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FINAL

PHASE I
REMEDIAL INVESTIGATION REPORT
APPENDICES (VOLUME II OF III)

CROYDON TCE SITE
BUCKS COUNTY, PENNSYLVANIA

AUGUST 1988
W.A. NO. 124-3LM7

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PHASE I REMEDIAL INVESTIGATION REPORT

APPENDICES
VOLUME II OF III

CROYDON TCE SITE
BUCKS COUNTY, PENNSYLVANIA

EPA WORK ASSIGNMENT NUMBER 124-3LM7
UNDER
CONTRACT NUMBER 68-01-7250

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APPENDIX A

FINAL

PHASE II RI/FS WORK PLAN

APPENDIX A

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A.1.0 INTRODUCTION

NUS Corporation (NUS), under contract to Ebasco Services Incorporated (EBASCO), is pleased to submit this Final Phase II Work Plan for the Croydon TCE Site Remedial Investigation/ Feasibility Study (RI/FS) to the U.S. Environmental Protection Agency (EPA). Preparation of this Work Plan was accomplished in response to Work Assignment Number 124-3LM7 under EPA Contract Number 68-02-7250 pursuant to the Final Phase 1 RI/FS Work Plan dated August, 1987.

During the scoping of the Phase I Croydon TCE Site RI/FS, limited data were available on the extent of a known volatile organic contaminant plume and potential sources of groundwater contamination within the Croydon TCE Site study area. Consequently, the RI/FS was conducted in two phases.

The Phase I RI/FS focused on identifying potential contaminant source areas, characterizing groundwater contamination within the study area, defining the extent of the contaminant plume, and assessing the public health risks of those residents who depend on groundwater as a source of potable water. The results of the Phase I RI/FS are presented in the Croydon TCE Site Phase I RI Report.

If, upon evaluation of the Phase I RI results, additional data were required to define and remediate identified potential sources of contamination, or to determine the extent of contamination in groundwater, a Phase II RI/FS would be conducted. Based on data obtained during the Phase I RI/FS, a Phase II RI/FS is required to meet the project objectives. This Work Plan outlines the Phase II RI/FS activities.

This Final Phase II RI/FS Work Plan describes the scope of work, resources, and budget necessary to collect the additional data required to: (1) define the extent of the contaminant plume identified during the Phase I RI; (2) to evaluate the identified potential sources of groundwater contamination; (3) to adequately assess and confirm the present and potential health and environmental risks; and (4) to evaluate the feasibility of potential remedial alternatives for the Croydon TCE Site. The methodology and approach used to establish the project objectives and the Phase II RI/FS scope of work follow the latest EPA and REM III guidance for planning and implementing a remedial investigation and feasibility study. This guidance is based on the requirements of the Superfund Amendments and Reauthorization Act (SARA) of 1986, which emphasizes the RI/FS "scoping process" and a phased RI and FS.

This Work Plan focuses on the scoping of the Phase II RI/FS and the tasks required to implement the RI/FS. Because the Phase I RI Report provides detailed information on the site background, the Phase I analytical data, and the Phase I public health and environmental assessment, sections of the Phase I RI Report have been referenced in this Work Plan as appropriate.

The Phase II RI/FS Work Plan consists of six sections, including this Introduction (Section A.1.0). Section A.2.0, Site Background Information, references the Phase I RI Report. Section A.3.0 outlines the scoping of the Phase II RI/FS and defines the Phase II RI/FS objectives.

Eight tasks have been identified to conduct the Phase II RI for the Croydon TCE Site. Section A.4.0 of this report defines these tasks. The FS tasks (9 through 12) are provided in Section A.5.0. Project management activities, including the project organization, quality assurance and data management, schedule, and cost estimates are provided in Section A.6.0.

A.2.0 SITE BACKGROUND INFORMATION

The site background information, including a site description, the site history, and information on site geology, hydrogeology, and surface water hydrology is provided in Sections 2.0 and 3.0 of the Croydon TCE Site Phase I RI Report.

A.3.0 SCOPING OF THE PHASE II REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The overall project goals for the Croydon TCE Site RI/FS are to determine the nature and extent of the threat posed by the release of hazardous substances and to evaluate alternatives for remedying the site problem(s). The overall objective of the RI is to collect the necessary data to determine the distribution and migration of contaminants, identify cleanup criteria, and identify and support the remedial alternative evaluation. The objectives of the FS are to develop and evaluate the remedial action alternatives with respect to protection of public health and environment, compliance with Applicable or Relevant and Appropriate Requirements (ARARs), and a reduction of contaminant mobility, toxicity, and volume.

Because only a limited amount of information was available for the study area and the source(s) of the TCE groundwater contamination was unknown, a two-phased RI/FS was proposed to gather sufficient information to meet the project goals. Phase I RI/FS objectives were subsequently identified and are outlined on Table 2-1 in the Phase I RI Report. Criteria for meeting these objectives were also established and are also given in Table 2-1. The REM III Project Team then identified the various investigations and data collection activities that are necessary to meet the criteria. (These are also given in Table 2-1.) The scope of work conducted under the Phase I investigation is described in Section 2.0 of the Phase I RI Report.

For the most part, the Phase I objectives have been satisfied. One of the criteria for performing a Phase II RI centered on the identification of potential source areas during the Phase I RI. Based on the findings of the Phase I hydrogeological

investigation, the TCE plume appears to be emanating from either Potential Source Area No. 1 or Potential Source Area No. 3b, which are located just north of U.S. Route 13. (See Figures 4-1 and 4-2 in the RI Report.) Therefore, this area will be the focus of study during the Phase II RI/FS.

The scoping of the Phase II RI/FS began after receipt, review, and evaluation of the Phase I data. As mentioned above, one reason for conducting a Phase II RI is to assess potential source areas that may be contributing to groundwater contamination. This Phase II study will focus on doing that. However, other studies related to confirming or supporting the Phase I findings and conclusions will also be performed. Some of these studies are primarily related to eliminating "Phase I" data limitations.

One such data limitation concerns groundwater flow and contaminant transport south of River Road. This area, which was not a part of the Phase I study area, will be included during the Phase II RI in order to assess whether another plume of TCE (emanating from the Bristol area) is migrating and combining with the Croydon TCE plume. Therefore, the Phase II study area has been expanded to assess groundwater flow direction and contaminant transport east of Route 413 and south of River Road.

The Phase II RI/FS has identified five objectives as shown on Figure A.3-1. The remainder of this Work Plan describes the Phase II scoping activities (i.e., review of existing data, identification of risks and data limitations, identification of potential remedial alternatives, etc.) and the proposed scope of work for the Phase II RI/FS.

A.3.1 SUMMARY OF EXISTING DATA

Please refer to Section 4.0 of the RI Report.

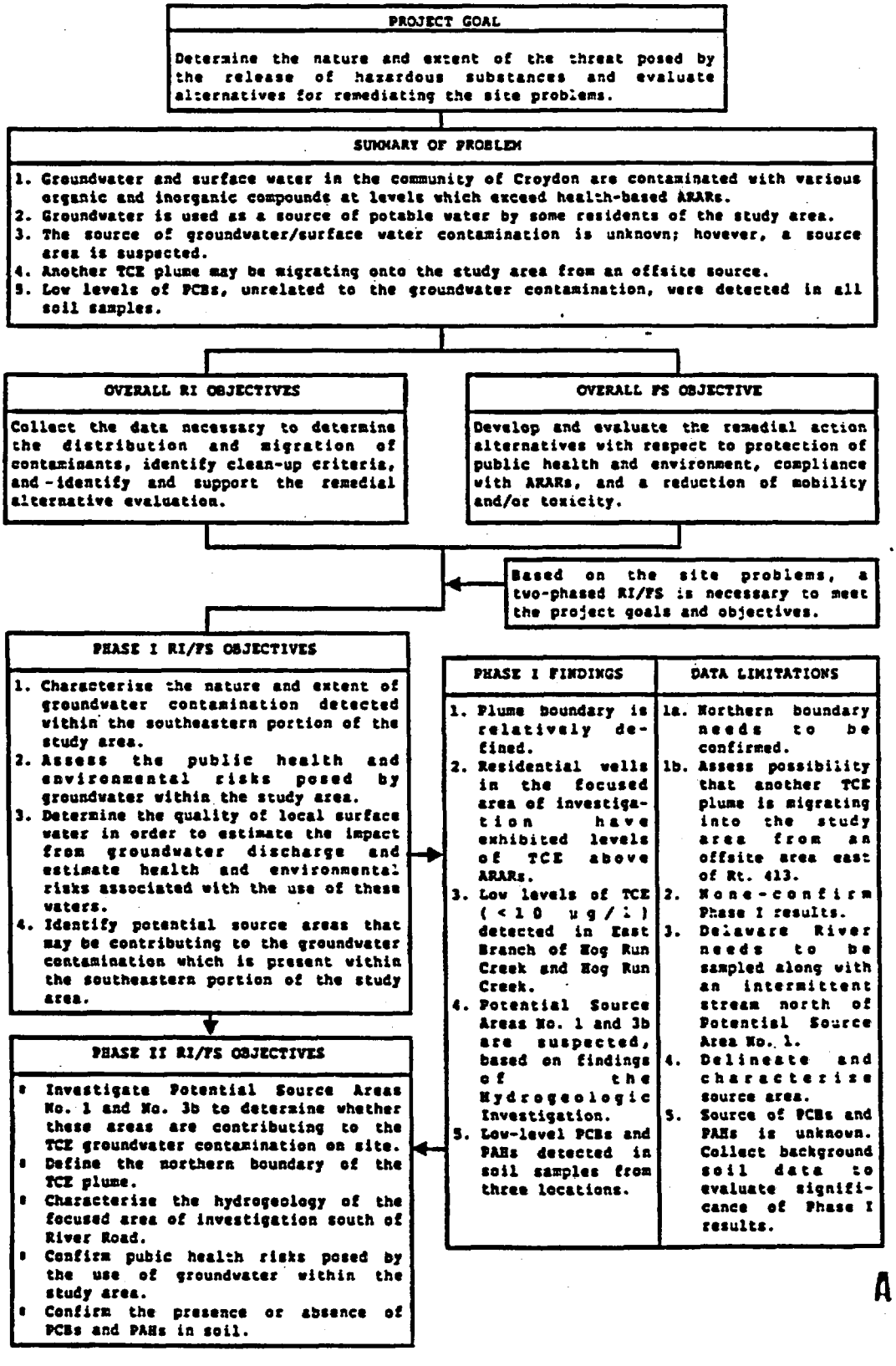
A.3.2 RISK ASSESSMENT

Please refer to Section 5.0 of the RI Report.

A.3.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

One of the primary concerns in the development of remedial action alternatives for sites governed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is the degree of public health or environmental protection afforded by each remedy. EPA policy states that in the process of developing and selecting remedial action alternatives, primary consideration should be given to actions that attain or exceed Applicable or Relevant and Appropriate Requirements (ARARs), as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Superfund Amendments and Reauthorization Act (SARA). The purpose of this

FIGURE A.3-1
PHASE II RI/FS SCOPING DIAGRAM
CROYDON TCE SITE



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requirements to make CERCLA response actions consistent with other pertinent Federal and state environmental requirements.

SARA defines an ARAR as

- Any standard, requirement, criteria, or limitation under Federal environmental law.
- Any promulgated standard, requirement, criteria, or limitation under a state environmental or facility siting law that is more stringent than the associated Federal standard, requirement, criteria, or limitation.

Applicable requirements are Federal public health and environmental requirements that would be legally applicable to a remedial action if that action was not undertaken pursuant to CERCLA. For example, if hazardous waste activities were undertaken pursuant to an approved permit, applicable regulations would be available to legally define the required remedial action for site closure. Relevant and appropriate requirements are Federal public health and environmental requirements that apply to circumstances sufficiently similar to those encountered at CERCLA sites, where their application would be appropriate although not legally required. In addition, SARA now requires that state ARARs be considered during the assembly of remedial alternatives if they are more stringent than Federal requirements. EPA has also indicated that "other" criteria, advisories, and guidelines must be considered in devising remedial alternatives. Examples of such "other" criteria include EPA Drinking Water Health Advisories, Carcinogenic Potency Factors (CPFs), and Reference Doses (RfDs).

Section 121 of SARA requires that the remedy for a CERCLA site must attain all ARARs unless one of the following conditions is satisfied: (1) the remedial action is an interim measure where the final remedy will attain the ARAR upon completion; (2) compliance will result in greater risk to human health and the environment than other options; (3) compliance is technically impracticable; (4) an alternative remedial action will attain the equivalent of the ARAR; (5) for state requirements, the state has not consistently applied the requirement in similar circumstances, or (6) compliance with the ARAR will not provide a balance between protecting public health, welfare, and the environment at the facility with the availability of Fund money for response at other facilities (Fund-balancing).

In addition to governing response actions at a site, ARARs may also dictate other aspects of the RI/FS. For example, standard analytical methods may be inadequate to indicate compliance or exceedance of the ARAR. Therefore, it is often necessary that ARARs be considered during the specification of chemical-analytical methods. In light of the RI/FS process, ARARs will be considered during the following: (1) Scoping of the Field Investigation (Task 1); (2) Risk Assessment (Task 6);

(3) Remedial Alternatives Screening (Task 9), and; (4) Remedial Alternatives Evaluation (Task 10).

ARARs fall into three broad categories, based on the manner in which they are applied at a site. These categories are as follows:

- Contaminant Specific - These ARARs govern the extent of site cleanup. Such ARARs may be actual concentration-based cleanup levels or they may provide the basis for calculating such levels.

- Location Specific - These ARARs are considered in view of natural or man-made site features. Examples of natural site features include wetlands, scenic rivers, and floodplains. Man-made features could include, for example, the presence of historic districts. ARARs based on aquifer designations are also location-specific ARARs.

- Action Specific - These ARARs pertain to the implementation of a given remedy. Examples of action-specific ARARs include monitoring requirements, effluent discharge limitations, hazardous waste manifesting requirements, and occupational health and safety requirements.

Tables A.3-1 and A.3-2 present a preliminary list of Federal and State ARARs for the Croydon TCE Site Phase II RI/FS, respectively. The ARARs are presented based on the category in which they fall. The rationale for the inclusion of each ARAR is provided in the tables. The ARARs identified in Tables A.3-1 and A.3-2 will be refined and revised, as necessary, as the RI/FS proceeds. A description of these ARARs is provided in the following paragraphs.

Additionally, Table A.3-3 presents a listing of concentration-based ARARs for the monitoring well and residential well contaminants of concern identified during the Phase I RI. These ARARs are also discussed below.

Federal ARARs

- Resource Conservation and Recovery Act (RCRA) of 1976 (Amended 1984) - Governs the generation, transportation, storage, and disposal of hazardous wastes. RCRA 40 CFR Part 264 standards are used for remedial actions including offsite hauling and disposal of hazardous wastes, onsite capping and landfilling, and groundwater monitoring.

- Safe Drinking Water Act - The Safe Drinking Water Act promulgated National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs). MCLs are enforceable standards for contaminants in public drinking water supply systems. They not only consider health factors,

TABLE A.3-1

FEDERAL ARARs AND TBCs(1)
CROYDON TCE SITE
PHASE II RI/FS

Contaminant-Specific	
Requirement	Rationale
Hazardous Waste Requirements (RCRA Subtitle C, 40 CFR, Part 264)	Standards applicable to treating, storing, and disposing of hazardous waste.
Safe Drinking Water Act	
Maximum Contaminant Levels (MCLs)	Remedial actions may provide groundwater cleanup to the MCLs.
Maximum Contaminant Level Goals (MCLGs)*	SARA Section 121(D)(2)(A)(II).
Toxic Substances Control Act (15 U.S.C. 2601)	
TSCA health data, chemical advisories, and Compliance Program policy*	Considered in the public health evaluation.
Health Advisories, EPA Office of Drinking Water*	RI activities identified presence of chemical for which health advisories are listed.
Clean Water Act (PL92-500)	
Federal Ambient Water Quality Criteria (AWQC) - human health through ingestion of water*	Remedial actions may provide groundwater remediation to relevant AWQC.
Reference Doses (RfD), EPA Office of Research and Development*	Considered in the public health evaluation.
Carcinogenic Potency Factors, EPA Environmental Criteria and Assessment Office; EPA Carcinogen Assessment Group*	Considered in the public health evaluation.
Clean Air Act (42 USC 7401)	
National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (40 CFR Part 50)	Remedial alternatives may include incineration or groundwater air-stripping technologies.
Public health basis to list pollutants as hazardous under Section 112 of the Clean Air Act*	Remedial alternatives may include incineration or groundwater air stripping technologies.

TABLE A.3-1
FEDERAL ARARs AND TBCs(1)
CROYDON TCE SITE - PHASE II RI/FS
PAGE TWO

Contaminant-Specific	
Requirement	Rationale
Health Effects Assessments*	Considered in the public health risk assessment included in RI Report.
Pesticides Registration, Tolerances, and Action Levels*	Pesticides are considered possible site contaminants.

Location-Specific	
Requirement	Rationale
EPA's Groundwater Protection Strategy*	Remedial alternatives must consider EPA classification of groundwater at site.
Endangered Species Act of 1978 (16 USC 1531)	Considered in the public health and environmental assessment.
Fish and Wildlife Coordination Act (16 USC 661)	Remedial alternatives may affect protected habitats.
Fish & Wildlife Improvement Act of 1978 (16 USC 742)	Remedial alternatives may affect protected habitats.
Fish & Wildlife Conservation Act of 1980 (16 USC 2901)	Remedial alternatives may affect protected habitats.
Rivers and Harbors Act of 1899 (33 CFR Parts 320-327)	Remedial alternatives may affect the Delaware River.
Regulation of Activities Affecting Waters of the U.S. (33 CFR, Parts 320-329)	Corps of Engineers regulations apply to navigable waters.
Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230)	Remedial alternatives may potentially include dredging and filling in wetlands.
Dredged Material Disposal Sites Removal or Restriction Procedures (404c); 40 CFR, Part 231	Remedial alternatives may potentially include dredging and filling in wetlands.
Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)	Both floodplain and wetland resources may be affected by the site remedial alternative.

TABLE A.3-1
FEDERAL ARARs AND TBCs(1)
CROYDON TCE SITE - PHASE II RI/FS
PAGE THREE

Action-Specific	
Requirement	**Rationale**
Safe Drinking Water Act	
Underground Injection Control Regulations (40 CFR, Parts 144, 145, 146, and 147)	May be applicable to onsite groundwater recirculation systems and tracer studies.
Clean Water Act	
NPDES Permit Requirements	Remedial alternatives may include discharge to surface waters.
Threshold Limit Values, American Conference of Governmental Industrial Hygienists*	May be appropriate requirements for air concentrations during remedial activities.
Occupational Safety and Health Administration Requirements (29 CFR, Parts 1910, 1926, and 1904)	Required for workers engaged in onsite remedial activities.
Department of Transportation Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-171.500)	Remedial alternatives include offsite treatment and disposal.
Hazardous Waste Requirements (RCRA Subtitle C, (40 CFR Part 264)	Applicable to treating, storing, and disposing of hazardous wastes.
General Pretreatment Regulations for Existing and New Sources of Pollutants (40 CFR Part 403)	Considered for remedial alternatives involving pretreatment of groundwater prior to treatment to a POTW.

1. ARAR: Applicable or Relevant and Appropriate Requirement.
   TBC Other Criterion, Advisory or Guideline "to be considered."

TABLE A.3-2

COMMONWEALTH OF PENNSYLVANIA
APPLICABLE OR RELEVANT AND APPROPRIATE STATE REQUIREMENTS
CROYDON TCE SITE

Action-Specific	
Requirement	Rationale
Pennsylvania Solid Waste Disposal Regulations, PA Code Title 25, Chapter 75	Standards for treating, storing, and disposing of hazardous wastes.
Pennsylvania Pollutant Discharge Elimination System (NPDES) Rules, PA Code Title 25, Chapter 92	Remedial actions may include discharge to surface waters.
Pennsylvania Wastewater Treatment Requirements, PA Code Title 25, Chapter 95	Remedial actions may include discharge to surface waters.
Pennsylvania Industrial Waste Regulations, PA Code Title 25, Chapter 97	Remedial actions may include discharge to surface waters.
Pennsylvania Special Water Pollution Regulations, PA Code Title 25, Chapter 101	Applicable for permitted solid waste disposal facilities.
Pennsylvania Air Pollution Control Regulations, PA Code Title 25, Chapters 121 through 143	Incineration is considered a potential remedial action.
Pennsylvania Storm Water Management Act of October 4, 1978, Act No. 167	Remedial actions may require stormwater management systems.
Pennsylvania Erosion Control Regulations, PA Code Title 25, Chapter 102	Soil disturbances during proposed remedial actions may require erosion and sedimentation control measures.
Pennsylvania Hazardous Substances Transportation Regulations PA Code Title 13 (Flammable Liquids and Flammable Solids) and Title 15 (Oxidizing Materials, Poisons, and Corrosive Liquids)	Applicable to wastes shipped offsite for analysis, treatment, or disposal.

TABLE A.3-2
COMMONWEALTH OF PENNSYLVANIA
APPLICABLE OR RELEVANT AND APPROPRIATE STATE REQUIREMENTS
CROYDON TCE SITE
PAGE TWO

Contaminant-Specific	
Requirement	**Rationale**
Pennsylvania Water Quality Standards, PA Code Title 25, Chapter 93	Remedial actions may include discharge to surface waters.
Pennsylvania Air Pollution Control Regulations, PA Code Title 25, Chapters 121 through 143	Incineration is considered a potential remedial action.

Location Specific	
Requirement	**Rationale**
Pennsylvania Wild and Scenic Rivers Act	Considered in the public health and environmental assessment. Remedial actions may include discharge to the Hog Run Creek or Delaware River.
Rare and Endangered Species Regulations PA Code Title 58	Considered in the public health and environmental assessment.

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TABLE A.3-3

COMPARISON OF PHASE I RI CONTAMINANTS OF CONCERN AND ARARs
CROYDON TCE SITE

Constituent	Maximum Concentration Detected (µg/l)			NPDWR (µg/l)(1)		Health Advisories (µg/l)(1)		AWQC			
								Aquatic Life (µg/l)(2)		Human Health (µg/l)(2)	
	RW	SW	MW	MCLs/ PMCLs	MCLGs/ PMCLGs	Child	Adult	Acute	Chronic	Ingestion of Drinking Water & Aquatic Life	Ingestion of Drinking Water
trichloroethene	97	6.1	420	5(A)	0(B)	-	-	2,000	-	0(2.7)*	0(2.8)*
tetrachloroethene	4.3	ND	4.1	-	0(B)	10 day: 34,000 longer term: 1,940	longer term: 6,000	5,280	840	0(0.8)*	0(0.88)*
1,1,1-trichloroethene	75	2.3	160	200(A)	200(B)	1 day: 140,000 10 day: 35,000 longer term: 35,000	longer term: 125,000 lifetime: 1,000	18,000	-	18.4 mg/l	19 mg/l
1,1-dichloroethane	3	ND	3	-	-	-	-	-	-	-	-
1,1-dichloroethene	5.1	ND	75	7(A)	-	-	-	11,600	-	0(33 ng/l)*	0(33 ng/l)*
chloroform	1.2	ND	8.9	-			-	28,900	1,240	0(0.19)*	0(0.19)*
1,4-dichlorobenzene	0.28	ND	ND	75	75	1 day: 10,700 10 day: 10,700 longer term: 10,700	longer term: 375,000 lifetime: 3,750	250	50	400	470
dieldrin	ND	ND	0.3	-	-	-	-	2.5	0.0019	0(0.74 ng/l)*	0(1.2 ng/l)*
4,4'- DDT	ND	ND	.2	-	-	-	-	1.1	0.001	0(0.024 ng/l)	0(0.2 ng/l)

* - AWQC is zero. The value corresponds to a 1 x 10^{-6} lifetime cancer risk

RW - Residential Wells
MW - Monitoring Wells
SW - Surface Water
NPDWR - National Primary Drinking Water Regulations
MCLs - Maximum Contaminant Level (µg/l)
PMCL - Proposed MCL
MCLG - Maximum Contaminant Level Goal (µg/l)
PMCLG - Proposed MCLG
AWQC - Ambient Water Quality Criteria (µg/l)

ND - Not Detected
(A) - Proposed
(B) Final
NA - Not Analyzed
NA - Not Analyzed

(S) - Sources
(1) USEPA, 1986a and 1986b
(2) USEPA, 1980

but also the economic and technical feasibility of removing a contaminant from a water supply system. EPA has also recently proposed Maximum Contaminant Level Goals (MCLGs) for several organic and inorganic compounds in drinking water. MCLGs are non-enforceable guidelines that do not consider the technical feasibility of contaminant removal.

- Toxic Substances Control Act of 1976 - The Toxic Substances Control Act (TSCA) provides authority to require testing of chemical substances entering the environment and to regulate them, where necessary. Polychlorinated biphenyl (PCB) regulation and enforcement (40 CFR Part 761) are important aspects of TSCA. 40 CFR Part 761 established regulations for manufacturing, processing, distributing in commerce, and prohibitions for using PCBs.

- USEPA Health Advisories - Health Advisories are non-enforceable guidelines, developed by the EPA Office of Drinking Water, for chemicals that may be intermittently encountered in public water supply systems. Health Advisories are available for short term, longer-term, and lifetime exposures for a 10-kg child and/or a 70-kg adult.

- Clean Water Act (as amended) - This act governs point-source discharge through the National Pollutant Discharge Elimination System (NPDES), as well as discharge of dredge or fill materials and oil and hazardous spills to U.S. waters.

  Also, Ambient Water Quality Criteria (AWQC) were developed for 64 pollutants in 1980 (45 CFR Part 231) pursuant to Section 304(a)(1) of the Clean Water Act. In 1983, EPA revised nine criteria previously published in the "Red Book" (Quality Criteria for Water, 1976), and in the 1980 criteria documents. These criteria are not legally enforceable, but have been used by many states to develop enforceable water quality standards. AWQC are available for the protection of human health from exposure to contaminants in drinking water, from ingestion of aquatic biota, and for the protection of freshwater and saltwater aquatic life.

- Clean Air Act of 1967 - This act governs air emissions resulting from remedial actions. The Clean Air Act promulgated the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50). NAAQS are available for six chemicals or groups of chemicals and for airborne particulates. The sources of the contaminants and the routes of exposure were considered in the formulation of the standards. These standards do not consider the costs of achievement or the feasibility of implementation. The NAAQS allow for a margin of safety to account for unidentified hazards and effects.

- Health Effects Assessments (HEAs) - HEAs present toxicity data for specific chemicals for use in public health assessments. Also considered applicable are Carcinogenic Potency Factors and Reference Doses provided in the Superfund Public Health Evaluation Manual (USEPA, 1986).

- Groundwater Protection Strategy - EPA's policy is to protect groundwater as needed for its highest present or potential beneficial use. This policy will be incorporated into future regulatory amendments. The strategy designates three categories of groundwater:

  - Class 1 - Special Groundwaters - Waters that are highly vulnerable to contamination and are either irreplaceable or ecologically vital sources of drinking water.

  - Class 2 - Current and Potential Sources of Drinking Water and Waters Having Other Beneficial Uses - Waters that are currently used or that are potentially available.

  - Class 3 - Groundwater Not a Potential Source of Drinking Water and of Limited Beneficial Use - Class 3 groundwater units are further subdivided into two subclasses.

    -- Subclass 3A includes groundwater units that are highly to intermediately interconnected to adjacent groundwater units of a higher class and/or to surface waters. They may, as a result, be contributing to the degradation of the adjacent waters. They may be managed at a similar level as Class 2 groundwaters depending upon the potential for producing adverse effects on the quality of adjacent waters.

    -- Subclass 3B is restricted to groundwater units characterized by a low degree of inter-connection to adjacent surface waters or other groundwater units of a higher class within the Classification Review Area. These groundwaters are naturally isolated from sources of drinking waters in such a way that there is little potential for producing adverse effects on quality. They have low resource values outside of mining or waste disposal.

- Endangered Species Act of 1978 (16 USC 1531) - This act provides for consideration of the impacts on endangered and threatened species.

- Fish and Wildlife Coordination Act (16 USC 661 et seq.) - This act provides for consideration of the impacts on wetlands and protected habitats.

- Fish and Wildlife Improvement Act of 1978 (16 USC 742a) - This act provides for consideration of the impacts on wetlands and protected habitats.

- Fish and Wildlife Conservation Act of 1960 (16 USC 2901) - This act, too, provides for consideration of the impacts on wetlands and protected habitats.

- Regulation of Activities Affecting Water of the U.S. (33 CFR Parts 320-329) - These U.S. Army Corps of Engineers Regulations are applicable to wetlands and navigable waters.

- Section 404(b)(1), Guideline for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 23) - These established guidelines are applicable to the dredge and fill of wetland environments.

- Dredged Material Disposal Sites Denial or Restriction Procedures (Section 404 Procedures) (40 CFR Part 231) - These established procedures for prohibiting or withdrawing the specification or denying, restricting, or withdrawing the use for specification, of any defined area as a disposal site for dredged or fill material are pursuant to Section 404(c) of the Clean Water Act.

- Occupational Safety and Health Act (OSHA requirements; 29 CFR Parts 1910, 1926, and 1904) - OSHA regulations provide occupational safety and health requirements applicable to workers engaged in onsite field activities.

- Federal Floodplain Executive Order (11988) - This executive order provides for consideration of floodplains during remedial actions. It is implemented by EPA's August 6, 1985 Policy on Floodplains and Wetlands Assessments for CERCLA actions (CERCLA Compliance Policy).

- Federal Wetlands Executive Order (11990) - This order provides for consideration of wetlands during remedial actions and is implemented by EPA's August 6, 1985 Policy on Floodplains and Wetlands Assessments for CERCLA actions (CERCLA Compliance Policy).

- DOT Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1 - 171.500) - These regulate the transport of hazardous waste materials including packaging, shipper equipment, and placarding. These requirements are considered applicable to any wastes shipped off site for laboratory analysis, treatment, or disposal.

Commonwealth of Pennsylvania ARARs

- Pennsylvania Solid Waste Disposal Regulations - These govern the generation, transportation, storage, and disposal of hazardous wastes.

- Pennsylvania National Pollutant Discharge Elimination System (NPDES) Rules - These rules govern point-source discharge to Pennsylvania waters through the Clean Water Act.

- Pennsylvania Water Quality Standards - These set forth water quality standards for receiving streams based upon designated uses.

- Pennsylvania Wastewater Treatment Requirements - These wastewater treatment regulations are required to maintain water quality, including effluent limitations based on best-practical-control technologies and waste-level allocations for pollutants for which minimum treatment requirements have not been established.

- Pennsylvania Industrial Waste Treatment Regulations - These regulations provide requirements and standards for treatment of industrial waste discharges to surface waters and underground waters.

- Pennsylvania Special Water Regulations - These regulations establish a procedure for mandatory notification of downstream users in the case of an accident in which a toxic substance enters surface waters. They also specify bonding requirements for solid waste facilities that would ensure closure of a permitted site in a manner that would abate or prevent water pollution.

- Pennsylvania Air Pollution Control Regulations - These govern air emissions from remedial actions and provide for the control and prevention of air pollutants. They also provide guidance for the design and operation of air pollution sources.

- Pennsylvania Storm Water Management Act - This act requires measures to control stormwater runoff during alterations or development of land. Stormwater management systems must be constructed in a manner consistent with the county watershed management plan.

- Pennsylvania Erosion Control Regulations - These regulations govern erosion and sedimentation control resulting from remedial actions that may involve earth-moving activities.

- Pennsylvania Hazardous Substances Transportation Regulations - These regulate the transport of flammable

liquids and solids, oxidizing materials, poisons, and corrosive liquids. These requirements may be applicable to any wastes shipped offsite for laboratory analysis, treatment, or disposal.

A.3.4 PRELIMINARY SCOPING OF REMEDIAL TECHNOLOGIES

A focused Feasibility Study (FFS) has been prepared to evaluate alternatives for eliminating public health risks that are present because of consumption of groundwater by domestic well owners. This FFS is primarily aimed at evaluating alternate water supplies and in-house water treatment systems, in addition to the no-action alternative. Remediation of contaminated groundwater (i.e., the entire plume) will be considered in the Phase II FS.

Based on the Phase I RI data, environmental problems associated with the Croydon TCE Site are primarily limited to the groundwater. However, it is possible that during the Phase II RI, the source(s) of the groundwater problem may be identified and subsequently characterized. Therefore, technologies for soil/waste remediation have also been developed and are presented on Table A.3-4.

As shown on Table A.3-4, potential remedial technologies have also been identified for remediating surface water/sediment; however, public health and environmental risks posed by these media are relatively low and consequently, may not require remediation.

The screening of technologies and the identification of innovative technologies will begin shortly after the Phase II RI is initiated. As the RI progresses, additional screening and identification of other technologies will occur. (The screening criteria are discussed in Section A.5.0.) Technologies remaining after screening will be combined into alternatives. To the degree possible, treatment alternatives will be developed that would eliminate the need for long-term management at the site and that would reduce toxicity, mobility, or volume as their principal element, in accordance with SARA.

In the event that the source of the groundwater problem is identified, an amendment to this Work Assignment will be submitted if treatability studies are warranted. This amendment will include a budget increase which will include provisions to research and identify candidate treatability studies, develop treatability study specifications, procure the appropriate vendors to perform the treatability study, and provide management during the treatability study. The results of the treatability study will be used to support the feasibility study and the EPA Record of Decision (ROD).

TABLE A.3-4

POTENTIAL REMEDIAL TECHNOLOGIES
CROYDON TCE SITE
BUCKS COUNTY, PENNSYLVANIA

Site Media	Preliminary Risks	Potential Remedial Objectives	Response Actions	Potential Remedial Technologies
Soils	• Dermal contact • Leaching to groundwater	• Reduce or eliminate dermal toxicity. • Reduce leaching to groundwater.	Removal Disposal (on/off site) Treatment (on/off site) Containment In-situ treatment	Excavation RCRA Landfill Solidification Incineration Thermal treatment Solvent extraction Slurry wall Cap In-situ solidification/ fixation In-situ vitrification Vapor extraction
Surface water/ sediments	• Biota uptake in offsite ditch and downstream receiving waters	• Reduce or eliminate sediment transport. • Reduce contaminant concentrations in offsite sediment.	Removal Disposal (on/off site) Treatment	Excavation Dredging RCRA Landfill Solidification Incineration Revegetation
Groundwater	• Present and future risks are not acceptable for ingestion, inhalation, and dermal contact.	• Prevent an increase in contaminant concentrations for receptors. • Reduce contaminant concentrations at site.	Pumping Treatment (onsite) Treatment (offsite) Alternate Water Supply*	Well points Ejector wells Deep wells Drainage trench Air stripping Activated carbon Biological Treatment

*Presently being evaluated as part of the focused feasibility study.

A.3.5 DATA LIMITATIONS/REQUIREMENTS

This section summarizes the data that are necessary to meet the overall objectives for performing the Phase II RI/FS at the Croydon TCE Site. The required data were identified by reviewing the Phase I RI data base and then determining the data needed to adequately meet the Phase I objectives, assess the risks to the public health and environment, and to evaluate the feasibility of remedial alternatives. Table A.3-5 provides the data limitations/ requirements identified during the Phase II RI/FS scoping process. The period of data collection (i.e., Phase I RI or Phase II RI) and the specified end uses of the data (i.e., risk assessment, feasibility study, etc.) are also given in this table. A summary of the specific Phase II RI/FS data limitations/requirements is provided below.

- Potential Source Areas No. 1 and No. 3b were identified during the Phase I RI as areas which may act as potential sources of groundwater contamination. The extent of environmental contamination (soil, groundwater) attributed to these source areas are unknown.

- The limits of the northern boundary of the contaminant plume were not defined during the Phase I RI. Additional data are required to delineate the extent of contamination north of U.S. Route 13.

- Define the position of the groundwater divide near the East branch of Hog Run Creek and its probable impact on the migration of contaminants.

- Determine the nature of the immiscible white liquid found in several of the monitoring wells.

- Define the local groundwater flow patterns near the intermittent stream, which is located north of Potential Source Area No. 1.

- In addition to the groundwater contaminant plume, the Phase I RI results suggest the possibility that another (offsite) TCE plume is migrating to the study area. The boundaries of the Phase I study area need to be expanded to confirm the presence/absence of this plume.

- Confirm the presence/absence of contaminants in the residential wells sampled during the Phase I RI to confidently characterize the risks to the public health.

- The Phase I RI identified the presence of pesticides, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) in soil samples obtained from 3 sampling locations. Additional data on the nature and extent of PCB, PAH, and pesticide contamination in background soil samples and in the Rohm & Haas landfill are required. It is currently unknown if the soil

TABLE A.3-5

DATA LIMITATIONS/REQUIREMENTS AND UTILIZATION
CROYDON TCE SITE

Media	Data Limitations/Requirements	Utilization			Data Collection Period	
		Source Delineation	Risk Assessment	Feasibility Study	Phase I RI	Phase II RI
Hazardous Waste(s)	• Location	X	X	X	X	X
	• Amount (Volume and Mass)	X		X		X
	• Physical Characteristics		X	X		X
	• Chemical Characteristics		X	X		X
Groundwater	• Areal extent of known contaminant plume	X	X	X	X	X
	• Groundwater quality throughout entire study area		X	X	X	
	• Groundwater users		X	X	X	
	• Groundwater flow patterns and rates		X	X	X	X*
	• Geologic conditions		X	X	X	X*
	• Hydraulic characteristics of the alluvial aquifer		X	X	X	X*
	• Interaction between surface waters and groundwater		X	X	X	X*
	• Background groundwater quality		X	X	X	X*

TABLE A.3-5
DATA LIMITATIONS/REQUIREMENTS AND UTILIZATION
CROYDON TCE SITE
PAGE TWO

Media	Data Limitations/Requirements	Utilization			Data Collection Period	
		Source Delineation	Risk Assessment	Feasibility Study	Phase I RI	Phase II RI
Soils	• Physical Characteristics			X		X
	• Chemical Characteristics	X	X	X	X	X*
Surface Water and Sediments	• Quality of Neshaminy Creek, Hog Run and intermittent streams		X	X	X	
	• Impact on Delaware River		X			X
	• 100-Year Floodplain			X		X
Biota	• Impact on biota in Neshaminy Creek, Hog Run and intermittent streams		X		X**	

* Phase II data collection will also be used to confirm and support Phase I findings/conclusions.

** Biota studies were considered following the review and evaluation of surface water and sediment samples. A biota investigation will not be conducted during the Phase II RI due to the relatively low levels of contaminants detected in surface waters/sediments. The EPA Region III Bioassessment Division supports this decision.

samples represent contaminants detected in the soil, or if these compounds are potentially attributed to the landfill. Fill material from the landfill may have been placed in areas where the Phase I soil samples were collected, based on conversations with a local property owner.

- The quality of surface water and sediment in the Delaware River and the unnamed stream located north of Route 13 was not defined during the Phase I RI. Because of field sampling limitations, no data are available to characterize the nature and extent of contamination associated with these surface water bodies.

A.3.6 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY OBJECTIVES

The overall objectives for the Croydon TCE Site RI/FS are to determine the nature of the public health and environmental risks posed by the site and to identify and establish remedial action alternatives to mitigate these concerns. Because of the limitations associated with the available data, the Croydon TCE Site RI/FS was conducted in two phases. The objectives of the Phase I RI/FS are provided below.

- Characterize the nature and extent of groundwater contamination, which was previously detected in the southeastern portion of the study area.

- Assess the public health and environmental risks posed by groundwater contamination within the study area.

- Determine the quality of local surface waters to estimate the impact from groundwater discharge and estimate health and environmental risks associated with the use of these surface waters.

- Identify potential source areas that may be contributing to groundwater contamination within the southeastern portion of the study area.

Data limitations were identified following a review of the Phase I RI data. The data required to adequately assess the risks to the public health and environment and to evaluate remedial alternatives were then determined. These data limitations were provided in Section A.3.4. To address these limitations, specific Phase II RI/FS objectives were established. The specific Phase II RI/FS objectives and rationale are provided in Table A.3-6.

A.3.7 TECHNICAL RATIONALE, OBJECTIVES, AND METHODOLOGIES FOR DATA COLLECTION

The purpose of this section is to present the methodologies by which the data limitations and the Phase II RI/FS objectives will be addressed. Table A.3-7 outlines the criteria for

TABLE A.3-6

SPECIFIC PHASE II RI/FS OBJECTIVES
CROYDON TCE SITE

Specific Phase II RI/FS Objectives	Rationale
1. Investigate Potential Source Area No. 1 and No. 3b to determine whether they are the source of the TCE groundwater contamination.	Data collected during the hydrogeologic and residential well investigations have indicated that the TCE plume may be emanating from the area north of U. S. Route 13. Two potential source areas were identified through the use of historical aerial photographs.
2. Define the northern boundary of the TCE plume.	Monitoring wells are required both upgradient and downgradient from Potential Source Area No. 1 and No. 3b to define the northern limits of the TCE plume.
3. Characterize the hydrogeology of the focused area of investigation.	The hydrogeology of the focused area of investigation is well documented with the exception of the area near River Road, which borders the study area to the south. Based on the Phase I RI data, a groundwater divide exists between the East Branch of Hog Run Creek and the Rohm & Haas treatment pond. The role of the groundwater divide is important to assess fate and transport of site contaminants in the groundwater. In addition, there is the possibility that a second TCE plume, emanating east of Rt. 413, may be migrating toward the East Branch Hog Run Creek. This will be assessed during the Phase II RI.

TABLE A.3-6
SPECIFIC PHASE II RI/FS OBJECTIVES
CROYDON TCE SITE
PAGE TWO

Specific Phase II RI/FS Objectives	Rationale
4. Confirm public health risks posed by the use of groundwater within the study area.	In order to characterize public health risks more accurately, a second round of sampling will be performed on all residential wells within the study area that have exhibited TCE above health-based ARARs.
5. Confirm the presence or absence of PCBs in the soil.	Soil sampling was performed in three areas that allegedly contained fill material from the Rohm & Haas landfill. Analysis of these samples revealed low levels of PCBs and PAHs. A second round of samples will be collected from these areas to confirm the presence/absence of PCBs and PAHs in soil. Soil samples will also be taken from the Rohm & Haas landfill area and two background (offsite) areas.
6. Define the nature and extent of contamination in the Delaware River and the unnamed stream located north of Route 13.	This objective was not fully satisfied during the Phase I RI because the intermittent stream was dry and there were time constraints associated with sampling the Delaware River. To satisfy this Phase I objective, these surface waters will be sampled during the Phase II RI.

