New York State
Department of Environmental Conservation
Division of Hazardous Waste Remediation

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

BECKER ELECTRONICS SITE
TOWN OF DURHAM
GREENE COUNTY, NEW YORK
SITE I.D. NO. 4-20-007

Final

PHASE I REMEDIAL INVESTIGATION REPORT
VOLUME 1

JUNE1992

Prepared By:

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PREPARED FOR

NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION

BY

METCALF & EDDY OF NEW YORK, INC.
TARRYTOWN, NEW YORK

JUNE 1992

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Section One

1.0 INTRODUCTION

On January 24, 1989, the New York State Department of Environmental Conservation (NYSDEC) authorized Metcalf & Eddy of New York, Inc. (M&E) to conduct a phased Remedial Investigation/Feasibility Study (RI/FS) for the Becker Electronics Manufacturing Site (Becker Electronics site) located in East Durham, New York. This Phase I RI/FS was performed by M&E as authorized under the standby work assignment number D002406-6.

The Becker Electronics site has been listed by NYSDEC as site number 4-20-007 in the Registry of Inactive Hazardous Waste Sites for New York State. In addition, the Becker Electronics site has been designated a Class 2 hazardous waste site by NYSDEC, indicating that it represents a significant threat to the public health and/or environment.

1.1 PURPOSE OF STUDY AND REPORT

The purpose of the overall RI/FS process is to perform a Remedial Investigation (RI) to determine the nature and extent of contamination at the site, sources of contamination, risk to public health and the environment, and to perform a Feasibility Study (FS) which will identify and evaluate mitigation alternatives, and recommend a cost-effective, environmentally sound and long-term remedial action, if necessary.

This document, entitled "Phase I Remedial Investigation Report for the Becker Electronics Site," presents a detailed description of the activities and results of the first phase of the field investigation program of the RI portion of the project as part of a multi-phased RI/FS prepared in accordance with the Federal Superfund Amendments and Reauthorization Act (SARA) and the NYSDEC Superfund Program.

The Phase I Remedial Investigation (Phase I RI) involved the analysis of existing information and environmental data in combination with a targeted field investigation/sampling program. The purpose of this phase was to provide an initial determination regarding the location and characterization of sources of contamination and to begin defining migration pathways, extent of contamination and exposed populations, as well as to assist in refining the type and location of additional sampling for subsequent investigations (i.e., Phase II RI), if required.

The Phase I field program for the Becker Electronics site involved site mobilization, review of aerial photography; topographic mapping; surveying; wildlife habitat surveys; aquifer permeability testing; air monitoring; sampling of surface and subsurface soils, groundwater, surface water and sediment, septic tanks and test pit soils.

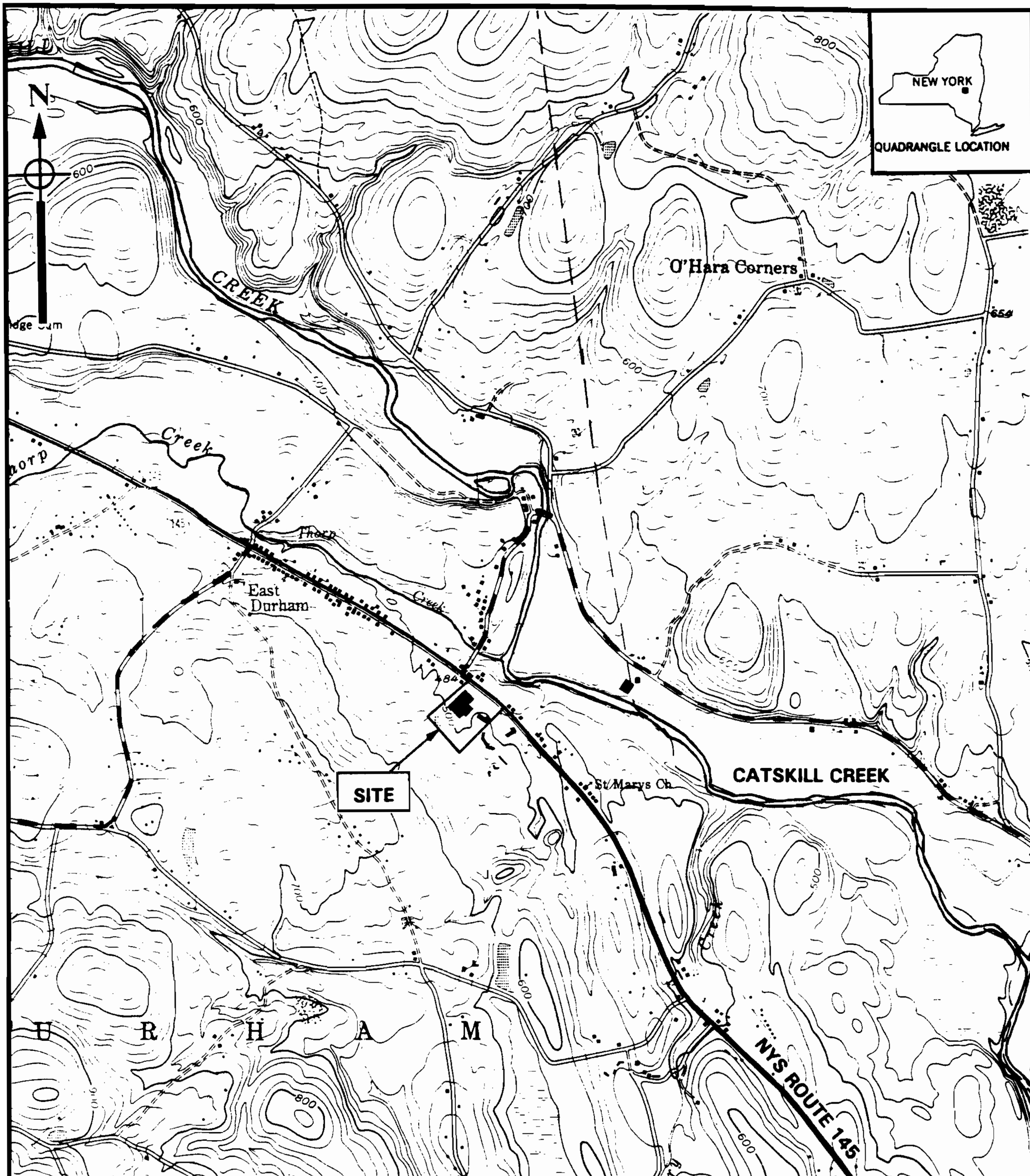
1.2 SITE BACKGROUND

1.2.1 Site Location, Ownership and Access

The Becker Electronics site is located in a rural, residential area in the hamlet of East Durham, within the Town of Durham, Greene County, New York. East Durham is located approximately 40 miles southwest of Albany, and 12 miles west of Catskill, New York (see Figure 1-1). The site is situated on the west side of New York State Route 145 on a parcel officially designated on the tax assessors map as Lot 1, Blocks 25 and 26. The property is presently owned by Becker Electronics Manufacturing, Inc. Access to the Becker Electronics site is via Route 145. Delineation of the site/study area boundary is illustrated in Figure 1-2. Several access roads and/or vehicle trails are located within the site boundaries.

1.2.2 Site Description

The Becker Electronics site is approximately 13 acres in size, and is comprised of several buildings which were once used for the manufacturing of high fidelity speakers and components, shipping and maintenance. Site



SOURCE: USGS 7.5 Minute Series Topographic Map Freehold (1943) and Greenville (1945), NY Quadrangles Photorevised 1980

1000 0 1000 2000 3000

SCALE IN FEET

1" = 2000 FEET
CONTOUR INTERVAL = 20 FEET

FIGURE 1-1
SITE LOCATION

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

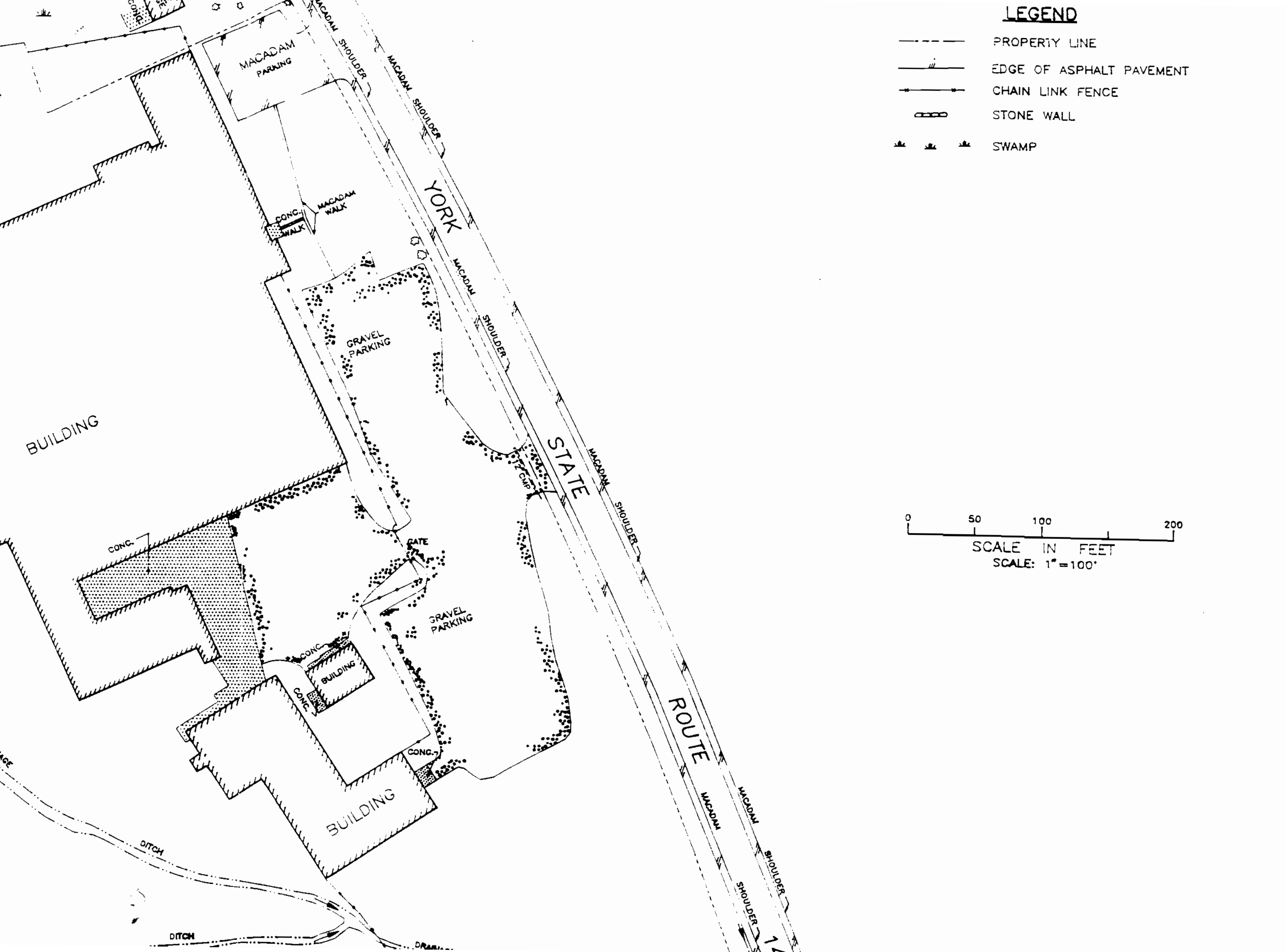

LEGEND
PROPERTY LINE
EDGE OF ASPHALT PAVEMENT
CHAIN LINK FENCE
STONE WALL
SWAMP
0
50
100
200
SCALE IN FEET
SCALE: 1" = 100'
YORK STATE ROUTE
MACADAM
SHOULDER
MACADAM PARKING
MACADAM WALK
CONC. WALK
GRAVEL PARKING
BUILDING
CONC.
GATE
12" CMP
DITCH

FIGURE 1-2 SITE PLAN/STUDY AREA BOUNDARY operations ceased several years ago and the facilities are currently inactive. Private residences and small business establishments (gift shops, a restaurant/pub, and a go-cart speedway/recreation area) are located north and east of the site. A gift shop is located immediately adjacent to the northeast corner of the site. A resort, the Weldon House, lies adjacent to the site on the south. Immediately north of the site, on the Irish Culture and Sports Center land, exists athletic fields used for recreational purposes. West of the site is undeveloped land consisting of grass fields and wooded areas.

Figure 1-2 is a detailed site plan showing existing buildings and other site features. The existing facilities are comprised of approximately 96,000 square feet (sq. ft.) of manufacturing/office space with 13,850 sq. ft. of associated garage area, a 4,700 sq. ft. sawdust storage building and a small pump house. Other than the existing buildings/structures and several paved and gravel parking areas, the site is grass-covered and contains a few small wooded areas, several large piles of debris, a fire pond and four drainage swales/ditches. The fire pond is located along the western border of the site. The debris piles appear to contain mainly particle boards. Also, some scrap metal has been disposed both adjacent to and within these piles. Small wetland areas exist on-site close to the mouth of the fire pond and surrounding portions of the drainage ditches. There are few wooded areas on-site (mainly along the borders of the site), with the exception of a small woodland immediately north of the fire pond.

1.2.2.1 **Demographics**. As stated previously, the Becker Electronics site is located in the hamlet of East Durham, in the Town of Durham, Greene County, New York. East Durham is a rural vacation community. The site is located in census tract 0802.00 and block #238. This area is approximately 1 square mile in size and includes the site and the lower portion of East Durham. The 1990 census showed 57 people living in block #238.

1.2.2.2 **Land Use**. The Becker Electronics site is situated along New York State Route 145 in an area of mixed residential and commercial land use.

Properties to the north and east consist of single family residences and small business establishments such as gift shops, a go-cart speedway/amusement area, and a restaurant/pub. A number of motels are located south and southeast of the site. The Weldon House resort/motel lies immediately adjacent to the southern boundary of the site. Immediately north of the site, on the Irish Culture and Sports Center land, exists athletic fields used for recreational purposes. West of the site is undeveloped land consisting of grass fields and wooded areas.

1.2.2.3 **Climate.** Climatological data was obtained from the reporting station in Cairo, New York, which is located approximately 2.5 miles southeast of the Becker Electronics site. The average annual precipitation for the area in the vicinity of the site was approximately 39.13 inches during the 10 year period of 1980 through 1990. In general, precipitation is rather evenly distributed throughout the year, with a little less occurring in winter than in the other seasons. The average annual temperature for the aforementioned period of time was 47.3 degrees Fahrenheit. July is the warmest month and January is the coldest month, with average temperatures of 70.6 and 21.5 degrees Fahrenheit, respectively.

1.2.2.4 **Topography and Surface Drainage.** Greene County lies within two physiographic provinces of the Appalachian Basin. These two physiographic provinces include the Hudson Valley section of the Valley and Ridge province and the Catskill section of the Appalachian Plateau province. The Becker Electronics site is located within a transition zone between these two physiographic provinces on the northeastern slope of the foothills of the Catskill Mountains. In the northern part of the county, the mountains increase in altitude from 800 feet near the Hudson River to approximately 1,000 feet at Durham, and continue to increase toward the northwest to merge with a 2,000 foot plateau in Albany and Schoharie Counties (Berdan 1954). Fenneman (1938) referred to this increase in height as a "ramp" between the Hudson Valley section of the Valley and Ridge province and the Appalachian Plateau province. This ramp represents an indefinite transitional boundary between the two physiographic provinces.

Elevations within a 1/2 mile radius of the Becker Electronics site range from approximately 435 to 700 feet above mean sea level (MSL). The topography at the site was mapped by YEC, Inc. surveyors, and is detailed in a topographic map included in Appendix A. Ground elevations (MSL) range from 507 feet at the western edge of the site to approximately 480 feet in the drainage ditch at the southeastern corner of the property. The western third of the site lies predominantly on a slope which is truncated at the rear of the buildings by a crescent shaped low scarp (approximately 10-15 feet). This is the most prominent topographic feature at the site. The scarp which generally trends northwest - southeast, changes direction toward the southern end of the property and parallels the southern property boundary. Field observations suggest that the scarp was created by excavation of an undetermined extent in this portion of the site. To the east of this scarp the property is relatively flat with a total change in relief of less than half of a foot.

Surface water drainage in Greene County is generally toward the Hudson River to the east with the exception of the western corner of the county. As discussed, the Becker site is located in the foothills of the Catskill Mountains, which are dissected by streams and tributaries of Catskill Creek. The site is located approximately 800 feet southwest of both Thorp Creek and Catskill Creek.

There are four drainage swales/ditches located on the site (see Figure 1-2). The first on-site drainage ditch flows from the outlet of the fire pond and runs in a southerly direction along the west border of the site, and then in an easterly direction along the south border of the site. The second on-site drainage ditch flows from the center of the site, runs in a southeasterly direction along the scarp and flows into the first drainage ditch (previously described above) which flows off-site. After this "southern" ditch runs off-site, it empties into an off-site drainage ditch that flows along Route 145, runs underneath Route 145 in front of Weldon House, and eventually empties into a small tributary of Catskill Creek. The third and fourth on-site drainage ditches flow from the center of the site, run in a northeasterly direction and flow off-site. After these "northern" ditches run off-site, they empty into a low-lying marsh/wetland area and small pond. Outflow from this area and pond flows easterly into a storm drainage culvert which crosses beneath Route 145 and eventually discharges into Thorp Creek (which is a tributary of Catskill Creek).

1.2.2.5 **Soils.** Soils at the Becker Electronics site have been classified by the United States Soil Conservation Service (SCGs) as "Tunkhannoc", which is defined as a gravelly loam.

1.2.2.6 **Wetlands.** Figure 1-3 shows the NYSDEC designated freshwater wetlands in the vicinity of the Becker Electronics site. Figure 1-3 indicates that there are no protected wetlands located directly within the boundaries of the site. There are two NYSDEC protected wetlands (GR-110, F-2) located within one mile of the site; however, both are considered upgradient of the site with respect to surface water drainage. The closest regulated NYSDEC wetland, F-3, is located downgradient of the site. Wetland F-3, is a Class II wetland located approximately one mile southeast of the site adjacent to Catskill Creek. NYSDEC classifies wetlands according to a value system, whereby Class I wetlands are the most valuable and Class IV wetlands are of least value.

1.2.2.7 **Floodplains.** Based on a review of Federal Emergency Management Agency (FEMA) flood map of the area, the site does not lie within the boundaries of the 100-year floodplain of either Catskill Creek, Thorp Creek or their tributaries.

1.2.2.8 **Surface Water.** Surface water drainage in northern Greene County is generally toward the Hudson River. The most prominent surface water bodies found in the immediate vicinity of the site are Thorp Creek and Catskill Creek. Thorp Creek, a tributary of Catskill Creek, is classified by the NYSDEC Division of Fish and Wildlife as a C(TS)-C class trout stream. Catskill Creek is classified as a C(T)-C class trout stream. The confluence of these two surface water bodies is located approximately 800 feet northeast of the site.

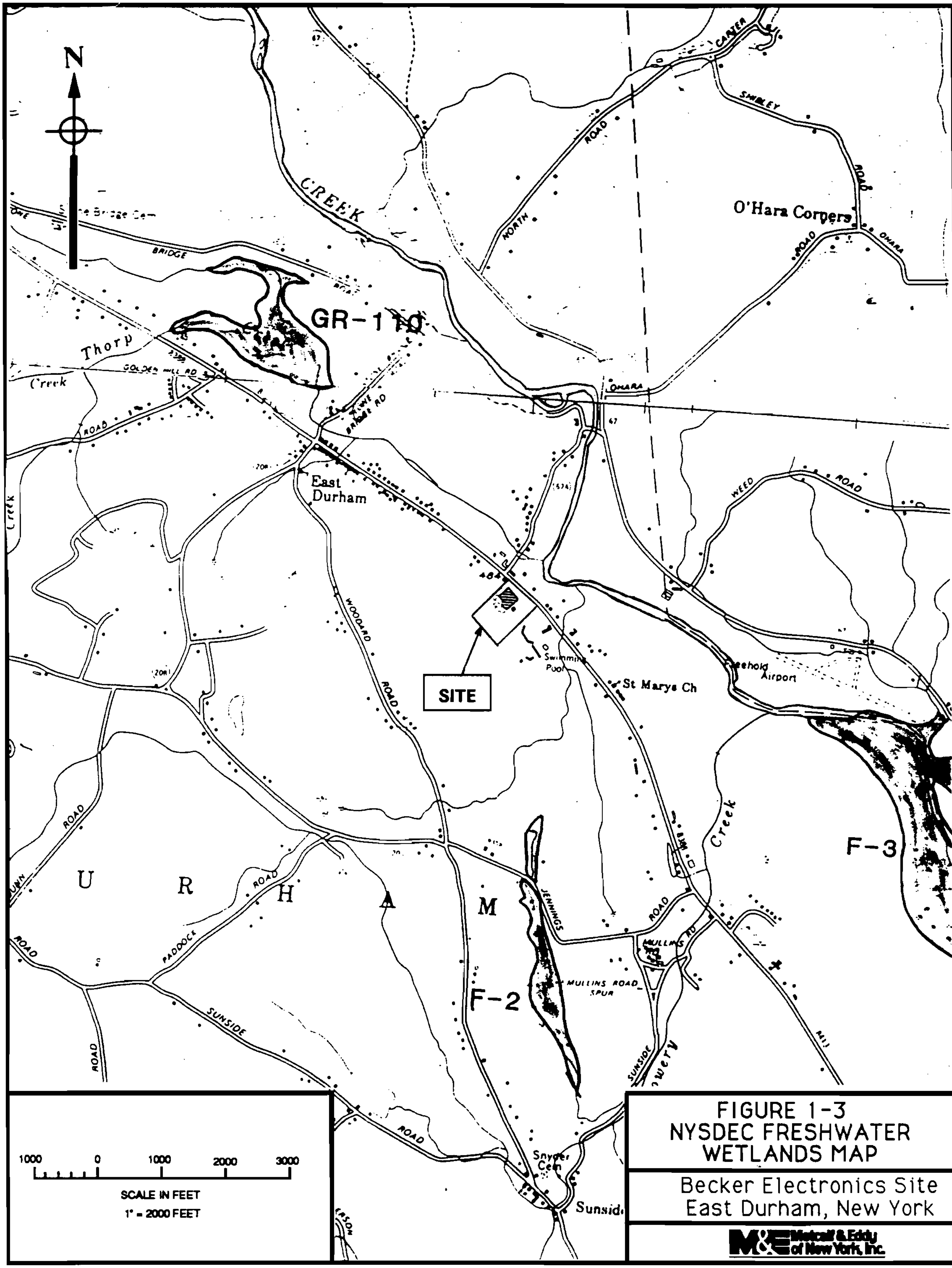


FIGURE 1-3
NYSDEC FRESHWATER
WETLANDS MAP

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

1.2.2.9 **Regional Geology**. A discussion of the regional geology for the area in which the site is located is provided below.

- Setting: Geologic formations encountered in Greene County are of two types, consolidated or bedrock, and unconsolidated deposits. Bedrock within Greene County is composed of Ordovician through Devonian Age sedimentary formations. The sediments which formed these bedrock formations were deposited in marine and subaerial environments in response to transgressional and recessional sea levels and regional structural uplift. The formational sequence of the existing bedrock material may be best characterized as a series of cycles which included periods of sediment deposition followed by regional uplift and erosion. For the past 450 million years this area had experienced the erosional portion of the cycle which has resulted in the modern landform (Berden, 1954).

  In general, unconsolidated deposits cover the bedrock in most places within Greene County. These unconsolidated deposits are primarily Pleistocene in age and are stratified and/or unstratified till, gravel, sand, and clay of varying thicknesses. Thin layers comprising less than 20 feet of Quaternary alluvium gravel, sand, and silt deposits can be found locally in stream bed channels.

- Stratigraphy: The Deepkill Shale of lower Ordovician Age is the oldest unit present and consists of a green siliceous shale, black shale and thin-bedded limestone and chert. Gray sandstone with chert and dark-gray shale make up the younger Normanskill Formation. Subsequent to the deposition which formed the Deepkill and Normanskill formations, the region underwent uplift and deformation. Throughout the late Ordovician and Middle Silurian Ages, erosion reduced the formations to a shallow plain. The total thickness of the Deepkill and Normanskill units in the county is reported to be approximately 1,200 feet along the Hudson River.

  In the late Silurian to the Middle Devonian, the region was transgressed by the sea. Deposits of thick muds and sands accumulated on top of the eroded Ordovician formation. These deposits formed the massive dark gray fossiliferous limestone, overlying these units known as the Devonian Helderberg Group and the Devonian Onondaga and Ulster Groups. The Helderberg group is a highly fossiliferous shaly or cherty limestone interspersed with massive crystalline limestone beds.

  The thickness of the Rondout and Manlius limestone ranges from 40 to 50 feet and the Helderberg Group is approximately 300 feet thick. The thickness of the Ulster Group ranges from 7 to 250 feet and the Onondaga limestone approximately 80 feet. Erosional processes have exposed a nearly complete sequence of highly deformed Ordovician through Devonian units at a road cut along Route 23 between Cairo and Catskill in the area of Route 87 approximately ten miles east of the site.

During the Middle Devonian, the landmass to the northeast of the region was uplifted. A thick sequence of alluvial sands and gravels were deposited on the lower Devonian formations. These deposits formed wedge of material from the uplifted and eroding landmass to the northeast. In the southern part of the county, the Middle Devonian Ashokan Formation was deposited over the Mount Marion formation and ranges in thickness from 250 to 350 feet. In the northern region of the county, the Mount Marion Formation is thicker (up to 1,100 feet) due to continued deposition.

The Catskill formation was formed during the middle to late Devonian Age from continued subaerial deposition of sand, silts, and muds. Occasional examples of crossbedding are evident in sandstone beds. Mud cracks have also been observed along the Catskill Creek. This formation underlies approximately five sixths of the county and makes up the foothills of the Catskill mountains on which the Becker Electronics site is located. This formation consists of red and gray sandstone along with red, gray and green shales. The Catskill formation attains a maximum thickness of 5,500 feet.

West along Route 23 near Cairo, undeformed Middle Devonian red and green shales and sandstones can be observed. The beds at this location dip generally to the northwest.

Pleistocene glacial alluvial and fluvial deposits of sand and gravel are found in valleys throughout the county. Glacial lakes formed in some valleys depositing silt and clay. Sporadic deposits of till are found in the upland areas.

- Structure: Several formations in Greene County have developed faults and folds as a result of two primary periods of deformation during the Ordovician and Devonian. The Deepkill and Normanskill Shales show the greatest amount of deformation resulting from at least two major episodes of folding and faulting. These formations may be part of a thrust block to the west.

  In the southern part of the county (from Catskill south), extensive thrust faulting and folding occurred. The faulting and folding occurred most notably in the Helderberg and Onondaga Groups. The folding and faulting decreases to the north of Climax. Paralleling the strike of the beds in this region are several normal faults. The dip of the lower limestone formations is generally to the northwest. They dip southwest in some northern areas.

  The younger Middle Devonian Bakoven Shale is highly deformed in local areas. The overlying younger formations are significantly less deformed. These younger formations (Mount Marion, Ashoken and Catskill Formations) have dips ranging from 7° in the northwest to 0° in the western part of the county.

The subtle faulting of the broad syncline of the Catskill formation is not readily detectable with the exception of some noted keystone or splay faulting along closely spaced joints. The joint orientation in the northwest ranges from N 42° to N 55°W. In the northeast part of the county, the joint sets are roughly between 58°W to N 74°W.

1.2.2.10 **Regional Hydrogeology**. Groundwater in Greene County occurs in either consolidated bedrock or unconsolidated deposits. Bedrock in Greene County can be categorized, with respect to hydrogeologic conditions, into three principal groups (Berdan, 1954). The first is comprised of shales and sandstones of the Deepkill and Normanskill formations found in a north-south belt from the Hudson River westward to a point several miles beyond U.S. Route 9W. Although these units have been highly deformed, their water bearing properties are relatively poor with wells situated within these units yielding from 0.5 to 32 gallons per minute (gpm) and an average yield of 10 gpm. The second group is comprised of water-bearing units ranging in age from late Silurian to middle Devonian including the Rondout and Manlius Limestones, Helderberg Group, Onondaga limestone and Bakoven shale. These units consist of alternating limestones and shales occurring in a narrow north-south belt 1 to 2 miles wide, parallel to the Hudson Valley. The beds have been moderately deformed creating joints and openings along bedding planes in the limestones which are commonly enlarged by solution. In the shales, groundwater occurs chiefly in joints and zones of fracture cleavage. In general, this second group yields small to moderate supplies to wells on the order of 1 to 30 gpm. The third group comprises the Mount Marion, Ashokan and Catskill formations. The rocks of this group underlie the remaining 90 percent of the area in the county. The Catskill formation is the most important of the three members of this group as it underlies the Becker Electronics site. Although the Catskill formation is relatively undeformed, it contains numerous joints which are the primary source of groundwater in this formation. Joints commonly extend to considerable depths. In addition, many of the sandstones have substantial primary porosity. Well yields are found to range from 14 to 20 gpm with an average of 17 gpm.

Pleistocene stratified sand and gravel deposits are a variable source of water within the unconsolidated materials in Greene County. The alluvial sand, silt, and gravel beds yield little water and are located primarily along the stream valleys in Greene County. These deposits are significant at Vly and West Kill Creeks.

Glacial drift deposits are up to 200 feet thick in some locations in the county. Deposits of sand and gravel were formed from deltas at the margin of glacial lakes and glacial outwash. The beds of fine to coarse sand with and lenses of gravel are the most productive source of water in the unconsolidated units.

The glacial till deposits found extensively in Durham, Greenville, and western Cairo Townships are of little substance as a source of water. Wells in the till overburden obtain water from lenses of sand but are not generally good sources of water.

There are several lacustrine deposits of clay and silt throughout the county. These are also poor sources of water except where there are lenses of sand present.

1.2.2.11 **Water Supply**. There are no community public water supply systems in the vicinity of the Becker Electronics site. Several vacation resort businesses including Weldon House, Keogh's Cottages and Erin's Melody House can be considered non-community public water supply systems under strict interpretation of Part 5 of the New York State Sanitary Code. The remainder of the residences and businesses in the vicinity of the site obtain their water from individually owned private water supply wells.

1.2.2.12 **Storm Water**. There is currently no storm drain system in place at the Becker Electronics site. Surface water runoff is captured by a system of drainage ditches which flow off-site to the northeast and southeast of the subject property. This drainage ditch system is comprised of four distinct ditches, the first of which flows south from the outlet of the fire pond along the western boundary of the property and then east along the southern property boundary. The second drainage ditch flows southeast from the center of the site to a confluence with the first drainage ditch and off the southeastern corner of the property. Outflow from this area then passes beneath New York State Route 145 via an 18-inch reinforced concrete pipe and ultimately discharges into Catskill Creek. The third and fourth drainage ditches flow from the center of the site in a northeasterly direction to a low lying marsh/wetland area located to the north of the subject property. Outflow from this marsh area and small pond flows into a culvert which runs beneath Route 145 in an easterly direction and discharges into Thorp Creek.

1.2.2.13 **Wastewater.** The area surrounding the Becker Electronics site is not located within a sewer district. Therefore, sanitary wastewater disposal is achieved by privately owned septic systems (septic tanks, leaching pools/tile fields) at each residential or commercial unit.

1.2.3 Site History

The Becker Electronics facility was formerly used to manufacture high fidelity speakers and speaker components. As part of the plant operations, 1,1,1-trichloroethane (and possibly other solvents) was used to remove oils from speaker magnet plates and other metal parts, and to degrease mechanical machinery.

In September 1980, the New York State Department of Health (NYSDOH) found that a private water supply well used by the Weldon House, a resort/motel located adjacent to the Becker site along the southern border of the property, was contaminated with 72,000 parts per billion (ppb) of 1,1,1-trichloroethane. Subsequent sampling of other private wells in the vicinity of the Becker Electronics site revealed that several domestic water supply wells were contaminated by industrial solvents. As a result, NYSDOH implemented a well sampling/monitoring program to inform surrounding property owners of the quality of their potable water supply.

In March of 1981, NYSDOH sampled a number of wells and surface water bodies at the Becker facility. The fire pond, drainage ditches, leach field, and water supply wells located on-site all showed the presence of 1,1,1-trichloroethane. The maximum concentration of 1,1,1-trichloroethane detected was 5,500 ppb.

Also in March 1981, Becker Electronics hired the consulting firm of Brinnier and Larios to review its manufacturing process and recommend a treatment process for the removal of 1,1,1-trichloroethane. The Brinnier and Larios report (prepared in 1981) indicated that the solvent 1,1,1-trichloroethane was initially used in the manufacturing process in 1976. Project records appear to show that this process was later discontinued in March of 1982. As part of the 1981 Brinnier and Larios report, Dunn Geoscience prepared a hydrogeolgic evaluation.

In January of 1983, Dunn Geoscience prepared an Interim Hydrogeologic Investigation Report on behalf of Becker Electronics. The purpose of this report was to summarize investigative work performed to date, address preliminary findings, and present recommendations for the installation of monitoring wells and initial clean-up activities. No project records indicate that any of the actions recommended in the Dunn Geoscience report were undertaken.

Becker Electronics entered into an agreement with NYSDEC in June of 1986 to monitor private wells affected by the contamination associated with the site, and to install and maintain carbon filtration treatment systems on those private wells which had unacceptable drinking water quality. In 1988, Becker Electronics closed the facility and declared bankruptcy. Since then, Becker Electronics has sporadically maintained the carbon filters and collected water samples from a portion of the impacted private wells. As of April 1991, M&E is currently sampling and providing maintenance of the treatment systems as part of an interim remedial measure under the RI/FS (see Section 1.2.5).

1.2.4 Previous Investigations

Previous investigations performed at the Becker Electronics site and other historical information related to the site include the following:

- Industrial Waste Study by Brinnier and Larios (July 1981)
- Interim Hydrogeologic Investigation Report by Dunn Geoscience (January 1983)
- NYSDEC and Dunn Geoscience (March 1983)
- NYSDEC file information to M&E (December 1989)
- NYSDOH file information to M&E (May 1989)

The available information obtained from previous investigations consists primarily of general background information on the site and the analytical results of soil, surface water and groundwater samples taken at the site and surrounding study area. This information provides a historical data base of contaminants detected and suspected to exist at the Becker Electronics site.

In evaluating the existing data base, caution was exercised and the following factors were taken into consideration:

- analytical methods
- analytical parameters
- age of data
- detection limits of analytical methods
- QA/QC procedures and documentation

1.2.5 Response Actions to Date

Four Interim Remedial Measures (IRMs) were proposed by M&E and approved by NYSDEC in the Becker Electronics Site Work Plan (October 1990). The following four IRMs were based on a review of NYSDOH and NYSDEC records and visits to the site on December 20, 1989 and May 2, 1990:

- Overpacking and staging approximately six containers of five gallons or less and approximately 12, 55 gallon drums and containers that were scattered about the site.

- Inspect and then prepare a carbon filter replacement and maintenance plan for the private water supply well treatment systems located at approximately 12 residences and businesses surrounding the Becker Electronics site that have been impacted by contamination from the site.

- Locate, uncover, and sample three known septic systems at the site.

- Locate an on-site underground storage tank and determine the nature of its contents.

During the period of time between the submittal of the Becker Phase I RI Work Plan in October 1990 and the [redacted] the containers scheduled for overpacking and staging were removed from the site by unknown sources.

During November 1990, M&E (and a subcontractor, AquaScience) and NYSDEC inspected several of the existing granular activated carbon (GAC) filter treatment systems at the residences and business establishments whose private water supply wells had shown signs of contamination according to the prior NYSDOH sampling and monitoring program. In addition, M&E (and its subcontractor, Megohmetrics Corp.) inspected all of the GAC systems at the impacted properties in April and early May 1991. Based on the observations made during this inspection and the analytical results of samples obtained by M&E from each of the systems in early May, Megohmetrics installed a new system, modified some of the existing systems, and replaced the carbon at several locations in May 1991. M&E sampled all of the systems again in August 1991, and based on the analytical results of these samples, Megohmetrics installed two new systems, modified two existing systems, and replaced carbon at one location in November 1991. A more detailed discussion of work performed as part of this IRM is contained in Sections 2 and 4.

The three septic systems specified in the July 3, 1984 draft SPDES permit for the Becker site were located and initially sampled as part of the M&E Phase I RI. Sediment/sludge and aqueous samples were obtained from the septic tanks, and soil samples were taken from test pits in leaching fields or near the septic tanks.

[redacted]ction 2.

An underground storage tank was located by M&E outside a boiler room along the southeast side of the main building. It was determined that the tank still contained some product, which is probably fuel oil (see Section 2 for further discussion).

1.3 REPORT ORGANIZATION

The Phase I RI Report for the Becker Electronics site is comprised of the following sections:

- Section 1.0 provides background information related to the site including the site description, site history, previous investigations, and response actions to date.
- Section 2.0 describes the various activities associated with the field work conducted during the Phase I RI field program which were performed in order to characterize the site. In addition, the individual programs relevant to the particular work activities including health and safety and quality assurance and control are reviewed.
- Section 3.0 presents the results of the field activities to determine the physical environmental/ecological characteristics of the site. Included in this section are the results of the aquifer testing, groundwater monitoring well installation program and the wildlife habitat survey conducted as part of the field investigation.

- Section 4.0 discusses the results of the field activities and sampling and their relation to the nature and extent of contamination. It presents the results of the site characterization and chemical contaminants found in each of the media sampled. Included in this section is a summary of New York State standards, criteria, and guidelines or guidance values (SCGs) established for the site that pertain to each medium, and a comparison to the contaminant levels found at the site.

- Section 5.0 includes physical, chemical, and/or biological factors of importance for each environmental medium and discusses potential routes of contaminant migration, as well as factors affecting migration for each analyte/matrix of importance.

- Section 6.0 presents a summary and recommendations based on the results and conclusions of the investigation.

This report also contains the following Appendices:

- Appendix A - Site Topographic Map

- Appendix B - Boring Logs

- Appendix C - Well Construction Diagrams

- Appendix D - Packer and Pump Test Data

- Appendix E - New York State Standards, Criteria and Guidelines/ Guidance Values

- Appendix F - Phase I RI Data Usability Report

- Appendix G - Phase I RI Data Tables

Section Two

2.0 STUDY AREA INVESTIGATION

2.1 FIELD ACTIVITIES/SITE CHARACTERIZATION

The Phase I component of the RI for the Becker Electronics site was comprised of the following tasks:

- Site Survey and Topographic Mapping
- Surface Water and Sediment Sampling
- Surface Soil Sampling
- Soil Boring and Subsurface Soil Sampling
- Test Pit Excavation and Soil Sampling
- Monitoring Well Installation and Groundwater Sampling
- Aquifer Testing
- Air Monitoring
- Implementation of Interim Remedial Measures (IRMs) including Container Management, Private Water Supply Treatment System Maintenance and Sampling, and Septic System Investigation and Sampling
- Wildlife Habitat Survey

2.1.1 Surface Features

2.1.1.1 Surveying Program and Topographic Mapping. A topographic survey was conducted at the Becker Electronics site by representatives of YEC, Inc. The objectives of the survey were to simplify data management and standardize maps, drawings, and other information pertinent to the RI/FS.

The surveying program included the following:

- Topographic survey of existing site features
- Establishing a grid for fire pond sampling

- Establishing surface water elevations of the fire pond
- Establishing well locations and elevations
- Locating sampling locations and elevations

The surveyor used a datum spot elevation of 484.0 feet at the intersection of New York State Route 145 and County Road 67A as a vertical control point. This datum spot elevation is based upon the U.S.G.S. 7 1/2 minute Freehold quadrangle map and the National Geodetic Vertical Datum of 1929. Elevations were obtained to one one-hundredth of a foot and are included on the surveyed base map included as Appendix A. This base map depicts the Becker Electronics site at a scale of one inch equals 30 feet with a topographic contour interval of one foot.

2.1.2 Soil Investigation

The purpose of the soil investigation was to provide data for characterization of the on-site soils. The soil investigation was initially conducted between November 7 and December 3, 1990 and resampling was performed on April 25, 1991. The soil investigation was conducted in accordance with the NYSDEC approved Work Plan.

2.1.2.1 **Surface Soil Sampling Program.** The purpose of the surface soil sampling program was to provide data which would allow for an evaluation of potential on-site residual contaminant source areas. Nineteen surface soil samples were collected on November 12 and 13, 1990. It should be noted that 14 surface soil samples were approved in the Work Plan, however, an additional five samples were requested during the site investigation by the NYSDEC field representative. All 19 samples were collected using a decontaminated stainless steel trowel. The sample locations are shown in Figure 2-1 and are summarized on Table 2-1.

All of the surface soil samples were analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL Metals, and TCL Pesticides/PCBs. Due to laboratory QA/QC problems associated with the initial sampling program, 13 of these

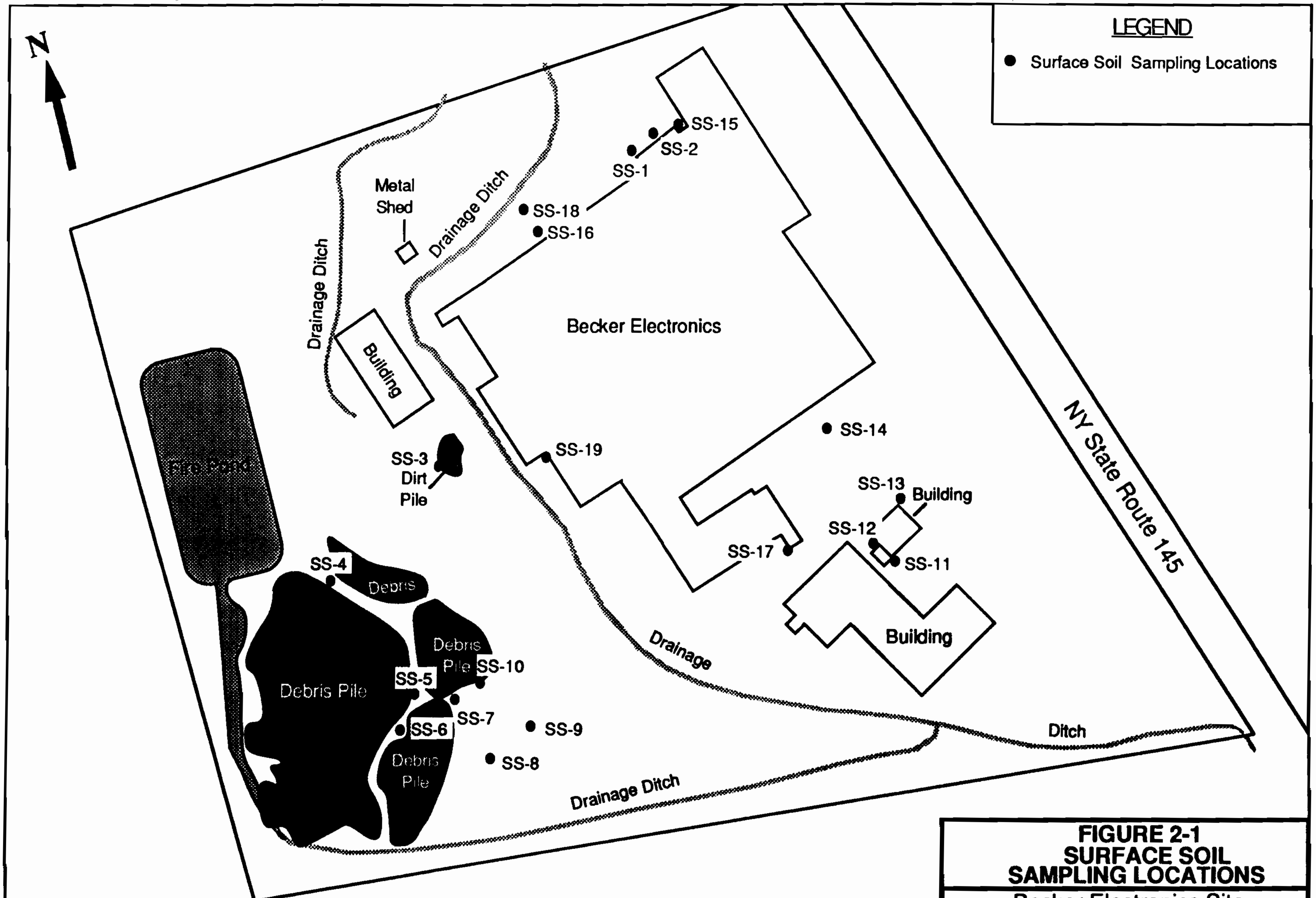


FIGURE 2-1
SURFACE SOIL SAMPLING LOCATIONS

Becker Electronics Site
East Durham, New York

M&E Metcalf & Eddy of New York, Inc.

