Essex/Hope Site

CHAUTAUQUA COUNTY

JAMESTOWN, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 907015

EPA ID # NYR000046094

Prepared for:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

DECEMBER 2017

CERTIFICATION STATEMENT

I, _____, certify that I am currently a New York State-registered professional engineer as defined in 6 *New York Codes, Rules, and Regulations* Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation *Technical Guidance for Site Investigation and Remediation* (DER-10).

_____P.E.

_____Date

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Acronyms and Abbreviations

µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
amsl	above mean sea level
AS	Air Sparging
AST	aboveground storage tank
bgs	below ground surface
BPU	Board of Public Utilities
CAMP	Community Air Monitoring Plan
CBTEX	cumene, benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH2M	CH2M HILL Engineers, Inc.
CFR	*Code of Federal Regulations*
COC	Certificate of Completion; constituent of concern
CPM	Custom Production Manufacturing Inc.
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EPA	U.S. Environmental Protection Agency
ESP	Essex Specialty Products, Inc.
EWP	Excavation Work Plan
FEMA	Federal Emergency Management Agency
FS	feasibility study
ft/day	feet per day
GAC	granular activated carbon
GC/MS	gas chromatograph/mass spectrometer
GWE&T	Groundwater Extraction and Treatment
HAPSITE	hazardous air pollutants onsite
HASP	Health and Safety Plan
IC	Institutional Control

ISCO	in situ chemical oxidation
MNA	monitored natural attenuation
MW	monitoring well
NAPL	nonaqueous phase liquid
NPLS	North Parking Lot Sump
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	*New York Codes, Rules, and Regulations*
O'Brien & Gere	O'Brien & Gere Engineers, Inc.
O&M	operations and maintenance
PCB	polychlorinated biphenyl
POTW	publicly owned treatment works
PRR	Periodic Review Report
QAPP	Quality Assurance Project Plan
RAO	remedial action objective
RI	remedial investigation
ROD	Record of Decision
RSO	Remedial System Optimization
RW	recovery well
SCG	Standards, Criteria, and Guidelines
SCO	Soil Cleanup Objective
Site	Essex/Hope Site
SMAART	Systematic Application of Advanced Remedial Technologies
SMP	Site Management Plan
SSD	subslab depressurization
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TCE	trichloroethene
URS	URS Corporation
USGS	U.S. Geological Survey
UST	underground storage tank
VeruTEK	VeruTEK Technologies, Inc.
VI	vapor intrusion
VIMS	vapor intrusion mitigation system

VOC	volatile organic compound
WBZ	water bearing zone
ZVI	zero-valent iron

Executive Summary

On behalf of Essex Specialty Products, Inc. (ESP), CH2M HILL Engineers, Inc. (CH2M) has prepared this Site Management Plan (SMP) for the ongoing remedial actions at the Essex/Hope site (the Site) in Jamestown, New York (Site No. 907015). The following provides a summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance, and reporting activities required by this SMP:

Site Identification: Site No. 907015, known as the Essex/Hope site, is located at 125 Blackstone Avenue in Jamestown, New York 14701

Institutional Controls:	1. The property may be used for industrial use;
	2. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the Chautauqua County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from NYSDOH;
	3. There shall be no construction, use, or occupancy of the property that results in the disturbance or excavation of the property which threatens the integrity of the engineering controls (ECs), or which results in unacceptable human exposure to contaminated soils;
	4. The owner of the property shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of ECs;
	5. The owner of the property shall provide a periodic certification, prepared and submitted by a professional engineer or environmental professional, which will certify that the institutional controls (ICs) and ECs put in place are unchanged from the previous certification, comply with the SMP, and have not been impaired;
	6. The owner of the property shall continue in force and effect any ICs and ECs required for the remedy and maintain such controls, unless the owner first obtains permission to discontinue such controls from the New York State Department of Environmental Conservation (NYSDEC) or relevant Agency, in compliance with this SMP, subject to modifications as approved by the NYSDEC or relevant Agency;
	7. The covenant shall run with the land and shall be binding upon all future owners of the property, and shall provide that the owner and its successors and assigns consent to enforcement by the NYSDEC or relevant Agency of the prohibitions and restrictions that the Order on Consent requires to be recorded; and
	8. Any deed of conveyance of the property, or any portion thereof, shall recite that said conveyance is subject to the Declaration of Covenants and Restrictions.
Engineering Controls:	1. Groundwater Extraction and Treatment (GWE&T) System
	2. Asphalt and Concrete Covers
	3. Subslab Depressurization (SSD)/Vapor Intrusion Mitigation System (VIMS)
	4. Monitoring Well Network

Inspections:	**Frequency**
1. GWE&T System Recovery Wells (RW-1S, RW-2S, RW-2D, and RW-6D)	Biweekly or As Needed Semiannually
2. Asphalt and Concrete Covers	Semiannually
3. SSD/VIMS (Monthly checks performed)	Annually
4. Monitoring Well Network	Quarterly
Monitoring:	
1. GWE&T System	Monthly
2. Recovery Wells (RW-1S, RW-2S, RW-3S, RW-2D, and RW-6D)	Semiannually (alternating seasons)
3. Monitoring Well Network Water Level Measurements Sampling	 Quarterly Annually
Maintenance:	
1. GWE&T System Components	Semiannually and As Needed
2. Recovery Wells (RW-1S, RW-2S, RW-2D, and RW-6D) Redevelopment	Annually and As Needed
3. Asphalt and Concrete Covers	As Needed
4. SSD/VIMS	Annually and As Needed
5. Monitoring Well Network (Detailed in Section 4.4)	As Needed
Reporting:	
1. Self-monitoring Report (submitted to Jamestown Board of Public Utilities)	Semiannually
2. Performance Monitoring Report (PMR, submitted to NYSDEC)	Annually
2. Periodic Review Report (PRR, submitted to NYSDEC)	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

SECTION 1

Introduction

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Essex/Hope Site located in Jamestown, New York (hereinafter referred to as the "Site"). The Site is currently in the New York State (NYS) State Superfund Program, Site No. 907015, which is administered by the New York State Department of Environmental Conservation (NYSDEC).

Essex Specialty Products, Inc. (ESP) entered into an Order on Consent on July 28, 1995 with the NYSDEC to remediate the Site. A figure showing the site location and boundaries of this Site is provided on Figure 1-1. The owner of the site parcels at the time of issuance of this SMP is Custom Production Manufacturing Inc. (CPM). The boundaries of the Site are more fully described in the property description (Schedule "A") that is part of the Declaration of Covenants and Restrictions, which is provided in Appendix A.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination." Institutional and engineering controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. A Declaration of Covenants and Restrictions granted to the NYSDEC and recorded with the Chautauqua County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Declaration of Covenants and Restrictions is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. This SMP has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Declaration of Covenants and Restrictions and the grantor's successors and assignees. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Declaration of Covenants and Restrictions. Failure to properly implement the SMP is a violation of the Declaration of Covenants and Restrictions, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of ECL, 6 *New York Codes, Rules, and Regulations* (NYCRR) Part 375 and the Order on Consent (Index No. B9-0354-94-05; Site No. 907015) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with the Site is provided in Appendix B of this SMP.

This SMP was prepared by CH2M HILL Engineers, Inc. (CH2M), on behalf of ESP, in accordance with the requirements of the NYSDEC's Division of Environmental Remediation *Technical Guidance for Site Investigation and Remediation* (DER-10), dated May 3, 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Declaration of Covenants and Restrictions for the Site.