TABLE A.3-7

CRITERIA FOR MEETING THE PHASE II RI/FS OBJECTIVES
CROYDON TCE SITE

RI Objectives	Criteria for Meeting Objectives	Data Collection Activities
1) Investigate Potential Source Areas No. 1 and No. 3b to determine whether they are contributing to the groundwater contamination at the site.	• Determine the presence or absence of TCE in groundwater upgradient and downgradient from both potential source areas. • Assess soil contamination at these potential source areas.	• Install groundwater monitoring wells upgradient and downgradient from Potential Source Areas No. 1 and No. 3b. • Collect groundwater samples and analyze the samples for TCL volatile organics. • Collect soil gas samples at Potential Source Areas No. 1 and No. 3b. • Auger soil borings (with sampling) where soil contamination is suspected, based on the results of the soil gas investigation. Analyze soil samples for TCL and TAL constituents.
2) Define the northern boundary of the TCE groundwater plume.	• Determine aquifer characteristics north of U.S. Route 13.	• Install monitoring wells north of U.S. Route 13. • Collect groundwater samples and analyze the samples for TCL volatile organics.

TABLE A.3-7
CRITERIA FOR MEETING THE PHASE II RI/FS OBJECTIVES
CROYDON TCE SITE
PAGE TWO

RI Objectives	Criteria for Meeting Objectives	Data Collection Activities
3) Characterize the hydrogeology and extent of groundwater contamination in the focused area of investigation.	• Confirm the presence or absence of TCE contamination in existing REM III/Rohm & Haas monitoring wells, newly installed REM III wells, and in selected Rohm & Haas wells south of River Road. • Confirm aquifer characteristics. • Investigate immiscible liquid detected during the Phase I RI.	• Sample all Phase I and Phase II monitoring wells and selected Rohm & Haas monitoring wells south of River Road. Analyze the samples for TCL volatile organics. • Conduct hydrogeologic testing of all newly installed monitoring wells. Obtain water level measurements from all monitoring wells and staff gauges. • Sample immiscible liquid and analyze for TCL and TAL constituents.
4) Confirm public health risks posed by the use of groundwater within the study area.	• Assess groundwater quality of selected domestic well users.	• Sample all residential wells within the focused area of investigation that exhibited elevated levels of TCE. Analyze the samples for TCL volatile organics. • Sample selected residential wells outside of the focused area of investigation to confirm Phase I results.

TABLE A.3-7
CRITERIA FOR MEETING THE PHASE II RI/FS OBJECTIVES
CROYDON TCE SITE
PAGE THREE

RI Objectives	*Criteria for Meeting Objectives*	Data Collection Activities
5) Confirm the presence or absence of PCBs, PAHs, and pesticides in soils.	• Resample 3 areas where contaminants were detected. • Determine background level of contaminants in soils. • Determine presence or absence of contaminants in landfill soils	• Collect soil samples from the 3 previously sampled areas, the Rohm & Haas Landfill, and background area. Analyze the samples for PCBs, PAHs, and pesticides.
6) Define the quality of surface waters and sediments in the Delaware River and the unnamed stream located north of Route 13 and estimate health risks associated with use of these waters.	• Determine surface water and sediment quality.	• Collect surface water and sediment samples from the Delaware River and the unnamed stream. Analyze the surface water samples for TCL volatile organics. Analyze the sediment samples for TCL organic constituents.

meeting each of the specific Phase II RI/FS objectives and the data gathering activities selected to meet these objectives.

The scoping of the Phase II RI/FS was conducted during a review of the Phase I RI results. This "brainstorming" period resulted in the development of the Phase II RI/FS objectives and the criteria to meet these objectives. Data collection activities were subsequently proposed to satisfy the criteria.

To meet Objective Number 1 (Investigate Potential Source Area No. 1 and No. 3b) a soil investigation will be conducted. The soil investigation includes soil gas analysis, and surface and subsurface soil sampling and analysis. . . The soil sampling investigation is discussed in detail in Section 4.3.1. The soil sampling investigation will also obtain information to satisfy Objective No. 5 (confirm the presence or absence of PCBs and PAHs in soils).

To satisfy the criteria for characterizing limits of the groundwater plume and the hydrogeology of the focused area, (Objective No. 2 and 3), a hydrogeologic investigation will be conducted. The hydrogeologic investigation is outlined in Section A.4.3.2 of this report. Each aspect of the hydrogeologic investigation (i.e., location and number of wells, sample analysis, etc.) is discussed in Section A.4.3.2. The hydrogeologic investigation will also obtain information to determine the extent to which the potential source areas are contributing to the groundwater contamination.

Objective No. 4 (Assess the Public Health and Environmental Risks Posed by Groundwater Within the Study Area) will be accomplished by obtaining additional data to determine the presence/absence of contaminants (TCE) in domestic wells within the study area. To satisfy this criterion, selected residential wells will be resampled. Section A.4.3.3 (Residential Well Survey/Investigation) discusses the rationale behind the residential well investigation.

To meet Objective No. 6 (Determine the Quality of Surface Waters and Sediments), a surface water and sediment investigation will be conducted. This investigation will consist of collecting surface water and sediment samples from the Delaware River and the unnamed stream located north of Route 13. Section A.4.3.5 outlines the rationale for the various aspects of this investigation.

A more detailed description of the field investigations is given in Section A.4.3 (Field Investigations).

Additionally, to meet the RI/FS objectives, analytical options must be selected. Appropriate analytical options must be chosen to support the Data Quality Objectives (DQOs) for the samples collected. DQOs and Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) goals are discussed in detail in the Field Operations Plan (FOP). The specific

analytical options to support an Phase II RI/FS are given in five general categories.

- Level V - Analysis by non-standard methods that may require method modification and/or development, as well as accelerated turnaround time.
- Level IV - All analyses are performed in an offsite laboratory using CLP protocols.
- Level III - Laboratory analysis performed in an offsite laboratory using methods other than the CLP Routine Analytical Services (RAS).
- Level II - Field analysis using a mobile laboratory.
- Level I - Field screening or analysis using portable instruments.

A.4.0 TASK PLAN FOR REMEDIAL INVESTIGATION

This section identifies the tasks that will be implemented to conduct the Phase II RI/FS for the Croydon TCE Site. The RI will be comprised of Tasks 1 through 8 as defined below:

- Task 1 - Project Planning
- Task 2 - Community Relations
- Task 3 - Field Investigation
- Task 4 - Sample Analysis and Data Validation
- Task 5 - Data Evaluations
- Task 6 - Risk Assessment
- Task 7 - Treatability Study/Pilot Testing
- Task 8 - Remedial Investigation Report

The FS will be comprised of Tasks 9 through 12 as defined below:

- Task 9 - Remedial Alternatives Screening
- Task 10 - Remedial Alternatives Evaluation
- Task 11 - Feasibility Study Report
- Task 12 - Post RI/FS Support

Section A.5.0 provides a detailed description of the FS tasks. The remainder of this section provides a detailed description of the RI tasks.

A.4.1 TASK 1 - PROJECT PLANNING

The performance of this task results in the preparation and submittal of the Draft and Final Phase II RI/FS Work Plan and Field Operations Plan. The activities that comprise this task are:

- Data Collection and Review
- Site Reconnaissance
- ARAR/DQO Determination (Preliminary)

- Remedial Alternatives Identification (Preliminary)
- Preliminary Risk Assessment
- RI/FS Brainstorming and Scoping Meetings
- Phase II Work Plan Preparation
- Phase II Field Sampling and Analysis Plan (FSAP) Preparation
- Phase II Site Management Plan (SMP) Preparation
- Phase II Health and Safety Plan (HASP) Preparation

A.4.2 TASK 2 - COMMUNITY RELATIONS

All community relations activities for the Phase I and Phase II RI/FS were presented in the Final Phase I RI/FS Work Plan. Therefore, no additional support over and above what is stated in the Phase I RI/FS Work Plan is required.

The REM III Team will or has provided the following support during the Phase I and Phase II RI/FS:

- Preparation of a Draft and Final Community Relations Plan (completed).
- Preparation of 5 fact sheets (2 fact sheets have been prepared to date).
- Participation at 3 public meetings (1 meeting has been conducted to date).
- Preparation of meeting minutes (1 meeting has been conducted to date).

Specifically, a public meeting will be held upon completion of the Phase I RI/FS Report (and Phase II Work Plan), and Phase II RI/FS. Preparation of a Responsiveness Summary will be discussed under Task 12.

A.4.3 TASK 3 - FIELD INVESTIGATIONS

This task describes the various field investigations that will be conducted to collect data for meeting the specific Phase II RI/FS objectives that were discussed previously. The following field investigations will be performed as part of the Phase II RI:

- Hydrogeologic Investigation
- Domestic Well Survey/Investigation
- Surface Water and Sediment Investigation
- Soil Investigation

The following subsections provide the details of these investigations.

A.4.3.1 Field Activities

A.4.3.1.1 Preparation of Bid Specifications and Subcontract Procurement

Under this subtask, two bid specifications will be prepared. A subcontractor will be procured for drilling and installation of 9 monitoring wells, and approximately 15 test borings. Following the drilling program, a subcontractor will be procured in order to remove drums containing drill cuttings and decontamination fluids. The preparation of the bid specifications was conducted in conjunction with the development of this Phase II Work Plan to avoid delays when procuring subcontractors.

A.4.3.1.2 Mobilization

This subtask will consist of field personnel orientation and of equipment mobilization and will be performed at the initiation of the Phase II field activities, as necessary. A field team orientation meeting will be held at the NUS office to familiarize personnel with the site history, health and safety requirements, and field procedures.

Equipment mobilization may include, but will not be limited to, the setup of the following equipment:

- Soil gas survey equipment.
- Sampling equipment for surface water, sediments, and groundwater.
- Health and safety decontamination equipment.

The field office trailer was mobilized during Phase I of the RI will be used for the Phase II RI. The trailer is currently located on the Rohm & Haas property and has electrical and telephone service. Before any drilling is conducted, onsite underground utilities will be located by contacting the appropriate utility companies (i.e., gas, electric, telephone).

A.4.3.2 Hydrogeologic Investigation

The goals of the Phase II hydrogeologic investigation at the Croydon TCE Site are to (1) determine if Potential Source Area No. 1 and No. 3b are contributing to groundwater contamination within the study area, (2) define the site geology and hydrogeology north of Route 13, (3) define the possible groundwater divide located in the vicinity of River Road/Rohm & Haas Manufacturing Area B, (4) confirm the extent of the groundwater contaminant plume, and (5) determine whether another TCE plume is migrating into the study area from an offsite source.

Groundwater sampling data from residential and groundwater monitoring wells taken during the Phase I RI have confirmed that groundwater in the southeastern portion of the study area is

contaminated with TCE and other related compounds. These data indicate a possible source of contamination in an area just north of U.S. Route 13 in the area between Penn Street (to the west) and Bristol Lanes (to the east). Historical aerial photographs of this area have been used to identify two potential source areas (No. 1 and No. 3b), which will be the focus of this investigation (see Figure A.4-1).

The specific data outputs from the proposed hydrogeologic investigation will include the determination of the following:

- Extent of contamination in the alluvial aquifer to the north of state Route 13, west of Bristol Lanes and east of Penn Street.
- Groundwater flow patterns and rates in the vicinity of the small intermittent stream north of Potential Source Area No. 1.
- The location of a groundwater divide between the East Branch of Hog Run Creek and the water treatment basins on Rohm & Haas Manufacturing Area B.
- Hydraulic characteristics of the alluvial aquifer at the newly installed, Phase II monitoring wells.
- Confirm the interaction between surface waters and groundwater within the study area.
- Assess background groundwater quality.

The hydrogeologic field investigation consists of the following:

- Drilling and installation of nine new monitoring wells. A shallow and deep well will be installed at 4 locations and a shallow well will be installed at 1 location. Two locations (MW-16 and MW-17) will be within Potential Source Area No. 1. Three locations (MW-18, MW-19, and MW-20) will be used to assess Potential Source Area No. 3b.
- Sampling and analysis of all newly installed monitoring wells (9), 29 REM III "Phase I" monitoring wells, and 24 Rohm & Haas monitoring wells.
- Hydrologic testing (i.e., slug tests) of newly installed monitoring wells.
- Installation of two staff gauges in the intermittent stream to the north of Bristol Lanes and Potential Source Area No. 1.
- Two comprehensive rounds of water level measurements from all monitoring wells and staff gauges.

Fig A. 4-1
(See back pocket)

The data obtained through the field investigation will be evaluated and combined with historical site information and available geologic/hydrogeologic publications to provide an assessment of the geologic and hydrogeologic conditions within the site area.

As described above, a total of 9 monitoring wells will be installed. Five well locations have been determined at this time. Four well locations will consist of a water table well and a deep alluvial well. One location (MW19) will consist only of a shallow well. The well locations will provide data to determine lateral and vertical variations in contaminant concentrations, determine vertical flow components within the aquifer, provide data for determining groundwater flow patterns and the area where the source of contamination is located.

The proposed monitoring wells, the REM III "Phase I" monitoring wells, and the location of the Rohm & Haas wells are shown in Figure A.4-1. The rationale for each well location and the primary functions for each well cluster are listed in Table A.4-1. The proposed well locations were selected by the REM III Team with input from EPA based on the locations of suspected source areas, the observed locations of TCE-contaminated wells, the locations of existing groundwater monitoring points currently available for sampling, the overall expected groundwater flow pattern for the area, and the data requirements of the Phase II RI/FS.

Well depths are projected to be approximately 15 to 25 feet deep for water table wells and from 35 to 65 feet deep for deep alluvial wells. Drilling, well construction/installation techniques, well development, and aquifer testing methods are described in the following subsections.

During the field investigation, two staff gauges will be installed in the intermittent stream north of Potential Source Area No. 1. The four staff gauges installed during Phase I of the RI will be re-surveyed for horizontal and vertical control because of suspected vandalism. The staff gauges will provide information to help define local surface water/groundwater interactions.

A.4.3.2.1 Drilling Operations

Hollow stem auger drilling is the preferred method. Potable water may be used if difficult drilling conditions are encountered. Each boring will be lithologically logged by the field geologist via split-barrel samples or cuttings, depending on the drilling/sampling techniques used. A complete log of each boring will be maintained, describing lithologies, depths of contacts, water levels/water yielding zones, total depths, and any other pertinent data that may be discovered. Geologic samples will be described using the Unified Soil Classification System (USCS). For geologic description purposes, split-barrel sampling will be performed at 5-foot intervals during

TABLE A.4-1

PROPOSED MONITORING WELL RATIONALE
CROYDON TCE SITE

NUS Well Location	Shallow and Deep Well Cluster	Well Function (A = Primary, B = Secondary)				Rationale
		Overall Water Quality	Source Area Identification	Plume Delineation	Groundwater Flow Directions	
CR-MW16	Yes	B	A	A	B	Downgradient of potential source No. 1.
CR-MW17	Yes	B	A	A	A	Upgradient well cluster from source No. 1. It will be located south of the intermittent stream (If not enough clearance, well may be located on north side of the intermittent stream).
CR-MW18	Yes	B	A	A	B	Upgradient of potential Source No, 3b.
CR-MW19	No	A	A	B	B	Close to suspected source area (Sherwood Refinishing Shop).
CR-MW20	Yes	B	A	A	B	Downgradient of potential source No. 3b.

operations. Detailed logging procedures for samples are described in the FOP.

Continuous sampling for soil analyses will be performed at monitoring well location MW19 since it is adjacent to a suspected source area. Samples will be collected from the ground surface to the water table, approximately 15 feet. A three-inch split spoon will be used to collect the sample. A total of 5 samples will be taken and analyzed for volatile organics.

A.4.3.2.2 Well Construction/Installation

Monitoring wells will be constructed of NSF-certified 2-inch diameter, nonglued-flush-joint, threaded, Schedule 40 PVC casing and wellscreens equipped with a 2-foot trap below the screen and a PVC end plug. The trap will be used to collect DNAPL if encountered. Figure A.4-2 illustrates typical well construction details for a monitoring well.

Well screens will be 10 feet in length with a slot size of 0.02 inches. The monitoring well installation procedure will consist of placing the PVC pipe and screen into the completed boring and backfilling the annulus of the boring, around the well screen, and approximately 1 to 3 feet above the well screen with clean silica sand. A bentonite pellet seal (minimum 2-foot thickness) will then be installed; the remainder of the annulus of the boring will be backfilled with a cement-bentonite grout to ground surface. The depths of all backfill material will be constantly monitored during the well installation process by means of a weighted steel or plastic tape.

Protective steel casings equipped with locking caps will be installed around all wells. Flush-mounted casings (see Figure A.4-3) may be installed at locations where a protruding casing would be undesirable (near roadways). Keyed-alike locks will be supplied by the drilling subcontractor for all wells. Monitoring wells will be surveyed after installation to determine vertical and horizontal coordinates.

A.4.3.2.3 Well Development

Monitoring wells will be developed after installation to remove fines and sediments from around the well screens and to remove drill cuttings and residual drilling fluids from the area around the monitored interval of the boring. Wells will be developed by air lift, bailing and surging, or by pumping, as determined by the field geologist.

A.4.3.2.4 Aquifer Testing

Monitoring wells will be used for aquifer testing to determine the groundwater flow conditions. The data generated from these tests will be used to define the water-yielding characteristics of the formation, develop groundwater velocity values for the

MONITORING WELL

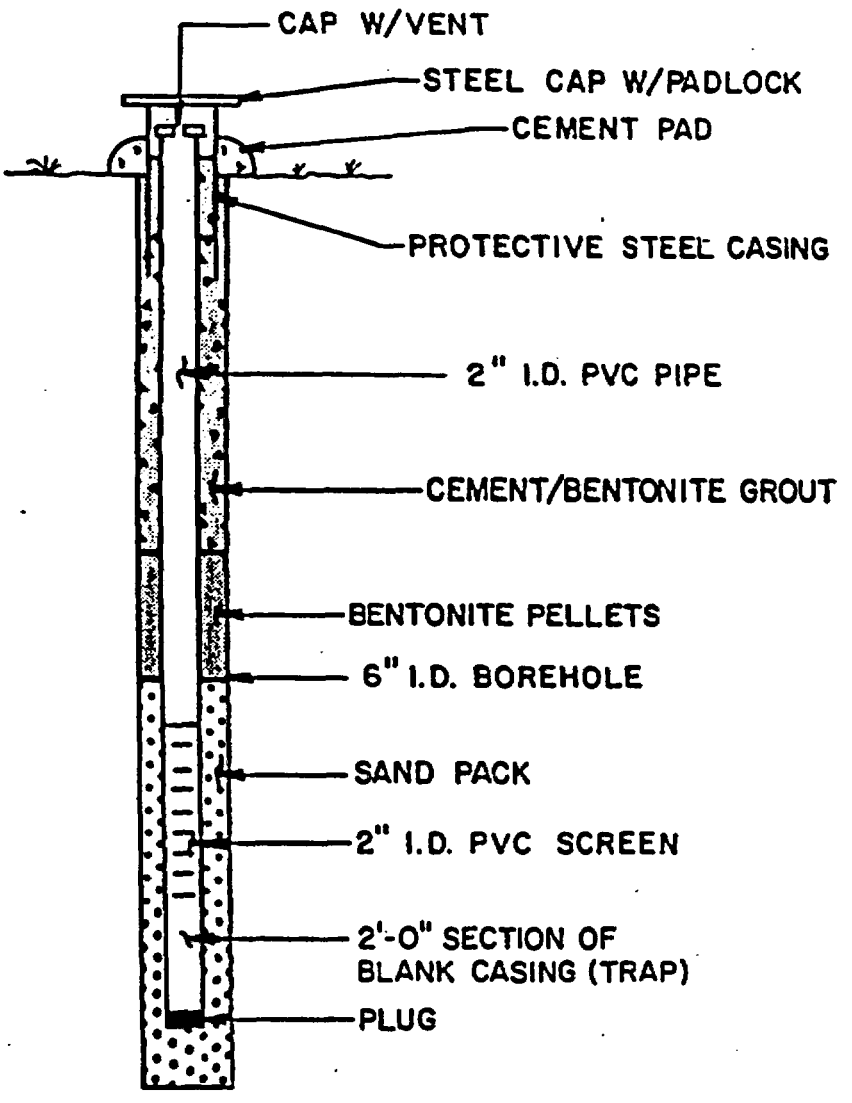

FIGURE A.4-2

MONITORING WELL CONSTRUCTION DETAILS
CROYDON TCE SITE, BUCKS COUNTY, PA

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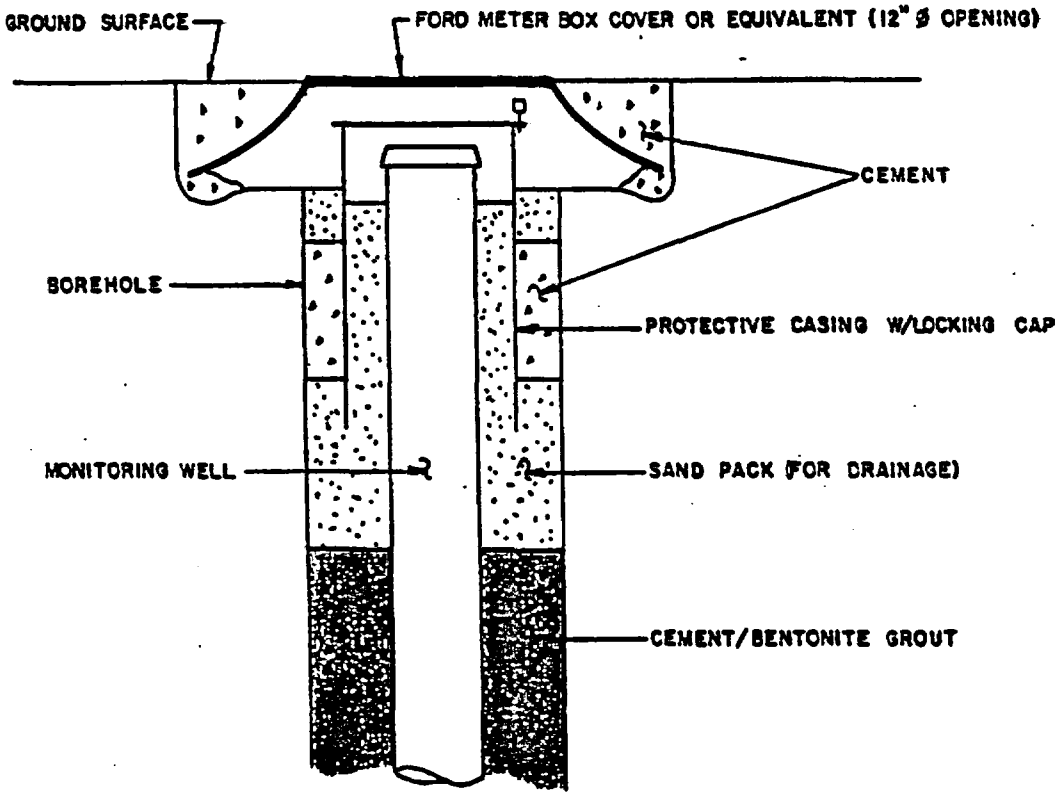
NUS CORPORATION



FLUSH MOUNTED
PROTECTIVE CASING INSTALLATION
CROYDON TCE SITE, BUCKS COUNTY, PA

NOT TO SCALE

FIGURE A.4-3

NUS CORPORATION

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alluvial aquifer, and estimate the rate of groundwater movement across and away from the site. Slug tests will be performed in the newly installed, Phase II monitoring wells and evaluatedusing the most appropriate evaluation technique for each type of test and for each individual set of hydrogeologic conditions. (The wells and evaluation techniques will be determined following the drilling program.) Pressure transducers and data loggers will be used for data collection, where appropriate, to obtain the most accurate field data possible. It is anticipated that each new monitoring well will be tested.

A.4.3.2.5 Water Level Monitoring

At least two comprehensive rounds of water level measurements will be made from the 29 Phase I REM III monitoring wells, the 9 Phase II monitoring wells, and selected Rohm & Haas monitoring wells. Staff gauge readings along Hog Run Creek and the intermittent stream to the north of the site will be recorded during each round of water level measurements. All measurements for each collection round shall be collected within a 24-hour period of consistent weather conditions to minimize atmospheric/ precipitation effects on groundwater conditions. Measurements will be taken with an M-scope (electrical water-level indicator), that has permanent markings at 1-foot intervals and that has both visual and audio signals. The top of the PVC well casing will be used as the reference point for determining depths of water. These water levels will be used to determine groundwater flow directions and to identify any variations which may occur in flow directions throughout the study area over time.

A.4.3.2.6 Field Sampling Program

Sampling and analysis of groundwater will be performed to define the horizontal and vertical extent of contamination, to delineate the contaminant plume(s), and to provide sufficient data for the assessment of public health and environmental effects, and the evaluation of remedial action alternatives. Sixty-one monitoring wells will be sampled during the Phase II RI. The groundwater sampling program will consist of sampling 9 newly installed monitoring wells, 29 existing REM III Phase I monitoring wells, and 24 Rohm & Haas monitoring wells. One round of groundwater sampling is proposed. Table A.4-2 summarizes the groundwater sampling and analysis program.

Field measurements to be taken on all monitoring wells include:

- pH
- Specific conductance
- Temperature
- Dissolved oxygen

These parameters will be measured onsite using calibrated field instrumentation (analytical option Level 1).

TABLE A.4-2

PROPOSED SAMPLING AND ANALYSIS PROGRAM - MONITORING WELLS
CROYDON TCE SITE

Media	No. of Samples	Field Duplicates	Field Blanks	Equipment Rinsate Blanks	Trip Blanks	Analysis (1) Required	Selected Analytical Option
Monitoring Wells	62(1)	4	4	4	20	TCL Volatile Organics	IV
	3(2)	1	1	1	0	TCL BNA Extractable	IV
	3	1	1	1	0	TCL Pesticides/PCBs	IV
	3	1	1	1	0	TAL Inorganics (3)	IV
	3	1	1	1	0	TOC	III
	62	0	0	0	0	pH	I
	62	0	0	0	0	Specific Conductance	I
	62	0	0	0	0	Dissolved Oxygen	I
	62	0	0	0	0	Temperature	I

(1) Includes 59 groundwater samples and 3 dense nonaqueous phase liquid (DNAPL) samples.
(2) DNAPL samples only.
(3) Includes cyanide.

Based on the Phase I RI analytical data, volatile organic compounds are considered the principle groundwater contaminants of concern. Consequently, all groundwater samples will be analyzed for Target Compound List (TCL) volatile organic compounds using EPA Method 601/602.

To insure that the data obtained are of sufficient quality for the intended data uses, Data Quality Objectives (DQOs) were established. Analytical options selected to achieve the DQOs include Level IV for the TCL volatile organic analyses.

Level IV was selected to support site characterization, the risk assessment, and the feasibility study.

Additionally, a white immiscible liquid was observed in groundwater during the development and purging of some of the Phase I monitoring wells. This liquid was usually observed after several minutes of pumping. The liquid may be a Dense Nonaqueous Phase Liquid (DNAPL) since it sank to the bottom of the holding container. Since the presence/absence of contaminants associated with this liquid is unknown, it will be sampled during the Phase II RI if observed. A maximum of three samples will be collected and analyzed for the following parameters:

- TCL volatile organics (expanded TIC list)
- TCL base-neutral/acid extractable organics
- TCL pesticides/PCBs
- Target Analyte List (TAL) inorganics
- Cyanide
- Total Organic Carbon
- pH

These data are required to support site characterization, the public health and environmental assessment, and the feasibility study. Level IV analyses was selected to meet the project objectives.

A.4.3.3 Residential Well Investigation

A discussion of the occurrence and distribution of the contaminants detected in the residential wells sampled during the Phase I RI is provided in Section 4.1 of the Phase I RI report. As indicated in Section 4.1, volatile organic contaminants (trichloroethene and related constituents) were detected at levels of potential concern in wells sampled in the vicinity of the TCE plume and/or in other portions of the study area. To confirm the presence/absence of these contaminants and to adequately characterize potential public health risks, selected residential wells will be resampled during the Phase II RI. Residential wells to be resampled include those located in the vicinity of the contaminant plume.

The residential well sampling and analysis program is summarized in Table A.4-3. A total of 9 residential wells will be sampled and analyzed for TCL volatile organics using EPA Method 601/602. Wells to be sampled for TCL volatile organics include residential wells located in the vicinity of the plume and one residential well located outside of the TCE plume that exhibited trichloroethene at 5 µg/l (RW 32). Figure A.4-4 depicts the located of these wells.

TAL inorganic constituents and/or nitrate. A total of two residential wells will be resampled and samples submitted for analyses of TAL inorganics. Eight residential wells will be resampled and samples submitted for nitrate analysis as indicated on Table A.4-3.

Analytical options were selected to ensure the data collected are of sufficient quality for the intended data use. To support the Phase II public health assessment, Level IV analytical option was selected.

A.4.3.4 Soil Investigation

The soil investigation for the Croydon TCE Site Phase II RI/FS consists of sampling and analysis of surface and subsurface soils. A discussion of the proposed investigation is provided in the following subsections.

A.4.3.4.1 Surface Soil Investigation

Eight surface soil samples were collected from 3 locations during the Phase I RI. Sampling locations are shown in Figure 4-5 of the Phase I RI Report. These locations included the athletic fields located adjacent to the Mary Devine Elementary School, an area in the vicinity of monitoring well MW-15 (across from Manufacturing Area B), and the yard of a private resident.

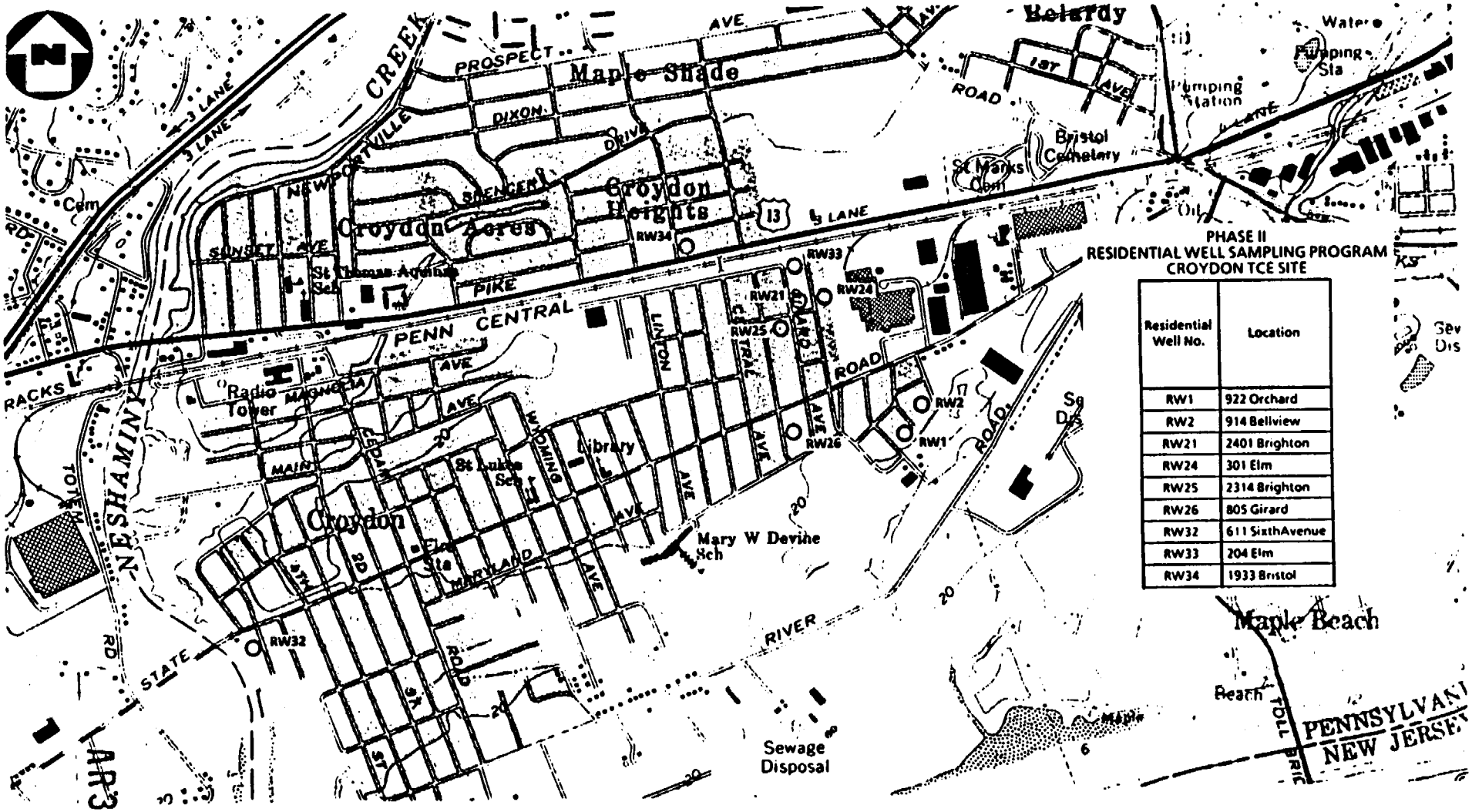
Section 4.0 of the Draft Phase I RI report provides a discussion of the occurrence and distribution of constituents detected in the surface soil samples. PCBs (Aroclor 1016 and 1242) were detected in all of the samples at a concentration range of 163 to 590 µg/kg. Additionally, pesticides and polycyclic aromatic hydrocarbons (PAHs) were identified in several of the samples.

The source of these surface soil contaminants has not been established. It is not likely that they are associated with Potential Source Areas No. 1 and 3b. It is currently unknown whether the levels detected are representative of background concentrations or if a potential source of these contaminants is present within the study area. During the Croydon TCE Site Phase I public meeting, a local resident stated that the Rohm & Haas Landfill is a potential source of these compounds. This resident also indicated that fill material from the landfill was allegedly placed in these areas at some previous time.

TABLE A.4-3

PROPOSED SAMPLING AND ANALYSIS PROGRAM - RESIDENTIAL WELLS
CROYDON TCE SITE

Media	No. of Samples	Field Duplicates	Field Blanks	Equipment Rinsate Blanks	Trip Blanks	Analysis Required	Selected Analytical Option
Residential Wells	9	1	1	0	2	TCL Volatile Organics	IV



Residential Well No.	Location
RW1	922 Orchard
RW2	914 Bellview
RW21	2401 Brighton
RW24	301 Elm
RW25	2314 Brighton
RW26	805 Girard
RW32	611 SixthAvenue
RW33	204 Elm
RW34	1933 Bristol

FIGURE A.4-4

PHASE II RESIDENTIAL WELL SAMPLING PROGRAM
CROYDON TCE SITE, BUCKS COUNTY, PA

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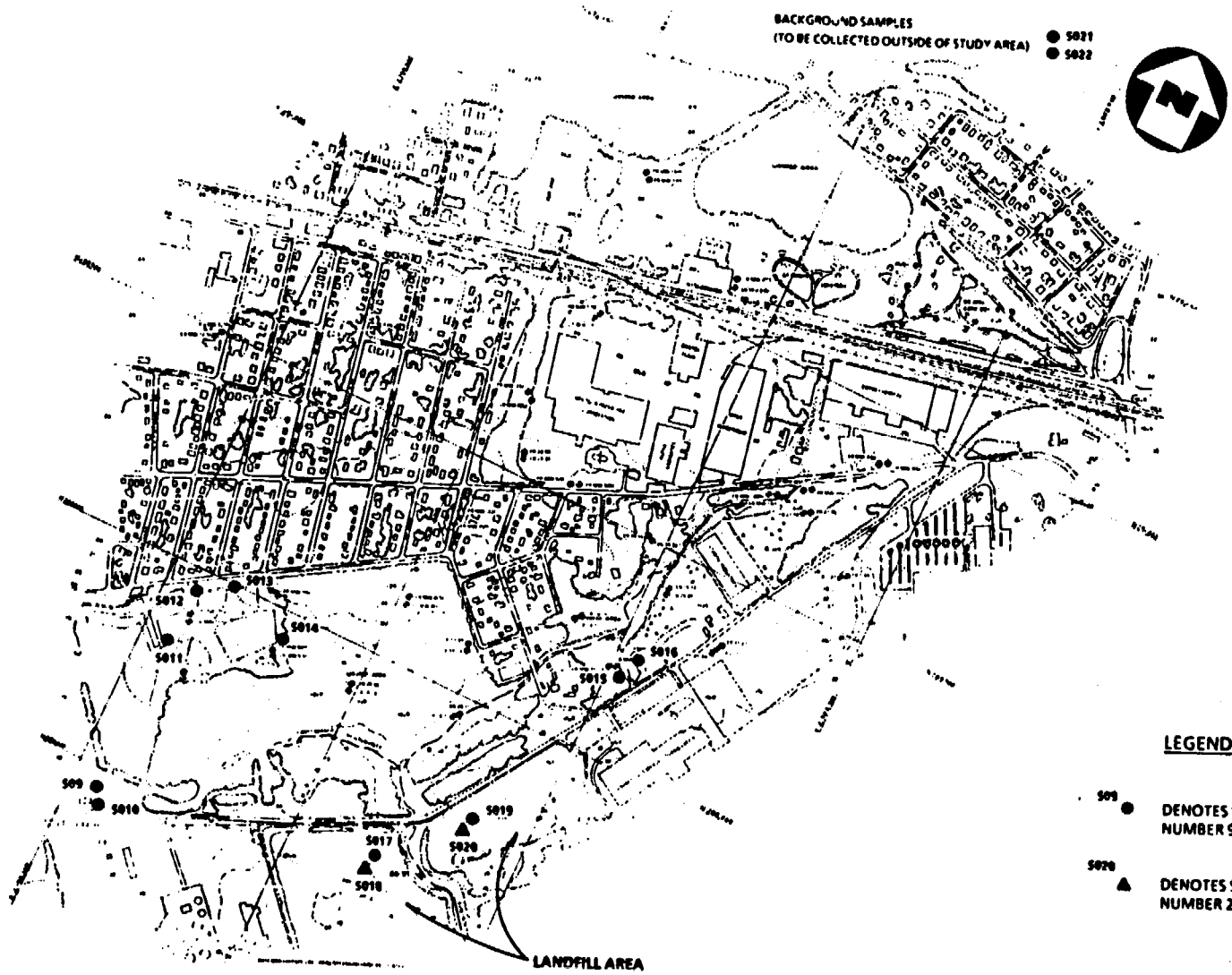

PHASE II SURFACE AND SHALLOW SOIL SAMPLING LOCATIONS
CROYDON TCE SITE, BUCKS COUNTY, PA

FIGURE A.4-5

NUS CORPORATION

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A surface soil sampling and analysis program will be conducted during the Phase II RI to confirm the presence/or absence of these compounds, to establish background concentrations, and to evaluate the Rohm & Haas landfill as a potential contaminant source. Table A.4-4 summarizes the scope of the surface soil sampling and analysis program. Figure A.4-5 illustrates the Phase II RI soil sampling locations.

Two surface soil samples will be collected from each of the previously sampled locations (i.e. athletic fields, area in the vicinity of MW-15, and in the yard of the private resident) to confirm the presence/absence of contamination.

To establish background concentrations, two background samples will be collected. Exact sample locations will be determined in the field to ensure that the samples are obtained outside of the study area.

To determine whether the landfill is a potential contaminant source, surface (0"-6") and shallow (36"-48") soil samples (grab) will be collected from the Rohm & Haas landfill area. Two surface soil samples and two shallow soil samples will be obtained for analysis. The shallow soil samples will be collected at a depth of 3 to 4 feet using a hand auger.

All samples collected will be submitted for analysis for the following parameters:

- TCL Base/Neutral/Acid extractable organics.
- TCL Pesticides/PCBs.

These data are required to support the public health and environmental assessment. To support the DQOs, Level IV analytical option was selected.

Shallow soil samples will also be collected near the Sherwood Refinishing Shop, which is suspected as the source within Potential Source Area No. 3b. Four shallow borings will be hand augered to a depth of 4 feet. Two soil samples will be collected from each shallow boring; a surface sample (0-6 inches) and a shallow soil sample (3-4 feet). The locations will be based on the results of soil gas analysis or visual observations. Table A.4-4 outlines the required analyses.

A.4.3.4.2 Subsurface Soil Sampling

Adequate source characterization is essential to the Superfund RI/FS process. At sites where soils are considered a source of contaminants, the chemical nature and concentrations of the contaminants and the locations and volumes of contaminated soils must be determined. As discussed in Sections 1.0 and 2.4 of the RI Report, Potential Source Area No. 1 and No. 3b were implicated as potential sources of groundwater contamination. All monitoring and residential wells located downgradient of

TABLE A.4-4

PROPOSED SAMPLING AND ANALYSIS PROGRAM - SURFACE AND SHALLOW SOILS
CROYDON TCE SITE

Media	No. of Samples	Field Duplicates	Field Blanks	Equipment Rinsate Blanks	Trip Blanks	Analysis Required	Selected Analytical Option
Surface and Shallow Soils at suspected landfill dumping areas.	14	1	1	1	0	TCL BNA Extractables	IV
	14	1	1	1	0	TCL Pesticides/PCBs	IV
Surface and shallow soils near Sherwood Refinishing Shop.	8	1	1	1	1	TCC Volatile Organics	IV
	4	0	0	0	0	BTU, Percent Ash, TOC	IV

these source areas were contaminated with TCE and related compounds. No residential wells upgradient of these source areas exhibited TCL organic contamination. The soils investigation for the Croydon TCE Site Phase II RI/FS is designed to provide the necessary data with which to characterize these potential source areas and to support the feasibility study.

The general technical approach to the source characterization includes a preliminary soil gas testing investigation to identify areas consequently warranting further study at the two potential source areas, and a refined soil gas testing program to delineate the extent of the contamination. If contaminant "hot spots" are identified by the soil gas investigation, a confirmatory soil boring sampling and analysis program will be conducted.

Soil gas testing will be conducted over the entire potential source area No. 1. However, only a small portion of potential source area No. 3b will be investigated via soil gas. This area is the property of the Sherwood Refinishing Shop, which is located just east of Penn Street along U. S. Route 13.

Soil Gas Sampling

The soil gas method includes drilling (hand augering) shallow 3-inch boreholes to a desired depth (2-4 feet). A soil gas sampling probe, consisting of a 3-foot section of PVC pipe with a fixed expansion bulb to seal the annular space, is inserted into the borehole. The probe is fitted with a cap including a reducing fitting that allows the probe to be connected to a pump with flexible tubing. The pump is operated long enough to purge approximately 10 probe volumes and a sample is obtained directly from the flexible tubing with a syringe. The sample may then be injected directly into a photovac portable gas chromatograph with a photoionization detector. Numerous other methods of soil gas sampling and analysis exist. However, the low detection limits afforded by the photovac, as well as the simplicity of this method make this approach favorable. The soil gas samples will be analyzed for PCE, TCE, and TCA (Analytical Option II).

For Potential Source Area No. 1, a preliminary survey will be based on an unbiased 200-foot grid (see Figure A.4-6). A 200-foot grid was selected to provide adequate coverage of this suspected source area. For potential source area No. 3b, a much smaller grid (10 foot) will be used to assess the extent of soil contamination. The area of concern within potential source area No. 3b is estimated to be 25 feet by 60 feet in total area. As mentioned previously, the area of concern is the Sherwood Refinishing Shop.

