INSTALLATION RESTORATION PROGRAM

1

STEWART AIR NATIONAL GUARD BASE

NEWBURGH, NEW YORK

SITE INSPECTION REPORT

HAZWRAP SUPPORT CONTRACTOR OFFICE
Oak Ridge, Tennessee 37831
Operated by MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-84OR21400

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VOLUME I

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NEWBURGH, NEW YORK

Prepared for:

HAZWRAP SUPPORT CONTRACTOR OFFICE
OAK RIDGE, TENNESSEE 37831

Operated by:

MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE
U.S. DEPARTMENT OF ENERGY

Prepared by:

E.C. JORDAN CO.
PORTLAND, MAINE

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SITE INSPECTION
STEWART AIR NATIONAL GUARD BASE

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GLOSSARY OF ACRONYMS

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ADDENDUM B - ANALYSIS OF PESTICIDE BURIAL SITE (PBS) CONTAMINATION AT STEWARD ANGB, NEWBURGH, NEW YORK

ADDENDUM C - LETTER REPORT - INITIAL SAMPLE ROUND AT STEWART AIR NATIONAL GUARD BASE (SANGB) NEAR THE PESTICIDES PIT BURIAL AREA

SITE INSPECTION
STEWART AIR NATIONAL GUARD BASE

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EXECUTIVE SUMMARY

This Site Inspection (SI) Report describes the field activities and presents and evaluates the resulting data for the Stewart/USAF Base landfill and adjacent former pesticide burial site at the Stewart Air National Guard Base (ANGB) in Newburgh, New York. This site is an inactive landfill that was used by the U.S. Air Force (USAF), and is now leased to the New York Air National Guard (NYANG) by the New York State Department of Transportation. The landfill was operated by the USAF from approximately 1963 to 1970, and was used for the disposal of domestic refuse from base housing and waste from food-dispensing facilities and aircraft maintenance operations on-base. From 1970 to 1982, the landfill was operated by the New York Metropolitan Transit Authority and a contingent from the U.S. Military Academy (USMA). Disposal operations at the landfill were discontinued in 1982. The abandoned pesticide disposal trench is located approximately 150 feet west of the inactive landfill. Material from the pit was excavated between April 27 and July 1, 1988, and the site brought back to grade.

As a part of a study for the U.S. Environmental Protection Agency (USEPA), in January 1984, NUS Corporation (NUS) made an evaluation of groundwater, surface water, soil, and sediment samples in the general vicinity and downgradient of the Stewart Air Force Base Landfill and the New Windsor Landfill. Based on this limited study, NUS concluded that surface water, stream sediment, and soils in the vicinity of the former landfill and pesticide burial site at Stewart ANGB and the inactive New Windsor Landfill contain several volatile organic compounds (VOCs) and pesticides, and that these compounds could potentially have an impact on surface water downgradient of the landfills.

Between September 1983 and March 1986, Dames and Moore conducted a series of test pit and monitoring well installation explorations of the former landfill and pesticide burial areas. These studies emphasized the pesticide disposal trench. Test pit excavations confirmed the presence of buried containers with various concentrations of pesticides and acids. The monitoring well installations indicated pesticide concentration at a depth of 45 feet and a distance of 30 feet downgradient from the disposal trench.

The ANG initiated an Installation Restoration Program (IRP) at the Stewart ANGB to identify and evaluate suspected problems associated with past hazardous waste disposal and spill sites. As a subcontractor to Martin Marietta Energy Systems, Inc. (MMES) Support Contractor Office, Oak Ridge, Tennessee, E.C. Jordan Co. (Jordan) of Portland, Maine, was assigned the task of acquiring site-specific data for the confirmation of contamination at the former landfill and the adjacent former pesticide burial site at Stewart ANGB. The data will be part of the information used by Jordan to develop and implement a Remedial Action Plan (RAP) and to prepare designs and specifications for site remediation, if required.

Jordan prepared and implemented a Work Plan in response to a Statement of Work issued under the IRP for the Stewart ANGB site. The investigation focused mainly on: (1) characterization of relevant geology and hydrogeology; (2) initial confirmation and quantification of contaminants; (3) identification of potential sources and receptors; and (4) determination of migration pathways. Subsurface explorations were conducted at 11 locations, with multiple piezometers installed in the test borings at each location. In addition, four monitoring wells were installed in separate borings at four of the exploration locations. One water sample and three soil/sediment samples were collected from surface locations. Eight soil samples were collected at depths ranging from 4 to 31 feet from eight of the subsurface explorations. Groundwater samples were collected once from each monitoring well. Samples (i.e., water and soil/sediment) were analyzed for inorganic compounds, VOCs, semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), organophosphorus pesticides, chlorinated herbicides, chloride, fluoride, sulfate, and pH.

Information from the subsurface explorations indicated a fairly uniform glacial till deposit over a shale bedrock. In general, the site is in a recharge area above a shallow groundwater system located in the till. The shallow portion of the bedrock aquifer beneath the site is confined by the glacial till. These local geologic data conform to the published regional geologic conditions. Groundwater information from the monitoring wells and piezometers, and permeability testing conducted in selected installations, was used to estimate hvdrogeologic parameters and characteristics of the till and bedrock. The glacial till has a low to moderate permeability with an average hydraulic conductivity calculated at 4.19×10^{-5} cm/sec. The hydraulic gradient in the vicinity of the former landfill and pesticide burial site is about 0.07 ft/ft, with an assumed effective porosity of approximately 0.2. Based on this, the average groundwater velocity is approximately 15 ft/yr. Vertical groundwater gradients between the bedrock and till are downward at most locations, ranging from 0.005 to 0.239. Groundwater flow in both the glacial till and bedrock is toward the east and southeast.

Results of previous chemical analysis of soil, sediment, groundwater, and surface water samples indicated that most site contamination is apparently related to migration of the chlorinated pesticide residues 2,4'-DDT; 4,4'-DDT; 4,4'-DDD; and 4,4'-DDE from the disposal area. In the immediate vicinity of the pesticide pit, Dames and Moore detected pesticide concentrations at low mg/kg levels in the soil and at µg/ℓ levels in the groundwater (Dames and Moore, 1985 and 1986). Migration of pesticide residues was confirmed at only one location by Jordan, in a ponded area approximately 450 feet northeast of the pit area, at concentrations of low mg/kg in the sediment and µg/ℓ in the surface water. Low levels of VOCs were identified in the groundwater immediately downgradient of the landfill. In general, based on the SI, it appears that there has not been substantial migration of compounds from the site and that potential for human contact with on-site soil, surface or groundwater is minimal.

Based on the results of this study, limited collection of additional surface soil/sediment samples are recommended both downgradient of the ponded area and on the surface of the landfill, particularly in the area downgradient of the former pesticide disposal pit. Additional sampling is recommended in the existing downgradient monitoring wells east of the landfill to verify the low contaminant concentrations detected in those wells.

1.0 INTRODUCTION

The ANG initiated an Installation Restoration Program (IRP) at the Stewart Air National Guard Base (ANGB) in the town of Newburgh, New York (Figure 1-1) to identify and evaluate suspected problems associated with past hazardous waste disposal and burial sites. As a subcontractor to MMES, E.C. Jordan Co. (Jordan) of Portland, Maine, initiated an SI to acquire site-specific data for the confirmation and quantification of environmental contamination at the former landfill and the adjacent pesticide burial site area at Stewart ANGB (Figure 1-2). The data will be part of the information used by Jordan to develop and implement a Remedial Investigation/Feasibility Study (RI/FS) and to prepare designs and specifications for implementing site remediation, if required.

This report summarizes the results of Task 2A(1) of the Phase II/IVA activities (Initial Site Investigation). It includes a review of background information; a description of the investigation program, including soil, groundwater, and surface water sampling; a hydrogeologic evaluation; preliminary contamination and risk assessments; and conclusions and recommendations.

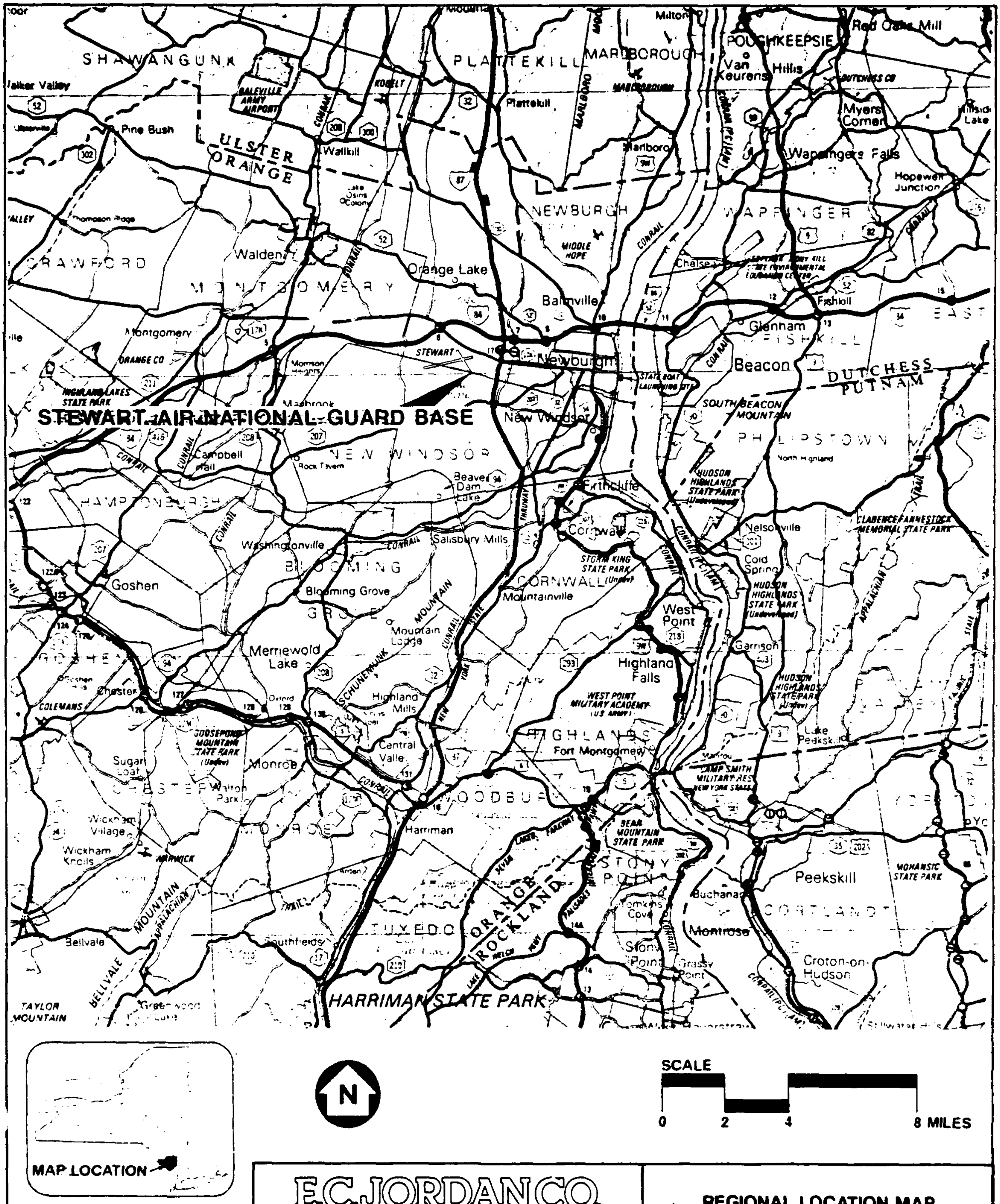
1.1 PURPOSE

The purpose of the Initial Site Investigation was to characterize the relevant geology and hydrogeology surrounding the former landfill and adjacent pesticide burial site; initiate confirmation and quantification of contaminants; identify potential sources and receptors; and determine migration patterns and rates. The site and study area are shown in Figure 1-3. Based on the hydrogeologic characterization and preliminary determination of the distribution and degree of contamination, Jordan will develop a detailed work plan for the Remedial Investigation (RI), to be submitted separately.

1.2 SCOPE

The scope of work required to fulfill the SI objectives consists of nine subtasks, described in the Stewart ANGB Task 1 Work Plan, and summarized as follows:

- Subtask 1 - Background Information Review
- Subtask 2 - Site Clearing
- Subtask 3 - Site Survey
- Subtask 4 - Geophysical Surveys
- Subtask 5 - Subsurface Exploration
- Subtask 6 - Sampling and Analytical Program
- Subtask 7 - Hydraulic Conductivity Determinations
- Subtask 8 - Site Inspection Report
- Subtask 9 - Remedial Investigation Work Plan



SOURCE: NEW YORK STATE ATLAS, N.Y. STATE D.O.T. 1980, ORANGE COUNTY, P.36

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REGIONAL LOCATION MAP

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE, N.Y.

SI

FIGURE 1-1

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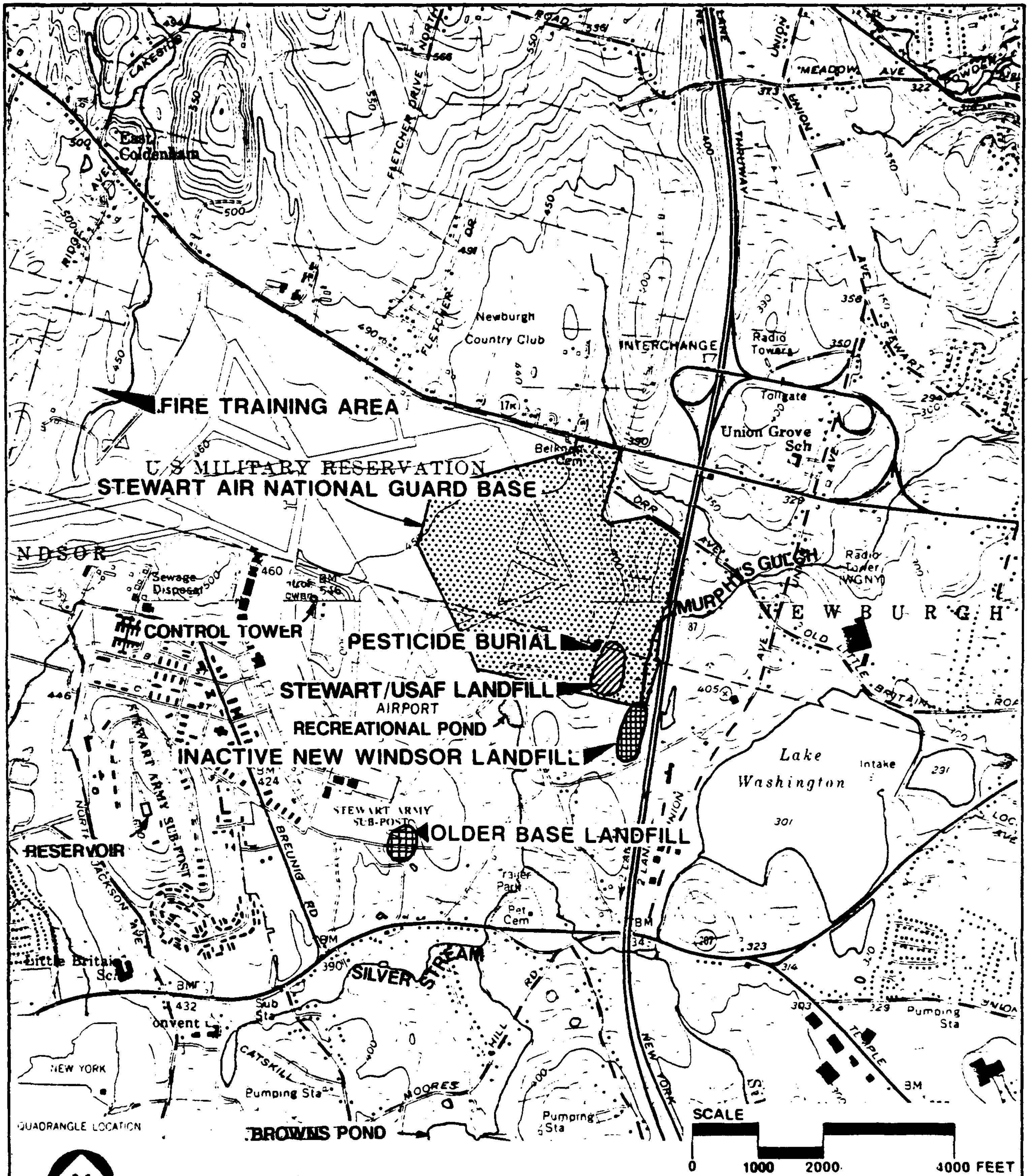

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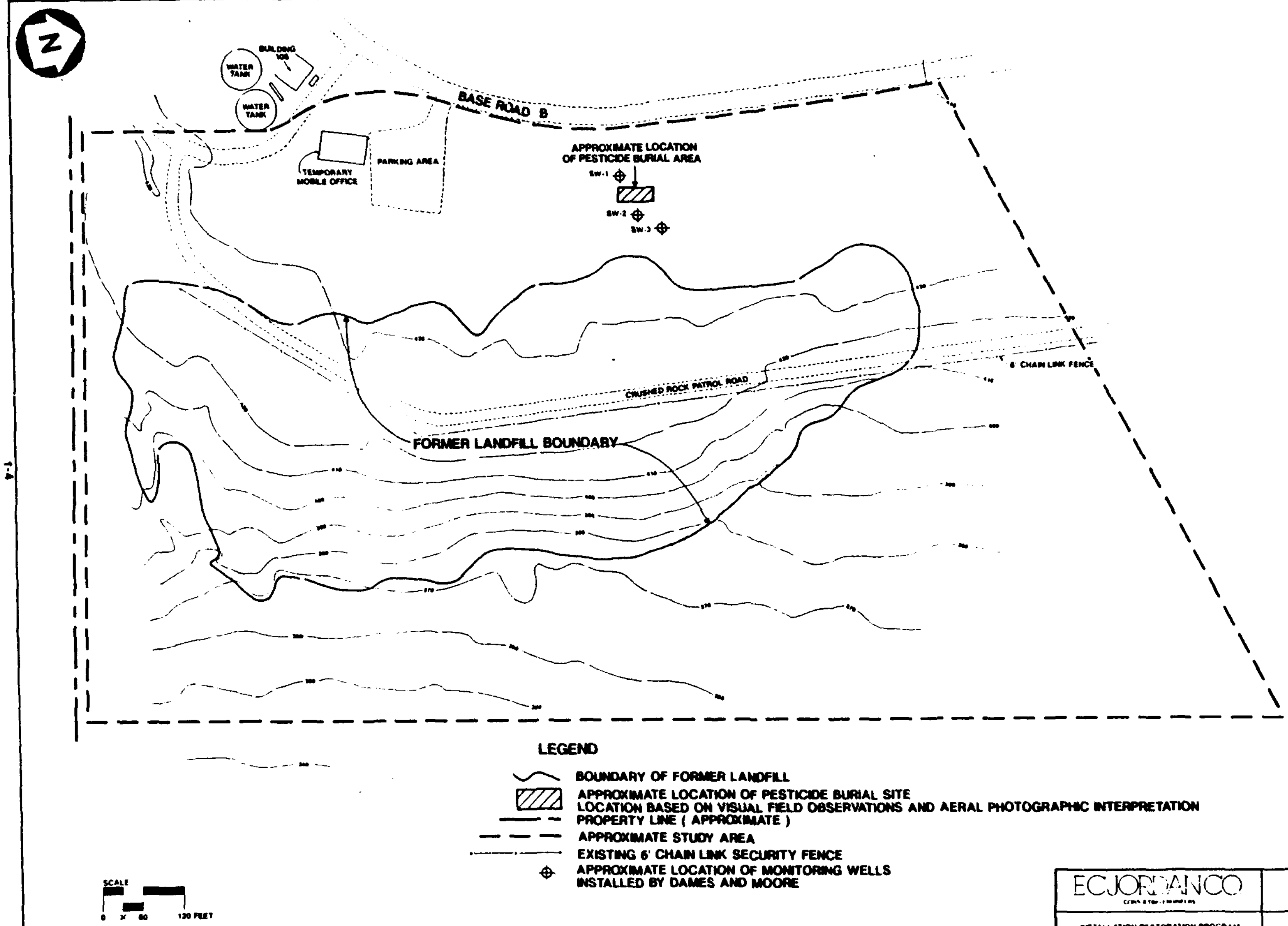
INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE, N.Y.

AREA LOCATION MAP

SI

FIGURE 1-2



ECJORDANCO	SITE PLAN	
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE, N.Y.	SI	FIGURE 1-3

1.3 PRIOR STUDIES AND INVESTIGATIONS

As part of a study for the U.S. Environmental Protection Agency (USEPA), in January 1984, NUS Corporation (NUS) made an evaluation of groundwater, surface water, soil, and sediment samples in the general area downgradient of the Stewart United States Air Force (USAF) Base Landfill and the New Windsor Landfill. Based on this limited investigation, NUS made the following general conclusions:

- The city of Newburgh's drinking water and water supply (Washington Lake) are free of hazardous substance contamination.

- Drinking water from private wells in the town of New Windsor in the vicinity of the Stewart/USAF Base landfill and adjacent pesticide burial site area and the New Windsor Landfill are free of hazardous substance contamination.

- Surface water and sediments from Silver Stream, from its tributary origin at Stewart Airport to its diversion into the southern end of Washington Lake, are essentially free of hazardous substance contamination. Surface water, stream sediment, and soils in the vicinity of the Stewart/USAF base landfill and adjacent pesticide burial site, and the New Windsor Landfill contain several volatile organic compounds (VOCs) and pesticides; these compounds may have an impact on Murphy's Gulch downstream of the landfills.

Between September 1983 and March 1986, Dames and Moore conducted a series of investigations at the Stewart/USAF base landfill and pesticide burial site. These studies emphasized the pesticide disposal trench. Test pit excavations confirmed the presence of buried containers with various concentrations of DDT, parathion, heptachlor, 2,4-D (2,4-dichlorophenoxy acetic acid), 2,4,5-T (2,4,5-trichlorophenoxy acetic acid), hydrofluoric acid, hydrochloric acid, and sulfuric acid. Soil and groundwater samples obtained from the installation of three monitoring wells (see Figure 1-3) close to the pesticide pit (under the direction of Dames and Moore) indicate pesticide contamination to a depth of at least 45 feet and at a distance of 30 feet from the disposal area. Boring logs and schematic monitoring well installation diagrams from the 1986 Dames and Moore - Step 2 Report are presented in Appendix H (Volume II). NYANG, under separate contract, has implemented actions for removal of the pesticides and acid containers and some contaminated soils in the immediate area of the pesticide burial pit.

2.0 PHYSICAL SETTING

The Stewart ANGB (part of the Stewart Airport Complex) is situated 2.5 miles west of the city of Newburgh, in the town of Newburgh, New York. The complex straddles the common border between the towns of Newburgh and New Windsor. The three municipalities are in Orange County, which is located on the western side of the Hudson River in the southeastern corner of New York State, approximately 35 miles northwest of New York City.

2.1 POPULATION CHARACTERISTICS

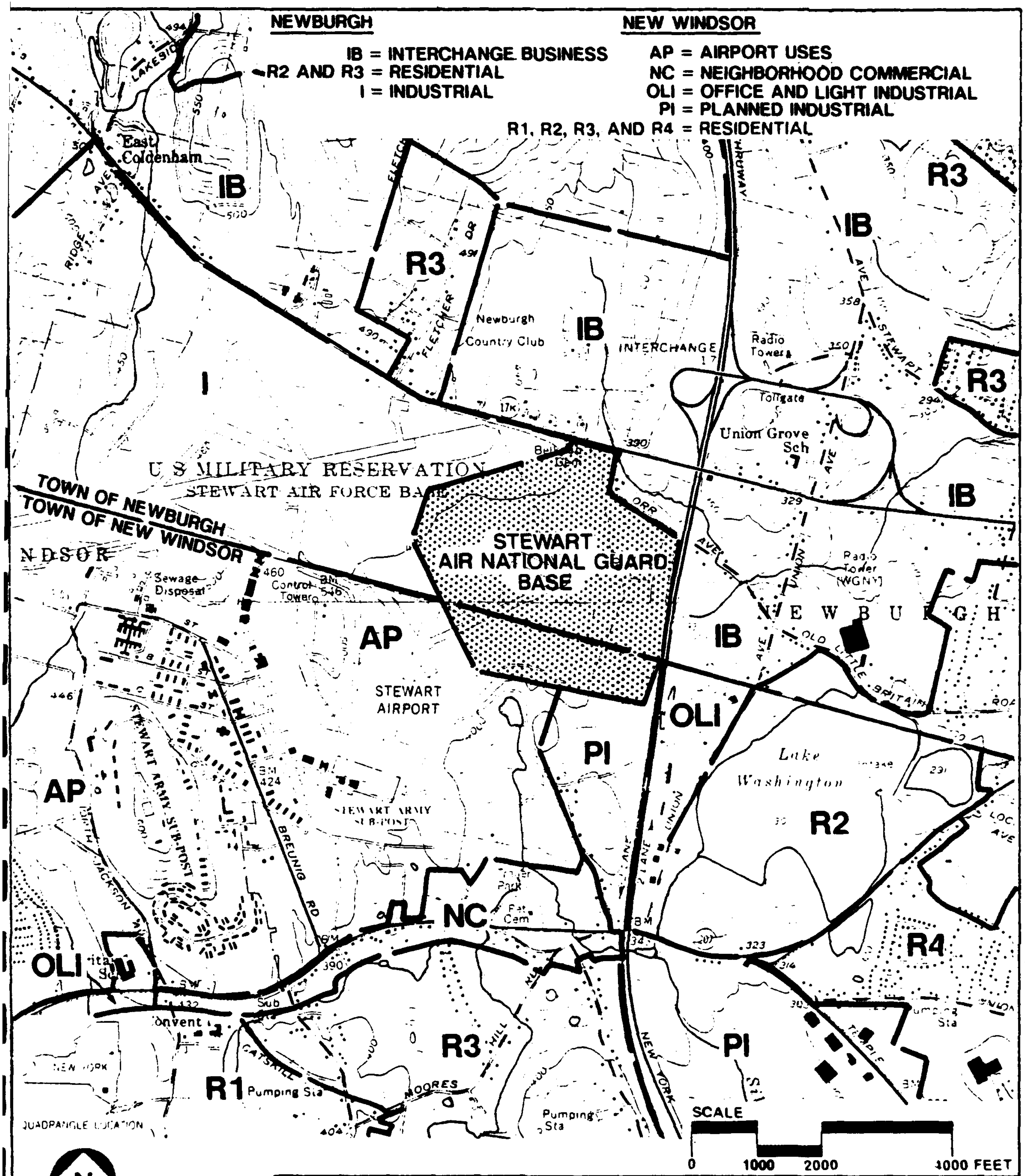
The city of Newburgh occupies approximately 4 square miles between the towns of Newburgh and New Windsor and the Hudson River. According to the 1980 Census, Orange County had a population of 260,000. The city of Newburgh, the town of Newburgh, and the town of New Windsor had populations of 23,400, 22,700, and 19,500, respectively.

2.2 LAND USE AND ZONING

The airport property consists of landing strips, taxiways, and support areas for the Stewart Airport Complex and the New York Air National Guard (NYANG). These facilities are zoned for Industrial (I) (town of Newburgh) and Airport (AP) (New Windsor) uses. Portions of the surrounding zoning plans for both towns are presented in Figure 2-1. In the town of Newburgh, the ANGB is bounded on the west and northwest by I zones, and on the north and east by Interchange Business (IB) zones. Some residential housing is scattered throughout the IB zone. In the town of New Windsor, the ANGB is bounded on south and southwest by AP zones, on the southeast by Planned Industrial (PI) zones, and to the east by Office and Light Industrial (OLI) zones. Residential housing is scattered throughout these zones.

2.3 NATURAL RESOURCES

The Newburgh area is located in an area of Chestnut, Chestnut Oak, and Poplar Forest types of the northeastern U.S. Prior to construction of the Stewart Airport, the complex area and land adjacent to the existing facility were heavily cleared for farming. Stonewalls, constructed during these activities, are still standing throughout the reforested, pasture, and cultivated areas. Orchards around the perimeter of the airport, clearly visible on 1963 and 1968 aerial photographs, have been nearly obliterated by perimeter activities (e.g., landfill development) and neglect. The former cleared areas immediately surrounding the Stewart/USAF base landfill on the Stewart ANGB property are in various stages of reforestation. East of the landfill, the regrowth consists in part of a nearly mature poplar stand with a high, well-developed canopy. North of this stand, the areas consist of a mixture of scrub growth and old pasture.



SOURCE: U.S.G.S. NEWBURGH AND CORNWALL, NEW YORK QUADRANGLES (1957) 7.5 MINUTE SERIES

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ZONING MAP

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE, N.Y.

SI

FIGURE 2-1

5139-01

Surface drainage at the Stewart/USAF base landfill flows principally to the east (see Figure 1-2). This surface water flows northeast along the western side of the New York State Thruway to a culvert, where it then turns eastward toward the Hudson River. This tributary to Quassaic Creek is known locally as Murphy's Gulch. The surface drainage flow in Murphy's Gulch west of the thruway, along the easternmost ANGB property line, has been partially restricted by vegetation and thruway embankment construction, causing ponding and increased growth of wetland vegetation. This surface water was formerly diverted to the city of Newburgh reservoir (Lake Washington). South of the former landfill, surface drainage is southward through the Recreational Pond to Silver Stream. In addition, surface water and stormwater runoff for part of the landing strips, taxiways, and support area is discharged in this same drainage area. Silver Stream is presently the major contributor to Lake Washington. Groundwater in the vicinity of the ANGB is used as a potable water supply by some nearby residences.

2.4 CLIMATOLOGY

Winters in Orange County are cold; summers are moderately warm with occasional hot spells. The climate in the area is classified as humid continental. The predominant year round winds are from the west. During the summer months the winds are generally from the west by southwest. The general direction of the wind during winter months is also from the west. As wind speeds increase the wind shifts to a west by northwest direction.

The number of days that had measurable amounts of rainfall varied slightly through the 12 months, ranging from 8 to 11 days per months. The monthly rainfalls were relatively constant during the summer months. The highest average monthly rainfall was 3.85 inches in May.

The number of days with measurable amounts of snowfall varied slightly during the middle to late winter months of December, January, February, and March, ranging from five to six days each month.

The average monthly snowfalls were highest in January and February with 12.2 inches and 12.7 inches, respectively. December and March, had average snowfalls of 9.3 inches and 10.6 inches, respectively. The months of November and April were low with regard to snowfalls, with average monthly snowfalls of 1.5 inches and 1.7 inches, respectively.

The climatological data is summarized in Table 2-1.

2.5 SITE PHYSIOGRAPHY AND DESCRIPTION

Orange County is 834 square miles in area. The county is part of the New England, the Valley and Ridge, and the Appalachian Plateau physiographic provinces (Figure 2-2) (Frimpter, 1972). Variations of bedrock lithology are responsible for the development of these distinct provinces. The southeastern portion of Orange County, known as the Hudson Highlands, lies in the New England Province. Altitudes range from near zero, at the Hudson River, to over

TABLE 2-1

SUMMARY OF TEMPERATURE AND PRECIPITATION DATA

MONTH	TEMPERATURE[1]		PRECIPITATION[2]								
	AVERAGE DAILY MAXIMUM (°F)	AVERAGE DAILY MINIMUM (°F)	AVERAGE MONTHLY RAINFALL (IN.)	GREATEST MONTHLY RAINFALL (IN.)	LEAST MONTHLY RAINFALL (IN.)	AVERAGE NO. OF DAYS WITH 0.10 INCH OR MORE (%)	AVERAGE MONTHLY SNOWFALL (IN.)	GREATEST MONTHLY SNOWFALL (IN.)	LEAST MONTHLY SNOWFALL (IN.)	AVERAGE NO. OF DAYS WITH 0.10 INCH OR MORE (%)
JANUARY	35.2	19.2	2.73	5.40	0.79	11	12.2	40.8	1.8	6
FEBRUARY	38.4	20.5	2.69	5.45	0.67	10	12.7	32.1	0.6	6
MARCH	47.1	28.7	3.13	6.34	0.80	11	10.6	36.4	0.0	5
APRIL	61.2	39.2	3.53	8.09	1.28	11	1.7	12.0	0.0	1
MAY	71.9	48.9	3.85	8.05	1.00	12	Trace[3]	Trace[3]	0.0	0
JUNE	81.5	58.5	3.42	6.29	0.74	10	0.0	0.0	0.0	0
JULY	86.3	63.5	3.59	9.21	0.75	10	0.0	0.0	0.0	0
AUGUST	84.2	61.9	3.72	14.94	1.17	9	0.0	0.0	0.0	0
SEPTEMBER	76.2	55.4	3.25	7.46	1.08	8	0.0	0.0	0.0	0
OCTOBER	65.0	44.9	3.20	14.12	0.02	8	Trace[3]	Trace[3]	0.0	0
NOVEMBER	51.0	35.1	3.73	7.12	0.92	11	1.5	7.4	0.0	1
DECEMBER	38.6	24.4	3.42	6.63	0.46	10	9.3	26.0	Trace[3]	5
YEAR	61.4	41.7	40.26	--	--	--	48.0	--	--	--

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[1] Recorded from 1951 to 1974 at West Point, New York
Source: Soil survey of Orange County, New York; U.S. Department of Agriculture, Soil Conservation Service, 1981.

[2] Data supplied by Stewart Air Force Base.

[3] *A trace of snowfall is considered to be less than 0.10 inch of accumulation.*

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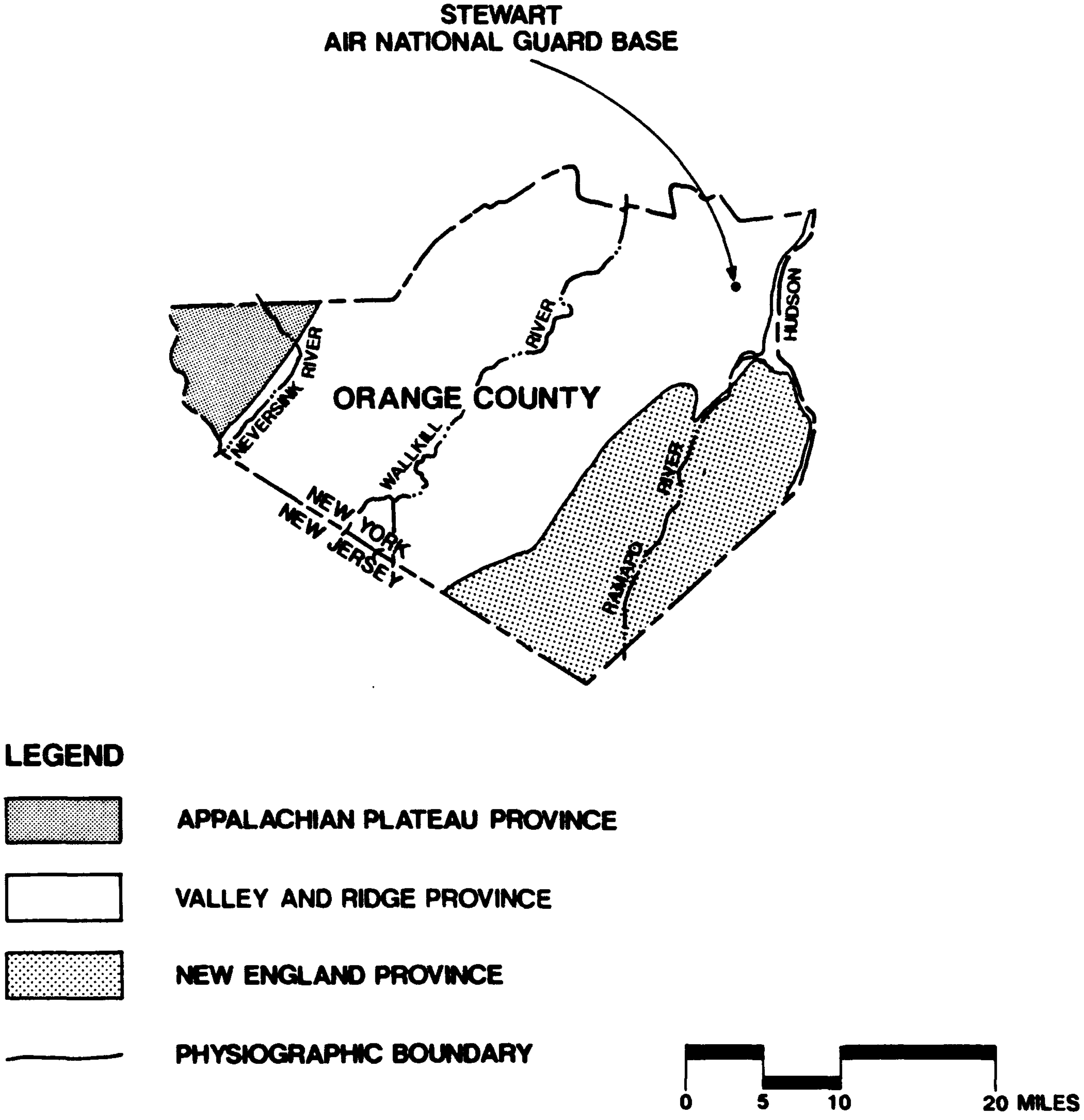

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E.C.JORDAN CO. CONSULTING ENGINEERS	PHYSIOGRAPHIC PROVINCES OF ORANGE COUNTY	
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE,N.Y.	SI	FIGURE 2-2

1,600 feet (National Geodetic Vertical Datum of 1929 [NGVD]). The central part of Orange County, which includes the Newburgh area and Stewart ANGB, is within the Hudson-Champlain Lowland of the Valley and Ridge Province and is characterized by a low, rolling relief. Much of this land has been cleared for farms and orchards. The western corner of the county is within the Appalachian Plateau, and is a generally rugged, forested area.

Immediately around the Stewart ANGB, the topography can be characterized as a gently to moderately rolling land surface. Hills and drainages are aligned in a regular north-south direction. Topographic relief ranges from an elevation of 301 feet (mean sea level [MSL]) at Lake Washington, to over 620 feet (NGVD) at the Army Sub Post reservoir, which is located approximately 4,000 feet southwest of the airport control tower (see Figure 1-2).

The former landfill is located on the southeastern portion of the base complex (see Figure 1-2) along the upper side slope of a drumlin deposit, which is one of several topographic features modified during construction of the air base (USGS, 1901). Existing drumlins are evident in the surrounding area. The landfill topography is subtle and generally blends into the natural area at the upper elevations. Due to the disposal activities, the eastern slope of the landfill is steeper than the natural topography. Household debris and demolition material are only partially covered and clearly visible at the base of the eastern slope. This area is covered by thick scrub brush and occasional scrubby trees.

The abandoned pesticide burial site is located west of and within approximately 100 feet of the former landfill. This site is at the same general surface elevation as the ANGB; no topographic expression identifies this area.

2.6 PAST SITE OPERATIONS

The former landfill was operated by the U.S. Air Force (USAF) from sometime after 1963 to 1970. It was reportedly used to dispose of domestic refuse from base housing and waste from food-dispensing facilities and aircraft maintenance operations on-base. From 1970 to 1982, the landfill was operated by the New York Metropolitan Transit Authority and a contingent from the U.S. Military Academy (USMA). Disposal operations at the landfill were discontinued in 1982. The land is now leased to the NYANG by the New York State Department of Transportation.

An abandoned pesticide disposal site is located approximately 100 feet west of the landfill (see Figure 1-3). Test pit excavations in April and May of 1984 confirmed the presence of buried containers. Analytical results indicate the presence of DDT, parathion, heptachlor, 2,4-D, 2,4,5-T, hydrochloric acid, hydrofluoric acid, and sulfuric acid.

An inactive disposal area, formerly known as the New Windsor Landfill, is located approximately 500 to 1,000 feet southeast of the former landfill and pesticide burial site (see Figure 1-2). A portion of the New Windsor Landfill appears to have encroached onto the NYANG property. This disposal area was closed by order of the Town Board of New Windsor and the New York State

Department of Environmental Conservation (NYSDEC). Orange colored leachate from this landfill can be observed flowing across the eastern edge of the Stewart ANGB property. This drainage eventually crosses under the thruway, continuing northeast to Brookside Pond which, in turn, drains into the Hudson River via Quassaic Creek.

3.0 BACKGROUND INFORMATION REVIEW

Jordan conducted a background search of available information to identify materials disposed of at the former landfill and pesticide burial site. This included available files at the base and interviews with current and former personnel familiar with site activities. In addition, personnel from the three water departments that supply water to residential and commercial users adjacent to the Stewart ANGB were interviewed. Aerial photographs, both current and historical, were examined to identify natural conditions and past landfill-related activities.

3.1 FILE SEARCH

A limited search was made for files associated with past military operations pertaining to disposal practices and the use of potential hazardous materials. Jordan was informed by Stewart ANGB personnel that USAF records were removed when the USAF left the facility. Jordan contacted the Air National Guard (ANG) Records Center in Washington, D.C., and was informed that, if records existed for Stewart, they were not on file at the center. In addition to the site background studies performed by others (see Section 1.3), Jordan reviewed some of the NYSDEC files pertaining to the inactive New Windsor Landfill.

3.2 PERSONNEL INTERVIEWS

Most information about the disposal of materials at this facility was obtained from independent verbal accounts provided by present and former base employees. The interview process was initiated by Jordan from a list provided by present ANG personnel, which was expanded upon. Twelve people were interviewed about the disposal of material from past and present activities associated with the base. Knowledge, from personnel experience, about these activities ranged from 1951 to the present. Affiliations at the interviewees included NYS Department of Transportation, NY Metropolitan Transit Authority, Lockhead Terminal, Inc., USAF, U.S. Army, U.S. Military Academy at West Point, and the present Base Fire Department.

In general, the most commonly received information identified more than one USAF landfill within the original base perimeter, and identified household trash and construction/demolition debris as the bulk of the material disposed of at the landfill on the present ANGB. Two contacts identified the potential disposal of solvents, while one contact made statements referring to pesticide containers and containers of paint, paint thinners, and oils disposed of at the landfills. The presence of drums with unknown contents were identified by three interviewees. However, it should be noted that some confusion appears to exist about which landfill received the material. A Fire Training Area (FTA) was also identified as a potential source of hazardous materials. The FTA is located approximately 2,000 feet northwest of the Stewart/USAF landfill, while the other base landfill is approximately 3,000 feet southwest (see Figure 1-2). Only one landfill (i.e., the present site under investigation) was identified on the Stewart ANGB property.

3.3 WATER SUPPLY AND DISTRIBUTION DATA

The three surrounding water departments were contacted to determine water supply sources and geographic distribution of the service areas adjacent to Stewart ANGB. Interviews were conducted with the Town of New Windsor Water Department, the City of Newburgh Water Department, and the Town of Newburgh Water Department.

The town of New Windsor water supply is the Catskill Aqueduct (i.e., the New York City water supply), with distribution along Union Avenue from Route 207 to the town line (Figure 3-1). No water is supplied to residential areas west of the thruway except for part of the Stewart Airport Complex, including the new line presently being completed to the NYANG facility. The city of Newburgh water supply is Lake Washington. The lake receives water from the surrounding watershed of Silver Stream upgradient from the diversion structure located near the corner of Route 203 and Union Avenue and Brown's Pond located in New Windsor. Murphy's Gulch (the drainage areas east and northeast of Stewart Airport Complex) formerly supplied water to Lake Washington by way of a diversion structure (i.e., Murphy's Gate) on Union Avenue. Murphy's Gate is presently closed due to potential contamination from the New Windsor Landfill and the former landfill at Stewart ANGB. The water resource from Brown's Pond is considered a back-up system to Lake Washington. The water from these sources is distributed to the city of Newburgh.

The water supply for the town of Newburgh is currently Chadwick Lake (3 miles north of Stewart ANGB). The Water Department plans to obtain water from the Delaware Aqueduct. The Water Department supplies water south along Union Avenue to the town line, west on Route 17K to the thruway. West of the thruway, the town of Newburgh also supplies water south along Lakeside Road to East Coldenham. Additional distribution is planned for the Fletcher Drive and Newburgh Country Club areas.

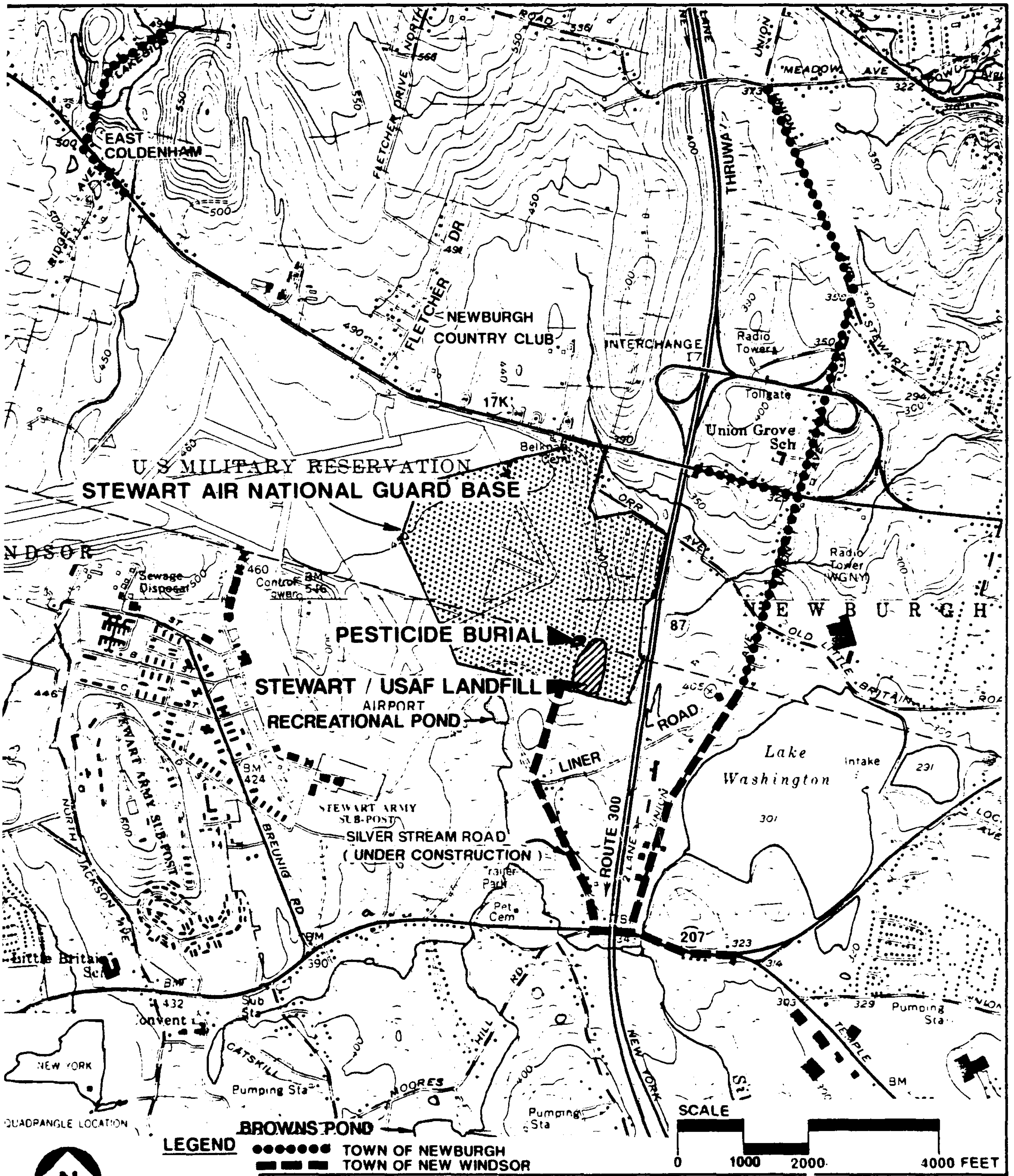
Residential areas around the Stewart Airport Complex not serviced by public water include:

- Route 17K, west of the thruway to East Coldenham
- Orr Avenue, west of Union Avenue and east of the thruway
- Liner Road, west of Union Avenue and east of the thruway
- Silver Stream and Liner Roads, from Route 207 to the thruway

It is assumed that these areas utilize groundwater as a potable water supply.

3.4 AERIAL PHOTOGRAPHY

Historical aerial photographs were reviewed at the Cornell Laboratory for Environmental Applications of Remote Sensing (CLEARS) library. Photographs of the base dated March 24, 1963; September 11, 1963; and March 27, 1968, were available at CLEARS. The 1963 photographs, at a scale of approximately 1 inch



SOURCE: U.S.G.S. NEWBURGH AND CORNWALL, NEW YORK QUADRANGLES (1957) 7.5 MINUTE SERIES

E.C. JORDAN CO. CONSULTING ENGINEERS	**SELECTED WATER DISTRIBUTION ROUTES**
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE, N.Y.	SI / **FIGURE 3-1**

139-01

equals 1,700 feet, clearly show no disposal activity at the Stewart/USAF landfill located on the Stewart ANGB property. However, the photographs do show landfill activity at the other base landfill, located southwest of the present facility. These photographs also show the initial stages of disposal activities at the New Windsor Landfill. The 1968 photographs, at a scale of approximately 1 inch equals 2,000 feet, show activity at all three landfill areas. At the Stewart/USAF Landfill (this study), the photographs clearly show a trench parallel to the southern property line, long piles of material running diagonally downslope toward the northeast, and a rectangular pit located adjacent to and west of the landfill. The location of the pit appears to coincide with the pesticide area identified in the Dames and Moore reports. The 1968 photographs show some activity continuing at the other base landfill and continued expansion of the New Windsor Landfill.

In addition, recent high altitude photographs taken in March 1984, as part of the National High Altitude Photography Program (NHAP), were reviewed. The photographs have an approximate scale of 1 inch equals 6,666 feet, and show no activity at either Stewart/USAF landfill; however, they do indicate that a portion of the inactive New Windsor Landfill has encroached onto the southeasternmost corner of the Stewart ANGB property.

4.0 SITE INSPECTION PROGRAM

Jordan developed the field investigation program to characterize the relevant geology and hydrogeology surrounding the former landfill and adjacent pesticide burial site, and to make a preliminary confirmation and quantification of the site contaminants in soils and groundwater at and downgradient of the site. This section describes the components of the Initial Site Investigation Program.

4.1 TECHNICAL APPROACH (WORK PLAN OVERVIEW)

In May 1987, Jordan completed the SI Work Plan as part of the IRP for the Stewart ANGB in Newburgh, New York. The Work Plan described the items necessary to: (1) identify the extent of the former landfill and adjacent pesticide burial site; (2) characterize the geology and hydrogeology; (3) make a preliminary confirmation of potential contamination; and (4) prepare a site inspection report of the activities, findings, and recommendations. The subtasks to complete this investigation consisted of a background information review, site clearing for access purposes, a site survey, geophysical surveys, subsurface explorations, a sampling and analytical program, and report preparation. Based on the hydrogeologic characterization and determination of the distribution and degree of contamination, Jordan has developed a detailed Work Plan for the RI/FS as part of the activities of the SI Work Plan, which will be submitted separately.

4.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or Relevant and Appropriate Requirements (ARARs) are federal and state public health and environmental requirements and guidelines that apply to hazardous waste site cleanup. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (or Superfund), the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP) require that all CERCLA-mandated hazardous waste site remedial actions comply with federal ARARs. SARA also requires attainment of state ARARs if they are more stringent than federal ARARs, are legally enforceable, and are consistently enforced statewide. ARARs are used to determine the appropriate extent of site cleanup, to scope and formulate remedial action alternatives, and to govern the implementation and operation of the selected action. Although the Stewart ANGB former landfill and pesticide burial site are not designated as Superfund sites and are not on the USEPA National Priority List (NPL), the identification of ARARs is useful to guide site investigation and evaluation work and future development of remedial action alternatives.

4.2.1 ARARs Definition

SARA defines ARARs as follows:

- Applicable Requirements are federal and state requirements that would be legally applicable, either directly or as incorporated by a federally authorized state program. Applicable requirements have jurisdiction over other requirements in a given situation. An example of an applicable requirement is the use of Maximum Contaminant Levels (MCLs) for a site where groundwater contamination is actually entering a public water supply.

- Relevant and Appropriate Requirements are federal and state requirements that, while not legally applicable, can be applied if, in the decision-maker's best professional judgement, site circumstances are similar to jurisdictionally covered situations and use of the requirement makes good sense. The term "relevant" is included so that requirements initially screened out as non-applicable because of jurisdictional restrictions can be reconsidered. For example, MCLs would be relevant and appropriate requirements for use at a site where groundwater contamination could effect a potential, as opposed to an actual, drinking water source, rather than an actual water supply. Relevant and appropriate requirements should be given the same weight for consideration as applicable requirements.

- Other Requirements to be Considered are federal and state nonregulatory requirements, such as guidance documents or criteria. Non-promulgated advisories or guidance documents do not have the status of potential ARARs. However, if there are no specific ARARs for a chemical or a situation, or if extant ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure public health and environmental protection.

4.2.2 ARARs Development

Under the description of ARARs set forth in the NCP and SARA, federal and state environmental requirements must be considered that are:

- chemical-specific (i.e., govern the extent of site cleanup)
- location-specific (i.e., pertain to existing site features)
- action-specific (i.e., pertain to proposed site remedies and govern implementation of the selected site remedy)

Chemical-specific ARARs govern the extent of site cleanup and provide either actual clean-up levels or a basis for calculating such levels. For instance, groundwater and surface water criteria and standards would provide necessary clean-up goals for the Stewart ANGB site. Chemical-specific ARARs would also be used to indicate acceptable levels of discharge to determine treatment and disposal requirements, and to assess the effectiveness of future remedial alternatives.

Location-specific ARARs govern natural site features (e.g., wetlands), as well as manmade features including existing landfills, disposal areas, and local historic buildings. Location-specific ARARs generally restrict concentrations of hazardous substances or the conduct of activities solely because of the site's particular characteristics or location. These ARARs provide a basis for assessing existing site conditions and subsequently aid in assessing potential remedies. At the Stewart ANGB site, for example, location-specific ARARs that pertain to adjacent wetland areas would be considered.

Action-specific ARARs are usually technology- or activity-based limitations that control actions at hazardous waste sites. As remedial alternatives are developed, action-specific ARARs pertaining to proposed site remedies provide a basis for assessing feasibility and effectiveness. For example, action-specific ARARs could include hazardous waste transportation and handling requirements, air and water emissions standards, groundwater monitoring, the Resource Conservation and Recovery Act (RCRA) landfilling and treatment requirements, and worker safety requirements.

4.2.3 ARARs Identification

Based on Jordan's initial understanding of the Stewart ANGB former landfill and pesticide burial site, Table 4-1 identifies characteristics and chemical contaminants found in the soil, surface water, groundwater, and potential chemical- and location-specific ARARs. Because of the potential for future and known drinking water sources, these ARARs will influence the hydrogeological sampling and analysis program in the site investigation by requiring consideration of drinking water standards contamination levels. The presence of Murphy's Gulch will also influence well placement to determine the presence or absence of contaminants in water potentially flowing from the landfill to the drainage area. These ARARs will continue to be reviewed and updated as site data are confirmed and quantified. Action-specific ARARs will be considered and developed as part of the RAP.

4.3 SURVEY AND BASE MAP PREPARATION

In accordance with Subtask 3, Jordan prepared a survey base map of the site and immediately adjacent areas for horizontal and vertical control. The vertical and horizontal components were surveyed to within ±0.1 and ±1.0 feet, respectively. The survey included key features of the site and exploration locations. A base map for the site is presented in Volume II of this report as Plate 1.