Approximate Scale: 1" = 120'

TABLE 2-1

SURFACE SOIL SAMPLING SUMMARY

Sample Number*	Type of Sample	Reasoning for Sample Location
BK-SS-1	Surface Soil	runoff area below deteriorated concrete block wall
BK-SS-2	Surface Soil	septic system #3 tank inlet
BK-SS-TB	Trip Blank	
BK-SS-3	Surface Soil	adjacent to black waste pile
BK-SS-4	Surface Soil	adjacent to particle board waste piles closest to fire pond
BK-SS-5	Surface Soil	adjacent to waste pile
BK-SS-6	Surface Soil	wet area between particle board waste piles
BK-SS-7	Surface Soil	taken from suspected oil/water separator concrete leachate box
BK-SS-8	Surface Soil	taken from suspected oil/water separator concrete leachate box
BK-SS-9	Surface Soil	adjacent to old truck body and suspected solvent area
BK-SS-10	Surface Soil	adjacent to old truck body and suspected solvent area
BK-SS-11	Surface Soil	drum storage runoff area
BK-SS-12	Surface Soil	drum storage runoff area
BK-SS-13	Surface Soil	gas pump by garage area
BK-SS-14	Surface Soil	surface stain in parking lot area
BK-SS-15	Surface Soil	northeast facility, back door
BK-SS-16	Surface Soil	runoff area showing stressed vegetation by facility door
BK-SS-17	Surface Soil	loading dock area
BK-SS-18	Surface Soil	runoff area showing stressed vegetation by facility door
BK-SS-19	Surface Soil	adjacent to loading bays where 65 ppm OVA reading was observed

* Note: BK = Becker
SS = Surface Soil

samples were resampled on April 25, 1991 in order to meet the data quality objectives stated in the Quality Assurance Project Plan (QAPP). These samples received the following analyses:

Sample Number	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
SS-1	—	1	—	—
SS-2	—	1	—	—
SS-4	—	1	—	—
SS-5	—	1	—	—
SS-6	—	1	—	—
SS-7	1	—	—	—
SS-9	—	1	—	—
SS-11	—	1	—	—
SS-12	1	1	—	—
SS-14	1	—	—	—
SS-15	—	1	—	—
SS-16	—	1	—	—
SS-18	—	1	—	—
Total	3	11	—	—

2.1.2.2 **Subsurface/Borehole Soil Sampling.** The soil boring program was designed to provide information regarding the nature and extent of contamination within the overburden soils at various on-site locations.

The objectives of the soil boring program were to:

- determine the thickness of overburden deposits covering the site
- evaluate the nature and vertical extent of contamination within the overburden soil
- evaluate the potential for contaminant migration through the unconsolidated aquifer.

The following activities were undertaken to meet the objectives of the soil boring program:

- Three borings were advanced to the top of bedrock

- One test pit was excavated to the top of bedrock
- Soil samples and bedrock cores were obtained from three bedrock monitoring well locations drilled
- Soil samples were not obtained during the construction of overburden monitoring well MW-2S due to it close proximity to soil boring BL-2 which was continuously sampled to bedrock.

The locations of the new overburden monitoring well (MW-2S) and three new bedrock monitoring wells (MW-4, MW-5, and MW-6) are shown in Figure 2-2. This figure also shows the locations of existing Becker Wells. The overburden and bedrock monitoring wells will be discussed in Section 2.1.3 of this report. The locations of the soil borings (BL-2, 3 and 4) and the test pit (BL-1) are shown in Figure 2-3. The soil borings were located in areas of suspected surficial contaminant spills in order to provide vertical delineation of strata and contamination of these areas.

The soil borings were advanced using a truck mounted CME-55 drill rig equipped with 4-1/4 inch ID hollow stem augers. The subsurface soils were sampled continuously in 2 foot intervals until bedrock was encountered. The soils were sampled in accordance with the Work Plan and American Standard Testing Method ASTM D 1586-84 which describes the Standard Penetration Test. Soil boring and test pit sample locations are shown in Figure 2-3.

A log of each boring was maintained during the field investigation. Soil samples were classified by an M&E geologist using the Unified Soil Classification System. Each soil sample collected was field screened using a Foxboro Organic Vapor Analyzer (OVA) Model 128. Provisions were made to collect samples from each boring which displayed elevated readings on the OVA to be submitted for laboratory analysis. A total of five soil samples were obtained on November 14 and December 3, 1990 from boreholes BL-2, BL-3, and BL-4, and test pit BL-1. These samples were analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL Metals and TCL Pesticides/PCBs. Geologic logs of each of the borings completed during the field investigation are provided in Appendix B.

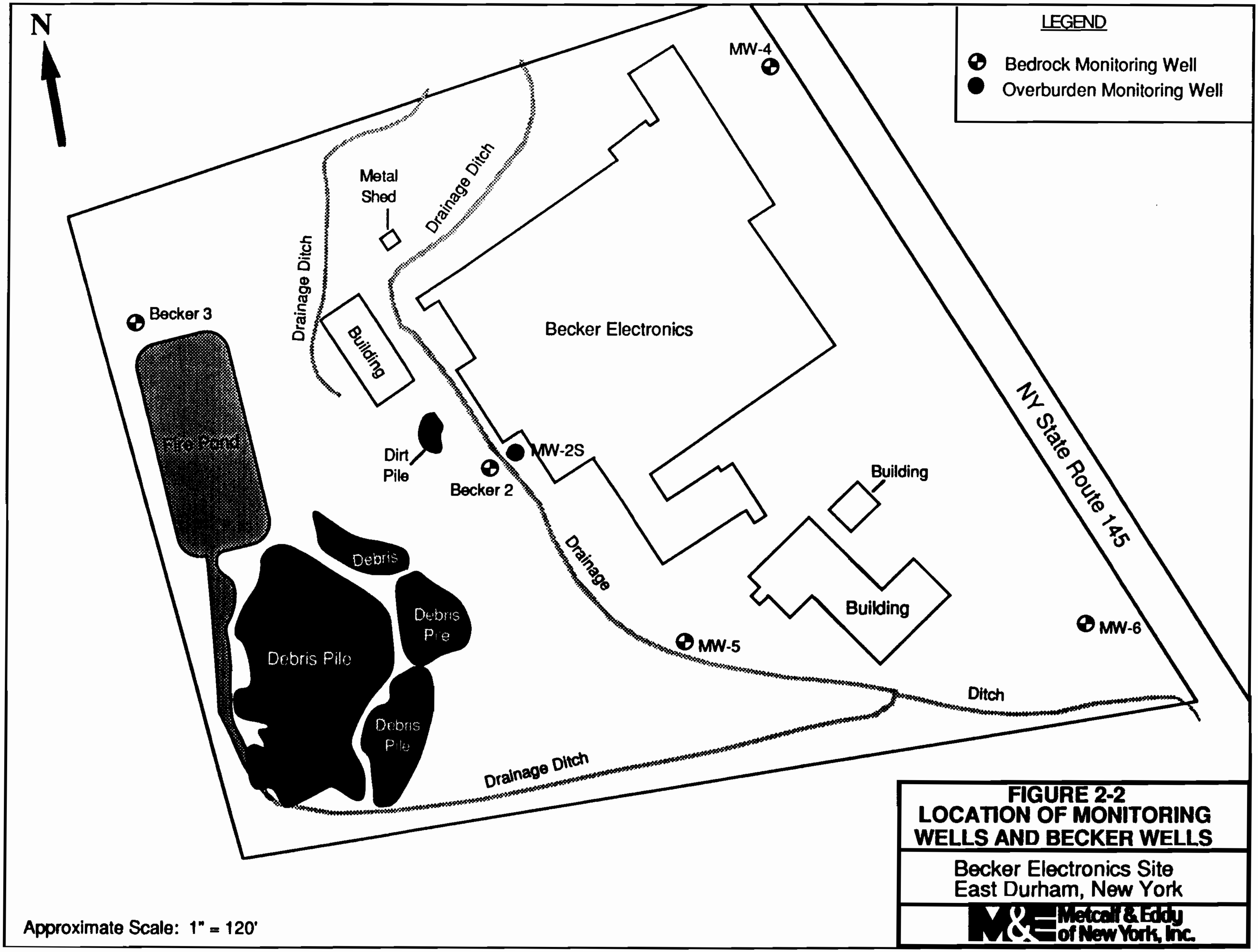


FIGURE 2-2
LOCATION OF MONITORING WELLS AND BECKER WELLS

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

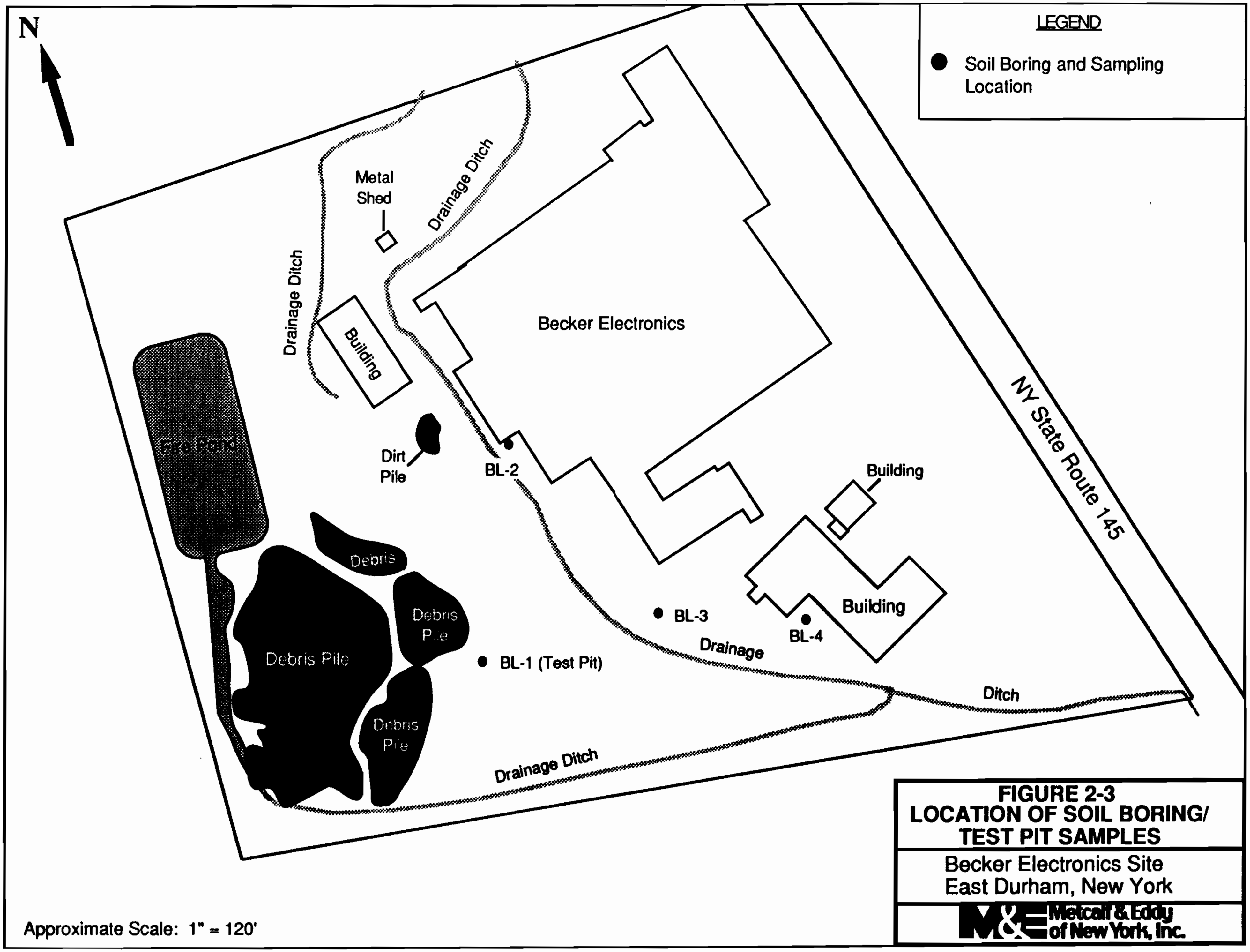


FIGURE 2-3
LOCATION OF SOIL BORING/ TEST PIT SAMPLES

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

NYSDEC site representatives requested that boring location BL-1 be moved to a location adjacent to the particle board waste pile. This area was not accessible to the drill rig and therefore, a test pit was authorized at this location. The test pit was excavated and sampled on December 3, 1990. The approximate dimensions of this excavation were 5 feet long by 3 feet wide by 3 1/2 feet deep. A sample was collected from the bottom of the excavation using a decontaminated stainless steel hand trowel.

Information regarding specific sample types and sampling depths at each location is summarized as follows:

Sample Number*	Depth of Sample	Type of Sample
BK-BL3	0-2'	split spoon soil
BK-BL4	2-4'	split spoon soil
BK-BL2	2-4'	split spoon soil
BK-BL2	4-6'	split spoon soil
BK-BL1	3.5'	test pit soil
* Note: BK = Becker BL = Boring Location 1,2,3,4 = Sample Location No.		

Due to laboratory QA/QC problems associated with the initial sampling program, all five of these locations were resampled in order to meet the data quality objectives stated in the QAPP. Resampling took place on May 1 and May 6, 1991. The samples were analyzed as follows:

Sample Number	Depth	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
BL-1	3.5'	—	1	—	—
BL-2	2-4'	1	1	—	—
BL-2	4-6'	1	1	—	—
BL-3	0-2'	1	1	—	—
BL-4	2-4'	1	1	—	—
Total		4	5	—	—

2.1.3 Groundwater Investigation

The purpose of the groundwater investigation was to obtain the data necessary to determine the nature and extent of groundwater contamination at the Becker Electronics site. Four groundwater monitoring wells consisting of one overburden and three bedrock wells were installed by M&E as part of this investigation. In addition to the four new monitoring wells, two existing Becker wells were also used to characterize subsurface conditions. The location of each of these wells are shown in Figure 2-2.

2.1.3.1 Monitoring Well Installation. A monitoring well installation program was conducted from November 15 through December 6, 1990. Due to the absence of significant thickness of overburden deposits at the site, a single overburden well was installed to enable comparisons to be drawn between the overburden and bedrock in terms of groundwater quality and hydrogeologic conditions. This well was proposed to be installed at monitoring well location MW-4; however, only 3.5 feet of overburden was observed during the installation of the bedrock well at this location. Based on the 7.5 feet of overburden thickness observed at soil boring location BL-2, and elevated OVA readings encountered during the investigation of the nearby septic tank system, a decision was reached by both M&E and NYSDEC to relocate the overburden monitoring well to this area as shown in Figure 2-2. In addition, relocating the overburden well to a position nearby the well on which the pump test would be conducted would enable the overburden well water level to be monitored during the pump test. This would provide information on any hydraulic connection with the bedrock aquifer. Installation of overburden monitoring well MW-2S was accomplished utilizing 4.25 inch I.D. hollow stem augers. The well was constructed of 2 inch I.D. stainless steel riser and 0.10 slot stainless steel screen set at a depth of 7.35 feet below grade as shown in the well construction diagram included in Appendix C. A curb box protective casing was installed at this location due to planned excavations in the immediate vicinity. MW-2S was developed in accordance with the approved Work Plan.

A total of three bedrock monitoring wells were installed at the locations specified in the Work Plan (see Figure 2-2). It was originally anticipated that bedrock monitoring well depths would be based on downhole video logging information obtained from the Weldon House Well #3. However, due to the fact that it was not possible to gain access to this well, an alternate criterion was established for determining bedrock monitoring well depths. This determination was based on the location of significantly increased rock quality designation (RQD) values with depth in the bedrock cores, as well as the observation of the presence of a siltstone marker bed, as described per an agreement between both the M&E and NYSDEC site representatives. By using this system, the screened intervals at each bedrock monitoring well location would intersect common stratigraphic sections. Due to unanticipated subsurface conditions and equipment problems, the procedures for construction of bedrock monitoring wells were modified throughout the installation program by M&E and NYSDEC field representatives. Specifically, modifications to drilling methods stated in the Work Plan included the following:

- Changed core size from HQ to NX at the MW-6 location in an effort to reduce the amount of water introduced into the borehole.
- Utilized an AX core barrel at the MW-4 location due to lack of other sizes of coring equipment on-site. A core was utilized for initial 10 feet in order to confirm bedrock. An NX core barrel was used for the remainder of the borehole.
- A 6.5 inch roller bit was used to ream the AX and NX core holes in order to set the 4-inch ID steel well casing.
- 4 inch ID steel casing was grouted 10 feet into bedrock at the MW-4 and MW-5 locations due to the incompetency of shallow bedrock.

Bedrock monitoring wells were constructed by casing off the overburden and incompetent upper bedrock surface. The high degree of competency of the bedrock allowed for an open hole well construction. Open hole well construction would also permit downhole geophysical and/or video surveys. Well construction diagrams for bedrock wells MW-4, MW-5 and MW-6 which were installed at depths of 64, 70 and 74.75 feet below grade respectively are included in Appendix C.

All of the bedrock monitoring wells were developed in accordance with the Work Plan until stabilization of physical parameters (ph, temperature, conductivity) and turbidity levels less than 50 NTUs were achieved.

2.1.3.2 Groundwater Elevation Measurements. Groundwater level measurements were recorded from each of the monitoring wells using an electronic water level indicator. Groundwater level measurements were recorded daily during each project day from November 6 to December 13, 1990, unless interrupted by on-going field investigations. Measurements were obtained periodically during the drilling, well installation, and development phases in addition to subsequent measurements made during sampling activities. A summary of these measurements is shown in Table 2-2.

2.1.3.3 Aquifer Testing Program. The purpose of the aquifer testing program was to obtain the data necessary to determine the hydrogeologic characteristics of the bedrock aquifer and the nature and extent of contamination within this zone underlying the Becker Electronics site. The aquifer testing program consisted of the following subtasks:

- Downhole video photography of existing Becker Wells
- Straddle packer testing
- Aquifer pump testing
- Measurement of groundwater water levels

Downhole Video Photography of Existing Becker Wells

A downhole video camera was utilized to determine well depth construction and aquifer characteristics including fracture zones for existing Becker Well #2 and Becker Well #3, both of which are not currently operational. These two wells served as production wells for the Becker Electronics facility. There is no well construction information available for these two wells other than the depths of well casing which were obtained through downhole video surveys. Downhole surveys were conducted on several dates beginning on November 7, 1990 and concluding on December 12, 1990. Use of downhole survey techniques was

TABLE 2-2

GROUNDWATER ELEVATION DATA

Date	Becker Well #2	Becker Well #3	MW-4	MW-5	MW-6	MW-2S
1/12/90	477.66	–	–	–	–	–
1/13	477.41	–	–	–	–	–
1/14	477.17	–	–	–	–	–
1/15	476.99	–	–	–	–	–
11/16	476.82	–	–	–	–	–
11/19	476.73	–	–	–	–	–
11/20	476.45	–	–	–	–	–
11/21	476.28	475.10	–	–	–	–
11/26	475.66	474.57	–	–	–	–
11/27	475.73	474.65	–	–	–	–
11/28	475.86	474.89	–	–	–	–
11/29	475.58	474.61	473.76	–	–	–
11/30	475.57	474.66	473.58	475.96	–	–
12/3	474.64	473.78	472.51	474.97	–	–
12/4	476.09	–	474.71	476.67	–	–
12/5	475.95	479.42	475.65	475.69	–	–
12/6	477.15	–	475.47	476.87	480.28	–
12/7	476.92	475.56	475.25	477.66	479.00	–
12/10	477.06	–	474.66	477.61	478.69	–
12/11	476.90	–	474.39	477.37	478.49	–
12/12	476.80	475.78	474.22	477.28	478.37	–
1/23/91	475.41	474.77	473.42	475.77	478.25	486.14

Note: Elevations are referenced to M.S.L.
Measurements are in feet and referenced to the top of casing.

selected as a means of obtaining information on well construction and casing depths which were not documented prior to the first phase of the RI.

The downhole equipment was rented from Colog, Inc. of Golden, Colorado and was operated by M&E personnel. The video system consisted of both a CAM 400, 3 inch O.D. color camera and a CAM 200, 1-5/8 inch O.D. black and white camera with lightheads attached to a 500 foot electric winch. The signal was sent from the downhole camera to the surface using the 4 wire-conductance cable. Once the signal was at the surface, it was displayed on a color monitor and recorded using a Panasonic VCR. It was necessary to remove the submersible pumps and rods from both wells in order to provide access for the downhole camera.

Packer Testing Program

To further define specific bedrock aquifer parameters, straddle packer tests were conducted at five foot intervals in the open bedrock core holes for each of the newly installed bedrock monitoring wells, namely, MW-4, MW-5 and MW-6.

An assembly consisting of two inflatable packers spaced five feet apart with 3/4 inch diameter steel riser was utilized for the test. The water injection rate was controlled by a pump pressure valve and gate valve attached to the riser pipe at the surface, as well as to a flow gauge to record the total amount and rate of water injected during a particular test interval. Packer inflation was controlled using compressed nitrogen at 100 psi.

Each five foot interval was tested at 5 psi, 10 psi and 15 psi above ambient pressure and then stepped back to 5 psi in order to determine any increase in permeability resulting from the test itself. This procedure was followed for all bedrock monitoring wells with the exception of MW-6, which could not be tested from 17.25 to 42 feet due to the 5.5 inch rock core hole existing over this interval. Data obtained from packer testing is provided in Appendix D.

Aquifer Pump Test

A pump test was performed from December 15-17, 1990 in order to characterize hydraulic conditions at the site and to provide the necessary data for any future groundwater pumping and treatment system design. Two existing and four newly installed wells were utilized in the test.

Test equipment consisted of an Aquistar DL4-16 digital water level recorder with corresponding pressure transducers placed in each of the six wells as follows:

- Becker Well #2 - 30 psig transducer
- Becker Well #3 - 10 psig transducer
- MW-2S - 10 psig transducer
- MW-4 - 5 psig transducer
- MW-5 - 5 psig transducer
- MW-6 - 10 psig transducer

Step-drawdown tests were conducted in Becker Well #2 in order to estimate a sustainable pumping rate for the constant rate pumping test. All groundwater withdrawn as part of pump testing was discharged into one of two 20,000 gallon storage tanks prior to treatment. A SPDES Permit (Permit #0093807) was secured by NYSDEC for the Becker Electronics site and all groundwater extracted during the investigation was treated utilizing a 2,000 lb activated carbon filter prior to discharge. Water was ultimately discharged downgradient of the site to preclude any artificial recharge to the aquifer that would potentially influence pump testing data. Becker Well #2 was tested in three steps with pumping rates being increased at 10 gpm intervals from 40 gpm to 60 gpm in order to estimate a sustainable pumping rate for the constant rate pumping test.

A constant rate pumping test was conducted in Becker Well #2 at a rate of 50 gpm for 24.5 hours. The remaining on-site monitoring wells were continuously monitored during the test and drawdown data was analyzed using the following standard methods:

- Theis Method
- Jacob Method
- Hantush-Jacob semi-log drawdown method
- Hantush-Jacob semi-log recovery method

results?

2.1.3.4 Groundwater Sampling. A total of six groundwater samples were collected; one from each monitoring well (MW-4, MW-5, MW-6 and MW-2S) and one from each Becker Well (Becker Well #2 and Becker Well #3). Figure 2-2 depicts the locations of each of the monitoring wells and Becker Wells (and groundwater samples). The following purge methods were used to evacuate three well volumes from each well utilizing 1 inch diameter endeflex tubing which was dedicated at each monitoring well:

WELL NUMBER	PURGE METHOD
Becker Well #2	Submersible Pump
Becker Well #3	Submersible Pump
MW-4	Drill Rig Centrifugal Pump
MW-5	Drill Rig Centrifugal Pump
MW-6	Drill Rig Centrifugal Pump
MW-2S	Centrifugal Pump

Measurements of temperature, pH, conductivity and turbidity were obtained after each well volume was purged. Turbidity measurements of less than 50 nephelometric turbidity units (NTUs) were achieved prior to collecting a groundwater sample from each well. Samples were collected utilizing a decontaminated teflon bailer with a teflon coated stainless steel leader. Sampling procedures were in accordance with the Work Plan.

Due to laboratory QA/QC problems associated with the initial sampling program, six groundwater locations were resampled in order to meet the data quality objectives stated in the QAPP. Resampling took place on May 2-3, 1991 and samples were analyzed as follows:

Sample Number	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
Becker #2	—	—	—	1
Becker #3	1	—	—	1
MW-4	1	1	—	1
MW-5	1	1	—	1
MW-6	—	1	—	1
MW-2S	1	1	—	1
Total	**4**	**4**	**—**	**6**

2.1.4 Surface Water and Sediment Sampling

2.1.4.1 Fire Pond Sampling. As part of the fire pond sampling program, an investigation was undertaken to ultimately determine the levels of contamination in both water and sediment in the pond. This information will be valuable should any remedial actions become necessary for the fire pond. As shown in Figure 2-4, a grid constructed of 25 foot spacings was surveyed at the pond in order to locate sampling points. Measurements of water column and sediment thickness were obtained using a weighted tape and hand auger at each grid node from November 14-19, 1990. Measurement points were accessed using a row boat. The weighted tape was used to measure water depth to the nearest inch, and sediment thickness was measured by turning the hand auger into the base of the pond until it was not possible to advance it further and using a tape measure to gauge the depth.

In order to determine the possibility of the fire pond acting as a residual contaminant source area, a total of nine samples were collected for laboratory analysis. Three surface water, three basal water, and three sediment samples were obtained on November 14, 1990. The fire pond sample locations are shown in Figure 2-4 and were designated as follows:

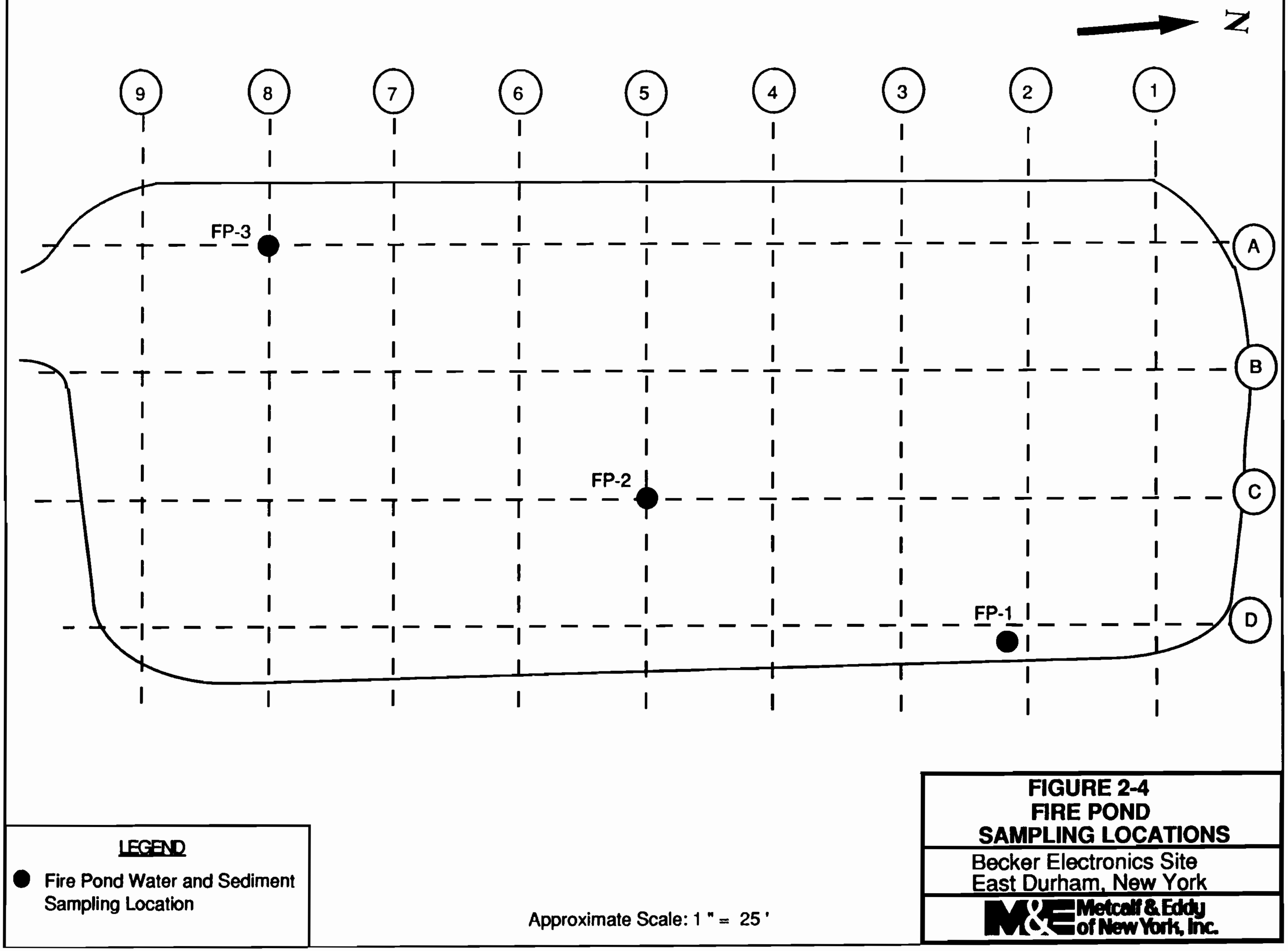


FIGURE 2-4
FIRE POND
SAMPLING LOCATIONS

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

SAMPLE NUMBER*	TYPE OF SAMPLE
BK-FP1-BW	basal water
BK-FP1-SW	surface water
BK-FP1-SD	sediment
BK-FP2-SW	surface water
BK-FP2-BW	basal water
BK-FP2-SD	sediment
BK-FP3-SW	surface water
BK-FP3-BW	basal water
BK-FP3-SD	sediment
BK-FP-EQB-BW	Equipment blank
BK-FP-EQB-SD	Equipment blank
BK-FP2-SW-Dup	Duplicate
BK-FP2-BW-Dup	Duplicate
BK-FP3-SD-Dup	Duplicate
* Note: BK = Becker 1, 2, or 3 = Sample No. BW = Basal Water	SW = Surface Water FP = Fire Pond SD = Sediment

The surface water samples were collected by immersing the sample bottle into the fire pond at the appropriate sampling location on the grid. The basal water was collected by using a stainless steel bottom sampler which was lowered by a teflon coated wire to the bottom of the fire pond. The plunger seal was manually opened with the teflon coated wire. Once the sampler was full (when no more air bubbles rose to the surface), the plunger was again seated and the sample was retrieved. This method insured that a representative basal water sample was collected. A stainless steel bucket auger was then used to collect the sediment samples from the bottom of the fire pond. All of the samples were analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL Metals, and TCL Pesticides/PCBs. In addition, pH, conductivity, turbidity and dissolved oxygen were also measured in the field.

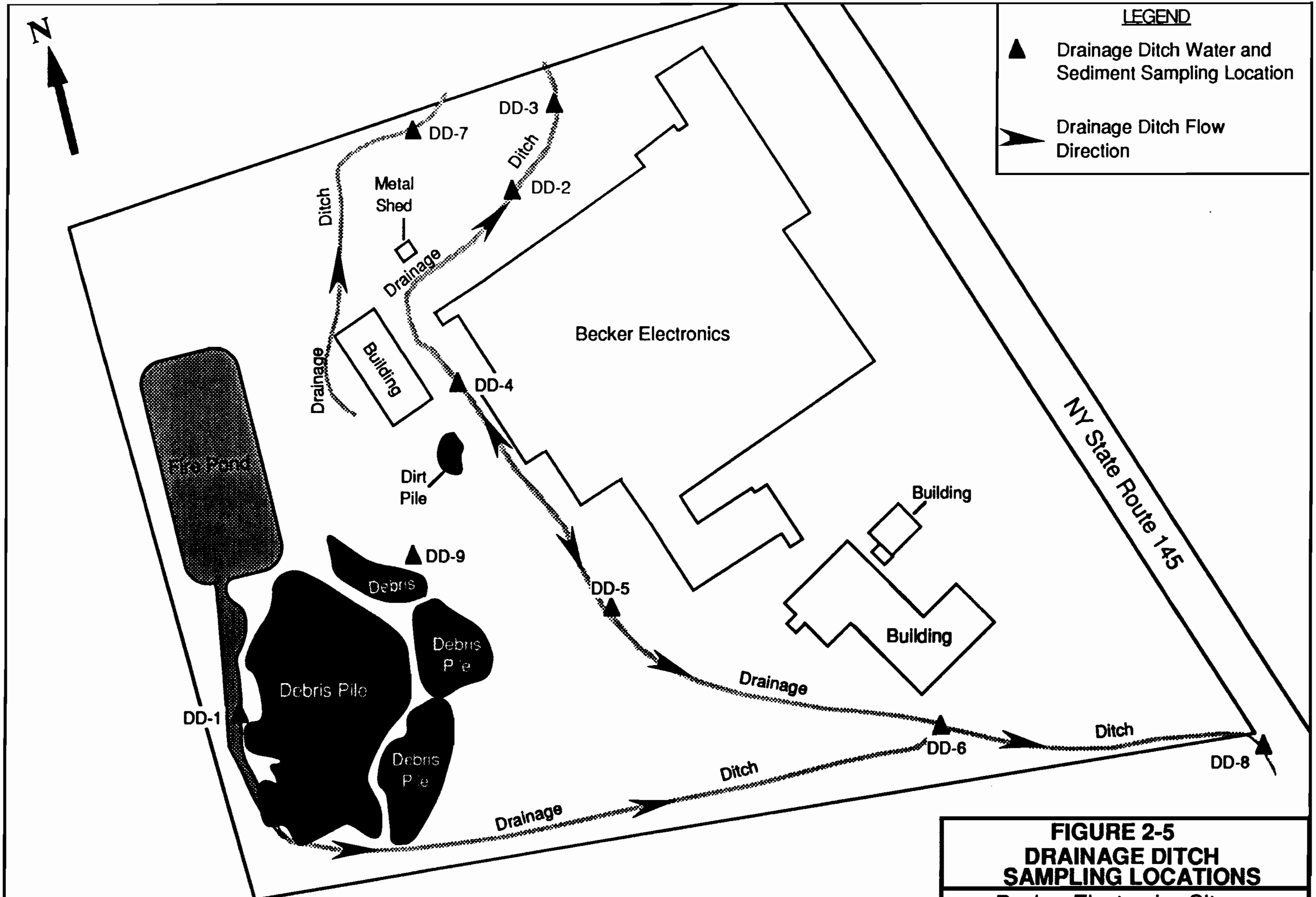
Due to problems associated with the initial sampling program, eight fire pond samples were resampled in order to meet the data quality objectives stated in the QAPP. Resampling took place on April 30 and May 1, 1991 and the samples received the following analyses:

Sample Number	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
FP-1 SW	—	—	—	1
FP-1 Sed	1	1	—	—
FP-2 SW	—	—	—	1
FP-2 BW	—	1	—	—
FP-2 Sed	1	1	—	—
FP-3 SW	—	1	—	1
FP-3 BW	—	1	—	—
FP-3 Sed	—	1	—	—
Total	2	6	—	3

2.1.4.2 **Drainage Ditch Sampling.** Samples were collected from drainage ditches located on the site in order to determine whether they might be potential residual contamination source areas and/or pathways of migration for any residual contamination. A total of 18 samples, including nine surface water and nine sediment samples were collected at nine sample locations on November 13, 15, and 16, 1990. Each of these drainage ditch sample locations are shown in Figure 2-5 and are designated as follows:

SAMPLE NUMBER*	TYPE OF SAMPLE
BK-DD1-SW	Surface Water
BK-DD1-SD	Sediment
BK-DD2-SW	Surface Water
BK-DD2-SD	Sediment
BK-DD3-SW	Surface Water
BK-DD3-SD	Sediment
BK-DD4-SW	Surface Water
BK-DD4-SD	Sediment
BK-DD5-SW	Surface Water
BK-DD5-SD	Sediment
BK-DD6-SW	Surface Water
BK-DD6-SD	Sediment
BK-DD7-SW	Surface Water
BK-DD7-SD	Sediment
BK-DD8-SW	Surface Water
BK-DD8-SD	Sediment
BK-DD9-SW	Surface Water
BK-DD9-SD	Sediment

* Note: BK = Becker; DD = Drainage Ditch; 1, 2, or 3 = Sample No.; SW = Surface Water; SD = Sediment



Approximate Scale: 1" = 120'

FIGURE 2-5
DRAINAGE DITCH SAMPLING LOCATIONS

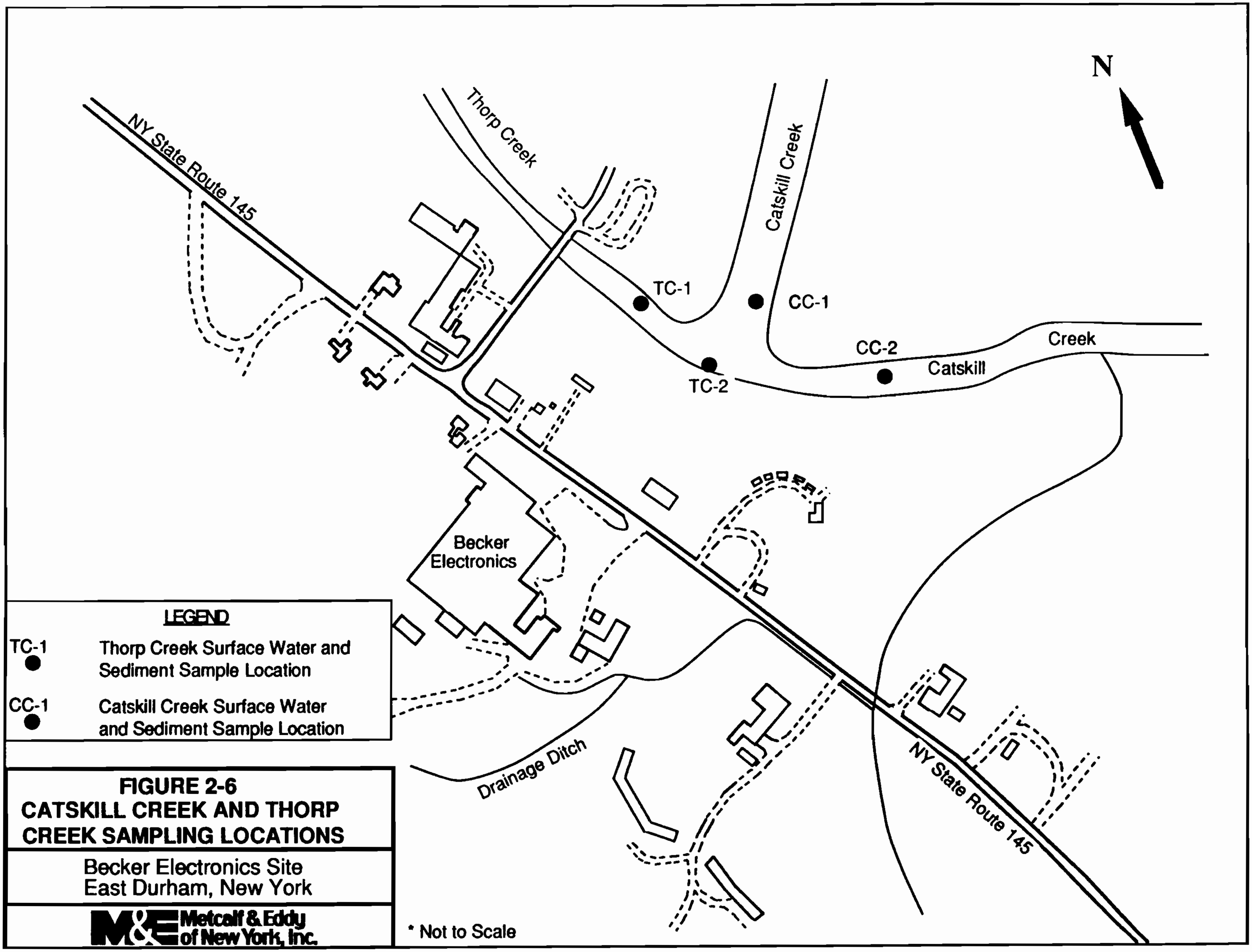
Becker Electronics Site
East Durham, New York

M&E Metcalf & Eddy of New York, Inc.

