FINAL

SITE CHARACTERIZATION REPORT

CONESTOGA PINES PARK SITE

CITY OF LANCASTER
LANCASTER COUNTY, PENNSYLVANIA

PADEP CONTRACT NO. ME359184
WORK REQUISITION NO. 33-077

Prepared For:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

Prepared by:

BAKER ENVIRONMENTAL, INC.

March 29, 2002

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Submitted to:
Commonwealth of Pennsylvania
Department of Environmental Protection
Environmental Cleanup Program
Hazardous Sites Cleanup Section
Southcentral Regional Office
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Harrisburg, Pennsylvania 17110

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March 29, 2002

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NOTICE

The information in this document has been funded by the Pennsylvania Department of Environmental Protection (PADEP) under Contract No. ME359184 to Baker Environmental, Inc. (Baker). This document has been formally released by Baker to the PADEP.

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National Groundwater Association: MTBE in Groundwater-Assessment and Remediation Technologies
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OSHA 8-Hour Hazardous Waste Operations and Emergency Response, Supervisor/Incident Command
OSHA 8-Hour Hazardous Waste Operations and Emergency Response Refresher
U.S. EPA: Risk Assessment, Communication and Management
U.S. EPA: Soil Vapor Survey Boot Camp
U.S. EPA: Treatment Technologies for Superfund
Pennsylvania Council of Professional Geologists: A Review of Geology for the Practicing Geologist

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Mark B Ioos

Mark B. Ioos, P.G.
Signed and sealed this day, March 29, 2002

"By affixing my seal to this report, I am certifying that the information is true and correct. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and that it is within my professional expertise to verify the correctness of the information."

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1.0 INTRODUCTION

1.1 Introduction

A Site Characterization was performed by Baker Environmental, Inc. (Baker) at the Conestoga Pines Park site located in the City of Lancaster, Lancaster County, Pennsylvania (Figure 1). This investigation was conducted on behalf of the Pennsylvania Department of Environmental Protection (PADEP) as authorized by PADEP Work Requisition Number 33-077, Contract Number ME-359184, pursuant to the Pennsylvania Hazardous Sites Cleanup Act (HSCA), Act 108, dated October 18, 1988. The report was prepared based on information shared during the scoping meeting between the PADEP and Baker personnel, one site visit, a review of available files relevant to the site, and the results of this investigation.

1.2 Purpose and Objectives

The Site Characterization was performed to determine the concentrations of volatile organic compounds contained in the soils, sediments, surface water, and groundwater at the Conestoga Pines Park site. The information and chemical data collected during the Site Characterization was evaluated to determine potential risks, and to identify additional site characterization needs.

1.3 Report Organization

This report outlines the investigative procedures and analytical results used to evaluate the potential environmental concerns at the Conestoga Pines Park site. The investigation included: the review of background information and previous reports; the performance of a limited fracture trace analysis; the drilling of shallow soil borings using membrane interface technology (MIP); the collection and analysis of soil samples from borings; the drilling and installation of two new monitoring wells; the collection of one round of groundwater samples from the existing monitoring well network at the site; and the collection and analysis of sediment, surface water, and surficial soil samples to evaluate potential impacts to the surface water drainage channels and soils at the site. The report summarizes the analytical results for the environmental samples collected during the Site Characterization. In addition, the report also

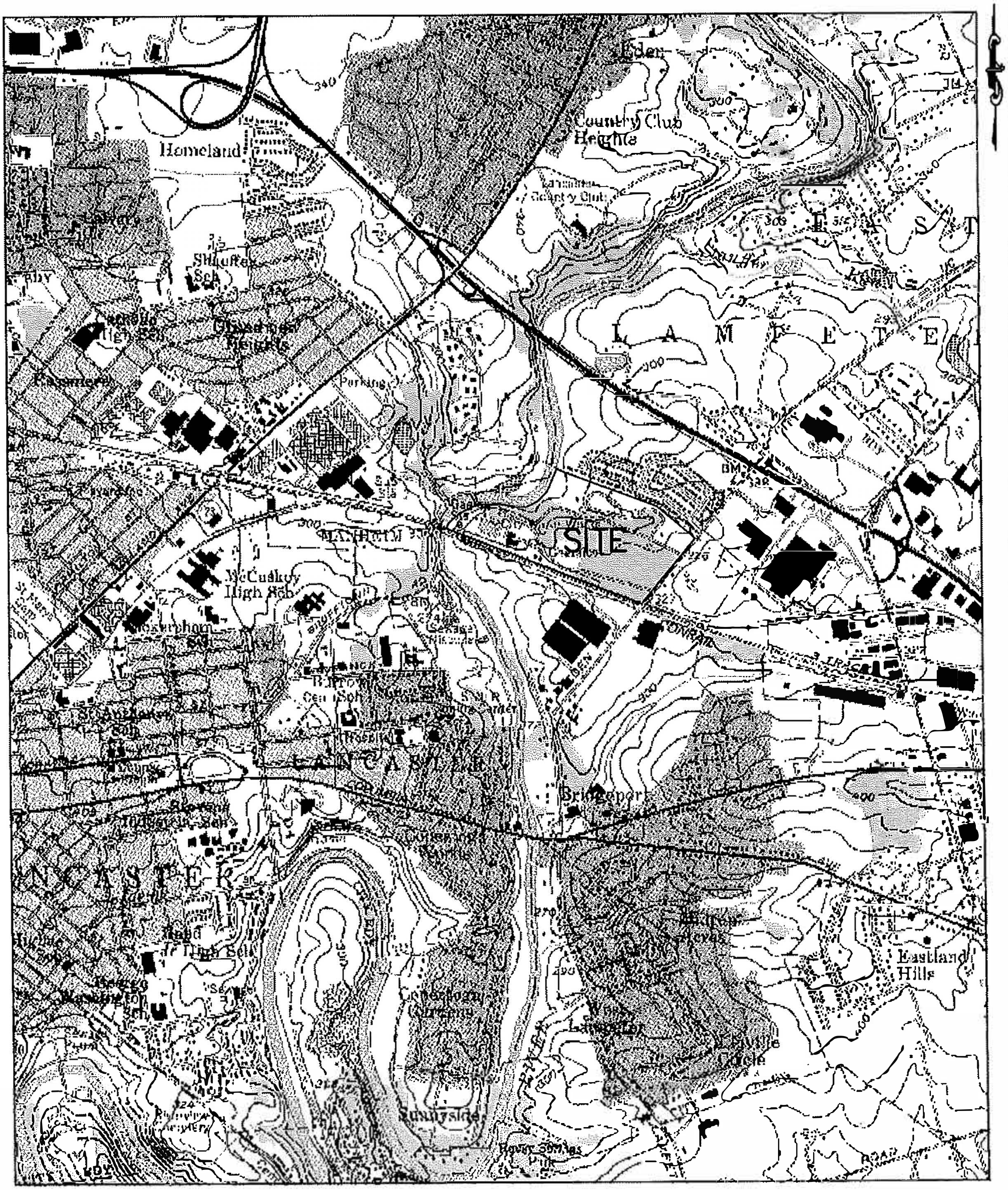

FIGURE 1
SITE LOCATION MAP
CONESTOGA PINES PARK SITE

SOURCE: U.S.G.S QUADRANGLE
LANCASTER, PENNSYLVANIA.

SCALE:	1" = 2000'	DATE:	AUGUST 2001
S.O. NO.:	24300-077	FILE:	FIGURE1
DSN/DWN:	JAD/JJR	CHK:	

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evaluates the potential risks to human and ecological receptors, and provides recommendations for further investigation of substances of environmental concern at the site.

2.0 SITE BACKGROUND

2.1 Site Location and Setting

The Conestoga Pines Park site is located along the western side of Pitney Road approximately ¾ of a mile north of State Route 340 (Old Philadelphia Pike), in the eastern portion of the City of Lancaster, Lancaster County, Pennsylvania. The site can be located on the Lancaster, Pennsylvania USGS 7.5 Minute Quadrangle Topographic Map at north 40^0 03' 07" latitude and west 76^0 16' 02" longitude (see Figure 1). The Lancaster County Parks and Recreation Department currently owns and maintains the park property.

Survey mapping indicates that the Conestoga Pines Park property is approximately 62 acres in size. The site is situated in a suburban area that is mainly served by public water. Some local residents and businesses, however, still rely upon private wells for their water supply needs. According to the United States 2000 Census report for Lancaster County Pennsylvania, 56,348 people were listed as residing in the City of Lancaster. The 2000 census report indicates that 491 people reside within census tract 132.02 situated in the immediate vicinity of the Conestoga Pines Park site (United States Census Bureau, 2000).

The Conestoga Pines Park site is situated in an east-west trending rolling lowland area in the central portion of Lancaster County, Pennsylvania. This lowland area is commonly referred to as the Conestoga Valley. In Lancaster County, the Conestoga Valley is mainly underlain by easily eroded rocks comprised of carbonates (i.e., limestone and dolomite) and shales. Interspersed throughout this lowland area are hills comprised of more resistant Cambrian quartzites, schists, slates, and phyllites. The northern boundary of the carbonate lowland area is bounded by the shale of the Cocalico formation (Meisler and Becher, 1966). To the south, the carbonate lowland area is bordered by a combination of resistant phyllites and schists, that is locally referred to as Mine Ridge (Potter, 1999). The main trunk streams draining the Conestoga Valley area are Chickies Creek and the Conestoga River. These streams flow in a southwestward direction, ultimately discharging to the Susquehanna River. The western edge of the Conestoga Pines Park site is bounded by the Conestoga River.

The Lancaster County, Pennsylvania area has a humid and temperate climate, characterized by relatively warm summers and moderately cold winters. The normal annual temperature is 52.7 °F (degrees Fahrenheit). Extreme changes in temperature within short periods of time are uncommon. Rainfall is generally evenly distributed throughout the year. The average annual precipitation for the area is 42.19 inches (Lancaster, Pennsylvania recording station). The largest amount of precipitation generally occurs during the summer months (i.e., June, July, and August), whereas the time between December and February is reportedly the driest period of the year (Pennsylvania State Climatologist, 2001).

2.2 Existing Site Conditions

The Conestoga Pines Park property is currently a public park in a mainly suburban area of central Lancaster County. Topography of the site slopes westward from Pitney Road along the eastern property boundary toward the Conestoga River that borders the park to the west. To the south, the site is bordered by the CBS/Playskool, Inc. facility and a series of railroad tracks maintained by the Norfolk Southern Corporation. A residential development (i.e., Eden Manor), borders the site to the north. The Lancaster Municipal Water Authority Public Filtration Plant is located north of the Norfolk Southern railroad tracks in the southwestern portion of the park property. The Commerce Industrial Park is located east of the site. The Arthur C. Morris Drive provides access to the park from Pitney Road. This paved road traverses the site from east to west, ending at a grass clearing approximately 150 feet east of the Conestoga River.

The Conestoga Pines Park site is partially grass covered and partially wooded. Structures at the site include a renovated barn, remnants of a former Civilian Conservation Corp (CCC) day camp, a public swimming pool and associated parking lot, and the Lancaster Municipal Water Authority Public Water Filtration Plant. The headwaters of a spring originate in a wooded area in the north central portion of the site, and form an unnamed stream that flows in an east to west direction (roughly parallel to Arthur C. Morris Drive). This unnamed stream ultimately discharges into the Conestoga River at the west end of the site. Features of the Conestoga Pines Park site are discussed below and are depicted on Figure 2.

The renovated barn is located along the southern side of Arthur C. Morris Drive, approximately 500 feet west of the entrance to the site from Pitney Road. This barn, which is currently used as a recreation center, is constructed of masonry (i.e., stone, and brick) and metal materials. Concrete slabs cover the ground surface along the north and east sides of the barn. Remnants of stone and brick walls border these concrete slabs. A stone porch and macadam walkway are situated along the west side of the barn. The barn is surrounded by a gravel driveway, with a small gravel parking lot facing Arthur C. Morris Drive (i.e., east side). Utility markings indicate that both public sewer and water hookups service the barn. Fill pipes for a fuel oil above ground storage tank (AST) are located at the rear (i.e., west) of the structure, suggesting that an oil furnace is used to supply heat to the barn. Overhead utility lines provide electric and telephone service to the barn. Utility poles are located along both sides of Arthur C. Morris Drive, from the barn eastward toward Pitney Road. The barn is surrounded by wooded land to the east, south, and west, and Arthur C. Morris Drive to the north.

The park property across Arthur C. Morris Drive north and east of the barn consists of a gently westward sloping grass field that is punctuated with isolated trees. This field extends from Pitney Road west to a wooded area. The tree line for this wooded area begins roughly north of the barn and trends northwest toward the Eden Manor residential area located north of the site. The wooded area extends approximately 1,000 feet west of this tree line, ending at a chain link fence surrounding the public swimming pool complex. An area of raised, flat topography with a steeply sloping western embankment is located approximately 150 feet north of the barn (western end of the grass field). According to information provided by the PADEP and a review of aerial photographs, a former farmhouse was located in this area. A three-inch diameter metal pipe, of unknown origin, emerges horizontally from this raised area, discharging to the west.

A drainage swale is located in the northeast portion of the Conestoga Pines Park property, near the border between the site and the Eden Manor residential neighborhood. The head point of this swale originates at the end of a corrugated metal drainage pipe situated approximately 350 feet west of Pitney Road. This drainage swale gradually becomes shallower to the west, eventually discharging water into the grass field as sheet flow. The corrugated metal pipe and drainage swale collectively function to convey surface water runoff from Pitney Road and from the residential areas north of the site toward the headwater spring and unnamed tributary stream located to the west.

The headwaters of the spring emanate from a depression situated approximately 200 feet west of the drainage swale and 200 feet north of the renovated barn. During the investigation (i.e., fall months of 2001), surface water flow near the headwaters of the spring was very low, and in places disappeared entirely. Water emanating from the spring flows westward in the unnamed tributary stream channel to its confluence point with the Conestoga River at the western end of the site. Crossovers along the stream are provided by a small bridge located at the entrance to the former CCC camp, and a paved roadway at the south side of the parking lot to the public swimming pool complex.

The public swimming pool is located in the western portion of the site, approximately 350 feet east of the Conestoga River. The outbuildings associated with the swimming pool complex are secured by a chain link fence. West of the swimming pool is an asphalt parking lot, approximately 110 feet wide and 200 feet long. The unnamed tributary stream is situated south of the swimming pool parking lot and is conveyed beneath the entrance roadway through a corrugated metal drainage pipe.

The Lancaster Water Authority Water Filtration Plant is located at the extreme west/southwest corner of the site. The filtration plant is separated from the other park facilities by a wooded area. Plant structures include above ground storage tanks, maintenance buildings, and other structures typical of water treatment plant operations. These outbuildings and structures are secured by a chain link fence.

Remnants of a former Civilian Conservation Corp (CCC) day camp are located in the north central portion of the site, in the area east of the swimming pool complex. This area of the site is largely overgrown with trees and undergrowth. Very little evidence of the camp remains. Visible remnants include a portion of a brick entranceway and a concrete spring box.

The Conestoga River borders the Conestoga Pines Park property to the west. The Conestoga River flows toward the south-southwest, where it discharges into the Susquehanna River near Safe Harbor, Pennsylvania, located approximately 10.4 miles southwest of the site. According to the water quality standards listed in Pennsylvania Code, Title 25, Environmental Resources, Chapter 93 – *Water Quality Standards*, the Conestoga River is designated as a Warm Water Fishery (WWF). In Pennsylvania, a watercourse with a WWF designation is protected for the "maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat."

Topography decreases from a high of approximately 327 feet above mean sea level near Pitney Road at the southeast corner of the Conestoga Pines Park site to a low of 260 feet above mean sea level along the Conestoga River which forms the western boundary of the property. Based upon these topographical differences, surface water runoff is in a west to northwesterly direction across the site. The unnamed stream that originates at the headwater spring receives surface water runoff from the drainage swale in the northeast portion of the site, and from grassy and wooded areas located on the eastern portion of the site. Surface water runoff from the northern perimeter of the site, including the Eden Manor residential development, also flows into the unnamed stream. The unnamed stream ultimately conveys this surface water to the Conestoga River.

2.3 Site History

Information regarding the history of the site was obtained from background information provided by the PADEP, and a review of the PADEP file records conducted on August 27, 2001.

The PADEP file records contained no documentation indicating when the Conestoga Pines Park site was purchased by the City of Lancaster or when it was first used as a public park. However, some approximations can be made based on information found in the files, specifically the following three historical documents:

- Aerial photograph dated November 11, 1957
- Aerial photograph dated May 23, 1964
- General Site Plan for Conestoga Pines Park dated November 18, 1968

The Lancaster Municipal Authority Water Filtration Plant appears in all of the above documents and appears relatively unchanged throughout the time span from 1957 to 1968. According to the PADEP documents, the filtration plant was constructed on the southwest portion of the site in the 1930's. The plant withdraws and treats raw surface water from the Conestoga River, serving as a source of potable water for the residents of Lancaster. The plant reportedly treats an average of eight million gallons of influent water each day from the Conestoga River. Treatment operations include: adjustments of pH; settling and coagulation of suspended solids; filtration; and a disinfection process.

Facilities related to the CCC Camp were also evident in both of the aerial photographs, and the camp is depicted as a "current structure" in the 1968 General Site Plan. According to the PADEP documents, this day camp was developed on the north central portion of the site in the 1930's, apparently prior to the use of the property as a public park. This camp was reportedly active from the 1930's until the 1970's. Little information was available regarding the specific operations of this camp, and no historical mapping was available to indicate the presence, orientation, or use of any structures at the camp. The 1968 General Site Plan indicates one structure, the Old Day Camp, to be demolished, and another Day Camp to be constructed nearby. A road, circling this portion of the site, and a parking lot at the southern end of the camp area (adjacent to the north side of the current Arthur C. Morris Drive) are the only structures depicted. Based on the current site conditions, no building structures associated with the operation of the former CCC camp remain on the property.

The barn is present in the aerial photographs and on the General Site Plan. Its size and orientation appear unchanged from 1957 to the present. In all three documents, a smaller building was formerly located along the north side of the barn. The General Site Plan labels this smaller building as a "Garage". A farmhouse, corresponding to the location of the area of raised flat topography at the site, appears in both the photographs and the General Site Plan. It is labeled as the "Future Site Supervisor" location in the 1968 General Site Plan. This designation, as well as several other "proposed" park features listed on the General Site Plan map, collectively suggest that development of the property into a public park may have been taking place circa 1968. The appearance of the fields and wooded areas immediately surrounding the farmhouse and barn are consistent with agricultural activities, indicating this portion of the site was being used for agricultural purposes prior to its conversion as a public park.

The pool complex and adjacent parking lot were not visible on the aerial photographs, but were depicted as "Existing Structures" on the General Site Plan, indicating they were likely constructed between 1964 and 1968. The 1964 photograph depicts another athletic field, possibly a tennis court, where the parking lot and swimming pool are currently located.

It is worth noting that a group of three, and possibly four, structures were identified just east of the day camp in the 1964 photograph. These structures may be present in the 1957 photograph as well, however, the poor quality of the photograph circumvents a definitive interpretation. These structures are depicted as "Existing Structures to be Demolished" on the General Site Plan, and are labeled as "Watchman's Shed", "Storage Shed", "Paint Shed", "Lawn Mower Shed", and "Garage." Presently, there is no obvious evidence of these structures at the site. It is not known whether these structures were used for commercial, industrial, or residential purposes.

In summary, it appears that the land use of the Conestoga Pines Park property varied over the past seventy years. Although largely agricultural, historical development of a potentially commercial or industrial nature is evident in the northcentral and southwestern portions of the site.

2.4 Previous Investigations

Information regarding previous investigations conducted at the Conestoga Pine Park site was provided by a review of file records maintained by the PADEP and relevant conversations with PADEP personnel.

In 1991 and 1992, the General Electric Company (GE), located along the western side of the Conestoga River, drilled four monitoring wells on the Conestoga Pines Park property as part of a Resource Conservation and Recovery Act (RCRA) facility investigation mandated by the U.S. Environmental Protection Agency (USEPA). Two monitoring wells, GW9109 and GW9110, were drilled on the western portion of the Conestoga Pines Park property in 1991. These monitoring wells were drilled to determine whether or not a groundwater plume containing trichloroethylene (TCE) had migrated from the GE facility to the east side of the Conestoga River. Groundwater samples collected from monitoring wells GW9109 and GW9110 were found to contain low concentrations of TCE. Based on this information, GE drilled two additional monitoring wells (i.e., GW9211 and GW9212) in the eastern portion of the Conestoga Pines Park site in an attempt to define the lateral extent of the TCE groundwater plume. The TCE concentrations detected in the groundwater samples collected from monitoring wells GW9211 and GW9212 were found to be higher than in monitoring wells GW9109 and GW9110. Static water level measurements recorded in the monitoring wells indicated that groundwater flow at the Conestoga Pines Park site was in a westward direction toward the Conestoga River. This information combined with the groundwater sampling data suggested that the source of the TCE contained in the groundwater underlying the Conestoga Pines Park property was most likely situated hydraulically upgradient to monitoring wells GW9211 and GW9212, and was not associated with the water quality problems at the GE site.

The analytical results for the environmental samples collected at the Conestoga Pine Park site are summarized in Table 1. This historical summary includes the testing results for both surface water and groundwater samples collected at the site. The sampling information was obtained from the PADEP and a review of the PADEP file records for the site. Groundwater samples collected from the four monitoring wells revealed elevated concentrations of volatile organic compounds (VOCs). The VOCs identified in the groundwater samples were trichloroethylene (TCE), cis-1,2-dichloroethylene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethylene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA). Concentrations of VOCs were found to be higher in monitoring wells GW9211 and GW9212 located in the eastern portion of the site, than in monitoring wells GW9109 and GW9110 situated near the Conestoga River. The concentrations of VOCs decrease with depth in well cluster GW9211 and GW9212, suggesting that the source of chlorinated solvents is fairly close to the surface and located east of these monitoring wells.

Subsequent investigations at the site by the PADEP revealed that the highest concentrations of VOCs occur in the surface waters of the spring forming the headwaters of the unnamed stream. Surface water samples collected from the spring in 1992, 1993, 1994, 1995, and 1996 revealed TCE concentrations ranging from 498 micrograms per liter (µg/L) to 820 µg/L (see Table 1).

In October 1992, the Pennsylvania Department of Environmental Resources (PADER now the PADEP) performed a soil vapor survey at the site. Several areas were found to contain elevated concentrations of VOC vapors in the soils. The highest concentrations of VOC vapors were identified in the following areas: 1) Area #1 - a circular pattern situated northeast of the renovated barn; 2) Area #2 - a circular pattern situated northwest of the renovated barn; and 3) Area #3 - in a linear pattern extending to the west along Arthur C. Morris Drive to a former sand storage area (sand pit).

Area #1 is located between the former farmhouse location and the wooded lot where the headwater spring originates. Area #3 (i.e., sand pit) is located approximately fifty feet south of the paved road on the edge of the wooded hill that slopes to the south. A limited number of confirmatory soil samples at some of the soil vapor monitoring points were collected by the PADER in May 1993. The analytical results showed that the soil samples collected from these areas did not contain elevated concentrations of VOCs.

On October 13, 1999, and January 14, 2000, representatives from the PADEP collected several surface water samples along the unnamed stream that runs east to west through the site. The analytical results show that the sample location identified as the "headwater spring" continues to exhibit the elevated concentrations of TCE. The concentrations of VOCs contained in the surface water being discharged from the headwater spring were TCE (450-580 μg/L), cis-1,2-DCE (510-548 μg/L), and 1,1-DCE (18μg/L) (see Table 1). The regulatory standards for these compounds are 5 μg/L (TCE), 70 μg/L (cis-1,2-DCE), and 7 μg/L (1,1-DCE), respectively.

There is relatively little information regarding groundwater hydrology within the park boundaries. Environmental studies conducted on the CBS/Playskool property located south of the park indicate that groundwater flow at this site is toward the west/southwest (away from the park). The headwater spring has consistently been the area most highly impacted by VOCs. A private water supply well (i.e., Landis Well) is apparently located east of the headwater spring across Pitney Road. No VOCs have been detected in the groundwater samples collected from this well. Although it has been used as a background sampling point, the Landis well is not situated directly upgradient of the headwater spring.

The source for the VOCs contained in the groundwater underlying the Conestoga Pines Park site is unknown. Based upon information provided by previous environmental studies, the source of the VOCs may be located in either the eastern portion of the property, or east of the park with subsequent migration onto the site. According to conversations with PADEP personnel, solvents may have been previously disposed in the vicinity of the former farmhouse foundation at the site by the CBS/Playskool Company. This event may be the cause or may be contributing to the VOC concentrations observed in soils and groundwater at the Conestoga Pines Park site. Little is known about the former Garage, Paint Shop, Storage Shed, or Lawn Mower Shed once located in the northcentral portion of the site, and whether the former housekeeping practices conducted at these facilities may be the cause or a contributing cause for the VOC impacts identified at the site. A printing facility (i.e., R.R. Donnelly, Inc.) is located approximately 1,500 feet northeast of the Conestoga Pines Park site. According to PADEP personnel, groundwater underlying this facility has been impacted by VOCs. Accordingly, information regarding the R.R. Donnelly facility was evaluated to determine if this facility was serving as a source for the VOCs identified in the groundwater at the site. Lastly, a yet unidentified source or sources of VOCs may exist on the park property, which is/are producing the water quality impacts at the site.

2.5 Fracture Trace Analysis

According to Gold (1999), fracture traces are surface manifestations of vertical or near vertical zones of fracture concentration. These zones may locally exhibit higher porosities and permeabilities for both the storage and movement of groundwater. Lattman (1958) recognized that aerial photographs could be used to identify and map fracture traces based on topographic, vegetation, and/or soil tonal alignments. Wells drilled along fracture traces, especially at the intersection of such features, has been demonstrated by Parizek (1975) to provide larger groundwater yields.

A review of large scale aerial photographs was performed by Baker to determine if the bedrock in the vicinity of the Conestoga Pines Park site exhibits evidence of potential fracture traces, and whether any of the identified features can be used to explain the distribution of organic compounds detected in groundwater samples collected from the on-site wells.

The fracture traces occurring in the vicinity of the study area were identified by examining the low altitude black and white aerial photographs listed in Table 2. A Bausch and Lomb Hastings Triplet 10X-hand lens was used to examine and identify small features of interest on the photographs. For comparison purposes, the Lancaster, Pennsylvania, USGS 7.5 Minute Quadrangle Map was used to help distinguish geographic features.

Fracture traces were identified on the aerial photographs based on the vertical alignment of one or more of the following elements:

1. Surface sags or depressions;
2. Breaks in topographic slope oblique to the stratigraphic and structural strike of the rock bedding;
3. Straight segments and abrupt changes in stream channel alignments;

4. Gullies and tributary channels that are oblique to the local topographic slope;
5. Soil tonal zones, often darker in color, reflecting increased moisture content, and/or the accumulation of organic matter;
6. Linear zones of increased rock weathering; and
7. Alignment of sinkholes and elongated sags.

TABLE 2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION CONESTOGA PINES PARK SITE

SUMMARY OF AERIAL PHOTOGRAPHS

PHOTO SURVEY ID NUMBER	PHOTOGRAPH NUMBERS	SURVEY DATE	SCALE
AHG-6R	78	November 11, 1957	1:19,950
AHG-6EE	205EC	May 23, 1964	1:3,900

Care was taken during the inspection of the aerial photographs to distinguish between naturally occurring fracture traces and linear man-made features (i.e., power lines, roads, railroad tracks, surface grading, clear cuts, agricultural furrows created by farming/plowing, etc). Using the above-referenced criteria, potential fracture traces were identified and then plotted on a separate overlying clear transparency sheet for each aerial photograph. The scale of the transparency sheets was then adjusted to equal 1:24,000 using an electronic Xerox™ copy machine. The fracture traces were then transferred to the USGS topographic map presented in Figure 3.

Several potential fracture traces were identified in the vicinity of the Conestoga Pines Park site on the aerial photographs. Subtle differences in contrasting soil tonal colors were used to identify and map the fracture traces on the aerial photographs.

Of importance, several fracture traces exhibiting an east to west alignment were identified immediately east of the Conestoga Pines Park site (i.e., fracture trace group No. 1 on Figure 3). This group of fracture traces extends from the open field east of the site to the area adjacent to the headwater spring. It should be noted that geologic maps published by Meisler and

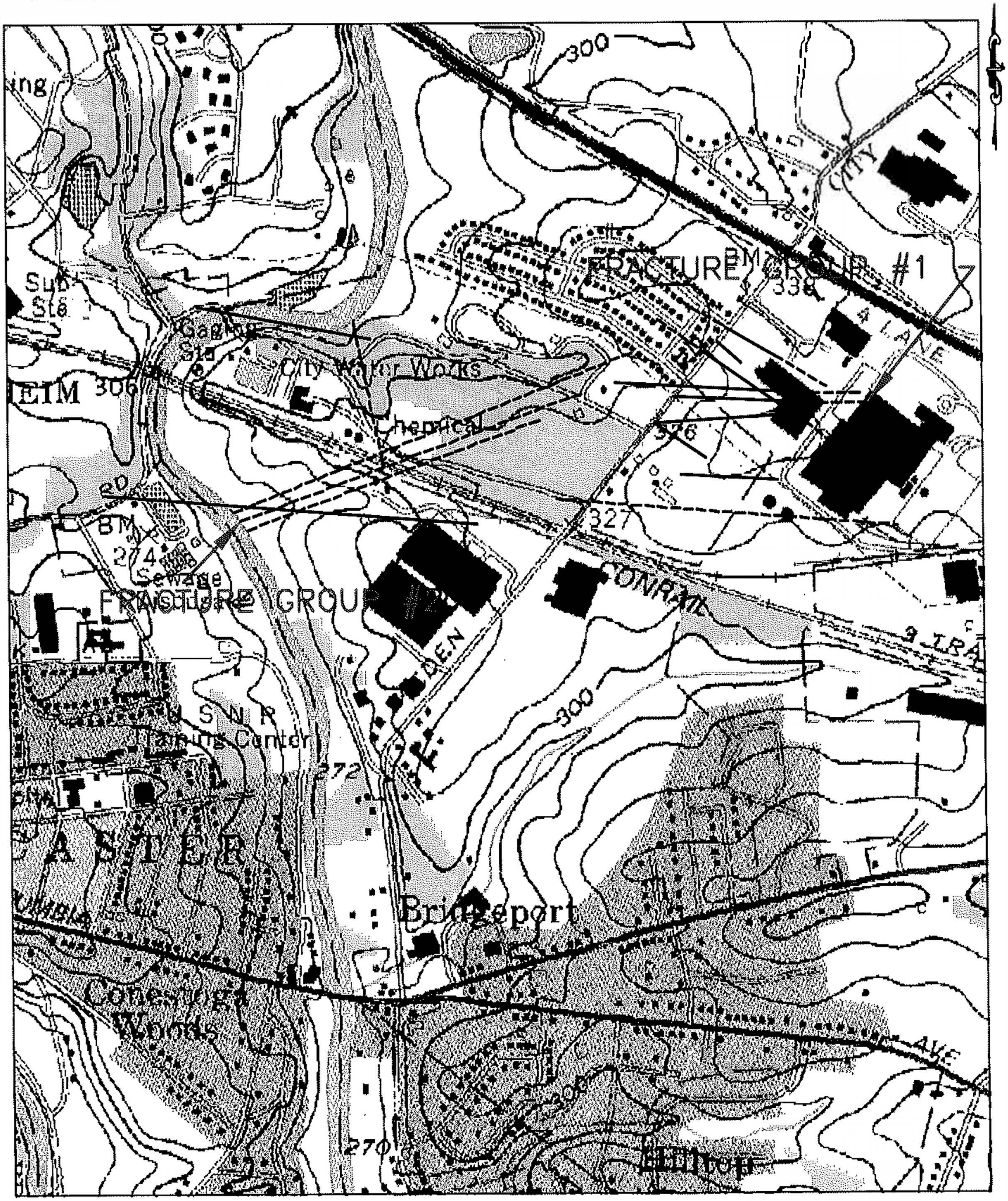

FIGURE 3
FRACTURE TRACE LOCATION MAP
CONESTOGA PINES PARK SITE

SOURCE: U.S.G.S QUADRANGLE
LANCASTER, PENNSYLVANIA.

SCALE:	1" = 1000'	DATE:	JAN 2002
S.O. NO.:	24300-077	FILE:	FIGURE3
DSN/DWN:	MBI/RWM	CHK:	

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Becher (1971) and Poth (1977) show that the rock beds in the vicinity of the site (i.e., Ledger formation) exhibit a east-west strike. Moreover, geologic cross sections of the local area prepared by Meisler and Becher (1971) show that the Conestoga Pines Park site is centered near the axial plane of an anticlinal structure (see Section 2.6 for a more detailed discussion of the regional geologic structure). These investigators report that the axes of these fold structures are oriented in an east-west direction. This information collectively suggests that the fracture traces identified as Group No. 1 on the aerial photographs may be genetically related to extensional fractures created by the upward flexure of the rock beds along the axial plane of the underlying anticlinal fold.

A second less distinct group of fracture traces (i.e., Group No. 2 on the Figure 3) exhibiting a southwest to northeast alignment were also identified on the aerial photographs. These fracture traces extend from the Conestoga River in a northeastward direction to the vicinity of the headwater spring at the site. According to Parizek (1976) the increased weathering of carbonate rocks at the intersection of two or more fracture traces may create surface sags, depressions, and possibly sinkholes. This information suggests that the headwater spring (depression) at the Conestoga Pines Park site may be related to the intersection of the fracture traces of groups No. 1 and No. 2.

Due to the vegetation covering the ground surface in the central and western portions of the site, no fracture trace could be confidently identified on the aerial photographs in the vicinity of the headwater spring.

2.6 Regional Geology and Hydrogeology

Bedrock geology exerts ultimate control on the storage, transmission, and utilization of groundwater. Geologic factors such as rock type, intergranular porosity, rock strata inclination, faults, joints, bedding planes, and solution channels affect groundwater movement and availability. Based on these relationships, it is important to review pertinent geologic factors of the City of Lancaster, Lancaster County, Pennsylvania area.

The study area is situated within of the Piedmont Physiographic Province (Geyer and Bolles, 1979). In southeastern Pennsylvania, the Piedmont Physiographic Province is represented by a southwest-northeast trending belt of rounded hills, punctuated by relatively narrow valleys. In Pennsylvania, this belt extends from southern York County to the Delaware River north of Philadelphia. The Piedmont Physiographic Province is underlain by a group of metamorphosed and complexly deformed sedimentary, volcanic, and plutonic rocks and associated unmetamorphosed intrusive igneous rock bodies (Poth, 1973 and 1977). The metamorphosed rocks range in age from late Precambrian through early Paleozoic. The youngest rocks are represented by the igneous intrusive bodies that are Jurassic in age. The Piedmont Physiographic Province has been divided by Crawford and others (1999a) into the following subsections: the Piedmont Upland section and the Piedmont Lowlands section. In Lancaster County, the Piedmont Upland section is represented by the crystalline rocks comprising the Honey Brook Upland and Mine Ridge anticlines (Crawford and Hoersch, 1984). The Honey Brook Upland is located along eastern edge of Lancaster County near the boundary with Chester County. The Mine Ridge Anticline is located in southeastern Lancaster County, and is considered to be an extension of the Honey Brook Upland area (Crawford et al., 1999b). The Piedmont Lowlands section extends from northern Lancaster County to central York County. This subsection is bounded to the north by the Mesozoic Gettysburg-Newark basin and to the south by the rocks of the Mine Ridge Anticline of the Piedmont Uplands section. The Piedmont Lowlands section is related both structurally and statigraphically to the rocks in the Great Valley to the north, but is separated from it by the Mesozoic Gettysburg-Newark basin and parts of the Piedmont Upland section (i.e., Honey Brook Upland). The Conestoga Pines Park site is situated within Conestoga Valley that is included as part of the Piedmont Lowlands section.

The dominant structural grain within the Piedmont Physiographic Province trends to the northeast and east-northeast. The regional geologic structure of the Piedmont Physiographic Province in Lancaster County consists of a series of thrust-bounded nappes that juxtapose rocks of various ages and degrees of metamorphism (Crawford and Crawford, 1980). During the Taconic orogeny these nappes, were arched upward and northwestward forming a complex fold and fault system. The nappe structure of the Cambrian-Ordovician age carbonate rocks underlying the Conestoga Valley area is comprised of isoclinal folds that are recumbent or strongly overturned to the north. Imbricate thrust faults and reverse faults occur throughout the carbonate rocks of the area (Meisler and Becher, 1973).

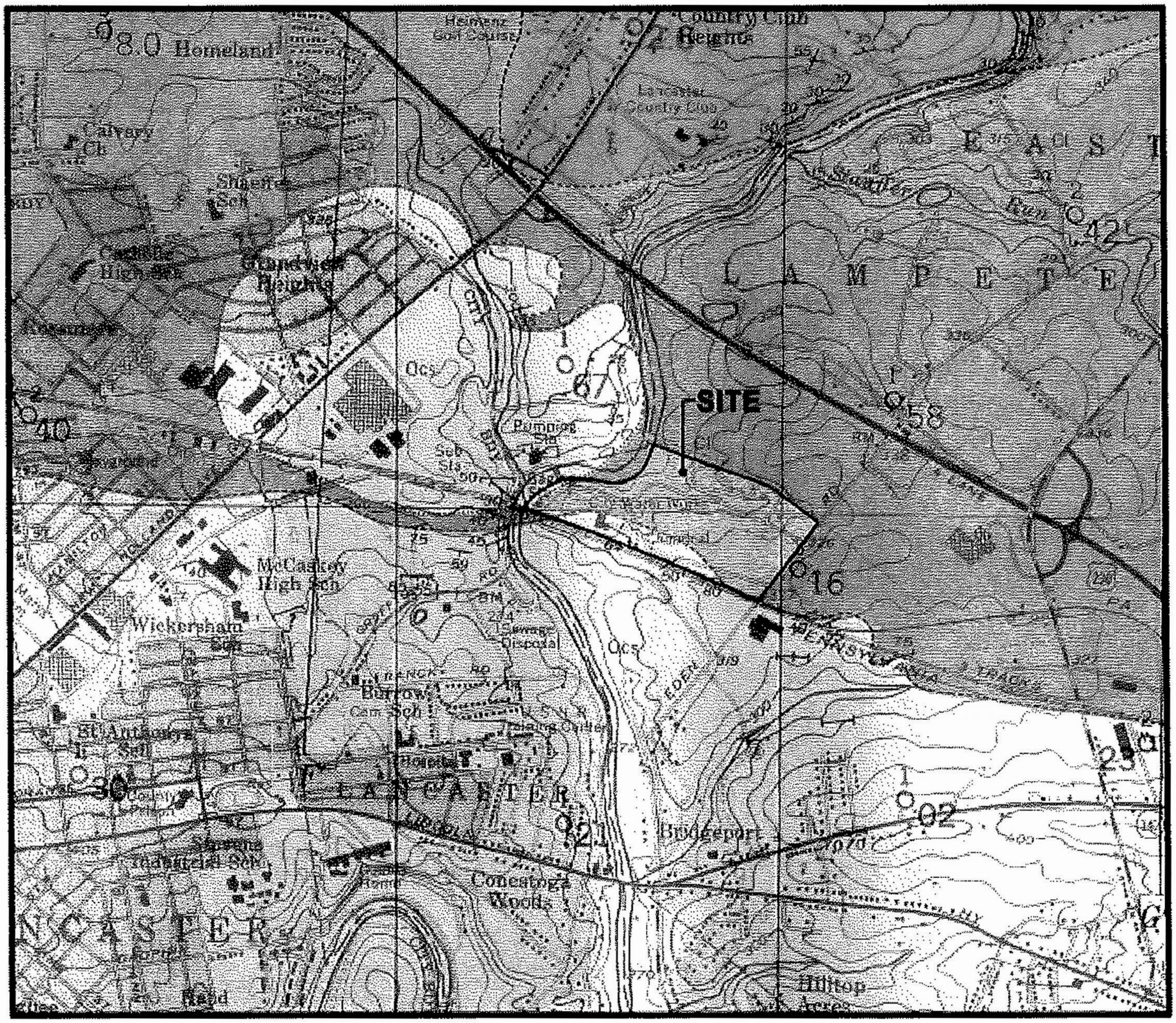
Geologic maps and cross sections published by Jonas and Stose (1930) and Meisler and Becher (1973) show that the Conestoga Pines Park site is situated near the crest of an unnamed anticlinal structure. Meisler and Becher (1973) report that the rock beds in the area along the Norfolk Southern railroad tracks situated south of the Conestoga Pines Park site strike toward the northeast and dip steeply to the southeast. Cleavage in the rocks of this area also strikes toward the northeast, but exhibits a dip toward the northwest. Jonas and Stose (1930) identified two faults exhibiting an east-west alignment situated north and south of the Conestoga Pines Park site. According to Jonas and Stose (1930) the rocks along the south side of these faults have been displaced upward relative to those on the north. Although no information regarding the dip of the fracture planes is provided by Jonas and Stose (1930), the relative displacement of the rocks is consistent with more recent geologic interpretations that these faults may represent reverse or thrust faults.

According to Meisler and Becher (1973) and Berg and Dodge (1981) the Conestoga Pines Park site is underlain by carbonate rocks (i.e., dolomite) that are mapped as the Ledger formation of Cambrian age (see Figure 4). Meisler and Becher (1973) report that the Ledger formation in the Lancaster area is comprised predominantly of massive, very light-gray to light gray, medium to coarsely crystalline, sparkling dolomite. The beds situated near the lower contact of the formation are typically comprised of light-gray to medium gray finely crystalline dolomite. Near the southern edge of the property, the Ledger formation is overlain unconformably by the younger Cambrian-Ordovician Conestoga formation. In the vicinity of the study area, the Conestoga formation is reportedly comprised of medium-gray finely to coarsely crystalline limestone. The east-west trending contact between the Ledger and Conestoga formations is mapped by Jonas and Stose (1930) and Meisler and Becher (1973) as an unconformity.

Groundwater within the carbonate rocks underlying the Conestoga Valley flows through a network of fractures that locally may be enlarged by solution. Depending upon the fractured character of the host rock, the walls of these fractures locally function as confining materials. Wells penetrating fractures under these conditions, may encounter groundwater under semi-confined conditions. Although confined groundwater conditions may exist locally, Meisler and Becher (1973) report that the groundwater flow system within the carbonate rocks of the Conestoga Valley is generally considered to be unconfined. Groundwater flow paths within the carbonate rocks of the Conestoga Valley are generally toward the gaining portions of nearby streams. The direction of groundwater flow within the carbonate rocks of the Conestoga Valley is largely controlled by the hydraulic gradient and spatial variability of the hydraulic conductivity. The transport of dissolved substances in the fractured bedrock is generally greatest in highly permeable fractures. The orientation of the fractures and solution openings may partially control the direction of groundwater flow.

According to Meisler and Becher (1973), primary porosity within the carbonate rocks underlying Conestoga Valley is virtually nonexistent. Groundwater flows primarily through a network of interconnected secondary openings (i.e., fractures, joints, faults, foliations, parting planes, and bedding planes) that may have been enlarged via solution. The secondary porosity of the rock is determined by the number and size of the openings, whereas the secondary permeability is a reflection of the degree of interconnection of the openings. Where dissolution of the carbonate rocks within Conestoga Valley has been active, permeability may be high.

FIGURE 4
REGIONAL GEOLOGIC MAP
CONESTOGA PINES PARK SITE



LEGEND

☐ Ocs - Ordovician Conestoga Formation

▨ Єl - Cambian Ledger Formation

▩ Єzc - Cambian Zooks Corner Formation

$\overset{5}{\circ}6.3$ Water Well: small number refers to last segment of well location number. Large number is the specific capacity of the well in gpm/ft.

SCALE: 1:24,000	**DATE: Jan. 2002**
S.O. NO.: 24300-077-0000	**FILE: Figure 4**
DSN/DWN: MBI/RWM	**CHK:**

Baker

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HARRISBURG, PENNSYLVANIA

Elsewhere in the same geologic unit the permeability may be significantly reduced by the lack of solution features.

According to Geyer and Wilshusen (1982) the Ledger formation underlying the study area has well developed, moderately abundant, irregularly spaced, and widely separated naturally occurring fractures, known as joints. These joints may be open and where present are typically steeply dipping. The joint and solution channel openings collectively provide a secondary porosity of low to high magnitude and a permeability of low to high magnitude. The formation is moderately resistant to weathering, and typically underlies rolling valleys with hills of low relief. Natural slopes are generally gentle. The overlying soil mantle is highly variable and in places may be extremely thin. The bedrock is moderately weathered to a shallow depth. Pinnacles typically characterize the interface between the overlying soil mantle and bedrock. The unweathered portions of the Ledger formation are usually difficult to excavate, due the pinnacled nature of the upper bedrock surface. The rock reportedly provides good foundation stability provided that a thorough investigation is performed to identify solution features. Drilling rates for the rock materials contained in the formation are typically fast.

The success of a well drilled into a bedrock formation is dependant upon the number and size of the natural openings encountered by the well bore, as well as the degree to which these fissures are interconnected. Poth (1977) reports that the Ledger formation is the highest yielding aquifer of Cambrian age in the Conestoga Valley. Hall (1934) and Meisler and Becher (1973) report that water bearing fractures contained in the Ledger formation generally decrease in size and number with depth. Information published by Poth (1977) shows that water supply wells completed in the Ledger formation in Lancaster County range in depth from 10 to 500 feet, with a median depth of 78 feet. Groundwater yields from wells completed in the Ledger formation in Lancaster County range from 2 to 550 gallons per minute (gpm), with a median yield of 30 gpm. Specific capacities (i.e., a measure of a well's ability to produce water) for wells drilled in the Ledger formation in Lancaster County range from 0.16 to 135 gallons per minute per foot of drawdown (gpm/ft), with a median specific capacity of 2.5 gpm/ft.

The chemical quality of groundwater is influenced by the composition of the soil and rock through which the water flows, and by the length of time the water has been in contact with these materials. Information published by Hall (1934) indicates that the groundwater produced from the Ledger formation in southeastern Pennsylvania produces hard water. Information published by Poth (1977) for groundwater samples collected from the Ledger formation indicates that hardness (expressed as $CaCO_3$) ranges from 192 to 340 parts per million (ppm). Iron was found to range between 0 and 0.09 ppm. Meisler and Becher (1973) described the effects of urbanization on the water quality of the carbonate rocks in the Lancaster, Pennsylvania area. According to Meisler and Becher (1973), urbanization has resulted in the local degradation of water quality by nitrate, sodium, and chloride. The most serious problem is impacts attributable to releases of nitrates, attributable to the use of nitrogen-rich fertilizers, cesspools, septic tanks, and barnyard wastes. Of the 53 wells sampled by Meisler and Becher (1973) 21 wells were found to contain nitrate concentrations greater than 45 mg/l. The PADEP Statewide Health-based Groundwater Standard for nitrate is 10 mg/l.

2.7 Regional Soils

Literature published by the United States Department of Agriculture (USDA) Soil Conservation Service (Custer, 1985) indicates that the portion of the Conestoga Pines Park site where the Site Characterization was performed is underlain by soils belonging to the Clarksville series, the Duffield series, and the Linden series. The maps prepared by the Soil Conservation Service show that the following soil types occur within the boundaries of the study area: the Clarksville silt loam (CkA), 0 to 5 percent slopes; the Duffield silt loam (DbB), 3 to 8 percent slopes; and the Linden silt loam (Lg) (Custer, 1985). The estimated percentages of the different soil types that underlie the study area on the Conestoga Pines Park property are listed in Table 3.

The Clarksville series consists of level to gently sloping, deep and moderately well drained soils occurring in depressions and broad drainageways. The soils are believed to have formed from colluvial materials or residuum weathered from limestone and siltstone. At the Conestoga Pines Park site, the soils belonging to the Clarksville series underlie area encompassing the surface water drainage swale and un-named tributary stream through the center portion of the study area.

The surface layer of the Clarksville silt loam (CkA), 0 to 5 percent slopes is typically a dark-grayish brown (10YR 4/2, Munsell soil color) silt loam, extending from the ground surface to a depth of 9 inches. The subsoil extends to a depth of 43 inches. The upper portion of the subsoil (to a depth of 22 inches) consists of a yellowish brown (10YR 5/6) silty clay loam. The middle portion of the subsoil to a depth of 33 inches is reported to be a yellowish brown (10YR 5/6) silty clay loam with distinct gray (10YR 6/1) and strong brown (7.5YR 5/6) mottles. The lower portion of the subsoil extends from 33 inches to 43 inches in depth, and is typically comprised of a yellowish-brown (10YR 5/6) silty clay loam with common distinct gray (10YR 6/1) and strong brown (7.5YR 5/6) mottles. The substratum (below a depth of 43 inches) is generally a strong brown (7.5YR 5/8) gravelly silty clay loam with common distinct gray (10YR

TABLE 3

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ESTIMATED PERCENTAGES OF SOIL TYPES

SOIL SERIES	SOIL TYPES	ESTIMATED PERCENTAGE OF LAND AREA
Clarksville Series	**Clarksville Silt Loam (CkA)**	**50 %**
Duffield Series	**Duffield Silt Loam (DbB)**	**35%**
Linden Series	**Linden Silt Loam (Lg)**	**15%**

6/1) and strong brown (7.5YR 5/6) mottles. The depth to bedrock is generally greater than 60 inches. Clarksville series soils typically exhibit a high water table (1.5 to 3 feet in depth), moderate moisture capacity (0.06 to 0.20 inches/inch), a moderate to slow permeability (0.06 to 2.0 inches/hour), and a neutral pH (5.6 to 7.8) (Custer, 1985).

The Duffield series consists of level to moderately sloping, deep, and well-drained soils underlying undulating slopes of limestone valleys on upland areas. The soils are believed to have formed in residuum weathered from limestone. At the Conestoga Pines Park site, the soils belonging to the Duffield series underlie the upland areas surrounding the drainage swale and unnamed tributary stream.

The surface layer of the Duffield silt loam (DbB), 3 to 8 percent slopes, is typically a dark-brown silt loam (10YR 4/3), extending from the ground surface to a depth of 10 inches. The subsoil extends to a depth of 60 inches or more. The upper portion of the subsoil (to a depth of 30 inches) consists of a dark yellowish brown (10YR 4/6) silty clay loam. The lower portion of the subsoil extends from 30 inches to 60 inches in depth, and is typically comprised of a strong brown (7.5YR 5/8) silty clay loam. The depth to bedrock is generally greater than 48 inches. Duffield series soils typically exhibit a high moisture capacity (0.14 to 0.22 inches/inch), a moderate permeability (0.6 to 2.0 inches/hour), and a slightly acid to neutral pH (5.1 to 7.8) (Custer, 1985).

The Linden series consists of nearly level, deep and well drained soils occurring in flood plains. The soils are believed to have formed from alluvial materials or residuum weathered from sandstone and siltstone. At the Conestoga Pines Park site, the soils belonging to the Linden series underlie area along the Conestoga River.

The surface layer of the Linden silt loam (Lg) is typically a dark brown (7.5YR 3/2) silt loam, extending from the ground surface to a depth of 10 inches. The subsoil extends to a depth of 40 inches. The upper portion of the subsoil (to a depth of 20 inches) consists of a dark reddish brown (5YR 3/4) loam. The lower portion of the subsoil extends from 20 inches to 40 inches in depth, and is typically comprised of a reddish brown (5YR 4/3) sandy loam. The substratum (below a depth of 40 inches) is generally a dark reddish brown (5YR 3/4) very gravelly sandy loam. The depth to bedrock is generally greater than 60 inches. Linden series soils typically exhibit high moisture capacity (0.05 to 0.18 inches/inch), a moderately rapid permeability (0.6 to 2.0 inches/hour), and a slightly acid to neutral pH (5.6 to 7.3) (Custer, 1985).

Detailed information regarding specific characteristics of the soils underlying the Conestoga Pines Park site is presented in Section 4.1 of this report.

3.0 SITE INVESTIGATION PROCEDURES

3.1 Site Assessment

The scope of the field procedures performed during the Site Characterization is outlined in the following sections.

3.1.1 Site Scoping Meeting and Historical Information Review

Baker received a requisition for services from the PADEP on July 30, 2001, to prepare a Workplan and Cost Proposal for performing investigative activities at the Conestoga Pines Park site. The Workplan and Cost Proposal were prepared as part of the project planning task of the Work Order. In addition, Baker also performed the following undertakings as part of the project planning task:

- Participated in an initial kickoff meeting and site visit on August 24, 2001, with informal interviews with Department personnel familiar with the history of the site.
- Performed a review of the PADEP file records and other historical information furnished by the Department, regarding the former land use and previous investigations performed at the site.
- Prepared a site-specific Health and Safety Plan (HASP), Field Sampling and Analysis Plan (FSAP), and Quality Assurance Project Plan (QAPP).
- Prepared bid documents and solicited quotations for subcontracted services at the site, including installation of soil borings using membrane interface probe (MIP) technology, installation of direct push borings and soil sampling, installation of monitoring wells, and site surveying services.

The information obtained from the site visit and historical records was collectively used to develop a Workplan for evaluating: 1) the existing conditions of the soils, surface water, sediments, and groundwater at the site; 2) the vertical and horizontal extent of the volatile organic compounds contained in the soils; 3) the directions of groundwater flow; 4) the potential pathways for the migration of volatile organic compounds; and 5) the potential environmental impacts to the soils, surface water, sediments, and groundwater at the site.

Based upon the information obtained from the PADEP and the site walkover inspection, several issues of concern requiring further investigation were identified. These issues of concern included:

- Assessing the concentrations of volatile organic compounds contained in the soils in the vicinity of the drainage swale located in the northeast portion of the site;
- Assessing the concentrations of volatile organic compounds contained in the soils along Pitney Road in the eastern portion of the site;
- Assessing the concentrations of volatile organic compounds contained in the soils in the vicinity of the former Garage, Paint Shop, Storage Shed, and Lawn Mower Shed;
- Assessing the concentrations of volatile organic compounds contained in the soils in the vicinity of the renovated barn.
- Assessing the concentrations of volatile organic compounds contained in the soils in the vicinity of monitoring wells GW9211 and GW9212 located in the northcentral portion of the site;
- Assessing the concentrations of volatile organic compounds contained in the soils in the vicinity of the former farmhouse location;
- Assessing the concentrations of volatile organic compounds contained in the groundwater at the site;
- Assessing the concentrations of volatile organic compounds contained in the surface water and sediments in the headwater spring, unnamed stream, drainage swale, and Granite Spring;
- Determining the direction(s) of groundwater flow below the site;
- Gathering information to develop a map of the site to spatially depict the locations of pertinent property boundaries, geographic features, and the environmental samples collected during the investigation.

3.1.2 Site Characterization Plan

Baker prepared a Workplan to address the issues of concern listed in Section 3.1.1. To determine pertinent property boundaries and to map the geographical features at the site, the Workplan included provisions for retaining a Pennsylvania-licensed surveyor to serve as a subcontractor. For assessing the chemical characteristics of the soils, sediments, surface water, and groundwater at the site, Baker proposed to collect the following samples as part of the Site Characterization: the collection of three surface water and sediment sample pairs from the headwater spring, drainage channel, and Granite Spring, the collection of one surface soil sample in a drainage ditch situated upgradient to the site; the drilling of 67 MIP soil borings; the collection of confirmatory soil samples from ten borings (one sample per boring) for the confirmation of the MIP drilling results; the installation of two new monitoring wells; and the collection of one round of groundwater samples (total of six samples) from the new and existing monitoring wells at the site. In addition, the Workplan included provisions for the on-site treatment of liquid investigation derived waste (IDW) materials, and the sampling and management of solid IDW materials anticipated to be generated during the site characterization activities.

Copies of the draft Workplan and Cost Proposal were submitted to the PADEP Southcentral Regional Office for review on September 20, 2001. The final versions of the Workplan and Cost Proposal were submitted to the PADEP on October 10, 2001. The PADEP issued authorization (i.e., "Notice to Proceed") for Baker to begin the Site Characterization at the Conestoga Pines Park site on October 17, 2001.

3.2 Field Procedures

The various field procedures, operations, and methods used by Baker to complete the project task objectives outlined in the Scope of Work are presented in the following sections.

3.2.1 Introduction

An intrusive field investigation was performed to characterize the concentrations of the volatile organic compounds contained in the soils, surface water, sediments, and groundwater at the site, as well as to evaluate potential risks to human health and the environment.

The field investigative procedures for each project task are outlined in the following sections. Representatives from the PADEP Southcentral Regional Office were present during the field investigation activities. Decisions regarding the sampling locations and the necessary analytical parameters for the soil, surface water, sediment, and groundwater samples were made collaboratively by Baker and the PADEP representatives, taking into consideration the project objectives and field conditions.

3.2.2 Collection of Surface Water and Sediment Samples

To assess the concentrations of volatile organic compounds contained in the surface water and sediments at the site, three sets of surface water and sediment samples were collected during the investigation.

One set of surface water and sediment samples (SW01 and SD01) was collected at the headwater spring. This sample provided information to assess the concentrations of volatile organic compounds contained the surface water runoff and shallow groundwater that forms the headwaters of the unnamed stream. A second sediment sample (SD02) was collected from Granite Spring, located south of Arthur C. Morris Drive, near of the swimming pool complex and parking lot area. At the time this investigation was conducted (i.e., fall 2001) no surface water flow was observed at this location. Accordingly, a corresponding surface water sample was not collected from Granite Spring. For evaluating dispersion and potential loading of compounds downstream, an additional set of surface water and sediment samples (i.e., SW03 and SD03) were collected from the stream channel immediately downstream from the swimming pool parking lot.

An attempt was made to collect a surface soil sample immediately down slope from the drainage pipe that emerges from beneath Pitney Road at the northeastern corner of the Conestoga Pines Park property. The presence of large rocks lining the bottom of the drainage swale limited the depth of penetration using a stainless steel hand auger. As a result, a sufficient amount of soil could not be obtained at this location to submit a sample to the state contract laboratory for analysis.

The sampling locations for the surface water and sediment samples collected during the investigation are shown on Figure 5.

The surface water and sediment samples were collected on October 29, 2001. Following the collection of the surface water and sediment samples, the sample containers were immediately placed into coolers and stored at 4°C for delivery to Lancaster Laboratories, Inc., the PADEP contract laboratory for this project. The surface water and sediment samples were collected using Level D PPE. Nitrile gloves were used to protect workers from direct contact with the surface water and sediment materials during the sampling procedures.

3.2.3 Installation of Membrane Interface Probe (MIP) Soil Borings

To evaluate the horizontal and vertical extent of volatile organic compounds contained in the soils at the site, a total of 67 soil borings were drilled at various locations using Membrane Interface Probe (MIP) technology. These borings were drilled at the site during the periods from November 5 through November 9, and November 12 through November 15, 2001. The drilling locations for the MIP soil borings were selected to evaluate the following areas of potential concern at the site:

- The drainage swale situated in the northeastern corner of the property;
- The surface water and sheet flow area situated between the western end of the drainage swale and the headwater spring;
- The eastern perimeter of the site, along Pitney Road;
- The areas both upgradient and downgradient to the former farmhouse location;
- The surface drainage areas situated east and southeast of the renovated barn, that convey runoff from Pitney Road southeast of the site and along Arthur C. Morris Drive;
- The fill area ("sand pit") northwest of the barn, in the vicinity of monitoring wells GW9211 and GW9212; and
- The former locations of the Garage, Paint Shop, Storage Shed, and Lawn Mower Shed.

MIP borings were also drilled along the northern boundary of the property to determine whether or not volatile organic compounds were migrating onto the Conestoga Pines Park property from sources located north of the site (i.e., Eden Manor residential development). The areas of concern were chosen based upon historical background information, as well as on-site coordination between Baker and representatives from the PADEP Southcentral Regional Office. In addition, real time results regarding the relative concentrations of VOCs provided by the MIP instrumentation were used to refine and focus the drilling locations for characterizing hot spots, and to chose the drilling locations of the confirmatory direct push soil borings. The locations of the MIP borings drilled during the soil investigation at the site are shown on Figure 5.

Baker retained the services of Zebra Environmental, Inc. (Zebra), located in Lynnbrook, New York, to drill the MIP soil borings. The soil borings were installed using a van-mounted hydraulic push drilling rig (Geoprobe 4220). A Baker representative was on-site during the drilling operations to supervise the installation of each test hole.

A van-mounted hydraulic push drilling rig was chosen to drill the soil borings at the Conestoga Pines Park site because: 1) the Geoprobe is relatively more mobile than a conventional drilling rig; 2) the Geoprobe generates virtually no cuttings, reducing the need for waste disposal; 3) the Geoprobe operates more quickly and is typically more cost effective than a conventional drilling rig; 4) the relatively small size of the drilling rig (i.e., van) prevented the creation of ruts, circumventing the need to make landscaping repairs; and 5) the borehole produced by the Geoprobe is only two inches in diameter, greatly reducing the amount of material needed for hole abandonment.

Borings were drilled using MIP technology for collection of vapor samples to characterize the relative concentration of the volatile organic compounds contained in the soils and shallow groundwater. Each boring was drilled to the point of refusal (i.e., assumed top of bedrock) or to groundwater, whichever was encountered first. Most borings were drilled to a depth of ten feet or less.

To detect VOCs in the subsurface, the MIP uses a heated membrane to raise the temperature of the soils/groundwater in the immediate vicinity of the sonde. This heating promotes the volatilization of light molecular weight organic compounds. Vapors collected by the MIP sonde are transferred to the surface via an inert carrier gas (i.e., nitrogen), and introduced into an Electronic Capture Detector (ECD) and a Flame Ionization Detector (FID) to determine the relative concentration of the VOC species. For this investigation, the MIP provided information regarding the relative concentrations of VOCs contained in both vadose and saturated zones. To maintain quality control, the MIP was calibrated prior to each boring location by conducting a response check using a one part per million (ppm) tetrachloroethylene (PCE) standard. To prevent false background readings from the exhaust of the ancillary equipment, the air discharges from the truck and electric generator were directed down wind of the boring locations using a 10-foot section of flexible corrugated hose.

An electronic soil conductivity probe was also used in conjunction with the MIP sonde for providing real time and continuous information regarding the lithology of the subsurface materials, probe depth, penetration rate, and membrane temperature. The MIP and soil conductivity results were plotted electronically on a drilling log for each boring. Information regarding the lithology of the subsurface materials and the ECD/PID reading recorded during the drilling of the MIP borings are outlined on the drilling logs presented in Appendix A.

To prevent cross contamination, all non-dedicated (i.e., reusable) sampling equipment was decontaminated between sample runs using an Alconox^{TM} soap wash and a deionized water rinse. The wash fluids generated during the decontamination procedures were temporarily containerized in a 55-gallon capacity steel drum and stored at the designated on-site staging area located southwest of the renovated barn. These decontamination fluids were treated on-site by passing the raw influent through a 200-pound activated carbon absorber at the conclusion of the field procedures. The treated effluent was ultimately discharged to the ground surface.

The MIP drilling activities were conducted using Level D personal protective equipment (PPE). Conditions in the ambient atmosphere were monitored using a PID and a Combustible Gas Indicator (CGI) for detection of potentially explosive gases. Disposable latex gloves were used to protect workers from direct contact with the subsurface materials during the MIP testing procedures.

3.2.4 Installation of Confirmatory Soil Borings

Based on the analytical results obtained from the MIP investigation, a total of nine confirmatory soil borings were drilled at various locations at the site. One confirmatory soil sample was collected from each of the nine borings; a second soil sample was collected from one boring (SB10). These borings were drilled at the site on November 14 and 15, 2001. The purpose of the confirmatory soil borings was to provide a correlation between the MIP boring results and actual concentrations of volatile organic compounds contained in the soils. In general, the confirmatory borings were drilled at locations where the MIP boring results (i.e., registered by the ECD and PID instruments) indicated the presence of volatile organic compounds in the subsurface materials. One confirmatory boring (SB14) was drilled in a remote area where no volatile organic compounds were detected by the MIP for establishing "background" conditions in the soils at the site.

Each confirmatory boring was drilled to the point of refusal (i.e., to the top of bedrock) or until groundwater was encountered. Based upon the data collected from the borings, the top of bedrock was found to vary from less than one foot to approximately 16 feet in depth. The locations of the confirmatory borings drilled during the soil investigation at the site are shown on Figure 5. The sampling locations for the confirmatory borings on Figure 5 correspond to the numbers used for the MIP borings.

Baker retained the services of Zebra to install the confirmatory soil borings at the Conestoga Pines Park site. The soil borings were drilled using the same van-mounted hydraulic push drilling rig as used for the MIP borings. The drilling locations for the confirmatory borings were determined collaboratively by Baker and the PADEP Project Officer using the MIP testing results. A Baker representative was on-site during the drilling operations to supervise the drilling of each test hole. The Baker representative also prepared a drilling log of the subsurface materials encountered in each boring. Information regarding the lithology of the subsurface materials encountered during the installation of each boring is outlined on the drilling logs presented in Appendix B.

During the installation of each boring, soil samples were collected at discrete sampling intervals based on PID readings, visual observations of the soil profile, and the MIP testing results. To prevent cross contamination, all non-dedicated (i.e., reusable) sampling equipment was decontaminated between sample runs using an Alconox™ soap wash and a deionized water rinse. The wash fluids generated during the decontamination procedures were temporarily containerized in a 55-gallon capacity steel drum and stored at the designated on-site staging area located southwest of the renovated barn. The decontamination fluids were treated on-site by passing the raw influent through a 200-pound liquid-phase activated carbon absorber at the conclusion of the field procedures. The treated effluent was ultimately discharged to the ground surface at the site. Upon recovery of the hydraulic push rod from the subsurface, the inner acetate sample tube was removed from the bottom of the drive shoe/sample sleeve. The acetate sample sleeve was split into two portions using a stainless steel knife. A PID was used to scan the soil materials contained in the sample tube for volatile organic vapors. To prevent the loss of VOCs, representative portions of the sample sleeve were immediately placed into EnCore® sampling tubes. The collection of the soil samples for volatile organic compounds was performed in accordance to U.S. EPA methodology 5035. The drilling of the borings and the collection of the soil samples were performed using Level D PPE. Disposable latex gloves were used to protect workers from direct contact with the subsurface materials during the sampling procedures. To minimize IDW, the residual soil materials not collected for analysis were backfilled into each borehole.

Following the collection of the confirmatory soil samples, the sample containers were immediately placed into coolers and stored at 4°C for delivery to Lancaster Laboratories, Inc., the PADEP contract laboratory for this project.

3.2.5 Installation of Monitoring Wells

To evaluate the direction(s) of groundwater flow and the vertical and lateral extent of the volatile organic compounds dissolved in the groundwater, two additional monitoring wells (i.e., MW01 and MW02) were drilled at the site during the investigation. Baker retained the services of a subcontractor (i.e., B.L. Myers Brothers, Inc.) to drill and install the two additional monitoring wells. One monitoring well (MW01) was drilled and installed in the northeast corner of the property, just west of Pitney Road. Monitoring well MW01 was drilled to assess the concentration of volatile organic compounds contained in the groundwater upgradient of the site. The second monitoring well (MW02) was drilled and installed downgradient (i.e., west) of the former farmhouse location. Monitoring well MW02 was drilled to assess the concentration of volatile organic compounds originating from a potential source area situated in the vicinity of the former farmhouse. The location of the monitoring wells at the Conestoga Pines Park site are shown on Figure 5. The drilling locations for the additional monitoring wells were chosen based upon the findings of the fracture trace analysis, the data provided by the MIP borings, the results of previous investigations, historical information obtained from a review of the PADEP file records, and discussions with the PADEP Project Officer.

The monitoring wells were installed using a truck-mounted air rotary percussion drilling rig. The drilling of the monitoring wells at the site was performed using OSHA Level D PPE. During drilling procedures, a PID was used to scan the well cuttings for volatile organic vapors. In addition, a combustible gas indicator was used to monitor the lower explosive limits (LEL) of the ambient air in the vicinity of the drilling rig during the well installation procedures.

The well drilling and construction procedures for monitoring well MW01 were performed on November 19, 2001. A 10-inch diameter borehole was drilled to a depth of 21 feet below the ground surface. Six-inch diameter steel surface casing was then installed in the borehole, to a depth of 21 feet. A grout mixture comprised of Portland cement and 5% bentonite was used to seal the annular space between the casing and the edge of the borehole to the ground surface. The borehole for monitoring well MW01 was then drilled to a total depth of 51 feet below grade using a 6-inch diameter drill bit. The well was completed as a 6-inch diameter open bedrock well. Monitoring well MW01 was constructed at the surface using a flush-mount manhole cover with a bolt-down well cap flange. During the drilling procedures, only one water bearing fracture zone (depth of 32 feet) was encountered. Information regarding the lithology of the subsurface materials encountered during the drilling of monitoring well MW01 is outlined on the drilling log presented in Appendix C.

The well drilling and construction procedures for monitoring well MW02 were performed over a two day period from November 19 through November 20, 2001. A 10-inch diameter borehole was drilled to a depth of 32 feet below the ground surface. Six-inch diameter steel surface casing was then installed in the borehole, to a depth of 32 feet. The surface casing was grouted in place using a mixture of Portland cement and 5% bentonite and allowed to set up overnight. The following day the borehole for monitoring well MW02 was drilled to a total depth of 40 feet below grade using a 6-inch diameter drill bit. The well was completed as a 6-inch diameter open bedrock well. Monitoring well MW02 was constructed at the surface using a flush-mount manhole cover with a bolt-down well cap flange. During the drilling procedures, only one water bearing fracture zone (depth of 32 feet) was encountered. Information regarding the lithology of the subsurface materials encountered during the drilling of monitoring well MW02 is outlined on the drilling log presented in Appendix C.

The cuttings generated during the drilling of the monitoring wells were screened using a PID. No volatile organic vapors were detected using the PID in the soil/rock materials generated during the drilling of monitoring well MW01. Elevated PID readings ranging from 52 ppm to 788 ppm were observed in the subsurface materials during the drilling of MW02. All cuttings generated during the drilling of both wells were containerized in 55-gallon capacity DOT shippable steel drums. The drums were sealed, labeled, and moved to the designated site staging area located along the southwest side the renovated barn.

Following the well construction procedures, each monitoring well was developed to clean out the sediment and silt materials that had accumulated in the boreholes. Monitoring well MW01 was developed on November 19, 2001, and monitoring well MW02 was developed on November 20, 2001. A Bruiser 4-inch diameter ½-horsepower submersible pump was used to develop monitoring well MW01. This monitoring well was pumped for a period of one hour, after which the groundwater produced from the borehole appeared clear. Monitoring well MW02 was developed by surging and circulating compressed air from the drilling rig. This method of development was chosen based upon the cave-in of rock materials within the borehole of monitoring well MW02. The rig air was surged and circulated in monitoring well MW02 for a period of twenty minutes, after which the groundwater appeared clear of sediment and silt. A total of 220 gallons of groundwater was generated during development of the monitoring wells. This water was temporarily containerized in 55-gallon capacity drums. The drums were sealed, labeled, and moved to the designated site staging area located along the southwest side the renovated barn. The development water was treated at the conclusion of the field investigation by passing the raw influent through a 200-pound liquid-phase activated granular carbon absorber. The treated effluent was ultimately discharged to the ground surface at the site.

3.2.6 Collection of Groundwater Samples

Following the installation of the two new monitoring wells, a full round of groundwater samples were collected from each monitoring well at the site (GW9109, GW9110, GW9211, GW9212, MW01, and MW02). Groundwater samples were collected to assess the concentrations of volatile organic compounds dissolved in the fractured bedrock aquifer underlying the site. The monitoring wells were sampled on November 26 and 27, 2001.

Prior to the collection of groundwater samples, the static level of the water in each well was measured to the nearest 0.01 foot using an electronic water tape. Based on this information, the volume of water contained in each well was calculated. In order to obtain representative samples of the groundwater, a minimum of 3 well volumes of water was purged from monitoring wells MW01, MW02, and GW9212 using an electric submersible pump (i.e., 2-inch diameter Grundfos Rediflo pump). Due to the large quantity of groundwater contained in monitoring wells GW9110, GW9211, and GW9109, only one well volume was purged from these wells using the 2-inch diameter Grundfos Rediflo pump prior to sampling. Following the purging procedures, a disposable polyethylene bailer was used to collect representative samples of the groundwater from each well. All non-dedicated sampling equipment was decontaminated between wells using an Alconox^{TM} soap wash and a deionized water rinse. The groundwater generated during purging activities, as well as the wash fluids generated during the decontamination procedures were treated on-site by passing the fluids through a 200-pound liquid-phase granular activated carbon absorber. The treated effluent was ultimately discharged to the ground surface at the site.

To determine when equilibrium conditions had been reached during the purging of the monitoring wells, field measurements for pH, specific conductance, and temperature were monitored in the pumped effluent. A summary of the well purging data recorded during the groundwater sampling event is presented in Table 4. Groundwater samples were not collected until the pH, specific conductance, and temperature had stabilized in each well to ±10%. None of the wells were purged dry. Following the collection of the groundwater samples; the sample containers were immediately placed into coolers and stored at 4^{0}C until delivery to the PADEP contract laboratory. The collection of groundwater samples was performed using OSHA Level D PPE. Latex gloves were used to protect workers from direct contact with the groundwater during the purging and sampling activities.

3.2.7 Site Survey

Baker retained the services of a Pennsylvania Registered Land Surveyor (i.e., Dawood Engineering, Inc.) to perform a survey of the site. The information gathered from the site survey was used to develop a detailed map of the Conestoga Pines Park site.

The site survey work was performed during the period from November 26 through November 30, 2001. The survey included the mapping of the site geographic features (i.e., park roads and walking paths, entrance to the former CCC camp, headwater spring, stream, renovated barn, house foundation, utility poles, fences, drainage channels, bare areas, and tree line limits), the drilling locations of the MIP and confirmatory soil borings, the locations and elevations of the new and existing monitoring wells, and the locations where the surface water and sediment samples were collected. To evaluate the direction of groundwater flow at the site, the top of the surface casing for each monitoring well was measured to the nearest 0.01 foot. A representative from Baker was present during a portion of the surveying activities, for directing the survey subcontractor to the points and features to be mapped at the site.