The data from the preliminary survey will be reviewed in the field with EPA, and isoconcentration plots will be generated. Contaminated areas should be identifiable based on these isoconcentration plots. A refined soil gas survey grid will

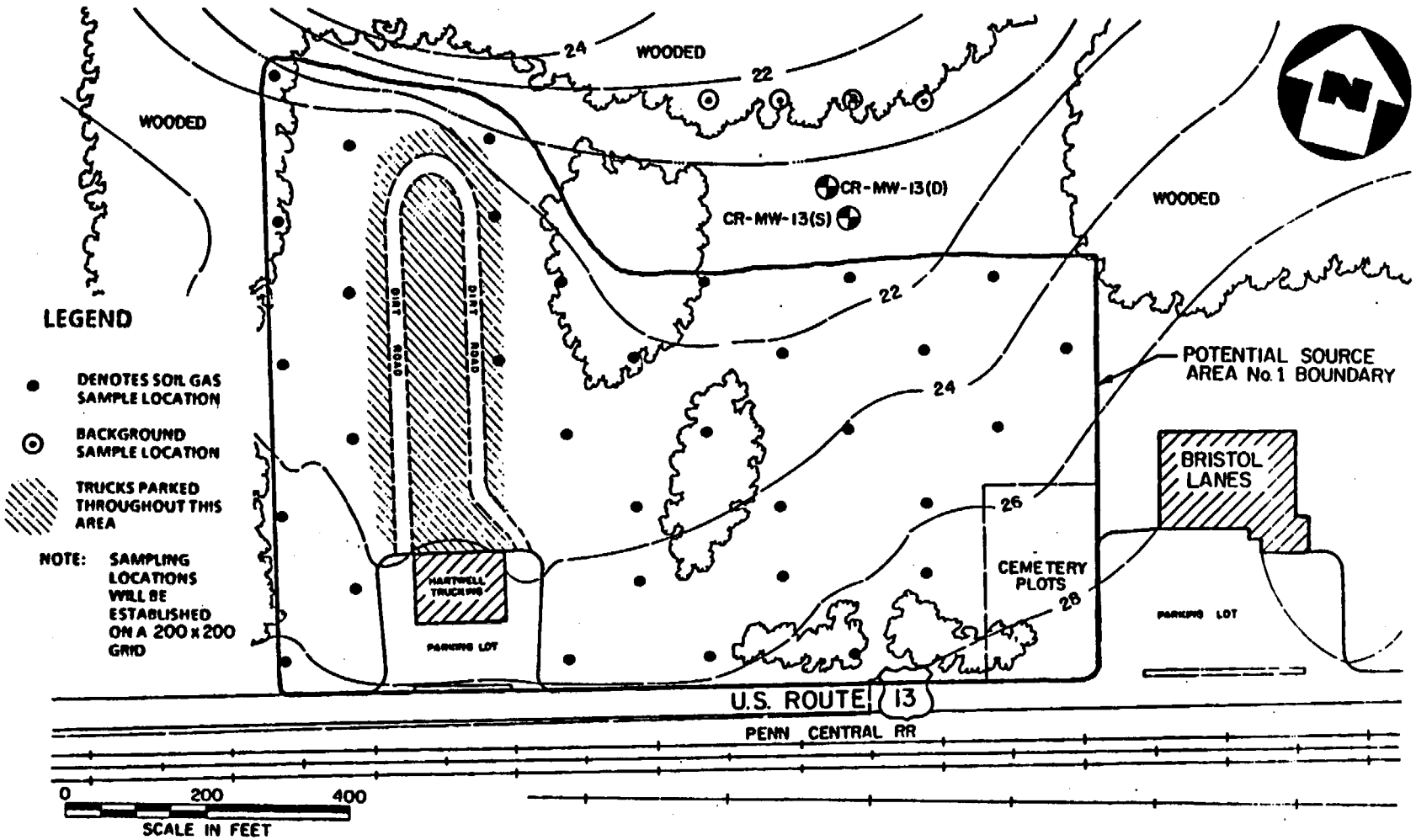


FIGURE A.4-6

PROPOSED SOIL GAS SAMPLING LOCATIONS
CROYDON TCE SITE, BUCKS COUNTY, PA

NUS CORPORATION

then be generated and sampling will be conducted to further define the contaminated area(s). As shown on Figure A.4-6, preliminary soil gas survey points have been identified. The number of grid points included in the refined survey cannot be determined at this time. Additionally, background soil gas samples will be obtained to determine background levels.

Subsurface Soil Sampling

Areas exhibiting the highest degree of soil gas contamination will be evaluated further via a subsurface soil sampling and analysis program. Areas exhibiting the highest degree of contamination will be identifiable by evaluating isoconcentration plots of the soil gas data. A single soil boring will be installed at each "hot spot" identified on the isoconcentration map. (A "hot spot" is defined as a sampling node which exhibits the presence of PCE, TCE, or TCA.) Continuous split-spoon soil samples will be collected from the initial boring to the water table (approximately 15 feet). A 3-inch split spoon will be used to ensure a sufficient quantity of sample is obtained for analyses.

If soil contamination is evident in the samples, based on air monitoring (HNU), headspace analysis, or visual analysis, an additional four soil borings will be installed at each corner of the contaminated area(s). These four soil borings will assist in determining the horizontal and vertical extent of soil contamination. Split-spoon soil samples will be collected in each of the four borings as previously described. If no contamination is evident in the initial boring, then the additional four soil borings will not be required.

Each sample collected will be submitted to a laboratory for analysis. The following analyses will be conducted:

- TCL volatile organics
- TCL base-neutral/acid extractable organics
- TCL pesticides/PCBs
- TAL inorganics

Level IV analysis is required for the TCL and TAL analyses since these data will support the risk assessment and feasibility study.

Additionally, a maximum of four soil samples from each contaminated area will be analyzed for the following parameters:

- pH
- BTU content
- Percent ash
- Grain size distribution
- Moisture content
- Nitrogen
- Phosphorous
- TOC

- COD
- BOD

The actual boring location and sampling depth will be determined in the field, based on areas exhibiting the highest soil gas readings or by visual inspection of drill cuttings.

These data are required to evaluate potential remedial technologies (i.e., incineration, fixation, in-situ treatment) for the feasibility study. The analytical option selected to meet this objective is Level III.

Table A.4-5 summarizes the scope of the soil sampling and analysis program. It is not possible to estimate the actual number of soil borings and soil samples that will be collected at this time. The number of borings installed and the number of samples obtained will depend upon the results of the soil gas survey and the presence/absence of contamination identified in the initial boring. However, it is assumed that a total of 15 borings and 45 soil samples (3 samples from each boring) will be submitted for analysis.

A.4.3.5 Surface Water and Sediment Investigation

Surface water and sediment samples were collected during the Phase I RI to determine the quality of local surface waters within the study area. The data were used during the Phase I RI to estimate health risks associated with the use of these waters. Because of field constraints or limitations during the Phase I field investigation, surface water and sediment samples were not collected from the unnamed tributary located north of Potential Source Area No. 1 or from the Delaware River. To characterize surface waters and sediments within the study area, samples from these surface water bodies will be obtained during the Phase II RI.

The proposed Phase II surface water and sediment sampling locations are presented on Figure A.4-7. Table A.4-6 summarizes the rationale for each sampling location. Sample analyses are provided in Table A.4-7.

All surface water samples will be analyzed for the following:

- TCL volatile organics (EPA Method 601/602)
- pH
- Specific conductance
- Alkalinity
- Dissolved oxygen
- Total suspended solids

Additionally, the sediment samples obtained from the same location will be analyzed for the following parameters:

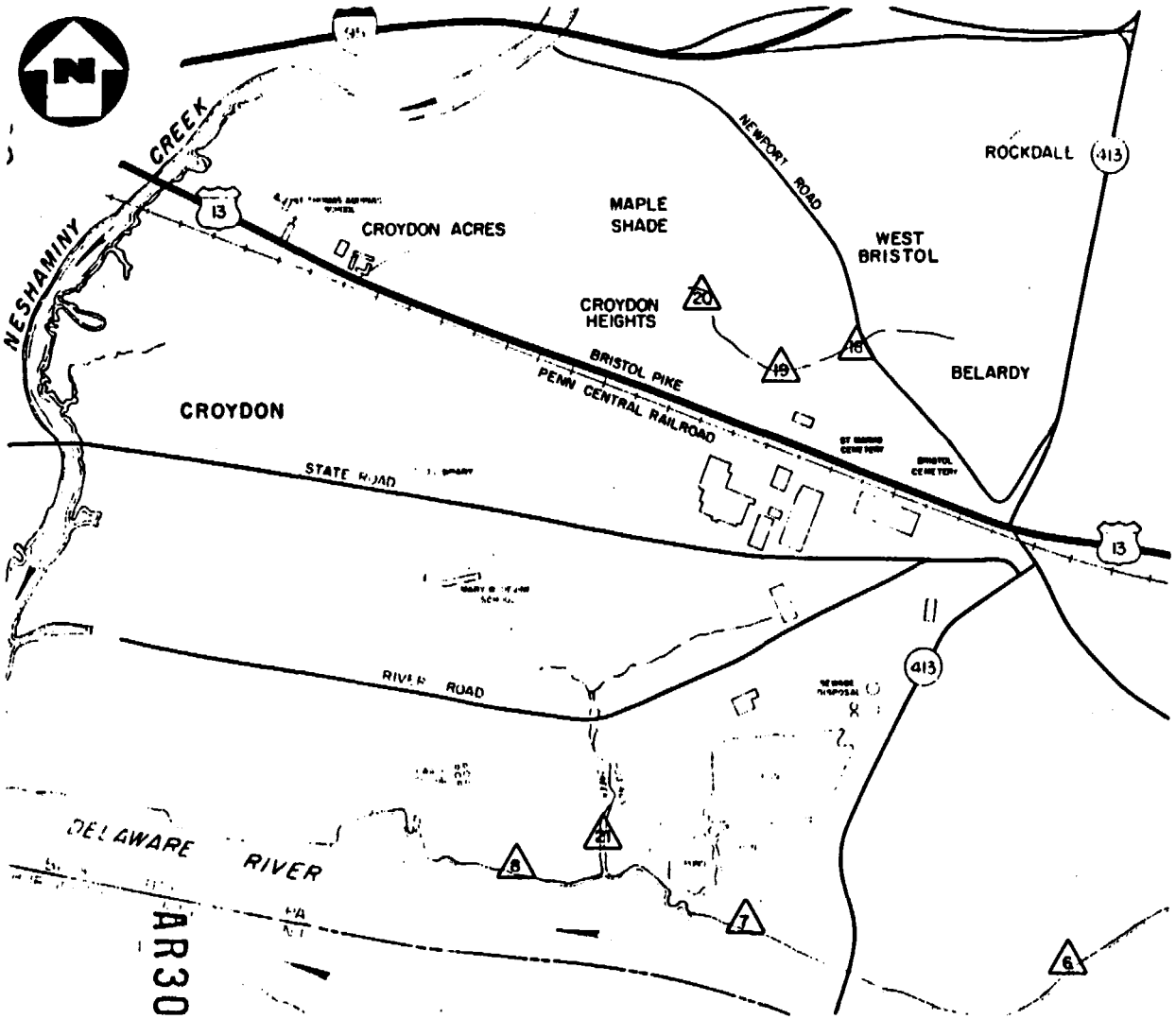
- TCL volatile organics (EPA Method 601/602)
- TCL base-neutral/acid extractable organics

TABLE A.4-5

PROPOSED SAMPLING AND ANALYSIS PROGRAM - SUBSURFACE SOIL SAMPLES
CROYDON TCE SITE

Media	No. of Samples	Field Duplicates	Bottle Blanks	Equipment Rinsate Blanks	Trip Blanks	Analysis (1) Required	Selected Analytical Option
Subsurface Soils	45(1)	3	3	3	10	TCL Volatile Organics	IV
	45	3	3	3	0	TCL BNA Extractable	IV
	45	3	3	3	0	TCL Pesticides/PCBs	IV
	45	3	3	3	0	TAL Inorganics (2)	IV
	12(3)	1	0	0	0	BTU, Percent Ash, Grain Size, CEC, Moisture Content, Nitrogen, Phosphorus, TOC, COD, BOD, pH	III

(1) Assumes 3 samples from 15 borings.
(2) Includes cyanide
(3) Assumes 4 samples from 3 potentially contaminated areas.



Station No. *	Description
6	Delaware River - Upstream
7	Delaware River - Adjacent to Rohm and Haas landfill area
8	Delaware River - Downstream from confluence with Hog Run Creek
18	Intermittent stream near Potential Source Area No. 1 (eastern portion)
19	Intermittent stream near Potential Source Area No. 1 (central portion)
20	Intermittent stream near Potential Source Area No. 1 (western portion)
21	Hog Run Creek prior to discharge into the Delaware River

* Station Numbers were not sampled during the Phase I RI due to unanticipated field conditions

△19 Denotes Surface Water and Sediment Sampling Location Number 19

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PHASE II SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
CROYDON TCE SITE, BUCKS COUNTY, PA

FIGURE A.4-7

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TABLE A.4-6

SURFACE WATER/SEDIMENT SAMPLING LOCATIONS AND RATIONALE
CROYDON TCE SITE

Station No.*	Description	Rationale
6	Delaware River - Upstream	Determine background surface water/sediment quality.
7	Delaware River - Adjacent to Rohm & Haas landfill area	Determine surface water/ sediment quality prior to potential influence of Hog Run Creek.
8	Delaware River - downstream from confluence with Hog Run Creek	Assess impact from Hog Run Creek
18	Intermittent stream near Potential Source Area No. 1 (eastern portion)	Assess impact, if any, of groundwater. Determine influence of Potential Source Area No. 1.
19	Intermittent stream near Potential Source Area No. 1 (central portion)	Same as No. 18.
20	Intermittent stream near Potential Source Area No. 1 (western portion)	Determine impact, if any, of groundwater in this portion of the study area.
21	Hog Run Creek prior to discharge into the Delaware River.	Evaluate impact on Hog Run Creek from the Rohm & Haas Landfill.

*Station numbers can be cross-referenced with Figure A.4-7.

TABLE A.4-7

PROPOSED PHASE II SURFACE WATER AND SEDIMENT
SAMPLING AND ANALYSIS PROGRAM
CROYDON TCE SITE

Media	No. of Samples	Field Duplicates	Field Blanks	Equipment Rinsate Blanks	Trip Blanks	Analysis Required	Selected Analytical Option
Surface Water	6	1	1	1	1	TCL Volatile Organics	IV
	6	1	0	0	0	TSS	I
	6	1	0	0	0	Alkalinity	I
	6	1	0	0	0	Specific Conductance Temperature, DO, pH	I
Sediment	6	1	1	1	1	TCL Organics	IV
	6	1	1	1	0	TAL Inorganics*	IV
	6	0	0	0	0	pH, temperature, specific conductance	I
	6	0	0	0	0	TOC, grain size, percent moisture	III

* Includes cyanide.

- TCL pesticides/PCBs
- TAL inorganics
- Cyanide
- pH, Specific conductance, TOC, grain size, percent moisture

These data are required to characterize surface water and sediments for the public health and environmental assessment and for the feasibility study. Consequently, analytical options selected include Level IV analyses for the TCL and TAL parameters and Level I for the pH analyses.

A.4.4 TASK 4 - SAMPLE ANALYSIS AND VALIDATION

A.4.4.1 Sample Analysis

Tables A.4-2 through A.4-7 summarize the sample analysis for each sample by media for the Phase II RI field activities. The number of samples to be collected, including QA/QC samples, is also provided in these tables. All samples will be analyzed by laboratories that participate in the EPA Contract Laboratory Program. If CLP laboratory analysis cannot be arranged, the samples can be analyzed by the REM III Laboratory Program. REM III laboratories will be employed to analyze a limited number of soil analyses including BTU content, percent ash, grain size, pH, BOD, COD, TOC, and percent moisture.

A.4.4.2 Quality Control and Data Validation

Validation is a systematic process of reviewing a body of data to provide assurance that the data are adequate for their intended use. The process includes the following activities:

- Auditing calibration measurement system and calibration verification.
- Auditing quality control activities.
- Screening data sets for outliers.
- Reviewing data for technical credibility versus the sample site setting.
- Auditing field-sample, data records and chain-of-custody.
- Checking intermediate calculations.
- Certifying the previous process.

The review and validation of CLP or REM III laboratory data will be conducted by REM III Team chemists using the following EPA documents:

- USEPA, 1987. Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analyses with modifications for use within Region III. EPA Technical Directive Document No. HQ8410-01. Hazardous Site Control Division. USEPA - OSWER, Washington, D.C. September 9, 1987.

- USEPA, Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses. EPA Office of Emergency and Remedial Response. USEPA - OSWER, Washington, D.C.

Several factors that will be considered during validation are sample holding times, instrument calibration, blank results, surrogate recoveries, matrix spike/matrix spike duplicates, chain-of-custody, and any other control procedures that are applicable.

A.4.5 TASK 5 - DATA EVALUATION

The purpose of this task is to organize the validated data collected from the field and laboratories into a working format for analysis and then perform the necessary evaluations to meet the project objectives. Task 5, therefore, has two distinct components, data reduction and data evaluation. Following are brief descriptions of these components.

A.4.5.1 Data Reduction

Data obtained from the various field investigations will be condensed and organized to facilitate evaluation and presentation in this subtask. Both the Phase I and Phase II data will be considered in the Phase II RI/FS. Reduction of hydrogeologic data will result in the production of various tables, figures, and drawings describing and summarizing the pertinent site features. These might include

- Figures displaying boring and monitoring well locations and elevations.
- Various hydrogeologic cross-sections.
- Flow nets and groundwater contours.
- Well log descriptions.
- Aquifer test data.

Data reduction will be facilitated by computerization. The computerized sampling and analytical data base will be amenable to manipulation and creation of different sorting profiles. Sorting profiles will assist in evaluating the occurrence and distribution of contaminants within the different media. Appropriate tables, maps, and figures will be produced to

summarize the occurrence and distribution of contaminants at the site and adjacent environs.

A.4.5.2 Data Evaluation

Once the data are reduced to a usable format, the data will be reviewed and evaluated to determine whether the Phase II RI/FS project objectives have been met. Following a preliminary assessment of the field investigation findings, a meeting will be held between USEPA Region III and the REM III Team to evaluate the Phase II results.

A.4.6 RISK ASSESSMENT

A.4.6.1 Baseline Public Health/Environmental Assessment

The public health/environmental assessment will address the potential human health and environmental effects associated with the Croydon TCE Site under the no-action alternative. The no-action alternative assumes that no remedial (corrective) actions will take place at the site. Evaluation of the no-action alternative is required under Section 300.68(f)(v) of the National Contingency Plan (NCP). By conducting such an assessment, the Environmental Protection Agency (EPA) will be able to determine if remedial actions are indicated for any area of the site. In addition, the baseline assessment will also provide a basis for determining the reduction in risk resulting from remediation. The baseline assessment will be based on the RI environmental monitoring data and other information developed during the RI. The main steps in this assessment will be performed in accordance with the latest EPA policy and guidance on risk assessment in general and for Superfund sites in particular (EPA, 1986d).

The first step in the public health/environmental assessment will be to review the results of the environmental sampling and other information developed during the Phase I and Phase II RIs to identify chemicals of potential concern for detailed study during the risk assessment. A key element in this screening process is a comparison of site concentrations to background levels of chemicals in appropriate media; naturally occurring chemicals present at background concentrations will not be considered to be site-related and will not be evaluated in the assessment. In addition, chemicals present in blanks at similar concentrations (i.e., laboratory and field contaminants) will not be selected for the detailed analysis. Depending on the number of chemicals detected at the site, selection of a subset of chemicals referred to as the chemicals of concern or indicator chemicals may not be necessary. If the selection is needed, relative concentration, mobility, persistence, and toxicity of the contaminants in the environmental samples taken at the site will be considered.

The objective of the exposure assessment is to identify actual or potential routes of exposure and characterize the likely

magnitude of exposure to human or environmental receptors. Potential human exposure pathways that may be important under current or future land-use conditions include ingestion of groundwater, inhalation of volatiles released from groundwater, exposure to environmental receptors from the surface water bodies at the site, as well as any other potentially complete pathways. For each exposure scenario, concentrations in relevant environmental media (air, surface water, groundwater, and soil) at the potential receptors' locations will be identified. Where concentrations have not been measured at the exposure point, estimates of current concentrations may, in certain instances, be made using models. The choice of models will be based on the sampling results. They may be simple partitioning models to determine release from soil or water to another medium (e.g., air) or more complex transport models. It is not possible to identify the specific models that will be selected here since it is not known what the data will reveal about the distribution of chemicals from the site. Should the modeling become necessary, the appropriate models will be selected from the available literature (i.e., EPA publications and reviewed journals). As part of this scope of work, models to predict the release of volatiles from groundwater used in the home will be developed as discussed below. All models and assumptions will be documented in the report and supplemented with appendices as appropriate.

Chemical intakes for each human exposure scenario will be estimated based on frequency and duration of exposure and rate of media intake (e.g., amount of water ingested per day). Human exposure is expressed in terms of intake which is the amount of a substance taken into the body per unit body weight per unit time. A chronic daily intake (CDI) is averaged over a lifetime for carcinogens (EPA, 1986a) and over the exposure period for noncarcinogens (EPA, 1986b). The CDI is calculated separately for each exposure pathway, since different populations at risk may be affected by the individual pathways. The assumptions used in these estimates will be stated clearly and will be thoroughly documented to the extent possible. The assumptions will be selected to represent an "average exposure case" and a "plausible maximum case." The exposure of nonhuman receptors will be estimated based on the sampling results or, if necessary, on the use of appropriate models that have appeared in the open literature.

Included in the risk assessment task will be the development of models which may quantify exposure by a variety of indoor air pathways. The pathways that will be considered are inhalation while showering, washing clothes, flushing the toilet, washing dishes, and any other indoor activities which require the use of water and could result in the release of volatile organics. The number of models that will be developed will depend on the amount of information that can be used to quantify releases. All assumptions will be documented and presented in the report.

The quantitative risk assessment will combine the results of the exposure assessment with the critical toxicity values in the appropriate media for each chemical of concern. For humans, toxicity data will be presented as

1. The carcinogenic potency factor for potential carcinogens.

2. The estimated risk reference dose (RfD) for noncarcinogens.

3. A semi-quantitative characterization based on any pertinent information that is available (e.g., subchronic toxicity studies or structural analogies) for chemicals for which no critical toxicity values are available.

For environmental receptors, environmental concentrations that have been associated with adverse effects in field or laboratory studies will be identified when available.

In addition to critical toxicity values, any applicable or relevant and appropriate requirements (ARARs) that have been established for the potential chemical(s) of concern will be identified. Currently, EPA considers maximum contaminant levels (MCLs) developed under the Safe Drinking Water Act, Federal Ambient Water Quality Criteria (AWQC), National Ambient Air Quality Standards (NAAQS), and state environmental standards to be potential ARARs for use in risk assessment at Superfund sites.

Risk assessments will be conducted separately for each exposure pathway and for each source, when appropriate. Results will be presented separately for the "average exposure case" and the "plausible maximum case" exposure assumptions. The risk assessment for each exposure pathway will include a discussion of the uncertainties in the estimates.

A.4.7 TASK 7 - TREATABILITY STUDY/PILOT TESTING

Treatability studies on soils (and not groundwater) may be conducted as part of the Phase II RI/FS if the source of the TCE groundwater contamination can be identified during the Subsurface Soil Investigation. If the source is identified and subsequently characterized, the REM III Team will perform the following:

- Conduct preliminary screening of technologies based on compatibility evaluation using field data obtained during the Phase II RI.

- Conduct a literature study to determine pertinent remediation technologies and tests needed for evaluation.

- Prepare and submit a treatability study evaluation report to EPA for review.

- Develop specifications for performing bench-scale treatability studies and issue inquiries to qualified vendors.

- Procure vendor(s) to implement the treatability study.

- Manage and oversee the implementation of the bench-scale treatability studies.

The results of the treatability study will be available during the feasibility study and will be used to support the evaluation of alternatives for soil (source) remediation. Subcontracting dollars have been included in the Phase II RI/FS budget.

A.4.8 TASK 8 - REMEDIAL INVESTIGATION REPORT

This task encompasses the preparation of the draft and final editions of the Phase II Remedial Investigation Report. The Phase II RI Report will contain both the Phase I and Phase II RI results and will include the following discussions:

- Site features investigation
- Hydrogeologic investigation
- Residential well survey and investigation
- Surface water and sediment investigation
- Soil investigation
- Public health and environmental concerns

A meeting will be held at EPA Region III following the development of the Draft Phase II RI Report. This meeting will summarize the findings of the Phase II RI.

A.5.0 TASK PLAN FOR FEASIBILITY STUDY

A Feasibility Study (FS) (Phase II) will be conducted following the Phase II RI. The Phase II FS will evaluate alternatives to address groundwater contamination in the southeastern portion of the study area and alternatives that mitigate contaminant sources (if identified during the Phase II RI). The Phase I FS, a focused feasibility study, is being undertaken at this time to assess the problem of residents depending on groundwater as a potable water supply source. The Phase II FS will consist of four tasks:

- Task 9 - Remedial Alternatives Screening
- Task 10 - Remedial Alternatives Evaluation
- Task 11 - Feasibility Study Report
- Task 12 - Post-RI/FS Support

The overall objective of the Croydon TCE Site FS is to screen and evaluate remedial alternatives to mitigate public health and environmental concerns as discussed in the risk assessment.

information gathered and evaluated under this task will be sufficient to allow EPA to select a remedial action that is

- Protective of human health and the environment
- Cost-effective
- In accordance with CERCLA as amended by SARA
- In accordance, to the extent possible, with the NCP (Section 300.68)

A.5.1 TASK 9 - REMEDIAL ALTERNATIVES SCREENING AND DEVELOPMENT

The objective of this task is to refine the range of response actions developed during the scoping process (Task 1). The alternatives will be screened using a definite set of criteria. Only those alternatives which pass the initial screening process will undergo full evaluation.

This task will employ data collected in the Field Investigation (Task 3), Data Evaluation (Task 5), and Risk Assessment (Task 6). The subtasks comprising Task 9 will accomplish the following objectives:

- Development of remedial response objectives and General Response Actions.
- Identification and screening of applicable technologies.
- Assembly and preliminary screening of remedial alternatives.

A.5.1.1 Development of Remedial Response Objectives and Response Actions

Based on the data collected in the Phase I and II RIs, the remedial response objectives will be developed more fully. Specific response objectives will be developed using a risk-based methodology to define cleanup levels that would reduce risks to public health and the environment to acceptable levels (this includes ARAR considerations and risk levels as presented in Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (USEPA, 1986a). Potential contaminant migration routes and exposure pathways, identified in the Risk Assessment, will be examined further as a basis for estimating acceptable contamination levels. Acceptable exposure levels for potential receptors will be identified and cleanup levels will then be estimated. Development of response objectives will also include refinement of ARARs specific to the site.

A.5.1.2 Identification of Applicable Technologies and Assembly of Alternatives

Based on the remedial response objectives, a list of applicable technologies will be identified. The technologies list will contain those previously identified in Section A.3.0. After

potential remedial technologies have been selected, operable units will be defined for each site condition requiring remediation (i.e., soils and groundwater). Each operable unit should meet at least one response objective.

After operable units have been defined, remedial alternatives will be identified. Each remedial alternative will be an overall site remedy incorporating more than one operable unit. The no-action alternative will be considered a baseline against which the other alternatives can be evaluated.

CERCLA, as amended by SARA, states that, to the maximum extent practicable, remedial actions that utilize permanent solutions and alternative treatment technologies or resource recovery technologies must be selected. Therefore, remedial actions that use these technologies will specifically be considered. To the extent possible, treatment options will range from alternatives that eliminate the need for long-term management at the site to alternatives involving treatments that would reduce toxicity, mobility, and volume as a principal goal.

A.5.1.3 Screening of Remedial Technologies/Alternatives

The lists of technologies and alternatives developed will be screened. The objective of this effort is to eliminate from further consideration any technologies and alternatives that are undesirable regarding implementability, effectiveness, and cost. The list of alternatives being considered will be narrowed by eliminating the following types of technologies:

- Technologies/alternatives that are not implementable or technically inapplicable.
- Technologies/alternatives that are not effective because they have adverse environmental impacts, do not provide adequate protection of public health, or do not attain ARARs.
- Technologies/alternatives that are more costly than other alternatives/technologies but do not provide greater environmental or public health benefits, reliability, or a more permanent solution. Costs will not be used to discriminate between treatment technologies and nontreatment technologies.

Reasons for elimination of any alternative at this stage will be documented in the FS report.

A meeting with EPA will be held following the screening of remedial technologies/alternatives to obtain EPA's concurrence on the list of alternatives that will undergo detailed evaluation.

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A.5.2 TASK 10 - REMEDIAL ALTERNATIVES EVALUATION

Remedial alternatives that pass the initial screening process (Task 9) and the no-action alternative will be further evaluated in detail and compared, as required in the NCP and in CERCLA, as amended by SARA. Effectiveness, implementability, and cost will be considered. The effectiveness evaluation will include consideration of public health, environmental impacts, and attainment of ARARs. As part of this evaluation process, SARA Subsection 121(b)(1) requires that waste, site, and inherent limitations, as well as the ability of each alternative to meet ARARs, be taken into account. Factors that would receive special consideration include:

- The long-term uncertainties of land disposal.
- The goals and requirements of the Solid Waste Disposal Act.
- The persistence, toxicity, mobility, and bioaccumulation of contaminants at the site.
- The short- and long-term potential for adverse human health effects.
- The long-term maintenance costs.
- The potential for future remedial action costs if the remedy fails.
- The potential threat to human health and the environment from the excavation, transportation, and redisposal or containment of hazardous substances, pollutants, or contaminants.

Both short- and long-term effects for each of these factors will be assessed. To the extent possible, remedial alternatives that use permanent solutions and alternative treatment technologies will be considered.

A.5.2.1 Implementability Evaluation

Each alternative will be evaluated for technical feasibility, administrative feasibility, and availability of the technology. Performance will be evaluated in terms of efficiency and useful life. Feasibility will be evaluated based on operation and maintenance requirements, and on the demonstrated performance of the remedial technologies involved. However, innovative treatment technologies or technologies achieving permanent solutions will not be eliminated because they have not been proven. During the analysis of technical feasibility, conditions on the site and external to the site will be considered. An estimate of the time required to implement the alternative, as well as the time required to achieve beneficial results, will be analyzed. Safety evaluations will include both

the short-term and long-term threats to the safety of nearby communities and environments and of workers onsite. To the extent possible, special consideration will be given to technologies that provide treatment, resource recovery, or permanent solutions. The long-term uncertainties will be carefully considered.

A.5.2.2 Effectiveness Evaluation

A baseline risk assessment will be conducted for the Phase II RI as part of Task 6 - Risk Assessment. This baseline assessment, which is an evaluation of the site without further remedial action, is also a detailed evaluation of the no-action alternative. The remaining alternatives must be evaluated in a two-step process. The first step is the development of target chemical concentrations. These target concentrations are numerical criteria which are used to judge conformance with ARARs which do not define specific levels. The target concentrations or action levels help to define design goals for the remedial action and are used as points of comparison to the baseline evaluation. The second step is the assessment and comparison of the short- and long-term risks to public health and the environment caused by implementation of each alternative. In this step, the degree to which each alternative meets ARARs will be assessed. Steps similar to those discussed for the baseline will be used in these evaluations. The selection of target chemical concentrations will include selection of indicator chemicals, identification of exposure pathways, and selection of the target concentrations. Selection of target concentrations will be based on ARARs, if they are available, or calculated using toxicity and chemical intake data developed during the baseline assessment. If offsite land disposal or containment is considered, the potential threat to human health and the environment from the excavation, transportation, and redisposal or containment of hazardous contaminants will be assessed.

A.5.2.3 Environmental Assessment

The environmental evaluation (also part of Task 6) will focus on the site problems and the contaminant pathways actually addressed by the alternative. This assessment will determine to what degree the alternative will protect and improve the environment. Adverse environmental impacts resulting from implementation of the alternatives will be fully described. Known environmental problems not addressed by the alternative will also be described.

The level of detail in the environmental assessments will depend on the degree of actual or potential damage to the environment being evaluated. A detailed assessment will be performed for the no-action alternative. This assessment will identify the extent of currently or potentially contaminated areas, identify possible environmental effects, and evaluate the significance of such effects. Other alternatives will be assessed in detail if

adverse environmental effects are expected to occur as a result of the response action.

A.5.2.4 Attainment of ARARs

ARARs must be considered during the detailed evaluation of alternatives. Prior to the ARAR conformance evaluation, site-specific and alternative-specific ARARs will have been defined. For site-specific ARAR evaluation, action levels may be developed, if possible, to provide specific numerical criteria. During the detailed analysis step, each alternative must be evaluated on the extent to which it attains ARARs.

A.5.2.5 Cost Evaluation

A detailed cost analysis will be performed for each alternative and will consist of the following steps:-

- Estimate capital and operation and maintenance costs (including long-term maintenance costs).
- Calculate annual costs and present worth.
- Evaluate the sensitivity of cost estimates to changes in key parameters such as discount rates, design, or effective life.
- Estimate 5-year evaluation costs.
- Assess the potential for future remedial action costs if the remedy fails (replacement costs).

For each alternative, the cost will be estimated within a range of -30 percent to +50 percent. The cost analysis will include separate evaluation of capital and operation and maintenance costs. Capital costs will consist of short-term installation costs such as engineering/design fees, materials and equipment, construction, and offsite treatment or disposal. Operation and maintenance costs will consist of long-term costs associated with operating and monitoring the remedial actions. Capital and annual operation and maintenance costs will be based on the anticipated time necessary for the alternative to achieve cleanup criteria.

A discount rate of 10 percent will be assumed for all present worth calculations. Cost estimates will be prepared using data from project files, the current EPA Remedial Action Costing Procedures Manual, USEPA technical reports, and quotations from equipment vendors. Equipment replacement costs will be included when the required performance period exceeds equipment design life.

A.5.3 TASK 11 - FEASIBILITY STUDY REPORT

Task 11 will consist of the following subtasks:

- Summarize each alternative in terms of effectiveness, implementability, and cost.
- Compare the remedial alternatives.
- Prepare the Draft and Final FS report.

The FS Report will include an executive summary, an introduction, a description of the screening and evaluation process, a summary of the detailed technical and cost evaluations, and a comparative evaluation of the remedial alternatives. This summary will be presented as table matrices. Backup information and calculations will be included as appendices.

A.5.4 TASK 12 - POST RI/FS SUPPORT

The REM III Team will provide support to EPA following completion of the Croydon TCE Site Phase II RI/FS. This support will include community relations, preparation of the Record of Decision and Responsiveness Summary, assistance to the U.S. Army Corps of Engineers or other parties involved in the remedial design/remedial action, work assignment closeout, and briefing support.

A.6.0 PROJECT MANAGEMENT APPROACH

A.6.1 ORGANIZATION AND APPROACH

The proposed project organization for the Croydon TCE RI/FS is shown in Figure A.6-1. The Regional Manager (RM), Mr. Richard C Evans, is responsible for the quality of all REM III work performed in Region III. Mr. Raymond P Wattras will serve as the Site Manager (SM). The SM has primary responsibility for implementing and executing the RI/FS. Supporting the SM are the Field Operations Leader (FOL), the FS Leader, the RI Leader and other technical support staff. The FOL is responsible for the onsite management of activities for the duration of the site investigation. The RI leader is responsible for the implementation of the RI and preparation of the RI report. The FS Leader is responsible for the implementation and preparation of the FS report.

The Phase II RI/FS tasks included in this Work Plan, in addition to the schedule and budget, comprise the baseline plans which form an integrated management information system against which work assignment progress can be measured. The baseline plans are a precise description of how the work assignment will be executed in terms of scope, schedule, and budget. The project schedule and detailed cost estimate are presented in Sections A.6.3 and A.6.4, respectively.

A.6.2 QUALITY ASSURANCE AND DATA MANAGEMENT

The site-specific quality assurance requirements will be in accordance with the Quality Assurance Program Plan (QAPP) for the REM III program, as approved by EPA. The REM III QAPP provides general guidance on the following subjects:

- Project organization and responsibility.
- QA objectives for measurement of data in terms of precision, accuracy, representativeness, completeness, and comparability.

Data management aspects of the program pertain to controlling and filing documents. Ebasco has developed a program filing system (Administrative Guideline Number PA-5) that conforms to the requirements of EPA and the REM III Program to ensure that the integrity of the documents is safeguarded. This guideline will be implemented to control and file all documents associated with the Croydon TCE Site RI/FS. The system includes document receipt control procedures, a file review and inspection system, and security measures to be followed.

A.6.3 PROJECT SCHEDULE

Figure A.6-2 depicts the schedule of tasks and activities for the Croydon TCE Site Phase II RI/FS. The schedule for the field investigation assumes that no site restrictions will be encountered and is dependent upon EPA approval of the Final Phase II Work Plan and the FOP by September 9, 1988.

A.6.4 COST ESTIMATES

The detailed cost estimate for the Croydon TCE Site Phase II RI/FS is presented under separate cover in the Optional Form 60 (OF-60). Costs for CLP analysis or REM III Laboratory Analysis (if required) are not included in the REM III Team total cost. Costs for potential additional investigations, such as treatability study/pilot testing, have not been included in the estimates for this Work Plan.

FIGURE A.6-1

PROJECT ORGANIZATION
CROYDON TCE SITE

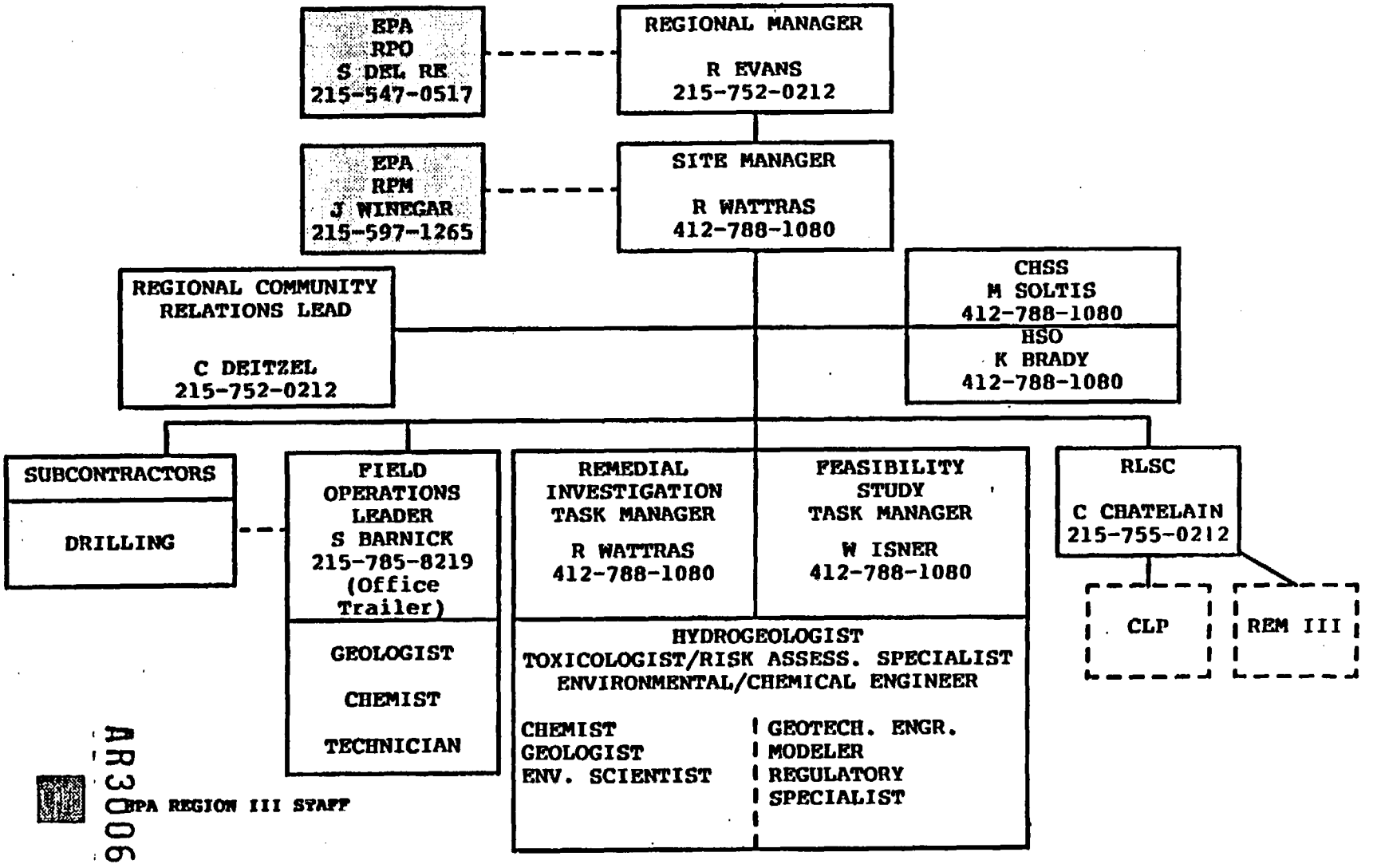

Fig A.6-2
(See back pocket)

EPA REGION III
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOC ID # 110923
PAGE # AR 300603

IMAGERY COVER SHEET
UNSCANNABLE ITEM

Contact the CERCLA Records Center to view this document.

SITE NAME Croydon TCE

OPERABLE UNIT OU1

SECTION/BOX/FOLDER Administrative Record - Section Volume III A - Filecom

REPORT OR DOCUMENT TITLE Final Phase I (RI) Report

DATE OF DOCUMENT 5/88

DESCRIPTION OF IMAGERY Phase II Monitoring well Sampling Locations

NUMBER AND TYPE OF IMAGERY ITEM(S) 1 Oversized Map

EPA REGION III
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOC ID # 110923
PAGE # AR 300604

IMAGERY COVER SHEET
UNSCANNABLE ITEM

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SITE NAME Croydon TCE

OPERABLE UNIT OU1

SECTION/BOX/FOLDER Administrative Record-Section Volume IIIA - Filecom

REPORT OR DOCUMENT TITLE Final Phase I (RI) Report

DATE OF DOCUMENT 5/9/88

DESCRIPTION OF IMAGERY Phase II RI/FS Project Schedule

NUMBER AND TYPE OF IMAGERY ITEM(S) 1 Oversized Map

B

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APPENDIX B

DESCRIPTION OF POTENTIAL TCE SOURCE AREAS

Note: The description of potential source areas was taken from the following document:

USEPA, 1985. Site Analysis - Rohm and Haas Landfill and Vicinity, Bristol, Pennsylvania. Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. (TS-PIC-84019). January 1985.

AERIAL PHOTO SITE ANALYSIS

Figures 2-12 depict activities observed at the preselected sites under study in this report.

SITE 1 (Figures 2A-F)

1940 (Figure 2A) - The site is a rectangular open field bordered by dirt roads to the north, east and west and by U.S. Route 13 (Bristol Pike) to the south. A pond, fed by an unnamed creek, is in the northeastern corner. One or more small buildings (3), probably residential, are clustered on the northern edge of the field.