Surface water samples were collected by immersing the sample bottle below the surface of the water in the drainage ditch. Sediment samples were collected from the bottom of the drainage ditch using a stainless steel hand auger. All the samples were analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL metals, and TCL Pesticides/PCBs. Due to laboratory problems associated with the initial sampling program, 20 drainage ditch samples were resampled in order to meet the data quality objectives stated in the QAPP. Resampling took place on April 24, 1991 and the samples were analyzed as follows:

Sample Number	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
DD-1 SW	—	1	—	1
DD-2 SW	—	1	—	1
DD-2 Sed	—	1	—	—
DD-3 SW	—	1	—	1
DD-3 Sed	—	1	—	1
DD-4 SW	—	—	—	1
DD-5 SW	—	1	—	1
DD-5 Sed	—	1	—	—
DD-6 SW	—	1	—	1
DD-6 Sed	—	1	—	—
DD-7 SW	—	1	—	1
DD-7 Sed	—	1	—	—
DD-8 SW	—	1	—	1
DD-8 Sed	—	1	—	—
DD-9 SW	—	—	—	1
DD-9 Sed	—	—	—	1
DD-10 SW	—	1	—	1
DD-10 Sed	—	1	—	—
DD-11 SW	—	1	—	1
DD-11 Sed	—	1	—	—
Total	—	19	—	18

2.1.4.3 **Catskill Creek and Thorp Creek Sampling.** In order to determine the impact, if any, of residual contamination from the site on Catskill Creek and Thorp Creek, four samples were obtained from these surface water bodies on November 19, 1990. In relation to the site, an upstream and downstream location was sampled in each creek. The sample locations in each creek are shown in Figure 2-6 and are designated as follows:



LEGEND

TC-1 ●	Thorp Creek Surface Water and Sediment Sample Location
CC-1 ●	Catskill Creek Surface Water and Sediment Sample Location

FIGURE 2-6
CATSKILL CREEK AND THORP CREEK SAMPLING LOCATIONS

Becker Electronics Site
East Durham, New York

M&E Metcalf & Eddy of New York, Inc.

Sample Location Number*	Type of Sample
BK-TC-1-SW	Surface Water
BK-TC-1-SD	Sediment
BK-TC-2-SW	Surface Water
BK-TC-2-SD	Sediment
BK-CC-1-SW	Surface Water
BK-CC-1-SD	Sediment
BK-CC-2-SW	Surface Water
BK-CC-2-SD	Sediment
* Note: BK = Becker; TC = Thorp Creek; CC = Catskill Creek	1 or 2 = Sample No.; SW = Surface Water; SD = Sediment

Surface water samples were collected by immersing the sample bottle below the water surface of the creek. Sediment samples were collected from the bottom of the creek using a stainless steel hand auger. All of the samples were analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL Metals, and TCL Pesticides/PCBs. Due to laboratory problems associated with the initial sampling program, nine locations were resampled in order to meet the data quality objectives stated in the QAPP. Resampling occurred on April 26, 1991 and the samples were analyzed as follows:

Sample Number	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
TC-1 SW	—	1	—	1
TC-1 SED	1	—	—	—
TC-2 SW	—	—	—	1
TC-2 SED	1	—	—	—
CC-1 SW	—	1	—	1
CC-1 SED	1	1	—	—
CC-2 SW	—	—	—	1
CC-2 SED	1	1	—	—
Total	4	4	—	4

2.1.5 Air Monitoring

An air monitoring program was implemented in order to establish ambient air quality conditions at various locations within the boundary of the site during field activities. The air monitoring field instrumentation utilized consisted of a Foxboro Model 128 organic vapor analyzer (OVA).

2.1.6 Waste Management

Waste management procedures were implemented for the two types of waste generated (solid and liquid) during investigative activities. Solid waste management consisted of handling drill cuttings generated during soil boring and monitoring well installation activities, as well as disposable PPE equipment and sampling materials. Liquid waste management involved the collection, storage, and treatment of decontamination water, as well as the water generated from monitoring well pump tests, and development and purge water generated during well installation and sampling.

2.1.6.1 Solid Waste. Management of solid wastes (including disposable PPE equipment and sampling materials, soils, and drill cuttings) generated during the field activities is described below.

General Refuse and Personnel Protective Equipment (PPE)

The Work Plan specifies that PPE was to be containerized for disposal at a later date. Upon selecting MacDonald Sanitation of East Windham, New York as the refuse vendor for the site, it was discovered that the final refuse destination was an incinerator located in Springfield, Massachusetts. The NYSDEC representative investigated and identified the final refuse destination as the Springfield Resource Recovery Incinerator, an approved RCRA facility. Based upon knowledge of the waste stream and types of contaminants detected, NYSDEC deemed the PPE waste to be RCRA non-hazardous. The NYSDEC representative then authorized M&E to bag and dispose of the disposable PPE material in the general refuse shipments. It should be noted that several drums containing PPE and disposable sampling equipment generated during the May 1991 resampling program remain at the site and will be disposed of as part of the Phase II RI.

Soils

All borehole soils were placed in 55 gallon DOT approved drums. Five drums containing drill cuttings are currently staged at the Becker Electronics site until disposal methods are identified later in the project.

2.1.6.2 Liquid Waste. Management of liquid wastes (including decontamination, pump test, purge and development water) generated during field activities is described below.

On-site Treatment System

Approximately 125,000 gallons of water were generated during the Phase I RI. Water generated during the investigation included decontamination water and monitoring well pump test, purge and development water. The liquid waste management program provided for all water to be treated on-site and to be discharged in accordance with an approved State Pollutant Discharge Elimination System Permit (SPDES). A NYSDEC SPDES permit was obtained by the NYSDEC Project Manager for use at the site. The permit outlined effluent sampling frequency and monitoring requirements. Water treatment and discharge during the first phase RI was performed in accordance with the SPDES permit issued.

The treatment system consisted of two 20,000 gallon holding tanks, a jet transfer pump, and a 2,000 pound Calgon liquid phase activated carbon filter. The water was transferred from various work areas directly into the holding tanks. A jet type transfer pump was used to pump the water from the holding tanks to the carbon filter. PVC pipe was used to rig the holding tanks, pump and carbon filter. The water was treated at a rate of approximately 25 GPM. All of the decontamination, purge, pump test and development water was staged in the holding tanks until the SPDES permit was obtained and the water could be treated.

2.1.7 Quality Assurance/Quality Control Procedures

As part of the Work Plan, a Quality Assurance Project Plan (QAPP) was prepared which developed and described the detailed sample collection protocols and analytical procedures to be used to ensure that high quality and valid data would be collected as part of this project. All work undertaken during the Phase I RI was performed in accordance with the procedures outlined in the QAPP.

2.1.8 Health And Safety Program

Prior to the Phase I RI and as part of the Work Plan, a Health and Safety Plan was prepared in order to establish occupational health and safety requirements, responsibilities, and procedures to protect workers during the field investigation at the Becker Electronics site. The requirements for worker health and safety were based on the following:

- The Standard Operating Safety Guides, U.S. Environmental Protection Agency (EPA), Office of Emergency and Remedial Response, November, 1984;
- The Occupational Health and Safety Administration (OSHA) Regulations, 29 CFR Parts 1019.120 and 1926;
- Health and Safety Manual for Hazardous Waste Projects, Metcalf & Eddy, April, 1987
- Superfund Amendments and Reauthorization Act (SARA), Title I, Section 126.

All activities associated with the Phase I RI were performed in accordance with this Health and Safety Plan.

2.2 IMPLEMENTATION OF IRMs

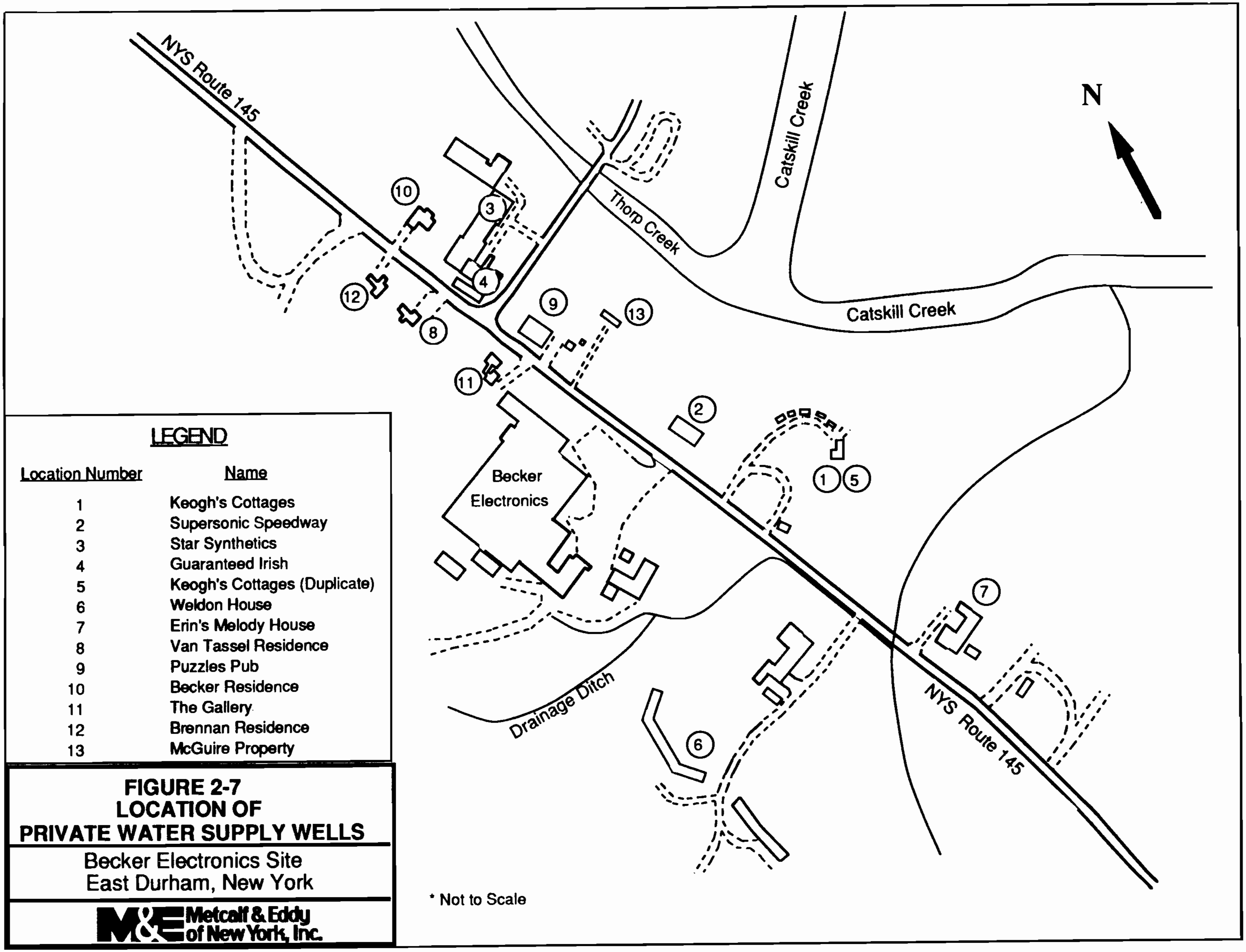
2.2.1 Container Management

At some time between submittal of the Work Plan in October 1990 and the Phase I RI field investigation mobilization on November 1, 1990, the containers scheduled for overpacking and staging were removed from the site by unknown sources. As a result, this IRM was not necessary at that time.

2.2.2 Private Water Supply Treatment

2.2.2.1 Treatment System Installation and Maintenance. On November 6, 1990, M&E (and a subcontractor, Aquascience, Inc.) inspected the existing granular activated carbon (GAC) treatment systems in the homes and businesses surrounding the Becker Electronics site whose private water supply wells had been impacted by contamination from the site. The purpose of this inspection was to gather information on each of the treatment systems in order to prepare a carbon replacement and system maintenance program for the affected private wells. The area surrounding the site is a summer resort community and therefore, many of the locations are closed or vacant during the off-season. Figure 2-7 shows the locations of residences and business establishments in the study area with private water supply wells. Provided below is a brief description of the six locations that contained GAC systems, details on the existing GAC system characteristics, and a description of the seven locations that did not contain treatment systems:

- Keogh's Cottages - This site consists of a main house and 5 separate cottages, all served by one treatment system located in the basement of the main house.
- Supersonic Speedway - This site is a small amusement park consisting of the main building which serves as a fast food restaurant, a small go-cart track, batting cages and mini-golf course. The treatment system is housed in the rear of the main building.
- Star Synthetics Manufacturing - This site consists of a machine shop and a warehouse for the manufacturing and storage of nylon



LEGEND

Location Number	Name
1	Keogh's Cottages
2	Supersonic Speedway
3	Star Synthetics
4	Guaranteed Irish
5	Keogh's Cottages (Duplicate)
6	Weldon House
7	Erin's Melody House
8	Van Tassel Residence
9	Puzzles Pub
10	Becker Residence
11	The Gallery
12	Brennan Residence
13	McGuire Property

FIGURE 2-7
LOCATION OF
PRIVATE WATER SUPPLY WELLS

Becker Electronics Site
East Durham, New York

M&E Metcalf & Eddy of New York, Inc.

rope. There was no water treatment system present at this site during the initial inspection.

- Guaranteed Irish - This site consists of an upstairs retail store (gift shop) and basement apartment and storage room. There was no water treatment system present at this site during the initial inspection.

- Weldon House - This site consists of a main house (consisting of a three story hotel and cafeteria) and two separate single story buildings containing 8-10 units each. One treatment system, located in a wash room of one of the single story units, serves all three buildings.

- Erin's Melody Inn - This site is a multi-unit motel. There was no water treatment system present at this site during the initial inspection, except for a chlorinator.

- Becker Residence - This site is a single story private residence. There was no water treatment system present at this site during the initial inspection, only an in-line fabric filter.

- The Gallery - This site consists of a two story house and attached garage. The first floor is used as an art gallery and gift shop, while the second floor is used as an apartment. The water treatment system is located in the basement.

- Van Tassel Residence - This site is a private residence. There was no water treatment system present at this site during the initial inspection.

- Eileen's/O'Neils Restaurant (now Puzzles Pub) - This site is a single story building with basement and is used as a restaurant and bar. The water treatment system is located in the basement.

- Moran Residence (McGuire Property) - This site is a private residence consisting of a single story building and separate shed. The shed houses the water treatment system.

- Russell Residence - This site is a private residence. It was sampled by the NYSDOH in 1981 and again in 1988. The results of these samples indicated that there was no contamination in the well. There was no water treatment system at this site and the NYSDEC representative instructed M&E not to investigate or sample this site based on previous sample results.

- Brennan Residence - This site ia a private residence. There is no water treatment system present at this location.

Based on the observations made during the initial inspection and a review of existing NYSDOH records, M&E recommended to NYSDEC that many of the existing

GAC systems be upgraded and that some locations that did not have treatment be fitted with complete GAC systems. After receiving NYSDEC approval to proceed, M&E completed a review of acceptable subcontractors, prepared a bid document for the work to perform the necessary modifications and installations, and solicited bids. Bids were received, reviewed and evaluated and Megohmetrics Corp. was selected to perform the work.

In April and early May of 1991, M&E and Megohmetrics inspected all of the GAC systems at the impacted properties. Based on the observations made during this inspection and the analytical results of samples obtained by M&E (in early May) at each of the private well locations, M&E made recommendations to NYSDEC to have several systems modified, carbon replaced in several systems and to install a new system at one location. After NYSDEC and NYSDOH approval to proceed, system modifications/installations were completed by Megohmetrics under M&E oversight in May 1991. Table 2-3 summarizes the treatment system maintenance and installation schedule completed as an IRM during the Phase I Remedial Investigation.

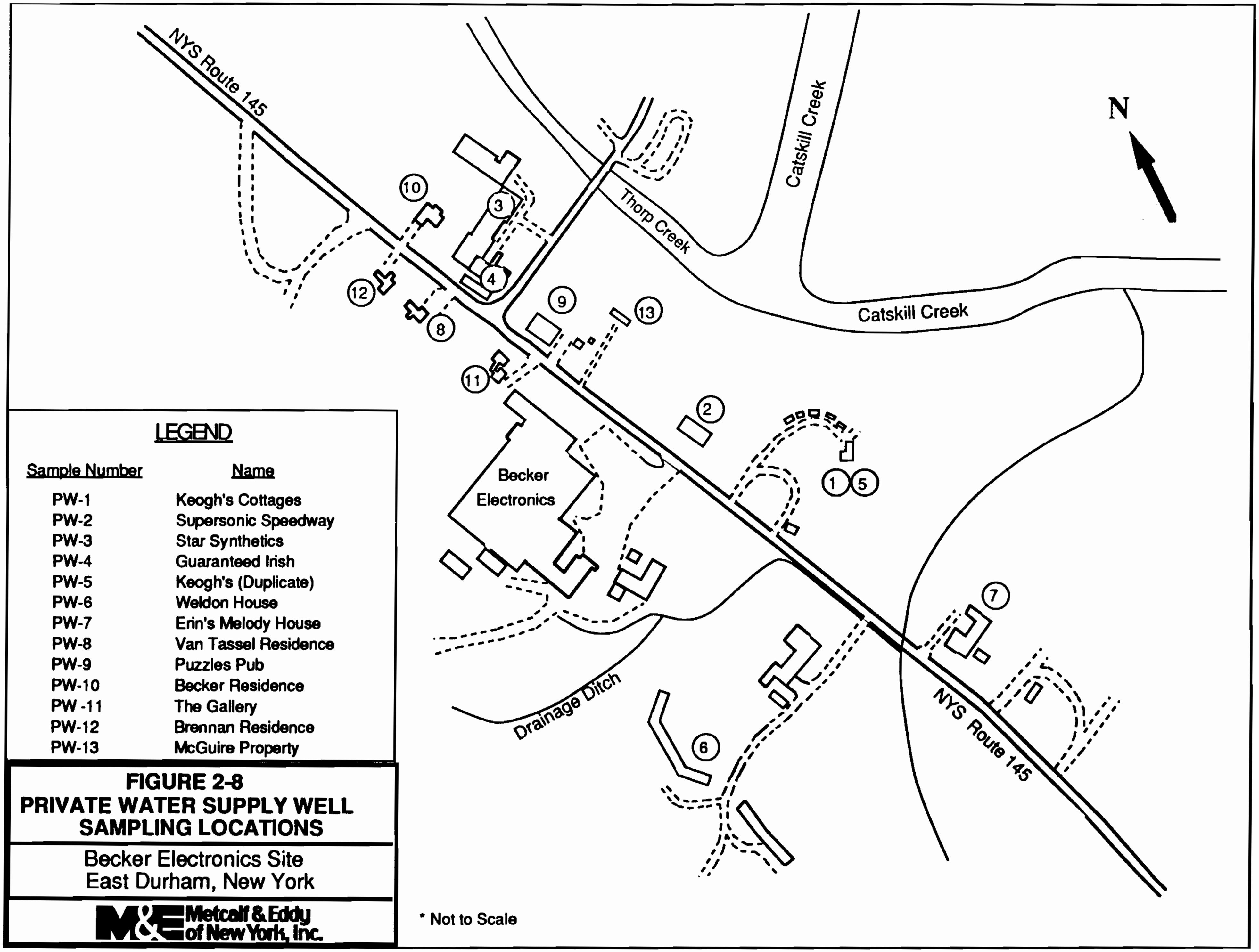
On August 29, 1991, M&E sampled the private wells as part of the scheduled GAC monitoring program. Based on the analytical results of these samples, M&E recommended that new systems be installed at two locations, that additional equipment be installed on two existing systems, and that the carbon be replaced at one location. The new installations were deemed necessary by NYSDEC and NYSDOH and the additional work was approved. Table 2-3 summarizes the additional treatment systems installed at the respective locations.

It should be noted that as part of the GAC system maintenance program, all of the systems are scheduled for maintenance in March, 1992.

2.2.2.2 **Private Water Supply Sampling**. As part of the sampling program, M&E obtained samples from the private water supply wells surrounding the Becker Electronics site in November 1990, May 1991 and August 1991. The private water supply sampling locations are shown in Figure 2-8. Because this is a summer resort community, many of the private wells were not accessible in

TABLE 2-3
PRIVATE WATER SUPPLY TREATMENT
TREATMENT INSTALLATION/MAINTENANCE SUMMARY

Private Well Location	Private Well ID	Nov 1990	May 1991	Aug 1991
Keogh's Cottage	PW-1	2, 3.3 cu. ft. GAC adsorbers, water meter, chlorinator	GAC replacement and UV disinfection system added	---
Supersonic Speedway	PW-2	2, 4.0 cu. ft. GAC adsorbers, chlorinator	GAC replacement and UV disinfection system added	Water meter added
Star Synthetics	PW-3	No system	No system	2, 2.0 cu. ft. GAC adsorbers, water meter, particulate (fabric) filter and UV disinfection added
Guaranteed Irish	PW-4	No system	No system	2, 2.0 cu. ft. GAC adsorbers, water meter particulate (fabric) filter and UV disinfection
Weldon House	PW-6	2, 10 cu. ft. GAC adsorbers, chlorinator	GAC replacement	---
Erin's Melody House	PW-7	Chlorinator	---	---
Van Tassal Residence	PW-8	No system	No system	No system
Puzzles Pub	PW-9	2, 2.0 cu.ft. GAC adsorbers, chlorinator	GAC replacement and particulate (fabric) filter, water meter and UV disinfection added	---
Becker Residence	PW-10	Particulate (fabric) filter	2, 2.0 cu. ft. GAC adsorbers, water meter and UV disinfection system added	---
The Gallery	PW-11	2, 2.0 cu. ft. GAC adsorbers, chlorinator	---	GAC replacement, particulate (fabric) filter and UV disinfection added
Brennan Residence	PW-12	No system	No system	No system
McGuire Property	PW-13	2, 2.0 cu. ft. GAC adsorbers, particulate (sand) filter	---	---



LEGEND

Sample Number	Name
PW-1	Keogh's Cottages
PW-2	Supersonic Speedway
PW-3	Star Synthetics
PW-4	Guaranteed Irish
PW-5	Keogh's (Duplicate)
PW-6	Weldon House
PW-7	Erin's Melody House
PW-8	Van Tassel Residence
PW-9	Puzzles Pub
PW-10	Becker Residence
PW -11	The Gallery
PW-12	Brennan Residence
PW-13	McGuire Property

FIGURE 2-8
PRIVATE WATER SUPPLY WELL SAMPLING LOCATIONS

Becker Electronics Site
East Durham, New York

M&E Metcalf & Eddy of New York, Inc.

* Not to Scale

November 1990. Except where noted, samples were analyzed for volatile organic compounds using EPA Method 524.2. Table 2-4 summarizes the results of sample analysis performed during the aforementioned periods.

2.2.3 Septic System Investigation and Sampling

A review of project files and documents indicated the presence of three septic systems at the Becker Electronics site. The approximate locations of these septic systems are shown in Figure 2-9. This information was obtained from a draft SPDES permit (#NY-0093807) for Becker Electronics dated July 3, 1984. According to the permit, two septic systems, designated as discharge outfalls #001 and #002 were permitted for sanitary waste with a total maximum discharge of 2,000 gallons per day (1,000 gpd maximum per each system). Although these systems were permitted to receive only sanitary waste, they are believed to have received industrial wastewater. The remaining septic system, discharge outfall #003, was permitted as an industrial waste discharge with a daily maximum rate not to exceed 250 gpd. These three septic systems were sampled to evaluate them as potential residual contaminant source areas. The excavation work was initially performed in level "C" and downgraded when OVA readings remained below 1 ppm.

The septic system referred to as SPDES #002 was designated as Septic System #1 (ST-1) during the Phase I RI. This system was excavated and sampled on November 7, 1990. A John Deere model 310A backhoe was used to uncover the junction box and excavate a distribution box and a lateral in the leaching field.

Three laboratory samples were collected from ST-1. The samples were collected from the brick-lined junction box using a teflon sampling bucket on an extended 8 foot teflon rod. One sample was collected from the water (ST-1-SW) in the junction box and the second sample was a sediment sample (ST-1-SD) collected from the bottom of the junction box. The third sample was a soil sample (ST-1-SL) collected using a stainless steel trowel underneath the 4" PVC lateral in the leaching field. These sample locations are shown in Figure 2-9 and are summarized as follows:

TABLE 2-4
PRIVATE WATER SUPPLY TREATMENT
SAMPLING RESULTS - 1,1,1-TRICHLORETHANE & 1,1-DICHLROETHANE*

Private Well Sample Location	Sample ID	Nov 1990** TCA	Nov 1990** DCA	May 1991 TCA	May 1991 DCA	Aug 1991 TCA	Aug 1991 DCA
Keogh's Cottages/Duplicate	PW-1F/PW-5F	ND	42	ND/ND	29/23	5.8/5.4	30/27
	PW-1M/PW-5M	ND	29	ND/ND	30/27	ND/ND	ND/ND
	PW-1L/PW-5L	ND	ND	ND/ND	29/24	ND/ND	ND/ND
Supersonic Speedway	PW-2F	2	ND	1.6	ND	4.0	2.2
	PW-2M	ND	ND	ND	0.5	ND	9.9
	PW-2L	ND	ND	ND	ND	ND	ND
Star Synthetics	PW-3F	1.0J	1.0J	ND	3.0	ND	3.4
	PW-3M	NA	NA	NA	NA	NA	NA
	PW-3L	NA	NA	NA	NA	NA	NA
Guaranteed Irish	PW-4F	NS	NS	ND	2.4	4.3	ND
	PW-4M	NA	NA	NA	NA	NA	NA
	PW-4L	NA	NA	NA	NA	NA	NA
Weldon House	PW-6F	NS	NS	0.6	55	1.3	60
	PW-6M	NS	NS	ND	32	ND	50
	PW-6L	NS	NS	0.5	35	ND	2.3
Erin's Melody House	PW-7F	NS	NS	ND	ND	NS	NS
	PW-7M	NA	NA	NA	NA	NA	NA
	PW-7L	NA	NA	NA	NA	NA	NA
Van Tassel Residence	PW-8F	NS	NS	ND	ND	NS	NS
	PW-8M	NA	NA	NA	NA	NA	NA
	PW-8L	NA	NA	NA	NA	NA	NA
Puzzles Pub	PW-9F	NS	NS	ND	3.3	1.5	2.5
	PW-9M	NS	NS	ND	3.6	ND	ND
	PW-9L	NS	NS	2.6	3.7	ND	ND
Becker Residence	PW-10F	NS	NS	ND	14	0.8	ND
	PW-10M	NA	NA	NA	NA	ND	ND
	PW-10L	NA	NA	NA	NA	ND	ND
The Gallery	PW-11F	NS	NS	22E	5.4	12	4.2
	PW-11M	NS	NS	ND	0.6	ND	1.2
	PW-11L	NS	NS	ND	0.5	ND	ND
Brennan Residence	PW-12F	NS	NS	ND	ND	NS	NS
	PW-12M	NA	NA	NA	NA	NA	NA
	PW-12L	NA	NA	NA	NA	NA	NA
McGuire Property	PW-13F	NS	NS	NS	NS	4.1	8.0
	PW-13M	NS	NS	NS	NS	ND	ND
	PW-13L	NS	NS	NS	NS	ND	ND

NS - Not Sampled
ND - Non detected at or above MDL
NA - Not Applicable
F - Pretreatment Sample
M - Intermediate Sample

L - Post Treatment Sample
E - Concentration exceeded calibration range of instrument
J - Estimated Concentration

* Does not represent all analytes described above CRQL. Analytical results for all detected compounds appears in "Phase I Remedial Investigation Report, Appendix G."

** TCL Volatiles analysis performed

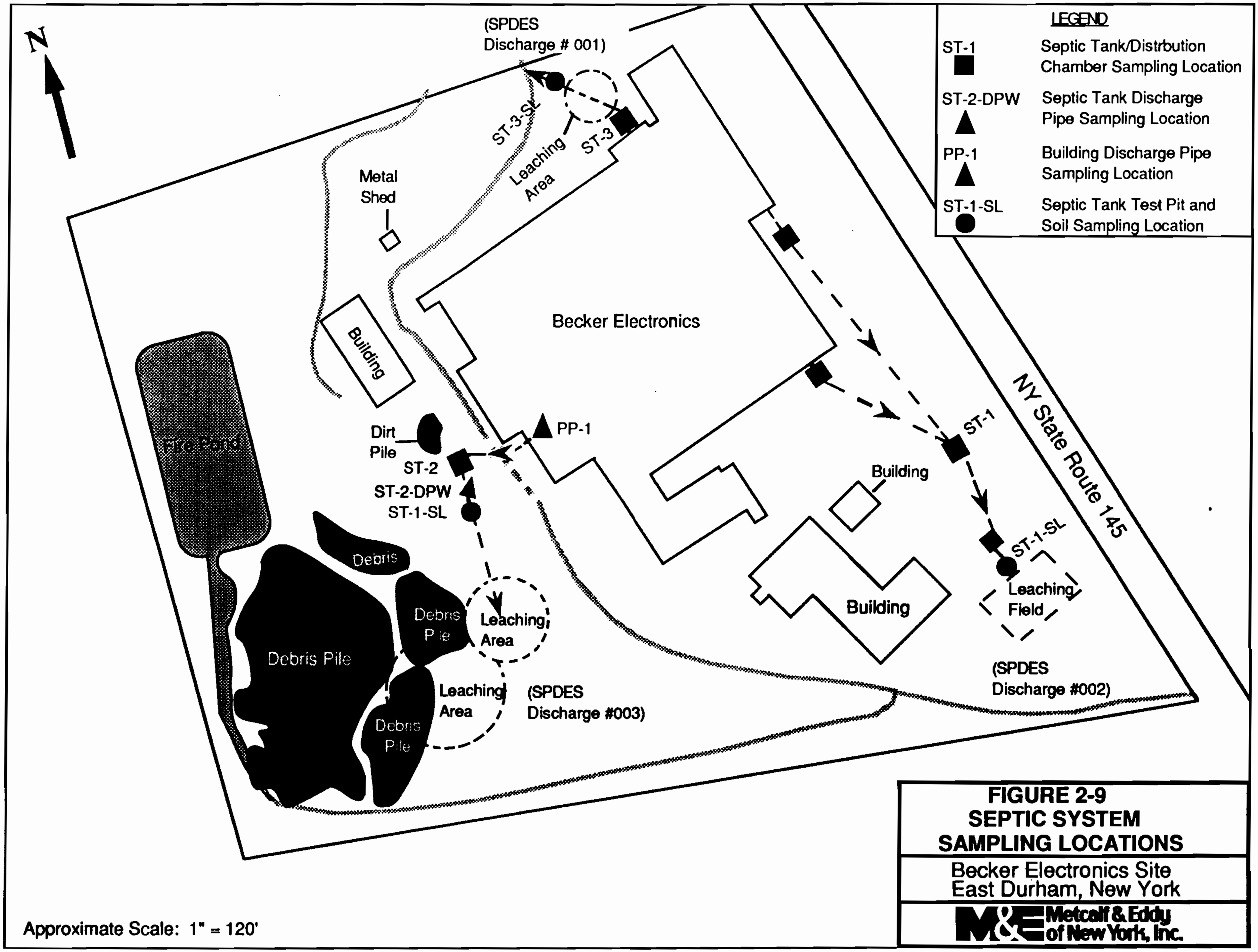


FIGURE 2-9
SEPTIC SYSTEM
SAMPLING LOCATIONS

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

Sample Location Number*	Type of Sample		
BK-ST1-SW	Water		
BK-ST1-SD	Sediment		
BK-ST1-SL (TP)	Soil		
* Note: BK = Becker SD = Sediment	ST = Septic Tank TP = Test Pit Samples	SW = Water SL = Soil	

The septic system referred to as SPDES #001 was designated as Septic System #3 (ST-3) during the Phase I RI. This septic system was excavated and sampled on November 8, 1990. The John Deere was used to open the top of the septic tank and excavate in the leaching field.

Three laboratory samples were collected from ST-3. The samples were collected from the concrete holding tank using a long handled teflon scoop. One water sample (ST-3-SW) was collected from in the holding tank and a sediment sample (ST-3-SD) was collected from the bottom of the tank. The third sample was a soil sample (ST-3-SL) collected using a stainless steel trowel underneath the 4" PVC outfall pipe along the drainage ditch. These sample locations are shown in Figure 2-9 and are summarized as follows:

Sample Location Number*	Type of Sample
BK-ST3-SW	Water
BK-ST3-SD	Sediment
BK-ST3-SL (TP)	Soil
* Note: BK = Becker SW = Water SL = Soil	ST = Septic Tank SD = Sediment TP = Test Pit

Sample BK-ST3-SL (TP) was not collected in the leaching field as specified in the Work Plan. When the leaching field was excavated, it was discovered that the laterals were solid 4" PVC pipe. This solid PVC pipe was traced to the drainage ditch/swale west of the septic tank. Apparently, the outlet on the septic tank was piped directly to the drainage ditch. A field decision was made by M&E and approved by the NYSDEC representative that the soil sample location be relocated to underneath the PVC septic outfall pipe at the drainage ditch.

The septic system referred to as SPDES #003 was designated as Septic System #2 (ST-2) during the Phase I RI. This septic system was outlined in the draft permit to receive industrial waste with a permitted discharge rate of 250 gallons per day.

An attempt was made to locate this septic tank on November 8, 1990. The backhoe was used to excavate two test pits at locations where information from project files indicated the septic tank may be located; however, the tank could not be located. A 4 inch PVC line was identified inside the Becker building and was suspected to be a potential discharge pipe to the unfound septic tank. This pipe was uncovered where it exited the building using the backhoe. A PVC to metal connector was uncovered where the pipe exited the building. A metal pipe from the connector was uncovered for approximately 15 linear feet. The direction and depth of the pipe suggested that it could have been a water supply line for Becker Well #2. As a result, the excavation process was halted and the excavation was backfilled. During the excavation, elevated OVA readings were detected in the sustained breathing zone, indicating the possible existence of residual contamination.

As a result of discussions between M&E and NYSDEC, it was decided that it was necessary to confirm whether or not the metal pipe was connected to Becker Well #2. On November 16, 1990, an excavation was commenced adjacent to Becker Well #2. A 1 inch metal pipe was uncovered that penetrated the casing in Becker Well #2. This metal pipe was on the north side of the well and was approximately three feet below grade. Further excavation revealed that approximately five feet from Becker Well #2, the metal pipe contained a 90 degree elbow. At this point, it was clear that the pipe which exited the building did not connect to Becker Well #2. The pipe that penetrated Becker Well #2 was removed and the area surrounding the casing was sealed with bentonite slurry grout and backfilled.

On November 19, 1990, the NYSDEC representative directed M&E to cut and sample the PVC discharge pipe located in the building. When the pipe was cut, it was discovered to be 1/2 to 3/4 full of sediment. A sample was taken of this sediment and analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL Metals and TCL Pesticides/PCBs.

Upon NYSDEC approval, M&E remobilized the backhoe to continue uncovering the metal pipe that exited the Becker building. On December 3 and 4, 1990, the original excavation was re-opened and the end of the metal pipe was found to enter an underground storage container of unknown construction and type. According to information obtained from project documents and files, it appeared that this underground storage container was the septic system referred to as SPDES #003, and /or possibly part of an oil/water separator.

A dye test was performed on December 4, 1990, and the results of this test confirmed that the PVC pipe inside the building joined with the metal pipe that was excavated, and that this metal pipe entered the underground container known as SPDES #003 (also know as ST-2 as part of this investigation).

Further inspection of this underground container indicated that it was a buried 55 gallon drum with the drum bottom removed. The drum bottom opened into a storage vessel of unknown construction. The storage vessel had an exit discharge pipe and a sump pump. The discharge point of this vessel was unknown, but the pipe was believed to discharge to the leaching field(s) in the vicinity of the debris piles (see Figure 2-9).

On December 5, 1990, two samples were collected from this area. One sediment sample was collected from the bottom of the underground storage vessel using a stainless steel hand-bucket auger. The other sample was a soil sample collected from the 6"-12" interval along the north side of the 55 gallon drain in a visibly stained area. This sample was collected using the stainless steel hand bucket auger. It was decided by the M&E site manager and the NYSDEC representative that a water sample from the storage vessel would not be a representative sample due to runoff water from the excavation entering the storage tank. Therefore, a surface water sample was not collected. These sample locations are shown in Figure 2-9 and are summarized as follows:

Sample Location Number*	Type of Sample
BK-PP-1	Sediment
BK-ST2-SD	Sediment
BK-ST2-TP	Soil

* Note: BK = Becker; SD = Sediment; TP = Test Pit; ST = Septic Tank; PP = PVC Pipe in building; 1,2 = Sample No.

All of the septic system samples were analyzed for TCL Volatile Organics, TCL Semivolatile Organics, TCL Metals, and TCL Pesticides/P2CBs. Due to problems associated with the initial sampling program, locations were resampled in order to meet the data quality objectives stated in the QAPP. Resampling occurred on May 6-7, 1991 and samples were analyzed as follows:

Septic System Resampling Program Analysis				
Sample Number*	Volatiles	Semivolatiles	Metals	Pesticides/PCBs
ST-1 SW	—	1	—	—
ST-1 SED	—	1	—	—
ST-1 SL	—	1	—	—
PP-1	—	1	—	—
ST-2 SED	1	1	—	—
ST-2 SL	1	1	—	—
ST-2 DPW	1	1	—	—
ST-3 SW	—	1	—	1
ST-3 SED	—	1	—	—
ST-3 SL	—	1	—	—
ST-4 SL	—	1	—	—
Total	3	11	—	1

* Note: SW = Water From Septic Tank; SL = Soil from Test Pit; DPW = Water From Discharge Pipe at ST-2; SED = Sediment/Sludge From Septic Tank; PP= Sediment From PVC Pipe from Building

It is important to note that during the resampling program, additional excavation was performed in the vicinity of septic tank system ST-2. As a result, the discharge pipe from the underground vessel (known as septic tank ST-2) was uncovered and identified as black endeflex hose (approximately 2-

inch diameter). Further excavation indicated that this hose exits ST-2 and runs below grade in the direction of the leaching field(s) located in the vicinity of the debris piles. It was deduced that when the system was in operation, the industrial wastes were collected in the underground tank (ST-2) and then pumped, via the sump pump and endeflex hose, to the leaching field(s) near the debris piles. The sample designated ST-2-DPW was a water sample obtained from this discharge pipe/hose.

2.2.4 Underground Storage Tank Investigation

An underground storage tank and fill pipe were located by M&E under a concrete paved area outside a boiler room along the southeast side of the main building. A wooden staff was lowered into the fill pipe and it was determined that the tank still contained some product. Based on the location of this tank being outside a boiler room, it is likely that the tank contains fuel oil.

In addition, it is important to note that a fuel (gas) pump was found at the front of a small building/garage located in the southeast portion of the site. This building also contained an attached drum storage area. It is not known whether an underground storage tank is still present near this pump, and further investigation may be warranted.

Section Three

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

3.1 RESULTS OF FIELD ACTIVITIES/PHYSICAL CHARACTERISTICS

3.1.1 Surface Features

The Becker Electronics site is characterized by relatively flat topography in the extreme western portion of the site; a westward sloping scarp which is located immediately behind the main Becker building and wraps around the northwest and southwest sides of the building; and a generally flat surface comprising the eastern half of the site which is occupied by two smaller buildings, work areas, lawns, and paved and gravel parking areas (refer to topographic map of site in Appendix A).

Due to past disposal activities, several debris piles are located on the southwestern portion of the site (refer to Figure 1-2) which can be accessed by means of an unpaved dirt road. Structures present at the site include a cluster of four buildings, a silo and a small pump house.

A fire pond is located in the northwestern portion of the site. There are four drainage ditches located on the site. The first drainage ditch flows south from the outlet of the fire pond along the western boundary of the property and then east along the southern property boundary. The second drainage ditch flows southeast from the center of the site, along the base of the scarp to a confluence with the first drainage ditch and off the southeastern corner of the property. The third and fourth drainage ditches flow from the center of the site in a northeasterly direction. One of these ditches flows along the base of the scarp. Both ditches exit the property and discharge to a low lying marsh/wetland area located to the north of the subject property (refer to Figure 1-2).

3.1.1.1 **Fire Pond Investigation**. Measurements of water depth and sediment thickness were obtained along a grid coordinate system established for the fire pond. The results of these measurements are as follows:

Grid Designation	Depth of Water	Sediment Thickness
A-2	64"	0"
A-3	66"	0"
A-4	48"	0"
A-5	48"	1"
A-6	52"	1"
A-7	43"	0"
A-8	49"	0"
A-9	---	---
B-2	104"	5"
B-3	118"	6"
B-4	115"	6"
B-5	82"	0"
B-6	90"	0"
B-7	97"	0"
B-8	98"	2"
B-9	9"	--- (root mat)
C-2	108"	0"
C-3	114"	2"
C-4	125"	6"
C-5	83"	0"
C-6	92"	1"
C-7	96"	0"
C-8	98"	1"
C-9	40"	1"
D-2	56"	4"
D-3	56"	5"
D-4	44"	5"
D-5	54"	7"
D-6	57"	8"
D-7	54"	5"
D-8	56"	1"
D-9	12"	8"

Based on these measurements, it is calculated that the total volume of water present in the fire pond is approximately 100,000 cubic feet and the total volume of sediment is approximately 3,700 cubic feet.

3.1.2 Downhole Camera Survey

The downhole camera survey at Becker Well #2 showed well casing extending to 61.4 feet below ground surface. Numerous high angle joints/fractures were observed with significant fracture zones located from 72.7-76.0', 100.7-106.0' and at 130'. The total depth of the hole was measured at 344.2'.

Due to poor visibility resulting from highly turbid groundwater conditions at Becker Well #3, borehole characterization was not possible other than measuring the well casing to a depth of 114.0'. At the direction of NYSDEC, downhole camera surveying was terminated at this stage.

3.1.3 Packer Testing

A total of 21 permeability tests were performed on selected zones within the three bedrock wells installed. As previously noted, permeability testing was not performed at monitoring well MW-6 from 17.25 to 42 feet due to the larger diameter borehole precluding the isolation of discrete zones with the inflatable packers utilized. Table 3-1 provides average hydraulic conductivity values for each of the zones tested. The hydraulic conductivity values were calculated using the following equation:

$$K = \frac{Q}{2\pi LP} \cdot \ln\frac{L}{r}$$

where Q = flow rate (ft^3/day)
L = test interval length (ft)
P = pressure (ft)
r = radius of borehole (ft)

The range of average hydraulic conductivity values obtained from the bedrock wells tested concur with the range of 1×10^{-2} to 1×10^{-8} cm/s cited in the

TABLE 3-1

BEDROCK PACKER TESTING: HYDRAULIC CONDUCTIVITY ESTIMATES

WELL	TEST INTERVAL DEPTH (FT.)	TEST INTERVAL ELEVATION (FT. MSL)	AVERAGE HYDRAULIC CONDUCTIVITY (CM/S)
MW-4	16.5-21.5	469.72-464.72	3.77E-04
	21.5-26.5	464.72-459.72	No Flow
	26.5-31.5	459.72-454.72	4.31E-03
	31.5-36.5	454.72-449.72	No Flow(1)
	36.5-41.5	449.72-444.72	No Flow(1)
	41.5-46.5	444.72-439.72	No Flow(1)
	46.5-51.5	439.72-434.72	No Flow(1)
	51.5-56.5	434.72-429.72	No Flow(1)
	56.5-61.5	429.72-424.72	No Flow(1)
MW-5	19.5-24.5	466.81-461.81	No Flow(1)
	24.5-29.5	461.81-456.81	No Flow(1)
	29.5-34.5	456.81-451.81	No Flow(1)
	34.5-39.5	446.81-441.81	1.73E-05
	39.5-44.5	436.81-431.81	1.31E-04
	44.5-49.5	431.81-426.81	2.27E-04
	49.5-54.5	426.81-421.81	6.25E-03
	54.5-59.5	421.81-416.81	5.19E-03
	62.4-67.4	413.91-408.91	9.79E-04
MW-6	48.5-53.5	437.72-432.72	3.72E-04
	53.5-58.5	432.72-427.72	No Flow(1)
	62.5-67.5	427.72-422.72	No Flow(1)

(1) No flow observed within specified test zone

literature for hydraulic conductivities of fractured sedimentary and metamorphic rock units (Freeze and Cherry, 1979).