1.2 Revisions

Revisions to this SMP will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Declaration of Covenants and Restrictions for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by ESP or its consultant to the NYSDEC, as needed, in accordance with the NYSDEC's DER-10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent, 6 NYCRR Part 375 and/or the ECL.
- 7-day advance notice of any field activity (except for routine maintenance activities) associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.
- Notice within 48 hours of any damage or defect to the foundation, structures, or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Order on Consent, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1-1 includes contact information for the above notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

SECTION 2

Summary of Previous Investigations and Remedial Actions

As part of the sale of the site from ESP to Lilly Industries, Inc., a Phase I environmental audit was conducted in 1989 and a Phase 2 investigation was completed in 1990. Soil and groundwater impacts were detected during these investigations, the NYSDEC was notified in October 1990, and the Site was entered into the NYSDEC Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. An Order on Consent was issued in June 1991 to conduct a remedial investigation (RI) and feasibility study (FS), and another Order on Consent was issued in October 1991 to remove stained soils impacted with phthalates from the eastern former underground storage tank (UST) area. The RI Report was completed in 1993, and the FS Report was completed in 1994 (O'Brien & Gere Engineers, Inc. [O'Brien & Gere], 1994), and the Record of Decision (ROD) was issued by the NYSDEC in 1994 (NYSDEC, 1994). An Order on Consent was signed by the NYSDEC and ESP in 1995 to implement the remedies outlined in the ROD. Presently, a groundwater extraction and treatment (GWE&T) system is in operation, which consists of two shallow and two deep recovery wells. Additionally, portions of the Site are managed with a cap to prevent dermal contact and particulate inhalation exposure and minimize leaching of semivolatile organic compounds (SVOCs) into groundwater. A vapor intrusion mitigation system (VIMS) was installed at a downgradient residence. Site limitations are managed by ICs in the form of a Declaration of Covenants and Restrictions.

The Declaration of Covenants and Restrictions signed by CPM and the NYSDEC in 2014 restricted use of the Site to industrial purposes (Appendix A). The responsibilities associated with the implementation of this SMP are outlined in Appendix C, *Responsibilities of Owner and Remedial Party*. The GWE&T system operates under a Jamestown Board of Public Utilities (BPU) pretreatment permit, first issued in 1996 and most recently renewed in November 2017, for discharge to the city sewer and publicly owned treatment works (POTW), which is included in Appendix D. Pretreatment effluent limitations are contained in the permit and described in Section 4, *Monitoring and Sampling Plan*.

Tables 2-1, 2-2, and 2-3 provide summaries of the site investigations, key areas and historically observed impacts, and site-specific remedial action objectives, respectively. Figure 2-1 depicts the areas of remediation at the Site.

2.1 Site Location and Description

The Site is located in Jamestown, Chautauqua County, New York, and is identified as Section 371.13 Block 4 and Lots 40 and 49 on the Chautauqua County Tax Map (see Figure 1-1). The Site is an approximately 4.7-acre area and is bounded by Hopkins Avenue to the north, Blackstone Avenue to the south, two parking lots (owned by Johnson Machine & Fiber Products, Inc. and Rollform of Jamestown, Inc.) to the east, and a parking lot (owned by Hope's Windows, Inc.) and Angove Avenue to the west (see Figure 1-1). The boundaries of the Site are described in Appendix A. The owner of the site parcels at the time of issuance of this SMP is CPM.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of two main buildings: the Plant 5 Building on the northern side of the property and the West Building on the western side of the Site. The remainder of the Site includes paved areas, vegetated

areas, a remedial system treatment building, and a Quonset hut. The Site is zoned industrial and is currently utilized for commercial and industrial uses. The site occupant is CPM, a sheet metal contractor.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include industrial and commercial properties, with the exception of a few residences located to the northwest and northeast of the Site. The properties surrounding the Site are shown on Figure 1-1.

2.2.2 Geology

The soils within the Chadakoin River valley are predominantly sands, silts, clays, and gravels deposited during a series of glacial advances and retreats. The soils deposited at and near the Site consist of a series of deposits related to glacial advances and retreats. When the glaciers overlaid the Site, subglacial tills of highly compacted unsorted materials were deposited. During glacial retreats, recessional morainal deposits consisting of unsorted materials were deposited to form hills and ridges. As the ice retreated, glaciofluvial outwash deposits of sorted sands and gravels were deposited (Crain, 1966). Glacial lakes that formed in Cassadaga Valley may have occasionally inundated the Site, resulting in the deposition of silt and clay lake layers at and near the Site. The alternating silts and clays have been interpreted as varves formed by annual variations in melting, with the coarser-grained silts and fine-grained sands are deposited during the summer when melting is occurring and the finer-grained clays deposited during the winter when melting is not occurring.

A U.S. Geological Survey (USGS) map (Anderson *et al*., 1982) indicated surficial deposits at the Site consisted of predominantly sands, although morainal deposits consisting of a mixture of clay, silt, sands, and gravels were mapped nearby to the south and west. In Cassadaga Creek to the east, these silts and clays form a confining layer up to 200 feet thick.

Bedrock underneath the site consists of Devonian siltstones and shales (Tesmer, 1963). A well located approximately 600 feet west of the site, near the Chadakoin River and Hope's Windows Plant 3, was drilled to 138 feet without encountering bedrock, but a well approximately 2,000 feet to the east-northeast, and along the river, reportedly reached bedrock at 571 feet below ground surface (bgs) (Crain, 1966). A well drilled 2,700 feet southeast of the Site and on the edge of the river valley encountered bedrock at 90 feet bgs, indicating the ancestral bedrock river valley was quite deep and narrow.

The ground surface at the Site gently slopes to the northeast, with elevations ranging from 1,281 feet above mean sea level (amsl) in the southwestern portion of the Site to 1,276 feet amsl at the Plant 5 Building.

Updated cross-sections, developed as part of 2016-2017 drilling investigations, show the relationships of the four primary stratigraphic units found at the Site, consisting of the following materials, in order of depth from the surface:

- Sand and gravel with occasional silt and fine-grained sands, generally classified as a silty sand with gravel extending to 10 to 15 feet bgs; although in the southwestern portion of the Site, observed thicknesses in some locations are less than 10 feet, and between 15 and 25 feet north of the Site and across the Former UST Area, adjacent to Bigelow Street (Figure 1-1).
- A shallow silty clay, generally ranging from 5 to 10 feet thick; however, the thickness varies considerably and is absent or only several inches thick in various locations.
- A generally 15- to 20-foot-thick silt or silt with sand, and in some locations 45 feet thick.
- A 40-to-50-foot-thick deep silty clay.

A geologic cross-section is shown on Figures 2-2A through 2-2E. Site-specific soil boring logs from the 2016-2017 drilling investigations are provided with the 2016-2017 Data Gap Investigation Reports,

which are included with the respective annual Periodic Review Report (PRR) submissions (CH2M, 2017a, 2017b).

2.2.3 Hydrogeology

The depth to groundwater at the Site is generally 7 to 11 feet bgs, and impacted groundwater occurs in two hydrostratigraphic zones. The Shallow Water Bearing Zone (WBZ) exists in the shallow sand and gravel unit under unconfined (water table) conditions. The Deep WBZ exists under confined to partially confined conditions in the fine-grained silt with sand unit and is separated in most areas from the Shallow WBZ by the shallow silty clay layer. Groundwater flow in both the Shallow and Deep WBZs under non-pumping conditions is east to northeast toward the Chadakoin River.

Vertical gradients under pumping conditions are generally downward between the Shallow and Deep WBZs, and as expected, the largest vertical gradients are observed near extraction wells RW-2D and RW-6D. While a downward vertical gradient indicates the possibility that contamination in the Shallow WBZ may migrate downward into the Deep WBZ, the presence of the shallow silty clay in most areas of the Site likely impedes or prevents this migration. However, this shallow silty clay appears to be either absent or very thin in the western portion of the North Parking Lot Sump (NPLS) Area (CH2M, 2017a). Downward vertical migration from the Shallow WBZ and vadose zone soil in the NPLS Area may be the source of the trichloroethene (TCE) concentration observed in the Deep WBZ. The hydraulic conductivity of the Shallow WBZ is approximately 9 feet per day (ft/day), while the hydraulic conductivity of the Deep WBZ is about 2 ft/day.