The elevation measurements recorded by the subcontractor were tied into two vertical control points. One control point consists of a square cut in the southwest corner of the end wall on the left side of the entrance to the parking lot of the swimming pool complex. The other control point was a DOT disc in a headwall along Pitney Road with an assumed elevation of 999.95 feet (see Figure 2). Control point elevations were based on a vertical datum assumed by Dawood Engineering. An original benchmark elevation of 100.0 was based on sewer construction drawings. It should be noted that the elevations depicted on the site maps presented in the report do not correspond to mean sea level.

The electronic data produced from the survey activities were used to develop a site map using AutoCAD™ Version 2000 software.

3.2.8 IDW Management

Investigation Derived Waste (IDW) generated during the investigation activities was managed appropriately to minimize exposure to potential contaminants, and impacts to human health and the environment. To minimize the volume of IDW produced during the investigation, the subsurface materials generated during the installation of the soil borings were backfilled in each test hole. Approximately 25 gallons of liquid IDW generated from the decontamination of sampling equipment during the investigation procedures was containerized in a 55-gallon capacity steel drum and stored at the designated on-site staging area located southwest of the renovated barn. These liquid IDW fluids were treated on-site at the conclusion of the field procedures by passing the raw influent through a 200-pound liquid-phase activated carbon absorber. Treated water was ultimately discharged to the ground surface at the site.

At the request of the PADEP, solid IDW materials generated during the drilling of the monitoring wells (i.e., soils and well cuttings) were containerized in a 55-gallon capacity DOT shippable steel drums and stored at the designated site staging area situated southwest of the renovated barn. A total of nine drums of soils/well cuttings and one drum of used activated carbon were generated during the investigation activities.

To characterize the IDW materials, Baker collected representative samples of the soil/well cuttings and used activated carbon containerized in the 55-gallon capacity drums on November 29, 2001. The samples of the IDW materials were placed into coolers and stored at 4^0C until delivery to Lancaster Laboratories, Inc., the PADEP contract laboratory. IDW sample collection was completed using OSHA Level D PPE. Latex gloves were used to protect the workers from direct contact with the IDW materials during the sampling activities.

Contracting arrangements were made for the disposal of soil and used activated carbon IDW materials between Baker and Waste Recovery Solutions, Inc., of Myerstown, Pennsylvania. The IDW materials generated during the investigative activities were transported and disposed of at the Waste Management, Inc., Modern Landfill facility, located in York County, Pennsylvania (PADEP Municipal and Residual Waste Processing Permit No. 100113). The IDW materials were removed from the site on January 28, 2002. The IDW materials were transferred to the Modern Landfill facility on January 31, 2002, under Non-hazardous Waste Manifest No. 012802A. A copy of the manifest and pertinent background information regarding the disposal of the IDW materials is included in Appendix D.

3.3 <u>Sample Analytical Program</u>

3.3.1 Introduction

In accordance with the project objectives, soil, surface water, sediment, and groundwater samples were collected during the investigation to characterize the concentrations of organic and inorganic compounds contained in these media. The environmental samples collected during the investigation were submitted for analysis to Lancaster Laboratories, Inc., of Lancaster, Pennsylvania (i.e., PADEP selected state contract laboratory). The testing results for the environmental samples analyzed by Lancaster Laboratories, Inc. followed CLP type III reporting protocols.

Field Quality Assurance/Quality Control (QA/QC) samples were collected for each environmental medium of samples during the investigation. The QA/QC requirements for the selected sample groups were performed in accordance with the guidelines outlined in the Quality Assurance Project Plan (QAPP) developed by Baker prior to initiation of the field investigation activities.

Three QA/QC samples were submitted to Lancaster Laboratories, Inc. along with the soil samples collected from the confirmatory borings drilled at the site. These QA/QC samples included one duplicate sample, one field blank sample, and one rinsate sample. A total of two QA/QC samples were also submitted to Lancaster Laboratories, Inc. with groundwater samples as part of the site investigation. These QA/QC samples included one field blank sample and one rinsate sample. Two QA/QC samples were submitted to Lancaster Laboratories, Inc., with the surface water and sediment samples. These QA/QC samples included one duplicate surface water sample and one duplicate sediment sample. During transit to the testing laboratory, trip blank samples were placed in each cooler that contained samples for VOC analysis. A total of five trip blank samples were used during the investigation for documenting the sampling handling procedures.

In order to identify and accurately track the environmental samples collected during the investigation, including QA/QC samples, a unique number was give to each sample. This number was designed to provide information regarding the sample date, the sample media, sampling location, the depth of the sample (soils only), and QA/QC qualifiers. The sample designation format used during the investigation is as follows:

PADEP Site # - Sample Date - Medium-Station # - Depth or QA/QC designation

An explanation of each of these identifiers is given below.

PADEP Site # 077 (for all samples)

Sample Date 103101 October 31, 2001

Medium	S – soil	GW - groundwater	SS – surface soil
	SW - surface water	SD – sediment	IDW–invest. derived waste

Station # A unique sample number was used to identify the sample location:

SB01	Soil sample collected from soil boring No. 1
GW9109	Groundwater sample collected from monitoring well GW9109
SW01	Surface water sample No. 1

SD01	Sediment sample No. 1
SS01	Surface Soil sample No. 1
DRUM	IDW composite sample collected from drums (i.e., well cuttings)
CARBON	IDW sample from used carbon

Depth Indicators were used for the soil samples, referencing the depth interval of the sample. For example:

01 = ground surface to 1 foot below ground surface (bgs)
13 = 1 to 3 feet bgs
35 = 3 to 5 feet bgs
57 = 5 to 7 feet bgs
79 = 7 to 9 feet bgs
1011 = 10 to 11 feet bgs

QA/QC QA/QC sample designations followed the indicators for depth of the subsurface soil samples and the station # for surface water, sediment, and IDW samples:

DUP = Duplicate Sample:
RINSATE = Equipment Rinsates
TB = Trip Blanks

Using this sample designation format the sample number 077-103101-S-SB01-79DUP refers to:

077-103101-S-SB01-79DUP	PADEP Site # for Conestoga Pines Park Site
077-**103101**-S-SB01-79DUP	Date collected – October 31, 2001
077-103101-**S**-SB01-79DUP	Sample Type - Soil
077-103101-S-**SB01**-79DUP	Sample Location – Soil Boring #1
077-103101-S-SB01-**79**DUP	Depth of Soil Sample – 7 to 9 feet bgs
077-103101-S-SB01-79**DUP**	QA/QC Designation–Duplicate Sample

3.3.2 Analysis of Surface Water and Sediment Samples

A total of two surface water and three sediment samples were collected during the investigation to evaluate the concentrations of volatile organic compounds contained in these media. The surface water samples were collected to evaluate potential impacts to the unnamed stream that originates at the headwater spring and flows westward toward the Conestoga River. In addition, one sediment sample was collected from Granite Spring, to determine if VOCs may be migrating onto the Conestoga Pines Park property via the unnamed stream from a source situated south of the site. The surface water and sediment samples were submitted to Lancaster Laboratories, Inc. for analytical testing. The surface water samples were analyzed for Target Compound List (TCL) VOCs. The sediment samples were analyzed for TCL VOCs and total organic carbon. In addition, one duplicate surface water sample and one duplicate sediment sample were collected during investigation. A trip blank sample was placed in the sample cooler that accompanied the surface water and sediment samples during transit to the testing laboratory.

A summary of the analytical methods used to analyze the surface water and sediment samples collected during this phase of the investigation are outlined in Table 5.

3.3.3 Analysis of Soil Samples Collected from Confirmatory Borings

To characterize the horizontal and vertical extent of volatile organic compounds contained in the soils, and to establish a correlation between these results and MIP testing information, a total of nine confirmatory borings were drilled in selected locations at the site. The soil samples collected from the confirmatory borings during this phase of the investigation were submitted to Lancaster Laboratories, Inc. for analytical testing.

Soil samples were collected directly from the acetate macro-core sample sleeve and placed into Encore® sample containers following EPA Method 5035. To preserve the integrity of the soil samples, the containers were stored in coolers at 4°C until delivered to Lancaster Laboratories, Inc. for analysis.

A total of ten soil samples were submitted to Lancaster Laboratories, Inc. for TCL VOC analysis. In addition, one duplicate soil sample was collected during the soil boring investigation.

A summary of the analytical methods used to analyze the soil samples collected during this phase of the investigation is outlined in Table 5.

3.3.4 Analysis of Groundwater Samples Collected from Monitoring Wells

A total of six groundwater samples were collected during the investigation from the monitoring wells at the Conestoga Pines Park site. The collection of the groundwater samples from the monitoring wells occurred during the period from November 26 through November 27, 2001. The groundwater samples collected during the investigation were submitted to Lancaster Laboratories, Inc. for the analysis of the following parameters: TCL VOCs, chloride, sulfate, carbonate alkalinity, bicarbonate alkalinity, total dissolved solids (TDS), potassium, sodium, magnesium, and calcium. The following QA/QC samples were collected during the groundwater sampling event: one duplicate sample, one rinsate sample, and one field blank sample (i.e., total of three QA/QC samples). In addition, during transit to the testing laboratory, trip blank samples (total of two) were placed in each cooler that contained samples for VOC analysis. A summary of the analytical methods used to analyze the soil samples collected during the investigation is outlined in Table 5.

3.3.5 Analysis of IDW Samples

A total of two IDW samples were collected at the completion of field investigation activities at the Conestoga Pines Park site. One sample was collected from the drums of soils/well cuttings, and the other was collected from the drum containing used activated carbon. These IDW samples were collected on November 29, 2001. The soil and used carbon IDW samples were analyzed for total TCL VOCs, and Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds, TCLP metals, and RCRA hazardous waste characteristics (i.e., reactivity, corrosivity, and ignitability). A summary of the analytical methods used to analyze the IDW samples collected during the investigation is outlined in Table 5.

4.0 SITE CHARACTERIZATION RESULTS

The results of the site characterization of the soils, surface water, sediments and groundwater at the Conestoga Pines Park site are presented in the following sections.

4.1 Site Stratigraphy

A total of nine soil borings were drilled during the field portion of the investigation to characterize the subsurface materials at the Conestoga Pines Park site. These test holes collectively provided information regarding the types of geologic materials underlying the study area, variations in the elevation of the top of bedrock, and the concentrations of volatile organic compounds contained in the soils.

To standardize the description of the soil and rock materials encountered in the borings during the investigation, the designation of color was made by comparing these materials to the standards presented in the Munsell Soil Color Charts. The Munsell system for describing soil and rock colors is based upon hue, value, and chroma. The hue notation of a color indicates its relation to red, yellow, green, blue, and purple. The value notation is an expression of the "lightness" of a color. The chroma notation is an indication of the strength of the color (i.e., departure from a neutral of the same lightness). The Munsell notation for a color consists of separate characters for hue, value, and chroma. These are combined in this order to form the color designation. For a particular soil color, the hue is designated by the letter abbreviation of the color (R for Red, Y for yellow, etc.), preceded by the numbers from 0 to 10. The notation for value consists of the numbers from 0 to 10, designating absolute black to absolute white, respectively. Accordingly, a color of value 5 is visually midway between absolute white and absolute black. The notation for chroma consists of numbers beginning at 0 for neutral grays to a maximum of 20. In writing the Munsell color notation, the order is hue, value, and chroma. Using this format, a color of hue 2.5Y, value 4, and chroma 3, is written 2.5Y 4/3.

The information obtained from the review of aerial photographs and the Soil Survey Report for Lancaster County (Custer, 1985) suggest that the Conestoga Pines Park site is underlain by relatively undisturbed soils. Site modifications are believed to have occurred in areas where the current and former building structures are located (i.e., farmhouse, Garage, Paint Shed, and associated buildings) in the northcentral portion of the site, near the renovated barn, as well as in the vicinity of the reported "sand pit" area located near monitoring wells GW9211 and GW9212. In general, the top of bedrock was found to range from less than one foot in depth (near surface outcrops) to eighteen and one half feet in depth (SB64). The depth to bedrock was found to vary spatially across the site.

The soil materials recovered from the confirmatory borings drilled at the Conestoga Pines Park site showed that the interval from the ground surface to a depth of 1 foot is comprised mainly of very dark brown (7.5YR 2/2.5– Munsell Soil Color), clayey silt, containing moderate amounts of organic matter and 2 to 5 millimeter- (mm) sized weathered carbonate rock fragments. The subsurface materials from a depth of 1 foot to 5 feet were found to consist mainly of strong brown (7.5YR 4/6 and 5/6) and dark yellowish brown (10YR 3/6, 4/4, and 4/6), clay and silty clay, containing 5 to 10 mm quartz and carbonate rock fragments. The subsurface materials comprising the interval from a depth of 5 feet to the point of refusal (assumed top of bedrock) were found to be comprised mainly of strong brown (7.5YR 4/6), yellowish brown (10YR 4/6 and 5/6), and dark reddish brown (5YR 3/4), clayey sand, containing abundant amounts of 5 to 10 mm weathered carbonate rock fragments. Groundwater was encountered at depths between 10 feet to 12 feet in borings SB10, SB64, and SB68.

Abundant amounts of weathered carbonate (i.e., limestone and dolomite) rock fragments were observed within the soil profile at the site. These rock fragments are believed to represent materials derived from the weathering of the underlying Ledger formation. The contact between the soil and the upper surface of competent bedrock is abrupt. Differences in the depth to competent bedrock at the site are interpreted to be a result of the differential weathering of the underlying rock materials. The variable depth of bedrock at the site suggests that the soil/bedrock interface may be pinnacled.

Rock cuttings collected during the installation of the monitoring wells MW01 and MW02 showed that the bedrock underlying the site consists of gray (10YR 5/1) dolomite. The dolomite rock fragments recovered from the boreholes of the monitoring wells were found to exhibit characteristics consistent with information published by Meisler and Becher (1973) and Poth (1977) regarding the Ledger formation in central Lancaster County, Pennsylvania.

One water bearing fracture zone was encountered during the drilling of the borehole for monitoring well MW01. This fracture was encountered at a depth of 32 to 33 feet, and yielded groundwater at an estimated flow rate of 10 gallons per minute (gpm). During the drilling of monitoring well MW02, one water bearing fracture zone was encountered at a depth of 32 to 33 feet. This water bearing fracture zone yielded groundwater at an estimated rate of over 20 gpm. The fractured interval encountered during the drilling of the borehole for monitoring well MW02 was comprised of extremely broken and unstable rock materials. Following the conclusion of the drilling operations, a cave-in of the rock materials from this fractured interval had plugged the borehole of monitoring well MW02 from a depth of 34.5 to 40 feet. The relative elevations of the fractures encountered in the boreholes for monitoring wells MW01 and MW02 are shown on the drilling logs presented in Appendix C.

4.2 Conceptual Site Geologic Model

Groundwater occurs within both the overburden and in the bedrock at the Conestoga Pines Park site. According to Meisler and Becher (1973) primary porosity/permeability is virtually non-existent in the carbonate rocks underlying the Conestoga Valley area. Groundwater contained in the Ledger formation is produced mainly from secondary openings (i.e., fractures, solution cavities, etc.) contained in the rocks. These fractures are believed to have been produced by various natural stresses/forces superimposed upon the rocks. The number and size of the water-bearing openings determines the amount of secondary porosity contained in the rock. The number, size, and degree of interconnection of the openings influence the magnitude of the secondary permeability. Where the rocks are extensively fractured, permeability may be high, whereas elsewhere in the same unit the rock may be nearly impermeable. This information suggests that the rate of groundwater flow (and hence the migration of dissolved solutes) may be greater in zones where the underlying bedrock is extensively fractured. This phenomenon is believed to be important in providing a pathway for the migration of solutes in the fractured bedrock aquifer underlying the Conestoga Pines Park site.

Shallow groundwater at the Conestoga Pines Park site is believed to occur under water table conditions. The water levels measured in nested monitoring well pair GW9211 and GW9212, however, show a potentiometric difference between the shallow and deep portions of the underlying fractured bedrock aquifer. At the time the site characterization was conducted, the groundwater contained in monitoring well GW9211 (i.e., deep well) was generally slightly higher in elevation than the potentiometric level recorded in monitoring well GW9212 (i.e., shallow well). This information indicates that deep groundwater exhibits a higher hydraulic potential than groundwater contained in the shallow portions of the fractured bedrock aquifer underlying the site. Importantly, these differences of hydraulic potential may be providing a pressure gradient for limiting the downward migration of chlorinated solvents to deeper levels of the fractured bedrock aquifer.

4.3 Hydrogeologic Assessment

A description of the directions of groundwater flow in the fractured bedrock aquifer underlying the Conestoga Pines Park site is presented in the following section.

4.3.1 Groundwater Flow Directions

Water level elevations were measured periodically in the monitoring wells at the site during the investigation. The static water levels (SWLs) recorded in the monitoring wells during the study are listed in Table 6. For comparison purposes, the elevation of the top of the surface casing for each of these monitoring points was surveyed to an arbitrary datum established at the site (i.e., 999.30 feet for the DOT disc in the headwall of the drainage ditch situated at the northeast corner of the site). A summary of the construction for the monitoring wells at the Conestoga Pines Park site is displayed in Table 7. The locations of the monitoring wells at the site are shown on Figure 6.

It is expected that shallow groundwater contained within the Ledger formation underlying the Conestoga Pines Park site occurs mainly under water table conditions. In general, the water table typically mimics the local surface topography. Relatively higher water elevations recorded in monitoring well MW01, and lower water elevations measured in monitoring wells GW9109 and GW9110 suggest that groundwater flow on November 26, 2001, was toward the west-northwest (see Figure 7). A similar groundwater flow direction was determined for the water levels measured in the monitoring wells on and January 28, 2002 (see Figure 8). The directions of groundwater flow as depicted on Figures 7 and 8, are consistent with the local topographic differences in the vicinity of the Conestoga Pines Park site.

The November 26, 2001, groundwater flow map (Figure 7) indicates that the hydraulic gradient of the water table between monitoring wells MW01 and GW9109 was 0.022 feet per foot. The water table contour map prepared for January 28, 2002 (Figure 8) shows that the hydraulic gradient of the water table between monitoring wells MW01 and GW9109 was 0.023 feet per foot.

The preparation of the groundwater flow maps (i.e., Figures 7 and 8) neglected using the groundwater elevation data for monitoring well GW9211. The groundwater elevation data for monitoring well GW9211 was neglected in constructing Figures 7 and 8, because the water level in this well is believed to represent the potentiometric conditions in the deeper portions of the underlying fractured bedrock aquifer rather than the shallow water table flow conditions.

4.4 Laboratory Analytical Results

The analytical results for the environmental samples collected during the field investigation for the Site Characterization are discussed in the following sections. The organization and presentation of the analytical results is based upon the location of sample origin (i.e., MIP and soil boring sample results, surface water samples, sediment samples, etc.).

The soil samples collected during the investigation were evaluated based upon the Statewide Health-based Standards for Soils, listed in Title 25, Pennsylvania Code Chapter 250, *Administration of the Land Recycling Program*, Appendix A, Tables 3 and 4, dated November 24, 2001 (i.e., maximum allowable limits). These soil standards are segregated into various categories (i.e., Residential, Non-Residential, and Soil to Groundwater Pathway Standards), based upon the current and potential future land use of the site. The Residential standards pertain to sites used for domestic housing purposes, whereas the Non-Residential standards are used for industrial sites. The Soil to Groundwater Pathway Standards represent statewide generic limits for assessing the potential leaching of organic and inorganic compounds to groundwater. For comparison purposes, the measured concentrations of organic compounds detected in the soil samples collected during the investigation were evaluated based upon either the Non-Residential Direct Contact or Non-Residential Soil to Groundwater Pathway Standards.

The groundwater samples collected from the monitoring wells during the investigation were evaluated based on the PADEP Non-Residential Statewide Health-based Groundwater Standards, listed in Title 25, Pennsylvania Code Chapter 250, *Administration of the Land Recycling Program*, Appendix A, Tables 1 and 2, dated November 24, 2001.

The surface water samples collected during the investigation were compared to the standards listed in Title 25, Pennsylvania Code Chapter 16, *Water Quality Toxics Management Strategy*, Appendix A, Table 1, dated November 18, 2000.

The sediment samples collected during the investigation were compared to the threshold screening values derived using U.S. EPA's equilibrium partitioning (EqP) approach or literature-based threshold screening values expressed as bulk sediment concentrations (dry weight). These screening values used to evaluate the sediment samples are discussed in more detail in Section 4.4.1.2.

4.4.1 Surface Water and Sediment Sample Results

A total of two surface water and three sediment samples were collected during the investigation to assess potential impacts to these media. These surface water and sediment samples were collected from the headwater spring and the drainage channel to the stream situated south of the swimming pool parking lot. An additional sediment sample was collected from Granite Spring (see Figure 5). The surface water samples collected during the investigation were submitted to Lancaster Laboratories, Inc. for analysis of TCL VOCs. The testing results for the surface water samples collected during the investigation are summarized in Table 8. The sediment samples collected at the site were submitted to Lancaster Laboratories, Inc. for analysis of TCL VOCs and total organic carbon. The testing results for the sediment samples collected during the investigation are summarized in Table 9.

To evaluate potential impacts related to volatile organic compounds at the site, the analytical results were compared to conservative surface water and sediment threshold screening values. The procedures used to select the various criteria and toxicological benchmarks used as threshold screening values for the surface water and sediment samples are outlined in the following paragraphs.

4.4.1.1 Surface Water Screening Values and Results

The specific criteria and toxicological benchmarks used to evaluate the analytical results for the surface water samples collected at the site are listed below in their order of decreasing preference.

- PADEP fish and aquatic life criteria contained in Title 25, Chapter 16 (Appendix A, Table 1) of the Pennsylvania Code.
- U.S. EPA National Ambient Water Quality Criteria (NAWQC) (U.S. EPA 1999).
- Great Lakes Basin Tier II criteria (U.S. EPA 1995a).
- Literature-based toxicological benchmarks (Suter II 1996).

The PADEP fish and aquatic life criteria and the U.S. EPA NAWQC contain two expressions of allowable magnitude: a criterion maximum concentration (CMC) to protect against acute (short-term) effects and a criterion continuous concentration (CCC) to protect against chronic (long-term) effects. The reader is referred to Pennsylvania Code, Chapter 16.22 for a description of the methodology used to derive the PADEP fish and aquatic life criteria, and Stephan and others (1985) for a description of the procedures used to derive the U.S. EPA NAWQC. For the evaluation of the surface water analytical data, only the most sensitive expressions (i.e., CCC values) were chosen from the PADEP fish and aquatic life criteria and the U.S. EPA NAWQC threshold screening values.

The Great Lakes Basin Tier II criteria also contain an acute and chronic expression of allowable magnitude. The acute criteria are expressed as Secondary Maximum Concentrations (SMCs), while the chronic criteria are expressed as Secondary Chronic Values (SCVs). The Great Lakes Basin Tier II criteria used as threshold screening values in this evaluation were derived by the Indiana Department of Environmental Management (IDEM 2000) in accordance with procedures developed by the U.S. EPA (1995a). The Tier II methodology allows for the derivation of criteria when the toxicological database for a given chemical is less than the minimum data required for the selection of U.S. EPA NAWQC (i.e., data for species from eight families of aquatic organisms). This methodology uses statistically derived adjustment factors that compensate for a limited database (Host et al. 1991). It is noted that for a given chemical, Tier II criteria can only be derived if the database includes acceptable test data for at least one representative of the Order *Cladocera* (e.g., *Daphnia magna*, *Daphnia pulex*, or *Ceriodaphnia dubia*). Identical to the PADEP fish and aquatic life criteria and the U.S. EPA NAWQC, only the most sensitive expressions of allowable magnitude (SCVs) were used as threshold screening values.

For chemicals detected in the surface water samples lacking PADEP fish and aquatic life criteria, U.S. EPA NAWQC, and Great Lakes Basin Tier II criteria, a comparison was made to the chronic toxicological benchmarks established or compiled by Suter II (1996). These chronic benchmarks include Tier II criteria (SCVs) derived using slight modifications to the U.S. EPA Great Lakes Basin methodology. These modifications include the derivation of Tier II values for chemicals whose toxicological database lacks toxicity data for a *cladoceran* (i.e., *daphnid*). The chemical-specific criteria and toxicological benchmarks selected as surface water threshold screening values are listed in Table 8. The procedures used to select these screening values are summarized in Appendix E.

The analytical results for the surface water sample collected from the headwater spring (i.e., sample SW01) show that the concentration of cis-1,2-Dichloroethylene (cis-1,2-DCE) exceeded the Threshold Screening Value established for this parameter (see Table 8). The concentrations of TCL VOCs measured in the other surface water samples collected at the

Conestoga Pines Park site during the investigation were all below the established Threshold Screening Values (see Table 8). It should be noted that detectable concentrations of 1,1-dichloroethane (1,1-DCA), 1,1-dichlorethylene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), and trichloroethylene (TCE) were also measured in surface water sample SW01 collected from the headwater spring. The surface water samples collected downstream from the headwater spring (i.e., SW02 and SW02 duplicate) were found to contain lower detectable concentrations of cis-1,2-DCE and TCE. Surface water samples SW02 and SW02 duplicate were collected from the drainage channel approximately 150 feet upstream from the confluence point with the Conestoga River. This information suggests that surface water flow in the stream channel may be transporting dissolved concentrations of cis-1,2-DCE and TCE offsite. It should be noted that the confluence point between this small stream and the Conestoga River is situated upgradient to the water intake for the nearby Lancaster Water Authority public water filtration plant.

The source for the chlorinated solvents detected in the surface water samples collected at the Conestoga Pines Park site during the investigation is unknown. As will be discussed further in Sections 4.4.2 and 4.4.3 of this report, the source area for the chlorinated solvents contained in the surface water and groundwater at the site may be situated in the vicinity of the foundation to the former farmhouse.

4.4.1.2 Sediment Screening Values and Results

To evaluate potential impacts to sediment-associated biota, the analytical results for the sediment samples were compared to threshold screening values derived using U.S. EPA's equilibrium partitioning (EqP) approach or literature-based threshold screening values expressed as bulk sediment concentrations (dry weight). A discussion of the EqP-based and bulk sediment threshold screening values used in the evaluation of the analytical results for the sediment samples is provided in the following paragraphs.

For nonionic organics such as polynuclear aromatic hydrocarbons (PAHs) the U.S. EPA has chosen the EqP approach for developing sediment quality criteria (U.S. EPA 1993). This is also the methodology supported by Oak Ridge National Laboratory (ORNL) for the development of sediment quality benchmarks for use in screening-level ecological risk assessments at Department of Energy (DOE) sites (Jones and Suter II 1997). This same approach was used to develop threshold screening values for nonionic organic chemicals detected in the sediment samples collected at the site during the investigation.

There are three underlying assumptions to the derivation of the threshold screening values using the EqP method. First, it is assumed that equilibrium has been attained between the sediment pore water concentration and the bulk sediment concentration. Secondly, partitioning between sediment pore water and bulk sediment is assumed to be dependent on the organic content of the sediment with little dependence upon other chemical or physical properties. Finally, the EqP approach assumes that toxicity correlates with the concentration of the chemical in the pore water and not to the bulk sediment concentration (i.e., the pore water concentration represents the bioavailable fraction).

The relationship between the concentration of an organic chemical in sediment pore water and bulk sediment is described by the partitioning coefficient, K_p (U.S. EPA 1993):

$$K_p = (C_s)/(C_{pw}) \qquad \text{Equation 1}$$

where C_s is the concentration in bulk sediment and C_{pw} is the concentration in sediment pore water. For a given organic chemical, the partition coefficient can be derived by multiplying the fraction of organic carbon (f_{oc}) present in the sediment by the chemical's organic carbon partition coefficient (K_{oc}) (U.S. EPA 1993):

$$K_p = (f_{oc})(k_{oc}) \qquad \text{Equation 2}$$

Combining Equations 1 and 2 yields the following:

$$C_{sed} = (k_{oc})(f_{oc})(C_{pw}) \qquad \text{Equation 3}$$

If the organic carbon content of the sediment is known, a site-specific sediment threshold screening value (TSV_{sed}) can be calculated for a given non-polar organic chemical by setting C_{pw} equivalent to a conservative surface water threshold screening value (TSV_{sw}):

$$TSV_{sed} = (K_{oc})(f_{oc})(TSV_{sw}) \qquad \text{Equation 4}$$

In Equation 4, TSV_{sed} represents the concentration of the chemical in bulk sediment that at equilibrium will result in a sediment pore water concentration equal to the surface water threshold screening value. Sediment concentrations less than TSV_{sed} would be protective of sediment-associated biota. The use of surface water threshold screening values (i.e., criteria and toxicological benchmarks) in Equation 4 assumes that the sensitivities of sediment-associated biota and the species typically tested to derive surface water criteria and toxicological benchmarks (predominantly water column species) are similar. Furthermore, it assumes that levels of protection afforded by the surface water threshold screening values are appropriate for sediment-associated biota. It is noted that the EqP approach can only be used if the f_{oc} is greater than 0.2 percent. At f_{oc} values less than 0.2 percent, other factors (e.g., particle size, sorption to inorganic mineral fractions) become relatively more important (U.S. EPA 1993). For the calculation of EqP threshold screening values for this investigation, a relatively conservative f_{oc} value of 1% was used in the calculations (see Appendix E).

Although the EqP approach was developed by the U.S. EPA for nonionic organic chemicals, this method was also utilized to derive sediment threshold screening values for ionic organic chemicals detected in the sediment samples at the site. It should be noted that the application of the EqP approach to ionic organic chemicals likely overestimates the pore water concentrations since adsorption mechanisms other than hydrophobicity may significantly increase the fraction of the chemical sorbed to sediment particles (Jones and Suter II 1997). Accordingly, the EqP-based threshold screening values developed for ionic chemicals are likely to be overly conservative. Notwithstanding, the application of the EqP approach to the development of threshold screening values for ionic chemicals is documented in the literature (U.S. EPA 1996a, and Jones and Suter II 1997).

The EqB-based sediment threshold screening values for organic chemicals detected in the sediment samples are summarized in Table 9. The procedures and calculations used in determining the EqB-based screening values are summarized in Appendix E. Included in Appendix E are the chemical-specific K_{oc} values and surface water threshold screening values used in their derivation. The K_{oc} values were taken from Pennsylvania Code, Title 25, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 5, dated August 16, 1997. For a given chemical, if a K_{oc} value was not available from this source, values were calculated from the following equation (U.S. EPA 1993 and 1996a):

$$\mathrm{Log}K_{oc} = 0.00028 + (0.983)(\log K_{ow}) \qquad \text{Equation 5}$$

where K_{ow} is the octanol-water partition coefficient. When Equation 5 was used to calculate the K_{oc} values, $\log K_{ow}$ values used in the calculation were taken from the U.S. EPA document entitled Internal Report on Summary of Measured, Calculated, and Recommended $\log K_{ow}$ values (U.S. EPA 1995b).

The analytical results for the sediment samples collected during the investigation show that the measured concentrations of cis-1,2-DCE exceeded the EqB-based screening values at the following locations: SD01, SD03, and SD03 duplicate. Relatively high concentrations of TCE were also detected in sediment samples SD01, SD03, and SD03 duplicate. In addition, the concentration of acetone measured in sediment sample SW02 was found to exceed the EqB-based screening value established for this compound (see Table 9). It should be noted that relatively high concentrations of acetone were also detected in sediment samples SD01, SD03, and SD03 duplicate. The locations where these sediment samples were collected are shown on Figure 5.

As will be discussed further in Section 4.4.2 of this report, the principle source area for the chlorinated solvents contained in the groundwater at the Conestoga Pines Park site is suspected to be the area situated between the foundation to the former farmhouse and the headwater spring. Importantly, the sediment sampling locations where elevated concentrations of cis-1,2-DCE and TCE were detected are situated hydraulically downgradient to the direction of groundwater flow from this suspected source area. Water level measurements recorded from nested monitoring wells GW9211 and GW9212 show that the groundwater contained in the deeper portions of the bedrock aquifer underlying the Conestoga Pines Park site exhibits a higher hydraulic potential than the groundwater contained in the shallow water table flow system. This information suggests that the headwater spring and northern portion of the drainage channel to the stream are situated in an area of groundwater discharge (i.e., influent stream). This finding implies that these areas where elevated concentrations of cis-1,2-DCE were detected are situated hydraulically downgradient to the direction of groundwater flow from the suspected source area (i.e., in the vicinity of the foundation to the former farmhouse). As will be discussed in Section 4.5.3.1 of the report, abiotic and biotic transformations of TCE may be important in producing more recalcitrant daughter products (i.e., cis-1,2-DCE) in the groundwater underlying the site.

This information collectively suggests that the elevated concentrations of cis-1,2-DCE detected in the sediments occurring in the headwater spring and the drainage channel to the stream in the vicinity of the swimming pool complex may be related to the local discharge of shallow groundwater to the headwater spring and drainage channel. Based upon this supposition, abiotic and biotic transformations occurring near the groundwater/surface water interface (i.e., stream bed) may be important in altering TCE to cis-1,2-DCE.

The sediment sample collected from Granite Spring was found to contain acetone at a concentration that exceeded the EqB-based screening value established for this compound. It should be noted that acetone was also detected in the sediment samples collected from the headwater spring and drainage channel to the stream south of the swimming pool complex. In addition, acetone was detected in the QA/QC duplicate sample (SW03D) collected from the drainage channel to the stream south of the swimming pool complex. The measured concentrations of acetone in these soil borings are summarized in Table 9. The source of the acetone measured in the soil samples collected at the Conestoga Pines Park site is unknown. It should be noted, however, that the extraction/analysis methods used by the testing laboratory as part of the sample preparation procedures for the Encore® sample tubes (i.e., U.S. EPA Method 5035) may inadvertently provide a source for low concentrations of acetone in soil samples. In the laboratory, the soil/sediment materials contained in the Encore® sample tubes are mixed with sodium bisulfate (required for extraction). The mixing process may create acetone and/or acetone byproducts. This information suggests that the concentrations of acetone detected in the sediment materials collected at the site during the investigation may be related to the sample preparation procedures by the testing laboratory rather than the disposal of this compound at the site.

4.4.2 MIP and Confirmatory Soil Sample Results

To identify the location of potential source area(s) for the VOCs dissolved in the groundwater, a total of 67 soil borings were drilled in the northern portion of the Conestoga Pines Park site using MIP technology. The drilling locations for the MIP borings were chosen based upon the historical background information for the site, the results of a soil vapor survey conducted by the PADEP in 1992, and the analytical results for the groundwater samples previously collected from the headwater spring and monitoring wells GW9211 and GW9212. The locations where the MIP borings were drilled at the site are displayed on Figure 5.

To confirm the MIP testing results, 10 soil samples and one duplicate soil sample were collected from 9 confirmatory borings drilled using a Geoprobe® direct-push drilling rig. The drilling locations for the confirmatory borings and the intervals for sample collection were chosen based upon the MIP testing results. The locations where the confirmatory soil borings were drilled at the site are displayed in Figure 5. The confirmatory soil samples (SB04, SB05, SB05 duplicate, SB07, SB10 2 to 4 feet, SB10 10 to 12 feet, SB14 background, SB29, SB53, SB64, and SB67) were submitted to the state contract laboratory (i.e., Lancaster Laboratories, Inc.) for the analysis of TCL VOCs. The analytical results for the confirmatory soil samples are summarized in Tables 10.1 through 10.3. The testing results for the QA/QC samples collected during the investigation are summarized in Tables 11.1 through 11.2.

To establish the "background" conditions for evaluating the sample results, a soil sample was collected from confirmatory boring SB14 drilled approximately 70 feet north of the headwater spring (see Figure 5). The selection of this boring to establish the background conditions in the soils at the site was based on the relatively low ECD and PID instrument readings recorded in this area (see Figures 9, 10, and 11). The analytical results show that no volatile aromatic or chlorinated hydrocarbon compounds were detected in the soil sample collected from boring SB14 (see Table 10.2). It should be noted that 37 micrograms per kilogram (μg/kg) of acetone was detected in the soil sample collected from boring SB14. The source of the acetone detected in this soil sample is unknown.

It should be noted that acetone was detected in each of the soil samples collected from confirmatory borings drilled at the site during the investigation. In addition, acetone was detected in the QA/QC duplicate sample collected from soil boring SB05 and in the "background" sample collected from boring SB14. The acetone concentrations detected in these soil samples were below the PADEP Direct Contact and Soil to Groundwater Pathway Standards. The measured concentrations of acetone in these soil borings are summarized in Tables 10.1 through 10.3. The source of the acetone measured in the soil samples collected at the Conestoga Pines Park site is unknown. It should be noted, however, that the extraction/analysis methods used by the testing laboratory as part of the sample preparation procedures for the Encore® sample tubes (i.e., U.S. EPA Method 5035) may inadvertently provide a source for low concentrations of acetone in soil samples. In the laboratory, the soil materials contained in the Encore® sample tubes are mixed with sodium bisulfate (required for extraction). The mixing process may create acetone and/or acetone byproducts. This information suggests that the concentrations of acetone detected in the soil materials collected from the confirmatory borings drilled at the site during the investigation may be related to the sample preparation procedures by the testing laboratory rather than the disposal of this compound at the site.

The MIP testing results show that several anomalies were detected by the electron capture detector (ECD) and photoionization detector (PID) instruments. The ECD results (sensitive to volatile chlorinated solvents) show that anomalies were detected in the vicinity of soil borings SB22, SB23, SB34, SB53, SB54, SB55, SB59, SB60, and SB63 (see Figures 9 and 10). The PID results (sensitive to volatile aromatic hydrocarbon compounds) show that anomalies were detected in the vicinity of soil borings SB04, SB08, SB09, SB10, SB15, SB26, SB28, SB46, and SB48 (see Figure 11).

An isolated PID anomaly was identified in the vicinity of SB04, drilled in the southeast corner of the study area (see Figure 11). Lower PID readings recorded in the soils along the park access road (i.e., Arthur C. Morris Drive) suggest that low concentrations of VOCs may be present in the subsurface northwest of soil boring SB04. The relatively low readings recorded by the ECD instrument (see Figures 9 and 10) in this area suggest that the anomaly may be the result of volatile aromatic organic compounds rather than volatile chlorinated organic compounds. It should be noted that an aboveground storage tank (AST) was observed on the farm property situated along the southeast side of Pitney Road. This AST is situated roughly upgradient to the drilling location of soil boring SB04. It should be noted that no volatile aromatic or chlorinated organic compounds were detected in the confirmatory soil sample collected from soil boring SB04 (see Table 10.1). The ECD and PID instruments used with the MIP are sensitive to both non-aqueous phase liquids (i.e., NAPL absorbed phase) and soil vapors (i.e., non-absorbed phase). This information collectively suggests that the PID anomaly identified in the southeast corner of the site may represent an accumulation of volatile organic soil vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL resulting from an inadvertent spill or the disposal of solvents.

A small PID anomaly was identified in the vicinity of soil boring SB05, drilled in the northeast corner of the site (see Figure 11). Soil boring SB05 was drilled in close proximity to a corrugated metal drainage pipe located in this area. This drainage pipe conveys surface water runoff from Pitney Road and the Eden Manor residential development situated along the east and north sides of the site, respectively. The relatively low readings recorded by the ECD instrument (see Figures 9 and 10) in this area suggest that the anomaly may be the result of volatile aromatic organic compounds rather than volatile chlorinated organic compounds. The analytical results for the confirmatory soil sample collected from soil boring SB05 show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials (see Table 10.1). The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information collectively suggests that the PID anomaly identified in the vicinity of the drainage pipe may represent an accumulation of volatile organic soil vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL. The source for the volatile aromatic organic compounds occurring in the subsurface materials in this area is unknown, but may be have originated from light molecular weight hydrocarbon compounds that were transported onto the site in the surface water through the drainage pipe. It should be noted that 20 μg/kg of methyl ethyl ketone (2-Butanone) was detected in the soil sample collected from boring SB05. The source of the methyl ethyl ketone is unknown, but may be related to the transport of foreign substances onto the site via surface water originating from Pitney Road and/or the Eden Manor development.

A relatively large PID anomaly was identified in the general vicinity of soil borings SB08, SB09, SB10, SB44, SB45, SB46, and SB48 (see Figure 11). The anomaly is located immediately down slope of the discharge point from the corrugated metal drainage pipe situated at the northeast corner of the site. The highest PID readings were recorded in the vicinity of soil borings SB09 and SB10, corresponding to the area where surface water runoff from the drainage pipe spreads out as sheet flow (see Figure 11). The relatively low readings recorded by the ECD instrument (see Figures 9 and 10) in this area suggest that the anomaly may be the result of volatile aromatic organic compounds rather than volatile chlorinated organic compounds. The analytical results for the confirmatory soil sample collected from boring SB07 and the two confirmatory soil samples collected from soil boring SB10 (2 to 4 feet, and 10 to 12 feet) show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials (see Tables 10.1 and 10.2). The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information collectively suggests that the PID anomaly identified in the area down slope of the drainage pipe may represent an accumulation of volatile organic soil vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL. The source for the volatile aromatic organic compounds occurring in the subsurface materials in this area is unknown, but may be related to light molecular weight hydrocarbon compounds being transported onto the site via surface water runoff. It should be noted that 16 μg/kg of methyl ethyl ketone (2-Butanone) was detected in the soil sample collected from boring SB07. The source of the methyl ethyl ketone is unknown, but may be related to the transport of foreign substances onto the site via surface water originating from Pitney Road and/or the Eden Manor development.

A second large PID anomaly was identified in the area situated approximately 140 feet north of the headwater spring (see Figure 11). The highest PID readings were recorded in the vicinity of soil boring SB15. Information obtained from the review of the 1968 "General Site Plan" map of the Conestoga Pines Park property indicates that the following structures were once located in this area: watchman's shed, lawn mower shed, paint shed, storage shed, and a garage. The relatively low readings recorded by the ECD instrument (see Figures 9 and 10) in this area suggest that the anomaly may be the result of volatile aromatic organic compounds rather than volatile chlorinated organic compounds. The analytical results for the confirmatory soil sample collected from soil boring SB14 show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials (see Table 10.2). The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information collectively suggests that the PID anomaly identified north of the headwater spring may represent an accumulation of volatile organic soil vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL. The source for the volatile aromatic organic compounds occurring in the subsurface materials in this area is unknown, but may be related to spillage/disposal of light molecular weight hydrocarbon compounds in the vicinity of the former building structures.

A third large PID anomaly was identified in the area situated east of monitoring wells GW9211 and GW9212 (see Figure 11). The highest PID readings were recorded in the vicinity of soil borings SB26, SB27, and SB28. The soil vapor survey performed by the PADEP in 1992 also identified elevated concentrations of VOCs occurring the pore spaces of the subsurface materials underlying this area. The relatively low readings recorded by the ECD instrument (see Figures 9 and 10) in this area suggest that the anomaly may be the result of volatile aromatic organic compounds rather than volatile chlorinated organic compounds. The analytical results for the confirmatory soil sample collected from soil boring SB29 show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials (see Table 10.2). The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information collectively suggests that the PID anomaly identified east of monitoring wells GW9211 and GW9212 may represent an accumulation of volatile organic soil vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL. The source for the volatile aromatic organic compounds occurring in the subsurface materials in this area is unknown. It should be noted, that although elevated concentrations of chlorinated solvents were detected in the groundwater samples collected from monitoring wells GW9211 and GW9212, no volatile aromatic organic compounds were identified in these samples by the testing laboratory (see Section 4.4.3 of this report).

A small ECD anomaly was identified in the area of confirmatory borings SB53, SB54, and SB55 drilled southeast of the renovated barn (see Figure 5). The highest ECD readings were recorded in the vicinity of soil borings SB54 and SB55. The relatively low readings recorded by the PID instrument (see Figure 11) in this area suggest that the anomaly may be the result of volatile chlorinated organic compounds rather than volatile aromatic organic compounds. The analytical results for the confirmatory soil sample collected from soil boring SB53 show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials (see Table 10.3). It should be noted that 15 μg/kg of methyl ethyl ketone (i.e., 2-butanone) was detected in the soil sample collected from boring SB53. The source of the methyl ethyl ketone detected in this soil sample is unknown. The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information suggests that source/cause of the elevated ECD readings in the soils situated in the vicinity of borings SB53, BS54, and SB55 may be related to an accumulation of volatile organic vapors contained in the pore spaces of the subsurface materials related to the presence of methyl ethyl ketone.

A relatively large ECD anomaly was identified in the area situated between the foundation to the former farmhouse and the headwater spring (see Figures 9 and 10). A separate finger of this anomaly also extends in a westward direction toward monitoring wells GW9211 and GW9212. The highest ECD readings were recorded in the vicinity of soil borings SB22, SB23, SB24, SB59, SB60, and SB63. Background information provided by the PADEP Project Officer suggests that chlorinated solvents may have been disposed at one time in the area of the foundation to the former farmhouse. The relatively low readings recorded by the PID instrument (see Figure 11) in this area suggest that the anomaly may be the result of volatile chlorinated organic compounds rather than volatile aromatic organic compounds. The analytical results for the confirmatory soil samples collected from soil borings SB64 and SB67 show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials (see Table 10.3). The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information suggests that source/cause of the high ECD readings in the soils situated between the foundation to the former farmhouse and the headwater spring may be related to an accumulation of volatile organic vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL.

Groundwater samples collected from monitoring wells GW9211 and GW9212 and surface water samples collected from the headwater spring were found to contain elevated concentrations of chlorinated solvents (see Sections 4.4.1.1 and 4.4.3 of this report). Static water level measurements recorded in the monitoring wells indicate that the direction of groundwater flow in the underlying fractured bedrock aquifer is in a westerly direction. It should be noted, that no significant ECD anomalies were identified in the area east of the foundation to the former farmhouse. This information collectively suggests that the source for the chlorinated solvents dissolved in the fractured bedrock aquifer underlying the site may be situated in the vicinity of the foundation to the former farmhouse. The non-detection of chlorinated solvents in the soil samples collected from confirmatory borings SB64 and SB67 is enigmatic. These results suggest that any residual NAPL serving as the source for the chlorinated solvents dissolved in the groundwater may be situated at a depth deeper than 8 to 10 feet where the soil samples were collected in these confirmatory borings.

4.4.3 Groundwater Samples Collected from Monitoring Wells

One round of groundwater samples was collected from the six monitoring wells at the Conestoga Pines Park site during the investigation. Due to the number of sampling points (i.e., 6 wells) and the relatively large purge volumes in some wells, the sampling procedures were performed over a two day period from November 26 through November 27, 2001. A total of six groundwater samples were collected from the monitoring wells during the investigation. In addition, one duplicate groundwater sample was collected from monitoring well MW02. The groundwater samples collected from the monitoring wells during the investigation were submitted to Lancaster Laboratories, Inc. for the analysis of the following parameters: TCL VOCs; total concentrations of calcium, magnesium, potassium, and sodium; and general water quality parameters (i.e., sulfate, chloride, carbonate alkalinity, bicarbonate alkalinity, and total dissolved solids). The testing results for the groundwater samples collected from the monitoring wells during the investigation are summarized in Tables 12.1 and 12.2, and 13.1 and 13.2.

The groundwater samples collected from the monitoring wells during the investigation were found to contain the following VOCs: carbon tetrachloride, chloroform, 1,1-dichlorethane (1,1-DCA), 1,1-dichlorethylene (1,1-DCE), cis-1,2-dichloroethylene (cis-1,2-DCE), 1,1,1-trichlorethane (1,1,1-TCA), and trichloroethylene (TCE). The analytical results show that the measured concentrations of 1,1-DCE, cis-1,2-DCE, and TCE in groundwater samples MW02, MW02 duplicate, GW9211, and GW9212 exceeded the PADEP Statewide Health-based Groundwater Standards established for these parameters (see Tables 12.1 and 12.2). In addition, the concentration of carbon tetrachloride (12 µg/L) was found to exceed the PADEP Statewide Health-based Groundwater Standard established for this compound in the groundwater sample collected from monitoring well GW9211. The groundwater samples collected from monitoring well GW9110 were also found to contain a concentration of TCE (93 µg/L) that exceeded the PADEP Statewide Health-based Groundwater Standard established for this compound. The analytical results show that no VOCs were detected in the groundwater samples collected from monitoring wells MW01 and GW9109.

The highest concentrations of cis-1,2-DCE (850 µg/L) were detected in the groundwater samples collected from monitoring well MW02. The groundwater samples collected from monitoring well GW9211 were found to contain the highest concentrations of carbon tetrachloride, chloroform, 1,1-DCE, 1,1,1-TCA, and TCE at 12 µg/L, 5 µg/L, 30 µg/L, 32 µg/L, and 780 µg/L, respectively. Monitoring wells MW02, GW9211, and GW9212 are situated hydraulically downgradient to the foundation of the former farmhouse. As discussed in Section

4.4.2, a relatively large ECD anomaly was identified using the MIP in this area. The analytical results for the groundwater samples collected from monitoring well MW01 (i.e., upgradient monitoring well) show that no VOCs were detected in this well. This information suggests that the source for the elevated concentrations of chlorinated solvents dissolved in the groundwater of monitoring wells MW02, GW9211, and GW9212 may be the area in the vicinity of the foundation to the former farmhouse. The analytical results show that relatively lower concentrations of cis-1,2-DCE and TCE (67 µg/L and 93 µg/L , respectively) were detected in the groundwater samples collected from monitoring well GW9110. Based upon the direction of groundwater flow (see Figures 7 and 8) monitoring well GW9110 is situated hydraulically downgradient to the foundation of the former farmhouse (i.e., the suspected source area of the chlorinated solvents). The elevated concentrations of TCE measured in the groundwater samples collected from monitoring well GW9110 and the direction of groundwater flow collectively suggest that the plume of chlorinated solvents is migrating toward the Conestoga River.

The groundwater samples collected from the monitoring wells during the investigation were also submitted to the testing laboratory for the analysis of the following general water quality parameters: total alkalinity; bicarbonate alkalinity; chloride; sulfate; total dissolved solids; and total concentrations of calcium, magnesium, potassium, and sodium.

To evaluate the chemistry of the groundwater contained within the fractured bedrock aquifer underlying the Conestoga Pines Park site a geochemical analysis was performed. This assessment included a detailed examination of the principle cation and anion chemical constituents dissolved in the groundwater. Because the state contract laboratory neglected to analyzed the groundwater samples collected from monitoring wells GW9110, GW9211, and GW9212 for sulfate, the geochemical analysis only included an evaluation of the results for the following samples: MW01; MW02; MW02 duplicate; and GW9109.

The natural chemical characteristics of groundwater are influenced primarily by the composition of the soil and rock materials through which the water flows, and by the length of time the water has been in contact with these materials. The term hydrochemical facies has been used to describe the bodies of groundwater contained in an aquifer system that differ in their chemical composition (Back, 1961). These hydrochemical facies are a function of the lithology of the aquifer, solution of the bedrock framework, and the flow patterns within the aquifer (Fetter, 1988).

Most natural groundwaters can be represented as solutions of three cationic constituents (calcium, magnesium, and the alkali metals), and three anionic species (sulfate, chloride, and those contributing to alkalinity). The chemical composition of groundwater can be shown graphically by plotting the relative amounts of these major cation and anion species on a trilinear (i.e., Piper diagram) diagram. Specifically, a Piper diagram combines three distinct fields for plotting the chemical data, two triangular-shaped fields at the lower left and right, and an intervening diamond-shaped field. All three fields have scales that total 100 percent. To compare the electrochemical composition of the ions contained in a water sample, the concentrations of the chemical species measured by the testing laboratory must be converted to milliequivalents per liter (meq/l). Data are posted on the trilinear diagram by plotting the percentage of the ionic species representing the three-cation groups (Ca^{+2}, Mg^{+2}, and Na^{+}+K^{+}) as a single point in the triangular field at the lower left. The three-anion groups (SO_4^{-2}, Cl^{-}, and HCO_3^{-}) are plotted likewise in the triangular field at the lower right. The central diamond-shaped field is used to show the overall chemical characteristics of the water sample. This point is plotted at the intersection of the rays projected from the postings of the cations and anions. The position of this point in the central diamond-shaped field indicates the relative composition of a water sample in terms of the cation-anion pairs.

The calculations used to convert the measured levels of the major cations and anions to milliequivalents per liter (meq/l) are shown in Appendix F. The results of these computations were plotted on a trilinear diagram (i.e., Piper diagram) following the procedure outlined above. The graphical results showing the chemical characteristics of the groundwater samples collected in November 2001 from monitoring wells MW01, MW02, and GW9109 are presented in Figure 12.

The Piper diagram shows that the postings of the cation-anion pairs are centered in one group. The data points for these wells are plotted toward the left portion of the central diamond-shaped field (see Figure 12). According to Piper (1944), the relative position of the data points in the central diamond-shaped field indicates that the groundwater samples collected from monitoring wells MW01, MW02, and GW9109 are of the calcium bicarbonate type. Specifically, alkaline earths and weak acids dominate the chemical properties of this groundwater category. It should be noted that the chemical characteristics exhibited by the groundwater contained in monitoring wells MW01, MW02, and GW9109 are consistent with published information by Meisler and Becher (1971) regarding the typical water quality conditions in the carbonate rocks underlying the central portion of Lancaster County, Pennsylvania.

To qualitatively evaluate differences in the groundwater chemistry at the site, a Stiff diagram was created for the groundwater samples collected from monitoring wells MW01, MW02, GW9109, GW9110, and GW9211. A Stiff diagram is a plot showing the most abundant cations (i.e., calcium, magnesium, sodium, and potassium) and anions (i.e., bicarbonate alkalinity,

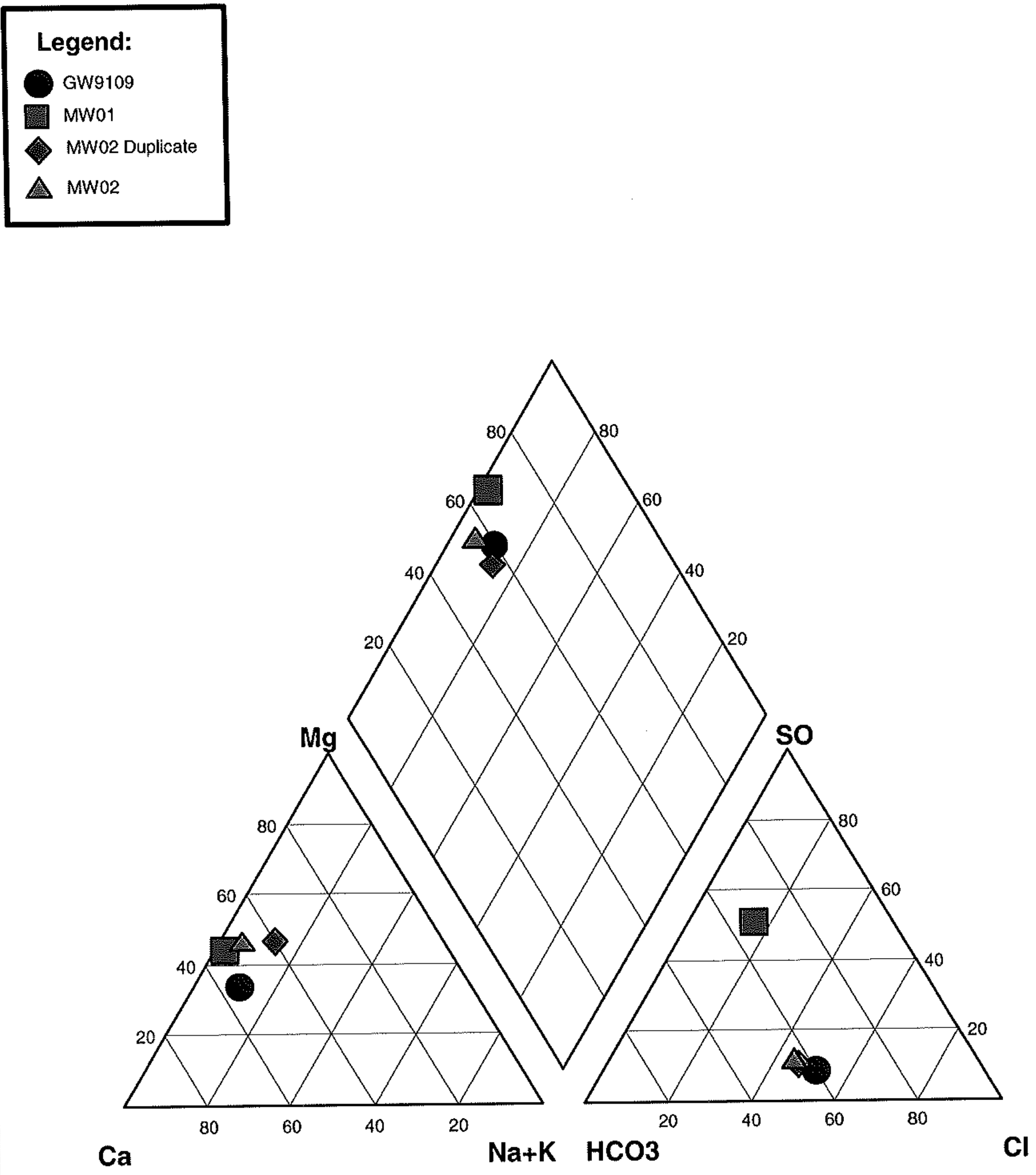

FIGURE 12: PIPER DIAGRAM

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sulfate, and chloride) measured in a sample. These diagrams are useful for visually segregating groundwater populations of different chemistries. A Stiff diagram is a line plot with cations on the left and anions on the right. The distance from the centerline is proportional to the measured concentration of the cations and anions in milliequivalents per liter (meq/l). The Stiff diagrams used to evaluate the sample data were created in accordance with procedures outlined by Hem (1985). A graphical representation of the Stiff diagrams for the groundwater samples collected from the monitoring wells during the investigation is presented in Figure 13. It should be noted that because the state contract laboratory neglected to analyze the groundwater samples collected from monitoring wells GW9110, GW9211, and GW9212 for sulfate, an average value of 52 mg/l for this parameter was used to prepare the Stiff diagram plots for these wells. This estimated value for the sulfate concentration in monitoring wells GW9110, GW9211, and GW9212 was determined by averaging the measured amounts of sulfate in the following groundwater samples: MW02, MW02 duplicate, and GW9109. Based upon the relatively low calculated charge balance error (-1.84% to 3.37%) between the sum of the cations and anions in the groundwater samples from monitoring wells GW9110, GW9211, and GW9212, this procedure was deemed to be a reasonable estimate (see Appendix F).

The Stiff diagrams graphically show that the groundwater samples collected from monitoring wells MW02, GW9109, GW9110, and GW9211 contain relatively low concentrations of sulfate and equal concentrations of bicarbonate alkalinity and chloride. The Stiff patterns exhibited for these wells are very similar in shape, suggesting that that the groundwater exhibits similar characteristics and may share a common source. The Stiff diagram for monitoring well MW01, however, shows that the groundwater contains relatively higher concentrations of sulfate than the samples collected from monitoring wells MW02, GW9109, GW9110, and GW9211. The source for the higher concentrations of sulfate dissolved in the groundwater contained in monitoring well MW01 is unknown, but may possibly be related to foreign substances being transported onto the site in surface water runoff from Pitney Road.

4.4.4 IDW Sample Results

During the performance of the field procedures for the Site Characterization, the following IDW materials were generated: liquid waste derived from the cleaning and decontamination of equipment, solid waste consisting of soils/cuttings generated during the drilling of monitoring wells MW01 and MW02, and used granular activated carbon media used to treat decontamination fluids and the groundwater purged from the monitoring wells. The

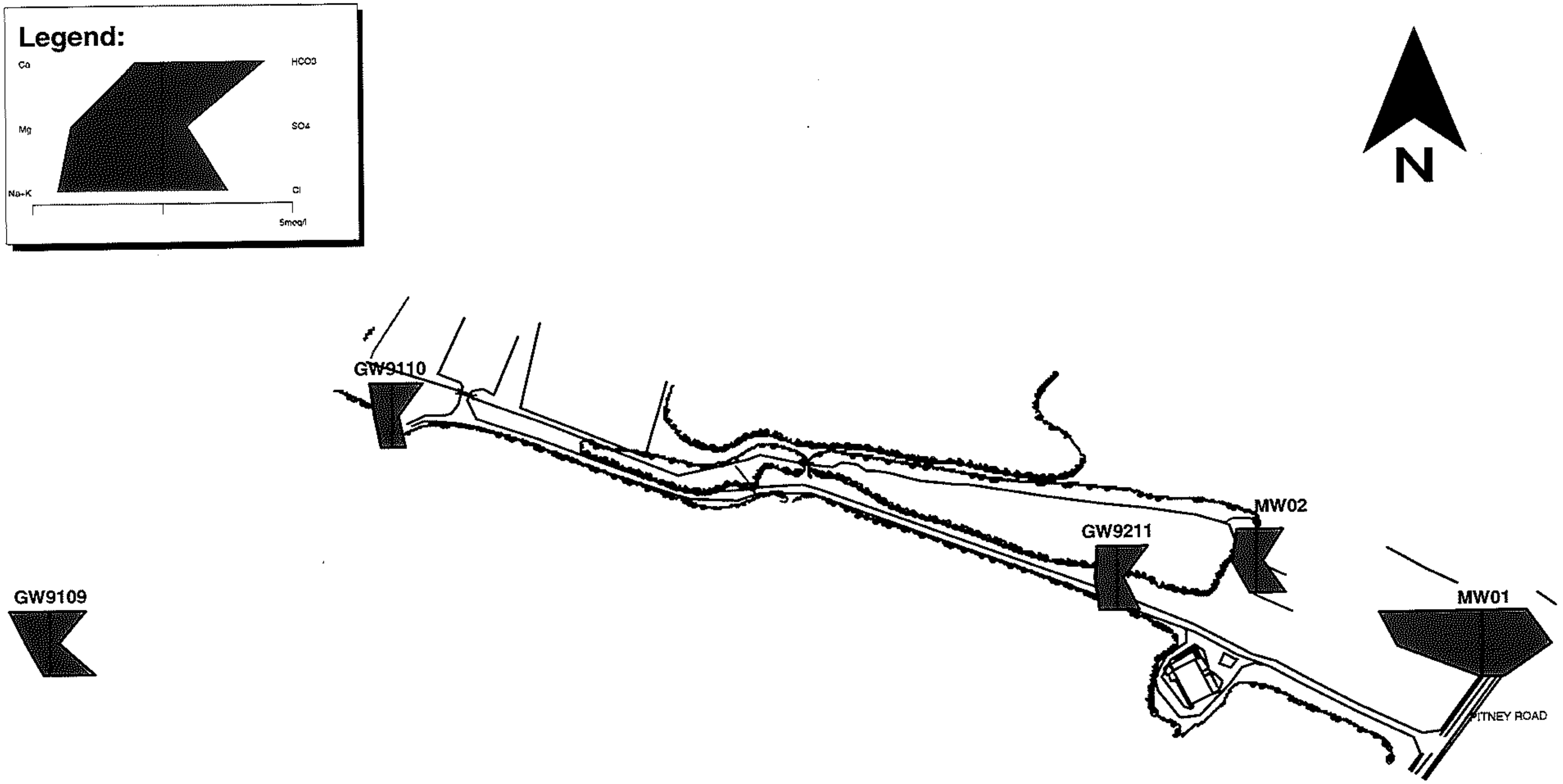

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FIGURE 13: STIFF DIAGRAM MAP

analytical results for the samples collected from these solid waste streams are summarized in Tables 14, 15, 16, 17, 18, 19, 20, and 21.

Samples of the soil/rock cuttings materials were submitted to Lancaster laboratories, Inc. for TCLP extraction and analysis of VOCs and metals, as well as the analysis of total concentrations of VOCs, and RCRA characteristics. The TCLP testing results for the soil/rock cuttings materials show that no VOCs or metals were detected in the TCLP leachate solution. Accordingly, the concentrations of VOCs and metals were all below the U.S. EPA TCLP Standards. The analytical results show that the total concentrations of VOCs were less than the laboratory reporting limits. The RCRA characteristic testing results show that the soil/rock cutting materials did not exhibit hazardous characteristics based upon corrosivity, ignitability, or reactivity. The testing results collectively indicate that the soil/rock cutting materials did not exhibit hazardous concentrations of VOCs, metals, or hazardous characteristics. Accordingly, the soil/rock cutting materials were disposed of as a residual waste (see Appendix D for disposal manifests).

The granular carbon media was used during the investigation to treat the decontamination/cleaning fluids and the groundwater purged from the monitoring wells. The samples of the used carbon media were submitted to Lancaster Laboratories, Inc. for TCLP extraction and analysis of VOCs and metals, as well as the analysis of total concentrations of VOCs, and RCRA characteristics. The testing results show that no VOCs were detected in the TCLP leachate solution. Barium was the only heavy metal that exhibited the tendency to leach from the used carbon media. The concentrations of VOCs and metals measured in the TCLP leachate extraction fluid were all below the U.S. EPA TCLP Standards. This information suggests that the used granular carbon media does not exhibit hazardous characteristics based on TCLP toxicity. The analysis of the used carbon media sample for total VOCs showed that xylenes and TCE were the only VOCs detected. The concentration of xylene was measured at 1,200 micrograms per kilogram (µg/kg), and TCE was measured at 2,700 µg/kg. The RCRA characteristic testing results show that the used carbon media materials did not exhibit hazardous characteristics based upon corrosivity, ignitability, or reactivity. The testing results collectively indicate that the used carbon media did not exhibit hazardous concentrations of VOCs, metals, or hazardous characteristics. Accordingly, used carbon media were disposed of as a residual waste (see Appendix D for disposal manifests).

4.5 Fate and Transport of Waste-Related Constituents

This section evaluates the various physical and chemical properties of the compounds of concern detected in the samples collected at the site during the investigation, and provides a discussion of the relationship these properties have on influencing the fate and transport of the compounds of concern in the environment.

4.5.1 Chemical and Physical Properties

The potential for a chemical to migrate and persist in environmental media is an important factor in evaluating risk to human health and the environment. The environmental mobility of a compound is influenced by: its physical and chemical properties, the physical characteristics of the site, and the natural subsurface chemical conditions. For organic compounds, these properties include specific gravity, vapor pressure, water solubility, octanol/water partition coefficient, organic carbon partition coefficient, and Henry's law constant. A discussion of the environmental significance of the properties outlined above is presented in the following paragraphs.

Specific gravity is the ratio of a given amount of pure chemical to the weight of the same volume of water at a given temperature. Its primary use is to determine whether a contaminant will have a tendency to float or sink (as an immiscible liquid) in water if it exceeds its corresponding water solubility.

Vapor pressure provides an indication of the rate at which a chemical may volatilize. It is of primary significance at environmental interfaces such as surface soil/air and surface water/air. Volatilization is not as important when evaluating groundwater and subsurface soil as it is when evaluating surface soil or surface water. Vapor pressures for VOCs are generally higher than vapor pressures for SVOCs. Chemicals with high vapor pressures will enter the atmosphere at a quicker rate than those chemicals with lower vapor pressures.

The rate at which a chemical is leached from soil by infiltrating precipitation can be proportional to its water solubility. More soluble chemicals (e.g., VOCs) are usually more readily leached than less soluble chemicals (e.g., inorganics). The water solubilities indicate, for example, that VOCs are usually several orders of magnitude more soluble than SVOCs. Consequently, highly soluble chemicals will migrate at a faster rate than less water-soluble chemicals.

The octanol/water partition coefficient (K_{OW}) is a measure of the equilibrium partitioning of chemicals between octanol and water. A linear relationship between K_{OW} and the uptake of chemicals (e.g., bioconcentration) by fatty tissues of ecological and human receptors has been established (Lyman et. al., 1982). The coefficient also is useful in characterizing the sorption of organic compounds by soil and rock materials where experimental values are not available.

The organic carbon partition coefficient (K_{OC}) indicates the tendency of a chemical to adhere to soil and sediment particles containing organic carbon. The solubility of a chemical in water is inversely proportional to the K_{OC} coefficient. Chemicals exhibiting high K_{OC} values generally have low water solubilities. Conversely, chemicals with low K_{OC} values tend to have high water solubilities. Chemicals with high K_{OC} values such as SVOCs and pesticides are relatively immobile in the environment and are preferentially bound to the soil or sediment. Accordingly, chemicals with high K_{OC} values are not subject to aqueous transport to the extent of chemicals with low K_{OC} values.

Vapor pressure and water solubility are both useful for determining volatilization from surface water bodies and from groundwater. Accordingly, these two properties can be used to estimate an equilibrium concentration of a chemical in the water phase and in the air directly above the water. This equilibrium concentration can be expressed as Henry's Law Constant.

4.5.2 Waste Constituent Pathways

Based on the evaluation of existing conditions at the site, the following general potential waste constituent transport pathways have been identified:

- Off-site atmospheric deposition of windblown dust
- Surface soil and water run-off
- Leaching of waste constituents to groundwater
- Migration of groundwater constituents off-site

Constituents released to the environment may undergo the following along their transport pathway:

- Physical transformations (i.e., volatilization, precipitation)
- Chemical transformations (i.e., photolysis, hydrolysis, oxidation, reduction)
- Biological transformation (i.e., biodegradation)
- Accumulation in one or more media

The transport pathways listed above are discussed in the following paragraphs. The behavior of relevant compounds of environmental concern (i.e., VOCs) in each transport pathway under the existing conditions at the site is summarized in Section 4.5.3.

4.5.2.1 Offsite Atmospheric Deposition of Windblown Dust

Wind can act as a transport medium by eroding exposed soil that contains waste materials, blowing these substances off site. This is influenced by wind velocity, the grain size/density of the soil particles, and the amount of vegetative and manmade cover over the soil materials. Observations made at the site during the investigation found that the surface of the site is mainly covered either by asphalt/concrete, gravel materials, or vegetation. The existing manmade cover materials and vegetation will limit potential airborne migration of waste-related constituents. Non-vegetated areas occur at the site along the stream banks surrounding the headwater spring and the un-named stream channel.

The analytical results for the soil samples collected from the confirmatory borings drilled at the site show that the concentrations of VOCs in the soils are below the PADEP direct contact and Soil to Groundwater Pathway Standards. Based upon this information, the health effects associated with the off-site migration of VOCs via the wind and wind blown dust are expected to be minimal. If in the future, the removal of soil materials in the vicinity of the foundation to the former farmhouse is deemed necessary, off-site migration of volatile organic vapors may possibly pose a concern during the excavation/remedial procedures.

4.5.2.2 Surface Water and Sediment Runoff

Surface water can function to transport waste-related substance off-site, both as solid particles and in solution. The analytical results for the surface water samples collected at the Conestoga Pines Park site during the investigation were found to contain a wide variety of VOCs. Although the concentrations of TCL VOCs were all below the surface water threshold screening values, the presence of low levels of these substances in the surface water samples suggests that waste-related materials are being transported off-site. Of particular concern are cis-1,2-DCE and TCE that were detected in both the surface water and sediment samples. The origin of the VOCs is not known, but is attributed to the discharge of shallow groundwater containing chlorinated solvents to the headwater spring and northern portion of the drainage channel to the stream.

Water can erode sediment particles during precipitation events. This is influenced by site topography, the amount of precipitation, the sediment particle size, density, and cohesion. Sediment samples collected from the headwater spring and the drainage channel to the stream situated south of the swimming pool parking lot were found to contain elevated concentrations of cis-1,2-DCE (see Table 9). This information indicates that some loading of VOCs has occurred in the areas where the sediment samples were collected. The source of the VOCs, is unclear, but is most likely related to the discharge of shallow groundwater containing chlorinated solvents to the headwater spring and northern portion of the drainage channel to the stream.

4.5.2.3 Leaching of Soil Constituents to Groundwater

Organic compounds that adhere to soil particles or have accumulated in soil pore spaces can leach and migrate vertically downward via infiltrating precipitation to the underlying groundwater. This is influenced by the physical and chemical properties of the soil, the physical and chemical properties of the waste constituents, the amount of precipitation, and the depth to the water table.

The origin of the organic compounds contained in the groundwater at the site is attributed to vertical percolation of water through the soil and waste materials. The various organic constituents contained within the soil and waste materials are mobilized in the dissolved phase and percolate vertically under gravity within the water. The level in which these dissolved phase compounds are detected is dependent on the parent concentration within the source materials, the solubility of the compounds, and time frame in which the water is in contact with the waste materials.

The vertical pathway of migration for the organic compounds detected in the groundwater at the Conestoga Pines Park site is believed to be controlled by the primary and secondary hydraulic conductivity of the underlying soil and weathered bedrock materials. Groundwater samples collected from monitoring wells GW9110 and GW9211 show that VOCs (namely cis-1,2-DCE and TCE) have infiltrated downward to impact the underlying fractured bedrock aquifer.

During the investigation, the ECD instrument responses provided information suggesting that a relatively large anomaly suspected to contain chlorinated solvents may be present in the area situated between the foundation of the former farmhouse and the headwater spring. No other ECD anomalies were identified upgradient to this area. Static water levels recorded in the monitoring wells at the site during the investigation indicate that groundwater contained in the shallow portion of the fractured bedrock aquifer underlying the site is flowing in a west-northwesterly direction. The analytical results for the groundwater samples collected from monitoring well MW01 (i.e., upgradient well) show that no VOCs were detected in this well. This information implies that chlorinated solvents are not migrating from an offsite source onto the Conestoga Pines Park property. Because no VOCs were detected in the soil samples collected from the confirmatory borings drilled in the vicinity of the foundation to the former farmhouse, the source area for the chlorinated solvents contained in the groundwater at the site remains unknown. The identification of a relatively large ECD anomaly coupled with the indirect information outlined above, however, collectively suggests that the source for the chlorinated solvents occurring in the headwater spring and monitoring wells GW9110, GW9211, and GW9212 may be situated in the vicinity of the foundation to the former farmhouse.