Correlation of packer testing within individual zones generally conforms to rock quality designation (RQD) values obtained from core samples within these zones. Zones where core samples display RQD values of 30% or less correspond to zones of greater hydraulic conductivity values. Zones where core samples display RQD values of 90% or greater correspond to zones of no flow. Zones whose RQD values fall between 30-90% fail to provide correlation between hydraulic conductivity values and RQD values. This inconsistency may be the result of joint spacing, failure to recognize mechanical breaks induced by drilling, or silting between joint sets restricting flow.

3.1.4 Pump Testing

Step Drawdown Test

Drawdown and recovery curves for the three discharge rates utilized for the step drawdown portion of the test are presented in Appendix D. The graphs generated from drawdown data observed in the pumping well display apparent stabilization at 40 gpm. At 50 gpm, similar results were obtained. The apparent stabilization observed at the 60 gpm step is a result of drawdown exceeding the operating range of the pressure transducer. Results obtained from the step drawdown portion of the test resulted in the selection of a 50 gpm discharge rate for the constant pump test.

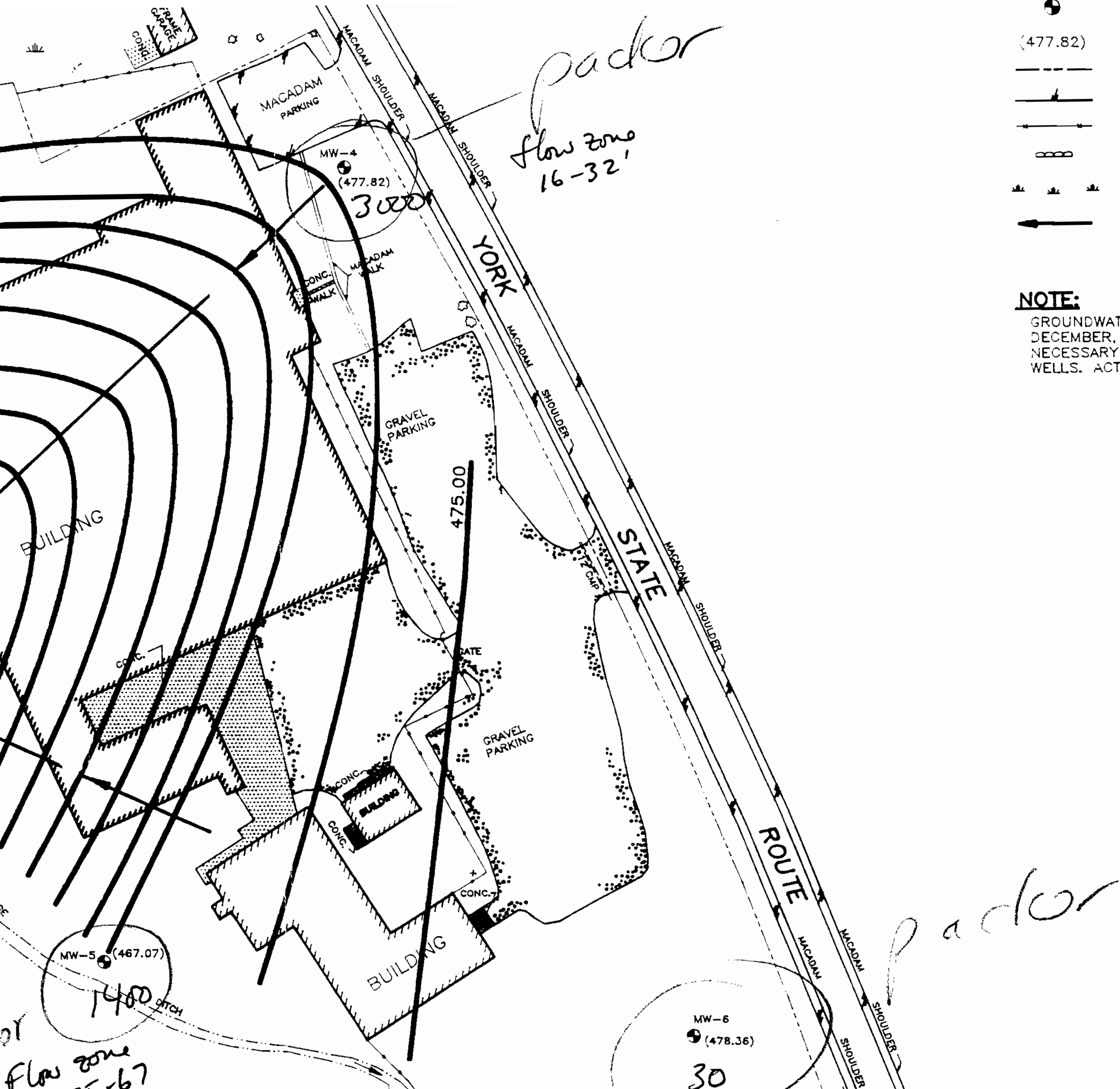
Constant Rate Pump Test

Drawdown/recovery curves for both the pumping well, B-2 (Becker Well #2), and the observation wells MW-2S, B-3 (Becker Well #3), MW-4, MW-5 and MW-6 are presented in Appendix D and a summary of drawdown data is as follows:

	Distance from Pumped Well (ft)	Open Borehole/Screen Elevation (ft. MSL)	Observed Drawdown Following 24.5 Hrs. Pumping (ft)*
MW-2S	39.0	483.49-480.04	0.21
B-2	0	422.62-344.62	63.80
B-3	379.5	390.66-273.00	3.35
MW-4	472.5	472.72-422.06	1.40
MW-5	271.5	472.96-416.23	10.21
MW-6	624.0	468.97-411.47	0.09
* Becker Well #2 pumped at 50 gpm for 24.5 hours			

Groundwater contours based on elevation data obtained following the 24.5 hour pump test of Becker Well #2 are shown in Figure 3-1. All pump test calculations assume that the local groundwater system is an anisotropic, unconfined aquifer. The anisotropic characteristics of the aquifer are reflected in groundwater contours plotted following active pumping. The constant withdrawal of water from Becker Well #2 forms an elliptical cone of depression whose long axis is oriented NE-SW. On this axis the cone extends north from the pumped well to monitoring well MW-4, positioned 475 feet from the pumped well. The southward extension of the cone cannot be depicted with any degree of accuracy due to the lack of monitoring points in the southwest portion of the site. Responses to withdrawal from Becker Well #2 were also observed along the east-west axis in Becker Well #3 (B-3) and MW-5, positioned 379.5 and 271.5 feet, respectively, from the pumped well. Drawdown detected at MW-2S was insignificant as compared to normal daily fluctuations in groundwater elevation.

Aquifer parameters were calculated from observed residual drawdown data in observation wells using Theis and Jacob modified nonequilibrium equations for obtaining transmissivity and storage coefficients as defined by Driscoll (1986). Time vs. drawdown curves for Becker Well #3 and MW-5 are shown in Appendix D. To reduce the effects of partial penetration on calculated values, wells nearest to the pumping well ($r < 1/2D$) and wells most distant from the pumped well ($r > 2D$) were not considered. Transmissivity (T) values obtained using the Theis nonequilibrium equation were calculated for observation wells B-3 (Becker Well #3) and MW-5. Their respective T values of 4,943.82 and 4,474.57 gpd/ft, when used to calculate the storage coefficients (S) of each well, produces S values of 3.57×10^{-5} and 8.85×10^{-5}. Since the



●	GROUNDWATER MONITORING WELL LOCATION
(477.82)	GROUNDWATER ELEVATION ABOVE M.S.L. AS OBSERVED ON DECEMBER 17, 1990
— - - —	PROPERTY LINE
	EDGE OF ASPHALT PAVEMENT
	CHAIN LINK FENCE
	STONE WALL
	SWAMP
	GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER CONTOURS SHOWN ARE BASED ON DECEMBER, 1990 GROUNDWATER DATA AND ARE NECESSARY INTERPOLATIONS BETWEEN MONITORING WELLS. ACTUAL SUBSURFACE CONDITIONS MAY VARY.

true aquifer thickness is not known, estimated values based on existing well conditions were used in calculating mean hydraulic conductivity. A minimum aquifer thickness value was assigned based on static conditions observed in the pumped well prior to the test. The calculated values obtained by estimating hydraulic conductivity (K) values in the fractured bedrock aquifer produced a range for K between 6.54×10^{-4} and 7.22×10^{-4} cm/sec for Becker Well #3 and MW-5, respectively. These values concur with average hydraulic conductivity values obtained from bedrock packer testing.

3.1.5 Climate/Meteorology

A basic site monitoring program was conducted on a daily basis. The following measurements were recorded daily during each project day from November 6 to December 13, 1990 unless interrupted by on-going field investigations:

- maximum and minimum temperature (°F)
- recorded temperature (°F)
- precipitation in inches

A thermometer and rain gauge were located in an open area near the site field trailer to collect daily temperature recordings and precipitation volumes. A daily summary of meteorological data is included on Table 3-2.

3.1.6 Site Geology

3.1.6.1 Stratigraphy. Bedrock encountered during the first phase drilling investigation consisted of shale and siltstone of the Catskill formation, as shown in the geologic cross-section included as Figure 3-2. The maximum borehole depth at the site was 75 feet below ground surface (at MW-6). The shale encountered was reddish-brown, green and grey in color and was mottled to various degrees.

TABLE 3-2

DAILY METEOROLOGICAL DATA SUMMARY

DATE	RAIN GAUGE (IN)	RECORDED TEMP (°F)	MAXIMUM TEMP (°F)	MINIMUM TEMP (°F)
11/06/90	0.38	54	63	45
11/07/90	0	43	57	28
11/08/90	0	40	33	36
11/09/90	0	31	47	21
11/12/90	0	32	49	28
11/13/90	0	29	36	24
11/14/90	0	28	36	24
11/15/90	0	30	47	23
11/16/90	0	52	74	29
11/19/90	0.34	35	78	25
11/20/90	0	34	44	31
11/21/90	0	29	48	29
11/26/90	2.60	38	62	23
11/27/90	0	34	60	28
11/28/90	0	36	59	32
11/29/90	0	42	76	35
11/30/90	0	30	44	27
12/3/90	0	28	59	16
12/4/90	1.33	36	44	26
12/5/90	0.06	27	45	27
12/6/90	0	27	29	19
12/7/90	0	28	42	25
12/10/90	0	48	54	21
12/11/90	0	22	48	18
12/12/90	0	24	34	18

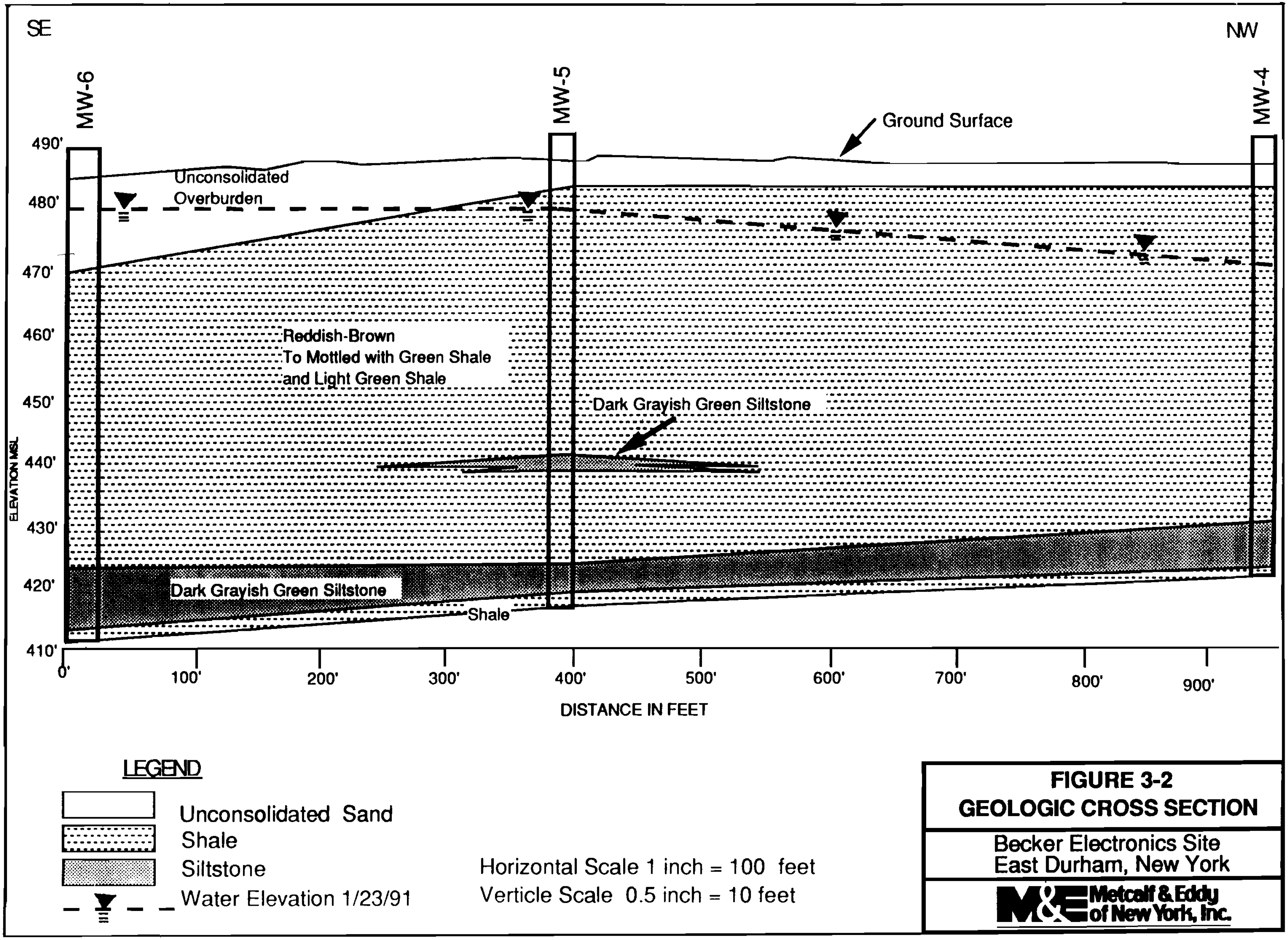


FIGURE 3-2
GEOLOGIC CROSS SECTION

Becker Electronics Site
East Durham, New York

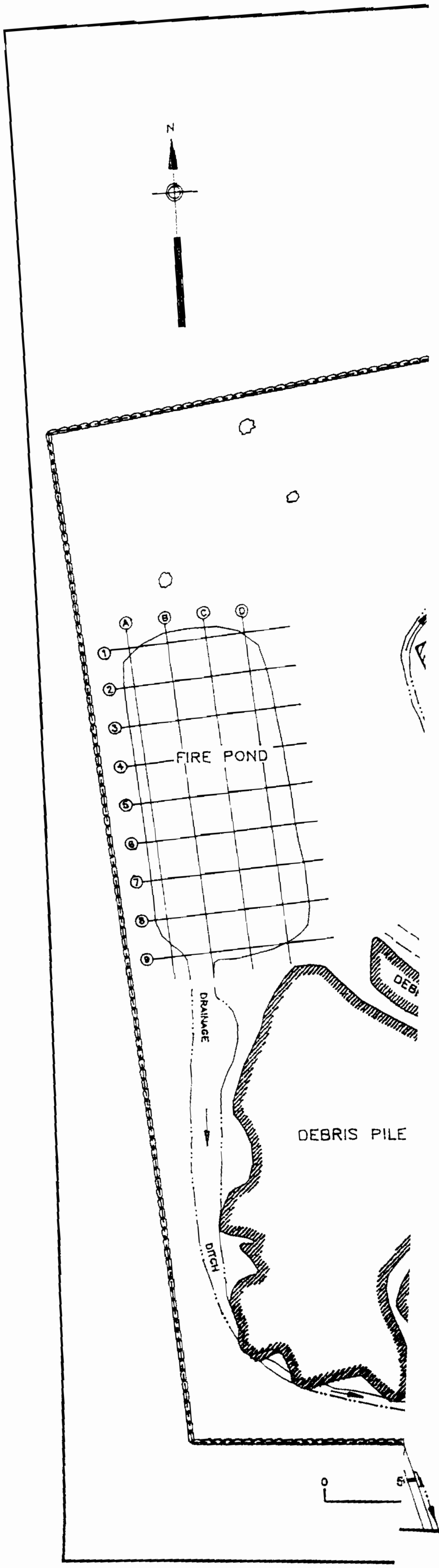
Metcalf & Eddy of New York, Inc.

A bed of dark grey-green siltstone was encountered during bedrock coring at each of the three bedrock monitoring well locations. The upper contact of this siltstone was gradational with a reddish-brown mottled shale. The lower contact consisted of a sharp contact, possibly erosional, with the underlying reddish brown shale. This distinctive siltstone marker bed ranged in elevation (MSL) from 413.22 feet (at MW-6) to 422.97 feet (at MW-4) and 423.81 feet (at MW-5).

Bedrock at the site is covered by a thin veneer of fine silty sand. These unconsolidated glacial deposits range in thickness from 3 to 17 feet in the eastern portion of the site. Unconsolidated deposits were found to be thinnest at the MW-4 and MW-5 and thickening toward MW-6 in the southeast corner of the site. No subsurface borings were located west of the scarp behind the Becker Electronics building; however, based on field observations of bedrock surface exposures in that area it would appear that any unconsolidated deposits overlying bedrock are relatively thin in nature.

3.1.6.2 **Geologic Structure**. Bedrock outcrops exposed in the drainage ditch channel flowing along the southern site boundary displayed southeast dips of approximately 2 to 4 degrees with a northeast-southwest strike. Two nearly vertical joint sets were observed in outcrops and trend North 30° East and North 60° West. It appears that the bend in Catskill Creek located immediately to the east of the site, is a surface expression of these joint sets. Observation of both bedrock cores and outcrops located in the immediate site vicinity shows bedding at the site to be horizontal with little to no deformation. The bedrock surface contour map shown as Figure 3-3 indicates that bedrock is sloping in a southeasterly direction at the site.

An analysis of bedrock cores obtained at the MW-4 monitoring well location revealed closely jointed shale from 483 feet (M.S.L.) to 430 feet with RQD values ranging from 0% to 93% and varying considerably with depth. High angle fractures are present throughout this interval, several of which have been filled due to mineralization. The intervals from 471 feet to 448 feet (M.S.L.) exhibited a relatively high degree of fracturing. The shale graded



LEGEND

- GROUNDWATER MONITORING WELL LOCATION
- PROPERTY LINE
- EDGE OF ASPHALT PAVEMENT
- CHAIN LINK FENCE
- STONE WALL
- SWAMP
- BEDROCK SURFACE CONTOUR MAP

I.D.NUMBER	SURFACE ELEVATION	ELEVATION OF TOP OF BEDROCK
MW-2S	487.39'	480.04'
MW-4	486.22'	482.72'
MW-5	486.31'	482.81'
MW-6	486.22'	468.97'
BL-2	487.66'	480.16'
BL-3	486.22'	484.22'
BL-4	487.61'	483.11'

FIGURE 3-3
BEDROCK SURFACE CONTOUR MAP

into a moderately jointed siltstone characterized by high RQD values and little fracturing from 430 to 423 feet.

Bedrock cores obtained from the MW-5 monitoring well location show closely to moderately jointed shale and siltstone with a moderate degree of high angle fracturing. RQD values are generally high, ranging from 63% to 90% for the entire borehole with the exception of the interval between 437 feet and 431 feet (M.S.L.) which is highly fractured.

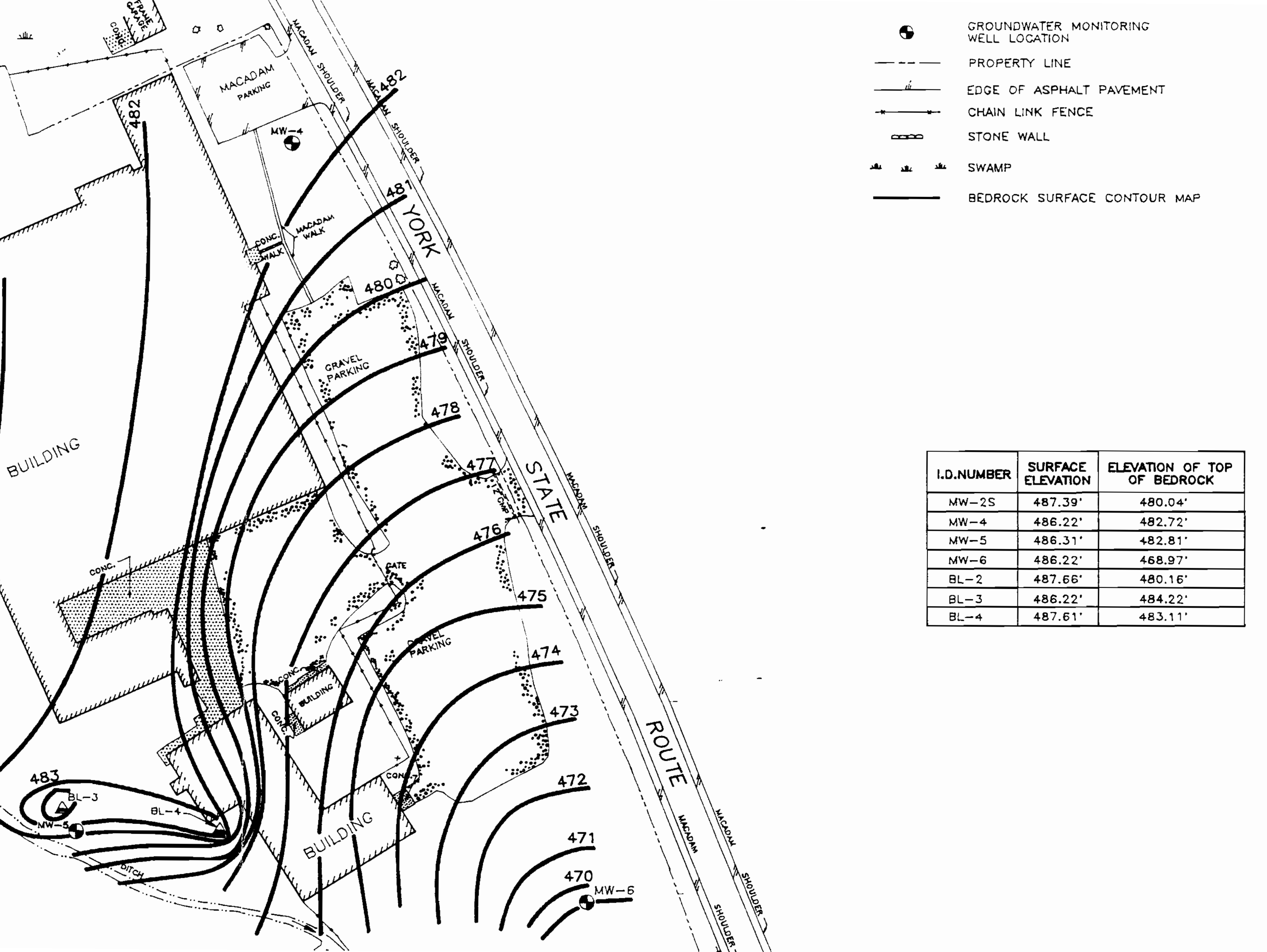
Bedrock cores obtained from the MW-6 monitoring well location are characterized by moderately jointed shales exhibiting RQD values from 71% to 100% with the exception of the interval from 441 feet to 429 feet (M.S.L) which is highly fractured. The depth interval of this fractured zone correlates with a similar zone at the MW-5 location.

3.1.7 Site Hydrogeology

Groundwater underlying the Becker Electronics site was found to occur under unconfined conditions primarily within the shales and siltstones of the Catskill formation as well as in the overlying unconsolidated deposits. Unconsolidated deposits varied in thickness throughout the site averaging less than five feet in areas of the site investigated. Groundwater in the unconsolidated deposits appears to be perched at the MW-2S monitoring well location as evidenced by the large discrepancy in groundwater elevations between MW-2S and the on-site bedrock monitoring wells. Groundwater elevations at MW-2S are approximately 10 feet higher in elevation than the bedrock monitoring wells on a consistent basis. It should be noted that a high percentage of clay was observed in a two foot thickness overlying bedrock at this location. It is likely that lenses of groundwater are present in the unconsolidated deposits throughout the site due to permeability changes in the material. It should be noted that the pump test at Becker Well #2 had no detectable impact on MW-2S which supports the idea of perched groundwater in the shallow unconsolidated deposits at the site. Groundwater recharge at the site is primarily the result of precipitation infiltration. Correlation between precipitation and recharge was inconclusive due to the lack of significant rainfall events during site activities and the lack of continuous groundwater level recording capabilities.

The average depth to groundwater from ground surface for bedrock monitoring wells was from 7 to 10 feet. A comparison of bedrock groundwater elevations shows a variation of approximately 5 feet across the site. Using groundwater elevations from the MW-4 and MW-6 monitoring well locations an average hydraulic gradient of 7.87×10^{-3} ft/ft was calculated. Groundwater elevations obtained on December 12, 1990 and January 23, 1991 were contoured and groundwater contour maps are depicted in Figures 3-4 and 3-5. Based on these maps, groundwater is shown to be moving generally in a north to northeast direction. Judging from these flow directions it does not appear topography is having a significant influence, but rather groundwater flow direction is being controlled by joint/fracture orientations in the bedrock. This is supported by the elliptical shaped cone of depression with its long axis oriented northeast-southwest created by the constant rate pump test (refer to Figure 3-1). An additional influence on both groundwater flow direction and potential velocity are effects resulting from the pumping of private wells surrounding the Becker Electronics site.

Hydraulic conductivity values calculated for bedrock monitoring wells resulted in values ranging from 4.31×10^{-3} to 1.73×10^{-5} cm/sec. As was previously mentioned, these values are consistent with those cited in the literature for fractured sedimentary and metamorphic rock units.



I.D.NUMBER	SURFACE ELEVATION	ELEVATION OF TOP OF BEDROCK
MW-2S	487.39'	480.04'
MW-4	486.22'	482.72'
MW-5	486.31'	482.81'
MW-6	486.22'	468.97'
BL-2	487.66'	480.16'
BL-3	486.22'	484.22'
BL-4	487.61'	483.11'

GROUNDWATER MONITORING WELL LOCATION

(474.22) GROUNDWATER ELEVATION ABOVE M.S.L. AS OBSERVED ON DECEMBER 12, 1990

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

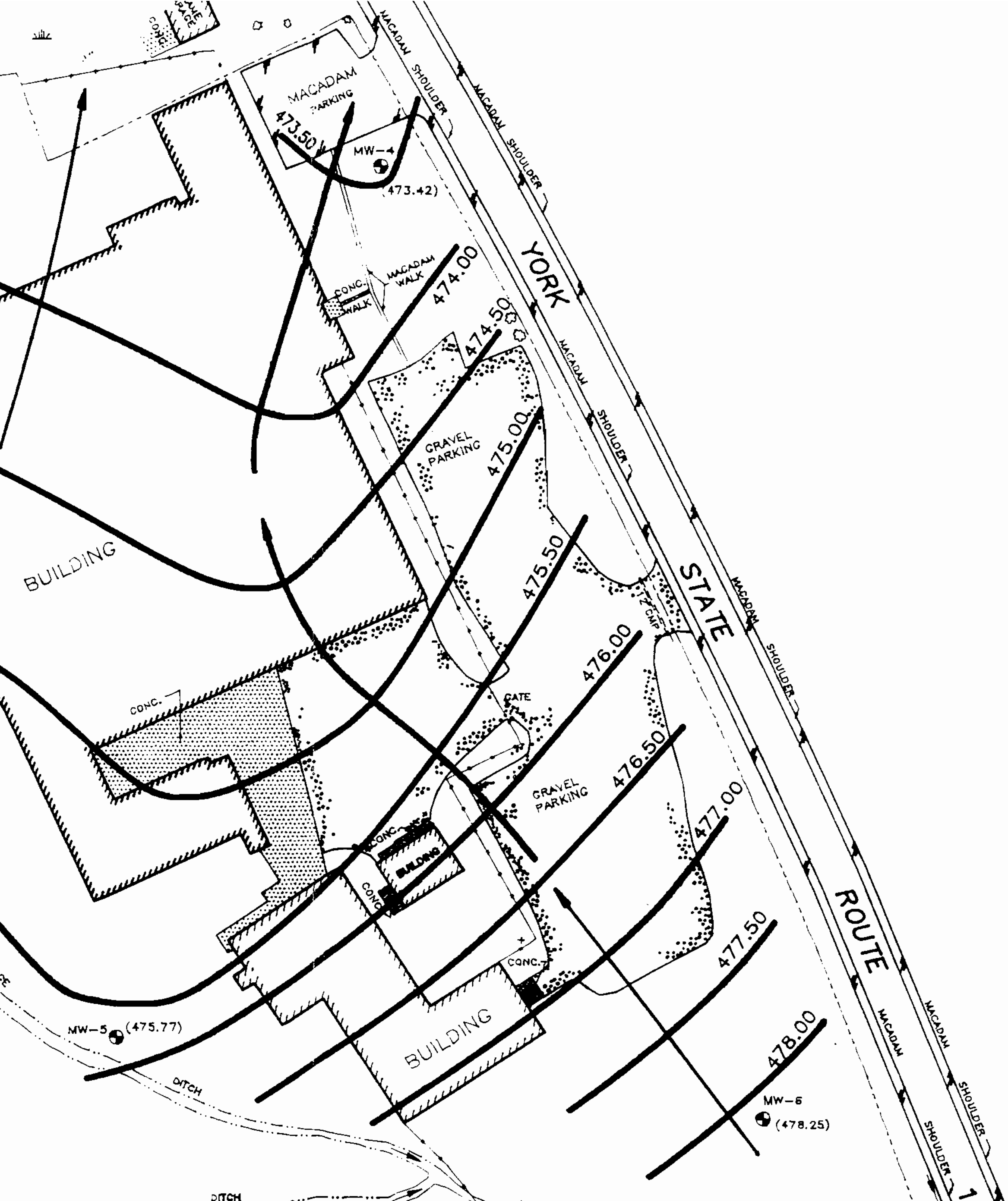
CHAIN LINK FENCE

STONE WALL

SWAMP

GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER CONTOURS SHOWN ARE BASED ON DECEMBER, 1990 GROUNDWATER DATA AND ARE NECESSARY INTERPOLATIONS BETWEEN MONITORING WELLS. ACTUAL SUBSURFACE CONDITIONS MAY VARY.



(473.42) GROUNDWATER ELEVATION ABOVE M.S.L. AS OBSERVED ON JANUARY 23, 1991

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

CHAIN LINK FENCE

STONE WALL

SWAMP

GROUNDWATER FLOW DIRECTION

NOTE:
GROUNDWATER CONTOURS SHOWN ARE BASED ON JANUARY, 1991 GROUNDWATER DATA AND ARE NECESSARY INTERPOLATIONS BETWEEN MONITORING WELLS. ACTUAL SUBSURFACE CONDITIONS MAY VARY.

3.2 WILDLIFE HABITAT ASSESSMENT

This section provides an initial characterization of the terrestrial and aquatic ecology at and surrounding the Becker Electronics site. The data from this evaluation has been incorporated into an overall site-based environmental risk assessment. The environmental risk assessment is part of a separate document entitled, "Becker Electronics Site Draft Baseline Human Health Risk and Environmental Risk Assessment," dated February 1992. Included in this section is a description of major habitat types around the site, including the associated fish and wildlife populations. The information provided in this section concerning study area ecology was obtained during the Phase I RI field investigation and supplemented with data from NYSDEC, as well as other pertinent sources and personal communications.

3.2.1 Cover Type Map

A cover type map for the site and adjacent areas (within a 0.5 mile radius of the site) will be prepared as part of the Phase II RI from a color aerial photograph (to be obtained as part of the Phase II RI) and groundlevel photographs, USGS topographic maps and soil maps. Cover types will be classified using the NYS Natural Heritage cover types published in "Natural and Ecological Communities of New York State" (Reschke, 1988). This map will be groundtruthed after completion to verify the location of all cover types pertinent to the study area.

The cover map will include major vegetation communities, wetlands, aquatic habitats and any other significant habitats or areas of special concern on and adjacent to the site.

3.2.2 Special Resources

3.2.2.1 **Wetlands**. A list of regulated wetlands which occur within a 2 mile radius of the site, provided by USDA-SCS, Greene County, indicates that three such wetlands occur. These wetlands are designated at GR-110, F-2, and F-3 on the attached wetlands map (refer to Figure 1-3). These wetlands will be field checked to determine if they provide any significant habitat for fish or wildlife species.

3.2.2.2 **Streams.** The major stream located within a 0.5 mile radius of the site is Catskill Creek. Two of its tributaries, Thorp Creek and unnamed tributary #1, also occur within this radius (refer to Figure 1-3).

In the vicinity of the site, Catskill Creek is classified as C(T) - C class trout stream, and Thorp Creek as C(TS) - C class trout spawning stream, by the Division of Fish and Wildlife, NYSDEC.

3.2.2.3 **Wild and Scenic Rivers.** No wild and scenic rivers are listed by NYSDEC for the East Durham area of Greene County.

3.2.2.4 **Significant Habitats and Species of Concern.** Documentation received from NYSDEC's Natural Heritage Program indicates that no significant habitats are known to occur in the vicinity of the site. No rare, threatened or endangered species are listed by the Natural Heritage Program for this area of Greene County.

Recently, young bald eagles have been released in the general area approximately 10 miles north of the site and may use Catskill Creek as a feeding area. Ospreys are also known to use Catskill Creek as a feeding area during migration.

3.2.3 Habitats

3.2.3.1 **On Site Habitats.** A description of the various habitat types and the species they contain is shown in Table 3-3. Both vegetative and wetland communities occur on site (see Figure 3-6).

TABLE 3-3

VEGETATION/HABITATS OBSERVED, 11-12-90

HABITAT #1 - Bare ground on west side of building #2, (rear of furniture storage building)

SCIENTIFIC NAME	COMMON NAME
TREES/SHRUB	
Alnus rugosa	Speckled alder
Populus deltoides	Cottonwood
Rhus typhina	Staghorn sumac
HERBS	
Alliaria officinalis	Garlic mustard
Centauria maculosa	Spotted knapweed
Daucus carota	Queen Anne's lace
Eragrostis pectinacea	Purple lovegrass
Fragaria virginiana	Common strawberry
Gallium mollugo	Wild madder
Oenothera biennis	Common evening primrose
Panicum dichotomiflorum	Fall panic grass
Poa pratensis	Kentucky bluegrass
Rubus sp.	Blackberry
Seteria glauca	Yellow foxtail grass
Solidago sp.	Goldenrod
Verbascum thapsus	Common evening primrose

HABITAT #2 - Drainage ditch below outcrop in southeast area of site

SCIENTIFIC NAME	COMMON NAME
TREES/SHRUBS	
Alnus rugosa	Speckled Alder
HERBS	
Aster dumosus	Bushy aster
Cardamine pennsylvanica	Pennsylvania bittercress
Carex sp.	Sedge
Jancus effusus	Soft rush
Lemna sp.	Duckweed
Lythrum salicaria	Purple loosestrife
Rumex crispus	Curly dock
Tussilago farfara	Colt's foot
Typha latifolia	Broad-leaved cattail
Verbena hastata	Blue vervain

TABLE 3-3 (Continued)

VEGETATION/ HABITATS OBSERVED, 11-12-90

HABITAT #3 - Escarpment on west side of ditch, southeast area

TREES/SHRUBS

Betula populifolia	Gray birch
Pyrus sp.	Apple

HERBS

Barbarea vulgaris	Winter Cress
Brophyta	Mosses
Centauria maculosa	Spotted knapweed
Daucus carota	Queen Anne's lace
Gramineae	Grasses
Solidago sp.	Goldenrod

HABITAT #4 - Drainage ditch/swale south of fire pond, west and south boundaries of site - Palustrine Wetland

TREES/SHRUBS

Betula populifolia	Gray birch
Robinia pseudoacacia	Black locust
Salix sp.	Willow
Rhus typhina	Staghorn sumac
Lonicera tatarica	Tratarian honeysuckle
Rosa multiflora	Multiflora rose

HERBS

Barbarea vulgaris	Winter cress
Bidens frondosa	Beggar ticks
Cardamine pennsylvanica	Pennsylvania bittercress
Cirsium vulgare	Bull thistle
Lycopus americanus	Cut-leaved water horehound
Rumex crispus	Curly dock
Scirpus cyperinus	Woolgrass
Solunum dulcamara	Nightshade
Solidage gigantea	Goldenrod
Solidago sp.	Goldenrod
Typha angustifolia	Narrowleaf cattail
Typha latifolia	Broadleaf cattail

TABLE 3-3 (Continued)

VEGETATION/ HABITATS OBSERVED, 11-12-90

HABITAT #5 - Fire Pond Border

TREES/SHRUBS

Betula populifolia	Gray birch
Alnus rugosa	Speckled alder

HERBS

Lythrum salicaria	Purple loosestrife
Phalaris arundinacea	Reed canary grass
Scirpus cyperinus	Woolrush

HABITAT #6 - Woodland north of fire pond

TREES/SHRUBS

Betula populifolia	Gray birch
Carya ovata	Shagbark hickory
Fraxinus americanum	White ash
Pinus strobus	White pine
Quercus alba	White oak
Quercus rubra	Red oak
Rosa multiflora	Multiflora rose

HERBS

Aster sp.	Aster
Solidage sp.	Goldenrod
Brophyta	Moss

HABITAT #7 - Woodland/old field edge, northern portion of site

TREES/SHRUBS

Alnus rugosa	Speckled alder
Eleanus angustifolia	Russian olive
Juniperus virginiana	Red cedar
Populus deltoides	Cottonwood
Quercus alba	White oak
Rhus typhina	Staghorn sumac
Rosa multiflora	Multiflora rose

HERBS

Aster sp.	Aster
Solidago sp.	Goldenrod
Gramineae	Grass

TABLE 3-3 (Continued)

VEGETATION/ HABITATS OBSERVED, 11-12-90

HABITAT #8 - Groundwater stream, north-central portion of site, from west of chip shed to northern property boundary - Palustrine Wetland

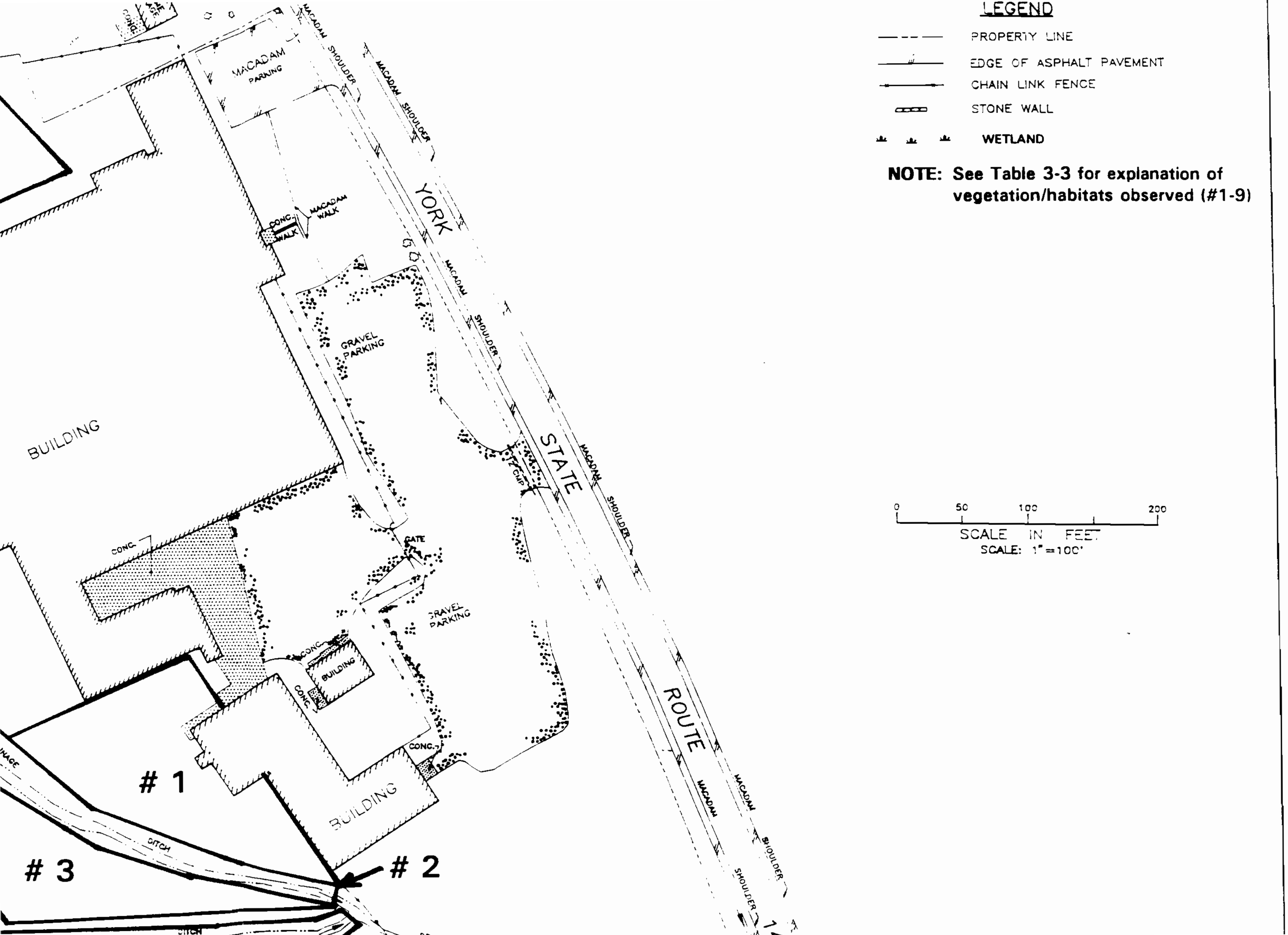
HERBS

Lythrum salicaria	Purple loosestrife
Phalaris arundinacea	Reed canary grass
Typha latifolia	Broadleaf cattail
Juncus effusus	Soft rush

HABITAT #9 - old field/lawn, northeast portion of site

HERBS

Aster sp.	Aster
Poa pratensis	Kentucky bluegrass
Solidago sp.	Goldenrod


LEGEND
PROPERTY LINE
EDGE OF ASPHALT PAVEMENT
CHAIN LINK FENCE
STONE WALL
WETLAND
NOTE: See Table 3-3 for explanation of vegetation/habitats observed (#1-9)
0
50
100
200
SCALE IN FEET
SCALE: 1"=100'
YORK
STATE
ROUTE
MACADAM
SHOULDER
MACADAM PARKING
MACADAM WALK
CONC. WALK
GRAVEL PARKING
BUILDING
CONC.
GATE
CMP
DITCH
1
2
3

Vegetative Communities

Upland: The major vegetative community in upland areas of the site is Old Field. Remains of the original Oak-Pine forest are confined to the north, west and south perimeters of the site.