1951 (Figure 2B) - Three billboards are present onsite. No other significant changes are noted.

1958 (Figure 2C) - The pond has been filled, leaving only a stream channel along its former northern edge. The filled pond area has revegetated and a few light-toned ground scars (GS) are present. A new (since 1951) dirt access road forms a loop from U.S. Route 13 to the edge of the filled pond area and back. Several possible dark-toned ground stains (GST) are visible on the new access road. A row of unidentifiable, light-toned objects is visible in the southeastern corner of the site. The cluster of buildings seen in 1940 and 1951 appears abandoned, as the access road to them is covered by shrubs and trees.

1962 (Figure 2D) - Imagery was available for only the eastern half of the site. In this portion, three circular features (approximately 12-15 meters (39-49 feet) in diameter) are visible, each tangentially bordered by two diametrically opposed, very light-toned rectangular objects. Mottled ground scarring appears around the easternmost circular feature. Dark-toned possible ground stains are seen in the filled pond area. The widened stream channel in this area indicates probable fill material erosion. Three buildings are located near the southern border (U.S. Route 13). No access roads are onsite.

1970 (Figure 2E) - The circular ground scars seen in 1962 are no longer present. In the eastern half of the site, an open storage area (possibly for lumber) can be seen. Two buildings and a dark-toned probable ground stain, possibly from a wood treatment operation, can be distinguished. In the western half, there is a large excavation area (EX) containing light-toned (LT) mounded material (MM) and a vehicle (V). Probable ground stains are visible around the perimeter of the excavation area. To the west of the excavation area are rows of medium-toned mounded material.

1974 (Figure 2F) - The bulk of the open storage area seen in 1970 is no longer present. A building, four trucks, two trailers and two possible small sheds (none of which are annotated) are still visible on the 1970 location. Northeast of that area, a dark-toned possible ground stain is visible. The filled pond area shows continued signs of fill material erosion (first noted in the 1962 imagery). A facility with one building and numerous semi-trailers onsite is visible where the excavation area was seen in 1970. Several dark-toned ground stains are visible on and off the facility grounds. A

trench (TR) is visible along the facility's eastern border. The medium-toned mounded material seen in 1970 is still visible; in addition, 40-50 similar-looking mounds now appear in several rows in the center of the site.

1978 (Figure 2G) - The facility seen in 1974 appears little changed; it is slightly expanded with scattered dark-toned ground stains (not annotated). The medium-toned mounded material, seen in two areas in 1974, is no longer visible. The eastern half of the site has revegetated, except for dirt roads or trails that crisscross the area and a large, very light-toned bare area. The roads/trails appear well-traveled and several lead to the bare area. They do not appear to be connected with either the facility to the west or the activities of the building east of the site; they are possibly used by minibike and motorcycle riders.

West of the facility is a light-toned area, possibly a mound. Two access roads lead to it, one from the facility and the other from a facility west of the site.

SITE 2 (Figures 3A-F)

1940 (Figure 3A) - The site appears as part of an open field and contains two residences (not annotated).

1951 (Figure 3B) - A large dark-toned (DK) area extends from the center of the site to the southeast corner, onto the property of the adjacent Owens-Illinois[1] facility. The origin and nature of this feature are not discernible from the imagery; the possibilities include ground staining, spreading of dark-toned material, a burn area and vegetation cover. To the north of this area is a hump-shaped formation of earthen material with probable vehicle tracks running across it. This hump-shaped formation extends from the western boundary of the Owens-Illinois facility to an onsite area appearing as a probable medium-toned ground stain. A trench extends northwest, from the northwest corner of the Owens-Illinois building, onto the site with no apparent outlet. The number of residences onsite has increased; they continue to increase in number throughout the years of analysis and will not be further mentioned.

1958 (Figure 3C) - Of the features seen in 1951, the dark-toned area, hump-shaped formation and medium-toned ground stain are no longer seen and the trench is only faintly visible. Along the eastern boundary is an impoundment (IM) containing standing liquid.

1962 - No photo coverage of the site was available.

1970 (Figure 3D) - The impoundment seen in 1958 is no longer visible. Ditched drainage runs northward along the eastern border. Most of the site, except for the residential strip along the western boundary, now supports shrub and young tree growth.

1974 (Figure 3E) - The drainage ditch has been moved to the west to allow for expansion of the Owens-Illinois facility onto the site.

[1]Collateral information, EPA Region 3.

1978 (Figure 3F) - No significant changes are noted. Between the residential area and the drainage ditch, the site is mostly tree-covered.

SITES 3 AND 4 (Figures 4A-G)

Sites 3 and 4 are analyzed together due to their proximity to each other. Site 3 is described as a "railroad truck" fabrication facility.[1] Site 4, a flare manufacturing facility, includes an adjacent excavation area prior to 1970.[1] This excavation area is later covered by a large warehouse.

1940 (Figure 4A) - Each site contains several buildings and small sheds. The number of buildings for each site changes, generally increasing, throughout the years of imagery, and no further mention of them will be made unless relevant. Both facilities are accessible from State Road by the same access road. A separate access road services the adjacent excavation area from State Road. No access roads directly connect the facilities' buildings to the excavation area. A narrow pool of medium-toned standing liquid (SL) lies along the western edge of the excavation floor. At the northern end is a dark-toned area with possible mounded material. An extraction area (EXT) and possible light-toned mounded material lie south of the dark-toned area. A film defect is visible north of the excavation area and extends into the dark-toned area.

1951 (Figure 4B) - No significant changes are noted on Site 3.

The excavation area seen on Site 4 in 1940 has been extended northward and will be referred to as the main excavation. A second, smaller and shallower excavation appears adjacent to and west of the main excavation and will be referred to as the western excavation. Access to the two excavation areas is separate; the access road to the western excavation originates from the adjacent Owens-Illinois facility (to the west).

In the main excavation, dark-toned standing liquid covers nearly half of the excavation floor. Approximately 50-60 mounds of light-toned material are in the southwestern corner and along the western wall. West of Building 1 (B1) on Site 4, light-toned material (M) trails down the main excavation wall and forms a pile on the excavation floor.

The western excavation contains a pool of light-toned standing liquid surrounded by dark-toned probable ground staining. Light-toned liquid appears to be flowing into the pool from a dark-toned object, possibly a drum or pipeline outlet.

[1]Collateral information, EPA Region 3.

1958 (Figure 4C) - No significant changes are noted on Site 3.

Dark-toned possible ground stains are visible in the southwestern corner of the facility grounds on Site 4. Dark-toned standing liquid is present in the main excavation on Site 4, in the same areas seen in 1951; however, the liquid appears much shallower, covering approximately one-sixth of the total bottom area (versus one-half in 1951). Shrubs and low vegetation cover most of the bottom and sides; however, the access road appears vegetation-free from State Road to the excavation center, indicating possible recent use. The light-toned mounded material seen along the western wall of the main excavation in 1951 appears eroded. The trail of light-toned material that was located behind B1 in 1951 is still visible, and the pile of light-toned material on the excavation floor directly below has increased in size. Little vegetation occurs on this pile, possibly indicating recent activity.

In the western excavation, further excavation appears to have occurred, including removal of a portion of the wall between the main and western excavations. Dark-toned standing liquid appears where light-toned standing liquid was seen in 1951. The dark-toned object seen in 1951 is visible, again with liquid appearing to flow from it to the pool of standing liquid. The access road from the Owens-Illinois facility, seen in 1951, has revegetated.

1962 (Figure 4D) - No significant changes are noted on Site 3.

Southwest of the facility on Site 4, disturbed ground and a trench are visible. The trail of light-toned material that ran down the main excavation wall behind B1 in 1951 and 1958 is no longer distinct. In the main excavation, over 100 light- and medium-toned mounds of material have been added along the western wall. Standing liquid appears to cover nearly one-half of the bottom area and is bordered by shrub vegetation. Dark-toned possible ground stains or standing liquids are scattered throughout the non-vegetated areas.

In the western excavation (as previously seen in 1951), light-toned standing liquid appears, surrounded by dark-toned probable standing liquid or ground staining. The dark-toned object seen in 1951 and 1958 is visible, although no liquid appears to be flowing from it. Little vegetation is seen, and dark-toned ground stains are present.

1970 (Figure 4E) - No significant changes are noted on Site 3.

A ground scar is visible southwest of the Site 4 facility where the disturbed ground was seen in 1962. The main excavation area, including the access road, is almost entirely covered by vegetation, interspersed with dark-toned standing liquid. Mounds of material are visible along the western wall and access road.

In the western excavation, a pool of dark-toned standing liquid is visible. The remainder of the area, to the south, has been further excavated downward to the level of the main excavation floor and is littered with dark-toned debris (DB) and dark-toned probable ground stains (not annotated). The dark-toned object is still visible.

1974 (Figure 4F) - On Site 3, several dark-toned possible ground stains and a small excavation area are visible in the northwestern corner. The excavation area may be incidental to the construction of the adjacent industrial building.

Four industrial buildings have been built adjacent to the buildings of Sites 3 and 4 and are directly over both of the excavation areas, completely covering any signs of their former existence. These new structures are located directly over both of the former excavation areas, which were apparently filled sometime after 1970.

1978 (Figure 4G) - Probable ground staining is visible on Site 3; the excavation has been filled and revegetated.

No significant changes are noted on Site 4.

SITE 5 (Figures 5A-G)

1940 (Figure 5A) - The site is an agricultural field.

1951 (Figure 5B) - No significant changes are noted.

1958 (Figure 5C) - No significant changes are noted.

1962 (Figure 5D) - Two large hump-shaped mounds of earth-like material, possibly sludge from the nearby water treatment plant (WTP), appear in the site's southwestern corner. Possible ground staining is visible in the vicinity of the mounds. The light-toned area seen in the eastern portion of the site is possible mounded material or disturbed ground.

1970 (Figure 5E) - The two hump-shaped mounds seen in 1962 are no longer visible; a possible remnant of one of the mounds, probable ground staining and ground scarring are visible in the southwestern corner of the site. Most of the site appears as a graded area. Railroad tracks pass through the western portion of the site.

1974 (Figure 5F) - A large hump-shaped mound of earthen material, similar to those seen in 1962, is onsite. The northwest portion of the mound appears to have been dug out and removed, leaving a shallow depression that contains a dark-toned standing liquid. A ridge, possibly a dike, runs along the northeastern corner of the site, bordering the road. Ditched drainage leads to the northwest from the northeast corner. Dark-toned probable ground stains are present. The southwestern corner has revegetated with faint ground scarring.

Northeast of Site 5 is an area with a ridge, probable ground staining and ground scarring similar to that seen on Site 5.

1978 (Figure 5G) - The hump-shaped mound seen in 1974 appears to have been removed. An irregularly shaped mound of light-toned material, possibly a remnant of the 1974 mound, remains. The ridge and standing liquid seen in 1974 are not present; the ditched drainage and much of the probable ground staining remain. A fence, which now surrounds the water treatment plant, extends to the southern portion of the site. The site as a whole appears as a sparsely vegetated, graded area.

The area northeast of Site 5 seen in the 1974 imagery has completely revegetated except for an area of ground scarring. Possible ground stains are also visible.

SITES 6 AND 7 (Figures 6A-G)

Sites 6 and 7 are analyzed together due to their proximity to each other. Site 6 is described as Scorpio Industries, whose present operations are unknown.[1] Site 7 is described as a possible truck repair facility.[1]

1940 (Figure 6A) - Site 6 appears as a wooded area. Site 7 consists of two buildings and a possible shed. The drainage annotated is a tributary of an unnamed creek which flows southwest into the Delaware River. No other significant features are noted.

1951 (Figure 6B) - Site 6 shows no change. On Site 7, several probable dark-toned ground stains are visible.

1958 (Figure 6C) - Site 6 shows no change. On Site 7, all but one of the ground stains seen in 1951 are no longer present. Two possible light-toned mounds of material are visible onsite.

1962 (Figure 6D) - Site 6 shows no change. On Site 7, several possible dark-toned ground stains are visible.

1970 (Figure 6E) - Site 6 is a cleared lot with ditched drainage on the northwestern border. The clearing activities on Site 6 have disrupted the drainage pattern in the vicinity of the two sites. The operations on Site 7 appear to have expanded with increased building space and the presence of numerous vehicles, mostly trucks (not annotated). The possible ground stains seen in 1962 are no longer distinctly visible, possibly due to shadows; however, probable dark-toned standing liquid is present. Possible junked vehicles lie to the northwest. Possible ground staining is visible in the open area southwest of Site 7.

1974 (Figure 6F) - Site 6 contains a large building with a parking lot. Two dark-toned ground stains, originating at the northwestern edge of the building, extend northwestward across the parking lot to a drainage ditch, which contains a dark-toned liquid. On Site 7, probable dark-toned standing liquid and a drainage ditch are visible. Scattered refuse (R) is visible to the northwest where possible junked vehicles were seen in 1970. In the open area southwest of Site 7, there are areas of probable dark-toned ground staining (as seen in 1970) and light-toned mounded material.

1978 (Figure 6G) - Much of the area northeast of Site 6 has been cleared of trees; ground scars and dark-toned ground stains are visible in this area. Dark-toned standing liquid is visible in the drainage ditch on Site 6; and dark-toned ground stains, similar to those seen northeast of the parking lot on Site 6, form a trail southwest of Site 6.

[1]Collateral information, EPA Region 3.

On Site 7, the probable standing liquid seen in 1974 is no longer visible. Light-toned mounded material is present and refuse is strewn about the slope to the northwest. The drainage ditch leading northwest from Site 7 is less distinct than seen in 1974. In the open area southwest of Site 7, the mounded material seen in 1974 is no longer visible, but probable ground stains remain.

SITE 8 (Figures 7A-G)

The building onsite is currently a VFW post[1]; its prior uses are unknown.

1940 (Figure 7A) - Multi-toned refuse (type indeterminable from the imagery) is scattered southeast of the building on the slope that leads down to a pond. The refuse is present, in varying quantities, in every year of analysis and will not be further mentioned. Several possible dark-toned ground stains are visible north of the building. A possible boat or platform lies in the southwestern corner of the pond. Several film defects are present southwest of the site.

1951 (Figure 7B) - The possible ground stains and possible boat or platform seen in 1940 are no longer present. A probable vehicle is present.

1958 (Figure 7C) - No significant changes are noted.

1962 (Figure 7D) - Light-toned mounds of fine-textured material are visible on the slope at the pond's edge. Dark-toned possible standing liquid with a trail leading to the pond is seen in the site's southwestern section. Numerous vehicles are visible northwest of the building.

1970 (Figure 7E) - The piles present in 1962 are no longer visible. A probable dark-toned ground stain lies southwest of the building where the possible standing liquid was seen in 1962. An additional dark-toned probable ground stain is also visible in this area.

1974 (Figure 7F) - The probable ground stains present in 1970 are no longer visible. One vehicle is present onsite.

1978 (Figure 7G) - Several possible dark-toned ground stains are visible in the immediate vicinity of the building. The pond has almost completely dried up; refuse can be seen in the dried-bed area of the pond to the north. One vehicle is onsite.

[1]Collateral information, EPA Region 3.

SITE 9 (Figures 9A-G)

Site 9 is described as a commercial structure containing several small businesses.[1]

1940 (Figure 9A) - The site appears as a semi-wooded lot. The drainage pattern does not change significantly throughout the period of analysis and will not be further annotated.

1951 (Figure 9B) - No significant changes are noted.

1958 (Figure 9C) - No significant changes are noted.

1962 (Figure 9D) - No significant changes are noted.

1970 (Figure 9E) - No significant changes are noted.

1974 (Figure 9F) - A building and a parking lot containing several vehicles (not annotated) are present. Debris, probably construction-related, appears in the immediate vicinity and southeast of the building.

1978 (Figure 9G) - The debris present in 1974 is no longer visible, and the corresponding areas have revegetated. No additional significant changes or features are noted.

SITE 10 (Figures 9A-F)

1940-1978 - Site 10 is described as a metal tubing manufacturer, now apparently closed.[1] Probable dark-toned ground stains are seen onsite for all years of imagery. No other significant features were noted for any year analyzed. The site was not covered on available 1962 imagery.

SITE 11 (Figures 10A-G)

1940 (Figure 10A) - The site is an open field, probably agricultural. A film defect extends through the site.

1951 (Figure 10B) - An access road is present on the southern and eastern borders of the site.

1958 (Figure 10C) - Light-toned ground scars are present in the southern section of the site. Electric power line structures are visible to the northeast. They are present in all subsequent years of analysis and will not be further annotated.

1962 (Figure 10D) - No significant changes are noted. Two film defects are present.

[1]Collateral information, EPA Region 3.

1970 (Figure 10E) - A pit (P) is visible northeast of the light-toned ground scars first seen in 1958. A very light-toned standing liquid is seen at the bottom of the pit. An access road leads to the pit. Southwest of the pit is a ground scarred area with an irregularly shaped mound of material. A probable fence or dike surrounds both areas.

1974 (Figure 10F) - As seen in 1970, the pit with standing liquid (now smaller) and ground scarred area (showing signs of excavation activity in the previous area of the mounded material) are still visible. A similar but larger new pit is seen to the northeast. Very light-toned standing liquid also lies at the bottom of the large pit, and an apparent overflow drainage channel runs southwest from the pit's southern corner. The large pit is serviced by an access road, and vehicle tracks can be seen leading to its edge. Medium-toned mounded material is present just west of the pit area. Northeast of the large pit is a ridge of earth-like material, possibly sludge. The probable fence or dike seen in 1970 is no longer present, but a similar structure nearly encloses the large pit and the nearby mounded material.

1978 (Figure 10G) - None of the features seen in 1974, except the access roads, are present. Most of the area southeast of the access road bisecting the site appears to have been covered by light-toned earth-like material. Large possible ground stains of various tones appear throughout the area.

SITE 12 (Figures 11A-G)

1940 (Figure 11A) - The entire site is an agricultural field. Southeast of the site are rows of mounded material.

1951 (Figure 11B) - No significant onsite changes are noted. The mounded material seen in the 1940 imagery appears eroded and/or covered by vegetation.

1958 (Figure 11C) - The two large treatment basins of a water treatment plant are first seen northeast of the site. In the southwestern portion of the site, three dark-toned, circular ground scars (approximately 36 meters (117 feet) in diameter) are arranged in a triangle. This portion of the site does not appear to be used currently for agriculture. The mounded material seen in the 1940 and 1951 imagery is not visible; it likely has been inundated by the lagoon.

1962 (Figure 11D) - A series of trenches is visible in the southwestern portion of the site; most contain dark-toned standing liquid or ground staining. They are accessible from a newly present access road which runs through the site. Two smaller tanks and two rectangular excavations, probably lagoons or sludge drying beds, have been added to the water treatment operation. Disturbed ground lies southwest of the excavations, and a cleared, vegetation-free area lies north of the trenches. The circular ground scars seen in 1962 are no longer visible due to the trench construction.

1970 (Figure 11E) - Disturbed ground covers the area where trenches were seen in 1962. A new series of trenches lies just southwest of the rectangular excavations. All of the trenches contain dark-toned standing liquid or ground staining. The excavations contain dark- and very light-toned standing liquid, residue or ground staining. These observations concerning the excavations occur in all subsequent years of analysis and will not be mentioned further. Several vertical tanks are visible in the southwestern portion and are connected by pipeline to the Rohm and Haas Croydon Plant (not annotated). The vertical tanks are present throughout the remainder of the period of analysis and will not be further annotated.

1974 (Figure 11F) - The trenches seen in the 1970 imagery exhibit little probable dark-toned standing liquid or ground staining, and it is not apparent that they are currently in use. The northeastern excavation seen in the 1970 imagery has been subdivided into eight impoundments. The disturbed ground seen in 1970 (covering the trenches seen in 1962) has not revegetated. Approximately twelve semi-trailers are present in the southwest portion of the site.

1978 (Figure 11G) - The trenches seen in 1970 and 1974 show little change from 1974. Northwest of the trenches is an area of probable ground staining. Southwest of the trenches are numerous mounds of light-toned material. The disturbed ground area of 1970 and 1974 has revegetated. Semi-trailers, possible sheds and an extension of the Rohm and Haas Croydon facility are also present in the southwestern section of the site. One-half of the southwestern excavation has been subdivided into four impoundments.

SITE 13 (Figures 12A-F)

1940 (Figure 12A) - The site is a semi-wooded area with several trails through it. Trails appear onsite throughout the period of analysis and will not be annotated.

1951 (Figure 12B) - No significant changes are noted.

1958 (Figure 12C) - No significant changes are noted.

1962 - The site was not covered by available photography.

1970 (Figure 12D) - The site has been cleared of trees and shrubs, and two baseball diamonds are visible. Mounds of material, probably soil, lie along the site's eastern and southern boundaries and are probably a result of the clearing activities.

1974 (Figure 12E) - A building has been erected in the northwestern corner. The southeastern corner appears striated, possibly a result of clearing activity or grading of the mounded material seen along the southern border in the 1970 imagery. The striations may have been present in 1970, but the poor quality of the 1970 photography prevented their detection. Trails through the site appear to be the result of motorcycle activity, although an automobile or truck could use them. Unidentifiable refuse is visible in the southwestern corner. The mounded material seen in the 1970 imagery along the eastern border is still present.

1978 (Figure 12F) - Two additional baseball diamonds (not annotated) are present. The mounded material seen in 1970 and 1974 is no longer visible; it may have been used in construction of the fields. The striated area seen in 1974 has revegetated; the striations are no longer visible. Possible dark-toned ground staining is visible in the southwestern corner where refuse, still present but not annotated, was seen in 1974. The building and trails seen in 1974 remain unchanged.

C

APPENDIX C

TIDAL FLUCTUATIONS - DELAWARE RIVER

APPENDIX C

TIDAL FLUCTUATIONS - DELAWARE RIVER
CROYDON TCE SITE

Station No. 1917, Philadelphia, PA(1)					Station No. 1928, Burlington, VT(2,3,4)				
Date	High Tide		Low Tide		Date	High Tide		Low Tide	
	Time	Height	Time	Height		Time	Height	Time	Height
Jan. 4, 1988	01:33	5.0	08:21	0.1	Jan. 4, 1988	03:00	5.2	10:03	0.1
	13:52	6.1	21:06	0.1		15:19	6.3	22:48	0.1
Jan. 5, 1988	02:17	5.0	09:03	0.2	Jan. 5, 1988	03:44	5.2	10:45	0.2
	14:34	6.1	21:48	0.2		16:01	6.3	23:30	0.2
Jan. 6, 1988	03:00	5.0	09:45	0.2	Jan. 6, 1988	04:27	5.2	11:27	0.2
	15:15	6.0	22:27	0.2		16:42	6.3		
Jan. 7, 1988	03:44	5.0	10:25	0.2	Jan. 7, 1988			00:19	0.2
	15:55	5.9	23:06	0.2		05:11	5.2	12:07	0.2
						17:22	6.1		
Jan. 8, 1988	04:24	5.0	11:07	0.2	Jan. 8, 1988			00:48	0.2
	16:36	5.8	23:44	0.2		05:51	5.2	12:49	0.2
						18:03	6.0		
					Jan. 9, 1988			01:26	0.2

Source: NOAA, 1987, Tide Tables, 1988, High and Low Water Prediction, East Coast of North and South America, Including Greenland, U.S. Department of Commerce, pp. 289.

(1) Station No. 1917: Latitude 39°57', Longitude 75°08'
(2) Station No. 1928: Latitude 40°05', Longitude 74°52' (Subordinate Station)
(3) Times at the subordinate station are adjusted by +0127 hours for high water and by +0142 hours for low water.
(4) Heights at the subordinate station are adjusted by +0.2 feet for high water and by +0.0 feet for low water.

ID

AR300621

APPENDIX D

MONITORING WELL BORING LOGS

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE GRAINED SOILS

More than half of material is LARGER than No. 200 sieve size

		FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)	GROUP SYMBOL	TYPICAL NAMES
GRAVELS 50%(+) > ¼" Ø	CLEAN GRAVELS (Low % fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravels, gravel sand mixtures, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
	GRAVELS w/FINES (High % fines)	Non plastic fines (for identification procedures see ML)	GM	Silty gravels, poorly graded gravel sand silt mixtures.
		Plastic fines (for identification procedures see CL)	GC	Clayey gravels, poorly graded gravel sand clay mixtures.
SANDS 50%(+) < ¼" Ø	CLEAN SANDS (Low % fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	SW	Well graded sand, gravelly sands, little or no fines
		Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.
	SANDS w/FINES (High % fines)	Non plastic fines (for identification procedures see ML)	SM	Silty sands, poorly graded sand silt mixtures
		Plastic fines (for identification procedures see CL)	SC	Clayey sands, poorly graded sand clay mixtures.

FINE GRAINED SOILS

More than half of material is SMALLER than No. 200 sieve size

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)

Identification procedures on fraction smaller than No. 40 sieve size

	DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)	GROUP SYMBOL	TYPICAL NAMES
SILTS & CLAYS Liquid limit < 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
	Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity
SILTS & CLAYS Liquid limit > 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays
	Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture.			Pt	Peat and other organic soils

Boundary classifications: Soils possessing characteristics of two groups are designated by combining group symbols. For example GW-GC, well graded gravel sand mixture with clay binder.
All sieve sizes on this chart are U.S. standard.

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE - BLOWS/FOOT
Very loose	0-4
Loose	5-10
Medium dense	11-30
Dense	31-50
Very dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC. COMPRESSIVE STR. TONS/SQ. FT.	STANDARD PENETRATION RESISTANCE - BLOWS/FOOT	FIELD IDENTIFICATION METHODS
Very soft	Less than 0.25	0 to 2	Easily penetrated several inches by fist
Soft	0.25 to 0.50	2 to 4	Easily penetrated several inches by thumb
Medium stiff	0.50 to 1.0	4 to 8	Can be penetrated several inches by thumb
Stiff	1.0 to 2.0	8 to 15	Readily indented by thumb
Very stiff	2.0 to 4.0	15 to 30	Readily indented by thumbnail
Hard	More than 4.0	Over 30	Indented with difficulty by thumbnail

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

DESCRIPTIVE TERMS	SCREWDRIVER OR KNIFE EFFECTS	HAMMER EFFECTS
Soft	Easily gouged	Crushes when pressed with hammer
Medium soft	Can be gouged	Breaks (one blow) Crumbly edges
Medium hard	Can be scratched	Breaks (one blow) Sharp edges
Hard	Cannot be scratched	Breaks conchoidally (several blows) Sharp edges

ROCK BROKENNESS

DESCRIPTIVE TERMS	ABBREVIATION	SPACING
Very broken	(V. Br.)	0 - 2"
Broken	(Br.)	2" - 1'
Blocky	(Bl.)	1' - 3'
Massive	(M.)	3' - 10'

LEGEND

SOIL SAMPLES - TYPES

S - 2" O.D. Split Barrel Sample
ST - 3" O.D. Undisturbed Sample
O - Other Samples, Specify in Remarks

ROCK SAMPLES - TYPES

X - NX (Conventional) Core (~2-1/8" O.D.)
Q - NQ (Wireline) Core (~1-7/8" O.D.)
Z - Other Core Sizes, Specify in Remarks

WATER LEVELS

12/18
▼12.6' Initial Level w/Date & Depth

12/18
▼12.6' Stabilized Level w/Date & Dept

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: C-1
PROJECT NO.: 621Y — DATE: 9/87 — DRILLER: C. Wilson
ELEVATION: 26.06 — FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA: 16.0 Ft (From ground surface 11.0/87, 2:00 PM
(Date, Time & Conditions) EL. W.T.: 7.5 (11/10/87, 8:00 AM)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
C-1	1	3 4	1.8/2.0		Loose	DK BRN	Top soil 0.3 Ft. Tr.	ML	damp 0 ppm
	2	4 5					Organics, silty fine		
							sand, tr. coarse		
	4	7	1.2/2.0		MED	DK BRN	sand		
S-2	5	9 12			DENSE		↓	ML	0 ppm
	6								
							Cobbles, gravel,	GW	
C-3	9.0	27 78	0.5/4.5		Very Dense	TAN	and some fine to		sand - rock flour
	10.0	100/5"					med grained sand		0 ppm
	11.0								gravel & cobbles
									light green schist
									and green schist
	14	50 100/4"	.75/.75		Very Dense		med. grained sand,	SW	1 Ft of blow in
S-4	15						some coarse sand,		0 ppm
	16						Tr. gravel (still		
							in cobbles)		
	19	17 50	1.7/2.0		DENSE	Br		SW	W.T. 11.0.2
C-5	20	2 19					coarse sand w/		0 ppm
	21						some gravel and		
							little silt		
									AR300624
S-6	24	11 27	2.0/2.0		Very	DK Br	med - coarse sand	SW	
	25	31 57			Dense		w/ some silt +		0 ppm

REMARKS: Hollow Stem Auger
140 lb Hammer - Split Spoon

BORING CR-MW01S

PAGE 1 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW01(S)
PROJECT NO.: 621Y — DATE: 11/27 — DRILLER: E. Woodward
ELEVATION: — FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY-CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		
	25								
	26						[illegible]		
				T.D. 28'					
	30								
	33								

REMARKS: Installed well on 11/10

BORING CR-MW01(S)

PAGE 2 OF 2

* See Legend on Back

AR300625

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: [illegible]
PROJECT NO.: 621Y — DATE: 11.5.87 — DRILLER: [illegible]
ELEVATION: 26.11 — FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA: 15.3 FT [illegible]
(Date, Time & Conditions): 11.15 FT 11/10/87

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
S-1	1	3 / 4	1.8/2.0		LOOSE	DR BR	[illegible]	ML	damp 0 ppm
		4 / 5					[illegible]		
							[illegible]		
	4	7 / 7	1.3/2.0		MED	DR BR	sand		
S-2	5	9 / 10			DENSE			ML	0 ppm
	6								
									hitting cobbles
S-3	9.0	37 / 78	0.5/1.5		Very Dense	Tan	cobbles, gravel,	GW	sand, rock flour
	10	100/5"					and some fine +		0 ppm
	11.0						med gr. sand		[illegible]
									[illegible]
									[illegible]
	14	58 / 120/2"	.75/.75		Very Dense		med grained sand,		1' of blow-in
S-4	15						some coarse sand,	GW	[illegible]
	16						Tr. gravel		[illegible] "4"
							(cobble zone)		
									W.T. 15.4'
	19	17 / 23	1.7/2.0		DENSE	Gr		SW	-heaving, using roto-bit
S-5	20	21 / 19					coarse sand w/		to break up cobbles
	21						some gravel and		inside the auger
							little silt		
									-smooth drilling
S-6	24	11 / 27	2.0/2.0		Very Dense	Dr Br	med-coarse sand w/	SW	
	25	31 / 57					some silt and gravel		AR300626

REMARKS: Hollow stem auger [illegible] 140 lb HAMMER
on large boulder at 14' [illegible]
[illegible]

BORING [illegible]

PAGE 1 OF 3

* See Legend on Back

BORING LOG **NUS CORPORATION**

PROJECT: Croyden TCE BORING NO.: [illegible]
PROJECT NO.: 621Y DATE: [illegible] DRILLER: [illegible]
ELEVATION: FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	[illegible]								
									saturated
							med-coarse sand w/		
	29	7 / 15	2.0/2.0		Dense	Brown	gravel	SW	
S-7	30	27 / 37		clay		Tan-Yellow	silty clay	CL	
	31								[illegible]
S-8	34	19 / 23	1.9/2.0		Very	Tan-nish			
	35	57 / 100/4"			Dense	Yellow	med-grained sand	SP	well sorted
	36						tr. gravel, tr. silt		
	39	11 / 21	1.6/2.0		Very Dense	White Brown			
S-9	40	69 / 79					med to coarse grained		Qtz sand
	41						sand		
	44	17 / 22	2.0/2.0		Very Dense	Br.	coarse sand w/	SW	grey silty sand,
S-10	45	21 / 31					lenses of clay, fine		brown silty sand,
	46						silty sand, and		grey clay, white
							clean coarse sand		sand
	49	21 / 32	2.0/2.0		very		med sand, no		- no fines, was
S-11	50	39 / 32			Dense		gravel or cobbles		AR300627

REMARKS 29' - 11/15/87

BORING [illegible]

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: [illegible]
PROJECT NO.: 621Y — DATE: 6.27 — DRILLER: [illegible]
ELEVATION: — FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA: 15.0 ft [illegible]
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
									0 ppm
S-12	54	9/9	20/60		med dense	white tan	med-coarse sand	SP	well sorted
	55	11/13					mainly qtz grains,		grain size 1-2mm
	56						little silt		• fines may have been
							• no fines, rounded		wash out by flushing
S-13	59	7/9	-						0 ppm
	60	14/20						SP	Sample fell out
	61								of split spoon,
									no recovery
	64	7/8	1.0/20			tan			- kaolinic clays
S-14	65	28/41			DENSE			SP	0 ppm
	66								
	69	19/38	1.8/20		very				0 ppm
S-15		78			Dense	silver	weathered Bedrock		
				T.D. 70'			micaceous		
									AR300628

REMARKS

BORING [illegible]

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW02(S)
PROJECT NO.: 621Y — DATE: 12/16/87 — DRILLER: Karl Altzeberger
ELEVATION: 26.90 — FIELD GEOLOGIST: T. Karwick
WATER LEVEL DATA: 24 hr. 13.8 12/17/87 Static
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		
							See boring log CR-MW02(D) for lithologic description.		
	5.0								
	10.0								
	15.0								W.T. 13.2 FT
	20.0								
				T.D. 22'					
	23.0								AR300629

REMARKS: Hollow Stem Auger, 140 lb Hammer, Split Spoon Sample

BORING CR-MW02(S)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW22(D)
PROJECT NO.: 621Y — DATE: 12/6/87 — DRILLER: Geary Bros
ELEVATION: 27.10 — FIELD GEOLOGIST:
WATER LEVEL DATA: EL WT. 14.4 12/7/87 7:00 a.m.
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* — SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	0.0								HNU
S-1		2/2	1.8/1.5		Loose/ Medium	Dark Brown	Silty fine sand	SM	2ppm
	2.0	4/4					fr. med grained sand		-some cohesiveness
							+ Organics		
	4.0								
S-2		10/11	1.5/1.5		DENSE	Reddish Br	med to coarse sand	SW	0ppm
	5.5	21				to Greenish Grey	w/ some gravel, little silt		dry-damp
							Gravel + sand		
	9.0								
S-3		4/6	1.4/1.5		MED DENSE	Lt Brn	med. grained sand	SP	well sorted, clean, dry
	10.5	11					↓		
						BR	Gravel w/ silty sand	GW	W.T. 14.0
	14.0								
S-4		18/21	1.2/1.5		Very DENSE		broken cobbles, weathered schist Frags.		ϕ ¼" - 1½"
	15.5	39							green-black schist, blk. white
	19.0								
S-5		7/32	1.3/1.5		Very DENSE	BR	Broken up weathered Gneiss	GW	saturated 0ppm
	20.5	59					+ schist, sand +		Gravel w/ Boundaries
							Gravel		
	24.0						↓		
S-6	25.5	11/19							HR300630 0ppm

REMARKS — Begin Drilling at 12:30

BORING CR-MW22(D)

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* See Legend on Back

BORING LOG **NUS CORPORATION**

PROJECT: Croyden TCE BORING NO.: CR-MW02(C)
PROJECT NO.: 621Y DATE: 12/11/87 12/6/87 DRILLER: Barry [illegible]
ELEVATION: FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	27.0	89							[illegible]
							↓		0 ppm
	29.0								several ft of blowing
S-7		21 / 12 / 14	1.5/1.5		DENSE	BR	med to coarse sand,	SW	washed out before
	30.5						little gravel and silt		sampling
S-8	34.0	9 / 10	1.4/1.5		MED DENSE	BR		SW	no blowing 0 ppm
	35.5	17							
									37.5 ft - hi [illegible] blowing [illegible]
	39.0						↓		
S-9		15 / 11 / 17	1.5/1.5		MED DENSE		Gravel and sand,	GP	Granite and schist
	40.5						med to coarse sand,		0 ppm
							little silt		
	44.0						↓		
S-10		120/3"	—		VERY DENSE			GP	Blow-in 0 ppm
	45.5								Hard Drilling
							Clay w/ little sand		
	49.0					BRIGHT			
S-11	50.5	9 / 13 / 20	1.3/1.5		DENSE	ORANGE		CL	0 ppm

* See Legend on Back

REMARKS

AR300631

BORING CR-MW02

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BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE
PROJECT NO.: 621Y
LEVATION:
DATE: 12/12/1 12/16/87
FIELD GEOLOGIST:
BORING NO.:
DRILLER:
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
									Hole
							↓		
	54.0								Open
S-12		14/13	1.5/1.5		DENSE	brown	clay wl fr. sand	CL	most of sample washes out under hi press
	55.5	20							
S-13	59.0								
		15/17							NO SAMPLE RECOVERED
	60.5	21							
	64.0								
S-13		11/19							NO sample recovered - Hit at bottom of sampler
	66.5	8/10					↑		
	69.0								
S-13		7/10	1.5/1.5			Gry	weather schist		
	70.5	15							
									AR300632

REMARKS: Drilled to 50 ft on 12/1
Redrilled boring on 12/16

BORING CR-MW02CD

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: SC-SB03(S)
PROJECT NO.: 621Y — DATE: 11/13/87 — DRILLER: S. Adolphson
ELEVATION: 12.38 — FIELD GEOLOGIST: C. Evans
WATER LEVEL DATA: E.O.T.: 11.2 (12/4/87 9:00 AM)
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		HNU
S-1	0.0	2 / 6	5/1.5		med dense	Br	med - coarse sand w/	SW	2 ppm
	1.3	9					gravel, some silt,		
							to pebbles		
	4.0						Brown / some fine	GW	Damp
S-2		9 / 10	1.0/1.5		med dense	Br	sand and silt		2 ppm
	5.5	10				Grayish Br	Fine sand little silt	SP	saturated
S-3	9.0								0 PPM
		7 / 23			Dense	Br	med - coarse sand	SW	3 gravel 1/4 - 1"
	10.5	12					w/ some gravel and		some pebbles
							little silt		& 3 to 4 cobbles
									cobbles = 1 FT.
	14.0								
S-4		7 / 9	1.5/1.5		med dense	Red-Br.	Fine sand, little silt	SP	0 ppm
	15.5	7		TD 15 FT					

AR300633

REMARKS: - boring logged from surface (0)
Hollow Stem Auger
140 lb Hammer, Split Spoon Sample

BORING SC-SB03(S)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW03 (D)
PROJECT NO.: 621Y — DATE: 11/16/87 — DRILLER: Bill Shinn
ELEVATION: 12.38 — FIELD GEOLOGIST: S. Barnicle
WATER LEVEL DATA: W.T. = 10.93 (11/4/87)
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
									HNU
S-1	0.0	8/6	1.5/1.5		MED DENSE	Br	med + coarse gravel	SW	well rounded Qtz
	1.5	10					w/ Gravel, some		gravel Oppm
							silt, to Organics	GW	-Damp
	4.0	9/10	1.0/1.5				Gravel w/ some fine		
S-2	5.5	12			MED DENSE	Br	sand + silt		Saturated Oppm
						Grayish Brown	Fine sand, little silt	SP	
S-3	9.0								Oppm
		7/23			DENSE	Br.	med-coarse sand	SW	% gravel 1/4"-1",
	10.5	18					w/ some gravel		Schist, Biotite &
							and little silt		Qtz, saturated
									cobbles at 11ft
	14.0	7/9	1.5/1.5						
S-4		7			MED DENSE	Red-Br.	Fine sand, little silt	SP	Oppm
	15.5								
	19.0								
S-5		9/5	.9/1.5		MED DENSE	Brown	fine to med sand,	SP	% 1/4" - 2 1/2" (brown
	20.5	8					little silt, to gravel		mp) Schist
	24.0	6/9	1.5/1.5		MED DENSE	Br.		SP	
	25.5	17							

AR300634

REMARKS: Hollow stem Auger, 8" O.D. 4 1/2" I.D. 1401b Hammer, 30 inch drop. Rig: Diedrich 55

BORING CR-MW03(D)

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* See Legend on Back

BORING LOG — NUS CORPORATION

PROJECT: Croyden TCE
BORING NO.: [illegible]
PROJECT NO.: 621Y
DATE: [illegible]
DRILLER: [illegible]
ELEVATION:
FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth.ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
									HNU
	[illegible]								
									hitting cobble 26ft
	[illegible]	100/6"	1.5/1.5		Very DENSE				
S-7						Brown			0 ppm
	[illegible]						Gravel, cobbles broken up, coarse sand little med-fine sand and silt	GP	30' boulders + cobbles - resistance - [illegible]
S-8	34.0	15 / 33 / 45	.5/1.5		Very DENSE	Gr. [illegible]	Cobbles, gravel, coarse sand, some med grained sand	GP	0 ppm; broken cobbles [illegible] [illegible]
	[illegible]								
S-9	39.0	11 / 13 / 8 / 10	2.0/2.0		MED DENSE	Tanish	med. and coarse sand well sorted, tr. fines	SP	[illegible]; 0 ppm
	40.5								
S-10	[illegible]	10 / 33 / [illegible] / 20	1.2/2.0		VERY DENSE	[illegible]	fine med sand w/ little coarse sand tr. biotite	SP	[illegible] sand
	[illegible]								
S-11	49.0	12 / 15	2.0/2.0		MED DENSE	[illegible] gray, white	coarse sand w/ trace		

AR300635

REMARKS added H2O after 30 ft to wash out auger
[illegible] (stabilizing [illegible] 30')

BORING CR-MW03(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW03(C)
PROJECT NO.: 621Y — DATE: 11/18/87 — DRILLER: Gahagan
ELEVATION: — FIELD GEOLOGIST: S. Carrick
WATER LEVEL DATA: (Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY, CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	50.5						clay, some biotite	CL	HNU
							some med sand,		
							some fine sand		
	54.0								
S-12			20/20			Tan	med. coarse sand	SW	- wet @
	55.5						w/ little silt		
	59.9								
	60						med grained sand	SW	NO SAMPLE TAKEN
	61						w/ little silt		- more resistant
									drilling at 60
		10	1.5/1.5			ORANGE TAN			
		22			VERY DENSE		Sandy clay, w/	CL	
S-13		30					little coarse sand,		
				T.D. 65'			little gravel mix		- slippery feeling

AR300636

REMARKS

BORING CR-MW03(C)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR MW 04-S
PROJECT NO.: 621Y — DATE: 10/20/87 — DRILLER: B. Woodington
ELEVATION: 13.05 — FIELD GEOLOGIST: S. Barnick (Jonn Mathes Assoc.)
WATER LEVEL DATA: W.T.: 10 ft (or 3 ft, 1 hr stabilized)
(Date, Time & Conditions) 10/20, Morn., Cool, foggy, damp — W.T. El. 11.15 (11/6/

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION* — SOIL DENSITY-CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS — HNU
	0.0								
S-1					Very Loose	Br	med. grained sand,	SW	moist 0
	1.5						little silt, tr. pebbles		
							↓		
	3.0								
S-2		3/2					↓		Moist - Sat 0
	7.0	1			Very Soft	Gr	Clay, tr. sand,	CL	
							some silt		
							dark gray to mulgray clay		
	10.0								
S-3		6/7	.5/2.0		Med Dense	Lt. Br	Med to coarse sand	SW	large gr. broken 0
	12.0	13					to gravel, then		up, hitting large
							to fine sand, tr. silt		cobbles at 10'
									- water
	15.0								
S-4		4/9	1.5/2.0			Gr.	gray clay, tr. fine sand	CL	W.T. 8.5' 0
	17.0	19/32			Very Stiff		clay w/ more sand & gr.		
	20.0								
S-5		3/8	2.0/2.0		Med Dense	Rusty Brown	Fine to med sand	SP	saturated 0
	22.0	7/8					- well sorted		
									AR300637

REMARKS: hollow stem auger; started 9:00 Am
background HNU: 1 ppm, LEL: 20.9/0.0/0.0
140 lb hammer / 30 inch stroke.