The Jamestown BPU supplies water to the Site and vicinity. The BPU supplies water to Jamestown from a network of wells more than 2 miles east of the Site (and hydraulically downgradient). Historical data indicate groundwater has been historically used in the vicinity of the Site. Sixteen water supply wells were mapped near the site on a 1966 map (Crain, 1966). No recently installed (2000 and more recent) water supply wells were identified within 1 mile of the Site, according to an NYSDEC water well database. Most historical wells in the immediate vicinity of the Site were drilled 70 to 140 feet bgs (deeper than the impacted WBZs at the Site). According to the FS Report for the Site (O'Brien & Gere, 1994), there were no user wells in the area and the area was supplied by the municipal water supply.

Representative Shallow and Deep WBZ groundwater contour maps from October 16, 2017 are shown on Figures 2-3A and 2-3B. A monitoring well inventory summarizing the well identification number, location coordinates, and screened intervals, including 2017 groundwater elevation data, is provided as Table 2-4. Groundwater monitoring well construction logs available for the Site are provided in Appendix E.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Table 2-1 and Section 8, *References*. Figure 2-1 summarizes the site investigations and areas of remediation at the Site.

ESP owned and operated the manufacturing facilities at the Site from 1982 to 1989, at which time the facilities were sold to Lilly Industries, Inc. Prior to this period, the facility was owned and operated by Essex Chemical Corporation, Tremco, Inc., Rubbermaid, Jamestown Finishing Products, Inc., and Jamestown Wood Finishing Company, which all produced various paints, varnishes, and other industrial coatings since approximately the early 1900s. Hope's Windows, Inc. also owned a portion of the property (Plant 5 Building) which was sold to ESP in the mid-1980s (NYSDEC, 1994).

Constituents of concern (COCs) at the Site include the following:

- Chlorinated volatile organic compounds (CVOCs)

  - TCE
  - cis-1,2-Dichloroethene (cis-1,2-DCE)
  - trans-1,2-DCE
  - Vinyl chloride
  - 1,1-DCE
- Ketones
  - Acetone
  - 2-Butanone (also known as methyl ethyl ketone)
- Petroleum-related compounds
  - Cumene, benzene, toluene, ethylbenzene, and xylenes (CBTEX)
  - 1,2,4-trimethylbenzene and 1,3,5 trimethylbenzene
- Bis(2-ethylhexyl)phthalate
- Polychlorinated biphenyls (PCBs)

Three separate areas were identified in the early 1990s during RIs and subsequently became the focus of remedial actions (Figure 1-1):

1. PCB-contaminated soils and CVOCs in shallow and deep groundwater were identified in the NPLS Area, located in a parking lot on the southern side of Hopkins Street.
2. Bis(2-ethylhexyl)phthalate-contaminated soils were found in the previously closed UST Area, located south of the Plant 5 Building.
3. Petroleum-related compounds were identified in the Former Aboveground Storage Tank (AST)/UST Area soils, located along the back of the West Building.

As the result of further delineation during supplemental investigation activities conducted since the March 1994 ROD (NYSDEC, 1994), impacts to groundwater have been observed elsewhere at the Site and offsite. Table 2-2 summarizes historically observed impacts at the Site.

The remedial systems at the Site were designed and constructed to address impacted groundwater and soil using a combination of soil vapor extraction (SVE), air sparging (AS), and a GWE&T system. The original remedial action implementation was conducted in 1996 and 1997, based on the March 1994 ROD (NYSDEC, 1994) and a 1995 *Basis of Design Report* (Dow Environmental Inc., 1995), and included the following:

- A groundwater extraction well network consisting of five shallow and two deep recovery wells for activated carbon groundwater treatment and discharge to the local POTW
- Soil excavation in the NPLS Area to remove PCB-impacted soil in the area of a former sump, and on the eastern side of the Former UST Area to remove bis(2-ethylhexyl)phthalate
- SVE wells in the vadose zone and AS wells in the Shallow WBZ in the NPLS, Former AST/UST, and Former UST areas to remediate vadose zone soil and supplement the treatment of impacted groundwater via enhanced biodegradation and volatilization of organic constituents
- Capping with either asphalt or concrete in the NPLS, AST/UST, and UST areas to prevent dermal contact and particulate inhalation exposure, minimize leaching of SVOCs into groundwater, and improve the efficiency of the SVE system
- Long-term monitoring of a network of monitoring wells across the Site

Modifications to the ROD-related remedial systems have been made and communicated to NYSDEC through reporting, including the following:

- Shutdown of deep recovery well RW-1D in the NPLS Area in 1999 because of concerns that it was drawing contamination into deeper groundwater
- Shutdown of the AS system in the NPLS Area in 2000 to allow for a test of zero-valent iron (ZVI) injections in this area
- Shutdown of the AS system in the Former UST Area in 2000 and the SVE system in 2002 in advance of UST removal
- Removal of RW-4S and RW-5S from the groundwater extraction system in 2002 to allow UST removal
- Shutdown of AS and SVE system in 2006 in the Former AST/UST Area because of a decreased mass of COCs removed by the system
- Shutdown of SVE system in the NPLS Area in 2007 because of minimal concentrations in the extracted vapor stream
- Installation of a new recovery well (RW-6D) in 2007 near the northeastern corner of the Plant 5 Building following an offsite investigation in 2005-2006 that indicated deep groundwater impacts from TCE in this area
- Shutdown of pumping at RW-3S in August 2017 due to the limited effectiveness and asymptotic concentrations observed at this well

In addition to regular performance monitoring, multiple site investigations have been conducted to further define the nature and extent of contamination in soil, soil vapor, and groundwater at and near the Site.

Since 2000, multiple voluntary supplemental remedial actions have been implemented with the NYSDEC's approval and include the following (Table 2-1):

- Pilot-testing ZVI injections in the Shallow and Deep WBZs in the NPLS Area and in the Deep WBZ under the Plant 5 Building in 2000 (Radian International, LLC, 2000; URS Corporation [URS], 2003a)
- Treating the Former UST Area in 2001 using a biochemical oxidation process (URS, 2001a), followed by excavating and removing the USTs and surrounding soil in late 2002 and early 2003 (URS, 2001b, 2002, 2003b)
- Installing a VIMS at a residence at 159 Hopkins Avenue in 2008, located offsite east of the Site (URS, 2008, 2009)
- Conducting in situ chemical oxidation (ISCO) injections into the Shallow WBZ in the Former UST Area and into the Deep WBZ near the northeastern corner of the Plant 5 Building in 2012 (VeruTEK Technologies, Inc. [VeruTEK], 2010; URS, 2012)
- Removing three drywells receiving water from roof drains in the Former UST Area and paving the area (completed in fourth quarter 2015 and described in a Construction Completion Report included as part of the 2015 PRR submission [CH2M, 2016a])
- Between March and May 2016, a VI investigation using hazardous air pollutants onsite (HAPSITE, gas chromatograph/mass spectrometer [GC/MS]) was conducted to assess the potential for VI against potential indoor sources in the Plant 5 Building (CH2M, 2016b)
- In the fall seasons of 2016 and 2017, data gap investigations were undertaken to refine the CSM, assess current remedial system performance, and plan for potential future remedial activities (CH2M, 2017a)

Future voluntary supplemental remedial actions and investigations will be detailed in subsequent PRR submissions (see Section 7, *Reporting Requirements*).

2.4 Remedial Action Objectives

The remedial action objectives (RAOs) for soil and groundwater at the Site as listed in the ROD dated March 11, 1994, are as follows:

- Eliminate the potential for direct human or animal contact with contaminated soils
- Mitigate the impacts of contaminated groundwater to the environment
- Mitigate, to the extent practicable, migration of contaminants from onsite areas to groundwater
- Provide for attainment of RAOs for groundwater and soil quality

The RAOs are the criteria to evaluate remediation effectiveness, which are included in the ROD and listed in Table 2-3. The depth to which soil RAOs are applicable was not specified in the ROD (NYSDEC, 1994), but the soil sampling plans in the Performance Monitoring Plans produced by URS limited soil sampling to the shallowest 6 feet of soil in the vadose zone.