Dominant species in the old field communities are spotted knapweed, goldenrod, aster and various species of grasses. A complete list of species recorded on site is shown in Table 3-4.

Wetland: Palustrine wetland communities occur in two areas on the site. They are dominated by alder shrubs, cattails, purple loosestrife, woolgrass, reed canary grass and soft rush. Densities of species in both of these wetlands are relatively sparse. Surface waters in both wetlands exhibit a dark brown color which was attributed to "staining" from tannins leaching from the particle waste pile.

The palustrine wetland in the southwestern corner of the site is a fringe wetland which surrounds the fire pond outlet stream and covers less than one quarter acre. Its eastern and southern boundaries are defined by the particle waste pile, which constricts flow in several areas. Off-site flow is directed through a ditch along the southern boundary of the site to Route 145 where it combines with a small clear tributary of Catskill Creek approximately 150 feet south of the site.

The second palustrine emergent wetland occupies the downslope area southeast of the fire pond. The wetland is fed primarily by groundwater and stormwater runoff, and serves as the headwaters of a drainage ditch flowing off-site in the northwest portion of the site. The drainage ditch flows off-site in a northerly direction where it combines with outflow from a ditch exiting the site from the area west of the Becker plant. The combined ditch discharge flows north for several meters where it enters a culvert under the adjacent property and flows east to Route 145 at the junction of Route 65A. The discharge flows under Route 145 and approximately 100 meters along the northern side of Route 65A where it empties into Thorp Creek.

Both of these on-site wetlands show signs of physical alteration within the past 5 years, and both have outlet streams characterized by intermittent flow. No wildlife species were observed using either of the wetlands during the site visit. Due to the disturbed nature of these wetlands, a full scale delineation may not be required. These wetlands will be documented on a site map with approximate boundaries and acreage.

The fire pond in the northwest corner of the site is an artificial impoundment constructed prior to 1977. It is connected through an underground piping system to a pump house and fire hydrant on Route 145 on the eastern boundary of the site. The depth of the pond is approximately 7 feet, as measured by M&E on November 12, 1990. The pond measures approximately 75 x 200 feet. The morphology of the pond is

TABLE 3-4

VEGETATION/PLANT INVENTORY

SCIENTIFIC NAME	COMMON NAME
TREES/SHRUBS	
Alnus rugosa	Speckled alder
Betula populifolia	Gray birch
Carya ovata	Shagbark hickory
Eleagnus angustifolia	Russian olive
Fraxinus americanum	White ash
Juniperus virginiana	Red cedar
Lonicer tatarica	Tartarian honeysuckle
Pinus strobus	White pine
Populus deltoides	Cottonwood
Pyrus sp.	Apple
Quercus alba	White oak
Rhus typhina	Red oak
Rosa multiflora	Staghorn sumac
	Multiflora rose
HERBS	
Alliaria officinalis	Garlic mustard
Aster dumosus	Bushy aster
Bidens frondosa	Beggar ticks
Bryophyta	Moss
Cardamine pennsylvanica	Pennsylvania bittercress
Carex sp.	Sedge
Centauria maculosa	Spotted knapweed
Cirsium vulgare	Bull thistle
Daucus carota	Queen Anne's lace
Eragrostis pectinacea	Purple lovegrass
Fragaria virginiana	Common strawberry
Gallium mollugo	Wild madder
Gramineae	Grasses
Jancus effusus	Soft rush
Lemna sp.	Duckweed
Lycopus americanus	Cut-leaved water horehound
Lythrum salicaria	Purple loosestrife
Oenothera biennis	Common evening primrose
Panicum dichotomiflorum	Fall panic grass
Phalaris arundinacea	Reed canary grass
Poa pratensis	Kentucky bluegrass
Robus sp.	Blackberry
Rumex crispus	Curly dock
Scirpus cyperinus	Woolgrass

TABLE 3-4 (Cont'd)

VEGETATION/PLANT INVENTORY

SCIENTIFIC NAME	COMMON NAME
HERBS (Cont'd)	
Setaria glauca	Yellow foxtail grass
Solanum dulcamara	Nightshade
Solidago gigantea	Late goldenrod
Solidago sp.	Goldenrod
Tussilago farfara	Colt's foot
Typha angustifolia	Narrowleaf cattail
Typha latifolia	Broad-leaved cattail
Verbascum thapsus	Common evening primrose
Verbena hastata	Blue vervain

such that the edges drop abruptly to the 7 foot depth, thus preventing the growth of littoral vegetation and restricting the amount of habitat available for aquatic organisms. The only aquatic macroorganisms noted during the site visit were tadpoles. No inlet to the pond exists, and the outlet in the southwest corner feeds the fringe wetland in that area of the site.

Aquatic Communities

Sampling of aquatic communities on site, a survey of fish and/or macroinvertebrates in the fire pond, streams and ditches on site will be carried out during the Phase II RI. As indicated in the above section, the only macroorganisms observed on site during the 1990 survey were tadpoles in the fire pond.

The presence or absence of benthic and planktonic communities in the fire pond will be investigated during the Phase II RI.

Wildlife Communities

A survey of birds, mammals, reptiles and amphibians will be undertaken during the Phase II RI. During the 1990 vegetation survey, the following observations were made: 1) white-footed mouse near the eastern border of the particle board waste pile, 2) deer tracks in mud on path on west side of Becker building, 3) Cottontail rabbit droppings in northern wooded portion of site, 4) Black-capped chickadee in forest edge on western boundary of site. No reptiles or amphibians, except for tadpoles in fire pond, were observed during the survey.

3.2.3.2 Off-Site Habitats.

Vegetative Communities

The vegetative communities which surround the Becker site consist mainly of oak-pine forest in undisturbed areas, and an old field in recently disturbed areas.

Aquatic Communities

Aquatic communities associated with Thorp Creek and Catskill Creek in the general area of the Becker site will be investigated during the Phase II RI.

A preliminary survey of Thorp Creek on November 12, 1990, indicates that the creek ranges from 10 to 20 feet in width and has an approximate maximum depth of 12 feet. Thorp Creek is a clear mountain stream which drains into Catskill Creek approximately 800 feet east of the Becker site.

The discharge from the site, which enters Thorp Creek approximately 50 meters above its confluence with Catskill Creek, was relatively clear at the time of the survey indicating that the tannin leachate from the site is significantly diluted by road runoff before entering Thorp Creek. Comparative visual observations of Thorp Creek's water and sediment color, turbidity and periphyton abundance were made above and below the discharge point. No visible adverse impacts from the discharge were detected.

Catskill Creek ranges from 50 or 100 feet in width with an approximate maximum depth of 16 feet. As mentioned above, Catskill Creek receives discharge from the southern portion of the Becker site via a small unnamed tributary that has its headwaters in the hilly area south of the Becker site. Using the same visual standards as those applied at Thorp Creek, no adverse ecological impacts were detected at or below the confluence of the discharge and the unnamed tributary of Catskill Creek, or in Catskill Creek itself.

The entire 9-mile stretch of Catskill Creek was observed to have extremely rapid flow at the time of the survey. Due to this flow rate, the entering Becker discharge was rapidly dispersed. Observations of bank erosion and leaf pack heights in mid-channel vegetation indicate that the volume of flow in Catskill Creek increased significantly during spring thaw and storm events during other times of the year.

Information on catches from local fishermen confirm the presence of active trout population in Catskill Creek, a factor identifying the Creek as a special resource area.

Qualitative observations of the macroinvertebrate community in Catskill Creek indicate it to be rich and diverse. Six orders of aquatic insects were identified during the initial 1990 survey, including the pollution sensitive orders Ephemeroptera (mayfly), Trichoptera (caddisfly) and Plecoptera (stonefly). Representatives of these orders were found in several locations below the Becker discharge area.

Fish stocking and natural population production data may be available from the State Fish and Wildlife Division, and along with information from local rod and gun clubs, could provide supplemental information.

Additional field work is proposed for the Phase II RI field program to further characterize aquatic communities. Such investigations may include an electroshocking study at sites along Catskill Creek to evaluate fish populations, and macroinvertebrate sampling to assess surface water quality.

3.2.4 Resource Characterization

3.2.4.1 Habitats Associated With Cover Type Map. Based on information obtained from Region 4 Fish and Wildlife Division, NYSDEC, wildlife expected to occur in habitats in the general area surrounding the Becker site as indicated on the site cover type map include the following: **Mammals** - Whitetail deer, Eastern cottontail rabbit, Gray squirrel, Short-tailed shrew, Chipmunk, Whitefooted Deermouse, Meadow Vole, Muskrat, Otter, and Bobcat. **Birds** - Wild turkey, Ruffed grouse, Woodcock, Waterfowl, Migrating osprey, Migrating song birds. Bald eagles, recently released from a "hacking" site ten miles north of the site, are expected to use Catskill Creek as a feeding area once the eagles are established. **Fish** - Brown trout, Rainbow trout, Longnose suckers, White suckers, Longnose dace, Pumpkinseed, Creek chub, Common shiner, and Sunfish. All of these species were recorded after a fisk kill in July, 1990, in Thorp Creek at the junction of Stone Bridge Road, approximately one mile north of location of the Becker discharge into Thorp Creek. In addition to the above-named species, Blacknose dace, Fall fish, and Tesselated darters occur in Catskill Creek. **Reptiles and Amphibians** - There are no records available for reptiles and amphibians for the East Durham area of Greene County.

3.2.4.2 General Quality of Habitat. No information is available at the present time on the general quality of habitats on or adjacent to the Becker site. A reconnaissance survey, as outlined in the NYSDEC-FWD guidelines, will be required before this information can be obtained.

Section Four

4.0 NATURE AND EXTENT OF CONTAMINATION

The purpose of this section is to provide a discussion of the results of the field activities and sampling, and the nature, extent and significance of contamination found during the Phase I Remedial Investigation. The determination of significance, at least on a preliminary basis (with final determination possibly based on the health risk assessment) will be in relation to New York State standards and/or guidance values. Areas and matrices determined to be "significantly" contaminated will be the focus of the risk assessment.

4.1 IDENTIFICATION OF NEW YORK STANDARDS, CRITERIA AND GUIDANCE VALUES

The National Contingency Plan (NCP) which is used as guidance requires the determination of the extent to which federal, state or local public health and environmental standards are applicable or relevant and appropriate to sites. In addition, federal or state advisories, criteria and guidance must be reviewed to determine if they are relevant in developing remedial actions at the site. Because the Becker Electronics site is a New York State Superfund Site, New York State standards, criteria and guidance values (SCGs) are applicable requirements pertinent to this project.

SCGs may be categorized as contaminant-specific, location-specific, or action-specific. A summary of the SCGs for the Becker Electronics site is presented in Table 4-1. Some of the potential location-specific SCGs do not pertain to the site. This determination is based upon available information that the site does not contain any protected wetlands, floodplain or flood hazard zones, endangered species, wild or scenic rivers, or historical or archeological areas. SCGs for the site, therefore, will be based primarily on waste or remedy-related characteristics.

It should be stressed that a baseline public health and environmental risk assessment has been performed for select indicator chemicals in each

TABLE 4-1

STANDARDS, CRITERIA AND GUIDANCE VALUES

Statute, Regulation or Program	Applicability	Category
NYSDEC Ambient Water Quality Standards and Guidance Values	Applicable to all groundwaters and surface waters of NYS	Action-specific Contaminant-specific Location-specific (point of discharge classification)
NYSDOH Requirements for General Organic Chemicals and Metals in Drinking Water (PHL; Sections 201 and 205)	Applicable to sources of potable water supply.	Contaminant-specific
NYSDEC Soil Cleanup Criteria Based upon Partitioning Theory	Applicable for contaminated soil remediation and to be protective of water quality	Action-specific Contaminant-specific Location-specific
NYSDEC Sediment Criteria	Applicable for contaminated sediment remediation	Contaminant-specific Location-specific
Eastern United States Background concentrations of twenty elements in soils	To be considered for comparative purposes to concentrations of metals in soil media.	Contaminant-specific
OSHA Standards (29 CFR 1900-1999)	Applicable to workers and the work place throughout implementation of investigation activities and remedial actions at the Becker Electronics site	Action-specific Contaminant-specific Location-specific

environmental medium of concern. A comparison to both the SCGs and to the risk assessment conclusions will be reviewed in the feasibility study to determine the appropriate remedial alternatives to be implemented at the site.

Based upon the media investigated at the site during the Phase I RI, the primary New York State SCGs include the following:

- New York State Department of Environmental Conservation's Ambient Water Quality Standards and Guidance Values

  These water quality standards and guidance values are a compilation of the values contained in 6NYCRR Parts 701, 702, and 703; New York State Department of Health (NYSDOH) regulations 10NYCRR, Subpart 5-1, maximum contaminant levels; and the NYSDOH Part 170 standards. It should be noted that some of the standards are dependent upon the hardness of the water matrix sampled and chemical state.

- New York State Department of Health's Requirements for General Organic Chemicals and Metals in Drinking Water (Public Health Law, Sections 201 and 205), dated January, 1990

  These standards, from 10NYCRR Subpart 5-1, were established to protect the health of those persons that utilize a groundwater or surface water resource as a potable water supply.

- New York State Department of Environmental Conservation's Division of Fish and Wildlife Sediment Criteria Guidance, dated December, 1989

  This guidance document provides sediment cleanup criteria for both organic compounds and metals. The document addresses aquatic toxicity, human health residue and wildlife residue for organic compounds, and no-effect levels, lowest-effect levels and limit of tolerance levels for metals.

- Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1900-1999)

  All occupational safety and health requirements are applicable for workers conducting the RI activities. Many OSHA requirements, regarding dermal contact and breathing zone requirements, have been incorporated into the Health and Safety Plan for the site.

In addition to the New York State SCGs listed above, the following guidance documents will be used:

- "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Concentration of Chemicals in Biota," by E.E. Kenaga and C.A.I. Goring, 1980

  The NYSDEC recommends utilization of this "Partitioning Theory" to calculate cleanup criteria for specified contaminants in soil media, in order to mitigate contaminant leaching and thereby protect groundwater and surface water quality in New York State. This theory is based upon the solubility of compounds in water, and is usable only for select non-polar compounds and not for soluble metals or other polar compounds. In addition, it is recommended that for compounds for which the calculated cleanup criteria are low, alternate criteria, based upon the protection of human health be utilized.

- Eastern United States Background Concentrations of Twenty Elements in Soils, Undated

  This paper, prepared by E. Carol McGovern of the NYSDEC's Wildlife Resources Center, provides information relative to background concentrations of twenty metals detected in soils of the eastern United States.

NYSDEC Soil and Sediment Cleanup Criteria were calculated for contaminants at the site. These calculations were performed using the partitioning theory which is based upon the solubility of compounds in water. The New York State SCGs and other criteria listed throughout this section will be used along with the Risk Assessment to determine the need for remediation of the site. Copies of the documents containing the New York State SCGs and criteria are included in Appendix E.

4.1.1 Groundwater - Private Well Water

The primary New York State SCGs for this medium are the NYSDEC Class GA Groundwater Standards and Guidance Values, and the NYSDOH Drinking Water Standards.

4.1.2 Surface Water

The primary New York State SCGs for surface water are the NYSDEC Class C Surface Water standards and guidance values. The Fire Pond and Drainage Ditches are the on-site surface water bodies of concern. Catskill and Thorp Creeks are the off-site surface water bodies of concern relative to this study. Both the on-site and off-site surface water bodies are designated as Class C water bodies (a water body of which is primarily used for fishing). Although the on-site surface water bodies are not used for fishing per se they are hydraulically connected to the off-site Class C surface water bodies.

It should be noted that the NYSDEC standards and guidance values for Class C Surface Waters include compounds and elements, the standards for which are based upon the degree of hardness of the surface water and in some cases ionic species and valence of the metal. For such cases, the SCG has been calculated on a sample-specific basis using the hardness values for surface water in the vicinity of the site. The hardness value was obtained from the NYSDEC Bureau of Monitoring and Assessment.

4.1.3 Sediment

Concentrations of contaminants detected in surface water sediments have been compared to those levels calculated and/or listed in NYSDEC's Sediment Criteria Guidance by the Bureau of Environmental Protection Division of Fish and Wildlife. An Aquatic Toxicity Value was used for comparison when available for the contaminants identified. If no toxicity value was available for comparison, the Human Health value was considered. Where sediment criteria do not exist, concentrations were compared to values calculated using the Partitioning Theory of Kenaga and Goring.

4.1.4 Surface and Subsurface Soil

Concentrations of organic contaminants detected in surface soils and subsurface soils (borehole and test pit soils) are compared, where applicable, to those levels calculated in accordance with the Partitioning Theory, tentatively adopted by the NYSDEC. Such levels will be listed as NYSDEC Soil Cleanup Criteria. This model is used in those cases where the potential exists for contaminants to leach from soils into groundwater supplies. Other guidelines to be considered are the eastern United States background concentrations for metals.

4.2 DATA VALIDATION/USABILITY

4.2.1 Data Validation

Data validation was performed on the low level soil, sediment, surface water septic tank, and groundwater samples collected by Metcalf & Eddy at the Becker Electronics site. The samples were collected over two distinct periods of time (November 11, 1990 thru December 27, 1990 and April 24, 1991 thru May 8, 1991) and submitted to the laboratory, Pace Incorporated, for analysis of volatile organics, semivolatile organics, pesticides/PCBs and metals in accordance with New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) methodology.

These samples were collected and analyzed in support of a First Phase RI at the site. Numerous quality control problems became evident during the initial validation process undertaken by M&E's subcontractor NyTest Environmental, Inc. Following further review, resubmittal of information, and consultation with NYSDEC QA/QC staff, M&E determined that major elements of the data would be rejected requiring a resampling program which subsequently took place April-May 1991. Incomplete and otherwise unacceptable data packages required submittal. As a subcontractor to M&E, Gradient Corporation provided data validation for the resubmittals, as well as the resampling data packages, and prepared a data usability report.

4.2.2 Data Usability

A copy of the Data Usability report prepared by Gradient Corporation is included in Appendix F. Data usability was based upon an evaluation of representativeness, precision and accuracy of a sample or analyte following a review of laboratory quality control (QC) samples, matrix QC samples, field and laboratory blanks, holding times and calibrations as delineated in the data validation reports. Laboratory audits were conducted during the resampling program and shortly thereafter to assess compliance by Pace, Inc. with NYSDEC ASP analyses.

Based on the data validation from the initial resampling programs, the organics data (semivolatiles, volatiles and pesticides) is usable and comprehensive. QC deficiencies were noted for ASP vs. USEPA Method 524.2 holding times related to private well testing for volatile organics. The data is consistent with historical data and is usable.

Metals data had major deficiencies in all phases of sampling media. It should be noted that the resubmitted data packages were received after the resampling program had been completed. Preliminary assessments of the data validation and usability did not warrant metals to be included in the resampling program at that time.

Laboratory practices contributed to much of the non-compliance with NYSDEC ASP protocols. These practices do not individually cause disqualification of results but cumulatively caused all data to be qualified as estimated. Those metals analyses performed by inductively coupled plasma spectroscopy (ICP) include aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, nickel, potassium, silver, sodium, vanadium and zinc. These estimated results are of particular interest in cases where the data is at or exceeds the NYSDEC SCG level.

Additional problems during the analyses resulted in poor recoveries on analyte quantification and false positive readings due to interferences for silver and antimony. This data was determined to be unusable. A significant portion of lead data was unusable as a result of poor matrix spike recoveries.

Other metals; mercury, arsenic, selenium and thallium had results that were usable as estimated values. A total of 107 samples were analyzed for metals, inclusive of field blanks and duplicates. A summary of usability is presented in Table 4-2.

While the Becker project QAPP had a goal of 100% completeness a recommended technical value would be 90-95% since effects other than laboratory or field discrepancies such as matrix effects can cause data to be unusable. It is noted that 16 of 23 metals meet the 90% level and 13 of 23 meet the 95% level. More detailed descriptions of the usability results are presented by contaminant group and media.

Table 4-2

SUMMARY OF METALS DATA USABILITY

Analyte	Total # Usable Data	Total # Unusable Data	% Usable
Aluminum	76	31	71
Antimony	0	107	0
Arsenic	98	9	92
Barium	106	1	99
Beryllium	106	1	99
Cadmium	106	1	99
Calcium	96	11	90
Chromium	106	1	99
Cobalt	106	1	99
Copper	105	2	98
Iron	88	19	82
Lead	56	51	52
Magnesium	101	6	94
Manganese	95	12	89
Mercury	104	3	97
Nickel	106	1	99
Potassium	106	1	99
Selenium	106	1	99
Silver	0	107	0
Sodium	106	1	99
Thallium	106	1	99
Vanadium	106	1	99
Zinc	87	20	81

4.2.2.1 **Metals.**

Groundwater Groundwater sampling was comprised of seven field samples at locations MW-2 through MW-6, one field duplicate sample, and four field equipment blanks.

In summary, all antimony and arsenic data are unusable. All iron and zinc data are unusable. Aluminum values for MW-2 and MW-2-EQB are unusable. Data for lead are unusable in samples MW-5 and MW-5-EQB. All other data are usable but they must be considered estimated values.

Fire Pond Water Fire Pond Water Sampling was comprised of six samples at locations FP-1-SW through FP-3-SW and FP-1-BW through FP-3-BW, two field duplicates and two equipment blanks.

All mercury data are usable. All furnace data (selenium, thallium, arsenic) except for lead (samples FP-1-SW through FP-3-SW and FP-2-BW-DUP, FP-3-BW), are usable. All antimony and silver data are unusable. Zinc data are usable except for samples FP-1-SW through FP-3-SW. All remaining ICP analytes are usable but they must all be considered estimated values.

Fire Pond Sediment Fire Pond Sediment Sampling was comprised of three sediment samples at locations FP-1-SD through FP-3-SD, one field duplicate and one equipment blank. All mercury data are usable. All furnace data (lead, selenium, thallium) except for arsenic are usable. All remaining ICP analytes, except for antimony and silver and the single aluminum value for FP-EQB, are usable but they must all be considered estimated values.

Drainage Ditch Water Drainage Ditch water sampling consisted of nine field samples collected at locations DD-1-SW through DD-9-SW and two field duplicates. All furnace analytes (arsenic, lead, selenium, and thallium), except lead for samples DD-6-SW and DD-6-SW-DUP, are usable. All remaining ICP analytes, except antimony and silver on all samples and aluminum for DD-4-SW and DD-9-SW, are usable but they must all be considered estimated values.

Drainage Ditch Sediment Drainage Ditch sediment sampling consisted of nine field samples collected at locations DD-1-SD through DD-9-SD, two field duplicates and one equipment blank.

All mercury data are usable. All furnace data (arsenic, selenium, thallium), with the exception of lead, are usable. All remaining ICP analytes, except antimony, manganese, and silver, are usable but that they must all be considered estimated values.

Catskill and Thorp Creek Water Catskill and Thorp Creeks water sampling consisted of four field samples collected at locations TC-1-SW, TC-2-SW and CC-1-SW, CC-2-SW, one field duplicate and one equipment blank.

The furnace analytes, arsenic, lead, selenium and thallium, are usable. All mercury data are usable. All remaining ICP analytes, except aluminum, antimony, calcium, iron, manganese, and silver, are usable but that they must all be considered estimated values.

Catskill and Thorp Creek Sediments Catskill and Thorp Creeks sediment sampling consisted of four field samples collected at locations TC-1-SD, TC-2-SD and CC-1-SD, CC-2-SD, one field duplicate and one equipment blank.

All mercury data are usable. All furnace data (arsenic, selenium, thallium), except for lead, are usable. All remaining ICP analytes, except for antimony, calcium, and silver, are usable but they must all be considered estimated values.

Surface Soil Surface Soil sampling consisted of 19 field samples collected at locations SS-1 through SS-19, one field duplicate and one equipment blank.

All mercury data are usable. With the exception of lead, all furnace data (arsenic, selenium, thallium) are usable. All remaining ICP analytes, except for antimony and silver, are usable but they must all be considered estimated values.

Soil Boring Soil Boring sampling comprised four soil samples at locations BL-1 through BL-4, one field duplicate and two equipment blanks.

All mercury data are usable. Selenium and thallium furnace data are usable. All arsenic data are unusable except for BL-1. Furnace lead data, excepting the single equipment blank value (BL-1-EQB), are all usable with the caution that they were improperly quantitated by the laboratory which will add to the uncertainty of the value. Laboratory protocols for the furnace method of standard additions used to quantitate for lead was non-compliant, but did not deviate significantly enough from NYSDEC ASP to cause the data to be unusable. All antimony and silver data are unusable. All remaining ICP analytes, except for zinc in BL-2-DUP and aluminum in BL-EQB, are usable but they must all be considered estimated values.

Septic Tank Water Septic Tank Water was collected on 11/07/90 and 11/08/90, and consisted of two field samples and two equipment blanks.

In summary, antimony and silver data are unusable. All other data are usable with the exception of aluminum, copper, iron, and zinc for ST-3-SW. The ICP data is technically usable but non-compliant and therefore estimated values.

Septic Tank Sediment/Sludge Samples were collected on 11/07/90, 11/08/90 and 12/05/90 consisting of the three field samples and two equipment blanks.

In summary, all antimony and silver data are unusable. All data associated with sample ST-3-SD are unusable. All other data are usable but non-compliant and therefore estimated values.

Septic Tank Test Pit Soil Septic Tank Test Pit soil sampling consisted of three field samples collected at locations ST-1-TP through ST-3-TP, one field duplicate and two equipment blanks.

Sodium failed criteria in the laboratory control sample and therefore may be biased 20% low, but usable. Magnesium failed criteria in the interference check sample (ICSAB) associated with these data and may be biased 20% high but usable. Beryllium and cadmium were found as false positives in the ICS solutions and considering the high amount of iron (a major interfering element) in these samples may be biased high approximately the level of the CRDL. This would be a bias of 1 mg/Kg for beryllium and 1 mg/Kg for cadmium. The data are usable with this caveat. All remaining ICP analytes, except antimony and silver, are usable but they must all be considered estimated values. The remaining furnace analytes, arsenic, lead, selenium and thallium, are all usable, except for lead in samples ST-3-TP, ST-3-TP-DUP, and ST-2-TP-EQB. All mercury data are usable.

Discharge Pipe Sediment Discharge Pipe sediment sampling consisted of one field sample collected at location PP-1.

All furnace analytes, except lead, are usable. The mercury result is unusable. All remaining ICP analytes, except antimony and silver, are usable but they must all be considered estimated values.

SPDES Permit Sampling SPDES Permit sampling consisted of two field samples collected from the treatment system discharge on May 2, 1991 (SPDES-1) and May 7, 1991 (SPDES-2). No field duplicates or equipment blanks were associated with this sampling event.

Though all the ICP data are usable, they must all be considered estimated values.

4.2.2.2 Semivolatile Organics.

Groundwater The only semivolatile organic compounds detected in any of the groundwater samples were low levels of bis(2-ethylhexyl)phthalate (BEHP). Low levels of BEHP were also detected in some of the field blanks, thus the detection limit for BEHP has been raised due to possible contamination.

All groundwater semivolatile organic data are usable.

Fire Pond Water The basic functional QC criteria for the semivolatile organic analyses were met. However, isolated calibration problems jeopardized data quality for certain analytes. Detection limits for 3,3'-dichlorobenzidine for samples FP-2-BW, FP-3-SW, FP-3-BW, FP-4-SW, and FP-EB-BW are estimated due to poor calibration. Calibration problems for 4-chloroaniline required estimated detection limits for FP1-BW, FP2-SW, and FP2-SW. Poor internal standard response for d_{12}-perylene and d_{12}-chrysene for sample FP-3-SW required estimating detection limits for any analytes quantitated using those internal standards. Lastly, the detection limit for bis(2-ethylhexyl)phthalate for FP1-BW, FP1-SW, and FP2-SW has been raised due to possible contamination. Except for the instances mentioned above, all fire pond water semivolatile organic data are usable except for N-nitroso-di-n-propylamine and 2,4-dinitrotoluene for samples FP2-BW, FP3-SW, FP3-BW, FP4-SW, and FP-EB-BW.

Fire Pond Sediment Data for FP1-SED can be used only as a preliminary indicator of the presence of contaminants. The analytical QC criteria for FP2-SED, FP3-SED, FP4-SED were acceptable. The calibration of hexachlorocyclopentadiene for sample FP-2-SED was above criteria resulting in an estimated detection limit. However, this compound was not detected in this sample; thus, the data is acceptable. With regard to the blanks, detection limits for BEHP, diethylphthalate, and di-n-butylphthalate have been raised due to possible contamination. Semivolatile organic data for FP1-SED is not usable, while data for FP2-SED, FP3-SED, and FP4-SED are usable.

Drainage Ditch Water Except for the 14 ppb of bis(2-ethylhexyl)phthalate in sample PD-2-SW, there no semivolatile organics detected in any of the drainage ditch water samples. Calibration problems in sample DD-2-SW for 3-nitroaniline required raising the detection limit. All drainage ditch water semivolatile organic data are usable.

Drainage Ditch Sediment Many of the drainage ditch sediments are characterized with significant amounts of BEHP (DD-2-SED, DD-5-SED, DD-8-SED, and DD-11-SED). In addition, sample DD-6-SED contains almost all of the polynuclear aromatic hydrocarbons on the TCL, indicating petroleum as a possible contaminant.

Although the concentration for a number of analytes has been estimated, all drainage ditch semivolatile organic data are usable.

Catskill and Thorp Creek Water No semivolatile organic compounds were detected in any of the creek water samples. Non-compliant calibrations for benzoic acid and 2,4-dinitrophenol were noted for CC-2-SW, and for 3,3'-dichlorobenzidine for CC-1-SW, thus requiring the detection limits for these compounds to be estimated. Surrogate and matrix spike recoveries were generally good; however, there was no recovery of N-nitroso-di-n-propylamine and 2,4-dinitrotoluene in the matrix spike blank. Therefore, data for these two compounds is rejected for samples TC-1-SW and CC-1-SW. All Catskill and Thorp Creek water semivolatile organic data are usable except for N-nitroso-di-n-propyl amine and 2,4-dinitrotoluene in samples TC-1-SW and CC-1-SW.

Catskill and Thorp Creek Sediment No semivolatile organics were detected in any of the creek sediment samples. As with the creek water samples, there was no recovery of N-nitroso-di-n-propylamine and 2,4-dinitrotoluene in the matrix spike blank. Therefore, data for these two compounds is rejected for samples TC-2-SED, TC-3-SED, CC-1-SED, and CC-2-SED. No contaminants were noted in the blanks. All Catskill and Thorp Creek sediment semivolatile organic data are usable except for N-nitroso-di-n-propylamine and 2,4,-dinitrotoluene in samples TC-2-SED, TC-3-SED, CC-1-SED, and CC-2-SED.

Surface Soil Phthalates, bis(2-ethylhexyl) and/or di-n-octyl, were detected in significant quantities in 13 of 19 surface soil samples. Two soil samples (SS-2 and SS-15) also contained a suite of polynuclear aromatic hydrocarbons which may be indicative of petroleum contamination. Phenol was detected in one soil sample (SS-2) and 1,4-dichlorobenzene was found in two soil samples (SS-4 and SS-5).

Although the concentration of most analytes has been estimated, all surface soil semivolatile organic data are usable.

Soil Borings Bis(2-ethylhexyl)phthalate was detected in four of the five soil boring samples and butylbenzylphthalate was found in one of the samples. No other semivolatile organic compounds were detected in the soil boring samples. Due to problems with the calibrations, the detection limits for 3,3'-dichlorobenzidine have been qualified for samples BL-1, BL-2 (2-4), BL-2 (4-6), and BL-5; and the quantitation of bis(2-ethylhexyl)phthalate has been estimated for BL-5 because the concentration recorded was above the calibration range. The value recorded for BL-2 (a duplicate of BL-5) for bis(2-ethylhexyl)phthalate should be considered the true concentration of the sample. Detections limits for bis(2-ethylhexyl)phthalate, diethylphthalate, and di-n-butylphthalate had to be raised for BL-4 due to possible blank contamination. All soil boring semivolatile organic data are usable.

Septic Tank Water No semivolatile organics were detected in any of the septic tank water samples. The detection limit for bis(2-ethylhexyl)phthalate had to be raised slightly for all samples due to possible blank contamination. All septic tank water semivolatile organic data are usable.

Septic Tank Sediment Two of the three septic tank sediment samples (ST-1-SED and ST-3-SED) contained numerous polynuclear aromatic hydrocarbons. 1,4-Dichlorobenzene was also found in these same two samples. Bis(2-ethylhexyl)phthalate was found in high quantities in all three samples, di-n-butyl phthalate and di-n-octyl phthalate in two of the sediments, and butyl benzyl phthalate in ST-1-SED. Benzoic acid and 2-methylnaphthalene were detected in ST-2-SED.

There were serious problems with internal standard responses and calibration, which resulted in almost all of the quantitative data being qualified. The septic tank sediment semivolatile organic data can only be used to ascertain the presence or absence of contaminants and to determine an "order-of-magnitude" concentration.

Septic Tank Test Pit Soil Polynuclear aromatic hydrocarbons and benzoic acid were detected in one of the three septic tank test pit soil samples. In addition, two of the three samples contained bis(2-ethylhexyl)phthalate, and one sample contained di-n-octyl phthalate. The internal standard responses for ST-1-SL were poor, and the reanalysis of the sample produced a poor comparison of results.

Minor calibration problems resulted in estimated detection limits for benzoic acid for ST-4-SL and estimated detection limits for 3,3'-dichlorobenzidine for ST-3-SL and ST-2-SL. Surrogate recoveries were slightly high for 2-

fluorobiphenyl for all samples. Due to internal standard problems and poor precision and accuracy results for the reanalysis, data for ST-1-SL are not usable. All other septic tank test pit soil semivolatile organic data are usable.

Discharge Pipe Sediment Benzoic acid, 2-methylnaphthalene, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate were detected in the discharge pipe sediment sample. Minor internal standard criteria problems required qualifying the quantitation of benzoic acid, 2-methylnaphthalene, and bis (2-ethylhexyl)phthalate. The detection limits for benzoic acid and 2,4-dinitrophenol were estimated due to calibration problems. The discharge pipe sediment semivolatile organic data are usable.

4.2.2.3 Volatile Organics.

Groundwater All groundwater samples contained some chlorinated ethane and ethylene compounds in varying concentrations. Although there was low level contamination of methylene chloride and acetone in some of the blanks, only the methylene chloride detection limit for MW-5 required being raised slightly (28 vs. 25 ppb). Due to a low relative response factor for 2-butanone (<0.05), the 2-butanone data for MW-3 is not usable. All groundwater volatile organic data, with the exception of 2-butanone for MW-3, are usable.

Private Water Supply Significant QC problems were evidenced in all private water supply samples analyzed for volatile organics by EPA Method 524.2. All analyses were performed after 7 days of Verified Time of Sample Receipt (VTSR), but usually within 14 days of sampling. The ASP preservation and holding time requirements were not met and the data are non-compliant. The non-detect results of associated samples (PW-6-F and PW-6-L) were rejected due to possible misidentification of target analytes. Review of the mass spectra of identified compounds confirmed their presence. The results for this set of data are consistent with historical data, and make sense from a hydrogeological perspective.

Fire Pond Water No volatile organics were found in any of the fire pond water samples. The laboratory method blanks contained low levels of acetone and methylene chloride, thus the detection limits for these two compounds have been raised for a few of the samples due to possible contamination. All fire pond water volatile organic data are usable.

Fire Pond Sediment No volatile organics were found in any of the fire pond sediments. Low level contamination of methylene chloride and acetone in some of the blanks required the slightly raising the detection limit for these two compounds. With the exception of methylene chloride in FP2-SD and FP3-SD, all fire pond sediment data are usable.

Drainage Ditch Water Low levels of 1,1,1-trichloroethane and other halogenated solvents were detected in the drainage ditch waters. However, holding times for DD1-SW and DD8-SW were missed by 1 day (8 days VTSR). Although contractually these two samples are non-compliant, they should be considered scientifically acceptable, and thus usable.

Drainage Ditch Sediment Most drainage ditch sediment samples contained no volatile organics. Chloroethane and 1,1-dichloroethane were detected in DD-4-SD and 1,1,1-trichloroethane in DD-8-SD.

Due to several problems associated with the volatile organic analysis of the drainage ditch sediments, the overall data quality for these samples is suspect. Data for these samples should be used only to determine the general nature of contamination.

Catskill and Thorp Creek Water For the most part the creek water samples did not contain volatile organic compounds. Trace levels (2 ppb) of 1,2-dichloroethane and 1,1,1-trichloroethane were found in CC-1-SW, and 10 ppb of 1,1,1-trichloroethane was detected in TC-2-SW.

Detection limits for acetone levels had to be raised slightly due to possible contamination noted in the blank. All Catskill and Thorp Creek water volatile organic data are usable.

Catskill and Thorp Creek Sediment No volatile organic compounds were detected in any of the creek sediment samples. All surrogate and matrix spike recoveries were acceptable. Low level contamination of methylene chloride and acetone in all of the blanks necessitated raising the detection limit slightly for these two compounds. All Catskill and Thorp Creek sediment volatile organic data are usable.

Surface Soil The surface soils were generally devoid of significant levels of volatile organic contaminants. SS-9, SS-10, S-11, SS-22 contained low levels of toluene, and SS-18 contained both toluene and xylene. In addition, SS-18 contained low levels of 4-methyl-2-pentanone, 2-butanone, and 1,1-dichloroethane. SS-12 contained low levels of 1,1,1-trichloroethane, while S-11 contained relatively high levels of 1,1,1-trichloroethane as well as a low level of trichloroethane.

Due to blank contamination, the detection limits were raised slightly for methylene chloride and acetone in samples SS-12, SS-22, SS-7, and SS-14, and for methylene chloride, acetone, and chloroform in samples SS-1, SS-2, SS-15, SS-16, and SS-18. Although the concentrations of a few analytes have been qualified, all surface soil volatile organic data are usable.

Soil Borings There were no volatile organic compounds detected in any of the soil boring samples. Low level contamination of methylene chloride and acetone in the blanks required raising the detection limit slightly for these two compounds. All soil boring volatile organic data are usable.

Septic Tank Discharge Pipe Water 1,1-Dichloroethane and 1,1,1-trichloroethane were detected in two of the three septic tank water samples. Low level blank contamination of acetone, methylene chloride, and chloroform required slightly raising the detection limits for these three compounds for samples ST-1-SW and ST-3-SW; and for methylene chloride and acetone for sample ST-2-SW. Due to a poor relative response factor for 2-butanone in the continuing calibration, data for this compound is rejected for ST-2-SW. All matrix spike and surrogate spike recoveries were good. All septic tank water volatile organic data, except for 2-butanone in sample ST-2-SW, is usable.

Septic Tank Sediment Chloroethane, 1-1-dichloroethane, 1,1,1-trichloroethane and toluene were detected in sample ST-2-SED, and toluene was detected in ST-3-SD. The holding time for ST-5-SED was missed by 1 day (8 days VTSR). Although contractually this sample is non-compliant, it should be considered scientifically acceptable, and thus usable.

Low level contamination of acetone, methylene chloride, and chloroform required slightly raising the detection limits for these three compounds for ST-1-SD; and for methylene chloride and acetone for ST-2-SED. All septic tank sediment volatile organic data are usable.

Septic Tank Test Pit Soil There were no volatile organic compounds detected in any of the septic tank test pit soil samples. Low level blank contamination of acetone, methylene chloride, and chloroform required slightly raising the detection limits for these three compounds for ST-1-TP and ST-3-TP; and for methylene chloride and acetone for ST-2-SL. Matrix spike and surrogate spike recoveries were good. All septic tank test pit soil volatile organic data are usable.

Discharge Pipe Sediment Data for this sample was originally rejected by Nytest due to holding time problems. No other sample was taken to replace the original sample.

SPDES Permit No volatile organic constituents were detected in either of the SPDES water samples. Low level blank contamination of methylene chloride and acetone required slightly raising the detection limits for these two compounds for sample SPDES-1. Because of a poor relative response factor for 2-butanone in the continuing calibration, data for this compound is rejected for SPDES-2. All SPDES volatile organic data, except for 2-butanone in SPDES-2, is usable.

4.2.2.4 Pesticides.

Groundwater No pesticides were detected in any of the groundwater samples analyzed. There was a false positive reported for dieldrin in MW-4 which has been deleted from the final data report. All groundwater pesticide data are usable.

Fire Pond Water No pesticides were detected in any of the fire pond water samples. All fire pond water pesticide data are usable.

Fire Pond Sediment As with the fire pond water samples, no pesticides were detected in the fire pond sediments. All fire pond sediment pesticide data are usable.

Drainage Ditch Water No pesticides were detected in the drainage ditch waters. All holding time and analytical QC criteria were met. All drainage ditch water pesticide data are usable.

Drainage Ditch Sediment One drainage ditch sediment (DD-4-SED) contained 4100 ppb of Aroclor-1254. All drainage ditch sediment pesticide data are usable.

Catskill and Thorp Creek Water No pesticides were detected in any of the creek water samples. All Catskill and Thorp Creek water pesticide data are usable.

Catskill and Thorp Creek Sediment There were also no pesticides found in the creek sediment samples. All Catskill and Thorp Creek sediment pesticide data are usable.

Surface Soil No pesticides were detected in any of the surface soil samples. All surface soil pesticide data are usable.

Soil Boring No pesticides were detected in any of the soil boring samples. 4,4'-DDT and endosulfan sulfate were found to "coelute" in the DB-5 confirmation column, resulting in a resolution less than 25%. This resulted in improper calibration factors for DDT. This was of no consequence, since no DDT or endosulfan sulfate were detected in any of the samples. All soil boring pesticide data are usable.