TABLE 4-1

POTENTIAL CHEMICAL-SPECIFIC AND LOCATION-SPECIFIC ARARs
STEWART ANGB, NEW YORK

MEDIA	POTENTIAL FEDERAL ARARs	POTENTIAL STATE ARARs	OTHER REQUIREMENTS TO BE CONSIDERED
Groundwater	* RCRA Subpart F Groundwater Protection Standards, Alternate Concentration Limits (ACLs)	* 6 NYCRR Part 703 - NYSDEC Groundwater Quality Regulation	Safe Drinking Water Act - Maximum Contaminant Level Goals (MCLGs)
	** Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	** Technical and Operations Guidance Series (TOGS)	Clean Water Act - Ambient Water Quality Criteria
		** State Sanitary Code, Part 5 - Drinking Water Supplies	Health Advisories (USEPA Office of Drinking Water)
		** Title 10 NYCRR Part 170 - Water Supplies	USEPA Risk Reference Doses (RfDs)
		** NYSDOH PWS 69 - Organic Chemical Action Steps for Drinking Water	USEPA Carcinogen Assessment Group Potency Factors
		** NYSDOH PWS 159 - Responding to Organic Chemical Concerns at Public Water Systems	Acceptable Intake - Chronic (AIC) and Subchronic (AIS) - USEPA Health Assessment Documents
			USEPA Office of Water Guidance - Water-related Fate of 129 Priority Pollutants (1979)
Surface Water/Wetlands	* NPDES Regulations (40 CFR 122, 125)	* 6 NYCRR - Parts 701, 702, 704 - Surface Water Quality Standards	Federal Ambient Water Quality Criteria (AWQC)
		* 6 NYCRR - Parts 750-757 - Implementation of NPDES Program in NYS	
		** Technical and Operations Guidance Series	
Soils/Sediment/Waste	* Toxic Substance Control Act - PCB Disposal Requirements (40 CFR Part 761)	* NYCRR - Part 371 Identification and Listing of Hazardous Waste (includes regulation of PCBs)	
	** Land Disposal Restrictions for Certain "California List" Hazardous Waste (40 CFR Part 260)		
Wetlands	** Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR 230 Section 40 (b)) for Wetlands	* NYCRR Parts 662-665 - Regulations for Freshwater Wetlands	Wetlands Executive Order (EO 11990)

TABLE 4-1 (continued)

MEDIA	POTENTIAL FEDERAL ARARs	POTENTIAL STATE ARARs	OTHER REQUIREMENTS TO BE CONSIDERED
	* Clean Water Act (CWA) - 40 CRF Part 404	* ECL Article 24 and Article 71, Title 23 - Freshwater Wetlands Act	
	** Fish and Wildlife Coordinations Act (16 U.S.C. 661)		
	* National Environmental Policy Act - 40 CFR Part 6		

* Applicable
** Relevant and Appropriate

5.0 GEOPHYSICAL INVESTIGATION

Jordan conducted a geophysical survey at the Stewart ANGB from July 14 to 16, 1987. The purpose of the survey was to define the limits of the base landfill and to delineate the presence, if any, of a conductive groundwater plume emanating and flowing in a direction hydraulically downgradient from the landfill. The landfill boundaries were mapped with a magnetometer, and conductive groundwater was delineated with a terrain conductivity meter. For this study, an EDA Instruments Omni Plus magnetometer with vertical gradiometer capability was used. A Geonics EM-31 Terrain Conductivity Meter was used for the plume-tracing activities.

5.1 MAGNETOMETER SURVEY

The magnetometer survey consisted of a series of traverses oriented in a direction approximately perpendicular to the presumed landfill boundary. Magnetometer measurements were referenced to a baseline laid out by the field party. Jordan personnel located the baseline by using a compass and cloth tape, referencing the baseline to known landmarks wherever possible. Measurements along individual traverses were 10 feet apart, and traverses were generally separated by 50 to 100 feet around the landfill perimeter. In the northeastern portion of the landfill, Jordan concluded that the boundary was adequately defined by topographic expression.

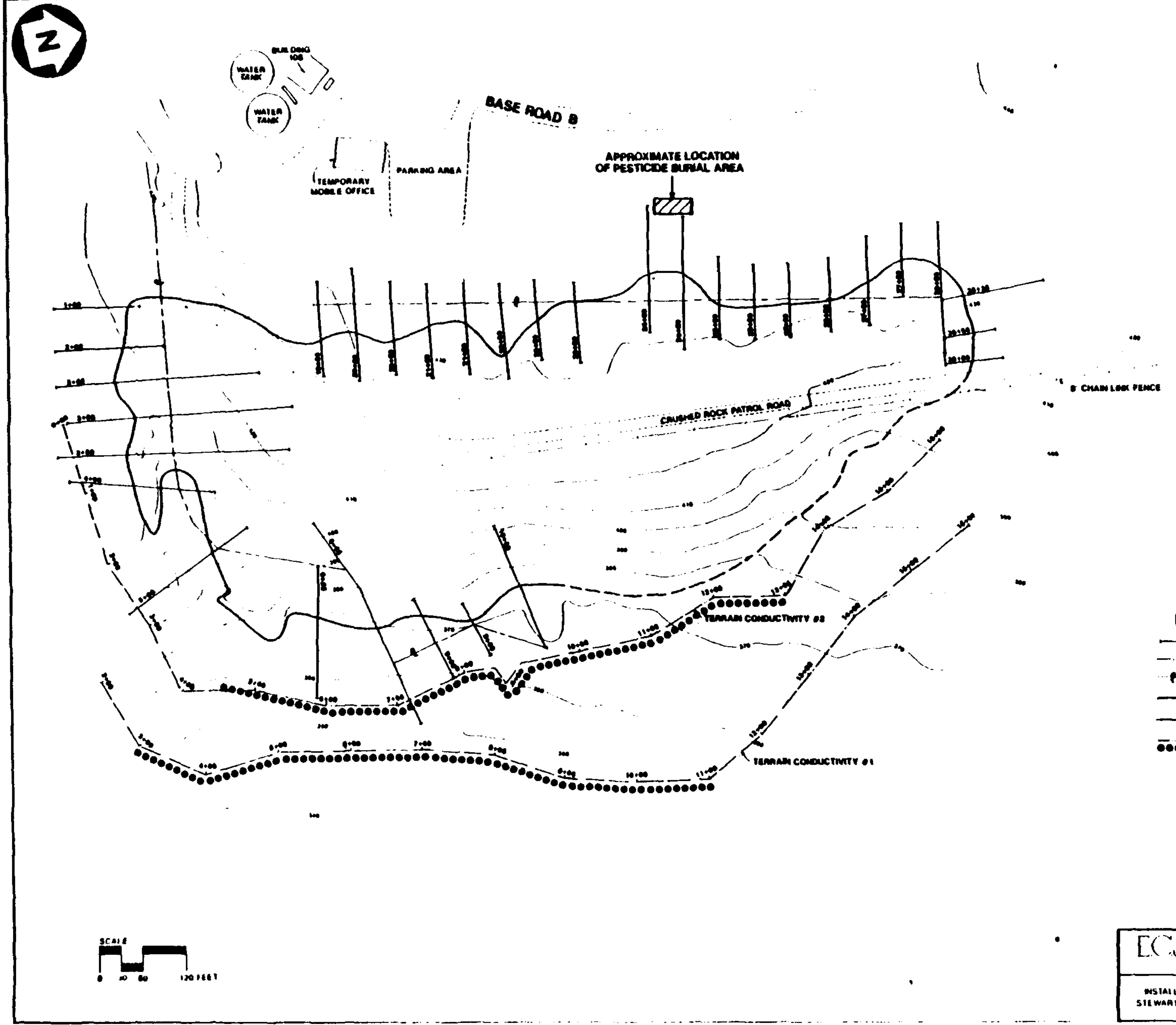
The magnetometer data were very sensitive to the presence of landfill refuse, because it generally contains enough ferrous material to create a significant magnetic disturbance. The interpreted position of the landfill perimeter and magnetometer survey traverses are shown in Figure 5-1. Appendix A (Volume II) explains the magnetic technique and presents the raw data used to interpret the landfill boundaries (see Figures A-2 through A-20).

5.2 TERRAIN CONDUCTIVITY SURVEY

The terrain conductivity survey consisted of two subparallel traverses. Line 1 is situated approximately 100 feet from the eastern toe of the landfill (hydraulically downgradient). Line 2 is approximately 200 feet away from the toe of the landfill. Measurements were taken at 20-foot intervals along each traverse. The approximate locations of the terrain conductivity survey traverses are shown in Figure 5-1.

The terrain conductivity data are presented in profile form in Volume II, Appendix A (see Figure A-21). The data units are expressed in millimhos per meter. Background values range from 3 to 5 millimhos per meter. Conductive subsurface conditions are indicated by values above background levels on Line 1 (Stations 500 to 1300) and Line 2 (Stations 300 to 1100).

The location of monitoring well JMW-108 was selected to coincide with the higher surface conductive condition observed between Stations 500 and 1300 on Line 1. The specific conductivity values measured in the downgradient



LEGEND

- MAGNETOMETER PROFILE LINE
- TERRAIN CONDUCTIVITY #1 AND #2
- BASE LINE
- BOUNDARY OF FORMER LANDFILL (BASED ON MAGNETOMETER SURVEY)
- BOUNDARY OF FORMER LANDFILL (BASED ON TOPOGRAPHY)
- ●●●●●●●● TERRAIN CONDUCTIVITY ABOVE BACKGROUND

E.C. JORDAN CO.	GEOPHYSICAL SURVEY TRAVERSE LOCATIONS	
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE, N.Y.	SI	FIGURE 5-1

monitoring wells vary from 697 to 1217 micromhos per centimeter in the vicinity of the terrain conductivity survey. These values are not high enough to suggest a correlation with the measured terrain conductivity values. Jordan therefore concludes that the elevated terrain conductivity values reflect the conductivity of surface soil as it is affected by surface water runoff from the landfill rather than deeper groundwater conditions.

6.0 SOILS

The interpretation of geologic conditions at the site is based on surface and subsurface explorations and existing geologic and previous site reports in the vicinity of the former landfill and pesticide burial site. The exploration program, surficial soils, geology, and sampling and analytical results are discussed in this section.

6.1 HAND SAMPLES AND BORINGS

Soil samples were collected by hand and from soil borings at the site to characterize geologic materials and to obtain samples for laboratory analysis. The following subsections describe these investigations. Figure 6-1 shows the hand sediment and test boring locations.

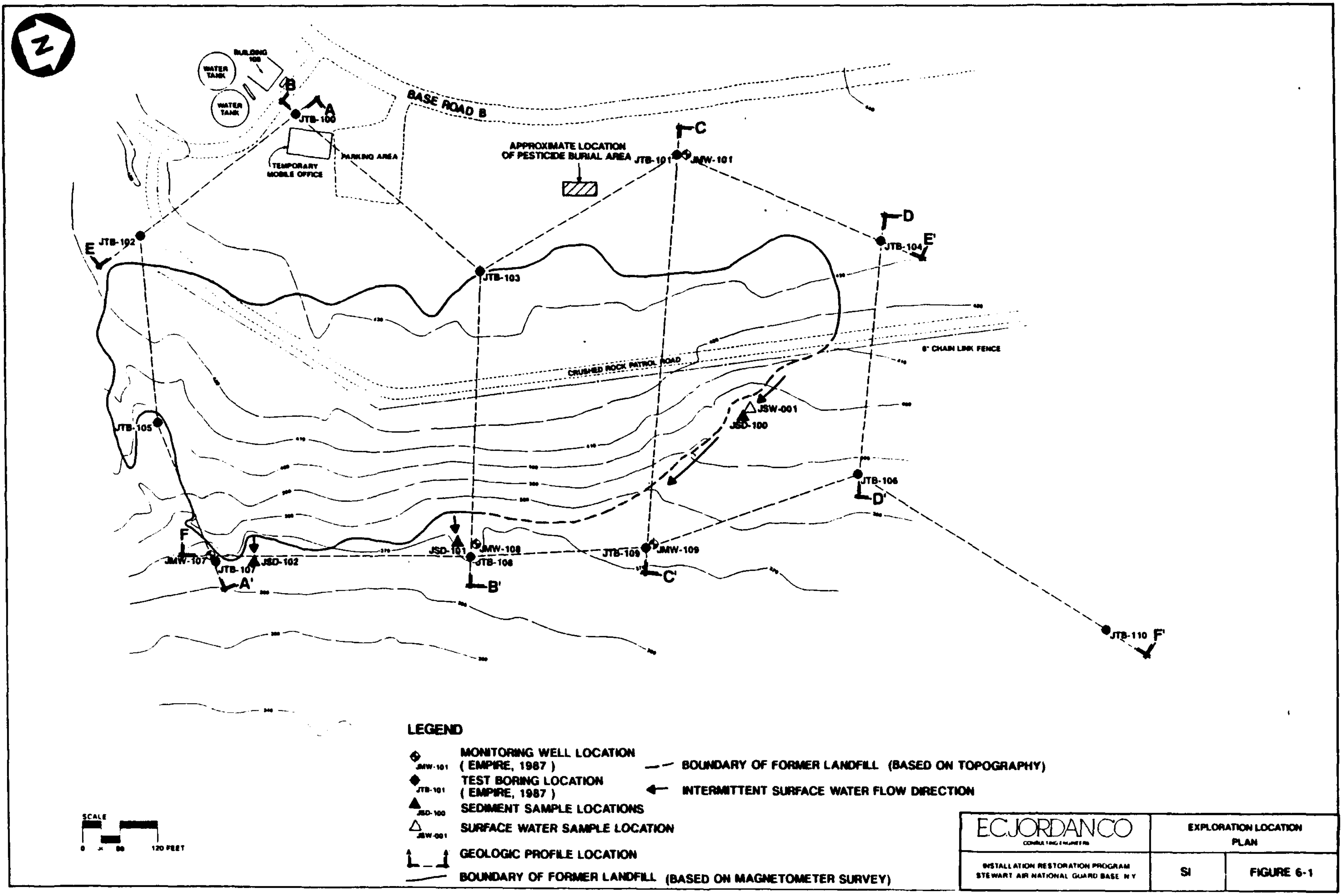
6.1.1 Hand Samples

Surface soil and sediment samples collected at three locations downgradient from the landfill area are designated JSD-100 through JSD-102. The samples, consisting of the 1- to 2-inch layer of sediment and soil, were collected with stainless steel laboratory spatulas. The spatulas were cleaned and sealed in plastic bags in the laboratory, prior to their use in the field investigation.

The JSD-100 soil/sediment samples were collected from a manmade water-filled swale at the northeastern corner of the landfill (see Figure 6-1). This soil/sediment consisted primarily of a soft, gray and brown, colloidal silt-like material in approximately 4 to 6 inches of water. Because of the availability of what appeared to be a homogeneous material, this sample site was used to collect the duplicate, replicate, matrix spike, and matrix duplicate spike samples. Sample locations JSD-101 and JSD-102 (see Figure 6-1) were selected based on visual indications of intermittent seepage flow immediately downgradient from the toe of the landfill. No surface water was present at these locations when the samples were collected. At both locations, the loose forest litter was removed prior to sample collection. Both samples consisted of an olive-brown clayey silt with a trace of fine gravel and organics.

6.1.2 Borings

Eleven test borings (JTB-100 through JTB-110) were completed at the Stewart ANGB site using either 4.25-inch ID, hollow-stem augers or 4-inch ID, flush-jointed spun casings in soil and weathered rock (see Figure 6-1). Borings were completed to bedrock using an NX-size core barrel or roller bit. Split-spoon soil samples were collected at 5-foot intervals to characterize the geology and subsurface contamination at the sites. Split-spoon samples were scanned with a photoionization (PI) meter during sample collection activities to determine whether VOCs were present. Soil samples were logged according to geologic characteristics, soil classification, and other observations (see Volume II, Appendix B). Four split-spoon samples were selected from the 11 test borings for chemical analysis. Drilling data for the test borings and installation of monitoring wells and piezometers are summarized in Appendix B-3 (Volume II).


N
WATER TANK
WATER TANK
BUILDING 100
B
A
JTB-100
TEMPORARY MOBILE OFFICE
PARKING AREA
BASE ROAD B
APPROXIMATE LOCATION OF PESTICIDE BURIAL AREA
C
JTB-101
JMW-101
D
JTB-104
E'
E
JTB-102
JTB-103
CRUSHED ROCK PATROL ROAD
6' CHAIN LINK FENCE
JSW-001
JSD-100
JTB-105
JTB-106
D'
F
JMW-107
JTB-107
JSD-102
A'
JSD-101
JMW-108
JTB-108
B'
JTB-109
JMW-109
C'
JTB-110
F'
LEGEND
JMW-101 MONITORING WELL LOCATION (EMPIRE, 1987)
JTB-101 TEST BORING LOCATION (EMPIRE, 1987)
JSD-100 SEDIMENT SAMPLE LOCATIONS
JSW-001 SURFACE WATER SAMPLE LOCATION
GEOLOGIC PROFILE LOCATION
BOUNDARY OF FORMER LANDFILL (BASED ON MAGNETOMETER SURVEY)
BOUNDARY OF FORMER LANDFILL (BASED ON TOPOGRAPHY)
INTERMITTENT SURFACE WATER FLOW DIRECTION
SCALE
0
30
60
120 FEET
E.C.JORDAN CO
CONSULTING ENGINEERS
INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE N Y
EXPLORATION LOCATION PLAN
SI
FIGURE 6-1

Split spoons were decontaminated between each sample to prevent cross-contamination, according to procedures in the Jordan Corporate Quality Assurance Project Plan (QAPP) prepared for the IRP project.

6.2 SOILS

The general soil unit in the Stewart ANGB area is the Mardin-Erie (USDA-SCS, 1981). This unit, formed on upland glacial till deposits, consists of gently sloping and sloping, deep, moderately well-drained and somewhat poorly drained, medium textured soils. Extensive modification of the soil and topography has occurred in the developed areas at the Stewart ANGB facility. The airfield and runways were constructed primarily by cut and fill of the existing on-site materials. These glacial till materials, originally deposited as drumloidal hills with crest elevations of slightly over 500 feet, were cut to an approximate 450-foot elevation (MSL).

The soils at lower elevations, such as the eastern side of the Stewart ANGB property along the thruway, consist of Alden silt loam, a poorly drained glacial till soil capped or mixed with local colluvial material.

6.3 GEOLOGY

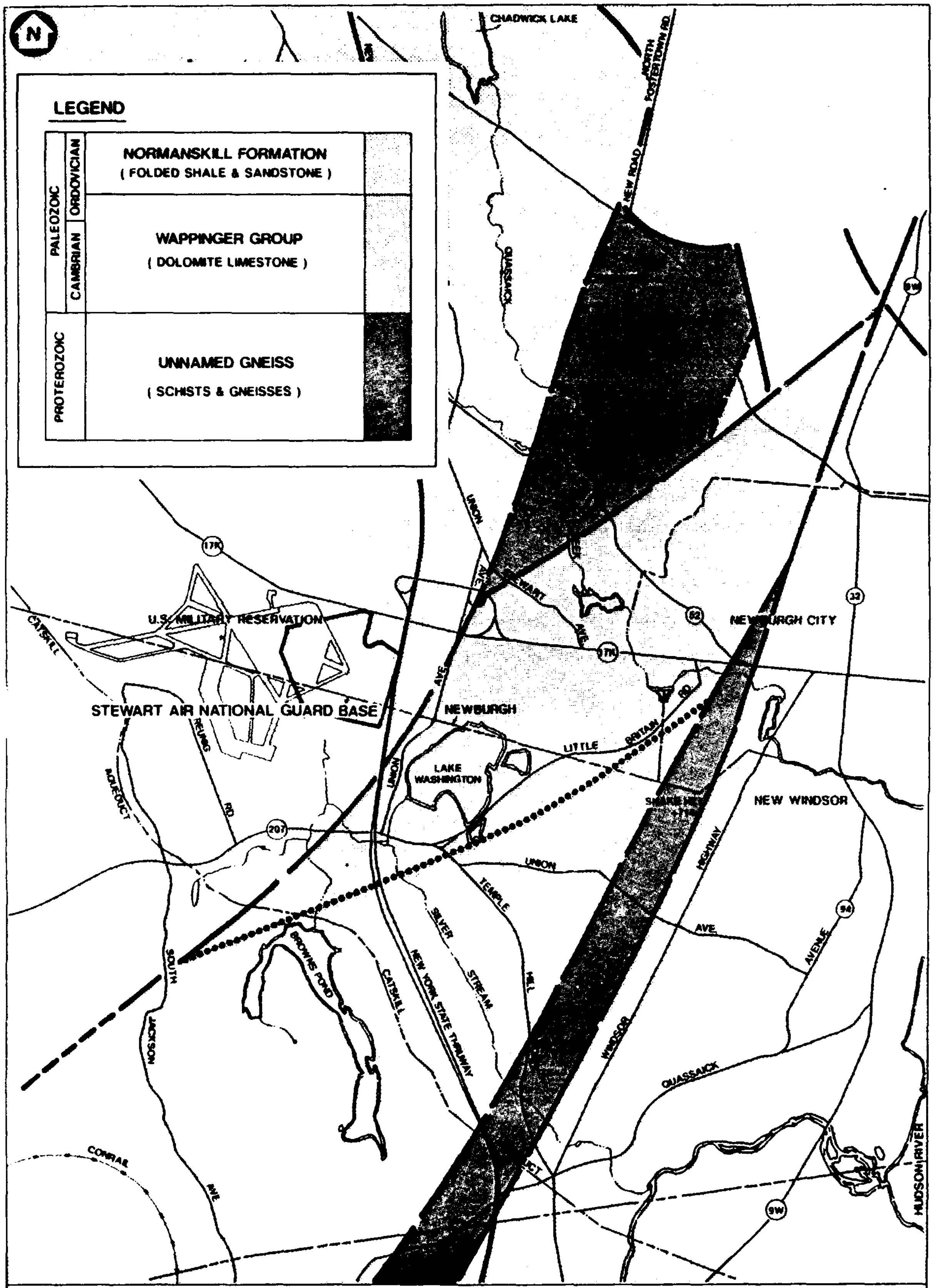
The interpretation of the regional and local geologic conditions at the site is based on subsurface investigations, reconnaissance of the area, and published geologic literature.

6.3.1 Regional Geology

The regional geology in the area around Newburgh is relatively simple. A large portion of the Hudson-Champlain Valley is underlain by alternating layers of slaty and soft shales. These shales, originally identified by Holywasser (1926) as the Hudson River Formation, comprise the youngest unit in the area. The Hudson River Formation is presently known and mapped as the Normanskill Formation (Figure 6-2) (Fisher, 1970). Isoclinal folding is evident throughout much of the formation, with the long axis trending slightly east of north. The folds are overturned toward the west. Within rocks of this group, a slaty cleavage is evident at about 30 degrees to the bedding planes. Most beds dip steeply to the east (Holywasser, 1926).

Cronomer Hill, northwest of the city of Newburgh, and Snake Hill, southwest of the city, consist of Pre-Cambrian gneiss and schist. Holywasser describes this as a klippe; that is, an erosional remnant of Pre-Cambrian rocks from the Hudson Highlands (Holywasser, 1926). A very thin Cambrian age conglomeratic quartzite, not shown on Figure 6-2, overlies the gneiss and is, in turn, conformably overlain by a gray limestone known as the Wappinger Limestone. A combination of thrust and gravity faults separate these lithological units.

Pleistocene (glacial) deposits consisting primarily of gravel and sand, boulders, clays, and lacustrine material overlie the bedrock. These materials are extremely varied in thickness and texture.



LEGEND

●●●●● CONTACT

▬ FAULT (DASHED WHERE INFERRED)

SCALE

0 2,000 4,000 8,000 FEET

SOURCE: U.S.G.S. QUADRANGLES, NEWBURGH, N.Y., 1957 AND CORNWALL, N.Y., 1957 AND FISHER et. al. 1970

E.C. JORDAN CO. CONSULTING ENGINEERS	GEOLOGY OF THE NEWBURGH, N.Y. AREA	
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE, N.Y.	SI	FIGURE 6-2

6.3.2 Local Geology

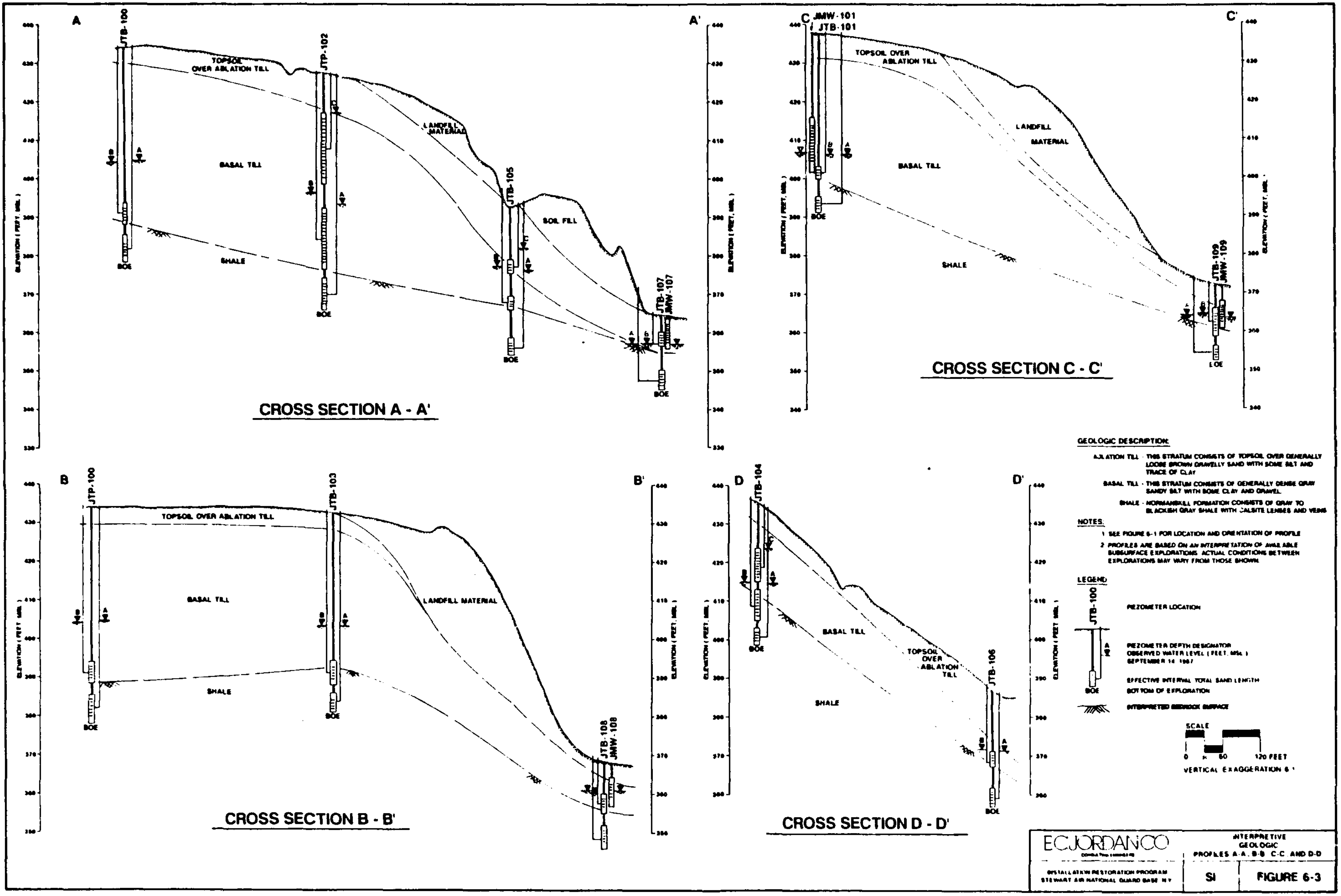
The bedrock underlying the site is part of the Normanskill Formation. These rocks consist of thinly laminated, gray to blackish gray shale with calcite lenses and veins. The rocks appear to be highly fractured in the upper portions (zero to 10 feet deep). The deeper shale formation appears to be very competent, based on low water yields encountered in a deep groundwater production well recently drilled (1987) to support the Stewart ANGB construction. In general, the bedding was observed to have a dip angle of approximately 45 degrees from vertical. One rock core (JTB-110) exhibited bedding dips of approximately 70 degrees from vertical. Most of the observed fractures and core breaks were parallel and subparallel to the bedding surfaces. Weathering is slight to moderate along natural fracture faces. Minor inclusions of calcite were observed in JMW-106 and JMW-101. The transition from soil to competent unweathered bedrock is gradual, ranging from approximately 5 to 10 feet thick. The soil stratum and competent bedrock surface are depicted on the subsurface profiles (Figures 6-3 and 6-4). The depth of landfill material shown on the Interpretive Geologic Profiles is inferred from the general topography and the excavation identified on aerial photographs (see Section 3.4). In general, the bedrock surface slopes southeast and east from a bedrock high at JTB-104.

The surficial material overlying bedrock consists primarily of poorly sorted and well-graded glacial tills. In general, a brown weathered till overlies a deeper unweathered gray till. Finer stratified sand and silt materials were encountered at the surface on the lower elevations, downslope from the landfill. The materials appear to represent either a slope wash deposit or a thin stratum of lacustrine material. Because this deposit is relatively thin and discontinuous, it is not shown as a separate stratigraphic unit on the subsurface profiles or boring logs.

Results from 12 grain-size analyses performed on the till indicate a well-graded material with a fine fraction (i.e., percent by dry weight passing the U.S. No. 200 sieve), of between 25 and 46 percent and 43 and 55 percent for the brown weathered till and the gray unweathered till, respectively. Both the stratified sand and silt stratum and the highly weathered portion of the bedrock exhibited a slight bimodal grain-size distribution. Grain-size distribution curves are presented in Appendix C (Volume II).

6.4 SOIL SAMPLING

As part of the SI activities, 11 soil samples were collected from separate locations for chemical analyses. Three samples (i.e., JSD1000101, JSD1010101, and JSD1020101) were taken from the surface soil from selected locations downslope of the landfill. Four subsurface soils samples (i.e., JMW1013101, JMW1070401, JMW1080701, and JMW1090501) were collected from each of the four monitoring well borings from a depth within the effective screened interval. Sample JMW1070401 was also selected because the adjacent exploration sample (i.e., JTB1070401) presented the only PI meter reading above background observed during the investigation. The other four analytical samples (i.e., JTB1021201, JTB1030501, JTB1050701, and JTB1060501) were selected to evaluate



GEOLOGIC DESCRIPTION:

ABLATION TILL - THIS STRATUM CONSISTS OF TOPSOIL OVER GENERALLY LOOSE BROWN GRAVELLY SAND WITH SOME SILT AND TRACE OF CLAY

BASAL TILL - THIS STRATUM CONSISTS OF GENERALLY DENSE GRAY SANDY SILT WITH SOME CLAY AND GRAVEL

SHALE - NORMANSKILL FORMATION CONSISTS OF GRAY TO BLACKISH GRAY SHALE WITH CALSITE LENSES AND VEINS

NOTES:

1 SEE FIGURE 6-1 FOR LOCATION AND ORIENTATION OF PROFILE

2 PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.

LEGEND

PIEZOMETER LOCATION

PIEZOMETER DEPTH DESIGNATOR

OBSERVED WATER LEVEL (FEET, MSL) SEPTEMBER 14 1987

EFFECTIVE INTERVAL TOTAL SAND LENGTH

BOTTOM OF EXPLORATION

INTERPRETED BEDROCK SURFACE

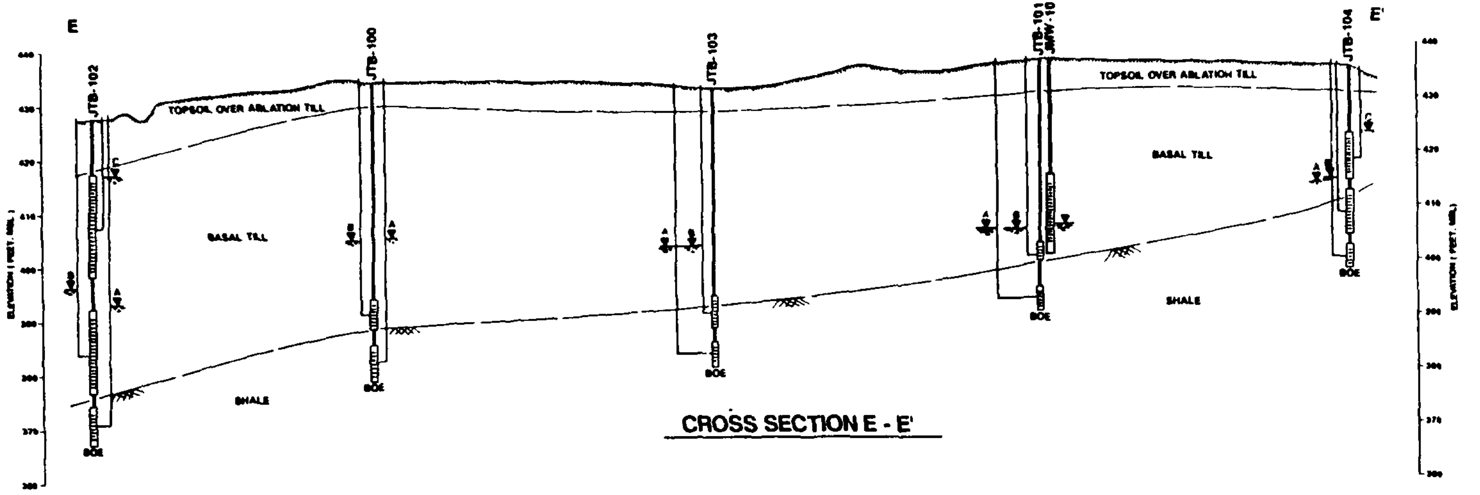
E.C. JORDAN CO.

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE N.Y.

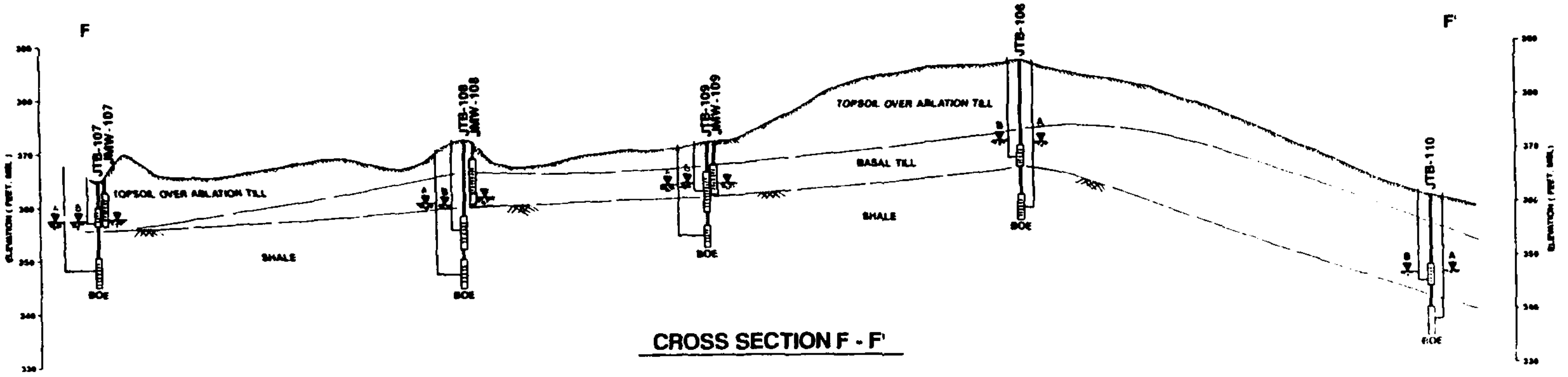
INTERPRETIVE
GEOLOGIC
PROFILES A-A', B-B', C-C' AND D-D'

SI

FIGURE 6-3



CROSS SECTION E - E'



CROSS SECTION F - F'

GEOLOGIC DESCRIPTION:

ABLATION TILL - THIS STRATUM CONSISTS OF TOPSOIL OVER GENERALLY LOOSE BROWN GRAVELLY SAND WITH SOME SILT AND TRACE OF CLAY

BASAL TILL - THIS STRATUM CONSISTS OF GENERALLY DENSE GRAY SANDY SILT WITH SOME CLAY AND GRAVEL

SHALE - NORMANSKILL FORMATION CONSISTS OF GRAY TO BLACKISH GRAY SHALE WITH CALSITE LENSES AND VEINS

NOTES

1 SEE FIGURE 6-1 FOR LOCATION AND ORIENTATION OF PROFILE

2 PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN

LEGEND

JTB-110	PIEZOMETER LOCATION
A	PIEZOMETER DEPTH DESIGNATOR
	OBSERVED WATER LEVEL (FEET, MSL) SEPTEMBER 14 1987
	EFFECTIVE INTERVAL TOTAL SAND LENGTH
BOE	BOTTOM OF EXPLORATION
	INTERPRETED BEDROCK SURFACE

SCALE
0 60 120 FEET
VERTICAL EXAGGERATION 6:1

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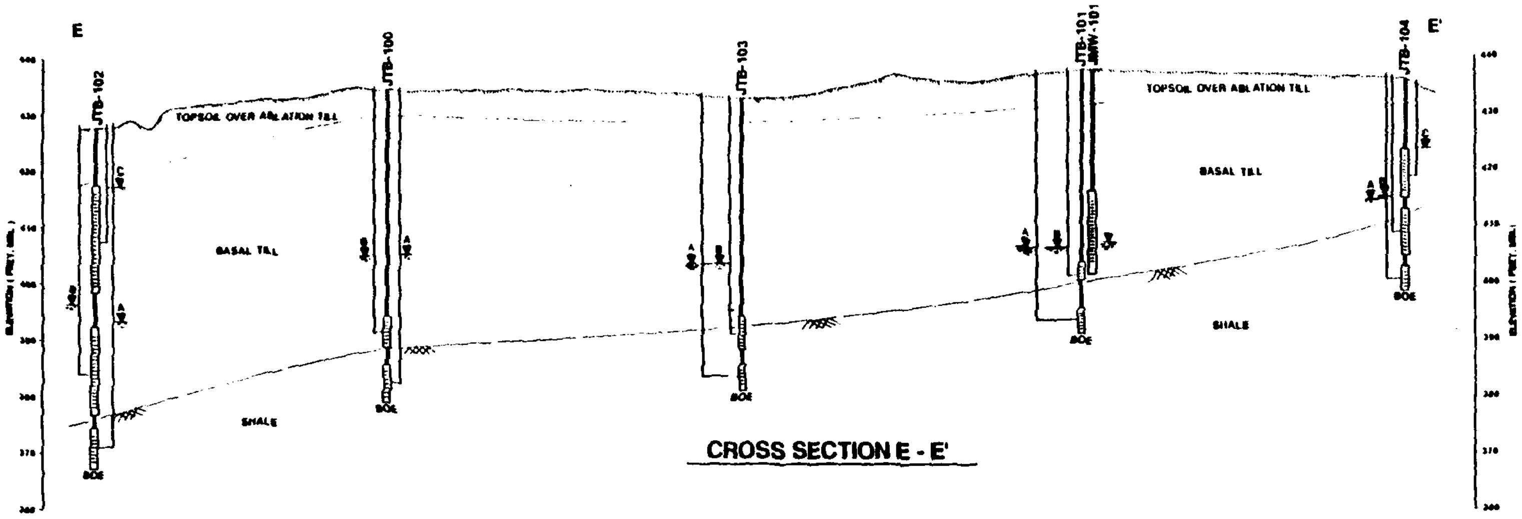
INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE, N.Y

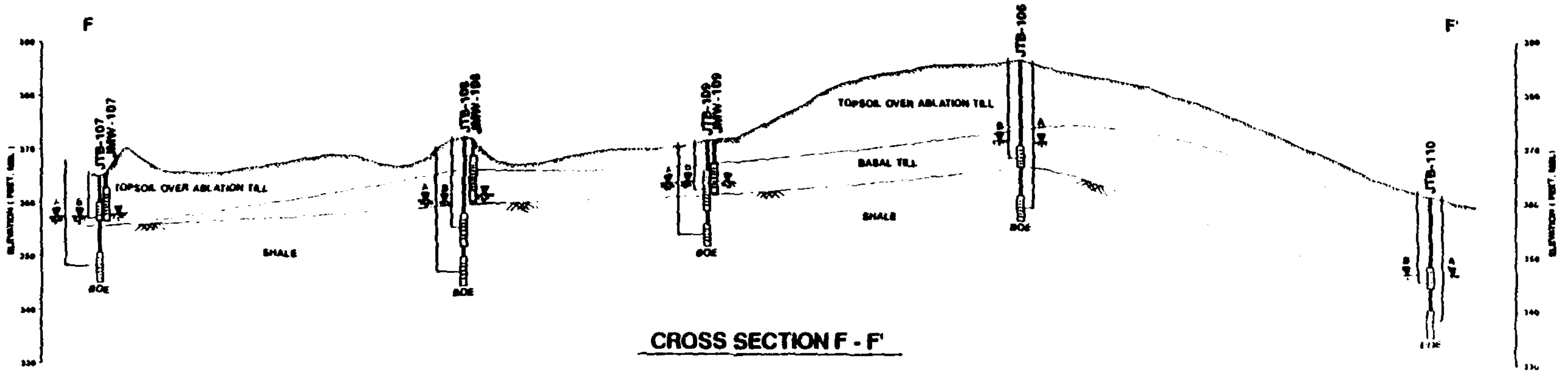
INTERPRETIVE
GEOLOGIC
PROFILES E-E' AND F-F'

SI

FIGURE 6-4



CROSS SECTION E - E'



CROSS SECTION F - F'

GEOLOGIC DESCRIPTION

ABLATION TILL - THIS STRATUM CONSISTS OF TOPSOIL OVER GENERALLY LOOSE BROWN GRAVELLY SAND WITH SOME SILT AND TRACE OF CLAY

BASAL TILL THIS STRATUM CONSISTS OF GENERALLY DENSE GRAY SANDY SILT WITH SOME CLAY AND GRAVEL

SHALE NORMANSKILL FORMATION CONSISTS OF GRAY TO BLACKISH GRAY SHALE WITH CALCITE LENSES AND VEINS

NOTES

1 SEE FIGURE 6-1 FOR LOCATION AND ORIENTATION OF PROFILE

2 PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN

LEGEND

PIEZOMETER LOCATION

PIEZOMETER DEPTH DESIGNATOR
OBSERVED WATER LEVEL (FEET, MSL)
SEPTEMBER 14 1983

EFFECTIVE INTERVAL TOTAL SAND LENGTH
BOTTOM OF EXPLORATION

INTERPRETED BEDROCK SURFACE

E.C. JORDAN CO.
CONSULTING ENGINEERS

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE, N.Y.

INTERPRETIVE
GEOLOGIC
PROFILES E-E' AND F-F'

SI

FIGURE 6-4

aerial distribution of contaminants and to sample a range of stratigraphic characteristics. Analytical results are discussed in the following section and summarized in Table 6-1.

6.5 RESULTS OF SOIL/SEDIMENT ANALYSES

Each surface and subsurface soil sample was analyzed for the metals, VOCs, semivolatile organic compounds (SVOCs), organophosphate and chlorinated pesticides, herbicides, and polychlorinated biphenyls (PCBs) contained on the USEPA Hazardous Substance List (HSL). In addition, samples were analyzed for the chloride, fluoride, and sulfate anions, and measured for soil pH. Analyses were performed for the CERCLA-SARA USEPA National Contract Laboratory Program (CLP), Caucus Organics Protocol (CLP-COP) or Caucus Inorganics Protocol (CLP-CIP), as appropriate. VOCs and SVOCs were analyzed by Gas Chromatography/Mass Spectrometry (GC/MS), except for organophosphate and chlorinated pesticides, herbicides, and PCBs, which were analyzed by GC only. Metals were analyzed by atomic absorption and plasma emission spectrometry, and anions were characterized by wet chemical methods.

The complete data base, as presented in Volume II, Appendix E, includes positive results, data qualification flags, sample identification number explanation, and results of equipment decontamination (sampler) blanks, trip blanks, and replicate quality control samples. Appendix E (Volume II) also defines each type of data qualifier. Results for the three surface environmental sediment/soil samples and eight subsurface environmental soil samples are summarized in Table 6-1. Data presented in Table 6-1 represent quantifiable results based on review of detection limits, field blanks, laboratory method blanks, and other data qualifiers. Specific qualification of results based on the data review are highlighted in the following discussions of each analyte group.

In general, however, the following conventions were followed in reporting the results. First, results of analysis in which the chemical/element was observed at a level less than the contract required detection limit (CRDL) are not presented in Table 6-1 as quantitative values. Such low concentrations are below levels for which the method has been judged to provide a reliable estimate of concentration but that sufficient analyte appears to be present to identify the compound. In Appendix E, such values are qualified with a "J" flag representing an estimated value for organics, or the symbol "[ ]" for an inorganic result equal to or greater than the Instrument Detection Limit (IDL) but less than the CRDL.

Secondly, positive results occurring in method blanks were assessed and the field results were corrected as appropriate (in accordance with CLP procedures) to adjust for contamination introduced during handling. This type of blank contamination is frequently observed in GC/MS analyses at trace levels for chemicals such as phthalate esters, which are ubiquitous wherever plastic equipment is used, or other common volatile laboratory reagent chemicals, such as acetone, toluene, and methylene chloride.

Blank contamination occurs as a laboratory artifact due to the presence of solvents in the laboratory atmosphere, during decontamination of equipment, or from contact with plasticizers. For such common contaminants observed in the method blanks, CLP guidelines indicate that the detection limit should be revised to a value 10 times the observed contamination level. Much less frequently, blanks have been observed to be contaminated by other HSL or non-HSL chemicals. For these chemicals, the guidelines indicate a revision of the detection limit by a factor of 5 times the observed value.

6.5.1 Inorganic Chemicals

Results of metals analyses indicate that the major cation constituents of soil (i.e., calcium, magnesium, aluminum, and iron) were present in surface and subsurface soils at levels typical of unconsolidated sediment matrices, and that other metals (i.e., arsenic, cadmium, chromium, lead, mercury, and zinc) were found at low to sub-mg/kg levels. Beryllium was detected in several samples but below the CRDL (see Volume II, Appendix E). None of the metals were observed to exceed concentrations normally associated with background soil values. Ranges cited by two authors for cation/metal content of soil (mg/kg) are as follows:

	Lindsay (1979)	Swain (1955)
Arsenic	0.1 - 40	Not Given
Beryllium	Not Given	3 - 40
Cadmium	0.01 - 7	0.01 - 7
Chromium	1 - 3000	5 - 1000
Copper	2 - 100	2 - 100
Lead	2 - 200	2 - 200
Mercury	0.01 - 0.50	0.02 - 0.2
Nickel	5 - 1000	10 - 1000
Zinc	10 - 300	10 - 300
Barium	100 - 3000	Not Given
Iron	7000 - 500,000	50,000 - 300,000
Manganese	20 - 3000	200 - 2000
Vanadium	Not Given	20 - 500
Aluminum	10,000 - 300,000	Not Given
Magnesium	600 - 6000	Not Given
Calcium	7000 - 550,000	Not Given
Potassium	400 - 30,000	Not Given

Sulfate concentration and pH were elevated in soil samples from JMW-101 and JTB-102. The pH was also elevated in JMW-108 soil samples.

6.5.2 Organic Chemicals

No VOCs were observed at concentrations greater than the CRDL in either the subsurface or surface soil/sediments. As shown in Appendix E (Volume II), methylene chloride and acetone were observed in method blanks as well as in several samples, but at different levels, which suggests that the observed occurrence is an artifact of sample handling or laboratory analysis. Benzene was also identified in two samples (i.e., JMW-107 and JSD-100 MSD) at levels below the CRDL of 5 ug/kg (see Volume II, Appendix E). This analyte was also identified in the method blank at 1.5 ug/kg. Sample JSD-100 MSD was one of four replicates at sediment/soil sampling location JSD-100. Benzene was not identified in the other three replicates for that sample. In JMW-107 soil, the benzene concentration reported was 1.7 µg/kg, which is equivalent to the blank level. Although benzene is a carcinogen, its appearance in the blanks at levels similar to the two samples and its distribution in only one of four replicates indicate that its occurrence is not an environmental contaminant, but rather an artifact of the sampling and analysis process.

Chloroform was identified below the CRDL in five of the eight subsurface soil samples and in one soil/sediment sample replicate (JSD-100 MSD) from sediment sample location JSD-100. Toluene was detected below the CRDL in JTB-103. Both analytes are common sample handling artifacts; however, no evidence of method blank contamination was observed. Three locations where these contaminants were observed are below the land surface hydraulically upgradient of the landfill.

Three phthalate esters (i.e., diethyl phthalate, bis(2-ethylhexyl)phthalate [BEHP], and di-n-butyl phthalate) were identified in the subsurface soil samples, as well as the surface soil/sediment (see Volume II, Appendix E). BEHP and diethyl phthalate were identified in the laboratory method blanks. None of the values tabulated in Appendix E (Volume II) are greater than the CRDL, as modified to account for blank contamination. Di-n-butylphthalate was not observed in samples at greater than 25 percent of the CRDL. Because of these factors, the phthalate esters are not included in Table 6-1. Phthalate esters are common artifacts of sample handling due to their widespread use as plasticizers and occurrence on sample handling and protective equipment. Because of the sporadic identification of these analytes in the environmental samples and their occurrence in method and sample blanks, their presence in the soil as contaminants is questionable.

Polynuclear aromatic hydrocarbons (PAHs) were observed at one surface soil/ sediment sample location (JSD-101, at the toe of the landfill), but not in the subsurface or other sediment sampling locations. Five PAH species (listed in Table 6-1) were identified and quantified in JSD-101. Concentrations of the species quantified ranged from 450 to 620 µg/kg; the CRDL is 330 µg/kg. An additional five species were identified at this location but at levels lower than the CRDL: acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, and chrysene. PAHs are multi-ringed aromatic compounds that generally result from the incomplete combustion of hydrocarbons, in coal, or the weathering of petroleum products. PAHs are widely distributed in soils as a result of deposition of unburned combustion products, vehicle exhaust, and the natural consequence of wildfires. In general, such distribution results in the sporadic occurrence of numerous species of PAHs at levels less than 1,000 to 5,000 µg/kg. Higher concentrations of PAHs occur as a result of contamination due to wastes from activities such as coke manufacture, creosote, ash disposal, and coal tar.

TABLE 6-1
Summary of Soil Chemical Analysis
Stewart Air National Guard Base

ECJ LOCATION ID		JMW-101	JMW-107	JMW-108	JMW-109	JTB-102	JTB-103	JTB-105	JTB-106
ECJ SAMPLE ID		JMW1013101	JMW1070401	JMW1080701	JMW1090501	JTB1021201	JTB1030501	JTB1050701	JTB1060501
COMPUCHEM ID		145827	144191	144768	145249	145960	146673	145545	144195
DATE SAMPLED		8/10/87	8/01/87	8/04/87	8/06/87	8/11/87	8/13/87	8/07/87	8/01/87
DEPTH(ft)		31	4	7	5	12	5	7	5
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
INORGANIC COMPOUNDS (mg/kg)	DETECTION LIMIT								
ARSENIC	2	3.4 N	-	2.3 N	-	3.1 N	-	NA	2.5 N
CADMIUM	1	-	-	-	-	-	-	NA	1.4
CHROMIUM	2	11	11	11	12	11	11	NA	24
COPPER	5	25 E	6.7	20	24 E	27 E	28 E	NA	6.7
LEAD	1	9.5 N	9.6 N	8 N	20	7 N	9.2 N	NA	14 N
MERCURY	0.02	-	-	0.13 N	0.11 N	0.12 N	-	NA	-
NICKEL	8	13	11	12	17	-	16	NA	12
ZINC	4	117	54	-	-	-	-	NA	48
BARIUM	40	52	-	-	-	-	-	NA	41
IRON	20	18800	17700	17800	21400	19400	18500	NA	18100
MANGANESE	3	790	594	504	999	471	575	NA	595
VANADIUM	10	12	-	-	14	12	12	NA	12
ALUMINUM	40	8140	7810	7510	9220	8190	7940	NA	7950
MAGNESIUM	100	5830 E	3370 E	3250	3820 E	6150 E	4070 E	NA	3470 E
CALCIUM	100	30900	1800	2120	2490	25500	28300	NA	4690
POTASSIUM	100	-	883	-	-	-	-	NA	837
PCBs(ug/kg)									
AROCLOR-1254	160	210	-	-	-	210	-	-	-
pH, SULFATE, CHLORIDE, FLUORIDE (mg/kg)									
pH		9.3	7.5	8	7.2	9.2	8.9	7.7	6.9
SULFATE		1100	-	-	-	590	-	66	-
FLUORIDE		-	0.44	3.5	1.8	-	-	-	0.29
CHLORIDE		39	-	25	-	40	14	21	-
PERCENT SOLIDS		87	87	90	88	90	89	93	84

E = INDICATES A VALUE ESTIMATED DUE TO THE PRESENCE OF INTERFERENCE.
N = INDICATES SPIKE SAMPLE RECOVERY IS NOT WITHIN CONTROL LIMITS.
- = ANALYZED FOR BUT NOT DETECTED.
NA = NOT ANALYZED (INSUFFICIENT SAMPLE VOLUME)

TABLE 6-1 con't.
Summary of Soil Chemical Analysis
Stewart Air National Guard Base

ECJ LOCATION ID		JSD-100	JSD-100	JSD-100	JSD-100	JSD-101	JSD-102
ECJ SAMPLE ID		JDUP01XX01	JSD1000101	JSD100MSD	JSD100MSD1	JSD1010101	JSD1020101
COMPUCHEM ID		144007	144003	144009	144017	144005	144006
DATE SAMPLED		7/30/87	7/30/87	7/30/87	7/30/87	7/30/87	7/30/87
DEPTH(ft)		0	1	0	0	1	1
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
INORGANIC COMPOUNDS (mg/kg)	DETECTION LIMIT						
ARSENIC	2	3.4 N	3.9 N	4.4 SN	4.3 N	3 N	-
CADMIUM	1	3.6	-	3.7	-	-	2.9
CHROMIUM	2	16	21	15	18	11	8.7
COPPER	5	-	44	-	40	-	-
LEAD	1	22 N	27 N	28 N	24 N	24 N	29 N
MERCURY	0.02	-	-	-	-	-	0.26 N
NICKEL	8	17	20	16	21	15	-
ZINC	4	81	104	78	98	59	43
BARIUM	40	75	86	72	82	-	-
IRON	20	24800	32600	23700	30500	15900	9650
MANGANESE	3	1020	1190	987	1070	2310	282
VANADIUM	10	17	22	17	21	15	-
ALUMINUM	40	12800	15600	12000	15000	7370	6400
MAGNESIUM	100	5310 E	6520 E	5080 E	6130 E	2880 E	1990 E
CALCIUM	100	7250	9060	7620	7820	3430	3980
SEMI-VOLATILE ORGANIC COMPOUNDS (ug/kg)							
BENZO(A)PYRENE	330	-	-	-	-	260	-
BENZO(B)FLUORANTHENE	330	-	-	-	-	450	-
FLUORANTHENE	330	-	-	-	-	450	-
PHENANTHRENE	330	-	-	-	-	620	-
PYRENE	330	-	-	-	-	500	-
	330	-	-	-	-	540	-
PESTICIDES(ug/kg)							
4,4'-DDT	16	2300	2300 C	3100 C	2800	-	-
4,4'-DDE	16	190	180	230	230	-	-
4,4'DDD	16	170	-	130	120	-	-
pH, SULFATE, CHLORIDE, FLUORIDE (ug/kg)							
pH		7.7	7.8	7.7	7.9	7.5	7.4
FLUORIDE		1.4	1.4	1.7	1.7	0.6	0.67
CHLORIDE		7.3	20	21	13	-	-
PERCENT SOLIDS		64	56	61	59	78	74

E = INDICATES A VALUE ESTIMATED DUE TO THE PRESENCE OF INTERFERENCE.
N = INDICATES SPIKE SAMPLE RECOVERY IS NOT WITHIN CONTROL LIMITS.
- = ANALYZED FOR BUT NOT DETECTED.

Two subsurface soil samples (i.e., JMW-101 at 31 feet and JTB-102 at 12 feet) contained PCBs, identified as Aroclor-1254, at concentration levels just above the CRDL. Review of the chromatographic results and quality control data indicated that the analyte was accurately identified and quantified. PCBs are generally associated with the disposal of transformer oil. These compounds are extremely insoluble and tend not to migrate in soils as a result of leaching. Their presence at depths greater than 10 feet in two borings, located far from a likely source and upgradient of the landfill, is difficult to explain based on the behavior of PCBs in the environment.

The pesticide residues 4,4-DDT, 4,4-DDE, and 4-DDE were identified in each of four replicate samples from the sediments of the small shallow pond location JSD-100. The compounds 4,4-DDT and 4,4-DDE generally occur as transformation products or impurities in the pesticide DDT. As shown in Table 6-1, two of the four results were confirmed by GC/MS analysis. The location of JSD-100 is in the surface drainage pathway downslope from the pesticide burial pit. The presence of these compounds in the sediments indicates present or past migration, most likely via transport of contaminated soil particles. Chlorinated pesticide residues such as DDT, DDE, and DDD are strongly sorbed to particulate matter and have a very low water solubility. DDT was identified in the surface water at the JSW-100 sample location (see Section 8.3) and in the pesticide burial site. Except in the immediate area of the pesticide pit, no DDT or transformation products were identified at any other soil sample locations or in the groundwater. Pesticides associated with the pesticide pit are discussed in Section 10.0.

7.0 GROUNDWATER

Characterization of the site hydrogeologic conditions and groundwater quality is designed to: (1) evaluate groundwater movement in the strata beneath the site, and (2) identify pathways for contaminant migration in groundwater. The interpretation of groundwater conditions is based on water level observations in monitoring wells and piezometers installed at the site, geology, and permeability data. Assessment of the site groundwater quality is based on water quality determinations from the monitoring wells screened in the glacial till. The exploration program, hydrogeological conditions, and sampling and analytical results are discussed in this section.