BORING CR mw04(
PAGE 1 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR mw 04 S
PROJECT NO.: 621Y — DATE: 10/20 - 21/87 — DRILLER: B. Woodington
ELEVATION: — FIELD GEOLOGIST: S. Barnick (John Mathes Assoc.)
WATER LEVEL DATA: 10/20 AT 30' (1 hr stabilized) W.T. 10'
(Date, Time & Conditions) 10/21/87 Cool & Rainy All day

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	23.0								HNU
S-6		3 5	2.0/2.0			Brown	fine med sand, tr.	SP	0
	27.0	19 15			med dense		fines, tr. gravel		Very well sorted
	30.0								
S-7		13 12	20/20			Br	fairly clean med sand,	SP	W.T. 21'
	32.0	43 96		Sand silt	very dense		tr. silty fine sand		
							-cobbles		
	35.0								
S-8		100	.3/3.0				Cobbles, gravel	GW	Refusal
	37.0						some sand & silt		
									AR300638

REMARKS Refusal at 35', this boring will be used for the shallow monitoring well

BORING CR-mw04S

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW04 (D)
PROJECT NO.: 621Y — DATE: 10/20-22/87 — DRILLER: R. Woodington
ELEVATION: 12.24 — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA: 10.7, 11.0 ± 11/16/87 ≈ Stabilized
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
	2.0								
S-1					Very Loose	Br.	med grained sand	SW	moist 0
	3.5						little silt, tr.		
							pebbles		
							↓		
	5.0								
S-2		2 2							moist - sat. 0
	7.0	1			Very Soft	Grey	Clay, tr. sand,	CL	
							some silt, dark		
							grey to med grey		
	10.0						clay		
S-3		6 7 13	.5/2.0		MED DENSE	Light Brown	med to coarse sand	SW	large gravel 0
	12.0						to gravel, then		broken up, hitting
							to fine sand, tr.		large cobbles
							silt		at 10', water
	15.0								
S-4		4 9 12	1.5/2.0			Grey	grey clay, tr. fine	CL	W.T. 8.5' 0
	17.0				Very Stiff		sandy clay w/ more		
							sand and gravel		
	20.0								
S-5		3 8 7 8	2.0/2.0		MED DENSE	Brown	Fine to med sand	SP	saturated 0
	22.0						-well sorted		
									AR300639

REMARKS: 0-25 feet was logged from CR-MW04(S)
Hollow Stem Auger
140lb Hammer, 30"

BORING CR-MW04(D)
PAGE 1 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW24(D)
PROJECT NO.: 621Y — DATE: 10/20-22/87 — DRILLER: C. Woodcock /
ELEVATION: — FIELD GEOLOGIST: C. Carrick Jeff Harris
WATER LEVEL DATA: (Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNu
	25.0								
S-6		2/5	2.0/2.0			Brown	fine-med sand, tr.	SP	0
	27.0	19/15			med Dense		fines, tr. gravel		very well sorted
	30.0								
S-7		13/12	2.0/2.0	sand		Br.	fairly clean med.	SP	W.T. 21'
	32.0	43/9in		silt	Very Dense		sand, to silty		
							fine sand		
							cobbles		
	35.0								
S-8		100	.7/2.0		Very Dense		cobbles, gravel		cobbles 2"-5" ø
	37.0						some sand & silt		
	39	3/6							
S-9		7	2.0/2.0		MED DENSE	Tan-Brown	Coarse sand w/some	GW	wash rot auger
	41						gravel, little med.		well sorted,
							to fine sand,		sub angular sand
							little silt		gravel ø ¼"-1"
	44	8/19							
S-10		19							
	46		1.0/2.0		DENSE	red Br	fine sand	SP	
									W.T. 2.3 ft
									after 1 hr - staple
11	50						hit rock		##B20064 collected due to heave-in.

T.D. 50'

REMARKS: Hollow stem Auger

BORING CR-MW24(D)

PAGE 2 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW05(S)
PROJECT NO.: 621Y — DATE: 12/1/87 — DRILLER: Eli Shinn
ELEVATION: 29.01 — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA: El W.T. 11.4 (12/4/87, water)
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth Ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	0								drill
S-1	1.5	7/7	1.5/1.5		med dense	Red Br.	silty fine sand	SM	damp 2 ppm
		8					w. gravel		
	4.0					Light Gray	silt, dr. organics	OH	
S-2		7/13	1.0/1.5		loose to dense	LR.	some fine sand		2ppm
	5.5	11							
S-3	7.0								
		11/46	1.0/1.5		very dense	↓			
	10.5	52				Grey-BR	fine grained sand	SW	hitting cobbles at
							some gravel, dry		13 FT
									3-4 inch cobbles encountered
	14.0								
S-4		28/49	.5/1.0		very dense		gravel & cobbles	GW	Drilled & Sampled
	15.5	50/5"							cobbles, 2ppm
	17.0								
S-5		13/37	1.2/1.5		very dense	Red BR.	gravel, med gr. sand	GW	gravel well rounded Qtz
	20.5	50/4"					some silt, some		
							coarse sand		
									0 ppm
S-6	24.0				very dense	Red Br.	gravel and sand	GW	Ø gravel ¼"
		100/10	1.0/1.5				little silt		colors

REMARKS: boring log from CR-MW05(D)
Hollow Stem Auger -
140 lb Hammer, Split Spoon Sample

BORING CR-MW05(S)

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* See Legend on Back

AR300641

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW05S 2
PROJECT NO.: 621Y — DATE: 12/1/87 — DRILLER: E. Finley
ELEVATION: — FIELD GEOLOGIST: S. Garnick
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	25.5								
	29.0			T.D. 22Ft					
S-7		62/54	1.5/1.5		very DENSE	Br.	Gravel and med. gr.	GW	
	30.5	28					sand, fr. silt		

AR300642

REMARKS

BORING CR-MW05S

PAGE 2 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE — BORING NO.: CR-MW05CD
PROJECT NO.: 621Y — DATE: 11/12/87 — DRILLER: B. Woodington
ELEVATION: 29.23 — FIELD GEOLOGIST: S. Earnick
WATER LEVEL DATA: E: W.T. 11.4 (12/7/87 7:30 hrs)
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR ROD (°/.)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	0								Hnu
S-1	1.5	7 7 8	1.5/1.5		med dense	Red Br.	silty - fine sand	SM	Damp 0
							↓ trace gravel		
	4.0	7 13	1.0/1.5		med dense	Dark Br	silt, trace organics	SM	4.5 ft - saturated
S-2	5.5	11					some fine sand		0
S-3	9.0	11 46	1.0/1.5		very dense	↓			
	10.5	98				Grey-Br	fine grained sand, some gravel, dry	SW	hitting cobbles at 10.5 ft - purplish in color (Diorite cobbles)
S-4	14.0	22 49 50/5"	.5/1.0		Very Dense		↑ Gravel + cobbles ↓	GW	Diorite and schist cobbles 0
	15.5								
	19.0	13 37	1.2/1.5		Very Dense	Red Br	Gravel, med gr. sand, some silt, some coarse sand	GW	gravel well rounded - fine 0
S-5	23.5	50/5"							
S-6	24.0	100 50 14	1.4/1.5		Very Dense	Red-Br	Gravel and Sand little silt	GW	Gravel 1/4" Diorite Schist
	28.5								

REMARKS Hollow Stem Auger, 8" O.D., 140 lb hammer, 30 inch stroke.

BORING CR-MW05CD

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW05
PROJECT NO.: 621Y — DATE: 11/12/87 — DRILLER: R. Woodson
ELEVATION: — FIELD GEOLOGIST: C. Ennis
WATER LEVEL DATA (Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	26								
S-7	29	62/54	1.5/1.5		Very	Br.	Gravel and med-gr	GW	
	30.5	68			Dense		sand to silt		
S-8	34.0	33/50	1.5/1.5			Br.	Sand w/ some gravel	SW	med grained sand, silt
	35.5	22			Very Dense				
						red-dish			
	39.5	15/19/19	1.5/1.5		med DENSE	Br	med. grained sand	SP	some silt,
S-9	40.5						to. gravel, to silt		
	44.0	12/12/37	1.5/1.5		DENSE	Br	med-coarse sand	SP	
S-10	45.5						some gravel		
S-11	49.0	12/51/67	1.5/1.5		Very Dense	Br		SP	
	50.5								AR300644

REMARKS

BORING CR-MW05

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW03 (D)
PROJECT NO.: 621Y — DATE: 11/12/87 — DRILLER: D. Woodington
LEVATION: — FIELD GEOLOGIST: C. Carnicle
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
	51								
S-12	54	20/25/49	—		Very DENSE		Coral, gravel and cobbles, little silt	SW	NO Recovery 0
	55.5								
S-13	59.0	20/50/14	-		DENSE			SW	NO RECOVERY Retainer is being observed during 0
	60.5								
				Clay			(Based on Driller		
									- broken up cobble
	64.0	100/24						CL	of schist
S-14	65.5	24			very DENSE		Clay and sand		end of bore hole.
									- last wrench down hole

REMARKS: Driller could not drill any further - ran out of augers. Weathered schist was encountered after the clay layer at CR-MW03.

BORING CR-MW03

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* See Legend on Back

AR300645

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW106S

PROJECT NO.: 621Y — DATE: 1/7/87 — DRILLER: B. Woodward

LEVATION: 27.00 — FIELD GEOLOGIST: S. Barrick

WATER LEVEL DATA: El. WT. 12.17 (11/6/87 = Static)

(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		HNu
							Topsoil		
	4.0	8/13							
S-1		11/21	1.2/6.0		med dense	Tan	med-fine sand, w/ little gravel	SW	0 ppm
	6.0								
S-2	8.0	21/48/52/57	1.2/2.0		Very Dense	Grey Brown	sand & gravel w/ cobbles	SW	med-fine sand 0 ppm hitting cobbles at 10 ft
	10.0								
	12.0	21/25	1.0/2.0		DENSE	Green & Rusty Brown	Gravel	GW	moist
S-3		14/11					Silty sand & gravel	SW	0 ppm
	14.0								
	16.0	26/11							
S-4		10/9	1.2/2.0		medium dense	Reddish Brow	med-course sand, some gravel (weathered shale & schist)	SW	saturated 0 ppm
	21.0								
	24.0	23/11	.9/10.0		med dense		med course sand, some gravel	SW	
S-5		15/14							Auger refusal @ 26'

AR300046

REMARKS: Hollow Stem Auger 8" I.D. 140 lb Hammer / Split spoon Sampling

BORING CR-MW106S

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW03-23
PROJECT NO.: 621Y — DATE: 11/4/87 — DRILLER: S. Washington
LEVATION: — FIELD GEOLOGIST: T. Carrick
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	26.0								HNU
	29.0	7/5	5%/2.0		base	Red-Br	med - coarse sand,	SP	0 ppm
S-6		5/7					tr. gravel, tr. silt		
	31.0			T.D. 30'					
S-7									

AR300647

REMARKS

BORING CR-MW03(S)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW06 (L)
PROJECT NO.: 621Y — DATE: 11/2/87 — DRILLER: E. Woodington
LEVATION: 67.06 — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA: 17.24' (T.P.C.) 11/4/87 1600 hrs. W.L. El 11.23
(Date, Time & Conditions) Clear ~ 30's ~ 33°F

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
									HNU
							topsoil		
	4.0	8 13							0
S-1		11 21	1.3/2.0		MED DENSE	Tan	med - fine sand, w/	SW	
	6.0						little gravel		
									0
S-2	9.5	31 48 53 59	1.2/2.0		Very DENSE	Grey, Brown	Sand + gravel w/ cobbles	SW	med - fine sand
	11.5								hitting cobbles 10'
	14.0	61 25	1.0/2.0		DENSE	Green + Rusty Brown	Gravel	GW	moist 0
S-3		14 11					Silty sand + Gravel	SW	
	16.0								
	19.0	22 11							
S-4		10 6	1.2/2.0		MEDIUM DENSE	Red to Brown	MED - COARSE SAND, some GRAVEL (WEATHERED BEDROCK)	SW	SATURATED 0
	21.0								
	24.0	29 11	.9/2.0		med DENSE		med coarse sand	SW	saturated 0
S-5		15 14					some gravel		AR300648

REMARKS: Hollow Stem Auger
140 lb Hammer, Split Spoon Sample

BORING CR-MW06(L)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW06D
PROJECT NO.: 621Y — DATE: Nov 2 1987 — DRILLER: E. Washington
ELEVATION: — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
		1							
	29.0	7	2 0/2 0		loose	Red-BR	med - coarse sand,	SP	0
C-6		5					tr gravel, tr. silt		
		7							
	31								
S-7	34.0	21	2.0/2.0		med Dense			SP	
		13							
		20							
		9							
	36.0								
									(high recovery
	39.0	41			Very Dense	Red BR			in sand
S-8		52							
		38					med - coarse sand	SP	0
		39							
	41.0						tr. silt		
	44.0	20	.8/2.0		med DENSE	Br	med - coarse sand,	SW	
S-9		11							
		10					some gravel, little		0
		9							
	46.0						silt		
									47' hitting large
									cobbles
S-10	49	44	.8/2.0		Very Dense	Green Grey	Broken Rock -	GW	
		122/5"				Black			
							meta-conglomerate		

AR300649

REMARKS: Stopped @ 49' 11/2/87
Completed hole on 11/3/87

BORING CR-MW06D

* See Legend on Back

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BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW36(D)
PROJECT NO.: 621Y — DATE: 11/2/27 — DRILLER: B. Woodington
LEVATION: — FIELD GEOLOGIST: S. Parrish
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	51					light brown	[illegible]	GW	sample S-11 @
S-11	52	89 48 47	0.5/100				coarse sand		is broke up rock
							hit bedrock @ 55'		[illegible]
							[illegible]		[illegible]
							[illegible]		
							[illegible]		
							[illegible]		
							[illegible]		

AR300650

REMARKS

BORING CR-MW36(D)

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* See Legend on Back

BORING LOG NUS CORPORATION

PROJECT: Croyden TCE BORING NO.: CR-[illegible]
PROJECT NO.: 621Y DATE: 11/2/87 (11/30/87) DRILLER: B[illegible]
ELEVATION: 30.03 FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA [illegible] 11:08 (11/5/87 [illegible])
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
								SM	
	4.0	8 / 10	2.0/2.0		MED DENSE	OR TAN	silt w/ fine sand +	SM	dry
S-1		12 / 15					little gravel		
	6.0								
									7' hitting cobbles
	9.0	100/	5"		Very DENSE				
						OR	Silt, fine sand	SM	No sample recovered
	11.0					Brown	w/ some gravel		11' [illegible]
							and cobbles		
	14.0	32 / 31	1.5/2.0		Very DENSE	Dark Brown			
S-2		47 / 75					Cobbles, fine sand,	GP	-damp
	16.0						some gravel, +		-all gravel and
							little silt		cobbles
	19.0	48 / 36	1.1/2.0		Very DENSE	Or Brn	↓		
S-3		67 / 43							
	21.0							GP	

AR300651

REMARKS boring was sampled during CR-[illegible](D)
-Hollow Stem Auger
140 lb Hammer, Split Spoon Sampler

BORING CR-[illegible]

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW37(D)
PROJECT NO.: 621Y — DATE: 10/29/87 — DRILLER: B. Woodington
LEVATION: 29.97 — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA: 11/2/87, 1000 HRS, Partly Cloud, 50°
(Date, Time & Conditions): 20.60 Ft (From Top of PVC) Fl. 27 11.29

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
								SM	
	4.0	8/10	2.0/2.0		MED DENSE	Orange Tan	silt w/ fine sand	SM	dry
S-1		13/15					little gravel		
	6.0								
									7' hitting cobbles
~~S-2~~	9.0	100/5"			Very Dense				no sample recovered
							silt, fine sand	SM	
	11.0					OF BR	w/ some gravel		11' soil is damp
							and cobbles		
	14.0	32/31	1.5/2.0		VERY DENSE	Dark Brown			
S-2		47/75					Cobbles, fine sand,	GP	0ppm
	16.0						+ some gravel, little		-damp
							silt		-all gravel and
									cobbles
	19.6	42/36	1.1/2.0		VERY DENSE	OF BR.			0ppm
S-3		67/42						GP	sample sat. 20'
	21.0								
	24.0	68/59	1.7/2.0		VERY DENSE				
S-4	25.0	92/43							AR300652

REMARKS: Hollow Stem Auger

BORING CR MW37(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW07 (D)
PROJECT NO.: 621Y — DATE: 10/27/21 — DRILLER: B. Woodington
EVATION: — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
									0 ppm
	29	65/20	1.4/2.0		DENSE	Dark Brown	dirty - silty sand	SM	sand very fine
S-5		21/23							
	31								
S-6	34	13/31	2.7/2.0		DENSE	[illegible]			
		24/22					silty med grained	SM	0 ppm
	36						sand with gravel		
	39	17/22	2.9/2.0		DENSE				wash augers out
S-7		10/7				Red-			0 ppm
	41					Brown	med-coarse sand	SW	hitting more
							little gravel, few		cobbles at 40 ft
							cobbles		
	44	8/11	1.2/2.0		DENSE	Brown			
S-8		24/22					med-coarse sand,	SP	used rotary bit
	46						some silt, no		+ water to wash
							gravel or cobbles		out hole

AR 300655

REMARKS: Started at 44' on 10/30

BORING CR-MW07(

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW07 (D)
PROJECT NO.: 621Y — DATE: [illegible] — DRILLER: E. Woodington
EVATION: — FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
		9	1.3/2.0						
	49	15			DENSE	Br	med grained silty	Sm	1½ ft blow in
S-9		20					sand		
		20							0 ppm
	51								Qtz sand
		20	—						
S-10	54	24			DENSE	Br	NO SAMPLE RECOVERY		used water to
		24							
		22						Sm	flush out 0 ppm
	56					[illegible]	- silty sand		auger
	57	25				Brown	med-coarse sand		
		100/4"			very DENSE				
S-11	58			57' T.D.			blow in,		57' drilling hard
	59						-boulder or bedrock		(hitting boulders
							at 57', can		and cobbles)
							not drill any deeper		58' believed to
									be into bedrock,
									"drill pulling hard"

AR300654

REMARKS HNU 0 ppm

BORING CR-MW07(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW 8 (S)
PROJECT NO.: 621Y — DATE: 11/6/87 — DRILLER: Adolphson, Ithaelberg
ELEVATION: 20.68 — FIELD GEOLOGIST: P. JONES
WATER LEVEL DATA: Elapsed 12.33 — S.W.L. 12.44 (T.O.C.)
(Date, Time & Conditions) (11/6/87)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY-CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
							See log for		
							CR-MW 8(D) for		
							Lithological Descrip.		
BOH				BOH			BOH = 22 FT		

AR300655

REMARKS: RIG - CME 550 — NQ Diamond Core - Split Spoons
Mathes Geotech
Hollow Stem Auger

BORING CR-MW 8(S)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW8(D)
PROJECT NO.: 621Y — DATE: 11/5/87 — DRILLER: Gregg Mid-Atlantic C. Hatcher
ELEVATION: 80.52 — FIELD GEOLOGIST: P. JONES
WATER LEVEL DATA: S.W. 12.4' (Fld. Tape)
(Date, Time & Conditions): E.W.T. 12.20 (11/6/87 12:00 PM)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
S-1	4.0-5.5	2 / 2 / 1	0.6/1.5		VERY LOOSE	BROWN	MED-COARSE SAND, SOME GRAVEL	SP	DAMP
S-2	9.0-10.5	5 / 5 / 7	0.6/1.5		MED DENSE	GREY	COARSE SAND, SOME SAT TRACE CLAY, TRACE GRAVEL	SP	DAMP
S-3	14.0-15.5	15 / 37 / 43	0.5/1.5		VERY DENSE	LIGHT BROWN	GRAVEL, MED-COARSE SAND, TRACE SILT	GP	SATURATED
S-4	19.0-20.5	7 / 35 / 54	1.2/1.5		VERY DENSE	TAN	FINE-MED GRAVEL, MED-COARSE SAND	(GP) (SP)	
S-5	24.0-25.0	2 / 84	0.3/1.0		VERY DENSE	TAN	MED-COARSE SAND, FINE-MED GRAVEL	(SP)	

REMARKS: SWL AFTER S-5 = 10.72' BGL
RIG - MAYHEW CREATION CME-55B 7x16
Hollow Stem Auger, split Spoon Sample

BORING CR-MW8(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW 3D
PROJECT NO.: 621Y — DATE: 11/5/87 — DRILLER: S Adrian, C [illegible]
ELEVATION: — FIELD GEOLOGIST: P. JONES
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
		X							
S-6	29.0-30.5	4 / 7 / 8	1.4/1.5		MED DENSE	TAN	MED-COARSE SAND TRACE GRAVEL	(SP)	
S-7	34.0-35.5	4 / 13 / 11	0.5/1.5		MED-DENSE	TAN	MED-COARSE SAND SOME GRAVEL	(SP)	
S-8	39.0-40.5	4 / 3 / 3	1.5/1.5		LOOSE	TAN	MED-COARSE SAND	(SP)	
S-9	44.0-45.5	81 / 85 / 83	0.7/1.5		VERY DENSE	BROWN	MED-COARSE SAND / FINE-MED GRAVEL	SP / GP	
S-10	49.0-50.5	8 / 19	1.2/1.5		DENSE	TAN-BROWN	MED-COARSE SAND		AR300657

REMARKS

BORING CR-MW 3(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE
BORING NO.: CR-MW 8(D)
PROJECT NO.: 621Y
DATE: 11/6/87
DRILLER: Adams [illegible]
ELEVATION:
FIELD GEOLOGIST: R. JONES
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION*: SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	MATERIAL DESCRIPTION*: COLOR	MATERIAL DESCRIPTION*: MATERIAL CLASSIFICATION	USCS	REMARKS
		18					Last 6" - weathered schist		
[illegible] Soil									

AR300658

REMARKS

BORING CR-MW8(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: SR-MW09(S)
PROJECT NO.: 621Y — DATE: 10/22/87 — DRILLER: Barry Woodington
ELEVATION: 16.25 — FIELD GEOLOGIST: S. Barrick
WATER LEVEL DATA: 8.7' (from ground surface) at 14' depth
(Date, Time & Conditions) E.O.W.T. 9.39 (12/3/87 @ 8:30 AM)

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
							Silty loam, tr. organics		
								ML	
	4.0	41/33	2.0/2.0		DENSE	Grey Brown	silty-clayey fine	ML	Gravel ϕ 1"
S-1		23/31					sand w/ gravel		
	6.0								
S-2	9.0	21/46	2.0/2.0		VERY DENSE	Brown			+ boulders,
		38/30					Gravel w/ little	GW	large cobbles
	11.0						fine sand and silt		
							some coarse sand		
	14.0	30/21			DENSE	Brown - tan	Gravel + Cobbles,	GW	W.T. 8.7'
S-3		22/19					little coarse sand,		Gravel - well rounded
	16.0						fine sand, + silt		Qtz, Cobbles are
									Qtzite + Conglomerate
									few black pebbles
	19.0	41/33	1.5/2.0	T.D. 18'	DENSE	Br.	Sand w/ some gravel	SW	(slate)
S-4		19/17					+ cobbles		- medgr. sand
	21.0								

AR300659

REMARKS: 15 min. standby to allow water level to stabilize
- Hollow stem auger, 8" O.D. 140 lb Split Spoon Hammer

BORING SR-MW09(S)

PAGE 1 OF 1

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE
BORING NO.: CR-mw09 (2)
PROJECT NO.: 621Y
DATE: 10/27/87
DRILLER: Barry Woodington
ELEVATION: 16.33
FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA (Date, Time & Conditions): [illegible] 3.77 [illegible] /5/87 [illegible]

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
							silty loam, tr. organics	ML	
S-1	4.0	41	2.0/2.0		DENSE	Grey Brown	silty-clayey fine sand w/ gravel	ML	gravel ϕ 1"
		22							
		23							
		21							
	6.0								
									-hit boulders or large cobbles
S-2	9.0	21	8.0/2.0		VERY DENSE	Brown	Gravel w/ little fine sand and silt some coarse sand	GW	-W.T at 9.3'
		46							
		38							
		20							
	11.0								
S-3	14.0	30	1.0/2.0		DENSE	Brown [illegible]	Gravel + cobbles, little coarse sand, fine sand + silt	GW	Gravel - well rounded qtz, Cobbles are Qtzite conglomerate few black pebbles, slate
		21							
	15.0	22							
		19							
	16.0								
S-4	19.0	41	1.5/2.0		DENSE	Br.	Sand w/ some gravel + cobbles	SW	-medge sand
		22							
		19							
		17							
	21.0								

REMARKS: Hollow Stem Auger, 8" diameter auger (o.d.)
CME 55 Rig
140 lb Hammer, Split Spoon San[pler]

* See Legend on Back

BORING CR-mw09(2)

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW09 (D)
PROJECT NO.: 621Y — DATE: 10/27/87 — DRILLER: Barry Washington
ELEVATION: — FIELD GEOLOGIST: S. Barnick & Greg
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	24.0	7/9	0.5/3.0		med DENSE	Br.	Gravel, few cobbles little coarse to	GW	ϕ 1/2" - 1/2"
S-5		7/12							
	26.0						med sand, cobbles are sandstone conglomerate, most of the fine have been washed out		
S-6	29.0	32/48	1.0/2.0		very DENSE	Reddish brown to grayish brown	fine to coarse sand, gravel, some silt, and cobble	SW	cobbles are chert & graywacke
	31.0	17/18							
	34	34/60	1.2/2.0		very DENSE	Brown	med sand w/ little silt, little gravel few cobbles	SW	-graywacke cobble
S-7		75/28							
	36								-less problems with blowin after 29'
S-8	39	47/73	1.0/2.0		very DENSE		coarse to med gr. sand, little silt	SW	
S-9		100/2" / 100/1"							
	41			T.D. 40			-		40' hitting rock or boulder
									AR300660

REMARKS

BORING CR-MW09

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* See Legend on Back

BORING LOG | **NUS CORPORATION**

PROJECT: Croyden TCE | BORING NO.: CR MW 10-D
PROJECT NO.: 621Y | DATE: 10/23/87 | DRILLER: Barry Woodington
ELEVATION: 19.16 | FIELD GEOLOGIST: S. E[illegible] → [illegible] Harris
WATER LEVEL DATA: [illegible]
(Date, Time & Conditions) 10/23/87 10:00Am Cool, Pt. Cldy, Breezy [illegible]

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
-						Rusty Brown	Silty fine gr. sand, w/ some gravel tr. clay	SM	moist
S-1	4	52 / 20	0.5/1.5		very DENSE	Rusty Brown	Sand + Gravel, little silt	GW	fine to med sand
	5	51							Gravel ½"-1½" ø
							Gravel		well rounded, 1" ø
S-2	9	6 / 20	0.5/1.5		very DENSE	Rusty Brown	Med - cs. sand w/ some gravel + cobbles, little silt + clay	SW	
	10	51							W.T. at 9ft
									Adding Water Into Casing
S-3	14	14 / 27	1.0/2.0		DENSE	Rusty Brown	Gravel and sand, w/ little silt, cobbles	GW	sand med - cs grain
	15	52							Gravel well rounded
S-4	19	11 / 30	1.5/2.0		very DENSE	"	med - fine sand w/ some gravel + cobbles, more silt and clay	SW	poorly sorted
	20	21 / 21							
S-5	24	12 / 20	1.0/2.0		DENSE	Brown	↓		poorly sorted
	25	18 / 21							

AR300661

REMARKS: Hollow Stem Auger, Split Spoon Sample
No HNU Readings

BORING CR MW 10-D

PAGE 1 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR mw 10 D
PROJECT NO.: 621Y — DATE: 10/23/87 — DRILLER: Barry Woodington +
ELEVATION: — FIELD GEOLOGIST: S. Barnick Cecil Harris
WATER LEVEL DATA: (Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
							↓		
							↓		
							↓		
S-6	29	102/100	0.5/2.0		Very Dense	Brown	Cobble, bnkn up, med grained sand only little silt (Possible washing in recovery)	GW	100 Blows → 3" Refusal at 28.5' - large cobbles or boulder
	30								
S-7	34	13/30							
		56/100	.6/2.0		Very Dense	Brown to Greenish Grey	Gravel + Cobbles, some fine sand little silt	GW	100 Blows → 6" Gravel - Quartz Cobbles: ign & sedimentary Sandstone
	36								
	39	60/63	0.5/2.0		Very Dense				- no large cobbles
S-8		41/38					Cobbles w/ fine sand and silt, some gravel	GW	- fairly easy drilling (1.5 ft of blowin)
	41								
	44	19/60	2.0/2.0		Very Dense		med - fine sand + cobbles & gravel some silt	SW	(1.5 ft of blowin) hitting boulders + cobbles
S-9		47/36							
	46								
	49	7/7	1.3/2.0				↓		1 ft of blowin
S-10		18/30			Dense	↓	↓		AR300662

REMARKS

BORING CR mw10

PAGE 2 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR mw10D
PROJECT NO.: 621Y — DATE: 10/23/87 — DRILLER: Barry Woodington
ELEVATION: — FIELD GEOLOGIST: C. Barnick / Cecil Harris
WATER LEVEL DATA 10/26.87 @ 2 pm, 8.3' (well depth 58')
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		
	51								
	54								
S-11		102/5"	.4		Very Dense	Brown to Green/Grey	Gravel + Cobbles	GP	Sample broken up by rotary bit - only a little sand & silt
	56						Gravel is compose of Qtz - possibly bedrock		
							Cobbles Greenish		
	58	100/40	.3/20		Very Dense		Qtz - Sandstone		
S-12	60						→ Broken up Gravel + cobbles, very little amount of fines	GP	Slate, Qtzite, Qtz, Qtzite contains mafic minerals → schist
							↓		
	63	130/6" 100/12"		T.D. 63'	Very Dense				
S-13							Broken-up Qtz + Schist, much more mafic min. (hornblende- Amphibolite)	GP	
	65								

AR300663

REMARKS Drilled to 58' on 10/23
Completed hole on 10/26 T.D. 63'

BORING CR mw10

AA0346 PAGE 3 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: SB-MW11 (S)
PROJECT NO.: 621Y — DATE: 10/23/27 — DRILLER: B. Woodington
ELEVATION: 17.71 — FIELD GEOLOGIST: E. Barnick
WATER LEVEL DATA (Date, Time & Conditions): E. W.T. 9.88 11/5/87 8:00am)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		
						Br	silty loam, tr. organics	ML	
	4.0	71/56	3/6.0		very loose	Br	silt w/ some fine	ML	moist
S-1		31/37					sand, tr gravel		gravel subrounded
	6.0								to angular
							-gravel and small		
							cobbles		
S-2	9.0	31/20	.6/2.0		dense	light brown	silty sand w/	SW	W.T. = 9.0'
		25/24					diorite, Green schist		15 min; W.T. 7.3
	11.0						and qtz cobbles		purple, green &
									white cobbles &
									gravel
	13.0	50/22	.2/6.0		very dense	brown	silty sand w/ cobbles	SW	Cobbles are
S-3		49/101					and gravel		broken up Diorite
	15.0								& Green schist.
									Gravel qtz.
				T.D. 18'					

REMARKS: Water added after 15 ft to clean out auger

Drilling method: Hollow Stem Auger

AR 300664

BORING SB-MW11 (S)

PAGE 1 OF 1

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: SB-MW-2D
PROJECT NO.: 621Y — DATE: 10/28/87 — DRILLER: B. Wood
ELEVATION: 17.42 — FIELD GEOLOGIST: S. Barnick
WATER LEVEL DATA: 9.16' (Top of PVC) 10/29/87 0950 hrs
(Date, Time & Conditions) El. W.T. 13.09

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth Ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		
						Br.	silty loam to organics	ML	
	4.0	71/56	.3/2.0		Very Dense	Br.	silt w/ sand fine	ML	moist
S-1		31/37					sand, tr gravel		gravel subrounded to angular
	10.0								
							gravel and small cobbles		
S-2	9.0	21/20	.6/2.0		DENSE	It Brown	silty sand w/	SW	
		29/24							W.T. 9.5'
	11.0						Qtzite, Greenschist		Purple, Green+white
							and Qtz cobbles		Cobbles + Gravel
	14.0	57/68	.8/2.0		Very Dense	Brown	silty sand w/ cobbles	GW	cobbles are broken
S-3		49/61					and gravel		up - Qtzite +
	16.0								Greenschist,
									gravel - qtz.
									W.T. 13.0' @15' depth
	19.0	19/79	1.0/2.0		Very	Green Brown	Broken up cobbles of	GW	
S-4		21/18			Dense		Greenschist little		-more below in
	21.0						fine sand and silt		
							some well rounded		Gravel Ø ≈ ½"
							Qtz Gravel		
									AR300665

REMARKS: Hollow Stem Auger
140 lb Hammer, Split Spoon Sample

BORING SB-MW-2D

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE
BORING NO.: CR-MW11 (D)
PROJECT NO.: 621Y
DATE: 10/28/87
DRILLER: B. [illegible]
ELEVATION:
FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY / SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	24.0	31 / 64	.9/2.0		Very Dense	Greenish Brown	mostly broken up	GW	
S-5		17 / 12					green schist, coarse		- more fines
	26.0						[illegible] gravel, little		and sand
							fine-coarse sand		
							little silt		
S-6	29.5	41 / 36	2.0/2.0		Very DENSE	Brown			
		21 / 16					Med-CS. Sand	SW	- Angular
	31.5						-some well rounded		
							gravel, few cobbles		
	34.0	11 / 10	1.0/2.0		MED DENSE	White Green	med-cs. sand, little	SW	- Augers were
S-7		11 / 13					gravel, no cobbles		washed out before
	36.0						little silt		sample was
									taken
	39.0	31 / 37	2.0/2.0		Very DENSE	[illegible] Green Brown	Gravel, broken cobbles,	GM	
S-8		28 / 19				Red-Brown	coarse sand, fine sand,		
	41.0						and silt		

AR300666

REMARKS

BORING CR-MW11(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.:
PROJECT NO.: 621Y — DATE: — DRILLER:
ELEVATION: — FIELD GEOLOGIST: S. Barrick
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	44.0	7 45	.5/2.0		VERY	DK Brown			
S-9		23 27			DENSE	to Red	Green schist cobbles,	GW	
	46.0					Br.	gravel, coarse sand,		
							fine sand and silt		- starting to look like
									weathered bedrock
S-10	49.0	46 25 21 19	1.6/2.0		DENSE	GREEN Brown	Green schist cobbles, some gravel - coarse - and fine sand silt-clay	GW	
	51.0								
	54.0	49 52	.8/2.0		VERY	Green Brown	silt + gravel		
S-11		48 39		T.D. 54'	DENSE				
	56.0					Black + white	weathered schist		metallic, micaceous
							- Graphitic micaceous schist		biotite
									AR300667

REMARKS

BORING CB-mw11(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE — BORING NO.: CR-MW 2(S)
PROJECT NO.: 621Y — DATE: 12/5/87 — DRILLER: W. SCHNOOR OF MATHES
ELEVATION: 23.00 — FIELD GEOLOGIST: KEVIN T. McCREANOR
WATER LEVEL DATA: 15.2 (T.O.C.) (12/7/87 AM)
(Date, Time & Conditions): E.O.W.T. 10.22 (12/7/87)

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth Ft.)	MATERIAL DESCRIPTION* — SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	1.0						SEE CR-MW 12(D) FOR		
							DETAILED LITHOLOGIC		
							DESCRIPTIONS		
				▽13.5'					
	23.0								
							HOLE COMPLETED TO 23.0'	12/5	
							2"ϕ PVC MONITOR WELL		AR300668

REMARKS: DRILLERS USED A CME 550 w/ 8" Hollow AUGERS TO 23.0'

BORING CR-MW1a(S)

PAGE 1 OF 1

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW 12 (D)
PROJECT NO.: 621Y — DATE: 12/5/87 — DRILLER: [illegible] of MATHES
ELEVATION: 54.73 — FIELD GEOLOGIST: KEVIN T. McCREANOR
WATER LEVEL DATA: 14.0 [illegible] 12/5/87 [illegible]
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (Ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, Ft.)	MATERIAL DESCRIPTION*: SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
S-1	1.0	17 / 18			M.DENSE	BROWN	GRAVELLY SAND	SW	DRY HNU-0
		6 / 10			↓	↓	↓	↓	
				4.0					
S-2	5.0	1 / 1			V.LOOSE	TAN	SILTY FINE SAND	SM	DAMP HNU-0
		2 / 1			↓	↓	↓	↓	
				9.0					
	10.0	12 / 7			M.DENSE	BROWN ORANGE	SAND - SOME GRAVEL	SW	DAMP HNU-0
S-3		8 / 9			↓	↓	↓	↓	GRAVEL - SUB ANGULAR ≤ 2"
									SOME RUST COLORED COATING
									ON GRAVELS
S-4	15.0	10 / 9		▽14.9'					MOIST HNU-0
		12 / 12							
S-5	20.0	8 / 9							WET HNU-0
		12 / 13							GRAVEL - ROUNDED ≤ 1"
				24.0	↓	↓	↓	↓	
S-6	25.0	4 / 7			M.DENSE	BROWN	SAND - FINE GRAINED	SM	WET HNU

AR390669

REMARKS: DRILLERS USED CME 550 w/ 8" Hollow AUGERS TO 59.0'
SAMPLE S-13 EXTENDED HOLE TO 61.0'
Split Spoon Sampler

BORING CR-MW 12(D)

PAGE 1 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW12(L)
PROJECT NO.: 621Y — DATE: 12/5/87 — DRILLER: N. SCHINN OF MATHES
ELEVATION: — FIELD GEOLOGIST: KEVIN T. McCREANOR
WATER LEVEL DATA:
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
S-6	26.0	12/14			M. LENSE	BROWN	SAND	SM	
				29.0					
S-7	30.0	4/5 8/11			M. STIFF TO STIFF	TAN TO WHITE	CLAY - TRACE COARSE SAND AND MICA GRAINS	CL	DAMP TO MOIST
	35.0	4/6 6/9							
S-8									
S-9	40.0	4/5 8/11							
S-10	45.0	4/8 7/11							
S-11	50.0	5/7							AR300670

REMARKS

BORING CR-MW12(D)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW12(D)
PROJECT NO.: 621Y — DATE: 12/5/87 — DRILLER: W. SCHINN OF MAINES
ELEVATION: — FIELD GEOLOGIST: KEVIN T. McCREANOR
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
S-11	51.0	9 11			M. STIFF to STIFF	TAN to WHITE	CLAY - TRACE COARSE SAND AND MICA GRAINS	CL	
S-12	55.0	4 8 9 11							
S-13	61.0'	3 6 8 12							
							HOLE COMPLETED TO 61.0' 12/5		
							BACKFILLED TO 33' 2"ϕ PVC MONITOR WELL INSTALLED 12/7		

AR300671

REMARKS

BORING CR-MW12(D)

PAGE 3 OF 3

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW13(S)
PROJECT NO.: 621Y — DATE: 12/2/87 — DRILLER: W. SCHINN of MATHES Co
ELEVATION: 20.19 — FIELD GEOLOGIST: KEVIN T McCREANOR
WATER LEVEL DATA - 2 [illegible] 12/5/87
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION*			USCS	REMARKS
					SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		
	1.0						SEE CR-MW13(D) FOR		
							DETAILED LITHOLOGIC		
							DESCRIPTIONS		
				▽4.9'					
	15.0								
							HOLE COMPLETED TO 15.0' 12/2		
							2" ϕ PVC MONITOR WELL INSTALLED 12/2		

AR300672

REMARKS DRILLERS USED CME550 w/ 8"ϕ HOLLOW AUGERS TO 15.0'

BORING CR-MW13(S)

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* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW13(D)
PROJECT NO.: 621Y — DATE: 12/3/87 — DRILLER: W. Schinn of Mat-E
ELEVATION: 20.58 — FIELD GEOLOGIST: Kevin T. McCreanor
WATER LEVEL DATA: 7.85 (T.O.C.)
(Date, Time & Conditions): E.L. W.T. 14.73 (12/5/87)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	1.0			0.4	"LOOSE"	BROWN	SAND AND CLAY SOME ORGANICS	CL	NO SOIL SAMPLE TAKEN
					M. DENSE TO V. DENSE	LT. BROWN	SAND, SOME GRAVEL	SW	MOIST HNU-0
									GRAVEL-.5"Φ SUB ROUNDED
S-1	5.0	6 23 33 50		▽5.6'					WET HNU-0
	10.0	12 14 15 20							WET HNU-0
S-2									
S-3	15.0	6 21 23 24							WET HNU-0
									END OF DAY 12/2
				19.0'					
S-4	20.0	9 11 31 33			M. LOOSE	TAN	SAND	SP	WET HNU-0
S-5	25.0	6 12							WET HNU-0

AR300673

REMARKS: Drillers used CME 550 w/ 8"Φ Hollow Augers To 44.0'
Sample S-9 extended hole to 46.0'
140 lb Hammer, Split Spoon-Sample

BORING CR-MW13(D)
PAGE 1 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE — BORING NO.: CR-MW13(D)
PROJECT NO.: 621Y — DATE: 12/2/87 — DRILLER: W. SHAVON & MATHES
ELEVATION: — FIELD GEOLOGIST: KEVIN T. McCREANOR
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
S-5	26.0	18 23		25.5	M. DENSE	TAN	SAND	SP	WET
					M. DENSE	TAN	SILTY SAND - SOME CLAY	SM	WET
S-6	30.0	7 11		29.7					
		15 14			M. DENSE	BROWN TO ORANGE	COARSE SAND - SOME SILT	SP	WET HNU-0
				34.0					
	35.0	3 5			STIFF	TAN TO ORANGE	CLAY AND SAND	CL	MOIST HNU-0
S-7		9 11					- SOME MICA GRAINS		
S-8	40.0	7 9		40.3					
		8 14			SOFT	BROWN GREEN BLACK	DECOMPOSED SCHIST		DAMP HNU-0
S-9	46.0	12 15		46.0'					
							HOLE COMPLETED TO 46.0' 12/3		
							2"ϕ PVC MONITOR WELL INSTALLED 12/3		