Septic Tank Water No pesticides were detected in the one septic tank water sample analyzed. All pesticide data for the septic tank water sample are usable.

Septic Tank Sediment No pesticides were detected in either of the septic tank sediment samples. The surrogate recovery of DBC was good for ST1-SD, but initially a problem for ST2-SD. A diluted analysis of ST2-SD did produce acceptable recoveries (25% versus 20%). Matrix spike results associated with ST1-SD were good, however were poor for ST2-SD. Recoveries varied due to co-eluting compounds in the matrix. Recoveries and relative percent deviations were acceptable for lindane, dieldrin, and endrin, but high (>300%) recoveries were noted for heptachlor, aldrin, and 4,4'-DDT. Due to the matrix problems, all pesticide data for ST2-SD, which are non-detects, have been estimated. All septic tank sediment pesticide data are usable.

Septic Tank Test Pit Soil No pesticides were detected in the three septic tank test pit soil samples. The matrix spikes for ST-3-TP had unacceptable recoveries, including 0% for DDT in both the matrix spike and matrix spike duplicate samples and 0% for aldrin in the matrix spike. The detection limits for ST-3-TP have thus been qualified to reflect the matrix spike problems. All septic tank test pit soil pesticide data are usable.

Discharge Pipe Sediment No pesticides were detected in the one discharge pipe sediment sample. There was one significant QC problem associated with sample PP-1, which was analyzed at 1:10 and 1:100 dilutions due to the presence of interferences. The DDD result has been rejected, as it was impossible to determine if it is truly present. The pesticide data for the discharge pipe sediment are usable for all analytes except 4,4'-DDD.

4.3 RESULTS OF PHASE I SITE CHARACTERIZATION

The analytical results for Target Compound List volatiles, semi-volatiles, pesticides/PCBs and metals are presented in data tables which can be found in Appendix G of this document. Data qualifiers used are defined in each of these tables.

With respect to the presentation of data, the following should be noted:

- All of the data presented by the analytical laboratory is included on the tables contained in Appendix G. In order to determine data validity and usability, one should refer to Section 4.2 of this document as well as the Data Usability Report, contained in Appendix F.

- These data tables present analytical results for each environmental sample on a medium-specific basis, as well as all equipment and trip blanks associated with the subject sampling effort. Also presented are the New York State SCGs considered for that medium.

- With respect to New York State SCGs, these data tables list the applicable New York State standard or guidance value on a contaminant-specific basis. These include NYSDEC Groundwater and Surface Water Standards or Guidance Values, NYSDOH Drinking Water Standards, as well as calculated soil cleanup criteria based upon the Partitioning Theory, and the NYSDEC Sediment Criteria Guidance. With respect to the Partitioning Theory and the Sediment Criteria Guidance, SCGs have been calculated for all compounds analyzed.

In reviewing these data tables, it will be noted that certain compounds do not have New York State SCGs associated with them. These compounds, as well as other compounds that have been detected at the site, are addressed in the health risk and environmental assessments. These assessments, together with the applicable standards and guidance values, will be utilized to define additional investigation if any, which should be performed at the Becker Electronics site. In instances where samples were either resampled or re-analyzed, the most recent usable data was utilized for comparison with SCGs.

It should be noted that although a number of compounds were detected in various media at the site, those found below SCGs will not be considered in the following discussion on nature and extent of contamination. The discussion will focus only on those contaminants which exceed SCGs. These contaminants will also be compared to concentrations detected in equipment, trip and method blanks and site background samples. This comparison is made to determine whether or not the contamination of concern detected above its SCG is a direct result of hazardous waste at the Becker Electronics site, a result of environmental or laboratory contamination, or is naturally occurring.

In media where contaminant concentrations exceed SCG's, particularly estimated inorganic contaminants, it will be necessary to compare these concentrations to site specific background samples during the second phase RI. Summary tables have been prepared for presentation of contaminants exceeding SCGs. It, should be noted that all J (estimated concentration) qualifiers have been dropped from reported concentration values in these tables. The reader should refer to the data tables contained in Appendix G for a complete account of data results.

4.3.1 Surface Soils

The Phase I RI at the Becker Electronics site included the collection of 19 surface soil samples from locations throughout the site which were suspected of being contaminated based on field observations. All of the samples obtained were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The entire suite of analyses can be found in Tables 30, 31, 32, and 33 located in Appendix G. Table 4-3 presents those compounds which were detected at concentrations exceeding SCGs.

The VOCs 1,1,1-trichloroethane, 1,1-dichloroethane, and 2-butanone were each found in one surface soil sample at concentrations exceeding SCGs. 1,1-dichloroethane and 2-butanone were each detected above SCGs in sample SS-18. 1,1,1 trichloroethane and trichloroethene were reported exceeding SCGs in sample SS-11.

A number of Semi-VOCs including; benzoic acid, chrysene, bis(2-ethyl-hexyl)phthalate, di-n-octylphthalate, phenol, benzo(b)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene were found above SCGs in ten of the 19 samples. Samples, SS-2 and SS-15 contained a suite of polynuclear aromatic hydrocarbons which may be indicative of petroleum contamination.

Numerous metals including barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, and zinc were detected at concentrations exceeding New York State natural background levels in soil.

TABLE 4-3
SURFACE SOIL INVESTIGATION
CONTAMINANTS EXCEEDING SCGs/NATURAL BACKGROUND LEVELS

	SCG[a]	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10
Volatile Organic Compounds (μg/kg)											
1,1,1-Trichloroethane	23	U	U	UJ	U	U	U	U	U	U	U
1,1-Dichloroethane	5	U	U	UJ	U	U	U	U	U	U	U
2-Butanone	7	U	U	UJ	UJ	UJ	UJ	U	UJ	UJ	U
Trichloroethene	19	U	U	UJ	U	U	U	U	U	U	U
Semi-VOCs (μg/kg)											
Benzoic Acid	75	U	U	UJ	U	U	U	U	U	U	U
Chrysene	12	U	68*	UJ	U	U	U	U	U	UJ	U
Bis(2-ethylhexyl)phthalate	10838	3100	4600	13000*	U	6400	5500	U	U	1800	U
Di-n-octylphthalate	3578	U	U	500	U	550	240	UJ	U	84	340
Phenol	0.43	U	54*	U	U	U	U	U	U	UJ	U
Benzo(b)fluoranthene	33	U	130*	UJ	U	U	U	UJ	U	UJ	U
Benzo(a)pyrene	ND	U	63*	UJ	U	U	U	UJ	U	UJ	U
Indeno(1,2,3-cd)pyrene	96	U	U	UJ	U	U	U	UJ	U	UJ	U
Inorganics (mg/kg)											
Barium	250-350	107	72.9	763*	78.8	56.8	109	306	89.5	334	112
Beryllium	0-0.9	4.0*	2.9*	2.3*	3.1*	2.9*	6.3*	4.0*	3.1*	5.6*	5.9*
Cadmium	0.0001-0.1	1.4	0.80*	42.9*	0.78*	UJ	1.4*	UJ	UJ	1.2*	1.5*
Calcium	150-1650	1470	1390	51100*	1490	2010*	3990*	2080*	2340*	2530*	11600*
Chromium	1.5-25	28.5*	14.9	205*	15.8	12.5	29.1*	24.0	16.0	28.1*	26.5*
Cobalt	2.5-6	11.0*	9.0*	26.0*	10.9*	8.1*	19.1*	11.6*	11.3*	16.0*	18.1*
Copper	<1-15	160.0*	14.6	106*	11.9	31.3*	16.2*	28.3*	47.6*	18.6*	10.4
Iron	17500-25000	24,400	17300	15100	19900	16900	37300*	24500	19300	33600*	34900*
Lead	1-12.5	R	R	404*	11.7	5	8.4	6	14.2*	12.4	6.6
Magnesium	1700-6000	3590	2630	6120*	2690	2930	5700	3640	3040	5240	5520
Manganese	400-600	686*	414	2590*	313	179	265	199	442	192	465
Mercury	0.042-0.066	1.2*	U	U	U	U	U	U	U	U	U
Nickel	6-12.5	30.2*	22.8*	33.8*	26.2*	23.8*	56.7*	34.7*	28.3*	50.1*	53.2*
Zinc	37-60	472*	90.5*	390*	97.7*	97.4*	109*	263*	93.2*	157*	104*

* Exceeds New York State Soil Cleanup Criteria/Natural background level

a New York State SCGs are the NYSDEC Soil Cleanup Criteria for VOCs/Semi-VOCs. There are no SCGs for inorganics, therefore the NYSDEC range of natural background levels in soil will be used for comparison.

Note: U = Not Detected
UJ = Compound not detected — the sample quantitation limit is an estimate
R = Data rejected due to deficient laboratory QA/QC

TABLE 4-3 (continued)
SURFACE SOIL INVESTIGATION
CONTAMINANTS EXCEEDING SCGs/NATURAL BACKGROUND LEVELS

	SCG[a]	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18	SS-19
Volatile Organic Compounds (μg/kg)										
1,1,1-Trichloroethane	23	470*	14	U	U	U	U	UJ	U	U
1,1-Dichloroethane	5	U	U	U	U	U	U	U	8*	U
2-Butanone	7	U	U	U	U	U	U	U	56*	U
Trichloroethene	19	22*	U	U	U	U	U	UJ	U	U
Semi-VOCs (μg/kg)										
Benzoic Acid	75	130*	15000*	U	U	U	U	U	140*	U
Chrysene	12	U	U	170*	UJ	U	U	U	U	U
Bis(2-ethylhexyl)phthalate	10838	U	45000*	UJ	UJ	1500	31000*	26000*	11000*	14000*
Di-n-octylphthalate	3578	U	U	UJ	UJ	U	1000	4400*	340	7400*
Phenol	0.43	U	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	33	U	U	UJ	UJ	420*	U	U	UJ	U
Benzo(a)pyrene	ND	U	U	UJ	UJ	230*	U	U	UJ	U
Indeno(1,2,3-cd)pyrene	96	U	U	UJ	UJ	220*	U	U	UJ	U
Inorganics (mg/kg)										
Barium	250-350	94.2	62.1	80.8	154	65.7	85.2	194	52.2	65.1
Beryllium	0-0.9	7.3*	4.6*	4.5*	0.66	3.3*	4.5*	4.1*	4.2*	3.7*
Cadmium	0.0001-0.1	1.9*	1.2*	4.5*	UJ	1.4*	1.60*	5.1*	0.85	1.2*
Calcium	150-1650	4380*	6940*	30500*	299000*	12600*	8920*	131000*	1030	6540*
Chromium	1.5-25	24.3	23.5	21.4	3.9	17.3	24.9	24.9	22.5	22.7
Cobalt	2.5-6	16.3*	14.1*	14.0*	UJ	10*	14.6*	15.7*	14.4*	11.8*
Copper	<1-15	53.5*	38.6*	26.0*	10.9	21.0*	34.2*	330*	48.6*	21.2*
Iron	17500-25000	49100*	28600*	26600*	4720	20400	25800*	25300*	24800	22100
Lead	1-12.5	54.5*	27.7*	17.2*	5.5	R	R	74.4*	R	24.3*
Magnesium	1700-6000	3750	4390	5760	11200*	4720	5080	9010*	4860	3800
Manganese	400-600	672	585	508	150	472	503	423	183	474
Mercury	0.042-0.066	U	U	U	U	U	U	U	U	U
Nickel	6-12.5	48.7*	38.6*	38.4*	6.6	24.3*	38.4*	36.5*	39.1*	31.8*
Zinc	37-60	280*	328*	115*	104*	88.6*	663*	505*	960*	188*

* Exceeds New York State Soil Cleanup Criteria/Natural background level

a New York State SCGs are the NYSDEC Soil Cleanup Criteria for VOCs/Semi-VOCs. There are no SCGs for inorganics, therefore the NYSDEC range of natural background levels in soil will be used for comparison.

Note: U = Not Detected
UJ = Compound not detected – the sample quantitation limit is an estimate
R = Data rejected due to deficient laboratory QA/QC

It should be noted that although lead data was deemed unusable as per the data usability report it will be identified as a contaminant of concern at this time due to its toxicity and presence as a contaminant of concern in several other site media.

Based upon comparison of compound concentrations with applicable SCGs and New York State natural background levels in soil the following compounds will be considered contaminants of concern for surface soils:

Contaminants of Concern	Number of Samples Detected Above SCGs	Total Number of Samples Collected
1,1,1-Trichloroethane	1	19
1,1-Dichloroethane	1	19
2-Butanone	1	19
Trichloroethene	1	19
Benzoic Acid	3	19
Chrysene	2	19
Bis(2-ethylhexyl)phthalate	6	19
Di-n-octylphthalate	2	19
Phenol	1	19
Benzo(b)fluoranthene	2	19
Benzo(a)pyrene	2	19
Indeno(1,2,3-cd)pyrene	1	19
Barium	1	19
Beryllium	18	19
Cadmium	13	19
Calcium	15	19
Chromium	5	19
Cobalt	18	19
Copper	15	19
Iron	8	19
Lead	7	19

Contaminants of Concern	Number of Samples Detected Above SCGs	Total Number of Samples Collected
Magnesium	3	19
Manganese	2	19
Mercury	1	19
Nickel ✓	18	19
Zinc ✓	19	19

4.3.2 Subsurface Soils

The investigation of subsurface soil at the Becker Electronics site included sampling and laboratory analysis of borehole soil collected from four soil borings. All samples were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The results of these analyses can be found in Tables 34, 35, 36, and 37 located in Appendix G. Table 4-4 presents those contaminants which were detected above the maximum range of New York State natural background levels in soil.

There were no VOCs, Semi-VOCs or pesticides/PCBs reported at concentrations exceeding SCGs for subsurface soils.

The metals beryllium, cadmium, calcium, cobalt, iron, nickel and zinc were found at concentrations exceeding natural background levels. Zinc was detected in all samples except BL-2(4-6') at concentrations exceeding natural background levels. Iron was detected in samples, BL-2(2-4'), BL-3 and BL-4 exceeding natural background levels, and cadmium and calcium were found exceeding natural background levels in samples BL-3 and BL-2(4-6') respectively.

TABLE 4-4

SOIL BORING INVESTIGATION
CONTAMINANTS EXCEEDING RANGE OF NATURAL BACKGROUND LEVELS IN SOIL

	Natural Background Levels in Soil[a]	BL-1	BL-2 (2-4')	BL-2 (4-6')	BL-3	BL-4
Inorganics (mg/kg)						
Beryllium	0-0.9	2.7*	4.5*	2.9*	6.2*	4.7*
Cadmium	0.0001-1.0	0.9	0.90	UJ	1.0*	0.86
Calcium	150-6500	1760	4050	8010*	2340	5020
Cobalt	2.5-6	9.3*	14.9*	9.3*	15.3*	15.2*
Iron	17500-25000	18400	27700*	17900	36000*	28300*
Nickel	6-12.5	23.6*	41.0*	28.1*	51.1*	28.1*
Zinc	37-60	68.6*	75.7*	R	92.5*	72.3*

* Exceeds NYSDEC natural background level in soil

a Since there are no New York State SCGs for inorganics the NYSDEC range of natural background levels in soil will be used for comparison.

Note: U = Not Detected

UJ = Compound not detected - the sample quantitation limit is an estimate

R = Data rejected due to deficient laboratory QA/QC

To summarize, the contaminants of concern detected in subsurface soils at the Becker Electronics site are as follows:

Contaminants of Concern	Number of Samples Detected Above Natural Background levels	**Total Number of Samples Collected**
Beryllium	55	55
Cadmium	1	5
~~Calcium~~	1	5
Cobalt	5	5
~~Iron~~	3	5
Nickel	5	5
Zinc	4	5

4.3.3 Groundwater

The groundwater investigation program at the Becker Electronics site consisted of the installation and sampling of three bedrock monitoring wells and one overburden well in addition to the sampling of two existing Becker wells. Each of these six wells was sampled and analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analyses can be found in Tables 1, 2, 3, and 4 of Appendix G. Table 4-5 presents the contaminants exceeding SCGs for groundwater underlying the Becker Electronics site. Due to the possibility of off-site pumping wells creating a reversal in the hydraulic gradient in the vicinity of monitoring well MW-6 as well as the complexities of bedrock fracture flow, caution should be used in regarding MW-6 as an upgradient well representing background conditions.

Based upon groundwater sampling, the contaminants found to exceed SCGs for this medium are the VOCs, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethene(total), chloroform, 1,1,1-trichloroethane, trichloroethene,

TABLE 4-5

GROUNDWATER INVESTIGATION
CONTAMINANTS EXCEEDING SCGs

	SCG[a]	MW-2S	Becker-2	Becker-3	MW-4	MW-5	MW-6	Site Background[b]
Volatile Organic Compounds (μg/l)								
1,1-Dichloroethene	5	96*	11*	U	230*	63*	U	U
1,1-Dichloroethane	5	230*	85*	40*	290*	670*	7*	7
1,2-Dichloroethene (Total)	5	U	5*	U	400*	U	U	U
Chloroform	7	U	U	U	U	17*	U	U
1,1,1-Trichloroethane	5	2200*	12*	U	1700*	650*	23*	23
Trichloroethene	5	U	5*	U	530*	U	U	U
Tetrachloroethene	5	U	U	U	52*	U	U	U
Toluene	5	U	U	U	62*	21*	U	UJ
Inorganics (μg/l)								
Iron	300	3140*	5610*	U	16,900*	12800*	10700*	10700
Lead	25	U	U	U	25.6*	U	U	U
Manganese	300	1580*	U	U	470*	U	3450*	3450
Mercury	2	2.3*	U	U	U	U	U	U
Sodium	20000	22700*	U	U	U	U	U	U
Zinc	300	23	1050*	R	192	163	64	64

* Exceeds New York State standards, criteria or guidance values
a New York State SCGs are the NYSDEC Standards (s) and guidance values (g) for class GA groundwater
b Concentrations from "background" monitoring well MW-6 sample.

Note: U = Not Detected
R = Value was rejected due to deficient laboratory QA/QC
UJ = Compound not detected - the sample quantitation limit is an estimate

tetrachloroethene and toluene; and the metals iron, lead, manganese, mercury, sodium and zinc. VOCs were detected in all of the on-site wells. No Semi-VOCs exceeded SCGs. 1,1-dichloroethene was detected at concentrations exceeding its corresponding SCG in the overburden well (MW-2S) and in three of the five bedrock wells (Becker-2, MW-4 and MW-5); 1,1-dichloroethane in all six wells; 1,2-dichloroethene(total) in two of the five bedrock wells (Becker-2 and MW-4); chloroform in MW-5; 1,1,1-trichloroethane in the overburden well and four of the five bedrock wells; trichloroethene in two of the five bedrock wells (Becker-2 and MW-4); tetrachloroethene in one of the five bedrock wells (MW-4); and toluene in two of the five bedrock wells (MW-4 and MW-5).

With the exception of chloroform, all of the aforementioned VOCs will be considered contaminants of concern for groundwater at the Becker Electronics site. Although chloroform concentration exceeded the NYSDEC Class GA groundwater standard at MW-5 (17μg/l), it will not be included as a contaminant of concern at this time due to the following:

1. The detected concentration is below NYSDOH drinking water standards

2. The concentration is listed as an estimated value subject to uncertainty

3. Its occurrence is solely identified in a single media sample and is undetected in any other media

A resampling effort scheduled as part of the second phase RI may allow reconsideration of chloroform as a contaminant of concern.

Metals that were found at concentrations exceeding SCGs include: iron (MW-2S, MW-2, MW-4, MW-5, MW-6); lead (MW-4, MW-6); manganese (MW-2S, MW-4, MW-6); mercury (MW-2S); sodium (MW-2S) and zinc (MW-2). The data for iron and zinc was deemed unusable by the data usability report.

The levels of manganese detected at the site were within normal ranges of what naturally occurs in groundwaters. The effects of this constituent are similar in nature to iron, where staining of fixtures and imparting of a certain "taste" can occur at levels above 300 ppb. The NYSDOH has established this level for "aesthetic" purposes rather than for any health impacts.

The NYSDEC Class GA Groundwater standard for sodium is 20,000 $\mu g/l$, which is the NYSDOH recommended level for individuals on a severely restricted sodium diet. In addition, the NYSDOH has set a level for individuals on a moderate sodium restricted diet at which they should refrain from drinking water with sodium concentrations greater than 250,000 $\mu g/l$. Sodium was only detected in the overburden well (MW-2S) at a concentration significantly below the NYSDOH recommended level. As a result both manganese and sodium will not be considered as contaminants of concern.

Based on their occurrence in various media sampled during the first phase RI, and their estimated values exceeding SCG's, lead and mercury are the only two metals identified as contaminants of concern for groundwater at the Becker Electronics site.

In summary, the contaminants of concern detected in groundwater at the Becker Electronics site are as follows:

Contaminants of Concern	Number of Samples Detected Above SCGs	Total Number of Samples Collected
1,1-Dichloroethene	4	6
1,1-Dichloroethane	6	6
1,2-Dichloroethene(total)	2	6
1,1,1-Trichloroethane	5	6
Trichloroethene	2	6
Tetrachloroethene	1	6
Toluene	2	6
Lead	1	6
Mercury	1	6

4.3.4 Surface Water

4.3.4.1 Catskill and Thorp Creeks. The surface water investigation conducted during the Phase I RI included the collection of water samples at two locations along Thorp Creek and two locations along Catskill Creek. All samples obtained were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analyses can be found in Tables 22, 23, 24, and 25 located in Appendix G.

There were no compounds found in either Catskill or Thorp Creek surface waters at concentrations exceeding SCGs. 1,2-Dichloroethene(total) (for which there is no SCG) was detected at 2-μg/l in the Catskill Creek upstream sample.

4.3.4.2 Drainage Ditch and Surface Drainage. The Phase I RI surface water investigation included the collection of eight water samples from drainage ditches at the Becker Electronics site and one water sample from ponded surface drainage. All samples were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analytical results can be found in Tables 14, 15, 16, and 17 located in Appendix G. Contaminants detected at concentrations exceeding SCGs are shown in Table 4-6.

Based on this drainage ditch/surface drainage investigation contaminants found exceeding SCGs include the VOC trichloroethene; the semi-voc bis(2-ethylhexyl) phthalate and the metals, aluminum, beryllium, cadmium, cobalt, copper, iron, lead, mercury, nickel, vanadium, and zinc. Both trichloroethene and bis(2-ethylhexyl)phthalate were detected above SCGs in sample DD-2. The metals; beryllium,cobalt, mercury, and nickel were all found exceeding SCGs in only one sample, surface drainage sample DD-9. Zinc was detected exceeding SCGs in all nine samples. Cadmium was found exceeding SCGs in three samples and vanadium was found exceeding SCGs in two samples (DD-4, DD-5, DD-9 and DD-5, DD-9 respectively). Aluminum, copper and lead were all found exceeding SCGs in seven of the nine samples and iron in all but one sample (DD-8).

TABLE 4-6
SURFACE WATER INVESTIGATION
DRAINAGE DITCH AND SURFACE DRAINAGE
CONTAMINANTS EXCEEDING SCGs

	SCG[a]	DD-1	DD-2	DD-3	DD-4	DD-5	DD-6	DD-7	DD-8	DD-9
<u>Volatile Organic Compounds (μg/l)</u>										
Trichloroethene	11	U	12*	U	U	U	U	U	3	U
<u>Semi-VOCs (μg/l)</u>										
Bis(2-ethylhexyl)phthalate	0.6	U	14*	UJ	U	UJ	UJ	UJ	UJ	U
<u>Inorganics (μg/l)</u>										
Aluminum	100	504*	428*	335*	R	6410*	219*	3680*	166*	R
Beryllium	11	UJ	UJ	UJ	UJ	2	UJ	UJ	UJ	27*
Cadmium	0.9	UJ	UJ	UJ	14*	5*	UJ	UJ	UJ	21*
Cobalt	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	105*
Copper	9	18*	24*	24*	85*	32*	8	28*	8	447*
Iron	300	1110*	968*	675*	6570*	11300*	449*	6280*	266	144000*
Lead	2	8.1*	2.9*	1.8	99*	42*	18.6*	12.5*	0.7	125*
Mercury	0.2	U	U	U	U	U	U	U	U	0.32*
Nickel	74	UJ	UJ	UJ	21	18	UJ	UJ	UJ	283*
Vanadium	14	UJ	UJ	UJ	UJ	17*	UJ	9	UJ	112*
Zinc	30	97*	117*	212*	548*	1100*	43*	77*	33*	1370*

* Exceeds New York State standards, criteria or guidance values

a New York State SCGs are the NYSDEC Class C surface water standards (s) and guidance values (g). Values are calculated based on a hardness of 71 mg/l

Note: U = Not Detected
UJ = Compound not detected. Sample quantitation limit is an estimate.
R = Data rejected due to deficient laboratory QA/QC
Sample DD-9 was obtained from an area of ponded surface drainage

In summary, the contaminants of concern identified for drainage ditch and surface drainage water at the Becker Electronics site include the following:

Contaminants of Concern	Number of Samples Detected Above SCG	Total Number of Samples Collected
Trichloroethene	1	9
Bis(2-ethylhexyl)phthalate	1	9
Aluminum	7	9
Beryllium	1	9
Cadmium	3	9
Cobalt	1	9
Copper	7	9
Iron	8	9
Lead	77	99
Mercury	1	9
Nickel	1	9
Vanadium	2	9
Zinc	9	9

4.3.4.3 **Fire Pond.** As part of the Phase I RI, surface water and basal water samples were obtained from three locations in the Becker Electronics fire pond. All samples were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of results for these analyses can be found in Tables 6, 7, 8, and 9 located in Appendix G. Table 4-7 shows contaminants found in the fire pond at concentration exceeding SCGs.

Based on the fire pond investigation the metals beryllium, cadmium, cobalt, copper, iron, lead, nickel, vanadium, and zinc were all detected in samples at concentrations exceeding SCGs.

In summary, the contaminants of concern identified for fire pond water include the following:

TABLE 4-7

SURFACE WATER INVESTIGATION
FIRE POND
CONTAMINANTS EXCEEDING SCGs

	SCG[a]	FP-1-SW	FP-1-BW	FP-2-SW	FP-2-BW	FP-3-SW	FP-3-BW
Inorganics (μg/l)							
Beryllium	11	UJ	15*	UJ	5	UJ	UJ
Cadmium	0.9	UJ	9*	UJ	5*	UJ	UJ
Cobalt	5	UJ	64*	UJ	18*	UJ	UJ
Copper	9	7	202*	9*	136*	10*	21*
Iron	300	770*	80200*	780*	29700	802*	7660*
Lead	2	R	185*	R	84*	R	R
Nickel	74	UJ	147*	UJ	47	UJ	UJ
Vanadium	14	UJ	79*	UJ	35*	UJ	11
Zinc	30	61*	710*	56*	R	63*	R

* Exceeds New York State standards, criteria or guidance values

a New York State SCGs are the NYSDEC Class C surface water standards (s) and guidance values (g). Values are calculated based on a hardness of 71 mg/l

Note: U = Not Detected
UJ = A value followed by a U or a UJ is an elevated detection limit due to blank contamination.
R = Data rejected due to deficient laboratory QA/QC

Contaminants of Concern	Number of Samples Detected Above SCG	Total Number of Samples Collected
Beryllium	1	6
Cadmium	2	6
Cobalt	2	6
Copper	5	6
Iron	5	6
Lead	2	6
Nickel	1	6
Vanadium	2	6
Zinc	4	6

4.3.5 Surface Water Sediment

4.3.5.1 **Catskill and Thorp Creeks**. The Phase I RI included the collection of four off-site surface water sediment samples along Catskill and Thorp Creeks at the same locations where surface water samples were obtained. Each of these four samples was analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analyses can be found on Tables 26, 27, 28, and 29 contained in Appendix G. Table 4-8 presents the contaminants which exceeded SCGs for surface water sediment.

Based on the surface water sediment investigation, the contaminants exceeding SCGs are the metals arsenic, cadmium, iron, manganese, nickel, and zinc. All of these metals were detected in the upstream sample (SS-1) at concentrations either exceeding SCGs or at comparable concentrations to the downstream locations therefore, these constituents appear to be naturally occurring at the levels detected during this investigation. As a result of the above findings no contaminants of concern are identified for surface water sediment in Catskill and Thorp Creeks.

4.3.5.2 **Drainage Ditch**. The Phase I RI surface water sediment investigation included the collection of eight environmental samples from on-site drainage ditches and one from an area of ponded surface drainage. Samples were collected from the same locations sampled in the surface water investigation program. Each of these nine samples was analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analyses can be found on Tables 18, 19, 20, and 21 contained in Appendix G. Table 4-9 shows contaminants exceeding SCGs for drainage ditch/surface drainage sediment.

TABLE 4-8

SURFACE WATER SEDIMENT INVESTIGATION
CATSKILL AND THORP CREEKS
CONTAMINANTS EXCEEDING SCGs

	SCG[a]	TC-1	TC-2	CC-1	CC-2	Site Background[b]
Inorganics (mg/kg)						
Arsenic	5	5.3*	4.8	4	6*	4
Cadmium	0.8	1.4*	1.3*	0.88*	1.1*	0.88*
Iron	24000	28900*	28900*	24800*	36900*	24800*
Manganese	428	517*	639*	965*	738*	965*
Nickel	22	37.6*	33.7	31.6*	43.9*	31.6
Zinc	85	77	80.8	61.5	101*	61.5

* Exceeds New York State standards, criteria or guidance values

a New York State SCGs are from the NYSDEC Fish and Wildlife Division's Sediment Criteria Guidance (December 1989).

b Concentration from "upstream, background" sample CC-1

Note: U = Not Detected

UJ = Compound not detected - the sample quantitation limit is an estimate

TABLE 4-9
SURFACE WATER SEDIMENT INVESTIGATION
DRAINAGE DITCH AND SURFACE DRAINAGE
CONTAMINANTS EXCEEDING SCGs

	SCG	DD-1	DD-2	DD-3	DD-4	DD-5	DD-6	DD-7	DD-8	DD-9
Semi-VOCs (μg/kg)										
1,4-Dichlorobenzene	209[a]	U	U	230*	U	130	85	U	130	U
Chrysene	23[b]	U	UJ	U	U	U	64*	U	U	U
Bis(2-ethylhexyl)phthalate	2083[a]	U	13000*	U	65000*	2900*	U	U	2900*	4700*
Benzo(b)fluoranthene	23[b]	U	UJ	U	U	U	U	U	85*	U
Benzo(a)anthracene	23[b]	U	UJ	U	U	U	62*	U	U	U
Inorganics (mg/kg)[c]										
Arsenic	5	5.3*	1.1	4.1	5.4*	4.3	5.2*	6.0*	3.1	1.80
Cadmium	0.8	1.5*	2.1*	2.0*	13.1*	1.8*	1.0*	1.6*	2.0*	UJ
Chromium	26	22.4	33.5*	88.1*	74.5*	27.9*	19.0	34.3*	32.9*	12.9
Copper	19	28.1*	55.4*	22.1*	44.2*	15.9	26.7*	27.4*	18.6	10.6
Iron	24000	28600*	20900	37500*	14300	23900	24300*	30400*	27100*	16100
Lead	27	R	R	R	159*	R	R	R	R	8.2
Manganese	428	R	R	R	652*	R	R	R	R	307
Nickel	22	36.7*	35.1*	48.8*	23.6*	36.2*	32.1*	40.5*	31.7*	21.7
Zinc	85	61.6	256*	323*	215*	395*	88.7*	135*	135*	71.3

* Exceeds New York State standards, criteria or guidance values
a New York State SCGs are from the NYSDEC Fish and Wildlife Division's Sediment Criteria Guidance - Aquatic Toxicity Basis (12/89)
b New York State SCGs are from the NYSDEC Fish and Wildlife Division's Sediment Criteria Guidance - Human Health Basis (12/89)
c New York State SCGs are from the NYSDEC Fish and Wildlife Division's Sediment Criteria Guidance (12/89)

Note: U = Not detected
UJ = Compound not detected - the sample quantitation limit is an estimate
R = Data rejected due to deficient laboratory QA/QC
Sample DD-9 was obtained from an area of ponded surface drainage.

Based on the results of drainage ditch/surface drainage sediment sampling, the contaminants exceeding SCGs include the Semi-VOCs; 1,4-dichlorobenzene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(a)anthracene and the metals; arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc. All of the above constituents will be considered as contaminants of concern with the exception of lead and manganese. Lead and manganese data was classified as unusable in the data usability report and therefore, these constituents cannot be addressed at this time. The SCGs for sediment were based on a variety of assumptions which take into account physical solubility parameters, contaminant uptake levels and threshold toxicity effects. Consistent with NYSDEC Guidelines for a Habitat Based Assessment, when these criteria are exceeded further evaluation of the extent and nature of contamination and effects on the biosystem are required.

In summary, the contaminants of concern detected in drainage ditch/surface drainage sediment at the Becker Electronics site include the following:

Contaminants of Concern	Number of Samples Detected Above SCGs	**Total Number of Samples Collected**
1,4-Dichlorobenzene	1	9
Chrysene	1	9
Bis(2-ethylhexyl)phthalate	5	9
Benzo(b)fluoranthene	1	9
Benzo(a)anthracene	1	9
Arsenic	4	9
Cadmium	8	9
Chromium	6	9
Copper	6	9
Iron	5	9
Nickel	8	9
Zinc	7	9

4.3.5.3 **Fire Pond.** The Phase I RI fire pond sediment investigation included the collection of three samples from the same locations at which surface and basal water samples were obtained. These three environmental samples were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analyses can be found on Tables 10, 11, 12, and 13 contained in Appendix G. Table 4-10 presents the contaminants which exceeded SCGs for fire

TABLE 4-10

SURFACE WATER SEDIMENT INVESTIGATION
FIRE POND
CONTAMINANTS EXCEEDING SCGs

	SCG	FP-1	FP-2	FP-3
Semi-VOCs (μg/kg)				
4-Nitrophenol	9[a]	UJ	180*	U
Inorganics (mg/kg)[b]				
Cadmium	0.8	UJ	0.91*	1.3*
Copper	19	15.4	693*	UJ
Iron	24000	20200	23900	32600*
Lead	27	14.0	32.7*	5.0
Manganese	428	218	557*	354
Nickel	22	25.4*	36.4*	47.0*
Zinc	85	58.1	88.2*	79.2

* Exceeds New York State standards, criteria or guidance values
a New York State SCGs are from the NYSDEC Fish and Wildlife Division's Sediment Criteria Guidance - Aquatic Toxicity Basis (12/89)
b New York State SCGs are from the NYSDEC Fish and Wildlife Division's Sediment Criteria Guidance (12/89)

Note: U = Not detected
UJ = Compound not detected - the sample quantitation limit is an estimate

pond sediment at the Becker Electronics site. As discussed under drainage sediment further studies may be required.

Constituents detected at concentrations exceeding SCGs and which will be identified as contaminants of concern for the Becker Electronics site are as follows:

Contaminants of Concern	Number of Samples Detected Above SCGs	Total Number of Samples Collected
4-Nitrophenol	1	3
Cadmium	2	3
Copper	1	3
Iron	1	3
Lead	1	3
Manganese	1	3
Nickel	3	3
Zinc	1	3

4.3.6 Private Water Supply

This section presents the analytical results of samples obtained during the Phase I RI in May, 1991 as well as those obtained as part of the off-site private water supply IRM in August, 1991. Samples were collected from 12 private residences in May, 1991 and 10 residences in August, 1991. All of the above mentioned samples were analyzed for volatile organic compounds using E.P.A. Method 524.2. The complete set of analyses can be found in Table 5 of Appendix G. Contaminants exceeding SCGs are presented in Table 4-11.

Two VOCs, 1,1-dichloroethane and 1,1,1-trichloroethane, were found to exceed SCGs in samples collected as part of both sampling episodes. May, 1991 analytical results show 1,1-dichloroethane above SCGs in samples PW-1, PW-6, PW-10 and PW-11 and 1,1,1-trichloroethane exceeding SCGs in sample PW-11. August 1991 analytical results found 1,1-dichloroethane above SCGs in samples PW-1, PW-6, and PW-13 and 1,1,1-trichloroethane exceeding SCGs in samples PW-1 and PW-11.

For locations which were sampled in both May and August, 1,1,1-trichloroethane was reported in sample PW-1 as undetected in May, 1991 and as exceeding SCGs in August, 1991. Locations PW-10 and PW-11 exceeded SCGs for 1,1-dichloroethane in

TABLE 4-11

PRIVATE WATER SUPPLY INVESTIGATION
CONTAMINANTS EXCEEDING SCGs

	SCG[a]	PW-1	PW-2	PW-3	PW-4	PW-6	PW-7	PW-8	PW-9	PW-10	PW-11	PW-12	PW-13
Volatile Organic Compounds (μg/l)													
1,1-Dichloroethane	5	29*/30*	UJ/2.2	3.0/3.4	2.4/U	55*/60*	UJ/NS	UJ/NS	3.3/2.5	14*/U	5.4*/4.2	UJ/NS	NS/8.0*
1,1,1-Trichloroethane	5	U/5.8*	1.6/4.0	UJ/U	UJ/4.3	0.6/1.3	UJ/NS	UJ/NS	UJ/1.5	UJ/0.8	22*/12*	UJ/NS	NS/4.1

* Exceeds New York State standards, criteria or guidance values
a New York State SCGs are the NYSDEC Class GA Groundwater standards and guidance values

Note: U = Not detected
NS = Not Sampled
Two values are listed for each sample. The first value is the result of sampling in May, 1991 and the second value from August 1991. For sample locations at which several samples were obtained both pre and post filtration, the samples shown are always the prefiltration sample.

the May sample and dropped below SCGs in the August, 1991 sample results.

The VOCs 1,1-dichloroethane and 1,1,1-trichloroethane are identified as contaminants of concern for private water supply.

4.3.7 Septic Tanks

A septic tank investigation was conducted as part of the Phase I RI for the Becker Electronics site. Included as part of this investigation was the collection of two water samples from septic tanks and one water sample (ST-2) from a discharge pipe running from the facility building to a leaching field. All three samples were analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals with the exception of ST-2, which was not analyzed for metals. A complete set of analytical results can be found in Tables 38, 39, 40, and 41 located in Appendix G. Table 4-12 presents the contaminants exceeding SCGs.

The VOCs 1,1-dichloroethane, 1,1,1-trichloroethane and the metals iron and zinc were detected exceeding SCGs. The exceedances of SCGs for these VOCs occurred in samples ST-1 and ST-2 and the metals in sample ST-1.

In summary, the contaminants of concern detected in septic tank water samples collected at the Becker Electronics site are as follows:

Contaminants of Concern	Number of Samples Detected Above SCGs	Total Number of Samples Collected
1,1-Dichloroethane	2	3
1,1,1-Trichloroethane	2	3
Iron	1	2
Zinc	1	2

4.3.7.1 Septic Tank Sediment/Sludge. The septic tank investigation performed at the Becker Electronics site during the Phase I RI included the collection of three sediment/sludge samples and a sediment sample from a discharge pipe emanating from the Becker facility and leading to a leaching field located behind the facility. Each sample was analyzed for TCL volatiles, semi-

TABLE 4-12
SEPTIC TANK INVESTIGATION
SEPTIC TANK WATER
CONTAMINANTS EXCEEDING SCGs

	SCG[a]	ST-1	ST-2	ST-3
<u>Volatile Organic Compounds (µg/l)</u>				
1,1-Dichloroethane	5	9*	23*	U
1,1,1-Trichloroethane	5	27*	34*	U
<u>Inorganics (µg/l)</u>				
Iron	300	1720*	NS	R
Zinc	300	850*	NS	R

* Exceeds New York State standards and guidance values

a New York State SCGs are the NYSDEC standards and guidance values for Class GA groundwater

Note:
U = Not detected
N/A = Not Available
NS = Not sampled
R = Rejected data due to deficient laboratory QA/QC
UJ = Compound not detected - the sample quantitation limit is an estimate
Sample ST-2 was collected from building discharge pipe water.

volatiles, pesticides/PCBs and metals. The complete set of analyses can be found in Tables 42, 43, 44, and 45 contained in Appendix G. Table 4-13 presents the contaminants which exceeded SCGs/natural background levels for septic tank sediment/sludge at the Becker Electronics site.

It should be noted that as a result of the data usability report findings all of the data for sample ST-3 was declared unusable and thus will not be included in this discussion. As a result the semi-voc 1,4-dichlorobenzene and the metal vanadium, which were only detected exceeding natural background levels in ST-3, will not be considered contaminants of concern at this time.

The following is a summary of contaminants of concern detected in septic tank sludge/sediment and discharge pipe sediment at the Becker Electronics site:

Contaminants of Concern	Number of Samples Detected Above SCGs/Natural Background Levels	**Total Number of Samples Collected***
Chloroethane	1	3
1,1-Dichloroethane	1	3
1,1,1-Trichloroethane	1	3
Toluene	1	3
Chrysene	1	3
Bis(2-ethylhexyl)phthalate	1	3
Arsenic	1	3
Barium	2	3
Beryllium	2	3
Cadmium	3	3
Calcium	3	3
Chromium	2	3
Cobalt	3	3
Copper	3	3
Iron	3	3
Lead	3	3
Magnesium	1	3
Manganese	2	3
Mercury	2	3
Nickel	3	3
Sodium	1	3
Zinc	3	3

* Note: Due to the fact that the data usability report has deemed the results from sample ST-3 unusable this sample will not be included in this matrix.

TABLE 4-13
SEPTIC TANK INVESTIGATION
SEPTIC TANK SEDIMENT/SLUDGE
CONTAMINANTS EXCEEDING SCGs/NATURAL BACKGROUND LEVELS

	SCG[a]	ST-1	ST-2	ST-3[1]	PP-1
Volatile Organic Compounds (μg/kg)					
Chloroethane	6	U	380*	U	R
1,1-Dichloroethane	5	U	76*	U	R
1,1,1-Trichloroethane	23	U	53*	U	R
Toluene	45	U	54*	320*	R
Semi-VOCs (μg/kg)					
Chrysene	12	140*	U	UJ	U
Bis(2-ethylhexyl)phthalate	10838	6700	38000*	170000*	6500
1,4-Dichlorobenzene	240	170	U	8600*	U
Inorganics (mg/kg)					
Arsenic	<0.1-6.5	5.8	2.6	166*	14.6*
Barium	250-350	277	1400*	3250*	4380*
Beryllium	0-0.9	5.1*	7.0*	57*	28.5*
Cadmium	0.0001-1.0	3.9*	8.0*	118*	13.1*
Calcium	150-6500	28000*	17000*	27800*	86900*
Chromium	1.5-25	23.4	70.1*	1240*	257*
Cobalt	2.5-6	16.2*	14.9*	253*	30.7*
Copper	<1-15	117*	189*	34200*	1140*
Iron	17500-25000	31800*	56700*	361000*	240000*
Lead	1-12.5	23.4*	59.7*	4000*	181*
Magnesium	1700-6000	3720	3120	68600*	6210*
Manganese	400-600	411	15000*	3920*	12800*
Mercury	0.042-0.066	0.23*	U	2*	0.16*
Nickel	6-12.5	42.6*	41.3*	926*	112*
Sodium	6000-8000	UJ	876	2970	8020*
Vanadium	25-60	16.2	12.4	767*	9.4
Zinc	37-60	1580*	9150*	224000*	29400*

* Exceeds New York State standards, criteria or guidance values

a New York State SCGs are the NYSDEC Soil Cleanup Criteria except for inorganics where no SCGs are available. Inorganics are compared with NYSDEC natural background levels in soil.