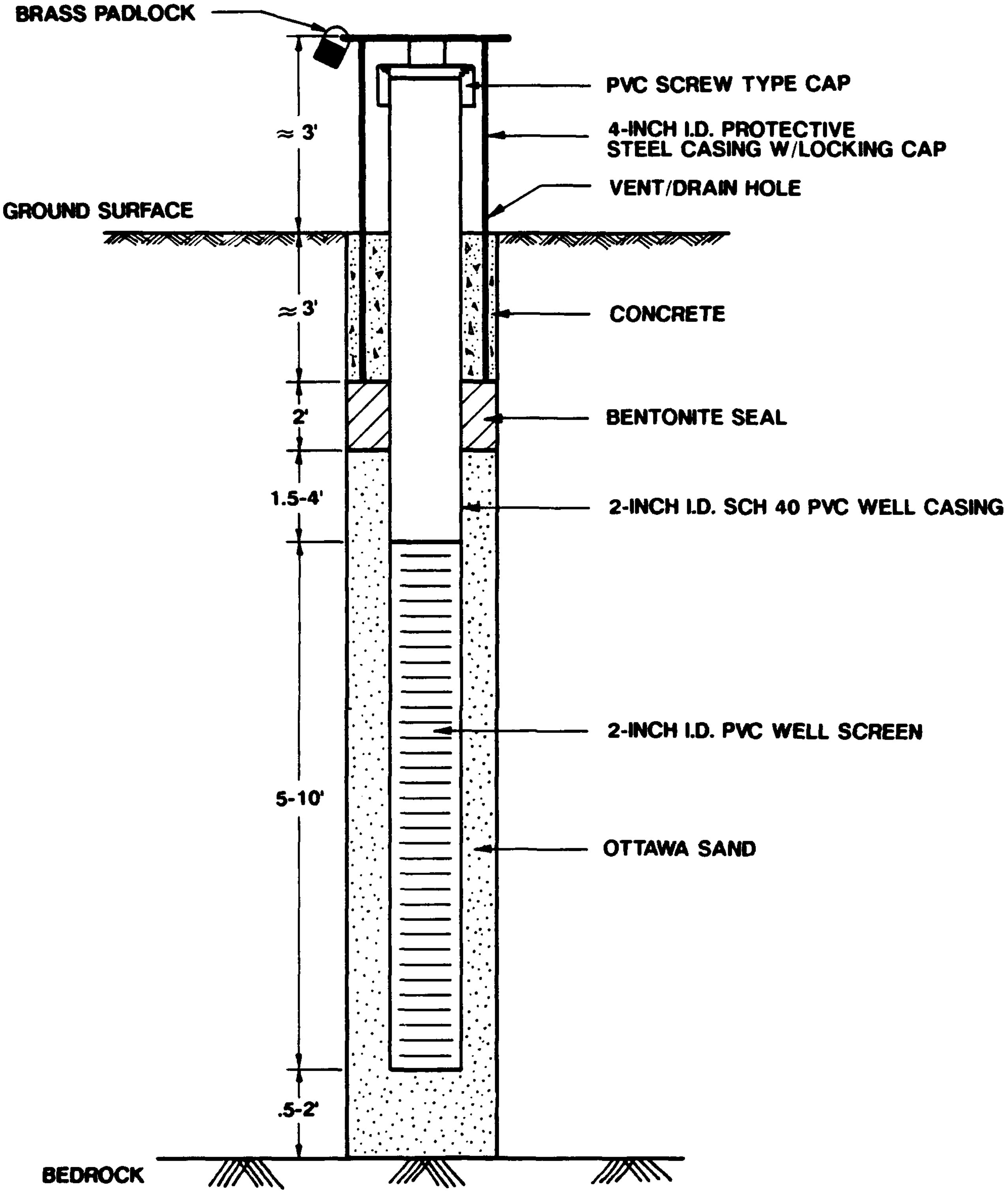
7.1 MONITORING WELLS AND PIEZOMETERS

Twenty-five multilevel piezometers were installed in single boreholes at 11 boring locations (see Section 6.1.2). Three boring locations had three piezometers each and eight locations had two piezometers each. The purpose of the piezometers was to provide water level data. Four groundwater quality monitoring wells were installed in separate boreholes at four boring locations. The monitoring wells provided access to groundwater for obtaining water level measurements, permeability data, and water samples for laboratory analyses. Groundwater is monitored by four monitoring wells and piezometers in the ablation till; by nine monitoring wells and piezometers in the underlying basal till; by four piezometers at the shale/till contact; and by 12 piezometers in the shale bedrock.

Screen monitoring depths for the piezometers and monitoring wells range from 2.5 to 61.5 feet and 4.3 to 32.5 feet below the ground surface, respectively. Installation locations are shown in Figure 6-1. The monitoring wells and piezometers consisted of Schedule 40 polyvinyl chloride (PVC) material and were 2-inch and 3/4-inch ID, flush-threaded, joint casing, respectively. Screen slot width in both types of installation was 0.01-inch. Schematic presentations of the installation details of the monitoring wells and piezometer are shown on Figures 7-1 and 7-2, respectively. Installation details for each location are presented on the boring logs in Volume II, Appendix B and in Table 7-1.

The annulus around the well screens were backfilled with clean silica sand to a depth of 1.5 to 4 feet above the screened interval. The augers or steel casing were raised so that only the clean silica sand would occupy the annular space around the well screen. Above the sandpack, wells and piezometers had a minimum 2-foot-thick bentonite pellet seal. A cement plug and locking steel protective casing were installed at the ground surface for monitoring wells and piezometers.

In September 1987, Jordan personnel surveyed the locations of the subsurface explorations and ground elevations of the borings, and measured elevations of the uncapped tops of casing. Horizontal locations and elevations were determined to the nearest 1.0 foot and 0.01 foot, respectively. Jordan developed the monitoring wells and piezometers by periodically removing formation water



NOT TO SCALE

E.C. JORDAN CO.
CONSULTING ENGINEERS

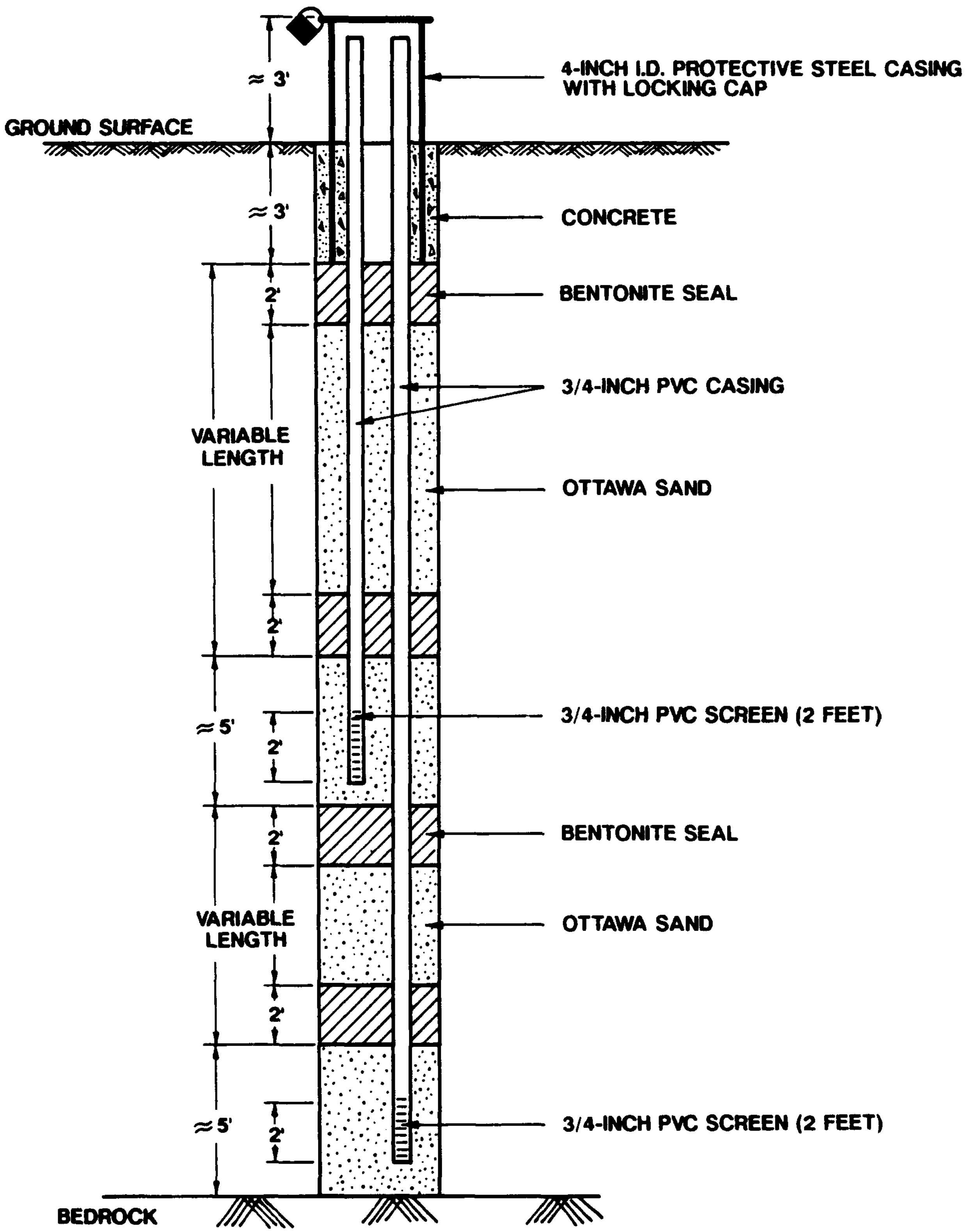
MONITORING WELL
INSTALLATION DETAILS

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE, N.Y.

SI

FIGURE 7-1

5139-02



E.C.JORDAN CO. CONSULTING ENGINEERS	PIEZOMETER INSTALLATION DETAILS	
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE, N.Y.	SI	FIGURE 7-2

ɪOT TO SCALE

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MONITORING WELL AND PIEZOMETER INSTALLATION DETAILS
STEWART ANGB, NEW YORK

BORING* NUMBER	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	PVC RISER ELEVATION	EFFECTIVE** MONITORING INTERVAL	BOTTOM OF SCREEN ELEVATION	SCREEN LENGTH IN FEET	BEDROCK SURFACE ELEVATION	GEOLOGIC MATERIAL
JTB-100A	433.93	436.6	436.06	378.3 - 385.3	381.4	2	388.3	Shale
JTB-100B			436.29	388.4 - 393.9	389.4	2		Basal Till
JTB-101A	437.64	440.15	439.50	391.2 - 395.6	392.6	2	399.9	Shale
JTB-101B			439.65	399.9 - 403.6	400.6	2		Basal Till
JMW-101	437.83	440.21	440.00	404.9 - 417.6	405.1	10		Basal Till
JTB-102A	427.62	430.36	430.27	366.0 - 374.6	368.1	2	376.0	Shale
JTB-102B			430.37	376.6 - 392.6	377.6	2		Basal Till
JTB-102C			430.27	398.6 - 417.6	413.6	2		Basal Till
JTB-103A	432.54	435.48	434.56	381.1 - 386.0	381.3	2	390.0	Shale
JTB-103B			434.71	388.5 - 394.3	390.7	2		Shale/Till
JTB-104A	435.54	437.95	437.62	398.5 - 402.9	398.7	2	411.0	Shale
JTB-104B			437.69	405.0 - 413.0	409.3	2		Shale/Till
JTB-104C			437.69	415.0 - 423.5	419.5	2		Basal Till
JTB-105A	392.69	394.57	394.23	354.7 - 358.7	355.2	2	367.2	Shale
JTB-105B			394.43	366.4 - 369.7	366.7	2		Basal Till
JTB-105C			394.57	375.5 - 379.0	375.7	2		Ablation Till
JTB-106A	386.97	389.95	389.78	357.0 - 361.7	359.0	2	367.5	Shale
JTB-106B			389.88	367.5 - 371.0	368.0	2		Basal Till
JTB-107A	364.79	367.99	367.15	345.4 - 350.8	346.8	2	355.4	Shale
JTB-107B			367.72	356.8 - 360.8	357.2	2		Ablation Till
JMW-107	364.14	367.43	367.21	354.6 - 361.6	354.6	5		Ablation Till
JTB-108A	367.34	370.25	370.10	350.5 - 344.3	345.8	2	354.5	Shale
JTB-108B			370.21	352.5 - 358.5	354.8	2		Basal Till
JMW-108	368.34	370.85	370.73	356.3 - 364.1	356.8	5		Basal Till
JTB-109A	371.72	374.01	374.01	352.3 - 356.5	352.3	2	361.3	Shale
JTB-109B			374.02	358.7 - 366.4	361.9	2		Basal Till
JMW-109	372.02	374.45	374.32	361.0 - 368.0	361.0	5		Basal Till
JTB-110A	361.34	364.22	363.88	335.1 - 340.3	336.8	2	342.4	Shale
JTB-110B			363.98	344.3 - 348.3	345.3	2		Basal Till

NOTE:

*JTB = Test boring with multiple piezometer installations   JMW = Test boring with monitoring well installation
**Interval includes total sandpack length and any caved intervals

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by pumping and then allowing the water levels to recover. Well development continued until the discharged groundwater from the monitoring wells was free of sediment.

7.2 PERMEABILITY TESTING

On September 11, 12, and 13, 1987, Jordan personnel conducted rising-head permeability tests on the four monitoring wells to determine the hydraulic conductivity of the glacial till. No permeability tests were conducted in the shallow bedrock. The testing consisted of depressing the water level in each of the monitoring wells by evacuation with either a manually operated Brainard Kilan pitcher pump or battery-powered peristaltic pump and then measuring the rate of water level recovery. Due to the small amount of standing water in the wells under static conditions and the relatively rapid response, water levels at the start of testing ranged from only 1.41 to 5.10 feet below static. The time required for the water levels to recover ranged from 20 to 45 minutes. The Hvorslev (1949) empirical method was used to calculate the hydraulic conductivities from rising-head test data. The method used assumes an unconfined isotropic, homogeneous, and incompressible aquifer and incompressibility of aquifer water.

Table D-1 in Appendix D (Volume II) presents field data from the rising-head permeability tests conducted in each monitoring well. Table 7-2 indicates that the average value of hydraulic conductivity for the basal till was 4.19×10^{-5} cm/sec with a range of 2.24×10^{-5} to 5.19×10^{-5} cm/sec. The one hydraulic conductivity value measured for the ablation till was 4.20×10^{-5} cm/sec. Although hydraulic conductivity data are limited, especially for the ablation till, these values suggest that the horizontal hydraulic conductivities are moderately consistent across the site, regardless of till type and soil depth.

7.3 WATER LEVEL OBSERVATIONS

Jordan periodically measured groundwater levels in the monitoring wells and piezometers during the exploration program. This information was obtained to construct a groundwater surface contour map, from which hydraulic gradients and flow directions were determined (see Section 7.4). Complete sets of water level measurements for monitoring wells and piezometers installed at the site were taken on August 14, September 2, and September 14, 1987, and January 18, 1989 (Table 7-3). The water level data show fluctuations through the period of measurements. Low water levels were recorded on September 14 in piezometers JTB-100B and JTB-103A and on September 2, 1987, in piezometers JTB-102B, JTB-105A, and JTB-105B. Water levels measured on September 14, 1987, in JMW-109, JTB-109B, and JTB-102C (all in shallow till) were high. The water levels made January 18, 1989 show the highest conditions for the period of measure in all wells and piezometers except for JMW-101, JTB-100A, and JTB-105B. These water level fluctuations are common in tills, due to low permeability and variable recharge conditions following rainfall events.

TABLE 7-2

HYDRAULIC CONDUCTIVITY RESULTS
STEWART ANGB, NEW YORK

WELL	GEOLOGIC MATERIAL	HYDRAULIC CONDUCTIVITY (CM/SEC)	HEAD DEPRESS (FT.)	SCREEN DEPTH (FT.)
JMW-101	Basal Till	2.24×10^{-5}	1.41	20-32.5
JMW-107	Ablation Till	4.20×10^{-5}	1.98	2.5-9.5
JMW-108	Basal Till	5.13×10^{-5}	5.1	4.3-12.0
JMW-109	Basal Till	5.19×10^{-5}	2.04	8.0-22.0

TABLE 7-3
WATER LEVEL OBSERVATIONS

STEWART ANGB, NEW YORK

LOCATION	CASING ELEVATION (FT)	8/11/87 ELEVATION (FT)	8/14/87 ELEVATION (FT)	9/2/87 ELEVATION (FT)	9/14/87 ELEVATION (FT)	1/18/89 ELEVATION (FT)
JMW-101	440.21	429.63	408.77[3]	429	431.83	428.55
JMW-107	367.43	357.18	356.88	356.7	359.0	361.67
JMW-108	370.85	362.35	362.15	362.27	362.14	366.99
JMW-109	374.45	364.4	364.33	366.09	369.48	669.80
JTB-100A	436.6	--	--[1]	405.02	404.7	405.14
JTB-100B	436.6	--	422.6[2]	405.15	404.32	405.82
JTB-101A	440.15	406.55	403.54	407.34	406.41	407.84
JTB-101B	440.15	406.59	403.54	407.35	406.45	407.88
JTB-102A	430.36	--	392.68	393.29	393.35	394.02
JTB-102B	430.36	--	395.17	393.18	396.77	397.49
JTB-102C	430.36	--	416.01	416.18	417.4	417.71
JTB-103A	435.48	--	420.63[2]	404.79	403.86	413.18[3]
JTB-103B	435.48	--	420.12[2]	404.95	403.95	407.68
JTB-104A	437.95	--	413.82	414.19	414.83	417.45
JTB-104B	437.95	--	414.06	414.53	415.15	418.34
JTB-104C	437.95	--	419.88	420.55	424.06	425.47
JTB-105A	394.57	376.63	376.36	376.64	376.25	377.95
JTB-105B	394.57	377.3	377.12	378.98	377.25	378.72
JTB-105C	394.57	280.96	380.66	380.26	382.05	382.59
JTB-106A	389.95	371.32	371.24	371.76	371.39	373.15
JTB-106B	389.95	371.68	371.75	372.1	371.77	373.31
JTB-107A	367.99	356.54	356.37	356.3	357.92	360.96
JTB-107B	367.99	356.54	356.37	--	358.39	361.12
JTB-108A	370.25	360.73	360.58	360.81	360.68	364.92
JTB-108B	370.25	360.45	360.17	360.72	360.49	364.81
JTB-109A	374.01	364.19	364.08	365.91	368.81	369.28
JTB-109B	374.01	364.19	364.05	365.77	369.48	369.82
JTB-110A	364.22	346.31	346.18	346.36	346.85	352.90
JTB-110B	364.22	346.19	346.17	346.26	346.75	352.85

---

[1] Depth below top of casing.

[2] Not installed by this date.

[3] May be an anomalous measurement.

7.4 HYDROGEOLOGY

7.4.1 Regional Hydrogeology

Based on regional geology and topography, Jordan interprets that the groundwater movement at the site occurs primarily in the glacial till and in the underlying sedimentary rocks (predominantly shale). Based on elevations of surface water bodies located in the vicinity of the site, the regional groundwater flow pattern is southeast toward the Hudson River.

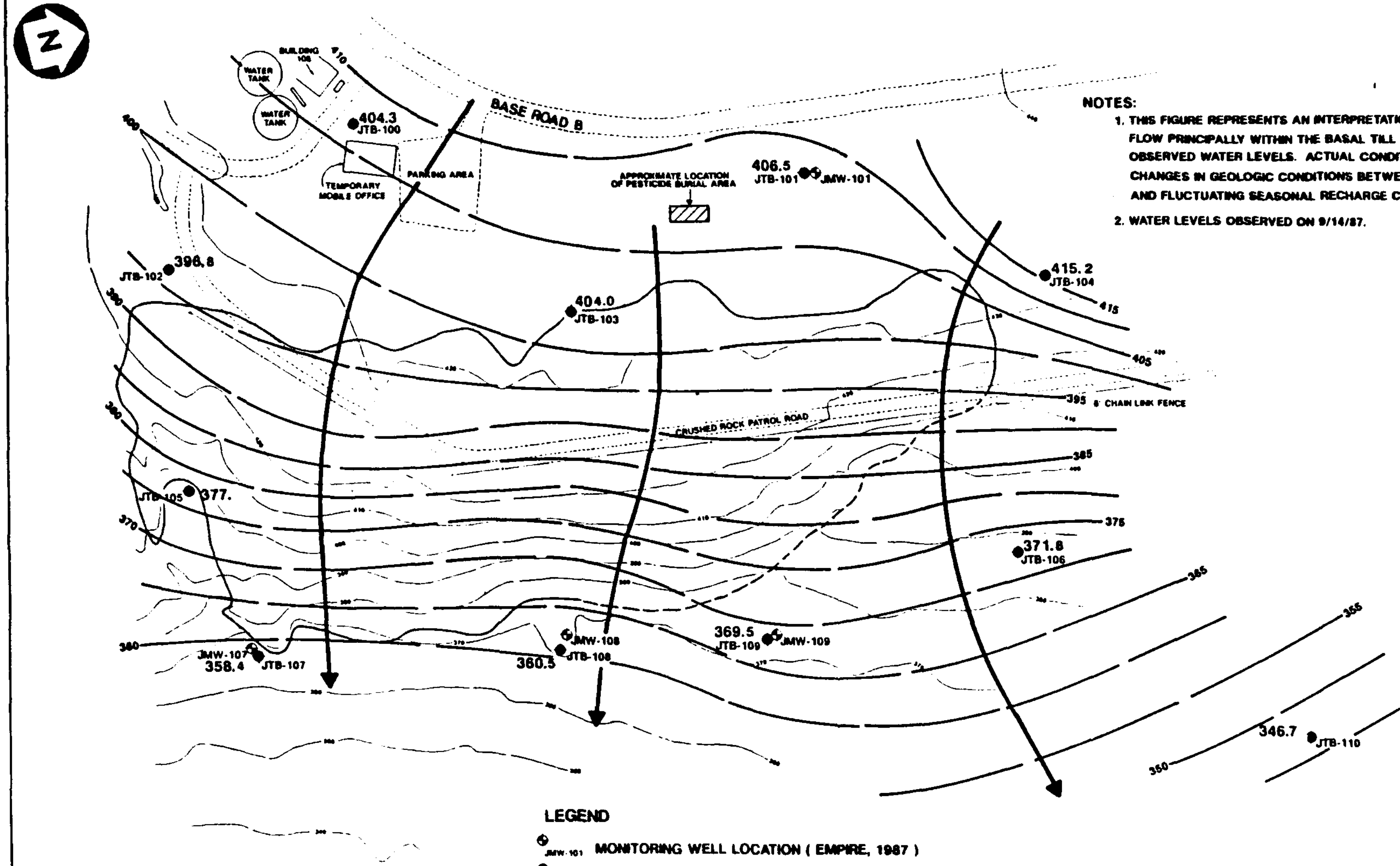
A water supply well recently drilled at Stewart ANGB (Figure 8-1) reached a total depth of 1,100 feet in shale and yielded less than 10 gallons per minute (gpm) (Morano Construction, personal communication). Because the water yield was less than needed by the contractor, the well casing was capped by the drilling company (personal communication with the drilling contractor, Dunn and Dunn). Yields for wells in shale in Orange County range from 0 to 400 gpm, averaging 22 gpm (Hammond, 1978). The high yields are probably associated with fault zones and other highly fractured bedrock areas. Data for wells tapping sandstone in Orange County indicate that well yields range from 4 to 50 gpm, with an average of 22 gpm.

7.4.2 Local Hydrogeology

Groundwater at the site occurs in the unconsolidated ablation till and basal till, and in the underlying bedrock. Based on the existing piezometric data, it appears that groundwater saturates the ablation till only near the toe of the landfill; the upper zone of ablation till in the more upland areas of the site is unsaturated.

Based on groundwater level data for September 14, 1987, groundwater flow in the basal till (from "B"-series piezometers) and the bedrock (from "A"-series piezometers) is southeast toward the toe of the former landfill. Interpretative potentiometric surface contour maps for the basal till and the bedrock are shown in Figures 7-3 and 7-4. The potentiometric surfaces for both conform to the bedrock topography shown in Figure 7-5. Because only two boring locations have monitoring points in the ablation till, accurate determination of groundwater flow direction in the ablation till was not possible.

Using a horizontal hydraulic gradient of 0.07 (measured between JTB-101B and JTB-108B on September 14, 1987), an average horizontal hydraulic conductivity of 4.2×10^{-5} cm/sec, and an effective porosity of 0.20, the average groundwater velocity (interstitial or seepage velocity) for the till is approximately 15 ft/yr (1.47×10^{-5} cm/sec). The groundwater velocity is obtained from the following expression:



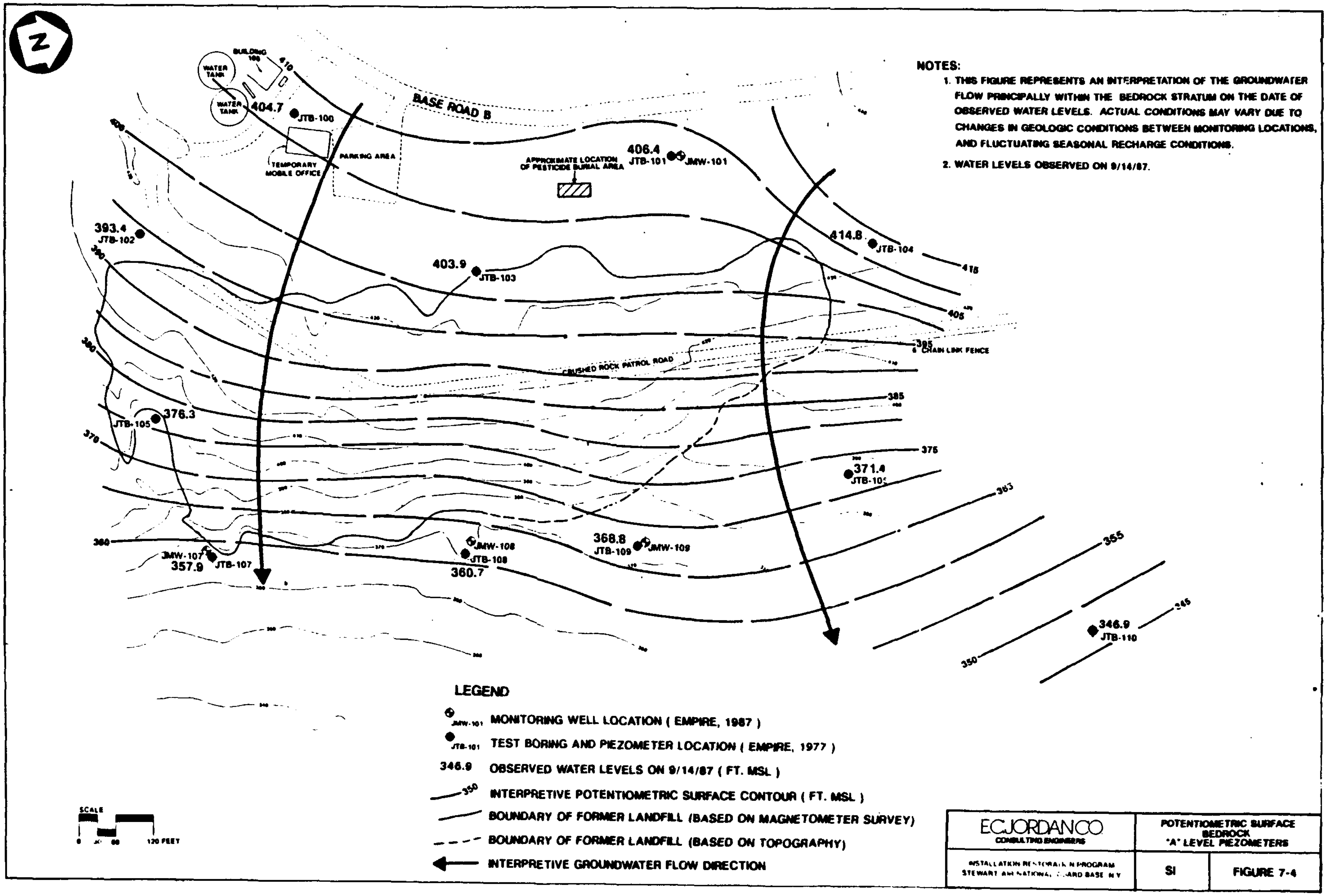
NOTES:

1. THIS FIGURE REPRESENTS AN INTERPRETATION OF THE GROUNDWATER FLOW PRINCIPALLY WITHIN THE BASAL TILL STRATUM ON THE DATE OF OBSERVED WATER LEVELS. ACTUAL CONDITIONS MAY VARY DUE TO CHANGES IN GEOLOGIC CONDITIONS BETWEEN MONITORING LOCATIONS, AND FLUCTUATING SEASONAL RECHARGE CONDITIONS.
2. WATER LEVELS OBSERVED ON 9/14/87.

LEGEND

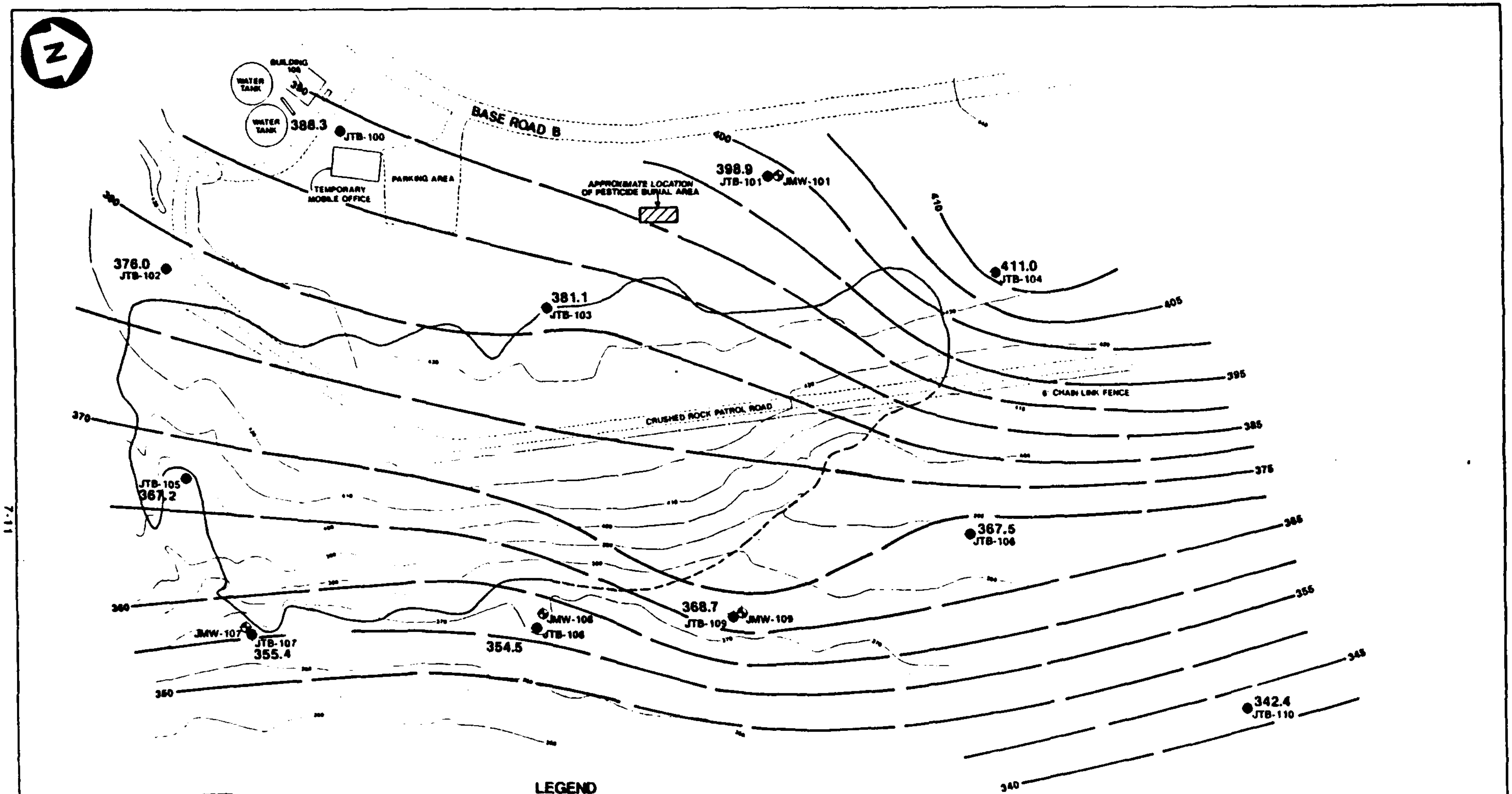
⊕ JMW-101	MONITORING WELL LOCATION (EMPIRE, 1987)
● JTB-101	TEST BORING AND PIEZOMETER LOCATION (EMPIRE, 1987)
360.5	OBSERVED WATER LEVELS ON 9/14/87 (FT. MSL)
⁀350	INTERPRETIVE POTENTIOMETRIC SURFACE CONTOUR (FT. MSL)
⁀	BOUNDARY OF FORMER LANDFILL (BASED ON MAGNETOMETER SURVEY)
- - -	BOUNDARY OF FORMER LANDFILL (BASED ON TOPOGRAPHY)
←	INTERPRETIVE GROUNDWATER FLOW DIRECTION

E.C. JORDAN CO	POTENTIOMETRIC SURFACE BASAL TILL "B" LEVEL PIEZOMETERS	
INSTALLATION RESTORATION PROGRAM STEWART AIR NATIONAL GUARD BASE N.Y.	SI	FIGURE 7-3



NOTES:

1. THIS FIGURE REPRESENTS AN INTERPRETATION OF THE GROUNDWATER FLOW PRINCIPALLY WITHIN THE BEDROCK STRATUM ON THE DATE OF OBSERVED WATER LEVELS. ACTUAL CONDITIONS MAY VARY DUE TO CHANGES IN GEOLOGIC CONDITIONS BETWEEN MONITORING LOCATIONS, AND FLUCTUATING SEASONAL RECHARGE CONDITIONS.
2. WATER LEVELS OBSERVED ON 9/14/87.



LEGEND

- JMW-101 MONITORING WELL LOCATION (EMPIRE, 1987)
- JTB-101 TEST BORING AND PIEZOMETER LOCATION (EMPIRE, 1977)
- 354.5 OBSERVED WATER LEVELS ON 9/14/87 (FT. MSL)
- 365 INTERPRETIVE TOP OF BEDROCK SURFACE CONTOUR (FT. MSL)
- BOUNDARY OF FORMER LANDFILL (BASED ON MAGNETOMETER SURVEY)
- BOUNDARY OF FORMER LANDFILL (BASED ON TOPOGRAPHY)

NOTES:

1. BEDROCK SURFACE CONTOURS BASED ON INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATION DATA. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.

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STEWART AIR NATIONAL GUARD BASE, N.Y.

BEDROCK SURFACE CONTOUR MAP

SI

FIGURE 7-5

$$v = \frac{Q}{nA} = \frac{\frac{dh}{dl} \times K}{n}$$

where:
K = horizontal hydraulic conductivity
n = effective porosity
v = seepage or interstitial groundwater velocity
dh/dl = groundwater gradient

Vertical downward hydraulic gradients (recharging condition) were measured at all locations except JTB-108 and JTB-110 (September 14, 1987, water levels). Downward gradients between the till and bedrock ranged from 0.005 to 0.239 ft/ft and downward gradients in the till ranged from 0.515 to 0.878 ft/ft. While permeability data are not available for the bedrock, the lower gradients between the bottom of the till and the upper bedrock suggest that the upper portions of the bedrock are more permeable than the till. This suggests that the upper portion of the bedrock aquifer is confined. The upward gradients measured between the till and the bedrock at JTB-108 and JTB-110 range between 0.01 and 0.03.

Groundwater in the till discharges under unconfined conditions into Murphy's Gulch, which runs northward along the western side of the thruway. A small component of the flow in the lower portion of the site may flow beneath Murphy's Gulch and discharge toward the east and northeast. Over the northern portions of the site, shallow groundwater in the till moves downward and may recharge the shallow bedrock. East of the toe of the former landfill, groundwater in the bedrock moves upward into the basal till.

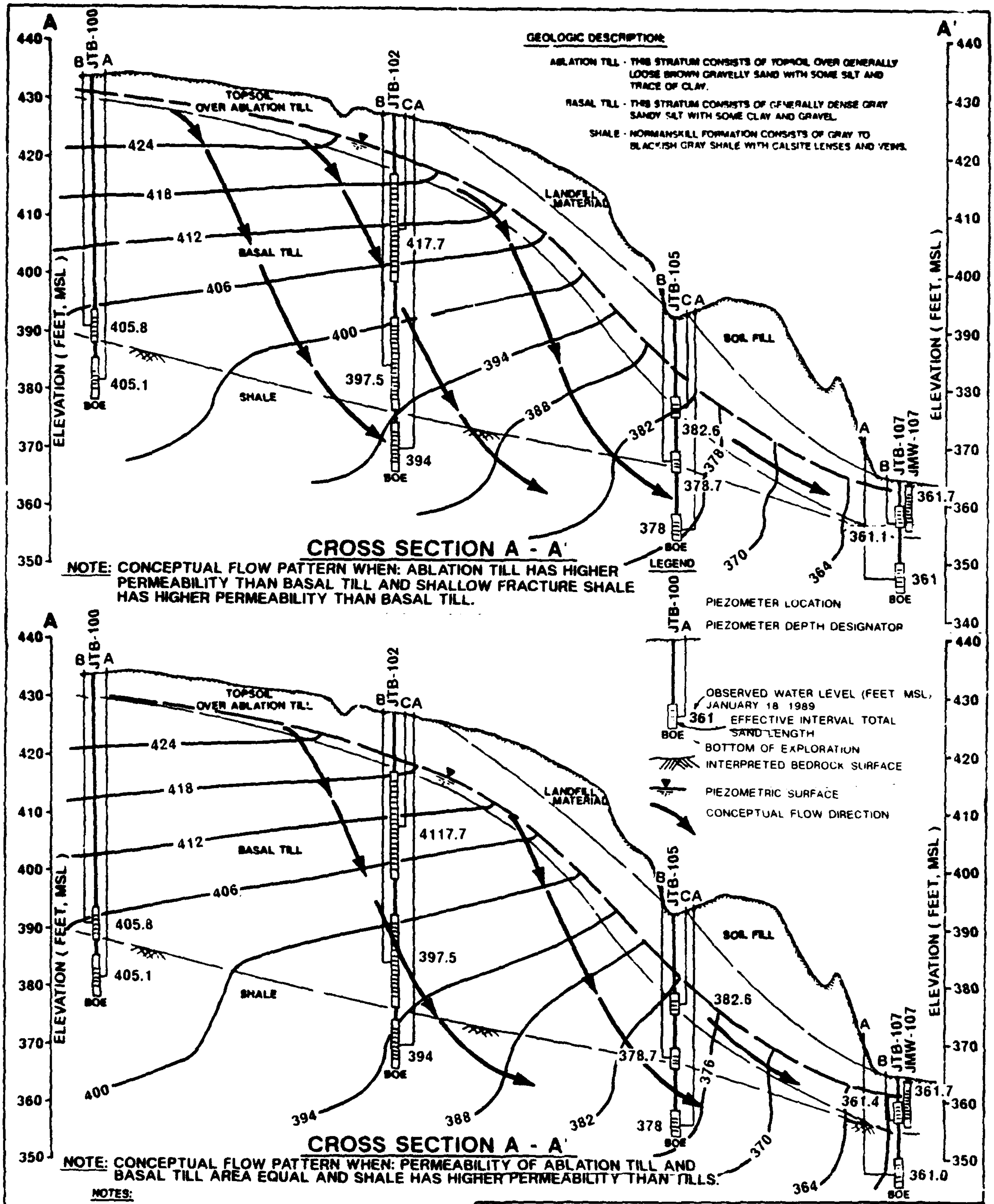
Although no water level data are available for the area directly underlying the landfill, the understanding of site hydrogeology suggests that the glacial till extends beneath the landfill and that groundwater may be moving vertically from the till into the bedrock. Consequently, potential exists for landfill leachate to migrate into the bedrock. Farther downgradient, groundwater in the bedrock flows upward into the glacial till and discharges into Murphy's Gulch. Based on the water level data in Table 7-3, two conceptual flow diagrams are presented for profile A-A' in Figure 7-6.

7.5 GROUNDWATER USE CLASSIFICATION

Most of the water supply in the region is obtained from surface water reservoirs. While the glacial till is not a high-yield deposit, nor used extensively in the immediate area as a water resource, the groundwater is classified as Class GA. According to NYSDEC's Groundwater Classifications Quality Standards and Effluent Standards and/or Limitations, Section 703.5, the best usage of Class GA waters is as a source of potable water.

7.6 GROUNDWATER SAMPLING

Groundwater sampling consisted of one round. On September 1 and 2, 1987, JMW-101 and JMW-107 through JMW-109 were sampled according to provisions in the



GEOLOGIC DESCRIPTION:

ABLATION TILL - THIS STRATUM CONSISTS OF TOPSOIL OVER GENERALLY LOOSE BROWN GRAVELLY SAND WITH SOME SILT AND TRACE OF CLAY.

BASAL TILL - THIS STRATUM CONSISTS OF GENERALLY DENSE GRAY SANDY SILT WITH SOME CLAY AND GRAVEL.

SHALE - NORMANSKILL FORMATION CONSISTS OF GRAY TO BLACKISH GRAY SHALE WITH CALSITE LENSES AND VEINS.

CROSS SECTION A - A'

NOTE: CONCEPTUAL FLOW PATTERN WHEN: ABLATION TILL HAS HIGHER PERMEABILITY THAN BASAL TILL AND SHALLOW FRACTURE SHALE HAS HIGHER PERMEABILITY THAN BASAL TILL.

CROSS SECTION A - A'

NOTE: CONCEPTUAL FLOW PATTERN WHEN: PERMEABILITY OF ABLATION TILL AND BASAL TILL AREA EQUAL AND SHALE HAS HIGHER PERMEABILITY THAN TILLS.

NOTES:

1. SEE FIGURE 6-1 FOR LOCATION AND ORIENTATION OF PROFILE.
2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.

SCALE
0 120 240 FEET

E.C.JORDAN CO.
CONSULTING ENGINEERS

CONCEPTUAL GROUNDWATER
FLOW DIAGRAM
PROFILE A-A'

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE N.Y.

FIGURE 7-6

5139-02

QAPP. Groundwater samples were shipped to CompuChem Laboratories according to USEPA's CLP procedures. Analytical results are tabulated in Appendix E (Volume II), and Surface and Groundwater Field Sample Data Records are included in Appendix F (Volume II).

7.7 RESULTS OF GROUNDWATER ANALYSES

Table 7-4 summarizes groundwater sampling from each of the four monitoring wells (see Figure 6-1). Each sample was analyzed for the metals, VOCs and SVOCs, organophosphate, and HSL chlorinated pesticides, herbicides, and PCBs. Analyses were performed in accordance with CERCLA-SARA National CLP protocols (either CLP-COP or CLP-CIP), as well as for the chloride, fluoride, and sulfate anions and for pH. VOCs and SVOCs were analyzed by GC/MS, while pesticides, herbicides, and PCBs were analyzed only by GC. Metals were analyzed by either atomic absorption or plasma emission spectroscopy; and anions were analyzed by wet chemical methods.

The complete data base is included in Appendix E (Volume II), and contains all positive results, qualification flags, results of sampling and trip blanks, and results of duplicate analysis. Table 7-4 represents the results of assessing the data in accordance with USEPA functional guidelines for quantification and positive identification (see Section 6.5). The following paragraphs summarize the findings and qualification of the groundwater monitoring data.

Table 7-4 also shows the major cation content (i.e., calcium, magnesium, sodium, and potassium) of groundwater. JMW-101, located upgradient and significantly deeper than the other wells, was found to have generally higher levels of major cations, particularly divalent ions, than the three downgradient samples. The higher levels of major cations may be the result of longer residence time at the deeper location. Manganese was relatively high in all wells except JMW-107. Compared to data typical of wells downgradient of a landfill, iron concentrations were extremely low. The only trace metal observed at concentrations above the CRDL was mercury in JMW-108. As shown in Table 7-4, four replicate samples were analyzed from this well (i.e., JMW108XX01, JMW108R101, JMW108R201, and JMW108R301); only one replicate contained mercury, and it was at a high level relative to the CRDL. This finding probably reflects contamination of the sample during handling. Arsenic, barium, and zinc were detected in the monitoring wells at levels below the CRDL (see Appendix E). The CRDLs for these compounds in groundwater are as follows:

Arsenic	10 μg/ℓ
Barium	200 μg/ℓ
Zinc	20 μg/ℓ

Chloride concentration was high in the sample from JMW-108, but not from other monitoring wells downgradient of the landfill. Groundwater having a chloride concentration exceeding 250 mg/ℓ and exceeding 1,000 mg/ℓ total dissolved solids is considered to be naturally saline, according to New York groundwater quality standards (NYCRR 703). Based on the observed concentrations of other

TABLE 7-4
Summary of Groundwater Chemical Analysis
Stewart Air National Guard BAse

	(ug/l) DETECTION LIMIT								
ECJ LOCATION ID		JMW-101	JMW-109	JMW-107	JMW-108	JMW-108	JMW-108	JMW-108	JMW-109
ECJ SAMPLE ID		JMW101XX01	JMW101XX01	JMW107XX01	JMW108XX01	JMW108R101	JMW108R201	JMW108R301	JMW109XX01
COMPUCHEM ID		150770	150759	150746	150751	150752	150765	150756	150762
DATE SAMPLED									
MATRIX		WA	WA	WA	WA	WA	WA	WA	WA
INORGANIC COMPOUNDS (ug/l)									
CALCIUM	5000	306000	128000	204000	212000	210000	213000	211000	128000
IRON	100	466	112	-	154	206	131	-	-
MAGNESIUM	5000	89900	17800	19400	27700	27300	28100	27000	17700
MANGANESE	15	2750	9430	160	5940	5240	5800	5660	9150
MERCURY	0.2	-	-	-	-	-	-	7.5	-
SODIUM	5000	117000	46400	35700	101000	98600	100000	101000	45900
VOLATILE ORGANIC COMPOUNDS									
1,1.1-TRICHLOROETHANE	5	-	-	8.6	-	-	-	-	-
SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)									
BIS-(2-ETHYLHEXYL)PHTHALATE	10	-	-	-	-	-	-	26	-
pH, SULFATE, CHLORIDE, FLUORIDE (mg/l)									
pH		6.8	6.4	6.7	6.6	-	-	-	6.5
SULFATE		1300	40	45	60	-	-	-	40
FLUORIDE		0.16	0.16	0.1	0.12	-	-	-	0.22
CHLORIDE		11	67	54	250	-	-	-	68

- = ANALYZED FOR BUT NOT DETECTED
NR = NOT REQUESTED

anions and cations, it is unlikely that the total dissolved solids content in JMW-108 exceeds 1,000 mg/ℓ. It is possible that elevated chloride in this well is due to the presence of leachate from the landfill, although iron is not elevated and pH is not highly acidic, as might also be expected.

Reportedly, sulfuric acid (up to 10 gallons) was disposed of in the pesticide pit. Sulfate concentration in JMW-101 (located near the pit) is 1,300 mg/ℓ, which is extremely high for non-saline groundwater. Based on available hydrogeologic data, the high sulfate content in this sample cannot be explained, since interpreted groundwater contours indicate that the well is hydraulically upgradient. However, the soil sample collected at a depth of 31 feet below the land surface at JMW-101 contained 1,100 mg/kg of sulfate.

Several VOCs were identified in the groundwater from the downgradient wells (i.e., JMW-107, JMW-108, and JMW-109). Except for 1,1,1-trichlorethane observed at 8.6 µg/ℓ in JMW-107, all identified analytes were below the CRDL. Complete results are presented with qualification flags in Appendix E. Methylene chloride, identified in all samples, blanks, and method blanks, is a common laboratory solvent and occurs frequently as an artifact introduced during the sampling and analysis process. Because of its occurrence at similar levels in all samples and blanks, it is concluded that the methylene chloride found in the groundwater samples was an introduced contaminant, and was unlikely to be present in the groundwater at levels shown in Appendix E.

As shown in Appendix E (Volume II), nine HSL VOCs, in addition to methylene chloride, were identified in the groundwater samples. Except for acetone in the duplicate (JDUP-1XX01) samples from JMW-109, the other analytes identified were the following halogenated hydrocarbon residues: 1,1,1-trichloroethane, chloromethane, 1,1-dichloroethane, biomomethane, trans-1,2-dichloroethene, vinyl chloride, chloroform, and chloroethane.

Because each compound was identified at a low level, the GC/MS data were reviewed to assess the accuracy of the identifications based on retention times and spectral matching of sample data with standards, as well as other quality control data. The data indicate that low concentrations of three halocarbon residues are migrating from the landfill. The upgradient well (i.e., JMW-101) contained only traces of chloroform. Chloroform was detected in the soil sampler blank associated with the data set. It is a common laboratory solvent, however, and is generated in chlorinated potable water. The presence of chloroform in JMW-101 may or may not be related to environmental contamination.

JMW-107, JMW-108, and JMW-109 contained solvent residues. The only contaminant identified in JMW-107 was 1,1,1-trichloroethane at a concentration of 8.6 µg/ℓ. The residue 1,1-dichloroethane was observed in JMW-108 and two of three replicates from JMW-108. 1,1-Dichloroethane is recognized as a transformation product of 1,1,1-trichloroethane. It is not a commonly used solvent. JMW-109 and the duplicate of that sample contained a number of VOCs at concentrations below the CRDL. Vinyl chloride was identified in one replicate. The comparability of results (see Appendix E) for four of the eight identified compounds, and the occurrence of seven different residues in one replicate and four in the other, indicate migration of VOCs from the landfill.

BEHP was identified at 26 µg/ℓ in one replicate, and below the CRDL in the sample and each of the remaining two replicates of JMW-108. In JMW-109, BEHP was below the CRDL. No other SVOCs, pesticides, herbicides, or PCBs were identified in groundwater at this site. As indicated in Section 6.5, phthalate esters are commonly observed as sampling artifacts because of their widespread occurrence in plastic materials, as well as in sample handling and protective equipment. No BEHP was detected in the laboratory method blank. However, analysis of the sampler blank showed this compound identified below the CRDL, suggesting the possibility that some, if not all, of the BEHP may be an artifact of sampling. Phthalate esters, however, are also commonly observed as components of landfill leachate.

8.0 SURFACE WATER

8.1 LOCAL AND REGIONAL WATERSHEDS

Surface water runoff in the Stewart ANGB area flows in an east and southeast direction. Runoff is moderately high because of the runway surfaces and predominantly glacial till type of soils. Most runoff from the existing runway facility is collected in a storm drainage system and discharged to the southeast into Recreational Pond. This water flows southward via an unnamed tributary to Silver Stream, then eastward as Silver Stream to a diversion structure, where it flows northward into Lake Washington.

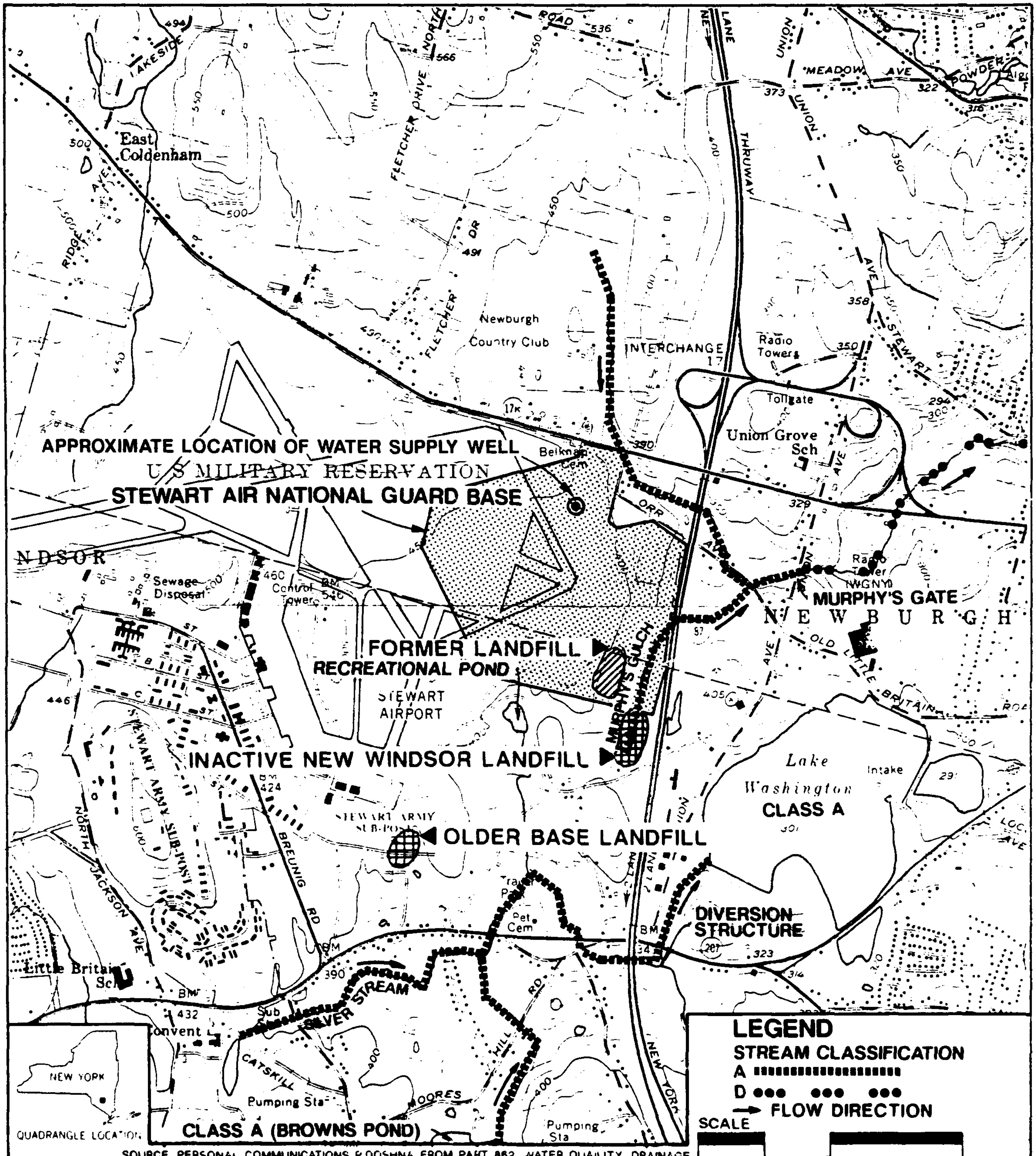
All water in Silver Stream, except during periods of flooding, enters Lake Washington. Floodwaters that pass the diversion structure flow southeastward to Moodna Creek. Surface water along the eastern perimeter of the ANGB facility, outside the storm drainage system, moves as sheet flow toward the east, including the area in and around the former landfill and pesticide burial site. This sheet flow runoff enters Murphy's Gulch, a tributary of Quassaic Creek. The Murphy's Gulch portion of the drainage receives runoff from the former landfill and pesticide burial site areas, as well as from the former New Windsor Landfill off Liner Road. This drainage flows northward and eastward, crossing the thruway. At Union Avenue (Route 300), Murphy's Gulch passes through Murphy's Gate, a diversion structure formerly used to route surface water to Lake Washington. This gate has been closed for several years, allowing the water to continue eastward, via the natural channel, to Brookside Pond and Quassaic Creek. Both Moodna and Quassaic creeks are tributaries to the Hudson River.

No natural surface water bodies were observed within the site study area. A small enclosed depression, part of a manmade drainageway, occurs along the northeastern perimeter of the landfill. While the surface water in this depression, approximately 100 to 200 square feet in area, is assumed to be intermittent, it had standing water in the bottom whenever field activities were conducted. The standing water was never observed to be more than 4 to 6 inches deep. Surface runoff from the northern portion of the landfill and surrounding natural undisturbed surface flows through this drainageway. Sediment samples and one surface water sample were collected from this area.

8.2 SURFACE WATER CLASSIFICATION

The surface water bodies in the area have been assigned several use classifications by NYSDEC (Figure 8-1). NYSDEC categorized the best usage and related conditions for these waters as:

- Class A - Protection for drinking water supply
- Class B - Protection for primary contact and any other uses expect as a source of water supply (no surface water is classified B in the study area)



SOURCE PERSONAL COMMUNICATIONS P DOSHNA FROM PART 862, WATER QUALITY DRAINAGE BASINOF STREAMS ENTERING THE HUDSON RIVER IN ORANGE, OLSTER, AND DUTCHES COUNTIES, NYSDEC

E.C. JORDAN CO.
CONSULTING ENGINEERS

SURFACE WATER CLASSIFICATION

SOURCE: U.S.G.S. NEWBURGH AND CORNWALL, NEW YORK QUADRANGLES (1957) 7.5 MINUTE SERIES

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STEWART AIR NATIONAL GUARD BASE, N.Y.