4.5.2.4 Migration of Solutes in Groundwater

Volatile organic compounds were detected in the groundwater samples collected from selected monitoring wells during the investigation. The following paragraphs discuss the potential pathways for the offsite migration of organic constituents dissolved in the groundwater.

Three general processes govern the migration of dissolved solutes in groundwater. These processes are advection (movement caused by flow of groundwater), dispersion (movement caused by irregular mixing of waters during advection), and chemical mechanisms that occur during advection.

Advection is the process that most strongly influences the migration of dissolved organic solutes. Groundwater flows from areas of higher hydraulic potential to areas of lower hydraulic potential (i.e., higher head to lower head). Total head is the summation of total elevation head, pressure head, and velocity head. The hydraulic gradient is a term used to describe the magnitude of this force or the relative slope of the water table.

Advection and dispersion are the two basic processes that function to transport solutes in groundwater. Diffusion is the process by which a solute dissolved in groundwater moves from areas of high concentration to areas of lower concentration. Advection is the process by which moving (i.e., flowing) groundwater carries with it dissolved solutes.

As a solute flows through a porous medium, it will gradually mix with the surrounding groundwater. The net result of this mixing is a dilution of the solute by a process known as dispersion. The mixing that occurs parallel to the direction of groundwater flow is termed longitudinal dispersion, whereas the dispersion that occurs normal to the direction of groundwater flow is lateral dispersion. For simple hydrogeologic systems, the spreading is estimated to be proportional to the groundwater flow rate. In the absence of detailed studies to determine dispersive characteristics at the site, longitudinal and transverse dispersion must be estimated based on similar hydrogeological systems (Mackey et al., 1985).

Based upon their physical properties, dissolved chemicals may interact with the aquifer solids (i.e., subsurface soil) encountered along the flow path through adsorption, partitioning, ion exchange, and other processes. These interactions result in the chemical's distribution between the aqueous phase and the aquifer solids, diminution of concentrations in the aqueous phase, and retardation of the movement of the contaminant relative to groundwater flow. The higher the fraction of the contaminant sorbed, the more retarded its transport (Mackey et al. 1985). The sorption of certain halogenated organic solvents is affected by hydrophobility (antipathy for dissolving in water) and the fraction of solid organic matter in the aquifer solids (organic carbon content).

Organic chemicals can be transformed into other compounds by a complex set of chemical and biological mechanisms. The principle classes of chemical reactions that can affect organic chemicals in water are hydrolysis and oxidation. It is believed that most chemical reactions occurring in the groundwater zone are likely to be slow compared with transformations mediated by microorganisms. Certain organic chemicals in groundwater can be biologically transformed by microorganisms attached to solid surfaces of the aquifer framework. Factors that affect the rates of biotransformation of organic chemicals include water temperature and pH, the number and type of microorganism species present, the concentration of substrate, presence of microbial toxicants and nutrients, and the availability of electron acceptors (Mackey et al., 1985).

The interaction of non-ionic organic chemicals with solid phases can be used to predict the fate of the chemical. Sorptive binding is a function of the organic content of the sorbent. Sorption of non-ionic organic compounds can be attributed to an active fraction of the soil organic matter. The uptake of neutral organics by soil results from their partitioning and a function of the aqueous solubility of the chemical and its liquid-liquid (e.g., octanol-water) partition coefficient (Chiou et. al., 1979). Organic matrices in natural systems that have varying origins, degrees of humification, and degrees of association with inorganic matrices exhibit dissimilarities in their ability to sorb non-ionic organic compounds.

The groundwater samples collected from monitoring wells MW02, GW9110, GW9211, and GW9212 were found to contain VOCs that exceeded the PADEP Statewide Health-based Groundwater Standards. Relatively high concentrations of VOCs were also detected in the surface water samples collected from the headwater spring and the drainage channel to the stream situated south of the swimming pool parking lot. The VOCs detected in these samples are attributed to the local leaching of solvents contained in the subsurface materials in the vicinity of the foundation to the former farmhouse.

Static water level measurements recorded in the monitoring wells at the site show that groundwater is flowing in a west-northwest direction (see Figures 7 and 8). In addition, the fracture trace analysis (see Section 2.5 of the report) identified several west-southwestward trending fracture traces cross cutting through the Conestoga Pines Park property. According to Lattman (1958), fracture traces are natural linear features consisting of topographic, vegetation, and/or soil tonal alignments visible on aerial photographs. These zones often represent areas exhibiting higher porosities and permeabilities for both the storage and movement of groundwater.

This information collectively suggests that the potential pathways for the offsite migration of VOCs are: 1) the migration of solutes within natural fractures contained within the bedrock underlying the area; 2) the migration of solutes along fracture traces due to increased porosity and permeability; and 3) the west-northwestward component of groundwater that is allowing the solutes to migrate through the natural fractures and/or along the fracture trace via the process of advection.

4.5.3 Fate and Transport Summary

The contaminant fate and transport data for waste-related constituents at the Conestoga Pines Park site are presented in the following sections.

4.5.3.1 Volatile Organic Compounds

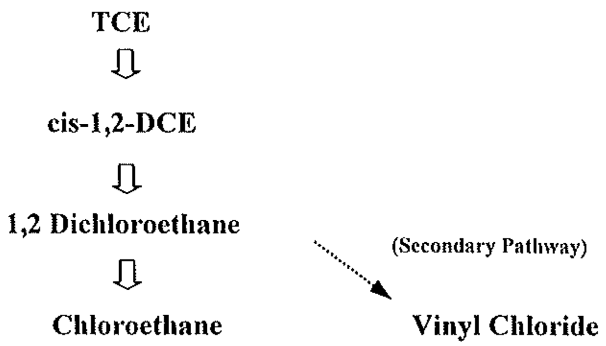
Elevated concentrations of VOCs were detected in the groundwater samples collected from the monitoring wells at the site during the investigation. The principal constituents of concern are the chlorinated solvents cis-1,2-DCE and TCE dissolved within the groundwater. Volatile organic compounds exhibit the potential to be mobile in the environment. Their mobility in the vadose zone is a function of low water solubilities and high vapor pressures. In groundwater, the mobility of these compounds is a function of their low absorption to the aquifer materials (i.e., low K_{ow} and K_{oc} values), low water solubility, and specific gravity (i.e., density) greater than that of water.

In surface media, VOCs will readily volatilize into the atmosphere. Because VOCs are highly mobile in soil, they will leach to underlying groundwater, but will not partition significantly from the water column to soil. In natural water and soil systems, VOCs will slowly biodegrade. Consequently, in subsurface environments, VOCs will tend to persist. Hydrolysis, oxidation, and direct photolysis are not important fate processes for VOCs in groundwater at the site.

Chlorinated solvents (i.e., cis-1,2-DCE, TCE, and vinyl chloride) persist in the environment because they are recalcitrant to both chemical and biological degradation. Information published by Barbee (1994) suggests that the average half-life for abiotic (i.e., chemical) transformations of chlorinated solvents ranges from two months to greater than a million years. Of the chlorinated solvents, the ethene compounds tend to be the most resistant to abiotic degradation. Anaerobic reductive dehalogenation is recognized as the primary biodegradation process in groundwater. Aerobic biodegradation, however, may be locally important in some shallow groundwater flow systems.

The rate and extent of abiotic (i.e., chemical) and biotic (i.e., microbiological) transformations of chlorinated solvents in the subsurface is a function of the physiochemical properties, soil and groundwater chemistry, and the types of the indigenous microbial populations. The molecular size, structure, types of chemical bonds, aqueous solubility, and concentration collectively regulate physiochemical transformations in the subsurface. Soil and groundwater chemistry, such as pH and redox (E_h) conditions together with the type and availability of electron acceptors/donors also greatly control the degradation rate of chlorinated solvents in the subsurface. Biotransformation of chlorinated solvents is also regulated by the capacity of the indigenous microbial community to metabolize or co-metabolize the parent and daughter compounds, accessibility to the microbes, other constituents (i.e., heavy metals) that may create toxic conditions, and the availability of essential microbial growth factors (i.e., temperature, pH, and nutrients).

Chlorinated solvents exist in a formally oxidized state due to highly electronegative halogen substitutes on the molecules. Accordingly, the parent compounds are generally more susceptible to reduction than to oxidation reactions (Sims et. al., 1991). With increasing halogenation, reduction becomes much more likely than oxidation (Vogel et. al., 1987). According to the summary by Kollig and others (1990) and McCarty (1991), the primary and secondary anaerobic abiotic transformation pathways for the types of chlorinated solvents present in the groundwater at the Conestoga Pines Park site would be:



Based on this transformation pathway, vinyl chloride may or may not originate as a daughter product from the breakdown of more halogenated chlorinated solvents. It should be noted that cis-1,2-DCE is an ethene-based organic compound, and is considered to be one of the least reactive chlorinated solvents (Barbee 1994).

Reductive dehalogenation is believed to be the most important process for biotransforming chlorinated solvents in the subsurface environment. This reaction is carried out primarily by indigenous populations of methane-oxidizing bacteria (i.e., methanotrophs) occurring the groundwater. During reductive dehalogenation, methanotrophs do not directly use chlorinated solvents as an energy source, but biodegrade the compounds by co-metabolism (McCarty 1991). In co-metabolic reductive dehalogenation, bacterial growth is supported by a primary substrate that supplies energy and carbon, causing the release of enzymes and cofactors. These enzymes and cofactors serve as a secondary substrate, facilitating the biodegradation of the chlorinated solvents. The biodegradation of some chlorinated solvents may produce daughter products that are more recalcitrant and of greater health threat than the parent compound. An example reaction would be: TCE→cis-1,2-DCE→vinyl chloride. Moreover, this process may create less halogenated daughter products that exhibit lower reaction rates under anaerobic conditions (McCarty 1991).

A historical review of the sampling data indicates that chlorinated solvents have persisted in the surface water of the headwater spring at the Conestoga Pines Park site for an extended period of time (+10 years). Based on this information, it appears that abiotic and biotic transformations of cis-1,2-DCE and TCE are occurring at only relatively slow rates within the soils and fractured bedrock aquifer underlying the study area. The cause(s) for the reduced rate of the transformations is unknown. Information published by Barbee (1994) suggests that low rates of biodegradation of chlorinated solvents may be related to the lack of sufficient substrate for microbial growth. In addition, the rate of biodegradation may also be hindered by the relatively high concentrations of TCE and/or metals dissolved in the groundwater. Higher rates of biodegradation have been reported by Barbee (1994) along the edges of plumes where the concentrations of solvents and metals are diluted.

Based upon the information outlined above, cis-1,2-DCE is most likely a daughter product from the breakdown of TCE dissolved in groundwater underlying the study area. It is expected that the VOCs found in the groundwater in the study area will slowly biodegrade over time. Remedial measures, by adding supplementary amendments to stimulate abiotic and biotic transformations, however, would be required if more rapid degradation of the VOCs in these media is deemed necessary.

5.0 COMPARISON OF RESULTS TO SELECTED SCREENING CRITERIA

To evaluate potential risks, the analytical results for the environmental samples collected during the field procedures for the Site Characterization were compared to the established regulatory standards and guidelines outlined in Section 4.4. The following paragraphs summarize the organic compounds that were found to exceed these standards and guidelines.

5.1 Human Health and Ecological Criteria

The analytical results for the environmental samples collected during the investigation show that several organic compounds were found to exceed the established regulatory and guidance standards. A summary of the organic compounds that were found to exceed the established regulatory and guidance standards are summarized in Table 22 and are discussed in the following paragraphs.

Surficial Soils

The analytical results for the soil samples collected from the confirmatory borings drilled during the investigation show that no volatile aromatic or chlorinated organic compounds exceeding the PADEP Soil to Groundwater Pathway Standards were detected in the subsurface materials underlying the site.

Low concentrations of acetone and methyl ethyl ketone (2-Butanone) were detected in several soil samples collected from the confirmatory borings. The concentrations of acetone and methyl ethyl ketone, however, were below PADEP Soil to Groundwater Pathway Standards established for these parameters. This information suggests that the measured concentrations of acetone and methyl ethyl ketone contained in the soils should not pose a risk to impact groundwater at the site.

Onsite Groundwater

The groundwater samples collected from the monitoring wells during the investigation were found to contain elevated concentrations of carbon tetrachloride, 1,1-DCE, cis-1,2-DCE, and TCE that exceeded the PADEP Statewide Health-based Groundwater Standards (see Table 22). Low levels of 1,1-DCA, 1,1,1-TCA, and chloroform were also detected in some of the groundwater samples collected at the site (see Tables 12.1 and 12.2). The measured concentrations of 1,1-DCA, 1,1,1-TCA, and chloroform, however, were below the PADEP Statewide Health-based Groundwater Standards established for these parameters.

The source for the elevated concentrations of the chlorinated solvents dissolved in the groundwater is unclear, but is believed to be associated with previous spills/releases in the vicinity of the foundation to the former farmhouse. Static water levels measured in the monitoring wells during the investigation indicate that shallow groundwater is flowing in a west-northwest direction. The analytical results for the groundwater samples collected from the monitoring wells and the direction of groundwater flow collectively indicate that the plume of chlorinated solvents contained in the fractured bedrock aquifer is migrating toward the Conestoga River.

Surface Water

The surface water samples collected from the headwater spring and drainage channel to the unnamed stream during the investigation were found to contain 1,1-DCA, 1,1-DCE, cis-1,2-DCE, 1,1,1-TCA, and TCE. The surface water sample collected from the headwater spring (i.e., SW01) was found to contain a concentration of cis-1,2-DCE (630 µg/L) that exceeded the Threshold Screening Value established for this compound at 620 µg/L (see Table 8). The measured concentrations of 1,1-DCA, 1,1-DCE, 1,1,1-TCA, and TCE, however, were all below the established surface water threshold screening values (see Table 8) established for these parameters.

The relatively high concentrations of TCE and cis-1,2-DCE, which were detected in the surface water samples collected from the drainage channel to the unnamed stream near the swimming pool parking lot, suggest that chlorinated solvents are likely being discharged to the Conestoga River.

Sediment

The analytical results for the sediment samples collected during the investigation were found to contain elevated concentrations of acetone and cis-1,2-DCE that exceeded the EqB-based screening values (see Table 22). Relatively high concentrations of TCE were also detected in the sediment samples collected from the headwater spring and the drainage channel to the stream near the swimming pool parking lot. The measured concentrations of TCE at these locations, however, were all below the EqB-based screening value established for this parameter.

The concentrations of cis-1,2-DCE and TCE detected in the sediments at the Conestoga Pines Park site are believed to be related to the local discharge of shallow groundwater to the headwater spring and northern portion of the drainage channel to the unnamed stream. Based upon this supposition, abiotic and biotic transformations that are occurring near the groundwater/surface water interface (i.e., stream bed) may be important in altering TCE to cis-1,2-DCE.

The comparison of the analytical results for the sediment samples to the bulk sediment threshold screening values suggest that the concentrations of organic compounds contained in the sediments at the site may pose a potential risk to organisms residing in the headwater spring and stream channel aquatic habitats. It should be noted that the risk evaluation outlined above is qualitative in nature, being based strictly on a comparison to human health and ecological-based standards.

5.2 Potential Receptors

Background information as well as the findings of the investigation were collectively used to identify the following potential receptors in the vicinity of the site: the headwater spring; the stream channel; the Conestoga River, private and public water supply wells; and public water supply intakes.

Headwater Spring, Stream Channel, and Conestoga River

The headwater spring, the unnamed stream channel, and the Conestoga River are potential receptors for the discharge of surface water and sediments containing elevated concentrations of chlorinated solvents at the Conestoga Pines Park site. Surface water is conveyed in the stream channel from the headwater spring to the confluence point with the Conestoga River, situated along the western edge of the Conestoga Pines Park property. Surface water flow within the Conestoga River is in a south-southwesterly direction toward the Susquehanna River. Surface water samples collected downstream from the headwater spring (approximately 150 feet from the confluence point with the Conestoga River) were found to contain relatively high concentrations of cis-1,2-DCE and TCE (i.e., 46 μg/L and 53 μg/L, respectively). This information suggests that surface water flow from the headwater spring and stream channel may be transporting dissolved concentrations of cis-1,2-DCE and TCE offsite to the Conestoga River.

The headwater spring and stream channel areas are openly accessible to the public. There is a strong possibility that individuals enjoying the amenities of the Conestoga Pines Park site may experience direct contact with the surface water and sediments contained in these areas. Importantly, the organic compounds detected in the surface water and sediment samples collected from the headwater spring and stream channel may pose a potential risk to members of the public who may come in contact with these media at the park.

Public and Private Water Supply Wells and Public Water Intakes

Information provided by the PADEP Bureau of Watershed Management indicates that there are two surface water intakes situated downstream of the Conestoga Pines Park site along the Conestoga River. The closest water supply intake along the Conestoga River situated downstream of the Conestoga Pines Park site is the Lancaster Municipal Water Authority Public filtration plant. This water intake is located approximately 1,200 feet downstream of the confluence point between the unnamed stream at the Conestoga Pines Park site and the Conestoga River. The plant withdraws and treats raw surface water from the Conestoga River that is used as a partial source of potable water for the residents of the City of Lancaster (population of 108,000 people). As mentioned above, relatively high levels of cis-1,2-DCE and TCE were detected in the surface water samples collected from the unnamed stream at the Conestoga Pines Park site. Importantly, it is believed that the unnamed stream may be discharging dissolved concentrations of cis-1,2-DCE and TCE to the Conestoga River upgradient to the water intake for the Lancaster Municipal Water Authority Public filtration plant. Currently, no information is available regarding the concentrations of cis-1,2-DCE and TCE dissolved in the surface water of the Conestoga River at the water intake to the Lancaster Municipal Water Authority Public filtration plant.

The second water supply intake along the Conestoga River situated downstream of the Conestoga Pines Park site is the Safe Harbor Power Corporation filtration plant. This water intake is located along the Conestoga River approximately 10.4 miles southwest of the Conestoga Pines Park site. The plant withdraws and treats raw surface water from the Conestoga River that is used as a source of potable water for the residents of the Safe Harbor, Pennsylvania area (population of 75 people). Due to the relatively large distance from the Conestoga Pines Park, the discharge of water from the unnamed stream at the site containing cis-1,2-DCE and TCE is not expected to impact the quality of water at the intake to the Safe Harbor Power Corporation filtration plant.

Based upon information obtained from the Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geological Survey, Pennsylvania Ground Water Information System (PaGWIS) database, there are no private or public water supply wells situated hydraulically downgradient of the suspected source area for chlorinated solvents at the Conestoga Pines Park site.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based upon the review of available information and the results of the Site Characterization, the following conclusions have been developed.

- The geologic horizons beneath the Conestoga Pines Park site can be segregated into three categories: 1) a shallow soil/overburden interval; 2) a weathered bedrock interval; and 3) a deeper unweathered bedrock interval.

- The points of refusal recorded from the drilling of the MIP and confirmatory borings indicate that the depth to bedrock varies across the site. In general, the top of bedrock was found to vary from less than one foot in depth (i.e., near surface outcrops) to over eighteen feet in depth (near soil boring SB64). The contact between the soil and the upper surface of competent bedrock is abrupt. Differences in the depth to competent bedrock at the site are interpreted to be a result of the differential weathering of the underlying rock materials. The variable depth of bedrock at the site suggests that the soil/bedrock interface may be pinnacled.

- Two groundwater flow systems underlie the Conestoga Pines Park site. A shallow groundwater flow system occurs within the soil, weathered bedrock, and upper portions of the fractured bedrock intervals and can be characterized as a water table aquifer. Groundwater flow within the deeper portions of the fractured bedrock underlying the Conestoga Pines Park site is believed to occur under semiconfined hydraulic conditions, and exhibits a higher hydraulic potential than the shallow water table flow system.

- During the investigation, shallow groundwater flow within the water table aquifer has consistently been in a west-northwesterly direction. This direction of groundwater flow is consistent with local topographic differences in the vicinity of the Conestoga Pines Park site.

- The surface water samples collected from the headwater spring and drainage channel to the unnamed stream during the investigation were found to contain 1,1-DCA, 1,1-DCE, cis-1,2-DCE, 1,1,1-TCA, and TCE. The surface water sample collected from the headwater spring was found to contain a concentration of cis-1,2-DCE that exceeded the Threshold Screening Value established for this compound. The measured concentrations of 1,1-DCA, 1,1-DCE, 1,1,1-TCA, and TCE, however, were all below the established surface water threshold screening values established for these parameters. The relatively high concentrations of TCE and cis-1,2-DCE, which were detected in the surface water samples collected from the drainage channel to the unnamed stream near the swimming pool parking lot, suggest that chlorinated solvents are likely being discharged to the Conestoga River.

- The analytical results for the sediment samples collected during the investigation were found to contain elevated concentrations of acetone and cis-1,2-DCE that exceeded the EqB-based screening values. Relatively high concentrations of TCE were also detected in the sediment samples collected from the headwater spring and the drainage channel to the stream near the swimming pool parking lot. The sediment sampling locations where elevated concentrations of cis-1,2-DCE were detected are all situated hydraulically downgradient to the direction of groundwater flow from the presumed source area of chlorinated solvents (i.e., foundation ton the former farmhouse) at the site. Based upon water level measurements recorded from the onsite monitoring wells, shallow groundwater is believed to be discharging to the headwater spring and northern portion of the drainage channel to the unnamed stream. Abiotic and biotic transformations of TCE are believed to be important in producing more recalcitrant daughter products (i.e., cis-1,2-DCE) in the groundwater underlying the site. This information collectively suggests that the elevated concentrations of cis-1,2-DCE detected in the sediments at the Conestoga Pines Park site may be related to: 1) the local discharge of shallow groundwater to the headwater spring and stream channel; and 2) the subsequent abiotic and biotic transformations of TCE to cis-1,2-DCE.

- The comparison of the analytical results for the sediment samples to the bulk sediment threshold screening values suggest that the concentrations of organic compounds contained in the sediments at the site may pose a potential risk to organisms residing in the headwater spring and stream channel aquatic habitats. It should be noted that the risk evaluation outlined above is qualitative in nature, being based strictly on a comparison to human health and ecological-based standards.

- The MIP testing results show that several anomalies were detected using the PID instrument. In these areas, relatively low readings recorded by the ECD instrument suggest that the PID anomalies may be the result of volatile aromatic organic compounds rather than volatile chlorinated organic compounds. It should be noted that no volatile aromatic or chlorinated organic compounds were detected in the soil samples collected from confirmatory borings drilled in the vicinity of the PID anomalies. The ECD and PID instruments used with the MIP are sensitive to both non-aqueous phase liquids (i.e., NAPL absorbed phase) and soil vapors (i.e., non-absorbed phase). This information collectively suggests that the PID anomalies identified at the site may represent an accumulation of volatile organic soil vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL.

- A relatively large ECD anomaly was identified in the area situated between the foundation to the former farmhouse and the headwater spring. Background information furnished by the PADEP suggests that chlorinated solvents may have been disposed in this area at one time. The relatively low readings recorded by the PID instrument in this area suggest that the ECD anomaly may be the result of volatile chlorinated organic compounds rather than volatile aromatic organic compounds. The analytical results for the soil samples collected from the confirmatory borings drilled in this area show that no volatile aromatic or chlorinated organic compounds were detected in the subsurface materials submitted for analysis. The ECD and PID instruments used with the MIP are sensitive to both NAPL (i.e., absorbed phase) and soil vapors (i.e., non-absorbed phase). This information suggests that source/cause of the high ECD readings in the soils situated between the foundation to the former farmhouse and the headwater spring may be related to an accumulation of volatile organic vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL. If present, separate phase NAPL may lie at a depth greater than 10 feet (bottom depth of confirmatory soil samples). Based upon the direction of groundwater flow and the absence of other ECD anomalies at the site, the source of the chlorinated solvents contained in the shallow groundwater flow system is believed to be situated in the area between the foundation to the former farmhouse and the headwater spring.

- The groundwater samples collected from the monitoring wells during the investigation were found to contain elevated concentrations of carbon tetrachloride, 1,1-DCE, cis-1,2-DCE, and TCE that exceeded the PADEP Statewide Health-based Groundwater Standards. Low levels of 1,1-DCA, 1,1,1-TCA, and chloroform (below the PADEP Statewide Health-based Groundwater Standards) were also detected in some of the groundwater samples collected at the site. The source for the elevated concentrations of the chlorinated solvents dissolved in the groundwater is unclear, but is believed to be associated with previous spills/releases in the vicinity of the foundation to the former farmhouse. Static water levels measured in the monitoring wells during the investigation indicate that shallow groundwater is flowing in a west-northwest direction. The analytical results for the groundwater samples collected from the monitoring wells and the direction of groundwater flow collectively indicate that the plume of chlorinated solvents contained in the fractured bedrock aquifer is migrating toward the Conestoga River.

- A geochemical analysis was performed to evaluate the chemistry of the groundwater contained within the fractured bedrock aquifer underlying the Conestoga Pines Park site. This evaluation shows that the groundwater contained in the shallow bedrock flow system is of the calcium bicarbonate type. The chemical composition of the groundwater at the Conestoga Pines Park site is consistent with published information regarding the characteristics of the groundwater contained in the carbonate rocks underlying the central portion of Lancaster County, Pennsylvania. A geochemical similarity was found to exist between the groundwater contained in monitoring wells MW02, GW9109, and GW9212. This geochemical similarity suggests that the groundwater contained in these monitoring wells may share a common source. It should be noted that the groundwater samples collected from monitoring wells MW02, GW9109, and GW9212 were found to contain the highest concentrations of TCE and cis-1,2-DCE, suggesting that the chlorinated solvents contained in these wells may share a common source.

- The following constituent pathways are deemed to be the greatest concern to human and ecological receptors in the vicinity of the site: the leaching of VOCs from the soils to the underlying groundwater; the inflow of shallow groundwater containing elevated concentrations of chlorinated solvents to the headwater spring and stream channel; the potential offsite migration of chlorinated solvents contained in the surface water and sediments; and the potential off-site migration of the groundwater containing chlorinated solvents.

6.2 Recommendations

The primary objective of Site Characterization was to evaluate the Conestoga Pines Park from an environmental standpoint with respect to characterizing and identifying the potential environmental concerns at the site. The recommendations that follow stem from the conclusions presented in Section 6.1.

1. The results of the MIP investigation indicate that a large ECD anomaly occurs in the area situated between the foundation to the former farmhouse and the headwater spring. The analytical results for the soil samples collected from the confirmatory borings drilled in the vicinity of the foundation to the former farmhouse show that no aromatic or chlorinated VOCs were detected in the subsurface materials submitted for analysis. This information suggests that source/cause of the high ECD readings in the soils situated between the foundation to the former farmhouse and the headwater spring may be related to an accumulation of volatile organic vapors contained in the pore spaces of the subsurface materials rather than absorbed NAPL. If present, separate phase NAPL may lie at a depth greater than 10 feet (bottom depth of confirmatory soil samples). To determine whether or not the subsurface materials underlying the foundation to the former farmhouse are serving as the source for the chlorinated solvents detected in the groundwater at the site, Baker recommends that the PADEP consider drilling six additional soil borings in this area. Because the confirmatory borings were terminated at relatively shallow depths (i.e., 8 to 10 feet, based upon refusal), Baker recommends that the supplementary soil borings be drilled using a hollow-stem auger drilling rig. Greater depths of penetration should be obtained using this drilling technology. To determine whether or not the subsurface materials underlying this area contain chlorinated solvents, the soil samples should be collected from the interval situated between 10 feet and the top of bedrock. These soil samples should be analyzed for TCL VOCs. The results of this subsequent drilling program will provide information regarding the lateral and vertical extent of the impacted areas for focusing potential future remedial efforts (if deemed necessary).

2. Based upon the results of the supplemental soil boring investigation, Baker recommends that the PADEP consider installing one additional upgradient monitoring well (MW03) at the site, to confirm the location of the source area for chlorinated solvents dissolved in the groundwater. This upgradient monitoring wells should be drilled along the east side of the foundation to the former farmhouse.

3. To further assess the concentrations of chlorinated solvents contained in the fractured bedrock aquifer underlying the Conestoga Pines Park site, Baker recommends that the PADEP consider collecting one additional round of the groundwater samples from the monitoring well network, following the installation of the additional upgradient monitoring well (MW03). The groundwater samples collected from the monitoring wells during this phase of the investigation should be analyzed for TCL VOCs.

4. Elevated concentrations of TCE and cis-1,2-DCE were detected in the surface water, sediment, and groundwater samples collected at the site. The headwater spring and stream channel areas are openly accessible to the public. There is a strong possibility

that individuals enjoying the amenities of the Conestoga Pines Park site may experience direct contact with the surface water and sediments contained in these areas. Based on this information, Baker recommends that the PADEP provide the Lancaster County Parks and Recreation Department with a copy of this report, as well as discussing the need to post signs at the park to alert the general public of the water quality problems. In addition, Baker further recommends that the PADEP consider performing a risk assessment of both human and ecological receptors at the site. The results of the risk assessment will provide information to that can be used to determine if remedial action is warranted for the chlorinated solvents contained in the surface water, sediments, and groundwater at the site.

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TABLES

TABLE 1.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF HISTORICAL SAMPLING RESULTS
SURFACE WATER SAMPLES

LOCATION	SAMPLE DATE	Acetone	Carbon Tetrachloride	Chloroform	1,1-DCA	1,2-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1,1-TCA	1,1,2-TCA	TCE	PCE
Headwater Spring	5/13/92	—	**11**	6	25	—	**35**	**900**	—	38	—	**1200**	3.2
	6/6/92	—	**7.2**	4.7	20.5	2	**28.5**	**770**	—	65	1.0	**820**	3.0
	4/13/93	—	**10**	5.9	21.9	—	**30**	**654.9**	—	72.1	—	**810.4**	3.3
	5/19/93	—	**8.3**	6	20.7	—	**25**	**631.1**	—	59	—	**816.1**	3
	4/25/94	—	**9.0**	4.4	13.3	0.8	**26**	**570**	—	40	0.6	**690**	2.5
	7/11/95	6	**12**	4	10	—	**8**	**310**	—	78	—	**350**	2
	5/6/96	—	—	58.2	—	—		**372**	—	26.6	—	**498**	—
	12/10/96	—	4.0	—	8.5	—	**16**	**390**	4.7	22	—	**440**	—
	10/13/99	—	—	—	—	—		**548**	—	32	—	**580**	—
	1/14/00	—	—	—	13	—	**18**	**510**	—	23	—	**450**	—
Upwelling at Bridge to Pool	6/16/92	—	2.0	1.3	2.0	—	3.2	47	—	7.7	—	**80**	—
	4/13/93	—	—	—	—	—	—	25	—	4.4	—	**46.4**	—
	7/11/95	—	—	—	—	—	—	44	—	—	—	**79**	—
	5/6/96	—	—	7	—	—	—	19.1	—	2.4	—	**35.4**	—
	12/10/96	—	—	—	—	—	—	15	—	—	—	**28**	—
	4/25/94	—	0.7	0.7	0.8	—	1.3	17.2	—	2.5	—	**32**	—
Granite Spring	4/13/93	—	—	—	—	—	—	26.9	—	3.7	—	**44**	—
	4/25/94	—	—	—	—	—	0.5	7.4	—	1	—	**13.6**	—
	7/11/95	—	—	—	—	—	—	27	—		—	**48**	—
	5/6/96	—	—	—	—	—	—	7.8	—	0.83	—	**10**	—
	12/10/96	—	—	—	0.52	—	0.59	12	—	1.4	—	**17**	—
Confluence w/Conestoga River	5/13/92	—	—	—	—	—	—	18	—	—	—	**21**	—
	10/13/99	—	—	—	—	—	—	16.7	—	—	—	**17.8**	—
	1/14/00	—	—	—	0.29	—	0.34	9.4	—	0.52	—	**11**	—
SW Tributary Bridge to Pool	6/16/92	—	—	—	—	—	—	12	—	0.9	—	**11**	—
	4/13/93	—	—	—	—	—	—	49	—	4.3	—	**57.7**	—
	7/11/95	—	—	—	—	—	—	22	—	—	—	**19**	—
Stream at Bridge to CCC Camp	10/13/99	—	—	—	—	—	—	59.4	—	—	—	**53.8**	—
	1/14/00	—	—	—	—	—	—	24	—	—	—	**21**	—
Spring Below Bridge to Pool	10/13/99	—	—	—	—	—	—	31.5	—	—	—	**61.3**	—
	1/14/00	—	—	—	—	—	—	32	—	—	—	**50**	—
Stream Near GE Wells	5/13/92	—	—	2.8	11	—	**10**	**410**	—	**243.2**	—	**460**	—
Fracture Spring	12/10/96	—	—	9.5	—	—	—	—	—	—	—	2.5	—
MSC[1]		10,000	5	100	110	5	7	70	100	200	5	5	5
UNITS		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L

Shaded areas indicate that the measured concentration of the parameter exceeded the regulatory standard.

1 - MSC: Pennsylvania Department of Environmental Protection (PADEP) Non-residential Medium Specific Concentration (MSC) Standards for organic regulated substances in groundwater, listed in Title 25, PA Code, Chapter 250, *"Administration of the Land Recycling Program"* regulations, Appendix A, Table 1, dated November 24, 2001.

TABLE 1.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF HISTORICAL SAMPLING RESULTS
MONITORING WELLS

MONITORING WELL	SAMPLE DATE	Benzene	Carbon Tetrachloride	Chloroform	1,1-DCA	1,2-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1,1-TCA	1,1,2-TCA	TCE	PCE
MW9109	7/16/91	—	—	—	—	—	—	—	—	—	—	4	—
MW9110	7/3/91	—	—	—	—	—	—	—	—	—	—	**43**	—
	4/25/94	—	—	—	0.5	—	0.6	8.6	—	0.7	—	**16.6**	—
MW9211	4/10/92	—	—	—	—	—	—	**300**	—	—	—	**570**	—
MW9212	4/10/92	—	—	—	18	—	**20**	**560**	—	49	—	**680**	—
	4/25/94	1.2	3.0	4.0	12.9	—	18.3	**450**	—	37	0.7	**510**	1.5
MSC[1]		5	5	100	110	5	7	70	100	200	5	5	5
UNITS		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L

Shaded areas indicate that the measured concentration of the parameter exceeded the regulatory standard.

[1] - MSC: Pennsylvania Department of Environmental Protection (PADEP) Non-residential Medium Specific Concentration (MSC) Standards for organic regulated substances in groundwater, listed in Title 25, PA Code, Chapter 250, *"Administration of the Land Recycling Program"* regulations, Appendix A, Table 1, dated November 24, 2001.

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TABLE 4
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF PRE-SAMPLING PARAMETERS AND WELL PURGING DATA COLLECTION OF GROUNDWATER SAMPLES ON NOVEMBER 26 AND 27, 2001

MONITORING WELL	TD[1] (Feet)	SWL[2] (Feet)	Well Diameter (Inches)	MINIMUM[3] PURGE VOLUME (Gallons)	TOTAL[4] PURGE VOLUME (Gallons)	Final Pre-sampling Parameters		
						TEMPERATURE IN DEGREES "C"	pH Standard Units	SPECIFIC CONDUCTANCE AT 25 C us/cm
MW01	48.90	27.65	6	93.71	100	13.9	6.69	644
MW02	34.57	11.24	6	102.89	105	13.7	6.97	682
GW 9109	127.75	39.78	8	688.81	300[5]	13.7	6.76	713
GW 9110	135.00	7.95	8	994.80	340[5]	13.1	6.68	615
GW 9211	204.00	9.94	8	1,519.49	510[5]	13.1	6.82	591
GW 9212	23.90	10.25	4	27.44	40	14.1	6.62	714

1 = (TD) - Total Depth of Well, measured from Top of Casing (TOC).
2 = (SWL) - Static Water Level, measured from TOC.
3 = (Purge Volume) - Calculated amount of water in gallons to be removed before sampling. Approximately three (3) well volumes.
4 = (Total Volume Purged) - Actual amount of water purged from well (in Gallons), prior to sampling.
5 = A minimum of one well volume was purged from wells MW-GW9109, MW-GW9110 and MW-GW9211 due to the large volumes of purge water required. Pre-sampling parameters were stable prior to sampling.

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PARAMETERS	ANALYTCAL METHOD		TORING WELL UNDWATER *UPLICATE*	IDW USED CARBON FILTER MEDIA	IDW SOIL/ROCK COMPOSITE SAMPLES
	Soil/Solid Waste	Water/W			
TCL Volatiles (VOC)	SW846 8260B/5035[1]	SW84	1	1	1
Water Chemistry Parameters					
Alkalinity		EPA	1		
Carbonate		EPA	1		
Bicarbonate		EPA	1		
Sulfate		EPA	1		
Chloride		EPA	1		
Total Dissolved Solids (TDS)		EPA	1		
Total Organic Carbon (TOC)		EPA			
Calcium, total		EPA	1		
Magnesium, total		EPA	1		
Potassium, total		EPA	1		
Sodium, total		EPA	1		
TCLP Volatiles & Metals	1311			1	1
RCRA Characteristics					
Ignitability	SW846 7.1			1	1
Reactive Cyanide	SW846 7.3.3			1	1
Reactive Sulfide	SW846 7.3.4			1	1
Corrosivity	SW846 9045C			1	1
Field Blank					
Rinsate					

One trip blank accompanied each cooler containing samples for v

1 - Solid waste samples for volatile organic compound (VOC) ana

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TABLE 6
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF STATIC WATER LEVEL MEASUREMENTS AND GROUNDWATER ELEVATIONS

MONITORING WELL	POINT OF REFERENCE	DATE OF MEASUREMENT		
		11/26/01	12/21/01	1/28/02
MW01	TOC*	997.70	997.70	997.70
	SWL^	27.65	27.59	26.55
	GW ELEVATION	970.05	970.11	971.15
MW02	TOC*	980.95	980.95	980.95
	SWL^	11.24	11.19	10.28
	GW ELEVATION	969.71	969.76	970.67
GW9109	TOC*	962.24	962.24	962.24
	SWL^	39.78	40.01	39.73
	GW ELEVATION	922.46	922.23	922.51
GW9110	TOC*	938.14	938.14	938.14
	SWL^	7.95	8.03	7.80
	GW ELEVATION	930.19	930.11	930.34
GW9211	TOC*	975.51	975.51	975.51
	SWL^	9.94	9.96	9.26
	GW ELEVATION	965.57	965.55	966.25
GW9212	TOC*	975.53	975.53	975.53
	SWL^	10.25	10.20	9.48
	GW ELEVATION	965.28	965.33	966.05

* - Top of Casing (TOC) surveyed on November 26, 2001.

^ - Static Water Level (SWL) measured in feet below Top of Casing.

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TABLE 7
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF MONITORING WELL CONSTRUCTION DATA

WELL	TOTAL DEPTH* (Feet)	DEPTH TO BEDROCK (Feet)	CASING MATERIAL		WELL CONSTRUCTION	ESTIMATED YIELD (GPM)	WATER-BEARING ZONE DEPTHS (Feet)
			Interval (Feet)	Type			
MW01	48.9	6	0 - 21	Steel	Open Bedrock	10	32
MW02	34.6	8	0 - 25	Steel	Open Bedrock	+20	32
GW9109	127.8	Unknown	Unknown	Steel	Open Bedrock	10	Unknown
GW9110	135	Unknown	Unknown	Steel	Open Bedrock	10	Unknown
GW9211	204	Unknown	Unknown	Steel	Open Bedrock	10	Unknown
GW9212	23.9	Unknown	Unknown	Steel	Open Bedrock	10	Unknown

* Total depth measured from ground surface.

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TABLE 8
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF SURFACE WATER SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-102901-SW01		077-102901-SW03		077-102901-SW03Dup		**Surface Water Threshold Screening Values^a**	**Units**
Sample Type	Surface Water		Surface Water		Surface Water			
Sample Date	10/29/01		10/29/01		10/29/01			
Location	Headwaters		Bridge Near Pool		Bridge Near Pool			
Compound		DQ		DQ		DQ		
Acetone	20	U	20	U	20	U	86,000	ug/l
Benzene	5	U	5	U	5	U	130	ug/l
Bromodichloromethane	5	U	5	U	5	U	—	ug/l
Bromomethane	5	U	5	U	5	U	110	ug/l
Carbon disulfide	5	U	5	U	5	U	—	ug/l
Carbon tetrachloride	5	U	5	U	5	U	560	ug/l
Chlorobenzene	5	U	5	U	5	U	240	ug/l
Chloroethane	5	U	5	U	5	U	—	ug/l
Chloroform	5	U	5	U	5	U	390	ug/l
Dibromochloromethane	5	U	5	U	5	U	—	ug/l
1,1-Dichloroethane	20		5	U	5	U	740^b	ug/l
1,2-Dichloroethane	5	U	5	U	5	U	3,100	ug/l
1,1-Dichloroethylene	19		5	U	5	U	1,500	ug/l
cis-1,2-Dichloroethylene	**630**		46		46		620^b	ug/l
trans-1,2-Dichloroethylene	5	U	5	U	5	U	—	ug/l
Dichloromethane (Methylene chloride)	5	U	5	U	5	U	2,400	ug/l
1,2-Dichloropropane	5	U	5	U	5	U	2,200	ug/l
cis-1,3-Dichloropropene	5	U	5	U	5	U	—	ug/l
trans-1,3-Dichloropropene	5	U	5	U	5	U	—	ug/l
Ethylbenzene	5	U	5	U	5	U	580	ug/l
2-Hexanone	10	U	10	U	10	U	4,300	ug/l
Methyl Chloride (Chloromethane)	5	U	5	U	5	U	5,500	ug/l
Methyl Ethyl Ketone (2-Butanone)	10	U	10	U	10	U	32,000	ug/l
4-Methyl-2-pentanone	10	U	10	U	10	U	5,000	ug/l
Styrene	5	U	5	U	5	U	—	ug/l
1,1,2,2-Tetrachloroethane	5	U	5	U	5	U	210	ug/l
Tetrachloroethylene (PCE)	5	U	5	U	5	U	140	ug/l
Toluene	5	U	5	U	5	U	330	ug/l
Tribromomethane (Bromoform)	5	U	5	U	5	U	370	ug/l
1,1,1-Trichloroethane	21		5	U	5	U	610	ug/l
1,1,2-Trichloroethane	5	U	5	U	5	U	680	ug/l
Trichloroethylene (TCE)	320		51		53		450	ug/l
Vinyl chloride	5	U	5	U	5	U	—	ug/l
Xylenes (total)	5	U	5	U	5	U	210	ug/l

"U" - Indicates compound analyzed but not detected.

a - Surface Water Threshold Screening Values represent the "Criteria Continuous Concentration" listed in the Pennsylvania Department of Environmental Protection (PADEP), Title 25, Pennsylvania Code, Chapter 16, "Water Quality Toxics Management Strategy" regulations, Appendix A, Table 1, dated November 18, 2000.

b - Standards for 1,1-Dichloroethane and cis-1,2-Dichloroethylene represent Great Lakes Basin Tier II (secondary chronic values) developed by the Indiana Department of Environmental Management (IDEM).

TABLE 9
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF SEDIMENT SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-102901-SD01		077-102901-SD02		077-102901-SD03		077-102901-SD03D		Equilibrium Partitioning-Based Sediment Threshold Screening Values^a	Units
Sample Type	Sediment		Sediment		Sediment		Sediment			
Sample Date	10/29/01		10/29/01		10/29/01		10/29/01			
Location	Headwaters		Granite Spring		Bridge Near Pool		Bridge Near Pool			
Compound		DQ		DQ		DQ		DQ		
Acetone	57		**830**		78		62		266.6	ug/kg
Benzene	8	U	34	U	10	U	8	U	75.4	ug/kg
Bromodichloromethane	8	U	34	U	10	U	8	U	—	ug/kg
Bromomethane	8	U	34	U	10	U	8	U	—	ug/kg
Carbon disulfide	8	U	**34**	U	10	U	8	U	26.7	ug/kg
Carbon tetrachloride	8	U	34	U	10	U	8	U	896	ug/kg
Chlorobenzene	8	U	34	U	10	U	8	U	480	ug/kg
Chloroethane	8	U	34	U	10	U	8	U	—	ug/kg
Chloroform	8	U	34	U	10	U	8	U	218.4	ug/kg
Dibromochloromethane	8	U	34	U	10	U	8	U	—	ug/kg
1,1-Dichloroethane	8	U	34	U	10	U	8	U	—	ug/kg
1,2-Dichloroethane	8	U	34	U	10	U	8	U	1,178	ug/kg
1,1-Dichloroethylene	8	U	34	U	10	U	8	U	975	ug/kg
cis-1,2-Dichloroethylene	**250**		**34**	U	**36**		**27**		15.3	ug/kg
trans-1,2-Dichloroethylene	8	U	34	U	10	U	8	U	263.2	ug/kg
Dichloromethane (Methylene chloride)	8	U	34	U	10	U	8	U	384	ug/kg
1,2-Dichloropropane	8	U	34	U	10	U	8	U	1,034	ug/kg
cis-1,3-Dichloropropene	8	U	34	U	10	U	8	U	—	ug/kg
trans-1,3-Dichloropropene	8	U	34	U	10	U	8	U	—	ug/kg
Ethylbenzene	8	U	34	U	10	U	8	U	1,276	ug/kg
2-Hexanone	16	U	67	U	19	U	16	U	—	ug/kg
Methyl Chloride (Chloromethane)	8	U	34	U	10	U	8	U	330	ug/kg
Methyl Ethyl Ketone (2-Butanone)	16	U	67	U	19	U	16	U	10,240	ug/kg
4-Methyl-2-pentanone	16	U	67	U	19	U	16	U	850	ug/kg
Styrene	8	U	34	U	10	U	8	U	—	ug/kg
1,1,2,2-Tetrachloroethane	8	U	34	U	10	U	8	U	165.9	ug/kg
Tetrachloroethylene (PCE)	8	U	34	U	10	U	8	U	420	ug/kg
Toluene	8	U	34	U	10	U	8	U	429	ug/kg
Tribromomethane (Bromoform)	8	U	34	U	10	U	8	U	—	ug/kg
1,1,1-Trichloroethane	8	U	34	U	10	U	8	U	610	ug/kg
1,1,2-Trichloroethane	8	U	34	U	10	U	8	U	516.8	ug/kg
Trichloroethylene (TCE)	320		34	U	110		80		418.5	ug/kg
Vinyl chloride	8	U	34	U	10	U	8	U	—	ug/kg
Xylenes (total)	8	U	34	U	10	U	8	U	735	ug/kg
Total Organic Carbon (TOC)	20,400		190,000		39,300		36,100		—	mg/kg

Shaded areas indicate that the measured level of the parameter exceeded the established Threshold Sreening Value.
Results in bold type indicate that the instrument detection limit exceeded the Threshold Sreening Value established for the parameter.
"U" - Indicates compound analyzed but not detected.
a - Equilibrium Partitioning-based Sediment Threshold Screening Values calculated in accordance with procedures and guidelines outlined in Appendix E.

Job No. 24300-077-0000 Subtask 08000

TABLE 10.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF SOIL BORING SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-111401-S-SB040506		077-111501-S-SB050608		077-111501-S-SB050608Dup		077-111501-S-SB070204		PADEP ACT 2 Standards 0' - 2' Direct Contact Standard (NR)[a]	PADEP ACT 2 Standards Soil to Groundwater Pathway (NR)[b]	Units
Sample Type	Soil		Soil		Soil		Soil				
Sample Date	11/14/01		11/15/01		11/15/01		11/15/01				
Sample Depth (ft.)											
Compound		DQ		DQ		DQ		DQ			
Acetone	65		130		23	U	180		10,000,000	1,000,000	ug/kg
Benzene	6	U	6	U	6	U	6	U	210,000	500	ug/kg
Bromodichloromethane	6	U	6	U	6	U	6	U	45,000	10,000	ug/kg
Bromomethane	6	U	6	U	6	U	6	U	270,000	1,000	ug/kg
Carbon disulfide	6	U	6	U	6	U	6	U	10,000,000	410,000	ug/kg
Carbon tetrachloride	6	U	6	U	6	U	6	U	110,000	500	ug/kg
Chlorobenzene	6	U	6	U	6	U	6	U	10,000,000	10,000	ug/kg
Chloroethane	6	U	6	U	6	U	6	U	10,000,000	90,000	ug/kg
Chloroform	6	U	6	U	6	U	6	U	17,000	10,000	ug/kg
Dibromochloromethane	6	U	6	U	6	U	6	U	61,000	10,000	ug/kg
1,1-Dichloroethane	6	U	6	U	6	U	6	U	1,000,000	11,000	ug/kg
1,2-Dichloroethane	6	U	6	U	6	U	6	U	63,000	500	ug/kg
1,1-Dichloroethylene	6	U	6	U	6	U	6	U	33,000	700	ug/kg
cis-1,2-Dichloroethylene	6	U	6	U	6	U	6	U	1,900,000	7,000	ug/kg
trans-1,2-Dichloroethylene	6	U	6	U	6	U	6	U	3,700,000	10,000	ug/kg
Dichloromethane (Methylene chloride)	6	U	6	U	6	U	6	U	3,500,000	500	ug/kg
1,2-Dichloropropane	6	U	6	U	6	U	6	U	160,000	500	ug/kg
cis-1,3-Dichloropropene	6	U	6	U	6	U	6	U	410,000[c]	2,600[c]	ug/kg
trans-1,3-Dichloropropene	6	U	6	U	6	U	6	U	410,000[c]	2,600[c]	ug/kg
Ethyl benzene	6	U	6	U	6	U	6	U	10,000,000	70,000	ug/kg
2-Hexanone	12	U	11	U	12	U	12	U	–	–	ug/kg
Methyl Chloride (Chloromethane)	6	U	6	U	6	U	6	U	920,000	300	ug/kg
Methyl Ethyl Ketone (2-Butanone)	12	U	20		12	U	16		10,000,000	580,000	ug/kg
4-Methyl-2-pentanone	12	U	11	U	12	U	12	U	4,300,000	41,000	ug/kg
Styrene	6	U	6	U	6	U	6	U	10,000,000	10,000	ug/kg
1,1,2,2-Tetrachloroethane	6	U	6	U	6	U	6	U	28,000	30	ug/kg
Tetrachloroethylene (PCE)	6	U	6	U	6	U	6	U	1,500,000	500	ug/kg
Tribromomethane (Bromoform)	6	U	6	U	6	U	6	U	1,500,000	10,000	ug/kg
Toluene	6	U	6	U	6	U	6	U	10,000,000	100,000	ug/kg
1,1,1-Trichloroethane	6	U	6	U	6	U	6	U	10,000,000	20,000	ug/kg
1,1,2-Trichloroethane	6	U	6	U	6	U	6	U	100,000	500	ug/kg
Trichloroethylene (TCE)	6	U	6	U	6	U	6	U	970,000	500	ug/kg
Vinyl chloride	6	U	6	U	6	U	6	U	53,000	200	ug/kg
Xylenes (total)	6	U	6	U	6	U	6	U	10,000,000	1,000,000	ug/kg

"U" - Indicates compound analyzed but not detected.

a - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Soil - Direct Contact Numeric Values, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 3A., dated November 24, 2001.

b - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Soil - Soil to Groundwater Numeric Values, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 3B., dated November 24, 2001.

c - MSC value presented is for 1,3-Dichloropropene.

TABLE 10.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF SOIL BORING SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-111501-S-SB100204		077-111501-S-SB101012		077-111501-S-SB140608		077-111501-S-SB290406		PADEP ACT 2 Standards 0' - 2' Direct Contact Standard (NR)[a]	PADEP ACT 2 Standards Soil to Groundwater Pathway (NR)[b]	Units
Sample Type	Soil		Soil		Soil		Soil				
Sample Date	11/15/01		11/15/01		11/15/01		11/15/01				
Sample Depth (ft.)											
Compound		DQ		DQ		DQ		DQ			
Acetone	130		47		37		110		10,000,000	1,000,000	ug/kg
Benzene	5	U	7	U	5	U	6	U	210,000	500	ug/kg
Bromodichloromethane	5	U	7	U	5	U	6	U	45,000	10,000	ug/kg
Bromomethane	5	U	7	U	5	U	6	U	270,000	1,000	ug/kg
Carbon disulfide	5	U	7	U	5	U	6	U	10,000,000	410,000	ug/kg
Carbon tetrachloride	5	U	7	U	5	U	6	U	110,000	500	ug/kg
Chlorobenzene	5	U	7	U	5	U	6	U	10,000,000	10,000	ug/kg
Chloroethane	5	U	7	U	5	U	6	U	10,000,000	90,000	ug/kg
Chloroform	5	U	7	U	5	U	6	U	17,000	10,000	ug/kg
Dibromochloromethane	5	U	7	U	5	U	6	U	61,000	10,000	ug/kg
1,1-Dichloroethane	5	U	7	U	5	U	6	U	1,000,000	11,000	ug/kg
1,2-Dichloroethane	5	U	7	U	5	U	6	U	63,000	500	ug/kg
1,1-Dichloroethylene	5	U	7	U	5	U	6	U	33,000	700	ug/kg
cis-1,2-Dichloroethylene	5	U	7	U	5	U	6	U	1,900,000	7,000	ug/kg
trans-1,2-Dichloroethylene	5	U	7	U	5	U	6	U	3,700,000	10,000	ug/kg
Dichloromethane (Methylene chloride)	5	U	7	U	5	U	6	U	3,500,000	500	ug/kg
1,2-Dichloropropane	5	U	7	U	5	U	6	U	160,000	500	ug/kg
cis-1,3-Dichloropropene	5	U	7	U	5	U	6	U	410,000[c]	2,600[c]	ug/kg
trans-1,3-Dichloropropene	5	U	7	U	5	U	6	U	410,000[c]	2,600[c]	ug/kg
Ethyl benzene	5	U	7	U	5	U	6	U	10,000,000	70,000	ug/kg
2-Hexanone	11	U	13	U	11	U	11	U	–	–	ug/kg
Methyl Chloride (Chloromethane)	5	U	7	U	5	U	6	U	920,000	300	ug/kg
Methyl Ethyl Ketone (2-Butanone)	11	U	11	U	11	U	11	U	10,000,000	580,000	ug/kg
4-Methyl-2-pentanone	11	U	13	U	11	U	11	U	4,300,000	41,000	ug/kg
Styrene	5	U	7	U	5	U	6	U	10,000,000	10,000	ug/kg
1,1,2,2-Tetrachloroethane	5	U	7	U	5	U	6	U	28,000	30	ug/kg
Tetrachloroethylene (PCE)	5	U	7	U	5	U	6	U	1,500,000	500	ug/kg
Toluene	5	U	7	U	5	U	6	U	10,000,000	100,000	ug/kg
Tribromomethane (Bromoform)	5	U	7	U	5	U	6	U	1,500,000	10,000	ug/kg
1,1,1-Trichloroethane	5	U	7	U	5	U	6	U	10,000,000	20,000	ug/kg
1,1,2-Trichloroethane	5	U	7	U	5	U	6	U	100,000	500	ug/kg
Trichloroethylene (TCE)	5	U	7	U	5	U	6	U	970,000	500	ug/kg
Vinyl chloride	5	U	7	U	5	U	6	U	53,000	200	ug/kg
Xylenes (total)	5	U	7	U	5	U	6	U	10,000,000	1,000,000	ug/kg

"U" - Indicates compound analyzed but not detected.

a - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Soil - Direct Contact Numeric Values, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 3A., dated November 24, 2001.

b - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Soil - Soil to Groundwater Numeric Values, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 3B., dated November 24, 2001.

c - MSC value presented is for 1,3-Dichloropropene.

TABLE 10.3
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF SOIL BORING SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-111401-S-SB530506		077-111501-S-SB640810		077-111501-S-SB670810		PADEP ACT 2 Standards 0' - 2' Direct Contact Standard (NR)^a	PADEP ACT 2 Standards Soil to Groundwater Pathway (NR)^b	Units
Sample Type	Soil		Soil		Soil				
Sample Date	11/14/01		11/15/01		11/15/01				
Sample Depth (ft.)									
Compound		DQ		DQ		DQ			
Acetone	140		28	U	20	U	10,000,000	1,000,000	ug/kg
Benzene	6	U	7	U	5	U	210,000	500	ug/kg
Bromodichloromethane	6	U	7	U	5	U	45,000	10,000	ug/kg
Bromomethane	6	U	7	U	5	U	270,000	1,000	ug/kg
Carbon disulfide	6	U	7	U	5	U	10,000,000	410,000	ug/kg
Carbon tetrachloride	6	U	7	U	5	U	110,000	500	ug/kg
Chlorobenzene	6	U	7	U	5	U	10,000,000	10,000	ug/kg
Chloroethane	6	U	7	U	5	U	10,000,000	90,000	ug/kg
Chloroform	6	U	7	U	5	U	17,000	10,000	ug/kg
Dibromochloromethane	6	U	7	U	5	U	61,000	10,000	ug/kg
1,1-Dichloroethane	6	U	7	U	5	U	1,000,000	11,000	ug/kg
1,2-Dichloroethane	6	U	7	U	5	U	63,000	500	ug/kg
1,1-Dichloroethylene	6	U	7	U	5	U	33,000	700	ug/kg
cis-1,2-Dichloroethylene	6	U	7	U	5	U	1,900,000	7,000	ug/kg
trans-1,2-Dichloroethylene	6	U	7	U	5	U	3,700,000	10,000	ug/kg
Dichloromethane (Methylene chloride)	6	U	7	U	5	U	3,500,000	500	ug/kg
1,2-Dichloropropane	6	U	7	U	5	U	160,000	500	ug/kg
cis-1,3-Dichloropropene	6	U	7	U	5	U	410,000^c	2,600^c	ug/kg
trans-1,3-Dichloropropene	6	U	7	U	5	U	410,000^c	2,600^c	ug/kg
Ethyl benzene	6	U	7	U	5	U	10,000,000	70,000	ug/kg
2-Hexanone	13	U	14	U	10	U	–	–	ug/kg
Methyl Chloride (Chloromethane)	6	U	7	U	5	U	920,000	300	ug/kg
Methyl Ethyl Ketone (2-Butanone)	15		14	U	10	U	10,000,000	580,000	ug/kg
4-Methyl-2-pentanone	13	U	14	U	10	U	4,300,000	41,000	ug/kg
Styrene	6	U	7	U	5	U	10,000,000	10,000	ug/kg
1,1,2,2-Tetrachloroethane	6	U	7	U	5	U	28,000	30	ug/kg
Tetrachloroethylene (PCE)	6	U	7	U	5	U	1,500,000	500	ug/kg
Toluene	6	U	7	U	5	U	10,000,000	100,000	ug/kg
Tribromomethane (Bromoform)	6	U	7	U	5	U	1,500,000	10,000	ug/kg
1,1,1-Trichloroethane	6	U	7	U	5	U	10,000,000	20,000	ug/kg
1,1,2-Trichloroethane	6	U	7	U	5	U	100,000	500	ug/kg
Trichloroethylene (TCE)	6	U	7	U	5	U	970,000	500	ug/kg
Vinyl chloride	6	U	7	U	5	U	53,000	200	ug/kg
Xylenes (total)	6	U	7	U	5	U	10,000,000	1,000,000	ug/kg

"U" - Indicates compound analyzed but not detected.

a - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Soil - Direct Contact Numeric Values, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 3A., dated November 24, 2001.

b - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Soil - Soil to Groundwater Numeric Values, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 3B., dated November 24, 2001.

c - MSC value presented is for 1,3-Dichloropropene.

TABLE 11.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF QA/QC SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	Trip Blank		Trip Blank		Field Blank		Rinsate Blank		Trip Blank		**Units**
Sample Type	Water		Water		Water		Water		Water		
Sample Date	10/29/01		11/14/01		11/15/01		11/15/01		11/15/01		
Compound		DQ		DQ		DQ		DQ		DQ	
Acetone	20	U	20	U	20	U	20	U	20	U	ug/l
Benzene	5	U	5	U	5	U	5	U	5	U	ug/l
Bromodichloromethane	5	U	5	U	5	U	5	U	5	U	ug/l
Bromomethane	5	U	5	U	5	U	5	U	5	U	ug/l
Carbon disulfide	5	U	5	U	5	U	5	U	5	U	ug/l
Carbon tetrachloride	5	U	5	U	5	U	5	U	5	U	ug/l
Chlorobenzene	5	U	5	U	5	U	5	U	5	U	ug/l
Chloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
Chloroform	5	U	5	U	5	U	5	U	5	U	ug/l
Dibromochloromethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,1-Dichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,2-Dichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,1-Dichloroethylene	5	U	5	U	5	U	5	U	5	U	ug/l
cis-1,2-Dichloroethylene	5	U	5	U	5	U	5	U	5	U	ug/l
trans-1,2-Dichloroethylene	5	U	5	U	5	U	5	U	5	U	ug/l
Dichlormethane (Methylene chloride)	5	U	5	U	5	U	5	U	5	U	ug/l
1,2-Dichloropropane	5	U	5	U	5	U	5	U	5	U	ug/l
cis-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U	ug/l
trans-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U	ug/l
Ethylbenzene	5	U	5	U	5	U	5	U	5	U	ug/l
2-Hexanone	10	U	10	U	10	U	10	U	10	U	ug/l
Methyl Chloride (Chloromethane)	5	U	5	U	5	U	5	U	5	U	ug/l
Methyl Ethyl Ketone (2-Butanone)	10	U	10	U	10	U	10	U	10	U	ug/l
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	ug/l
Styrene	5	U	5	U	5	U	5	U	5	U	ug/l
1,1,2,2-Tetrachloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
Tetrachloroethylene (PCE)	5	U	5	U	5	U	5	U	5	U	ug/l
Toluene	5	U	5	U	5	U	5	U	5	U	ug/l
Tribromomethane (Bromoform)	5	U	5	U	5	U	5	U	5	U	ug/l
1,1,1-Trichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,1,2-Trichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
Trichloroethylene (TCE)	5	U	5	U	5	U	5	U	5	U	ug/l
Vinyl chloride	5	U	5	U	5	U	5	U	5	U	ug/l
Xylene (Total)	5	U	5	U	5	U	5	U	5	U	ug/l

"U" - Indicates compound analyzed but not detected.

TABLE 11.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF QA/QC SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	Trip Blank		Field Blank		Equipment Blank		Trip Blank		Trip Blank		Units
Sample Type	Water		Water		Water		Water		Water		
Sample Date	10/26/01		11/27/01		11/27/01		11/27/01		11/29/01		
Compound		DQ		DQ		DQ		DQ		DQ	
Acetone	20	U	20	U	20	U	20	U	20	U	ug/l
Benzene	5	U	5	U	5	U	5	U	5	U	ug/l
Bromodichloromethane	5	U	5	U	5	U	5	U	5	U	ug/l
Bromomethane	5	U	5	U	5	U	5	U	5	U	ug/l
Carbon disulfide	5	U	5	U	5	U	5	U	5	U	ug/l
Carbon tetrachloride	5	U	5	U	5	U	5	U	5	U	ug/l
Chlorobenzene	5	U	5	U	5	U	5	U	5	U	ug/l
Chloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
Chloroform	5	U	5	U	5	U	5	U	5	U	ug/l
Dibromochloromethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,1-Dichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,2-Dichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,1-Dichloroethylene	5	U	5	U	5	U	5	U	5	U	ug/l
cis-1,2-Dichloroethylene	5	U	5	U	5	U	5	U	5	U	ug/l
trans-1,2-Dichloroethylene	5	U	5	U	5	U	5	U	5	U	ug/l
Dichlormethane (Methylene chloride)	5	U	5	U	5	U	5	U	5	U	ug/l
1,2-Dichloropropane	5	U	5	U	5	U	5	U	5	U	ug/l
cis-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U	ug/l
trans-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U	ug/l
Ethylbenzene	5	U	5	U	5	U	5	U	5	U	ug/l
2-Hexanone	10	U	10	U	10	U	10	U	10	U	ug/l
Methyl Chloride (Chloromethane)	5	U	5	U	5	U	5	U	5	U	ug/l
Methyl Ethyl Ketone (2-Butanone)	10	U	10	U	10	U	10	U	10	U	ug/l
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	ug/l
Styrene	5	U	5	U	5	U	5	U	5	U	ug/l
1,1,2,2-Tetrachloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
Tetrachloroethylene (PCE)	5	U	5	U	5	U	5	U	5	U	ug/l
Toluene	5	U	5	U	5	U	5	U	5	U	ug/l
Tribromomethane (Bromoform)	5	U	5	U	5	U	5	U	5	U	ug/l
1,1,1-Trichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
1,1,2-Trichloroethane	5	U	5	U	5	U	5	U	5	U	ug/l
Trichloroethylene (TCE)	5	U	5	U	5	U	5	U	5	U	ug/l
Vinyl chloride	5	U	5	U	5	U	5	U	5	U	ug/l
Xylene (Total)	5	U	5	U	5	U	5	U	5	U	ug/l

"U" - Indicates compound analyzed but not detected.

TABLE 12.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF GROUNDWATER SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-112601-GW-MW01		077-112601-GW-MW02		077-112601-GW-MW02Dup		077-112601-GW-GW9109		PADEP Act 2 MSC's for Organics in Groundwater (NR)[a]	Units
Sample Type	Groundwater		Groundwater		Groundwater		Groundwater			
Sample Date	11/26/01		11/26/01		11/26/01		11/26/01			
Location										
Compound		DQ		DQ		DQ		DQ		
Acetone	20	U	20	U	20	U	20	U	10,000	ug/l
Benzene	5	U	5	U	5	U	5	U	5	ug/l
Bromodichloromethane	5	U	5	U	5	U	5	U	100	ug/l
Bromomethane	5	U	5	U	5	U	5	U	10	ug/l
Carbon disulfide	5	U	5	U	5	U	5	U	4,100	ug/l
Carbon tetrachloride	5	U	5	U	5	U	5	U	5	ug/l
Chlorobenzene	5	U	5	U	5	U	5	U	100	ug/l
Chloroethane	5	U	5	U	5	U	5	U	900	ug/l
Chloroform	5	U	5	U	5	U	5	U	100	ug/l
Dibromochloromethane	5	U	5	U	5	U	5	U	100	ug/l
1,1-Dichloroethane	5	U	21		22		5	U	110	ug/l
1,2-Dichloroethane	5	U	5	U	5	U	5	U	5	ug/l
1,1-Dichloroethylene	5	U	**18**		**19**		5	U	7	ug/l
cis-1,2-Dichloroethylene	5	U	**850**		**820**		5	U	70	ug/l
trans-1,2-Dichloroethylene	5	U	5	U	5	U	5	U	100	ug/l
Dichloromethane (Methylene chloride)	5	U	5	U	5	U	5	U	5	ug/l
1,2-Dichloropropane	5	U	5	U	5	U	5	U	5	ug/l
cis-1,3-Dichloropropene	5	U	5	U	5	U	5	U	26[b]	ug/l
trans-1,3-Dichloropropene	5	U	5	U	5	U	5	U	26[b]	ug/l
Ethylbenzene	5	U	5	U	5	U	5	U	700	ug/l
2-Hexanone	10	U	10	U	10	U	10	U	—	ug/l
Methyl Chloride (Chloromethane)	**5**	U	**5**	U	**5**	U	**5**	U	3	ug/l
Methyl Ethyl Ketone (2-Butanone)	10	U	10	U	10	U	10	U	5,800	ug/l
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	410	ug/l
Styrene	5	U	5	U	5	U	5	U	100	ug/l
1,1,2,2-Tetrachloroethane	**5**	U	**5**	U	**5**	U	**5**	U	0.3	ug/l
Tetrachloroethylene (PCE)	5	U	5	U	5	U	5	U	5	ug/l
Toluene	5	U	5	U	5	U	5	U	1,000	ug/l
Tribromomethane (Bromoform)	5	U	5	U	5	U	5	U	100	ug/l
1,1,1-Trichloroethane	5	U	19		20		5	U	200	ug/l
1,1,2-Trichloroethane	5	U	5	U	5	U	5	U	5	ug/l
Trichloroethylene (TCE)	5	U	**390**		**370**		5	U	5	ug/l
Vinyl chloride	**5**	U	**5**	U	**5**	U	**5**	U	2	ug/l
Xylene (Total)	5	U	5	U	5	U	5	U	5,100	ug/l

Shaded areas indicate that the measured level of the parameter exceeded the established regulatory standard(s).

Results in bold type indicate that the instrument detection limit exceeded the PADEP Act 2 MSC established for the parameter.

"U" - Indicates compound analyzed but not detected.

a - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Groundwater, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 1, dated November 24, 2001.

b - MSC value presented is for 1,3-Dichloropropene.

Job No. 24300-077-0000 Subtask 08000

TABLE 12.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF GROUNDWATER SAMPLE RESULTS
TCL VOCs
(Lancaster Laboratories, Inc.)

Sample No.	077-112701-GW-GW9110		077-112701-GW-GW9211		077-112701-GW-GW9212		PADEP Act 2 MSC's for Organics in Groundwater (NR)[a]	Units
Sample Type	Groundwater		Groundwater		Groundwater			
Sample Date	11/27/01		11/27/01		11/27/01			
Location								
Compound		DQ		DQ		DQ		
Acetone	20	U	20	U	20	U	10,000	ug/l
Benzene	5	U	5	U	5	U	5	ug/l
Bromodichloromethane	5	U	5	U	5	U	100	ug/l
Bromomethane	5	U	5	U	5	U	10	ug/l
Carbon disulfide	5	U	5	U	5	U	4,100	ug/l
Carbon tetrachloride	5	U	**12**		5	U	5	ug/l
Chlorobenzene	5	U	5	U	5	U	100	ug/l
Chloroethane	5	U	5	U	5	U	900	ug/l
Chloroform	5	U	5		5	U	100	ug/l
Dibromochloromethane	5	U	5	U	5	U	100	ug/l
1,1-Dichloroethane	5	U	16		20		110	ug/l
1,2-Dichloroethane	5	U	5	U	5	U	5	ug/l
1,1-Dichloroethylene	5	U	**30**		**19**		7	ug/l
cis-1,2-Dichloroethylene	67		**470**		**750**		70	ug/l
trans-1,2-Dichloroethylene	5	U	5	U	5	U	100	ug/l
Dichloromethane (Methylene chloride)	5	U	5	U	5	U	5	ug/l
1,2-Dichloropropane	5	U	5	U	5	U	5	ug/l
cis-1,3-Dichloropropene	5	U	5	U	5	U	26[b]	ug/l
trans-1,3-Dichloropropene	5	U	5	U	5	U	26[b]	ug/l
Ethylbenzene	5	U	5	U	5	U	700	ug/l
2-Hexanone	10	U	10	U	10	U	—	ug/l
Methyl Chloride (Chloromethane)	**5**	U	**5**	U	**5**	U	3	ug/l
Methyl Ethyl Ketone (2-Butanone)	10	U	10	U	10	U	5,800	ug/l
4-Methyl-2-pentanone	10	U	10	U	10	U	410	ug/l
Styrene	5	U	5	U	5	U	100	ug/l
1,1,2,2-Tetrachloroethane	**5**	U	**5**	U	**5**	U	0.3	ug/l
Tetrachloroethylene (PCE)	5	U	5	U	5	U	5	ug/l
Toluene	5	U	5	U	5	U	1,000	ug/l
Tribromomethane (Bromoform)	5	U	5	U	5	U	100	ug/l
1,1,1-Trichloroethane	5	U	32		22		200	ug/l
1,1,2-Trichloroethane	5	U	5	U	5	U	5	ug/l
Trichloroethylene (TCE)	**93**		**780**		**510**		5	ug/l
Vinyl chloride	**5**	U	**5**	U	**5**	U	2	ug/l
Xylene (Total)	5	U	5	U	5	U	5,100	ug/l

Shaded areas indicate that the measured level of the parameter exceeded the established regulatory standard(s).
Results in bold type indicate that the instrument detection limit exceeded the PADEP Act 2 MSC established for the parameter.
"U" - Indicates compound analyzed but not detected.
a - Non-Residential (NR) Medium Specific Concentrations (MSC) for Organic Related Substances in Groundwater, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 1, dated November 24, 2001.
b - MSC value presented is for 1,3-Dichloropropene.

Job No. 24300-077-0000 Subtask 08000

TABLE 13.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF GROUNDWATER SAMPLE RESULTS
TAL METALS AND WATER QUALITY PARAMETERS
(Lancaster Laboratories, Inc.)

Sample No.	077-112601-GW-MW01		077-112601-GW-MW02		077-112601-GW-MW02Dup		077-112601-GW-GW9109		PADEP Act 2 MSC's for Inorganics in Groundwater (NR)^{a}	Units
Sample Type	Groundwater		Groundwater		Groundwater		Groundwater			
Sample Date	11/26/01		11/26/01		11/26/01		11/26/01			
Location										
Compound		DQ		DQ		DQ		DQ		
TAL Metals										
Calcium	319		61.6		175		122		—	mg/l
Magnesium	161		44		101		45.9		—	mg/l
Potassium	5.2		9.4		8.2		4.3		—	mg/l
Sodium	10.5		18.7		20.6		24.9		—	mg/l
Water Quality Parameters										
Alkalinity	412		250		260		328		—	mg/l
Alkalinity to pH 8.3	2	U	2	U	2	U	2	U	—	mg/l
Bicarbonate	412		250		260		328		—	mg/l
Carbonate	2	U	2	U	2	U	2	U	—	mg/l
Chloride	113		155		156		245		250^{b}	mg/l
Sulfate	500	U	48		51		57		500	mg/l
Total Dissolved Solids	693		613		592		783		—	mg/l

"U" - Indicates compound analyzed but not detected.

a - Non-Residential (NR) Medium Specific Concentrations (MSC) for Inorganic Related Substances in Groundwater, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 2, dated November 24, 2001.

b - Indicates a Secondary Drinking Water Standard.

Job No. 24300-077-0000 Subtask 08000

TABLE 13.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF GROUNDWATER SAMPLE RESULTS
TAL METALS AND WATER QUALITY PARAMETERS
(Lancaster Laboratories, Inc.)