1 Results for ST-3 expressed in μg/l due to lab preparation method.

Note: U = Not detected
N/A = Not Available
R = Rejected data due to deficient laboratory QA/QC
UJ = Compound not detected - the sample quantitation limit is an estimate.
Sample PP-1 was calculated from building discharge pipe sediment.

4.3.7.2 **Septic Tank Test Pit Soil.** The septic tank investigation conducted at the Becker Electronics site as part of the Phase I RI also included the collection of three sediment samples from test pits excavated in the vicinity of suspected leaching fields. Each sample was analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs and metals. The complete set of analytical results can be found in Tables 46, 47, 48, and 49 located in Appendix G. The contaminants which exceeded SCGs and/or New York State natural background levels are presented in Table 4-14.

The Semi-VOCs benzo(b)fluoranthene and benzoic acid were found exceeding SCGs in sample ST-1. With regard to metals beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel and zinc were all detected exceeding natural background levels. The metals beryllium, cadmium, cobalt and nickel were above natural background levels in all three samples.

The following is a summary of contaminants of concern identified for septic tank test pit soil at the Becker Electronics site:

Contaminants of Concern	Number of Samples Detected Above SCGs/Natural Background Levels	Total Number of Samples Collected
Benzo(b)fluoranthene	1	3
Benzoic Acid	1	3
Beryllium	3	3
Cadmium	3	3
Chromium	2	3
Cobalt	3	3
Copper	1	3
Iron	1	3
Lead	2	3
Manganese	1	3
Nickel	3	3
Zinc	2	3

TABLE 4-14
SEPTIC TANK INVESTIGATION
SEPTIC TANK TEST PIT SOIL
CONTAMINANTS EXCEEDING SCGs/NATURAL BACKGROUND LEVELS

	SCG[a]	ST-1	ST-2	ST-3
Semi-VOCs (µg/kg)				
Benzo(b)fluoranthene	33	140*	U	U
Benzoic Acid	75	310*	U	U
Inorganics (mg/kg)				
Beryllium	0-0.9	5*	1.9*	3.5*
Cadmium	0.0001-1.0	1.2*	2.9*	1.0*
Chromium	1.5-25	27.0*	15.3	38.4*
Cobalt	2.5-6	21.2*	6.1*	9.3*
Copper	<1-15	79.0*	13.2	13.1
Iron	17500-25000	3100*	11400	21700
Lead	1-12.5	14.9*	19.0*	R
Manganese	400-600	980*	252	324
Nickel	6-12.5	42.5*	16.4*	24.1*
Zinc	37-60	348*	46.7	174*

* Exceeds New York State standards and guidance values

a New York State SCGs for Semi-VOCs are the NYSDEC soil cleanup criteria. Since SCGs are not available for inorganics values will be compared to NYSDEC natural background levels in soil.

Note: U = Not detected
N/A = Not Available
R = Rejected data due to deficient laboratory QA/QC

Section Five

5.0 CONTAMINANT FATE AND TRANSPORT

In section 4 of this report the results of the Phase I RI were compared to SCGs, QA/QC results and site background conditions resulting in the identification of site specific contaminants of concern.

The purpose of section 5 is to provide further discussion regarding the possible cause, nature, and extent of contamination, as well as potential routes of migration (i.e., groundwater, surface water) and factors affecting contaminant migration for the media of concern (e.g., sorption to soil, solubility in water, movement within the groundwater, movement via stream sediment etc.). All discussion of contaminant fate and transport will focus on the contaminants of concern for the particular media. Further discussion of contaminant fate and transport, with particular respect to persistence and toxicity, as well as routes of migration and potential/impacted receptors, will be presented in the Baseline Human Health Risk and Environmental Risk Assessment.

In general, many of the contaminants of concern detected in the environmental media at the Becker Electronics site are chemical constituents utilized in a variety of processes associated with the manufacturing of speakers and speaker components. Volatile organic compounds are used as solvents in the removal of lubrication, cutting and milling oils from machined parts and in the ultrasonic cleaning process associated with magnetic winding. Solvents such as 1,1,1-trichloroethane and tetrachloroethene are used to strip off excess solder in wiring connections. In addition, the spray paint used in the painting of various components contains numerous volatile organic compounds.

Semivolatile organic compounds, such as polynuclear aromatic hydrocarbons (PAHs), are found in lubricating and cutting oils associated with the machining of metallic components. The stripping off of these oils in the manufacturing process can generate PAHs as waste material. Vinyl coatings used on wire, wood products such as speaker cabinets, enamel paints, and polymers used in the lining of magnets and plastic parts all contain a variety of PAHs. These materials along with plastics (in which the compound bis(2-ethylhexyl)phthalate is a constituent), phenolic adhesives and glues were dumped on the Becker property and/or incinerated. The incineration of these materials, as well as the leaching and natural degradation of these materials exposed to the elements, would be a potential source of PAHs from which they could migrate to surface water, groundwater etc. It should also be noted that 2-Butanone, also known as methyl ethyl ketone (MEK), is a solvent in the coatings industry and is found in cements and adhesives used in the manufacturing of vinyl wood-simulated coverings such as those used on speaker cabinets manufactured by Becker Electronics.

A wide variety of metals have been detected in the environmental media at the site which are associated with various aspects of speaker component manufacturing. Aluminum is found in many speaker parts as is iron which is the base material for speaker parts and components. It should be noted that some forms of iron contain nickel which may be a source of the widespread detection of nickel as a contaminant of concern in nearly all on-site environmental media. Beryllium and copper are contained in the electrodes of audio components. Copper wire is also almost exclusively used for speaker wire.

Cadmium and chromium are widely used in the plating of speakers and speaker components as a rust preventative. Lead, zinc, and antimony are all contained in certain types of lead solder. As was previously noted, the excess solder used in connecting circuitry components together is stripped off using either organic solvents or a strong alkali solution such as sodium hydroxide or potassium hydroxide. These alkali scouring agents are also used in the scouring/cleaning of machined metallic parts and are a potential source of abnormally high sodium and potassium concentrations in environmental media.

5.1 SURFACE SOILS

Surface soil samples were collected throughout the site from locations at which either waste disposal was suspected, dumping of waste materials was conducted or visual disturbance (i.e., discoloration) of soils was observed.

Contaminants of concern identified in surface soils are shown in Figure 5-1. Nickel and cadmium are highly prevalent throughout the site in surface soil samples. The extremely high frequency of occurrence of these two metals is also evident in surface samples obtained from other media (i.e., drainage ditch sediment) within the Becker Electronics site. Chromium was found predominantly in the vicinity of the debris piles behind the facility and immediately adjacent to the building in the vicinity of septic tank #3. As with all surface soil contaminants, the primary route of migration would be desorption from soil particles and transport via surface runoff created by precipitation into on-site drainage ditches. This migration path is evidenced by the occurrence of contaminants of concern in surface soils as well as drainage ditch/fire pond water and sediments. Surface soils contain the greatest abundance of metals as contaminants of concern, (a total of 13) and each of these contaminants of concern, with the exception of barium and magnesium, is detected in at least one of the other surficial environmental media. Cadmium, copper, iron, lead and zinc are identified as contaminants of concern in all of the surficial environmental media at the Becker Electronics site. The common occurrence of these contaminants of concern in surficial media is strong evidence for transport by surface runoff of contamination throughout the site.

With respect to volatiles, 1,1,1-trichloroethane and trichloroethene were found in soil sample SS-11 in what appears to be a former drum staging area adjacent to a small building located immediately southeast of the main facility building. Several empty drums still remain at this location. The volatiles 2-butanone and 1,1-dichloroethane were found immediately adjacent to the drainage ditch in sample SS-18 on the north side of the main facility building. 1,1,1-trichloroethane, 1,1-dichloroethane and trichloroethene are also identified as contaminants of concern in groundwater. Each of these volatile organic compounds is known to percolate downward through soils and into groundwater where it can remain stable for long periods of time. The occurrence of semi-volatile contaminants was concentrated among samples located in the vicinity of septic tank #3 and at other locations immediately adjacent to facility buildings which appear to have been locations of waste disposal. This location is noted as a disposal area on a site map constructed by Dunn Geoscience (1982). Migration of surface soil contaminants into groundwater appear minimal for semi-volatiles and

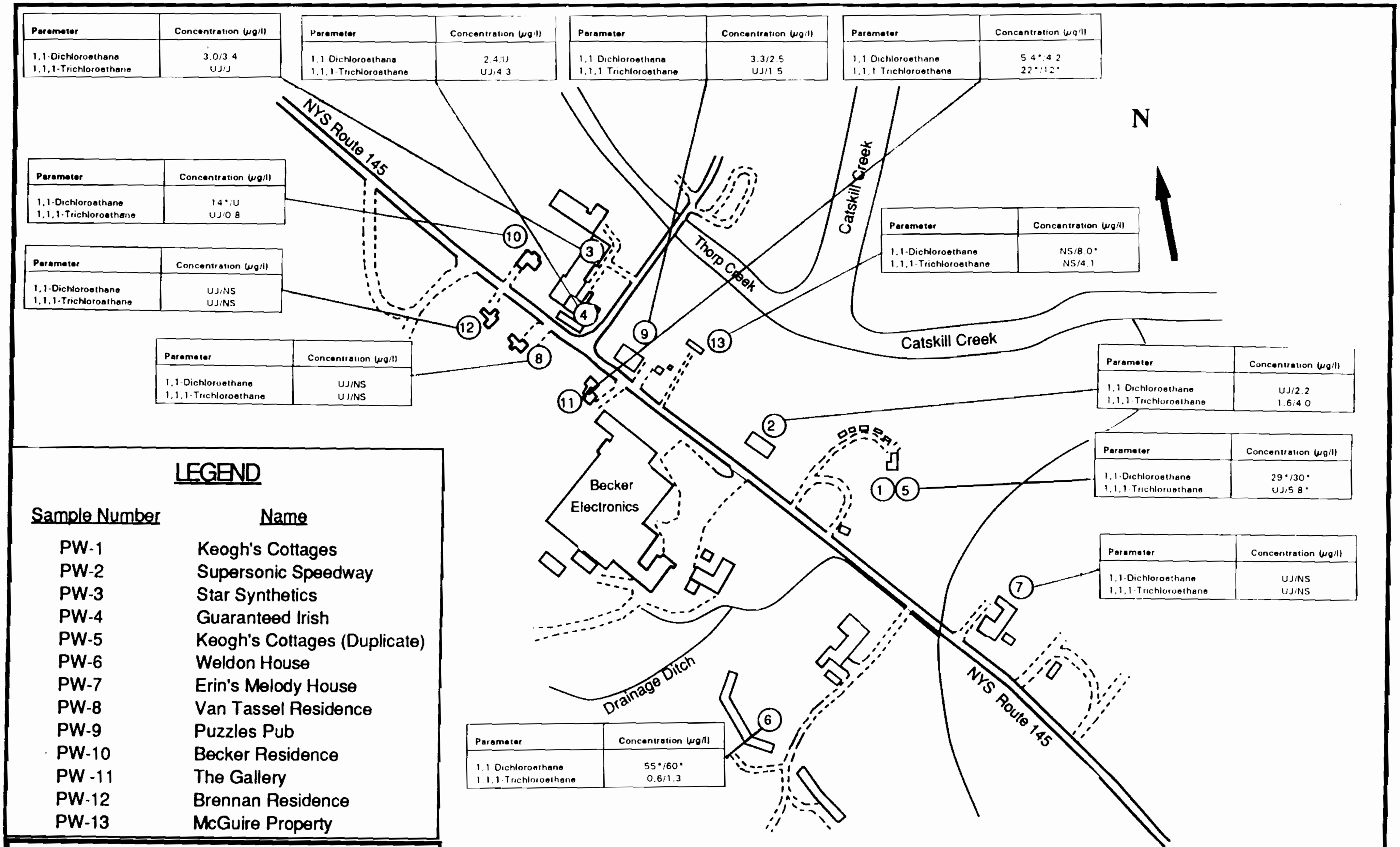
5.4 SEPTIC TANKS

As evidenced by the numerous contaminants of concern identified for samples obtained from Phase I RI septic tank sediment/sludge as well as drainage pipe water/sediment and test pit soil from leaching fields, these locations were most likely disposal destinations for many industrial wastes and are significant sources of subsurface contamination. Septic tank water was contaminated primarily by volatile organic compounds including 1,1-dichloroethane and 1,1,1-trichloroethane. Contaminants of concern identified for septic tank water and sediment/sludge are shown in Figures 5-6 and 5-7, respectively. Also included in these figures are water and sediment sample results obtained from a pipe found exiting the facility building and leading to a leaching field to the west of the facility. Figure 5-8 shows contaminants of concern found in soil samples obtained from test pits excavated in leaching fields around the site.

Septic tanks one, two, and three all contain numerous volatile organic compounds and metals as contaminants of concern. The presence of calcium as a contaminant of concern at these locations is significant as it may result from having been used in the form of calcium hydroxide as a scouring agent in the manufacturing process and would have served to mobilize many of the metals ultimately found in septic tanks. Of particular concern is the septic tank contamination at and in the vicinity of septic tank #3 which is situated adjacent to the northern site boundary and in the downgradient region of the site with respect to groundwater-flow direction.

5.5 SUBSURFACE SOIL

Subsurface soil samples were obtained from soil borings located in areas of suspected surficial spills at locations behind (west of) the facility buildings. Contaminants of concern identified for subsurface soils are shown in Figure 5-9. Only metals were identified as contaminants of concern in subsurface soil and include beryllium, cadmium, calcium, cobalt, iron, nickel and zinc. These metals were most likely transported by groundwater from areas of subsurface waste disposal (i.e., septic tanks, leaching fields) or downward migration from



Parameter	Concentration (µg/l)
1,1-Dichloroethane	3.0/3.4
1,1,1-Trichloroethane	UJ/J

Parameter	Concentration (µg/l)
1,1 Dichloroethane	2.4:U
1,1,1-Trichloroethane	UJ/4.3

Parameter	Concentration (µg/l)
1,1 Dichloroethane	3.3/2.5
1,1,1 Trichloroethane	UJ/1.5

Parameter	Concentration (µg/l)
1,1 Dichloroethane	5.4*/4.2
1,1,1 Trichloroethane	22*/12*

Parameter	Concentration (µg/l)
1,1-Dichloroethane	14*/U
1,1,1-Trichloroethane	UJ/0.8

Parameter	Concentration (µg/l)
1,1-Dichloroethane	UJ/NS
1,1,1-Trichloroethane	UJ/NS

Parameter	Concentration (µg/l)
1,1-Dichloroethane	NS/8.0*
1,1,1-Trichloroethane	NS/4.1

Parameter	Concentration (µg/l)
1,1-Dichloroethane	UJ/NS
1,1,1-Trichloroethane	UJ/NS

Parameter	Concentration (µg/l)
1,1 Dichloroethane	UJ/2.2
1,1,1-Trichloroethane	1.6/4.0

Parameter	Concentration (µg/l)
1,1-Dichloroethane	29*/30*
1,1,1-Trichloroethane	UJ/5.8*

Parameter	Concentration (µg/l)
1,1-Dichloroethane	UJ/NS
1,1,1-Trichloroethane	UJ/NS

Parameter	Concentration (µg/l)
1,1 Dichloroethane	55*/60*
1,1,1-Trichloroethane	0.6/1.3

LEGEND

Sample Number	Name
PW-1	Keogh's Cottages
PW-2	Supersonic Speedway
PW-3	Star Synthetics
PW-4	Guaranteed Irish
PW-5	Keogh's Cottages (Duplicate)
PW-6	Weldon House
PW-7	Erin's Melody House
PW-8	Van Tassel Residence
PW-9	Puzzles Pub
PW-10	Becker Residence
PW -11	The Gallery
PW-12	Brennan Residence
PW-13	McGuire Property

FIGURE 5-11
CONTAMINANTS OF CONCERN IN PRIVATE WATER SUPPLY WELLS

Becker Electronics Site
East Durham, New York

Metcalf & Eddy of New York, Inc.

Notes:

* Exceeds New York State standards, criteria or guidance values
U = Not Detected
NS = Not Sampled

Two values are listed for each sample. The first value is the result of sampling in May 1991 and the second value is the result of sampling in August 1991. For sample locations where both filtered and unfiltered samples were obtained, the results of analysis of the unfiltered sample is given.

metals based on their absence in groundwater on-site samples although volatiles are found in both media. Off-site migration via surface runoff does not appear to be reaching Catskill and Thorp Creeks based on the sampling results of these surface water bodies although the extent of off-site migration through drainage ditches and culverts is unknown.

5.2 SURFACE WATER

Surface water samples were obtained as part of the Phase I RI from a number of locations both on and off-site including the fire pond, various drainage ditches, ponded surface drainage in the vicinity of debris piles, and both Catskill and Thorp Creeks. Contaminants of concern were not detected in the off-site surface water of Catskill and Thorp Creeks and it appears at this time that they are not being impacted by contamination originating at the Becker Electronics site.

Contaminants of concern identified for drainage ditch/surface drainage water and fire pond water are shown in Figures 5-2 and 5-3 respectively. Volatile organic contaminants of concern were not identified for fire pond water. Trichloroethene was found in drainage ditch surface water samples DD-2 and DD-8, both of which are located along segments of drainage ditches contiguous to the site boundary which flow in an off-site direction. The minimal occurrence of volatile organic compounds in surface water is not unusual given their affinity for rapid volatilization when exposed to the atmosphere. The semi-volatile bis(2-ethylhexyl)phthalate was identified as a contaminant of concern for surface water although it occurs at significant concentrations in only one sample (DD-2).

As observed in surface soils, metals comprised the majority of contaminants of concern in surface waters and included aluminum, beryllium, cadmium, cobalt, copper, iron, lead, mercury, nickel, vanadium and zinc. All of these metallic contaminants of concern were common to both drainage ditch/surface drainage water and fire pond water with the exception of aluminum and mercury which were not identified as contaminants of concern for fire pond water. Fire pond water was sampled at both the surface and the water/bottom sediment interface. Analysis of these sample results shows an increase in the variety of contaminants of concern in the basal water samples at each location as well as a significant increase in concentration for most compounds. This most likely reflects the tendency of these metals to sink and adsorb to bottom sediments. It appears that the metals aluminum, copper, iron, lead and zinc are the most highly mobile of the contaminants of concern judging from their frequent detections throughout the drainage ditch paths and are found in all samples obtained at site boundaries.

5.3 SURFACE WATER SEDIMENT

Surface water sediment samples were obtained as part of the Phase I RI at all of the locations at which surface water was sampled both on and off-site. Although several constituents were detected above SCGs in Catskill and Thorp Creek surface water sediment they were also detected at comparable concentrations in upstream background samples and therefore were not identified as contaminants of concern for these waterways.

Contaminants of concern identified for drainage ditch/surface drainage water sediment and fire pond sediment are shown in Figures 5-4 and 5-5 respectively. There were no volatile organic compounds identified as contaminants of concern in sediment samples. Several semi-volatile compounds are contaminants of concern including 1,4-dichlorobenzene, bis(2-ethylhexyl)phthalate, chrysene, benzo(a)anthracene, benzo(b)fluoranthene and 4-nitrophenol. None of these semi-volatiles, with the exception of bis(2-ethylhexyl)phthalate in one sample, were identified as contaminants of concern for surface waters. These contaminants appear to have an affinity to adsorb to sediment, particularly bis(2-ethylhexyl)phthalate which exceeded SCGs in five of the nine drainage sediment samples.

Again, as observed in both surface soil and surface water samples metals, including arsenic, cadmium, copper, chromium, iron, lead,manganese, nickel and zinc represent the majority of contaminants of concern for this medium. These metals are adsorbing to surface water sediments throughout the site and although they are not a concern with regard to Catskill and Thorp Creeks at this time, their extent in off-site drainage-ways is unknown, particularly in the marshy area adjacent to the northern Becker Electronics property line where both metals and organic compounds would have a strong affinity for adsorption to organic matter.

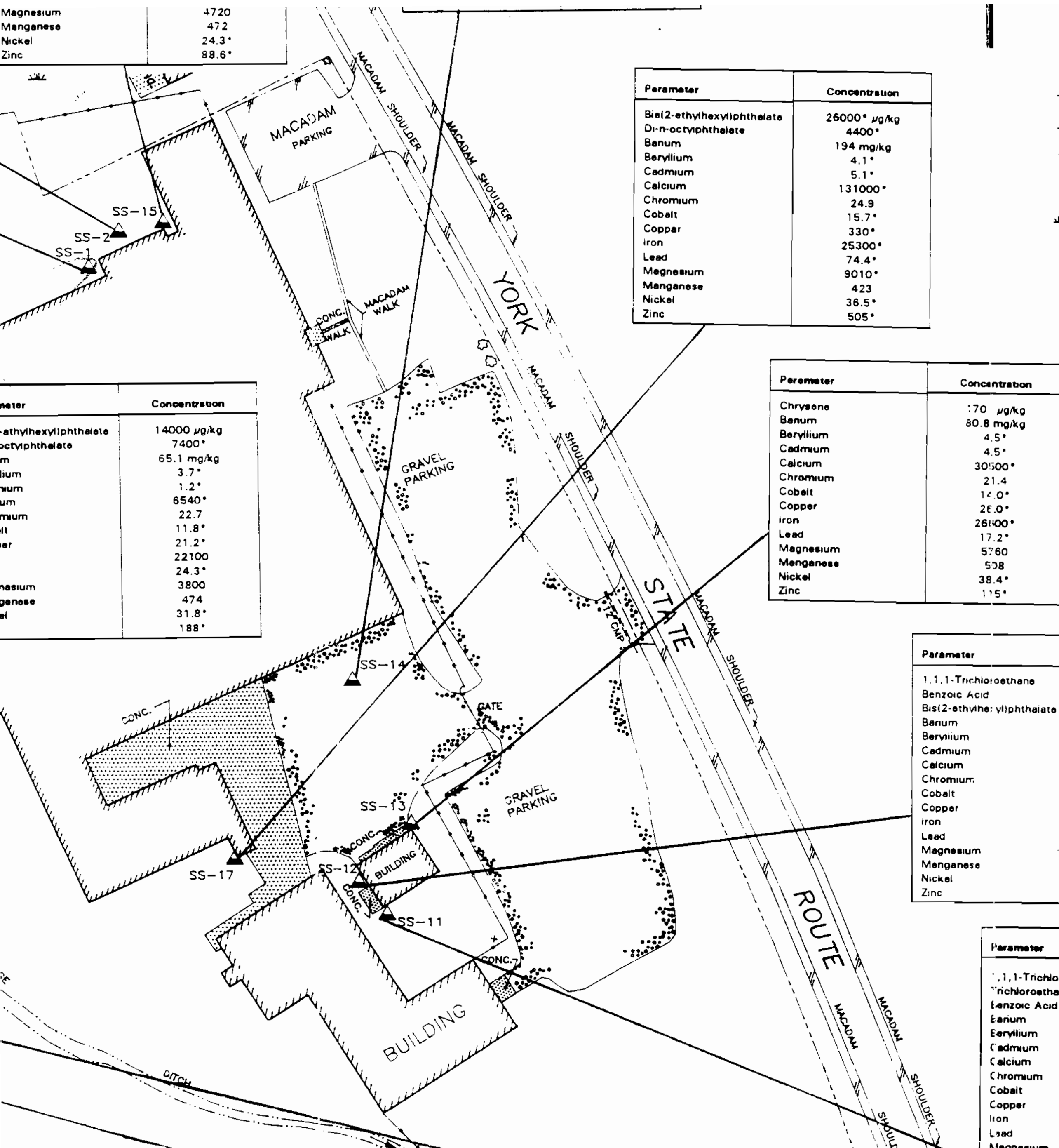
surficial waste disposal and adsorbed to subsurface soil particles. The contaminants of concern for subsurface soil are also common to septic tanks sediment/sludge and surface soils.

5.6 GROUNDWATER/PRIVATE WATER SUPPLY

Volatile organic compounds comprise the majority of contaminants of concern in groundwater both on and off-site as shown in Figures 5-10 and 5-11 which depict the contaminants of concern for both groundwater and private water supply wells. It is important to note that the off-site, private water supply locations were sampled solely for volatile organic compounds. 1,1-dichloroethane was detected at concentrations exceeding SCGs at all six on-site monitoring well locations as well as at private water supply locations to the north, south and east of the Becker facility. 1,1,1-trichloroethane was also detected as a contaminant of concern in off-site private water supply samples. Additional VOCs identified as contaminants of concern for on-site groundwater are 1,1-dichloroethene, 1,2-dichloroethene(total), trichloroethene, tetrachloroethene and toluene.

The metals, lead and mercury were identified as contaminants of concern for groundwater based on their exceedance of SCGs in monitoring wells MW-4 and MW-2S. The extent to which these metals (and/or additional metals) may be migrating off-site is unknown due to the omission of metals analysis in private water/supply samples.

Taking into account the generally northward movement of groundwater through the site contamination would be expected to migrate off-site in a similar fashion. This is primarily the case as evidenced by contaminants of concern being detected in private water supply sample locations 3, 4, 9, 10 and 11, however, contaminants of concern have also been detected off-site to the south and east. Of particular concern is private water supply sample location #6 (Weldon House) which is significantly contaminated with 1,1-dichloroethane. The combination of fracture-joint orientation and off-site groundwater pumping seem to influence the hydraulic gradient in this area as to create a local reversal in groundwater flow direction. This may also be the case with regard to private water supply sample location #5 (Keogh's Cottages).



Parameter	Concentration
Magnesium	4720
Manganese	472
Nickel	24.3*
Zinc	88.6*

Parameter	Concentration
Bis(2-ethylhexyl)phthalate	26000* µg/kg
Di-n-octylphthalate	4400*
Barium	194 mg/kg
Beryllium	4.1*
Cadmium	5.1*
Calcium	131000*
Chromium	24.9
Cobalt	15.7*
Copper	330*
Iron	25300*
Lead	74.4*
Magnesium	9010*
Manganese	423
Nickel	36.5*
Zinc	505*

Parameter	Concentration
Chrysene	170 µg/kg
Barium	80.8 mg/kg
Beryllium	4.5*
Cadmium	4.5*
Calcium	30500*
Chromium	21.4
Cobalt	14.0*
Copper	26.0*
Iron	26600*
Lead	17.2*
Magnesium	5760
Manganese	508
Nickel	38.4*
Zinc	115*

Parameter	Concentration
-ethylhexyl)phthalate	14000 µg/kg
octylphthalate	7400*
m	65.1 mg/kg
llium	3.7*
nium	1.2*
um	6540*
mium	22.7
lt	11.8*
er	21.2*
	22100
	24.3*
nesium	3800
ganese	474
el	31.8*
	188*

Parameter	Concentration
1,1,1-Trichloroethane	14 µg/kg
Benzoic Acid	15000*
Bis(2-ethylhexyl)phthalate	45000*
Barium	62.1 mg/kg
Beryllium	4.6*
Cadmium	1.2*
Calcium	6940*
Chromium	23.5
Cobalt	14.1*
Copper	38.6
Iron	28600*
Lead	27.7*
Magnesium	4390
Manganese	585
Nickel	38.6*
Zinc	328*

Parameter	Concentration
1,1,1-Trichloroethane	470* µg/kg
Trichloroethane	22*
Benzoic Acid	130*
Barium	94.2 mg/kg
Beryllium	7.3*
Cadmium	1.9*
Calcium	4380*
Chromium	24.3
Cobalt	16.3*
Copper	53.5*
Iron	49100*
Lead	54.5*

* DENOTES CONCENTRATION EXCEEDING NYS SCG/NATURAL BACKGROUND LEVEL IN SOIL

SURFACE SOIL SAMPLE LOCATION

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

CHAIN LINK FENCE

STONE WALL

SWAMP

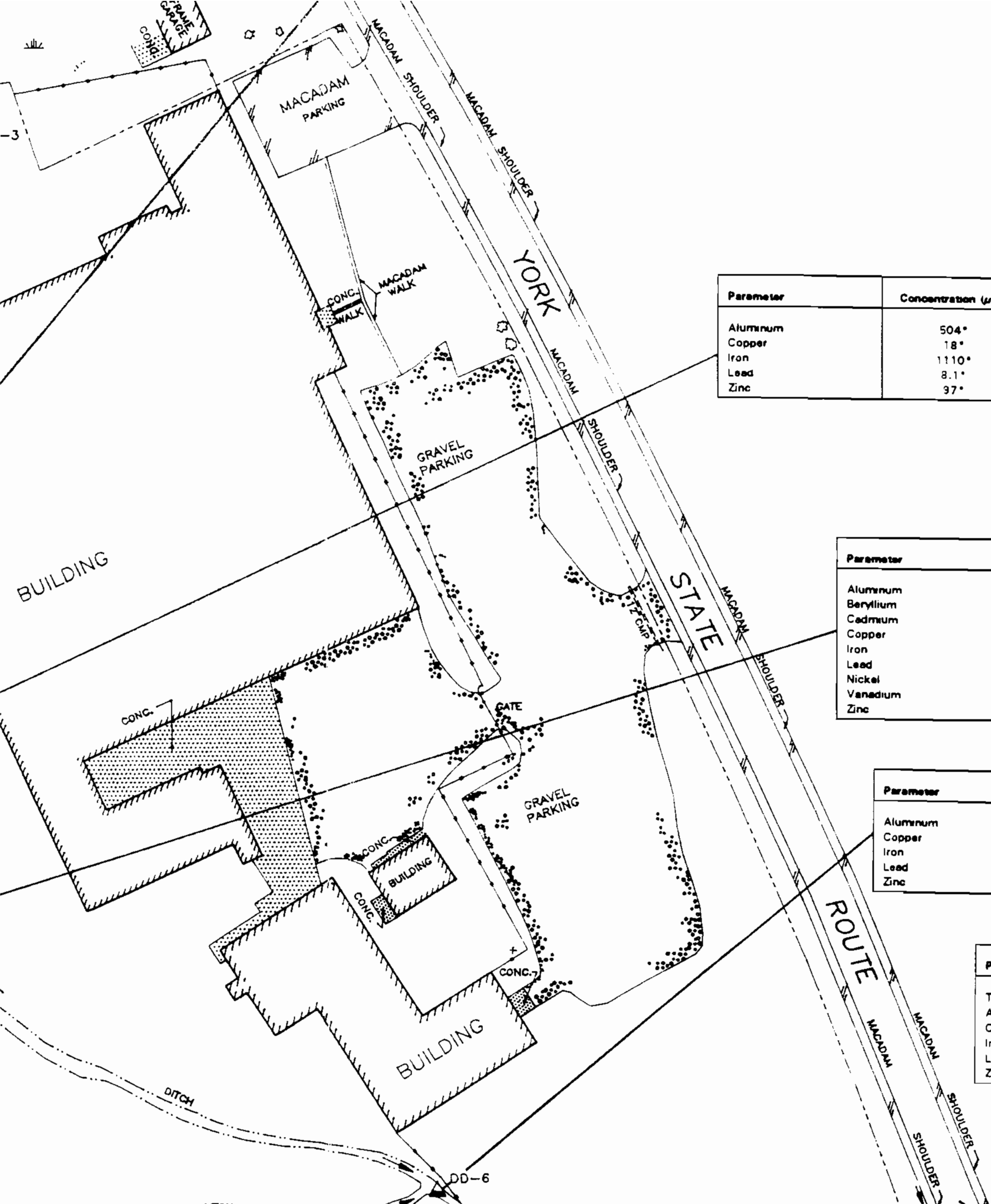
0 50 100 200

SCALE IN FEET

SCALE: 1"=100'

Notes:

1. Non-detect values for parameters are not shown on this figure.
2. Contaminant concentrations for volatile and semivolatile compounds expressed in µg/kg; Inorganic compounds expressed in mg/kg unless otherwise noted



Parameter	Concentration (µg/l)
Aluminum	504*
Copper	18*
Iron	1110*
Lead	8.1*
Zinc	37*

Parameter	Concentration (µg/l)
Aluminum	6410*
Beryllium	2
Cadmium	5*
Copper	32*
Iron	11300*
Lead	42
Nickel	18
Vanadium	17*
Zinc	1100*

Parameter	Concentration (µg/l)
Aluminum	219*
Copper	8
Iron	449*
Lead	18.6*
Zinc	43*

Parameter	Concentration (µg/l)
Trichloroethene	3
Aluminum	166*
Copper	8
Iron	266
Lead	0.7
Zinc	33*

DRAINAGE DITCH AND SURFACE DRAINAGE SAMPLE LOCATION

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

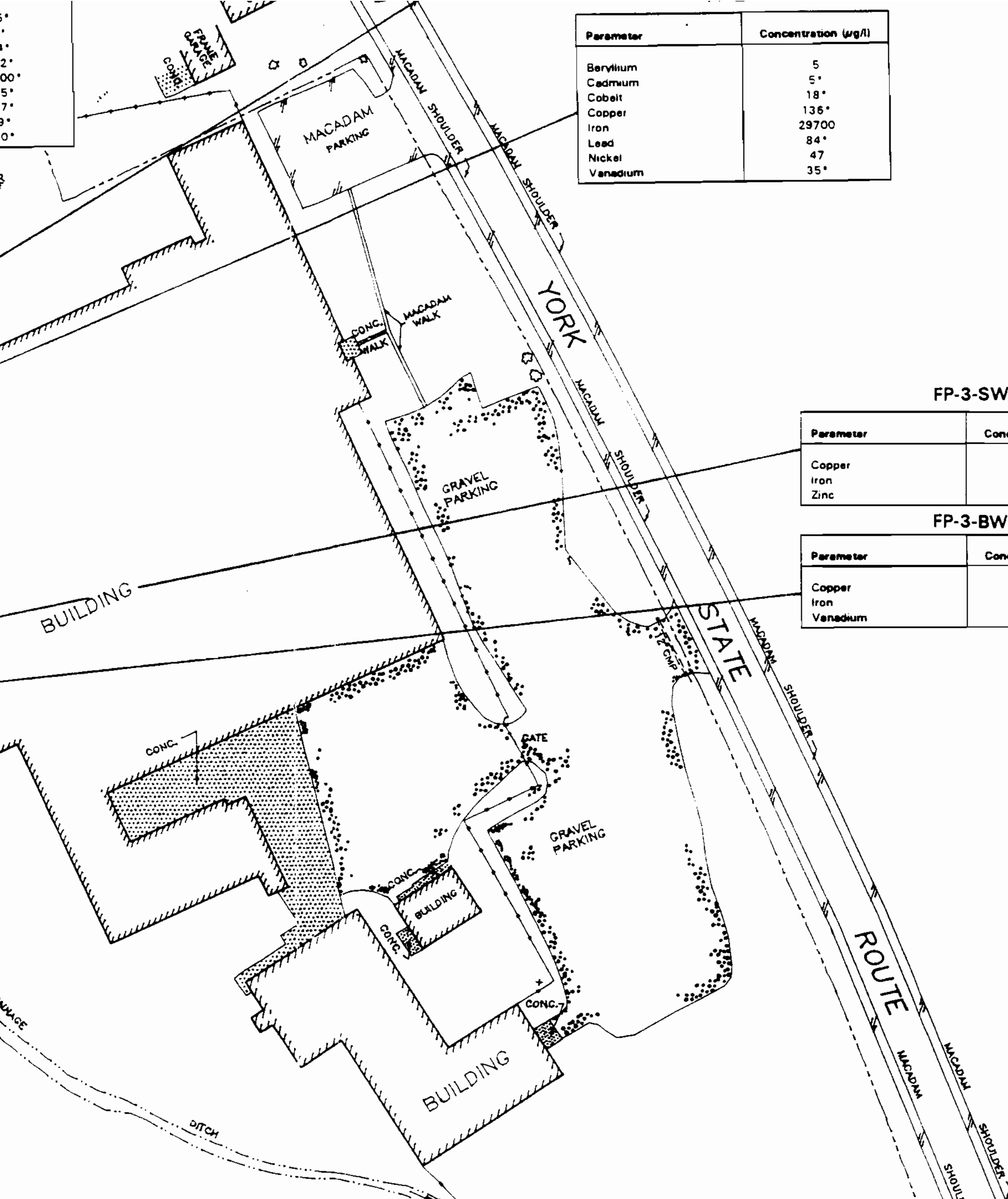
CHAIN LINK FENCE

STONE WALL

SWAMP

Notes:
1. Non-detect values for parameters are not shown on this figure.
2. Units for volatile and semivolatile organic compounds and metals are in µg/l.

Parameter	Concentration (µg/l)
Beryllium	5
Cadmium	5*
Cobalt	18*
Copper	136*
Iron	29700
Lead	84*
Nickel	47
Vanadium	35*



FP-3-SW

Parameter	Concentration (µg/l)
Copper	10*
Iron	802*
Zinc	63*

FP-3-BW

Parameter	Concentration (µg/l)
Copper	21*
Iron	7680*
Vanadium	11

* DENOTES CONCENTRATION EXCEEDING NYS SCG

- FIRE POND SAMPLE LOCATION
- PROPERTY LINE
- EDGE OF ASPHALT PAVEMENT
- CHAIN LINK FENCE
- STONE WALL
- SWAMP

Notes:
1. Non-detect values for parameters are not shown on this figure.
2. Units for volatile and semivolatile organic compounds and metals are in µg/l.