AR300674

REMARKS

BORING CR-MW13(D)

PAGE 2 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: [illegible]
PROJECT NO.: 621Y — DATE: [illegible] — DRILLER: [illegible]
ELEVATION: 14.80 — FIELD GEOLOGIST: [illegible]
WATER LEVEL DATA: 4.3' [illegible]
(Date, Time & Conditions) 6.3 [illegible] (12/3/87) [illegible] 11.15

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	0.0								HNU
S-1		2 / 7 / 5	1.2/1.5		Loose	Brown	[illegible], some organics,		[illegible] 3 ppm
	1.5						Fine - med + silt, [illegible]		
							[illegible]		
	4.0						[illegible] fine sand some	CL	
S-2		3 / 9 / 2	1.3/1.5		Very Stiff	Gray-Brown	[illegible]		2 ppm
	5.5								Saturated 5 ft
	9.0								
S-3		4 / 5 / 6	1.?/1.5		Stiff	Brown	Silt some clay, trace	[illegible]	2 ppm
	10.5						Fine sand		
	14.0								
S-4			1.5/1.5		Med Dense	Brown	Gravel, Fine - med /	GP	2 ppm
	15.5			TD 15'			some sand - med		
							coarse		

AR300675

REMARKS Boring Log From CR-MW-4(D)
Hollow Stem Auger

BORING CR-MW4(S)

PAGE 1 OF 1

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE — BORING NO.: CR-MW14(L)
PROJECT NO.: 621Y — DATE: 11/9/87 — DRILLER: Gregg Adolphson
ELEVATION: 14.89 — FIELD GEOLOGIST: F. Jones
WATER LEVEL DATA: C.O. T.P.C. (11/23/87)
(Date, Time & Conditions): 51 W.T. 11.2 (11/23/87)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (*)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
S-1	0.0	2/4	1.2/1.5		LOOSE	Br.	Loam, some organics;		damp 0
	1.5	5					fine sand + silt, tr.		
							gravel		
	4.0						Clay w/ fine sand		
S-2		2/3	1.2/1.5		VERY	GRAY BR.	some gravel		saturated at 5ft
	5.5	9			STIFF				0 ppm
	9.0								
S-3		4/5	1.2/1.5		STIFF	BROWN	Silt some clay, tr.	ML	0
	10.5	10					FINE SAND		
	14.0								
S-4		7/10	0.5/1.5		MED DENSE	BROWN	Gravel, fine-med/sand	GP	0
	15.5	13					sand - med coarse		
	19.0								
S-5		12/22	1.0/1.5		VERY DENSE	BROWN	FINE - COARSE SAND	SW	0
	20.5	28					TRACE GRAVEL		
	24.0								
S-6		6/12	1.3/1.5		MED DENSE	BROWN	FINE - COARSE SAND	SP	AR300676 0

REMARKS: Hollow Stem Auger
140 lb Hammer, Split Spoon Sample

BORING CR-MW14(D)

PAGE 1 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW-14(D)
PROJECT NO.: 621Y — DATE: 11/13/87 — DRILLER: Goldsborough, Hitzel
ELEVATION: — FIELD GEOLOGIST: S. Jones
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth/ft.)	SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS HNU
		12							
	26.0						TRACE GRAVEL, TRACE		
							SILT		
	29.0								
S-7		11 / 32	1.3/1.5		VERY DENSE	BROWN	MED-COARSE SAND	SP	0
	30.5	28					SOME GRAVEL, TRACE		
							SILT		
	34.0								
S-8		6 / 11	0.8/1.5		DENSE	BROWN	FINE-MED GRAVEL	GP	0
	35.5	21					MED-COARSE SAND	SP	
	39.0								
S-9		37 / 75	1.0/1.0		VERY DENSE	BROWN	COARSE SAND		0
	40.5						SOME FINE-MED GRAVEL		
	42.0								
S-10		35 / 51	.8/1.0	T.D. 42	VERY DENSE		MED-COARSE SAND	SP	0
	43.5	50					Boulder at 42'		

AR300677

REMARKS: Completed well on 11/10/87

BORING CR-MW-14(D)

PAGE 2 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW 15(S)
PROJECT NO.: 621Y — DATE: 11/4/87 — DRILLER: Holofpson, Hitzelberg
ELEVATION: 8.73 — FIELD GEOLOGIST: P. Jones
WATER LEVEL DATA: 2.02 = E.I.
(Date, Time & Conditions) E.I. W.T. 2.37 (11/4/87)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
							See log for CR-MW15(D) for Lithological Descrip		
BON				BON			BON @ 17 FT		

AR300678

REMARKS: MATHES GEOTECHNICAL - CME 550 RIG
Hollow Stem Auger

BORING CR-MW15(S)

PAGE 1 OF 1

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Crayden TCE — BORING NO.: CR-MW15(D)
PROJECT NO.: 621Y — DATE: 11/3/87 — DRILLER: GREGG ALCOLFTSON
ELEVATION: 8.75 — FIELD GEOLOGIST: P. Jones
WATER LEVEL DATA: 3.35 (-FIC)
(Date, Time & Conditions): 2.54 (11/4/87)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR ROD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	4.5								
S-1		10/14	0.5/1.5		MED DENSE	GREY BROWN	FINE-MED GRAVEL,	GP	SATURATED
	5.5	14					med-coarse sand, TR silt and clay		
	9.5								
S-2		2/3	0.6/1.5		MED STIFF	GREY BROWN	silt - fine sand, tr.	ML	
	10.5	4					clay		
	14.5								
S-3		4/9	0.8/1.5		MED DENSE	TAN	MED FINE SAND,	SP	
	15.5	8					little silt		
	19.0								
S-4		6/21	0.75/1.5		DENSE	TAN	FINE SAND - SOME	SM	
	20.5	18					SILT, TR. GRAVEL,	SC	
	24.0						TR. CLAY		
S-5		6/8	1.2/1.5		MED DENSE	RED-BROWN	Fine-Coarse Sand, Tr.	SC	AR300679

REMARKS: MAINES GEOTECHNICAL SME REG RIG TO MW 15 11-4-87
Hollow Stem Auger, Split Spoon Sample
140 lb Hammer

BORING CR-MW15(D)

PAGE 1 OF 2

* See Legend on Back

BORING LOG — **NUS CORPORATION**

PROJECT: Croyden TCE — BORING NO.: CR-MW15(C)
PROJECT NO.: 621Y — DATE: 11/3/87 — DRILLER: Gregg Anderson
LEVATION: — FIELD GEOLOGIST: P. JONES
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE	DEPTH (ft.)	BLOWS 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION* SOIL DENSITY CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS	REMARKS
	25.5	17					gravel, silt + clay		
	29.0								
S-6		4/12	1.25/1.5		DENSE	BROWN TAN-WHITE	FINE-COARSE SAND,	SC	at 30.0', 4"
	30.5	22					TR. GRAVEL +		layer of TAN-WHITE
							SILT		clayey silt
	34.0								
S-7		8/11	1.4/1.5		VERY STIFF	GREY WHITE	SILTY CLAY - SOME	CL	
	35.5	16					WEATHERED SCHIST		
							IN MATRIX		
	39.0								
S-8		6/9	1.0/1.5			GRAY	HIGHLY WEATHERED		
	40.5	10					SCHIST - SOME		
							SILT + CLAY		
	44.0								
S-9		10/10	0.75/1.5			GREY BLACK	WEATHERED SCHIST,		
	45.5	18					TRACE CLAY		BOTTOM OF HOLE

AR300680

REMARKS

BORING CR-MW15(C)

* See Legend on Back

E

APPENDIX E

MONITORING WELL CONSTRUCTION FORMS

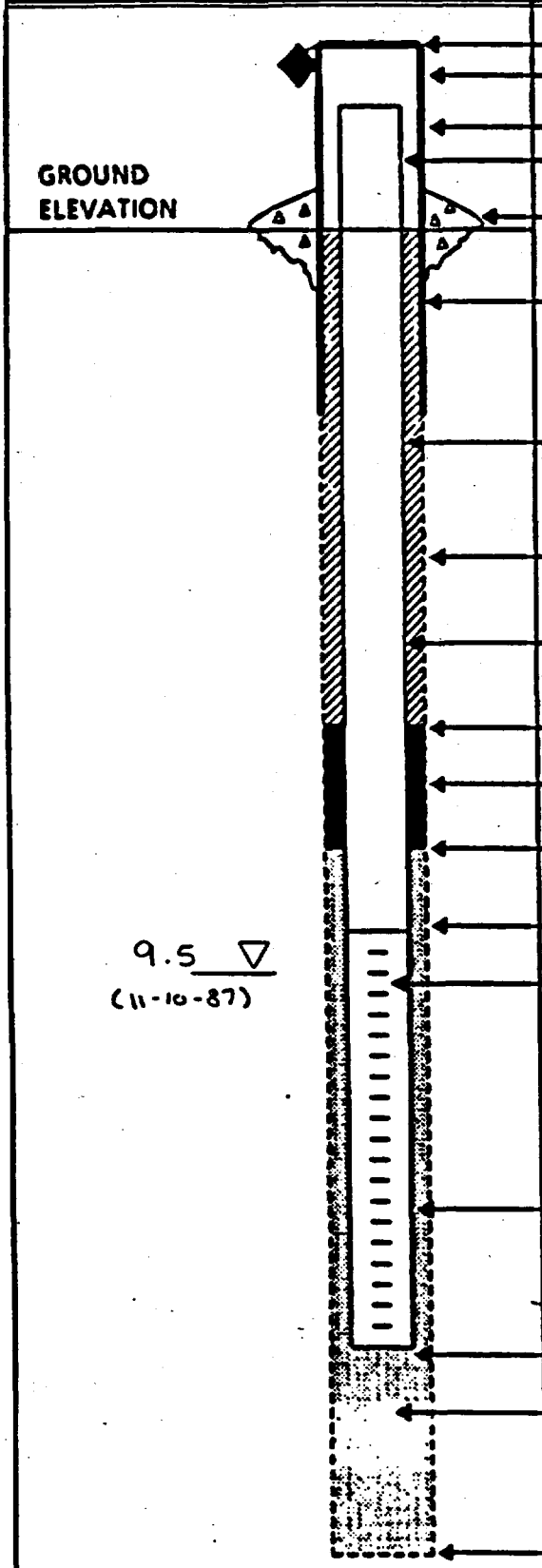
NUS CORPORATION

BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 26.06
FIELD GEOLOGIST: S Barnick
LOCATION: Bucks Co., PA
BORING: CR-MW1(S)
DATE: 11/10/87

DRILLER: B. Bissington
DRILLING METHOD: Hollow Stem Auger
DEVELOPMENT METHOD: Bailer



ELEVATION OF TOP OF SURFACE CASING: 28.49
ELEVATION OF TOP OF RISER PIPE: 28.12
STICK - UP TOP OF SURFACE CASING: 2.43
STICK - UP RISER PIPE: 2.06
TYPE OF SURFACE SEAL: concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: cement/bentonite grout
ELEVATION / DEPTH TOP OF SEAL: 14.06 / 12.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 12.06 / 14.0
ELEVATION / DEPTH TOP OF SCREEN: 10.06 / 16.0
TYPE OF SCREEN: PVC Sch40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand

AR300683

ELEVATION / DEPTH BOTTOM OF SCREEN: AR300683 -1.94 / 26.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -1.94 / 28.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: Coarse sand
ELEVATION / DEPTH OF HOLE: -1.94 / 28.0

NUS CORPORATION

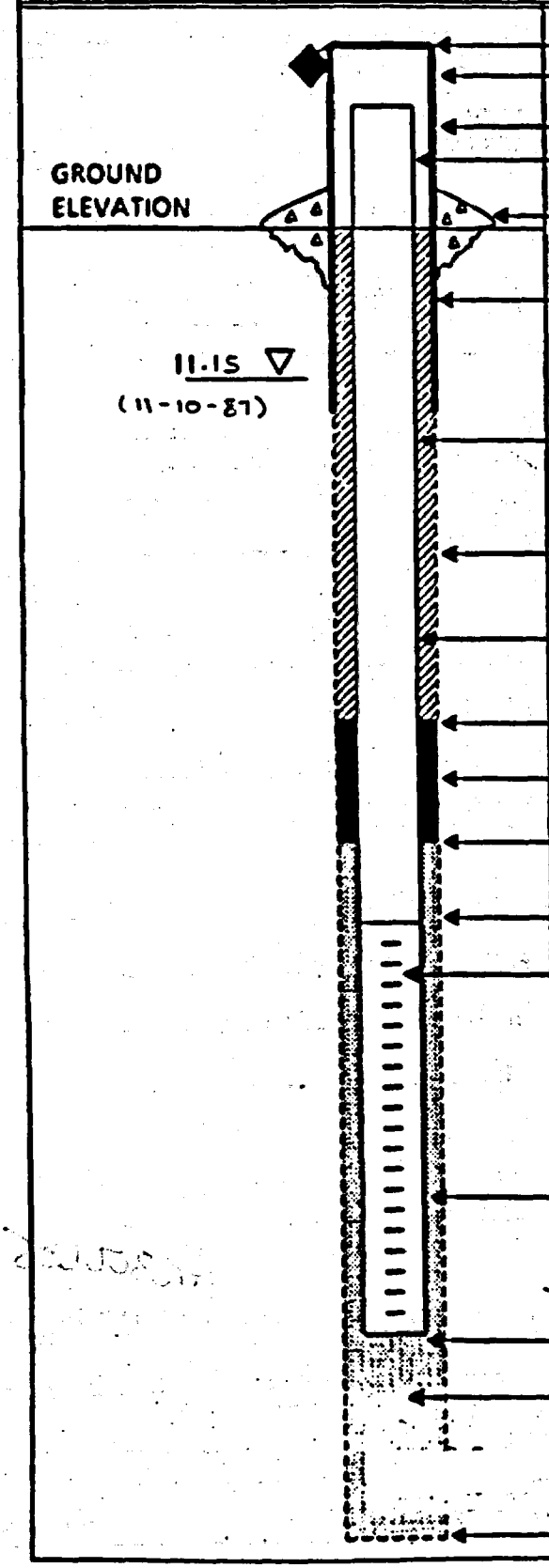
BORING NO. [illegible]

OVERBURDEN MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 26.11
FIELD GEOLOGIST S Parris

LOCATION Bucks Co., PA
BORING [illegible]
DATE 11/5/87

DRILLER [illegible]
DRILLING METHOD [illegible]
DEVELOPMENT METHOD Rod Pump / Airlift



ELEVATION OF TOP OF SURFACE CASING: 28.18
ELEVATION OF TOP OF RISER PIPE: 27.63
STICK - UP TOP OF SURFACE CASING: 2.07
STICK - UP RISER PIPE: 1.52
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sched
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement-bentonite grout
ELEVATION / DEPTH TOP OF SEAL: -27.89 / 54.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: -29.89 / 56.0
ELEVATION / DEPTH TOP OF SCREEN: -31.89 / 58.0
TYPE OF SCREEN: PVC Sched
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean coarse Sand
AR 300684
ELEVATION / DEPTH BOTTOM OF SCREEN: -41.89 / 68.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -43.89 / 70.0
TYPE OF BACKFILL BELOW OBSERVATION : Sand
ELEVATION / DEPTH OF HOLE: -43.89 / 70.0

NUS CORPORATION

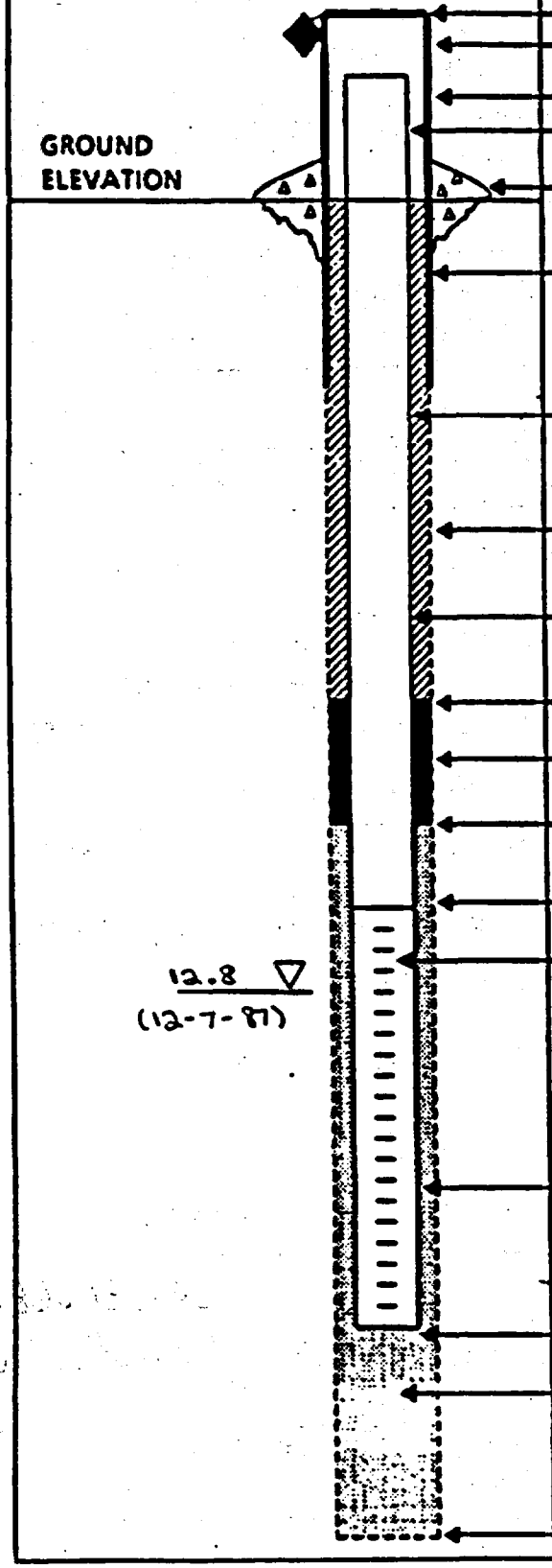
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 26.90
FIELD GEOLOGIST: [illegible]

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: [illegible]/87

DRILLER: Karl Hitzelb[illegible]
DRILLING METHOD: Hollow stem auger
DEVELOPMENT METHOD: Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 29.24
ELEVATION OF TOP OF RISER PIPE: 28.97
STICK - UP TOP OF SURFACE CASING: 2.34
STICK - UP RISER PIPE: 2.07
TYPE OF SURFACE SEAL: concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: cement-bentonite grout
ELEVATION / DEPTH TOP OF SEAL: 19.90 / 8.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 16.9 / 10.0
ELEVATION / DEPTH TOP OF SCREEN: 14.9 / 12.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10 FT
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand
AR300685
ELEVATION / DEPTH BOTTOM OF SCREEN: AR300685 4.9 / 24.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: 2.9 / 24.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE
ELEVATION / DEPTH OF HOLE: 2.9 / 24.0

NUS CORPORATION

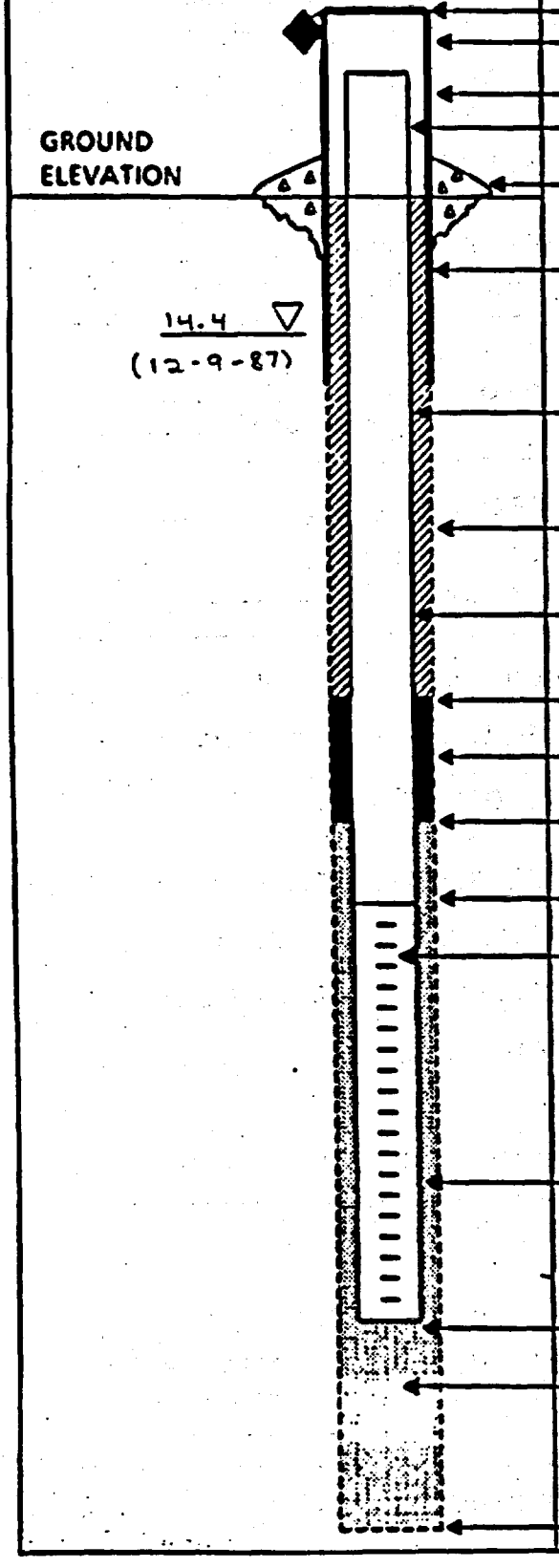
BORING NO : CR-MW102

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 27.10
FIELD GEOLOGIST S. Barnick

LOCATION Bucks Co., PA
BORING CR-MW102(D)
DATE 12/7/87

DRILLER Karl Hitzelberger
DRILLING METHOD Hollow stem Auger
DEVELOPMENT METHOD Air Lift



ELEVATION OF TOP OF SURFACE CASING : 29.33
ELEVATION OF TOP OF RISER PIPE: 29.06
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE :
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Bentonite & Cement Grout
ELEVATION / DEPTH TOP OF SEAL: -6.9 / 34.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: -8.9 / 36.0
ELEVATION / DEPTH TOP OF SCREEN: -10.9 / 38.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean coarse sand
ELEVATION / DEPTH BOTTOM OF SCREEN: -20.9 / 48.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -22.9 / 50.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: Hole plug
ELEVATION / DEPTH OF HOLE: -42.9 / 70.0

NUS CORPORATION

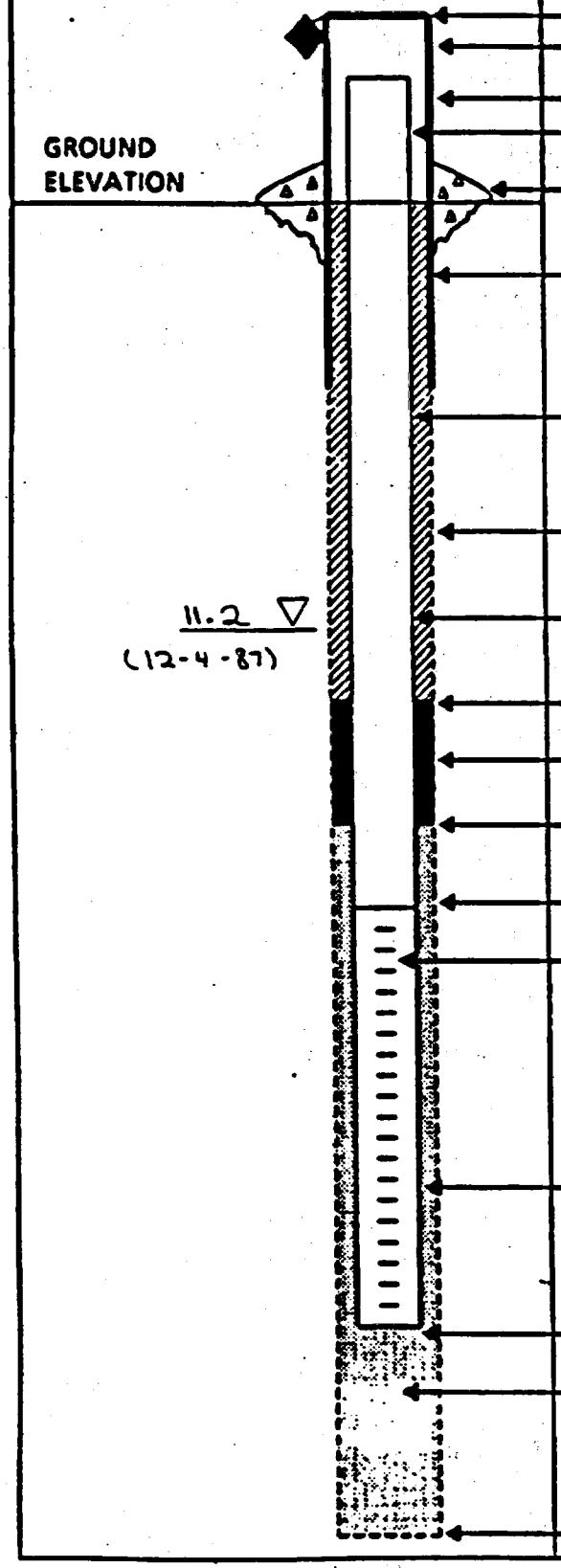
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 12.38
FIELD GEOLOGIST: [illegible]

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: 11/19 87

DRILLER: [illegible]
DRILLING METHOD: [illegible]
DEVELOPMENT METHOD: Pump (Teflon)



ELEVATION OF TOP OF SURFACE CASING: 14.39
ELEVATION OF TOP OF RISER PIPE: 14.10
STICK - UP TOP OF SURFACE CASING: 2.01
STICK - UP RISER PIPE: 1.72
TYPE OF SURFACE SEAL: concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: None
ELEVATION / DEPTH TOP OF SEAL: 10.38 / ± 0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 9.38 / 3.0
ELEVATION / DEPTH TOP OF SCREEN: 8.38 / 4.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.02 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand
ELEVATION / DEPTH BOTTOM OF SCREEN: -1.62 / 14.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -3.12 / 15.5
TYPE OF BACKFILL BELOW OBSERVATION WELL: cuttings
ELEVATION / DEPTH OF HOLE: -3.12 / 15.5

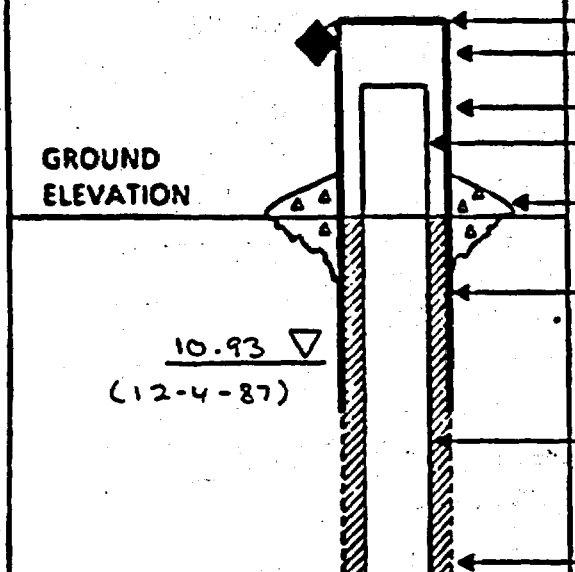
NUS CORPORATION

BORING NO : [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT	Croyden TCE	LOCATION	Bucks Co., PA
PROJECT NO.	621Y	BORING	[illegible]
ELEVATION	12.38	DATE	[illegible]
FIELD GEOLOGIST	[illegible]		

DRILLER [illegible]
DRILLING METHOD [illegible]
DEVELOPMENT METHOD Pump (Test)



ELEVATION OF TOP OF SURFACE CASING : 14.34
ELEVATION OF TOP OF RISER PIPE: 13.98

STICK - UP TOP OF SURFACE CASING: 1.96
STICK - UP RISER PIPE : 1.60

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D 2"
TYPE OF RISER PIPE: PVC Sch 40

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: Bentonite Pellets

ELEVATION / DEPTH TOP OF SEAL: -32.15/44.5

TYPE OF SEAL: Bentonite Pellets

DEPTH TOP OF SAND PACK: -33.62/46.0

ELEVATION / DEPTH TOP OF SCREEN: -35.62/48.0

TYPE OF SCREEN: PVC Sch 40

SLOT SIZE x LENGTH: 0.20 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: Clean Coarse Sand

AR300688

ELEVATION / DEPTH BOTTOM OF SCREEN: -45.62/58.0 AR300688

ELEVATION / DEPTH BOTTOM OF SAND PACK: -48.62/61.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: Hole plug

ELEVATION / DEPTH OF HOLE: -52.62/65.0

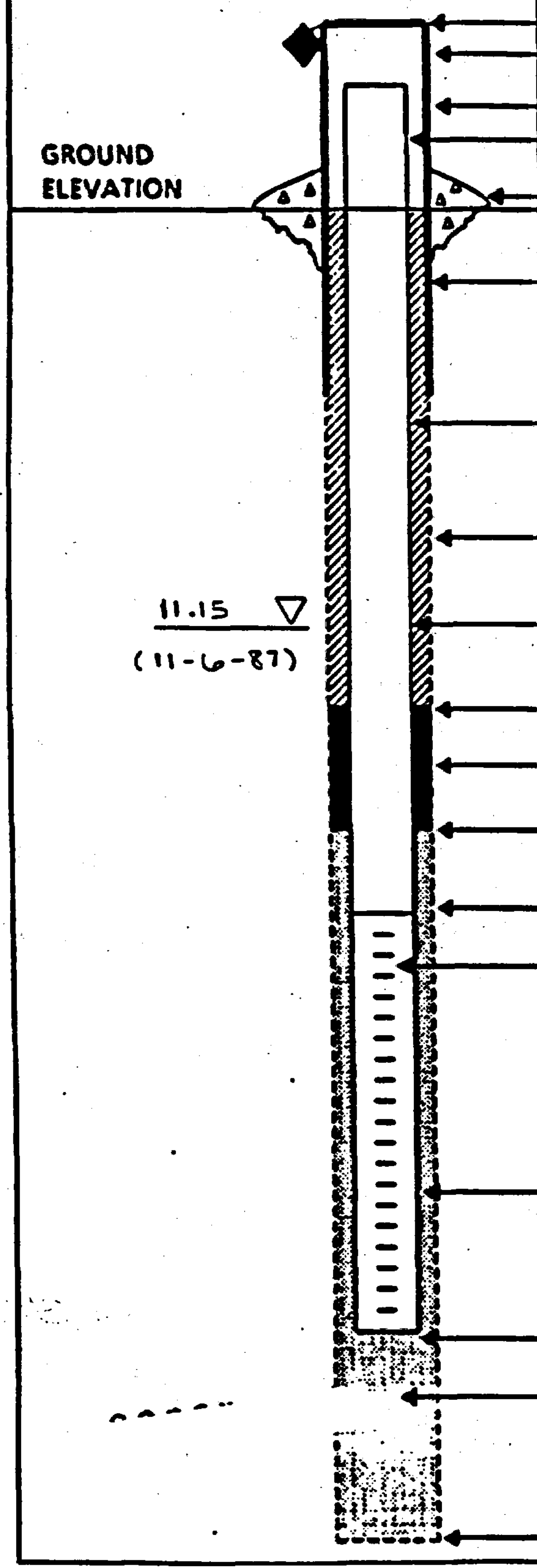
BORING NO. [illegible]

NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE LOCATION Bucks Co., PA
PROJECT NO. 621Y BORING CR-MW-5
ELEVATION 13.05 DATE 10/21/87
FIELD GEOLOGIST S. Barnick

DRILLER Barry Woodington
DRILLING John Mathes Assoc.
METHOD Hollow Stem Auger
DEVELOPMENT
METHOD Bail Pump



ELEVATION OF TOP OF SURFACE CASING: 14.86
ELEVATION OF TOP OF RISER PIPE: 14.65
STICK-UP TOP OF SURFACE CASING: 1.81
STICK-UP RISER PIPE: 1.60
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Concrete
ELEVATION / DEPTH TOP OF SEAL: 9.05 / 4'
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 7.05 / 6'
ELEVATION / DEPTH TOP OF SCREEN: 4.05 / 9'
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: coarse, clean sand
ELEVATION / DEPTH BOTTOM OF SCREEN: -5.95 / 19
ELEVATION / DEPTH BOTTOM OF SAND PACK: -10.95 / 24
TYPE OF BACKFILL BELOW OBSERVATION WELL: hole collasped w/ sand + gravel
ELEVATION / DEPTH OF HOLE: -21.95 35

AR300689

NUS CORPORATION

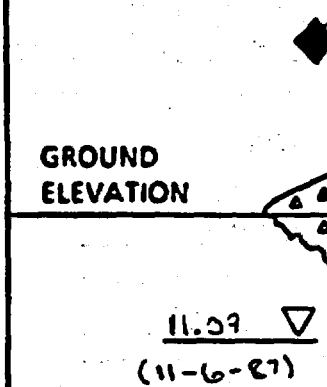
BORING NO. SK Mw4

OVERBURDEN MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 13.24
FIELD GEOLOGIST S. Barnick

LOCATION Bucks Co., PA
BORING C R-MW04D1
DATE 10/22/87

DRILLER Cecil Harris
DRILLING METHOD Hollowstem Auger mud Rotary
DEVELOPMENT METHOD Air Lift



ELEVATION OF TOP OF SURFACE CASING: 15.92
ELEVATION OF TOP OF RISER PIPE: 15.75
STICK - UP TOP OF SURFACE CASING: 2.68
STICK - UP RISER PIPE: 2.51
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement Grout w/ little bentonite
ELEVATION / DEPTH TOP OF SEAL: -16.76/ 30.0
TYPE OF SEAL: Bentonite Grout
DEPTH TOP OF SAND PACK: -18.76/ 32.0
ELEVATION / DEPTH TOP OF SCREEN: -20.76/ 34.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Natural Aquifer material
ELEVATION / DEPTH BOTTOM OF SCREEN: -30.76/ 44.0'
ELEVATION / DEPTH BOTTOM OF SAND PACK: -36.76/ 50.5
TYPE OF BACKFILL BELOW OBSERVATION WELL: Natural Material - Hole Collasped
ELEVATION / DEPTH OF HOLE: -36.76/ 50.5'

NUS CORPORATION

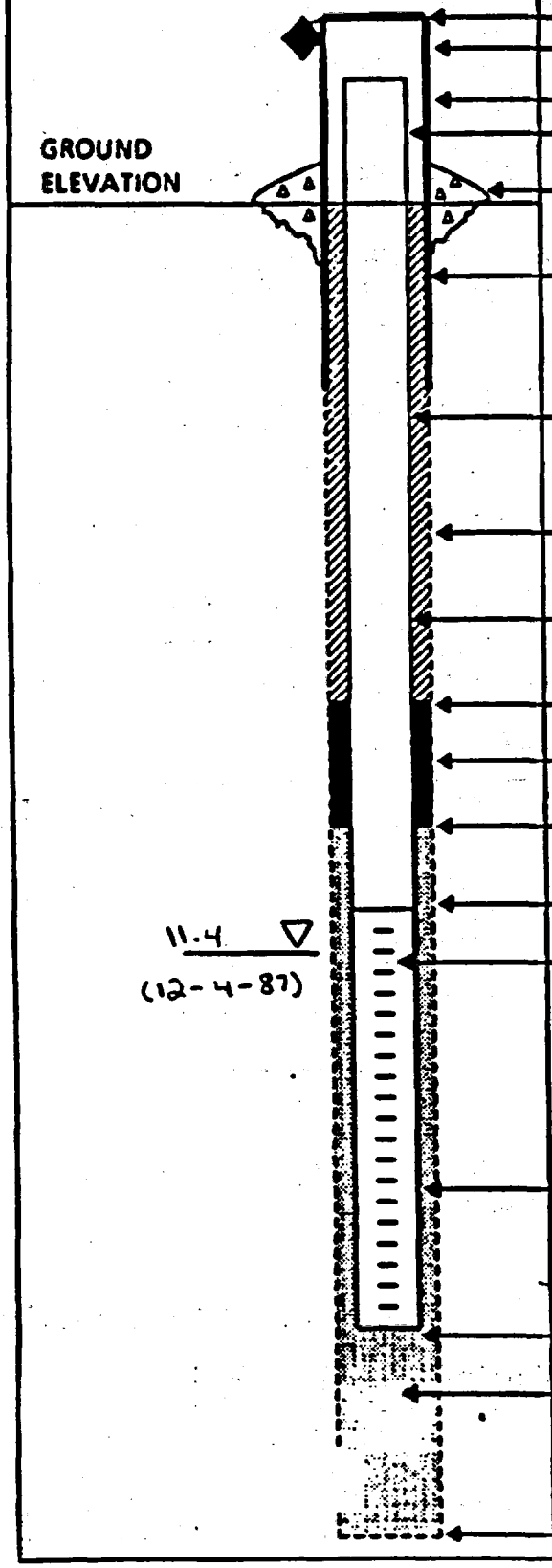
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 29.01
FIELD GEOLOGIST: [illegible]

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: [illegible]

DRILLER: [illegible]
DRILLING METHOD: [illegible]
DEVELOPMENT METHOD: Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 32.11
ELEVATION OF TOP OF RISER PIPE: 31.82

STICK - UP TOP OF SURFACE CASING: 3.10
STICK - UP RISER PIPE: 2.81

TYPE OF SURFACE SEAL: concrete

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel

RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: cement - bentonite grout

ELEVATION / DEPTH TOP OF SEAL: 16.01 / 13.0

TYPE OF SEAL: Bentonite pellets

DEPTH TOP OF SAND PACK: 14.01 / 15.0

ELEVATION / DEPTH TOP OF SCREEN: 13.01 / 17.0

TYPE OF SCREEN: PVC Sch 40

SLOT SIZE x LENGTH: 0.20 x 10 FT

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: clean coarse sand

AR300691

ELEVATION / DEPTH BOTTOM OF SCREEN: 3/4/03 AR300691

ELEVATION / DEPTH BOTTOM OF SAND PACK: 1.01 / 29.0

TYPE OF BACKFILL BELOW OBSERVATION WELL:

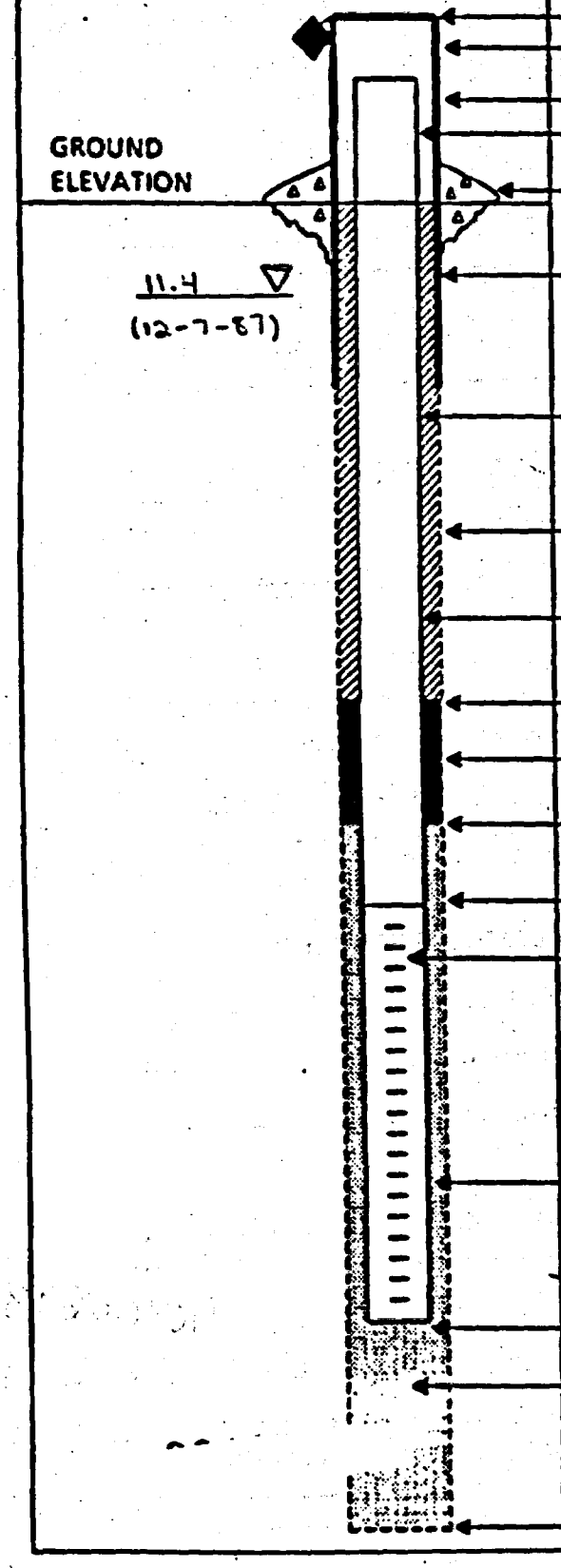
ELEVATION / DEPTH OF HOLE: 1.01 / 29.0

NUS CORPORATION

BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE	LOCATION Bucks Co., PA	DRILLER [illegible]	
PROJECT NO. 621Y	BORING [illegible]	DRILLING METHOD Hollow Stem Auger	
ELEVATION 29.23	DATE 11/12/87	DEVELOPMENT METHOD Rod Pump	
FIELD GEOLOGIST [illegible]			



ELEVATION OF TOP OF SURFACE CASING: 32.07

ELEVATION OF TOP OF RISER PIPE: 31.87

STICK - UP TOP OF SURFACE CASING: 2.84

STICK - UP RISER PIPE: 2.64

TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: Steel

RISER PIPE I.D. 2"

TYPE OF RISER PIPE: PVC Sch 40

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: cement / centonite grout

ELEVATION / DEPTH TOP OF SEAL: -14.77 / 44.0

TYPE OF SEAL: Bentonite Pellets

DEPTH TOP OF SAND PACK: -16.77 / 46.0

ELEVATION / DEPTH TOP OF SCREEN: -18.77 / 48.0

TYPE OF SCREEN: PVC Sch 40

SLOT SIZE x LENGTH: 0.20 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: Clean coarse Sand