SI

FIGURE 8-1

5139-02

- o Class C - Protection for fishing and fish propagation
- o Class D - Protection for fishing and fish survival

Surface water in Silver Stream above the diversion structure to Lake Washington and Murphy's Gulch, above the diversion known as Murphy's Gate at Union Avenue, is Class A. Surface water downstream from Murphy's Gate to Brookside Pond is Class D. Brookside Pond (not shown in Figure 8-1) water is Class C, while both Lake Washington and Brown's Pond are Class A.

8.3 RESULTS OF SURFACE WATER ANALYSIS

The single surface water sample (JSW-001) was analyzed for the metals, VOCs and SVOCs, organophosphate, and HSL chlorinated pesticides, herbicides, and PCBs. In addition, the sample was analyzed for chloride, fluoride, and sulfate in accordance with CERCLA-SARA National CLP protocols (either CLP-COP or CLP-CIP). VOCs and SVOCs were analyzed by GC/MS. Pesticides, herbicides, and PCBs were analyzed by either atomic absorption or plasma emission spectroscopy. Anions were analyzed by wet chemical methods (see Volume II, Appendix E). As described in Section 6.5, Appendix E (Volume II) data contain positive results, qualification flags, and results of sampling and trip blanks. These data were reviewed in accordance with USEPA functional guidelines for quantification and identification. Summarized quantified results are as follows:

Analyte	CRDL	Result of Analysis Sample JSW001XX01
Inorganic Compounds	(ug/ℓ)	(ug/ℓ)
Aluminum	200	739
Calcium	5000	13,500
Iron	100	1460
Magnesium	5000	34,800
Manganese	15	87
Sodium	5000	18,900
Chloride	Not Applicable	42
Fluoride	Not Applicable	0.2
Sulfate	Not Applicable	320
pH	Not Applicable	6.8
Pesticides/PCBs	(ug/ℓ)	(ug/ℓ)
4,4'-DDT	0.1	0.57

The only metals detected at concentrations greater than the CRDL were the major cations species, which are generally found in any surface water. As indicated in Appendix E (Volume II), arsenic, barium, copper, and zinc were identified, but at concentrations less than their respective CRDL. Zinc was identified at

20 ug/ℓ (the CRDL level). However, because the method blanks contained zinc at 4.2 ug/ℓ, the revised detection limit for zinc must be set at 42 ug/ℓ. Because zinc is so commonly used as a coating for other metals, it is widely distributed in the laboratory environment, and trace levels of blank contamination are common laboratory artifacts.

Sulfate concentration was an order of magnitude higher than the concentrations observed in the site groundwater (except JMW-101). Because of the turbid nature of the samples, there was high probability that the sulfate result would show a large positive interference.

HSL VOCs or SVOCs were not identified in the surface water sample, except for methylene chloride, which was also detected at similar levels in blanks. Therefore, it has been concluded that the methylene chloride, identified in the water samples at Stewart ANGB, is an artifact of the sampling and analysis process (see Section 7.7).

The chlorinated pesticide 4,4'-DDT was identified in the surface water sample at 0.57 ug/ℓ. As indicated in Section 6.5, the sediments in this shallow water body were also contaminated with DDT residues. Because of the strong sorptive tendencies of DDT for particulate matter and the turbid nature of the shallow pond, it is likely that the DDT detected was predominantly sorbed to particulate matter. This finding suggests potential pesticide residue migration from the pesticide pit area via surface drainage or the erosion channel.

9.0 AIR

Reconnaissance of the site and the known use of the site did not indicate the likelihood of an air emissions problem from VOC contamination in soils. Therefore, a specific program of air sampling and analysis was not implemented. Analyses of surficial and subsurface soils, surface water, and groundwater confirm the low potential for VOC emissions.

Air quality at the former landfill and pesticide burial site was monitored for VOC emissions with a Photovac TIP PI meter during subsurface explorations. Ambient air, borehole headspace, and soil sample headspace were monitored. None of the samples of surface soil or upper soil layers (of the subsurface) yielded PI meter readings above background. One reading, slightly above ambient air background levels, was detected within the sample spoon (JTB1070401) and in the reference jar headspace for a sample at a depth of 4 to 5 feet below the land surface. No other subsurface samples yielded PI meter readings above background, and no ambient air VOC levels were detected around JTB-107.

10.0 ABOVE AND BELOW GROUND STRUCTURES

The former landfill and pesticide burial site are situated on natural soils that were modified during construction of the airfield and disposal operations. Based on the background review and visual reconnaissance performed for this investigation, no structures, above or below ground, were constructed for these activities. The background review, including aerial photographic interpretation of the area, indicates that the landfill and pesticide burial activities involved the excavation of several trenches and at least one pit for the disposal of materials (see Section 3.2). To evaluate the site as a continuing source of contamination, these trenches and pesticide pits should be considered potential "leaky containers" of concentrated residual materials from the landfill operation.

The former pesticide pit located north of the landfill (see Figure 1-3) was investigated by Dames and Moore (Dames and Moore, 1985 and 1986). In 1984 and 1985, two sets of test pits were installed following a metal detector and magnetometer survey to locate and define the pesticide pit boundaries. Dimensions of the pit were estimated to be 15 by 25 feet. Approximately 40 five-gallon containers (200 gallons) of pesticide and 10 gallons of acid solution were estimated to be buried at depths up to 10 feet.

The primary pesticide found in the Dames and Moore study was DDT. The pesticide containers were observed to be crushed and leaking. Six samples of the oily liquid waste contained DDT at concentrations up to 12 percent (wt/v). Soils from test pits installed in the disposal area contained DDT levels up to 1.3 percent (w/w). DDE and DDD were found at slightly lower levels. The second most prevalent residues were the chlorinated phenoxy herbicides 2,4-D and 2,4,5-T, found at less than one part per million (ppm) in the soils and/or oily waste.

Based on the finding of containers of hydrofluoric, sulfuric, and hydrochloric acids; DDT; parathion; heptachlor; and 2,4-D, 2,4,5-T, and 2,4-D/2,4,5-T mixtures, monitoring wells were installed approximately 30 and 100 feet downgradient and approximately 100 feet upgradient of the pit area. The approximate locations of monitoring wells installed by Dames and Moore are shown in Figure 1-3. The upgradient and nearest downgradient wells were screened in the zone of weathered shale bedrock at depths of 39.4 and 35.1 feet below the land surface, respectively. The well located 100 feet downgradient was screened at a depth of 36.4 feet to intercept both the upper layers of the rocks and the overlying till. These wells were screened in the upper portion of the groundwater table. In the closest downgradient well (SW-2), soil samples were analyzed for pesticides from the top of the screened interval and from a depth of 25 feet below the land surface, at a soil interval from which high readings of organic vapors were measured (using a portable GC equipped with a PI detector).

Table 10-1 summarizes results of analysis of samples collected by Dames and Moore in October 1985. These data show that pesticide residues were present in the subsurface soils at ppm levels, and in the groundwater at parts per billion (ppb) levels within 30 feet of the pit. This indicates that migration occurred

TABLE 10-1

SUMMARY OF PESTICIDE CONCENTRATION RANGES OF ANALYTICAL DATA BY DAMES AND MOORE RESIDUAL WASTE, TEST PIT SOILS, SUBSURFACE SOILS, AND GROUNDWATER STEWART ANGB, NEW YORK

	RANGE OF CONCENTRATIONS							
RESIDUE	OILY LIQUID WASTE (mg/ℓ)		TEST PIT SOILS (mg/kg)		SUBSURFACE SOILS (mg/kg)		GROUNDWATER (ug/ℓ)	
Heptachlor	0.003	(1/5)[1]	--	(0/5)	--	(0/4)	--	(0/3)
Parathion	0.004	(1/5)	0.6 - 3.9	(3/5)	0.08	(1/4)	--	0/3
Malathion	--	(0/5)	--	(0/5)	0.01	(1/4)	--	0/3
Dieldrin	--	(0/5)	--	(0/5)	--	(0/4)	0.04	1/3
Lindane	--	(0/5)	--	(0/5)	--	(0/4)	0.03	1/3
4,4'-DDT	0.04 - 120,000	(5/5)	0.17 - 13000	(5/5)	0.001 - 8.2	(3/4)	15	1/3
2,4'-DDT	0.36 - 38,000	(5/5)	0.06 - 3900	(5/5)	0.42, 1.9	(2/4)	4.4	1/3
DDD	0.43 - 28,000	(5/5)	140 - 3900	(4/5)	0.47, 2.5	(2/4)	8.5	1/3
DDE	0.04 - 4000	(5/5)	6.1 - 130	(3/5)	0.026, 0.058	(2/4)	0.15	1/3
2,4-D	0.002 - 0.13	(4/5)	0.42	(1/5)	0.022 - 0.37	(3/4)	0.1, 20	2/3
2,4,5-T	0.005 - 0.05	(4/5)	0.37, 0.61	(2/5)	0.006, 0.040	(2/4)	0.45	1/3

Sources: Dames and Moore, 1985 and 1986

[1] Occurrence/Number of Analyses

due to the infiltration of water through the unsaturated zone. Pesticide residues, however, are strongly sorbed to the soil substrata, as shown by the relatively low concentrations measured in groundwater. The migration of pesticides in the subsurface appears to be limited. No pesticide residues were observed in any of the subsurface soils or groundwater samples tested during the 1987 program. Only two of the Dames and Moore wells (i.e., SW-2 and SW-3) were located at the top of the water table immediately downgradient of the pit area.

Migration of DDT via surface drainage was demonstrated based on results of sediment and surface water samples JSD-100/JSW-001 at surface location 100. The extent of migration further along the drainageway has not been documented, nor have the surface soils between the sample location and the pesticide pit area. Eroded soil from the pit area appears to be transported to the small ponded area, which may serve as a sediment trap.

Simple removal of pesticide containers and excavation of contaminated soil within the pesticide pit area was conducted by Geo-Con, Inc. of Pittsburgh, Pennsylvania in April and May 1988. A project summary report of these activities, prepared by Dynamac Corporation of Rockville, Maryland, is included as Addendum A to this report. Jordan was requested by the ANG, on August 31, 1988, to prepare a briefing document for presentation to the USEPA that summarized the past investigation at the pesticide pit area. This document, included as Addendum B, presents an initial assessment of the environmental and public health risks associated with the former Pesticide Burial Pit Site. As a follow up to this assessment, in June and July 1989 Jordan conducted an additional sampling program of downgradient surface soils and existing monitoring wells around the pit area. A letter report describing the field activities, analytical laboratory results and Jordan's conclusions and recommendations is included as Addendum C.

11.0 PRELIMINARY IDENTIFICATION OF PUBLIC HEALTH RISKS

11.1 INTRODUCTION

The purpose of this section is to identify potential risks posed to public health and to determine further investigations (if any) warranted at the site. Chemical compounds identified in the various media at the Stewart ANGB disposal site are listed in Table 11-1. Potential toxicological effects of prolonged exposure to these chemicals are briefly summarized in Table 11-2. The following discussion reviews the data collected and compares the results to appropriate guidelines or standards, identifies and locates potential human receptors, and describes additional data required to complete a full risk assessment.

11.2 RESULTS AND COMPARISON TO REGULATIONS

11.2.1 Subsurface and Surface Soils

The majority of soil samples collected were from subsurface locations. The sediment/surface soils were taken from areas that collected runoff during periods of precipitation. During dry periods, these areas can be exposed; thus, the classification as surface soils. The only contaminants of potential concern in subsurface soils are BEHP and PCBs. In surface soils, pesticides and PAHs were also identified. There are no federal or state standards or criteria pertaining to chemicals in the soil.

The following discussion qualitatively evaluates the significance of the findings of the site investigation.

PCBs. PCBs were identified at two subsurface locations (at depths of 12 and 31 feet), one upgradient of the defined disposal area (210 ug/kg at JMW-101) and one downgradient of the southern edge (210 ug/kg at JTB-102). The source of these compounds is not clear. In saturated subsurface soils, PCBs tend to remain absorbed to soils. It is hypothesized that these data represent separate areas of contamination and are not evidence of migration. Potential health effects of PCB exposure include evidence of carcinogenicity and fetotoxicity. (For a complete discussion, see Toxicological Profile Report on Selected PCBs, USEPA, 1987.)

BEHP. BEHP is ubiquitous in the environment and is classified as a probable human carcinogen by USEPA; however, it is not highly potent. The maximum level present in Stewart ANGB soils was 1,100 ppb, found at a depth of 31 feet. This level is not considered to pose a public health risk, given its subsurface location. BEHP was detected in the sediment/surface soil sample from the ponded depression (JSD-100) at 66 ug/kg (estimated concentration). Further surface soil sampling is required to determine if this source presents a public health risk.

PAHs. A variety of PAHs were identified in the sediment/soil sample. The compounds above the CRDL were fluoranthene, phenanthene, pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. Benzo(a)anthracene and benzo(a)pyrene were

TABLE 11-1

SUMMARY OF LANDFILL CONDITIONS
STEWART ANGB, NEW YORK

TECHNICAL FACTORS	SUBSURFACE SOILS	SEDIMENT/ SURFACE SOILS	SURFACE WATER	GROUNDWATER
Chemicals 1,1,1-trichloroethane	VOCs: Not above CRDL*	VOCs: Not above CRDL	VOCs: Not above CRDL	VOCs: Blank
	Metals: Normal soil constituents	Metals: Normal soil constituents	Metals: Al, Ca, Fe, Mg, Mn, Na	Metals: Ca, Fe, Mg, Mn, Hg (suspect data at JMW-108), and Na
	SVOCs: BEHP, PCBs	SVOCs: PAHs, BEHP	SVOCs: Not above CRDL	SVOCs: BEHP
	Pesticides: Not above CRDL	Pesticides: 4,4-DDT 4,4-DDE 4,4-DDD	Pesticides: 4,4-DDT	Pesticides: Not above CRDL
Chemical Transport Mechanisms	Both BEHP and PCBs are relatively insoluble in water and are therefore fairly immobile in the soil environment.	Both pesticides and PAHs are relatively insoluble in water; thus, they will remain absorbed to soils. Can be transported via erosion and fugitive dust.	Standing surface water only occurs during periods of precipitation. Could be transported off-site via excessive runoff.	Groundwater flow is toward the adjacent wet area associated with Murphy's Gulch.

TABLE 11-1 (continued)

SUMMARY OF LANDFILL CONDITIONS
STEWART ANGB, NEW YORK

TECHNICAL FACTORS	SUBSURFACE SOILS	SEDIMENT/ SURFACE SOILS	SURFACE WATER	GROUNDWATER
Persistence of Chemicals	BEHP is ubiquitous in the environment and is not readily degraded. PCBs are stable in the environment. Higher chlorinated forms are resistant to biodegradation.	PAHs are strongly absorbed to soil particles. They can undergo microbial inorganic degradation. DDT also is strongly absorbed to soil particles. It has an estimated half-life of 17 years. DDE is its breakdown product.	See Sediment/Surface Soils	Hg is the only metal of concern. Its persistence is determined by form. It can be tightly bound to soil particles. Inorganic Hg can be made more toxic via methylation by microorganisms.

* CRDL: Contract Required Detection Limit

TABLE 11-2

TOXICOLOGICAL PROPERTIES OF COMPOUNDS IDENTIFIED IN VARIOUS MEDIA
STEWART ANGB, NEW YORK

COMPOUND CLASS	MEDIA IDENTIFIED IN	SPECIFIC COMPOUNDS	TOXICOLOGICAL PROPERTIES[1]
Semivolatile Compounds			
Phthalate esters	Subsurface soils	Bis(2-ethylhexyl)phthalate	BEHP is considered a probable human carcinogen. It has low acute toxicity. Very high doses are potentially teratogenic and embryotoxic.
PCBs	Subsurface soils	Arochlor-1254	PCBs are considered a probable human carcinogen. Arochlors can bioaccumulate in humans. Can be fetotoxic. Can be absorbed through all routes.
PAHs	Sediment/surface soils	Phenanthrene, fluoranthene, pyrene benzo(a)anthracene, benzo(b(k)fluoranthene benzo(a)pyrene	PAHs are a diverse group of compounds of varying toxicity. They are highly lipid-soluble and are absorbed through the GI and respiratory tracts, and to a lesser degree, through the skin. Many PAHs have been shown to be potentially carcinogenic. Other PAHs are thought to be noncarcinogenic; these include fluorine, anthracene, pyrene, naphthalene, phenanthrene, and fluoranthene. The acute toxicity and chronic toxicity of low-level exposure are not well-understood.
Pesticides	Subsurface soils sediment/surface soils	4,4-DDT 4,4-DDD	DDT is considered a probable human carcinogen. DDT bioaccumulates in the food chain. In humans it is stored in the fatty tissues.

TABLE 11-2 (continued)

TOXICOLOGICAL PROPERTIES OF COMPOUNDS IDENTIFIED IN VARIOUS MEDIA
STEWART ANGB, NEW YORK

COMPOUND CLASS	MEDIA IDENTIFIED IN	SPECIFIC COMPOUNDS	TOXICOLOGICAL PROPERTIES[1]
Inorganic Compounds			
Metals	Groundwater	Hg	Toxicological effect depends on chemical form: elemental organic or inorganic, with the organic form most toxic. The direct effect is on the central nervous system. USEPA DWEL for Hg is 5.5 μg/ℓ.
Volatile Organic Compounds	Groundwater	Vinyl chloride	Known carcinogen
		trans-1,2-dichloroethene	USEPA DWEL is 70 μg/ℓ
		1,1,1-trichloroethane	USEPA DWEL is 200 μg/ℓ
		acetone, chloroform	Low toxicity
		1,1-dichloroethane chloromethane bromomethane	Information currently not available.
		chloroethane	

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[1] In assessing the risks to human health and the environment posed by these chemicals, not only toxicological properties but also potential receptors and probable exposure conditions must be considered. These factors will be addressed in the full risk assessment, which will be part of the complete RI.

present at concentrations just below the CRDL. These compounds, not identified in the subsurface soils, tend to remain absorbed to soils; therefore, they have low mobility in groundwater, but can be distributed by fugitive dust. If warranted, further soil sampling may be required to determine the distribution of these compounds and to assess the potential public health risk. PAHs are compounds of varying toxicity. Many PAHs have been shown to have carcinogenic potential, while others do not exhibit carcinogenicity (see Table 11-2). Of the PAHs identified at this site, NYSDEC classified the following as carcinogenic: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene (NYSDEC, 1985).

DDT. 4,4-DDT, and its breakdown products, 4,4-DDE and 4,4-DDD, were identified in the sediment/surface soils at runoff collection location JSD-100 at levels of 3,100, 230, and 130 ug/kg, respectively. It is hypothesized that the source is from previous subsurface exploration activities associated with the pesticide burial investigation on-site, which left contaminated soil on the surface. Without further surface soil samples, it is not possible to estimate the extent of contamination or potential impact on on- and off-site receptors. 4,4-DDT is persistent in the environment and bioaccumulates in the food chain, and is classified by USEPA as a probable human carcinogen. Thus, it may be of concern due to chronic, but not acute, exposure.

Under present site conditions and in the absence of excavations, PCBs and BEHP, identified in the subsurface soils (at least 5 feet below the surface), pose little risk of human contact or ingestion. PAHs and 4,4-DDT were both identified in surface soils; therefore, human exposure to these compounds is possible. Further surface soil data are required to estimate the magnitude of this risk.

Soils containing these compounds may be uncovered and exposed during future excavations. Such excavations would present chemical exposure risks to excavators, site workers, and passersby. The possible exposure routes for chemicals in the soil during excavations include direct contact and inhalation. Risks due to this type of exposure will be evaluated in the subsequent investigation report. As appropriate, recommendations will be made to minimize exposure during periods of excavation.

11.2.2 Groundwater and Surface Water

It is assumed that groundwater is used as a potable source at residences approximately 1,200 to 1,800 feet downgradient of the disposal site. However, most public supplies are taken from the nearby reservoirs. At this time, exposure to contaminants of concern through groundwater is minimal because of: (1) the low levels of contaminants found at on-site wells, and (2) the moderately low hydraulic conductivity of the soils.

Analysis of groundwater samples showed no pesticides, one SVOC, one VOC, and a variety of inorganic constituents. The only VOC identified above the CRDL was 1,1,1-trichloroethane at 8.6 ug/ℓ. This concentration, several orders of magnitude below USEPA's Drinking Water Equivalent Level (DWEL) of 1,000 ug/ℓ, is not considered to pose a risk to public health.

The only SVOC identified was BEHP, at levels ranging from 2.4 to 26 ug/ℓ. USEPA classified it as a B2; that is, a (probable) human carcinogen.

Several inorganic compounds were identified in the groundwater, most of which are normal constituents. The possible contaminant of concern in these data is mercury, which was identified only at JMW-108. This data point may be an anomaly, as it was reported in only one of four samples from this well. However, at the reported concentration of 7.5 ug/ℓ, this exceeds the USEPA DWEL of 5.5 ug/ℓ, which is a USEPA guideline for lifetime consumption.

4,4-DDT was identified in the surface water. Because human exposure to this intermittent standing surface water is minimal, it is not considered to pose a public risk; however, it may indicate a transport pathway of contaminants off-site.

11.2.3 Summary

In summary, based on this initial site investigation, it appears that there has not been substantial migration of compounds from the disposal area. The compounds identified are generally immobile in a soil matrix. The toxicity of these compounds is of concern for chronic, as opposed to acute, exposures. Information is lacking on the extent of possible surface soil contamination. Levels of some contaminants (especially mercury) in the groundwater need verification.

11.3 PRELIMINARY EXPOSURE ASSESSMENT

Based on the site investigation, it is expected that human contact with the on-site soils would be minimal because of topography and location factors. The disposal area is on the side of a fairly steep embankment, dropping approximately 100 feet over a distance of 600 feet. The proximity of the thruway, approximately 600 feet from the edge of the disposal area, also limits access by unauthorized persons. However, the site is only partially fenced and deer tracks were noted by the field team. Thus, occasional access by people (e.g., hunters) is possible. Given the location, it is not expected that children would frequent the area. An access road, installed by the ANGB, could expose base personnel to soil contaminants during maintenance activities; however, other than major road construction, this is not expected to be a significant route of exposure.

The on-site surface water, as discussed previously, is from surface runoff. The intermittent nature of its occurrence indicates that it is not a significant route of exposure.

To conservatively estimate risks to groundwater, it is assumed that an individual would drink 2 liters/day for an entire lifetime (i.e., 70 years) from the on-site wells. The maximum reported concentrations are used to approximate a worst-case scenario. For BEHP, the only carcinogen identified in the groundwater, the maximum excess risk is 5×10^{-7}.

Generally, risks of 10^{-4} to 10^{-7} are considered within the CERCLA guidelines for cleanup of hazardous waste sites. This indicates that vinyl chloride may pose a risk; however, this is highly uncertain, given its infrequent occurrence. The only non-carcinogenic risk estimated was for Hg. A ratio of the body dose calculated from these data to a body dose based on the DWEL indicates a risk ratio of 1.4. A ratio less than 1 indicates a low risk, while a ratio greater than 1 indicates health risks may be present.

Because municipal water is provided to base personnel and most area residents, Jordan believes that groundwater is not expected to present a specific public health risk. However, because there are some downgradient wells, continued groundwater sampling of the existing monitoring wells will be required to support the assumption of no contamination.

11.4 ADDITIONAL DATA NEEDS

To conduct a full public health risk assessment for the Stewart/USAF landfill and former pesticide disposal area at the Stewart ANGB, the following additional information is needed:

- levels of contaminants in surface soils to determine if risks are posed to humans through direct contact
- levels of contaminants in subsurface soils adjacent to the pesticide disposal area to determine if significant exposures may occur during remedial activities or planned construction associated with the ANGB expansion
- investigate the potential migration of contamination from the pesticide burial site
- additional groundwater samples to verify the presence or absence of mercury and to confirm the lack of SVOCs and pesticides

This additional information will make it possible to quantitate the public health risk at this site.

12.0 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

12.1 INTRODUCTION

The main purpose of performing a baseline environmental risk assessment at the Stewart ANGB disposal site is to assess present and potential future impacts on aquatic and terrestrial ecosystems which may be affected by site contaminants. Such an assessment will provide sufficient information to identify remedial response objectives, develop and evaluate remedial alternatives, and develop mitigative measures to protect the natural environment. The following discussion includes a review of existing analytical data, a preliminary environmental exposure assessment, an assessment of data necessary to complete an environmental risk assessment at the site, and the anticipated outline of the environmental risk assessment.

12.2 REVIEW OF CURRENT DATA

Available data that may be used to perform environmental risk assessment at the Stewart ANGB disposal site include sample analyses for three surficial sampling locations. Surface water and sediment samples were collected at Station JSD-100; sediment samples were collected only at Stations JSD-101 and JSD-102. Sampling of SW-1, SW-2, and SW-3 was performed by Dames and Moore during a previous investigation. Analytical data from subsurface soil samples collected at the site cannot be used for environmental risk assessment, because there are no exposure pathways for subsurface media. Organic and inorganic analytical data from surface water and sediments are summarized in Tables 12-1 and 12-2; groundwater data are summarized in narrative form.

Analytical results for the three sediment samples show markedly different organic chemical profiles. Analysis of sample JSD-100 revealed the presence of 4,4'-DDT (3,100 ppb), 4,4'-DDD (170 ppb), and 4,4'-DDE (230 ppb) in sediment. Pesticides were not reported at Stations JSD-101 and JSD-102. However, sediment sample JSD-101 was found to contain several PAHs at low levels. No chemicals were detected above CRDL in sediment sample JSD-102, except acetone and methylene chloride, which were also detected in blanks. No organophosphorus pesticides (i.e., sulfotepp, phorate, dimethoate, disulfoton, methyl parathion, and parathion) or chlorinated herbicides (i.e., 2,4-D, 2,4,5-TP, and 2,4,5-T) were detected in any sediment sample.

The only organic chemical reported at surface water sampling Station 100 (sample JSW-001) was 4,4'-DDT (0.57 ug/ℓ). The value reported for 4,4'-DDT is substantially above the chronic Ambient Water Quality Criteria (AWQC) for DDT of 0.001 ug/ℓ. Because this sample was not filtered and surface water was observed to be turbid at the time of sampling, it is possible that this value may be due, in part, to adsorbed suspended particulates present in the sample rather than in solution. However, this value is below the aqueous solubility of 4,4'-DDT (5.5 ug/ℓ).

These data indicate that pesticides and SVOCs are potential contaminants at the site, but provide no information on the areal extent. Additionally, because

TABLE 12-1

SUMMARY OF ORGANIC ANALYTICAL DATA
FOR SURFACE WATER AND SEDIMENTS
STEWART ANGB, NEW YORK

CONSTITUENT	CONCENTRATION SD-100 (ug/kg)	SW-001 (ug/ℓ)	SD-101 (ug/kg)	SD-102 (ug/kg)
Volatile Organics	--	--	--	--
Semivolatile Organics				
Phenanthrene	--	--	500	--
Fluoranthene	--	--	620	--
Pyrene	--	--	540	--
Benzo(b)fluoranthene	--	--	450	--
Benzo(k)fluoranthene	--	--	450	--
Benzo(a)pyrene	--	--	260	--
Pesticides/PCBs				
4,4'-DDE	--	--	--	230
4,4'-DDD	170	--	--	--
4,4'-DDT	3100 C	0.57	--	--
Organophosphorus Pesticides	--	--	--	--
Chlorinated Herbicides	--	--	--	--

-- = Analyzed for but not detected.
C = Confirmed by mass spectrometry.

Note: Highest value reported at each sampling location listed.

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TABLE 12-2

SUMMARY OF INORGANIC ANALYTICAL DATA
FOR SURFACE WATER AND SEDIMENTS
STEWART ANGB, NEW YORK

	CONCENTRATION			
CONSTITUENT	SD-100 (mg/kg)	SW-001 (ug/ℓ)	SD-101 (mg/kg)	SD-102 (mg/kg)
Arsenic	4.4 N	--	3 N	--
Cadmium	3.7	--	--	2.9
Chromium	21	--	11	8.7
Copper	44	--	--	--
Lead	28 N	--	24 N	29 N
Mercury	--	--	--	0.26 N
Nickel	21	--	15	--
Zinc	104	--	59	43
Barium	86	--	--	--
Iron	32600	1460	15900	9650
Manganese	1190	87	2310	282
Vanadium	22	--	15	--
Aluminum	15600	739	7370	6400
Magnesium	6520 E	34800	2880 E	1990 E
Calcium	9060	13500	3430	3980
Sodium	--	18900	--	--

-- = Analyzed for but not detected.
N = Indicates spike sample recovery is not within control limits.
E = Indicates a value estimated due to interference.

Note: Highest value reported at each sampling location listed.

PCBs were reported at depth in soils, they may also be a potential surficial contaminant. It should be noted that surface water and sediment sampling was limited in areas topographically downgradient of the site.

Based on available data, inorganic sediment contamination appears limited at the site. Levels of inorganic constituents appear slightly higher in sediment sample JSD-100 than in JSD-101 and JSD-102, overall. However, the reported levels appear to be within concentration ranges typically occurring naturally in soils, as described in Section 6.5.1. Inorganic contamination of surface water at the one location sampled also does not appear to be significant. The concentration of iron in the surface water sample (JSW-001) collected at Station 100 exceeds the AWQC of 1 ppm; however, the USEPA criteria document acknowledges that iron is often found in marsh water at concentrations greater than 1 ppm, with no adverse effects on aquatic life. Marshy conditions exist in the ponded area at Station 100, due to the presence of emergent vegetation. Levels of other inorganic constituents in the surface water sample collected do not appear elevated.

As described in Section 7.7, levels of cations were higher in JMW-101 than in other wells, except for mercury, which was detected at 7.4 ug/ℓ in JMW-108. Low levels of VOCs are believed to be migrating from the landfill. Additionally, sampling of SW-1, SW-2, and SW-3 (located adjacent to the pesticide burial pit) by Dames and Moore revealed the presence of pesticides in groundwater at depths ranging from about 35 to 50 feet in two of the wells; SW-2 contained the highest levels of contamination. Data from the Dames and Moore wells indicate that pesticides have migrated vertically downward and horizontally away from the disposal area toward the east and southeast. Therefore, it appears there is a potential that groundwater discharging to the surface at downgradient locations might be contaminated.

12.3 ENVIRONMENTAL EXPOSURE ASSESSMENT

Numerous species of birds, mammals, amphibians, reptiles, and invertebrates are expected (but have not yet been documented) in the vicinity of the Stewart ANGB disposal site. These organisms may be exposed to hazardous constituents as a result of direct contact with contaminated soils, sediments, and surface water; drinking contaminated surface water; ingestion of other contaminated organisms; and inhalation of contaminants adsorbed to airborne particulates.

Based on available data, it appears that exposure to pesticides, SVOCs, and possibly PCBs may be occurring. However, it is impossible to evaluate the significance of these exposures at this time because: (1) the areal extent of contamination is not known, and (2) the species and numbers of organisms potentially exposed have not been documented. Additionally, the wet area east and southeast of the site is a potential receptor of contamination via surface runoff or groundwater discharge. Migration of DDT via surface drainage has been demonstrated based on analytical results for samples JSD-100 and JSW-001 collected in a small ponded area receiving runoff from the area around the former pesticide burial pit. The potential for discharge of contaminated groundwater to the wetland also exists, although the levels of contaminants detected in wells between the former landfill and the wetland (JMW-107, JMW-108, and JMW-109) do not appear to pose a hazard to aquatic organisms, except for mercury in JMW-108. If contaminants are present in wetland sediments and surface water, exposures to aquatic organisms may also be occurring.

12.4 DATA GAPS AND RECOMMENDATIONS

Environmental risk assessment cannot be performed at this time for two reasons. First, the extent of chemical contamination in soils, sediments, and surface water is not fully known, precluding estimates of the potential magnitude of exposure. Second, organisms that may be exposed to contaminants in environmental media have not yet been identified. The approach developed to address these environmental risk assessment data needs is described in the following paragraphs.

To evaluate risks to terrestrial ecosystems, soil/sediment samples would be collected topographically upgradient of the pesticide burial area (background), along identifiable drainage swales, and between the former landfill and the wetland, to determine the areal extent of contamination. If earthworms are found near potentially contaminated areas, they would also be sampled and analyzed to evaluate the potential for food chain exposures. (Earthworms are primary consumers and serve as prey for other terrestrial organisms.) Also, a terrestrial habitat assessment will be performed at the site, and telephone interviews will be conducted with state fisheries and wildlife officials, to identify terrestrial organisms that may be exposed to surficial contamination. To evaluate risks to aquatic ecosystems, wetland surface water and sediment sampling would be performed, and biological sampling would be conducted to identify aquatic organisms potentially exposed to contaminants in the wetland. Based on results of worm sampling and wetland surface water and sediment sampling, additional analyses of biota tissue samples may be necessary to address the extent of food chain contamination. This approach will provide sufficient information to develop and screen remedial alternatives in a timely and cost-effective manner.

12.5 OUTLINE FOR BASELINE ENVIRONMENTAL RISK ASSESSMENT

The anticipated organization of the environmental risk assessment for the Stewart ANGB disposal site is presented in the following outline.

- 1.0 Baseline Environmental Risk Assessment
  - 1.1 Introduction
  - 1.2 Biological Characterization
    - 1.2.1 Aquatic Flora and Fauna
    - 1.2.2 Terrestrial Flora and Fauna
  - 1.3 Wetland Functional Attributes
  - 1.4 Floodplains Assessment
  - 1.5 Impact Evaluation
    - 1.5.1 Summary of Analytical Data
    - 1.5.2 Summary of Contaminant Transport and Fate
    - 1.5.3 Environmental Exposure Analysis

        1.5.4 Environmental Risk Characterization
        1.5.5 Observed Effects
        1.5.6 Summary of Current and Future Impacts
    1.6 Summary and Conclusions

A floodplain assessment is included in the outline, because it is assumed that the Murphy's Gulch drainage area floods periodically. Federal agencies are mandated to evaluate floodplain impacts by the Floodplains Management Executive Order (E.O. 11988).

13.0 SUMMARY/CONCLUSIONS AND RECOMMENDATIONS

Based on results of the SI, ANG/IRP activities at the former Stewart/USAF landfill and the adjacent former pesticide burial site area at the Stewart ANGB in Newburgh, New York, a set of conclusions have been drawn and recommendations for further action have been developed. In general, based on the SI, it appears that there has not been substantial migration of compounds from the site and that potential for human contact with on-site soil, surface or groundwater is minimal because of topography and location factors. In addition, the compounds identified are generally immobile in a soil matrix and toxicity of these compounds is of concern for chronic rather than acute exposures. Specific conclusions and recommendations for each matrix are summarized in the following sections.

13.1 SUMMARY/CONCLUSIONS

13.1.1 Hydrogeology

In general, the site serves as a recharge area. Groundwater in the till discharges under confined conditions into Murphy's Gulch. A small component of flow in the lower portion of the on-site till may flow beneath Murphy's Gulch and discharge to Lake Washington. The site hydrogeology suggests that the glacial till extends beneath the landfill and that groundwater may be moving vertically from the till into the bedrock. Consequently, potential exists for landfill leachate to migrate into the bedrock. Farther downgradient, groundwater in the bedrock may flow upward into the glacial till and discharge into Murphy's Gulch.

13.1.2 Soils Contamination

The most serious soil contamination at the site appears to be related to migration of the chlorinated pesticide residues 2,4'DDT, 4,4'DDT, 4,4'DDD, and 4,4'DDE from the pesticide disposal pit. These residues were found to have migrated deep into the subsurface soils in the vicinity of the pit. Concentrations were measured by Dames and Moore (1985 and 1986) at low mg/kg levels in the soils 25 to 35 feet below the land surface. Groundwater adjacent to the pit was found to contain ug/ℓ levels of pesticide residues. In addition to migration into the subsurface, DDT, DDD, and DDE were identified in the surface soil/sediment of a shallow ponded area downgradient of the landfill and pesticide pit. 4,4'-DDT was the predominant compound at this location and occurred at a concentration of approximately 3 mg/kg (3,000 µg/kg). The extent of contamination of surface soils, as a result of migration of pesticides from the pit area by surface water transport, is unknown.

PAHs were observed at low levels in a second surface soil/sediment location. Five compounds were identified at levels below the CRDL: acenapthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, and chrysene. Five other PAH compounds were observed at concentration levels ranging from 450 to 620 µg/kg: benzo(b)fluoranthene, benzo(k)fluoranthene, fluoranthene, phenanthene, and pyrene. The extent of distribution of these compounds in the site soil cannot be estimated based on existing data.

Two subsurface soil samples contained PCBs, each at 210 µg/kg. The PCB Araclor 1254 was identified at levels just above the CRDL. Because samples were not taken from borings into apparent fill materials and were located in areas topographically upgradient of the landfill at depths of 12 to 31 feet below the land surface, the extent of contamination and maximum PCB concentrations at the site cannot be estimated, based on existing data.

Low levels of the metals arsenic, cadmium, lead, mercury, and zinc were observed in one or more subsurface soils and surface soil/sediments samples. None of the metals were found in concentrations higher than would be expected for uncontaminated soils. In addition, concentration patterns were not apparent and therefore do not suggest that the metals were related to contaminant migration from the landfill or the pesticide pit.

Subsurface soils contained the VOCs, chloroform, and toluene, but at levels below the CRDL. Benzene, methylene chloride, and acetone were identified in environmental samples, also at levels below the CRDL. Because the method blanks contained these three chemicals at levels similar to the environmental samples, they are considered to be contaminants introduced during sample handling/analysis, and not present in the subsurface soils. The semivolatile phthalate esters (diethyl phthalate, BEHP, and di-n-butyl phthalate) were identified in subsurface and surface soil samples, at levels below the CRDL. These chemicals were detected in laboratory method blanks, as well as field blanks. Therefore, these chemicals were possibly not representative of site-related soil contamination. Phthalate esters, however, commonly occur in landfill leachate.

13.1.3 Groundwater Contamination

As indicated in the Section 13.1.2, chlorinated pesticides, two chlorinated phenoxy-herbicides, and two organic phosphate compounds were detected in groundwater in the immediate vicinity of the pesticide pit. Concentrations of DDT and its transformation products, DDE and DDD, ranging from 0.15 to 15 µg/ℓ, were found at that location. The herbicide 2,4-D was observed at 20 µg/ℓ; the remaining compounds were less than 1 µg/ℓ. Since pesticides were not detected in the groundwater farther downgradient at the toe of the landfill, the extent of migration in the groundwater in the vicinity of the former pesticide pit is unknown.

Except for 1,1,1-trichloroethane, found at 8.6 µg/ℓ in JMW-107, all other compounds identified were below the CRDL. Methylene chloride was observed at similar levels in environmental samples, sampling/trip blanks, and in laboratory method blanks, and was judged to be a laboratory artifact rather than a site-related contaminant. Nine other HSL VOCs were identified in groundwater very close to or below the CRDLs. These included: acetone, 1,1,1-trichloroethane, 1,1-dichloroethane, trans-1,2-dichloroethene, chloroform, chloromethane, bromomethane, chloroethane, and vinyl chloride.

The distribution of these compounds in the wells and the comparability of the replicate samples suggest that the chemicals identified potentially represent either: (1) migration of a more concentrated plume at greater depths in the aquifer, (2) the residual contamination from a plume or slug of VOCs that has migrated farther downgradient, (3) the beginning of a plume just beginning to migrate from the landfill, or (4) migration only of extremely low levels of VOCs. Therefore, the extent and concentration of contaminants in the source and migration in the groundwater are unknown. Because of the low levels observed, GC methods are likely to be more appropriate than GC/MS for further investigation of the groundwater.

The phthalate ester BEHP was observed in JMW-108, downgradient of the landfill. This compound is a common artifact of sample handling and was observed in the sampler blanks, but was not found in the associated laboratory method blanks. Phthalate esters are commonly observed in landfill leachate. Therefore, the presence of this compound in groundwater needs to be defined. No other HSL organics, pesticides, herbicides, or PCBs were identified in groundwater downgradient of the landfill.

Mercury was detected at 7.5 µg/ℓ in one of four replicate samples from JMW-108. The fact that detectable mercury was not found in the other downgradient wells or in the three other replicates from JMW-108 suggests that the mercury is a possible artifact. The presence of mercury requires confirmation. No other significant metals contamination was observed downgradient of the landfill.

13.1.4 Surface Water

The surface water sample collected in the drainageway from the pesticide pit contained 0.57 µg/ℓ 4,4'-DDT. As indicated in the preceding paragraphs, the sediments of this shallow pond also contained DDT residues. Because of its strong sorptive properties, it is likely that the observed DDT in surface water is predominantly bound to suspended particulate matter. These data indicate the migration of chlorinated pesticide residues by surface water transport. Except for methylene chloride, considered to be a laboratory contaminant and not site-related, no HSL VOCs or SVOCs were observed in the surface water. Arsenic, barium, copper, and zinc were identified at levels below the CRDL. Because of the turbid nature of the samples, these metals are likely related to the suspended particulate matter as a component of the civil matrix from the site, based on the analysis of metals content in site soils.

13.2 RECOMMENDATIONS

Based on the conclusions that there has not been substantial migration of compounds from the sites and the fact that potential for human contact is minimal at or downgradient of the site, Jordan recommends the following:

- The existing monitoring wells should be resampled and the groundwater analyzed for inorganic compounds, VOCs and SVOCs, pesticides, PCBs, organophosphorus pesticides, chlorinated herbicides, chloride, fluoride, sulfate, and pH. Because of the VOC trace levels observed, additional analyses for these chemicals should be performed using more sensitive GC methods.

- Because of the migration of pesticides to the ponded area northeast of the landfill boundary, additional surface soil/sediment samples should be collected from: (1) the areas east and downgradient of the JSD-100 sample location (ponded area); (2) on the landfill surface in the vicinity of the former pesticide burial pit; and (3) between the pit and ponded area. These samples should be analyzed for chlorinated and organophosphate pesticides, herbicides, and PCBs.
- A limited soil/sediment sampling program should be performed to further assess the presence and extent of PAHs.
- A Baseline Environmental Risk Assessment should be performed for the site.

GLOSSARY OF ACRONYMS

ACL	Alternate Concentration Limit
ANG	Air National Guard
ANGB	Air National Guard Base
AP	Airport
ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
BEHP	Bis(2-ethylhexyl)phthalate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEARS	Cornell Laboratory for Environmental Applications of Remote Sensing
CLP	Contract Laboratory Program
CLP-CIP	Contract Laboratory Program Caucus Inorganic Protocol
CLP-COP	Contract Laboratory Program Caucus Organic Protocol
CRDL	Contract Required Detection Limit
CWA	Clean Water Act
DWEL	Drinking Water Equivalent Level
FTA	Fire Training Area
GC	gas chromatography
gpm	gallons per minute
HSL	Hazardous Substance List
I	Industrial
IB	Interchange Business
IDL	Instrument Detection Limit
IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
MS	Mass Spectrometry
NCP	National Contingency Plan
NHAP	National High Altitude Photograph
NPL	National Priority List
NUS	NUS Corporation
NYANG	New York Air National Guard
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OLI	Office and Light Industrial

PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PI	Photoionization; Planned Industrial
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SVOCs	Semivolatile Organic Compounds
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
USMA	U.S. Military Academy
VOCs	Volatile Organic Compounds

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ADDENDUM A

CONSTRUCTION SUPERVISION REPORT - PESTICIDE REMOVAL PROJECT, STEWART ANG, NEWBURGH, NEW YORK

EXPLANATION

The ANG contracted with Geo-Con, Inc., of Pittsburgh, PA in 1986 to remove buried pesticide containers and contaminated soil at the Pesticide Burial Pit Area adjacent to the Stewart/USAF Base Landfill. The removal operations were implemented in April and May 1988. Dynamac Corporation of Rockville, MD was contracted by the ANG to observe the excavation and soil sampling operation conducted by Geo-Con, Inc., and to prepare a project summary report. This report presents background data, chronology of field activities and project summary. Analytical results of the soil sampling from the excavation are also included.

Hazardous Materials Technical Center

CONSTRUCTION SUPERVISION REPORT

PESTICIDE REMOVAL PROJECT
STEWART ANG, NEWBURGH, NY

Installation Restoration Program (IRP)
New York Air National Guard
Stewart Air National Guard Base
Newburgh, New York

Dave Hale
Construction Supervisor

Hazardous Materials Technical Center
Dynamac Corporation
Rockville, Maryland

March 1989

DYNAMAC CORPORATION
Operated for the Defense Logistics Agency by: DYNAMAC CORPORATION
Corporate Headquarters: The Dynamac Building, 11140 Rockville Pike, Rockville, MD 20852 Tel 301-468-2500

CONSTRUCTION SUPERVISION REPORT

PESTICIDE REMOVAL PROJECT
STEWART ANG, NEWBURGH, NY

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March 1989

Construction Supervision Report
Pesticide Removal Project
Stewart ANG, Newburgh, NY

LIST OF FIGURES

APPENDICES

1. Introduction

This report details the findings, observations, and work accomplishments for the pesticide excavation project at Stewart Air National Guard Base (Stewart ANGB) in Newburgh, NY (see Figure 1). A summary and overview of the project is provided, followed by a daily chronological log of the actual work and appendices containing pertinent analytical results and mapped locations.

2. Background

In 1986, Stewart ANGB officials contracted with Geo-Con, Inc. of Pittsburgh, PA, to have pesticides and other unknown chemicals buried in a former landfill section removed and disposed off-site (see Figure 2). These chemicals were anticipated to be largely in 5-gallon steel containers, and confined to an area defined by a 20′ x 53′ boundary. Plans were developed and a contract let to excavate this area as a reinforced pit, with the waste soil and excavated containers to be disposed in a regulated, permitted landfill facility in South Carolina. Figure 3 shows the Site Layout developed by Geo-Con for this removal action. It was anticipated that excavation of this pit down to a maximum depth of 21′ would remove most, if not all of the waste materials and contaminated soil containing above 10 ppm of DDT, as determined at a Draft Final design meeting on 5-6 June 1986 between HMTC, ANGSC, NYANG, NYDEC and USEPA Region 2 representatives.

The contract was originally scheduled for start and completion in the summer of 1986. Because of various contractural disputes and technical questions, actual remediation activities did not begin until the spring of 1988.

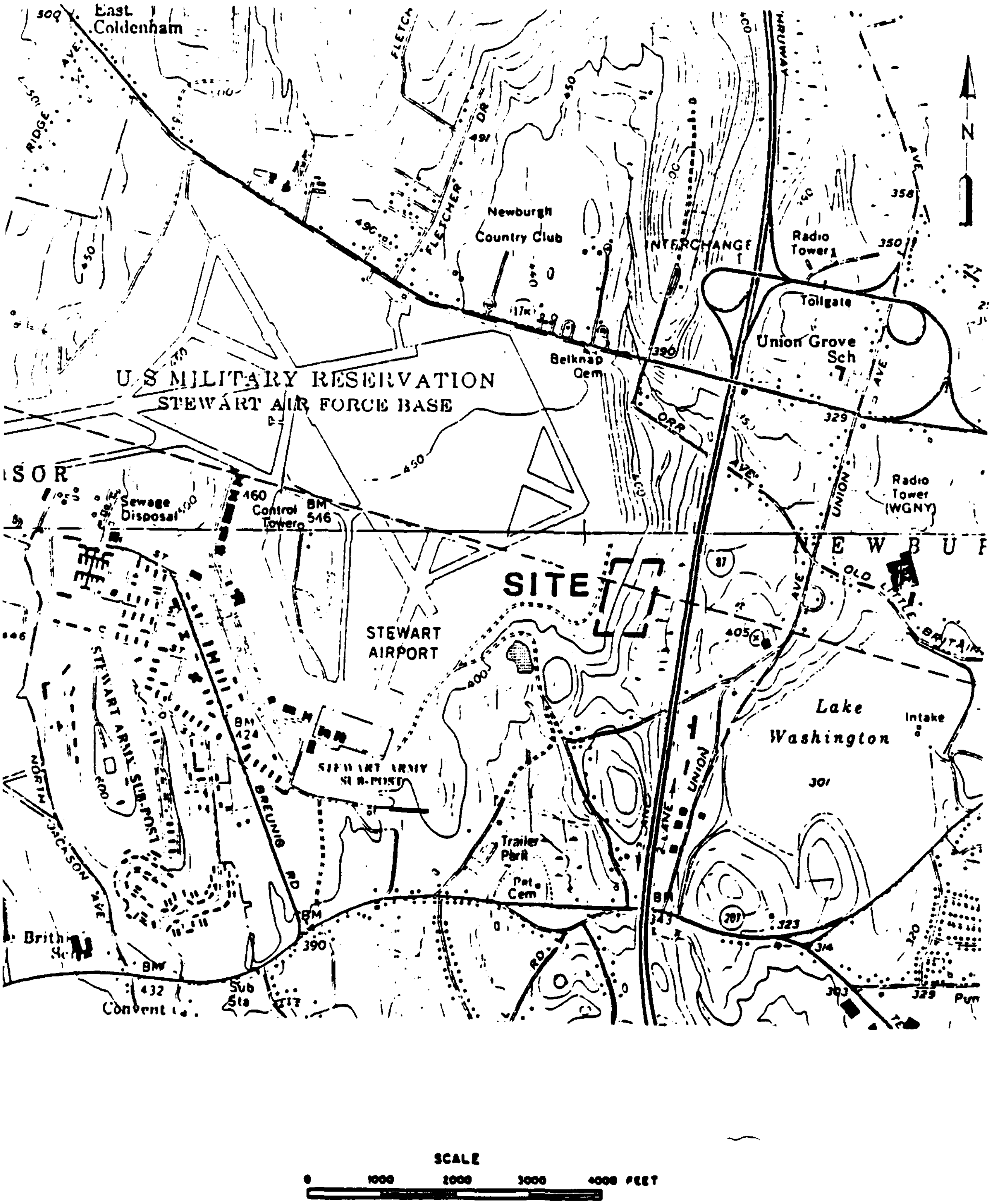
3. Project Summary

a. Site Preparation

Site preparation began in the early spring of 1988, and consisted of project mobilization, site delineation and control, and removal and stockpiling of the top 3′ to 4′ of surface soil from the pit area. Steel H-piles were driven into the

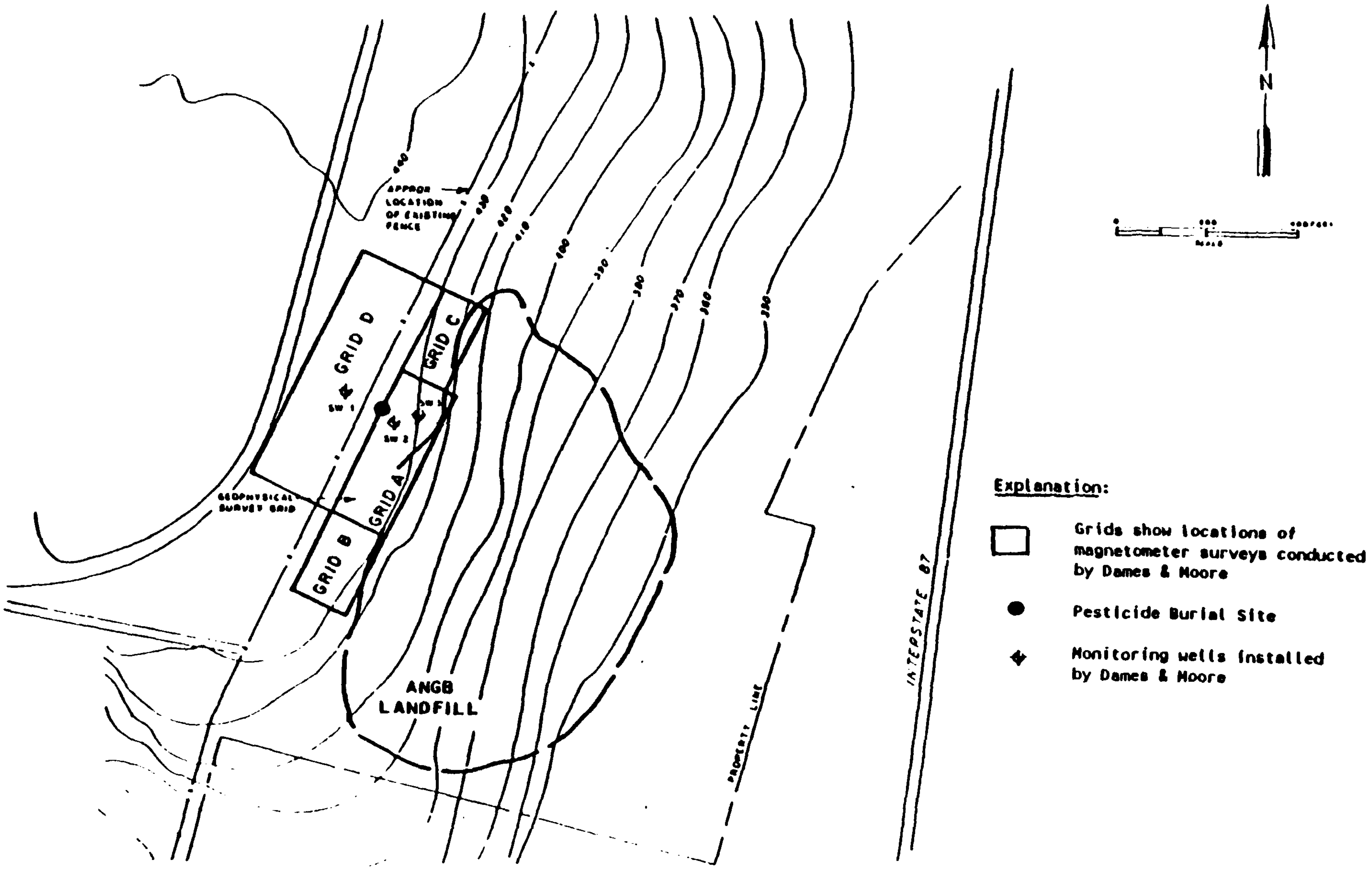
Source: USGS 7.5' Topographic Map
Cornwall, NY (1981) and Newburgh,
NY (1957) Quadrangles

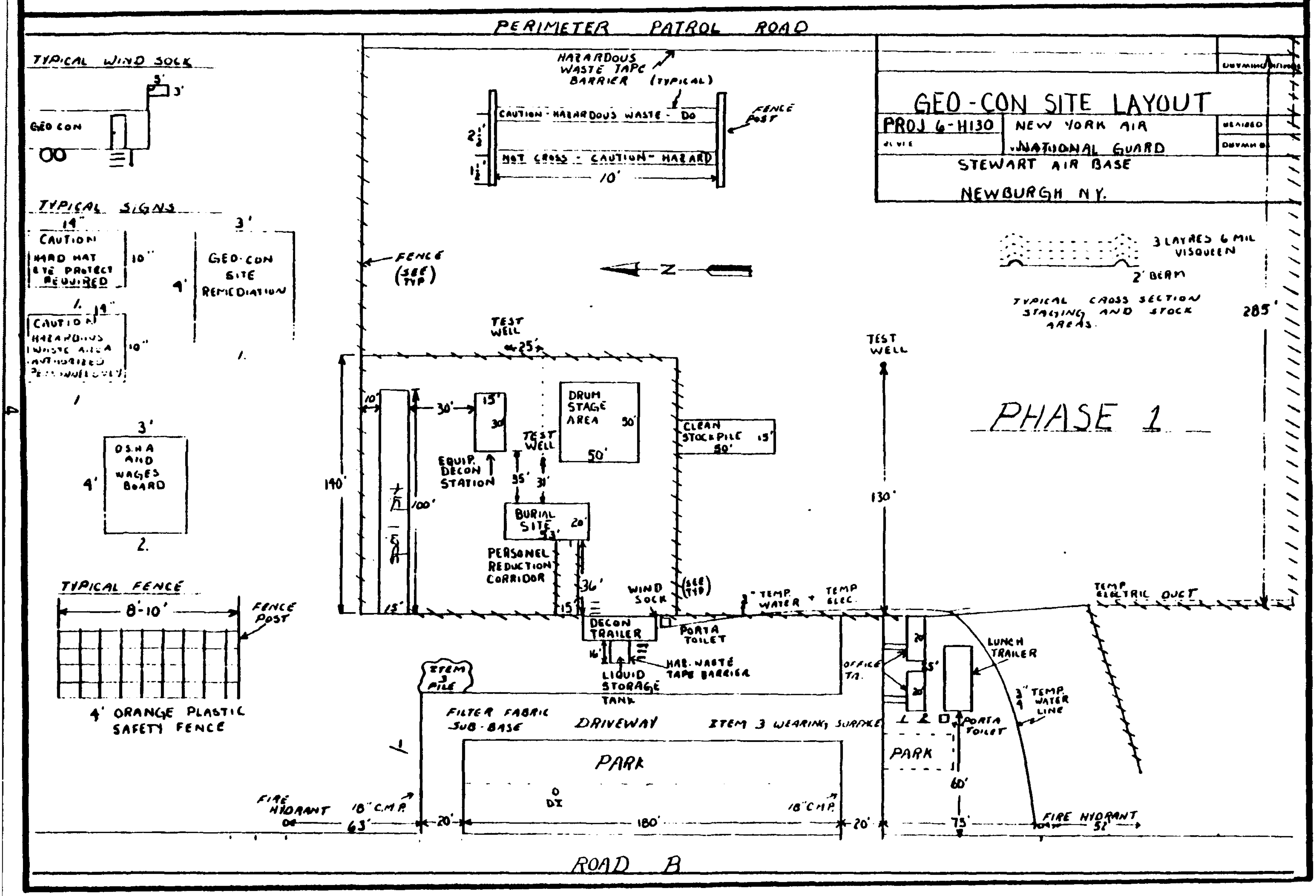
Figure 1.
Site Location Map



Source: Dames and Moore, 1986

Plot Plan




PERIMETER PATROL ROAD
GEO-CON SITE LAYOUT
PROJ 6-H130
NEW YORK AIR NATIONAL GUARD
STEWART AIR BASE
NEWBURGH N.Y.
TYPICAL WIND SOCK
3'
3'
GEO CON
TYPICAL SIGNS
14"
CAUTION HARD HAT EYE PROTECT REQUIRED
10"
1.
14"
CAUTION HAZARDOUS WASTE AREA AUTHORIZED PERSONNEL ONLY
10"
3'
GEO-CON SITE REMEDIATION
4'
1.
3'
OSHA AND WAGES BOARD
4'
2.
TYPICAL FENCE
8'-10'
FENCE POST
4' ORANGE PLASTIC SAFETY FENCE
HAZARDOUS WASTE TAPE BARRIER (TYPICAL)
CAUTION - HAZARDOUS WASTE - DO
NOT CROSS - CAUTION - HAZARD
2½'
1½'
10'
FENCE POST
FENCE (SEE TYP)
N
3 LAYRES 6 MIL VISQUEEN
2' BERM
TYPICAL CROSS SECTION STAGING AND STOCK AREAS
285'
TEST WELL
25'
140'
10'
30'
15'
30
100'
15'
EQUIP. DECON STATION
TEST WELL
35'
31'
DRUM STAGE AREA
30'
50'
CLEAN STOCKPILE
15'
50'
BURIAL SITE
20'
53'
PERSONEL REDUCTION CORRIDOR
36'
15'
WIND SOCK
(SEE TYP)
DECON TRAILER
16'
PORTA TOILET
HAZ. WASTE TAPE BARRIER
LIQUID STORAGE TANK
3" TEMP. WATER
TEMP ELEC.
TEST WELL
130'
PHASE 1
TEMP ELECTRIC DUCT
OFFICE TR.
20
20
15'
LUNCH TRAILER
3" TEMP. WATER LINE
PORTA TOILET
ITEM 3 PILE
FILTER FABRIC SUB-BASE
DRIVEWAY
ITEM 3 WEARING SURFACE
PARK
DI
PARK
60'
FIRE HYDRANT
18" C.M.P.
63'
20'
180'
18" C.M.P.
20'
75'
FIRE HYDRANT
51'
ROAD B

soil around the periphery of the 20′ x 53′ pit area to serve as the mechanical support means for the pit walls during excavation. Oaken timbers were to be placed horizontally within the flanges of these piles as excavation progressed to provide support to the pit walls. During placement of these piles, it was observed that the piles (H12x76) encountered very stiff resistance as shallow as 15′ to 17′ in depth, with no piles being driven more than 22′-23′ deep. Several of the piles curled and leaned during the driving process, indicating the presence of bedrock or very stiff hardpan material.

b. Initial Excavation and Findings

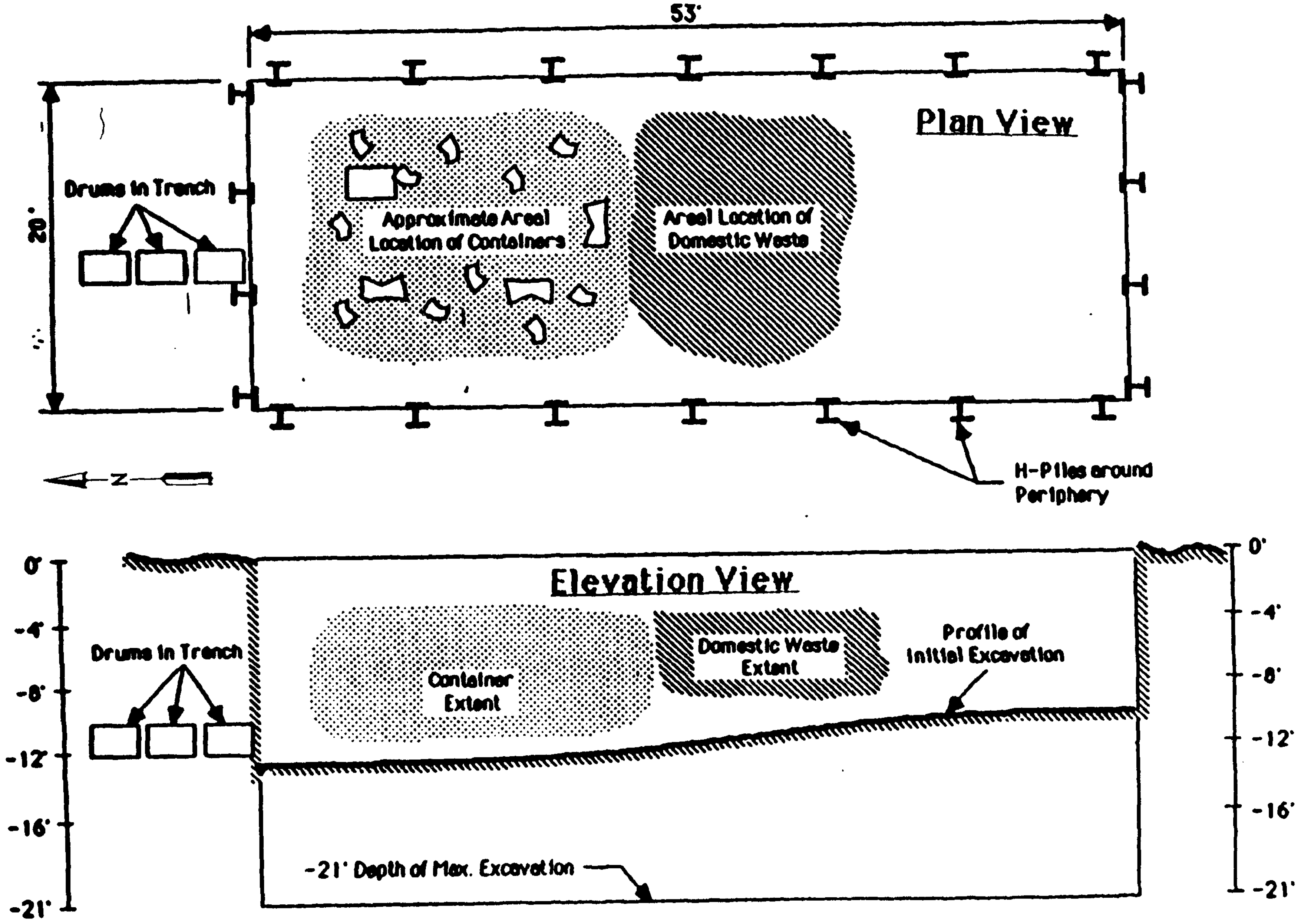
Excavation of the pit area began on 27 April 1988. Containers were found at approximately 4′ below the surface, scattered randomly within the pit area. Initially, the containers were hand-excavated. They were found to be moderately damaged and appeared to have been deliberately punctured in several locations. The first cans had 5 to 6 round, inward-facing holes around their bottom periphery, and appeared to have been tossed into the pit after being punctured. The cans were partially filled with a grayish, watery liquid that did not register any volatile constituents. Small amounts of yellowish material floated on the liquid that seeped into the holes in the pit bottom as the containers were removed. A 55-gallon drum lying partially sideways was found to be similarly punctured and damaged.