Sample No.	077-112701-GW-GW9110		077-112701-GW-GW9211		077-112701-GW-GW9212		PADEP Act 2 MSC's for Inorganics in Groundwater (NR)[a]	Units
Sample Type	Groundwater		Groundwater		Groundwater			
Sample Date	11/27/01		11/27/01		11/27/01			
Location								
Compound		DQ		DQ		DQ		
TAL Metals								
Calcium	66		65.1		85.3		—	mg/l
Magnesium	33.9		43.8		43.1		—	mg/l
Potassium	2.8		2.4		4.8		—	mg/l
Sodium	37.4		62.2		97.9		—	mg/l
Water Quality Parameters								
Alkalinity	294		288		308		—	mg/l
Alkalinity to pH 8.3	2	U	2	U	2	U	—	mg/l
Bicarbonate	294		288		308		—	mg/l
Carbonate	2	U	2	U	2	U	—	mg/l
Chloride	74.6		123		184		250[b]	mg/l
Sulfate	NA		NA		NA		500	mg/l
Total Dissolved Solids	502		509		674		—	mg/l

"U" - Indicates compound analyzed but not detected.

[a] - Non-Residential (NR) Medium Specific Concentrations (MSC) for Inorganic Related Substances in Groundwater, Pennsylvania Department of Environmental Protection (PADEP) listed in Title 25, PA Code, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 2, dated November 24, 2001.

[b] - Indicates a Secondary Drinking Water Standard.

NA - Not Analyzed by the testing laboratory.

TABLE 14
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
TCL VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Drum		**Units**
Sample Type	Composite Soil		
Sample Date	11/29/01		
Location	IDW Drums		
Compound	**Result**	**Detection Limit**	
Acetone	<21	21	ug/kg
Benzene	<5	5	ug/kg
Bromodichloromethane	<5	5	ug/kg
Bromomethane	<5	5	ug/kg
Carbon Disulfide	<5	5	ug/kg
Carbon Tetrachloride	<5	5	ug/kg
Chlorobenzene	<5	5	ug/kg
Chloroethane	<5	5	ug/kg
Chloroform	<5	5	ug/kg
Dibromochloromethane	<5	5	ug/kg
1,1-Dichloroethane	<5	5	ug/kg
1,2-Dichloroethane	<5	5	ug/kg
1,1-Dichloroethylene	<5	5	ug/kg
cis-1,2-Dichloroethylene	<5	5	ug/kg
trans-1,2-Dichloroethylene	<5	5	ug/kg
Dichloromethane (Methylene Chloride)	<5	5	ug/kg
1,2-Dichloropropane	<5	5	ug/kg
cis-1,3-Dichloropropene	<5	5	ug/kg
trans-1,3-Dichloropropene	<5	5	ug/kg
Ethylbenzene	<5	5	ug/kg
2-Hexanone	<11	11	ug/kg
Methyl Chloride (Chloromethane)	<5	5	ug/kg
Methyl Ethyl Ketone (2-Butanone)	<11	11	ug/kg
4-Methyl-2-pentanone	<11	11	ug/kg
Styrene	<5	5	ug/kg
1,1,2,2-Tetrachloroethane	<5	5	ug/kg
Tetrachloroethylene (PCE)	<5	5	ug/kg
Toluene	<5	5	ug/kg
Tribromomethane (Bromoform)	<5	5	ug/kg
1,1,1-Trichloroethane	<5	5	ug/kg
1,1,2-Trichloroethane	<5	5	ug/kg
Trichloroethylene (TCE)	<5	5	ug/kg
Xylenes (total)	<5	5	ug/kg
Vinyl Chloride (Chloroethene)	<5	5	ug/kg

Job No. 24300-077-0000 Subtask 03007

TABLE 15
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
TCLP VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Drum		**TCLP Standards***	**Units**
Sample Type	Composite Soil			
Sample Date	11/29/01			
Location	IDW Drums			
Compound	**Result**	**Detection Limit**		
Benzene	<0.1	0.1	0.5	mg/l
Carbon Tetrachloride	<0.1	0.1	0.5	mg/l
Chlorobenzene	<0.1	0.1	100	mg/l
Chloroform	<0.1	0.1	6	mg/l
1,2-Dichloroethane	<0.1	0.1	0.5	mg/l
1,1-Dichloroethylene	<0.1	0.1	0.7	mg/l
Methyl Ethyl Ketone (2-Butanone)	<0.2	0.2	200	mg/l
Tetrachloroethylene (PCE)	<0.1	0.1	0.7	mg/l
Trichloroethylene (TCE)	<0.1	0.1	0.5	mg/l
Vinyl Chloride Chloroethene	<0.1	0.1	0.2	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Method SW-846 8260B, Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

TABLE 16
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
TCLP METALS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Drum		**TCLP Standards***	**Units**
Sample Type	Composite Soil			
Sample Date	11/29/01			
Location	IDW Drums			
Compound	**Result**	**Detection Limit**		
Arsenic	<0.1	0.1	5	mg/l
Barium	<0.1	0.1	100	mg/l
Cadmium	<0.01	0.01	1	mg/l
Chromium	<0.03	0.03	5	mg/l
Lead	<0.1	0.1	5	mg/l
Mercury	<0.0002	0.0002	0.2	mg/l
Selenium	<0.2	0.2	1	mg/l
Silver	<0.02	0.02	5	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

TABLE 17
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
HAZARDOUS WASTE CHARACTERISTICS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Drum		**Hazardous Characteristic Threshold Standards***
Sample Type	Composite Soil		
Sample Date	11/29/01		
Location	IDW Drums		
Characteristic	**Result**		
Corrosivity	Non-corrosive	pH = 9.41	pH≤2, or pH≥12.5
Ignitability	Non-ignitable		Does not spontaneously ignite with exposure to air or water, not ignitable by friction, vapors not ignitable when exposed to flame.
Reactivity**	Non-reactive	Hydrogen Sulfide < 100 mg/kg Hydrogen Cyanide < 99 mg/kg	Hydrogen Cyanide ≤ 250 mg/kg Hydrogen Sulfide ≤ 500 mg/kg

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

**Interim threshold limits established by the Solid Waste Branch of EPA, July, 1992.

Job No. 24300-077-0000 Subtask 03007

TABLE 18
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
TCL VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Carbon		**Units**
Sample Type	Composite Activated Carbon		
Sample Date	11/29/01		
Location	Carbon Absorber		
Compound	**Result**	**Detection Limit**	
Acetone	<4,700	4,700	ug/kg
Benzene	<1,200	1,200	ug/kg
Bromodichloromethane	<1,200	1,200	ug/kg
Bromomethane	<1,200	1,200	ug/kg
Carbon Disulfide	<1,200	1,200	ug/kg
Carbon Tetrachloride	<1,200	1,200	ug/kg
Chlorobenzene	<1,200	1,200	ug/kg
Chloroethane	<1,200	1,200	ug/kg
Chloroform	<1,200	1,200	ug/kg
Dibromochloromethane	<1,200	1,200	ug/kg
1,1-Dichloroethane	<1,200	1,200	ug/kg
1,2-Dichloroethane	<1,200	1,200	ug/kg
1,1-Dichloroethylene	<1,200	1,200	ug/kg
cis-1,2-Dichloroethylene	12,000	1,200	ug/kg
trans-1,2-Dichloroethylene	<1,200	1,200	ug/kg
Dichloromethane (Methylene Chloride)	<1,200	1,200	ug/kg
1,2-Dichloropropane	<1,200	1,200	ug/kg
cis-1,3-Dichloropropene	<1,200	1,200	ug/kg
trans-1,3-Dichloropropene	<1,200	1,200	ug/kg
Ethylbenzene	<1,200	1,200	ug/kg
2-Hexanone	<2,400	2,400	ug/kg
Methyl Chloride (Chloromethane)	<1,200	1,200	ug/kg
Methyl Ethyl Ketone (2-Butanone)	<2,400	2,400	ug/kg
4-Methyl-2-pentanone	<2,400	2,400	ug/kg
Styrene	<1,200	1,200	ug/kg
1,1,2,2-Tetrachloroethane	<1,200	1,200	ug/kg
Tetrachloroethylene (PCE)	<1,200	1,200	ug/kg
Toluene	<1,200	1,200	ug/kg
Tribromomethane (Bromoform)	<1,200	1,200	ug/kg
1,1,1-Trichloroethane	<1,200	1,200	ug/kg
1,1,2-Trichloroethane	<1,200	1,200	ug/kg
Trichloroethylene (TCE)	2,700	1,200	ug/kg
Xylenes (total)	1,200	1,200	ug/kg
Vinyl Chloride (Chloroethene)	<1,200	1,200	ug/kg

TABLE 19
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
TCLP VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Carbon		**TCLP Standards***	**Units**
Sample Type	Composite Activated Carbon			
Sample Date	11/29/01			
Location	Carbon Absorber			
Compound	**Result**	**Detection Limit**		
Benzene	<0.1	0.1	0.5	mg/l
Carbon Tetrachloride	<0.1	0.1	0.5	mg/l
Chlorobenzene	<0.1	0.1	100	mg/l
Chloroform	<0.1	0.1	6	mg/l
1,2-Dichloroethane	<0.1	0.1	0.5	mg/l
1,1-Dichloroethylene	<0.1	0.1	0.7	mg/l
Methyl Ethyl Ketone (2-Butanone)	<0.2	0.2	200	mg/l
Tetrachloroethylene (PCE)	<0.1	0.1	1	mg/l
Trichloroethylene (TCE)	<0.1	0.1	0.5	mg/l
Vinyl Chloride (Chloroethene)	<0.1	0.1	0.2	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Method SW-846 8260B, Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

TABLE 20
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
TCLP METALS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Carbon		**TCLP Standards***	**Units**
Sample Type	Composite Activated Carbon			
Sample Date	11/29/01			
Location	Carbon Absorber			
Compound	**Result**	**Detection Limit**		
Arsenic	<0.1	0.1	5	mg/l
Barium	0.315	0.1	100	mg/l
Cadmium	<0.01	0.01	1	mg/l
Chromium	<0.03	0.03	5	mg/l
Lead	<0.1	0.1	5	mg/l
Mercury	<0.0002	0.0002	0.2	mg/l
Selenium	<0.2	0.2	1	mg/l
Silver	<0.02	0.02	5	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

TABLE 21
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
HAZARDOUS WASTE CHARACTERISTICS
(Analyzed by Lancaster Laboratories, Inc.)

Sample No.	077-112901-IDW-Carbon		**Hazardous Characteristic Threshold Standards***
Sample Type	Composite Activated Carbon		
Sample Date	11/29/01		
Location	Carbon Absorber		
Characteristic	**Result**		
Corrosivity	Non-corrosive	pH = 8.26	pH≤2, or pH≥12.5
Ignitability	Non-ignitable		Does not spontaneously ignite with exposure to air or water, not ignitable by friction, vapors not ignitable when exposed to flame.
Reactivity**	Non-reactive	Hydrogen Sulfide < 100 mg/kg Hydrogen Cyanide < 99 mg/kg	Hydrogen Cyanide ≤ 250 mg/kg Hydrogen Sulfide ≤ 500 mg/kg

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* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

**Interim threshold limits established by the Solid Waste Branch of EPA, July, 1992.

TABLE 22
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF ORGANIC COMPOUNDS
EXCEEDING REGULATORY AND/OR GUIDANCE STANDARDS

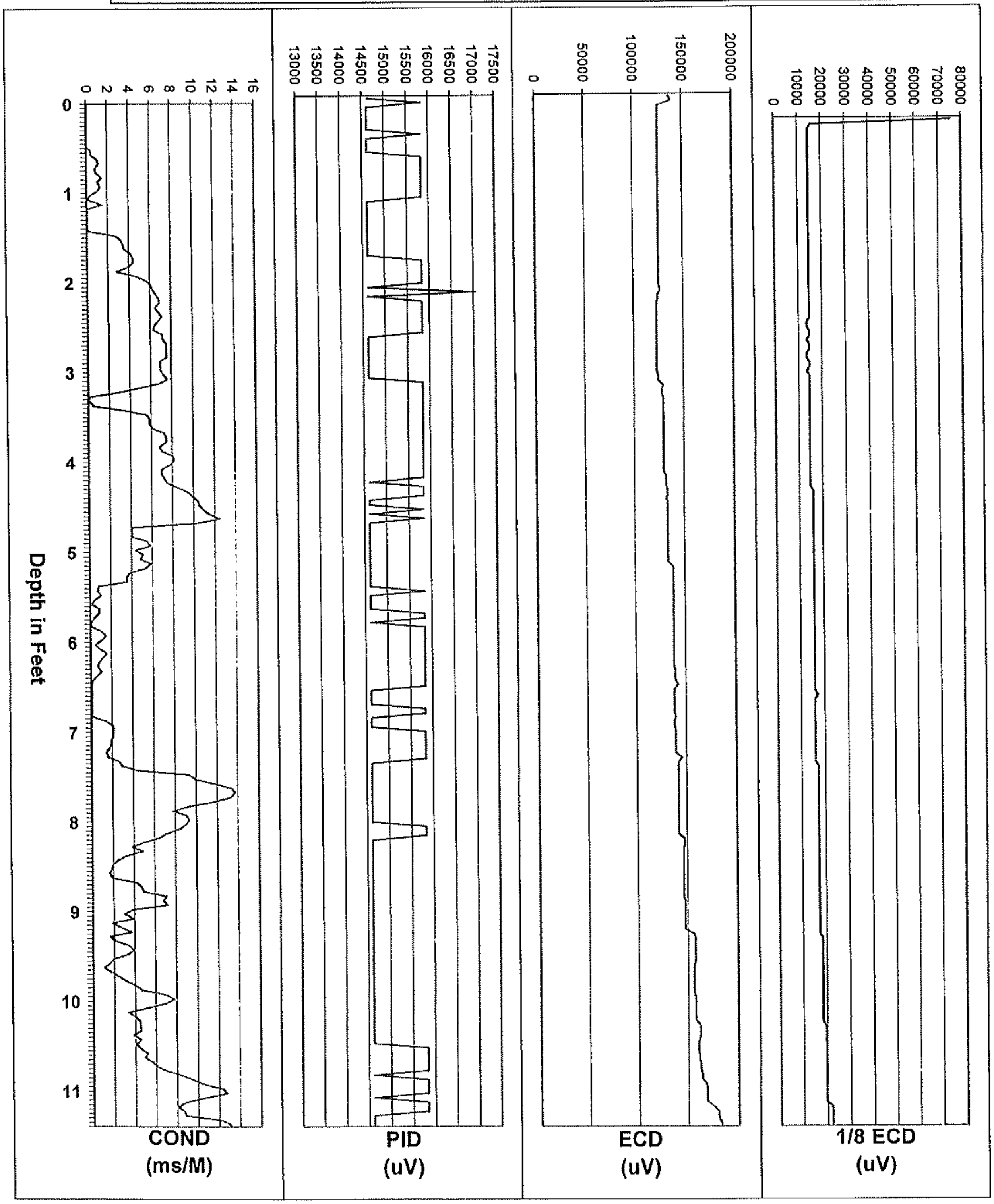
Compound	Sample Number	Sample Location	Sample Matrix and Concentration		
			Groundwater	Surface Water	Sediment
Acetone	077-102901-SD02	Granite Spring	—	—	830
Carbon Tetrachloride	077-112601-GW-GW9211	Monitoring Well GW9211	12	—	—
1,1-Dichloroethylene	077-112601-GW-MW02	Monitoring Well MW02	18	—	—
	077-112601-GW-MW02Dup	Monitoring Well MW02	19	—	—
	077-112601-GW-GW9211	Monitoring Well GW9211	30	—	—
	077-112601-GW-GW9212	Monitoring Well GW9212	19	—	—
cis-1,2-Dichloroethylene	077-102901-SW01	Headwater Spring	—	630	—
	077-102901-SD01	Headwater Spring	—	—	250
	077-102901-SD03	Bridge Near Pool	—	—	36
	077-102901-SD03Dup	Bridge Near Pool	—	—	27
	077-112601-GW-MW02	Monitoring Well MW02	850	—	—
	077-112601-GW-MW02Dup	Monitoring Well MW02	820	—	—
	077-112601-GW-GW9211	Monitoring Well GW9211	470	—	—
	077-112601-GW-GW9212	Monitoring Well GW9212	750	—	—
Trichloroethylene (TCE)	077-112601-GW-MW02	Monitoring Well MW02	390	—	—
	077-112601-GW-MW02Dup	Monitoring Well MW02	370	—	—
	077-112601-GW-GW9211	Monitoring Well GW9211	780	—	—
	077-112601-GW-GW9212	Monitoring Well GW9212	510	—	—
Units			**ug/L**	**ug/L**	**ug/kg**

Baker

APPENDIX A

DRILLING LOGS FOR MIP BORINGS

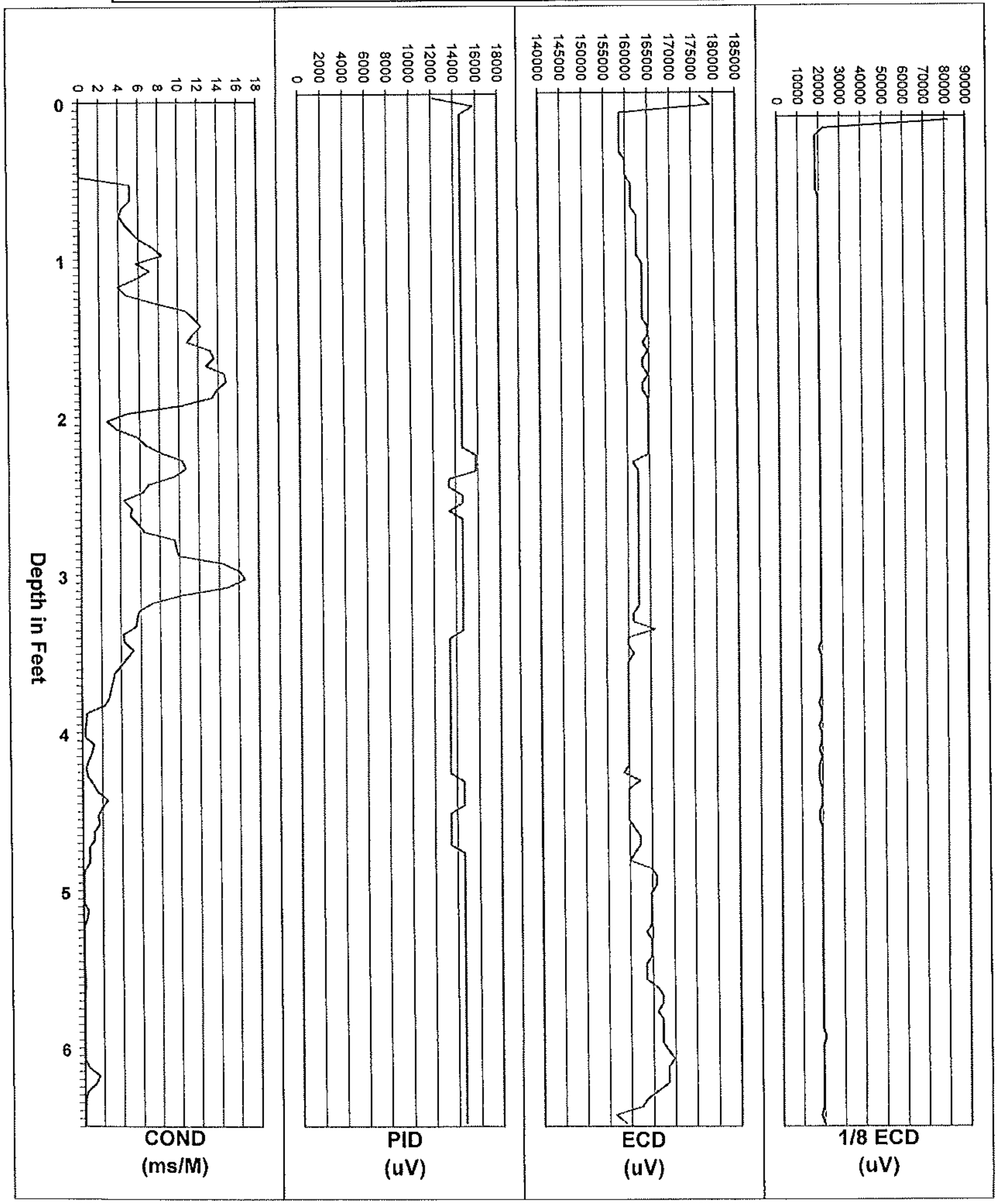
ZEBRA EC/MIP Summary Log, Point SB-01
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/5/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 1 of 67

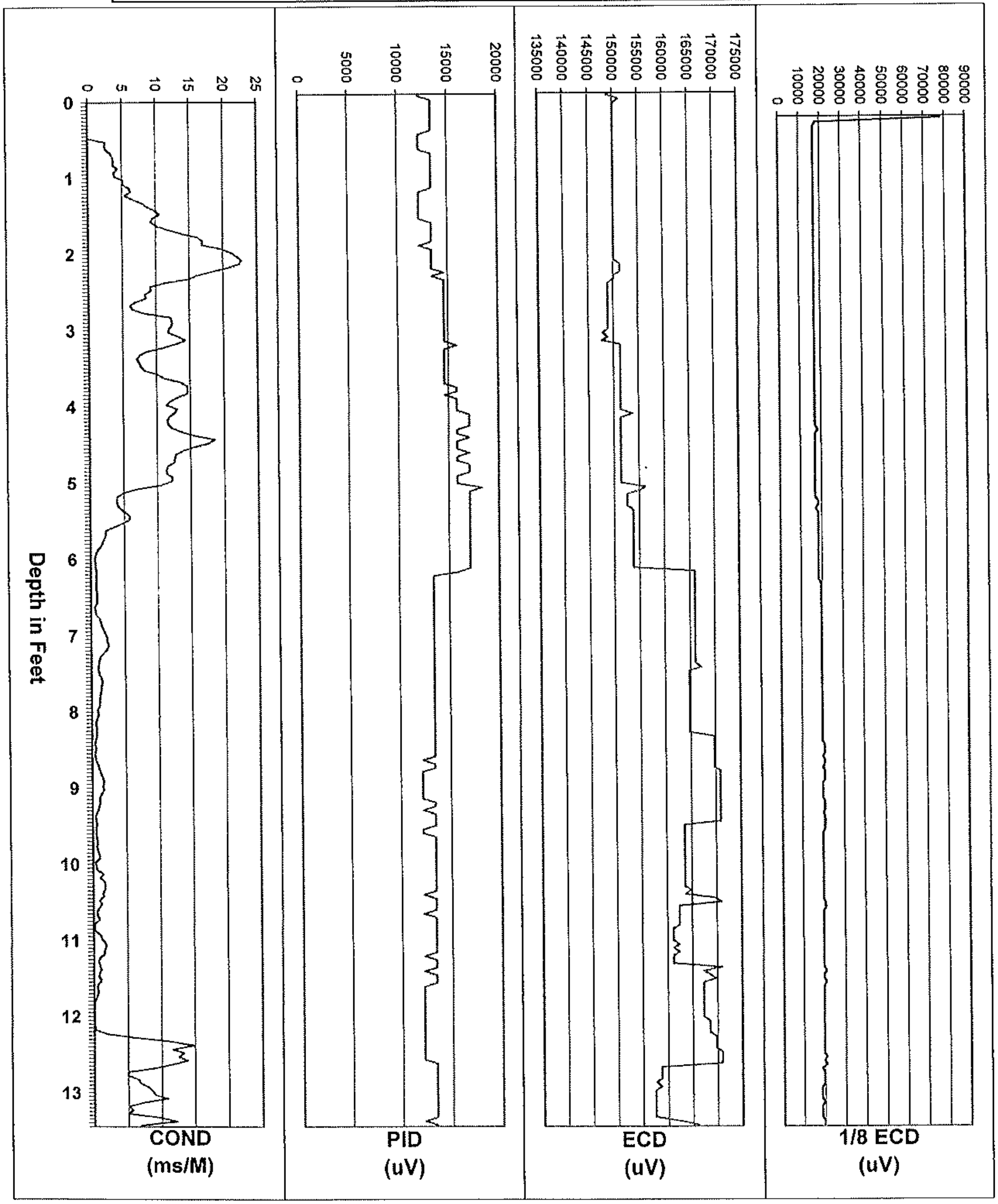
ZEBRA EC/MIP Summary Log, Point SB-02
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/5/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 2 of 67

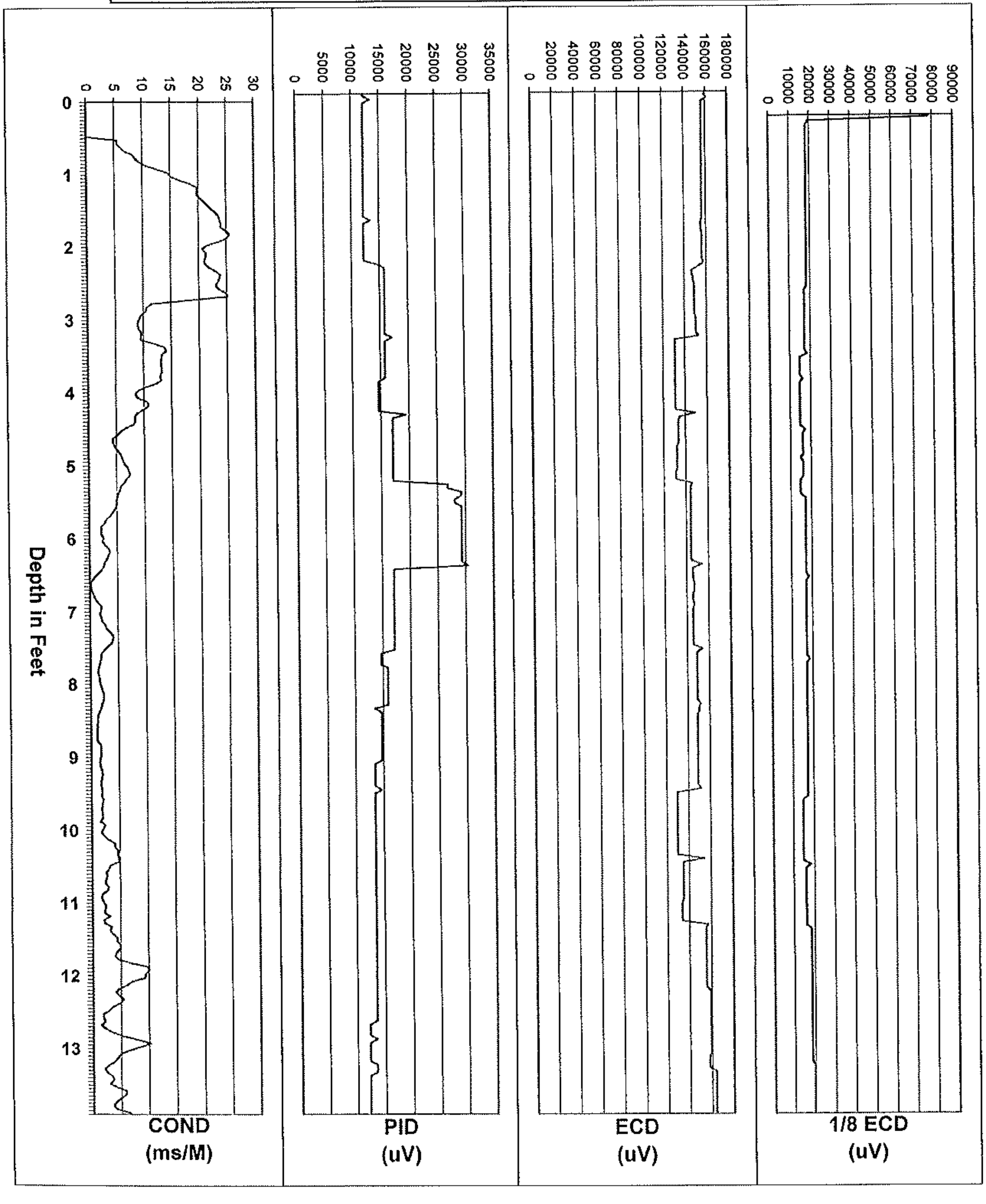
ZEBRA EC/MIP Summary Log, Point SB-03
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/5/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 3 of 67

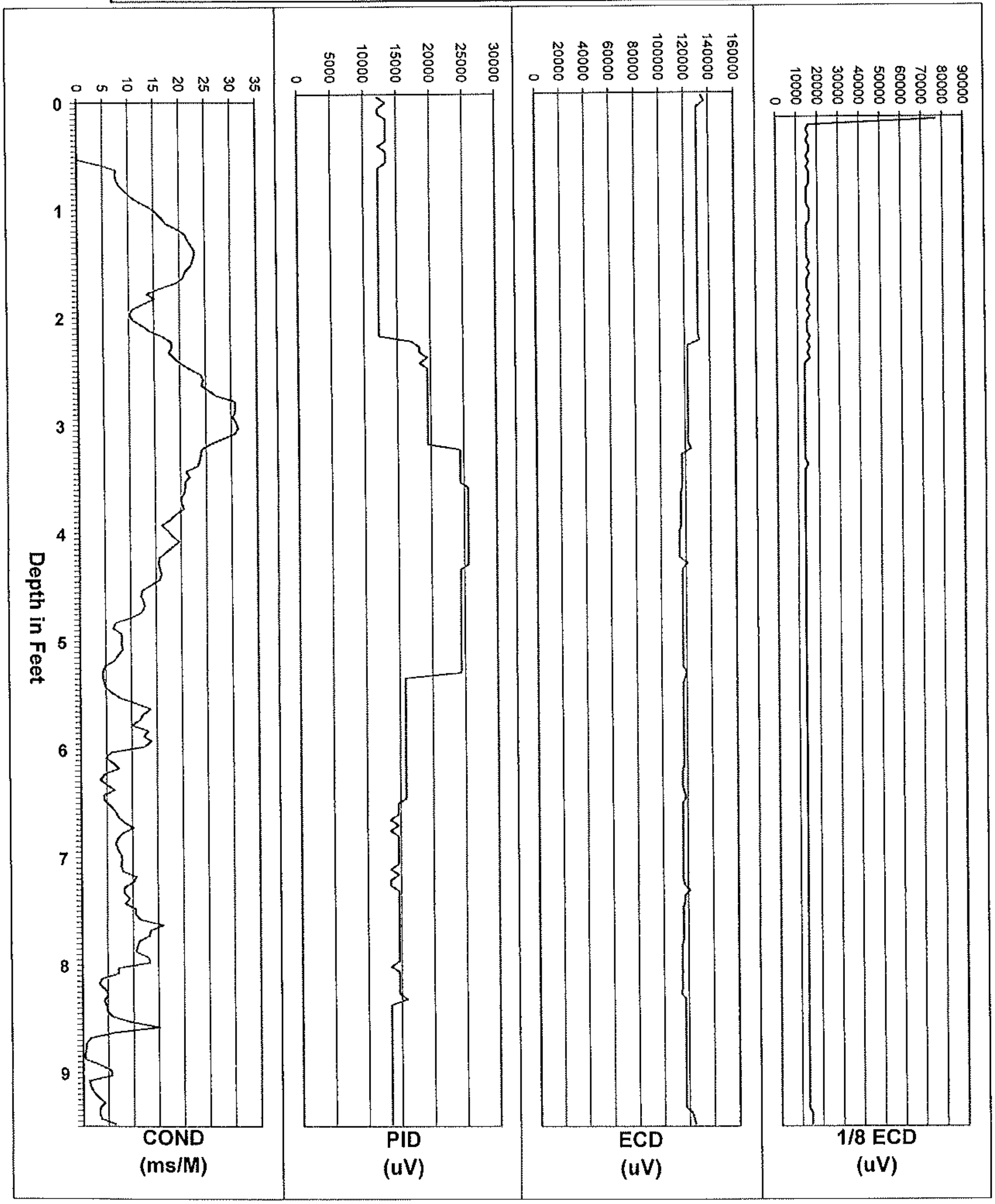
ZEBRA EC/MIP Summary Log, Point SB-04
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/5/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 4 of 67

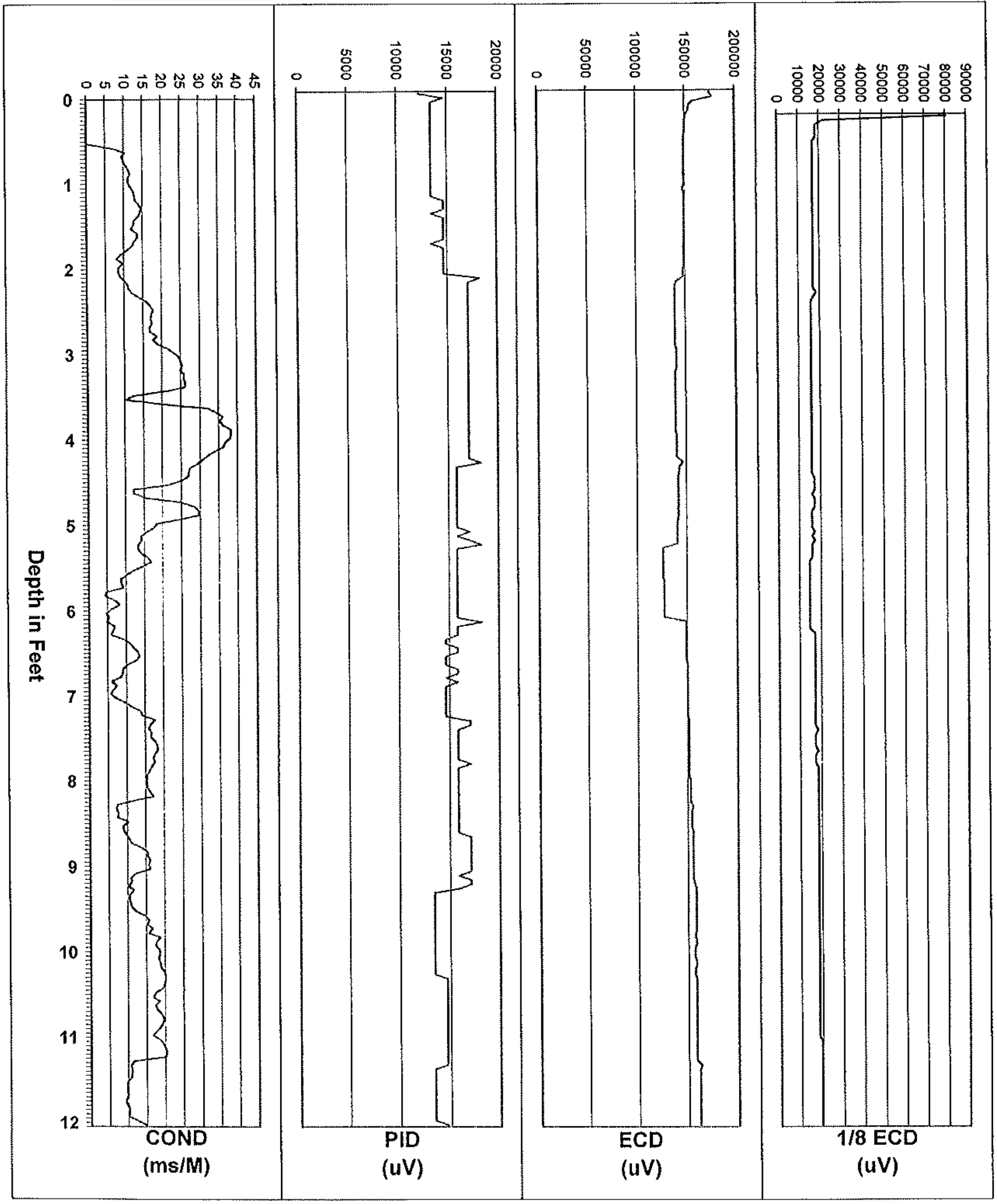
ZEBRA EC/MIP Summary Log, Point SB-05
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/5/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 5 of 67

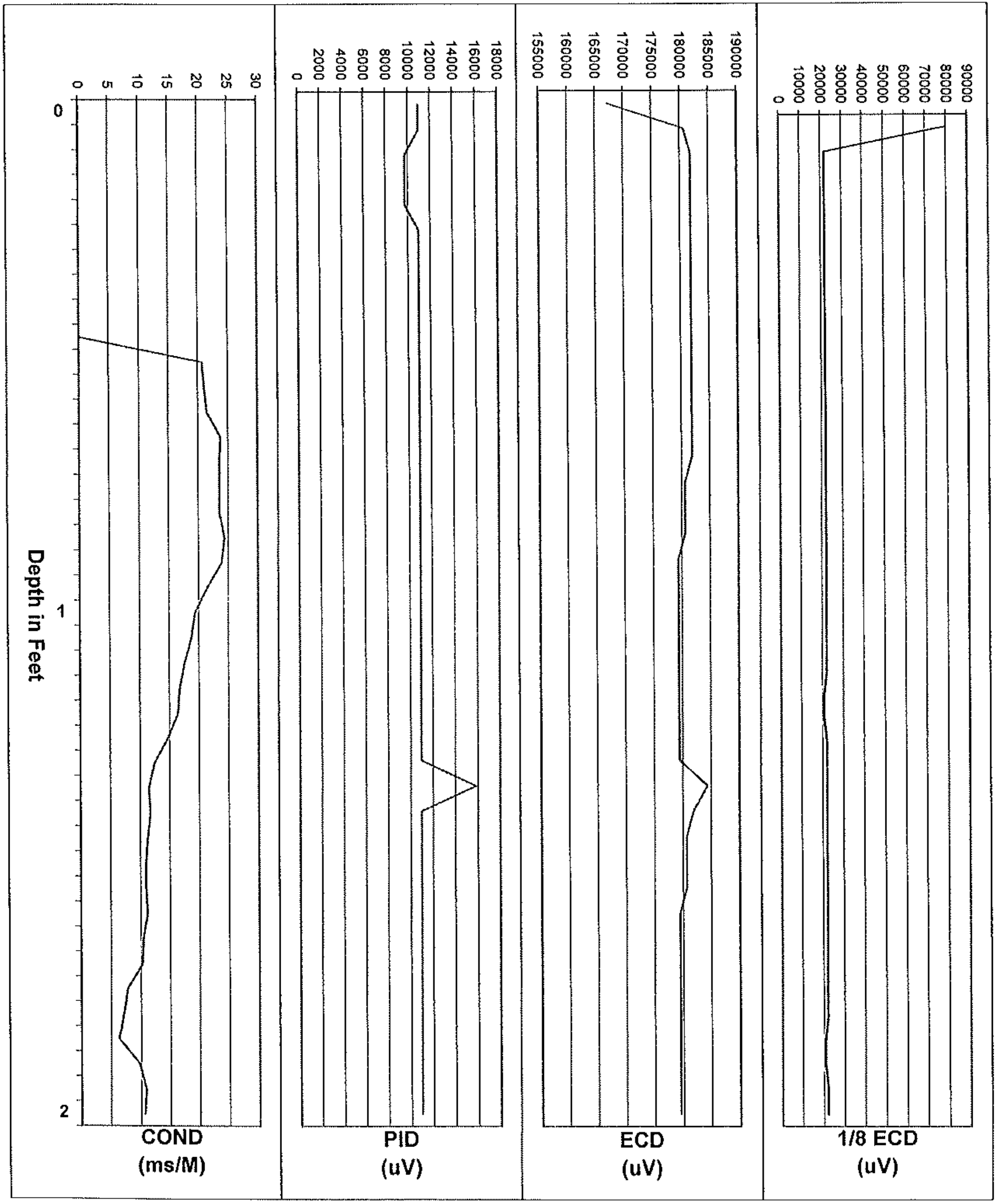
ZEBRA EC/MIP Summary Log, Point SB-06
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 6 of 67

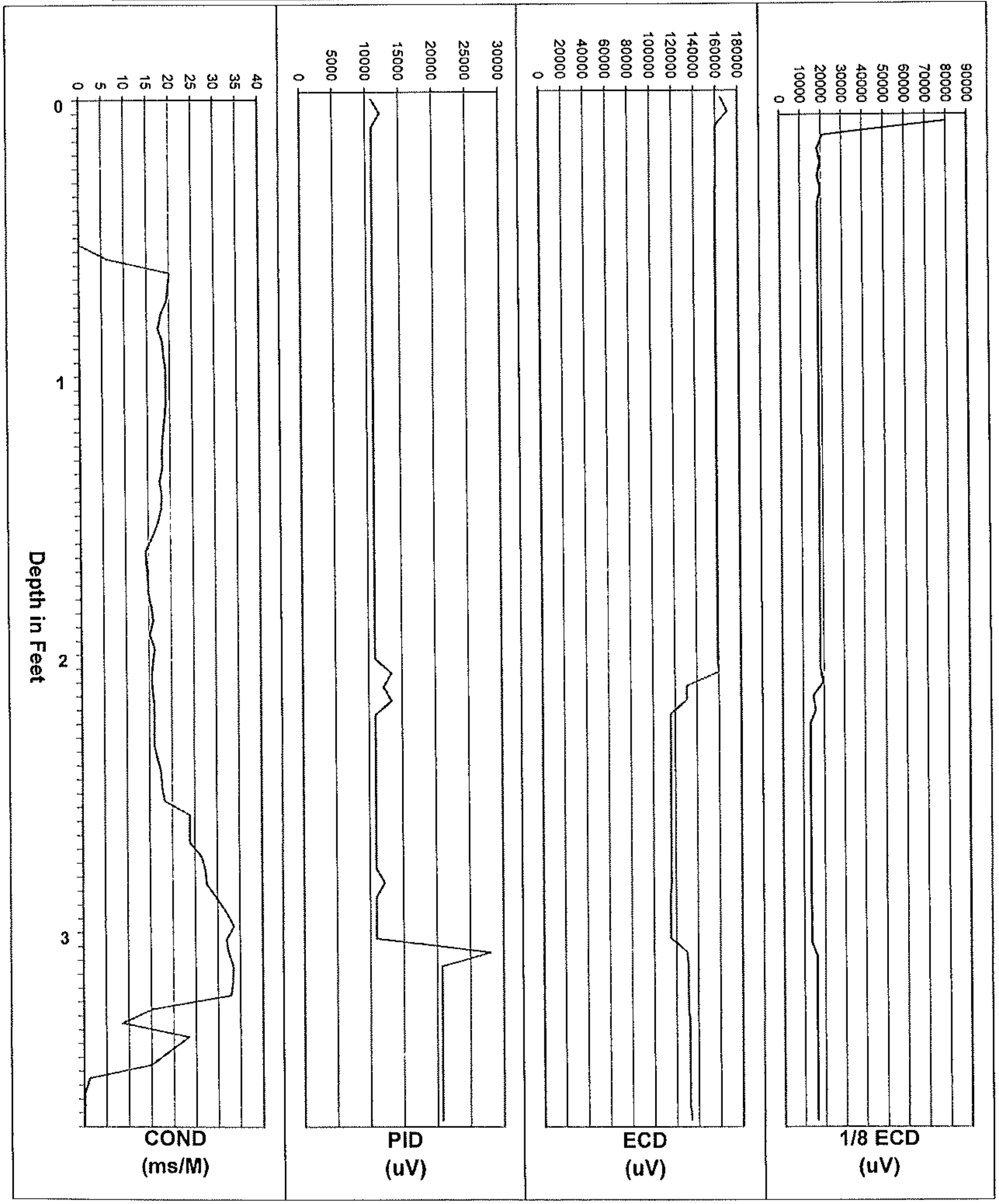
ZEBRA EC/MIP Summary Log, Point SB-07
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 7 of 67

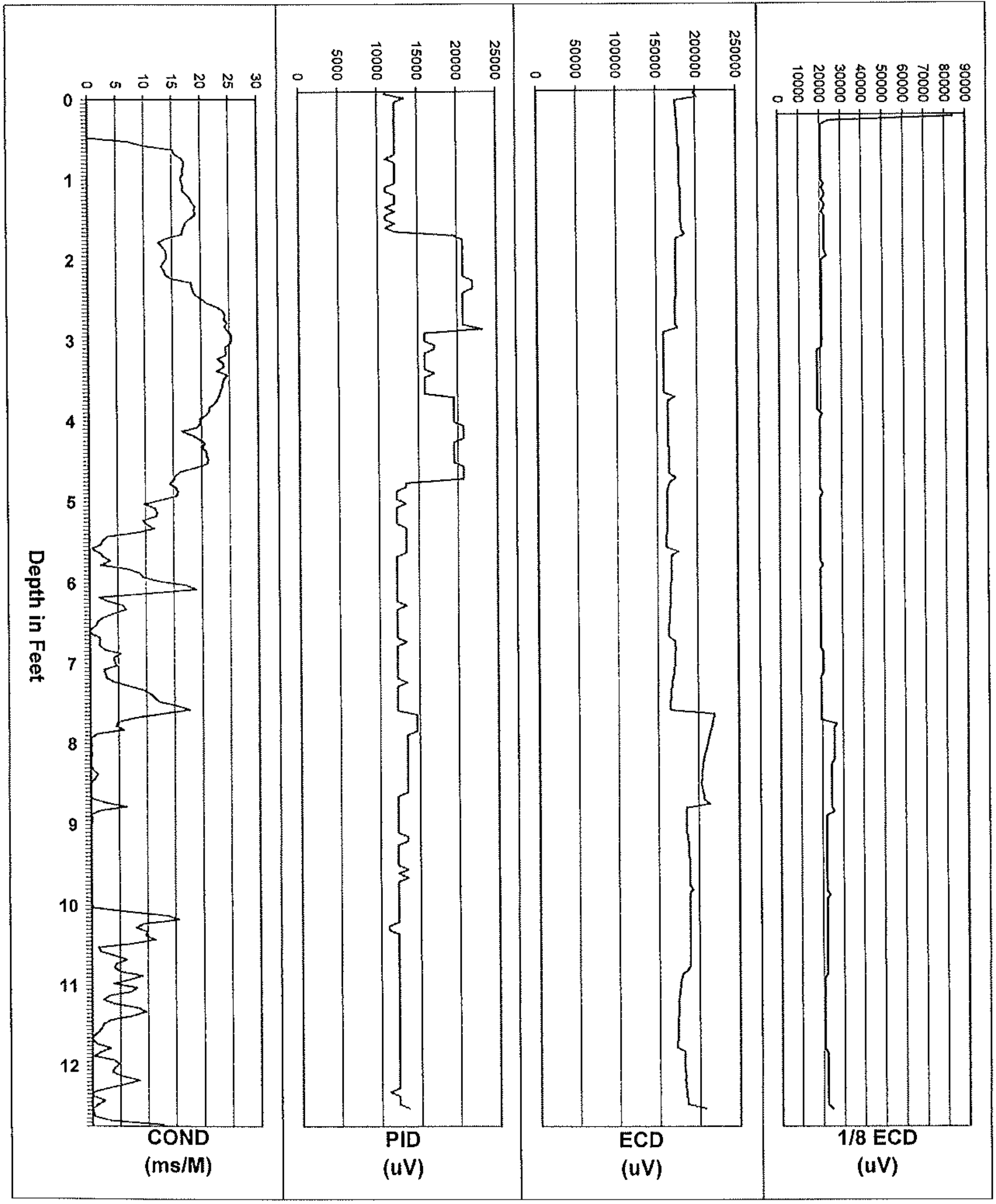
ZEBRA EC/MIP Summary Log, Point SB-08
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 8 of 67

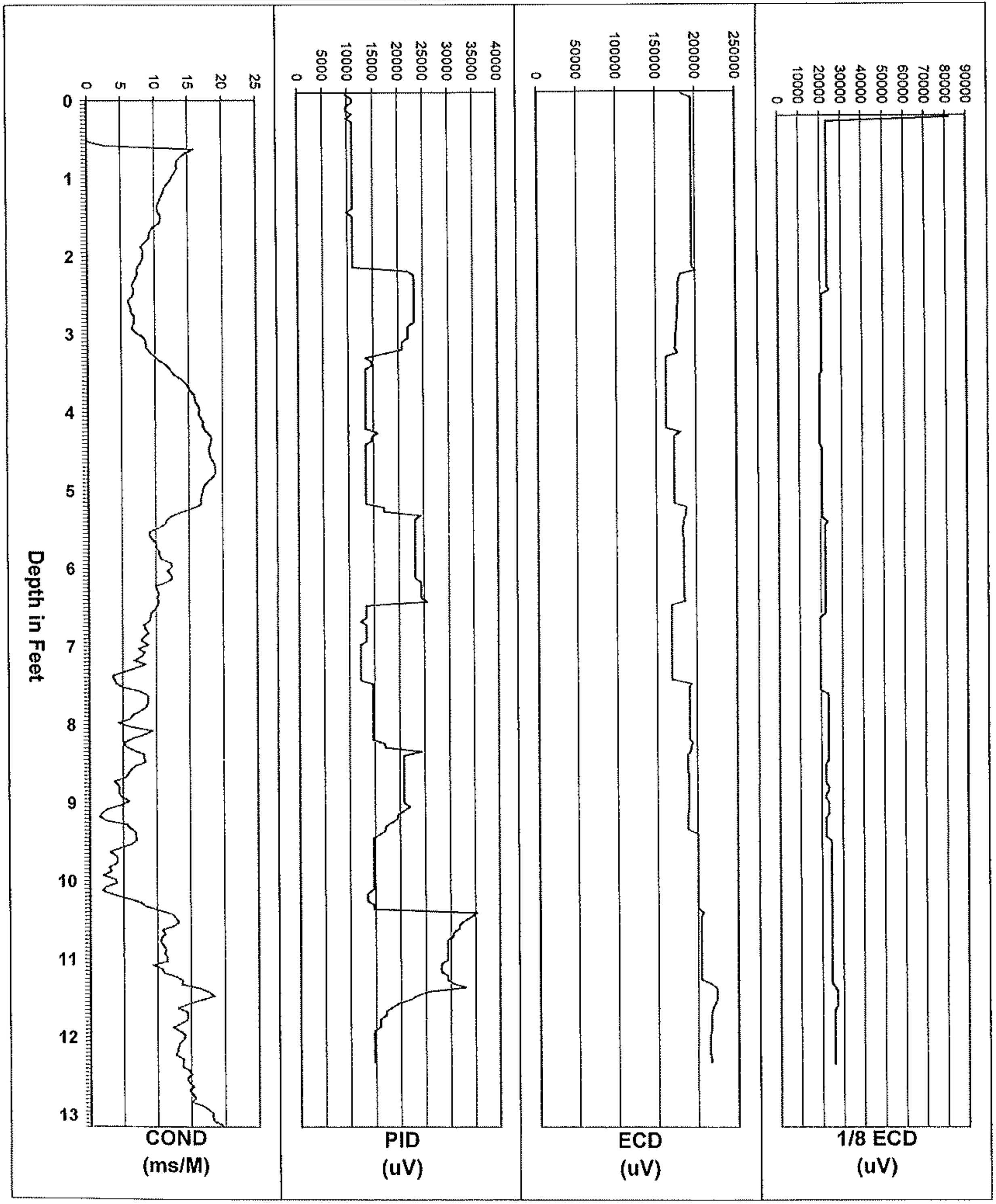
ZEBRA EC/MIP Summary Log, Point SB-09
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 9 of 67

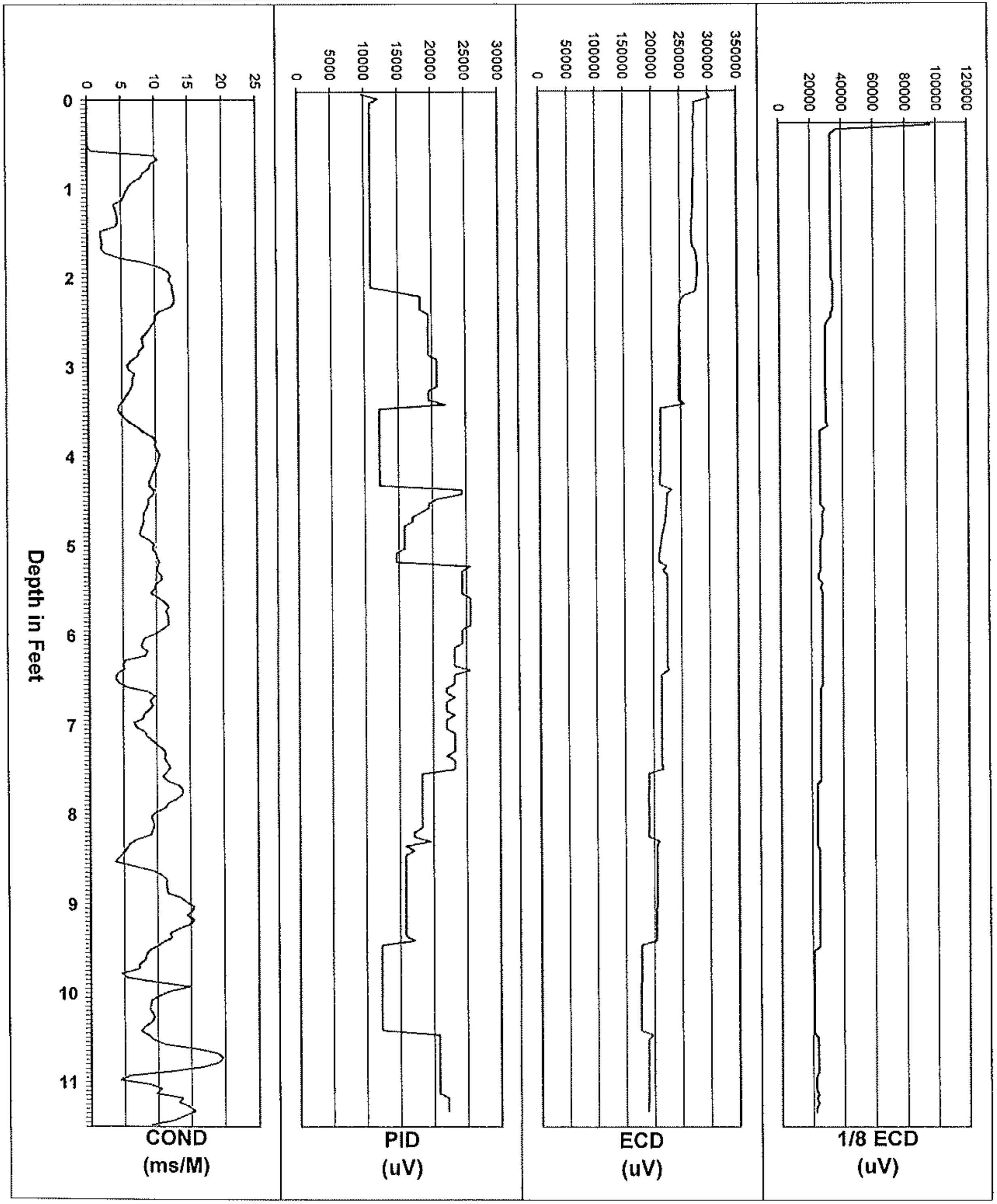
ZEBRA EC/MIP Summary Log, Point SB-10
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 10 of 67

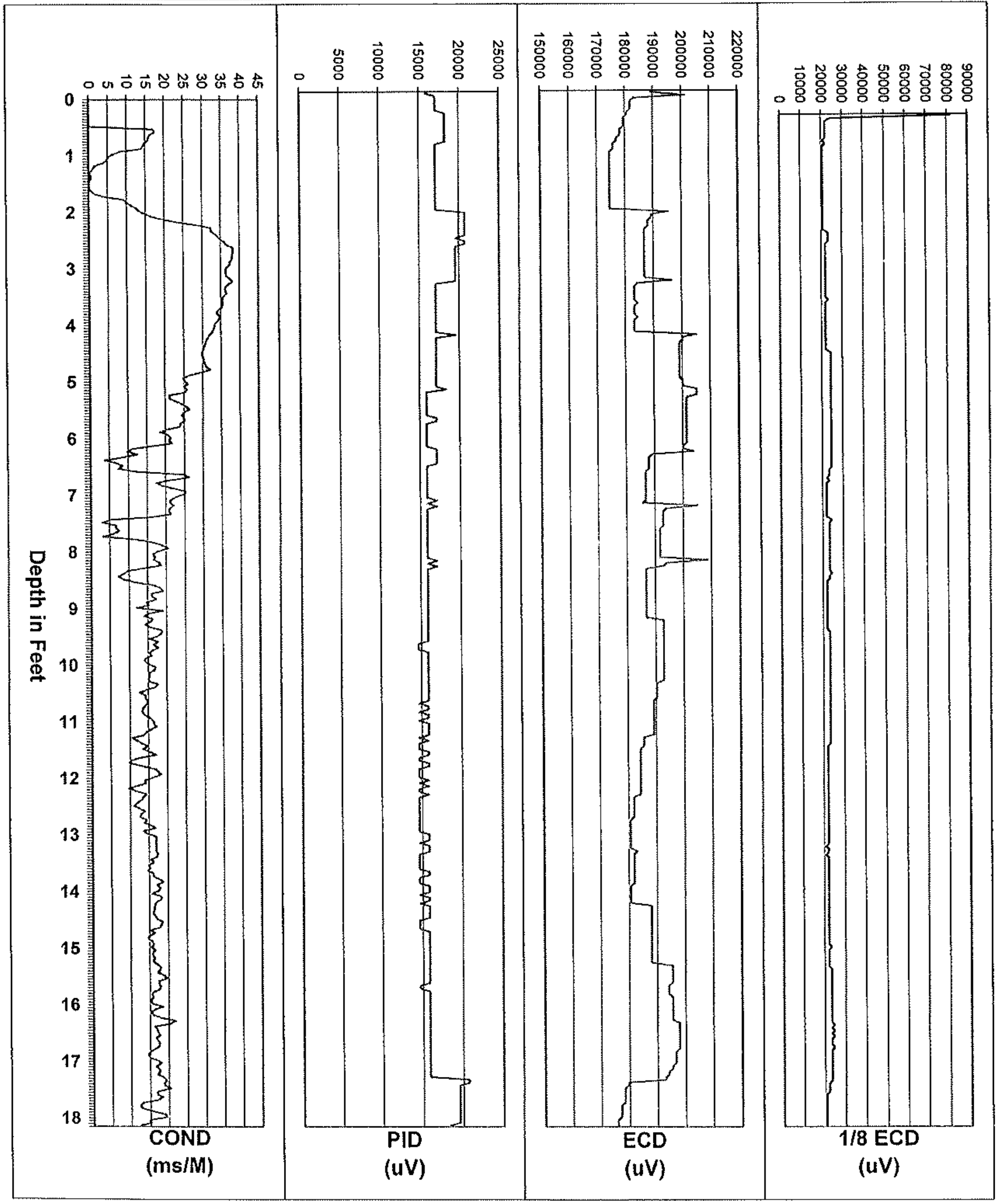
ZEBRA EC/MIP Summary Log, Point SB-11
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 11 of 67

ZEBRA EC/MIP Summary Log, Point SB-12
Lancaster, PA

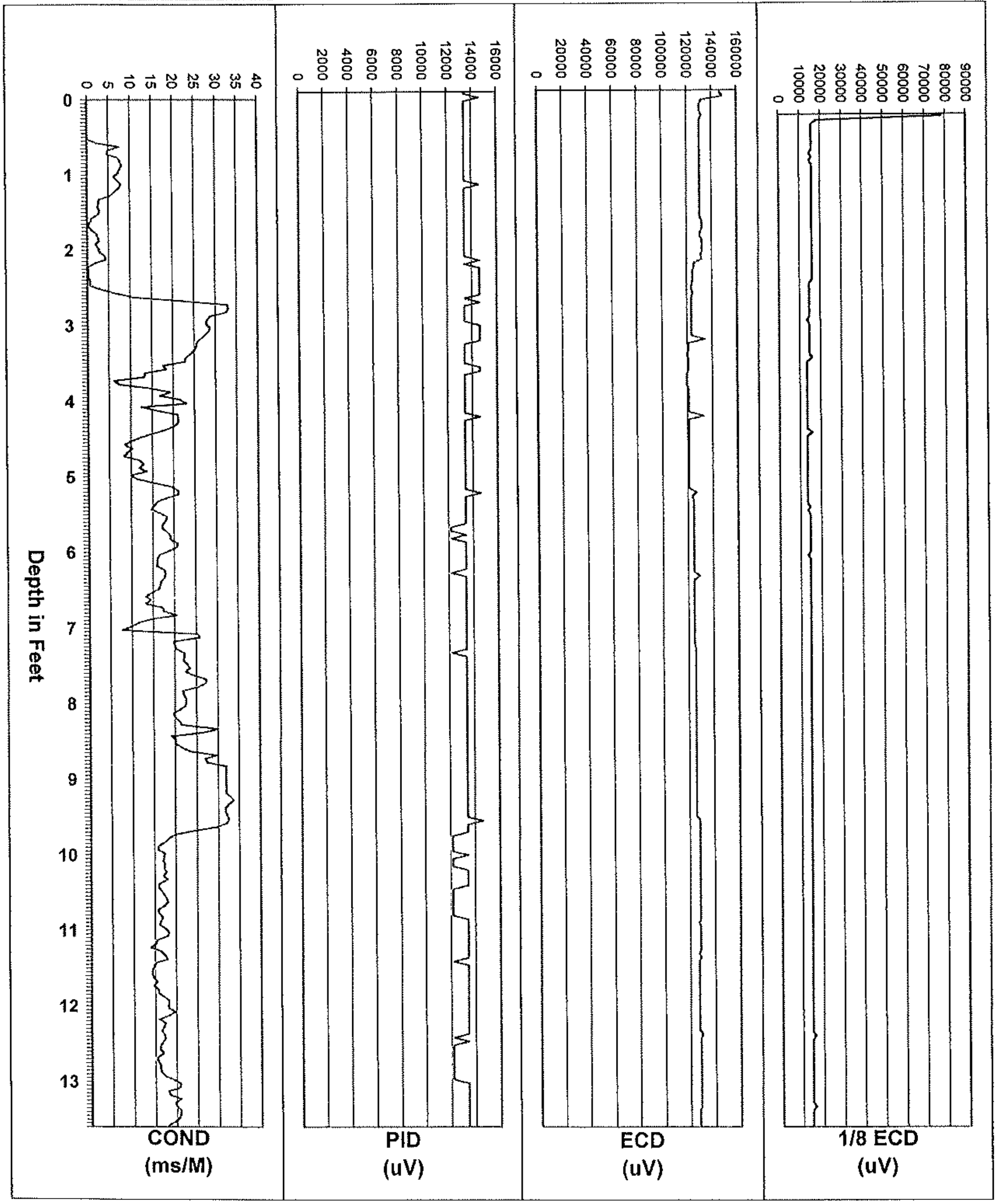


ZEBRA

for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 12 of 67

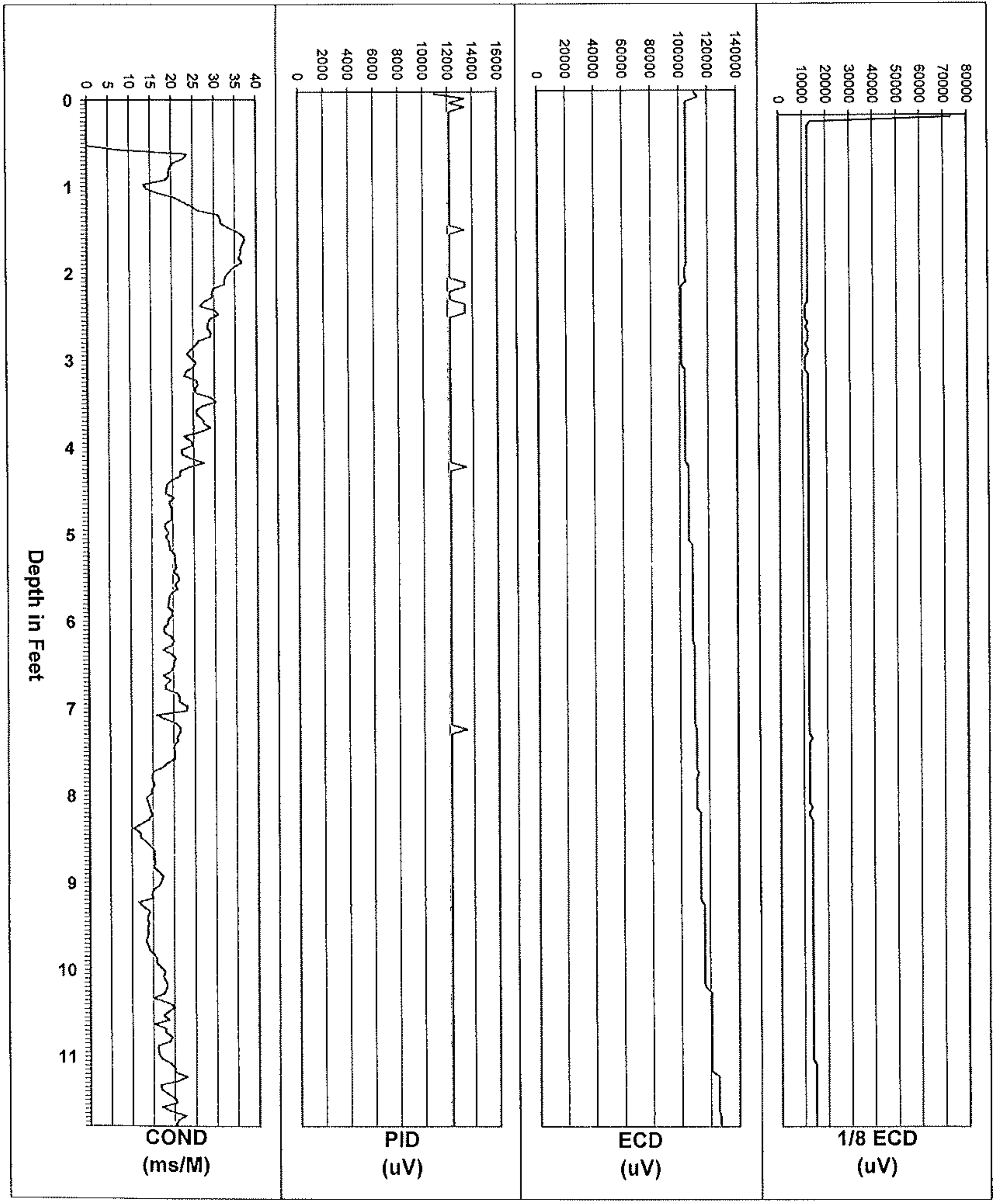
ZEBRA EC/MIP Summary Log, Point SB-13
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 13 of 67

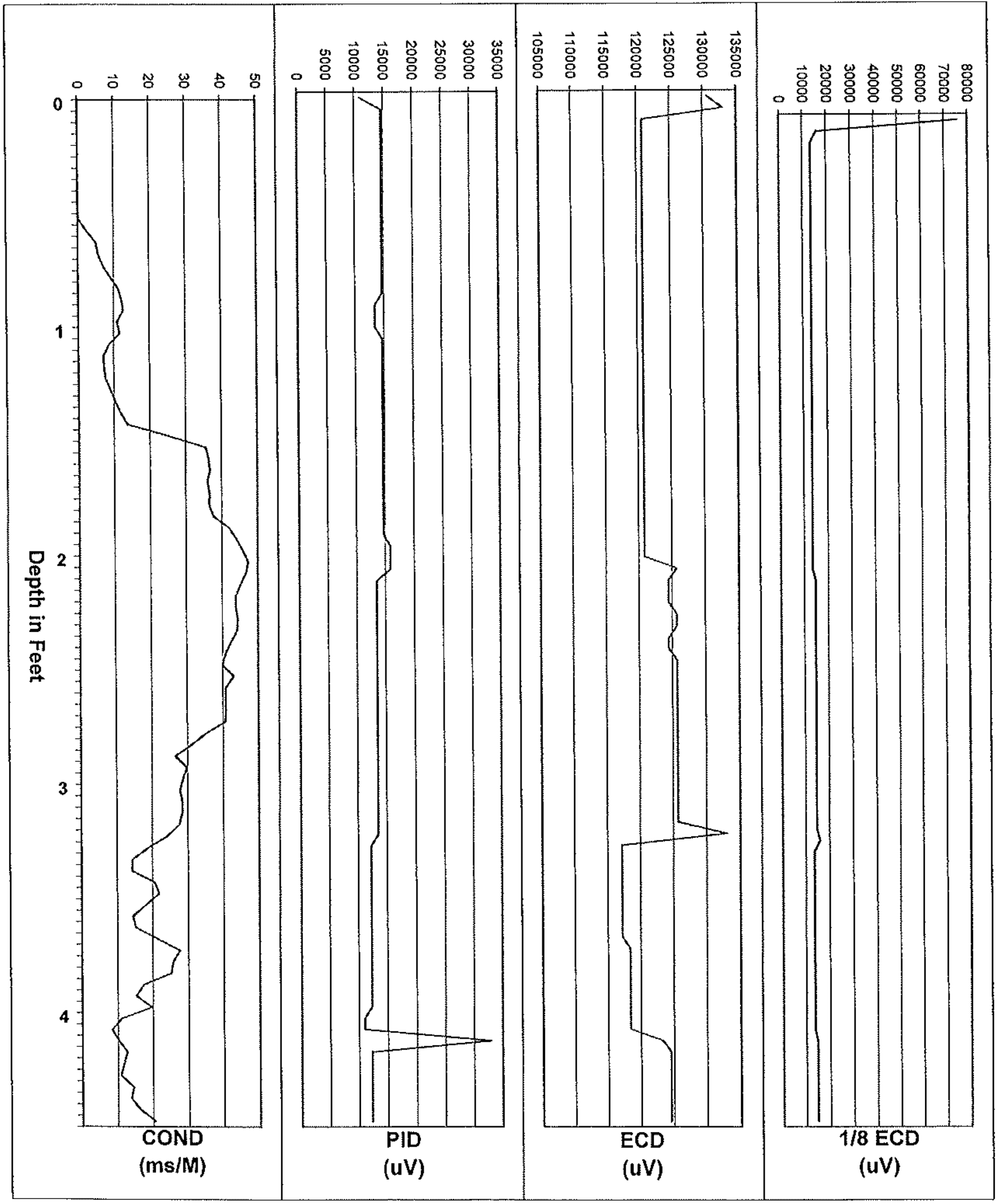
ZEBRA EC/MIP Summary Log, Point SB-14
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 14 of 67

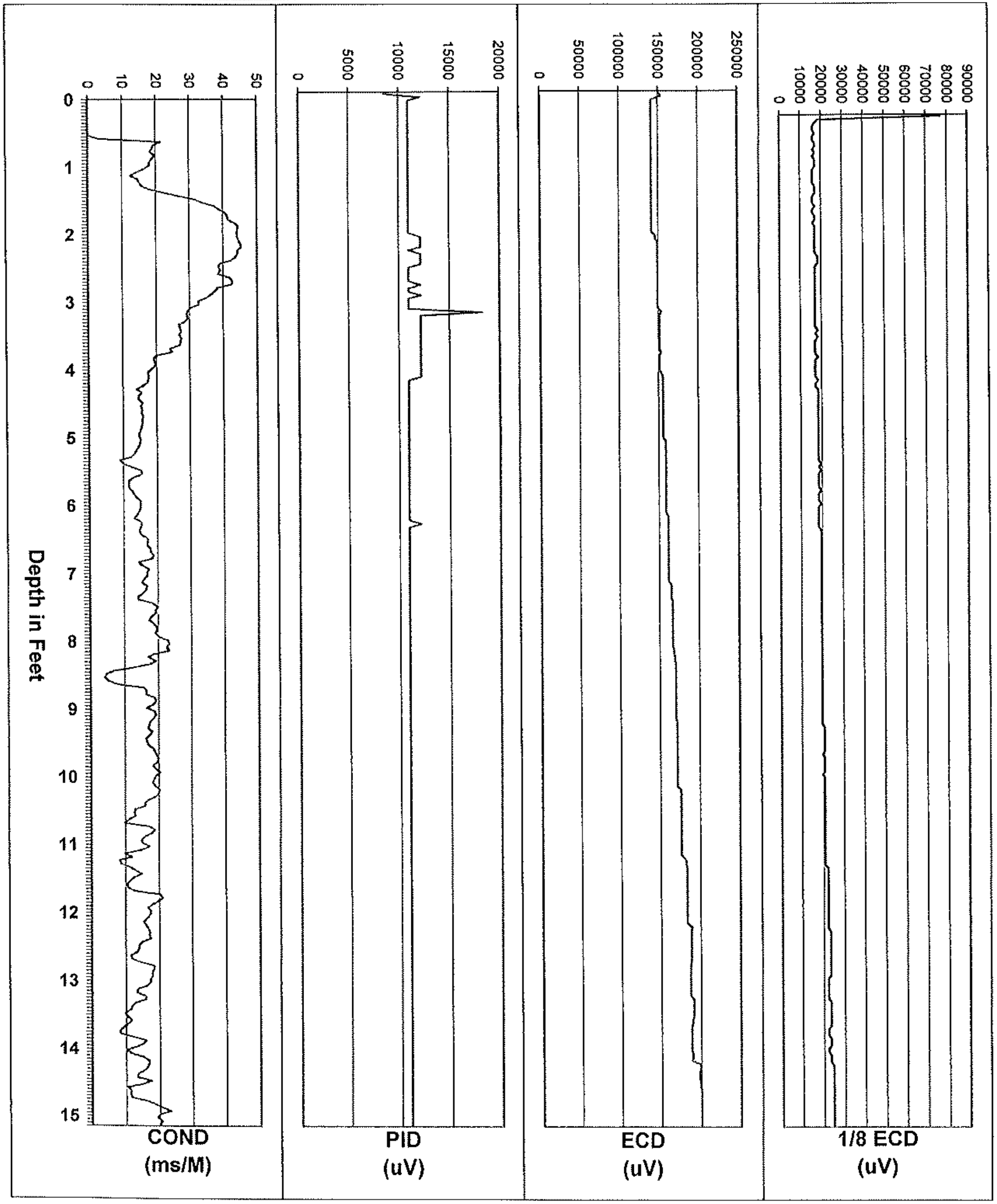
ZEBRA EC/MIP Summary Log, Point SB-15
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/6/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 15 of 67