2.5 Remaining Contamination

2.5.1 Soils

As part of the 2016-2017 data gap investigations, vadose zone soil samples were collected from 21 soil borings advanced onsite (CH2M, 2017a, 2017b).

Forty-two soil samples were collected to assess vadose zone soil conditions against RAOs across the NPLS Area, West Building, Plant 5 Building, Former AST/UST Area, and Former UST Area. Nine of the 21 soil borings had at least one vadose zone soil sample (12 of 39 samples) that exceeded the RAOs for one or more site constituents. The exceedances were primarily within the NPLS Area (six of eight borings, with the six borings with exceedances all in the southern portion of the NPLS Area) and the Former AST/UST Area (two of two borings). One boring under the southwestern portion of the Plant 5 Building also had an exceedance. The three other remaining borings within or near the Plant 5 Building did not have exceedances. Samples collected from the vadose zone within the Former UST Area (five borings) and West Building (one boring) were below applicable RAOs. The results are summarized in Table 2-5.

Future routine soil sampling as part the Monitoring and Sampling Plan (Section 4) is not recommended. Soil sampling will only be conducted on an as-needed basis, as part of any future site drilling investigations or supplemental remedial actions, and as needed to demonstrate compliance with RAOs.

Table 2-5 and Figure 2-4 summarize the results of recent soil samples collected at the Site in 2016 and 2017 that exceed the soil RAOs.

2.5.2 Groundwater

Shallow Water Bearing Zone

Shallow groundwater with COCs exceeding RAOs exists onsite and offsite. CVOCs (primarily TCE and its daughter products) exist in shallow groundwater under the NPLS Area, AST/UST Area, Plant 5 Building, and offsite areas to the north and east, roughly paralleling Hopkins Avenue. Past and ongoing remedial activities have reduced CVOC concentrations in the Shallow WBZ; however, recent soil sampling indicates that CVOCs exist in vadose zone soils in the southern portion of the NPLS Area that may serve as a continuing source to shallow groundwater. The highest TCE concentration (RAO of 5 micrograms per liter [µg/L]) detected in 2017 (510 µg/L) was reported at MW-101S, on the north side of the Plant 5 Building. Petroleum-related compounds exist in shallow groundwater under the West Building and in the eastern portion of the Former UST Area. Under the West Building, total xylenes (RAO of 5 µg/L) were

detected at MW-30S at a concentration of 7,000 µg/L in October 2017; this plume is limited to the eastern portion of the West Building. In the eastern UST area, 1,2,4-trimethylbenzene was detected at MW-26S at 3,900 µg/L in March 2017 (2,800 µg/L in October 2017). This plume is primarily limited to the eastern UST area with limited offsite impacts.

Table 2-6 and Figure 2-5A summarize the results of shallow groundwater samples collected at the Site in 2017 that exceed the groundwater RAOs. Recommended routine groundwater sampling parameters and frequencies are discussed in Section 4.

Deep Water Bearing Zone

Deep groundwater with COCs exceeding RAOs exists onsite and offsite. The primary COCs are CVOCs (TCE, cis-1,2-DCE, and vinyl chloride) and acetone. The CVOC plume extends from the NPLS Area, under a portion of the Plant 5 Building, and offsite to the north and east. The highest concentrations are observed in the upper portions of the Deep WBZ, immediately below the shallow silty clay unit. Nonaqueous phase liquid (NAPL) was detected in PZ-4D, under the western portion of the Plant 5 Building in March 2017. A larger-diameter monitoring well, MW-118D, was installed in October 2017 adjacent to PZ-4D; cis-1,2-DCE was detected at a concentration of 180,000 µg/L in a sample from MW-118D, although NAPL was not detected in the well. Soil borings advanced around MW-118D/PZ-4D did not encounter NAPL. The maximum TCE concentration in 2017 (160,000 µg/L) was observed at MW-123D in the northern portion of the NPLS Area, while the maximum reported vinyl chloride concentration was 40,000 µg/L at MW-21D, located north of the Plant 5 Building. The acetone plume is co-located within a portion of the CVOC plume near the northeast corner of the Plant 5 Building; concentrations have decreased markedly as a result of the GWE&T system pumping. The maximum acetone concentration detected in 2017 was in a February 2017 sample from RW-6D (19,000 µg/L).

Table 2-6 and Figure 2-5B summarize the results of recent deep groundwater samples collected at the Site in 2016 and 2017 that exceed the groundwater RAOs. Recommended routine groundwater sampling parameters and frequencies are discussed in Section 4.

2.5.3 Soil Vapor

Onsite

Installation and operation of remedial systems to mitigate onsite soil vapor impacts were implemented in 1998 as part of the selected remedy determined in the 1994 ROD and included the following:

- Soil remediation in the AST/UST and UST Areas by SVE for volatile organic constituents occurring above the shallow water table.
- AS in the shallow WBZ of the NPLS, UST, and AST/UST areas to supplement the treatment of impacted groundwater via enhanced biodegradation and volatilization of organic constituents. An SVE system was added to the NPLS Area to collect volatile organic compounds (VOCs) from the shallow groundwater in this area.

Shutdown of these systems took place between 2006 and 2007 due to decreased mass of COCs removed by the AS system and minimal concentrations in the extracted vapor stream of the SVE system. However, a VI investigation conducted in 2014 (URS, 2015) indicated concentrations of VOCs in excess of the New York State Department of Health (NYSDOH) VI guideline values in the former Plant 5 Building in subslab and indoor air, placing the building in the mitigation category decision matrix (NYSDOH, 2006). Subsequently, a VI investigation involving an indoor air portable GC/MS (HAPSITE) survey coupled with building pressure manipulation activities was conducted in Spring 2016 to assess the potential for VI against potential indoor sources in the Plant 5 Building (CH2M, 2016). Data collected through this investigation suggests that the previous indoor air concentrations of TCE were controlled primarily by

the TCE-containing products that were used and stored within the building for the industrial processes. Subslab soil vapor TCE concentrations were similar to those reported in the 2015 study.

Offsite

Offsite investigations performed between 2005 and 2007 indicated that concentrations of TCE and cis-1,2-DCE were observed in both groundwater and soil vapor samples. Subsequently, indoor air sampling was performed within a residence located at 159 Hopkins Avenue (owned by H&H Metal Specialty, Inc.) that overlies the groundwater plume. Results of the indoor air sampling during October and December 2007 detected TCE concentrations that exceeded the NYSDOH February 2005 guideline value of 5 micrograms per cubic meter ($\mu g/m^3$) for TCE (which has since been lowered to 2 $\mu g/m^3$), therefore requiring mitigation. Based on the results from the offsite investigations, a VIMS consisting of a subslab depressurization (SSD) system was installed in 2008 to mitigate indoor air contaminants. The system has been operated since 2008. Periodic inspections have been performed as part of the routine operations and maintenance (O&M; detailed in Section 5, *Operations and Maintenance Plan*) with annual certifications prepared and provided within the annual PRRs.

Ongoing investigations and groundwater sampling at the Site continue to show elevated site-related constituents in groundwater near the offsite property (159 Hopkins Avenue). An investigation was conducted in April 2017 to collect additional data and observations to confirm the effectiveness of the SSD system at the residence detailed in a Technical Memorandum submitted to NYSDEC in June 2017 (CH2M, 2017c). This report concluded that there appears to be current potential for VI into the building as the groundwater source strength remains elevated; however, because VOCs were detected in the SSD system exhaust gas and based on the indoor air VOC data, it was concluded that the SSD system is currently effective at mitigating the VI pathway.