ELEVATION / DEPTH BOTTOM OF SCREEN: -28.77/58.92

ELEVATION / DEPTH BOTTOM OF SAND PACK: -29.77 / 59.0

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: -35.77/65.0

NUS CORPORATION

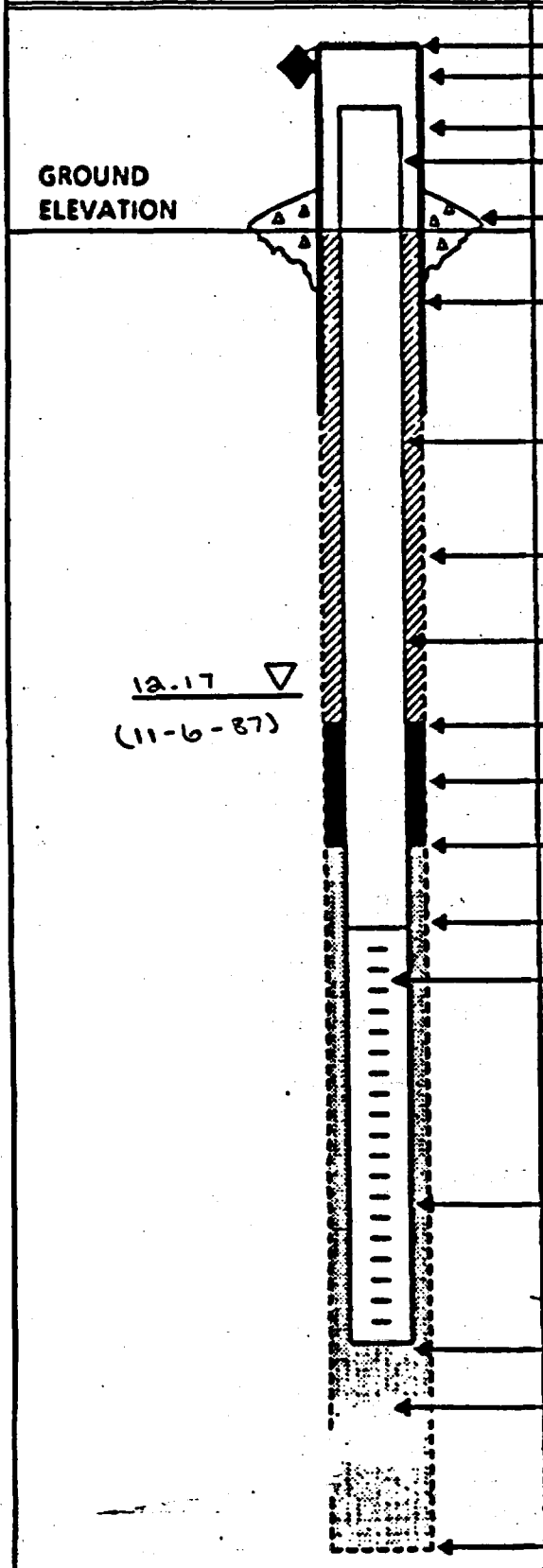
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 27.00
FIELD GEOLOGIST: E. Patrick

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: 10/6-87

DRILLER: E. Woodington
DRILLING METHOD: Hollow Stem Auger
DEVELOPMENT METHOD: Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 29.53
ELEVATION OF TOP OF RISER PIPE: 29.39
STICK - UP TOP OF SURFACE CASING: 2.53
STICK - UP RISER PIPE: 2.39
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement/ Concrete grout
ELEVATION / DEPTH TOP OF SEAL: 11.50/ 15.5
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 9.5/ 17.5
ELEVATION / DEPTH TOP OF SCREEN: 7.5/ 19.5
TYPE OF SCREEN: Slotted PVC
SLOT SIZE x LENGTH: .020 x 10FT
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean coarse Sand
AR300693
ELEVATION / DEPTH BOTTOM OF SCREEN: AR300693 9.
ELEVATION / DEPTH BOTTOM OF SAND PACK: -3.00/ 30.0
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -3.00/ 30.0

NUS CORPORATION

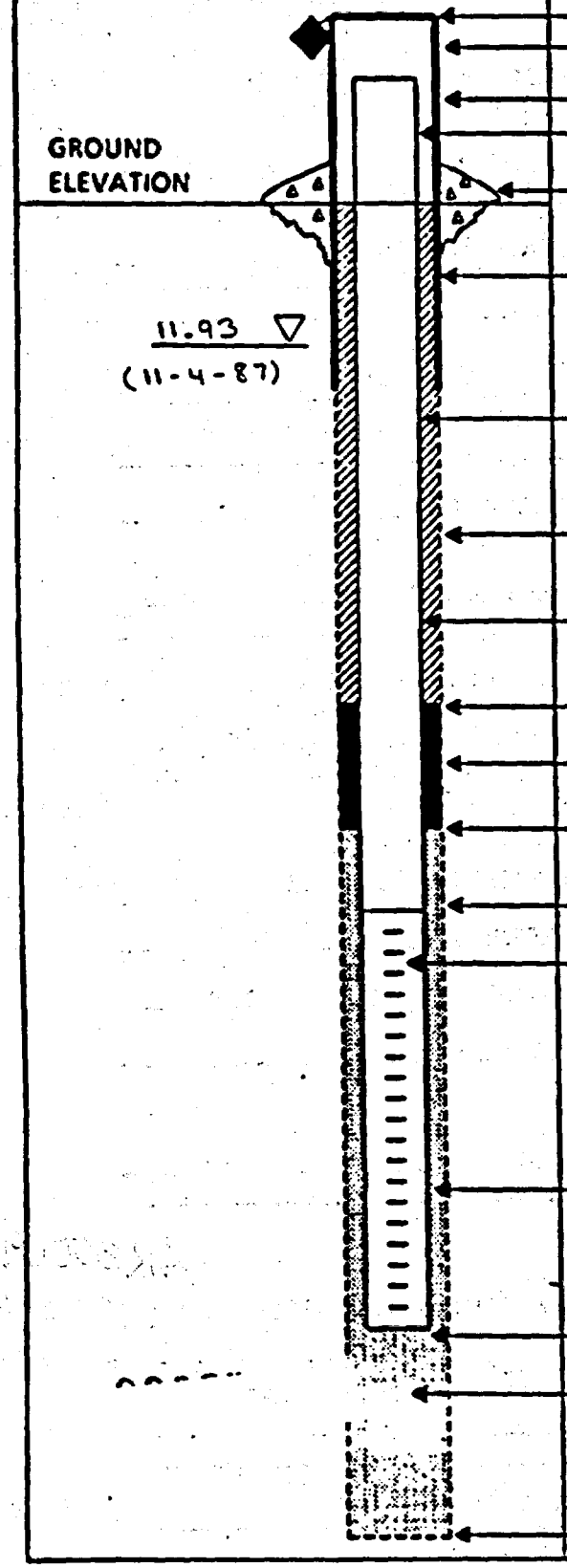
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 27.06
FIELD GEOLOGIST [illegible]

LOCATION Bucks Co., PA
BORING [illegible]
DATE [illegible]

DRILLER [illegible]
DRILLING METHOD [illegible]
DEVELOPMENT METHOD Air Lift



ELEVATION OF TOP OF SURFACE CASING: 29.36
ELEVATION OF TOP OF RISER PIPE: 29.17
STICK - UP TOP OF SURFACE CASING: 2.3
STICK - UP RISER PIPE: 2.11
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement grout
ELEVATION / DEPTH TOP OF SEAL: -9.94 / 37.0
TYPE OF SEAL: Bentonite slurry
DEPTH TOP OF SAND PACK: -11.94 / 39.0
ELEVATION / DEPTH TOP OF SCREEN: -13.94 / 41.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.02 x 10 ft
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand
AR300694
ELEVATION / DEPTH BOTTOM OF SCREEN: AR300694 -23.94 / 51.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -24.94 / 56.0
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -24.94 / ---

NUS CORPORATION

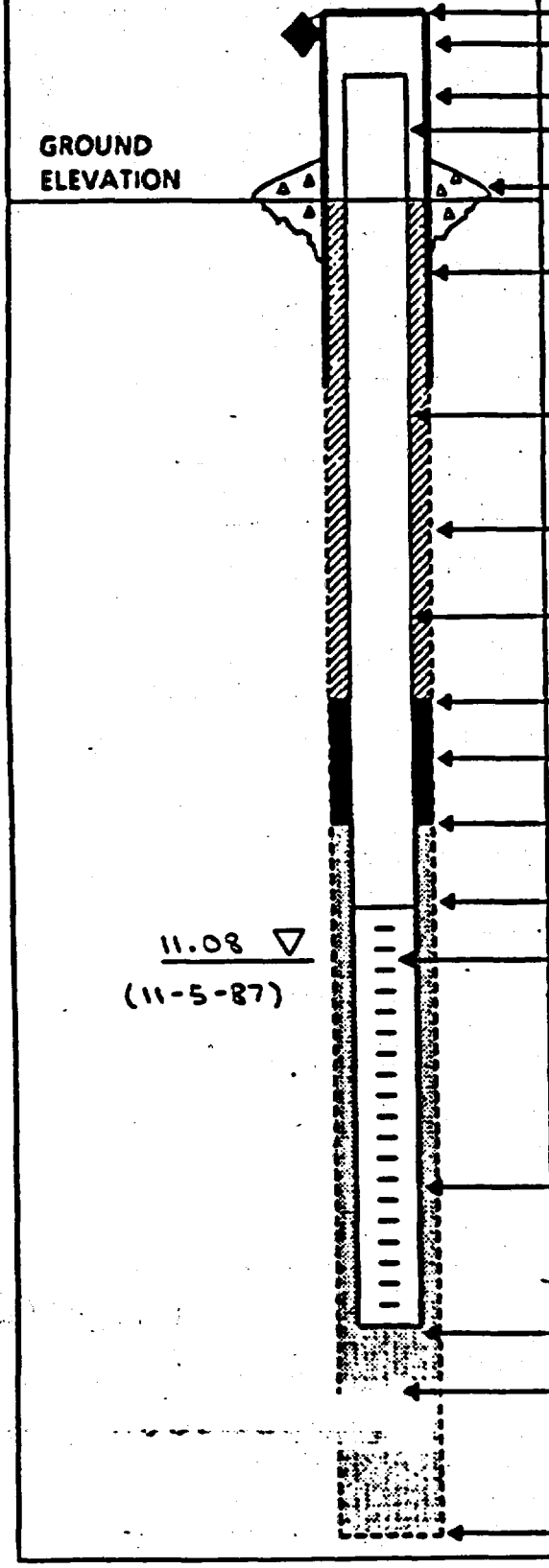
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 30.03
FIELD GEOLOGIST: [illegible]

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: 11/2/87

DRILLER: B. Woodhouse
DRILLING METHOD: [illegible]
DEVELOPMENT METHOD: Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 31.81
ELEVATION OF TOP OF RISER PIPE: 31.61
STICK - UP TOP OF SURFACE CASING: 1.78
STICK - UP RISER PIPE: 1.58
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement Grout
ELEVATION / DEPTH TOP OF SEAL: 16.03/ 14.0
TYPE OF SEAL: Bentonite Slurry
DEPTH TOP OF SAND PACK: 14.03/ 16.0
ELEVATION / DEPTH TOP OF SCREEN: 12.03/ 18.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10 ft
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand

AR300695

ELEVATION / DEPTH BOTTOM OF SCREEN: AR300695 2.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: 2.03/ 28.
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 2.03/ 28.0

NUS CORPORATION

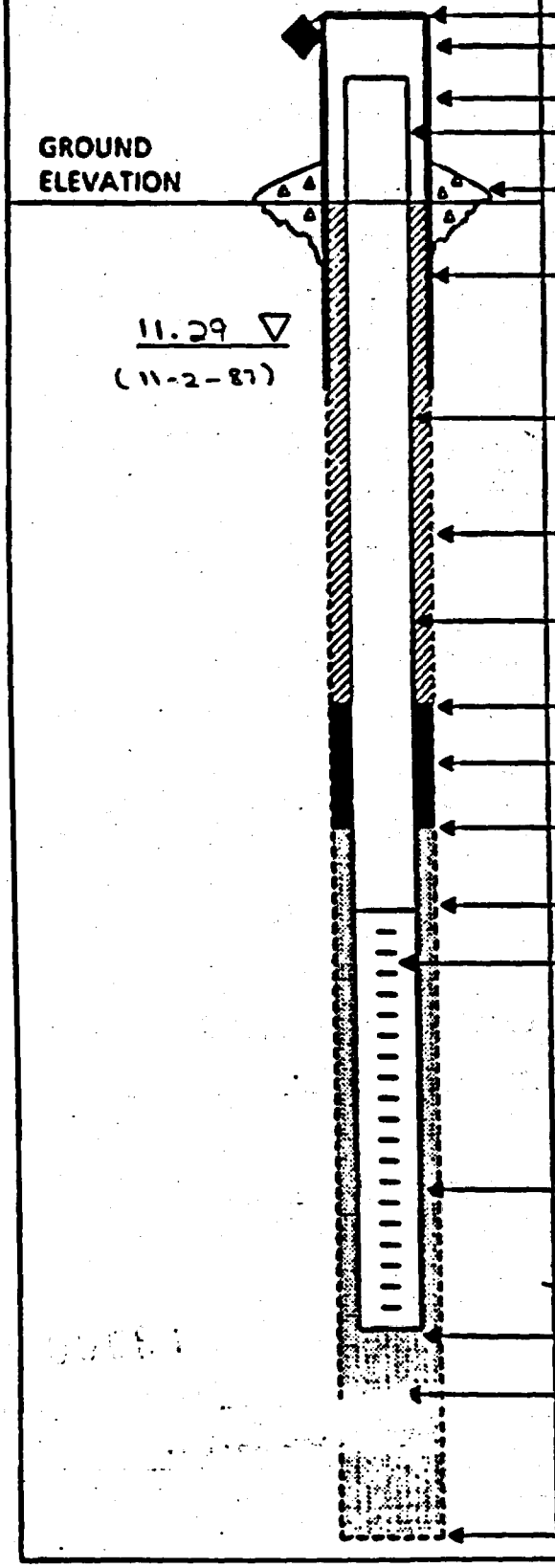
BORING NO : [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 29.97
FIELD GEOLOGIST [illegible]

LOCATION Bucks Co., PA
BORING [illegible]
DATE 11/2/87

DRILLER [illegible]
DRILLING METHOD [illegible]
DEVELOPMENT METHOD Air Lift



ELEVATION OF TOP OF SURFACE CASING : 32.11
ELEVATION OF TOP OF RISER PIPE: 31.91
STICK - UP TOP OF SURFACE CASING: 2.14
STICK - UP RISER PIPE : 1.94
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: Cement - Grout
ELEVATION / DEPTH TOP OF SEAL: -12.03/ 42.0
TYPE OF SEAL: Bentonite slurry
DEPTH TOP OF SAND PACK: -15.03/ 45.0
ELEVATION / DEPTH TOP OF SCREEN: -17.03/ 47.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.30 x 10ft
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean - coarse sand
ELEVATION / DEPTH BOTTOM OF SCREEN: -27.03/ 67.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -22.03/ 57.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: None
ELEVATION / DEPTH OF HOLE: -22.03/57.0

BORING NO: CR-MW 8(S)

NUS CORPORATION

OVERBURDEN MONITORING WELL SHEET

PROJECT: Croyden TCE
LOCATION: Bucks Co., PA
PROJECT NO.: 621Y
BORING: CR-MW 8(S)
ELEVATION: 20.68
DATE: 11/6/87
FIELD GEOLOGIST: P. JONES

DRILLER: Adolphson Peterson
DRILLING METHOD: HOLLOW STEM AUGER
DEVELOPMENT METHOD: Rod Pump

ELEVATION OF TOP OF SURFACE CASING: 23.05

ELEVATION OF TOP OF RISER PIPE: 22.81

STICK-UP TOP OF SURFACE CASING: 2.37

STICK-UP RISER PIPE: 2.13

TYPE OF SURFACE SEAL: CONCRETE

I.D. OF SURFACE CASING: 6"

TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER: 7¼"

TYPE OF BACKFILL: GROUT - BENTONITE AND PORTLAND CEMENT

ELEVATION / DEPTH TOP OF SEAL: 15.38 / 5.3'

TYPE OF SEAL: BENTONITE PELLETS (PELTONITE)

DEPTH TOP OF SAND PACK: 12.88 / 7.8'

ELEVATION / DEPTH TOP OF SCREEN: 10.85 / 9.83'

TYPE OF SCREEN: Slotted PVC

SLOT SIZE x LENGTH: .020 x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: COARSE SAND CLEAN - UNMARKED BAGS

ELEVATION / DEPTH BOTTOM OF SCREEN: 0.68 / 20

AR300069

ELEVATION / DEPTH BOTTOM OF SAND PACK: -1.32 / 22'

TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE

ELEVATION / DEPTH OF HOLE: -1.32 / 22

BORING NO. CR-MW8(D)

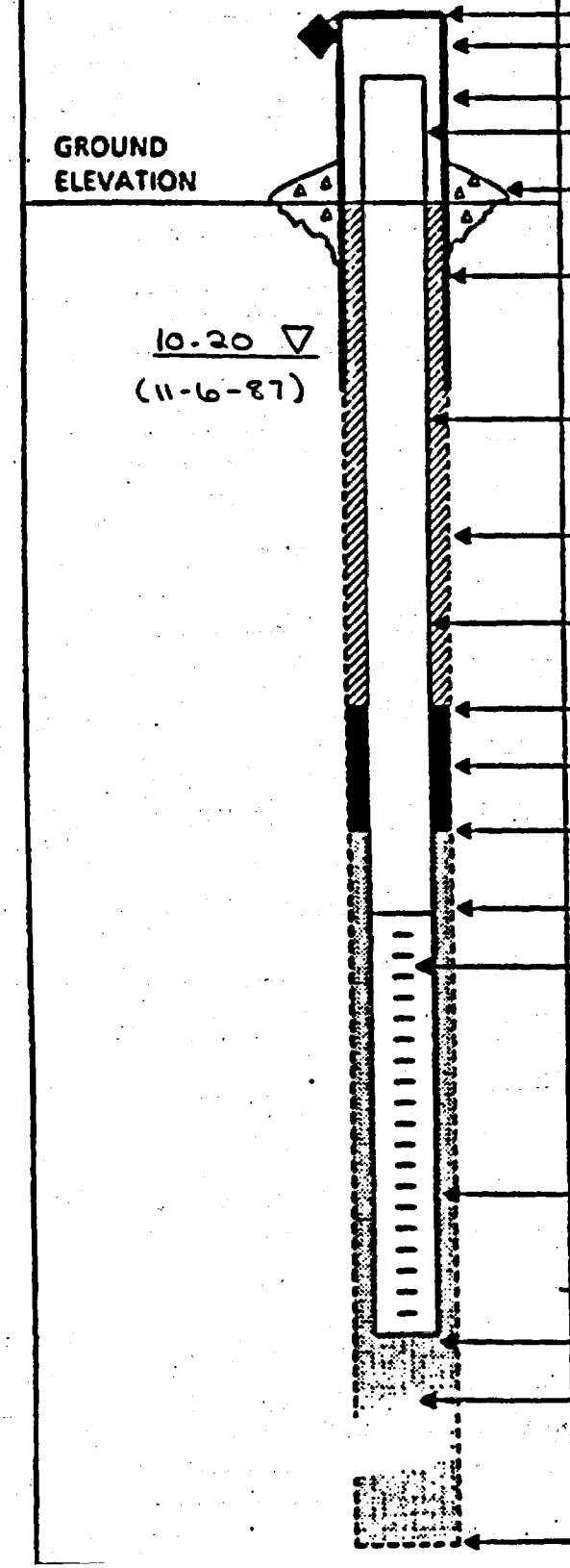
NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 20.52
FIELD GEOLOGIST P. JONES

LOCATION Bucks Co., PA
BORING CR-MW8(D)
DATE 11/6/87

DRILLER Adelphoic Hitchcock
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 22.90
ELEVATION OF TOP OF RISER PIPE: 22.69
STICK - UP TOP OF SURFACE CASING: 2.38
STICK - UP RISER PIPE: 2.17
TYPE OF SURFACE SEAL: CONCRETE
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: Sch 40 PVC
BOREHOLE DIAMETER: 7¼"
TYPE OF BACKFILL: GROUT - BENTONITE AND PORTLAND CEMENT
ELEVATION / DEPTH TOP OF SEAL: -12.38 / 32.9'
TYPE OF SEAL: BENTONITE PELLETS (PELTONITE)
DEPTH TOP OF SAND PACK: -15.08 / 35.6'
ELEVATION / DEPTH TOP OF SCREEN: -18.31 / 38.83'
TYPE OF SCREEN: Slotted PVC
SLOT SIZE x LENGTH: .020 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: COARSE SAND CLEAN - UNMARKED BAGS
AR 300698
ELEVATION / DEPTH BOTTOM OF SCREEN: AR 28.83/48.6'
ELEVATION / DEPTH BOTTOM OF SAND PACK: -30.48 / 51'
TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE
ELEVATION / DEPTH OF HOLE: -30.48 / 51

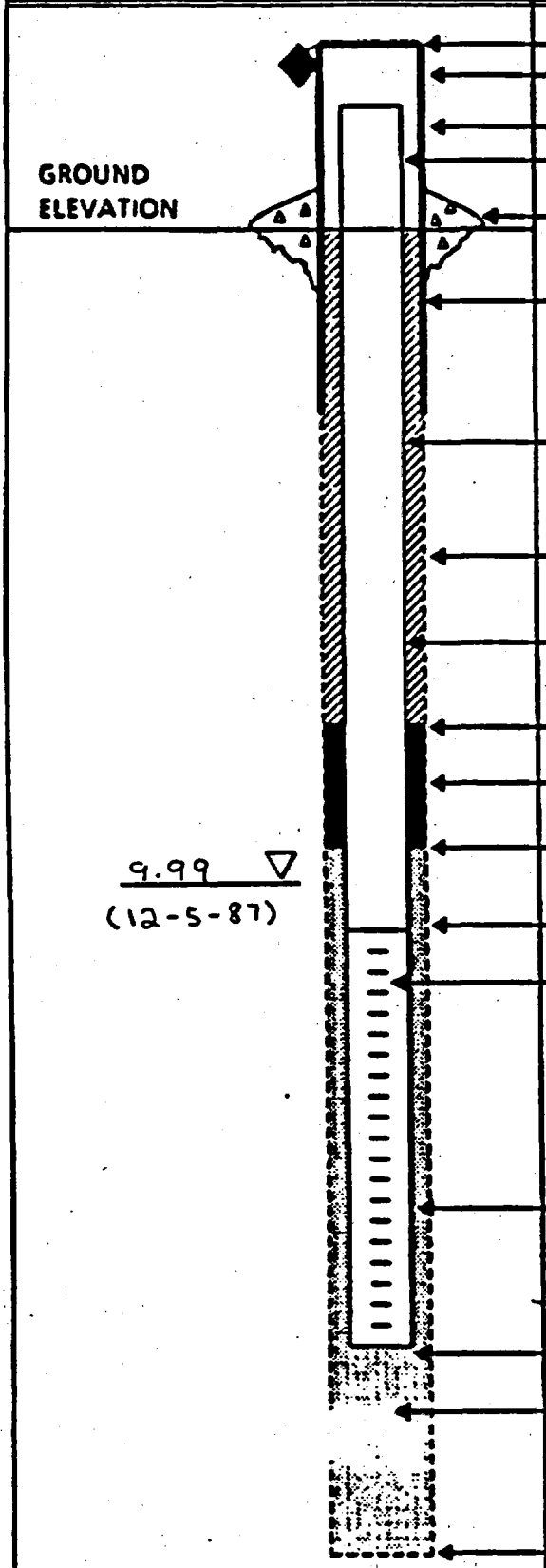
BORING NO. [illegible]

NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 16.25
FIELD GEOLOGIST: [illegible]
LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: 10/22/87

DRILLER: [illegible]
DRILLING METHOD: Hollow Stem Auger
DEVELOPMENT METHOD: Pump (Teal)



ELEVATION OF TOP OF SURFACE CASING: 17.96
ELEVATION OF TOP OF RISER PIPE: 17.69
STICK - UP TOP OF SURFACE CASING: 1.71
STICK - UP RISER PIPE: 1.44
TYPE OF SURFACE SEAL: concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: concrete
ELEVATION / DEPTH TOP OF SEAL: 12.25 / 4.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 10.25 / 6.0
ELEVATION / DEPTH TOP OF SCREEN: 9.25 / 8.0
TYPE OF SCREEN: PVC sch 40
SLOT SIZE x LENGTH: 0.20 x 10'+
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean - coarse, #2 sand
00
ELEVATION / DEPTH BOTTOM OF SCREEN: -1.75 / 18.0
AR300699
ELEVATION / DEPTH BOTTOM OF SAND PACK: -1.75 18.0
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -1.75 / 18.0

NUS CORPORATION

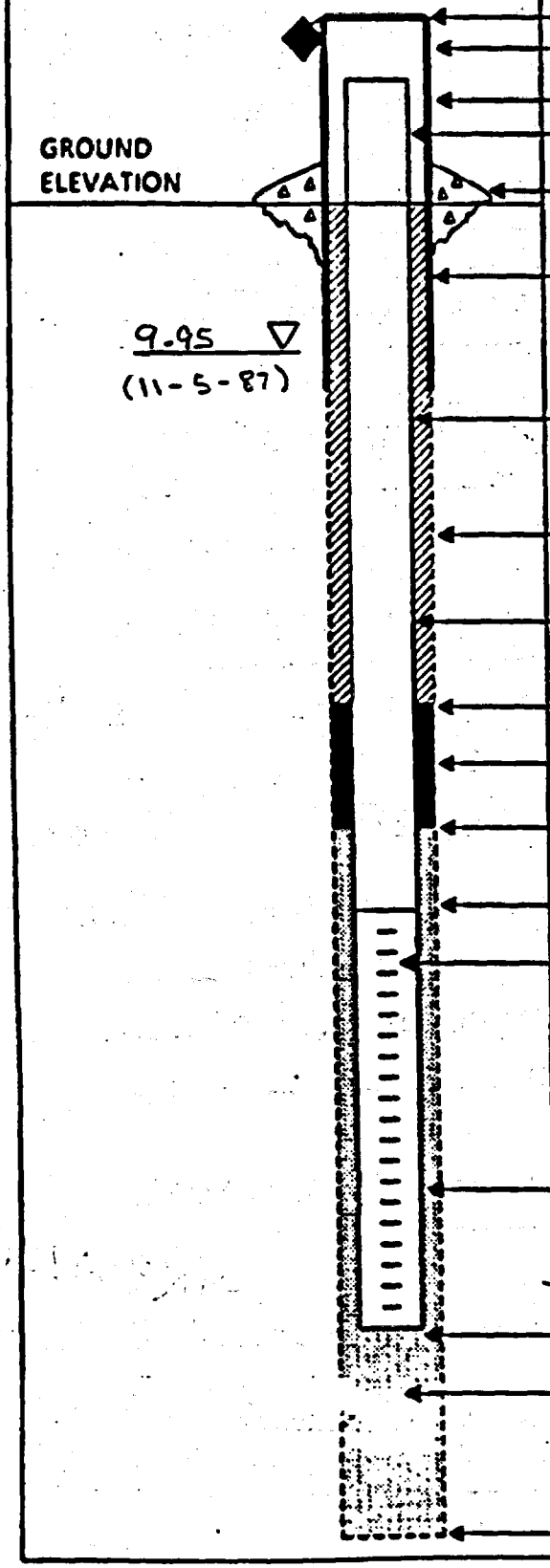
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 16.33
FIELD GEOLOGIST: S. Barrick

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: 10/27/87

DRILLER: Barry Woodington
DRILLING METHOD: Hollowstem Auger
DEVELOPMENT METHOD: Pump (Teal)



ELEVATION OF TOP OF SURFACE CASING: 18.38
ELEVATION OF TOP OF RISER PIPE: 18.06
STICK-UP TOP OF SURFACE CASING: 2.05
STICK-UP RISER PIPE: 1.73
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: cement grout
ELEVATION / DEPTH TOP OF SEAL: -7.67/24.0
TYPE OF SEAL: Bentonite Slurry
DEPTH TOP OF SAND PACK: -10.67/27.0
ELEVATION / DEPTH TOP OF SCREEN: -12.67/29.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean Coarse Sand
ELEVATION / DEPTH BOTTOM OF SCREEN: [illegible]/39.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -23.67/40.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: sand
ELEVATION / DEPTH OF HOLE: -23.67/40.0

AR300700

NUS CORPORATION

BORING NO: [illegible]

OVERBURDEN MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 19.16
FIELD GEOLOGIST: S. Barnick

LOCATION: Bucks Co., PA
BORING: CR-MW-1(S)
DATE: 10/26/87

DRILLER: Barry Woodington, John Mathes Assoc.
DRILLING METHOD: Hollow Stem Auger
DEVELOPMENT METHOD: Air Lift

ELEVATION OF TOP OF SURFACE CASING: 21.30
ELEVATION OF TOP OF RISER PIPE: 20.84
STICK-UP TOP OF SURFACE CASING: 2.14
STICK-UP RISER PIPE: 1.68
TYPE OF SURFACE SEAL: concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: cement / bentonite
ELEVATION / DEPTH TOP OF SEAL: -28.84/48.0
TYPE OF SEAL: Bentonite Slurry
DEPTH TOP OF SAND PACK: -30.84/ 50.0
ELEVATION / DEPTH TOP OF SCREEN: -32.84/52.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: natural material

AR300701

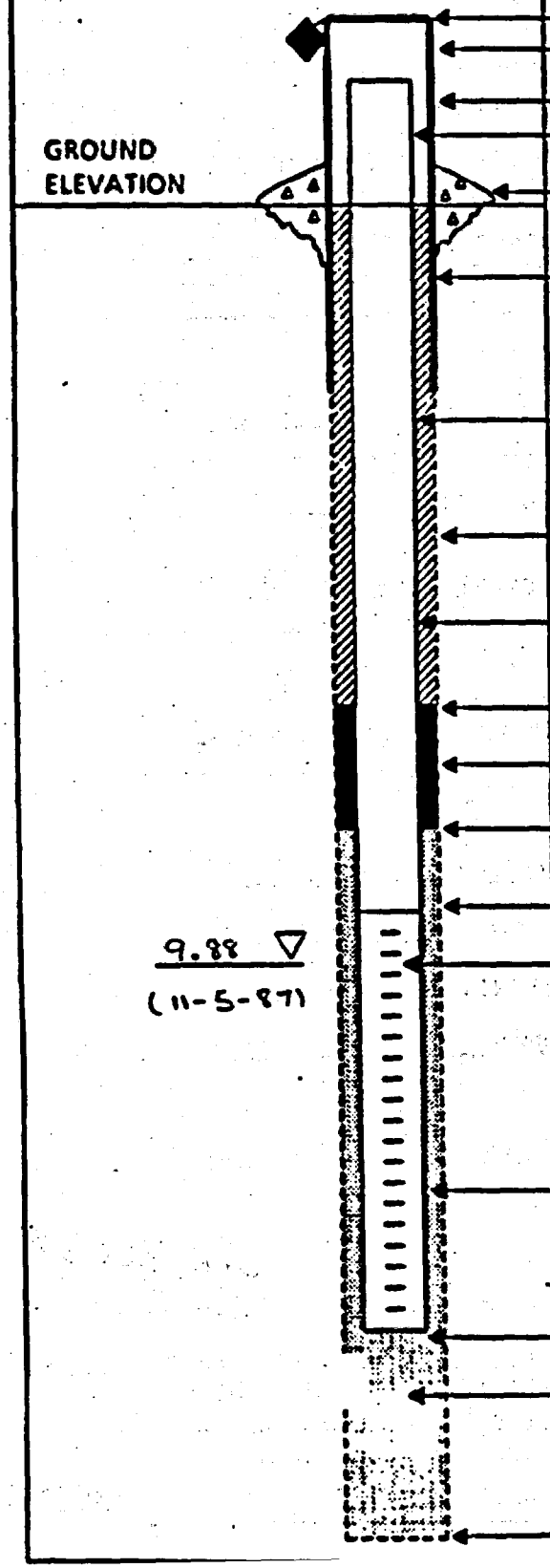
ELEVATION / DEPTH BOTTOM OF SCREEN: -42.84/62.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -43.84/63.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: natural aquifer material
ELEVATION / DEPTH OF HOLE: -43.84/63.0

NUS CORPORATION

BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 17.71
FIELD GEOLOGIST: S. Barnick
LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: 10/29/87
DRILLER: E. [illegible]
DRILLING METHOD: [illegible]
DEVELOPMENT METHOD: Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 19.69
ELEVATION OF TOP OF RISER PIPE: 19.56
STICK-UP TOP OF SURFACE CASING: 1.98
STICK-UP RISER PIPE: 1.85
TYPE OF SURFACE SEAL: concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: concrete
ELEVATION / DEPTH TOP OF SEAL: 13.71 / 4.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 12.71 / 5.0
ELEVATION / DEPTH TOP OF SCREEN: 10.71 / 7.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10 Ft
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand
ELEVATION / DEPTH BOTTOM OF SCREEN: 5.71 / 12.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -0.29 / 18.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: clean coarse sand
ELEVATION / DEPTH OF HOLE: -0.29 / 18.0

BORING NO. [illegible]

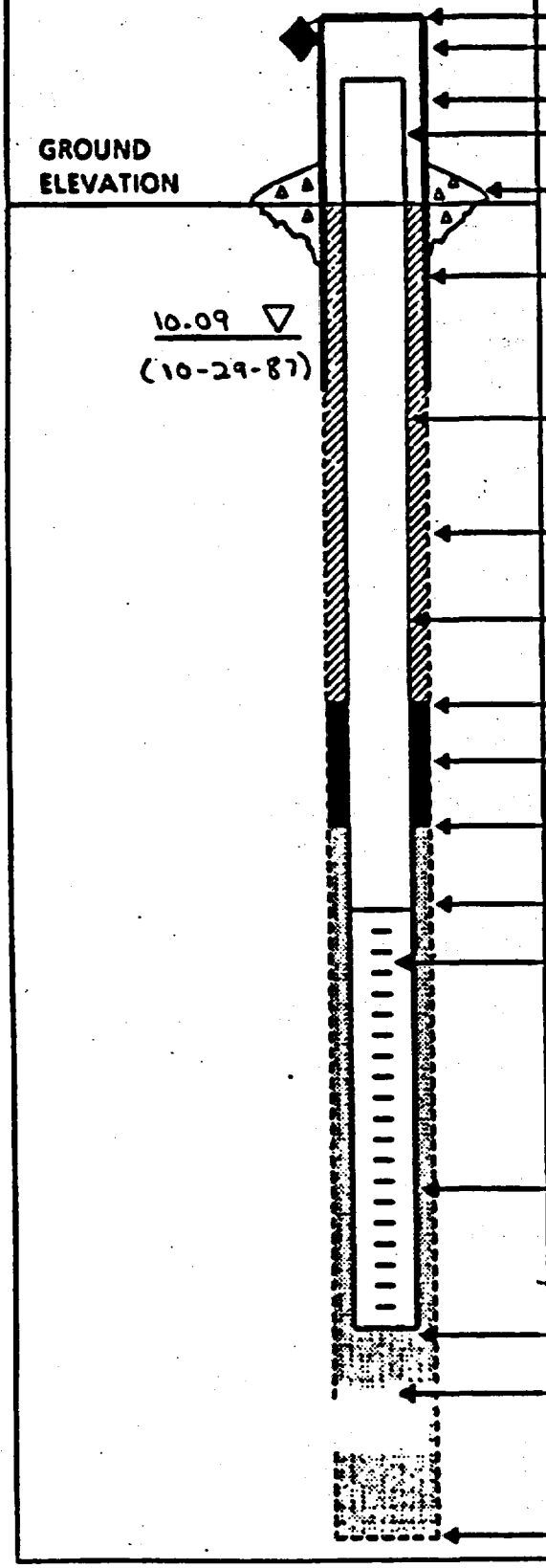
NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 17.43
FIELD GEOLOGIST: S. Barnick

LOCATION: Bucks Co., PA
BORING: CR-MW11(D)
DATE: 10/22/87

DRILLER: B. Woodside
DRILLING METHOD: Hollow Stem Auger
DEVELOPMENT METHOD: Rod Pump Test Pump



ELEVATION OF TOP OF SURFACE CASING: 19.55
ELEVATION OF TOP OF RISER PIPE: 19.25
STICK - UP TOP OF SURFACE CASING: 2.13
STICK - UP RISER PIPE: 1.83
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: cement grout
ELEVATION / DEPTH TOP OF SEAL: -20.58/ 38.0
TYPE OF SEAL: Bentonite slurry
DEPTH TOP OF SAND PACK: -23.58/ 41.0
ELEVATION / DEPTH TOP OF SCREEN: -25.58/ 43.0
TYPE OF SCREEN: PVC Sch40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: clean coarse sand
AR 300703
ELEVATION / DEPTH BOTTOM OF SCREEN: -35.58/ 53.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -36.58/ 54
TYPE OF BACKFILL BELOW OBSERVATION WELL: Sand
ELEVATION / DEPTH OF HOLE: -36.58/ 54.0

NUS CORPORATION

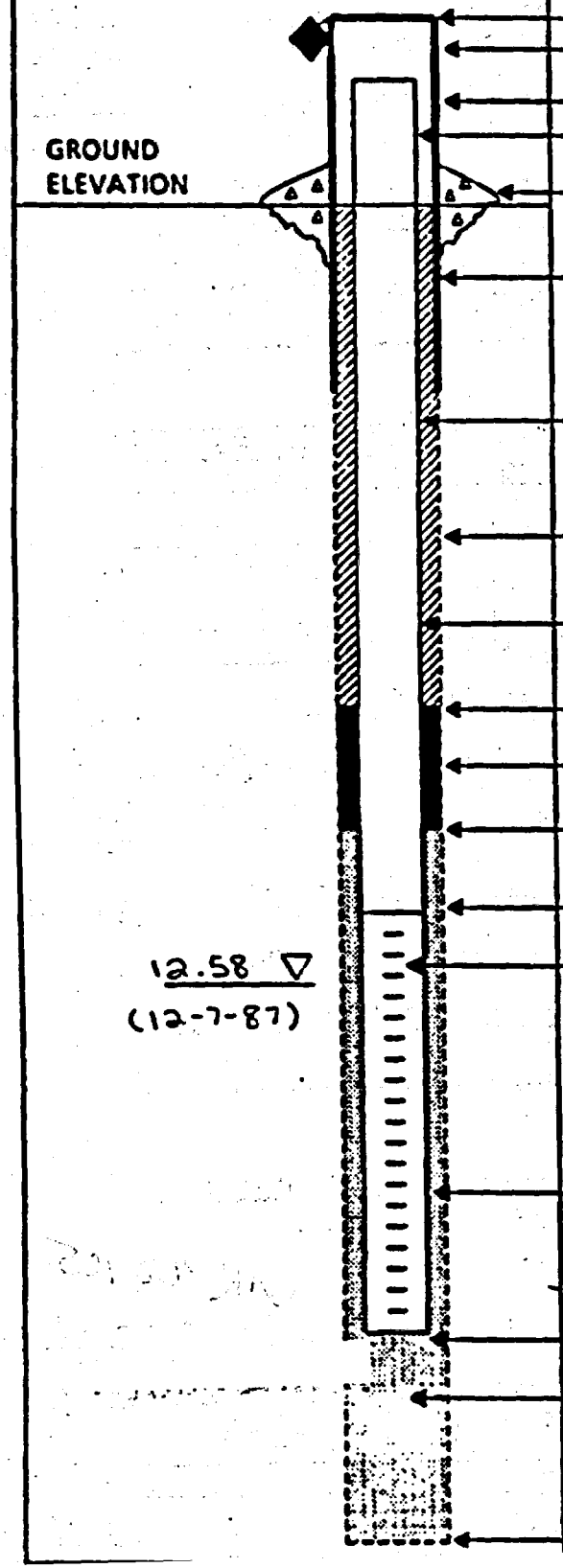
BORING NO : CR-MW-21(S)

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 25.00
FIELD GEOLOGIST KEVIN T. McCREANOR

LOCATION Bucks Co., PA
BORING CR-MW12(S)
DATE 5 DECEMBER 1987

DRILLER W. SCHNN
DRILLING METHOD Hollow Stem AUGER
DEVELOPMENT METHOD Rod Pump



ELEVATION OF TOP OF SURFACE CASING : 27.86
ELEVATION OF TOP OF RISER PIPE: 27.69
STICK - UP TOP OF SURFACE CASING: 2.86
STICK - UP RISER PIPE : 2.58
TYPE OF SURFACE SEAL: CEMENT & SAND MIX
I.D. OF SURFACE CASING: 6.0"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2.0"
TYPE OF RISER PIPE: PVC - SCH 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT & BENTONITE POWDER SLURRY MIX
ELEVATION / DEPTH TOP OF SEAL: 17.00 / 8.0'
TYPE OF SEAL: "PELTONITE" BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 15.00 / 10.0'
ELEVATION / DEPTH TOP OF SCREEN: 14.00 / 11.0'
TYPE OF SCREEN: PVC - SCH. 40
SLOT SIZE x LENGTH: 0.20 x 10 FT.
I.D. OF SCREEN: 2.0"
TYPE OF SAND PACK: CLEAN - COARSE SILICA SAND
ELEVATION / DEPTH BOTTOM OF SCREEN: 4.00 / 21.0'
ELEVATION / DEPTH BOTTOM OF SAND PACK: 2.00 / 23.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE
ELEVATION / DEPTH OF HOLE: 2.00 / 23.0'

BORING NO.: CR-MW12(C)

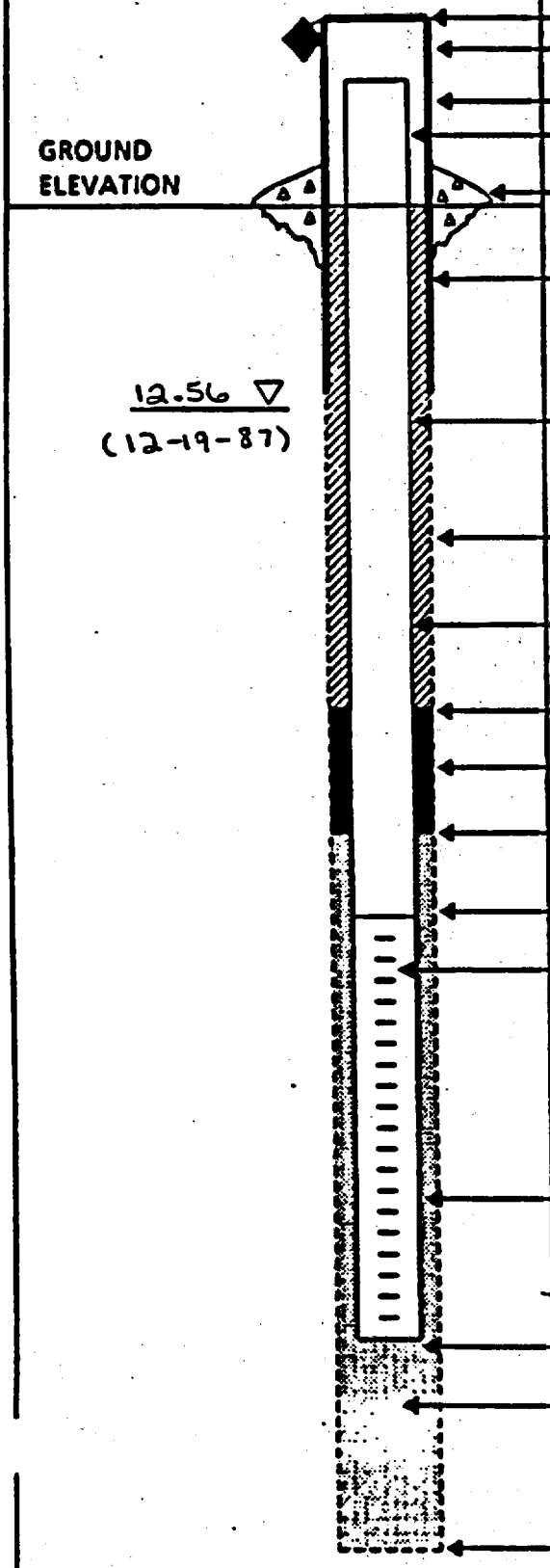
NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 24.73
FIELD GEOLOGIST: KEVIN T McCREANOR

LOCATION: Bucks Co., PA
BORING: CR-MW12(C)
DATE: 5 DECEMBER

DRILLER: W. SCHINN
DRILLING METHOD: AUGERING
DEVELOPMENT METHOD: Air Lift



ELEVATION OF TOP OF SURFACE CASING: 27.00
ELEVATION OF TOP OF RISER PIPE: 26.56

STICK - UP TOP OF SURFACE CASING: 2.27
STICK - UP RISER PIPE: 1.83

TYPE OF SURFACE SEAL: CEMENT & SAND MIX

I.D. OF SURFACE CASING: 6.0"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 2.0"
TYPE OF RISER PIPE: PVC - SCH. 40

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: CEMENT & BENTONITE POWDER SLURRY MIX

ELEVATION / DEPTH TOP OF SEAL: 6.73 / 18.0'

TYPE OF SEAL: "PELTONITE" BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 4.73 / 20.0'

ELEVATION / DEPTH TOP OF SCREEN: 3.73 / 21.0'

TYPE OF SCREEN: PVC - SCH. 40

SLOT SIZE x LENGTH: 0.20 x 10 FT.