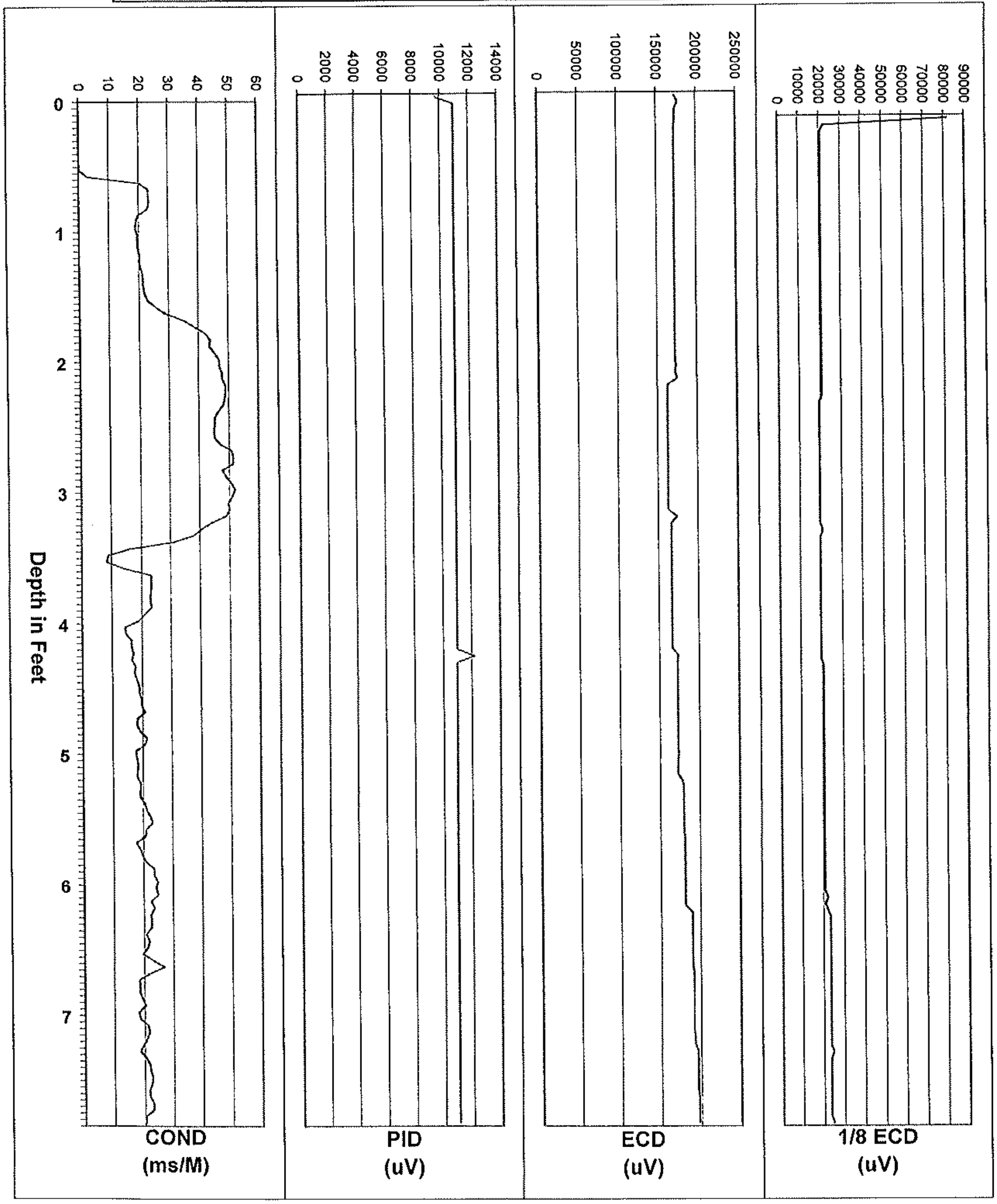
ZEBRA EC/MIP Summary Log, Point SB-16
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 16 of 67

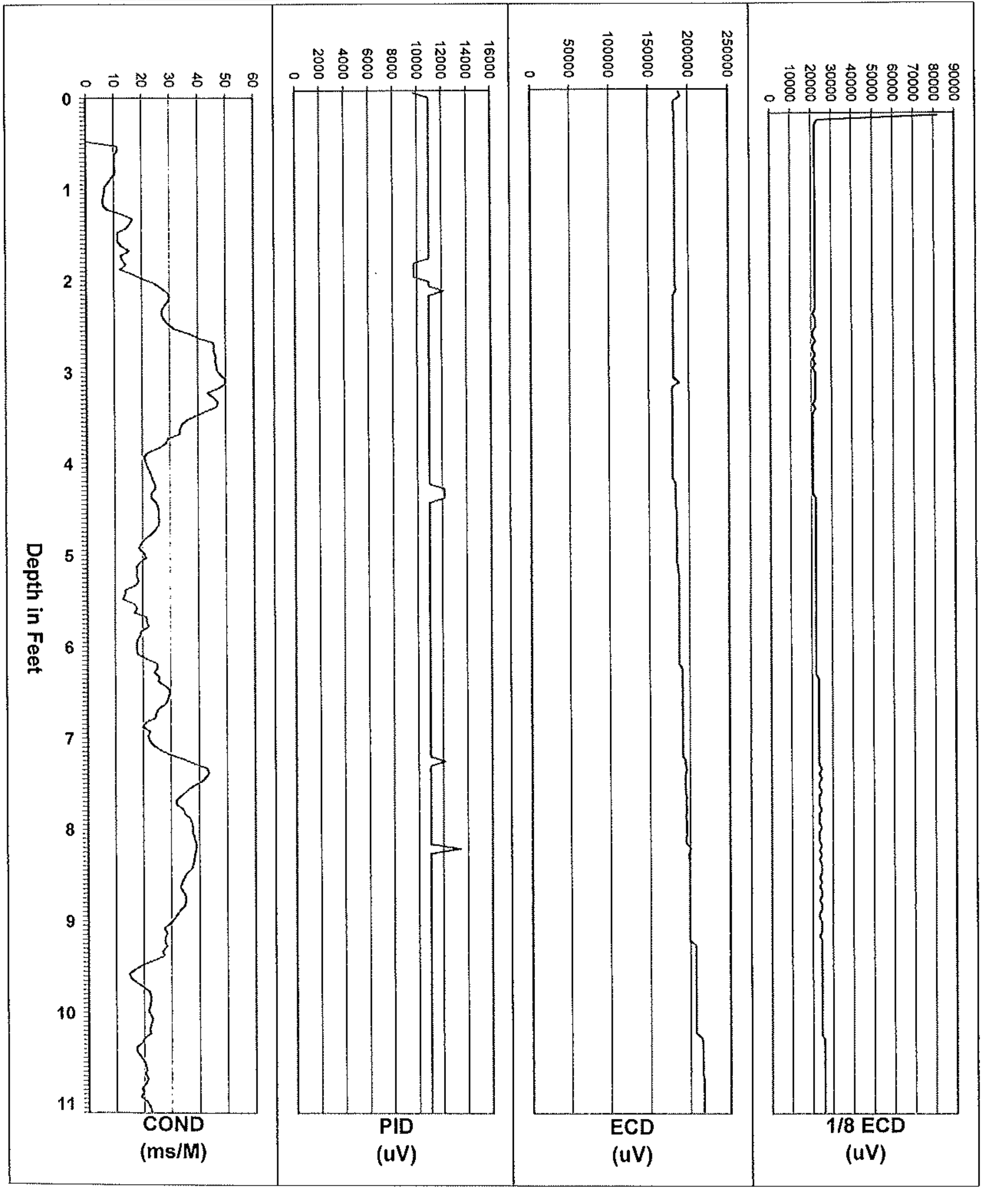
ZEBRA EC/MIP Summary Log, Point SB-17
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 17 of 67

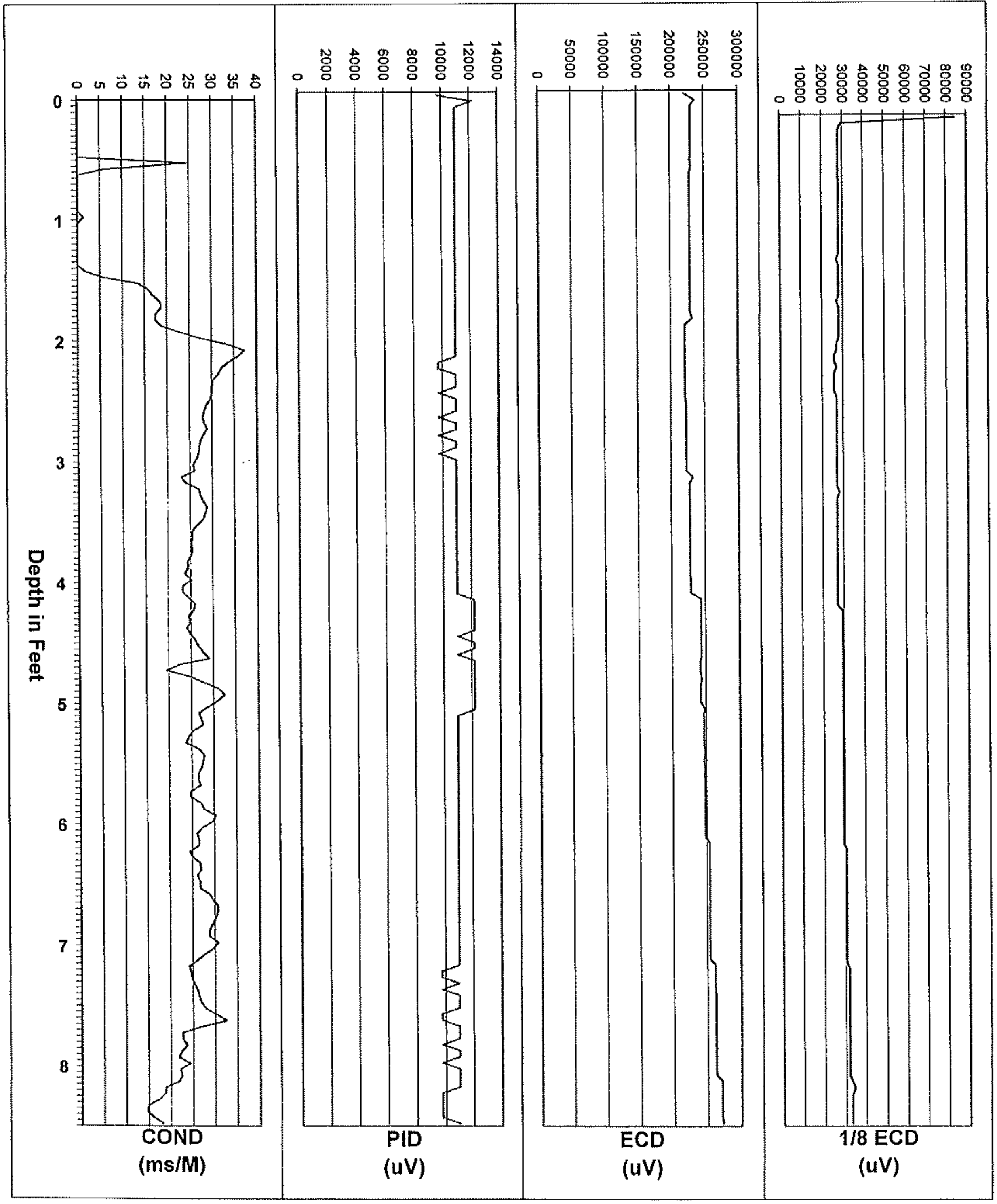
ZEBRA EC/MIP Summary Log, Point SB-18
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 18 of 67

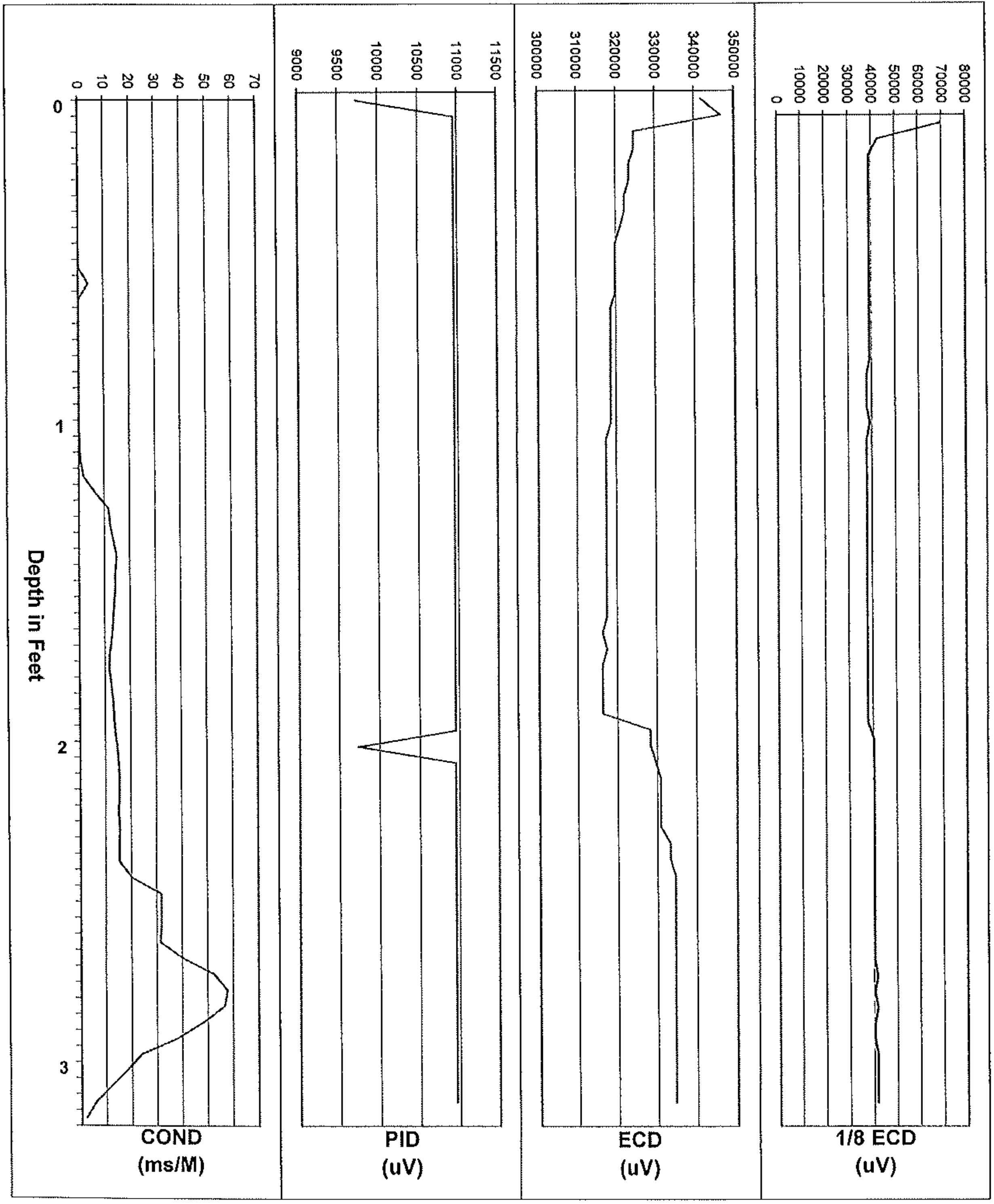
ZEBRA EC/MIP Summary Log, Point SB-19
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 19 of 67

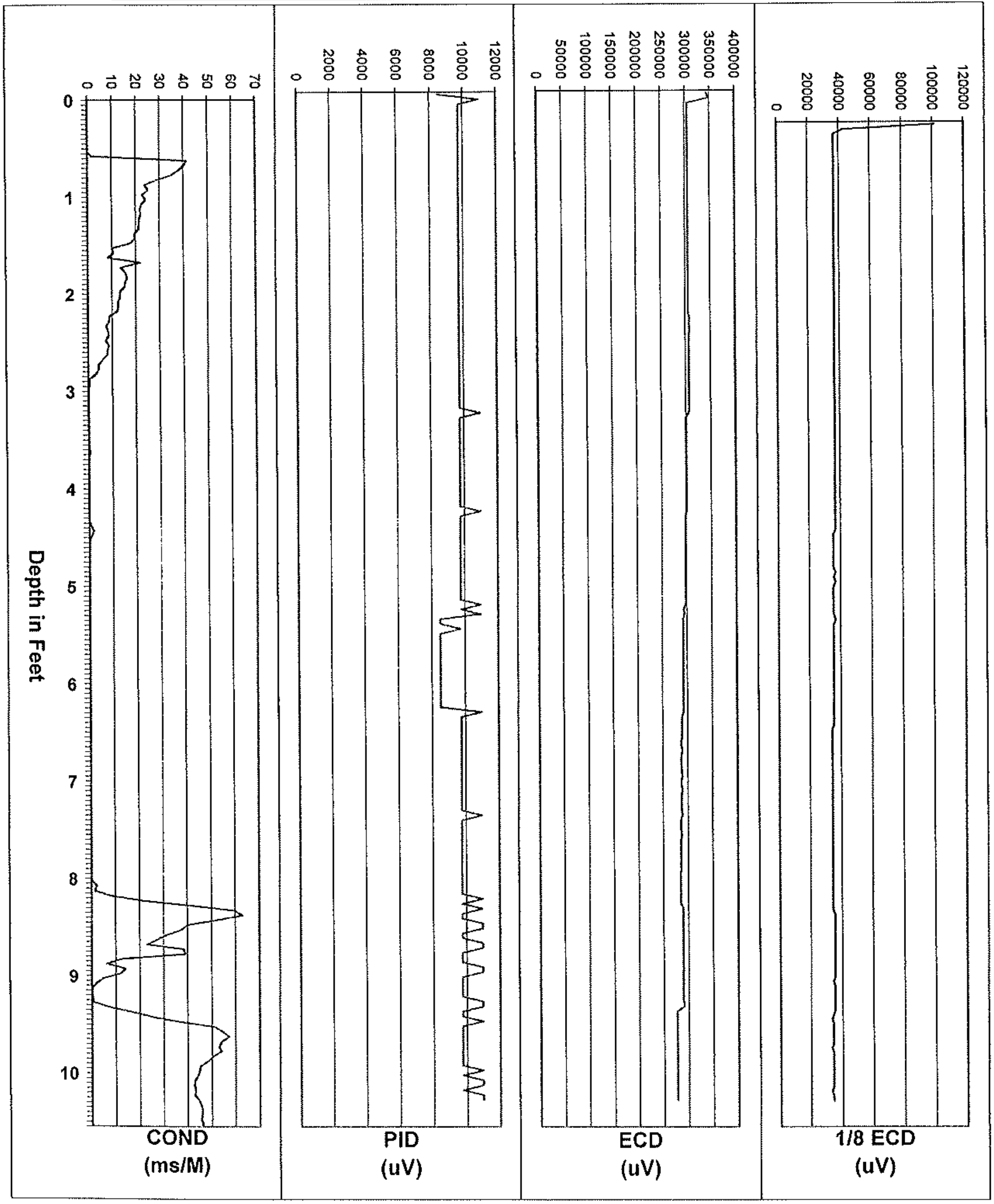
ZEBRA EC/MIP Summary Log, Point SB-20
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 20 of 67

ZEBRA EC/MIP Summary Log, Point SB-21
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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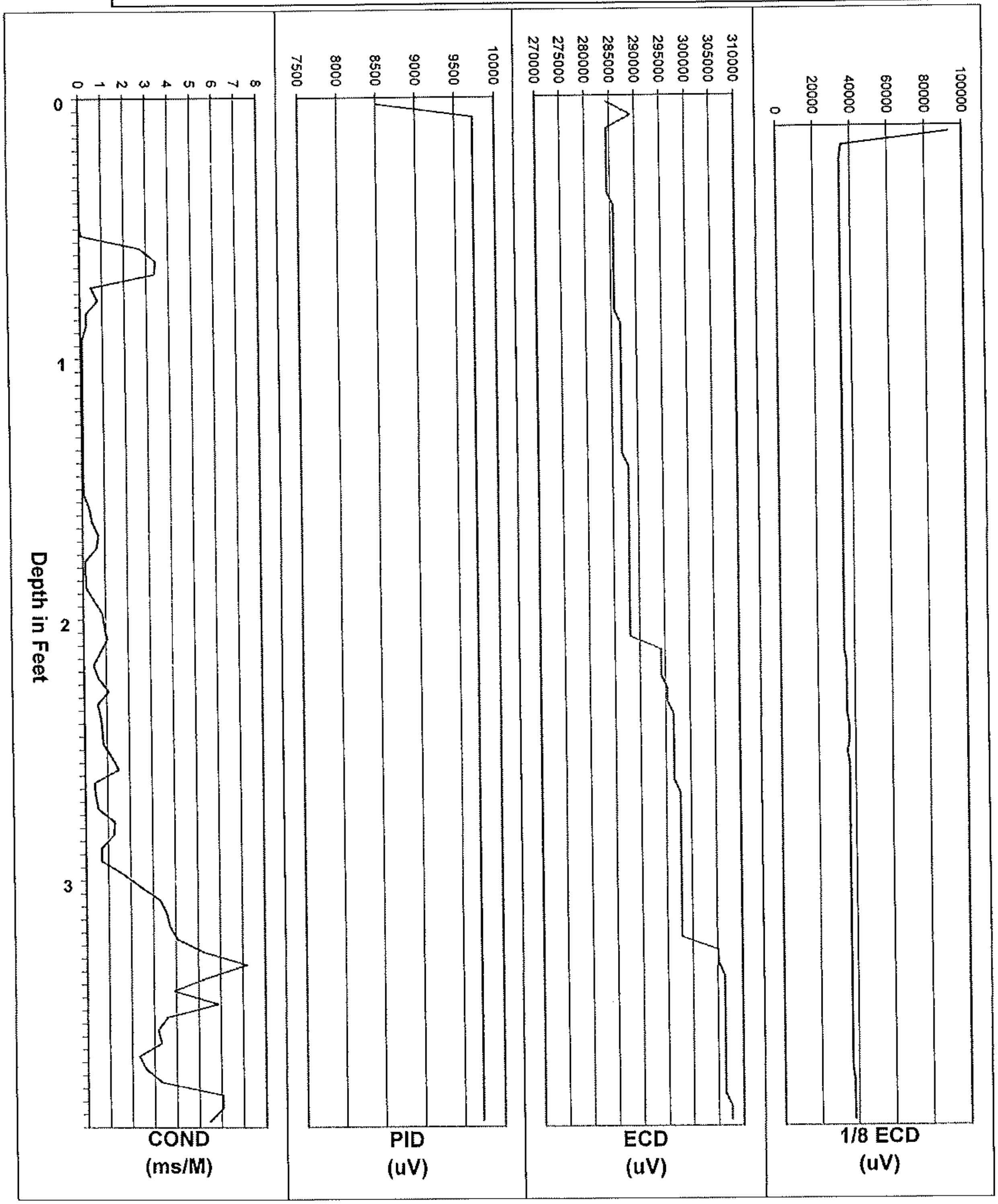
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 21 of 67

ZEBRA EC/MIP Summary Log, Point SB-22
Lancaster, PA



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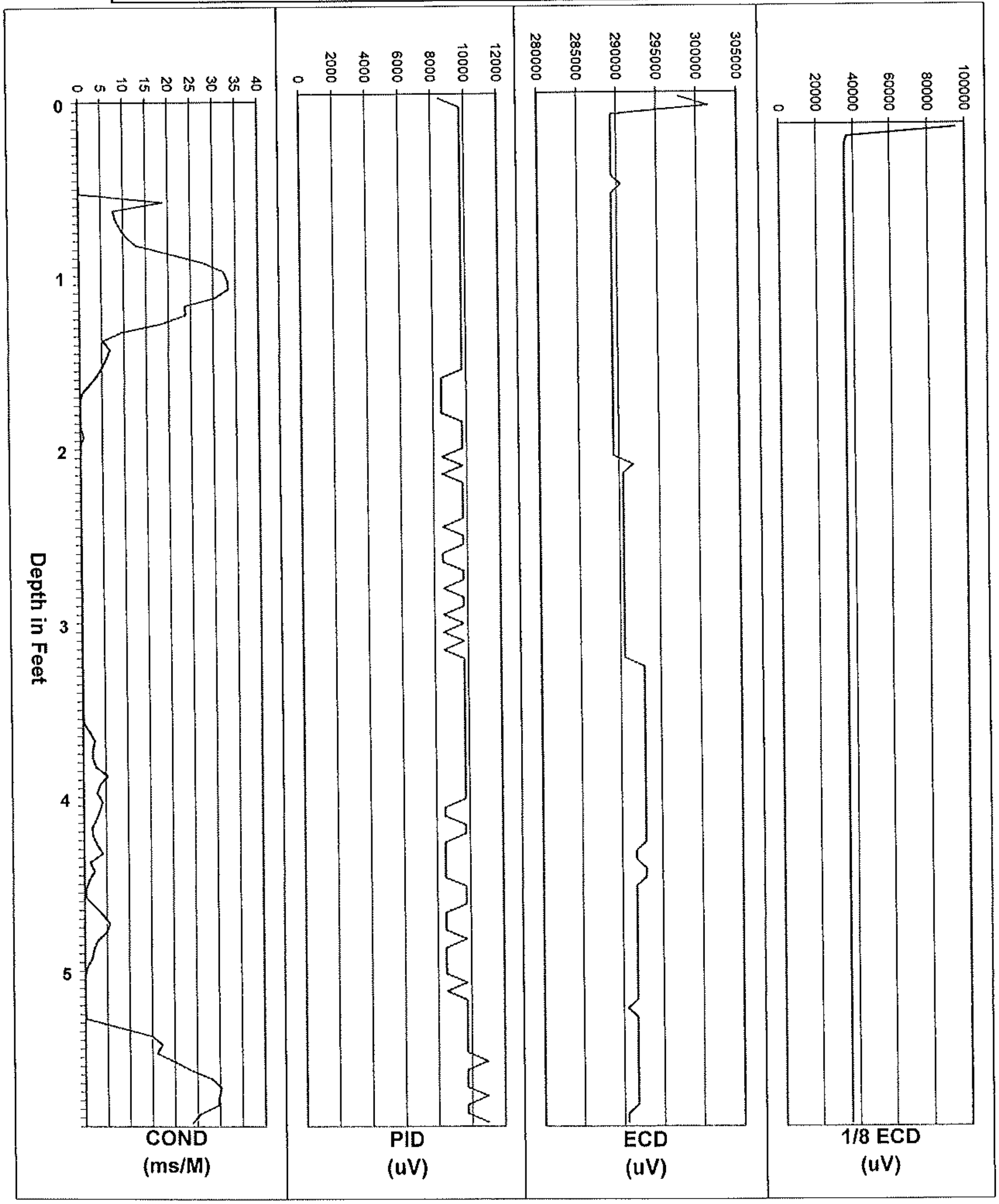
for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 22 of 67

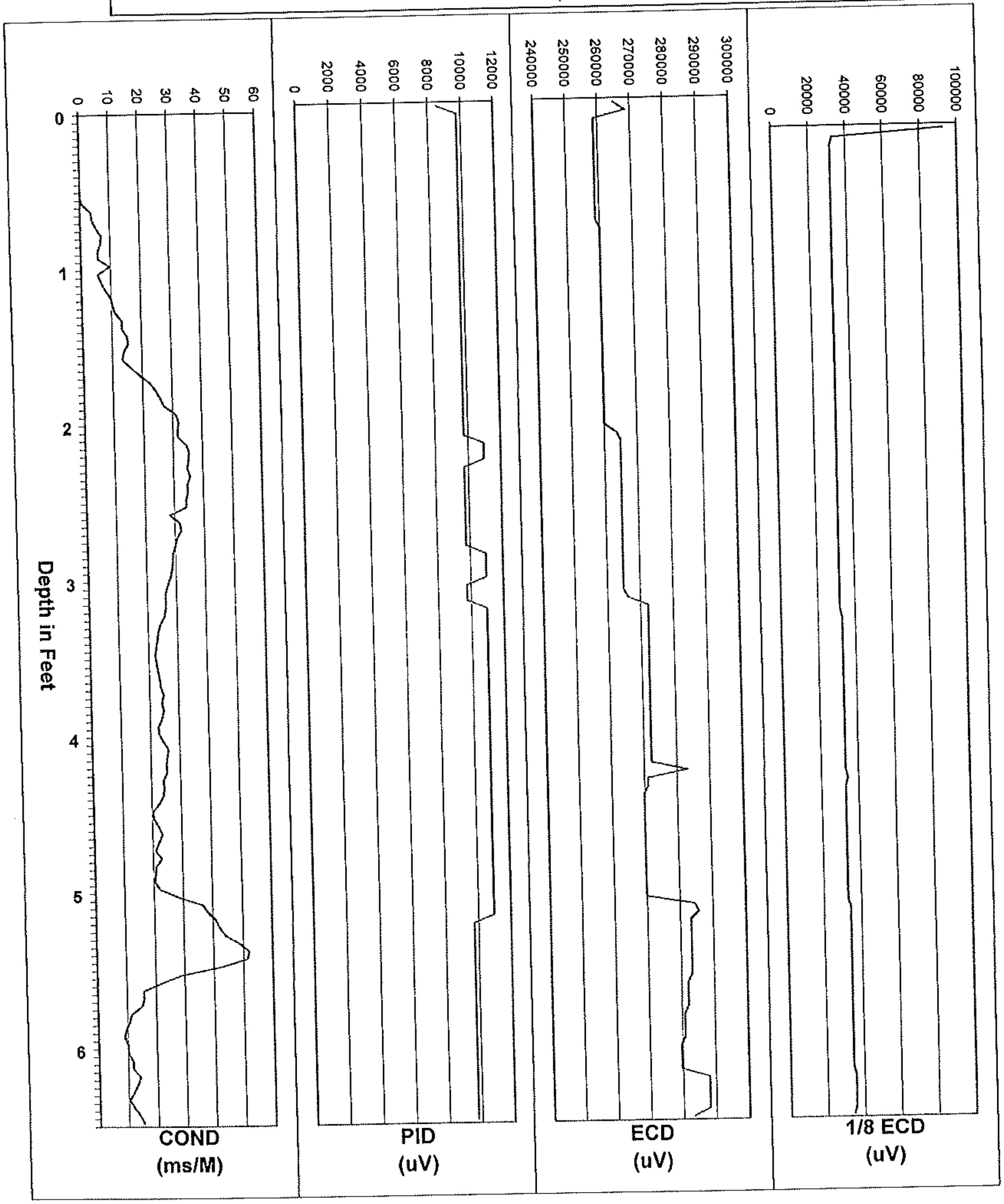
ZEBRA EC/MIP Summary Log, Point SB-23
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 23 of 67

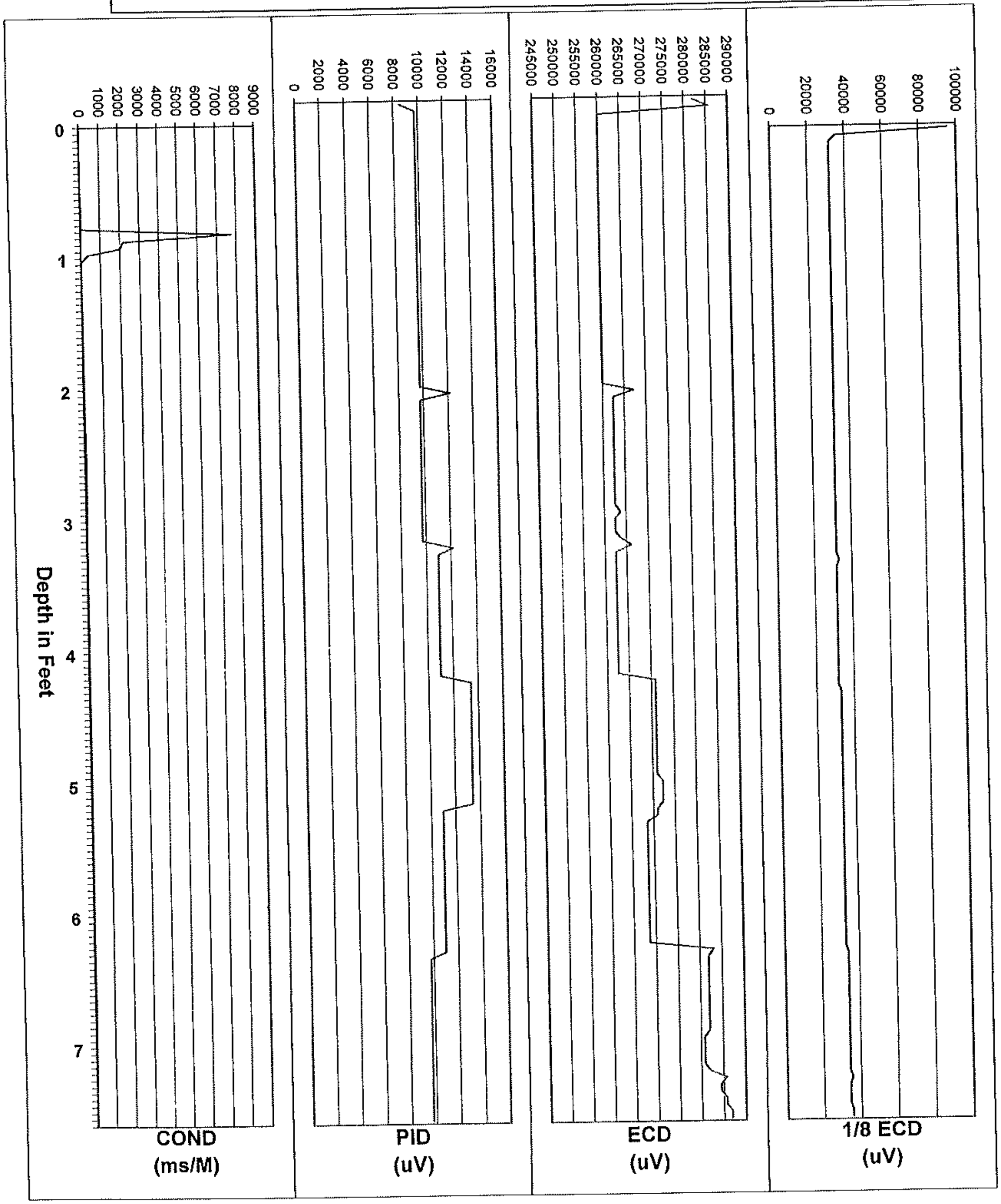
ZEBRA EC/MIP Summary Log, Point SB-24
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 24 of 67

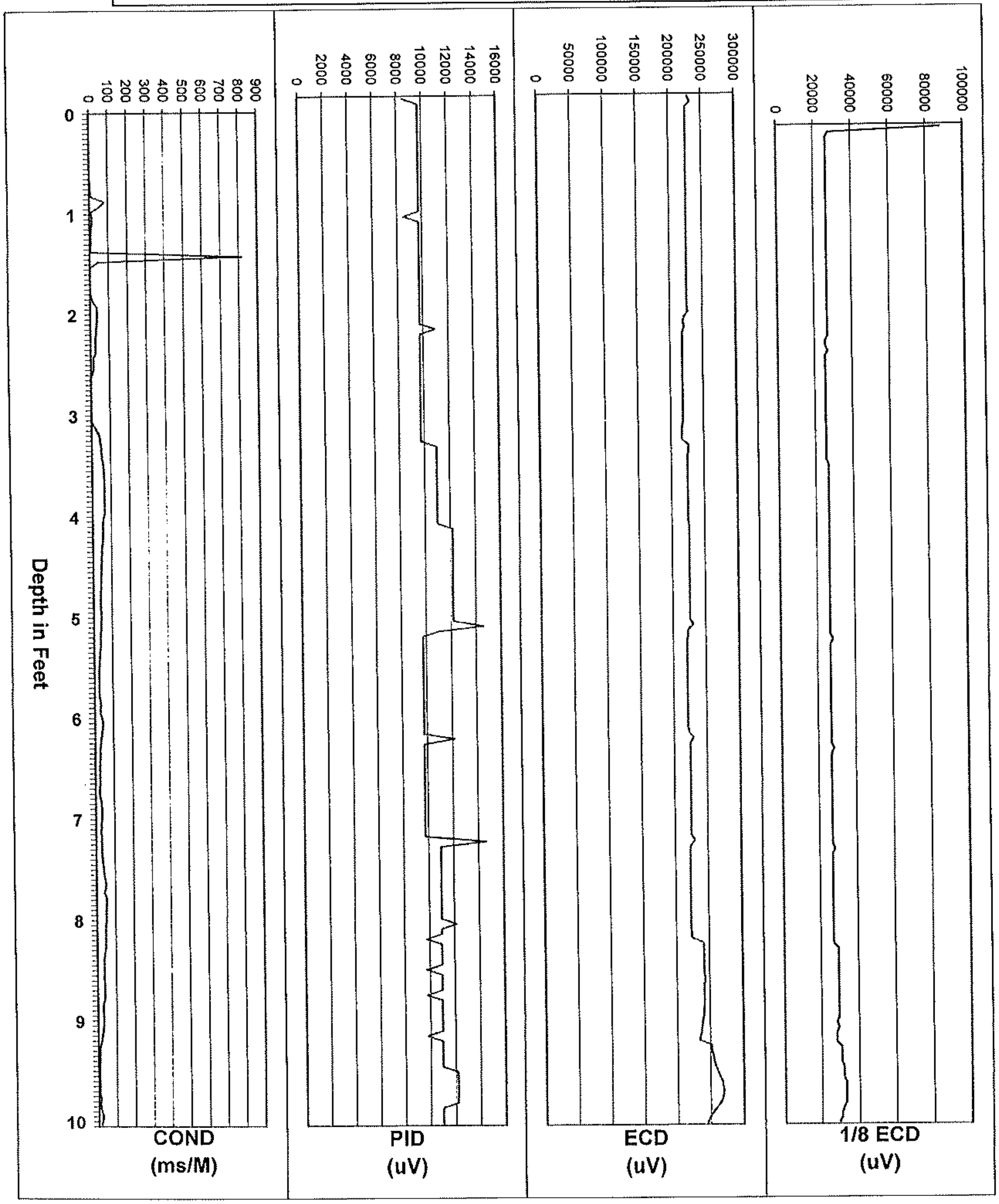
ZEBRA EC/MIP Summary Log, Point SB-25
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 25 of 67

ZEBRA EC/MIP Summary Log, Point SB-26
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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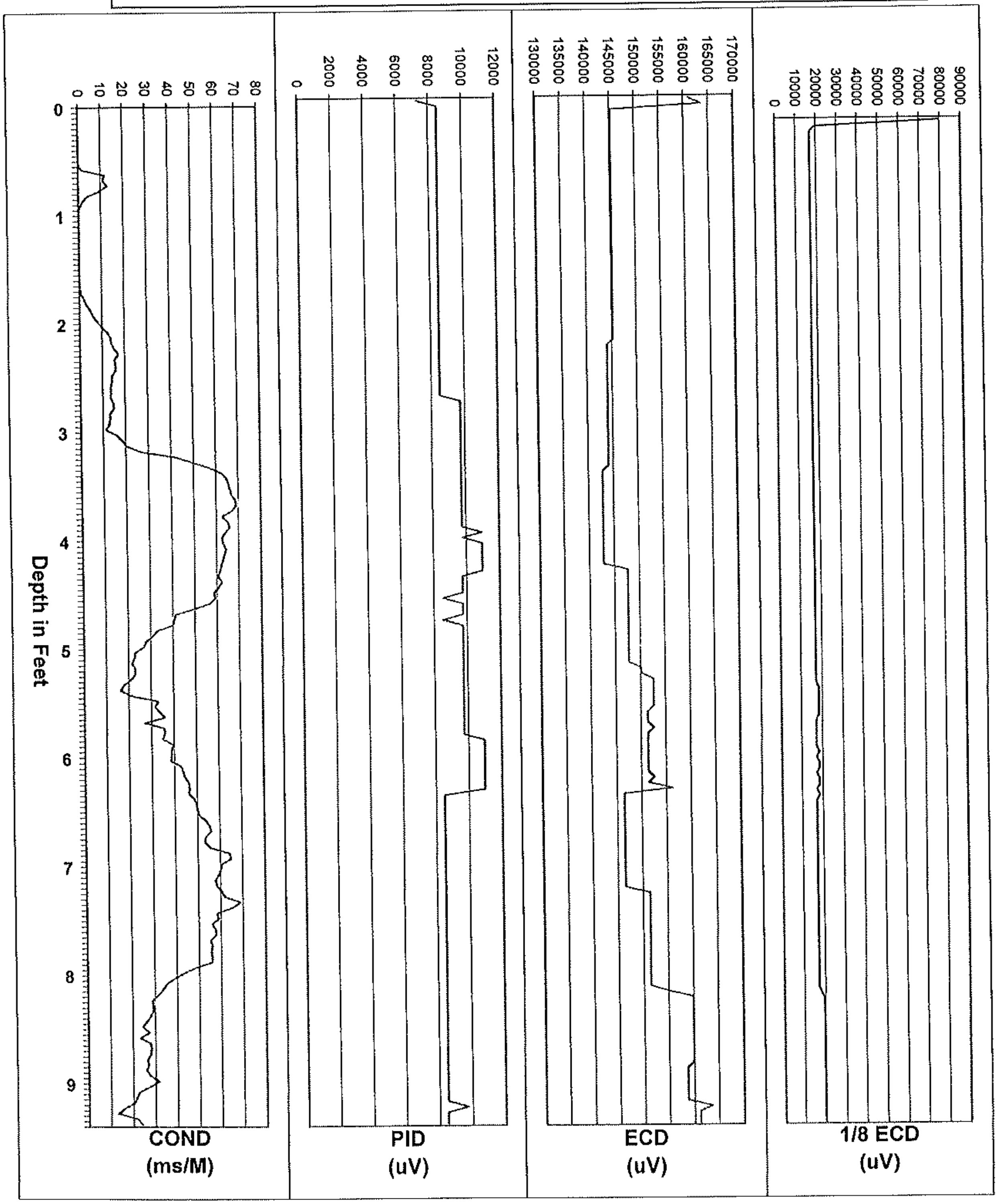
(516) 596-6300

Date: 11/7/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 26 of 67

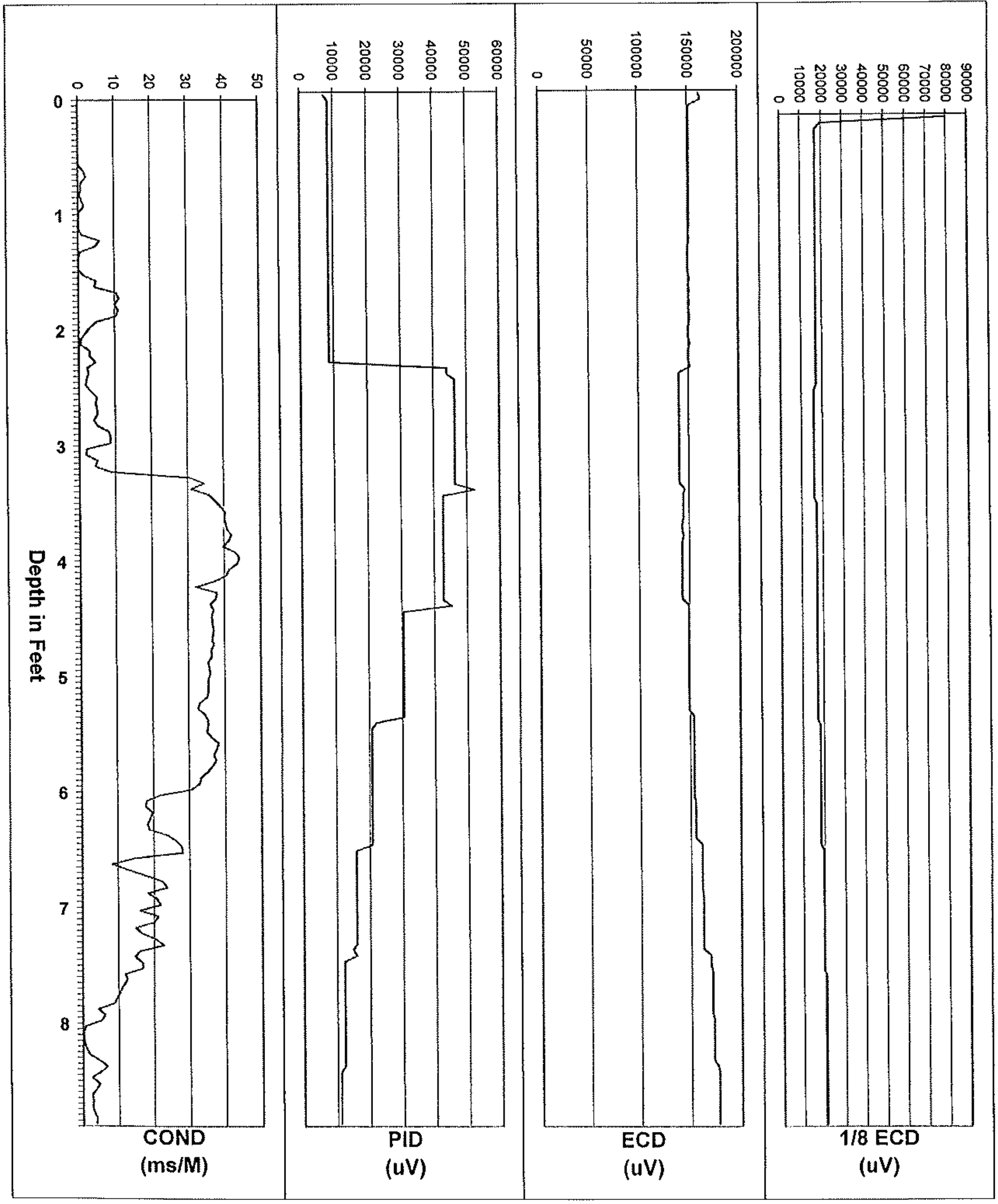
ZEBRA EC/MIP Summary Log, Point SB-27
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 27 of 67

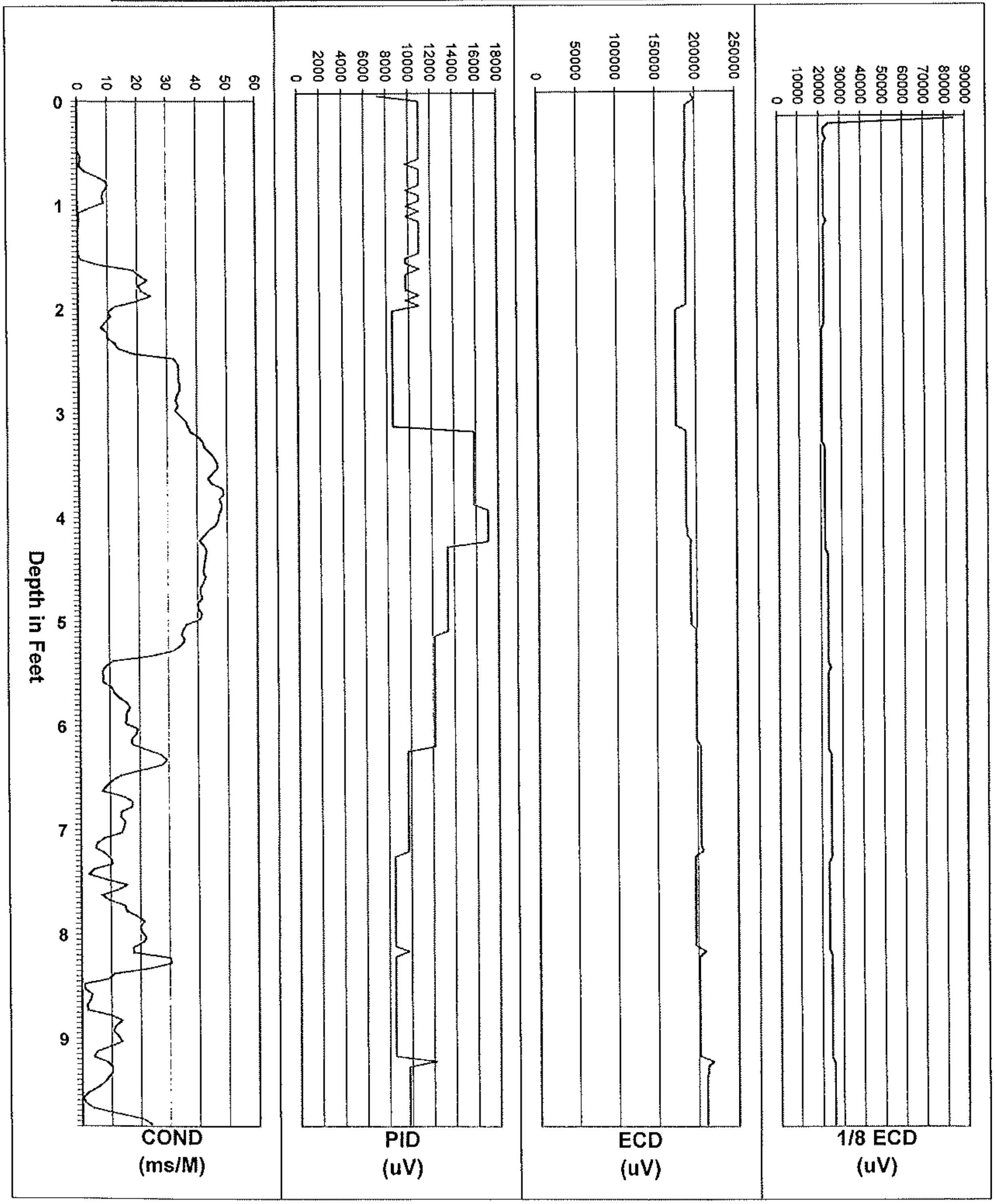
ZEBRA EC/MIP Summary Log, Point SB-28
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 28 of 67

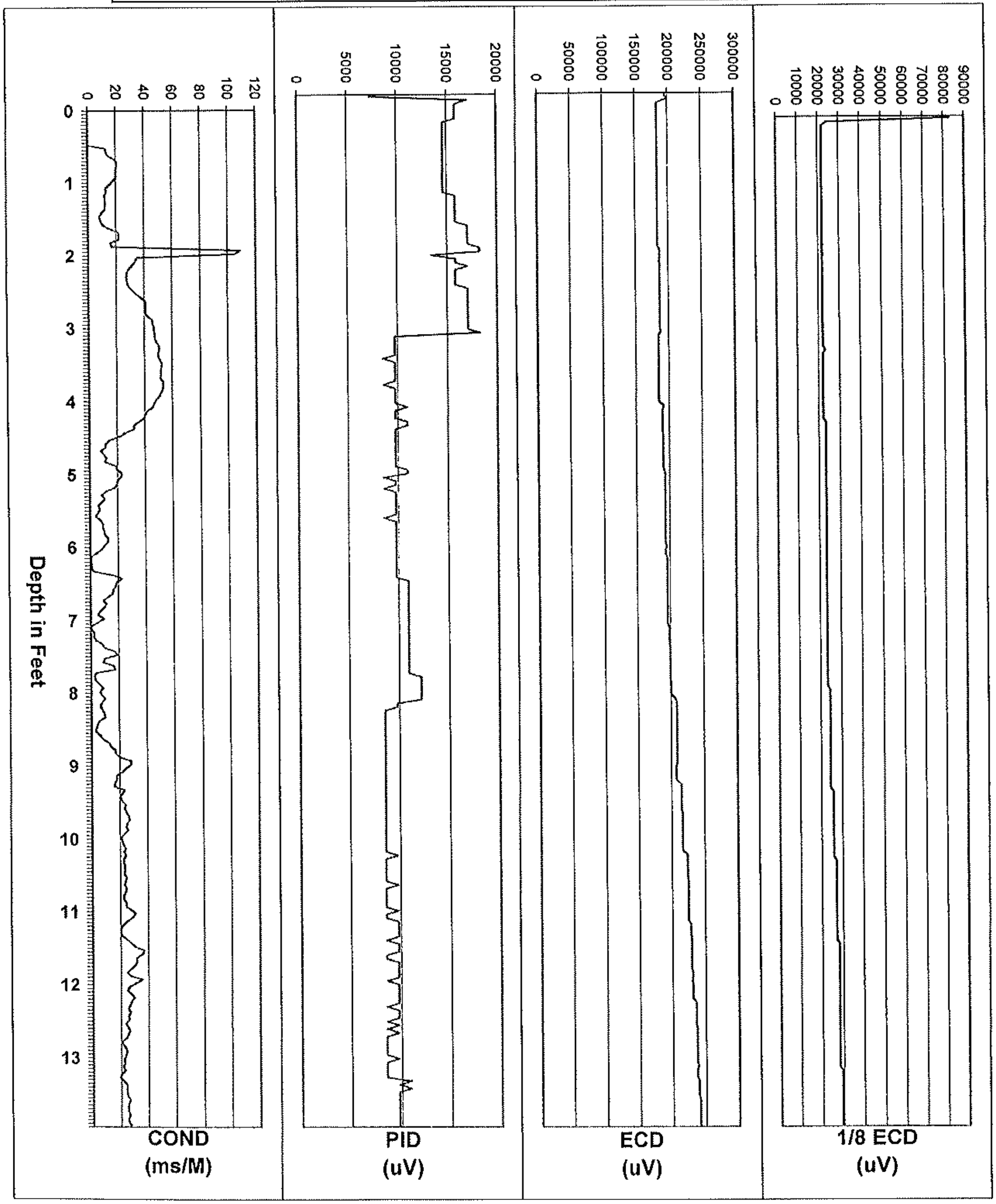
ZEBRA EC/MIP Summary Log, Point SB-29
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 29 of 67

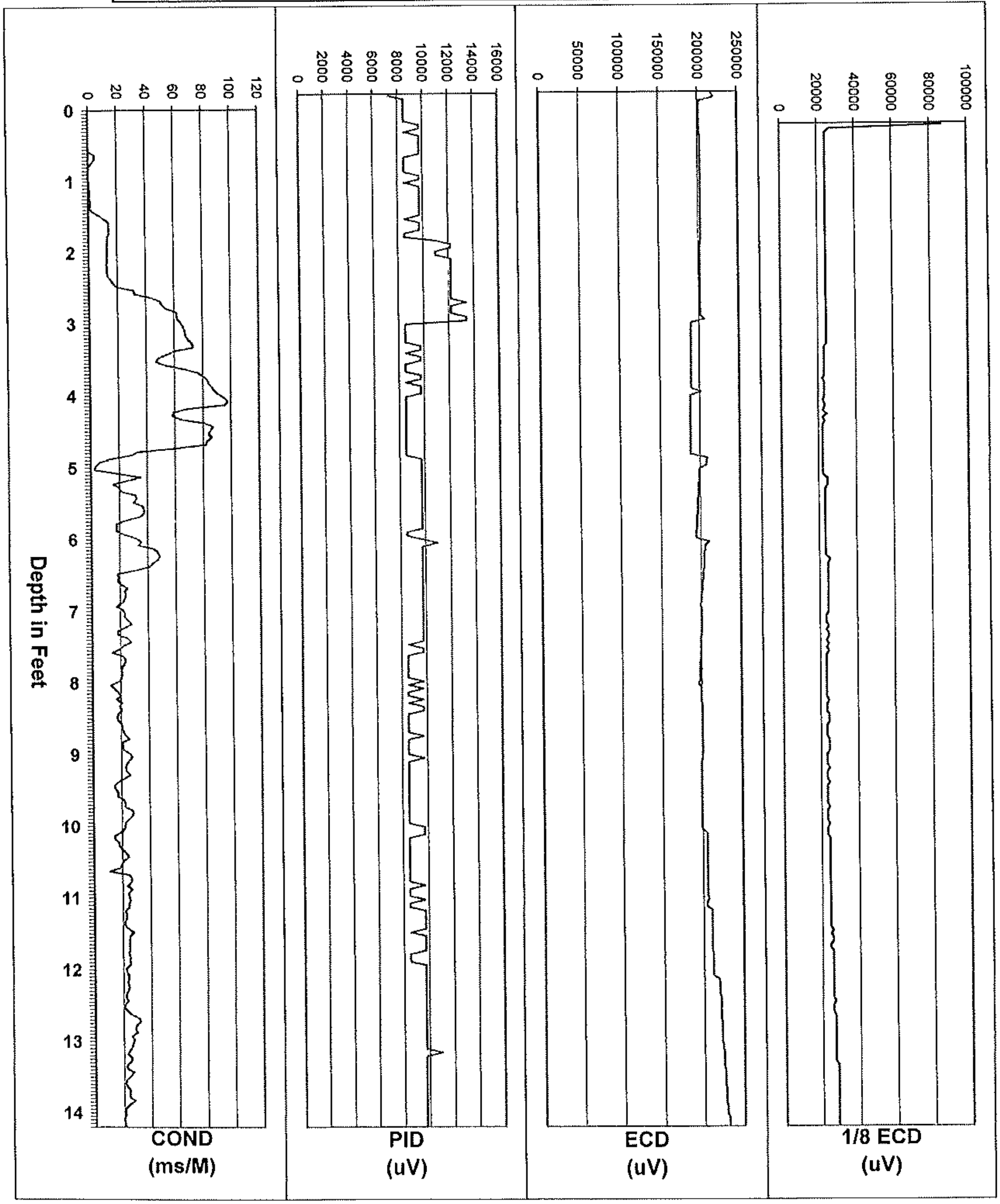
ZEBRA EC/MIP Summary Log, Point SB-30
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 30 of 67

ZEBRA EC/MIP Summary Log, Point SB-31
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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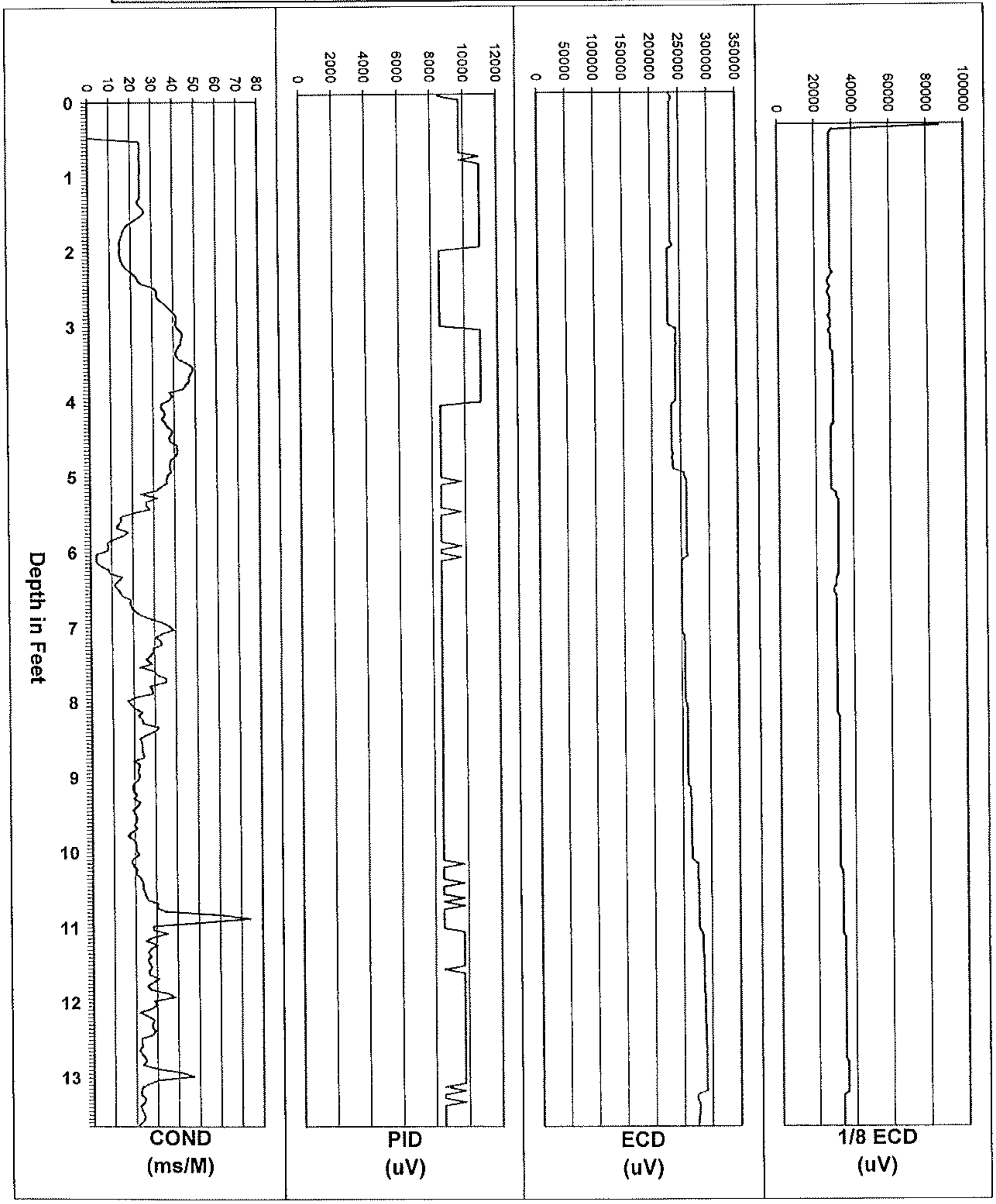
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 31 of 67

ZEBRA EC/MIP Summary Log, Point SB-32
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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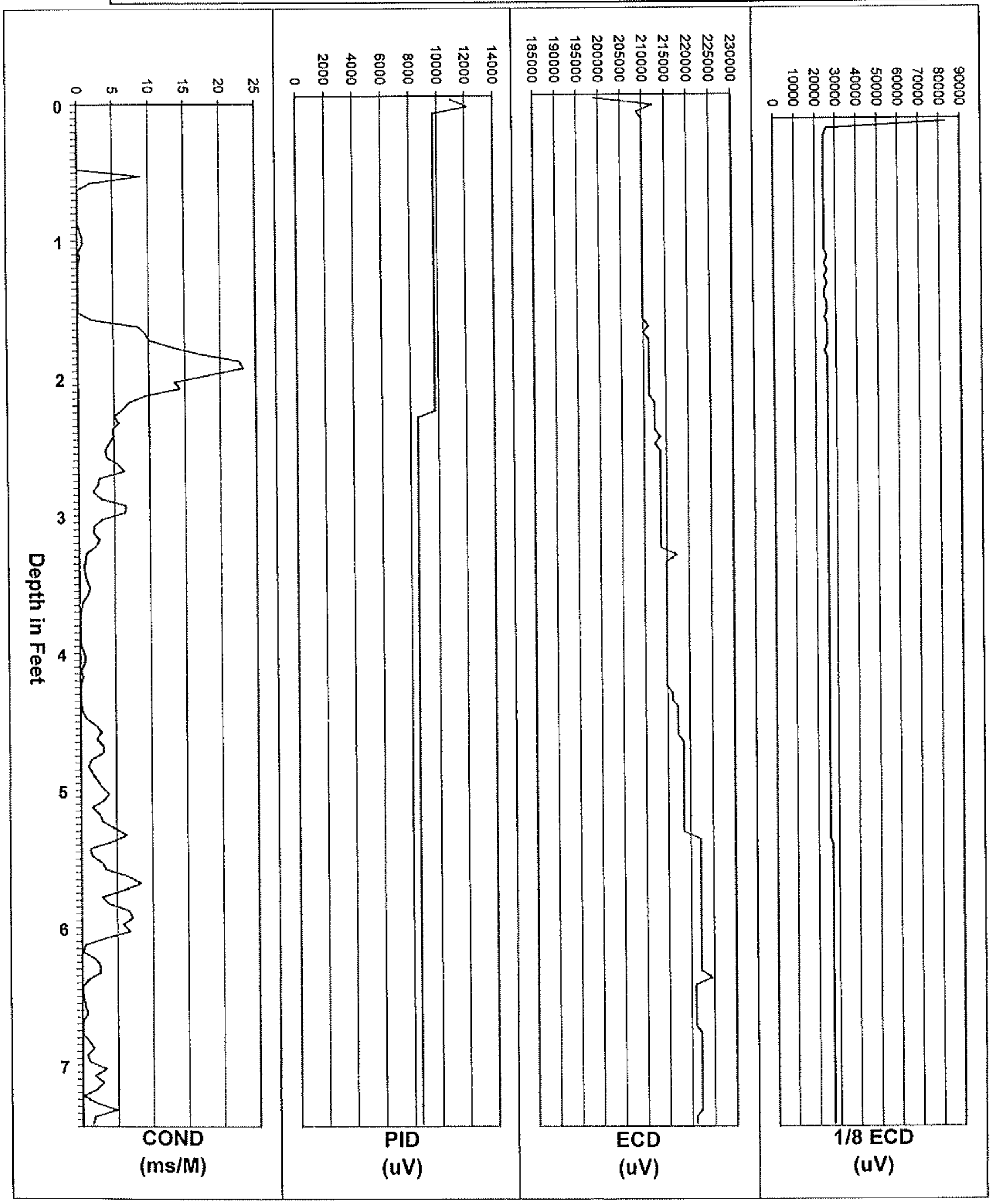
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 32 of 67

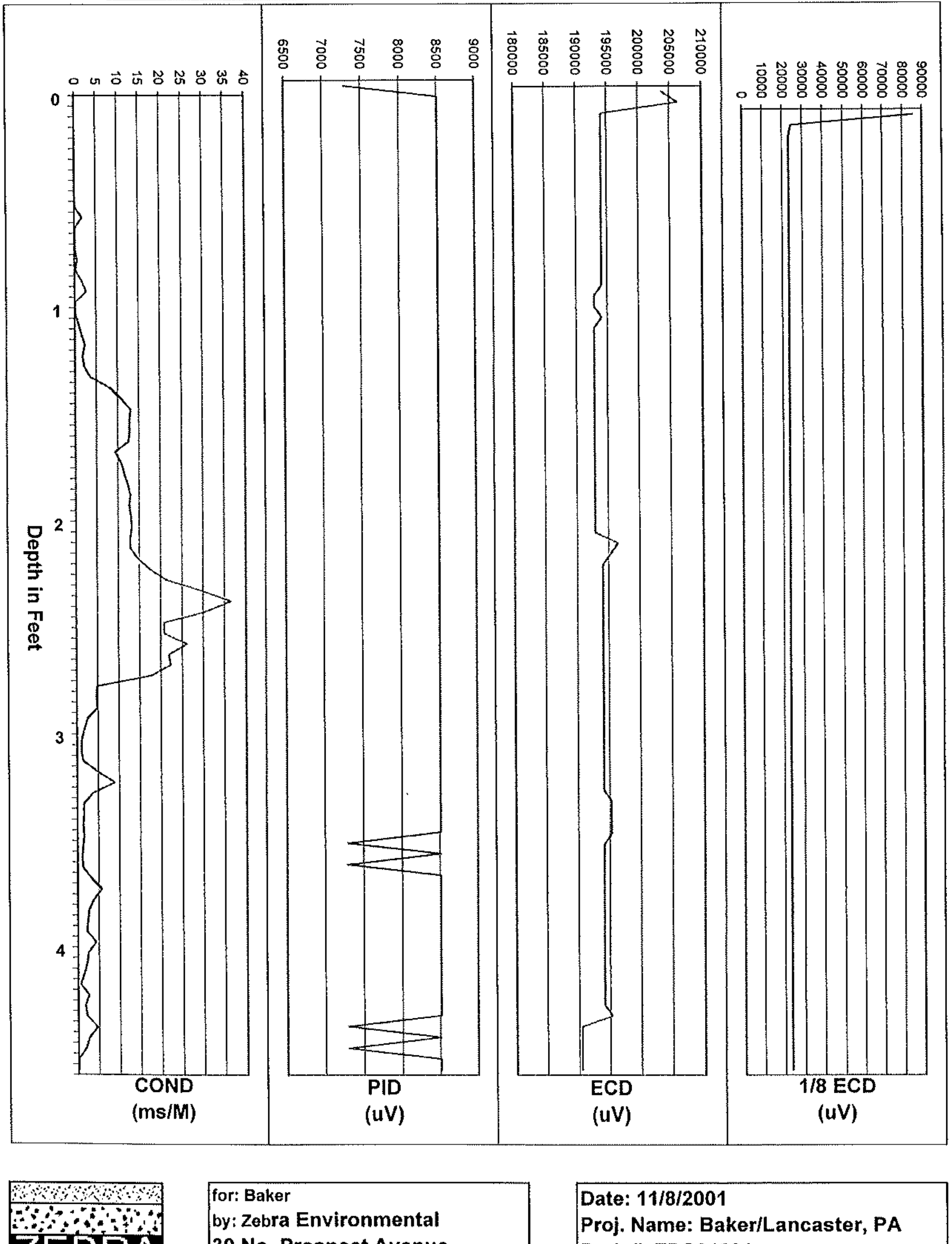
ZEBRA EC/MIP Summary Log, Point SB-33
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 33 of 67

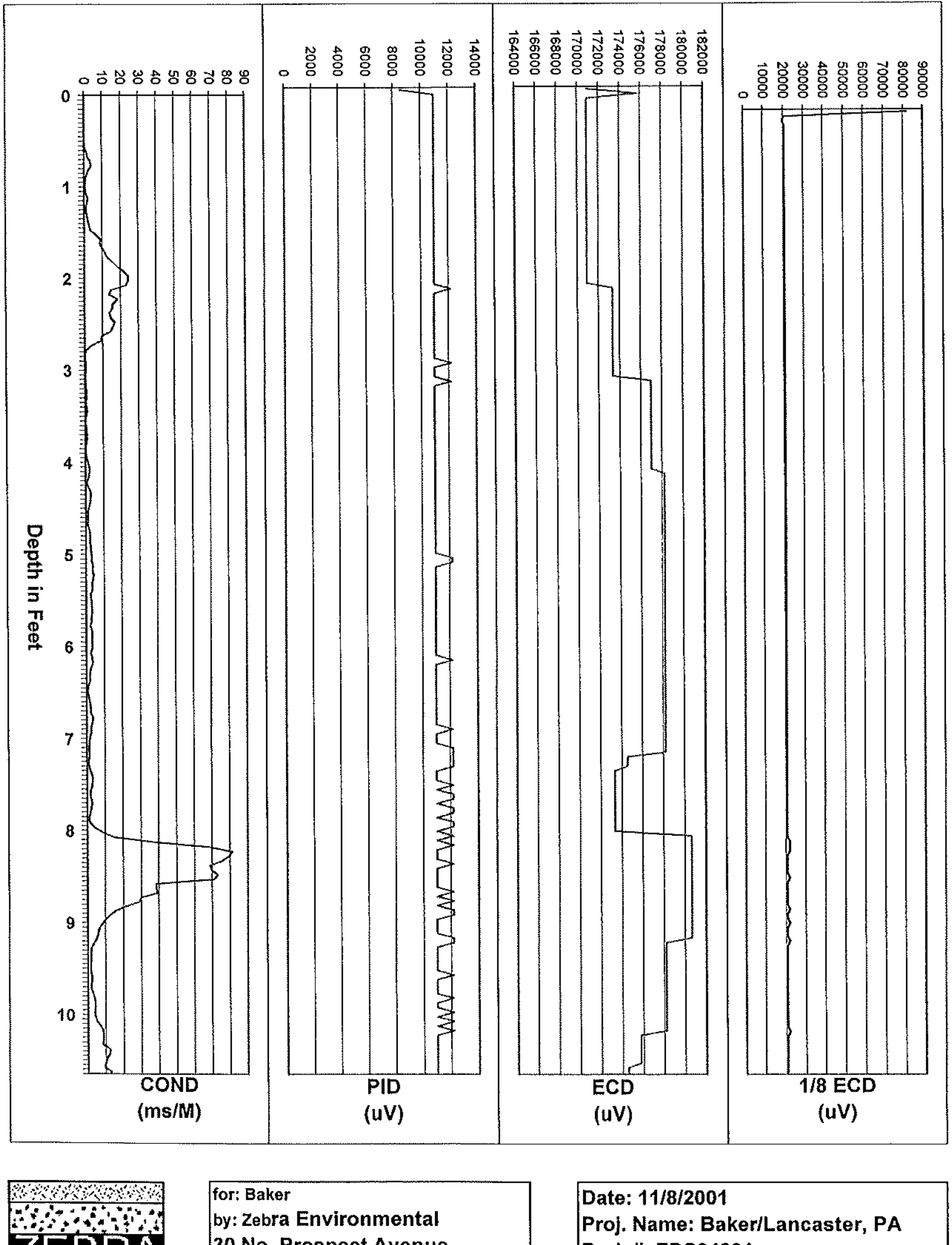
ZEBRA EC/MIP Summary Log, Point SB-34
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 34 of 67