SECTION 3

Institutional and Engineering Controls Plan

3.1 General

Because remaining contamination exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Declaration of Covenants and Restrictions;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix F) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A Declaration of Covenants and Restrictions was registered on February 24, 2014 with Chautauqua County. Adherence to these ICs on the Site is required by the Declaration of Covenants and Restrictions and will be implemented under this SMP. ICs identified in the Declaration of Covenants and Restrictions may not be discontinued without an amendment to or extinguishment of the Declaration of Covenants and Restrictions. The IC boundaries (property boundary) are shown on Figures 1-1 and 3-1. These ICs are the following:

- The property may be used for industrial use;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Chautauqua County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- There shall be no construction, use, or occupancy of the property that results in the disturbance or excavation of the property that threatens the integrity of the ECs or that results in unacceptable human exposure to contaminated soils;
- The owner of the property shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of the ECs;
- The owner of the property shall provide a periodic certification, prepared and submitted by a professional engineer or environmental professional, which will certify that the ICs and ECs put into place are unchanged from the previous certification, comply with this SMP, and have not been impaired;

- The owner of the property shall continue in force and effect any ICs and ECs required for the remedy and maintain such controls, unless the owner first obtains permission to discontinue such controls from the NYSDEC or relevant Agency, in compliance with this SMP, subject to modifications as approved by the NYSDEC or relevant Agency;
- The covenant shall run with the land and shall be binding upon all future owners of the property, and shall provide that the owner and its successors and assigns consent to enforcement by the NYSDEC or relevant Agency of the prohibitions and restrictions that the Order on Consent requires to be recorded; and
- Any deed of conveyance of the property, or any portion thereof, shall recite that said conveyance is subject to the Declaration of Covenants and Restrictions.

3.3 Engineering Controls

The following ECs are in place and active at the Site:

- The GWE&T system, which presently consists of two shallow and two deep recovery wells and activated carbon groundwater treatment with onsite discharge to the local POTW.
- Low-permeability asphalt and concrete covers are in the NPLS, Former UST, and Former AST/UST areas.
- A network of monitoring wells across the Site used to measure the effectiveness of the groundwater remedial activities. This monitoring well network was upgraded during the 2016 and 2017 data gap investigations (Figure 2-1 and Appendix E).

Previously installed and operated ECs part of the ROD, such as the AS/SVE systems and recovery wells at the UST area, are no longer in operation and/or have been shut down as part of subsequent remedial actions, as described in Section 2.3. Voluntary supplemental remedial activities were initiated in 2000, with the NYSDEC's approval, to refine the delineation of subsurface constituents and evaluate potential remedial alternatives to enhance remedial effectiveness.

In November 2008, an SSD system was installed at 159 Hopkins Avenue to mitigate VI concerns at a residence.

Procedures for operating and maintaining the ECs listed above are documented in the O&M Plan (included as part of the 2016 Annual PRR [CH2M, 2017b], and discussed in Section 5 of this SMP). As-built drawings signed and sealed by a professional engineer are included in the O&M Plan. Figure 2-1 shows the location of the ECs for the Site.

GWE&T System

The GWE&T system, installed in 1997, was designed to control migration of VOCs in groundwater and reduce their concentrations through groundwater extraction and treatment, and by operating 24 hours a day, 365 days a year. This remedial system is intended to treat extracted groundwater to meet the requirements of Industrial Wastewater Discharge Permit Number 26 for discharge to the City of Jamestown POTW (City of Jamestown BPU, 2017) (Appendix D). The O&M Plan (included as part of the 2016 Annual PRR [CH2M, 2017b]) includes additional details and description of the system's design, components, and operation.

Asphalt and Concrete Cap

Exposure to portions of the remaining contamination at the Site is prevented by a cover system placed over the Site. The asphalt and concrete cap is a passive component of the site remediation, installed in conjunction with the GWE&T system in 1997 over the NPLS, AST/UST, and UST areas. The cap over the Former UST Area was repaired and replaced in 2016 subsequent to the closure of three drywells. The

asphalt and concrete caps were designed to channel surface water away from the remedial areas and minimize the infiltration of precipitation. The O&M Plan (included as part of the 2016 Annual PRR [CH2M, 2017b]) includes additional details and description of the caps design and maintenance.

The asphalt cap comprises a minimum of 3.5 inches of asphalt pavement and the concrete cover comprises a minimum of 8 inches of concrete. Figure 2-1 presents the location of the cover system and applicable demarcation layers. The EWP provided in Appendix F outlines the procedures required to be implemented in the event the cover system is breached, penetrated, or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4 of this SMP and the O&M Plan. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site and previously submitted as part of the 2016-2017 Drilling Investigation Work Plan (CH2M, 2016c).

Monitoring Well Network

The monitoring wells are components of the remedial system that existed prior to remedial construction activities. An additional 26 wells were installed in 2016-2017 as part of an ongoing drilling investigation. The groundwater monitoring well network is used to measure the effectiveness of groundwater remediation activities during the O&M and performance review period.

A monitoring well inventory summarizing the wells identification number, location coordinates, designation, and screened intervals, including 2017 groundwater elevation data is provided in Table 2-4. Groundwater monitoring well construction logs are provided in Appendix E. The O&M Plan (included as part of the 2016 Annual PRR [CH2M, 2017b]) includes additional details and description of the monitoring well network maintenance.

SSD/VIM System

An SSD system was installed in 2008 at the residential building at 159 Hopkins Avenue, northeast of the Site (Figures 2-1 and 3-1). The property is owned by H&M Metals Specialty, Inc., which leases the building for residential use. The system consists of a single fan (DynaVac GP-501) that pulls air from four suction pits located in the corners of the basement and a U-Tube manometer that provides visual feedback to confirm system operation (URS, 2009). The VI mitigation system is designed to operate 24 hours a day, 365 days a year. The O&M Plan (included as part of the 2016 Annual PRR [CH2M, 2017b]) includes additional details and description of the system's design, components, and operation.

3.3.1 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of the NYSDEC DER-10.

GWE&T System

The GWE&T system will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicate that the GWE&T system may no longer be required, a proposal to discontinue the system, including the results of an impact study, will be submitted by the remedial party. Conditions that may warrant discontinuing the GWE&T system include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or the site standards, criteria, and guidelines (SCGs) as appropriate; (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC; or (3) the NYSDEC has determined that the GWE&T system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from

monitoring wells located throughout the Site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

Asphalt and Concrete Covers

The cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

Monitoring Wells associated with Monitored Natural Attenuation

Monitored natural attenuation (MNA) is not a component of the ROD; nevertheless, groundwater monitoring activities to assess natural attenuation are currently used, as determined by the NYSDEC with consultation with the NYSDOH. An MNA assessment must continue until residual groundwater concentrations are found to be consistently below ambient water quality standards, the site SCGs, or have become asymptotic at an acceptable level over an extended period. In the event that monitoring data indicate that MNA may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional source removal, treatment, and/or control measures will be evaluated.

SSD System

The active SSD system will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicate that the SSD system may no longer be required, a proposal to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH.

SECTION 4

Monitoring and Sampling Plan

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan (QAPP) provided in Appendix G.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, and soils);
- Assessing compliance with applicable NYSDEC SCGs, particularly groundwater standards and Part 375 soil cleanup objectives; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7, *Reporting Requirements*, of this SMP. Site documents such as the O&M Plan, HASP, and CAMP have been previously submitted to the NYSDEC as part of recent annual PRR and Data Gap Investigation Reports (CH2M, 2017a). These site documents are routinely updated to reflect minor changes in site contacts and/or conditions. For major changes in facilities, responsibilities, tasks, field activities etc., the respective document will be reissued with a revised tracking number and included as part of the corresponding annual PRR submission to the NYSDEC (detailed in Section 7).