Because of the damaged nature of the drums and the tight, nearly impervious gray clay material present in the pit, the decision was made to bulk excavate the pit using the medium-sized backhoe present. Once this was underway, the vast majority of the containers were found in the north central portion of the pit (see Figure 4). A few containers were found near or at the pit wall, except for a line of 55-gallon drums that extended several feet beyond the north face of the pit. Further discussion regarding these drums is given in Section 3 c., Excavation Results.

During the course of the bulk excavation, several containers leaked liquids that eventually collected in several sump holes dug into the bottom of the pit.

HMTC Source: HMTC, 5 May

Plan and Elevation Views



Several puddles contained floating pesticide materials. Twenty to thirty gallons of these materials were collected and removed from the pit bottom. The grayish watery liquid in the containers appeared to be suspended solids from the clay material. There were no noticeably large quantities of distillate fuel co-solvents such as kerosene or diesel. Also, a 55-gallon drum was found containing what appeared to be used motor oil.

c. Excavation Results

Approximately 105 5-gallon containers and 13 55-gallon containers were removed from the pit (1,240 theoretical gallons). Almost all of these were located in a cluster in the north central region of the pit. Wood, plastic strapping and domestic waste consisting of household garbage were found in the central area of the pit. Since no waste materials were detected in the southern end of the pit, and below the 6′ depth, it became apparent that the soil was undisturbed and uncontaminated, further digging in this area below the 10′ depth was suspended.

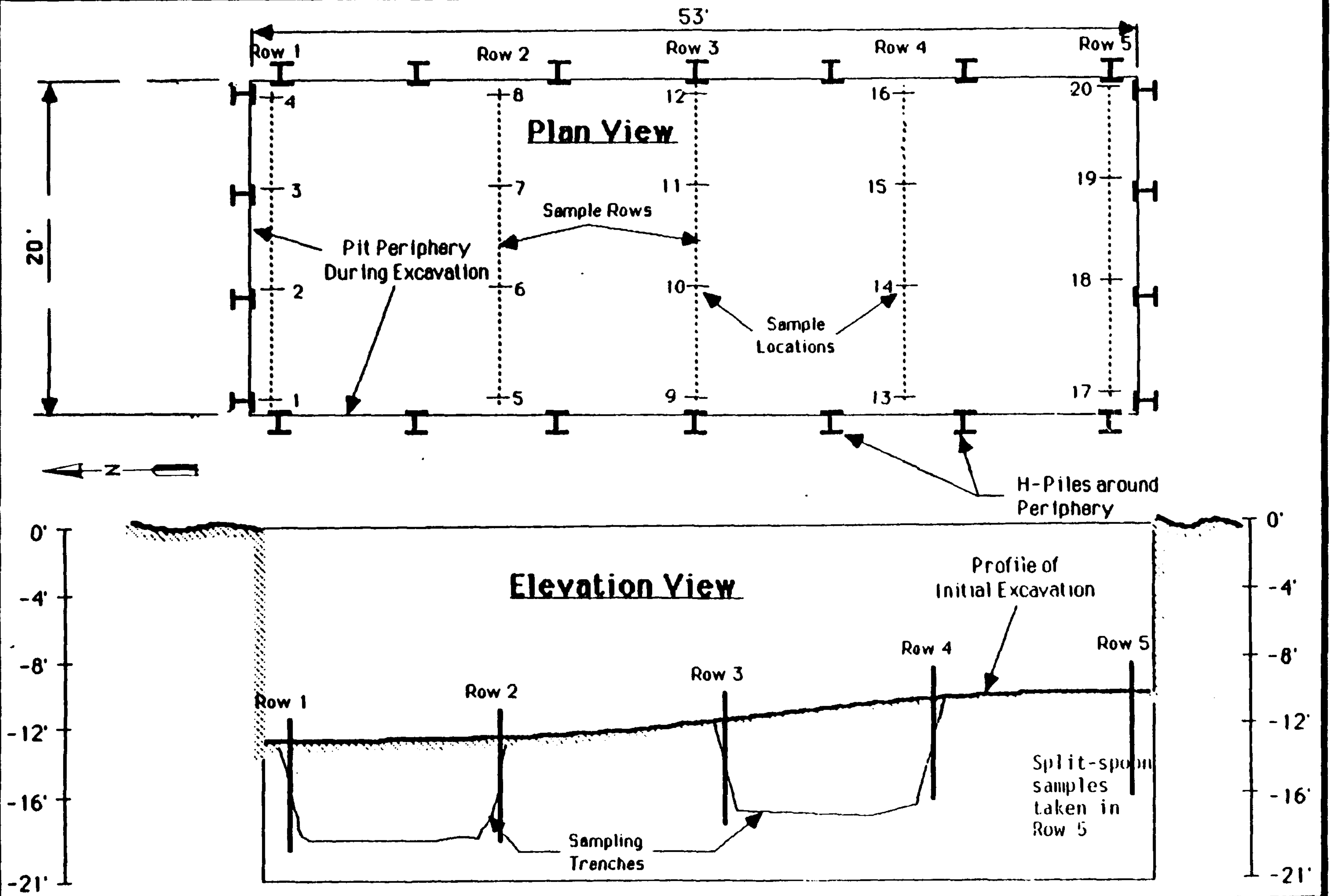
The maximum depth of container burial appeared to be approximately 12′. The bottom of the pit was excavated to a maximum depth of 14′ in the northern end, and 11′ in the southern end of the pit. The material at these depths contained a considerable amount of large and medium rocks and boulders and hardpan material. Three 55-gallon drums, lying horizontally end-to-end in a narrow trench 12′ deep, were recovered along the north face of the pit wall. These were in good shape and not leaking. Digging to 10′ beyond the north end of the pit revealed no further containers.

d. Sampling

Sampling of the pit bottom, waste pile, drums, and background soil was performed by an analytical subcontractor to Geo-Con, Lancy Environmental. Contract specifications called for pit bottom sampling to compromise a grid pattern of boreholes spaced as five rows of four across, with samples to be taken and composited across each row at 0′, -2′, -4′, and -6′ depths from the pit bottom, as shown in the plan view in Figure 5.

Source: HMTC, 5 May 1988

Figure 5.
Sample Locations



The soil constituting the pit bottom was extremely stiff gray clay interspersed with sizeable quantities of granite pebbles, cobbles, and boulders (estimated rock content about 25-30%). Because of this very rocky soil, the decision was made by NYANG and HMTC to dig two 6′ deep trenches into the pit bottom using a backhoe as a means of obtaining soil samples. Samples were then taken from the walls of these trenches at the appropriate depth specified. Soil from these trenches was segregated and kept in individual piles, pending the results of the analytical tests. Figure 5 shows the sample locations in plan and elevation views.

Two surface soil samples were taken approximately 200′ northwest of the pit to establish a representative level of residual pesticide in the nearby surface soils.

Two drum samples were taken at the beginning of excavation when the drums were initially found.

e. Sampling Results, Additional Pit Excavation, and Soil Disposal

Results from the pit bottom sample analyses indicated the need for additional pit bottom soil excavation and disposal. The results of these tests are plotted in Figure 6, and indicated that the majority of the additional soil to be removed lay beneath the pesticide drum locations. However, the results indicated that the maximum depth of soil to be removed would not exceed 18′, and the area to be covered was about one-third of the pit. The final profile of the excavated pit is shown in Figure 7. After this additional soil was removed, loading, transport, and disposal of the excavated soil began.

Originally, the contractor had planned to dispose of the contaminated soil at the GSX landfill facility in South Carolina. Due to scheduling and state-imposed disposal limitations, this facility could not accept the waste soil in a time frame acceptable to the contractor. The decision was made to dispose of the waste soil and liquids at the Chemical Waste Management landfill near Buffalo, NY.

HMTC Source: HMTC, 5 May 1988

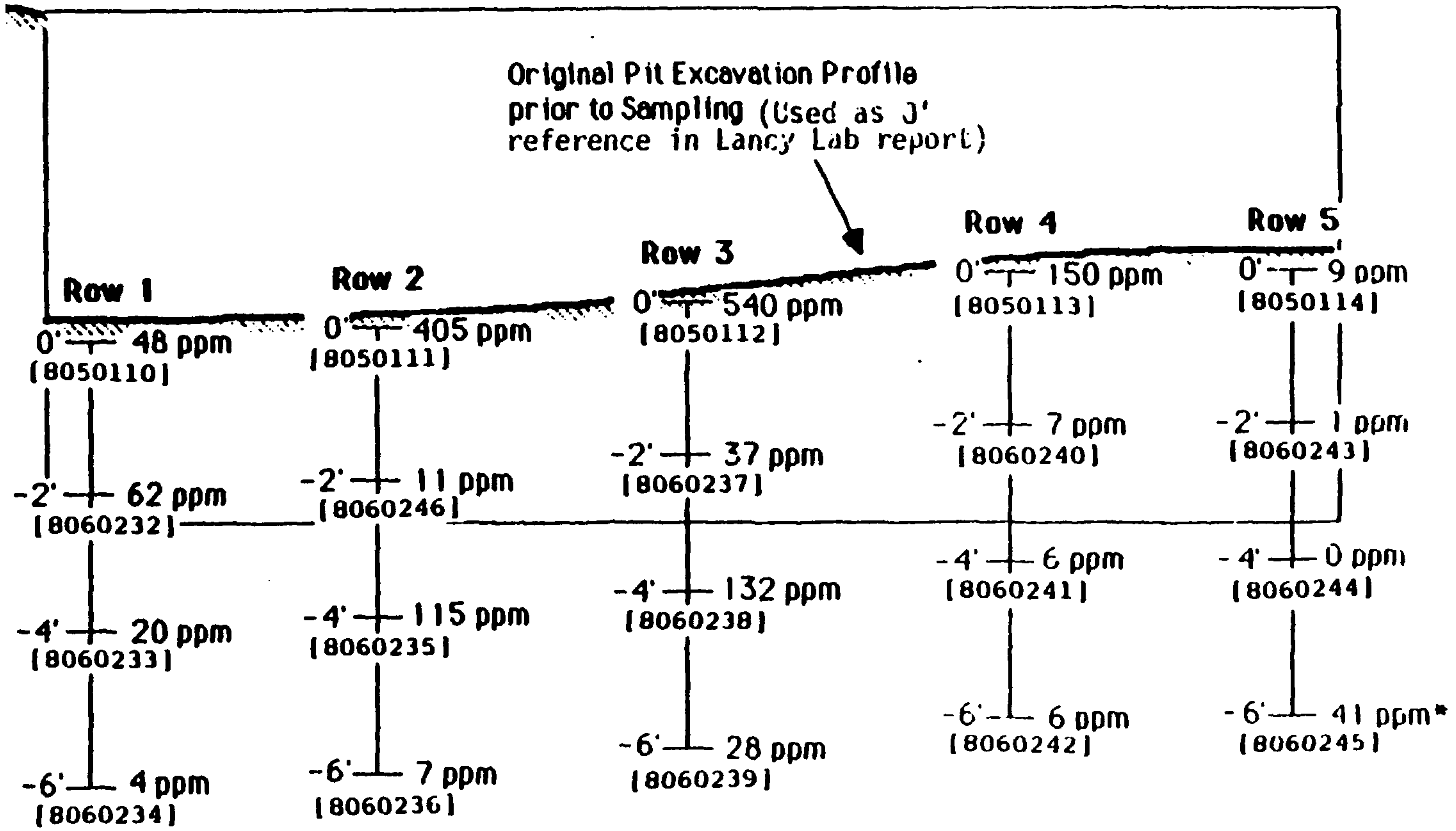
Figure 6.
Pit Bottom Sampling Results and Sample ID Numbers (shown in brackets)

Notes:

1) All results represent the total of DDT, DDD, and DDE

2) Results are listed as mg/kg or ppm

3) Samples were composited at each elevation from four locations in each row

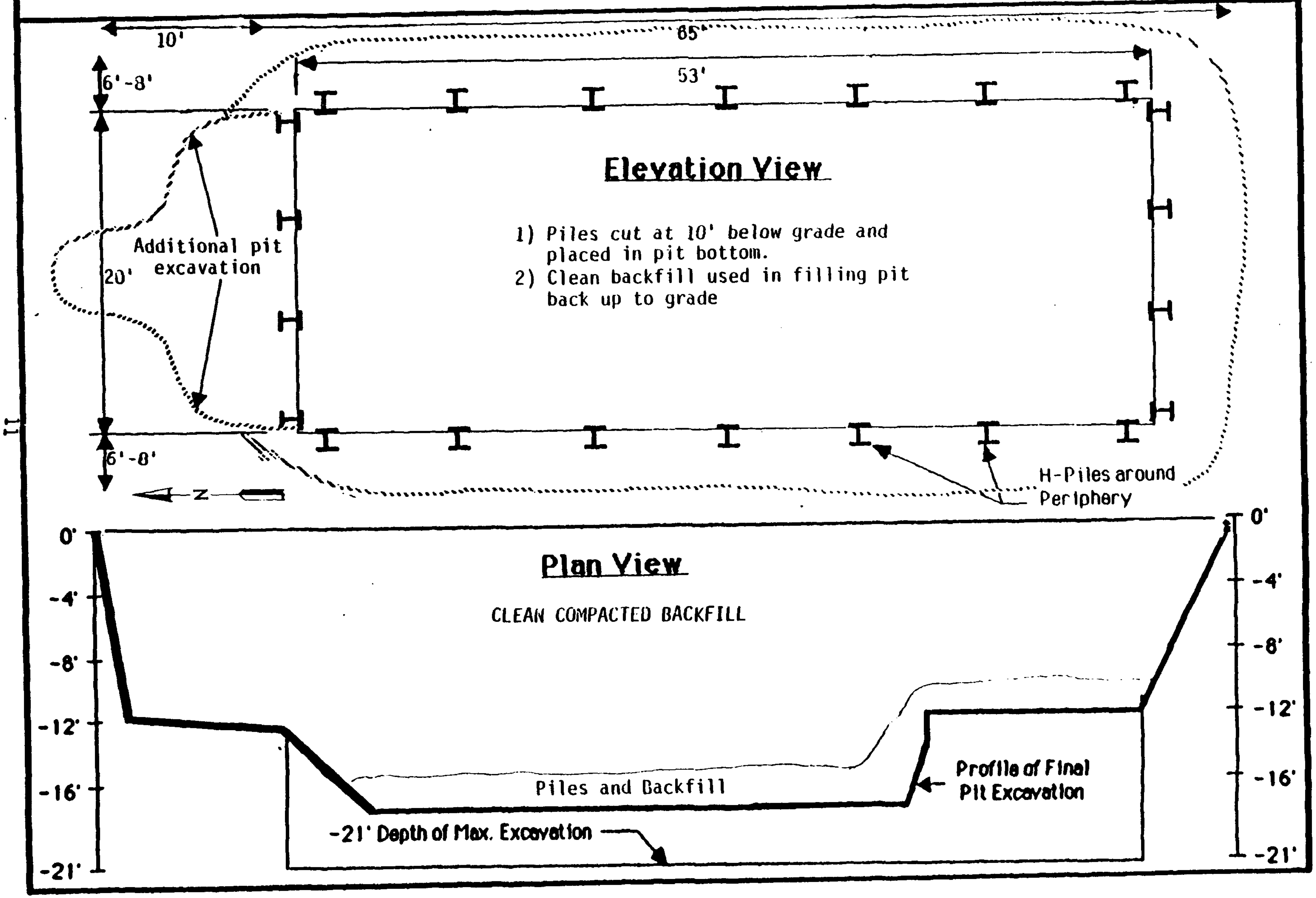


*The sample result at Row 5, -6' gave an anomylously high reading of 41ppm. This was presumed an error and a negligible value was assumed. See Section 5 of this report for disscussion.

HMTC

Source: HMTC, 5 May 1988

Figure 7.
Plan and Elevation View of Final Pit Area Limits



Five days were required for the loading of 67 trucks containing approximately 1,300 tons of soil and seven drums of collected liquid. The lagging timbers supporting the side walls were removed and shipped along with the contaminated soil. The vertical H-piles were exposed by removing an additional 6′ to 8′ of soil around the pit perimeter, and cut off approximately 10′ below grade, and buried in the pit beneath clean backfill. The pit was then completely backfilled, compacted, and the entire site graded to a final, level appearance.

f. Findings and Conclusions

Several findings and conclusions were reached during the removal operations. The containers were very well bounded within the northern section of the defined pit area. Only the line of three drums, which did not contain pesticides, extended beyond the pit confines. The containers were not in any orderly, stacked fashion as had been previously assumed; they were randomly scattered and appeared to have been heavily damaged from the loading of the backfill soil. Most importantly, they appeared to have been deliberately punctured prior to or during burial. Most of the intact containers excavated either leaked liquid from the ice pick-sized holes, or had little or no interior liquid to leak from them. Similar larger punctures were found on several of the 55-gallon drums.

Several puddles containing floating pesticide material were present, but no more than an estimated total of 20 to 30 gallons of these liquids were observed during the entire excavation. Liquid in the containers appeared to be largely composed of a grayish water, possibly suspended solids from the clay material. Whether this water was present in the containers prior to burial or infiltrated into the containers after burial is unknown. The observed pesticides were excavated.

The containers were confined to a localized area in the northern end of the pit. The southern end of the pit did not yield any waste materials of any kind, and digging in this area revealed the soil to be undisturbed. A considerable amount of domestic solid waste was excavated in the central portion of the pit, including a preserved New York Times newspaper dated 1 October 1969. Some of the soil in this area had a mottled black color. Also, a few 1-gallon plastic containers were found in the entire pit area, none with labels.

The soils in the lower elevations of the pit area were extremely tight, stiff, and apparently (from a visual inspection) impervious to liquid penetration. Although there was a significant percentage of rock and cobble in the soil, this did not appear to increase its permeability or porosity. The material was extremely difficult to dig and sample from, and it was concluded from field observations that very little migration of DDT occurred from the pit, either vertically or horizontally. The DDT material encountered was almost exclusively confined to the area of container disposal, and practically none was found in the virgin soil at lower elevations in the south end of the pit.

4. Chronological Project Log

Wednesday, 27 April

Previously, the top four feet of pit area had been excavated and stockpiled as clean fill material. Actual excavation of the pit area below the -4' elevation began on Wednesday morning, 27 April 1988. Workers were clothed in Level C personal protective equipment, using Tyvex or Sarnex suits with air-purifying respirators (APR). A survey of the pit area air was made with an Organic Vapor Analyzer (OVA) prior to worker entry, and found to contain no elevated levels of airborne organic vapors. Excavation was conducted by a John Deere 790D tracked backhoe, with a 1.5 cubic yard toothed bucket.

Shortly after beginning excavation activities, the first 5-gallon container was located, at 8:45 AM. Two workers descended into the pit with shovels, and carefully extracted the container. The container was intact, but very crumbled, although not as a result of the excavation activities. When the container was extracted and set upright, it began to leak a light gray, watery liquid from several (four to five) small pinholes. A second container was found nearby, and was similarly excavated by hand. It too was damaged and leaking. Work was suspended pending the outcome of a discussion with NYANG officials.

Inspection of the containers revealed that they were in reasonably good shape corrosion-wise, but were somewhat mangled, most likely due to the loading effects of the overburden. The most interesting features about them were that they were found in a seemingly random configuration and appeared to have been deliberately punctured in several locations around the bottoms of the cans. There were several round, smooth (no corrosion), inward holes in the containers, as if someone had punctured them with an ice pick or similar tool.

During discussions with NYANG officials, it was concluded that the containers were most likely situated in a random-dump configuration, and that their integrity was questionable based on the current findings. It was decided to proceed with a bulk excavation process, using the backhoe to quickly dig out and remove the containers and surrounding soil.

Work resumed, and several more 5-gallon containers, as well as 55-gallon drum, are found and excavated. The containers were situated in the north central portion of the pit area and appeared to be in a random order. The 55-gallon container was found lying mostly on its side. The containers appeared to be 1/3 to 1/2 full of liquid. Samples taken of these liquids had a small, yellowish floating segment, with the majority of the liquid appearing as a grayish water. OVA sampling of the sample bottles indicated an 80 ppm reading. For the day, ten 5-gallon, two 55-gallon, and one 1-gallon containers were excavated or extracted. Lagging of the walls in the northern end of the pit with oaken timbers was begun.

Thursday, 28 April

It rained all day Thursday. Geo-Con altered and repaired the cover over the pit area to better prevent the infiltration of rainwater into the pit. No other excavation work was performed on this day.

Friday, 29 April

Work was resumed on the shoring of the pit walls down to the -6′ elevation, which took all morning and the first part of the afternoon. At 2:30 PM, excavation was resumed, and six 5-gallon and one 55-gallon containers were immediately found.

Like the other containers, these were punctured and leaking in several places. The 55-gallon drum was also punctured by a tooth of the backhoe. Liquid from the containers was drained into and collected in a sump hole, where it is periodically pumped out and removed. Because of the tight clay nature of the soil in the pit area, these liquids did not visually percolate downward or laterally from the pit.

OVA sampling of the pit area and liquids collected from the pit was performed. It was then determined that the OVA had not been properly lit, and that the previous results from that day were in error. After properly restarting the OVA instrument, erratic readings resulted. These took the form of the instrument indicating background levels, then detecting extremely high concentrations of organic vapor. The erratic OVA readings continued in a random nature as the entire pit area and site periphery was surveyed. Further work was suspended at 3:30 PM until the cause of the erratic air sampling results could be determined. Overtime work for Saturday was planned. Corroded or dirty electrical connections on the OVA probe plug was the prime suspect for the OVA's erratic results.

Saturday, 30 April

OVA sampling around and in the pit area was inconclusive. It appeared that the OVA was still malfunctioning. Geo-Con decided to have a new OVA air-shipped in today, and not to proceed with further excavation until a consistent, believable air monitoring result could be obtained. Several Draeger (air sampling) tube tests were taken to try to detect the presence of hydrocarbons in the air, and all these results were negative. Cleaning of the dirty/corroded connection on the OVA helped somewhat; the results were more consistent (indicating nothing present), however, due to the inconsistencies, work was stopped until a new instrument was obtained.

Geo-Con picked up the new OVA from the Newark International Airport late Saturday. Surveying the site with the new instrument will be done on Sunday.

Sunday, 1 May

Upon opening the new OVA, it was found that it was not shipped fueled with the hydrogen gas necessary to operate the unit. After making telephone calls, the local industrial gas supplier opened long enough for fueling the two OVAs. During sampling the OVAs read reasonably consistent, within 20% of each other. Surveys of the pit and surrounding site yield the following results:

Background: 5 ppm
Hot Zone: 6 ppm
Pit Edge: 11 ppm
Pit Bottom: 14 ppm

There was good correlation with the original OVA unit. The cleaning seemed to have worked. Work was planned to resume on Monday, 2 May.

Monday, 2 May

After an extensive site safety meeting, excavation resumed at about 8:30 AM. Numerous 5- and 55-gallon containers were found. A continuous count was made of the containers and other debris as it was excavated from the pit, but before transfer to the waste pile area. The containers were no longer being segregated from the soil surrounding them.

A large amount of domestic waste was found in the center of the pit in the 6′ to 8′ horizon. A preserved New York Times newspaper dated 1 October 1969 was removed, along with other household waste such as soda pop cans, peanut butter jars, Army manuals, steel cables, etc. A large amount of wooden pallet material and plastic acid jugs were found with them.

Several different colors of floating liquids were detected in the various depressions in the pit bottom - blue, yellow, green, black, white, and gray. There appeared to be no significant quantities of these liquids, no more than 20 to 30 gallons, including leftover water from the previous digging activities.

Liquid samples from the various containers usually contained mostly the ubiquitous grayish, water liquid, with an occasional floating layer of yellowish material. One 5-gallon container that was punctured by the backhoe appeared to be mostly pure product (DDT?). One 55-gallon drum excavated appeared to be full of used motor oil.

Lagging was resumed at 11:00 AM. Approximately 40 5-gallon and three 55-gallon containers were removed in the morning. At 2:00 PM, excavation was resumed in the south end of the pit. During this time, it was observed that no waste materials were encountered in this end of the pit, and that consolidated and undisturbed soil was largely present. After meeting with NYANG officials and having them visit the site, it was concluded that this was virgin material, and that it was unlikely that waste materials would be encountered deeper. Thus, the decision was made to stop digging below the 10′ to 11′ horizon in this end of the pit, since the soil was dry, undisturbed, and unlikely to be contaminated.

By the end of the day, most of the contaminated soil and mud in the pit had been removed and stockpiled. No further layers of containers were encountered below the 11′ to 12′ horizon. The backhoe encountered extremely tough material at this depth with interspersed large round boulders and stone, as well as the beginnings of hardpan material. It appeared unlikely that further containers would be found below this elevation, as the digging was extremely difficult. At the end of the day, the count for containers excavated stood at 105 5-gallon and 10 55-gallon.

<u>Tuesday, 3 May</u>

The end of a 55-gallon drum was found just below the bottom lagging in the north face of the pit lying horizontally and projecting outside of the pit perimeter. This drum was excavated intact, at which time the end of another was detected behind it, further outside the pit area. After meeting with NYANG officials, it was decided to excavate behind the north face of the pit to follow the drums to uncover their full extent. During this excavation, it was observed that the drums were apparently laid end-to-end in a narrow trench at approximately

-12′ depth. The pattern of backfill material was distinct from the surrounding soil indicating a single trench with side slopes of approximately 0.5:1. A total of three drums, in good shape and not leaking were removed from this trench. Digging was done 5′ behind the last drum and did not indicate any further containers. Therefore, digging beyond the pit perimeter was suspended after going 10′ horizontally from the north face. The rest of the day was spent on cleaning out and leveling the pit bottom for sampling.

<u>Wednesday, 4 May</u>

Sampling crew from Geo-Con's analytical subcontractor, Lancy Environmental, arrived in the morning and prepared to begin sampling. They intend to use stainless steel hand augers of various lengths to obtain samples from the various depths. After expressing our doubt as to the ability and effectiveness of these devices to go 5′ deep into the hard material present in the pit bottom, they proceed to attempt sampling. As suspected, the hand augers could not penetrate more that 6" maximum into the rocky hardpan material. They were able to obtain samples only from the surface sampling grid locations, as well as the background and waste pile composite samples.

A question is raised as to the interpretation of the soil boring log (provided by Dames & Moore) included in the technical specification, with Geo-Con contending that is does not indicate the presence of the rocky, hard material present at the pit elevations. The NYANG feels that it does, and the possible dispute was left for another day. Some form of mechanical drilling apparatus was necessary to drill to the 5′ depth specified, and Geo-Con had a large tracked drilling rig available in Pittsburgh. It was decided to first obtain the results of the surface samples before drilling further, as clean results from these surface samples might justify omitting deeper drilling and sampling, resulting in savings to the NYANG for these items. Split samples obtained from the surface samples were provided to the NYANG for analysis by their in-house labs at Brooks AFB.

Thursday, 5 May

Lancy personnel departed for Pittsburgh, leaving one of their employees to wait for liquid sampling equipment to obtain samples from several of the drums containing liquid. After these samples were taken, further work on the project was effectively suspended until the analytical results of the waste pile and pit bottom samples were obtained. It was anticipated that this work will take anywhere from seven to ten working days.

Tuesday, 31 May through Thursday, 2 June

Geo-Con obtained a hand-operated, motor-assisted drill rig for use in the pit to obtain split-spoon samples down to a 6′ depth. This drilling was obtained from the manufacturer in Scranton, PA, transported to the site, assembled, and tested during this three day period. The device drove a 3" split spoon sampler reasonably well into the surface soils near the pit, and techniques to optimize its use and handling were developed.

Monday, 6 June through Friday, 10 June

The crew was reassembled to conduct the pit bottom sampling operation. It rained for most of the day Monday, and thereby stopped sampling work until Tuesday. When sampling resumed, the progress was slow and tedious. It took up to several hundred blows to drive the sampler up to 15" deep at a time, and then the sampler was even more difficult and time-consuming to extract. Because of the nature of the motorized cathead assist, the 1" diameter hemp rope used to operated the hammer overheated and burned through quickly during the extraction process. Up to five lengths of rope were burned to remove the sampler after each 15" drive. The deeper the borehole, the more effort, rope, and time it took to drive and extract the sampler.

After two days of slow and nominal progress, the contractor decided to use a 25-ton truck crane. Using the crane to drive the sampler proved difficult and unwieldy, and even its presumed ability in extracting the sampler was proven erroneous. After consultations with NYANG officials and their technical advisors, it was decided to excavate two trenches, using the backhoe, in the bottom of the pit approximating the sampling grid row lines. Soil samples were then extracted from the sides of these pits at the specified depths below pit bottom grade, and the soil from each of the trenches was segregated pending results of the lab analysis. The samples were then transported by the Lancy field technician to Pittsburgh for analysis.

Wednesday, 22 June

Geo-Con obtained final approval from the Chemical Waste Management landfill in Model City, NY to begin shipping up to 15 truckloads per day of contaminated soil for disposal. Loading and shipment was scheduled to begin the next day.

Thursday, 23 June through Wednesday, 29 June

Loading, transport, and disposal of the contaminated soil proceeded at a nominal pace of 15 truckloads per day. Fifteen trucks were loaded Thursday, 13 on Friday, 15 on Monday and Tuesday, and 9 on Wednesday. Seven 55-gallon drums of liquid collected from the pit bottom and drum overpacks were also loaded onto a Chemical Waste Management drum transport truck for disposal. During this time the remaining soil deemed necessary to be removed from the pit (DDT, DDD, and DDE above 10 ppm) was also excavated and loaded in to the trucks. During this additional excavation, a 6'x5'x3' granite boulder was removed from the pit. Additionally, the oaken lagging boards shoring up the pit walls were removed, loaded onto the trucks, and disposed along with the contaminated soil. The vertical H-piles were exposed and cut off approximately 10' below grade elevation. They were then buried in the bottom of the pit.

Thursday, 30 June through Friday, 1 July

Backfilling operations continued until the pit was completely filled. The site was then graded to obtain a level surface throughout the entire project site.

5. Analytical Report

Twenty composite samples were taken from Rows 1 to 5 at 0′, -2′, -4′ and -6′ depths form the pit bottom. Refer to Figure 5 and Appendices A and B for the complete analytical report corresponding to the samples collected by Lancy Environmental Services Company.

For analytical results for samples taken of waste water removed from the site, drum contents and background samples, see Appendix C.

One anomalous sample value was found at Row 5, -6′ in the southern end of the pit (Sample ID# 8060245). A combined total DDT, DDD, and DDE concentration of 41 ppm was reported. This result was considered anomalous because:

1) No debris or waste material had been found above it in the southern end of the pit (see Figure 4).
2) On the basis of direct observation during the removal, it was apparent that the soils throughout the southern third of the pit were undisturbed prior to the removal action.
3) Low levels of total pesticide compound concentrations had been found above it (see Figure 5). A 0.15 ppm concentration had been found 2 feet directly above it.
4) There were no visual indications of migration pathways for the contaminants within the dense, undisturbed clay soil matrix of the glacial till material.

APPENDIX A

Analytical Report for samples taken from Rows 1 to 5
at 0 ft. depth below pit bottom

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An Alcoa Separations Technology Company
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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample	Row 1-4 (19)	Row 5-8 (18)	Row 9-12 (17)	Row 13-16 (16)	Row 17-20 (15)
Lab Reference #	8050110	8050111	8050112	8050113	8050114
Parameter	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Ignitability	non	non	non	non	non
Pesticides	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
4,4'-DDT	29	330	430	95	6.3
4,4'-DDE	1.0	9.4	13	4.3	0.31
4,4'-DDD	18	66	97	51	2.3
Heptachlor	<0.16	<0.16	<0.16	<0.16	<0.16
Parathion	<0.10	<0.10	<0.10	<0.10	<0.10
2,4-D	<1.0	<1.0	<1.0	<1.0	<1.0
2,4,5-T	<0.20	<0.20	<0.20	<0.20	<0.20
Volatiles	(ug/Kg)	(ug/Kg)	(ug/Kg)	(ug/Kg)	(ug/Kg)
Benzene	<10	<10	<10	<10	14
Toluene	<10	21	30	<10	<10
Xylenes	<10	830	2700	71	<10

ASTM Leach

Sample	Row 1-4 (19)	Row 5-8 (18)	Row 9-12 (17)	Row 13-16 (16)	Row 17-20 (15)
Lab Reference #	8050115	8050116	8050117	8050118	8050119
Common Anions	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Bromide	<10	<10	<10	<10	<10
Chloride	<2.0	<2.0	<2.0	<2.0	<2.0
Fluoride	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrate	<20	<20	<20	<20	<20
Nitrite	<4.0	<4.0	<4.0	<4.0	<4.0
Phosphate	13	27	27	27	33
Sulfate	<4.0	<4.0	<4.0	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 1 30' Row 2 30' Row 3 30' Row 4 30' Row 5 30'

Title: Analysis of samples taken at pit bootom

APPENDIX B

Analytical Report for samples taken from Rows 1 to 5
at -2, -4, and -6 ft. depth below pit bottom

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ANALYSIS REPORT

Geo-Con Inc.
P.O. Box 17380
Pittsburgh, PA 15235

Attention: Bob Sims

Report Date 6/28/88
Sample Date 6/10/88 by JK
Received 6/13/88 by FM
Analyzed 6/13 - 6/27/88 by Staff
No. of Samples 15
Purchase Order # 16-H130-166

Analysis of Samples Taken from Locations 1,2,3,4

Project # 20642

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060232	8060233	8060234
Parameter			
Ignitability	non ignitable	non ignitable	non ignitable
	(μg/Kg)	(μg/Kg)	(μg/Kg)
Benzene	<50	<50	<50
Toluene	<50	<50	<50
Xylenes	<125	<125	<125
	(mg/Kg)	(mg/Kg)	(mg/Kg)
DDE	0.92	0.28	0.06
DDD	22	6.5	1.6
DDT	39	13	2.6
Heptachlor	<0.160	<0.160	<0.080
Parathion	<0.10	<0.10	<0.10
2,4-D	<1.0	<1.0	<1.0
2,4,5-T	<0.20	<0.20	<0.20

ASTM Leach

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060247	8060248	8060249
	(mg/L)	(mg/L)	(mg/L)
Parameter			
Bromide	<10	<10	<10
Chloride	<2.0	<2.0	<2.0
Fluoride	<1.0	<1.0	<1.0
Nitrate	<20	<20	<20
Nitrite	<4.0	<4.0	<4.0
Phosphate	48	28	48
Sulfate	<4.0	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 1 @-2' Row 1 @-4' Row 1 @-6'

Title: Analysis of composite samples taken below pit bottom

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ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 5,6,7,8

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.
Lab Reference #	8060246
	(mg/Kg)
Parameter	
Ignitability	non ignitable
Antimony	<20
Arsenic	6.5
Barium	84
Cadmium	2.3
Chromium	21
Cobalt	19
Copper	34
Iron	32000
Lead	15
Manganese	650
Mercury	0.08
Nickel	29
Selenium	<0.20
Silver	1.0
Titanium	87
Zinc	77
Acid Extractables	(µg/Kg)
Benzoic acid	<1900
4-Chloro-3-methylphenol	<370
2-Chlorophenol	<370
2,4-Dichlorophenol	<370
2,4-Dimethylphenol	<370
4,6-Dinitro-o-cresol	<1900
2,4-Dinitrophenol	<1900
2-Methylphenol	<370
4-Methylphenol	<370
2-Nitrophenol	<370
4-Nitrophenol	<1900
Pentachlorophenol	<1900
Phenol	<370
2,4,5-Trichlorophenol	<1900
2,4,6-Trichlorophenol	<370

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 2 @-2'

Title: Analysis of composite samples taken below pit bottom

ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 5,6,7,8

6/28/88
6-H130-166

Project =20642

Sample #	1.5-2 ft.
Lab Reference #	8060246
	(µg/Kg)
Base Neutrals	
Acenaphthene	<370
Acenaphthylene	<370
Anthracene	<370
Benzo(a)anthracene	<370
Benzo(b)fluoranthene	<370
Benzo (k)fluoranthene	<370
Benzo(ghi)perylene	<370
Benzo(a)pyrene	<370
Benzyl alcohol	<370
Bis(2-chloroethoxy)methane	<370
Bis(2-chloroethyl)ether	<370
Bis(2-chloroisopropyl)ether	<370
Bis(2-ethylhexyl)phthalate	<370
4-Bromophenyl phenyl ether	<370
Butyl benzyl phthalate	<370
4-Chloroaniline	<370
2-Chloronaphthalene	<370
4-Chlorophenyl phenyl ether	<370
Chrysene	<370
Dibenzo(a,h)anthracene	<370
Dibenzofuran	<370
Di-n-butyl phthalate	<370
1,2-Dichlorobenzene	<370
1,3-Dichlorobenzene	<370
1,4-Dichlorobenzene	<370
3,3'-Dichlorobenzidine	<740
Diethyl phthalate	<370
Dimethyl phthalate	<370
2,4-Dinitrotoluene	<370
2,6-Dinitrotoluene	<370
Di-n-octyl phthalate	<370
Fluoranthene	<370
Fluorene	<370
Hexachlorobenzene	<370
Hexachlorobutadiene	<370
Hexachlorocyclopentadiene	<370
Hexachloroethane	<370

C. John Ritzert, Manager-Technical Operations

EMTC Corrections to References

Sample location: Row 2 @-2'

Title: Analysis of composite samples taken below pit bottom

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ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 5,6,7,8

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.
Lab Reference #	8060246
	(µg/Kg)
Base Neutrals (cont'd)	
Indeno(1,2,3-cd)pyrene	<370
Isophorone	<370
2-Methyl naphthalene	1000
Naphthalene	660
2-Nitroaniline	<1900
3-Nitroaniline	<1900
4-Nitroaniline	<1900
Nitrobenzene	<370
N-Nitrosodi-n-propylamine	<370
N-Nitrosodiphenylamine	<370
Phenanthrene	<370
Pyrene	<370
1,2,4-Trichlorobenzene	<370
Pesticides	(mg/Kg)
Aldrin	<0.080
Alpha-BHC	<0.080
Beta-BHC	<0.080
Gamma-BHC	<0.080
Delta-BHC	<0.080
Chlordane	<0.080
4,4'-DDT	8.9
4,4'-DDE	0.11
4,4'-DDD	2.1
Dieldrin	<0.160
Alpha-Endosulfan	<0.080
Beta-Endosulfan	<0.160
Endosulfan Sulfate	<0.160
Endrin	<0.160
Endrin Aldehyde	<0.160
Heptachlor	<0.080
Heptachlor Epoxide	<0.080
PCB-1242	<1.0
PCB-1254	<1.0
PCB-1221	<1.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 2 @-2'

Title: Analysis of composite samples taken below pit bottom

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ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 5,6,7,8

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.
Lab Reference #	8060246
	(mg/Kg)
Pesticides (cont'd)	
PCB-1232	<1.0
PCB-1248	<1.0
PCB-1260	<1.0
PCB-1016	<1.0
Toxaphene	<1.0
Parathion	<0.10
2,4-D	<1.0
2,4,5-T	<0.20
Volatiles	(µg/Kg)
Acetone	<12
Benzene	<6.0
Bromodichloromethane	<6.0
Bromoform	<12
Bromomethane	<6.0
2-Butanone	<6.0
Carbon disulfide	<6.0
Carbon tetrachloride	<12
Chlorobenzene	<6.0
Chloroethane	<12
Chloroform	<6.0
Chloromethane	<6.0
Dibromochloromethane	<6.0
1,1-Dichloroethane	<6.0
1,2-Dichloroethane	<6.0
1,1-Dichloroethene	<6.0
(trans)-1,2-Dichloroethene	<6.0
1.2-Dichloropropane	<6.0
(cis)-1,3-Dichloropropene	<6.0
(trans)-1,3-Dichloropropene	<6.0
Ethyl benzene	<6.0
2-Hexanone	<12
Methylene chloride	<12
4-Methyl-2-pentanone	<12
Styrene	<6.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 2 @-2'

Title: Analysis of composite samples taken below pit bottom

Geo-Con, Inc.
Samples from Locations 5,6,7,8

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.
Lab Reference #	8060246
	(µg/Kg)
Volatiles (cont'd)	
1,1,2,2-Tetrachloroethane	<6.0
Tetrachloroethene	<6.0
Toluene	<6.0
1,1,1-Trichloroethane	<6.0
1,1,2-Trichloroethane	<6.0
Trichloroethene	<6.0
Vinyl acetate	<12
Vinyl chloride	<12
Xylenes (total)	<6.0

ASTM Leach	
Sample #	1.5-2 ft.
Lab Reference #	8060261
	(mg/L)
Parameter	
Bromide	<10
Chloride	<2.0
Fluoride	<1.0
Nitrate	<20
Nitrite	<4.0
Phosphate	34
Sulfate	<4.0

C. John Ritzert, Manager Technical Operations

HMTC Corrections to References

Sample location: Row 2 @-2'

Title: Analysis of composite samples taken below pit bottom

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ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 5,6,7,8

6/28/88
6-H130-166

Project #20642

Sample #	3.5-4 ft.	5.5-6 ft.
Lab Reference #	<u>8060235</u>	<u>8060236</u>
<u>Parameter</u>		
Ignitability	non ignitable	non ignitable
	(µg/Kg)	(µg/Kg)
Benzene	<50	<50
Toluene	<50	<50
Xylenes	350	<125
	(mg/Kg)	(mg/Kg)
DDE	1.6	0.11
DDD	33	2.0
DDT	80	4.6
Heptachlor	<0.160	<0.080
Parathion	<0.10	<0.10
2,4-D	<1.0	<1.0
2,4,5-T	<0.20	<0.20

<u>ASTM Leach</u>

Sample #	3.5-4 ft.	5.5-6 ft.
Lab Reference #	<u>8060250</u>	<u>8060251</u>
	(mg/L)	(mg/L)
<u>Parameter</u>		
Bromide	<10	<10
Chloride	<2.0	<2.0
Fluoride	<1.0	<1.0
Nitrate	<20	<20
Nitrite	<4.0	<4.0
Phosphate	54	54
Sulfate	<4.0	6.8

C. John Bitzert, Manager-Technical Operations

<u>HMTC Corrections to References</u>

Sample location: Row 2 3-4' Row 2 @-6'

Title: Analysis of composite samples taken below pit bottom

LANCY ENVIRONMENTAL SERVICES
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An Alcoa Separations Technology Company
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Pittsburgh, PA 15230-0419
Phone (412) 772-0044 • FAX (412) 772-0055

ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 9,10,11,12

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060237	8060238	8060239
Parameter			
Ignitability	non ignitable	non ignitable	non ignitable
	(µg/Kg)	(µg/Kg)	(µg/Kg)
Benzene	<50	<50	<50
Toluene	<50	73	<50
Xylenes	940	2100	<125
	(mg/Kg)	(mg/Kg)	(mg/Kg)
DDE	0.57	1.8	0.83
DDD	6.4	20	6.3
DDT	30	110	21
Heptachlor	<0.160	<0.160	<0.160
Parathion	<0.10	<0.10	<0.10
2,4-D	<1.0	<1.0	<1.0
2,4,5-T	<0.20	<0.20	<0.20

ASTM Leach

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060252	8060253	8060254
	(mg/L)	(mg/L)	(mg/L)
Parameter			
Bromide	<10	<10	<10
Chloride	<2.0	<2.0	<2.0
Fluoride	<1.0	<1.0	<1.0
Nitrate	<20	<20	<20
Nitrite	<4.0	<4.0	<4.0
Phosphate	28	48	34
Sulfate	<4.0	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location:	Row 3 @-2'	Row 3 @-4'	Row 3 @-6'

Title: Analysis of composite samples taken below pit bottom

ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 13,14,15,16

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060240	8060241	8060242
Parameter			
Ignitability	non ignitable	non ignitable	non ignitable
	(µg/Kg)	(µg/Kg)	(µg/Kg)
Benzene	<50	<50	<50
Toluene	<50	<50	<50
Xylenes	<125	<125	<125
	(mg/Kg)	(mg/Kg)	(mg/Kg)
DDE	0.12	0.12	0.12
DDD	1.6	1.8	2.2
DDT	5.0	4.0	4.1
Heptachlor	<0.080	<0.080	<0.080
Parathion	<0.1	<0.1	<0.1
2,4-D	<1.0	<1.0	<1.0
2,4,5-T	<0.20	<0.20	<0.20

ASTM Leach

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060255	8060256	8060257
	(mg/L)	(mg/L)	(mg/L)
Parameter			
Bromide	<10	<10	<10
Chloride	<2.0	<2.0	<2.0
Fluoride	<1.0	<1.0	<1.0
Nitrate	<20	<20	<20
Nitrite	<4.0	<4.0	<4.0
Phosphate	28	41	48
Sulfate	<4.0	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 4 @-2' Row 4 @-4' Row 4 @-6'

Title: Analysis of composite samples taken below pit bottom

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ANALYSIS REPORT

Geo-Con, Inc.
Samples from Locations 17,19,20

6/28/88
6-H130-166

Project #20642

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060243	8060244	8060245
Parameter			
Ignitability	non ignitable	non ignitable	non ignitable
	(µg/Kg)	(µg/Kg)	(µg/Kg)
Benzene	<50	<50	<50
Toluene	<50	<50	<50
Xylenes	<125	<125	<125
	(mg/Kg)	(mg/Kg)	(mg/Kg)
DDE	<0.016	<0.016	0.64
DDD	0.27	0.050	15
DDT	0.72	0.09	25
Heptachlor	<0.008	<0.008	<0.160
Parathion	<0.1	<0.1	<0.1
2,4-D	<1.0	<1.0	<1.0
2,4,5-T	<0.20	<0.20	<0.20

ASTM Leach

Sample #	1.5-2 ft.	3.5-4 ft.	5.5-6-ft.
Lab Reference #	8060258	8060259	8060260
	(mg/L)	(mg/L)	(mg/L)
Parameter			
Bromide	<10	<10	<10
Chloride	<2.0	<2.0	<2.0
Fluoride	<1.0	<1.0	<1.0
Nitrate	<20	<20	<20
Nitrite	<4.0	<4.0	<4.0
Phosphate	48	48	41
Sulfate	11	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Row 5 @-2' Row 5 @-4' Row 5 @-6'

Title: Analysis of composite samples taken below pit bottom

APPENDIX C

Analytical Report for samples taken from water removed from drums and pit bottom, stockpiles, and background samples

LANCY ENVIRONMENTAL SERVICES
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ANALYSIS REPORT

Geo-Con Inc.
P.O. Box 17380
Pittsburgh, PA 15235

Attention: Bob Sims

Report Date 5/18/88
Sample Date 5/5/88 by JK
Received 5/5/88 by FM
Analyzed 5/5 - 5/16/88 by Staff
No. of Samples 2
Purchase Order # 16-H130-166

Analysis of Pit Waste Water Samples — Project # 20642

Sample	Drum #1	Drum #2
Lab Reference #	8050127	8050128
	(mg/L)	(mg/L)
Parameter		
Flashpoint	>60°C	>60°C
Antimony	<0.2	<0.2
Arsenic	<0.002	<0.002
Barium	0.01	0.12
Cadmium	<0.004	<0.004
Chromium	<0.006	<0.006
Cobalt	<0.005	<0.005
Copper	<0.007	<0.007
Iron	0.36	0.88
Lead	<0.06	0.09
Manganese	0.41	0.92
Mercury	<0.0002	<0.0002
Nickel	<0.02	<0.02
Selenium	<0.002	<0.002
Silver	<0.01	<0.01
Titanium	<0.004	<0.004
Zinc	<0.05	<0.05
Acid Extractables	(ug/L)	(ug/L)
Benzoic Acid	<50	<250
4-Chloro-3-Methylphenol	<10	<50
2-Chlorophenol	<10	<50
2,4-Dichlorophenol	<10	<50
4,6-Dinitro-O-Cresol	<50	<250
2,4-Dinitrophenol	<50	<250
2-Methylphenol	<10	<50
3-Methylphenol	<10	<50
4-Methylphenol	<10	<50
2-Nitrophenol	<10	<50
4-Nitrophenol	<50	<250
Pentachlorophenol	<50	<250

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location:	Drum & Pit Water #1	Drum & Pit Water #2

Title: Analysis of composite samples of drum and pit bottom water

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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample Lab Reference #	Drum #1 8050127 (ug/L)	Drum #2 8050128 (ug/L)
Acid Extractables (cont'd)		
Phenol	<10	<50
2,4,5-Trichlorophenol	<50	330
2,4,6-Trichlorophenol	<10	<50
2,4-Dimethylphenol	<10	<50
Base Neutrals	(ug/L)	(ug/L)
Acenaphthene	<10	<50
Acenaphthylene	<10	<50
Aniline	<10	<50
Anthracene	<10	<50
Benzidine	<50	<250
Benzo(a)Anthracene	<10	<50
Benzo(a)Pyrene	<10	<50
3,4-Benzofluoranthene	<10	<50
Benzo(ghi)Perylene	<10	<50
Benzo(k)Fluoranthene	<10	<50
Benzyl Alcohol	<10	<50
Bis(2-Chloroethyoxy)Methane	<10	<50
Bis(2-Chloroethyl)Ether	<10	<50
Bis(2-Chloroisopropyl)Ether	<10	<50
Bis(2-Ethylhexyl)Phthalate	<10	<50
4-Bromophenyl Phenyl Ether	<10	<50
Butyl Benzyl Phthalate	<10	<50
4-Chloroaniline	<10	<50
2-Chloronaphthalene	<10	<50
4-Chlorophenyl Phenyl Ether	<10	<50
Chrysene	<10	<50
Dibenzo(a,h)Anthracine	<10	<50
Dibenzofuran	<10	<50
1,2-Dichlorobenzene	<10	<50
1,3-Dichlorobenzene	<10	<50
1,4-Dichlorobenzene	<10	<50
3,3'-Dichlorobenzidine	<20	<100
Diethyl Phthalate	<10	<50
Dimethyl Phthalate	<10	<50

E. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location:	Drum & Pit Water #1	Drum & Pit Water #2

Title: Analysis of composite samples of drum and pit bottom water

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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample	Drum #1	Drum #2
Lab Reference #	8050127	8050128
	(ug/L)	(ug/L)
Base Neutral (cont'd)		
Di-N-Butyl Phthalate	<10	<50
2,4-Dinitrotoluene	<10	<50
2,6-Dinitrotoluene	<10	<50
Di-N-Octyl Phthalate	<10	<50
1,2-Diphenylhydrazine	<10	<50
Fluoranthene	<10	<50
Fluorene	<10	<50
Hexachlorobenzene	<10	<50
Hexachlorobutadiene	<10	<50
Hexachlorocyclopentadiene	<10	<50
Hexachloroethane	<10	<50
Ideno(1,2,3-cd) Pyrene	<10	<50
Isophorone	<10	<50
2-Methyl Naphthalene	810	11000
Naphthalene	1300	22000
2-Nitroaniline	<50	<250
3-Nitroaniline	<50	<250
4-Nitroaniline	<50	<250
Nitrobenzene	<10	<50
N-Nitrosodimethylamine	<10	<50
N-Nitrosodi-N-Propylamine	<10	<50
N-Nitrosodiphenylamine	<10	<50
Phenanthrene	<10	<50
Pyrene	<10	<50
1,2,4-Trichlorobenzene	<10	<50
Pyridine	<10	<50
Pesticides	(mg/L)	(mg/L)
Aldrin	<0.01	<0.01
Alpha-BHC	<0.01	0.02
Beta-BHC	<0.01	0.36
Gamma-BHC	<0.01	<0.01
Delta-BHC	<0.01	<0.01
Chlordane	<0.01	<1.0
4,4'-DDT	0.90	530
4,4'-DDE	0.04	16
4,4'-DDD	<0.17	87

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location:	Drum & Pit Water #1	Drum & Pit Water #2

Title: Analysis of composite samples of drum and pit bottom water

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ANALYSIS REPORT

Geo-Con Inc.	5/18/88
Analysis of Background Samples	16-H130-166
	Project # 20642

Sample	Drum #1	Drum #2
Lab Reference #	8050127	8050128
	(mg/L)	(mg/L)
Pesticides (cont'd)		
Dieldrin	<0.01	<1.0
Alpha-Endosulfan	<0.01	<1.0
Beta-Endosulfan	<0.01	<1.0
Endosulfan Sulfate	<0.01	<1.0
Endrin	<0.01	<1.0
Endrin Aldehyde	<0.01	<1.0
Heptachlor	<0.01	<1.0
Heptachlor Epoxide	<0.01	<1.0
PCB-1242	<0.01	<1.0
PCB-1254	<0.01	<1.0
PCB-1221	<0.01	<1.0
PCB-1232	<0.01	<1.0
PCB-1248	<0.01	<1.0
PCB-1260	<0.01	<1.0
PCB-1016	<0.01	<1.0
Toxaphene	<0.01	<1.0
Parathion	<0.05	<0.05
2,4-D	<0.50	<1.0
2,4,5-T	<0.10	<0.20
Volatiles	(ug/L)	(ug/L)
Acrolein	<50	<50
Acrylonitrile	<50	<50
Acetone	<10	190
Benzene	<5.0	<5.0
Bromodichloromethane	<5.0	<5.0
Bromoform	<5.0	<5.0
Bromomethane	<10	<10
2-Butanone	<10	<10
Carbon Disulfide	<5.0	<5.0
Carbon Tetrachloride	<5.0	<5.0
Chlorobenzene	10	320
Chloroethane	<10	<10
2-Chloroethylvinylether	<5.0	<5.0
Chloroform	<5.0	30

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location:	Drum & Pit Water #1	Drum & Pit Water #2

Title: Analysis of composite samples of drum and pit bottom water

LANCY ENVIRONMENTAL SERVICES
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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample	Drum #1	Drum #2
Lab Reference #	8050127	8050128
	(ug/L)	(ug/L)
Volatiles (cont'd)		
Chloromethane	<10	<10
Dibromochloromethane	<5.0	<5.0
1,1-Dichloroethane	<5.0	<5.0
1,2-Dichloroethane	<5.0	10
1,1-Dichloroethene	<5.0	<5.0
(trans)-1,2-Dichloroethene	<5.0	<5.0
1,2-Dichloropropane	<5.0	<5.0
Trichlorofluoromethane	<5.0	<5.0
(cis)-1,3-Dichloropropene	<5.0	<5.0
(trans)-1,3-Dichloropropene	<5.0	<5.0
Ethylbenzene	<5.0	140
2-Hexanone	<10	<10
Methylene Chloride	<5.0	<5.0
4-methyl-2-pentanone	<10	<10
Styrene	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<5.0	<5.0
Tetrachloroethene	<5.0	<5.0
Toluene	10	180
1,1,1-Trichloroethane	<5.0	<5.0
1,1,2-Trichloroethane	<5.0	<5.0
Trichloroethene	<5.0	<5.0
Vinyl Acetate	<10	<10
Vinyl Chloride	<10	<10
Total Xylenes	53	870

Sample	Drum #1	Drum #2
Lab Reference #	8050127	8050128
	(mg/L)	(mg/L)
Common Anions		
Bromide	<10	<10
Chloride	89	35
Fluoride	<1.0	2.1
Nitrate	<20	<20
Nitrite	<4.0	<4.0
Phosphate	55	19
Sulfate	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

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ANALYSIS REPORT

Geo-Con Inc.
P.O. Box 17380
Pittsburgh, PA 15235

Attention: Bob Sims

Report Date 5/18/88
Sample Date 5/4/88 by RW
Received 5/5/88 by FM
Analyzed 5/5 - 5/16/88 by Staff
No. of Samples 9
Purchase Order # 16-H130-166

Analysis of Background Samples

Project # 20642

Sample Lab Reference #	Background #1 8050102 (mg/Kg)	Background #2 8050103 (mg/Kg)	Stockpile #1 8050104 (mg/Kg)	Stockpile #2 8050105 (mg/Kg)
Parameter				
Ignitability	non ignitable	non ignitable	non ignitable	non ignitable
Antimony	<20	<20	<20	<20
Arsenic	6.7	7.0	5.5	7.0
Barium	58	53	34	51
Cadmium	0.70	0.08	0.08	0.60
Chromium	14	16	13	13
Cobalt	16	16	11	17
Copper	17	25	19	23
Iron	20000	25000	19000	25000
Lead	27	15	15	11
Manganese	770	650	510	790
Mercury	0.05	0.04	<0.04	<0.04
Nickel	17	23	16	21
Selenium	<0.2	0.2	0.3	<0.2
Silver	<1.0	<1.0	<1.0	<1.0
Titanium	73	83	77	73
Zinc	63	70	53	61
Acid Extractables	(ug/Kg)	(ug/Kg)	(ug/Kg)	(ug/Kg)
Benzoic Acid	<2100	<2000	<38000	<9500
4-Chloro-3-Methylphenol	<410	<390	<7600	<1900
2-Chlorophenol	<410	<390	<7600	<1900
2,4-Dichlorophenol	<410	<390	<7600	<1900
4,6-Dinitro-O-Cresol	<2100	<2000	<38000	<9500
2,4-Dinitrophenol	<2100	<2000	<38000	<9500
2-Methylphenol	<410	<390	<7600	<1900
3-Methylphenol	<410	<390	<7600	<1900
4-Methylphenol	<410	<390	<7600	<1900
2-Nitrophenol	<410	<390	<7600	<1900
4-Nitrophenol	<2100	<2000	<38000	<9500
Pentachlorophenol	<2100	<2000	<38000	<9500

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Background #1 Background #2 Stockpile #1 Stockpile #2

Title: Analysis of background and stockpile samples

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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample	Background #1	Background #2	Stockpile #1	Stockpile #2
Lab Reference #	8050102	8050103	8050104	8050105
	(ug/Kg)	(ug/Kg)	(ug/Kg)	(ug/Kg)
Acid Extractables (cont'd)				
Phenol	<410	<390	<7600	<1900
2,4,5-Trichlorophenol	<2100	<2000	<38000	<9500
2,4,6-Trichlorophenol	<410	<390	<7600	<1900
2,4-Dimethylphenol	<410	<390	<7600	<1900
Base Neutrals	(ug/Kg)	(ug/Kg)	(ug/Kg)	(ug/Kg)
Acenaphthene	<410	<390	<7600	<1900
Acenaphthylene	<410	<390	<7600	<1900
Aniline	<410	<390	<7600	<1900
Anthracene	<410	<390	<7600	<1900
Benzidine	<2100	<2000	<38000	<9500
Benzo(a)Anthracene	<410	<390	<7600	<1900
Benzo(a)Pyrene	<410	<390	<7600	<1900
3,4-Benzofluoranthene	<410	<390	<7600	<1900
Benzo(ghi)Perylene	<410	<390	<7600	<1900
Benzo(k)Fluoranthene	<410	<390	<7600	<1900
Benzyl Alcohol	<410	<390	<7600	<1900
Bis(2-Chloroethyoxy)Methane	<410	<390	<7600	<1900
Bis(2-Chloroethyl)Ether	<410	<390	<7600	<1900
Bis(2-Chloroisopropyl)Ether	<410	<390	<7600	<1900
Bis(2-Ethylhexyl)Phthalate	<410	<390	<7600	<1900
4-Bromophenyl Phenyl Ether	<410	<390	<7600	<1900
Butyl Benzyl Phthalate	<410	<390	<7600	<1900
4-Chloroaniline	<410	<390	<7600	<1900
2-Chloronaphthalene	<410	<390	<7600	<1900
4-Chlorophenyl Phenyl Ether	<410	<390	<7600	<1900
Chrysene	<410	<390	<7600	<1900
Dibenzo(a,h)Anthracine	<410	<390	<7600	<1900
Dibenzofuran	<410	<390	<7600	<1900
1,2-Dichlorobenzene	<410	<390	<7600	<1900
1,3-Dichlorobenzene	<410	<390	<7600	<1900
1,4-Dichlorobenzene	<410	<390	<7600	<1900
3,3'-Dichlorobenzidine	<820	<780	<15000	<3800
Diethyl Phthalate	<410	<390	<7600	<1900
Dimethyl Phthalate	<410	<390	<7600	<1900

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Background #1 Background #2 Stockpile #1 Stockpile #2

Title: Analysis of background and stockpile samples

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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample Lab Reference #	Background #1 8050102 (ug/Kg)	Background #2 8050103 (ug/Kg)	Stockpile #1 8050104 (ug/Kg)	Stockpile #2 8050105 (ug/Kg)
Base Neutral (cont'd)				
Di-N-Butyl Phthalate	<410	<390	<7600	<1900
2,4-Dinitrotoluene	<410	<390	<7600	<1900
2,6-Dinitrotoluene	<410	<390	<7600	<1900
Di-N-Octyl Phthalate	<410	<390	<7600	<1900
1,2-Diphenylhydrazine	<410	<390	<7600	<1900
Fluoranthene	<410	<390	<7600	<1900
Fluorene	<410	<390	<7600	<1900
Hexachlorobenzene	<410	<390	<7600	<1900
Hexachlorobutadiene	<410	<390	<7600	<1900
Hexachlorocyclopentadiene	<410	<390	<7600	<1900
Hexachloroethane	<410	<390	<7600	<1900
Ideno(1,2,3-cd)Pyrene	<410	<390	<7600	<1900
Isophorone	<410	<390	<7600	<1900
2-Methyl Naphthalene	<410	<390	180000	25000
Naphthalene	<410	<390	130000	11000
2-Nitroaniline	<2100	<2000	<38000	<9500
3-Nitroaniline	<2100	<2000	<38000	<9500
4-Nitroaniline	<2100	<2000	<38000	<9500
Nitrobenzene	<410	<390	<7600	<1900
N-Nitrosodimethylamine	<410	<390	<7600	<1900
N-Nitrosodi-N-Propylamine	<410	<390	<7600	<1900
N-Nitrosodiphenylamine	<410	<390	<7600	<1900
Phenanthrene	<410	<390	<7600	<1900
Pyrene	<410	<390	<7600	<1900
1,2,4-Trichlorobenzene	<410	<390	<7600	<1900
Pyridine	<410	<390	<7600	<1900
Pesticides	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Aldrin	<0.008	<0.008	<0.20	<0.08
Alpha-BHC	<0.008	<0.008	<0.20	<0.08
Beta-BHC	<0.008	<0.008	0.57	0.15
Gamma-BHC	<0.008	<0.008	0.20	<0.08
Delta-BHC	<0.008	<0.008	<0.20	<0.08
Chlordane	<0.008	<0.008	<0.20	<0.08
4,4'-DDT	<0.016	<0.016	290	65
4,4'-DDE	<0.016	<0.016	11	1.5
4,4'-DDD	<0.016	<0.016	240	24

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Background #1 Background #2 Stockpile #1 Stockpile #

Title: Analysis of backgound and stockpile samples

LANCY ENVIRONMENTAL SERVICES
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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample	Background #1	Background #2	Stockpile #1	Stockpile #2
Lab Reference #	8050102	8050103	8050104	8050105
	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Pesticides (cont'd)				
Dieldrin	0.26	<0.016	<0.40	<0.16
Alpha-Endosulfan	<0.008	<0.008	<0.20	<0.08
Beta-Endosulfan	<0.016	<0.016	<0.40	<0.016
Endosulfan Sulfate	<0.016	<0.016	<0.40	<0.016
Endrin	<0.016	<0.016	<0.40	<0.016
Endrin Aldehyde	<0.016	<0.016	<0.40	<0.016
Heptachlor	<0.008	<0.008	<0.20	<0.08
Heptachlor Epoxide	<0.008	<0.008	<0.20	<0.08
PCB-1242	<0.100	<0.100	<2.5	<1.0
PCB-1254	<0.100	<0.100	<2.5	<1.0
PCB-1221	<0.100	<0.100	<2.5	<1.0
PCB-1232	<0.100	<0.100	<2.5	<1.0
PCB-1248	<0.100	<0.100	<2.5	<1.0
PCB-1260	<0.100	<0.100	<2.5	<1.0
PCB-1016	<0.100	<0.100	<2.5	<1.0
Toxaphene	<0.016	<0.100	<0.40	<0.16
Parathion	<0.10	<0.10	<0.10	<0.10
2,4-D	<1.0	<1.0	<1.0	<1.0
2,4,5-T	<0.20	<0.20	<0.20	<0.20
Volatiles	(ug/Kg)	(ug/Kg)	(mg/Kg)	(mg/Kg)
Acrolein	<60	<60	<25	<7.0
Acrylonitrile	<60	<60	<25	<7.0
Acetone	<12	<12	<2.5	<1.4
Benzene	<6.0	<6.0	<1.3	<0.7
Bromodichloromethane	<6.0	<6.0	<1.3	<0.7
Bromoform	<6.0	<6.0	<1.3	<0.7
Bromomethane	<12	<12	<2.5	<1.4
2-Butanone	<12	<12	<2.5	<1.4
Carbon Disulfide	<6.0	<6.0	<1.3	<0.7
Carbon Tetrachloride	<6.0	<6.0	<1.3	<0.7
Chlorobenzene	<6.0	<6.0	<1.3	<0.7
Chloroethane	<12	<12	<2.5	<1.4
2-Chloroethylvinylether	<6.0	<6.0	<1.3	<0.7
Chloroform	<6.0	<6.0	<1.3	<0.7

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Background #1 Background #2 Stockpile #1 Stockpile #2

Title: Analysis of background and stockpile samples

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ANALYSIS REPORT

Geo-Con Inc.
Analysis of Background Samples

5/18/88
16-H130-166

Project # 20642

Sample Lab Reference #	Background #1 8050102 (ug/Kg)	Background #2 8050103 (ug/Kg)	Stockpile #1 8050104 (mg/Kg)	Stockpile #2 8050105 (mg/Kg)
Volatiles (cont'd)				
Chloromethane	<12	<12	<2.5	<1.4
Dibromochloromethane	<6.0	<6.0	<1.3	<0.7
1,1-Dichloroethane	<6.0	<6.0	<1.3	<0.7
1,2-Dichloroethane	<6.0	<6.0	<1.3	<0.7
1,1-Dichloroethene	<6.0	<6.0	<1.3	<0.7
(trans)-1,2-Dichloroethene	<6.0	<6.0	<1.3	<0.7
1,2-Dichloropropane	<6.0	<6.0	<1.3	<0.7
Trichlorofluoromethane	<6.0	<6.0	<1.3	<0.7
(cis)-1,3-Dichloropropene	<6.0	<6.0	<1.3	<0.7
(trans)-1,3-Dichloropropene	<6.0	<6.0	<1.3	<0.7
Ethylbenzene	<6.0	<6.0	11	<0.7
2-Hexanone	<12	<12	<2.5	<1.4
Methylene Chloride	<6.0	<6.0	<1.3	<0.7
4-methyl-2-pentanone	<12	<12	<2.5	<1.4
Styrene	<6.0	<6.0	<1.3	<0.7
1,1,2,2-Tetrachloroethane	<6.0	<6.0	<1.3	<0.7
Tetrachloroethene	<6.0	<6.0	<1.3	<0.7
Toluene	<6.0	<6.0	3.3	<0.7
1,1,1-Trichloroethane	<6.0	<6.0	<1.3	<0.7
1,1,2-Trichloroethane	<6.0	<6.0	<1.3	<0.7
Trichloroethene	<6.0	<6.0	<1.3	<0.7
Vinyl Acetate	<12	<12	<2.5	<1.4
Vinyl Chloride	<12	<12	<2.5	<1.4
Total Xylenes	<6.0	<6.0	60	<0.7

ASTM Leach

Sample Lab Reference #	Background #1 8050106 (mg/L)	Background #2 8050107 (mg/L)	Stockpile #1 8050108 (mg/L)	Stockpile #2 8050109 (mg/L)
Common Anions				
Bromide	<10	<10	<10	<10
Chloride	<2.0	<2.0	<2.0	<2.0
Fluoride	<1.0	<1.0	<1.0	<1.0
Nitrate	<20	<20	<20	<20
Nitrite	<4.0	<4.0	<4.0	<4.0
Phosphate	<10	10	<10	19
Sulfate	<4.0	<4.0	<4.0	<4.0

C. John Ritzert, Manager-Technical Operations

HMTC Corrections to References

Sample location: Background #1 Background #2 Stockpile #1 Stockpile #2

Title: Analysis of background and stockpile samples

ADDENDUM B

ANALYSIS OF PESTICIDE BURIAL SITE (PBS) CONTAMINATION AT STEWART ANGB, NEWBURGH, NEW YORK

EXPLANATION

This report, requested by the ANG , consists of a review of available data (through November 1988) associated with contamination at the Pesticide Burial Pit Area. The report, prepared by the E.C. Jordan Co. of Portland, ME, presents an initial assessment of the environmental and public health risks associated with the former Pesticide Burial Pit Site at Stewart ANG Base. These data and report were presented to New York State Department of Environmental Conservation and the United States Environmental Protection Agency at a meeting held in December 1988 at Stewart ANG Base.

ANALYSIS OF PESTICIDE BURIAL SITE (PBS) CONTAMINATION AT STEWART ANGB, NEWBURGH, NY

FINAL
NOVEMBER 1988

Prepared by:

E.C. JORDAN CO.
261 COMMERCIAL STREET
PORTLAND, ME 04112

I. INTRODUCTION

The purpose of this report is to present an initial assessment of the environmental and public health risks associated with the former pesticide burial site (PBS) at Stewart Air National Guard Base (ANGB), Newburgh, NY. This report should provide assistance for developing a work plan for future site investigations.

This report is divided into two main sections. The first section presents a summary of available information regarding contaminant distribution and site characteristics that are required to assess potential hazards associated with the PBS. The second section consists of an analysis of fate and transport considerations, in relation to potential risks and future data needs. The references used are presented at the end of this report, and should be referred to for detailed information.

II. SUMMARY OF AVAILABLE INFORMATION

Dames & Moore

In 1984, the Air National Guard (ANG) retained Dames & Moore to locate an alleged burial trench on the ANGB in which containers of pesticides were believed to have been placed in the late 1960s. Dames & Moore performed geophysical surveys in 1984 that revealed the probable location of the PBS. In 1984 and 1985, Dames & Moore performed test pit excavations that confirmed the location of the PBS, and in which buried containers were discovered. Chemical analysis revealed that high concentrations of DDT, DDD, and DDE were present in an apparent oil carrier in the pit (Table 1); 2,4-D, 2,4,5-T, heptachlor, and parathion were present at lower concentrations (see Table 1).

In 1985, Dames & Moore installed three monitoring wells, collected subsurface soil samples from borings, groundwater samples from the wells for analyses, and performed in situ permeability tests. One well (SW-1) was installed approximately 100 feet upgradient of the PBS. Two downgradient wells were installed; one approximately 50 feet (SW-2), and the other approximately 100 feet (SW-3) from the PBS. Both SW-1 and SW-2 were screened in the weathered bedrock zone, and SW-3 was screened in both the weathered bedrock and overlying glacial till. Bedrock consisted of fractured shale approximately 45 feet below the surface. Groundwater was encountered in the zone of weathered bedrock. The average hydraulic conductivity value for the weathered rock zone was 5.6 x 10^{-5} cm/sec. A seepage velocity of 1.6 ft/yr was calculated for the weathered rock zone. Soil samples from one downgradient monitoring well boring (SW-2) showed the presence of pesticides at 25 and 35 feet below the soil surface. The pesticides detected were DDT, DDD, DDE, 2,4-D, and 2,4,5-T. Concentrations were 5-fold greater at 35 feet than at 25 feet (Table 2). The compound detected at the highest concentration was p,p'-DDT at 8.2 ppm (see Table 2). Based on these investigations, Dames & Moore recommended that remedial measures be implemented at the PBS.

The pesticide concentrations detected in groundwater are shown in Table 2. The proportional values for 2,4-D in groundwater relative to soil were greater than those for DDT and its derivatives; indicating the greater solubility and mobility of 2,4-D relative to the other compounds.

E.C. Jordan Co.

In 1987, the E.C. Jordan Co. (Jordan) was retained to perform a site investigation at an inactive landfill that was once used by the USAF, and is adjacent to the PBS. The results of this investigation were presented in a draft report prepared in March 1988. These studies characterized the site geology, hydrogeology, and distribution of contaminants migrating from the landfill. In addition, a preliminary exposure assessment and environmental risk assessment were performed. This study was designed to evaluate the landfill, but yielded information pertinent to the PBS. In the vicinity of the PBS, the geology was characterized by a layer of topsoil and ablation till ranging from 5 to 10 feet in thickness, overlying a basal till layer that extends to bedrock approximately 40 feet below the surface. Seepage velocities in both till layers are considered uniform, and the average hydraulic conductivity was 4.19×10^{-5} cm/sec. The hydraulic gradient in the vicinity of the PBS is about 0.04 ft/ft, with an assumed effective porosity of 0.2. The groundwater surface at the PBS is approximately 30-35 feet below the soil surface. Groundwater flows eastward from the PBS and under the landfill. Groundwater velocity in the vicinity of the PBS is estimated at approximately 8.7 ft/yr. Upward hydraulic gradients exist downgradient of the PBS, beyond the landfill. Groundwater likely discharges in the vicinity of Murphy's Gulch, approximately 1,000 - 1,500 feet east of the PBS.

Jordan did not install any monitoring wells directly between the PBS and landfill. Monitoring wells were installed downgradient of both the landfill and PBS, at a distance of about 600 feet from the PBS. No pesticide contamination was observed in these wells. Surface water and sediment samples were collected from a variety of locations. Sediment samples from a manmade intermittent pond (100 to 200 square feet) which receives surface run-off from the PBS, and is located approximately 450 feet from the PBS, contained levels of 4,4-DDT (p,p'-DDT), DDE, and DDD at 3,100, 230, and 170 ppb, respectively. The surface water at that location contained 4,4-DDT at 0.57 ppb.

Jordan's preliminary exposure assessment indicates that there is no risk presently posed by groundwater contamination because area residents are either greater than 2,700 feet from the site or are serviced by a municipal water supply. Exposure of wildlife to pesticides and other contaminants was considered likely; however, there was insufficient data available for Jordan to evaluate the significance of these exposures. Human exposure to surface contaminants was considered minimal because of limited access to the site.

Geo-Con Inc./Dynamac Corp.

In 1986, the ANG contracted with Geo-Con, Inc. to remove buried pesticides and contaminated soils from the PBS, with oversight support provided by the Hazardous Materials Technical Center operated by Dynamac Corp (Dynamac). The field operations took place in April and May of 1988, and were summarized in a draft report prepared by Dynamac. All containers and heavily contaminated soil were removed. The soils were excavated to a final depth of 12 to 18 feet within a

20 ft. x 53 ft. pit area prior to backfilling, according to Figure 1 of the Dynamac report. The predetermined criteria are reported in a separate review of these activities, prepared by Dynamac and presented under separate cover.

Composited soil samples were taken after containers were removed, from five rows along the bottom of the original pit. Additional samples were collected from each row at depths of 2, 4, and 6 feet below the pit bottom. The analytical results for these samples are summarized in Table 3. These values were obtained from the analytical report prepared by Lancy Environmental Services, dated June 28, 1988. These concentrations represent the pesticide concentrations present at approximately 20 feet below the existing ground surface.

III. FATE AND TRANSPORT ANALYSIS

Fate and Transport Considerations

The pesticides (DDT, DDD, DDE, parathion, 2,4-D, and 2,4,5-T) identified in the PBS have several pathways by which they can migrate to groundwater, surface water, and eventually be removed from the site. These pathways are dependent upon the chemical and physical properties of the compounds, especially water solubility and absorption on soil, which are summarized in Table 4.

DDT and its derivatives DDD and DDE are the most persistent of the contaminants present at the PBS. They have limited solubility in water and adsorb strongly on soil. They will eventually be transported to surface waters by two mechanisms. Once on soil in the PBS, they move slowly with water infiltration down to the aquifer. Once in the aquifer, they will partition between the soil and water, migrate in the groundwater along the bedrock and eventually move to the surface. Because they adsorb so strongly to the soil (large values of Koc), this migration will be very slow. The second possible transport mechanism is the erosion of DDT (as well as DDE and DDD)-contaminated surface soil (if such contamination is present) via storm surface runoff to the manmade intermittent ponded area approximately 450 feet from the PBS. Once in a surface water, the compounds will partition between the soil/sediment and the water. In the aqueous phase, DDT and its derivatives may evaporate (volatilize) and photolyze under sunlight. A half-life for the disappearance of DDT from surface waters is given by USEPA as 56-110 days, based on a combination of volatilization, hydrolysis and photolysis. These aqueous pathways become significant for DDT and its derivatives despite their low solubilities because biodegradation, either in the soil or water, is extremely slow. The biodegradation of these compounds absorbed on soil and sediment, although slow, is the primary fate for DDT, DDD, and DDE because most of the contaminants remain adsorbed to the soil.

In comparison to DDT, parathion (an organophosphate) is much more soluble in water, absorbs less strongly on soil, and is readily biodegradable; consequently, it is much less persistent. Parathion was detected at a much lower concentration in the soil than the other pesticides. It is expected to be more mobile than DDT (approximately 12,000 times faster based upon water solubilities), readily leaching into the groundwater. Biodegradation of parathion occurs more rapidly than DDT; Verscheuren (citation in Table 4) reports that 75-100% of parathion on soil disappears within 1 week. Biodegradation is the most probable cause for this disappearance. Parathion is unlikely to be present at any distance from the PBS because of its low concentration in the soil; further, it was not detected in groundwater.

The herbicides 2,4-D and 2,4,5-T are even more soluble in water than parathion; 2,4-D is approximately 124,000 times more soluble than DDT and will move more quickly into the groundwater. 2,4-D is the least persistent of the contaminants detected at the PBS. 2,4-D does not adsorb strongly to soil and partitions readily into the water.

Surface run-off of 2,4-D and 2,4,5-T contaminated soil is unlikely to be a major pathway for the transport of the herbicides. Run-off of the herbicides dissolved in rainwater is more likely than erosional transport of herbicides adsorbed on soil. Once in water, 2,4-D is rapidly hydrolyzed, volatilized, and photolyzed. 2,4-D is also readily biodegraded both on soil and in water. Less is known about the probable fate of 2,4,5-T, which was detected at much lower concentrations than 2,4-D. Based upon its solubility, however, it will likely not be as mobile as 2,4-D. 2,4,5-T is not as readily biodegradable as 2,4-D, but will degrade much more rapidly than DDT (see Table 4). Neither 2,4-D nor 2,4,5-T is likely to be present at a considerable distance from the PBS (such as Murphy's Gulch) because 2,4-D is readily degraded or dissipates by a variety of mechanisms, and because 2,4,5-T was present at a low initial concentration and is biodegradable.

Fate and Transport Models

The vertical and horizontal spread (VHS) model (50 FR 48896, Nov. 27, 1985) was used to conservatively estimate the amount of 4,4'-DDT and DDD expected in groundwater 1,000 and 1,500 feet from the PBS. The VHS equation and selected parameters are illustrated in Figure 1 for application to the PBS. The dimensions of the PBS, and contaminant concentrations in soil and at SW-2 are known. The groundwater velocity and infiltration rate are estimated, based on the data presented by Jordan (1988).

One application of the VHS model was based on the observed concentrations in SW-2, which is assumed to be 50 feet from the downgradient edge of the source at the PBS. This application resulted in predicted concentrations of 4,4'-DDT of 3.5 and 2.8 μg/ℓ at 1,000 and 1,500 feet, respectively (Table 5). The predicted concentrations of DDD were 2.0 μg/ℓ and 1.6 μg/ℓ at 1,000 and 1,500 feet, respectively (see Table 5). If the concentrations for 4,4'-DDT and 2,4'-DDT are combined, Co = 19.4 μg/ℓ, and then c(1000 ft) = 4.5 μg/ℓ and c (1500 ft) = 3.6 μg/ℓ.

Given the assumptions in this model, which does not include time dependence or attenuation due to adsorption processes, the expected DDT and DDD concentrations in groundwater reaching the surface at Murphy's Gulch are less than 5 μg/ℓ. If adsorbtive processes and groundwater flow were included, the final concentrations would be much lower. This model also conservatively assumed a continuous source of DDT and DDD leaching to the groundwater. This is unlikely since the barrels of pesticides and most contaminated soil were removed. The residual contamination is estimated to be 20 ppm over the area of the PBS and 20 feet down into the soil. This is very much lower than the initial concentrations of DDT and DDD in the buried drums which produced the observed concentrations in the groundwater. It is unlikely that DDT and DDD will ever be detectable in groundwater 1,000 and 1,500 feet from the PBS, where the groundwater surfaces.

The Organic Leaching Model (OLM) (51 FR 41082, Nov. 13, 1986) was used to estimate the correlation between DDT and DDD contamination in the soil and the detected amounts of DDT and DDD in the groundwater at SW-2, and to predict the groundwater DDT and DDD concentrations based on existing concentrations in soil (20 ppm). This estimate was derived to confirm that the observed values in soil and groundwater were consistent with each other. Although the OLM is designed to estimate leachate concentrations at landfills where leachate is expected to be acidic; it can be used as a conservative model to estimate groundwater concentrations of soil contaminants in an environment less conducive to leaching.

The OLM equation and pertinent parameters are illustrated in Figure 1 for application to the PBS. In this application, the amount of organic material leached by water infiltration through the soil above the PBS is assumed to be diluted by the groundwater flow. Thus, the measured groundwater concentration is this diluted leachate concentration observed some distance downgradient (e.g., SW-2). The parameters assumed for this model are a 20-foot aquifer (corresponds to the bottom of the unexcavated PBS to the bedrock under the PBS), a recharge (or water infiltration) of two to six inches per year (based on the slope of the ground and the relative impermeability of the PBS soil layers), a groundwater pore velocity of 8.7 feet per year (a Darcian velocity of 1.74 feet/year) and PBS dimensions of 53 feet (perpendicular to groundwater flow) by 20 feet (parallel to groundwater flow) and 20 feet deep.

The OLM was used to estimate a soil concentration responsible for the observed 4,4'-DDT and DDD concentrations in SW-2, approximately 50 feet from the PBS. To do this, the results of the VHS model application were used to develop estimated concentrations 50 feet upgradient of SW-2; i.e., at the downgradient edge of the source (see 0 feet in Table 5). Using these concentrations in the OLM yields 4,4'-DDT and DDD concentrations in soil of 62,760 ppm and 5,221 ppm, respectively. These are consistent with the concentrations measured in test pits in earlier studies (see Table 1). The water solubilities used for DDT and DDD in these calculations were 0.005 mg/ℓ and 0.10 mg/ℓ, respectively (USEPA Superfund Public Health Evaluation Manual, October, 1986; OSWER Directive 9285.4-1) (SPHEM). The leachate concentrations and initial groundwater concentrations below the PBS would be expected to be high because DDT and DDD are highly soluble in the solvent used for the formulated product. Initially, the DDT and DDD would not tend to bind to soil as the solvent leached from the PBS. Subsequent dilution and mixing in water will result in greater adsorption of DDT and DDD to the soil.

The OLM model was applied to existing PBS soil containing 4,4'-DDT and DDD at 25 and 15 μg/kg, respectively. The resulting expected groundwater concentrations below the PBS would be 2.7 and 5.9 μg/ℓ, respectively. This is lower than the observed concentrations at SW-2, downgradient of the PBS. Using the VHS model as described above, the amount of 4,4'-DDT and DDD estimated in the groundwater 1,000 feet from the PBS is 0.017 and 0.037 μg/ℓ, respectively.

Thus, the amount of DDT and DDD that would migrate from the PBS, and be in the groundwater where it surfaces in Murphy's Gulch, is very conservatively estimated at <0.1 ppb, with further dilution expected due to dissipative forces such as soil adsorption and degradation.

The pesticides DDT, DDD, and DDE were detected in a small, intermittent pond approximately 450 feet down the slope from the PBS. Only DDT was detected in the surface water (0.57 µg/ℓ), but DDT, DDD, and DDE were detected in the sediment. A possible pathway by which the pesticides could be transported to this pond is via storm runoff of surface soils which may have been removed from the PBS during excavation operations. The surface water concentration can be used to estimate the distribution coefficient, K_d, between soil and water. This value can be compared with literature values to get a measure of the reasonableness of this model. Accordingly, the following equations were used:

$$K_d = \frac{\text{concentration in soil}}{\text{concentration in water}}$$

and $K_d = K_{oc} F_{oc}$ where

$$K_{oc} = \frac{\text{concentration of solute on organic carbon}}{\text{concentration of solute in water}}$$

and F_{oc} is the fraction of organic carbon in soil.

Typically, sediments may contain 10% organic carbon ($F_{oc} = 0.1$). Assuming the sediment concentration of DDT is 3,100 µg/kg (the maximum observed in samples), $K_d = 54,400$ ℓ/kg and $K_{oc} = 544,000$. This is in very good agreement with literature values.

Similar calculations using literature K_{oc} values for DDD and DDE, and their observed maximum concentrations in sediment, yield surface water concentrations of 0.002 µg/ℓ for DDD and 0.0005 µg/ℓ for DDE; much below laboratory detection limits.

It is also interesting to note that the concentration of DDE in sediment was greater than the concentration of DDD. In the PBS, the DDD concentration was greater than the concentration of DDE. This would be expected because DDE results from aerobic degradation and photolysis of DDT, whereas DDD predominates under anaerobic conditions. Weathering of contaminated surface soils (oxidation, photolysis, aerobic degradation, etc.) is more likely to result in higher proportions of DDE, as observed in the sediment sample.

RISK ANALYSIS

There are two significant potential pathways for exposure of wildlife and humans to the pesticides at the PBS:

- exposure to surface soils, and surface waters and sediments in intermittent ponds; and

- exposure to contaminated groundwater migrating and discharging downgradient from the PBS.

Surface Contamination

The first exposure pathway cannot be adequately addressed by the available data. The data indicated that residues of DDT, DDD, and DDE were transported to the intermittent pond at the toe of the landfill via surface runoff from the PBS area. A potential explanation for the observed contamination is that soil particles containing adsorbed DDT and its derivatives are present on the surface around the PBS due to past test pit excavation activities. Calculations performed in the fate and transport analyses indicate that sediment concentrations at the intermittent pond should be at least a thousand times greater than the surface water concentrations if the contamination was bound to soil particles. The data obtained by Jordan confirm that supposition. Consequently, additional data are required to assess surface soil contamination topographically upstream of the PBS, and downstream of the PBS in drainageways and intermittent ponds.

Groundwater Contamination - Public Health Risks

Groundwater at the site is not used as a drinking water source, since a municipal water supply services the ANGB and most of the surrounding areas. Continued airport expansion is planned, therefore reducing the likelihood for future use of groundwater as a domestic water supply. The groundwater flowing past the PBS is expected to discharge into the area around Murphy's Gulch, about 1,000 - 1,500 feet east of the PBS. The nearest drinking water well services a residence approximately 1,700 feet southeast of the PBS, and more than 700 feet southeast of the Murphy's Gulch discharge area. Consequently, there is limited potential for contaminated groundwater to pose a human health hazard due to ingestion or other domestic use. An analysis of potential public health risks from ingestion of the contaminated groundwater was performed to establish an upper bound of risk.

The risk analysis examined worst-case risks associated with ingestion of groundwater at various distances downgradient of the PBS. The selected distances corresponded to the points analyzed in the VHS modeling described in the previous section of this report. The risk analysis focused on the same two scenarios that were examined in the Fate and Transport Analysis section of this report:

- Scenario I - risks associated with ingestion of groundwater already contaminated, as evidenced by observations at SW-2; and
- Scenario II - risks associated with ingestion of groundwater predicted to be contaminated by leaching (OLM Model) and dispersion (VHS Model) of subsurface contaminants from the PBS.

For both scenarios, the assumptions and methods used to derive the pesticide concentrations utilized in the risk analysis are described in the Fate and Transport Analysis section.

The risk analysis was highly conservative for several reasons. First, the VHS transport modeling considers dilution through dispersion, but not attenuative mechanisms such as adsorption. Consequently, the concentrations used for the risk analysis are likely to be at least one order of magnitude greater than actual concentrations. Secondly, the analysis conservatively assumed an unrealistic exposure scenario for a receptor drinking 2 liters of contaminated water on a daily basis for 70 years. The use of a more realistic body dose estimate would yield risk estimates at least an order of magnitude lower than the conservative estimates. Finally, the analysis examined potential receptors between the PBS and Murphy's Gulch, 1,000 to 1,500 feet downgradient, although the nearest receptor is at least 1,700 feet downgradient of the PBS.

The methodology employed is based on EPA guidance for conducting exposure and risk assessments (SPHEM). The noncarcinogenic risks and carcinogenic risks associated with estimated exposures to DDT and DDD were analyzed. DDE was not included in the analysis because no reference dose (RfD) or cancer potency factor (CPF) for DDE was available for use in the analysis. Further, DDE concentrations observed at the site were over 100 times lower than the DDT and DDD concentrations.

For noncarcinogenic risks, the predicted body dose of the contaminant is compared to the RfD. If the ratio is greater than 1.0, then the specified dose could result in adverse health effects. The results of this analysis for the PBS are shown in Table 6. A noncarcinogenic risk (>1.0) was associated with consumption of drinking water containing DDT and DDD at concentrations found at SW-2 (Scenario I), but not for consumption of water 1,000 feet downgradient of the PBS (see Table 6). Under Scenario II, no adverse noncarcinogenic risks are associated with the subsurface soil contamination at the PBS (see Table 6).

For carcinogenic risks, the CPF is multiplied by the estimated body dose to yield an incremental cancer risk. The EPA guidance indicates that the target total carcinogenic risk from exposures at a Superfund site may range from 10^{-4} to 10^{-7}. For the PBS, the cancer risk estimate associated with the existing groundwater contamination (Scenario I) is above the target range for drinking water at SW-2, but within the target range for water at 1,000 feet (see Table 6). Under Scenario II, the carcinogenic risks associated with DDT and DDD residues predicted to be in groundwater are within the target range, including groundwater directly below the PBS (see Table 6).

Groundwater Contamination - Environmental Risks

The potential environmental risks associated with contaminated groundwater are associated with discharge of contaminants to Murphy's Gulch. The EPA Ambient Water Quality Criteria for DDT in water is 0.001 ppb. This value is based on the FDA action level for human consumption of contaminated fish, and considers the bioaccumulation potential of DDT. This value is therefore not appropriate for assessment of risks to wildlife in Murphy's Gulch. Literature values for toxicity of DDT to aquatic species (Verscheuren, see citation in Table 4) indicates that concentrations exceeding 0.1 ppb are toxic to certain species. For assessment of environmental risks, an analysis of predicted DDT concentrations in the groundwater discharging to Murphy's Gulch (1,000 to 1,500 feet downgradient of the PBS) was examined. As with previous analyses in this report, two scenarios were examined: dispersion of existing groundwater contamination (I), and leaching and dispersion of subsurface soil contamination measured in the PBS after excavation (II).

For contamination observed at SW-2 (Scenario I), the VHS model provided a worst case estimate of the pesticide concentration expected at the discharge point, based simply on dilution through dispersion. This analysis does not consider the potential for degradation over time, nor the potential for retardation through adsorption. Based on estimated groundwater flow rates, the contamination observed in SW-2 would be expected to take nearly one hundred years to reach the discharge point. During that time, certain pesticides would likely be transformed or degraded via hydrolysis, dechlorination, and biodegradation; these include 2,4-D, 2,4,5-T, and parathion. The other group of pesticides found at the site are DDT and its derivatives. These compounds have a very high potential for adsorption to organic matter. Most of these contaminants would likely be adsorbed as they discharged to Murphy's Gulch and contacted the organic rich soils present in the discharge area. As the predicted maximum amount of DDT to reach the discharge area is 3.5 ppb (according to the VHS), the actual amount expected to be found in groundwater at the discharge area would likely be <0.1 ppb because of attenuation through adsorption. As the groundwater discharges, further loss due to adsorption, volatilization, and photodegradation would likely lower the surface water concentrations to <0.001 ppb. No adverse effects on wildlife would be expected from these concentrations of DDT.

The fate and transport analyses indicated that the levels of pesticides expected to be leached from the PBS into groundwater (Scenario II) are at least an order of magnitude lower than those already present in groundwater, as observed by Dames & Moore at SW-2. Furthermore, the expected concentrations to be discharged as a result of leaching from the PBS are likely to be nonhazardous; i.e., <0.001 ppb after consideration of adsorptive, chemical, and biological processes.

IV. CONCLUSIONS

The analyses performed here indicate that further subsurface soil investigations at the PBS are not warranted. The existing groundwater contamination observed in SW-2 poses a greater risk, although minimal, than the subsurface soil contamination remaining after excavation of the PBS. The PBS no longer represents a source of contamination which could be considered a threat to public health and the environment. No additional remedial activities are required for the PBS, however, groundwater monitoring should be performed to confirm the analyses presented here and to assess the fate of pesticides which have migrated from the PBS. I addition, the extent of DDT contamination observed in the intermittent pond at the toe of the landfill should be investigated to determine the source and potential environmental risks.

Monitoring of groundwater between the PBS and the landfill, downgradient of the landfill, and upgradient of the PBS should be conducted on a quarterly basis initially, to establish background DDT and DDD levels and to perform detailed fate and transport analyses. Long-term monitoring would be required only infrequently, based on the observed groundwater flow rates. Sufficient data should be obtained to perform detailed fate and transport analyses to assess potential future environmental risks, taking into consideration planned construction activities at the PBS that are associated with airport expansion. Detailed pre-construction data may be used to determine how planned activities will affect infiltration, pesticide mobility, and exposure assessments.

The analysis of available data indicates that additional surface soil surrounding the PBS and downstream of the PBS, should be sampled for pesticide analyses to locate the source of contamination observed in the intermittent pond at the toe of the landfill. In addition, sufficient sampling of surface waters and sediments should be performed to assess the potential environmental risks associated with any discovered contamination.

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NUS Corporation. Evaluation of Analytical Data from City of Newburgh Water Supply, Newburgh, New York, Stewart Annex, USMA Newburgh Landfill, Newburgh, New York and New Windsor Landfill, New Windsor, New York. October 15, 1984.

TABLE 1. PESTICIDE CONTAMINATION IN SAMPLES FROM TEST PITS IN PBS AT STEWART ANGB

Pesticide	Concentration in Soil Sample (ppb)					Concentration in Liquids (ppb)				
	TP-3-13	TP-5	TP-6	TP-7	TP-8	TP3-I[b]	TP3-II[b]	TP-6	TP-7	TP-8
Parathion	--[a]	--	2.2	0.59	3.9	--	--	--	--	3.8
DDE	--	--	130	6.1	7.2	--	--	1,500	4,000,000	37
DDD	3,900	--	950	140	370	7100	159,000	23,000	28,000,000	430
o,p'-DDT (2,4'-DDT)	3,900	0.06	600	25	49	950	100,000	16,000	38,000,000	360
p,p'-DDT (4,4'-DDT)	13,000	0.17	1,700	73	122	3,040	370,000	20,000	120,000,000	440
2,4-D	0.42	--	--	--	--	--	130	6.6	2.2	3.0
2,4,5-T	--	--	--	0.37	0.61	--	31.0	47.0	5.4	6.6

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[a] -- = less than detection limit.

NOTE: Data in this table were excerpted from Tables 2 and 3 in Dames & Moore (June 12, 1986).

TABLE 2. PESTICIDE CONCENTRATIONS IN SOIL BORINGS AND GROUNDWATER AT WELL SW-2 AT STEWART ANGB IN 1985

Pesticide	Concentration (ppb) in groundwater	Concentration (ppm) in soil at 25 feet	35 feet
p,p'-DDT (4,4'-DDT)	15.0	1.5	8.2
o,p'-DDT (2,4'-DDT)	4.4	0.42	1.9
DDD	8.5	0.47	2.5
DDE	0.15	0.026	0.058
2,4-D	20.0	0.067	0.35
2,4,5-T	0.45	0.006	0.04
parathion	--[a]	0.08	<0.01

[a] -- = less than detection limit

TABLE 3. PESTICIDE CONCENTRATIONS PRESENTLY IN SOIL AT A DEPTH OF APPROXIMATELY 20 FEET IN THE PBS AT STEWART ANGB

Pesticide	Concentrations (ppm) in composited samples from Row Nos.[a] 1	2	3	4	5
4,4'-DDT[b]	2.6	4.6	21	4.1	25.0[c]
DDD[b]	1.6	2.0	6.3	2.2	15.0[c]
DDE[b]	0.06	0.11	0.83	0.12	0.64[c]
TOTAL	4.26	6.71	28.13	6.42	40.64

NOTE: Samples were also analyzed for heptachlor, parathion, 2,4-D, and 2,4,5-T; all values below detection limits.

[a] Samples taken during excavation activities prior to backfilling.

[b] Mr. Roger Dhanda of Lancy Environmental Services stated in a personal communication (October 12, 1988) that these were the only isomers analyzed, according to the specified scope of work; i.e., the 2,4'-isomers were not analyzed.

[c] Mr. Dave Hale of Dynamac stated in a personal communication (September 22, 1988) that these values were suspect because no pesticide containers were buried in this section of the pit, and soil samples above this depth had only minute levels of pesticides (i.e., 1.0 and 0.1 ppm at 4 feet and 2 feet above, respectively).

TABLE 4. CHEMICAL AND PHYSICAL PROPERTIES OF CONTAMINANTS IN PBS AT STEWART ANGB

	Water Solubility (mg/l)	Koc (l/kg)	Half-life (t½) in soil (days)	Half-life (t½) in water (days)	Biodegradation	Photolysis (Aqueous) t½ (days)	Hydrolysis (Aqueous) t½	Volatilization (Aqueous) t½
DDT	0.005[1] (0.003)[5]	243,000[1]	1,000-5,500[1] 4-30 yrs (75-100%)	56-110[1]	Nondegradable[2] (t½=3,837 days, soil)	>150 yrs[1] 0.92[2]	81 days-12 yrs	hours to weeks (74 hours)
DDE	0.04[1]	4,400,000			slow[5]	0.92[2]	>120 yrs[3]	days to weeks[3]
DDD	0.10[1] (0.160)[5]	770,000			slow[3]	>150 yrs[3]	190-570 days[3]	days to months[3]
Parathion (methyl)	60[1] (24)[5]	460[1]	1 week (75-100%)		readily degradable (t½=4.5-55 days, soil)	10-30[2]		
2,4-D	620[1](890)[5]	20[1]			26 days[5] (t½=9.5-84 days, soil)	29[4], 62[2]	0.04-44 days[4]	38.5[4]
2,4,5-T	278[5]		5 mos. (75-100%)		>205 days[5]			

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[1] USEPA Superfund Public Health Evaluation Manual, Oct. 1986, OSWER Dir. 9285.4-1.

[2] Lyman, et al., Handbook of Chemical Property Estimation Methods, McGraw-Hill, New York (1982).

[3] USEPA, Water-Related Environmental Fate of 129 Priority Pollutants, EPA 440/4-79-029a, December 1979.

[4] Tinsley, Chemical Concepts in Pollutant Behavior, John Wiley & Sons, Inc. (1979).

[5] Verschueren, Handbook of Environmental Data for Organic Chemicals, Van Nostrand Reinhold Co., New York (1983).

TABLE 5. RESULTS OF VHS AND OLM/VHS MODEL APPLICATIONS TO OBSERVED PESTICIDE CONTAMINATION IN PBS AT STEWART ANGB

Contaminant	Concentration (ppb) Downgradient from Edge of Source: 0 feet	(SW-2)[a]	1,000 feet	1,500 feet
I. Transport of Contamination Observed in Groundwater at SW-2				
4,4'-DDT	104.7	15.0	3.5	2.8
4,4'-DDT and 2,4'-DDT	135.4	19.4	4.5	3.6
DDD	59.3	8.5	2.0	1.6
II. Transport of Contaminants Measured in Soil after excavation of PBS				
A. Assuming infiltration rate of 2 in/yr				
4,4'-DDT	0.52	0.074	0.017	0.014
DDD	1.12	0.160	0.037	0.030
B. Assuming infiltration rate of 6 in/yr				
4,4'-DDT	1.13	0.162	0.037	0.031
DDD	2.44	0.350	0.081	0.066

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[a] SW-2 located approximately 50 feet downgradient.

TABLE 6. WORST-CASE RISK ESTIMATES ASSOCIATED WITH INGESTION OF DDT AND DDD IN GROUNDWATER MIGRATING FROM PBS AT STEWART ANGB

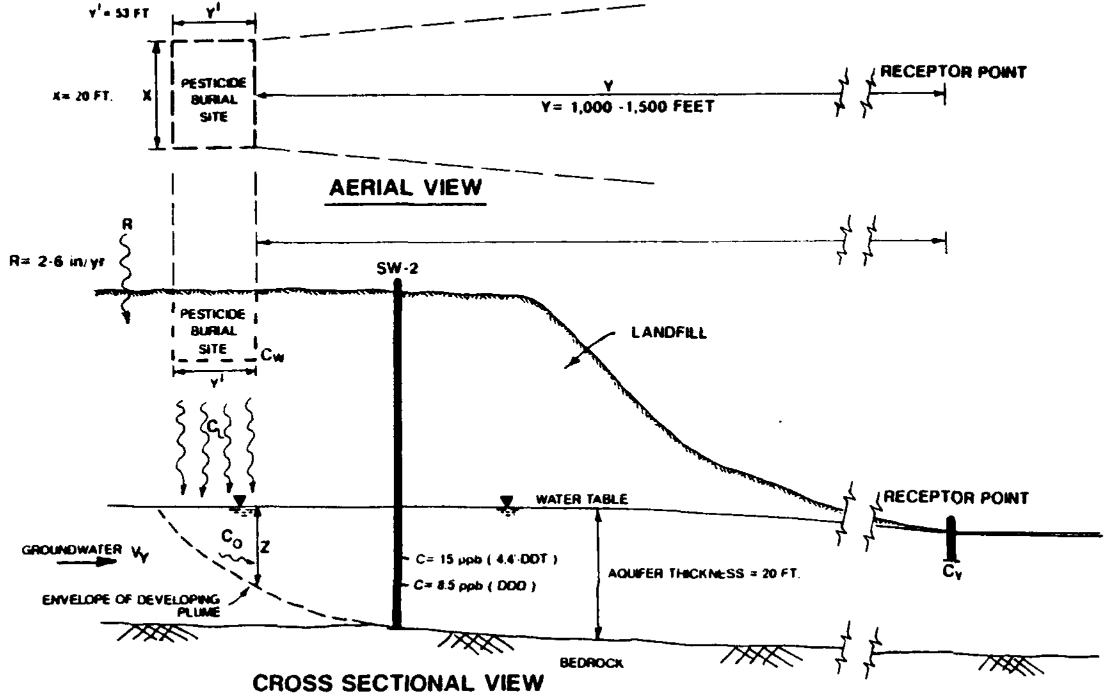
Scenario		Downgradient Distance (ft)	Total DDT and DDD[a] Concentration (μg/L)	Risk[b]	
				Noncarcinogenic	Carcinogenic
I.	Modeled by VHS Using Concentrations Observed in SW-2	0	194.7	1.11E+1[c]	1.89E-3[c]
		50 (SW-2)	27.9	1.59E+0[c]	2.71E-4[c]
		1,000	6.5	3.71E-1	6.31E-5
		1,500	5.2	2.97E-1	5.05E-5
II.A.	Modeled by OLM/VHS Using Concentrations in Soil at PBS and Infiltration Rate of 2 in/yr	0	1.64	9.37E-2	1.59E-5
		50 (SW-2)	0.234	1.34E-2	2.27E-6
		1,000	0.054	3.09E-3	5.25E-7
		1,500	0.044	2.51E-3	4.27E-7
II.B.	Modeled by OLM/VHS Using Concentrations in Soil at PBS and Infiltration Rate of 6 in/yr	0	3.57	2.04E-1	3.47E-5
		50 (SW-2)	0.512	2.93E-2	4.97E-6
		1,000	0.118	6.74E-3	1.15E-6
		1,500	0.097	5.54E-3	9.42E-7

---

[a] 4,4'-DDT; 2,4'-DDT, and DDD concentrations (IA) summed and treated as DDT. II.A. and B. no 2,4'-DDT.

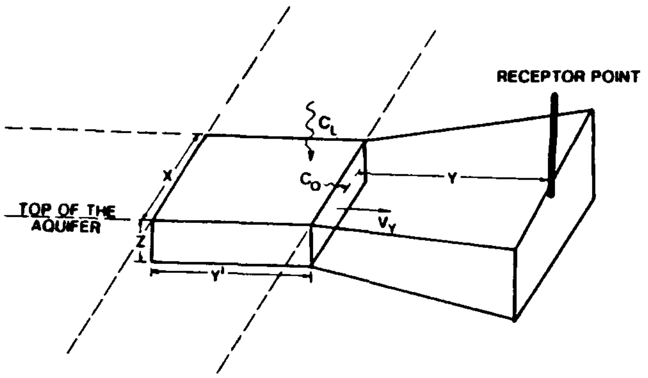
[b] Reference Dose (Rfd) = 5.0E-4 (noncarcinogenic effects)
Cancer Potency Factor (CPF) = 3.4E-1 (carcinogenic effects)
Relative Absorption Factor (RAF) = 1.0
Based on ingestion of 2 liters of water from the site, 365 days/year for 70 years by 70 kg person.

[c] These values indicate potential for adverse noncarcinogenic health effects (>1.0 E+0), or incremental carcinogenic risks above EPA Superfund target level range of 10^{-4} to 10^{-7}.