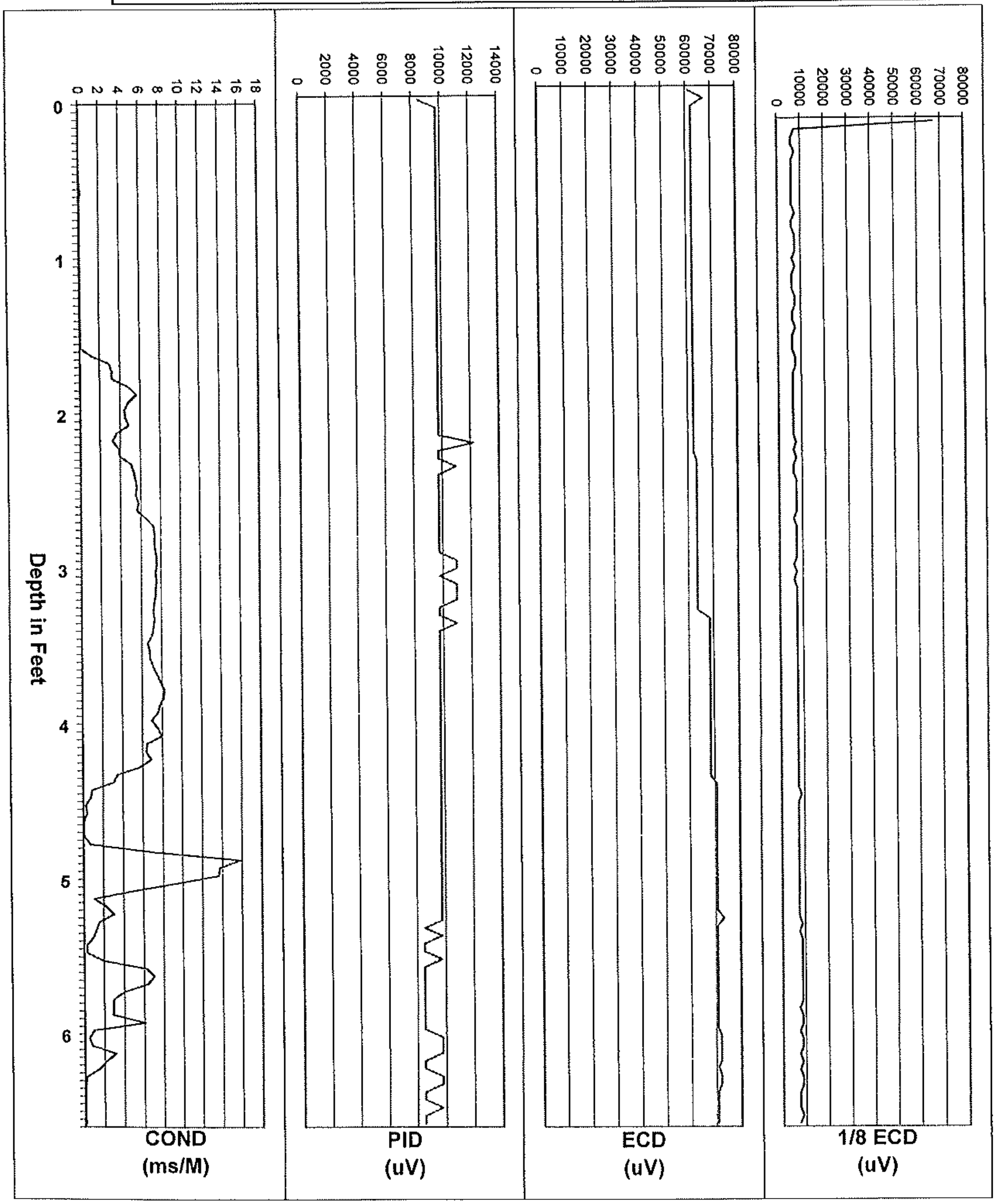
ZEBRA EC/MIP Summary Log, Point SB-35
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/8/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 35 of 67

ZEBRA EC/MIP Summary Log, Point SB-36
Lancaster, PA



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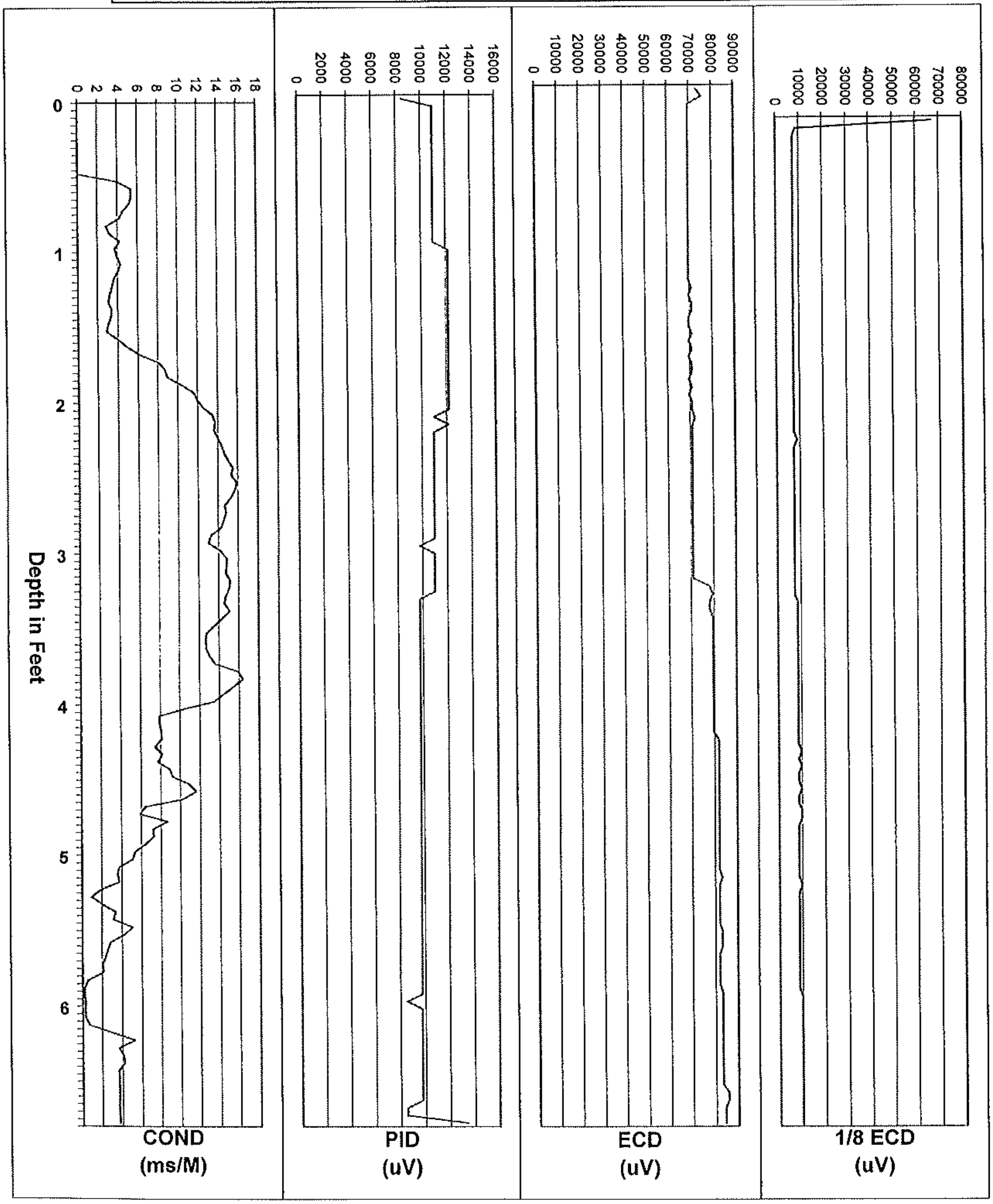
for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/9/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 36 of 67

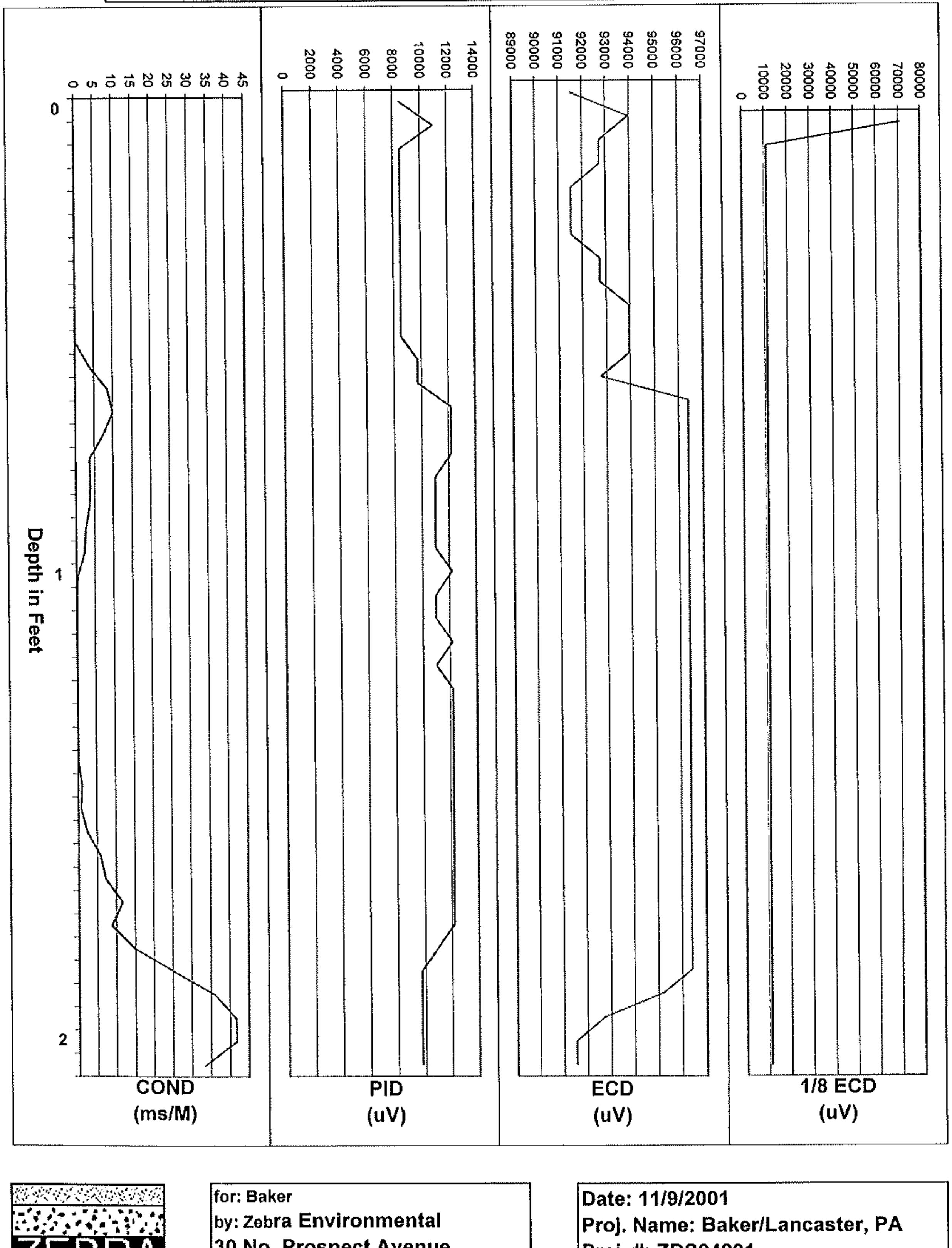
ZEBRA EC/MIP Summary Log, Point SB-37
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/9/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 37 of 67

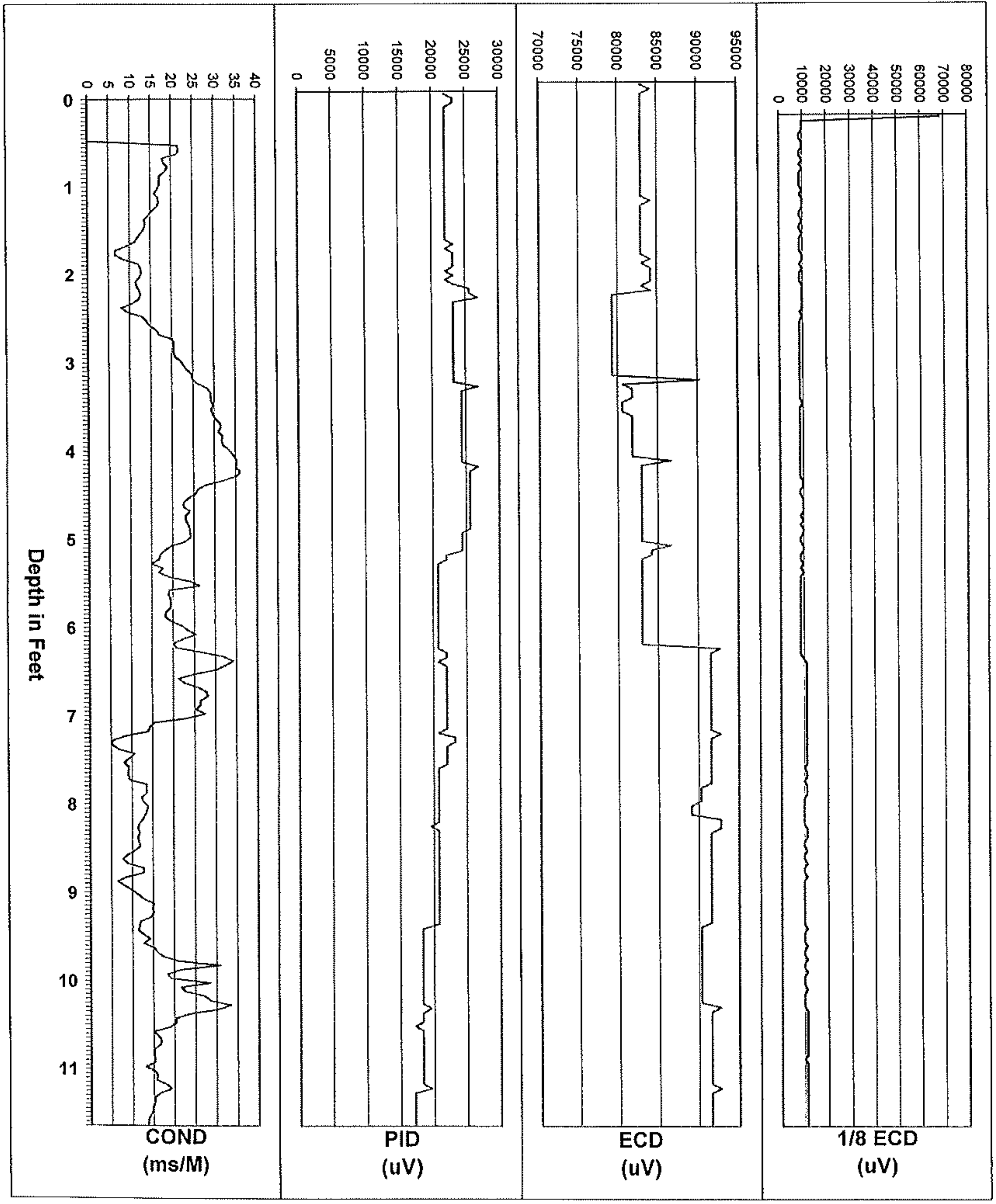
ZEBRA EC/MIP Summary Log, Point SB-38
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/9/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 38 of 67

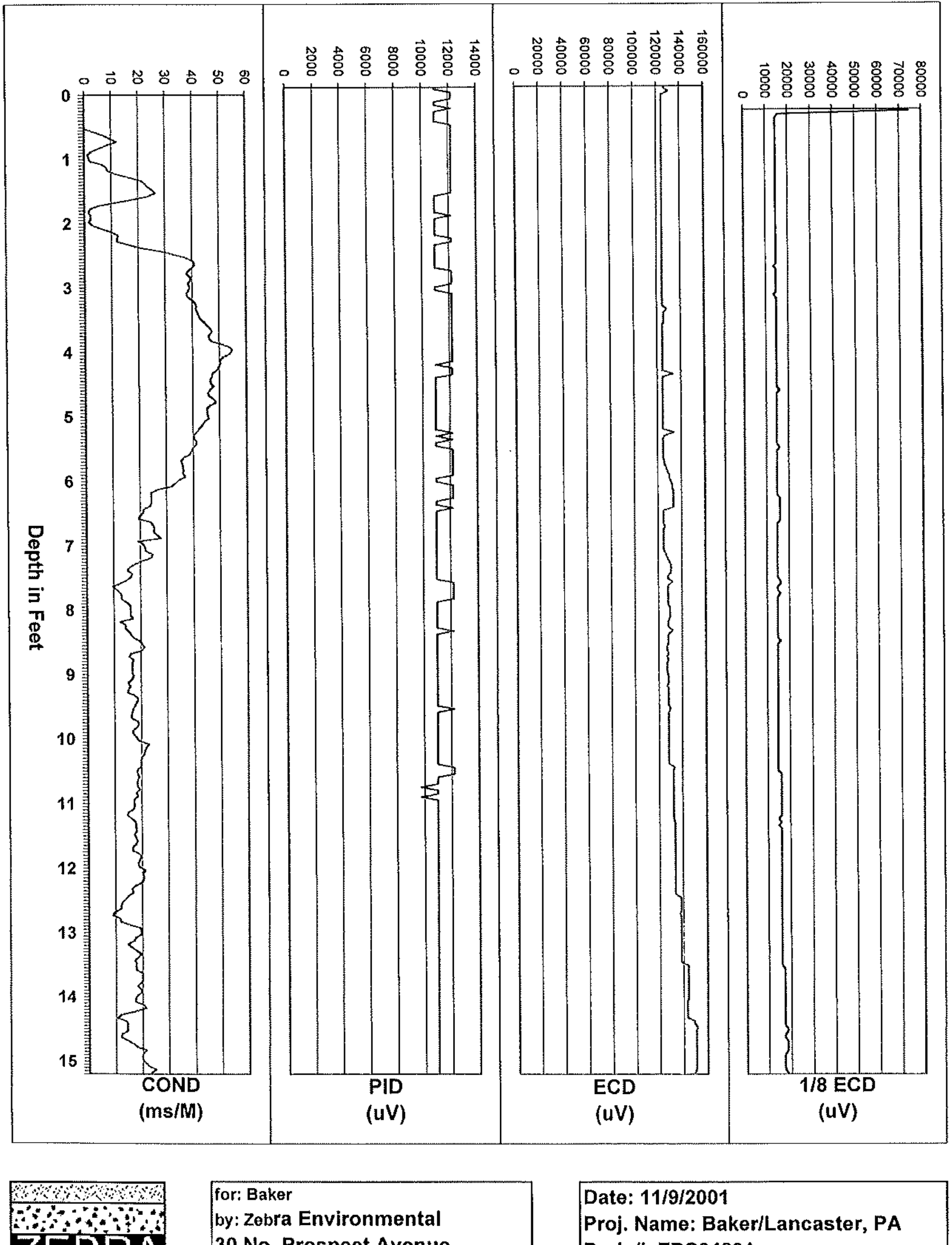
ZEBRA EC/MIP Summary Log, Point SB-39
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/9/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 39 of 67

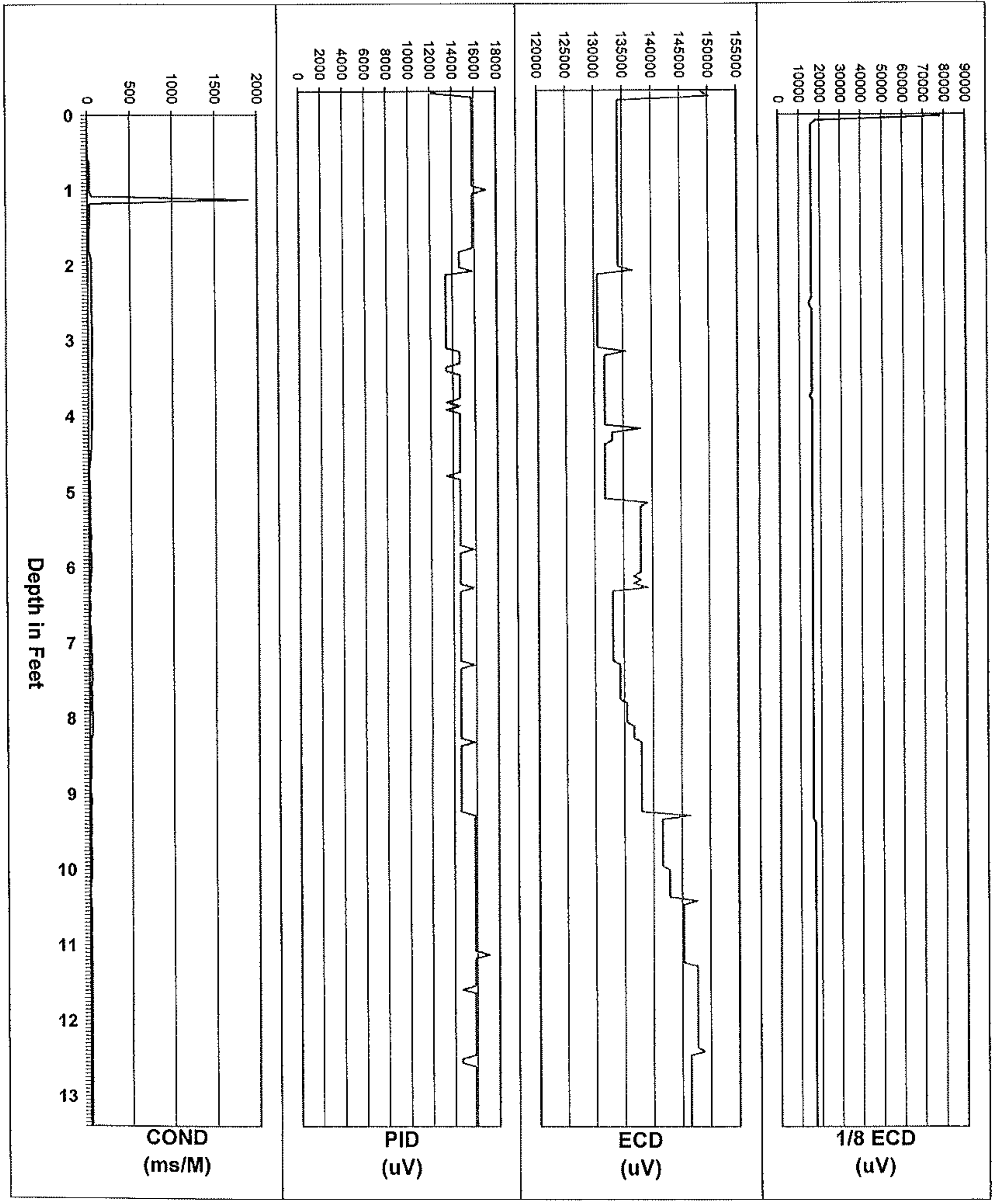
ZEBRA EC/MIP Summary Log, Point SB-40
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/9/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 40 of 67

ZEBRA EC/MIP Summary Log, Point SB-41
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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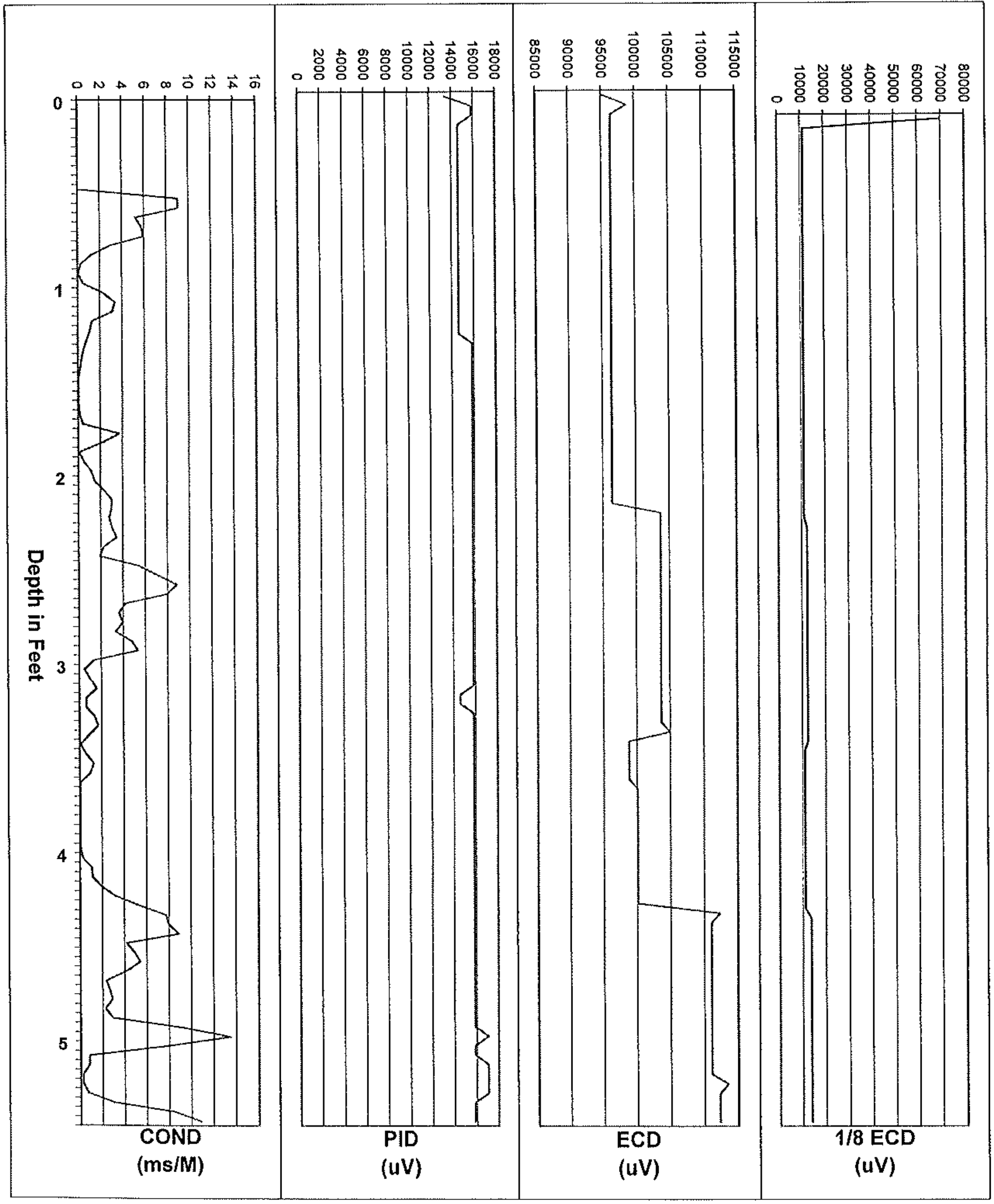
(516) 596-6300

Date: 11/9/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 41 of 67

ZEBRA EC/MIP Summary Log, Point SB-42
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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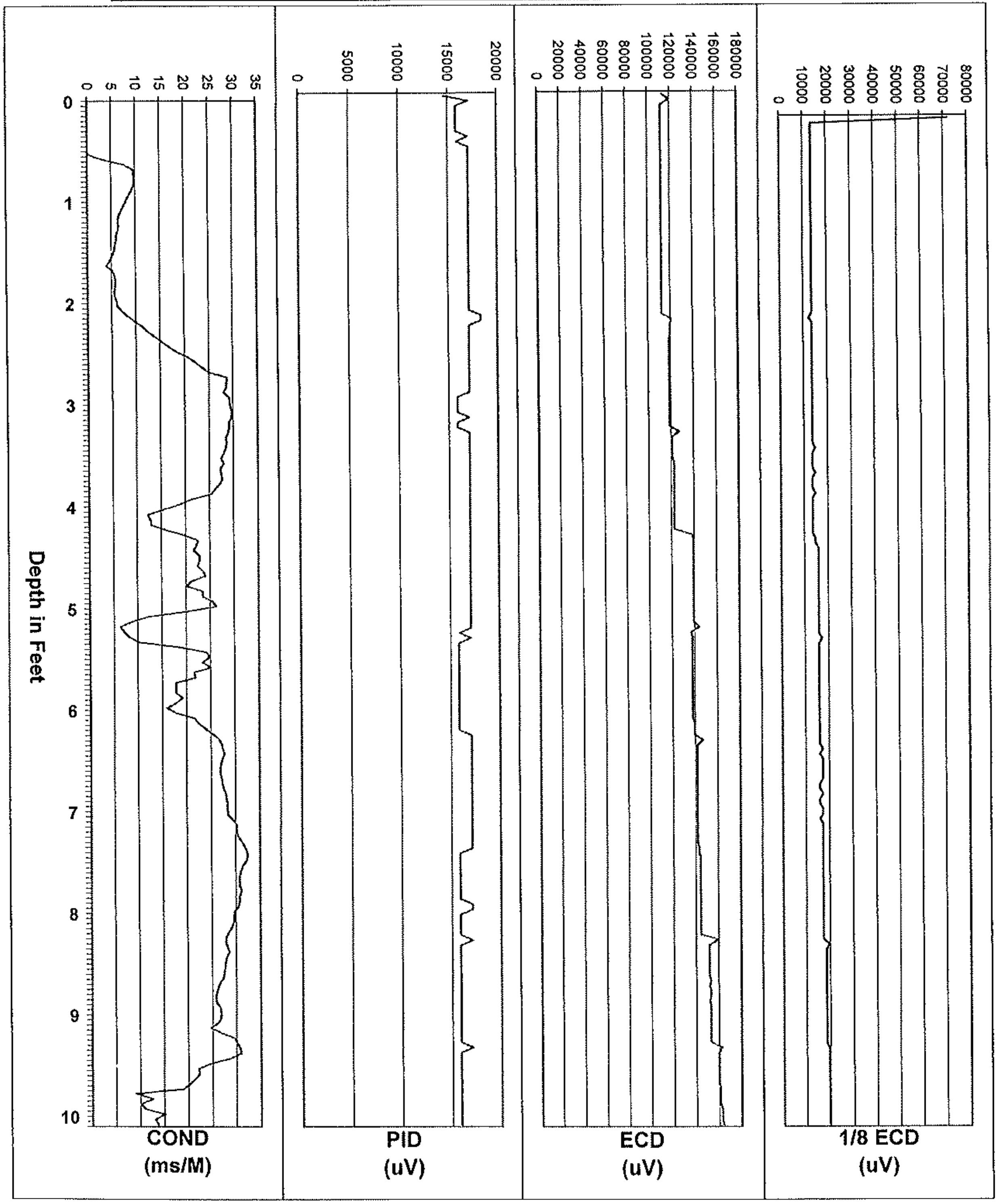
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 42 of 67

ZEBRA EC/MIP Summary Log, Point SB-43
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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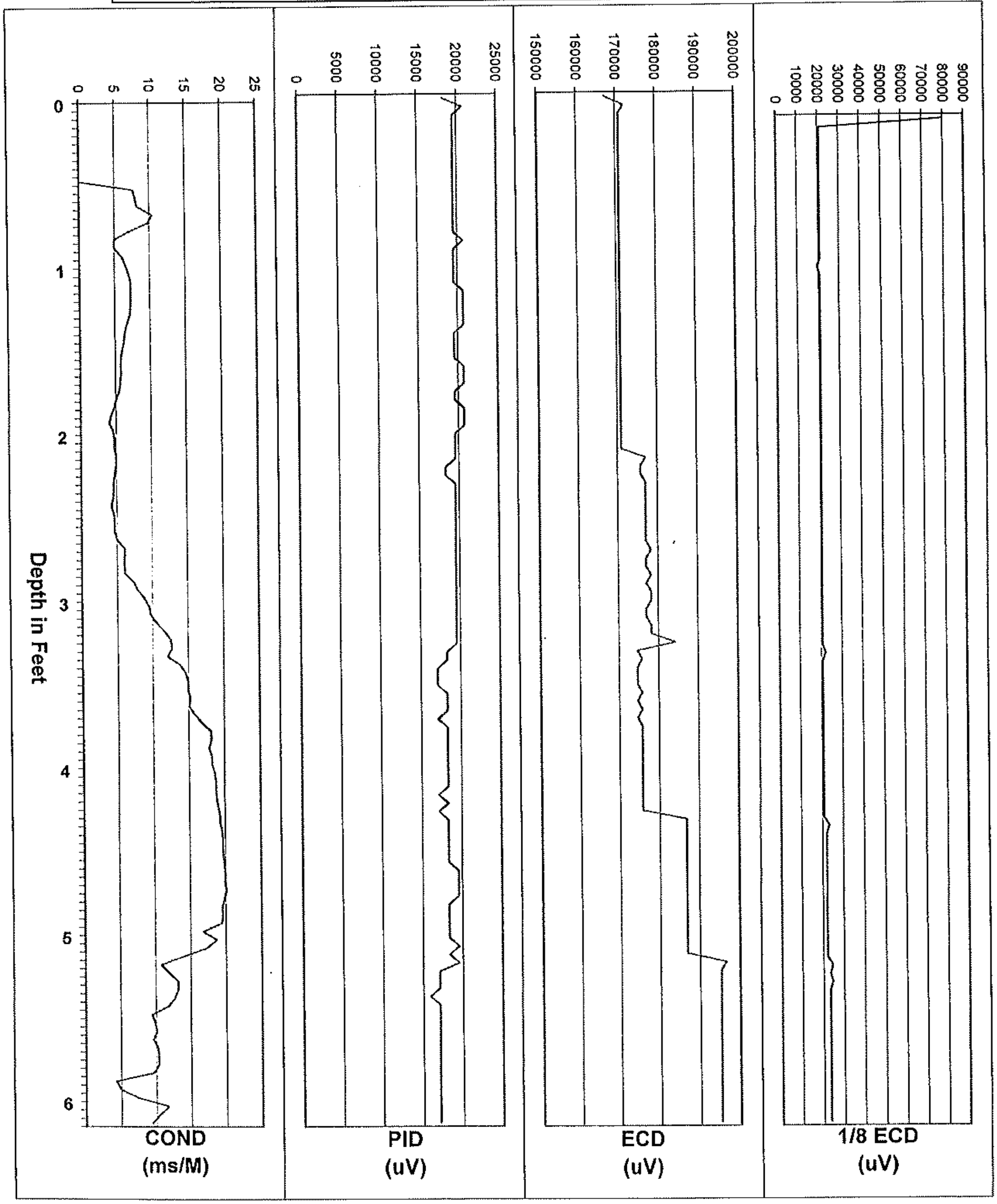
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 43 of 67

ZEBRA EC/MIP Summary Log, Point SB-44
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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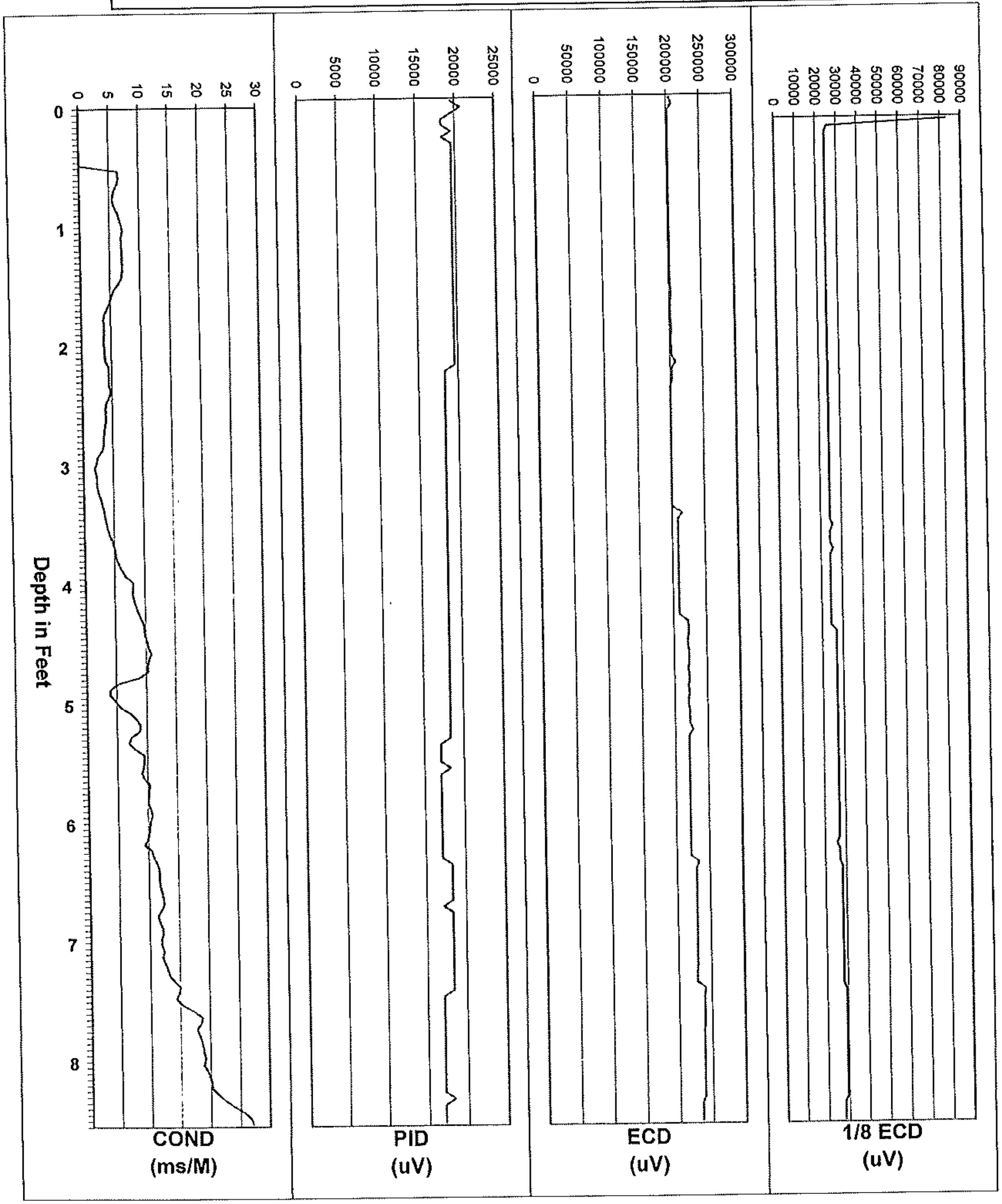
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 44 of 67

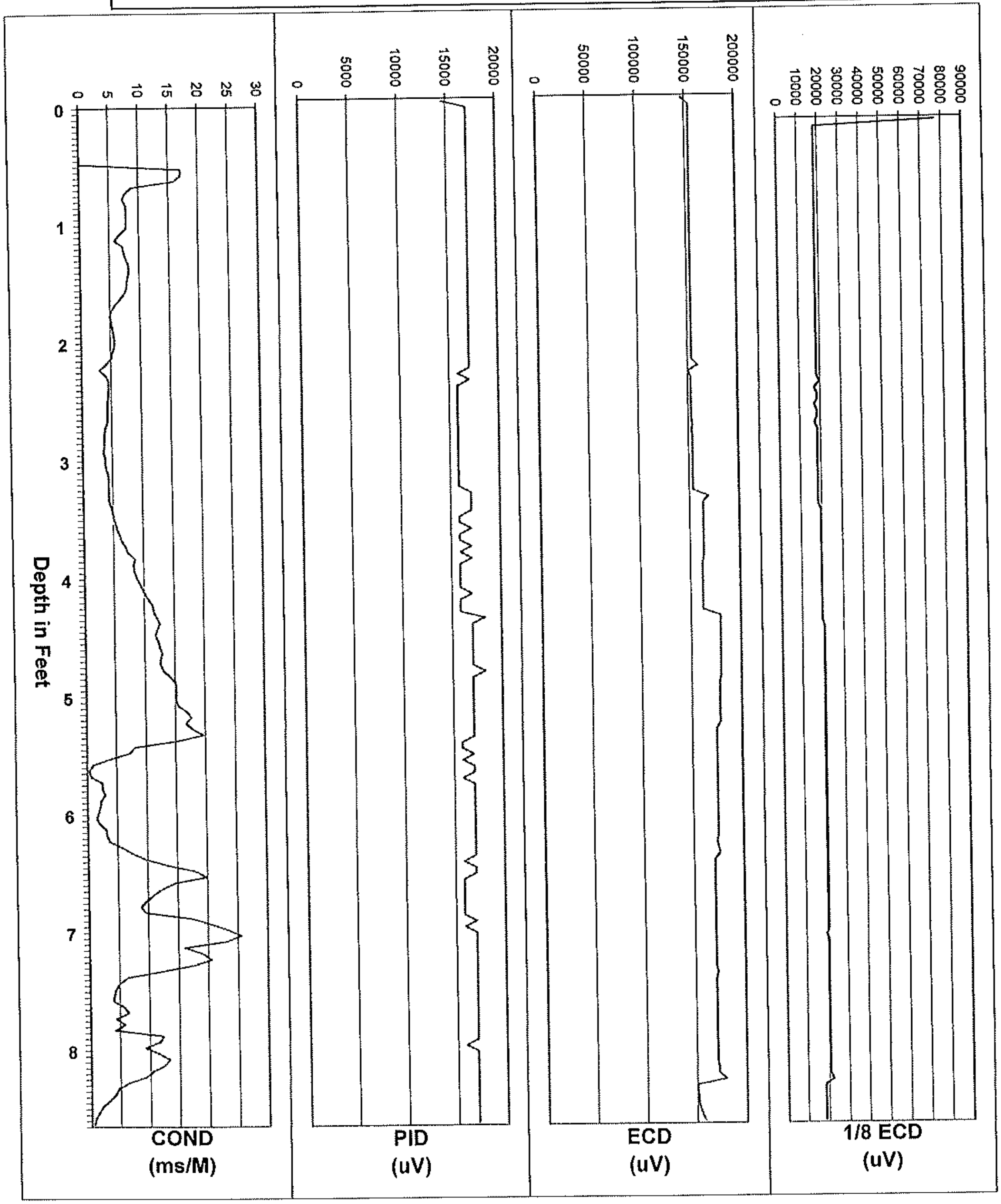
ZEBRA EC/MIP Summary Log, Point SB-45
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 45 of 67

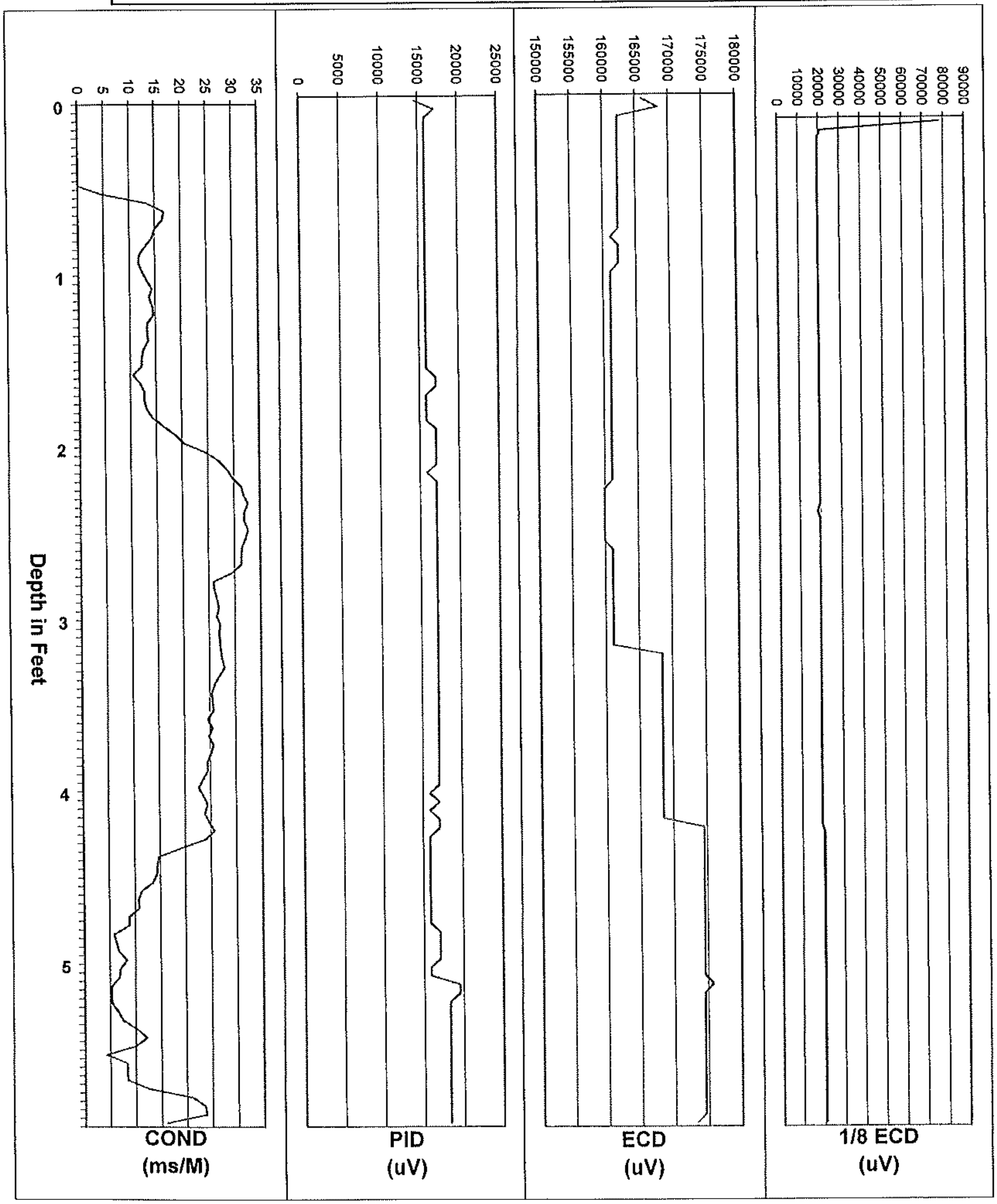
ZEBRA EC/MIP Summary Log, Point SB-46
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 46 of 67

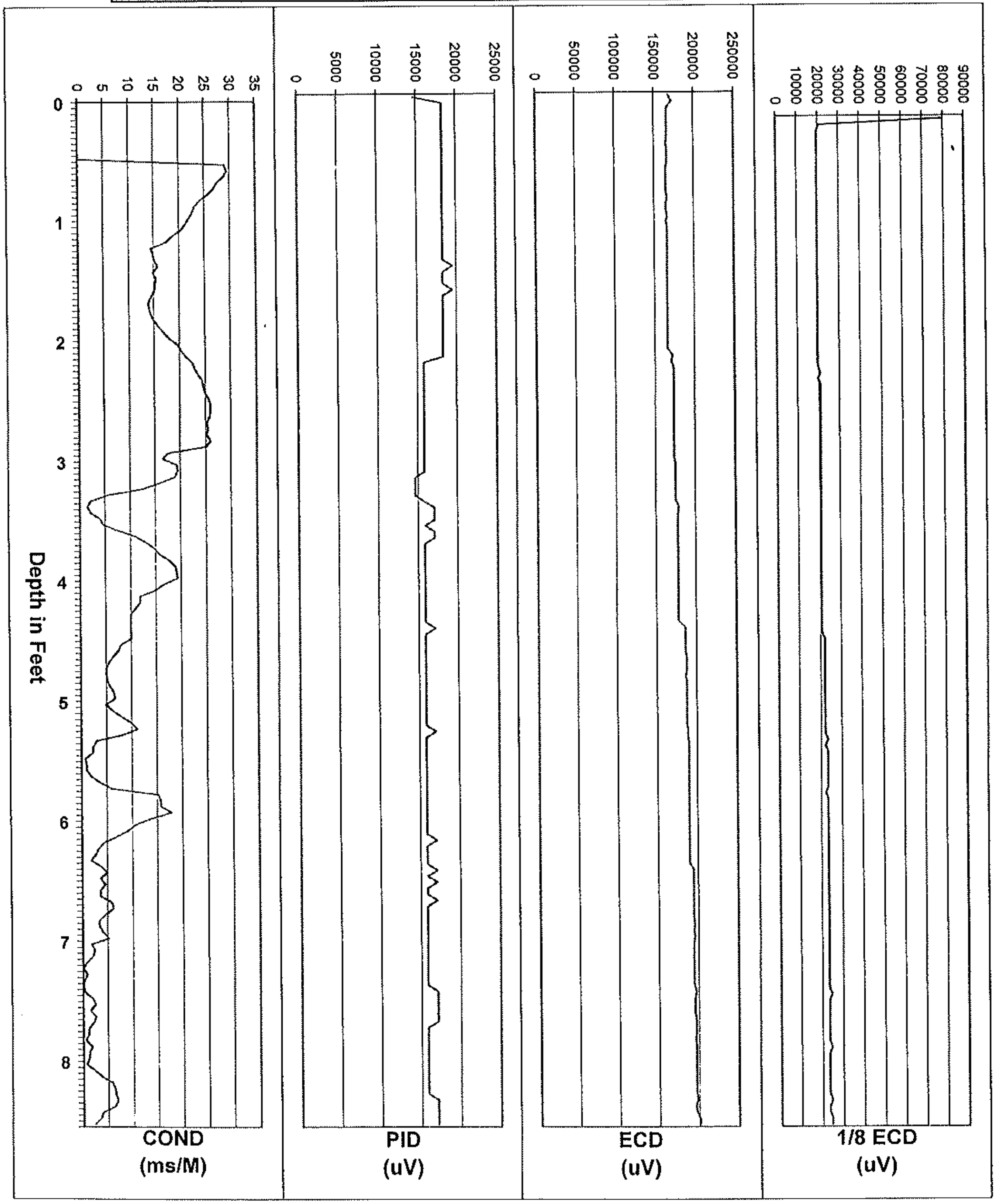
ZEBRA EC/MIP Summary Log, Point SB-47
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 47 of 67

ZEBRA EC/MIP Summary Log, Point SB-48
Lancaster, PA



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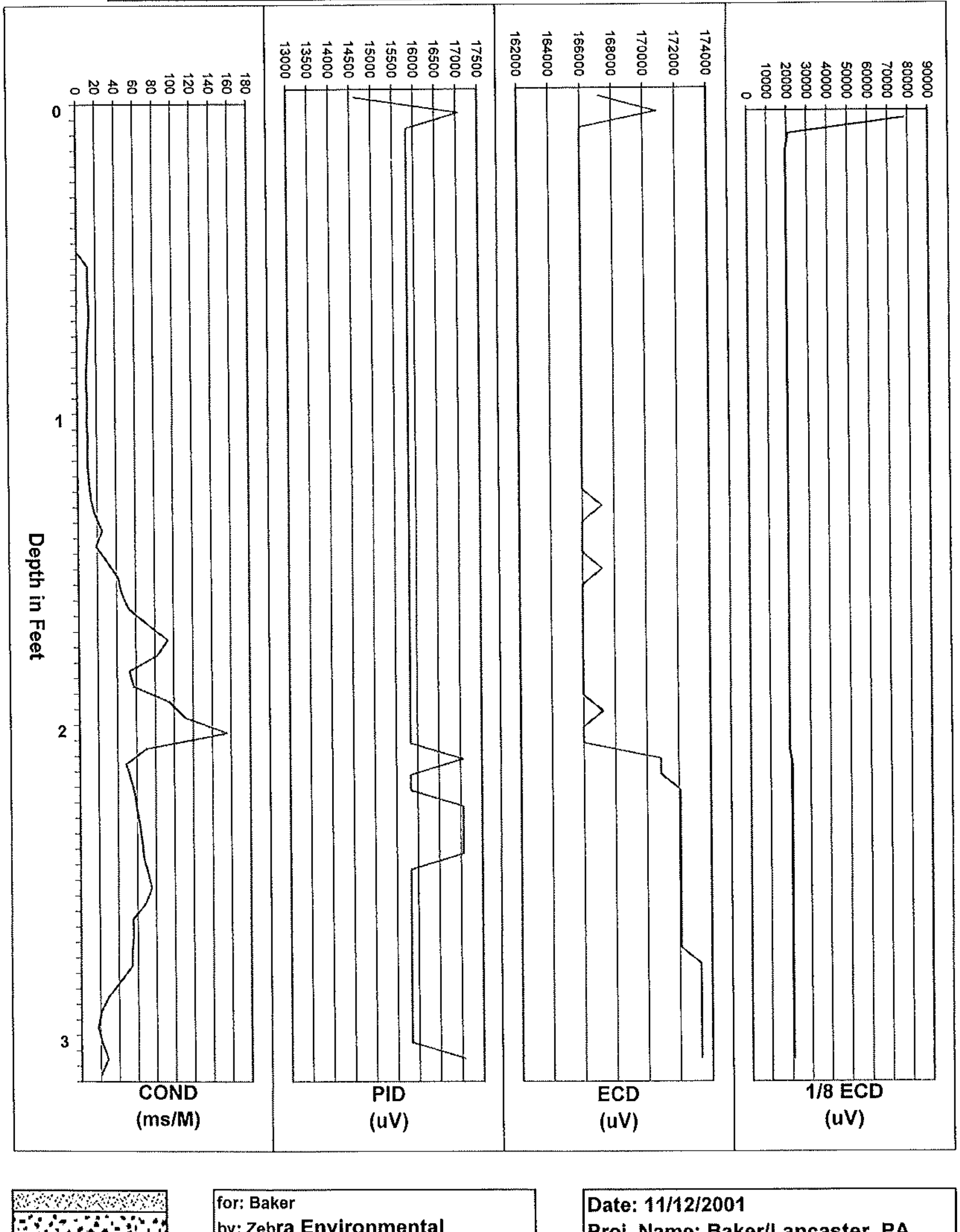
for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 48 of 67

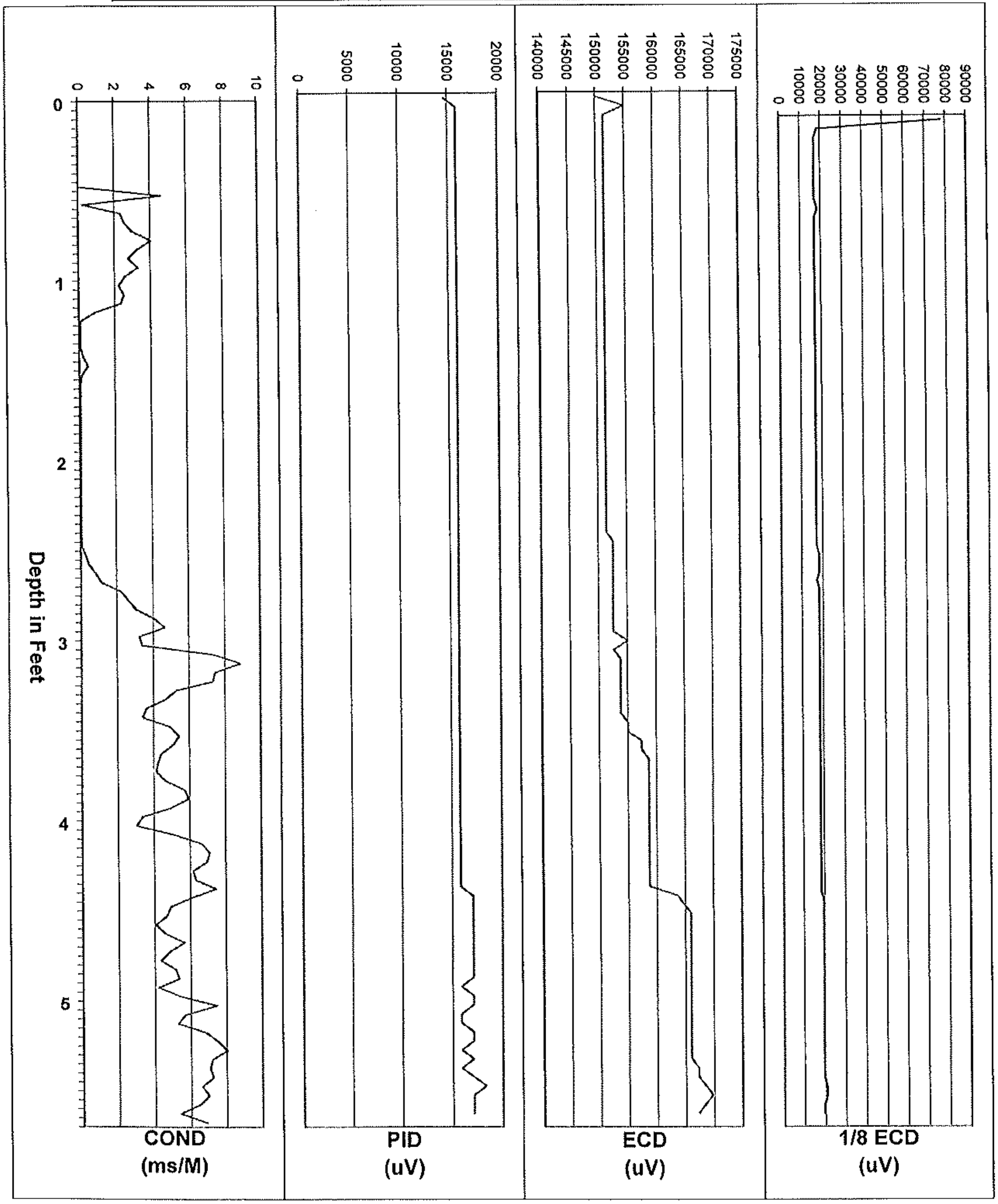
ZEBRA EC/MIP Summary Log, Point SB-49
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 49 of 67

ZEBRA EC/MIP Summary Log, Point SB-50
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
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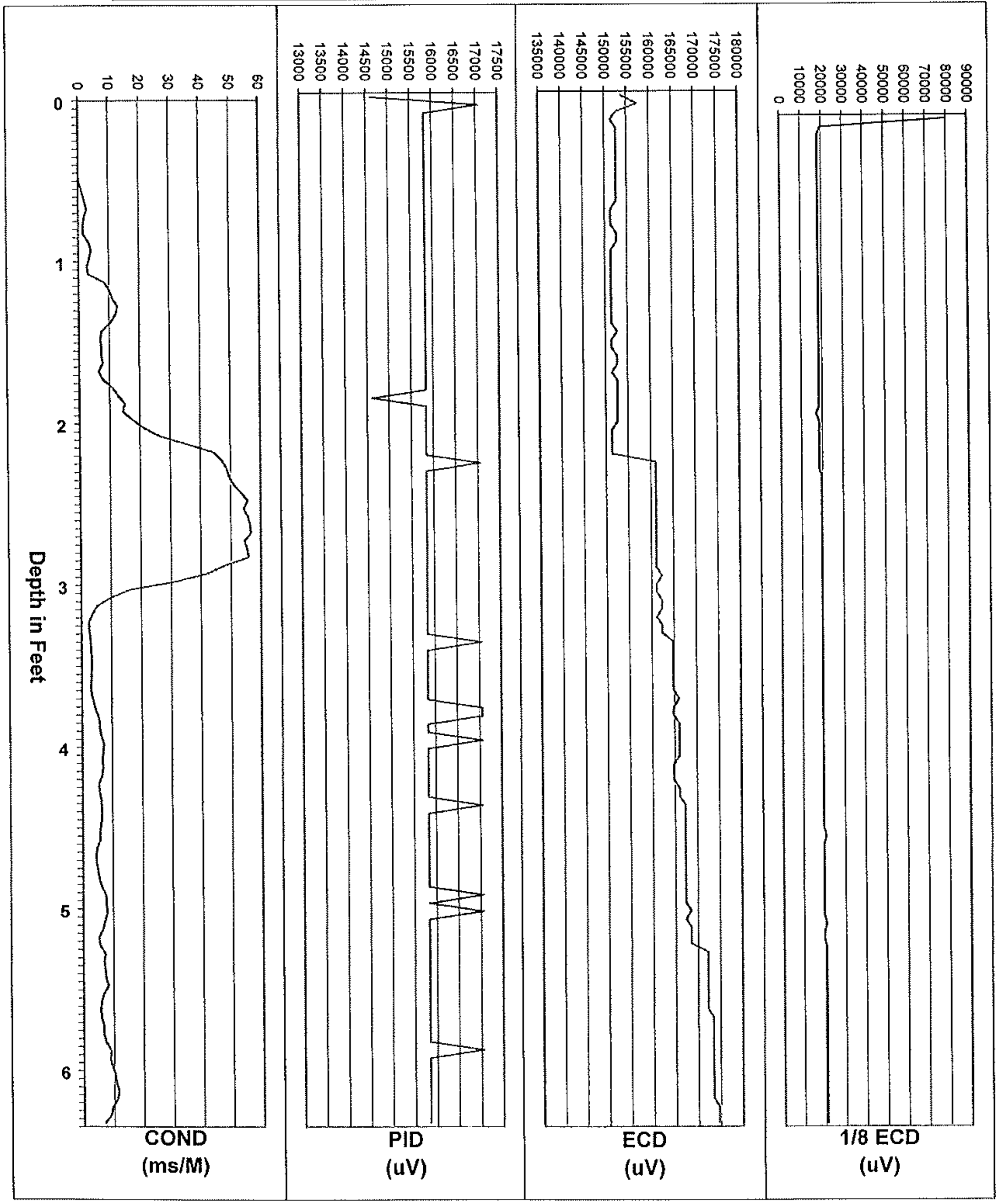
Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 50 of 67

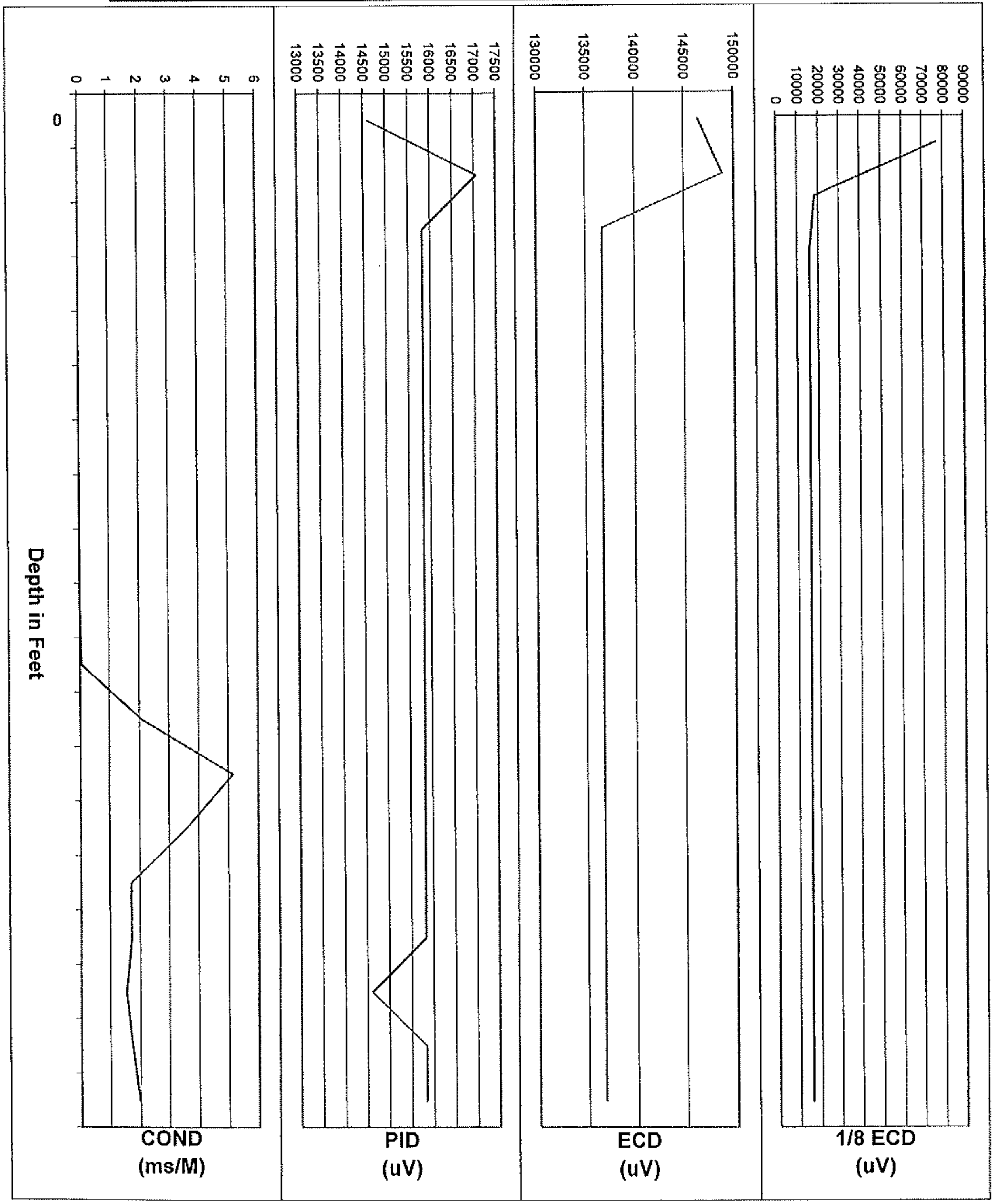
ZEBRA EC/MIP Summary Log, Point SB-51
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 51 of 67

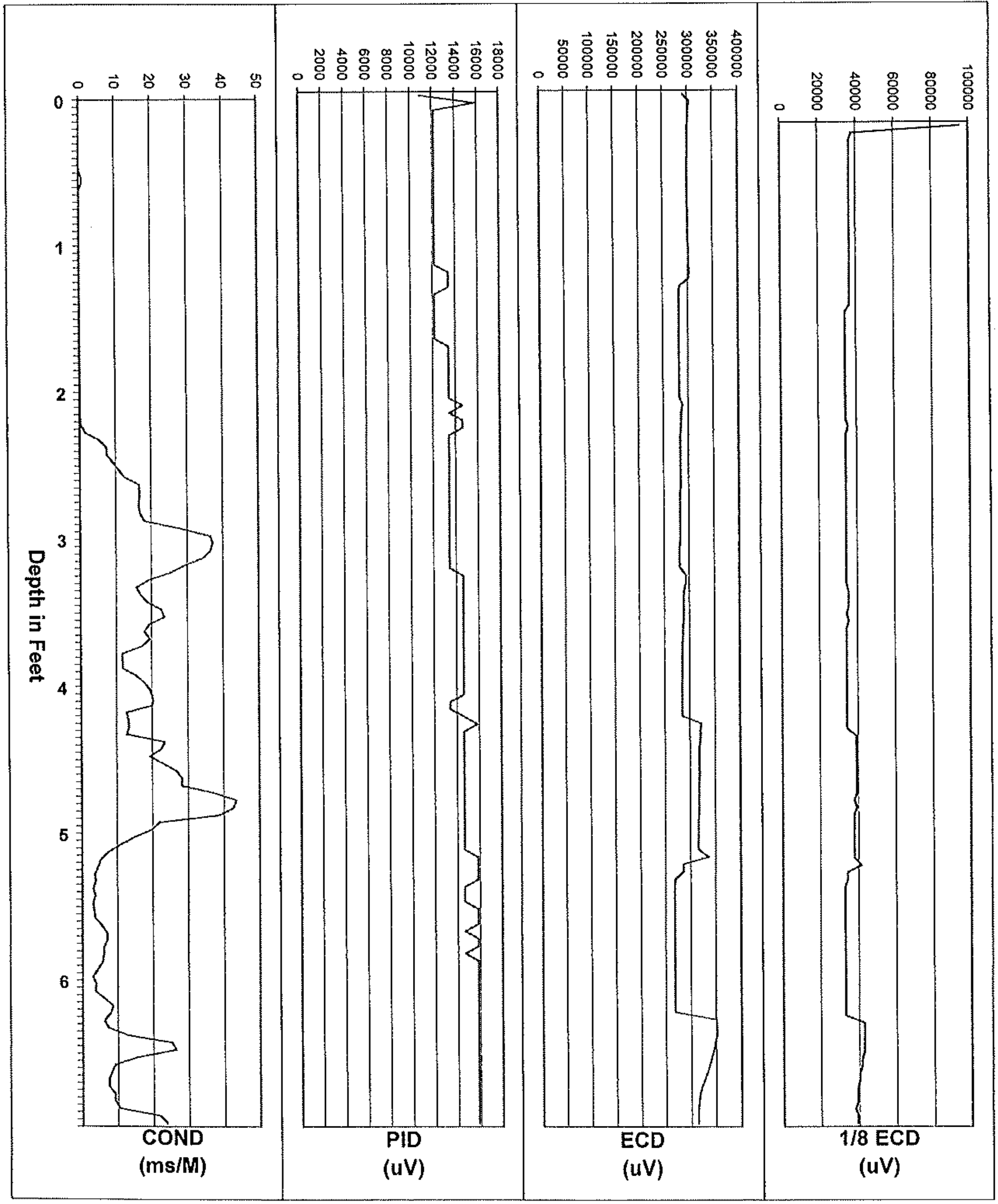
ZEBRA EC/MIP Summary Log, Point SB-52
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/12/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 52 of 67

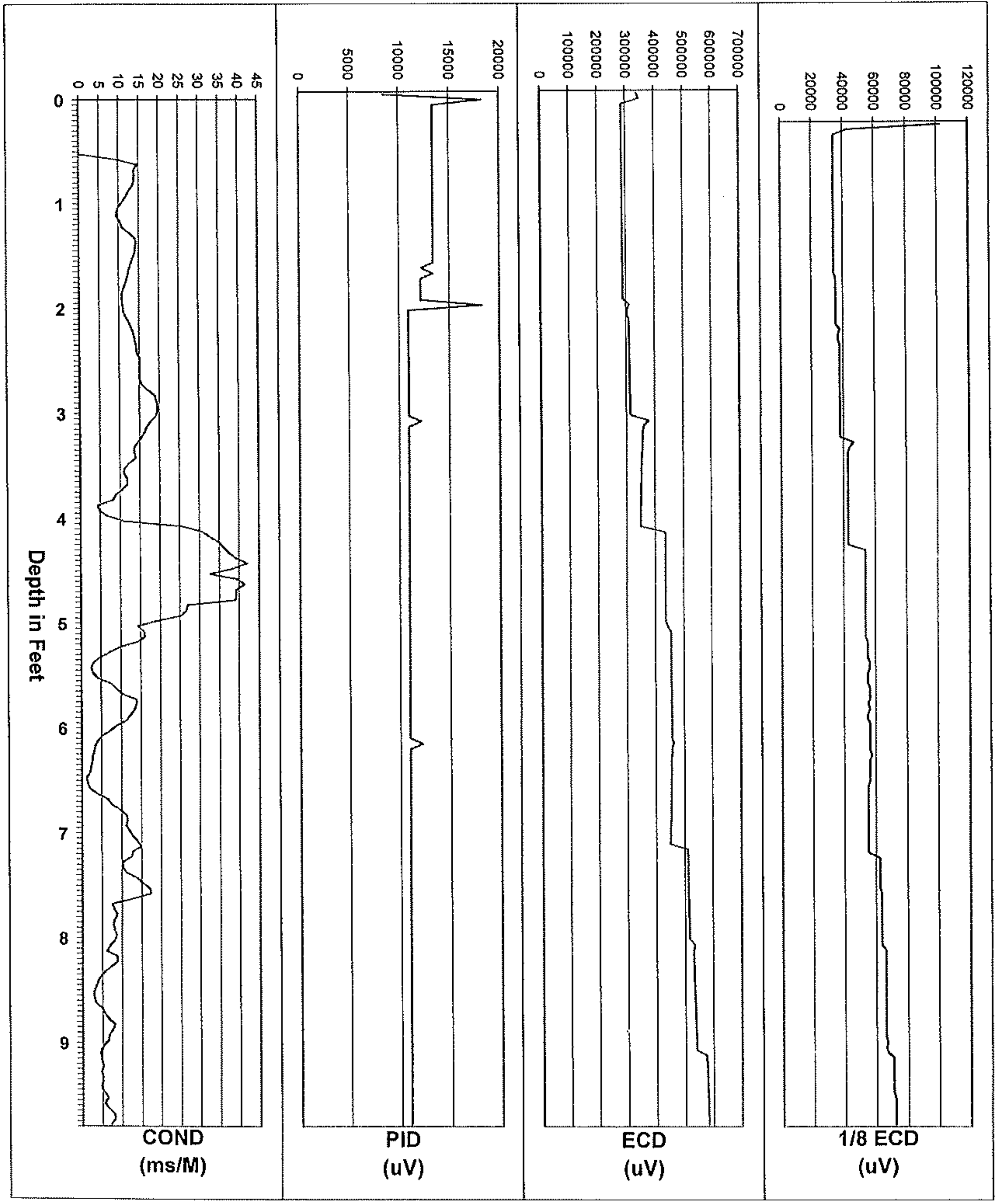
ZEBRA EC/MIP Summary Log, Point SB-53
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 53 of 67

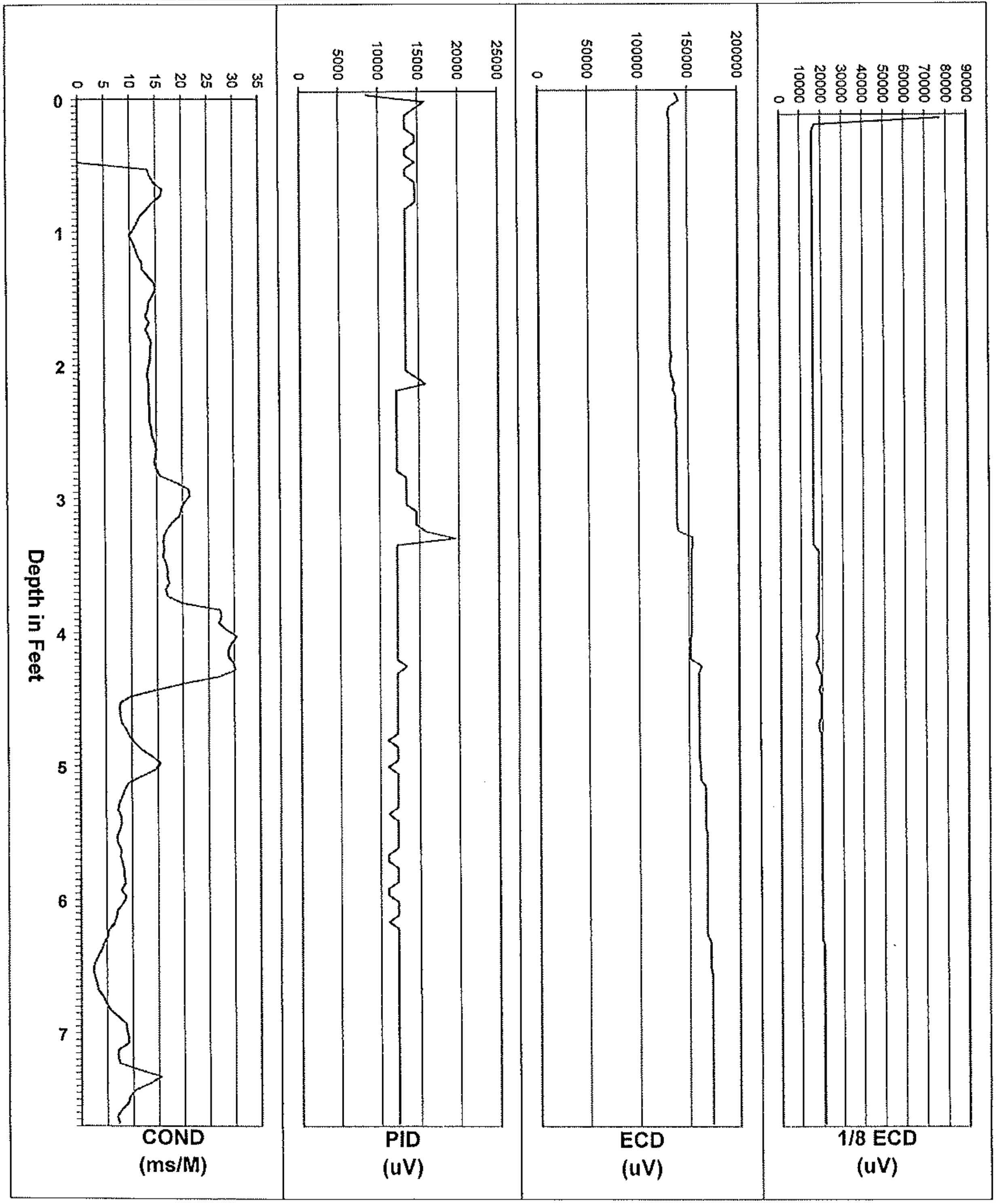
ZEBRA EC/MIP Summary Log, Point SB-54
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 54 of 67