4.2 Sitewide Inspection

Sitewide inspections will be performed at a minimum of once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Sitewide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, the site-specific inspection forms will be completed as provided in the O&M Plan. The forms will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and

- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted as described in Section 4.3 and the O&M Plan. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Declaration of Covenants and Restrictions;
- Achievement of remedial performance criteria;
- If site records are complete and up to date; and
- Reporting requirements are outlined in Section 7 of this SMP.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

Monitoring of the remedial systems (GWE&T and SSD/VIM systems, caps, and monitoring well network) will be performed on a routine basis, as identified in Table 4-1. Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the GWE&T and SSD/VIM systems has been reported or an emergency occurs that is deemed likely to affect the operation of the systems. GWE&T and SSD/VIM systems components to be monitored include, but are not limited to, the components included in Table 4-1. Section 5 of this SMP discusses the minimum operating requirements for the major components of the remedial system.

A complete list of components to be inspected is provided in the Inspection Checklists/Forms, provided in the O&M Plan. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the O&M Plan, is required as soon as is possible.

4.3.2 Remedial System Sampling

Samples shall be collected monthly from the influent and effluent streams of the GWE&T, and semiannually from five recovery wells in an alternating seasons fashion. Sampling locations, required analytical parameters, and schedule are provided in Table 4-2. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Detailed sample collection and analytical procedures and protocols are provided in the O&M Plan (CH2M, 2017c) and the QAPP (Appendix G).

4.4 Remediation Media Monitoring and Sampling

Samples shall be collected from onsite and offsite monitoring wells on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in Table 4-3. Figure 4-1 shows the location of the onsite and offsite groundwater sample locations. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Detailed sample collection and analytical procedures and protocols are provided in Appendices G and H.

4.4.1 Soil Sampling

Soil sampling will be performed as needed to further refine the conceptual site model (CSM) and assess the quality of the soil following completion of the remedial actions. Proposed soil sampling activities and modification to the frequency or sampling requirements will require approval from the NYSDEC.

Deliverables for the soil sampling program are specified in Section 7.

4.4.2 Water Level Monitoring

To assess the remedial system performance and assess capture zones, quarterly water levels will be measured at all accessible monitoring wells (Table 2-3). Water level contour maps will be created for both the Shallow and Deep WBZs. Water level measurements will be made with an electronic water level meter and recorded to the nearest 0.01-foot. Wells with suspected or confirmed NAPL (currently PZ-4D and MW-118D) will have product and water levels measured using an electronic interface probe.

4.4.3 Groundwater Sampling

Groundwater monitoring will be performed annually to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of monitoring wells has been installed to monitor upgradient, onsite, and downgradient groundwater conditions at the Site. Because the Site has been investigated and sampled regularly since the remedial design was implemented, the location and trends of the plumes are generally well understood. Therefore, the groundwater sampling network has been developed to focus annual sampling on the key wells that inform plume trends and potential downgradient plume migration. The network of onsite and offsite wells consists of 21 monitoring wells to be sampled annually. Wells to be sampled are identified on Figure 4-1, and the sampling network has been designed based on the following criteria:

- The monitoring well sampling network was designed to monitor the shallow TCE plume, the shallow CBTEX plume under the West Building, the trimethylbenzene plume in the eastern UST area, and the deep TCE/cis-1,2-DCE/vinyl chloride/acetone plume.
- Contaminant concentration trends near the plume sources will be monitored by the semiannual sampling of the extraction wells (described in Section 4.3.2), and annual sampling of monitoring wells in or near the source zones for the four plumes.
- Monitoring of sentinel wells (wells with little or no current impacts from COCs) to assess potential downgradient plume migration of the deep TCE plume, the shallow CBTEX plume, and the shallow trimethylbenzene plume.
- Sampling of monitoring wells near the downgradient tails of the deep TCE plume and shallow TCE plume (plume fringe) to assess contaminant concentration trends.

Groundwater samples will be collected using low-flow sampling techniques and submitted to an Environmental Laboratory Approval Program (ELAP)-certified laboratory for analysis of VOCs. For detailed procedures, see the Field Sampling Plan provided in Appendix H. If COCs are detected in

sentinel wells above RAOs, the NYSDEC will be notified and a recommendation for mitigation procedures (such as installation of additional wells, additional sampling, and/or remedial actions) will be made. For monitoring wells with sufficient data sets, statistical trend analyses will be conducted annually to determine contaminant concentration trends for key COCs. Monitoring wells may be dropped from the sampling program if groundwater concentrations are demonstrated to be less than RAOs and likely remain below RAOs (based on a stable or declining long-term trend). Changes to the monitoring network, chemical analyses, or sampling frequency may also be recommended if supplemental or alternative remedial actions are implemented. Any recommendations for changes to the monitoring network, chemical analyses, or sampling frequency will be made in the annual PRR and implemented following NYSDEC written approval.

A monitoring well inventory summarizing the wells identification number, location coordinates, depths, designation, and screened intervals, including 2017 groundwater elevation data, is provided in Table 2-4. Groundwater monitoring well construction logs are provided in Appendix E. Table 4-4 summarizes the monitoring wells to be sampled, along with rationale and analytes corresponding to each location. As part of the groundwater monitoring, one upgradient well, eight onsite wells, and 12 downgradient and/or offsite wells are sampled to evaluate the effectiveness of the remedial system.

If biofouling or silt accumulation occurs in the onsite and/or offsite monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent PRR. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with the NYSDEC guidance entitled CP-43: *Groundwater Monitoring Well Decommissioning Procedures*. Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7, *Reporting Requirements*.

4.4.4 Subslab Soil Vapor and Indoor Air Sampling

Subslab soil vapor and indoor air sampling will only be performed as needed to investigate VI potential pathways and human health risks, and/or assess the performance of the remedy. Proposed VI sampling activities and modifications to the frequency or sampling requirements will require approval from the NYSDEC.

4.4.5 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field logbook and associated sampling log as provided in the O&M Plan (CH2M, 2017c). Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling Plan provided as Appendix H of this document.

SECTION 5

Operations and Maintenance Plan

5.1 General

CH2M updated the O&M Plan in March 2017 from its original version (Radian Engineering, LLC, 1998) and submitted it to NYSDEC as part of the annual 2016 PRR (CH2M, 2017b). The O&M Plan will be reviewed annually and updated as needed. For major changes in facilities, responsibilities, tasks, etc., the O&M Plan will be reissued with a revised tracking number and included as part of the corresponding annual PRR submission to the NYSDEC. For non-substantive changes, changes will be tracked and summarized in subsequent PRR submissions; however, a full report will not be reissued.

The O&M Plan provides a brief description of the measures necessary to operate, monitor, and maintain the mechanical components of the remedy selected for the Site, as well as the following:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the GWE&T and SSD/VIM systems and caps.
- Will be updated periodically to reflect changes in site conditions or the manner in which the GWE&T and SSD/VIM systems, and caps are operated and/or maintained.

Further detail regarding the O&M of the GWE&T and SSD/VIM systems and caps is provided in the O&M Plan. A copy of this O&M Plan, along with the complete SMP, is to be maintained at the Site. This O&M Plan is not to be used as a standalone document, but as a component document of this SMP.

5.2 Remedial Systems Performance Criteria

Operating requirements for the major components of the GWE&T and SSD/VIM systems are discussed in detail in the O&M Plan (CH2M, 2017c), and summarized in Table 5-1. Sampling locations, required analytical parameters, and schedule for the GWE&T system and recovery wells are summarized in Table 4-2.

5.2.1 GWE&T System

This remedial system is intended to treat extracted groundwater to meet the requirements of Industrial Wastewater Discharge Permit Number 26 for discharge to the City of Jamestown BPU, included in Appendix D. The City of Jamestown BPU discharge limit is 2,130 µg/L total toxic organics.

Operating requirements for the major components of the GWE&T system, such as design flow rate for extraction wells, design flow rate for the transfer pump, and carbon vessels are discussed in detail in the O&M Plan (CH2M, 2017c), and summarized in Table 5-1.