I.D. OF SCREEN: 2.0"

TYPE OF SAND PACK: CLEAN - COARSE SILICA SAND

AR 300705

ELEVATION / DEPTH BOTTOM OF SCREEN: -7.27 / 31.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: -19.27 / 44.0'

TYPE OF BACKFILL BELOW OBSERVATION WELL: SAND & CUTTINGS FROM HOLE (AUGER'S SPIN REVERSED)

ELEVATION / DEPTH OF HOLE: -34.27 / 59.0'

NUS CORPORATION

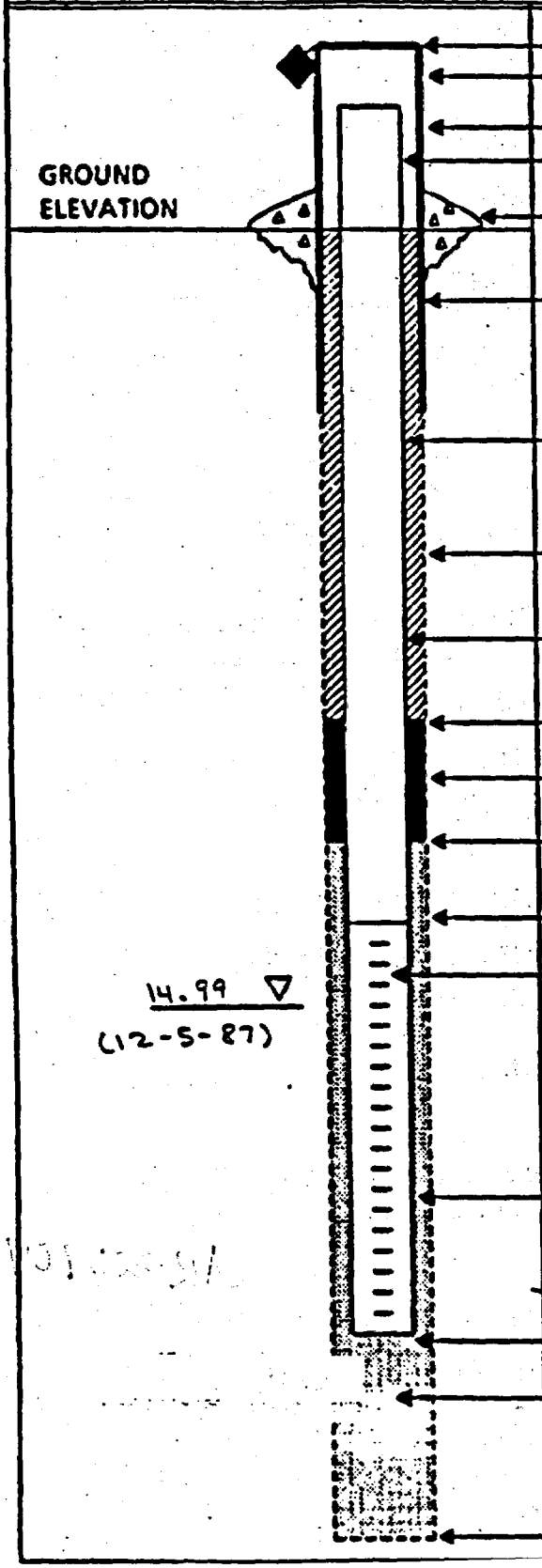
BORING NO : CR-MW 2

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 20.19
FIELD GEOLOGIST KEVIN T. McCREANOR

LOCATION Bucks Co., PA
BORING CR-MW 13(S)
DATE 2 DECEMBER 1987

DRILLER W. SCHINN
DRILLING METHOD Hollow Stem AUGERING
DEVELOPMENT METHOD PUMP (TEAL)



ELEVATION OF TOP OF SURFACE CASING : 23.07
ELEVATION OF TOP OF RISER PIPE: 22.09

STICK - UP TOP OF SURFACE CASING: 2.88
STICK - UP RISER PIPE : 1.90

TYPE OF SURFACE SEAL: CEMENT & SAND MIX

I.D. OF SURFACE CASING: 6.0"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 2.0"
TYPE OF RISER PIPE: PVC. - Sch. 40.

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: CEMENT & SAND MIX

ELEVATION / DEPTH TOP OF SEAL: 18.19 / 2.0'

TYPE OF SEAL: "PELTONITE" BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 17.19 / 3.0'

ELEVATION / DEPTH TOP OF SCREEN: 16.19 / 4.0'

TYPE OF SCREEN: PVC - SCH 40

SLOT SIZE x LENGTH: 0.20 X 10FT.

I.D. OF SCREEN: 2.0"

TYPE OF SAND PACK: CLEAN - COARSE SILICA SAND

ELEVATION / DEPTH BOTTOM OF SCREEN: AP300 6.19 14.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 5.19 / 15.0'

TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE

ELEVATION / DEPTH OF HOLE: 5.19 15.0'

BORING NO.: CR-MW-31A

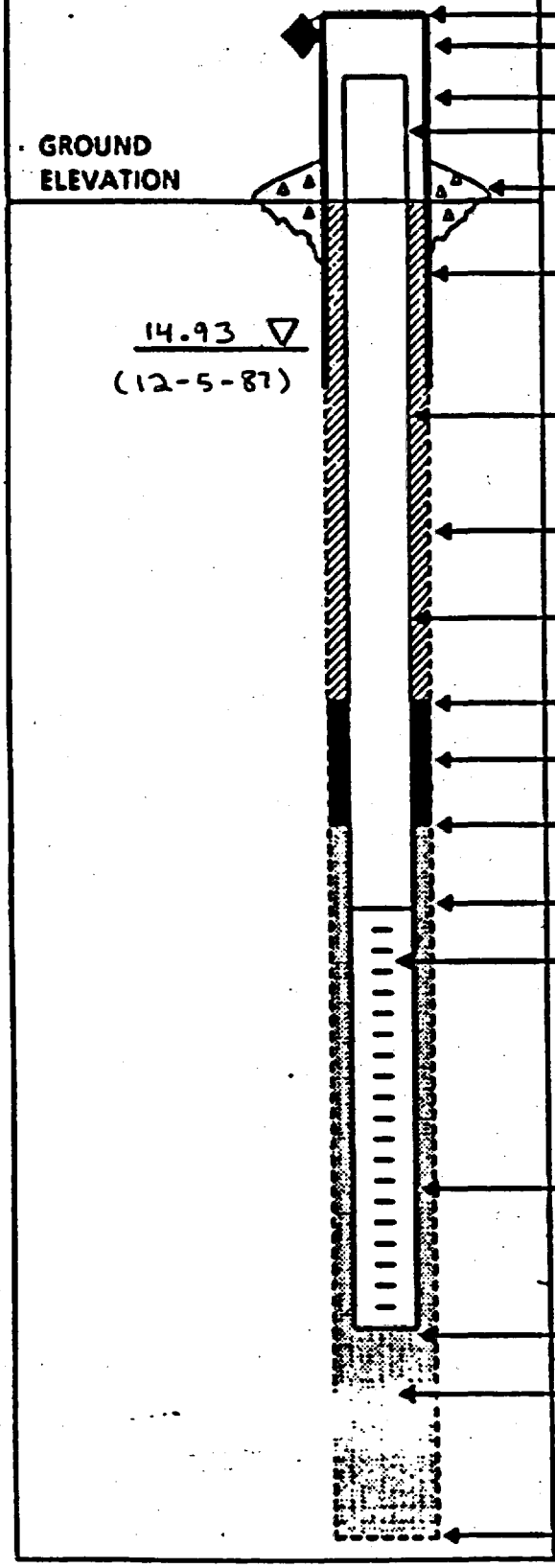
NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 20.59
FIELD GEOLOGIST: KEVIN T. McCREANOR

LOCATION: Bucks Co., PA
BORING: CR-MW13(D)
DATE: 2-3 DECEMBER 1987

DRILLER: W. SCOTT
DRILLING METHOD: Hollow Stem AUGER
DEVELOPMENT METHOD: Pump (Teal)



ELEVATION OF TOP OF SURFACE CASING: 23.02
ELEVATION OF TOP OF RISER PIPE: 22.78
STICK - UP TOP OF SURFACE CASING: 2.44
STICK - UP RISER PIPE: 2.20
TYPE OF SURFACE SEAL: CEMENT & SAND MIX
I.D. OF SURFACE CASING: 6.0"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2.0"
TYPE OF RISER PIPE: PVC - SCH. 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT/BENTONITE POWDER SLURRY MIX
ELEVATION / DEPTH TOP OF SEAL: 4.58 / 16.0'
TYPE OF SEAL: "PELTONITE" BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 2.58 / 18.0'
ELEVATION / DEPTH TOP OF SCREEN: 0.58 / 20.0'
TYPE OF SCREEN: PVC - SCH 40
SLOT SIZE x LENGTH: 0.20 x 10FT
I.D. OF SCREEN: 2.0"
TYPE OF SAND PACK: CLEAN - COARSE SILICA SAND
AR 300707
ELEVATION / DEPTH BOTTOM OF SCREEN: -9.42 / 30.0'
ELEVATION / DEPTH BOTTOM OF SAND PACK: -20.42 / 41.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: SAND & MATERIAL WHICH COLLAPSED FROM WALLS OF HOLE
ELEVATION / DEPTH OF HOLE: -23.42 / 44.0'

NUS CORPORATION

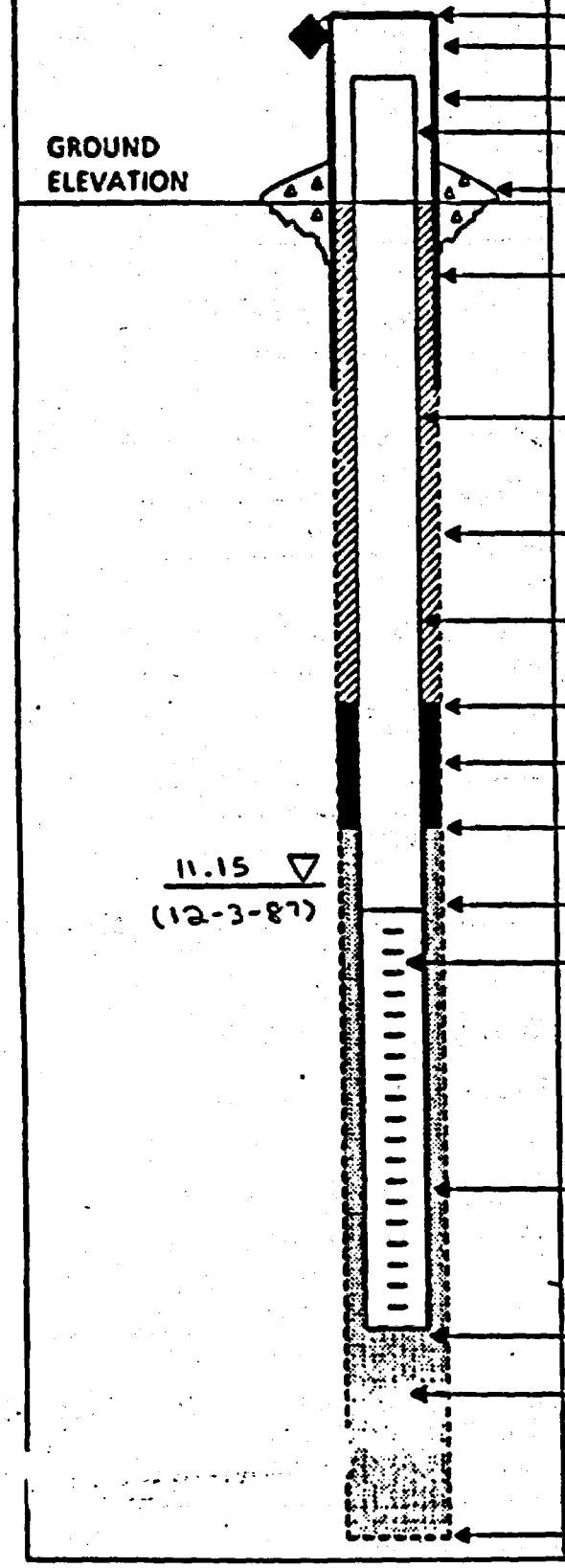
BORING NO. [illegible]

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 14.80
FIELD GEOLOGIST: [illegible]

LOCATION: Bucks Co., PA
BORING: [illegible]
DATE: [illegible]

DRILLER: Bill Shinn
DRILLING METHOD: [illegible]
DEVELOPMENT METHOD: Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 17.65
ELEVATION OF TOP OF RISER PIPE: 17.45
STICK - UP TOP OF SURFACE CASING: 2.85
STICK - UP RISER PIPE: 2.65
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: [illegible]
TYPE OF BACKFILL: [illegible]
ELEVATION / DEPTH TOP OF SEAL: 12.80 / 2.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: 11.30 / 3.5
ELEVATION / DEPTH TOP OF SCREEN: 10.80 / 4.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10 FT
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean coarse sand
ELEVATION / DEPTH BOTTOM OF SCREEN: 0.80 / 14.0
ELEVATION / DEPTH BOTTOM OF SAND PACK: -0.20 / 15.0
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -0.20 / 15.0

BORING NO.: [illegible]

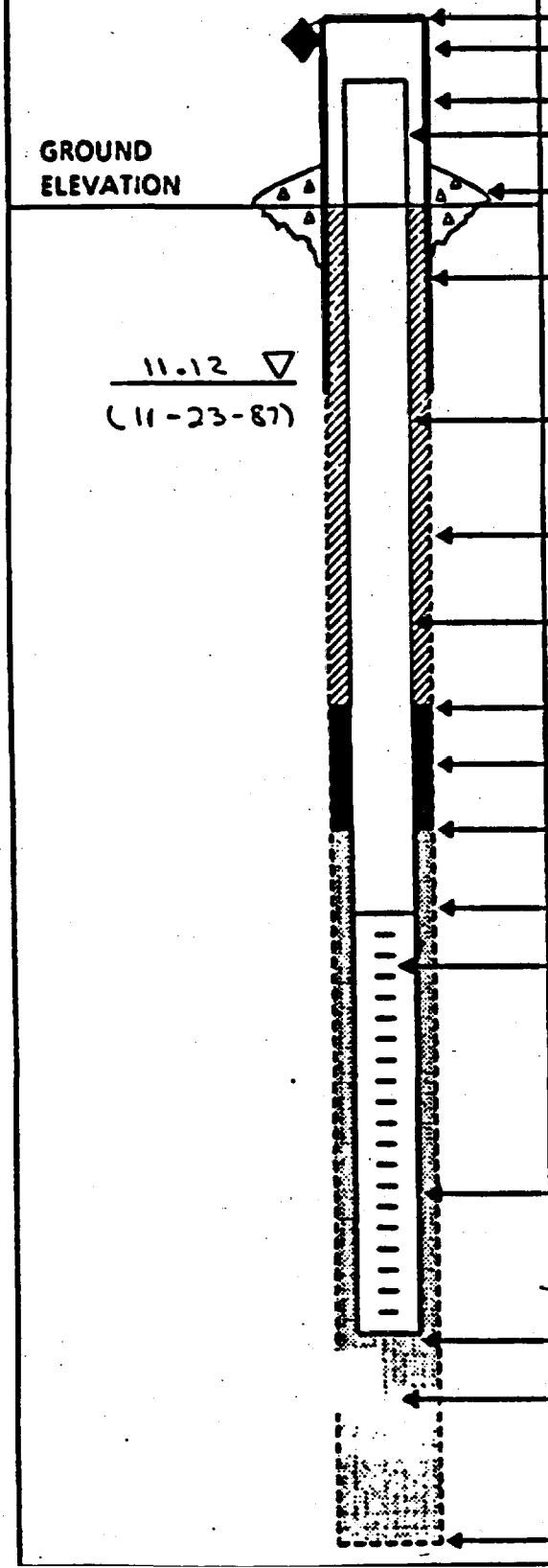
NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT: Croyden TCE
PROJECT NO.: 621Y
ELEVATION: 14.89
FIELD GEOLOGIST: S. Bacsick

LOCATION: Bucks Co., PA
BORING: CR-MW-4 (D)
DATE: 11/10/87

DRILLER: G Adolphson
DRILLING METHOD: Hollow Stem Auger
DEVELOPMENT METHOD: Pump (Teal)



ELEVATION OF TOP OF SURFACE CASING: 17.39
ELEVATION OF TOP OF RISER PIPE: 17.16
STICK - UP TOP OF SURFACE CASING: 2.50
STICK - UP RISER PIPE: 2.27
TYPE OF SURFACE SEAL: Concrete
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: PVC Sch 40
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: cement / bentonite grout
ELEVATION / DEPTH TOP OF SEAL: -12.11 / 27.0
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SAND PACK: -15.11 / 30.0
ELEVATION / DEPTH TOP OF SCREEN: -17.11 / 32.0
TYPE OF SCREEN: PVC Sch 40
SLOT SIZE x LENGTH: 0.20 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: Clean Coarse Sand
ELEVATION / DEPTH BOTTOM OF SCREEN: AR 307017/042
ELEVATION / DEPTH BOTTOM OF SAND PACK: -27.11 / 42.0
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -27.11 / 42.0

NUS CORPORATION

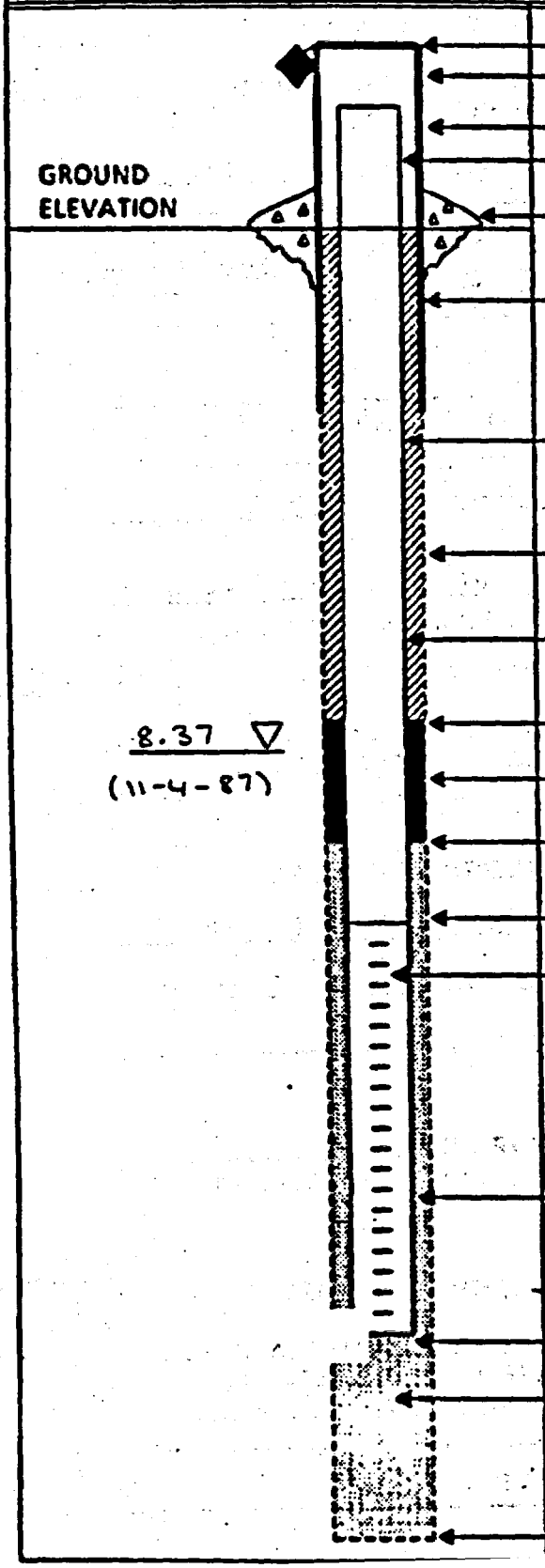
BORING NO : CR-MW 15

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 8.73
FIELD GEOLOGIST P. JONES

LOCATION Bucks Co., PA
BORING CR-MW 15 (S)
DATE 11/4/87

DRILLER Adelphia, Hatfield
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Rod Pump



ELEVATION OF TOP OF SURFACE CASING : 12.14
ELEVATION OF TOP OF RISER PIPE: 12.00
STICK - UP TOP OF SURFACE CASING: 3.41
STICK - UP RISER PIPE : 3.27
TYPE OF SURFACE SEAL: CONCRETE
I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: Sch 40 PVC
BOREHOLE DIAMETER: 7¼"
TYPE OF BACKFILL: GROUT • BENTONITE AND PORTLAND CEMENT
ELEVATION / DEPTH TOP OF SEAL: 8.23 / 0.5'
TYPE OF SEAL: BENTONITE PELLETS (PELTONITE)
DEPTH TOP OF SAND PACK: 5.98 / 2.75'
ELEVATION / DEPTH TOP OF SCREEN: 3.90 / 4.83'
TYPE OF SCREEN: Slotted PVC
SLOT SIZE x LENGTH: 020 x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: COARSE SAND CLEAN - UNWASHED SAND
AR 300710
ELEVATION / DEPTH BOTTOM OF SCREEN: -6.27 / 15'
AR300710
ELEVATION / DEPTH BOTTOM OF SAND PACK: -8.27 / 17'
TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE
ELEVATION / DEPTH OF HOLE: -8.27 / 17'

BORING NO : CR-MW 15(D)

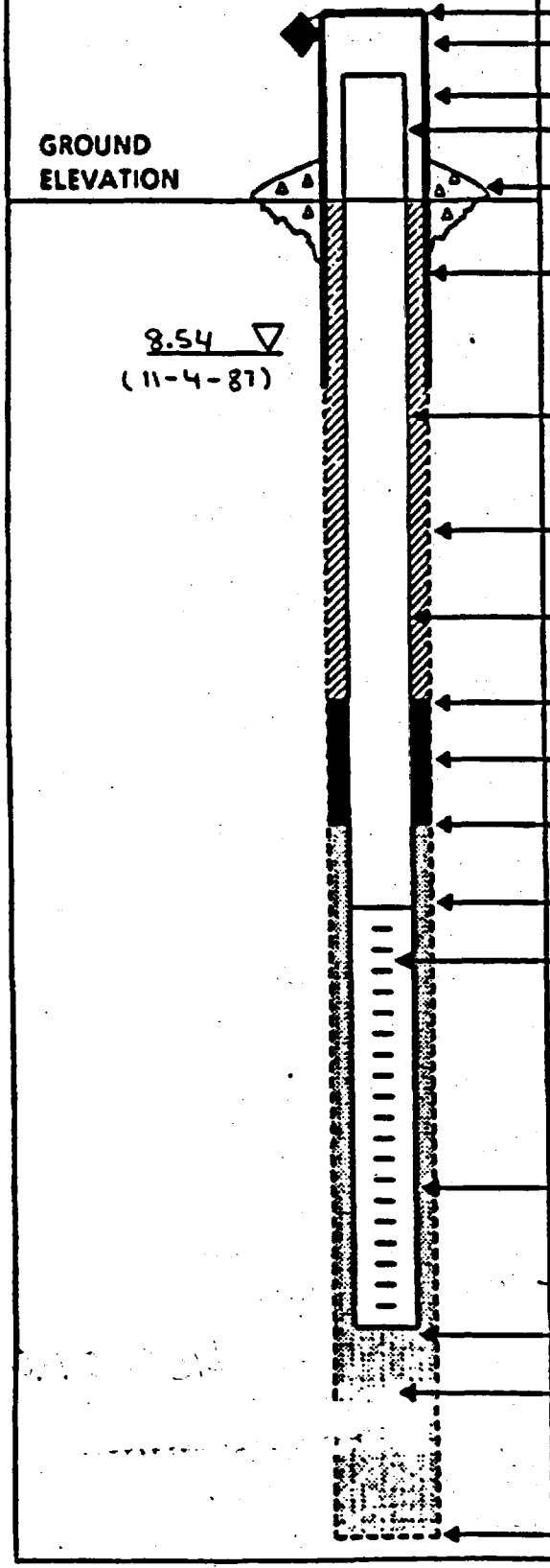
NUS CORPORATION

OVERBURDEN
MONITORING WELL SHEET

PROJECT Croyden TCE
PROJECT NO. 621Y
ELEVATION 8.75
FIELD GEOLOGIST P. JONES

LOCATION Bucks Co., PA
BORING CR-MW 15(D)
DATE 11/4/87

DRILLER Adolfson Assoc.
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT METHOD Rod Pump



ELEVATION OF TOP OF SURFACE CASING: 12.03
ELEVATION OF TOP OF RISER PIPE: 11.84
STICK - UP TOP OF SURFACE CASING: 3.28
STICK - UP RISER PIPE: 3.09
TYPE OF SURFACE SEAL: CONCRETE
I.D. OF SURFACE CASING: 4"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: Sch 40 PVC
BOREHOLE DIAMETER: 7¼"
TYPE OF BACKFILL: GROUT - BENTONITE AND PORTLAND CEMENT
ELEVATION / DEPTH TOP OF SEAL: -7.65 / 16.4'
TYPE OF SEAL: BENTONITE PELLETS (PELTONITE)
DEPTH TOP OF SAND PACK: -9.85 / 18.6'
ELEVATION / DEPTH TOP OF SCREEN: -12.08 / 20.83'
TYPE OF SCREEN: Slotted PVC
SLOT SIZE x LENGTH: 020 x 10 FT
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: COARSE SAND CLEAN - UNWASHED BAGS
ELEVATION / DEPTH BOTTOM OF SCREEN: -22.75 / 31'
ELEVATION / DEPTH BOTTOM OF SAND PACK: -24.25 / 33'
TYPE OF BACKFILL BELOW OBSERVATION WELL: BENTONITE CHIPS - FOR PLUG
ELEVATION / DEPTH OF HOLE: -36.75 / 45.5'

AR300711

F

AR300712

APPENDIX F

STATIC WATER LEVEL MEASUREMENTS

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: CROYDON TCE
PROJECT NO.: 1621
PERSONNEL: S. Barnick
DATE: 3-25-88

LOCATION
MUNICIPALITY: Croydon
COUNTY: Bucks County
STATE: PA
STREET OR MAP LOCATION (IF OFF-SITE):

WEATHER CONDITIONS
TEMPERATURE RANGE: 65-70°F
PRECIPITATION: NONE
BAROMETRIC PRESSURE:

EQUIPMENT NO.: 651574
EQUIPMENT NAME: WATER METER
LATEST CALIBRATION DATE: 3-25-88

TIDALLY-INFLUENCED [ ] YES [X] NO

WELL OR PIEZOMETER NO.	DATE/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW01(S)	1434	28.12	14.71		13.41
CR-MW01(D)	1437	27.63	14.21		13.42
CR-MW02(S)	1626	28.97	14.30		14.67
CR-MW02(D)	1625	29.06	14.83		14.23
CR-MW03(S)	1800	14.65	2.59		12.06
CR-MW04(D)	1765	15.75	3.58		12.17
CR-MW05(S)	1516	31.82	19.54		12.28
CR-MW05(D)	1503	31.87	19.54		12.33
CR-MW06(S)	1445	29.39	16.06		13.33
CR-MW06(D)	1447	~~29.17~~ 29.17	~~15.85~~ 15.85		13.32
CR-MW08(S)	1538	~~31.61~~ 31.61	19.47		12.14
CR-MW07(D)	1535	31.91	19.87		12.04
CR-MW14(S)	1406	17.45	5.61		11.84
CR-MW14(D)	1409	17.16	5.10		12.06
CR-MW15(S)	1703	12.00	3.71		8.29
CR-MW15(D)	1706	11.84	2.61		9.23
CR-18-30	1417	90.92	19.55		11.37
CR-18-55	1421	30.93	19.41		11.52
CR-19-15	1546	11.50	1.63		9.87
CR-19-37	1548	13.27	0.71		12.56
LF-13-18	1525	19.32	8.58		10.74
LF-13-43	1520	18.44	7.08		11.36

* All elevations to nearest 0.01 feet.

AR300714

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: CROWN TLE
PROJECT NO.: 1621 Y
PERSONNEL: S. Barnick
DATE: 3-25-88.

LOCATION
MUNICIPALITY: Conyngham
COUNTY: Luzerne
STATE: PA
STREET OR MAP LOCATION (IF OFF-SITE):

WEATHER CONDITIONS
TEMPERATURE RANGE: 65-70°F
PRECIPITATION: NONE
BAROMETRIC PRESSURE:

EQUIPMENT NO.: 165 13-74
EQUIPMENT NAME: WATER MASTER
LATEST CALIBRATION DATE: 3-25-88

TIDALLY-INFLUENCED [ ] YES [X] NO

WELL OR PIEZOMETER NO.	DATE/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-25-13	1636	14.04	4.68		9.36
CR-1-22	1637	23.54	13.25		10.29
CR-1-50	1640	22.81	12.37		10.44
CR-21-27	1719	16.09	5.47		10.62
CR-21-17	1723	16.18	5.68		10.50
CR-21-38	1725	15.93	5.17		10.76
S.G #1	1658	10.21	2.41		7.80
S.G. #4	1401	10.39	2.41		7.98

AR300715

* All elevations to nearest 0.01 feet.

ATTACHMENT A
FT-6.07, REV.0

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME Crowder TLE
PROJECT NO. 4334.553 (6.1.1)
PERSONNEL S Carnick
DATE 2-21-89

LOCATION MUNICIPALITY Crowder PA
COUNTY Cook
STATE PA
STREET OR MAP LOCATION (IF OFF-SITE)

WEATHER CONDITIONS
TEMPERATURE RANGE 35-45°F
PRECIPITATION none
BAROMETRIC PRESSURE

EQUIPMENT NO. N1603
EQUIPMENT NAME Micro PVC
LATEST CALIBRATION DATE

TIDALLY-INFLUENCED [ ] YES [ ] NO

WELL OR PIEZOMETER NO.	~~DATE~~/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW01(S)	0903	28.12	12.91		15.21
CR-MW01(D)	0901	27.63	12.46		15.17
CR-MW02(S)	1030	28.97	13.97		15.00
CR-MW02(D)	1028	29.06	14.09		14.97
CR-MW04(S)	0846	14.65	2.26		12.39
CR-MW04(D)	0847	15.75	3.09		12.66
CR-MW05(S)	0917	31.82	18.95		12.87
CR-MW05(D)	0916	31.87	18.97		12.90
CR-MW06(S)	0911	29.39	16.35		14.04
CR-MW06(D)	0910	29.17	16.15		14.02
CR-MW07(S)	0935	31.61	18.74		12.87
CR-MW07(D)	0936	31.91	19.08		12.83
CR-MW08(S)	0943	22.81	10.74		12.07
CR-MW08(D)	0944	22.61	10.59		12.10
CR-MW09(S)	0958	17.69	6.33		11.36
CR-MW09(D)	0959	18.06	6.73		11.33
CR-MW10(D)	1004	20.84	9.11		11.73
LF-14-20	0940	~~NMEAS FOR TOC~~ POC 21.15	9.40		11.75
CR-MW11(S)	0952	19.56	8.29		11.27
CR-MW11(D)	0953	19.25	8.00		11.25
CR-MW12(S)	1017	27.58	12.83		14.75
CR-MW12(D)	1015	26.56	11.72		14.84
CR-MW13(S)	1038	22.09	4.92		17.17
CR-MW03(S)	0839	14.10	1.55		12.55
CR-MW03(D)	0838	18.98	1.44		12.54

AR300751

ATTACHMENT A
FT-6.07, REV.0

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME Croydon TCE
PROJECT NO. 4236.553 (N2/T)
PERSONNEL S. Brezack
DATE 2-29-88

LOCATION
MUNICIPALITY Croydon
COUNTY Bucks
STATE PA
STREET OR MAP LOCATION (IF OFF-SITE)

WEATHER CONDITIONS
TEMPERATURE RANGE 35-48°F
PRECIPITATION None
BAROMETRIC PRESSURE

EQUIPMENT NO. N1603
EQUIPMENT NAME m-scope
LATEST CALIBRATION DATE

TIDALLY-INFLUENCED [ ] YES [ ] NO

WELL OR PIEZOMETER NO.	~~DATE/~~ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING# (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW13(D)	1037	22.78	5.60		17.18
CR-MW14(S)	0857	17.45	5.31		12.14
CR-MW14(D)	0855	17.16	4.67		12.49
CR-MW15(S)	0817	12.00	3.45		8.55
CR-MW15(D)	0820	~~[illegible]~~ 11.84 SB 3-8-88	2.35		~~[illegible]~~ 9.49 SB 3-8-88
LF 13-43	1512	~~Gr. El.~~ T.C. PVC 13.44	6.45		11.99
LF-13-13	1514	" 19.32	8.10		11.22
LF-15-26	1532	" 18.15	7.18		10.97
LF-15-37	1534	" 17.34	6.47		10.87
CR-18-30	1601	30.92	19.11		11.81
CR-18-55	1602	~~Gr. El.~~ T.C. PVC SB 3-8-88 30.93	18.87		12.06
CR-19-15	1539	" 11.50	1.43		10.07
CR-19-37	1538	" 12.12	0.16		11.96
CR-23-53	1540	28.92	15.31		13.61
CR-23-32	1539	28.89	15.30		13.59
CR-24-7		8.31	Could Not	Find	
CR-24-16		9.39	Could Not	Find	
CR-25-13		14.09	Could Not	Find	(Found 3-25-88)
CR-25-34		14.04	Could Not	Find	(Found 3-25-88)
CR-26-19	1540	15.34	4.18		11.16
CR-26-38	1539	15.28	3.90		11.38
CR-27-18	1545	14.52	2.51		12.01
CR-27-38	1546	14.75	2.50		12.25

* All elevations to nearest 0.01 feet.
\# Measurement from top of PVC.

AR300748

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: CROYDON TCE
PROJECT NO.: 6211
PERSONNEL: S. BARNICK
DATE: 1-9-88

LOCATION
MUNICIPALITY: CROYDON
COUNTY: BUCKS
STATE: PA
STREET OR MAP LOCATION (IF OFF-SITE):

WEATHER CONDITIONS
TEMPERATURE RANGE: 29°
PRECIPITATION: —
BAROMETRIC PRESSURE:

EQUIPMENT NO.:
EQUIPMENT NAME: M-SCOPE
LATEST CALIBRATION DATE: 1-4-88

TIDALLY-INFLUENCED [ ] YES [ ] NO

WELL OR PIEZOMETER NO.	DATE/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW00(S)	1030	28.12	15.32		12.80
CR-MW01(D)	1025	27.63	14.85		12.78
CR-MW02(S)		28.97			
CR-MW02(D)		29.04			
CR-MW03(S)	1135	14.10	3.14		10.96
CR-MW03(D)	1121	13.98	3.25		10.73
CR-MW04(S)	1144	14.65	3.60		11.05
CR-MW04(D)	1146	15.75	4.68		11.07
CR-MW05(S)	1105	31.82	20.70		11.12
CR-MW05(D)	1106	31.37	20.68		11.19
CR-MW06(S)	1045	29.39	17.48		11.91
CR-MW06(D)	1046	29.17	17.25		11.92
CR-MW07(S)	1004	31.61	20.71		10.90
CR-MW07(D)	1008	31.91	20.98		10.93
CR-MW08(S)	1001	22.81	12.47		10.34
CR-MW08(D)	1000	22.69	12.32		10.37
CR-MW09(S)	0858	17.69	7.89		9.80
CR-MW09(D)	0916	18.04	8.26		9.80
CR-MW10(D)	0935	20.84	10.80		10.04
CR-MW11(S)	0930	19.56	9.90		9.66
CR-MW11(D)	0928	19.25	9.61		9.64
CR-MW12(S)	0756	27.53	15.17		12.36
CR-MW12(D)	0806	26.56	14.10		12.46

AR300418

* All elevations to nearest 0.01 feet.

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: CROYDON TCE
PROJECT NO.: 6214
PERSONNEL: J. Barnick
DATE: 1-9-88

LOCATION
MUNICIPALITY: CROYDON
COUNTY: BUCKS
STATE: PA
STREET OR MAP LOCATION (IF OFF-SITE):

WEATHER CONDITIONS
TEMPERATURE RANGE: 29°
PRECIPITATION: —
BAROMETRIC PRESSURE:

EQUIPMENT NO.:
EQUIPMENT NAME: M-SCAPE
LATEST CALIBRATION DATE: 1-4-88

TIDALLY-INFLUENCED: [ ] YES [ ] NO

WELL OR PIEZOMETER NO.	DATE/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW13(S)		22.09			
CR-MW13(D)		22.78			
CR-MW14(S)	1200	17.45	6.41		11.04
CR-MW14(D)	1205	17.16	6.12		11.04
CR-MW15(S)	1230	12.00	3.73		8.27
CR-MW15(D)	1247	11.34	3.22		8.62
LF-15-37	0834	17.34	7.91		9.43
LF-15-26	0835	18.15	8.65		9.50
CR-23-32	1053	28.89	17.36		11.53
CR-23-53	1056	28.92	17.38		11.54
LF-14-20	0934	21.15	11.11		10.04
Gauge #1	1300	10.21	2.50		7.71
Gauge #2	1355		3.12	VANDALIZED	
Gauge #3	1346	6.23	2.50		3.72

* All elevations to nearest 0.01 feet.

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: CROYDON TCE
PROJECT NO.: 621Y
PERSONNEL: S. BARNICK
DATE: 1-6-88

LOCATION
MUNICIPALITY: CROYDON
COUNTY: BUCKS
STATE: PA
STREET OR MAP LOCATION (IF OFF-SITE):

WEATHER CONDITIONS
TEMPERATURE RANGE: 10° F
PRECIPITATION:
BAROMETRIC PRESSURE:

EQUIPMENT NO.:
EQUIPMENT NAME: M-SCOPE
LATEST CALIBRATION DATE: 1-4-88

TIDALLY-INFLUENCED: [ ] YES [ ] NO

WELL OR PIEZOMETER NO.	DATE/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW01(S)		STEVENS RECORDER FLOAT INHIBIT TO MEASUREMENT			
CR-MW01(D)	0852	27.63	14.82		12.81
CR-MW02(S)	1011	28.97	16.26		12.71
CR-MW02(D)	1103	29.06	16.37		12.69
CR-MW03(S)		Stevens Recorder - Float Inhibited - Water Level Measurement			
CR-MW03(D)	0834	13.98	3.23		10.75
CR-MW04(S)	0841	14.65	3.56		11.09
CR-MW04(D)	0841	15.75	4.71		11.04
CR-MW05(S)	0907	31.82	20.63		11.19
CR-MW05(D)	0906	31.87	20.61		11.26
CR-MW06(S)	0857	29.39	17.45		11.94
CR-MW06(D)	0856	29.17	17.28		11.89
CR-MW07(S)	0911	31.61	20.62		10.99
CR-MW07(D)	0912	31.91	20.73		11.18
CR-MW08(S)	1442	22.81	12.40		10.41
CR-MW08(D)	1443	22.69	12.26		10.43
CR-MW09(S)		STEVENS RECORDER			
CR-MW09(D)		STEVENS RECORDER			
CR-MW10(D)	0944	20.84	10.72		10.12
CR-MW11(S)	0918	19.56	9.81		9.75
CR-MW11(D)	0917	19.25	9.49		9.76
CR-MW12(S)		STEVENS RECORDER			
CR-MW12(D)	0953	26.56	14.03		12.53

AR300720

* All elevations to nearest 0.01 feet.

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME: CROYDON TCE
PROJECT NO.: 6214
PERSONNEL: J. BARNICK
DATE: 1-6-88

LOCATION
MUNICIPALITY: CROYDON
COUNTY:
STATE: PA
STREET OR MAP LOCATION (IF OFF-SITE):

WEATHER CONDITIONS
TEMPERATURE RANGE: 10°F
PRECIPITATION: -
BAROMETRIC PRESSURE:

EQUIPMENT NO.:
EQUIPMENT NAME: M-SCOPE
LATEST CALIBRATION DATE: 1-4-88

TIDALLY-INFLUENCED [ ] YES [ ] NO

WELL OR PIEZOMETER NO.	DATE/ TIME	ELEVATION OF REFERENCE POINT (FEET)*	WATER LEVEL INDICATOR READING (FEET)*	ADJUSTED DEPTH (FEET)*	GROUNDWATER ELEVATION (FEET)*
CR-MW1(S)	1205	22.07	7.62		14.47
CR-MW1(D)	1206	22.78	8.28		14.50
CR-MW4(S)	0846	17.45	6.39		11.06
CR-MW4(D)	0846	17.16	6.13		11.03
CR-MW8(S)		STEVENS RECORDER			
CR-MW8(D)		STEVENS RECORDER			
LF-15-37	0924	17.34	7.83		9.51
LF-15-26	0924	18.15	8.53		9.62
CR-23-32	0902	28.89	17.29		11.60
CR-23-53	0900	23.72	17.36		11.56
LF-14-20	0946		11.07		
CR-26-19	0932	15.34	5.50		9.84
CR-26-38		LOCK WOULD NOT OPEN			
GAUGE #1	1410	10.21	2.48		7.73
GAUGE #2	1350	VANDALIZED	3.31		
GAUGE #3	1358	6.32	2.37		3.35
					AR300

AR300721

* All elevations to nearest 0.01 feet.