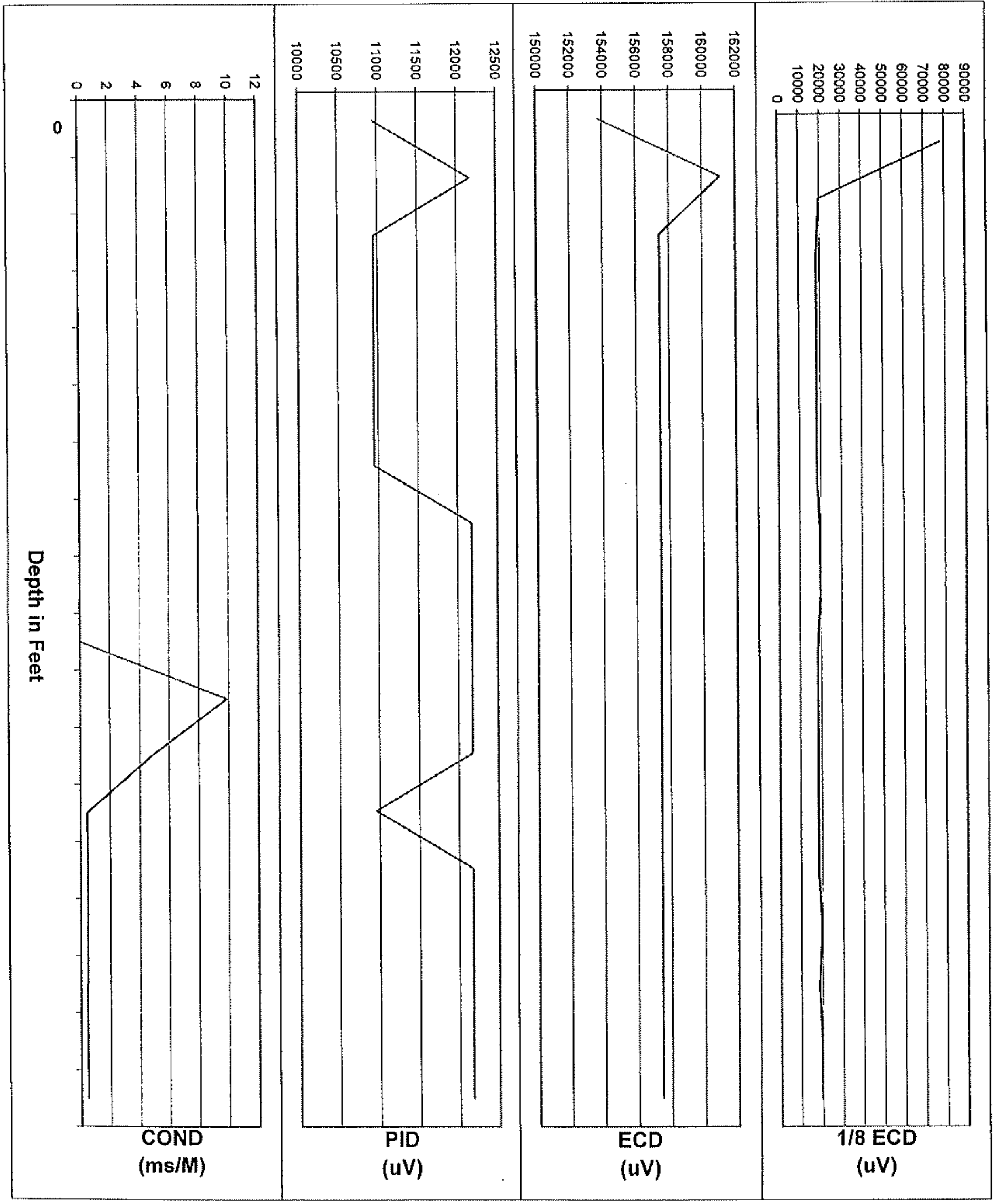
ZEBRA EC/MIP Summary Log, Point SB-55
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 55 of 67

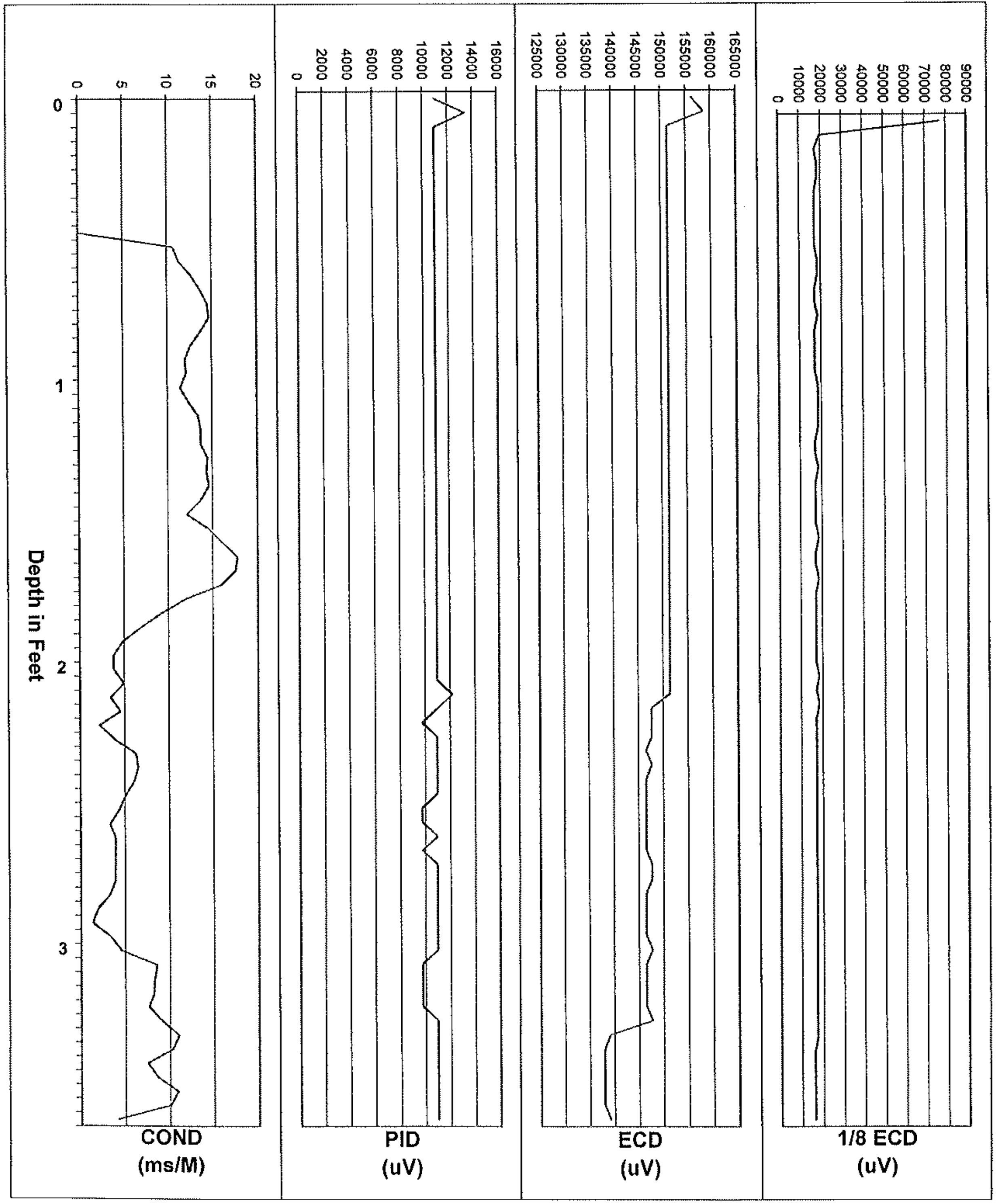
ZEBRA EC/MIP Summary Log, Point SB-56
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 56 of 67

ZEBRA EC/MIP Summary Log, Point SB-57
Lancaster, PA

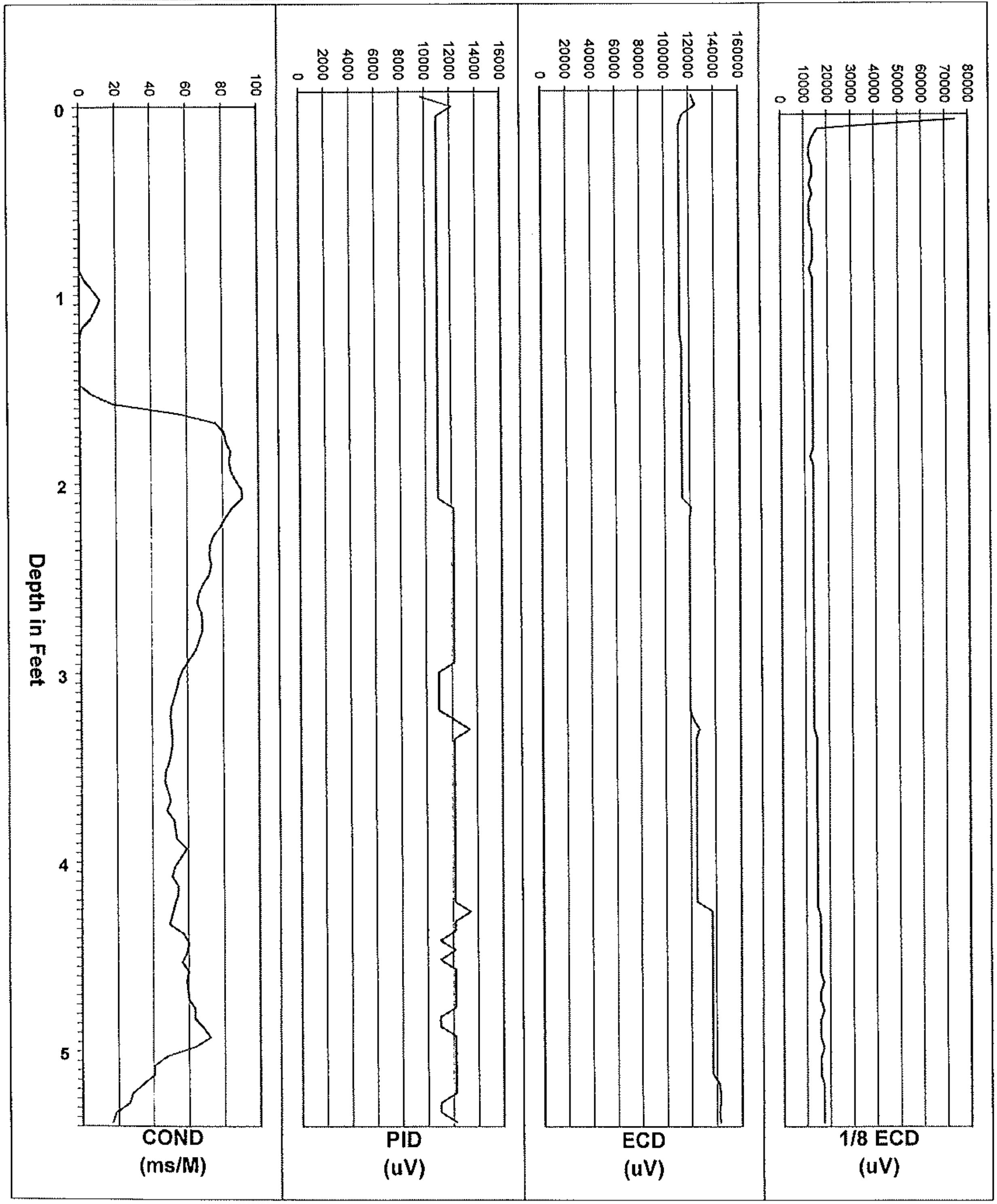


ZEBRA

for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 57 of 67

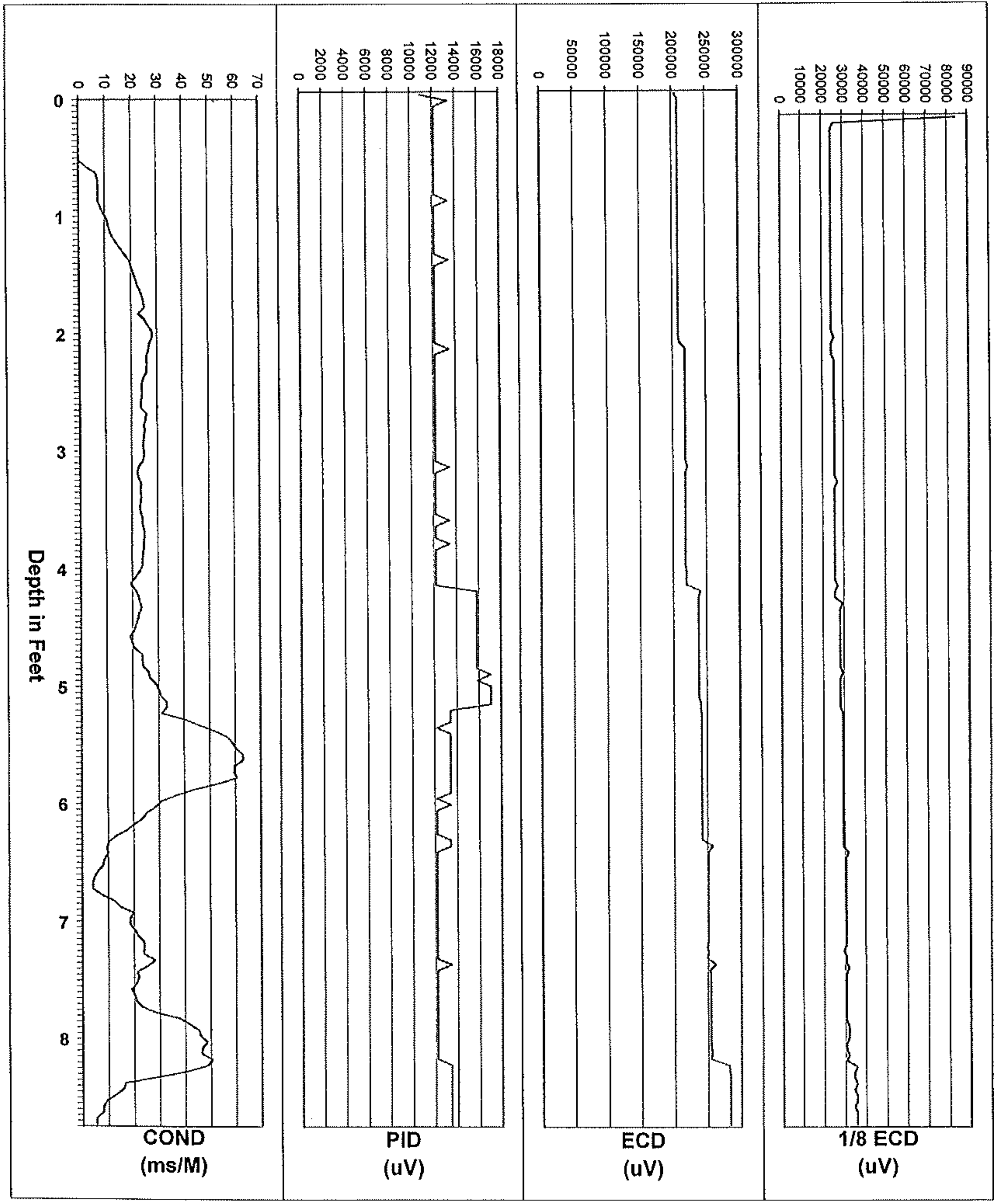
ZEBRA EC/MIP Summary Log, Point SB-58
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 58 of 67

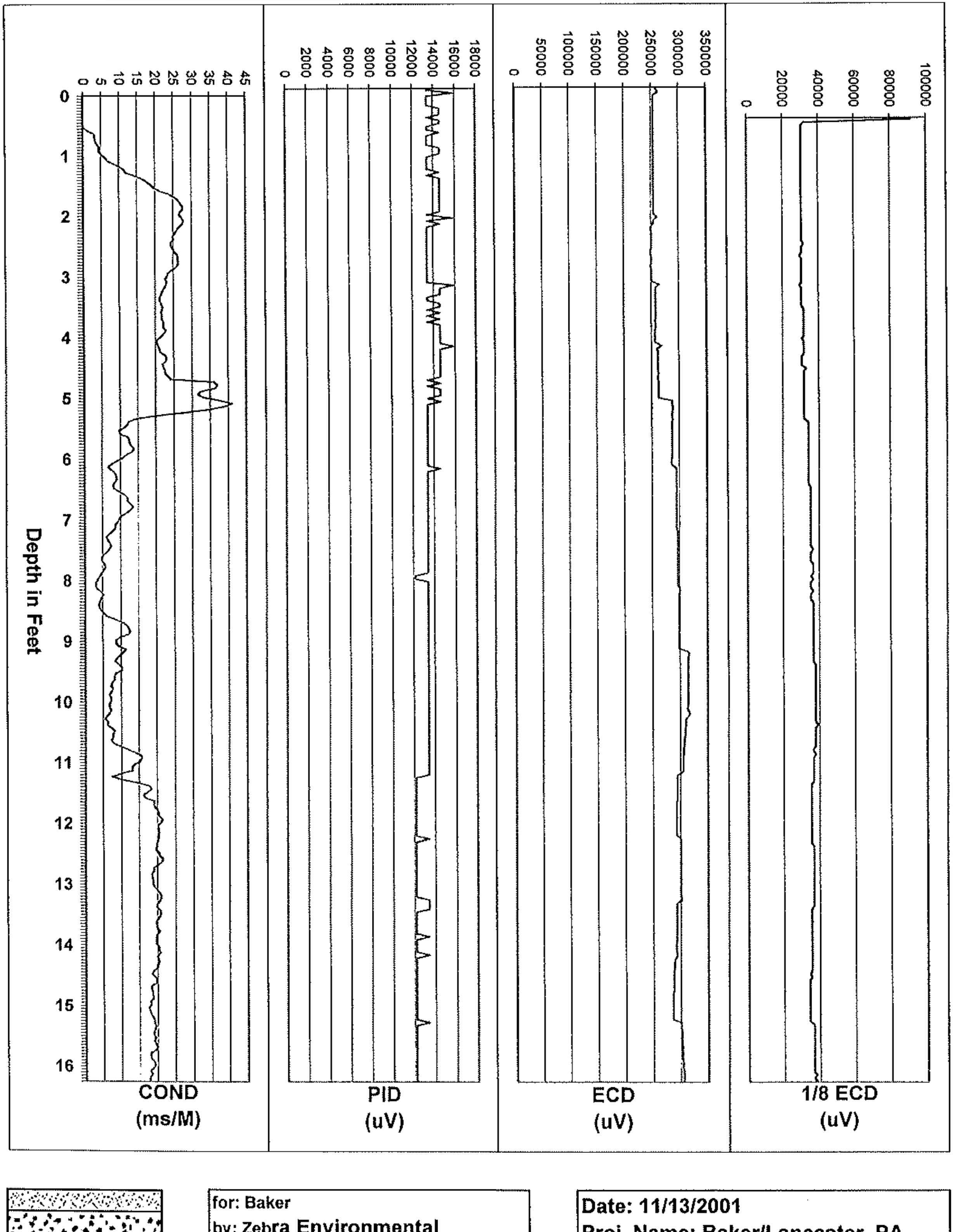
ZEBRA EC/MIP Summary Log, Point SB-59
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 59 of 67

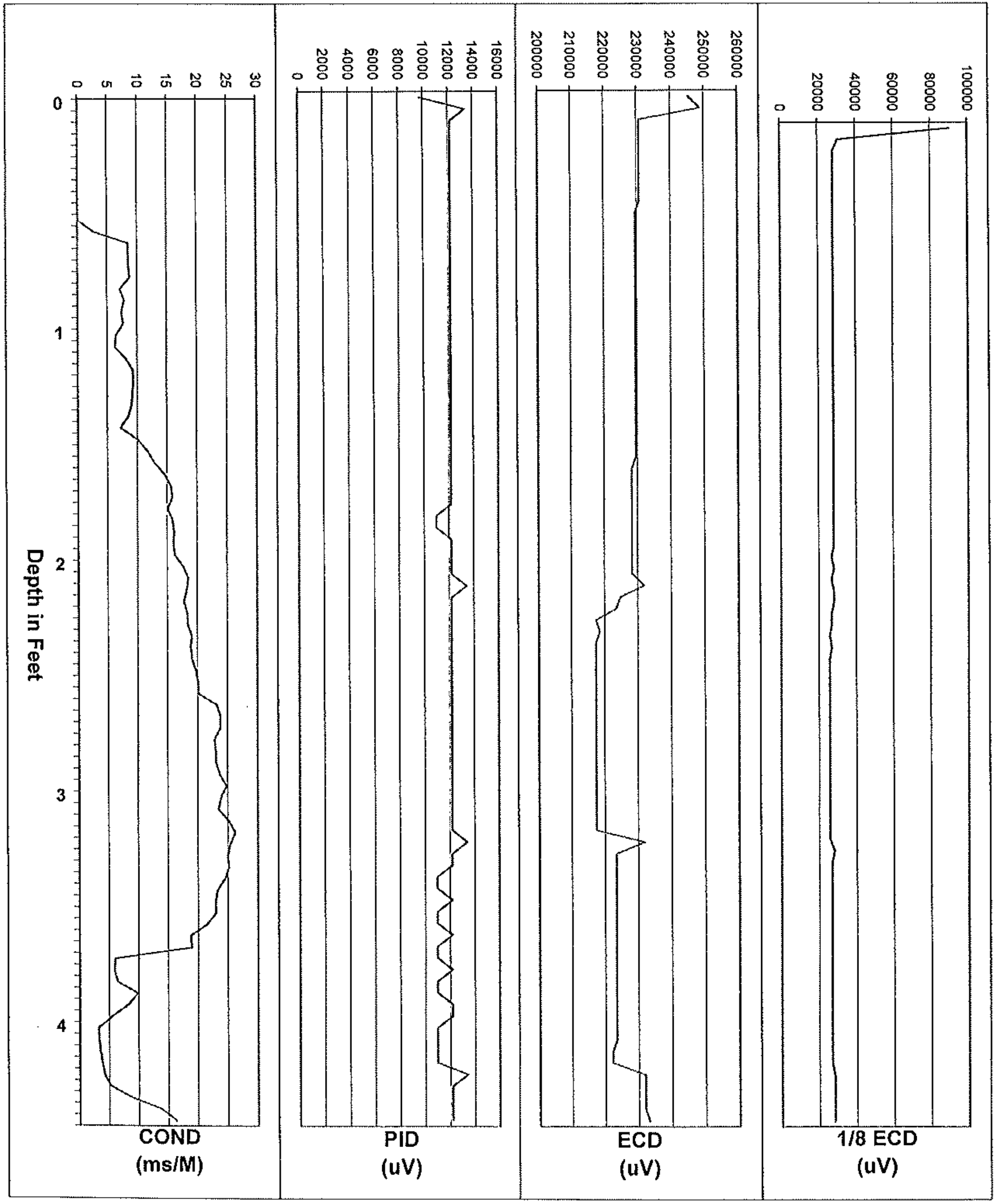
ZEBRA EC/MIP Summary Log, Point SB-60
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 60 of 67

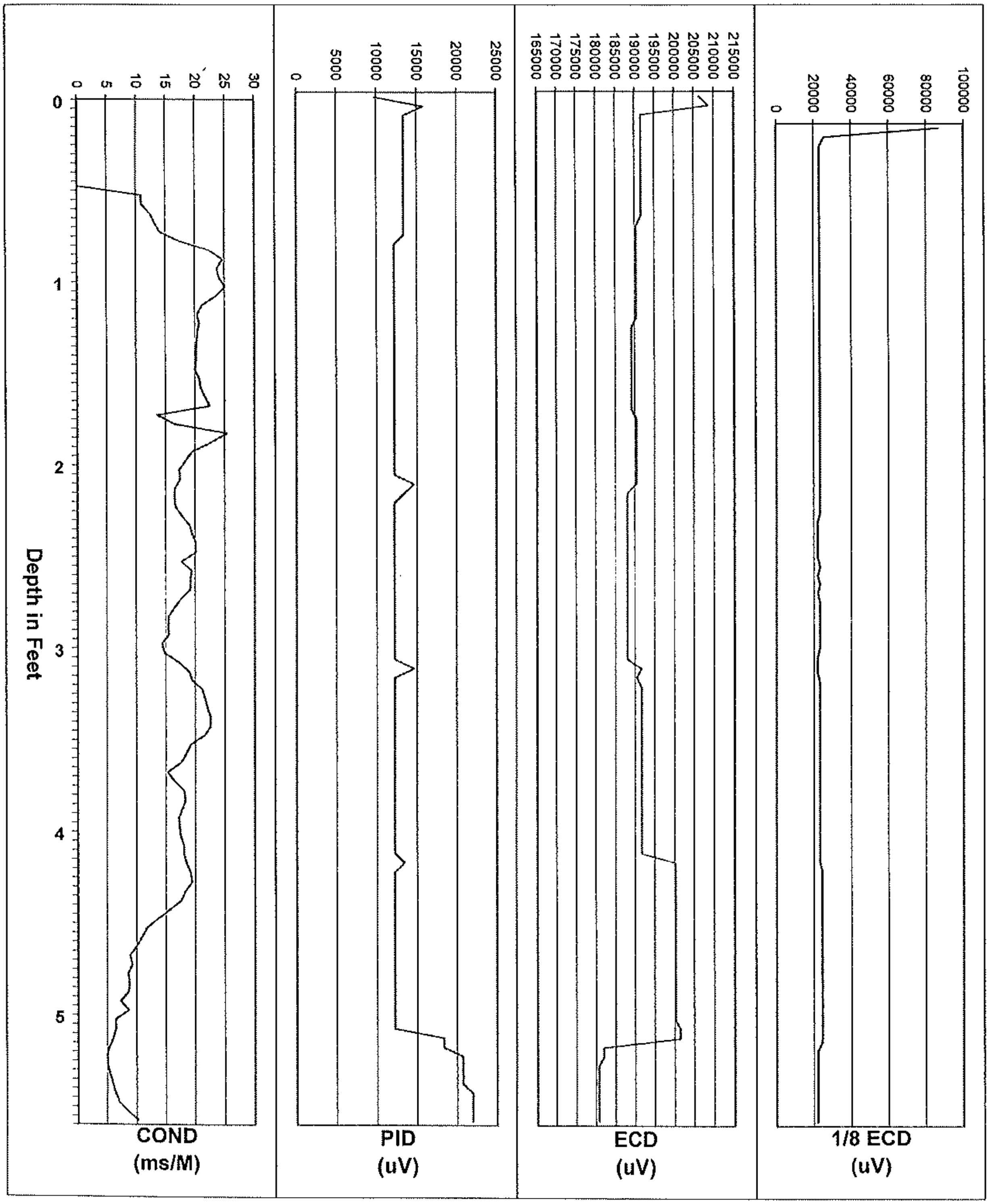
ZEBRA EC/MIP Summary Log, Point SB-61
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 61 of 67

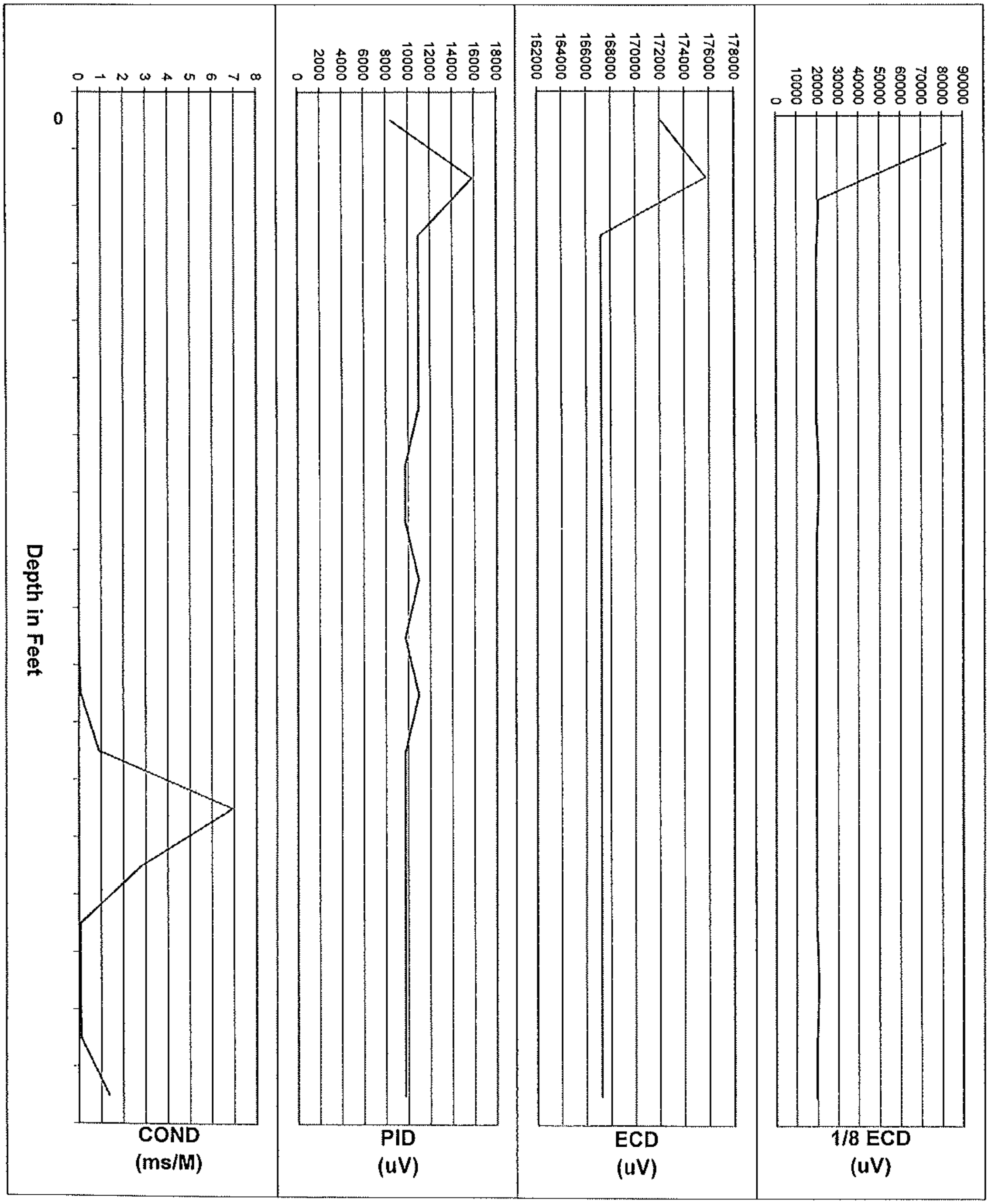
ZEBRA EC/MIP Summary Log, Point SB-62
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 62 of 67

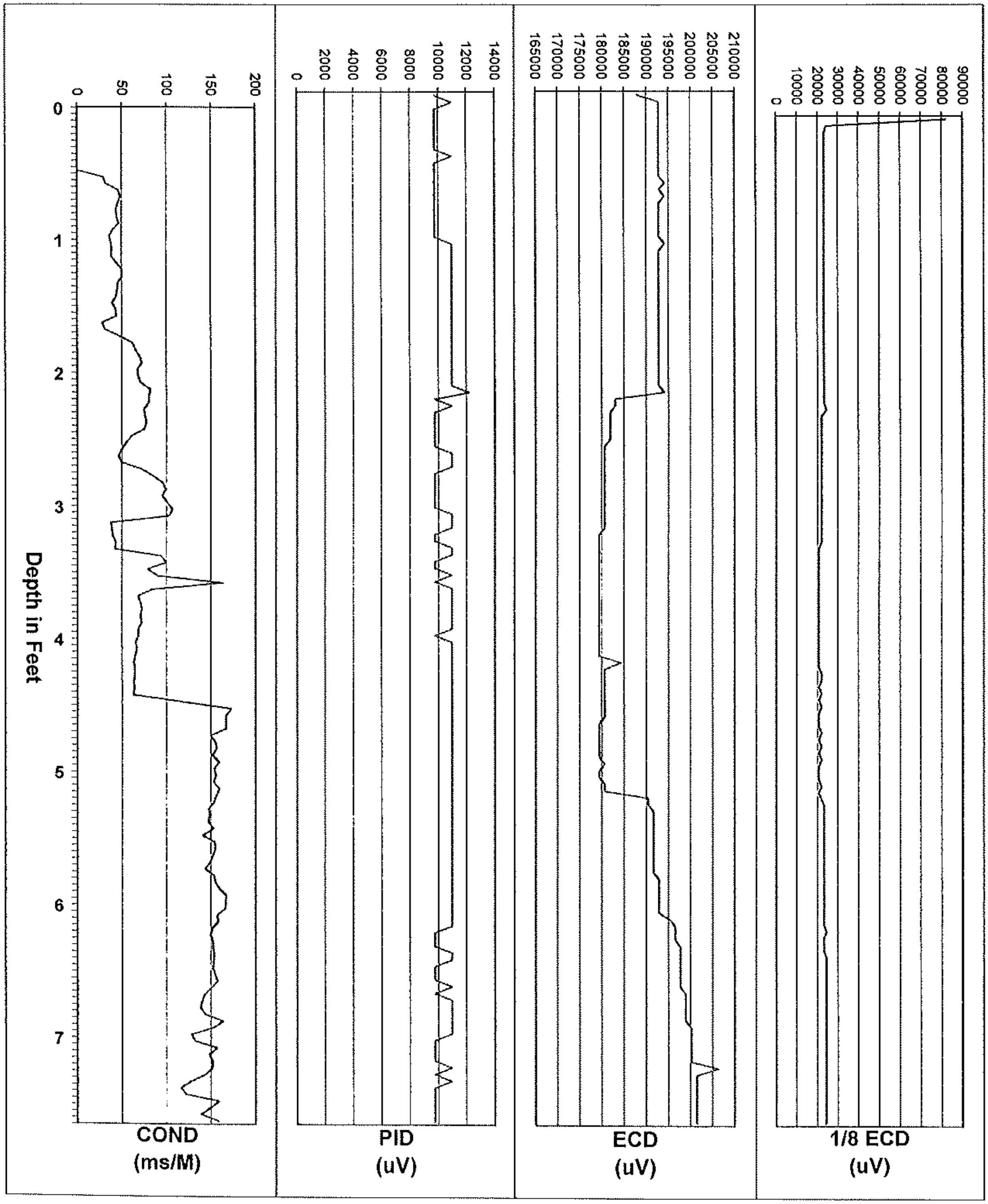
ZEBRA EC/MIP Summary Log, Point SB-63
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 63 of 67

ZEBRA EC/MIP Summary Log, Point SB-64
Lancaster, PA

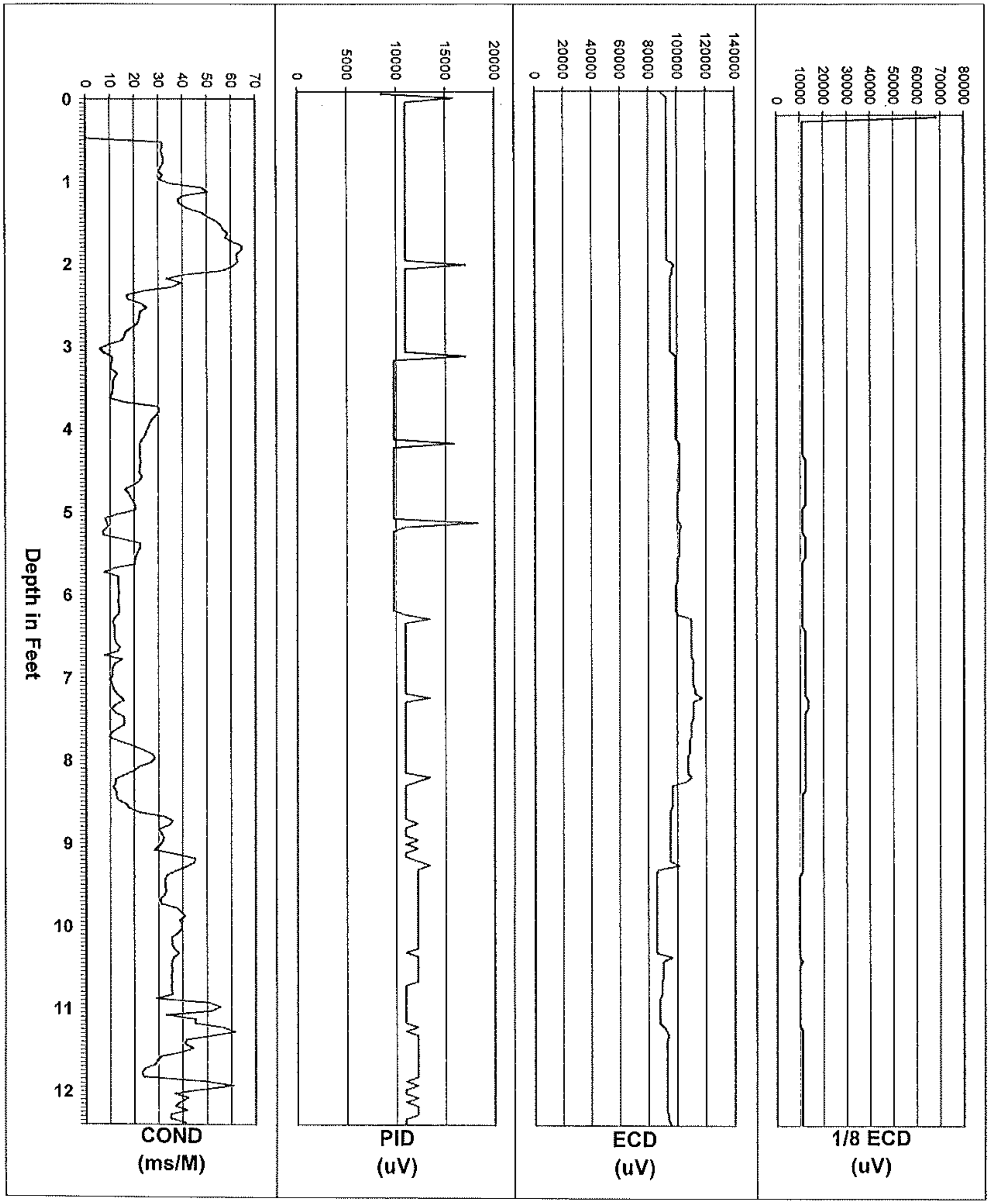


ZEBRA

for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/13/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 64 of 67

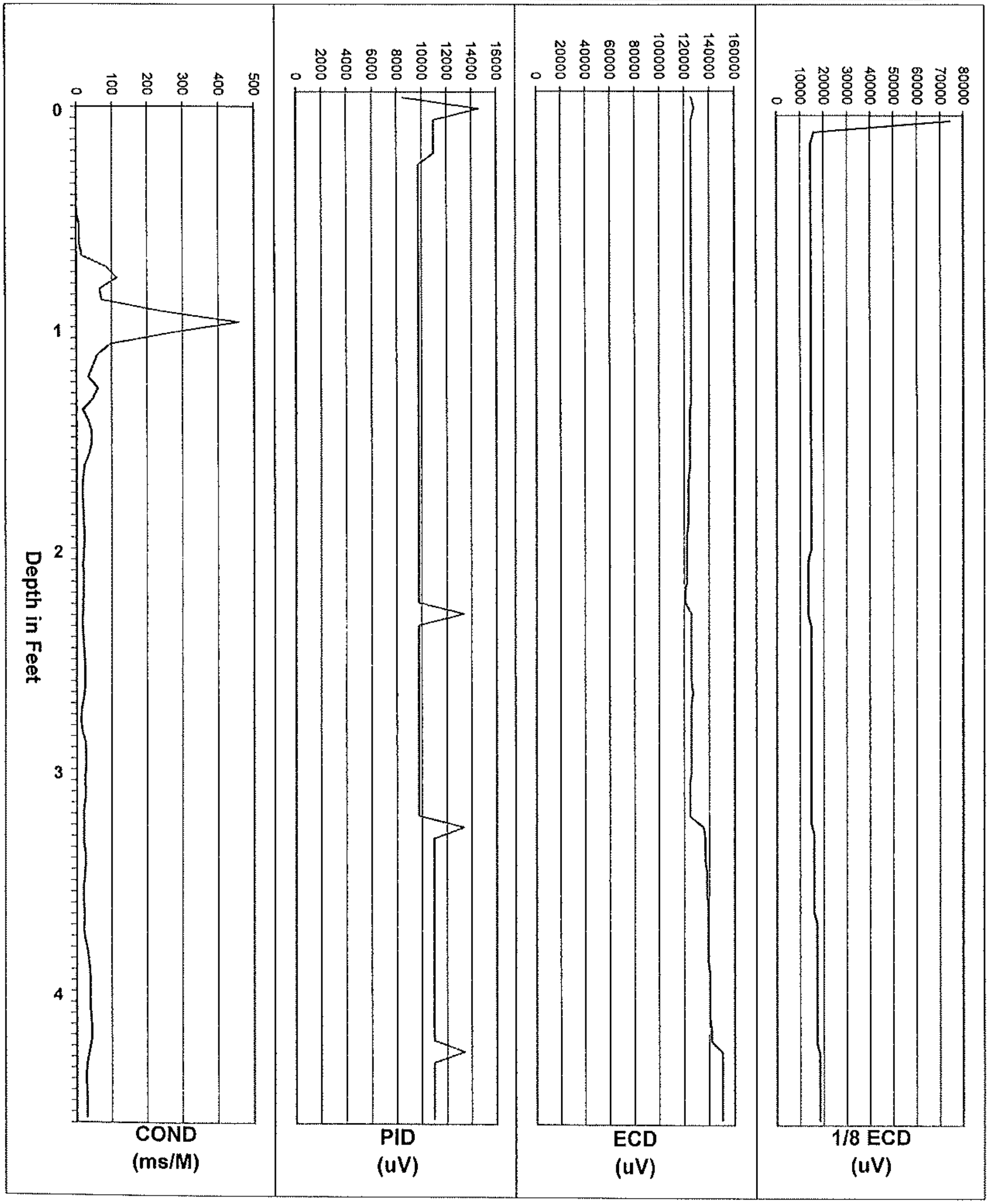
ZEBRA EC/MIP Summary Log, Point SB-65
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/14/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 65 of 67

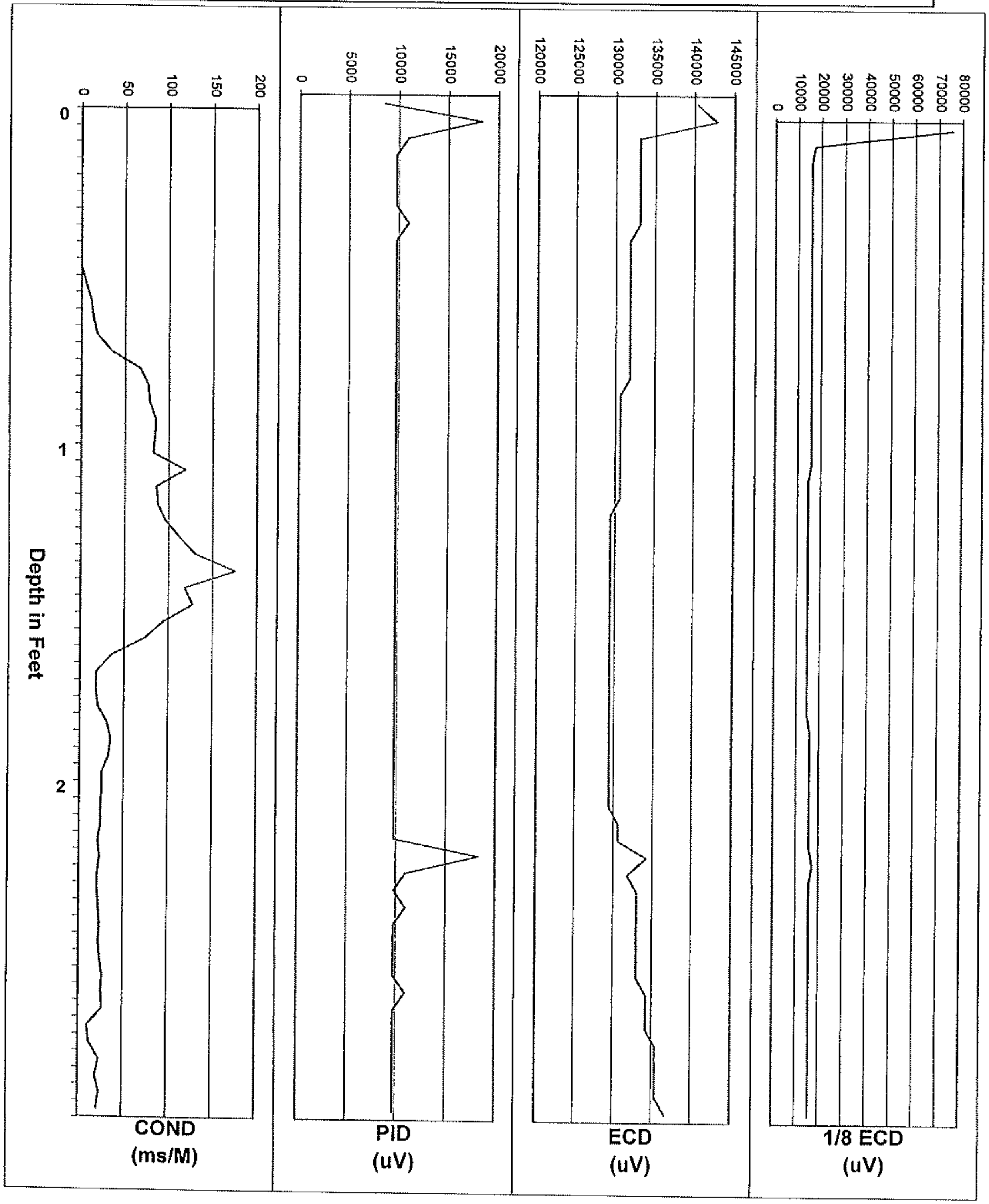
ZEBRA EC/MIP Summary Log, Point SB-66
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/14/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 66 of 67

ZEBRA EC/MIP Summary Log, Point SB-67
Lancaster, PA



for: Baker
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 11/14/2001
Proj. Name: Baker/Lancaster, PA
Proj. #: ZDS04891
Operators: PMO
Point 67 of 67

Baker

APPENDIX B

DRILLING LOGS FOR CONFIRMATORY SOIL BORINGS

Baker
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DIRECT PUSH SOIL BORING LOG

PROJECT: Conestoga Pines Park Site
S.O. NO.: 24300-077-0001
TASK NO.: 03002
BORING NO.: SB04
SHEET NO.: 1 of 1
ELEVATION: 999.91

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40 to 55°
Orientation:	Vertical	**Date Started:**	November 14, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 14, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	N/A
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 8'		

Remarks: Soil boring drilled at entrance to park, 35 feet north of intersection of Pitney Road and Arthur C. Morris Drive.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111401-S-SB040506	5 to 6 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	4' 100%	4.0'	<1.0	0' to 1' - Topsoil with organic material, dry, very dark brown, 7.5YR 2.5/2, 0-5mm rock fragments 1' to 3.5' - Clay, strong brown, 7.5YR4/6, moist 3.4' to 4' - Sandy clay, brown, 7.5YR4/3, dry	▨	
5 6 7 8	2	4' 100%	8.0'	<1.0	4' to 5.5' - Clayey sand, strong brown,7.5YR 5/6, moist 5.5' to 8' - Clay, strong brown 7.5YR 4/6, moist	▨	077-111401-S-SB040506
9 10 11					End of boring 8'		

DRILLING CO.: Zebra, Inc.
DRILLER: Joe Sakellis
BAKER REP.: Jeff Humpton/Julee Dugan
BORING NO.: SB04 SHEET 1 OF 1

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT: Conestoga Pines Park Site
S.O. NO.: 24300-077-0001
TASK NO.: 03002
BORING NO.: SB05
SHEET NO.: 1 of 1
ELEVATION: 995.64

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40 to 55°
Orientation:	Vertical	**Date Started:**	November 15, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 15, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	N/A
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 8.5'		

Remarks: Soil boring drilled in the northeast corner of the site, approximately 125 feet west of Pitney Road.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB050608	6 to 8 feet	Soil sample - to PADEP contract lab for TCL VOCs
077-111501-S-SB050608D	6 to 8 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	3.6' 90%	4.0'	<1.0	0' to 0.5' - Topsoil with organic material, very dark brown, 7.5YR 2.5/2, dry, 2-5 mm limestone fragments 0.5' to 2' - Clay, dark yellowish brown, 10YR 3/6, dry, 1-2mm limestone fragments 2' to 5' - Clay, yellowish brown, 10YR 5/6, moist, 1-2mm limestone fragments 5' to 5.5' - Quartz fragments, 10-20mm 5.5' to 8.5' - Clayey sand, yellowish brown, 10YR 5/6, mottled with yellow, 10YR 7/6, moist, 5-20mm sandstone fragments	▩ ░	
5 6 7 8	2	3.6' 90%	8.0'	<1.0			077-111501-S-SB050608 077-111501-S-SB050608D
	3	0' - 0%	8.5'	<1.0	Refusal at 8.5'		
9 10 11							

DRILLING CO.: Zebra, Inc.
DRILLER: Joe Sakellis
BAKER REP.: Jeff Humpton/Julee Dugan
BORING NO.: SB05 SHEET 1 OF 1

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT: Conestoga Pines Park Site
S.O. NO.: 24300-077-0001
TASK NO.: 03002
BORING NO.: SB07
SHEET NO.: 1 of 1
ELEVATION: 988.35

DRILLING INFORMATION

Drill Rig: Direct-Push Rig
Orientation: Vertical
Sampler Size: 2-inch ID
Sampler Length: 4-feet
Auger Size: N/A
Open Borehole Depth: 0 to 5'

Weather: Sunny, 40 to 55°
Date Started: November 15, 2001
Date Completed: November 15, 2001
Water Level 0 Hr.: N/A
Water Level 24 Hrs.: N/A

Remarks: Soil boring drilled approximately 200 feet west of Pitney Road, immediately south of drainage culvert.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB070204	2 to 4 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	3.6' 90%	4.0'	<1.0	0' to 1.0' - Topsoil with organic material and clay, very dark brown, 7.5YR2.5/2, moist 1' to 4' - Clay, dark yellowish brown, 10YR 3/6, moist, 2-5mm angular limestone fragments	▨	077-111501-S-SB070204
5	2	0.6' 60%	5.0'	<1.0	4' to 5' - 5-25mm angular dolomite fragments	░	
6 7 8 9 10 11					Refusal at 5'		

DRILLING CO.: Zebra, Inc.
DRILLER: Joe Sakellis
BAKER REP.: Jeff Humpton/Julee Dugan
BORING NO.: SB07 SHEET 1 OF 1

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT: Conestoga Pines Park Site
S.O. NO.: 24300-077-0001
TASK NO.: 03002
BORING NO.: SB10
SHEET NO.: 1 of 2
ELEVATION: 982.06

DRILLING INFORMATION

Drill Rig: Direct-Push Rig
Orientation: Vertical
Sampler Size: 2-inch ID
Sampler Length: 4-feet
Auger Size: N/A
Open Borehole Depth: 0 to 12'

Weather: Sunny, 40 to 55°
Date Started: November 15, 2001
Date Completed: November 15, 2001
Water Level 0 Hr.: N/A
Water Level 24 Hrs.: N/A

Remarks: Soil boring drilled in sheetflow area west of drainage swale.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB100204	2 to 4 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	4' 100%	4.0'	<1.0	0' to 0.5' - Topsoil with organic material, very dark brown, 7.5YR 2.5/2, moist, 1-2mm limestone fragments 0.5' to 2' - Clay, dark yellowish brown, 10YR 4/4, moist 2' to 2.5' - Qtz fragments, 5-20mm 2.5' to 5' - Silty clay, dark yellowish brown,10YR 4/4, moist to very moist	▨	077-111501-S-SB100204
5 6 7 8	2	3.0' 75%	8.0'	<1.0	5' to 5.5' - 5-15mm dolomite rock fragments 5.5' to 9' - Clayey sand, dark yellowish brown, 10YR4/4, very moist, 5-10mm dolomite fragments	▨ ░	
9 10 11	3	3.5' 88%			9' to 11' - Clayey sand, dark reddish brown, 5YR 3/4 moist, 5-10mm dolomite fragments 11' to 12' - Clayey sand, dark yellowish brn, 10YR 4/6, mottled w/ yellow, 10YR 7/6, very moist to wet,	░	
					Match to Sheet 2		

DRILLING CO.: Zebra, Inc.
DRILLER: Joe Sakellis
BAKER REP.: Jeff Humpton/Julee Dugan
BORING NO.: SB10 SHEET 1 OF 2

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT:	Conestoga Pines Park Site	**BORING NO.:**	SB10
SO NO.:	24300-077-0001	**SHEET NO.:**	2 of 2
TASK NO.:	03002	**ELEVATION:**	982.06

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
					Continued from Sheet 1		
12			12.0'	<1.0	3-5mm sandstone and dolomite fragments	▨	
					End of Boring at 12'		
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

DRILLING CO.:	Zebra, Inc.	**BAKER REP.:**	Jeff Humpton/Julee Dugan
DRILLER:	Joe Sakellis	**BORING NO.:**	SB10 SHEET 2 OF 2

Baker
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DIRECT PUSH SOIL BORING LOG

PROJECT:	Conestoga Pines Park Site	**BORING NO.:**	SB14
S.O. NO.:	24300-077-0001	**SHEET NO.:**	1 of 1
TASK NO.:	03002	**ELEVATION:**	973.38

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40 to 55°
Orientation:	Vertical	**Date Started:**	November 15, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 15, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	N/A
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 8'		

Remarks: Soil boring drilled approximately 75 feet north of spring headwater, in presumably unimpacted soils.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB140608	6 to 8 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1	1	3.6' 90%			0' to 1' - Topsoil with organic material, very dark brown, 7.5YR 2.5/2, moist, 1-2mm limestone fragments.	▨	
2					1' to 4' - Clay, dark yellowish brown, 10YR 4/6, mottled with dark grayish brown, 10YR 4/2, moist, 5-10mm quartz fragments.	▨	
3						▨	
4			4.0'	<1.0		▨	
5	2	2.7' 68%			4' to 7.5' - Clayey sand, dark yellowish brown, 10YR 4/6, wet, 5-25mm angular dolomite and sandstone fragments.	░	
6						░	
7						░	
8			8.0'	<1.0	7.5' to 8' - 15-20mm dolomite rock fragments.	░	077-111501-S-SB140608
9					End of boring at 8'		
10							
11							

DRILLING CO.:	Zebra, Inc.	**BAKER REP.:**	Jeff Humpton/Julee Dugan
DRILLER:	Joe Sakellis	**BORING NO.:**	SB10 SHEET 1 OF 1

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT:	Conestoga Pines Park Site	**BORING NO.:**	SB29
S.O. NO.:	24300-077-0001	**SHEET NO.:**	1 of 1
TASK NO.:	03002	**ELEVATION:**	974.64

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40 to 55°
Orientation:	Vertical	**Date Started:**	November 15, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 15, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	N/A
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 10'		

Remarks: Soil boring drilled approximately 20 feet east/southeast of MW9212.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB290406	4 to 6 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	2.8' 70%	4.0'	<1.0	0' to 1' - Topsoil, very dark brown, 7.5YR 2.5/2, dry, 1-2mm angular limestone rock fragments. 1' to 3' - Silty sand (fill), yellowish brown, 10YR 5/6, mottled with very dark brown, 10YR 2/2, 10-15mm angular limestone and brick frags. 3' to 6' - Clay, dark yellowish brown, 10YR 4/6, moist 6' to 7' - Sandy clay, dark yellowish brown 10YR 4/6, mottled w/yellow, 10YR 7/6, moist to very moist, 10-15mm angular dolomite rock fragments. 7' to 9' - Platy dolomite rock fragments, 20-25mm. 9' to 10' - Sandy clay, yellow, 10YR 7/6, moist, 10-20mm sandstone and limestone rock fragments.	▩	077-111501-S-SB290406
5 6 7 8	2	3.7' 93%	8.0'	<1.0		▩ ░	
9 10	3	1.6' 40%	10.0'	<1.0		░	
11					Refusal at 10'		

DRILLING CO.:	Zebra, Inc.	**BAKER REP.:**	Jeff Humpton/Julee Dugan
DRILLER:	Joe Sakellis	**BORING NO.:**	SB29 SHEET 1 OF 1

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT:	Conestoga Pines Park Site	**BORING NO.:**	SB53
S.O. NO.:	24300-077-0001	**SHEET NO.:**	1 of 1
TASK NO.:	03002	**ELEVATION:**	983.35

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40 to 55°
Orientation:	Vertical	**Date Started:**	November 14, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 14, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	N/A
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 8'		

Remarks: Soil boring drilled at edge of tree line, across from eastern corner of barn (recreation center).

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111401-S-SB530506	5 to 6 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	4' 100%	4.0'	<1.0	0' to 1' - Topsoil with organic material, very dark brown, 7.5YR 2.5/2, 1-2mm rock fragments. 1' to 3.9' - Clay, strong brown, 7.5YR 5/6, dry. 3.9' to 4' - Dolomite fragments 4' to 5.4' - Sandy clay, brown, 7.5YR 4/4, dry, 1-2mm dolomite fragments.	▩	
5 6 7 8	2	2.0' 50%	8.0'	<1.0	5.4' to 6' - Sandy clay, pink, 7.5YR 8/3, dry, 20-25mm dolomite fragments.	░	077-111401-S-SB530506
9 10 11					Refusal at 8'		

DRILLING CO.:	Zebra, Inc.	**BAKER REP.:**	Jeff Humpton/Julee Dugan
DRILLER:	Joe Sakellis	**BORING NO.:**	SB53

SHEET 1 OF 1

Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT: Conestoga Pines Park Site
S.O. NO.: 24300-077-0001
TASK NO.: 03002

BORING NO.: SB64
SHEET NO.: 1 of 2
ELEVATION: 977.79

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40° to 55°
Orientation:	Vertical	**Date Started:**	November 15, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 15, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	10' below ground surface
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 12'		

Remarks: Soil boring drilled approximately 50 feet west of former farmhouse foundation.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB640810	8 to 10 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	4' 100%	4.0'	<1.0	0' to 1' - Topsoil, very dark brown, 7.5YR 2.5/2, 1-2mm angular limestone rock fragments, dry. 1' to 5' - Clay, strong brown, 7.5YR 4/6, moist.	▨	
5 6 7 8	2	3.3' 83%	8.0'	<1.0	5' to 6' - Clayey sand, strong brown, 7.5YR 4/6, very moist. 6' to 10' - Sandy clay, yellow mottled with dark yellowish brown, 7.5YR 7/6 with 7.5YR 4/6, dry, 2-5mm angular dolomite and sandstone rock fragments.	░	
9 10 11	3	2.9' 73%			Water encountered in hole at 10'. 10' to 12' - Clayey sand, dark brown, 7.5YR 3/3, wet, 15-25mm	░	077-111501-S-SB640810
					Match to Sheet 2		

DRILLING CO.: Zebra, Inc.
DRILLER: Joe Sakellis

BAKER REP.: Jeff Humpton/Julee Dugan
BORING NO.: SB64 SHEET 1 OF 2

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT: Conestoga Pines Park Site
SO NO.: 24300-077-0001
TASK NO.: 03002
BORING NO.: SB64
SHEET NO.: 2 of 2
ELEVATION: 977.79

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
					Continued from Sheet 1		
12			12.0'	<1.0	angular dolomite rock fragments.	░	
13					End of Boring at 12'		
14							
15							
16							
17							
18							
19							
20							
21							
22							

DRILLING CO.: Zebra, Inc.
DRILLER: Joe Sakellis
BAKER REP.: Jeff Humpton/Julee Dugan
BORING NO.: SB64 SHEET 2 OF 2

Baker
Baker Environmental

DIRECT PUSH SOIL BORING LOG

PROJECT:	Conestoga Pines Park Site	**BORING NO.:**	SB67
S.O. NO.:	24300-077-0001	**SHEET NO.:**	1 of 1
TASK NO.:	03002	**ELEVATION:**	978.07

DRILLING INFORMATION

Drill Rig:	Direct-Push Rig	**Weather:**	Sunny, 40 to 55°
Orientation:	Vertical	**Date Started:**	November 15, 2001
Sampler Size:	2-inch ID	**Date Completed:**	November 15, 2001
Sampler Length:	4-feet	**Water Level 0 Hr.:**	N/A
Auger Size:	N/A	**Water Level 24 Hrs.:**	N/A
Open Borehole Depth:	0 to 10.5'		

Remarks: Soil boring drilled at site of MIP Boring 67, approximately 50 feet south of spring headwater.

SAMPLE INFORMATION

Sample No.	Sample Depth	Testing Parameters
077-111501-S-SB670810	8 to 10 feet	Soil sample - to PADEP contract lab for TCL VOCs

Depth (Feet)	Run No.	Amount Sample Recovery (Ft.,%)	Bottom Depth of Sample (Feet)	PID IN-SITU TESTING ppm	Visual Description	Graphic Log	Laboratory Sample No.
1 2 3 4	1	3.6' 90%	4.0'	<1.0	0 to 0.5' - Topsoil with organic matter and silt, very dark brown, 7.5YR 2.5/2, dry. 0.5' to 3.5' - Sandy silt (fill), dark grayish brown, 10YR 4/2, and very pale brown, 10YR 7/4, dry, 2-25mm limestone, sandstone, and dolomite fragments.	▩	
5 6 7 8	2	3.6' 90%	8.0'	<1.0	3.5' to 8' - Sandy clay, dark yellowish brown, 10YR 4/6, mottled with yellow, 10YR 7/6, dry to moist, 5-25mm angular sandstone and dolomite fragments. Wet layer 9' to 9.5'	▒	
9 10	3	2.0' 80%	10.5'	<1.0	8' to 10.5' - Sandy gravel, yellow, 10YR 7/6, mottled with gray, 10YR 6/1, moist to wet, 5-15mm sandstone and dolomite fragments. Wet layer 10' to 10.5'	░	077-111501-S-SB670810
11					Refusal at 10.5'		

DRILLING CO.:	Zebra, Inc.	**BAKER REP.:**	Jeff Humpton/Julee Dugan
DRILLER:	Joe Sakellis	**BORING NO.:**	SB67 SHEET 1 OF 1

APPENDIX C

DRILLING LOGS FOR MONITORING WELLS

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **Conestoga Pines Park**

PROJECT. NO.:	24300-077-0001 Subtask 03-04		BORING NO.:	**MW01**
COORDINATES:	NORTHING:	19327.04	EASTING:	9870.48
ELEVATION:	SURFACE:	997.70	TOP STEEL CASING:	997.70

Rig: Air Rotary	**Split Spoon**	**Temp Casing**	**Augers**	**Core Barrel**	**Date**	**Progress (Ft.)**	**Weather**	**Depth to Water (Ft.)**
Size (ID)	---	---	---	---	11-19-01	10" Diam. Hole to 21'	Sunny-Low 60's	+21'
Length	---	---	---	---	11-19-01	6" Diam. Hole to 51'	Sunny-Low 60's	32'
Type	---	---	---	---	11-19-01	Well Development	Sunny-Low 60's	32'
Hammer Wt.	---	---	---	---	11-20-01	Gauge SWL	Sunny-Mid 40's	27.61'
Fall	---	---	---	---	x	Gauge SWL	x	x

Remarks: Monitoring well MW01 drilled on the northeast corner of site (topographically upgradient) and immediately west of Pitney Road. PID background 0 meter units. Well was completed at the surface using a flushmount manhole cover.

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	**Diam.**	**Top Elev. (Ft.)**	**Bottom Depth (Ft.)**
Well Casing -- Steel Casing/Bentonite to Surface	6-in	--	21'
Well Screen -- None - Open Bedrock	6-in	21'	51'

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
					Flushmount Manhole Cover		TOC **997.70**
1 2 3 4 5 6 7 8 9 10				<1.0	0 to 0.5' - Topsoil 0.5' to 4' - Sandy clay, strong brown, 10YR 4/6, 5-10 mm angular quartz and limestone rock fragments, moist. 4' to 6' - Weathered dolomite, very pale brown mottled with strong brown and gray, 10YR 7/4 with 10YR 4/6 and 5/1. **TOP OF BEDROCK AT 6'** 6' to 30' - Dolomite, yellow mottled with dark yellowish brown and gray, 10YR 7/6 with 10YR 4/6 and 5/1, dry.	**6-INCH DIAMETER STEEL CASING** 1 2 3 4 5 6 7 8 9 10	
					Match to Sheet 2		

DRILLING CO.:	B.L. Myers, Inc.	**BAKER REP.:**	Jeff Humpton
DRILLER:	Bill Guissepe	**BORING NO.:**	MW01 SHEET 1 OF 4

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **Conestoga Pines Park**
PROJECT NO.: 24300-077-0001 Subtask 03-04   BORING NO.: **MW01**

SAMPLE TYPE	DEFINITIONS
S = Split Spoon A = Auger T = Shelby Tube W = Wash R = Air Rotary C = Core D = Denison P = Piston N = No Sample	SPT = Standard Penetration Test (ASTM D1586) PID = Photo Ionization Detector Measurement MSL = Mean Sea Level

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail		Elevation (Ft. MSL)
11					Continued from Sheet 1	6-INCH DIAMETER STEEL CASING	11	
12							12	
13							13	
14							14	
15							15	
16				<1.0			16	
17							17	
18							18	
19					End Drilling 10-inch Diameter hole at 21'. Install 6-inch Diameter Casing to 21'. Bentonite/grout slurry seal annular space between casing and edge of borehole.		19	
20							20	
21							21	
22						OPEN BEDROCK	22	
23							23	
24					6' to 32' - Hard rock		24	
25					25' to 32' - Dolomite, dark gray with brownish yellow mottles, 10YR4/1 and 10YR6/6, hard		25	
26							26	
27					Dry?		27	
28							28	
29							29	
30							30	
					Match to Sheet 3			

DRILLING CO.: B.L. Myers, Inc.   **BAKER REP.:** Jeff Humpton
DRILLER: Bill Guissepe   **BORING NO.:** MW01   SHEET 2 OF 4

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **Conestoga Pines Park**

PROJECT NO.: 24300-077-0001 Subtask 03-04

BORING NO.: **MW01**

SAMPLE TYPE	**DEFINITIONS**
S = Split Spoon A = Auger T = Shelby Tube W = Wash R = Air Rotary C = Core D = Denison P = Piston N = No Sample	SPT = Standard Penetration Test (ASTM D1586) PID = Photo Ionization Detector Measurement MSL = Mean Sea Level

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail		Elevation (Ft. MSL)
31					Continued from Sheet 2		31	
32							32	
33					32' to 33' - Fracture, water bearing, approximately 10 gpm.		33	
34							34	
35							35	
36							36	
37							37	
38					30' to 51'- Dolomite, grayish brown and dark gray, 10YR 5/2 and 10YR 4/1, wet		38	
39						OPEN BEDROCK	39	
40							40	
41							41	
42					33' to 51' - Hard rock		42	
43							43	
44							44	
45							45	
46							46	
47							47	
48							48	
49							49	
50							50	
					Match to Sheet 4			

DRILLING CO.: B.L. Myers, Inc.
DRILLER: Bill Guissepe

BAKER REP.: Jeff Humpton
BORING NO.: MW01 SHEET 3 OF 4

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **Conestoga Pines Park**

PROJECT NO.: 24300-077-0001 Subtask 03-04 BORING NO.: **MW01**

SAMPLE TYPE	**DEFINITIONS**
S = Split Spoon A = Auger T = Shelby Tube W = Wash R = Air Rotary C = Core D = Denison P = Piston N = No Sample	SPT = Standard Penetration Test (ASTM D1586) PID = Photo Ionization Detector Measurement MSL = Mean Sea Level

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail		Elevation (Ft. MSL)
51					Continued from Sheet 3		51	
					End Drilling at 51' Hole making approximately 10 GPM. Pump and purge to develop well. It should be noted that cave-in from the fracture was measured at 48.90' after well completion.			
52							52	
53							53	
54							54	
55							55	

DRILLING CO.: B.L. Myers, Inc.

DRILLER: Bill Guissepe

BAKER REP.: Jeff Humpton

BORING NO.: MW01 SHEET 4 OF 4

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: Conestoga Pines Park
PROJECT. NO.: 24300-077-0001 Subtask 03-04 BORING NO.: MW02
COORDINATES: NORTHING: 9903.49 EASTING: 10035.21
ELEVATION: SURFACE: 980.95 TOP STEEL CASING: 980.95

Rig: Air Rotary								
	Split Spoon	**Temp Casing**	**Augers**	**Core Barrel**	**Date**	**Progress (Ft.)**	**Weather**	**Depth to Water (Ft.)**
Size (ID)	---	---	---	---	11-19-01	10" Diam. Hole to 32'	Sunny-Low 60's	32'
Length	---	---	---	---	11-20-01	6" Diam. Hole to 40'	Sunny-Mid 40's	32'
Type	---	---	---	---	11-20-01	Well Development	Sunny-Mid 40's	32'
Hammer Wt.	---	---	---	---	11-20-01	Gauge SWL	Sunny-Mid 40's	11.24'
Fall	---	---	---	---	x	Gauge SWL	x	x

Remarks: Monitoring well MW02 drilled approximately 20 feet and topographically downgradient from the old farmhouse ruins. PID background 0 meter units. Well was completed at the surface with a flushmount manhole cover.

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	**Diam.**	**Top Elev. (Ft.)**	**Bottom Depth (Ft.)**
Well Casing -- Steel Casing/Bentonite to Surface	6-in	--	25'
Well Screen -- None - Open Bedrock	6-in	25'	40'

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
					Flushmount Manhole Cover		TOC **980.95**
1 2 3 4				788	0 to 0.5' - Topsoil 0.5' to 4' - Sandy clay, yellowish brown, 10YR 5/6, 5-25 mm angular quartz and limestone rock fragments, dry.	6-INCH DIAMETER STEEL CASING 1 2 3 4	
5 6 7 8				52	4' to 8' - Weathered dolomite, yellow mottled with gray, 10YR 7/6 with 10YR 5/1, 5-15 mm angular dolomite rock fragments, dry.	5 6 7 8	
9 10					**TOP OF BEDROCK AT 8'** 8' to 25' - Dolomite, yellow mottled with grayish brown, 10YR 7/6 with 10YR 5/2, 10-+25 mm dolomite rock fragments, dry.	9 10	
					Match to Sheet 2		

DRILLING CO.: B.L. Myers, Inc. **BAKER REP.:** Jeff Humpton
DRILLER: Bill Guissepe **BORING NO.:** MW02 SHEET 1 OF 3

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **Conestoga Pines Park**

PROJECT NO.: 24300-077-0001 Subtask 03-04 BORING NO.: **MW02**

SAMPLE TYPE	DEFINITIONS
S = Split Spoon A = Auger T = Shelby Tube W = Wash R = Air Rotary C = Core D = Denison P = Piston N = No Sample	SPT = Standard Penetration Test (ASTM D1586) PID = Photo Ionization Detector Measurement MSL = Mean Sea Level

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11					Continued from Sheet 1	6-INCH DIAMETER STEEL CASING	
12							
13							
14							
15					8' to 25' - Highly fractured dolomite, yellow with grayish brown mottles, 10-25mm rock fragments, fast drilling.		
16							
17							
18							
19							
20							
21							
22							
23					End Drilling 10-inch Diameter hole at 32'. Install 6-inch Diameter Casing to 25'. Bentonite/grout slurry seal annular space between casing and edge of borehole.		
24							
25							
26					25' to 40' - Dolomite, grayish brown and dark gray, 10YR 5/2 and 10YR 4/1, dry to wet.	OPEN BEDROCK	
27							
28					25' to 32' - Hard rock		
29							
30							
					Match to Sheet 3		

DRILLING CO.: B.L. Myers, Inc.