The GWE&T system consists of the combination of the following components:

- Four active groundwater recovery wells (RW-1S, RW-2S, RW-2D, and RW-6D):
  - Two shallow wells, RW-1S and RW-2S, operate in the NPLS Area; and
  - Two deep wells, RW-2D and RW-6D, operate in the NPLS Area and northeastern corner of Plant 5 Building, respectively.
- Four inactive recovery wells (RW-1D, RW-3S, RW-4S, and RW-5S)
- Transfer tank and transfer pump
- Cartridge filters
- Two liquid granular activated carbon (GAC) beds (each containing 900 pounds of GAC)

- Pipe manifold system
- System controls and auxiliary equipment
- Spill containment sump

The GWE&T system is designed to operate to operate 24 hours a day, 365 days with minimal monitoring and adjustment. Once groundwater is extracted, transferred to the treatment building, filtered and gone through the carbon vessels, the treated water is then discharged to the city sewer for transfer to the City of Jamestown BPU. Mechanical flow meters and flow totalizer indicators are connected in-line to the discharge piping inside the treatment building to monitor flow and to permit documentation of discharge to the POTW.

5.2.2 SSD/VIM Systems

The SSD system is designed to operate 24 hours a day, 365 days a year by lowering the subslab air pressure relative to the indoor air pressure using a fan-powered vent to draw air from beneath the slab. The difference in air pressure between the subslab and the living space is indicated by the pressure gauge installed on the system.

Additional operations and performance details are discussed in the O&M Plan (CH2M, 2017c). General SSD/VIM systems operating requirements are summarized in Table 5-1.

5.2.3 Asphalt and Concrete Caps

Asphalt and concrete caps were installed in the NPLS, AST/UST, and USTs areas to prevent dermal contact and particulate inhalation exposure, minimize leaching of semivolatile organic compounds into groundwater, and improve the efficiency of the former SVE system.

There are no operational requirements to this component of the remediation system.

5.3 Operations and Maintenance of Remedial Systems

The following sections provide a description of the O&M of the GWE&T and SSD/VIM systems, and caps. Cut-sheets and as-built drawings for the GWE&T and SSD/VIM systems, and caps are provided the previously submitted O&M Plan (CH2M, 2017c). The inspection, maintenance, monitoring, and sampling of the remedial systems schedule is summarized in Table 4-1.

5.3.1 GWE&T and SSD Systems

System Start-up and Testing

Manufacturer's recommendations, pre-startup inspection, baseline measurements, and testing methods for the GWE&T and SSD/VIM systems are discussed in detail in the O&M Plan (CH2M, 2017c).
The systems testing as described in the O&M Plan will be conducted if, in the course of the GWE&T and SSD/VIM systems' lifetime, the systems go down or significant changes are made to the systems and they must be restarted.

Routine and Non-routine System O&M

Manufacturer's recommendations, troubleshooting guide, adjustment and repairs, O&M schedule, inspections, and routine and non-routine maintenance activities for the GWE&T and SSD/VIM systems are discussed in detail in the O&M Plan (CH2M, 2017c).

System Monitoring Devices and Alarms

The GWE&T system is equipped with an autodial alarm system consisting of a pre-recorded message that is transmitted via the telephone line to predetermined destinations in the event that an emergency signal is activated. The autodialer is activated when any of the following conditions occur:

- Recovery well low/high levels
- Storage tank low/high level
- Power is lost to the treatment building
- Battery backup
- Treatment building temperatures under 45 degrees Fahrenheit

The SSD/VIM system is equipped with a manometer which indicates system degradation or failure, defined as change in fluid level from the original mark (set at 0.5-inch of water column static pressure). The fan must remain in continuous operation for the system to be effective. Monthly checks are made from the outside the residence to ensure the fan is in operation. The fan starts automatically after a power failure.

The GWE&T and SSD/VIM systems have warning devices to indicate if/when the systems are not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the O&M Plan (CH2M, 2017c), and the GWE&T and SSD/VIM systems will be restarted. Operational problems will be noted in the PRR to be prepared for that reporting period.

5.3.2 Asphalt and Concrete Caps

There are no operational requirements, system start-up, and testing or monitoring devices and alarms associated with this component of the remediation system. Asphalt and concrete surface areas are inspected semiannually for cracks and/or poor drainage. Repairs are to be made if necessary and consistent with the design parameters in the as-built drawings included in the O&M Plan (CH2M, 2017c). Maintenance problems and/or repairs will be noted in the PRR to be prepared for that reporting period.

SECTION 6

Periodic Assessments/Evaluations

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness, and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or ECs to severe storms/weather events and associated flooding.

A brief qualitative assessment of potential areas of climate change vulnerabilities associated with the Site was performed, primarily based on the review of site information, and published case studies and literature relevant to the site's geographic location and physical conditions. The assessment indicates that one key area of susceptibility applicable to the site corresponds to power supply related impacts. Susceptibility of the GWE&T and SSD/VIM systems to power loss and/or dips/surges in voltage during severe weather events, including lightning strikes, could result in failure of the systems and potential exposure of COCs to onsite and offsite receptors—this risk is believed to be small due to the automated shutdown controls and the autodialer and low hydraulic conductivity of the aquifers beneath the Site.

A prolonged shutdown or malfunction of the GWE&T system related to an electrical or power failure could impact CVOC plume capture, resulting in offsite migration to residences and commercial buildings while generating potential VI exposure onsite and offsite. The severity of this scenario is considered low due to the low hydraulic conductivity of the aquifers underlying the Site. Similarly, for the SSD/VIM systems, a prolonged shutdown could result in VI into the 159 Hopkins Avenue residence, causing exposure to the inhabitants. Therefore, the GWE&T and SSD/VIM systems are to be inspected as soon as possible after severe weather events and serviced as needed to ensure proper operation, as required by this SMP. Note that the GWE&T system is equipped with an autodialer that gets activated if/when power is lost to the treatment building, which helps ensure a timely response to a potential power-related failure to the GWE&T system.

Additional potential vulnerabilities that were considered, but are less applicable to the Site, are the following:

- Flooding: According to the Federal Emergency Management Agency (FEMA) Flood Hazard Boundary map, the Site is located under Zone C. This zone is described as areas of minimal flood hazard, above the 500-year flood level, which "may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain" (FEMA.gov). Additionally, there are no previously identified areas of insufficient groundwater recharge capabilities or inadequate stormwater management systems that may flood during severe rain events; as such, the drainage and storm water systems associated with and in the vicinity of the Site appear to be adequate. Flooding, if it were to occur, would likely result in shutdown of the recovery well pumps.
- Erosion: There are no areas at the Site that present evidence of erosion or areas that could be susceptible to erosion during periods of severe rain events. The Site is located in an industrial zone,

which is relatively flat and made impermeable by extensive asphalt and/or concrete coverage in the immediate surroundings.

- High Wind: There are no areas of the Site and remedial systems that may be susceptible to damage from the wind. The GWE&T and SSD systems are housed in enclosed buildings that provide adequate protection from falling objects, such as trees or utility structures, during periods of high wind.
- Spill/Contaminant Release: Hazardous waste at the Site, if not immediately removed upon generation (such as spent carbon), gets drummed and placed on top of a secondary containment spill platform, and subsequently transported offsite as soon as possible, or within 10 to 50 days in accordance with Title 40 *Code of Federal Regulations* (CFR) Part 262.11 and 6 *New York Codes, Rules, and Regulations* (NYCRR) 371. Waste accumulation areas, including secondary containment structures, are inspected at least weekly for malfunctions, deterioration, discharges, and leaks that could result in a release. Detailed waste management protocols for the site are included in the O&M Plan, and ensure prevention and mitigation of potential susceptibilities to a spill or other contaminant release due to storm-related damage caused by flooding, erosion, high winds, loss of power, etc.