AERIAL VIEW

CROSS SECTIONAL VIEW



PLUME DISPERSION

NOT TO SCALE

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OLM EQUATION

C_L = $0.00221\ (C_w)^{0.678}\ (S)^{0.373}$

C_L = contaminant concentration in leachate
C_w = contaminant concentration in waste or soil
S = water solubility of contaminant (at ambient temperature)

VHS EQUATION

C_y = $C_o\ \{\mathrm{erf}\ [Z/2(\alpha_z\ Y)^{0.5}]\}\ \{\mathrm{erf}\ [X/4(\alpha_t\ Y)^{0.5}]\}$

C_L = contaminant concentration in leachate
C_y = contaminant concentration at receptor location
C_o = contaminant concentration in groundwater flowing out
erf = error function
Z = penetration depth of leachate into the aquifer
Y = distance from edge of source to receptor
X = length of disposal site; perpendicular to groundwater flow direction
Y' = width of disposal site; parallel to groundwater flow direction
α_t = transverse dispersivity
α_z = vertical dispersivity

ASSUMPTIONS USED

α_t = $\alpha_L/3$, where α_L = lateral dispersivity = 0.1Y
α_z = $0.1\ \alpha_t$
Z = $(\alpha_z\ Y')^{0.5}$
C_o = $(C_L\ RX)/(RX + V_y\ Z)$
V_y = (pore velocity) (porosity) = (8.7 ft/yr) (0.2)
R = infiltration rate = 2-6 in/yr

FIGURE 1
APPLICATION OF VHS AND OLM MODELS TO PESTICIDE CONTAMINATION AT PESTICIDE BURIAL SITE
STEWART ANGB, NEWBURGH, N.Y.

E.C.JORDAN CO.

ADDENDUM C

LETTER REPORT - INITIAL SAMPLE ROUND
AT STEWART AIR NATIONAL GUARD BASE (SANGB)
NEAR THE PESTICIDES PIT BURIAL AREA

EXPLANATION

The ANG requested the E.C. Jordan Co. (Jordan) to conduct an additional sampling program in 1989 to examine the current contaminant levels downgradient of the former Pesticide Burial Pit Area. This sampling and analytical program, performed by Jordan in June and July 1989, consisted of surface soil sampling at twelve locations and groundwater sampling from four existing monitoring wells. The report describes the field activities, sample location selection rationale, analytical laboratory results, and Jordan's conclusions and recommendations.

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December 13, 1989

Ms. Kelly Gallagher
Martin Marietta Energy Systems
Hazardous Waste Remedial Actions Program
Tri Country Mall, MS-7606
P.O. Box 2003
Oak Ridge, TN 37830-7606

Dear Ms. Gallagher:

Subject: Initial Sample Round at Stewart Air National Guard Base (SANGB) near the Pesticides Pit Burial Area

This letter reports the results of the initial groundwater and surface soil sampling activities associated with pesticide contamination at SANGB, as outlined in the approved Technical Proposal for Amendment 4 to the Statement of Work for Phase II/IV-A Activities for Former Landfill and Adjacent Pesticide Burial Site (May, 1989). The purpose of the sampling round is to determine whether pesticides are migrating downgradient (in the case of groundwater) or downslope (in the case of surface soils) from the Pesticide Pit Burial Area (PPBA). Section 1 describes the field activities in chronological order; Section 2 presents the analytical parameters requested; Section 3 summarizes the results of the analyses; Section 4 presents an evaluation of the results; and Section 5 presents recommendations for additional sampling.

SECTION 1 - FIELD ACTIVITIES SUMMARY

Two samplers from the E.C. Jordan (JORDAN) Monitoring Department travelled to the site on June 26, 1989, to conduct the initial PPBA sampling round. Sampling activities were initiated on June 27 and completed on June 28, 1989. Analytical samples were obtained from four monitoring wells and twelve surface soil sampling locations. Samples were collected in accordance with procedures specified in the JORDAN Quality Assurance Project Plan (QAPP) (November, 1986) and the SANGB Site Project Work Plan (May, 1987). The Technical Proposal to Amendment 4 (May, 1989) served as a work plan for the field activities. All sample locations are shown on the enclosed PPBA Sampling Plan, Figure 1.

Collection and handling of quality assurance (QA) samples was performed in accordance with QA Level C requirements as defined in the Hazardous Waste Remedial Actions Program (HAZWRAP) document Requirements for Quality Control of Analytical Data, (August, 1988). Documentation records for the PPBA sampling activities include Instrument Calibration Records, Field Data Record Sheets for each sample collected, shipping records (Chain-of-Custody records and Analytical Request Forms), and a Weekly Field Summary Report. These documents are enclosed as Attachment A.

Summary of Site Logbook Notations

June 27, 1989 - On the first day of the sampling episode, a total of 5 groundwater samples (including 1 QA/QC duplicate sample) were collected from JORDAN well JMW-101 and Dames and Moore wells SW-1, SW-2, and SW-3 (see Figure 1). Two aqueous QA/QC samples (field and equipment blanks) were also collected. The samplers completed all documentation requirements and shipped 7 samples via Federal Express to Versar Inc., in Springfield, VA. The sample locations and numbers are listed on Table 1.

June 28, 1989 - On the second and final day of the sampling episode, a total of 14 surface soil samples (including two QA/QC duplicate samples) were collected from 12 sampling locations, SS-01 through SS-12 (see Figure 1). One aqueous QA/QC sample (equipment rinsate) was collected and archived in accordance with HAZWRAP procedures. Documentation requirements were completed and 15 samples were shipped via Federal Express to Versar, Inc. The JORDAN sample locations and numbers are listed on Table 1.

In addition, sampling personnel obtained a full round of water level measurements from all JORDAN wells and piezometers and the three Dames and Moore wells.

SECTION 2 - LABORATORY AND FIELD-MEASURED ANALYTICAL PARAMETERS

The laboratory analyses requested from Versar, Inc. for all groundwater, soil, and QA/QC samples collected during the PPBA sampling round include the following test parameters:

- Target Compound List (TCL) Pesticides and PCBs, as per the Contract Laboratory Program - Caucus Organic Protocols (CLP-COP)
- Herbicides as per Method SW 846-8150

A listing of specific compounds and detection limits for TCL pesticides and PCBs and the herbicides analysed by Method SW 846-8150 is presented on Table 2.

As groundwater from the four monitoring wells was withdrawn during the sampling process, the following parameters were measured in the field: pH (EPA Method E150.1), temperature (EPA Method E170.1), and specific conductance (EPA Method E120.1). The results of these field tests are reported on the sample data records (see Attachment A) and summarized in the following section.

SECTION 3 - RESULTS OF ANALYSIS

Groundwater

Field Testing. The table below summarizes the results of the field tests for pH, temperature, and specific conductance:

Location	Date	pH	Temperature (Deg C)	Sp. Conductivity um/hos @25 at deg. C
SW-1	6/27/89	7.7	18.7	740
SW-2	6/27/89	7.0	13.3	960
SW-3	6/27/89	7.2	15.0	820
JMW-101	6/27/89	7.1	19.2	837

Laboratory Testing. Validated results for groundwater analyzed for TCL pesticides and PCBs and SW 846-8150 herbicides are presented on Table 3. A summary is presented below.

Location	Date	4,4'-DDE (ug/l)	4,4'-DDD (ug/l)	4,4'-DDT (ug/l)
SW-1	6/27/89	ND	ND	ND
SW-2	6/27/89	66	230	760
SW-3	6/27/89	ND	0.25	ND
JMW-101	6/27/89	ND	ND	ND

Only 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE were detected at concentrations above detection limits in SW-2 and SW-3, which are located downgradient of the PPBA, at 50 feet and 100 feet southeast, respectively. No pesticides, herbicides, or PCBs were detected in samples from SW-1 and JMW-101, which are located upgradient of the PPBA.

Surface Soil

Laboratory Testing. The results for surface soil samples analyzed for TCL pesticides and PCBs and SW 846-8150 herbicides reported detection of TCL pesticides in 7 out of 12 samples located downslope of the PPBA excavation (see Figure 1). All surface soil sample results for SW 846-8150 herbicides were below the detection limit. Validated results for surface soils are presented on Table 4. The summary below presents only the samples containing detectable levels of 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT.

Location	Date	4,4'-DDE (ug/l)	4,4'-DDD (ug/l)	4,4'-DDT (ug/l)
SS-3	6/28/89	240	ND	ND
SS-6	6/28/89	94	ND	ND
SS-8	6/28/89	50	ND	ND
SS-8 (dup)	6/28/89	ND	ND	42
SS-11	6/28/89	490	49	150
SS-12	6/28/89	42	ND	ND

In addition to the pesticides presented above, heptachlor and gamma-chlordane was detected in SS-3 at 29 ug/kg and 75 ug/kg, respectively, and dieldrin was detected in SS-10 at 110 ug/kg.

SECTION 4 - DISCUSSION

Groundwater

High concentrations of 4,4'-DDT and its derivatives were found in the groundwater sample collected from Dames and Moore well SW-2. This is the same well that contained DDT contamination reported in a 1985 Dames and Moore study. JORDAN performed an analysis of groundwater contamination that was presented in a draft report to the ANG in November 1988. The concentrations of DDT and its derivatives observed in the present round of sampling and analysis are significantly greater than those observed by Dames and Moore in 1985.

Compound	Concentration (ppb) in groundwater at SW-2	
	1989	1985
4,4'-DDT	760	15.00
4,4'-DDD	230	8.50
4,4'-DDE	66	0.15

The concentration of DDT observed in the current round of sampling exceeds its aqueous solubility. It is noteworthy that the groundwater sampled at SW-2 contained an oily sheen. This oil likely represents the carrier used to formulate the pesticide product, and would provide an explanation for the concentration observed being greater than the aqueous solubility.

These data will be assessed in the context of the analysis of the Dames and Moore data that JORDAN performed in 1988. The final analysis and recommendations for future investigations will be included in a supplemental SI report.

Surface Soils

Results from the current round of sampling at SANGB indicate the presence of 4,4'-DDT and its derivatives 4,4'-DDE and 4,4'-DDD in surface soil samples. These compounds were found downslope from the PPBA and at the outlet of the intermittent pond. The analytical results for the surface samples indicate the presence of sub-ppm levels of 4,4'-DDT and its related compounds.

The state of New York has not established action levels for DDT and its derivatives. JORDAN is presently addressing issues related to DDT contamination at other sites including Plattsburgh Air Force Base (PAFB), which is also in New York. At PAFB, JORDAN has developed a preliminary cleanup goal of 10 ppm based on an assessment of public health and environmental risks. This is also consistent with action levels established for DDT and its derivatives by the state of New Jersey; these range from 1 to 10 ppm, depending upon the nature of the specific site.

The initial round of sampling performed at SANGB and reported here was designed to yield an assessment of the potential for significant pesticide contamination in surface soils around and downslope of the PPBA. The major route of migration for DDT is mechanical transport, which would allow DDT to accumulate in depressions and swales. In the SI field program, JORDAN collected sediment samples from the intermittent pond that contained 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE at 3.1, 0.17, and 0.23 ppm, respectively. Consequently, samples were collected in the current program from depressions and swales at locations where fine-grained soil particles were observed. These areas were located at distances of 250 feet or more downslope of the PPBA. The levels of DDT detected in samples at SANGB are below 1 ppm, however it is possible for hot spots to exist between the PPBA and the present sampling locations.

SECTION 5 - RECOMMENDATIONS

The ANGB recently approved JORDAN's proposal for work to be conducted under Amendment 4 of the Statement of Work. The proposal states that JORDAN will, upon notice to proceed, collect an additional 25 surface soil samples and 3 surface water samples from the intermittent pond (if deemed necessary) if the data from the current round of sampling and analysis indicate that additional sampling is warranted.

JORDAN recommends that additional surface soil samples be collected in the area between the PPBA and the Patrol Road (see Figure 1). In addition, samples should be collected between the SS-12 sample location and Murphy's Gulch, to assess the limits of contamination. JORDAN proposes that up to 28 surface soil samples be collected, and that no surface water samples be collected at this time. The exact number of samples will be governed primarily by the drainage patterns observed downslope of SS-12. It is recommended that a sample be collected at the point of discharge, into Murphy's Gulch, of each major drainage swale below SS-12, and one sample midway between SS-12 and each discharge point. A minimum of four samples will be collected in this area. The majority of the remaining samples will be collected from the area immediately surrounding the PPBA.

JORDAN recommends that a field gas chromatography program be considered that would be similar to one recently performed at Plattsburgh AFB. JORDAN has developed and successfully demonstrated capabilities to analyze soil samples in the field for DDT and its metabolites. Such a program would allow for more samples to be analyzed at the same cost that would be required for laboratory analyses.

JORDAN also recommends the installation of at least two monitoring wells between the pesticide pit and landfill to assess the migration of DDT contamination and to develop fate and transport analyses for decision-making purposes. The installation of monitoring wells may be accomplished within the scope of the work elements under Amendment 4 to the Statement of Work.

In accordance with the approved proposal, JORDAN is prepared to implement the supplementary sampling round within one week of notice to proceed.

Please do not hesitate to call us with any questions you may have. We appreciate your timely response to this letter report.

Very truly yours,

E.C. JORDAN CO.

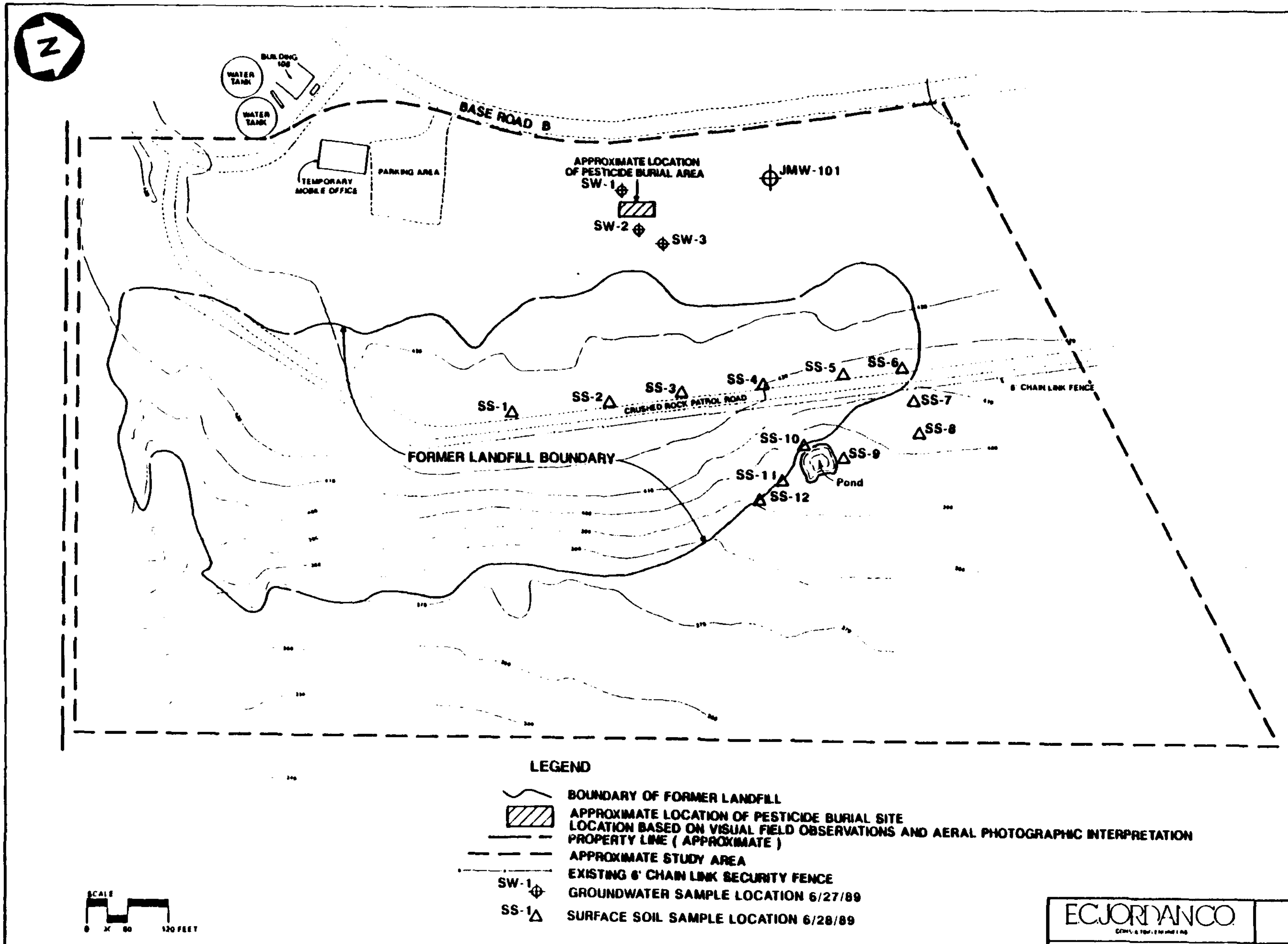
Frederick F Bragdon for R.C. Hebert and L.C. Healey

Richard C. Hebert
Task Order Manager

Linda C. Healey
Field Operations Leader

RCH/LCH/pja

cc: A. Ikalainen
F. Bragdon



E.C.JORDAN CO.

INSTALLATION RESTORATION PROGRAM
STEWART AIR NATIONAL GUARD BASE N Y

PPBA INITIAL SAMPLING PLAN

SI

FIGURE 1

STEWTAB.WK1
7/5/89

TABLE 1

PESTICIDES PIT BURIAL AREA
SAMPLE PLAN

STEWART AIR NATIONAL GUARD BASE
NEWBURGH, NEW YORK

LOCATION NUMBER	COLLECTION DATE	SAMPLE NUMBER	LABORATORY NUMBER PESTICIDES	LABORATORY NUMBER HERBICIDE	MATRIX	REMARKS
SW-1	06/27/89	STGWSW1XXX01X	75675 B	75682 B	GROUNDWATER	
SW-2	06/27/89	STGWSW2XXX01X	75676 B	75683 B	GROUNDWATER	
SW-3	06/27/89	STGWSW3XXX01X	75677 C	75684 C	GROUNDWATER	
SW-3	06/27/89	STGWSW3XXX01X	75678 B	75685 B	GROUNDWATER	Duplicate SW-3
JMW-101	06/27/89	STGW101XXX01XX	75674 B	75681 B	GROUNDWATER	
(BLANK)	06/27/89	STFBC01XXX01XX	75679 B	75686 B	DEIONIZED WATER	Field Blank
(BLANK)	06/27/89	STBS001XXX01XX	75680 B	75687 B	DEIONIZED WATER	Equipment Blank
SS-1	06/28/89	STSS001XXX01XX	75910 B	75924 B	SURFACE SOIL	
SS-2	06/28/89	STSS002XXX01XX	75911 B	75925 B	SURFACE SOIL	
SS-3	06/28/89	STSS003XXX01XX	75912 B	75926 B	SURFACE SOIL	
SS-3	06/28/89	STSS003XXX01XD	75913 B	75927 B	SURFACE SOIL	Duplicate SS-3
SS-4	06/28/89	STSS004XXX01XX	75914 B	75928 B	SURFACE SOIL	
SS-5	06/28/89	STSS005XXX01XX	75915 B	75929 B	SURFACE SOIL	
SS-6	06/28/89	STSS006XXX01XX	75916 B	75930 B	SURFACE SOIL	
SS-7	06/28/89	STSS007XXX01XX	75917 B	75931 B	SURFACE SOIL	
SS-8	06/28/89	STSS008XXX01XX	75918 B	75932 B	SURFACE SOIL	
SS-8	06/28/89	STSS008XXX01XD	75920 B	75934 B	SURFACE SOIL	Duplicate SS-8
SS-9	06/28/89	STSS009XXX01XX	75919 B	75933 B	SURFACE SOIL	
SS-10	06/28/89	STSS010XXX01XX	75921 B	75935 B	SURFACE SOIL	
SS-11	06/28/89	STSS011XXX01XX	75922 B	75936 B	SURFACE SOIL	
SS-12	06/28/89	STSS012XXX01XX	75923 B	75937 B	SURFACE SOIL	

TABLE 2
ANALYTICAL PARAMETERS

STEWART AIR NATIONAL GUARD BASE
NEWBURGH, NEW YORK

PESTICIDES / PCBs	METHOD	CONTRACT-REQUIRED DETECTION LIMIT	
		WATER	SOIL
		ug/l	ug/kg
alpha-BHC	CLP-COP	0.05	8
beta-BHC	CLP-COP	0.05	8
delta-BHC	CLP-COP	0.05	8
gamma-BHC (Lindane)	CLP-COP	0.05	8
Heptachlor	CLP-COP	0.05	8
Aldrin	CLP-COP	0.05	8
Heptachlor Epoxide	CLP-COP	0.05	8
Endosulfan I	CLP-COP	0.05	8
Dieldrin	CLP-COP	0.10	16
4,4'-DDE	CLP-COP	0.10	16
Endrin	CLP-COP	0.10	16
Endosulfan II	CLP-COP	0.10	16
4,4'-DDD	CLP-COP	0.10	16
Endrin Aldehyde	CLP-COP	0.10	16
Endosulfan Sulfate	CLP-COP	0.10	16
4,4'-DDT	CLP-COP	0.10	16
Methoxychlor	CLP-COP	0.50	80
Endrin Ketone	CLP-COP	0.10	16
alpha-Chlordane	CLP-COP	0.50	80
gamma-Chlordane	CLP-COP	0.50	80
Toxaphene	CLP-COP	1.00	160
Aroclor-1016	CLP-COP	0.50	80
Aroclor-1221	CLP-COP	0.50	80
Aroclor-1232	CLP-COP	0.50	80
Aroclor-1242	CLP-COP	0.50	80
Aroclor-1248	CLP-COP	0.50	80
Aroclor-1254	CLP-COP	1.00	160
Aroclor-1260	CLP-COP	1.00	160

HERBICIDES	METHOD	METHOD DETECTION LIMIT	
		WATER	SOIL
		ug/l	mg/kg
2,4-D	SW 846-8150	0.8	0.4
2,4-DB	SW 846-8150	4.0	2.0
2,4,5-T	SW 846-8150	0.8	0.4
2,4,5-TP (Silvex)	SW 846-8150	0.4	0.2
Dalapon	SW 846-8150	4.0	2.0
Dicamba	SW 846-8150	0.4	0.2
Dichloroprop	SW 846-8150	0.8	0.4
Dinoseb	SW 846-8150	NA	NA

TABLE 3

PROJECT: Stewart

Pesticides/PCBs Aqueous Analysis (ug/L)

22-Aug-89

Table 3
Summary Table

		JMW-101	SW-1	SW-2	SW-3	SW-3 (Dup.)
SAMPLE LOCATION:		STGW101XXX01XX	STGWSW1XXX01XX	STGWSW2XXX01XX	STGWSW3XXX01XX	STGWSW3XXX01XD
LAB NUMBER:		75674	75675	75676DL2	75677	75678
DATE SAMPLED:		06/27/89	06/27/89	06/27/89	06/27/89	06/27/89
DATE EXTRACTED:		07/01/89	06/29/89	06/29/89	06/29/89	06/29/89
DATE ANALYZED:		07/07/89	07/06/89	07/11/89	07/07/89	07/06/89
ANALYTE	CRQL					
alpha-BHC	0.05	-	-	-	-	-
beta-BHC	0.05	-	-	-	-	-
delta-BHC	0.05	-	-	-	-	-
gamma-BHC (Lindane)	0.05	-	-	-	-	-
Heptachlor	0.05	-	-	-	-	-
Aldrin	0.05	-	-	-	-	-
Heptachlor epoxide	0.05	-	-	-	-	-
Endosulfan I	0.05	-	-	-	-	-
Dieldrin	0.10	-	-	-	-	-
4,4'-DDE	0.10	-	-	66	-	-
Endrin	0.10	-	-	-	-	-
Endosulfan II	0.10	-	-	-	-	-
4,4'-DDD	0.10	-	-	230	-	0.25 J
Endosulfan sulfate	0.10	-	-	-	-	-
4,4'-DDT	0.10	-	-	760 D	-	-
Methoxychlor	0.50	-	-	-	-	-
Endrin ketone	0.10	-	-	-	-	-
alpha-Chlordane	0.50	-	-	-	-	-
gamma-Chlordane	0.50	-	-	-	-	-
Toxaphene	1.0	-	-	-	-	-
Aroclor-1016	0.50	-	-	-	-	-
Aroclor-1221	0.50	-	-	-	-	-
Aroclor-1232	0.50	-	-	-	-	-
Aroclor-1242	0.50	-	-	-	-	-
Aroclor-1248	0.50	-	-	-	-	-
Aroclor-1254	1.0	-	-	-	-	-
Aroclor-1260	1.0	-	-		-	-
Dilution Factor:		1.0	1.0	100.0	1.0	1.0
Associated Method Blank:		PBLK5071	RB5053	RB5053	RB5053	RB5053
Associated Equipment Blank:		STBS001XXX01XX	STBS001XXX01XX	STBS001XXX01XX	STBS001XXX01XX	STBS001XXX01XX
Associated Field Blank:		STFB001XXX01XX	STFB001XXX01XX	STFB001XXX01XX	STFB001XXX01XX	STFB001XXX01XX

TABLE 3 (continued)

PROJECT: Stewart

Miscellaneous Aqueous Analysis (ug/L)

24-Aug-89

Table 3
Summary Table

	JMW-101	SW-1	SW-2	SW-3	SW-3 (DUP.)
SAMPLE LOCATION:	STGW101XXX01XX	STGWSW1XXX01XX	STGWSW2XXX01XX	STGWSW3XXX01XX	STGWSW3XXX01XD
LAB NUMBER:	75681	75682	75683	75684	75685
DATE SAMPLED:	06/27/89	06/27/89	06/27/89	06/27/89	06/27/89
DATE EXTRACTED:	06/29/89	06/29/89	06/29/89	06/29/89	06/29/89
DATE ANALYZED:	07/07/89	07/07/89	07/07/89	07/07/89	07/07/89
ANALYTE					
Dalapon	-	-	-	-	-
Dicamba	-	-	-	-	-
Dichloroprop	-	-	-	-	-
2,4-D	-	-	-	-	-
2,4,5-TP(SILVEX)	-	-	-	-	-
2,4,5-T	-	-	-	-	-
2,4-DB	-	-	-	-	-
Dilution Factor:	1	1	1	1	1
Associated Method Blank:	RB5049 RB5050	RB5049 RB5050	RB5049 RB5050	RB5049 RB5050	RB5049 RB5050
Associated Equipment Blank:	STBS001XXX01XX STFB001XXX01XX	STBS001XXX01XX STFB001XXX01XX	STBS001XXX01XX STFB001XXX01XX	STBS001XXX01XX STFB001XXX01XX	STBS001XXX01XX STFB001XXX01XX

TABLE 4

PROJECT: Stewart

Pesticides/PCBs Soil Analysis (ug/kg)

22-Aug-89

Table 4
Summary Table

		SS-1	SS-2	SS-3	SS-3 (DUP.)	SS-4	SS-5	SS-6	SS-7
SAMPLE LOCATION:		STSS001XXX01XX	STSS002XXX01XX	STSS003XXX01XX	STSS003XXX01XD	STSS004XXX01XX	STSS005XXX01XX	STSS006XXX01XX	STSS007XXX01XX
LAB NUMBER:		75910	75911	75912	75913	75914	75915	75916	75917
DATE SAMPLED:		06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89
DATE EXTRACTED:		06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89
DATE ANALYZED:		07/10/89	07/07/89	07/07/89	07/07/89	07/10/89	07/10/89	07/10/89	07/10/89
ANALYTE	CRQL								
alpha-BHC	8	-	-	-	-	-	-	-	-
beta-BHC	8	-	-	-	-	-	-	-	-
delta-BHC	8	-	-	-	-	-	-	-	-
gamma-BHC (Lindane)	8	-	-	R	-	-	-	-	-
Heptachlor	8	-	-	29 J	-	-	-	-	-
Aldrin	8	-	-	-	-	-	-	-	-
Heptachlor epoxide	8	-	-	-	-	-	-	-	-
Endosulfan I	8	-	-	-	-	-	-	-	-
Dieldrin	16	-	-	-	-	-	-	-	-
4,4'-DDE	16	-	-	240 J	-	-	-	94	-
Endrin	16	-	-	-	-	-	-	-	-
Endosulfan II	16	-	-	-	-	-	-	-	-
4,4'-DDD	16	-	-	-	-	-	-	-	-
Endosulfan sulfate	16	-	-	-	-	-	-	-	-
4,4'-DDT	16	-	-	-	-	-	-	-	-
Methoxychlor	80	-	-	-	-	-	-	-	-
Endrin ketone	16	-	-	-	-	-	-	-	-
alpha-Chlordane	80	-	-	-	-	-	-	-	-
gamma-Chlordane	80	-	-	75 J	-	-	-	-	-
Toxaphene	160	-	-	-	-	-	-	-	-
Aroclor-1016	80	-	-	-	-	-	-	-	-
Aroclor-1221	80	-	-	-	-	-	-	-	-
Aroclor-1232	80	-	-	-	-	-	-	-	-
Aroclor-1242	80	-	-	-	-	-	-	-	-
Aroclor-1248	80	-	-	-	-	410	-	-	-
Aroclor-1254	160	-	-	-	-	-	-	-	-
Aroclor-1260	160	-	-	-	-	-	-	-	-
Dilution Factor:		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Percent Solids:		69.4	53.2	57.0	60.6	76.7	79.3	76.6	61.2
Associated Method Blank:		PBLK5064L	PBLK5064L	PBLK5064M	PBLK5064L	PBLK5064L	PBLK5064L	PBLK5064L	PBLK5064L

TABLE 4 (continued)

PROJECT: Stewart

Miscellaneous Soil Analysis (ug/g)

24-Aug-89

Table 4
Summary Table

	SS-1	SS-2	SS-3	SS-3(DUP)	SS-4	SS-5	SS-6	SS-7
SAMPLE LOCATION:	STSS001XXX01XX	STSS002XXX01XX	STSS003XXX01XX	STSS003XXX01XD	STSS004XXX01XX	STSS005XXX01XX	STSS006XXX01XX	STSS007XXX01XX
LAB NUMBER:	75924	75925	75926	75927	75928	75929	75930	75931
DATE SAMPLED:	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89
DATE EXTRACTED:	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89
DATE ANALYZED:	07/06/89	07/06/89	07/06/89	07/06/89	07/06/89	07/06/89	07/06/89	07/06/89
ANALYTE								
Dalapon	-	-	-	-	-	-	-	-
Dicamba	-	-	-	-	-	-	-	-
Dichloroprop	-	-	-	-	-	-	-	-
2,4-D	-	-	-	-	-	-	-	-
2,4,5-TP(SILVEX)	-	-	-	-	-	-	-	-
2,4,5-T	-	-	-	-	-	-	-	-
2,4-DB	-	-	-	-	-	-	-	-
Dilution Factor:	1	1	1	1	1	1	1	1
Percent Solids:	69.4	53.2	57	60.6	76.7	79.3	76.4	61.2
Associated Method Blank:	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063

TABLE 4 (continued)

PROJECT: Stewart

Pesticides/PCBs Soil Analysis (ug/kg)

22-Aug-89

Table 4
Summary Table

		SS-8	SS-8 (DUP.)	SS-9	SS-10	SS-11	SS-12
SAMPLE LOCATION:		STSS008XXX01XX	STSS008XXX01XD	STSS009XXX01XX	STSS010XXX01XX	STSS011XXX01XX	STSS012XXX01XX
LAB NUMBER:		75918	75920	75919	75921	75922	75923
DATE SAMPLED:		06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89
DATE EXTRACTED:		06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89
DATE ANALYZED:		07/10/89	07/10/89	07/10/89	07/10/89	07/10/89	07/11/89
ANALYTE	CRQL						
alpha-BHC	8	-	-	-	-	-	-
beta-BHC	8	-	-	-	-	-	-
delta-BHC	8	-	-	-	-	-	-
gamma-BHC (Lindane)	8	-	-	-	-	-	-
Heptachlor	8	-	-	-	-	-	-
Aldrin	8	-	-	-	-	-	-
Heptachlor epoxide	8	-	-	-	-	-	-
Endosulfan I	8	-	-	-	-	-	-
Dieldrin	16	-	-	-	110	-	-
4,4'-DDE	16	50 J	-	-	-	490	42
Endrin	16	-	-	-	-	-	-
Endosulfan II	16	-	-	-	-	-	-
4,4'-DDD	16	-	-	-	-	49	-
Endosulfan sulfate	16	-	-	-	-	-	-
4,4'-DDT	16	-	42 J	-	-	150	-
Methoxychlor	80	-	-	-	-	-	-
Endrin ketone	16	-	-	-	-	-	-
alpha-Chlordane	80	-	-	-	-	-	-
gamma-Chlordane	80	-	-	-	-	-	-
Toxaphene	160	-	-	-	-	-	-
Aroclor-1016	80	-	-	-	-	-	-
Aroclor-1221	80	-	-	-	-	-	-
Aroclor-1232	80	-	-	-	-	-	-
Aroclor-1242	80	-	-	-	-	-	-
Aroclor-1248	80	-	-	-	-	-	-
Aroclor-1254	160	-	-	-	-	-	-
Aroclor-1260	160	-	-	-	-	-	-
Dilution Factor:		1.0	1.0	1.0	1.0	1.0	1.0
Percent Solids:		81.4	84.4	73.8	62.4	73.5	68.3
Associated Method Blank:		PBLK5064L	PBLK5064L	PBLK5064L	PBLK5064L	PBLK5064M	PBLK5064L

TABLE 4 (continued)

PROJECT: Stewart | Miscellaneous Soil Analysis (ug/g) | 24-Aug-89

Table 4'
Summary Table

	SS-8	SS-8 (DUP)	SS-9	SS-10	SS-11	SS-12
SAMPLE LOCATION:	STSS008XXX01XX	STSS008XXX01XD	STSS009XXX01XX	STSS010XXX01XX	STSS011XXX01XX	STSS012XXX01XX
LAB NUMBER:	75932	75934	75933	75935	75936	75937
DATE SAMPLED:	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89	06/28/89
DATE EXTRACTED:	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89	06/30/89
DATE ANALYZED:	07/06/89	07/06/89	07/06/89	07/06/89	07/07/89	07/07/89
ANALYTE						
Dalapon	-	-	-	-	-	-
Dicamba	-	-	-	-	-	-
Dichloroprop	-	-	-	-	-	-
2,4-D	-	-	-	-	-	-
2,4,5-TP(SILVEX)	-	-	-	-	-	-
2,4,5-T	-	-	-	-	-	-
2,4-DB	-	-	-	-	-	-
Dilution Factor:	1	1	1	1	1	1
Percent Solids:	91.4	84.4	73.8	62.4	73.5	69.3
Associated Method Blank:	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063	RB5062 RB5063

ATTACHMENT A

- WEEKLY FIELD SUMMARY REPORT
- FIELD INSTRUMENT AND MATERIAL QUALITY ASSURANCE RECORD
- FIELD DATA RECORD SHEETS
- CHAIN-OF-CUSTODY RECORD
- ANALYSIS REQUEST FORM

JOB 5139-15

STEWART AIR NATIONAL GUARD BASE
WEEKLY FIELD SUMMARY REPORT

MONDAY

DATE: 6·26·89
WEATHER: 90°F
Sunny Humid
PERSONNEL ONSITE: Brad Schoonard
Mike Lounsbury

SITE ACTIVITIES: Traveled to site. Checked in with Lt. Col. Ohare and informed him of our sampling plans. Obtained a 24 hour pass.

TUESDAY

DATE: 6·27·89
WEATHER: 85°F
Hazy + Humid
PERSONNEL ONSITE: Brad Schoonard
Mike Lounsbury

SITE ACTIVITIES: Located and sampled monitoring wells. Collected all Groundwater QC samples. Completed documentation requirements and shipped samples.

WEDNESDAY

DATE: 6·28·89
WEATHER: 75°F
Occasional Showers
PERSONNEL ONSITE: Brad Schoonard
Mike Lounsbury

SITE ACTIVITIES: Located and sampled all Surface Soil locations. Obtained a complete round of water level measurements. Completed documentation requirements and Shipped samples.

THURSDAY

DATE:
WEATHER:
PERSONNEL ONSITE:

SITE ACTIVITIES:

FRIDAY

DATE:
WEATHER:
PERSONNEL ONSITE:

SITE ACTIVITIES:

E.C.JORDAN CO. ENGINEERS & SCIENTISTS

SAMPLE CREW ID # 1 GW

NAMES: B. Schoonard
M. Lounsbury

FIELD INSTRUMENTION & MATERIAL QUALITY ASSURANCE RECORD

PROJECT Stewart A.N.G. Newburgh N.Y.

JOB NUMBER 5139-15

DATE 6·27·89

FIELD INSTRUMENTATION CALIBRATION DATA

EQUIP. TYPE/I.D.	BATTERY CONDITION	CALIBRATION INFORMATION
YSI #3	OK	(PH 4 NA PH 7 NA PH 10 NA ISO — SLOPE —) Could Not Calibrate PH
Orion #3	BACK UP OK	PH 4 ✓ PH 7 ✓ PH 10 ___ ISO NA SLOPE 15
YSI #3	OK	COND STD. NA / — COND STD. NA / — COND. STD. LOT. NO. L088 12/89
Amber Science #3	BACK UP OK	COND STD. Dry / 22 COND STD. 200 / 200
DISSOLVED OXYGEN		
NA		AVG. WINKLER VALUE ___ PPM METER VALUE ___ PPM
REDOX		
NA		ZOBELL SOL. VALUE ___ METER VALUE ___
PHOTOIONIZATION METER		
Tip #7	OK	ZERO/ZERO AIR? ☐ YES ☑ NO SPAN GAS VALUE 100 PPM EQUIV. METER VALUE 100 PPM EQUIV.

BAILOR ID ☑ S.S. ID NO. 2" = #2 1" = #9
☐ TEFLON ID NO.
☐ OTHER ID NO.

PUMP ID ☑ KECK ID NO. BackPack
☐ ISCO ID NO.
☐ OTHER ID NO.

OTHER

OTHER

FLUIDS/MATERIALS RECORD

PH #4 Lot # 880901C
PH #7 Lot # 8809060

DEIONIZED WATER SOURCE: ☑ ECJ STAGING ☐ PORTABLE SYSTEM ☐ OTHER

TRIP BLANK WATER SOURCE: ☐ ECJ LAB, LOT NO. NA
☐ OTHER, TYPE NA ID

DECONTAMINATION FLUIDS: ☑ METHYL HYDRATE; LOT NO. C780708
☐ OTHER, TYPE NA ID

HNO3/DI RINSE SOLUTION: ☐ ECJ STAGING, LOT NO. NA

FILTRATION PAPER ID: (IN LINE) MANUF/TYPE NA LOT NO. /
(VACUUM) MANUF/TYPE NA LOT NO.

CHEMICALS USED: ☐ HNO3 LOT NO. NA ZNACC LOT NO. NA
☐ H2SO4 LOT NO. OTHER LOT NO.
☐ HCL LOT NO. OTHER LOT NO.
☐ NaOH LOT NO.

SAMPLER SIGNATURE Brad Schoonard / M.L.

01-19-89 B.S.

C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

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ROJECT: STEWART A.N.G. NEWBURGH N.Y.
JOB NUMBER: 5139-15
DATE: 6·27·89

AMPLE LOCATION ID: STGW101XXX01XX
LOCATION ACTIVITY START: 1400 END: 1430

ATER LEVEL / WELL DATA

ELL DEPTH: 36 +/-FT ☑ MEASURED ☐ HISTORICAL
HISTORICAL WELL DEPTH: 34 +/-FT
CASING STICK-UP (FROM GROUND): 2.4 +/- FT

ATER DEPTH: 4.51 FT
CASING/WELL DIFF.: -0.25 FT

EIGHT OF ATER COLUMN: 31 +/-FT

X ☑ .16 GAL/FT (2 IN.) ☐ .65 GAL/FT (4 IN.) ☐ 1.5 GAL/FT (6 IN.) ☐ ____GAL/FT (____IN.) = 5.0 GAL/VOL

8 TOTAL GAL PURGED

WELL DIA. ☑ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ________

ELL LOCKED?	WELL MATERIALS:	MEASURED FROM:	WATER LEVEL EQUIP. USED:	WELL INTEGRITY:	YES NO
☑ YES	☑ PVC	☑ TOP OF WELL	☑ ELECT.COND.PROBE	PROT. CASING SECURE	☑ ☐
☐ NO	☐ SS	☐ TOP OF CASING	☐ FLOAT ACTIVATED	CONCRETE COLLAR INTACT	☑ ☐
	☐ ______		☐ PRESS. TRANSDUCER	OTHER ______	

QUIPMENT DOCUMENTATION

URGING/SAMPLING EQUIP. USED: ✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT ID
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Keck
☐	☑	BAILER	2" #2
☑	☐	PVC/SILICON TUBING	
☐	☐	WATERRA HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	

31
x.16
186
31
4.96

DECONTAMINATION FLUIDS USED: (✓ ALL THAT APPLY AT LOCATION
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

IELD ANALYSIS DATA
AMBIENT AIR VOA ~~2.8~~ -3.5 PPM B.S.
WELL MOUTH ~~43~~ -3.5 PPM B.S.
FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 5 GAL	@ 8 GAL	@ ~~1.5~~ B.S. GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C	19.8	19.2			
pH, units	7.0	7.1			
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	508	837			

SAMPLE OBSERVATIONS:
☑ TURBID
☑ COLORED Rust
☐ CLOUDY
☐ CLEAR
☐ ODOR

AMPLE COLLECTION REQUIREMENTS
/ IF REQUIRED AT THIS LOCATION)

NALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓ HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	100 / 101	9039 33
✓ TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	102 / 103	9040143

OTES: MW-101

Purged dry at 1.5 volumes let recharge + Sampled.

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ____________

06-21-89 B.S.

SIGNATURE OF SAMPLER Brad Schoonard / M.L.

C E ENVIRONMENTAL

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E C JORDAN Engineers & Scientists

PROJECT: STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER: 5139-15
DATE: 6·27·89

SAMPLE LOCATION ID: STGWSW1XXX01XX
LOCATION ACTIVITY START: 1215 END: 1245

WATER LEVEL / WELL DATA

WELL DEPTH: 43 +/-FT
☑ MEASURED
☐ HISTORICAL
HISTORICAL WELL DEPTH: 52 +/-FT
CASING STICK-UP (FROM GROUND): 2.9 +/- FT

WATER DEPTH: 29.37 FT
CASING/WELL DIFF.: -0.65 FT

HEIGHT OF WATER COLUMN: 14 +/-FT

X
☑ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.) =
☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)

2.2 GAL/VOL
6 TOTAL GAL PURGED

WELL DIA.
☑ 2 INCH
☐ 4 INCH
☐ 6 INCH
☐ ________

WELL LOCKED?
☐ YES
☑ NO

WELL MATERIALS:
☑ PVC
☐ SS
☐ ________

MEASURED FROM:
☑ TOP OF WELL
☐ TOP OF CASING

WATER LEVEL EQUIP. USED:
☑ ELECT.COND.PROBE
☐ FLOAT ACTIVATED
☐ PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☐	☑
CONCRETE COLLAR INTACT	☐	☑
OTHER Uplifted + Broken up		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

2
14
16
.84
14
2.24

PURGING	SAMPLING	✓ IF USED FOR:	EQUIPMENT ID
☐	☐	PERISTALTIC PUMP	
* ☑	☐	SUBMERSIBLE PUMP	Keck
☐	☑	BAILER	245.5 1''
☑	☐	PVC/SILICON TUBING	
☑	☐	WATERRA HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED:
(✓ ALL THAT APPLY AT LOCATION
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________ ________

FIELD ANALYSIS DATA

AMBIENT AIR VOA: -2.8 PPM
WELL MOUTH: -1.0 PPM
FIELD DATA COLLECTED:
☐ IN-LINE
☑ IN CONTAINER

PURGE DATA	@ 2 GAL	@ 4 GAL	@ 6 GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C	15.6	18.8	18.7		
pH, units	8.2	7.7	7.7		
SPECIFIC CONDUCTIVITY (umnos/cm. @ 25 deg.c)	707	738	740		

SAMPLE OBSERVATIONS:
☑ TURBID
☑ COLORED Brown
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	104 / 105	9040143
☑ TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	106 / 107	9040143

NOTES: SW-1

* Bend in well at 3'. Unable to get pump past bend. Water level too low for peristaltic pump. Used waterra value and teflon tubing to purge well. Sample w/1" Bailer.

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ________________

06-21-89 B.S.

SIGNATURE OF SAMPLER Brad Schoonard / M.L

C E ENVIRONMENTAL

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E C JORDAN *Engineers & Scientists*

PROJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·27·89

SAMPLE LOCATION ID: STGWSW2XXX01XX

LOCATION ACTIVITY START: 1100 END: 1130

WATER LEVEL / WELL DATA

WELL DEPTH: 48 +/-FT

☑ MEASURED
☐ HISTORICAL

HISTORICAL WELL DEPTH: 48 +/-FT

CASING STICK-UP (FROM GROUND): 2.1 +/- FT

WATER DEPTH: 23.58 FT

CASING/WELL DIFF.: -0.37 FT

HEIGHT OF WATER COLUMN: 24 +/-FT

X
☑ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.) =
☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)

3.8 GAL/VOL

12 TOTAL GAL PURGED

WELL DIA.
☑ 2 INCH
☐ 4 INCH
☐ 6 INCH
☐ ________

WELL LOCKED?
☑ YES
☐ NO

WELL MATERIALS:
☐ PVC
☑ SS
☐ ________

MEASURED FROM:
☑ TOP OF WELL
☐ TOP OF CASING

WATER LEVEL EQUIP. USED:
☑ ELECT.COND.PROBE
☐ FLOAT ACTIVATED
☐ PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☐	☑
OTHER Cracked + Uplifted		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

3
24
x.16
144
24
3.84

PURGING	SAMPLING	✓ IF USED FOR:
☐	☐	PERISTALTIC PUMP
☑	☐	SUBMERSIBLE PUMP
☐	☑	BAILER
☑	☐	PVC/SILICON TUBING
☐	☐	WATERRA HAND PUMP
	☐	IN-LINE FILTER
	☐	PRESS/VAC FILTER

EQUIPMENT ID:
Keck
2" #2

DECONTAMINATION FLUIDS USED:
(✓ ALL THAT APPLY AT LOCATION
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

FIELD ANALYSIS DATA

AMBIENT AIR VOA: -2.8 PPM

WELL MOUTH: +43 PPM

FIELD DATA COLLECTED
☐ IN-LINE
☑ IN CONTAINER

PURGE DATA	@ 4 GAL	@ 8 GAL	@ 12 GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C	14.0	13.3	13.3		
pH, units	7.0	6.9	7.0		
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)	988	984	960		

SAMPLE OBSERVATIONS:
☑ TURBID
☑ COLORED Gray
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	108 / 109	9040143
☑ TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	110 / 111	9040143

NOTES: SW-2 Oily sheen on surface of purge water.

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ________

06-21-89 B.S.

SIGNATURE OF SAMPLER Brad Schoonard / M.L.

C E ENVIRONMENTAL

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E C JORDAN   Engineers & Scientists

ECT: STEWART A.N.G. NEWBURG N.Y.   JOB NUMBER: 5139-15   DATE: 6·27·89

LE LOCATION ID: STGWSW3XXX01XX   LOCATION ACTIVITY START: 0900 END: 1000

R LEVEL / WELL DATA

DEPTH: 50 +/-FT   ☑ MEASURED ☐ HISTORICAL   HISTORICAL WELL DEPTH: 48 +/-FT   CASING STICK-UP (FROM GROUND): 2.0 +/- FT

R DEPTH: 21.99 FT   CASING/WELL DIFF.: − 0.27 FT

HT OF R COLUMN: 28 +/-FT

X
☑ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.)
☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)
= 4.5 GAL/VOL
14 TOTAL GAL PURGED

WELL DIA.
☑ 2 INCH
☐ 4 INCH
☐ 6 INCH
☐ ________

LOCKED?
[✓ YES]
NO

WELL MATERIALS:
☐ PVC
☑ SS
☐ ________

MEASURED FROM:
☑ TOP OF WELL
☐ TOP OF CASING

WATER LEVEL EQUIP. USED:
☑ ELECT.COND.PROBE
☐ FLOAT ACTIVATED
☐ PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☑	☐
CONCRETE COLLAR INTACT	☑	☐
OTHER ________		

PMENT DOCUMENTATION

ING/SAMPLING EQUIP. USED:

28
x.16
168
28
4.48

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT ID
☐	☐	PERISTALTIC PUMP	
☑	☐	SUBMERSIBLE PUMP	Keck
☐	☑	BAILER	2" #2 S.S.
☑	☐	PVC/SILICON TUBING	
☐	☐	WATERRA HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED:
(✓ ALL THAT APPLY AT LOCATION
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

D ANALYSIS DATA   AMBIENT AIR VOA: − 0.7 PPM   WELL MOUTH: + 1.5 PPM   FIELD DATA COLLECTED ☐ IN-LINE ☑ IN CONTAINER

PURGE DATA	@ 4.5 GAL	@ 9 GAL	@ 13.5 GAL	@ ____ GAL	@ ____ GAL
MPERATURE, DEG C	13.6	13.6	15.0		
, units	8.0	7.2	7.2		
ECIFIC CONDUCTIVITY umnos/cm. @ 25 deg.c)	464	822	820		

SAMPLE OBSERVATIONS:
☐ TURBID
☐ COLORED
☑ CLOUDY Gray
☐ CLEAR
☑ ODOR septic

LE COLLECTION REQUIREMENTS
REQUIRED AT THIS LOCATION)

YTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
ERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	112 / 113	9040183
L PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	114 / 115	9040189

: SW-3   Bend in well at 40' - Pump would not go past this point. We Purged well dry (5 gal.) at 40'. Waited for Well to recharge + Purged again until third volume was obtained.

MS/MSD Herb. 135
MS/MSD Pest. 136
Lot #s the Same as above

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED   MS/MSD
DUPLICATE ID: STGWSW3XXX01XD

-21-89 B.S.

SIGNATURE OF SAMPLER: Brad Schoonmaker / M.L.

C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

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:T STEWART A.N.G. NEWBURG N.Y.	JOB NUMBER 5139-15	DATE 6·27·89	
: LOCATION ID STGW SW3XXX01XD	LOCATION ACTIVITY	START: ——	END: ——

LEVEL / WELL DATA

N/A

)EPTH +/-FT ☐ MEASURED ☐ HISTORICAL HISTORICAL WELL DEPTH +/-FT CASING STICK-UP (FROM GROUND) +/- FT

DEPTH FT CASING/WELL DIFF. FT

T OF COLUMN +/-FT

☐ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.) =
X ☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)

GAL/VOL

TOTAL GAL PURGED

WELL DIA. ☐ 2 INCH
☐ 4 INCH
☐ 6 INCH
☐ ________

LOCKED?
YES
NO

WELL MATERIALS:
☐ PVC
☐ SS
☐ ________

MEASURED FROM:
☐ TOP OF WELL
☐ TOP OF CASING

WATER LEVEL EQUIP. USED:
☐ ELECT.COND.PROBE
☐ FLOAT ACTIVATED
☐ PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☐	☐
CONCRETE COLLAR INTACT	☐	☐
OTHER ________		

MENT DOCUMENTATION

NG/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT ID
☐	☐	PERISTALTIC PUMP	________
☐	☐	SUBMERSIBLE PUMP	________
☐	☐	BAILER	________
☐	☐	PVC/SILICON TUBING	
☐	☐	WATERRA HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED:
(✓ ALL THAT APPLY AT LOCATION
☐ ETHYL ALCOHOL
☐ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

ANALYSIS
TA AMBIENT AIR VOA PPM WELL MOUTH PPM FIELD DATA COLLECTED ☐ IN-LINE
☐ IN CONTAINER

PURGE DATA	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL
PERATURE, DEG C					
units					
CIFIC CONDUCTIVITY					
hos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS:
☐ TURBID
☐ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

E COLLECTION REQUIREMENTS
REQUIRED AT THIS LOCATION)

TICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
PBICIDES SW 346-8150 CLP	4 DEG. C	2-1000 ml.	☑	116 / 117	9040183
PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	118 / 119	9040183

DUP-1 - Duplicate of SW-3

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ________

21-89 B.S.

SIGNATURE OF SAMPLER Brad Schoonard / M.L.

C E ENVIRONMENTAL

E C JORDAN Engineers & Scientists

PAGE 6 OF 23

PROJECT: STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER: 5139-15
DATE: 6·27·89

SAMPLE LOCATION ID: STFB001XXX01XX
LOCATION ACTIVITY START: 0915 END: 0930

WATER LEVEL / WELL DATA

WELL DEPTH: +/-FT ☐ MEASURED ☐ HISTORICAL
HISTORICAL WELL DEPTH: +/-FT
CASING STICK-UP (FROM GROUND): +/-FT

WATER DEPTH: FT
CASING/WELL DIFF.: FT

HEIGHT OF WATER COLUMN: +/-FT
X ☐ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.) =
☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)
GAL/VOL
TOTAL GAL PURGED

WELL DIA. ☐ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ________

WELL LOCKED? ☐ YES ☐ NO
WELL MATERIALS: ☐ PVC ☐ SS ☐ ________
MEASURED FROM: ☐ TOP OF WELL ☐ TOP OF CASING
WATER LEVEL EQUIP. USED: ☐ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER

WELL INTEGRITY:

	YES	NO
PROT. CASING SECURE	☐	☐
CONCRETE COLLAR INTACT	☐	☐
OTHER ________		

NA

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED: (✓ IF USED FOR:)

PURGING	SAMPLING		EQUIPMENT ID
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☐	☐	BAILER	
☐	☐	PVC/SILICON TUBING	
☐	☐	WATERRA HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED: (✓ ALL THAT APPLY AT LOCATION
☐ ETHYL ALCOHOL
☐ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

FIELD ANALYSIS DATA
AMBIENT AIR VOA: PPM
WELL MOUTH: PPM
FIELD DATA COLLECTED ☐ IN-LINE ☐ IN CONTAINER

PURGE DATA	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS:
☐ TURBID
☐ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	120 / 121	9040183
☑ TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	122 / 123	9040143

NOTES: Field Blank - 1 (DI Water) Water for field blank was obtained from CE-E Staging. Transported + Sampled from Monitoring Dept. 5 gal. Black Jugs.

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ________

06-21-89 B.S.

SIGNATURE OF SAMPLER Brad Schoonard / M.L.

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

PROJECT: STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER: 5139-15
DATE:

SAMPLE LOCATION ID: STFB002XXX01XX
LOCATION ACTIVITY: START: END:

NO SAMPLE

WATER LEVEL / WELL DATA

WELL DEPTH +/-FT
[ ] MEASURED
[ ] HISTORICAL
HISTORICAL WELL DEPTH +/-FT
CASING STICK-UP (FROM GROUND) +/- FT

WATER DEPTH FT
CASING/WELL DIFF. FT

HEIGHT OF WATER COLUMN +/-FT
X
[ ] .16 GAL/FT (2 IN.)
[ ] .65 GAL/FT (4 IN.) =
[ ] 1.5 GAL/FT (6 IN.)
[ ] ____GAL/FT (____IN.)
GAL/VOL
TOTAL GAL PURGED

WELL DIA.
[ ] 2 INCH
[ ] 4 INCH
[ ] 6 INCH
[ ] ____________

WELL LOCKED?
[ ] YES
[ ] NO

WELL MATERIALS:
[ ] PVC
[ ] SS
[ ] ____________

MEASURED FROM:
[ ] TOP OF WELL
[ ] TOP OF CASING

WATER LEVEL EQUIP. USED:
[ ] ELECT.COND.PROBE
[ ] FLOAT ACTIVATED
[ ] PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	[ ]	[ ]
CONCRETE COLLAR INTACT	[ ]	[ ]
OTHER ____________		

EQUIPMENT DOCUMENTATION

PURGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT ID
[ ]	[ ]	PERISTALTIC PUMP	
[ ]	[ ]	SUBMERSIBLE PUMP	
[ ]	[ ]	BAILER	
[ ]	[ ]	PVC/SILICON TUBING	
[ ]	[ ]	WATERRA HAND PUMP	
	[ ]	IN-LINE FILTER	
	[ ]	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED:
(✓ ALL THAT APPLY AT LOCATION
[ ] ETHYL ALCOHOL
[ ] DEIONIZED WATER
[ ] TSP SOLUTION
[ ] HNO3/D.I.WATER SOLUTION
[ ] POTABLE WATER
[ ] ____________

FIELD ANALYSIS DATA

AMBIENT AIR VOA PPM
WELL MOUTH PPM
FIELD DATA COLLECTED [ ]IN-LINE [ ]IN CONTAINER

PURGE DATA	@ ____GAL	@ ____GAL	@ ____GAL	@ ____GAL	@ ____GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS:
[ ] TURBID
[ ] COLORED
[ ] CLOUDY
[ ] CLEAR
[ ] ODOR

SAMPLE COLLECTION REQUIREMENTS
(✓ IF REQUIRED AT THIS LOCATION)

ANALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
[✓] HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	[ ]	/	
[✓] TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	[ ]	/	

NOTES: Field Blank -2 (Methyl Hydrate)

QC Sample NoT Needed

FIELD QC DATA: [ ] FIELD DUPLICATE COLLECTED

DUPLICATE ID ____________

06-21-89 B.S.