DRILLER: Bill Guissepe

BAKER REP.: Jeff Humpton

BORING NO.: MW02 SHEET 2 OF 3

Baker Environmental

MONITORING WELL CONSTRUCTION RECORD

PROJECT: **Conestoga Pines Park**

PROJECT NO.: 24300-077-0001 Subtask 03-04 BORING NO.: **MW02**

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS

SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector Measurement
MSL = Mean Sea Level

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	Lab Sample ID No.	PID meter units	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
31					Continued from Sheet 2	OPEN BEDROCK	
32					32' to 33' - Fracture, water bearing, approximately +20 gpm.		
33							
34							
35							
36					33' to 40' - Dolomite, grayish brown and dark gray, 10YR5/2 and 10YR4/1, hard, wet.		
37							
38							
39							
40							
41					**End Drilling at 40'** Hole making approximately +20 GPM. Surge and circulate air to develop well. It should be noted that cave-in from the fracture was measured at 34.57' after well completion.		
42							
43							
44							
45							
46							
47							
48							
49							
50							

DRILLING CO.: B.L. Myers, Inc.
DRILLER: Bill Guissepe
BAKER REP.: Jeff Humpton
BORING NO.: MW02 SHEET 3 OF 3

Baker

APPENDIX D

IDW TRANSPORTATION MANIFESTS AND DISPOSAL CERTIFICATION

WASTE RECOVERY
solutions, inc.
343 King Street, Myerstown, PA 17067

GENERATOR WASTE PROFILE SHEET

Section 1 - General Information

Generator Name PADEP - Southcentral Regional Office
Site Address Conestoga Pines Park, Pitney Road
Town, State, Zip Lancaster, PA 17604
Mail Address PADEP - 909 Elmerton Ave
Town, State, Zip Harrisburg, PA 17110
Facility Contact/Title Elise Juers - Project Officer
Phone 717-705-4852 Fax 717-705-4830 EPA ID # ____

Section 2 - Billing Information

Name Baker Environmental, Inc.
Mail Address 3600 Vartan Way, Second Floor
Town, State, Zip Harrisburg, PA 17110
Facility Contact/Title Mark Joos - Project Manager
Phone 717-540-6307 Fax 717-540-1994 EPA ID # ____

Section 3 - Waste Composition

Name of Waste well cuttings - soil
Process Generating Waste drilling of monitoring wells at Conestoga Pines.
Quantity: 9 eA - 55 gal Units: Drums Shipping Frequency: once
Waste Description (Chemical Composition)

TCLP VOCs - none detected %
TCLP metals - none detected %
RCRA characteristics - non-hazardous %
TCL VOC's - none detected %
____ %
____ %

See Attached tables and laboratory reports

Btu/pound ____

Total Metals			Yes	No				Yes	No
Arsenic	>	40 ppm	unknown		Mercury	>	2 ppm	unknown	
Barium	>	500 ppm	unknown		Molybdenum	>	70 ppm	unknown	
Beryllium	>	10 ppm	unknown		Nickel	>	150 ppm	unknown	
Cadmium	>	20 ppm	unknown		Selenium	>	20 ppm	unknown	
Chromium	>	70 ppm	unknown		Silver	>	80 ppm	unknown	
Lead	>	100 ppm	unknown		Zinc	>	5,000 ppm	unknown	

Physical State:

Liquid ______ Sludge _____ Solid X___ Type of Shipments - Bulk _____ Drums X_____
Single Phase X___ Bilayered _____ Multilayered _____ Other (describe)________________
Pumpable _____ Pourable _____ Dumpable X___

Does This Waste Contain Silicon? yes____

Shipping Name soils (well cuttings soils)________________

Attach all relevant Material Safety Data Sheets and Laboratory Analyses if available. Attach separate sheets to disclose all known and suspected hazards, Special Handling Precautions and additional comments.

Desired Destruction Method ___ *Incineration* X *Landfill* ___ *Treatment*

Section 4 - Certifications

GENERATOR'S CERTIFICATIONS

I hereby certify the above information is correct to the best of my knowledge. I further certify that WRS will be notified in writing of any process changes, which could significantly alter the composition and/or chemical/physical properties of the waste described above. I further certify that the waste has not been intentionally mixed with hazardous materials and that all known or suspected hazards have been disclosed. I further certify that this material neither contains nor has been mixed in any way with Polychlorinated Biphenyls (PCBs), Pesticides, or Herbicides to the best of my knowledge.

RESOURCE RECOVERY FACILITIES NON-HAZ CERTIFICATION

I certify that the waste materials consigned to WRS for recycling/reuse/treatment or destruction by incineration at a Resource Recovery facility are classified as non-hazardous according to federal regulations, 40 CFR Part 261. The waste does not exhibit the RCRA characteristics of ignitability, corrosivity, reactivity, or toxicity. It does not contain any hazardous levels of toxic metals, air emissions metals, volatile or semi-volatile organics, pesticides or herbicide constituents, nor is it a listed hazardous waste. This determination has been made based upon generator knowledge or analytical data.

Print Name Elise Juers________________ Title PADEP Project Office

Generator Signature Elise Juers________________ Date 1/10/02______

Section 5 - WRS Review

Residual Waste Code _______ Destination ____________________

Approval Code ________

Reviewed By ____________________

APPENDIX D
TABLE 1.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
TCL VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Drum		**Units**
Sample Type	Composite Soil		
Sample Date	11/29/01		
Location	IDW Drums		
Compound	**Result**	**Detection Limit**	
Acetone	<21	21	ug/kg
Benzene	<5	5	ug/kg
Bromodichloromethane	<5	5	ug/kg
Bromomethane	<5	5	ug/kg
Carbon Disulfide	<5	5	ug/kg
Carbon Tetrachloride	<5	5	ug/kg
Chlorobenzene	<5	5	ug/kg
Chloroethane	<5	5	ug/kg
Chloroform	<5	5	ug/kg
Dibromochloromethane	<5	5	ug/kg
1,1-Dichloroethane	<5	5	ug/kg
1,2-Dichloroethane	<5	5	ug/kg
1,1-Dichloroethylene	<5	5	ug/kg
cis-1,2-Dichloroethylene	<5	5	ug/kg
trans-1,2-Dichloroethylene	<5	5	ug/kg
Dichloromethane (Methylene Chloride)	<5	5	ug/kg
1,2-Dichloropropane	<5	5	ug/kg
cis-1,3-Dichloropropene	<5	5	ug/kg
trans-1,3-Dichloropropene	<5	5	ug/kg
Ethylbenzene	<5	5	ug/kg
2-Hexanone	<11	11	ug/kg
Methyl Chloride (Chloromethane)	<5	5	ug/kg
Methyl Ethyl Ketone (2-Butanone)	<11	11	ug/kg
4-Methyl-2-pentanone	<11	11	ug/kg
Styrene	<5	5	ug/kg
1,1,2,2-Tetrachloroethane	<5	5	ug/kg
Tetrachloroethylene (PCE)	<5	5	ug/kg
Toluene	<5	5	ug/kg
Tribromomethane (Bromoform)	<5	5	ug/kg
1,1,1-Trichloroethane	<5	5	ug/kg
1,1,2-Trichloroethane	<5	5	ug/kg
Trichloroethylene (TCE)	<5	5	ug/kg
Xylenes (total)	<5	5	ug/kg
Vinyl Chloride (Chloroethene)	<5	5	ug/kg

APPENDIX D
TABLE 1.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
TCLP VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Drum		**TCLP Standards***	**Units**
Sample Type	Composite Soil			
Sample Date	11/29/01			
Location	IDW Drums			
Compound	**Result**	**Detection Limit**		
Benzene	<0.1	0.1	0.5	mg/l
Carbon Tetrachloride	<0.1	0.1	0.5	mg/l
Chlorobenzene	<0.1	0.1	100	mg/l
Chloroform	<0.1	0.1	6	mg/l
1,2-Dichloroethane	<0.1	0.1	0.5	mg/l
1,1-Dichloroethylene	<0.1	0.1	0.7	mg/l
Methyl Ethyl Ketone (2-Butanone)	<0.2	0.2	200	mg/l
Tetrachloroethylene (PCE)	<0.1	0.1	0.7	mg/l
Trichloroethylene (TCE)	<0.1	0.1	0.5	mg/l
Vinyl Chloride Chloroethene	<0.1	0.1	0.2	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Method SW-846 8260B, Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

APPENDIX D
TABLE 1.3
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
TCLP METALS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Drum		TCLP Standards*	Units
Sample Type	Composite Soil			
Sample Date	11/29/01			
Location	IDW Drums			
Compound	Result	Detection Limit		
Arsenic	<0.1	0.1	5	mg/l
Barium	<0.1	0.1	100	mg/l
Cadmium	<0.01	0.01	1	mg/l
Chromium	<0.03	0.03	5	mg/l
Lead	<0.1	0.1	5	mg/l
Mercury	<0.0002	0.0002	0.2	mg/l
Selenium	<0.2	0.2	1	mg/l
Silver	<0.02	0.02	5	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

APPENDIX D
TABLE 1.4
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
MONITORING WELL CUTTINGS
HAZARDOUS WASTE CHARACTERISTICS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Drum		**Hazardous Characteristic Threshold Standards***
Sample Type	Composite Soil		
Sample Date	11/29/01		
Location	IDW Drums		
Characteristic	**Result**		
Corrosivity	Non-corrosive	pH = 9.41	pH≤2, or pH≥12.5
Ignitability	Non-ignitable		Does not spontaneously ignite with exposure to air or water, not ignitable by friction, vapors not ignitable when exposed to flame.
Reactivity**	Non-reactive	Hydrogen Sulfide < 100 mg/kg Hydrogen Cyanide < 99 mg/kg	Hydrogen Cyanide ≤ 250 mg/kg Hydrogen Sulfide ≤ 500 mg/kg

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

**Interim threshold limits established by the Solid Waste Branch of EPA, July, 1992.

Job No. 24300-077-0000 Subtask 03007

Analysis Report

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. TL 3735069

Collected:11/29/2001 09:15 by JD

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

Account Number: 06195

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum
TCLP ZERO HEADSPACE EXTRACTION

1DWZH SDG#: PAP73-03

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Units	Dilution Factor
03636	46.6 TCLP by 8260					
05386	Vinyl Chloride	75-01-4	< 0.10	0.10	mg/l	20
05390	1,1-Dichloroethene	75-35-4	< 0.10	0.10	mg/l	20
05396	Chloroform	67-66-3	< 0.10	0.10	mg/l	20
05399	Carbon Tetrachloride	56-23-5	< 0.10	0.10	mg/l	20
05401	Benzene	71-43-2	< 0.10	0.10	mg/l	20
05402	1,2-Dichloroethane	107-06-2	< 0.10	0.10	mg/l	20
05403	Trichloroethene	79-01-6	< 0.10	0.10	mg/l	20
05409	Tetrachloroethene	127-18-4	< 0.10	0.10	mg/l	20
05413	Chlorobenzene	108-90-7	< 0.10	0.10	mg/l	20
06305	2-Butanone	78-93-3	< 0.20	0.20	mg/l	20

The volatile organic analyses were performed on a zero headspace toxicity characteristic leachate of the submitted waste. The leachate was prepared according to the procedure specified in SW-846, Chapter 7.4 (Revision 3, 12/94).

If the TCLP extract contains any one of the Toxicity Characteristic (TC) constituents in an amount equal to or exceeding the concentrations specified in 40 CFR Part 261.24, the waste possesses the characteristic of toxicity and is a hazardous waste. These limits are listed below in mg/L. Other limits may apply for analyses performed under other regulations.

Benzene	0.5	1,1-Dichloroethene	0.7
Carbon Tetrachloride	0.5	Methyl Ethyl Ketone (2-Butanone)	200.0
Chlorobenzene	100.0	Tetrachloroethene	0.7
Chloroform	6.0	Trichloroethene	0.5
1,2-Dichloroethane	0.5	Vinyl Chloride	0.2

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

Lancaster Laboratories Sample No. TL 3735069

Collected:11/29/2001 09:15 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum
TCLP ZERO HEADSPACE EXTRACTION

1DWZH SDG#: PAP73-03

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	D I
03636	46.6 TCLP by 8260	SW-846 8260B	1	12/04/2001 16:05	Joseph P. Casillo	
00946	46.6 TCLP Zero Headspace Ext.	SW-846 1311	1	12/03/2001 14:15	Thomas H. Collins	
01163	GC/MS VOA Water Prep	SW-846 5030B	1	12/04/2001 16:05	Joseph P. Casillo	

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. TL 3735068

Collected:11/29/2001 09:15 by JD

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

Account Number: 06195

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum
TCLP NON-VOLATILE EXTRACTION

CRBNV SDG#: PAP73-02

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Units	Dilution Factor
00259	Mercury	7439-97-6	< 0.00020	0.00020	mg/l	1

The metal analyses were performed on a non-volatile leachate prepared according to the procedure specified in SW-846, Chapter 7.4 (Revision 3, December, 1994). A sample is considered to have failed the Toxicity Characteristic (TC) test and is considered a hazardous waste if any of the metal concentrations (mg/l) in the leachate exceed the following maxima (100 times the Primary Drinking Water Standards):

Arsenic	5.0	Cadmium	1.0	Lead	5.0	Selenium	1.0
Barium	100.0	Chromium	5.0	Mercury	0.2	Silver	5.0

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Units	Dilution Factor
01335	Arsenic	7440-38-2	< 0.100	0.100	mg/l	1
01336	Selenium	7782-49-2	< 0.200	0.200	mg/l	1
01746	Barium	7440-39-3	< 0.100	0.100	mg/l	1
01749	Cadmium	7440-43-9	< 0.0100	0.0100	mg/l	1
01751	Chromium	7440-47-3	< 0.0300	0.0300	mg/l	1
01755	Lead	7439-92-1	< 0.100	0.100	mg/l	1
01766	Silver	7440-22-4	< 0.0200	0.0200	mg/l	1

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	D.
00259	Mercury	SW-846 7470A	1	12/06/2001 07:31	Deborah A. Krady	1
01335	Arsenic	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
01336	Selenium	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
01746	Barium	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
01749	Cadmium	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
01751	Chromium	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
01755	Lead	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
01766	Silver	SW-846 6010B	1	12/06/2001 04:36	David K. Beck	
00947	49.3 TCLP Non-volatile Extract	SW-846 1311	1	12/04/2001 13:30	Carlene A. Landis	

Lancaster Laboratories Sample No. TL 3735068

Collected:11/29/2001 09:15 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum
TCLP NON-VOLATILE EXTRACTION

CRBNV SDG#: PAP73-02

05705	WW/TL SW 846 ICP Digest (tot)	SW-846 3010A	1	12/05/2001 19:20	Irimar Leon
05713	WW SW846 Hg Digest	SW-846 7470A	1	12/05/2001 20:01	Nelli S. Markaryan

Analysis Report

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. SW 3735067

Collected:11/29/2001 09:15 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:13
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum

1DWDR SDG#: PAP73-01

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation	Units	Dilution Factor
00111	88.6 Moisture	n.a.	3.53	0.50	% by wt.	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The result reported above is on an as-received basis.					
00394	87.4 pH	n.a.	9.41	0.010		1
	The pH was performed on a 1:1 slurry (25 gms. of sample and 25 ml. of deionized water) after being tumbled for 30 min.					
00496	51.1 Corrosivity	n.a.	See Below		See Below	1
	Corrosivity: The pH of a 1:1 slurry (with deionized water) was 9.41 indicating that the waste is not corrosive. A waste is corrosive if it exhibits a pH equal to or less than 2 or equal to or greater than 12.5.					
00542	50.2 Ignitability	n.a.	See Below		See Below	1
	The sample did not spontaneously ignite when exposed to air or water. The sample did not ignite by friction. The sample vapors did not ignite when exposed to a flame using a closed cup apparatus.					
01121	51.9 Reactivity	n.a.	See Below		See Below	1
	Reactivity: The sample was extracted by the interim method described in SW 846, Chapter 7.3. This solution was analyzed for cyanide and sulfide. This waste is not considered reactive and hazardous because it does not generate a quantity of hydrogen cyanide exceeding 250 mg/kg or hydrogen sulfide exceeding 500 mg/kg. These interim threshold limits were established by the Solid Waste Branch of EPA, July, 1992. These results do not reflect total cyanide or total sulfide.					
01122	51.9 Sulfide (Reactivity)	n.a.	< 100.	100.	mg/kg	1
01123	51.9 Cyanide (Reactivity)	n.a.	< 99.	99.	mg/kg	1
06292	37.8 TCL VOAs by 8260 (soil)					
05444	Chloromethane	74-87-3	< 5.	5.	ug/kg	1.02
05445	Vinyl Chloride	75-01-4	< 5.	5.	ug/kg	1.02

Lancaster Laboratories Sample No. SW 3735067

Collected:11/29/2001 09:15 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:13
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum

1DWDR SDG#: PAP73-01

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation	Units	Dilution Factor
05446	Bromomethane	74-83-9	< 5.	5.	ug/kg	1.02
05447	Chloroethane	75-00-3	< 5.	5.	ug/kg	1.02
05449	1,1-Dichloroethene	75-35-4	< 5.	5.	ug/kg	1.02
05450	Methylene Chloride	75-09-2	< 5.	5.	ug/kg	1.02
05451	trans-1,2-Dichloroethene	156-60-5	< 5.	5.	ug/kg	1.02
05452	1,1-Dichloroethane	75-34-3	< 5.	5.	ug/kg	1.02
05454	cis-1,2-Dichloroethene	156-59-2	< 5.	5.	ug/kg	1.02
05455	Chloroform	67-66-3	< 5.	5.	ug/kg	1.02
05457	1,1,1-Trichloroethane	71-55-6	< 5.	5.	ug/kg	1.02
05458	Carbon Tetrachloride	56-23-5	< 5.	5.	ug/kg	1.02
05460	Benzene	71-43-2	< 5.	5.	ug/kg	1.02
05461	1,2-Dichloroethane	107-06-2	< 5.	5.	ug/kg	1.02
05462	Trichloroethene	79-01-6	< 5.	5.	ug/kg	1.02
05463	1,2-Dichloropropane	78-87-5	< 5.	5.	ug/kg	1.02
05465	Bromodichloromethane	75-27-4	< 5.	5.	ug/kg	1.02
05466	Toluene	108-88-3	< 5.	5.	ug/kg	1.02
05467	1,1,2-Trichloroethane	79-00-5	< 5.	5.	ug/kg	1.02
05468	Tetrachloroethene	127-18-4	< 5.	5.	ug/kg	1.02
05470	Dibromochloromethane	124-48-1	< 5.	5.	ug/kg	1.02
05472	Chlorobenzene	108-90-7	< 5.	5.	ug/kg	1.02
05474	Ethylbenzene	100-41-4	< 5.	5.	ug/kg	1.02
05477	Styrene	100-42-5	< 5.	5.	ug/kg	1.02
05478	Bromoform	75-25-2	< 5.	5.	ug/kg	1.02
05480	1,1,2,2-Tetrachloroethane	79-34-5	< 5.	5.	ug/kg	1.02
06293	Acetone	67-64-1	< 21.	21.	ug/kg	1.02
06294	Carbon Disulfide	75-15-0	< 5.	5.	ug/kg	1.02
06296	2-Butanone	78-93-3	< 11.	11.	ug/kg	1.02
06297	trans-1,3-Dichloropropene	10061-02-6	< 5.	5.	ug/kg	1.02
06298	cis-1,3-Dichloropropene	10061-01-5	< 5.	5.	ug/kg	1.02
06299	4-Methyl-2-pentanone	108-10-1	< 11.	11.	ug/kg	1.02
06300	2-Hexanone	591-78-6	< 11.	11.	ug/kg	1.02
06301	Xylene (Total)	1330-20-7	< 5.	5.	ug/kg	1.02

A site-specific MSD sample was not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.

Lancaster Laboratories Sample No. SW 3735067

Collected:11/29/2001 09:15 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:13
Discard: 12/28/2001
077-112901-IDW-Drum Composite Soil Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Drum

1DWDR SDG#: PAP73-01

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Di F
00111	88.6 Moisture	EPA 160.3 modified	1	12/03/2001 19:05	Justin M. Bowers	
00394	87.4 pH	SW-846 9045C (modified)	1	11/30/2001 18:05	Luz M. Groff	
00496	51.1 Corrosivity	SW-846 Chapter 7	1	11/30/2001 18:05	Luz M. Groff	
00542	50.2 Ignitability	40 CFR 261.21	1	12/11/2001 19:25	Justin M. Bowers	
01121	51.9 Reactivity	SW-846 Chapter 7.3	1	12/03/2001 08:15	Susan E. Hibner	
01122	51.9 Sulfide (Reactivity)	SW-846 9034	1	12/03/2001 08:15	Susan E. Hibner	
01123	51.9 Cyanide (Reactivity)	SW-846 9012A (modified)	1	12/04/2001 12:23	Matthew J. Mercer	
06292	37.8 TCL VOAs by 8260 (soil)	SW-846 8260B	1	11/30/2001 07:03	Kelly L. Hoffer	
08389	101.1 Low Level VOA Soil Prep	SW-846 5035	1	11/29/2001 17:40	Medina A. Long	
08389	101.1 Low Level VOA Soil Prep	SW-846 5035	2	11/29/2001 17:41	Medina A. Long	
08389	101.1 Low Level VOA Soil Prep	SW-846 5035	3	11/29/2001 17:42	Medina A. Long	

WASTE RECOVERY
solutions, inc.
343 King Street, Myerstown, PA 17067

GENERATOR WASTE PROFILE SHEET

Section 1 - General Information

Generator Name PADEP - Southcentral Regional Office
Site Address Conestoga Pines Park, Pitney Road
Town, State, Zip Lancaster, PA 17604
Mail Address PADEP - 909 Elmerton Ave
Town, State, Zip Harrisburg, PA 17110
Facility Contact/Title Elise Juers - Project Officer
Phone 717-705-4852 Fax 717-705-4830 EPA ID #

Section 2 - Billing Information

Name Baker Environmental, Inc.
Mail Address 3600 Vartan Way, Second Floor
Town, State, Zip Harrisburg, PA 17110
Facility Contact/Title Mark Idos, Project Manager
Phone 717-540-6307 Fax 717-540-1994 EPA ID #

Section 3 - Waste Composition

Name of Waste Used granular Activated carbon
Process Generating Waste Treatment of Ground water at Conestoga Pines Park
Quantity: 1 ea - 55gal Units: Drum Shipping Frequency: one time
Waste Description (Chemical Composition)
TCLP VOC'S - none detected %
TCLP metals - none detected above %
TCLP standards %
RCRA characteristics - non-hazardous %
TCL VOC'S: cis-1,2-DCE: 12,000 ug/kg %
xylenes: 1,200 ug/kg %
TCE: 2,700 ug/kg
Btu/pound

see attached tables and laboratory reports.

Total Metals			Yes	No				Yes	No
Arsenic	>	40 ppm	unknown		Mercury	>	2 ppm	unknown	
Barium	>	500 ppm	unknown		Molybdenum	>	70 ppm	unknown	
Beryllium	>	10 ppm	unknown		Nickel	>	150 ppm	unknown	
Cadmium	>	20 ppm	unknown		Selenium	>	20 ppm	unknown	
Chromium	>	70 ppm	unknown		Silver	>	80 ppm	unknown	
Lead	>	100 ppm	unknown		Zinc	>	5,000 ppm	unknown	

Physical State:

Liquid _____ Sludge _____ Solid X Type of Shipments - Bulk _____ Drums 1
Single Phase X Bilayered _____ Multilayered _____ Other (describe) _____
Pumpable _____ Pourable _____ Dumpable X

Does This Waste Contain Silicon? yes

Shipping Name Used granular Activated carbon

Attach all relevant Material Safety Data Sheets and Laboratory Analyses if available. Attach separate sheets to disclose all known and suspected hazards, Special Handling Precautions and additional comments.

Desired Destruction Method ___ *Incineration* X *Landfill* ___ *Treatment*

Section 4 - Certifications

GENERATOR'S CERTIFICATIONS

I hereby certify the above information is correct to the best of my knowledge. I further certify that WRS will be notified in writing of any process changes, which could significantly alter the composition and/or chemical/physical properties of the waste described above. I further certify that the waste has not been intentionally mixed with hazardous materials and that all known or suspected hazards have been disclosed. I further certify that this material neither contains nor has been mixed in any way with Polychlorinated Biphenyls (PCBs), Pesticides, or Herbicides to the best of my knowledge.

RESOURCE RECOVERY FACILITIES NON-HAZ CERTIFICATION

I certify that the waste materials consigned to WRS for recycling/reuse/treatment or destruction by incineration at a Resource Recovery facility are classified as non-hazardous according to federal regulations, 40 CFR Part 261. The waste does not exhibit the RCRA characteristics of ignitability, corrosivity, reactivity, or toxicity. It does not contain any hazardous levels of toxic metals, air emissions metals, volatile or semi-volatile organics, pesticides or herbicide constituents, nor is it a listed hazardous waste. This determination has been made based upon generator knowledge or analytical data.

Print Name Elise Juers Title PADEP Project Office

Generator Signature Elise Juers for DEP Date 1/10/02

Section 5 - WRS Review

Residual Waste Code _____ Destination _____

Approval Code _____

Reviewed By _____

APPENDIX D
TABLE 2.1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
TCL VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Carbon		Units
Sample Type	Composite Activated Carbon		
Sample Date	11/29/01		
Location	Carbon Absorber		
Compound	Result	Detection Limit	
Acetone	<4,700	4,700	ug/kg
Benzene	<1,200	1,200	ug/kg
Bromodichloromethane	<1,200	1,200	ug/kg
Bromomethane	<1,200	1,200	ug/kg
Carbon Disulfide	<1,200	1,200	ug/kg
Carbon Tetrachloride	<1,200	1,200	ug/kg
Chlorobenzene	<1,200	1,200	ug/kg
Chloroethane	<1,200	1,200	ug/kg
Chloroform	<1,200	1,200	ug/kg
Dibromochloromethane	<1,200	1,200	ug/kg
1,1-Dichloroethane	<1,200	1,200	ug/kg
1,2-Dichloroethane	<1,200	1,200	ug/kg
1,1-Dichloroethylene	<1,200	1,200	ug/kg
cis-1,2-Dichloroethylene	12,000	1,200	ug/kg
trans-1,2-Dichloroethylene	<1,200	1,200	ug/kg
Dichloromethane (Methylene Chloride)	<1,200	1,200	ug/kg
1,2-Dichloropropane	<1,200	1,200	ug/kg
cis-1,3-Dichloropropene	<1,200	1,200	ug/kg
trans-1,3-Dichloropropene	<1,200	1,200	ug/kg
Ethylbenzene	<1,200	1,200	ug/kg
2-Hexanone	<2,400	2,400	ug/kg
Methyl Chloride (Chloromethane)	<1,200	1,200	ug/kg
Methyl Ethyl Ketone (2-Butanone)	<2,400	2,400	ug/kg
4-Methyl-2-pentanone	<2,400	2,400	ug/kg
Styrene	<1,200	1,200	ug/kg
1,1,2,2-Tetrachloroethane	<1,200	1,200	ug/kg
Tetrachloroethylene (PCE)	<1,200	1,200	ug/kg
Toluene	<1,200	1,200	ug/kg
Tribromomethane (Bromoform)	<1,200	1,200	ug/kg
1,1,1-Trichloroethane	<1,200	1,200	ug/kg
1,1,2-Trichloroethane	<1,200	1,200	ug/kg
Trichloroethylene (TCE)	2,700	1,200	ug/kg
Xylenes (total)	1,200	1,200	ug/kg
Vinyl Chloride (Chloroethene)	<1,200	1,200	ug/kg

APPENDIX D
TABLE 2.2
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
TCLP VOLATILE ORGANIC COMPOUNDS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Carbon		**TCLP Standards***	**Units**
Sample Type	Composite Activated Carbon			
Sample Date	11/29/01			
Location	Carbon Absorber			
Compound	**Result**	**Detection Limit**		
Benzene	<0.1	0.1	0.5	mg/l
Carbon Tetrachloride	<0.1	0.1	0.5	mg/l
Chlorobenzene	<0.1	0.1	100	mg/l
Chloroform	<0.1	0.1	6	mg/l
1,2-Dichloroethane	<0.1	0.1	0.5	mg/l
1,1-Dichloroethylene	<0.1	0.1	0.7	mg/l
Methyl Ethyl Ketone (2-Butanone)	<0.2	0.2	200	mg/l
Tetrachloroethylene (PCE)	<0.1	0.1	1	mg/l
Trichloroethylene (TCE)	<0.1	0.1	0.5	mg/l
Vinyl Chloride (Chloroethene)	<0.1	0.1	0.2	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Method SW-846 8260B, Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

APPENDIX D
TABLE 2.3
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
TCLP METALS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Carbon		**TCLP Standards***	**Units**
Sample Type	Composite Activated Carbon			
Sample Date	11/29/01			
Location	Carbon Absorber			
Compound	**Result**	**Detection Limit**		
Arsenic	<0.1	0.1	5	mg/l
Barium	0.315	0.1	100	mg/l
Cadmium	<0.01	0.01	1	mg/l
Chromium	<0.03	0.03	5	mg/l
Lead	<0.1	0.1	5	mg/l
Mercury	<0.0002	0.0002	0.2	mg/l
Selenium	<0.2	0.2	1	mg/l
Silver	<0.02	0.02	5	mg/l

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

Job No. 24300-077-0000 Subtask 03007

APPENDIX D
TABLE 2.4
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

SUMMARY OF IDW SAMPLE RESULTS
USED CARBON MEDIA
HAZARDOUS WASTE CHARACTERISTICS
(Analyzed by Lancaster Laboratories, Inc.)

Results Prepared by Baker Environmental, Inc.

Sample No.	077-112901-IDW-Carbon		**Hazardous Characteristic Threshold Standards***
Sample Type	Composite Activated Carbon		
Sample Date	11/29/01		
Location	Carbon Absorber		
Characteristic	**Result**		
Corrosivity	Non-corrosive	pH = 8.26	pH$\leq$2, or pH$\geq$12.5
Ignitability	Non-ignitable		Does not spontaneously ignite with exposure to air or water, not ignitable by friction, vapors not ignitable when exposed to flame.
Reactivity**	Non-reactive	Hydrogen Sulfide < 100 mg/kg Hydrogen Cyanide < 99 mg/kg	Hydrogen Cyanide $\leq$ 250 mg/kg Hydrogen Sulfide $\leq$ 500 mg/kg

* Toxicity Characteristic Leaching Procedure (TCLP), Toxicity Characteristic Constituent Levels, U.S. EPA Toxicity Characteristic Rule, dated March 29, 1990.

**Interim threshold limits established by the Solid Waste Branch of EPA, July, 1992.

Job No. 24300-077-0000 Subtask 03007

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. SW 3735070

Collected:11/29/2001 09:45 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Carbon Composite Granules Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Carbon

1DWCR SDG#: PAP73-04

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation	Units	Dilution Factor
00111	88.6 Moisture	n.a.	40.2	0.50	% by wt.	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The result reported above is on an as-received basis.					
00394	87.4 pH	n.a.	8.26	0.010		1
	The pH was performed on a 1:1 slurry (25 gms. of sample and 25 ml. of deionized water) after being tumbled for 30 min.					
00496	51.1 Corrosivity	n.a.	See Below		See Below	1
	Corrosivity: The pH of a 1:1 slurry (with deionized water) was 8.26 indicating that the waste is not corrosive. A waste is corrosive if it exhibits a pH equal to or less than 2 or equal to or greater than 12.5.					
00542	50.2 Ignitability	n.a.	See Below		See Below	1
	The sample did not spontaneously ignite when exposed to air or water. The sample did not ignite by friction. The sample vapors did not ignite when exposed to a flame using a closed cup apparatus.					
01121	51.9 Reactivity	n.a.	See Below		See Below	1
	Reactivity: The sample was extracted by the interim method described in SW 846, Chapter 7.3. This solution was analyzed for cyanide and sulfide. This waste is not considered reactive and hazardous because it does not generate a quantity of hydrogen cyanide exceeding 250 mg/kg or hydrogen sulfide exceeding 500 mg/kg. These interim threshold limits were established by the Solid Waste Branch of EPA, July, 1992. These results do not reflect total cyanide or total sulfide.					
01122	51.9 Sulfide (Reactivity)	n.a.	< 100.	100.	mg/kg	1
01123	51.9 Cyanide (Reactivity)	n.a.	< 99.	99.	mg/kg	1
06292	37.8 TCL VOAs by 8260 (soil)					
05444	Chloromethane	74-87-3	< 1,200.	1,200.	ug/kg	141.2
05445	Vinyl Chloride	75-01-4	< 1,200.	1,200.	ug/kg	141.2

Lancaster Laboratories Sample No. SW 3735070

Collected:11/29/2001 09:45 by JD	Account Number: 06195
Submitted: 11/29/2001 11:03	PA Dept. of Env. Protection
Reported: 12/13/2001 at 00:14	Rachel Carson Off.Bldg. 14th F
Discard: 12/28/2001	PO Box 8471
077-112901-IDW-Carbon Composite Granules Sample	Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Carbon

1DWCR SDG#: PAP73-04

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation	Units	Dilution Factor
05446	Bromomethane	74-83-9	< 1,200.	1,200.	ug/kg	141.2
05447	Chloroethane	75-00-3	< 1,200.	1,200.	ug/kg	141.2
05449	1,1-Dichloroethene	75-35-4	< 1,200.	1,200.	ug/kg	141.2
05450	Methylene Chloride	75-09-2	< 1,200.	1,200.	ug/kg	141.2
05451	trans-1,2-Dichloroethene	156-60-5	< 1,200.	1,200.	ug/kg	141.2
05452	1,1-Dichloroethane	75-34-3	< 1,200.	1,200.	ug/kg	141.2
05454	cis-1,2-Dichloroethene	156-59-2	12,000.	1,200.	ug/kg	141.2
05455	Chloroform	67-66-3	< 1,200.	1,200.	ug/kg	141.2
05457	1,1,1-Trichloroethane	71-55-6	< 1,200.	1,200.	ug/kg	141.2
05458	Carbon Tetrachloride	56-23-5	< 1,200.	1,200.	ug/kg	141.2
05460	Benzene	71-43-2	< 1,200.	1,200.	ug/kg	141.2
05461	1,2-Dichloroethane	107-06-2	< 1,200.	1,200.	ug/kg	141.2
05462	Trichloroethene	79-01-6	2,700.	1,200.	ug/kg	141.2
05463	1,2-Dichloropropane	78-87-5	< 1,200.	1,200.	ug/kg	141.2
05465	Bromodichloromethane	75-27-4	< 1,200.	1,200.	ug/kg	141.2
05466	Toluene	108-88-3	< 1,200.	1,200.	ug/kg	141.2
05467	1,1,2-Trichloroethane	79-00-5	< 1,200.	1,200.	ug/kg	141.2
05468	Tetrachloroethene	127-18-4	< 1,200.	1,200.	ug/kg	141.2
05470	Dibromochloromethane	124-48-1	< 1,200.	1,200.	ug/kg	141.2
05472	Chlorobenzene	108-90-7	< 1,200.	1,200.	ug/kg	141.2
05474	Ethylbenzene	100-41-4	< 1,200.	1,200.	ug/kg	141.2
05477	Styrene	100-42-5	< 1,200.	1,200.	ug/kg	141.2
05478	Bromoform	75-25-2	< 1,200.	1,200.	ug/kg	141.2
05480	1,1,2,2-Tetrachloroethane	79-34-5	< 1,200.	1,200.	ug/kg	141.2
06293	Acetone	67-64-1	< 4,700.	4,700.	ug/kg	141.2
06294	Carbon Disulfide	75-15-0	< 1,200.	1,200.	ug/kg	141.2
06296	2-Butanone	78-93-3	< 2,400.	2,400.	ug/kg	141.2
06297	trans-1,3-Dichloropropene	10061-02-6	< 1,200.	1,200.	ug/kg	141.2
06298	cis-1,3-Dichloropropene	10061-01-5	< 1,200.	1,200.	ug/kg	141.2
06299	4-Methyl-2-pentanone	108-10-1	< 2,400.	2,400.	ug/kg	141.2
06300	2-Hexanone	591-78-6	< 2,400.	2,400.	ug/kg	141.2
06301	Xylene (Total)	1330-20-7	1,200.	1,200.	ug/kg	141.2

Site-specific MS/MSD samples were not submitted for the project. A LCS/LCSD was performed to demonstrate precision and accuracy at a batch level.

The GC/MS volatile analysis was performed according to the high level soil method due to the level of target compounds. Therefore, the reporting

Lancaster Laboratories Sample No. SW 3735070

Collected:11/29/2001 09:45 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Carbon Composite Granules Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Carbon

1DWCR SDG#: PAP73-04

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation	Units	Dilution Factor
	limits were raised.					

Poor surrogate recoveries were observed for the GC/MS volatile fraction. The analysis was repeated and poor surrogate recoveries were again observed indicating a significant matrix effect.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dil Fac
00111	88.6 Moisture	EPA 160.3 modified	1	12/03/2001 19:05	Justin M. Bowers	1
00394	87.4 pH	SW-846 9045C (modified)	1	11/30/2001 18:05	Luz M. Groff	1
00496	51.1 Corrosivity	SW-846 Chapter 7	1	11/30/2001 18:05	Luz M. Groff	1
00542	50.2 Ignitability	40 CFR 261.21	1	12/11/2001 19:25	Justin M. Bowers	1
01121	51.9 Reactivity	SW-846 Chapter 7.3	1	12/03/2001 08:15	Susan E. Hibner	1
01122	51.9 Sulfide (Reactivity)	SW-846 9034	1	12/03/2001 08:15	Susan E. Hibner	1
01123	51.9 Cyanide (Reactivity)	SW-846 9012A (modified)	1	12/04/2001 12:26	Matthew J. Mercer	1
06292	37.8 TCL VOAs by 8260 (soil)	SW-846 8260B	1	12/03/2001 19:54	Nathaniel R. Kurtz	1
08389	101.1 Low Level VOA Soil Prep	SW-846 5035	1	11/29/2001 17:43	Medina A. Long	n.
08389	101.1 Low Level VOA Soil Prep	SW-846 5035	2	11/29/2001 17:44	Medina A. Long	n.
08389	101.1 Low Level VOA Soil Prep	SW-846 5035	3	11/29/2001 17:45	Medina A. Long	n.

Lancaster Laboratories Sample No. TL 3735071

Collected:11/29/2001 09:45 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Carbon Composite Granules Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Carbon
TCLP NON-VOLATILE EXTRACTION

1DWNV SDG#: PAP73-05

05705	WW/TL SW 846 ICP Digest (tot)	SW-846 3010A	1	12/05/2001 19:20	Irimar Leon
05713	WW SW846 Hg Digest	SW-846 7470A	1	12/05/2001 20:01	Nelli S. Markaryan

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Lancaster Laboratories Sample No. TL 3735072

Collected:11/29/2001 09:45 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Carbon Composite Granules Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Carbon
TCLP ZERO HEADSPACE EXTRACTION

CRBDW SDG#: PAP73-06

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Units	Dilution Factor
03636	46.6 TCLP by 8260					
05386	Vinyl Chloride	75-01-4	< 0.10	0.10	mg/l	20
05390	1,1-Dichloroethene	75-35-4	< 0.10	0.10	mg/l	20
05396	Chloroform	67-66-3	< 0.10	0.10	mg/l	20
05399	Carbon Tetrachloride	56-23-5	< 0.10	0.10	mg/l	20
05401	Benzene	71-43-2	< 0.10	0.10	mg/l	20
05402	1,2-Dichloroethane	107-06-2	< 0.10	0.10	mg/l	20
05403	Trichloroethene	79-01-6	< 0.10	0.10	mg/l	20
05409	Tetrachloroethene	127-18-4	< 0.10	0.10	mg/l	20
05413	Chlorobenzene	108-90-7	< 0.10	0.10	mg/l	20
06305	2-Butanone	78-93-3	< 0.20	0.20	mg/l	20

The volatile organic analyses were performed on a zero headspace toxicity characteristic leachate of the submitted waste. The leachate was prepared according to the procedure specified in SW-846, Chapter 7.4 (Revision 3, 12/94).

If the TCLP extract contains any one of the Toxicity Characteristic (TC) constituents in an amount equal to or exceeding the concentrations specified in 40 CFR Part 261.24, the waste possesses the characteristic of toxicity and is a hazardous waste. These limits are listed below in mg/L. Other limits may apply for analyses performed under other regulations.

Benzene	0.5	1,1-Dichloroethene	0.7
Carbon Tetrachloride	0.5	Methyl Ethyl Ketone (2-Butanone)	200.0
Chlorobenzene	100.0	Tetrachloroethene	0.7
Chloroform	6.0	Trichloroethene	0.5
1,2-Dichloroethane	0.5	Vinyl Chloride	0.2

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. TL 3735072

Collected:11/29/2001 09:45 by JD

Account Number: 06195

Submitted: 11/29/2001 11:03
Reported: 12/13/2001 at 00:14
Discard: 12/28/2001
077-112901-IDW-Carbon Composite Granules Sample

PA Dept. of Env. Protection
Rachel Carson Off.Bldg. 14th F
PO Box 8471
Harrisburg PA 17105-8471

SITE ID: 3-077 SAMPLE ID: 077-112901-IDW-Carbon
TCLP ZERO HEADSPACE EXTRACTION

CRBDW SDG#: PAP73-06

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Di F
03636	46.6 TCLP by 8260	SW-846 8260B	1	12/04/2001 16:31	Joseph P. Casillo	
00946	46.6 TCLP Zero Headspace Ext.	SW-846 1311	1	12/03/2001 14:15	Thomas H. Collins	
01163	GC/MS VOA Water Prep	SW-846 5030B	1	12/04/2001 16:31	Joseph P. Casillo	

BILL OF LADING

1. Customer's US EPA ID No. Not Required

Document No. 012802A

2. Page 1 1

Information in the shaded areas is not required by Federal law.

3. Customer's Name and Mailing Address
PA DEP - Conestoga Pines
Pitney Road, Lancaster, PA

4. Phone ( ) (717)540-1990

5. Transporter 1 Company Name Waste Recovery

6. US EPA ID Number PAR.000043026. . . .

7. Transporter 2 Company Name

8. US EPA ID Number . . . .

9. Designated Facility Name and Site Address
Waste Recovery Solutions
345 King Street
Myerstown, PA 17067

10. US EPA ID Number .PAR.000043026. . .

A. Document Number 012802A

B. State ID Not Required

C. State Transporter's ID PAAH 0683

D. Transporter's Phone (717)866-9955

E. State Transporter's ID

F. Transporter's Phone

G. State Facility's ID 301333

H. Facility's Phone (717)866-9955

	HM	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	L. Waste No.
a.		Spent Activated Carbon Non RCRA/Non DOT	. 1 .	DM	. 55 . .	P	NA
b.		SOIL CUTTINGS	. 9		. 495 .		
c.			. .	.	. . . . .		
d.			. .	.	. . . . .		

J. Additional Descriptions for Materials Listed Above

INI-

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. **CUSTOMER CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name DAVID FEKETE (BAKER) SUBCONTRACTOR & SIGNING ON BEHALF OF THE PADEP

Signature

Date Month 0.1 Day 2.8 Year 02

17. Transporter 1 Acknowledgement of receipt of Materials

Printed/Typed Name GARRY Bucher

Signature Garry L Bucher

Date Month 0.1 Day 2.8 Year 0.7

18. Transporter 2 Acknowledgement of receipt of Materials

Printed/Typed Name GARRY

Signature

Date Month . Day . Year .

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name

Signature

Date Month . Day . Year .

CUSTOMER

TRANSPORTER

FACILITY

CUSTOMER COPY

Waste Recovery Solutions, Inc.

Certificate of Disposal

Generator Name: PA DEP-Conestoga Pines

Approval Code: LFI-531

Date Received: 1/28/02

Amount Received: 9 Drums

The material described above was processed and disposed of in accordance with all federal and state regulations.

Date Disposed: 1/31/02
Disposition: Modern Landfill, York, PA

Walt Saunders

Walt Saunders

Baker

APPENDIX E

CALCULATIONS FOR SURFACE WATER AND SEDIMENT SCREENING VALUES

APPENDIX E

TABLE 1
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

CALCULATION OF EQUILIBRIUM PARTITIONING-BASED SEDIMENT THRESHOLD SCREENING VALUES
TCL VOCs
(Lancaster Laboratories, Inc.)

Organic Compounds	Koc[1]	Surface Water Threshold Screening Value[2]	Fraction Organic Carbon Content[3] (foc)	Sediment Threshold Screening Values[4]
Acetone	0.31	86,000	0.01	266.6
Benzene	58	130	0.01	75.4
2-Butanone (MEK)	32	32,000	0.01	10,240
Bromomethane	170	110	0.01	187
Carbon Disulfide[5]	300	8.9	0.01	26.7
Carbon Tetrachloride	160	560	0.01	896
Chlorobenzene	200	240	0.01	480
Chloroform	56	390	0.01	218.4
Chloromethane	6	5500	0.01	330
1,2-Dichloroethane	38	3100	0.01	1,178
1,1-Dichloroethene	65	1500	0.01	975
cis-1,2-Dichloroethene[5,6]	49	31.2	0.01	15.29
trans-1,2-Dichloroethene[5]	47	560	0.01	263.2
1,2-Dichloropropane	47	2200	0.01	1,034
Ethylbenzene	220	580	0.01	1,276
Methylene Chloride	16	2,400	0.01	384
4-Methyl-2-pentanone	17	5,000	0.01	850
1,1,2,2-Tetrachloroethane	79	210	0.01	165.9
Tetrachloroethene (PCE)	300	140	0.01	420
Toluene	130	330	0.01	429
1,1,1-Trichloroethane	100	610	0.01	610
1,1,2-Trichloroethane	76	680	0.01	516.8
Trichloroethene (TCE)	93	450	0.01	418.5
Xylenes (total)	350	210	0.01	735
UNITS	l/kg	ug/l	Dimensionless	ug/kg

1 - The Koc values shown were taken from Pennsylvania Code, Title 25, Chapter 250, "Administration of the Land Recycling Program" regulations, Appendix A, Table 5, unless otherwise noted.

2 - The surface water threshold screening values were taken from Pennsylvania Code, Title 25, Chapter 16, Water Quality Toxics Management Strategy" regulations, Appendix A, Table 1, unless otherwise noted.

3 - Fraction Organic Carbon (foc) content estimated at 1%,

4 - The sediment threshold screening values were calculated from the following equation: SQC = (Koc)(foc)(TSVsw) where Koc is the organic carbon partition coefficient (l/kg), foc is the fraction of organic carbon (unitless), and TSVsw is the surface water threshold screening value (ug/l).

5 - The surface water threshold screening value for this chemical represents a Secondary Chronic Value (SCV) from Suter II (1996).

6 - The surface water threshold screening value shown is for total dichloroethenes.

Baker

APPENDIX F

ION BALANCE SPREADSHEETS

APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL MW01
Sampled November 26, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	---	---	---
Ca	+ 2	40.08	20.04	319	15.92	53.50
Mg	+ 2	24.31	12.16	161	13.25	44.52
Na	+ 1	22.99	22.99	10.5	0.46	1.54
K	+ 1	39.10	39.10	5.21	0.13	0.45
TOTALS					29.75	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4	- 2	96.06	48.03	499	10.39	50.94
CO3	- 2	60.01	30.01	1.9	0.06	0.31
HCO3	- 1	61.00	61.00	412	6.75	33.12
Cl	- 1	35.45	35.45	113	3.19	15.63
TOTALS					20.39	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = 18.66 %

APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL MW02
Sampled November 26, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	—	—	—
Ca	+ 2	40.08	20.04	61.6	3.07	39.68
Mg	+ 2	24.31	12.16	44.0	3.62	46.73
Na	+ 1	22.99	22.99	18.7	0.81	10.50
K	+ 1	39.10	39.10	9.38	0.24	3.10
TOTALS					7.75	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4	- 2	96.06	48.03	48	1.00	10.48
CO3	- 2	60.01	30.01	2	0.07	0.70
HCO3	- 1	61.00	61.00	250	4.10	42.97
Cl	- 1	35.45	35.45	155	4.37	45.85
TOTALS					9.54	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = -10.35 %

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APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL MW02 Duplicate
Sampled November 26, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	—	—	—
Ca	+ 2	40.08	20.04	175	8.73	48.12
Mg	+ 2	24.31	12.16	101	8.31	45.79
Na	+ 1	22.99	22.99	20.6	0.90	4.94
K	+ 1	39.10	39.10	8.23	0.21	1.16
TOTALS					18.15	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4	- 2	96.06	48.03	51	1.06	10.84
CO3	- 2	60.01	30.01	2	0.07	0.68
HCO3	- 1	61.00	61.00	260	4.26	43.53
Cl	- 1	35.45	35.45	156	4.40	44.94
TOTALS					9.79	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = 29.91 %

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APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL GW9109
Sampled November 26, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	—	—	—
Ca	+ 2	40.08	20.04	122	6.09	55.06
Mg	+ 2	24.31	12.16	45.9	3.78	34.15
Na	+ 1	22.99	22.99	24.9	1.08	9.80
K	+ 1	39.10	39.10	4.29	0.11	0.99
TOTALS					11.06	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4	- 2	96.06	48.03	57	1.19	8.76
CO3	- 2	60.01	30.01	2	0.07	0.49
HCO3	- 1	61.00	61.00	328	5.38	39.71
Cl	- 1	35.45	35.45	245	6.91	51.04
TOTALS					13.54	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = -10.10 %

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APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL GW9110
Sampled November 27, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	---	---	---
Ca	+ 2	40.08	20.04	66.0	3.29	42.32
Mg	+ 2	24.31	12.16	33.9	2.79	35.84
Na	+ 1	22.99	22.99	37.4	1.63	20.91
K	+ 1	39.10	39.10	2.84	0.07	0.93
TOTALS					7.78	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4[1]	- 2	96.06	48.03	52	1.08	13.41
CO3	- 2	60.01	30.01	2	0.07	0.83
HCO3	- 1	61.00	61.00	294	4.82	59.70
Cl	- 1	35.45	35.45	74.6	2.10	26.07
TOTALS					8.07	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = -1.84 %

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1 - The sulfate concentration for this sample is based upon an average value calculated from the sum of the measure amount of sulfate in samples MW02, MW02D, and GW9109.

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APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL GW9211
Sampled November 27, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	---	---	---
Ca	+ 2	40.08	20.04	65.1	3.25	33.77
Mg	+ 2	24.31	12.16	43.8	3.60	37.46
Na	+ 1	22.99	22.99	62.2	2.71	28.13
K	+ 1	39.10	39.10	2.38	0.06	0.63
TOTALS					9.62	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4[1]	- 2	96.06	48.03	52	1.08	11.59
CO3	- 2	60.01	30.01	2	0.07	0.71
HCO3	- 1	61.00	61.00	288	4.72	50.55
Cl	- 1	35.45	35.45	123	3.47	37.15
TOTALS					9.34	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = 1.47 %

[1] The sulfate concentration for this sample is based upon an average value calculated from the sum of the measure amount of sulfate in samples MW02, MW02D, and GW9109.

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APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL GW9212
Sampled November 27, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	---	---	---
Ca	+ 2	40.08	20.04	85.3	4.26	34.94
Mg	+ 2	24.31	12.16	43.1	3.55	29.10
Na	+ 1	22.99	22.99	97.9	4.26	34.95
K	+ 1	39.10	39.10	4.82	0.12	1.01
TOTALS					12.18	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4[1]	- 2	96.06	48.03	52	1.08	9.51
CO3	- 2	60.01	30.01	2	0.07	0.59
HCO3	- 1	61.00	61.00	308	5.05	44.33
Cl	- 1	35.45	35.45	184	5.19	45.57
TOTALS					11.39	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = 3.37 %

[1] - The sulfate concentration for this sample is based upon an average value calculated from the sum of the measure amount of sulfate in samples MW02, MW02D, and GW9109.

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APPENDIX F
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONESTOGA PINES PARK SITE

ION BALANCE CALCULATIONS USING TOTAL METAL RESULTS
MONITORING WELL GW9212
Sampled November 27, 2001

CATIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
Fe	+ 3	55.85	18.62	---	---	---
Ca	+ 2	40.08	20.04	85.3	4.26	34.94
Mg	+ 2	24.31	12.16	43.1	3.55	29.10
Na	+ 1	22.99	22.99	97.9	4.26	34.95
K	+ 1	39.10	39.10	4.82	0.12	1.01
TOTALS					12.18	100.00

ANIONS	VALENCE	MOLECULAR WEIGHT	EQUIVALENT WEIGHT	CONCENTRATION (mg/L)	MILLIGRAM EQUIVALENTS PER LITER (meq/L)	PERCENT REACTING VALUES
SO4[1]	- 2	96.06	48.03	52	1.08	9.51
CO3	- 2	60.01	30.01	2	0.07	0.59
HCO3	- 1	61.00	61.00	308	5.05	44.33
Cl	- 1	35.45	35.45	184	5.19	45.57
TOTALS					11.39	100.00

ACCURACY CHECK

[(Total Cations - Total Anions) / (Total Cations + Total Anions)] x 100 = % Error

% Error = 3.37 %

1 - The sulfate concentration for this sample is based upon an average value calculated from the sum of the measure amount of sulfate in samples MW02, MW02D, and GW9109.

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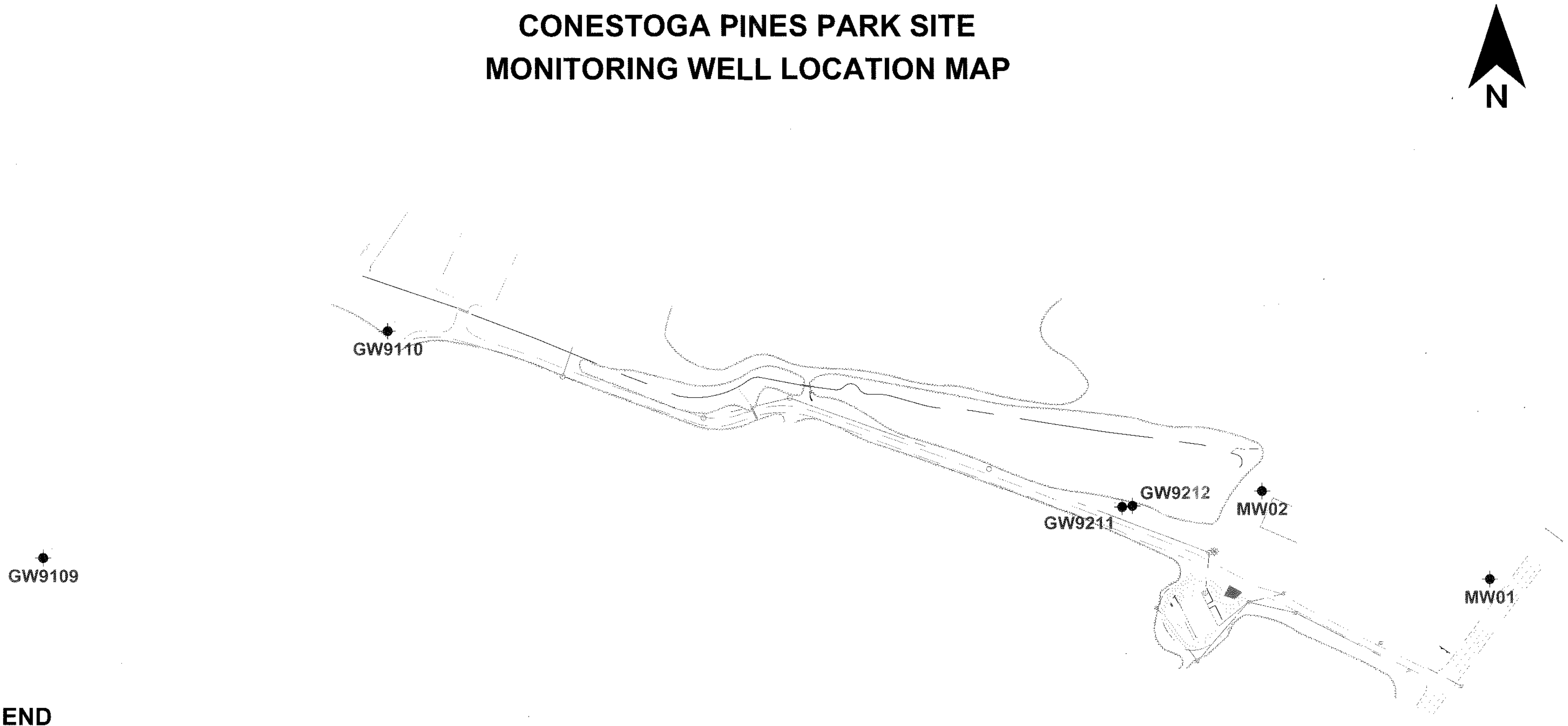
FIGURE 6
CONESTOGA PINES PARK SITE
MONITORING WELL LOCATION MAP



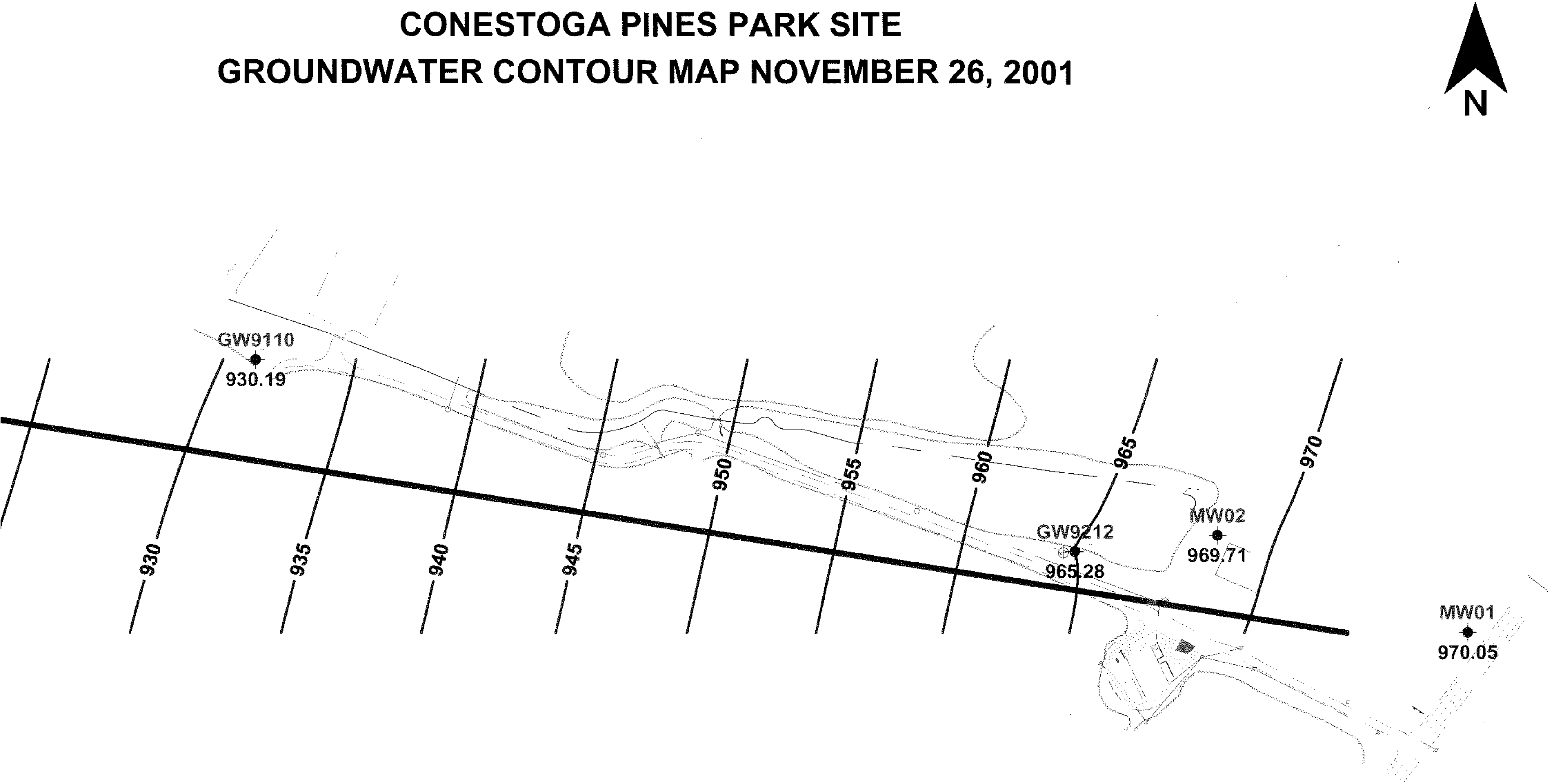
LEGEND

● - Monitoring Well
MW01

SCALE: 1 inch = 200 Feet

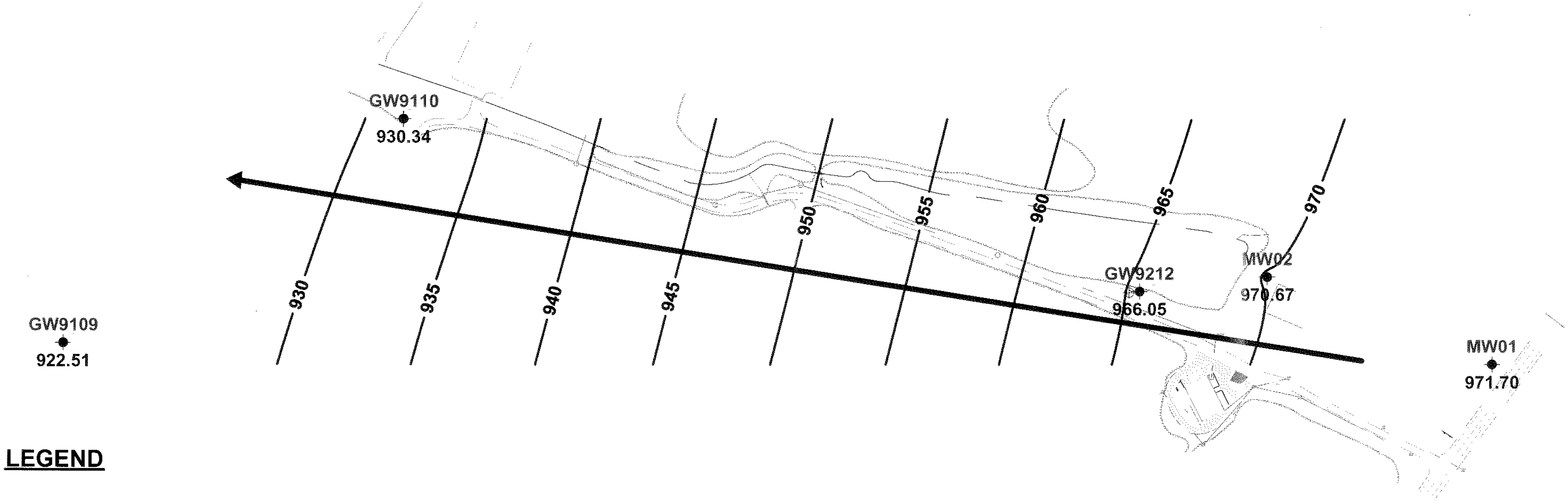
Baker

FIGURE 7
CONESTOGA PINES PARK SITE
GROUNDWATER CONTOUR MAP NOVEMBER 26, 2001



n in Feet

FIGURE 8
CONESTOGA PINES PARK SITE
GROUNDWATER CONTOUR MAP JANUARY 28, 2002



LEGEND

● - Monitoring Well

970.05 - Water Table Elevation in Feet

↗ - Water Table Contour Showing Groundwater Flow Direction

SCALE: 1 inch = 200 Feet

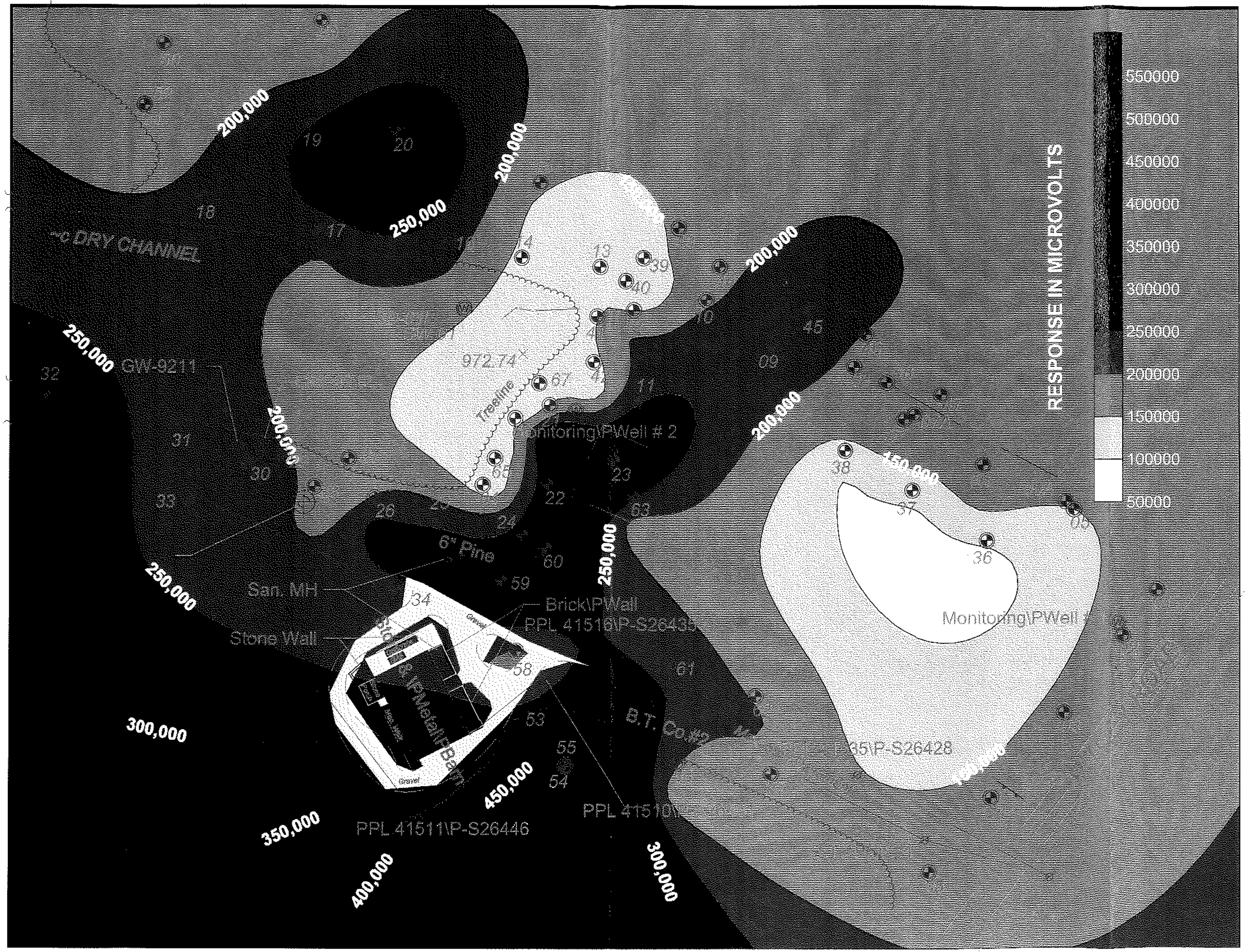
Minumum Curvature (Internal and Boundary Tension = 1)

ZEBRA

FIGURE 9

CONESTOGA PINES PARK SITE

MIP RESULTS - ECD MAXIMUM RESPONSE DISTRIBUTION MAP



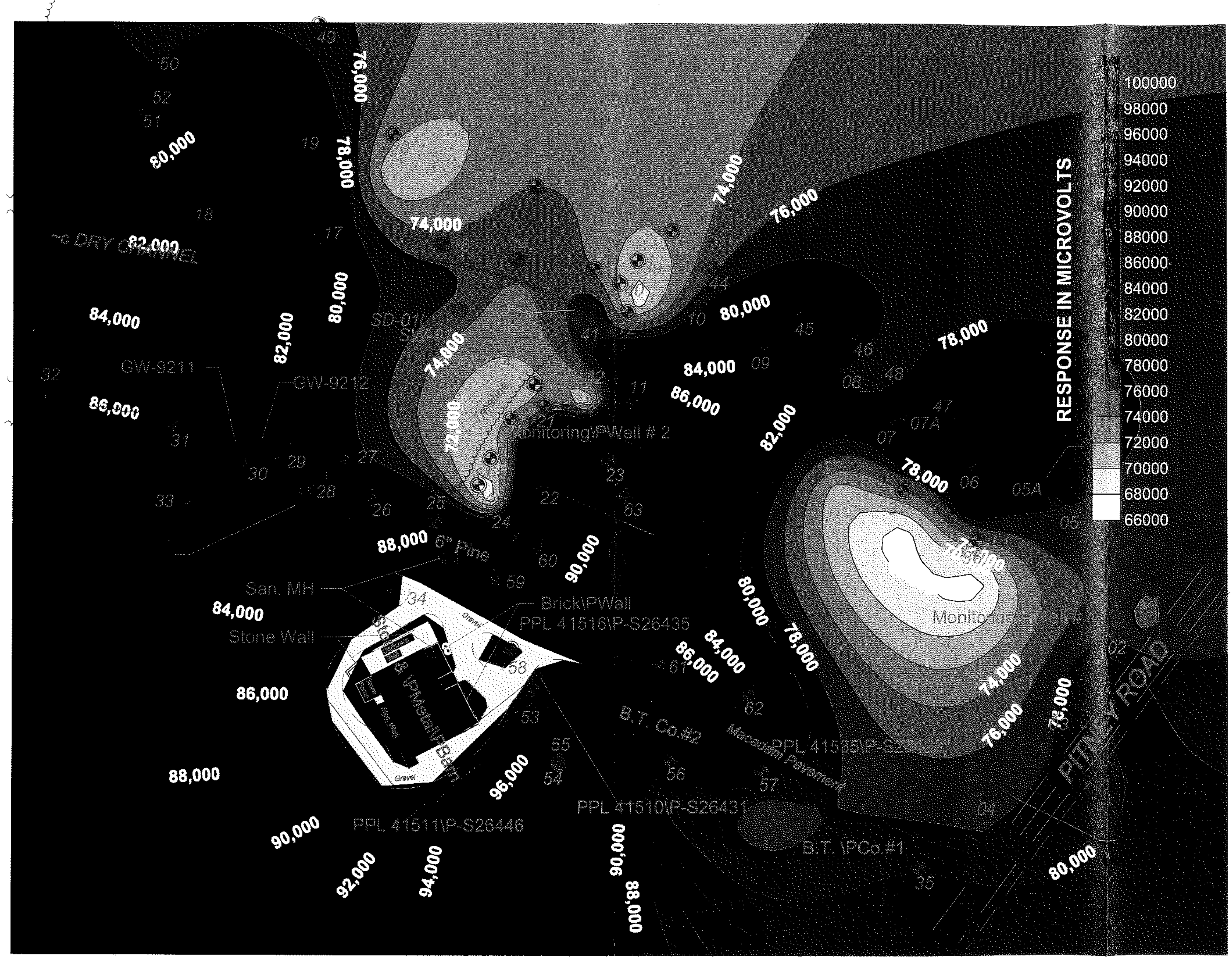
Scale: 1 inch = 100 feet (Approximate).

ZEBRA

FIGURE 10

CONESTOGA PINES PARK SITE

MIP RESULTS - ECD (1/8) MAXIMUM RESPONSE DITRIBUTION MAP



N

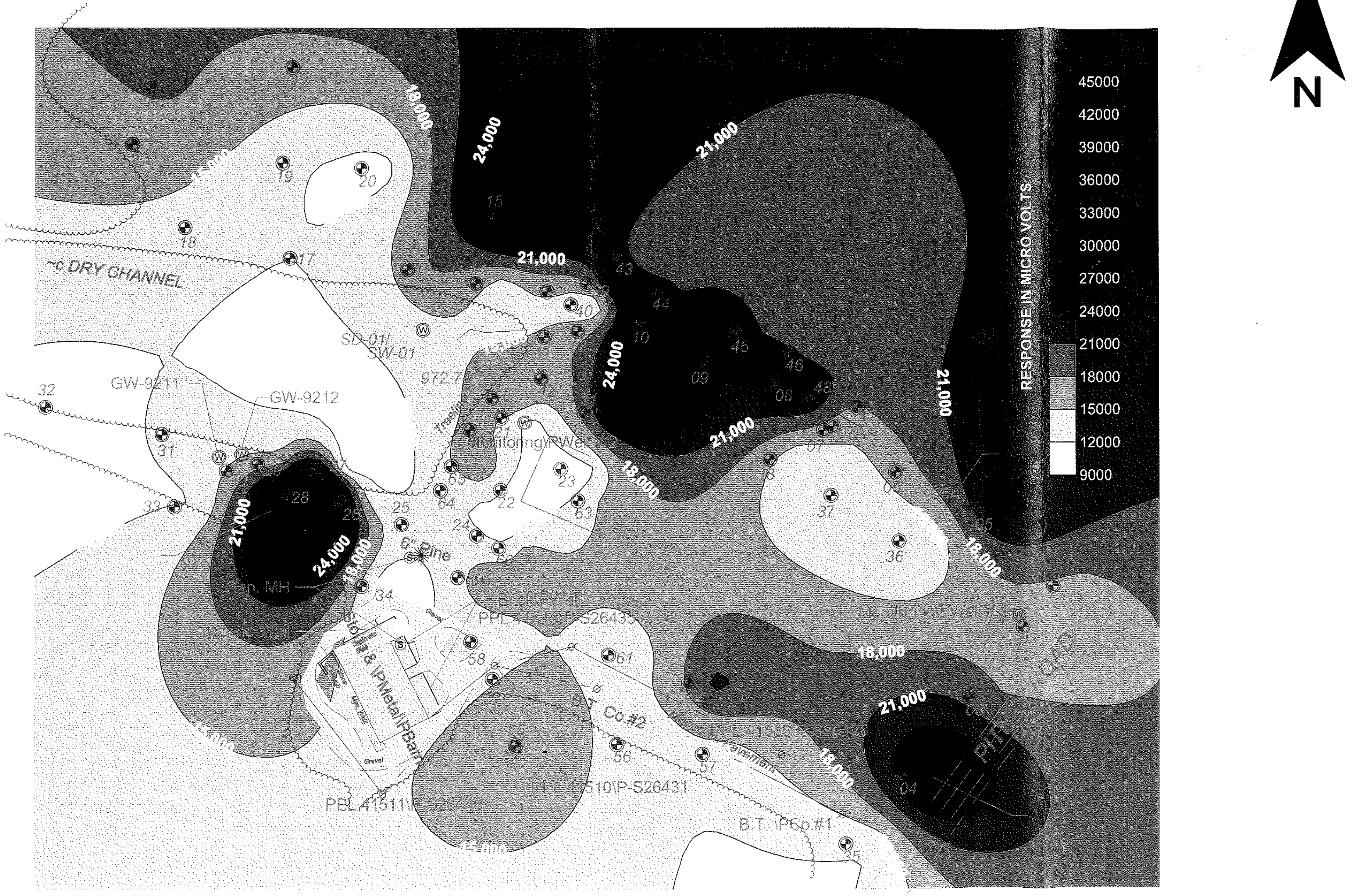
Scale: 1 inch = 100 feet (Approximate).

ZEBRA

FIGURE 11

CONESTOGA PINES PARK SITE

MIP RESULTS - PID MAXIMUM RESPONSE DISTRIBUTION MAP



Scale: 1 inch = 100 feet (Approximate).