DRAINAGE DITCH AND SURFACE DRAINAGE SAMPLE LOCATIONS

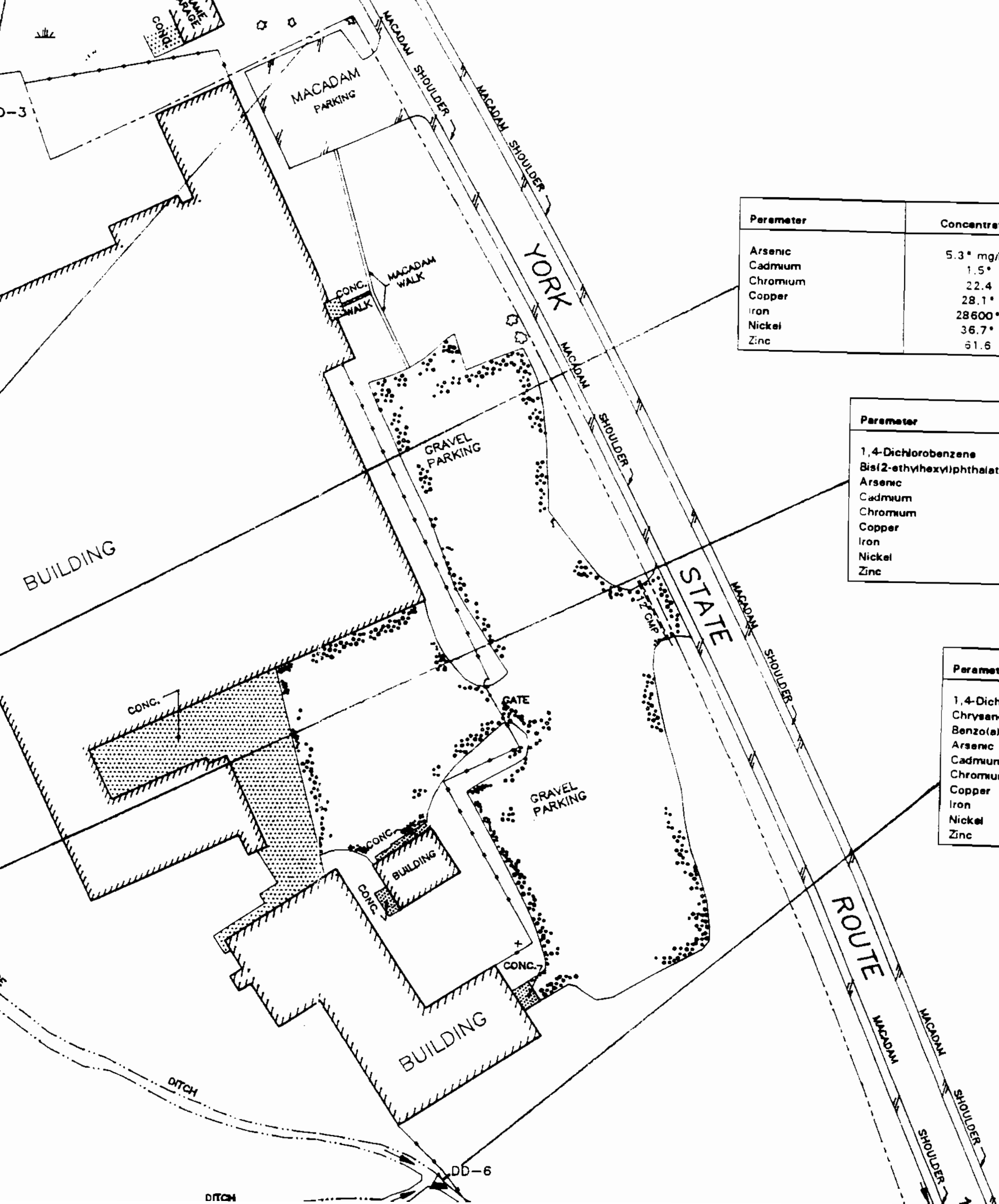
PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

CHAIN LINK FENCE

STONE WALL

SWAMP



Parameter	Concentration
Arsenic	5.3* mg/kg
Cadmium	1.5*
Chromium	22.4
Copper	28.1*
Iron	28600*
Nickel	36.7*
Zinc	61.6

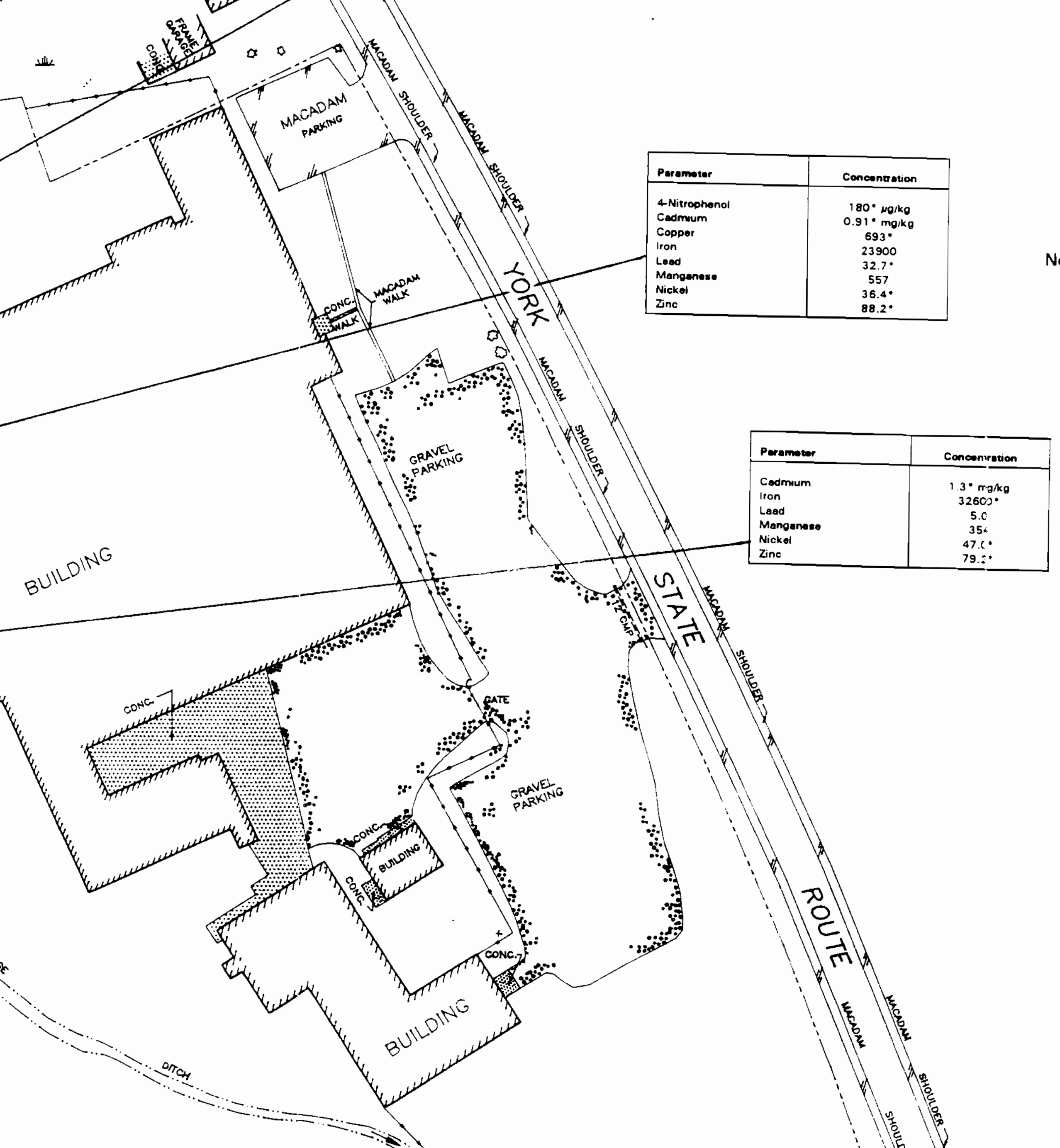
Parameter	Concentration
1,4-Dichlorobenzene	130 µg/kg
Bis(2-ethylhexyl)phthalate	2900*
Arsenic	4.3 mg/kg
Cadmium	1.8*
Chromium	27.9*
Copper	15.9
Iron	23900
Nickel	36.2*
Zinc	395*

Parameter	Concentration
1,4-Dichlorobenzene	85 µg/kg
Chrysene	64*
Benzo(a)anthracene	52*
Arsenic	5.2* mg/kg
Cadmium	1.0*
Chromium	19.0
Copper	26.7*
Iron	24300*
Nickel	32.1*
Zinc	98.7*

Parameter	Concentration
1,4-Dichlorobenzene	130 µg/kg
Bis(2-ethylhexyl)phthalate	2900*
Benzo(b)fluoranthene	85*
Arsenic	3.1 mg/kg
Cadmium	2.0*
Chromium	32.9*
Copper	18.6
Iron	27100*
Nickel	31.7*
Zinc	135*

Notes:

1. Non-detect values for parameters are not shown on this figure.
2. Contaminant concentrations for volatile and semivolatile compounds expressed in µg/kg; Inorganic compounds expressed in mg/kg unless otherwise noted



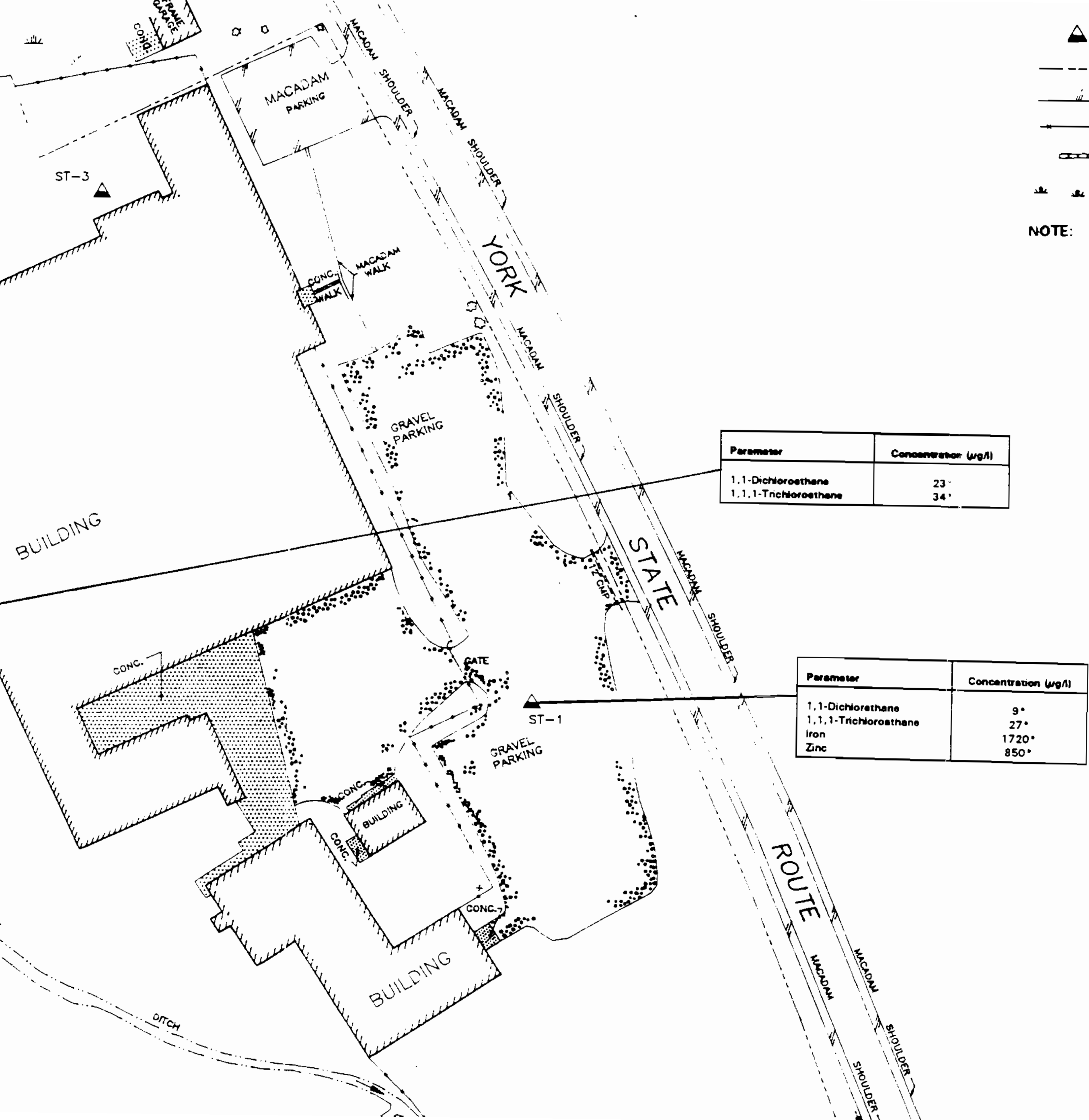
Parameter	Concentration
4-Nitrophenol	180* µg/kg
Cadmium	0.91* mg/kg
Copper	693*
Iron	23900
Lead	32.7*
Manganese	557
Nickel	36.4*
Zinc	88.2*

Parameter	Concentration
Cadmium	1.3* mg/kg
Iron	32600*
Lead	5.0
Manganese	354
Nickel	47.0*
Zinc	79.2*

*	DENOTES CONCENTRATION EXCEEDING NYS SCG
▲	FIRE POND SAMPLE LOCATION
— - - —	PROPERTY LINE
—/—	EDGE OF ASPHALT PAVEMENT
—x—	CHAIN LINK FENCE
○○○○	STONE WALL
(swamp symbols)	SWAMP

Notes:

1. Non-detect values for parameters are not shown on this figure.
2. Contaminant concentrations for volatile and semivolatile compounds expressed in µg/kg; Inorganic compounds expressed in mg/kg unless otherwise noted



Parameter	Concentration (µg/l)
1,1-Dichloroethane	23*
1,1,1-Trichloroethane	34*

Parameter	Concentration (µg/l)
1,1-Dichlorethane	9*
1,1,1-Trichloroethane	27*
Iron	1720*
Zinc	850*

SEPTIC TANK SAMPLE LOCATION

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

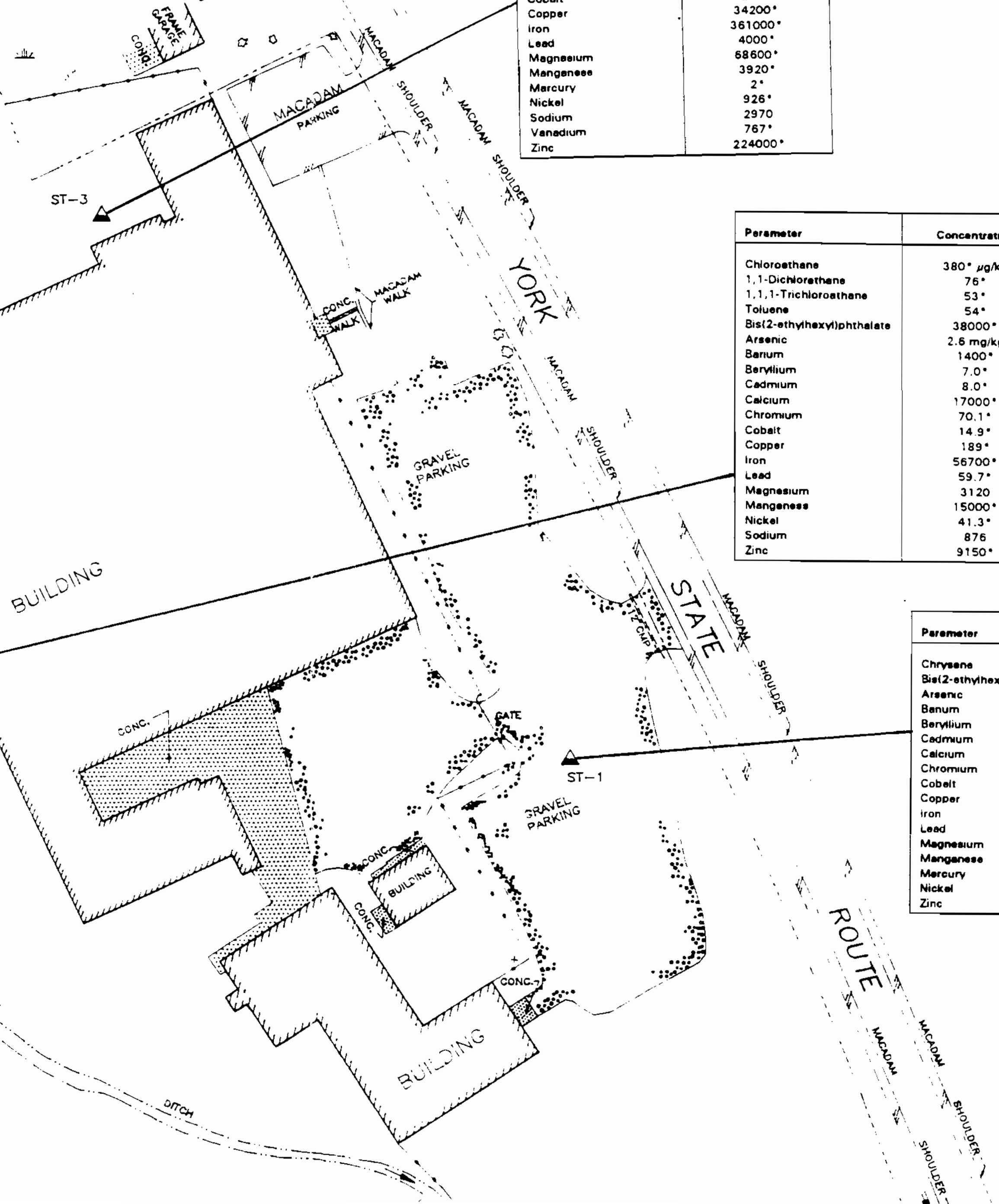
CHAIN LINK FENCE

STONE WALL

SWAMP

NOTE:

1. **Non-detect values for parameters are not shown on this figure**
2. **Contaminants of concern were not detected for sample ST-3.**



Parameter	Concentration
Copper	34200*
Iron	361000*
Lead	4000*
Magnesium	68600*
Manganese	3920*
Mercury	2*
Nickel	926*
Sodium	2970
Vanadium	767*
Zinc	224000*

Parameter	Concentration
Chloroethane	380* µg/kg
1,1-Dichlorethane	76*
1,1,1-Trichloroethane	53*
Toluene	54*
Bis(2-ethylhexyl)phthalate	38000*
Arsenic	2.6 mg/kg
Barium	1400*
Beryllium	7.0*
Cadmium	8.0*
Calcium	17000*
Chromium	70.1*
Cobalt	14.9*
Copper	189*
Iron	56700*
Lead	59.7*
Magnesium	3120
Manganese	15000*
Nickel	41.3*
Sodium	876
Zinc	9150*

Parameter	Concentration
Chrysene	140* µg/kg
Bis(2-ethylhexyl)phthalate	6700
Arsenic	5.8 mg/kg
Barium	277
Beryllium	5.1*
Cadmium	3.9*
Calcium	28000*
Chromium	23.4
Cobalt	16.2*
Copper	117*
Iron	31800*
Lead	23.4*
Magnesium	3720
Manganese	411
Mercury	0.23*
Nickel	42.8*
Zinc	1580*

▲ SEPTIC TANK SAMPLE LOCATION

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

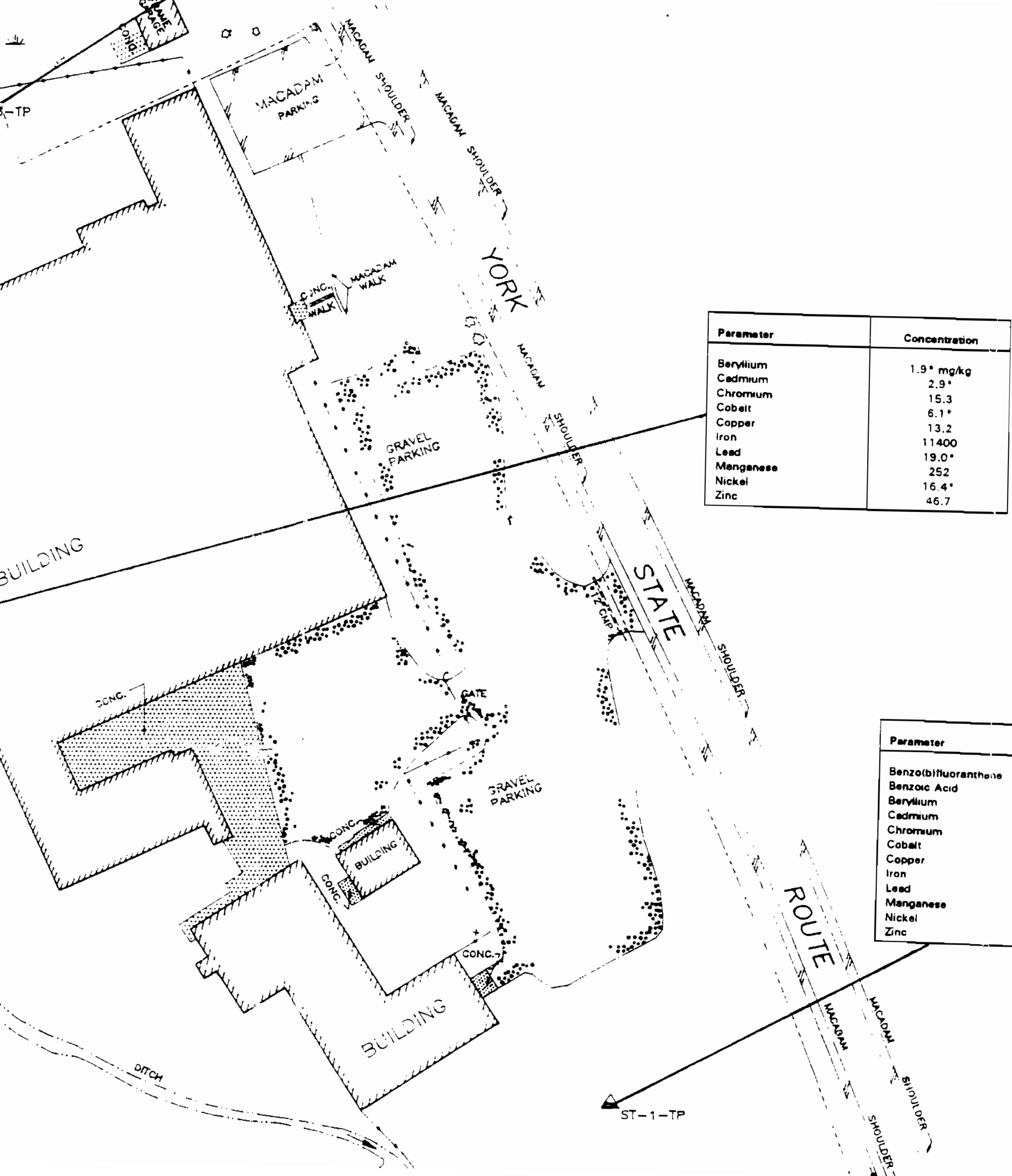
CHAIN LINK FENCE

STONE WALL

SWAMP

Notes:

1. Non-detect values for parameters are not shown on this figure.
2. Contaminant concentrations for voletile and semivolatile compounds expressed in µg/kg; Inorganic compounds expressed in mg/kg unless otherwise noted



Parameter	Concentration
Beryllium	1.9* mg/kg
Cadmium	2.9*
Chromium	15.3
Cobalt	6.1*
Copper	13.2
Iron	11400
Lead	19.0*
Manganese	252
Nickel	16.4*
Zinc	46.7

Parameter	Concentration
Benzo(b)fluoranthene	140* µg/kg
Benzoic Acid	310*
Beryllium	5* mg/kg
Cadmium	1.2*
Chromium	27.0*
Cobalt	21.2*
Copper	79.0*
Iron	31000*
Lead	14.9*
Manganese	980*
Nickel	42.5*
Zinc	348*

SCG/NATURAL BACKGROUND LEVEL IN SOIL

△ SEPTIC TANK TEST PIT SAMPLE LOCATION

PROPERTY LINE

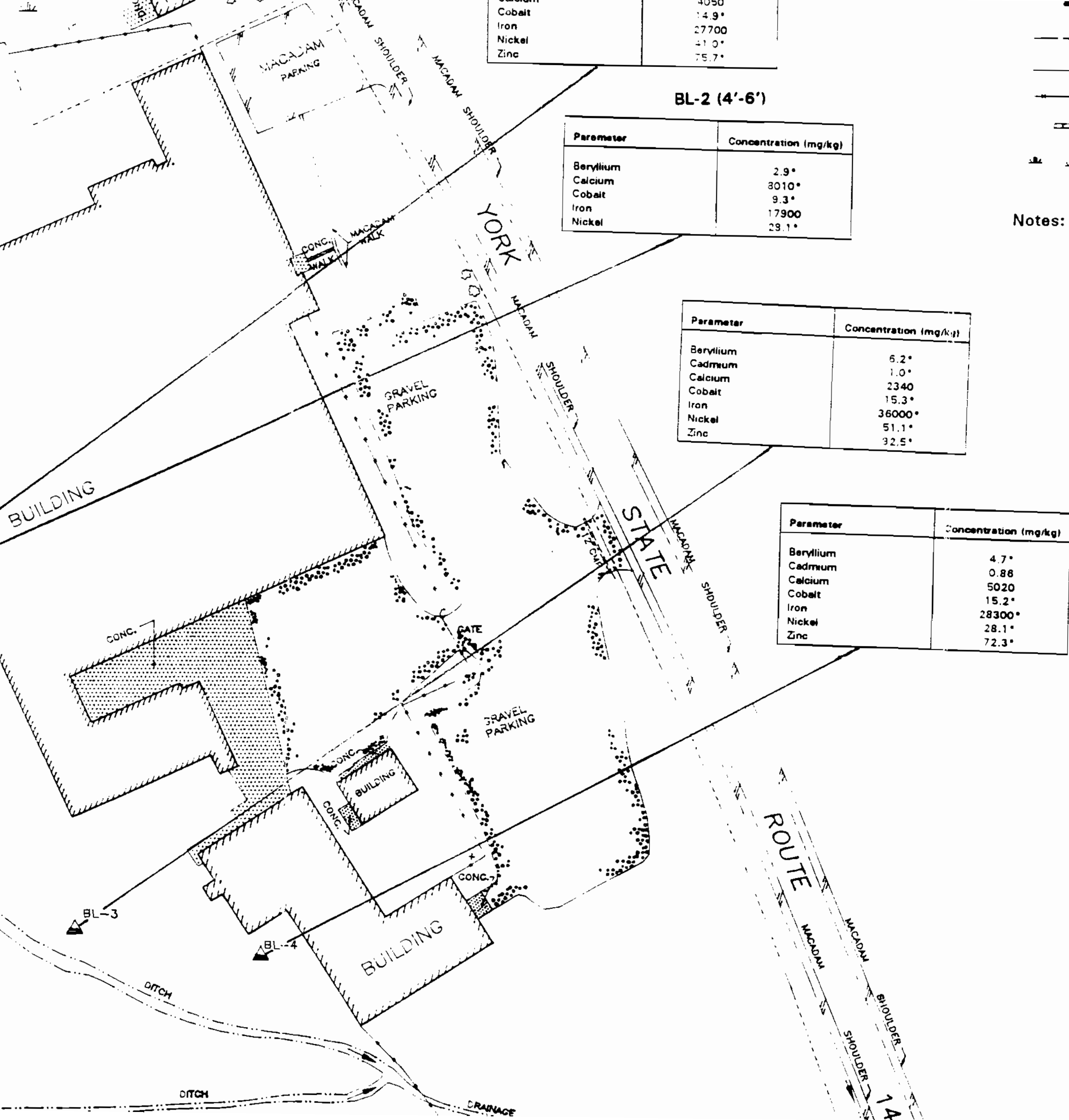
EDGE OF ASPHALT PAVEMENT

CHAIN LINK FENCE

STONE WALL

SWAMP

Notes:
1. Non-detect values for parameters are not shown on this figure.
2. Contaminant concentrations for volatile and semivolatile compounds expressed in µg/kg; Inorganic compounds expressed in mg/kg unless otherwise noted



Parameter	Concentration (mg/kg)
Calcium	4050
Cobalt	14.9*
Iron	27700
Nickel	41.0*
Zinc	75.7*

BL-2 (4'-6')

Parameter	Concentration (mg/kg)
Beryllium	2.9*
Calcium	3010*
Cobalt	9.3*
Iron	17900
Nickel	23.1*

Parameter	Concentration (mg/kg)
Beryllium	6.2*
Cadmium	1.0*
Calcium	2340
Cobalt	15.3*
Iron	36000*
Nickel	51.1*
Zinc	32.5*

Parameter	Concentration (mg/kg)
Beryllium	4.7*
Cadmium	0.88
Calcium	5020
Cobalt	15.2*
Iron	28300*
Nickel	28.1*
Zinc	72.3*

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

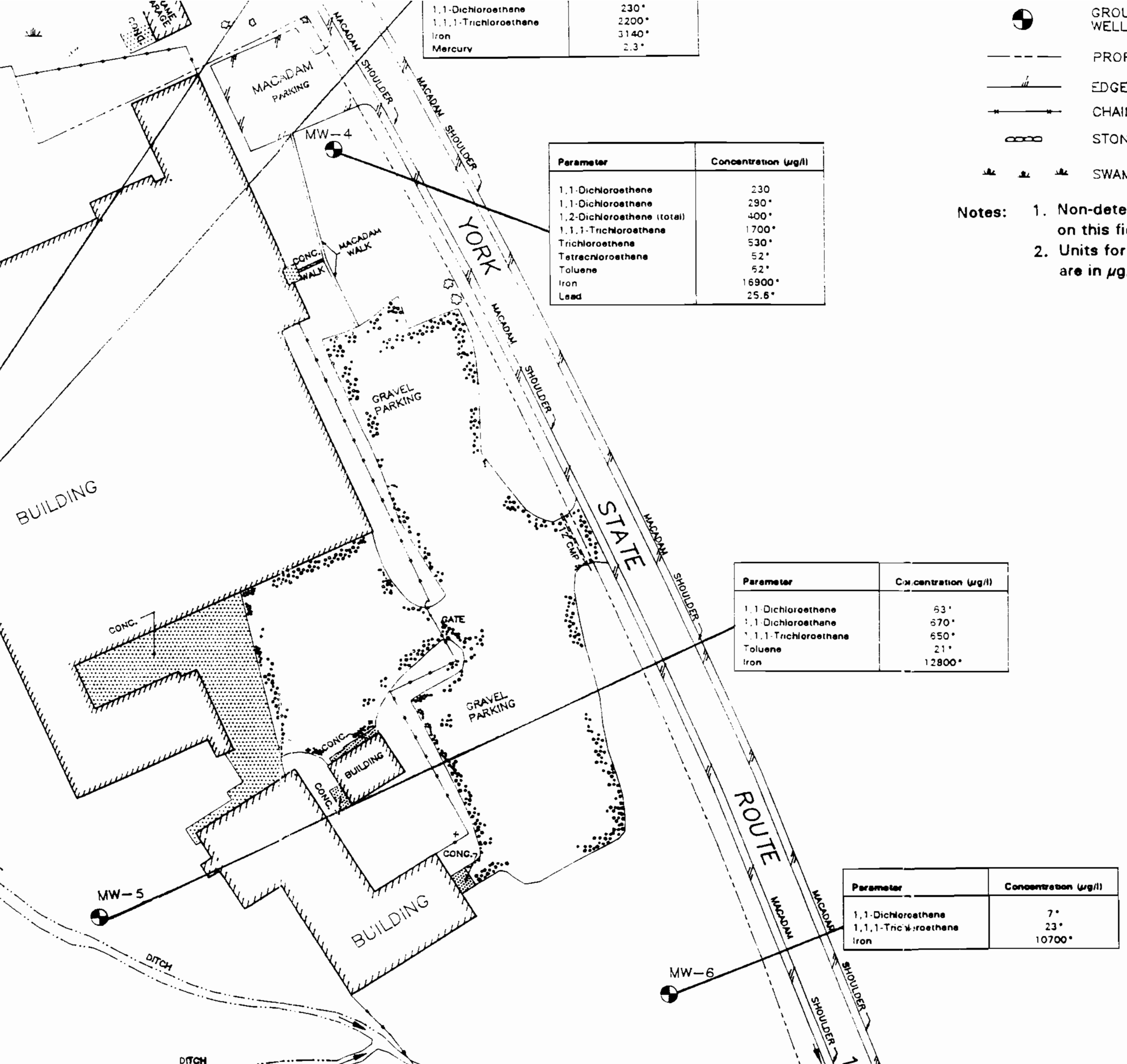
CHAIN LINK FENCE

STONE WALL

SWAMP

Notes:

1. Non-detect values for parameters are not shown on this figure.
2. Units for metals are in mg/kg.



1,1-Dichloroethane	230*
1,1,1-Trichloroethane	2200*
Iron	3140*
Mercury	2.3*

Parameter	Concentration (µg/l)
1,1-Dichloroethene	230
1,1-Dichloroethane	290*
1,2-Dichloroethene (total)	400*
1,1,1-Trichloroethane	1700*
Trichloroethene	530*
Tetrachloroethene	52*
Toluene	52*
Iron	16900*
Lead	25.6*

Parameter	Concentration (µg/l)
1,1-Dichloroethene	63*
1,1-Dichloroethane	670*
1,1,1-Trichloroethane	650*
Toluene	21*
Iron	12800*

Parameter	Concentration (µg/l)
1,1-Dichloroethane	7*
1,1,1-Trichloroethane	23*
Iron	10700*

GROUNDWATER MONITORING WELL LOCATION

PROPERTY LINE

EDGE OF ASPHALT PAVEMENT

CHAIN LINK FENCE

STONE WALL

SWAMP

Notes:

1. Non-detect values for parameters are not shown on this figure.
2. Units for volatile organic compounds and metals are in µg/l.

Section Six

6.0 SUMMARY AND RECOMMENDATIONS

6.1 SURFACE SOILS

Currently available data indicates that surface soils contain numerous contaminants of concern including volatile organic compounds, semi-volatiles and metals. The semi-volatile bis(2-ethylhexyl)phthalate and the metals beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, nickel and zinc all exhibited high detection frequencies with respect to concentrations exceeding SCGs and are found throughout the site. These soils were likely contaminated by past waste disposal practices, as well as on going degradation of waste debris piles. The contaminated surface soils represent a potential source of contamination with respect to all surface water bodies on-site and may impact off-site locations to some extent.

Based on the results of the Phase I RI, the following recommendations are proposed for the Phase II RI:

- Due to the fact that there were no surface soil samples previously collected to represent "background" conditions, several background samples should be obtained at off-site locations. These samples will provide a basis of comparison for analytical results, particularly with respect to metals.

- Resample several Phase I RI surface soil sample locations for select parameters for which analytical data was deemed unusable in the Phase I RI Data Usability report.

- The extent of contaminated surface soil underlying the debris piles at the site is unknown at his time. Therefore to better characterize the surface soil medium additional samples of soil from underneath and near the debris piles should be collected and analyzed for select parameters.

- Implement an Interim Remedial Measure (IRM). This IRM would restrict site access via a continuous chain link fence. Further discussion of this IRM is presented in Section 6.9 of this report.

6.2 SURFACE WATER/SURFACE WATER SEDIMENT

Based on the results of the Phase I RI, the contaminants of concern identified for surface waters were primarily metals including: aluminum, beryllium, cadmium, cobalt, copper, iron, lead, mercury, nickel, vanadium and zinc. The organic compounds trichloroethene and bis(2-ethylhexyl)phthalate were each detected above SCGs in only one of nine drainage ditch water samples and were not found exceeding SCGs in fire pond water. Based on available analytical data, both drainage ditch water and fire pond water contain inorganic contamination exceeding SCG criteria levels, however, as discussed earlier in this report the majority of this data is estimated. Contaminant migration is occurring on-site in drainage ditch water. Contaminants may also be migrating off-site in drainage ditch water. Of particular concern are the drainage ditches flowing off-site across the northern site boundary where five metals were found at levels exceeding SCGs (in samples DD-3 and DD-7).

Contaminants of concern found in surface water sediment were similar to those found in surface waters on-site with the addition of several semi-volatiles, particularly bis(2-ethylhexyl)phthalate, detected above SCGs in five of nine samples. As in surface waters, inorganic contamination is present in sediment throughout the site including sample locations immediately adjacent to the site boundaries. Although several inorganic contaminants were found exceeding SCGs in sediment from Catskill and Thorp Creeks, these contaminants of concern were identified at comparable concentrations in the upstream sample.

Based on the results of the Phase I RI, the following recommendations are proposed for the Phase II RI:

- Obtain several samples of surface water and surface water sediment from the marsh area located in an area adjacent to the northern site boundary, and analyze for full TCL parameters. Sediment samples should be obtained within depositional regimes, as well as a point just prior to the off-site drainage culvert outlet. The sediment in this area is of particular concern because of its potential affinity for contaminant adsorption due to high organic content.

- Sample surface water and surface water sediment at several off-site locations along the drainage ditch which flows off-site at the southern property boundary, and analyze for full TCL parameters. In addition, a sample of surface water and sediment should be collected at the point from which this drainage ditch discharges into Catskill Creek.

- An upstream surface water/sediment sample should be obtained from Thorp Creek north of the drainage outfall which is located just north of the bridge. The Phase I RI upstream sample location did not take this outfall into account and was actually located south of the bridge. A sample should also be obtained at the discharge point of this outfall. Both samples should receive full TCL analyses.

- Resample and analyze fire pond water and sediment, and on-site drainage ditch water and sediment to further delineate extent of contamination in each medium.

- Resample several Phase I RI sample locations along surface waterways for select parameters for which analytical data was deemed unusable in the Phase I RI Data Usability report.

6.3 SEPTIC SYSTEMS

As a result of the Phase I RI, numerous contaminants of concern were identified in the septic systems, primarily in the sediment/sludge samples collected from the septic tanks and in the soil samples obtained from the leaching fields. Contaminants of concern included volatile organic compounds, semi-volatiles and metals. These contaminants were introduced as a result of industrial waste disposal practices and are most likely a significant source of contamination in environmental media, particularly subsurface media. The full extent of contamination in the leaching fields is unknown at the present time.

Based on the results of the Phase I RI, the following recommendations are proposed for the Phase II RI:

- Investigate any septic tanks or distribution chambers which may have possibly been overlooked in the Phase I RI specifically, site records indicate that there may be septic tanks located in the northeast and east portions of the site property. In the event that additional septic tanks are uncovered, provision should be made to collect samples to be analyzed for the full TCL parameters.

- Define the Septic Tank #2 (ST-2) leaching field system, as well as leaching fields located in the eastern and southeastern portions of the site property. Soil gas analysis is the recommended investigative method. Once located, samples should be obtained from excavated test pit soil and analyzed for the full TCL parameters.

- Implement an IRM to remove and dispose of septic tank contents. Details of this IRM are provided in Section 6.9 of this report.

- Resample several Phase I RI locations for select parameters for which analytical data was deemed unusable in the Phase I Data Usability report.

6.4 SUBSURFACE SOIL

As a result of the Phase I RI, contaminants of concern identified for subsurface soils include the following metals: beryllium, cadmium, calcium, cobalt, iron, nickel and zinc. The primary path of migration for contaminants in subsurface soil would be via groundwater. Due to the presence of leaching fields utilized for the disposal of industrial wastes, there is potential for considerably more contaminated subsurface soil than that detected from soil borings.

Based on the results of the Phase I RI, the following recommendations are proposed for the Phase II RI:

- A test pit excavation program with associated subsurface soil sampling should be conducted in order to identify and characterize areas of potential buried waste, particularly an area located to the east of the debris piles (between the debris piles and the scarp).

- Resample several Phase I RI locations for select parameters for which analytical data was deemed unusable in the Phase I RI Data Usability report.

6.5 GROUNDWATER/PRIVATE WATER SUPPLY

Groundwater contamination was detected in all of the on-site monitoring wells (and Becker Wells) in addition to several off-site private water supply wells. Contaminants of concern consisted primarily of volatile organic compounds including the following: 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethene(total), 1,1,1-trichloroethane, trichloroethene and toluene. It should be noted that private water supply samples were analyzed solely for volatile organic compounds. Lead and mercury were identified as contaminants of concern for monitoring well samples, each being found above SCGs in one sample. Groundwater was found to be moving generally in a north to northeast direction through the site, although localized deviations in this path are very likely due to off-site pumping wells and joint/fracture orientation.

Based on the results of the Phase I RI, the following recommendations are proposed for the Phase II RI:

- Conduct a complete round of off-site private water supply well sampling and analyze the samples for volatile organic compounds (EPA Method 524.2).

- Locate and sample Becker Well #1, which is shown on old site maps in the northeast portion of the property. Analyze for full TCL parameters.

- Install and sample an off-site upgradient monitoring well cluster (bedrock and overburden, if possible) in the western portion of the Weldon House property. Analyze for full TCL parameters. This will establish baseline conditions for comparison with site specific background groundwater quality in the vicinity of the site. This monitoring well will also be used in establishing the off-site hydraulic gradient south of the Becker Electronics site.

- Install and sample one off-site bedrock monitoring well adjacent to the marsh area in the lot between the Van Tassel residence and the Gallery. Analyze the samples for full TCL parameters. This monitoring well location will serve to better define the hydraulic gradient and extent of off-site groundwater contamination moving north through the contaminated north and northeast portion of the site. In addition, it will serve as an early detection point for homes further downgradient.

- Install and sample one additional off-site bedrock monitoring well to be located immediately east of Keogh's Cottages. Analyze these samples for full TCL parameters. This monitoring well will be used in establishing the groundwater quality and the off-site hydraulic gradient east of the Becker Electronics site.

- Install and sample an on-site monitoring well cluster to be located immediately south and east of the on-site debris piles. Analyze these samples for full TCL parameters. This location will help to fill a data gap for groundwater quality in this area and provide an important observation well point for future pump testing.

6.7 CHEMICAL STORAGE

During preliminary surveys of site buildings, it was found that numerous drums of solvents and other chemicals were stored both inside and outside of the buildings. The number, contents and physical condition of these containers are not presently documented. Leakage of solvents and chemicals into facility drains (i.e., floor drains) and soil outside of buildings could further contaminate site media.

It is recommended that during the Phase II Remedial Investigation the following activities be performed:

- Identification and inventory of solvents and chemicals presently stored at the site
- Assessment of the conditions of each container/drum
- Over-pack leaking and damaged containers/drum
- Stage and secure drums until arrangements for disposal of these materials/wastes to a permitted facility are made. This may be implemented as an IRM or incorporated into the final remedial program.

6.8 DEBRIS PILES

There are four debris piles at the site consisting mainly of scrap particle board and metals previously used in the manufacturing and fabrication of speakers, cabinets and components. Other diverse wastes are visible in these piles, including discarded electrical components from the manufacturing operations. These debris piles may be producing contaminated leachate which is possibly impacting soil and drainage ditch water and sediment. The physical characteristics of the waste pile interior and extent of contamination beneath the waste piles are not presently known. In addition, there is a pile of saw-dust type material in a large storage building at the rear of the site, as well as a small pile of waste/dirt near the entrance to this building.

- Evaluate and perform a pump test on Monitoring Well #5 to provide data which will aid in the remedial design of any future groundwater pump and treatment system. In addition, a deep bedrock monitoring well is recommended adjacent to MW-5 to gather additional information on fracture zones encountered at depth in that location. Results of this pump test will be used to evaluate implementation of a long-term pilot test/IRM pump and treat program at the MW-5 location.

- Resample all monitoring wells and existing on-site wells and analyzed for full TCL parameters. This additional data is needed to support first phase RI data and provide characterization of the nature and extent of groundwater contamination.

- Produce a current aerial photograph of the site and surrounding study area to enable accurate representation of off-site monitoring well/sampling locations, as well as to assist in the development of a vegetation cover type map.

6.6 UNDERGROUND STORAGE TANK

An underground storage tank, estimated 5,000 gallon capacity, was used to fuel boilers at the site. A preliminary inspection indicated that there was free liquid (possibly fuel oil) remaining in the tank. Neither the condition nor the integrity of the tank is known. Based on the age of the tank, it is not likely to comply with Federal and State Underground Storage Tank (UST) regulations. The possible presence of residual fuel in the tank poses a potential risk of soil contamination from possible leaks which could be impacting groundwater.

The contents of the storage tank and the tank itself should be removed and disposed of in a proper manner. Removal of the tank will facilitate subsurface soil testing around the tank, and removal of contaminated soil, if present.

The remediation of the underground storage tank is an oil spills issue and has been referred to the Spill Response Unit for implementation.

There is evidence that there are other underground tank(s) on the site which are associated with a former fuel pump station and other boiler rooms. These areas should be investigated during the Phase II Remedial Investigation.

Approximate volumes of waste piles at the site are as follows:

- 7,000 cubic yards (large debris pile at rear of site)
- 3,000 cubic yards (material in storage building at rear of site)

The proposed recommendation consists of the following elements:

- Measure the volume of each of the debris piles
- Sample and analyze samples of debris and perform TCLP analysis.

Implementation of this task will provide a basis for determination of the volume and characteristics of the material for future remedial recommendations.

6.9 PROPOSED INTERIM REMEDIAL MEASURES

Two Interim Remedial Measures (IRMs) are proposed for the Becker Electronics site to accomplish two general objectives:

- Restrict access to site
- Reduce potential environmental degradation

These actions should be implemented as soon as feasible and prior to initiating the formal site remediation process.

The proposed IRMs deal with the following issues:

- Contact with potentially contaminated media (i.e. surface soil, surface sediment, water, and debris piles)
- Contamination in septic systems

While available data indicates that human health issues associated with surface soil contaminants is moderately low, access to the site should be restricted. The potential for environmental degradation on and immediately off-site does exist. Wastes stored at the site have the potential to further increase media contamination and potential environmental and human health risks.

The proposed IRMs are listed below in the appropriate sequence for implementation.

6.9.1 Restrict Access To Site

Although calculated risks from exposure to contaminated surface soils, surface water and sediments are relatively low, a quantifiable risk does currently exist. Furthermore, the nature and extent of contamination of the debris piles is not yet known beyond limited analyses of leachate samples.

At the present time, the site is only partially fenced, mainly in the front portion of the property. Inspection of the site shows evidence of trespass. Since the property is abutted by a summer resort (and two other motels/resorts in the immediate vicinity) with transient guests, the fire pond and other site features may entice people to enter the site.

Future work performed during the Phase II Remedial Investigation will disturb wastes on the site and could result in additional potential exposures to people on the site. Therefore, implementing these activities will require restricting access to the site. The most feasible way to accomplish this will involve upgrading the existing fence and installing new fencing where necessary.

The proposed IRM will consist of the following elements:

- Inspect existing fence at site
- Repair and upgrade existing fence as required
- Install chain-link fence around currently unfenced areas of site with appropriate access gates
- Post warning signs on perimeter fence restricting access and indicating potential hazards.

6.9.2 Contamination In Septic Systems

There are three septic systems at the Becker Electronics site which have been found to be contaminated with industrial wastes and chemicals. The chemical wastes in the septic systems are potential sources of contamination for subsurface soils and groundwater. To eliminate further site and groundwater contamination from these sources, the septic tanks contents should be removed and disposed of.

The proposed IRM will consist of the following elements:

- Pump out contents of three septic tanks; analyze and dispose of wastes at an approved facility