SIGNATURE OF SAMPLER ____________

C E ENVIRONMENTAL

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E C JORDAN Engineers & Scientists

OJECT: STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER: 5139-15
DATE: 6·27·89

MPLE LOCATION ID: STBS001XXX01XX
LOCATION ACTIVITY START: 1530 END: 1545

TER LEVEL / WELL DATA

LL DEPTH: +/-FT
☐ MEASURED
☐ HISTORICAL
HISTORICAL WELL DEPTH: +/-FT
CASING STICK-UP (FROM GROUND): +/- FT

NA

TER DEPTH: FT
CASING/WELL DIFF.: FT

IGHT OF TER COLUMN: +/-FT

☐ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.) =
X ☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)

GAL/VOL
TOTAL GAL PURGED

WELL DIA. ☐ 2 INCH ☐ 4 INCH ☐ 6 INCH ☐ ________

LL LOCKED? ☐ YES ☐ NO

WELL MATERIALS: ☐ PVC ☐ SS ☐ ________

MEASURED FROM: ☐ TOP OF WELL ☐ TOP OF CASING

WATER LEVEL EQUIP. USED: ☐ ELECT.COND.PROBE ☐ FLOAT ACTIVATED ☐ PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☐	☐
CONCRETE COLLAR INTACT	☐	☐
OTHER ________		

UIPMENT DOCUMENTATION

RGING/SAMPLING EQUIP. USED:

✓ IF USED FOR: PURGING	SAMPLING		EQUIPMENT ID
☐	☐	PERISTALTIC PUMP	
☐	☐	SUBMERSIBLE PUMP	
☐	☑	BAILER	2" #2
☐	☐	PVC/SILICON TUBING	
☐	☐	WATERRA HAND PUMP	
	☐	IN-LINE FILTER	
	☐	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED: (✓ ALL THAT APPLY AT LOCATION)
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

ELD ANALYSIS DATA
AMBIENT AIR VOA: PPM
WELL MOUTH: PPM
FIELD DATA COLLECTED ☐ IN-LINE ☐ IN CONTAINER

NA

PURGE DATA	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umhos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS: ☐ TURBID ☐ COLORED ☐ CLOUDY ☐ CLEAR ☐ ODOR

IMPLE COLLECTION REQUIREMENTS
IF REQUIRED AT THIS LOCATION)

IALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓ HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	124 / 135	9039333
✓ TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	126 / 127	9039333

ES: SB-1 (GW)

Made up with Blank Water from CE-E Staging facility.

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ________

06-21-89 B.S.

SIGNATURE OF SAMPLER Brad Schmand / M.L.

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

DJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·28·89

MPLE LOCATION ID: STSS001XXX01XX

LOCATION ACTIVITY START: 0930 END: 0945

RFACE SOIL INFORMATION

EPTH OF SAMPLE FROM SUFACE: 0" to 2" INCHES

EQUIPMENT USED FOR COLLECTION:
- [✓] S.S. HAND SPOON
- [✓] ALUMINUM PANS
- [ ] OTHER

DECONTAMINATION FLUIDS:
- [✓] ETHYL ALCOHOL
- [✓] DEIONIZED WATER
- [ ] TSP SOLUTION
- [ ] OTHER

YPE OF SAMPLE COLLECTED:
- ✓ DISCRETE
-] COMPOSIT

O. OF DISCRETE SAMPLES OR COMPOSIT

SOIL TYPE:
- [ ] CLAY
- [ ] SAND
- [✓] ORGANIC
- [✓] SILT
- [✓] GRAVEL

SAMPLE OBSERVATIONS: 1/2" Layer of Algae and organic mater over silt + Gravel - No real evidence of deposition

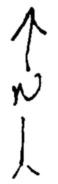
IELD QC DATA: [ ] FIELD DUPLICATE COLLECTED

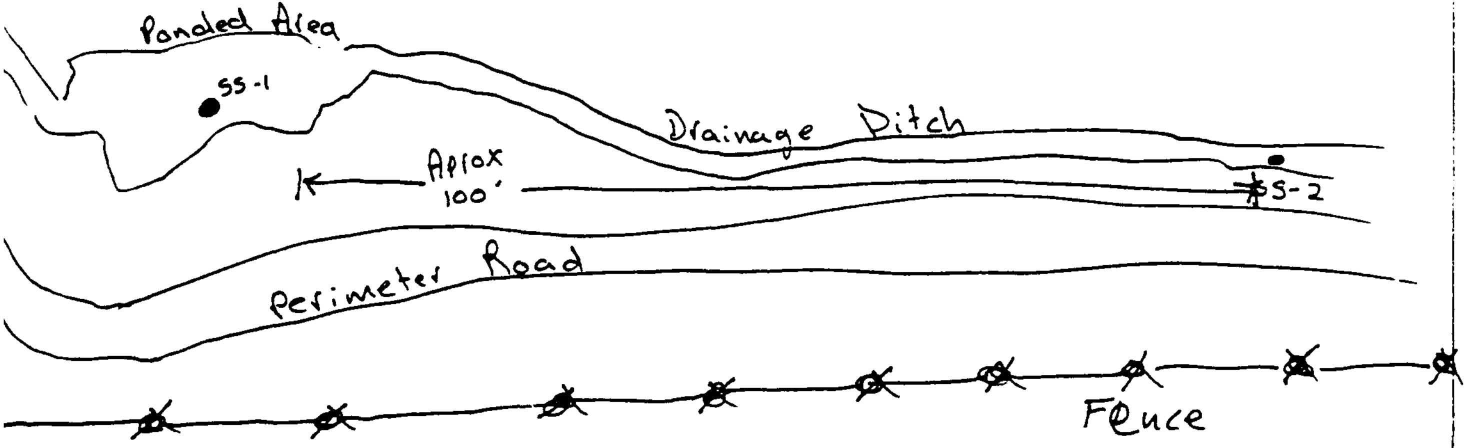
OP. ID NA

SAMPLE LOCATION SKETCH BELOW ? [✓] YES [ ] NO

MPLES COLLECTED (IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	[✓]	137/138	G8127333
✓ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	[✓]	139/140	G8127333

OTES/SKETCH SS-1 - No visible Flow - No Areas of deposition.





06-21-89 B.S.

SAMPLER SIGNATURE Brad Schoonard / M.L.

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

OJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·28·89

MPLE LOCATION ID: STSS002XXX01XX

LOCATION ACTIVITY: START: 0945 END: 1000

RFACE SOIL INFORMATION

EPTH OF SAMPLE FROM SUFACE: 0" to 1" INCHES

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☒ OTHER

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

YPE OF SAMPLE COLLECTED:
] DISCRETE
✓ COMPOSIT
O. OF DISCRETE SAMPLES OR COMPOSIT 2

SOIL TYPE:
☑ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☑ GRAVEL

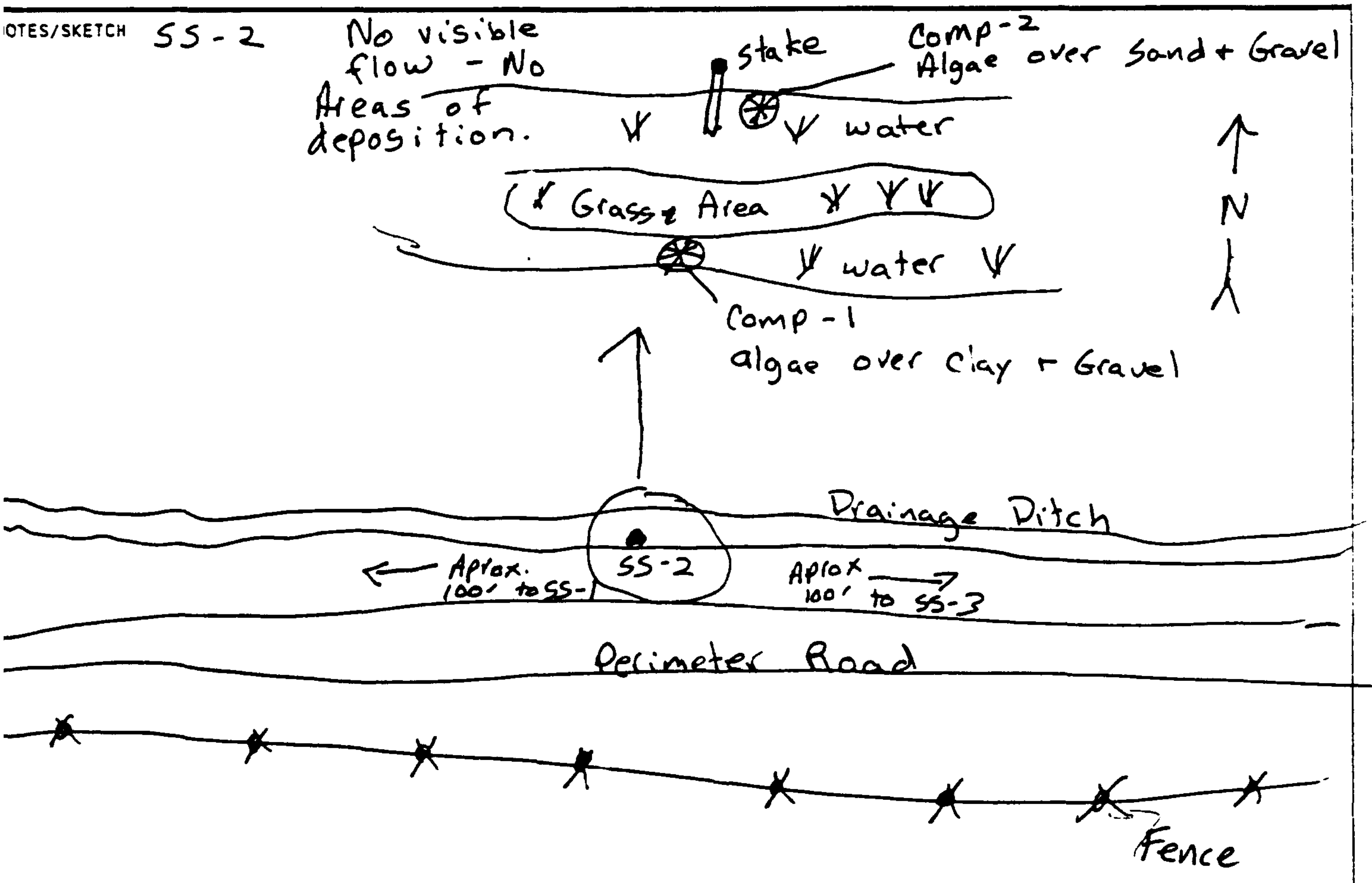
SAMPLE OBSERVATIONS: See Below

IELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
OP. ID N/A

SAMPLE LOCATION SKETCH BELOW ?
☑ YES
☐ NO

MPLES COLLECTED (IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	141 / 142	G8127333
✓ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	143 / 144	G8127333

IOTES/SKETCH SS-2



06-21-89 B.S.

SAMPLER SIGNATURE Bud Schrand / M.L.

C E ENVIRONMENTAL

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E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

ROJECT: STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER: 5139-15
DATE: 6·28·89

AMPLE LOCATION ID: STSS003XXX01XX
LOCATION ACTIVITY START: 1000 END: 1015

JRFACE SOIL INFORMATION

DEPTH OF SAMPLE FROM SUFACE: 0 to 1 INCHES

TYPE OF SAMPLE COLLECTED:
☐ DISCRETE
☑ COMPOSIT
NO. OF DISCRETE SAMPLES FOR COMPOSIT: 5 - From 2' Circle Around Stake

SOIL TYPE:
☐ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☑ GRAVEL

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
DOP. ID

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

SAMPLE OBSERVATIONS: Sand + Silt layer over Gravel.

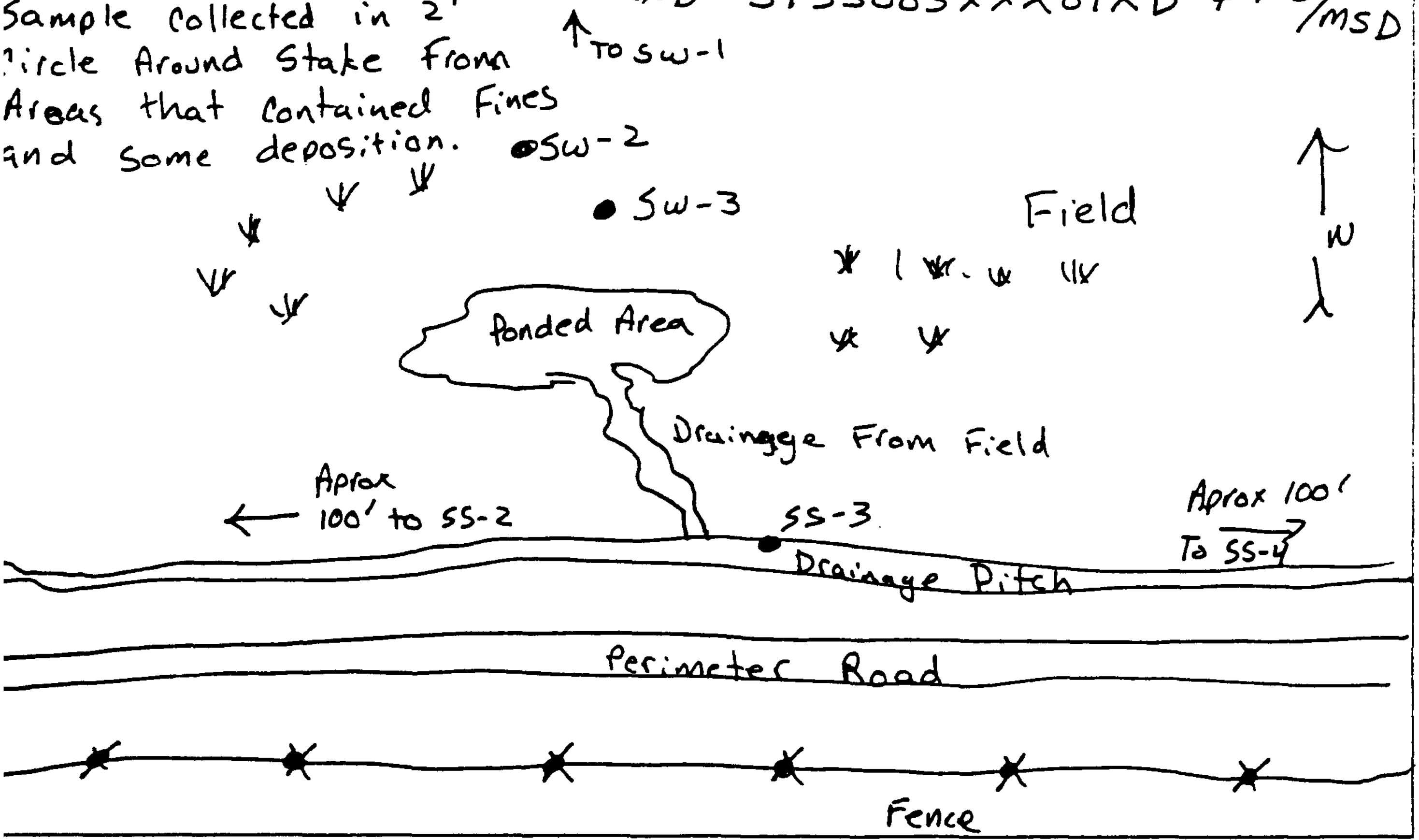
SAMPLE LOCATION SKETCH BELOW ?
☑ YES
☐ NO

AMPLES COLLECTED (✓ IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	145 / 146	G8127333
✓ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	147 / 148	G8127333

NOTES/SKETCH SS-3

Very Slow Flow
Sample collected in 2'
ircle Around Stake From
Areas that contained Fines
and some deposition.

Dup #2 Taken at this location
ID STSS003XXX01XD + MS/MSD



06-21-89 B.S.

SAMPLER SIGNATURE Brad Schoonord / M.L.

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

JECT STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER 5139-15

DATE 6·28·89

MPLE LOCATION ID STSS003XXX01XD

LOCATION ACTIVITY START: —— END: ——

RFACE SOIL INFORMATION

EPTH OF SAMPLE FROM SUFACE: INCHES

YPE OF SAMPLE COLLECTED:
] DISCRETE
] COMPOSIT
O. OF DISCRETE SAMPLES
OR COMPOSIT

SOIL TYPE:
☐ CLAY
☐ SAND
☐ ORGANIC
☐ SILT
☐ GRAVEL

NA

IELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
OP. ID

EQUIPMENT USED FOR COLLECTION:
☐ S.S. HAND SPOON
☐ ALUMINUM PANS
☐ OTHER

DECONTAMINATION FLUIDS:
☐ ETHYL ALCOHOL
☐ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

SAMPLE OBSERVATIONS:

SAMPLE LOCATION SKETCH BELOW ? ☐ YES ☐ NO

MPLES COLLECTED IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	149/150	*
✓TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	151/152	*

OTES/SKETCH DUP-2

* Series 200 Bottles were used for the duplicate portion of SS-3
Series 200 Lot # 221-0125

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

CT STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER 5139-15

DATE 6·28·89

E LOCATION ID STSS004XXX01XX

LOCATION ACTIVITY START: 1030 END: 1045

CE SOIL INFORMATION

H OF SAMPLE FROM SUFACE: 0" to 1" INCHES

OF SAMPLE COLLECTED:
DISCRETE
COMPOSIT
OF DISCRETE SAMPLES
COMPOSIT 4 from areas Around Stake

SOIL TYPE:
☐ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☑ GRAVEL

D QC DATA: ☐ FIELD DUPLICATE COLLECTED
ID

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

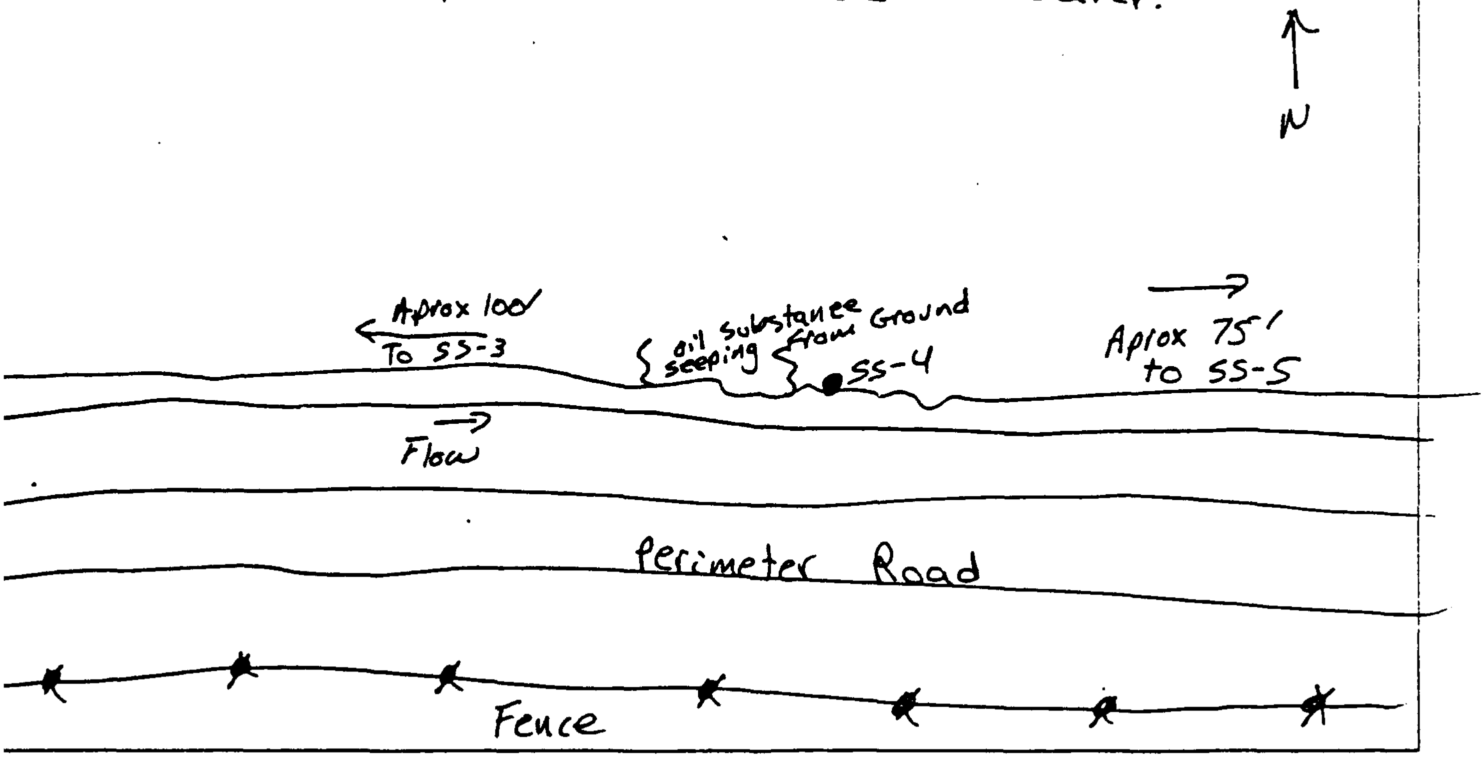
SAMPLE OBSERVATIONS: Sand + Silt + Gravel

SAMPLE LOCATION SKETCH BELOW ? ☑ YES ☐ NO

ES COLLECTED REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
ERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	153 / 154	8278273
CL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	155 / 156	8278273

S/SKETCH SS-4

low Flow - Sample Collected from obvious areas of deposition. Oil like substance seeping from ground near sample lotation Oily sheen on surface of water.



1-89 B.S.

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C E ENVIRONMENTAL

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E C JORDAN Engineers & Scientists

FIELD DATA RECORD - SURFACE SOIL

T STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER 5139-15

DATE 6·28·89

LOCATION ID STSS005XXX01XX

LOCATION ACTIVITY START: 1045 END: 1100

E SOIL INFORMATION

OF SAMPLE FROM SUFACE: 0 to 1 INCHES

OF SAMPLE COLLECTED:
ISCRETE
OMPOSIT
F DISCRETE SAMPLES
OMPOSIT 6

SOIL TYPE:
[ ] CLAY
[✓] SAND
[ ] ORGANIC
[✓] SILT
[✓] GRAVEL

QC DATA: [ ] FIELD DUPLICATE COLLECTED
ID n/A

EQUIPMENT USED FOR COLLECTION:
[✓] S.S. HAND SPOON
[✓] ALUMINUM PANS
[ ] OTHER

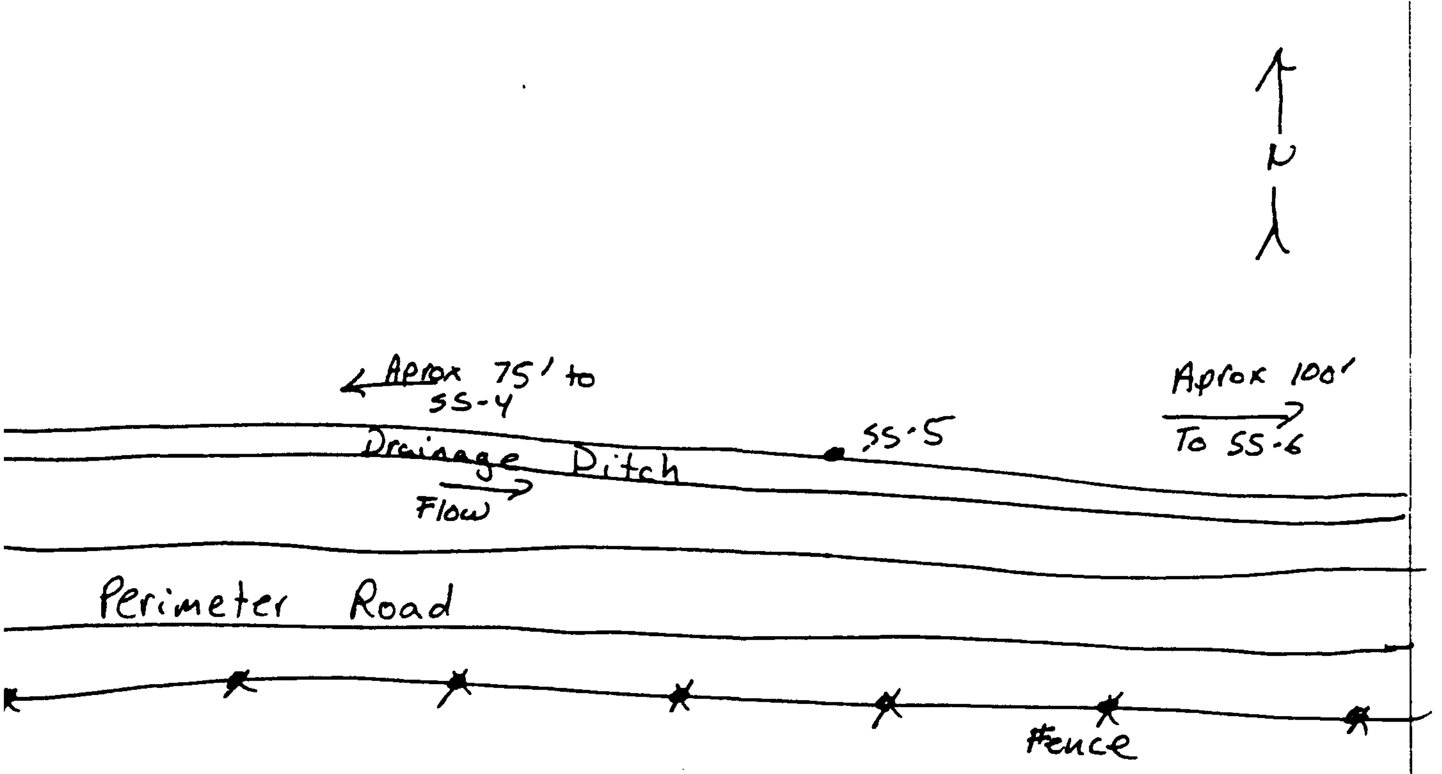
DECONTAMINATION FLUIDS:
[✓] ETHYL ALCOHOL
[✓] DEIONIZED WATER
[ ] TSP SOLUTION
[ ] OTHER

SAMPLE OBSERVATIONS: Mostly Sand w/ Some silt + Gravel. Collected in 3' Circle around Stake. Areas of deposition

SAMPLE LOCATION SKETCH BELOW ?
[✓] YES
[ ] NO

S COLLECTED REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
RBICIDES SW 846-8150 CLP	SOIL	2-4oz.	[✓]	157 / 158	8278273
L PEST./PCB CLP-COP	SOIL	2-4oz.	[✓]	159 / 160	8278273

/SKETCH SS-5 & [illegible] moderate Flow - Sample Collected from areas of deposition around Stake.



1-89 B.S.

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER 5139-15

DATE 6·28·89

LOCATION ID STSS006XXX01XX

LOCATION ACTIVITY START: 1100 END: 1115

SOIL INFORMATION

OF SAMPLE FROM SUFACE: 0 to 1' INCHES

F SAMPLE COLLECTED:
SCRETE
MPOSIT
DISCRETE SAMPLES
MPOSIT________

SOIL TYPE:
☐ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

QC DATA: ☐ FIELD DUPLICATE COLLECTED
ID________

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER________

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER________

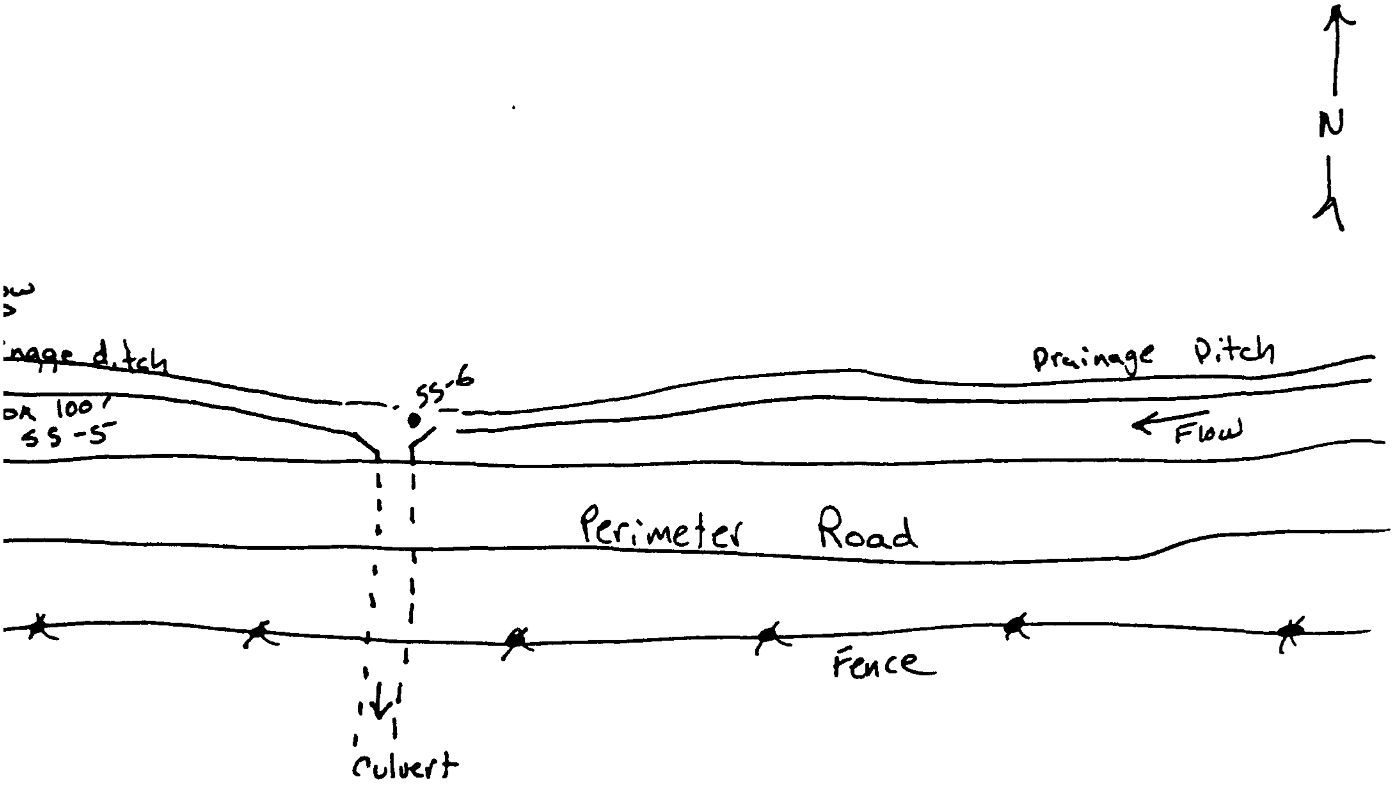
SAMPLE OBSERVATIONS: Fine Sands + Silt. No gravel in sample. Consists of deposition fines only

SAMPLE LOCATION SKETCH BELOW ?
☑ YES
☐ NO

S COLLECTED REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
RBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	161 / 162	8278273
PEST./PCB CLP-COP	SOIL	2-4oz.	☑	163 / 164	8278273

/SKETCH SS-6

Sample collected from area of deposition at entrance of culvert. Moderate flow



-89 B.S.

SAMPLER SIGNATURE Brad Schoonard / M.L.

C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

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FIELD DATA RECORD - SURFACE SOIL

IECT STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER 5139-15
DATE 6·28·89

'LE LOCATION ID STSS007XXX01XX
LOCATION ACTIVITY START: 1200 END: 1215

'ACE SOIL INFORMATION

'TH OF SAMPLE FROM SUFACE: 0 to 2 INCHES

'E OF SAMPLE COLLECTED:
☑ DISCRETE
COMPOSIT
. OF DISCRETE SAMPLES
COMPOSIT

SOIL TYPE:
☐ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

ELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
'. ID NA

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER

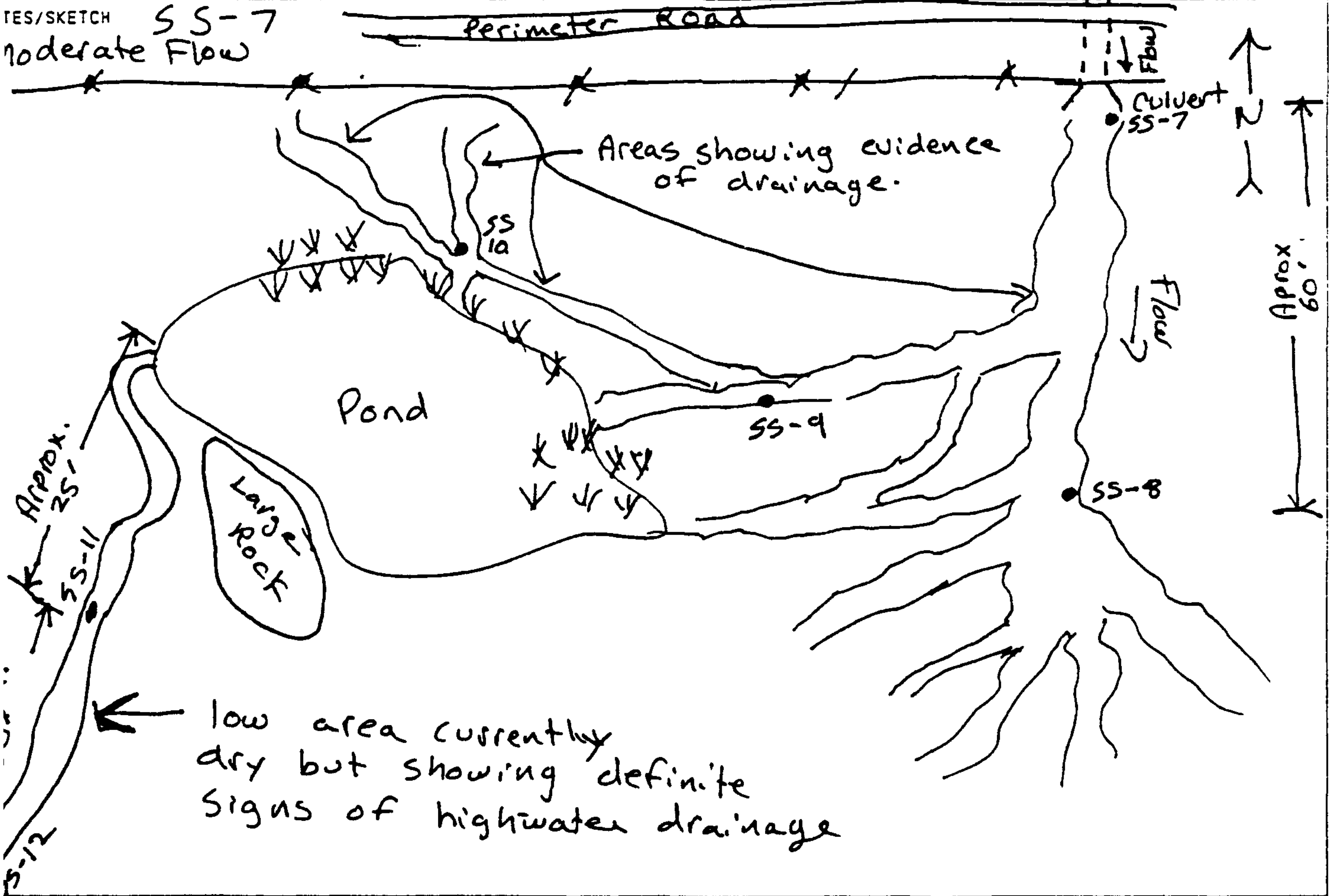
DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

SAMPLE OBSERVATIONS: Sample consisted of fine sand and silt deposition only.

SAMPLE LOCATION SKETCH BELOW ? ☑ YES ☐ NO

'LES COLLECTED (F REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
'HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	165 / 166	10298733
'TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	167 / 168	10298733

TES/SKETCH SS-7
noderate Flow



Areas showing evidence of drainage.

low area currently dry but showing definite signs of highwater drainage

-21-89 B.S.

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C E ENVIRONMENTAL

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E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

CT STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER 5139-15

DATE 6·28·89

E LOCATION ID STSS008XXX01XX

LOCATION ACTIVITY START: ~~1215~~ 1212 END: 1230

CE SOIL INFORMATION

H OF SAMPLE FROM SUFACE: 0 to 1" INCHES

OF SAMPLE COLLECTED:
DISCRETE
COMPOSIT
OF DISCRETE SAMPLES
COMPOSIT

SOIL TYPE:
☐ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

D QC DATA: ☑ FIELD DUPLICATE COLLECTED
ID STSS008XXX01XD

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

SAMPLE OBSERVATIONS: Sand and Silt depositions.

SAMPLE LOCATION SKETCH BELOW ?
☐ YES
☑ NO

ES COLLECTED (REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
ERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☐	169 / 170	10298733
CL PEST./PCB CLP-COP	SOIL	2-4oz.	☐	171 / 172	

S/SKETCH SS-8

Moderate Flow

DUP-3 was taken at this location ID-STSS008XXX01XD

For Sketch see SS-7.

10298723 / 08198714

Label # 171

Label # 172

1-89 B.S.

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C E ENVIRONMENTAL

E C JORDAN Engineers & Scientists

FIELD DATA RECORD - SURFACE SOIL

PROJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·28·89

SAMPLE LOCATION ID: STSS008XXX01XD

LOCATION ACTIVITY: START: — END: —

SURFACE SOIL INFORMATION

DEPTH OF SAMPLE FROM SUFACE: ______ INCHES

TYPE OF SAMPLE COLLECTED:
☐ DISCRETE
☐ COMPOSIT
NO. OF DISCRETE SAMPLES FOR COMPOSIT ______

SOIL TYPE:
☐ CLAY
☐ SAND
☐ ORGANIC
☐ SILT
☐ GRAVEL

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
DOP. ID ______

EQUIPMENT USED FOR COLLECTION:
☐ S.S. HAND SPOON
☐ ALUMINUM PANS
☐ OTHER ______

DECONTAMINATION FLUIDS:
☐ ETHYL ALCOHOL
☐ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER ______

SAMPLE OBSERVATIONS: ______

SAMPLE LOCATION SKETCH BELOW ? ☐ YES ☐ NO

SAMPLES COLLECTED (√ IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	√ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☐ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☐	173 / 174	*
☐ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☐	175 / 176	*

NOTES/SKETCH DUP-3

* Bottles used for duplicate sample were series 200.
Series 200 Lot # 221-0125

SAMPLER SIGNATURE Brad Schoonard / M. L

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

PROJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·28·89

SAMPLE LOCATION ID: STSS009XXX01XX

LOCATION ACTIVITY: START: 1230 END: 1245

SURFACE SOIL INFORMATION

DEPTH OF SAMPLE FROM SUFACE: 0 to 1 INCHES

TYPE OF SAMPLE COLLECTED:
☐ DISCRETE
☑ COMPOSIT
NO. OF DISCRETE SAMPLES FOR COMPOSIT 3

SOIL TYPE:
☑ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
DOP. ID NA

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

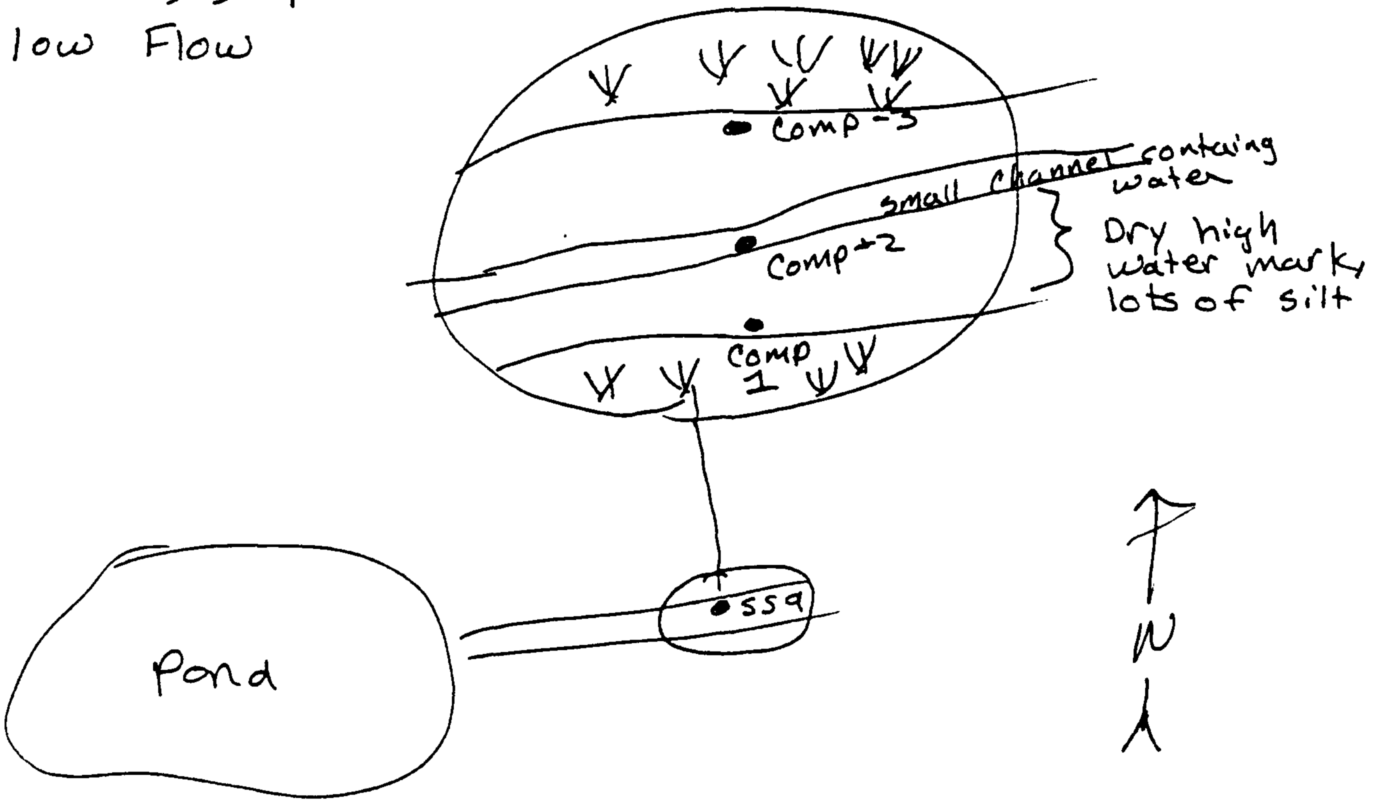
SAMPLE OBSERVATIONS: Mostly silt and Fine Sand w/some clay

SAMPLE LOCATION SKETCH BELOW ?
☑ YES
☐ NO

SAMPLES COLLECTED (✓ IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	177 / 178	8029123
☑ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	179 / 180	8029123

NOTES/SKETCH SS-9

low Flow



06-21-89 B.S.

SAMPLER SIGNATURE Brad Schoonard

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

PROJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·28·89

SAMPLE LOCATION ID: STSS010XXX01XX

LOCATION ACTIVITY START: 1245 END: 1300

SURFACE SOIL INFORMATION

DEPTH OF SAMPLE FROM SUFACE: 0 to 1 INCHES

TYPE OF SAMPLE COLLECTED:
☑ DISCRETE
☐ COMPOSIT
NO. OF DISCRETE SAMPLES FOR COMPOSIT ______

SOIL TYPE:
☑ CLAY
☑ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
DOP. ID NA

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER ______

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER ______

SAMPLE OBSERVATIONS: Mostly silt and Fine Sand w/ Some Clay.

SAMPLE LOCATION SKETCH BELOW ? ☐ YES ☑ NO

SAMPLES COLLECTED (✓ IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☐	181 / 182	8029123
☑ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☐	183 / 184	8029123

NOTES/SKETCH SS-10 low Flow

For sketch see SS-7

06-21-89 B.S.

SAMPLER SIGNATURE Brad Schonauf / M.L.

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C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

ROJECT: STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER: 5139-15
DATE: 6·28·89

AMPLE LOCATION ID: STSS011XXX01XX
LOCATION ACTIVITY START: 1300 END: 1315

URFACE SOIL INFORMATION

DEPTH OF SAMPLE FROM SUFACE: 0 to 2 INCHES

TYPE OF SAMPLE COLLECTED:
☑ DISCRETE
☐ COMPOSIT
NO. OF DISCRETE SAMPLES FOR COMPOSIT ____

SOIL TYPE:
☑ CLAY
☐ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER ____

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER ____

SAMPLE OBSERVATIONS: Some Silt/mostly Clay

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
DOP. ID ____

SAMPLE LOCATION SKETCH BELOW ? ☐ YES ☑ NO

AMPLES COLLECTED (✓ IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	185 / 186	8029123
☑ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	187 / 188	8029123

NOTES/SKETCH SS-11 NO Flow - location Dry

For sketch See SS-7

06-21-89 B.S.

SAMPLER SIGNATURE Brad Schoonord /M.L.

C E ENVIRONMENTAL

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E C JORDAN *Engineers & Scientists*

FIELD DATA RECORD - SURFACE SOIL

PROJECT: STEWART A.N.G. NEWBURG N.Y.

JOB NUMBER: 5139-15

DATE: 6·28·89

SAMPLE LOCATION ID: STSS012XXX01XX

LOCATION ACTIVITY START: 1315 END: 1330

SURFACE SOIL INFORMATION

DEPTH OF SAMPLE FROM SUFACE: 0 to 2 INCHES

TYPE OF SAMPLE COLLECTED:
☑ DISCRETE
☐ COMPOSIT
NO. OF DISCRETE SAMPLES FOR COMPOSIT

SOIL TYPE:
☑ CLAY
☐ SAND
☐ ORGANIC
☑ SILT
☐ GRAVEL

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED
DOP. ID: NA

EQUIPMENT USED FOR COLLECTION:
☑ S.S. HAND SPOON
☑ ALUMINUM PANS
☐ OTHER

DECONTAMINATION FLUIDS:
☑ ETHYL ALCOHOL
☑ DEIONIZED WATER
☐ TSP SOLUTION
☐ OTHER

SAMPLE OBSERVATIONS: Some Silt / mosty Clay

SAMPLE LOCATION SKETCH BELOW ? ☐ YES ☑ NO

SAMPLES COLLECTED (✓ IF REQUIRED AT THIS LOCATION)	MATRIX	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
☑ HERBICIDES SW 846-8150 CLP	SOIL	2-4oz.	☑	189 / 190	*
☑ TCL PEST./PCB CLP-COP	SOIL	2-4oz.	☑	191 / 192	*

NOTES/SKETCH SS-12 No Flow location dry

Series 200 Lot #
221-0125

For Sketch See SS-7

06-21-89 B.S.

SAMPLER SIGNATURE Bud Schoonard / M.L.

C E ENVIRONMENTAL

E C JORDAN *Engineers & Scientists*

PAGE 23 OF 23

ROJECT STEWART A.N.G. NEWBURG N.Y.
JOB NUMBER 5139-15
DATE 6·28·89

ac
AMPLE LOCATION ID STBS002XXX01XX
LOCATION ACTIVITY START: 1500 END: 1515

ATER LEVEL / WELL DATA

ELL DEPTH +/-FT
☐ MEASURED
☐ HISTORICAL
HISTORICAL WELL DEPTH +/-FT
CASING STICK-UP (FROM GROUND) +/-FT

ATER DEPTH FT
CASING/WELL DIFF. FT

EIGHT OF ATER COLUMN +/-FT

☐ .16 GAL/FT (2 IN.)
☐ .65 GAL/FT (4 IN.) =
X ☐ 1.5 GAL/FT (6 IN.)
☐ ____GAL/FT (____IN.)
GAL/VOL
TOTAL GAL PURGED

WELL DIA. ☐ 2 INCH
☐ 4 INCH
☐ 6 INCH
☐ ________

ELL LOCKED?
☐ YES
☐ NO

WELL MATERIALS:
☐ PVC
☐ SS
☐ ________

MEASURED FROM:
☐ TOP OF WELL
☐ TOP OF CASING

WATER LEVEL EQUIP. USED:
☐ ELECT.COND.PROBE
☐ FLOAT ACTIVATED
☐ PRESS. TRANSDUCER

WELL INTEGRITY:	YES	NO
PROT. CASING SECURE	☐	☐
CONCRETE COLLAR INTACT	☐	☐
OTHER ________		

NA

QUIPMENT DOCUMENTATION

URGING/SAMPLING EQUIP. USED: ✓ IF USED FOR:	PURGING	SAMPLING		EQUIPMENT ID
	☐	☐	PERISTALTIC PUMP	________
	☐	☐	SUBMERSIBLE PUMP	________
	☐	☐	BAILER	________
	☐	☐	PVC/SILICON TUBING	
	☐	☐	WATERRA HAND PUMP	
		☐	IN-LINE FILTER	
		☐	PRESS/VAC FILTER	

DECONTAMINATION FLUIDS USED:
(✓ ALL THAT APPLY AT LOCATION
☐ ETHYL ALCOHOL
☐ DEIONIZED WATER
☐ TSP SOLUTION
☐ HNO3/D.I.WATER SOLUTION
☐ POTABLE WATER
☐ ________

IELD ANALYSIS DATA
AMBIENT AIR VOA PPM
WELL MOUTH PPM
FIELD DATA COLLECTED ☐ IN-LINE
☐ IN CONTAINER

PURGE DATA	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL	@ ____ GAL
TEMPERATURE, DEG C					
pH, units					
SPECIFIC CONDUCTIVITY (umnos/cm. @ 25 deg.c)					

SAMPLE OBSERVATIONS:
☐ TURBID
☐ COLORED
☐ CLOUDY
☐ CLEAR
☐ ODOR

AMPLE COLLECTION REQUIREMENTS
IF REQUIRED AT THIS LOCATION)

NALYTICAL PARAMETER	PRESERVATION METHOD	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE ID'S	BOTTLE LOT NO.
✓ HERBICIDES SW 846-8150 CLP	4 DEG. C	2-1000 ml.	☑	132 / 133	9039333
✓ TCL PEST./PCB CLP-COP	4 DEG. C	2-1000 ml.	☑	134 / 135	9039333

TES: SB-2 (S.S.)

Ran DI water over Aluminum foil and S.S. Spoon into bottles - No blank water was available

FIELD QC DATA: ☐ FIELD DUPLICATE COLLECTED

DUPLICATE ID ________

06-21-89 B.S.

SIGNATURE OF SAMPLER Brad Schsenord / M.L.

CHAIN OF CUSTODY RECORD

PROJECT NO. 5139-15

PROJECT NAME Stewart A.N.G. Newburgh

SAMPLERS (SIGNATURE) Brad Schoonard

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	SAMPLE TYPE											REMARKS INDICATE SOIL/WATER/AIR SEDIMENT/SLUDGE
							1 liter A.G.											
1	6·27	1430		X	STGW101XXX01XX	4	4											Water
2	6·27	1245		X	STGWSW1XXX01XX	4	4											"
3	6·27	1130		X	STGWSW2XXX01XX	4	4											"
4	6·27	1000		X	STGWSW3XXX01XX	6	6	MS/MSD										"
5	6·27	—		X	STGWSW3XXX01XD	4	4											"
6	6·27	0930		X	STFB001XXX01XX	4	4											"
8	6·27	1545		X	STBS001XXX01XX	4	4											"

RELINQUISHED BY: (SIGNATURE) Brad Schoonard	DATE/TIME 6·27·89	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED FOR DISPOSAL BY: (SIGNATURE)	DATE/TIME	REMARKS Versar Inc. 3 coolers Shipped Airbill # 2218119260 Custody Seal #'s 100-105	

E.C.JORDAN CO.

PAGE 1 OF 1

CHAIN OF CUSTODY RECORD

PROJECT NO. 5139-15

PROJECT NAME Stewart A.N.G. Newburgh

SAMPLERS (SIGNATURE) Bud Schoonard

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	SAMPLE TYPE 4 oz. Jar		1 liter A.G.	REMARKS INDICATE SOIL/WATER/AIR SEDIMENT/SLUDGE
9	6·28	0945		X	STSS001XXX01XX	4	4			Sediment
10	6·28	1000		X	STSS002XXX01XX	4	4			"
11	6·28	1015		X	STSS003XXX01XX	4	4		MS/MSD	"
12	6·28	—		X	STSS003XXX01XD	4	4			"
13	6·28	1045		X	STSS004XXX01XX	4	4			"
14	6·28	1100		X	STSS005XXX01XX	4	4			"
15	6·28	1115		X	STSS006XXX01XX	4	4			"
16	6·28	1215		X	STSS007XXX01XX	4	4			"
17	6·28	1230		X	STSS008XXX01XX	4	4			"
18	6·28	—		X	STSS008XXX01XD	4	4			"
19	6·28	1245		X	STSS009XXX01XX	4	4			"
20	6·28	1300		X	STSS010XXX01XX	4	4			"
21	6·28	1315		X	STSS011XXX01XX	4	4			"
22	6·28	1330		X	STSS012XXX01XX	4	4			"
23	6·28	1515		X	STBS002XXX01XX	4			4	Water

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)
Bud Schoonard	6·28·91				

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED FOR DISPOSAL BY: (SIGNATURE)	DATE / TIME	REMARKS
				Versar Labs Inc. 2 coolers shipped Airbill # 2218119256 Custody Seal #5, 106-109

2 of 2

ANALYSIS REQUEST FORM

CLIENT INFORMATION: NAME Stewart A.N.G. Newburgh
COMPANY CE-Environmental
MAILING ADDRESS 261 Commercial St
Portland ME 04112

PURCHASE ORDER/JOB NUMBER 5139-15

WHERE TO SEND REPORT: ☐ DIRECTLY TO CLIENT
☑ ECJ-NAME Rich Hebert

ANALYSES REQUESTED BY: Brad Schoonard
TECHNICAL PROJECT MANAGER

APPROVED BY: Rich Hebert
PROJECT MANAGER

DATE RECEIVED
LAB LOCATION
RESULTS DUE
CLIENT I.D. NO.

☐ SOLID WASTE DATA FILE
☐ DATA DOCUMENTATION REQUIRED
☐ ENTERED IN COMPUTER

TYPE OF SAMPLE H2O
LIST ANY HAZARDS

☐ SPECIAL PROCEDURE

☐ FILTERED IN FIELD ☑ NON-FILTERED

ADDITIONAL INFORMATION OR SPECIAL PROCEDURES:
* Hold Sample for possible
Future Analysis.
7 day Verbal
14 day Written

SAMPLE IDENTIFICATION	LAB NUMBERS	DATE SAMPLED	SAMPLED BY	ANALYSES REQUIRED
				{TCL Pest, /PCBs CLP-CO
STBS002XXX01XX	*	6·28·89	B. Schoonard	Hebicides - SW846-8150 w
				CLP deliverables

EC JORDAN C
CONSULTING ENGINEERS

1 of 2

NALYSIS REQUEST FORM

NT INFORMATION: NAME Stewart A.N.G. Newburgh.
COMPANY CE-Environmental
MAILING ADDRESS 261 Commercial St.
Portland ME 04112

CHASE ORDER/JOB NUMBER 5139 -15

RE TO SEND REPORT: ☐ DIRECTLY TO CLIENT
☑ ECJ-NAME Rich Hebert

LYSES REQUESTED BY: Brad Schoonard
TECHNICAL PROJECT MANAGER

ROVED BY: Rich Hebert
PROJECT MANAGER

DATE RECEIVED
LAB LOCATION
RESULTS DUE
CLIENT I.D. NO.

☐ SOLID WASTE DATA FILE
☐ DATA DOCUMENTATION REQUIRED —
☐ ENTERED IN COMPUTER

TYPE OF SAMPLE Sediment
LIST ANY HAZARDS
☐ SPECIAL PROCEDURE

☐ FILTERED IN FIELD ☐ NON-FILTERED

ADDITIONAL INFORMATION OR SPECIAL PROCEDURES:
* Please do MS/MSD on this
Sample. No additional volume prov
7 day Verbal
14 day Written

MPLE IDENTIFICATION	LAB NUMBERS	DATE SAMPLED	SAMPLED BY	ANALYSES REQUIRED
				TCL Pest./PCBs CLP-COP
S001XXX01 XX		6·28·89	B.Schoonard	Herbicides - SW 846-8150
				CLP deliverables.
S002XXX01XX		6·28·89	B.Schoonard	Same As Above
SS003XXX01XX	*	6·28·89	B.Schoonard	Same As Above
S003XXX01XD		6·28·89	B.Schoonard	Same As Above
SS004XXX01XX		6·28·89	B.Schoonard	Same As Above
SS005XXX01XX		6·28·89	B.Schoonard	Same As Above
SS006XXX01XX		6·28·89	B.Schoonard	Same As Above
SS007XXX01XX		6·28·89	B.Schoonard	Same As Above
S008XXX01XX		6·28·89	B.Schoonard	Same As Above
SS009XXX01XX		6·28·89	B.Schoonard	Same As Above
SS008XXX01XD		6·28·89	B.Schoonard	Same As Above
S010XXX01XX		6·28·89	B.Schoonard	Same As Above
SS011XXX01XX		6·28·89	B.Schoonard	Same As Above
SS012XXX01XX		6·28·89	B.Schoonard	Same As Above