6.2 Green Remediation Evaluation

The NYSDEC's DER-31, *Green Remediation*, requires that green remediation concepts and techniques be considered during all stages of the remedial program, including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR.

Green remediation concepts and techniques applicable to the site in relation to the implementation and O&M of the GWE&T and SSD/VIM systems include:

Waste Generation:

- Operation of the SSD/VIM systems generates no waste.
- Extracted groundwater is treated through the GWE&T system rather than being transported offsite for disposal.
- Options to recycle GAC are being evaluated.

Energy usage:

- Operation of the GWE&T and SSD/VIM systems requires the use of electricity 24 hours per day/ 365 days per year.
- Lighting within the treatment building is limited to the routine visits (biweekly or as needed) made by the GWE&T system operator.
- There is no air conditioning at the treatment building; heating is turned on automatically as to maintain temperature between 62 and 68 degrees Fahrenheit in the winter months.

Emissions/Fuel Usage:

- Frequency of remedial systems routine inspections was reduced from weekly to biweekly or as needed, lessening the amount of required travel to and from the Site.

Water usage:

- Potable water at the Site is only used to backwash the carbon vessels as needed and for the use of the treatment building restroom by the operator.

Land and/or ecosystems:

- The Site is located in an industrial zone, hence disturbances of land and/or ecosystems as part of implementation/operation of the GWE&T and SSD/VIM systems is minimal to nonexistent.

Methods proposed to reduce energy consumption, resource usage, waste generation, water usage, etc., are to be included in the PRR, as applicable.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the project manager feels appropriate (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

Resource conservation parameters applicable to the site in relation to the O&M of the GWE&T system include the following:

- Groundwater extraction wells – periodic evaluations of the efficacy of each extraction well are made to determine if it should remain active. As an example, RW-3S was shut down in August 2017 due to the limited effectiveness and asymptotic concentrations observed at this well.
- Activated carbon systems – recycling options for the spent carbon generated at the Site are being evaluated.
- Electronic data collection related to the systems' routine O&M activities will be implemented in 2018 with the use of a portable tablet/computer instead of paper forms, reducing paper consumption and waste.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation, and water consumption.

Building operation components applicable to the Site in relation to the O&M of the GWE&T system include the following:

- There is no air conditioning at the treatment building.
- Heating is turned on automatically, maintaining temperature between 62 and 68 degrees Fahrenheit in the winter months.
- Treatment building use, occupancy and lighting are limited to the routine visits (biweekly or as needed) made by the GWE&T system operator.

6.2.4 Frequency of System Checks, Sampling, and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct

and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources. Site-specific examples include the following:

- Frequency of remedial systems routine inspections was reduced from weekly to biweekly or as needed, lessening the amount of required travel to and from the Site.
- The GWE&T system is equipped with an autodial alarm system that notifies the operators via telephone in the event that an emergency signal is activated, such as when power is lost to the treatment building.
- All site-related activities are routinely planned and coordinated in detail as to maximize consolidation of tasks while minimizing labor time.

6.3 Remedial System Optimization

An RSO study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a CSM, give a summary of past performance, document current cleanup practices, summarize progress made toward the Site's cleanup goals, gather additional performance or media specific data and information, and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

SECTION 7

Reporting Requirements

7.1 Site Management Reports

All site management inspection, maintenance, and monitoring events will be recorded on the appropriate site management forms provided in the O&M Plan (CH2M, 2017c). These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 7-1 and summarized in the PRR.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., subslab vapor, indoor air, outdoor air, etc.);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;

- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data are to be supplied electronically and submitted annually to the NYSDEC EQuISTM™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

PRRs shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the Site described in Appendix A. The report will be prepared in accordance with the NYSDEC DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include the following:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuISTM™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan, ROD, or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
  - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.

- The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as the following:
  - The number of days the system operated for the reporting period;
  - The average, high, and low flows per day;
  - The contaminant mass removed;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a professional engineer licensed to practice in NYS will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the Declaration of Covenants and Restrictions;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Remedial Party's Designated Site Representative for the site."

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix I. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised CSM and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs, etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control, and the NYSDOH Bureau of Environmental Exposure Investigation.

SECTION 8

References

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Tables

Table 1-1. Notifications[a]

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Name	Organization/Position	Contact Information
Maurice Moore	NYSDEC	Phone: (716) 851-7220
	Project Manager (DER)	email: maurice.moore@dec.ny.gov
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	Central Office Director	email: michael.cruden@dec.ny.gov
Chad Staniszewski	NYSDEC	Phone: (716) 851-7220
	Regional Contact	email: chad.staniszewski@dec.ny.gov
Angela Martin	NYSDOH	Phone: (518) 402-7860
	Public Health Specialist	email: Angela.Martin@health.ny.gov
Anita Bonamici	NYSDOH	Phone: (585) 423-8072
	Regional Director	email: Anita.Bonamici@health.ny.gov

DER = Division of Environmental Remediation

NYSDEC = New York State Department of Environmental Conservation

NYSDOH = New York State Department of Health

Notes:

[a]Notifications are subject to change and will be updated as necessary.

Table 2-1. Summary of Site Investigations

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Year	Investigation Name	Description	Consultant
1993	Phase I Remedial Investigation	-Further characterization of distribution of VOCs in groundwater to evaluate potential remedial options	O'Brien & Gere Engineers
1994	Phase II Remedial Investigation/Feasibility Study	-Presentation of RI results and evaluation of potential remedial actions that may be implemented to satisfy the remedial action objectives for the Site.	
1995	Basis of Design	- Presentation of the physical, chemical, and regulatory basis for the design of remedial actions	Dow Environmental
1998	Remedial Action Closeout Report	- Description of the implementation of the various remedial systems at the site	Radian Engineering
2000	Supplemental Investigations for SMAART Evaluations	- Assessment of remedial alternatives, including natural attenuation, in the former AST and former UST areas, and a ZVI permeable reactive wall in the NPLS area	Radian International
2001	Plant 5 East Area and UST Area Investigations Report	- Investigation of the former UST Area to determine if additional source existed - Investigation of the source and extent of vinyl chloride on the east side of the Plant 5 Building	URS
2004	UST Area and Groundwater Vinyl Chloride Investigations	- Investigation of VOCs contamination extent in the UST Area and vinyl chloride in the area east of the Plant 5 Building	
2006	UST Area and Offsite Groundwater Investigations	- Delineation of the southern VOC contamination extent in the former UST Area - Determination of VOC contamination extent in groundwater north and east of the site	
2008	Soil Vapor Sampling at 159 Hopkins Avenue	- Investigation of soil vapor conditions near a residence underlain by a TCE plume identified by the 2006 Offsite Groundwater Investigation	
2014	Draft West Area Site Investigation	- Delineation of CBTEX plume west of the former UST Area under the West Building	
	Supplemental Offsite Investigation	- Evaluation and confirmation of the extent of offsite VOC contamination north and east of the site - Completion of the western delineation of CBTEX contamination underneath the West Building	AECOM
2015	Soil Vapor Intrusion Investigation at the Plant 5 Building and West Building	- Assessment of presence of CBTEX contamination under the West Building and TCE and daughter products beneath the Plant 5 Building	URS
2016	Vapor Intrusion Investigation (HAPSITE)	- Assessment of potential for vapor intrusion against potential indoor sources in the Plant 5 Building	CH2M
	Data Gap Investigation	- Refinement of conceptual site model - Assessment of current remedial system performance - Planning for potential future remedial activities	

Table 2-1. Summary of Site Investigations

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Year	Investigation Name	Description	Consultant
2017	159 Hopkins Avenue Mitigation System - Effectiveness Evaluation	- Collect additional data and observations to confirm the effectiveness of the SSDS at the residence.	CH2M
	Data Gap Investigation	- Further refinement of conceptual site model - Additional planning for potential future remedial activities	

AST = aboveground storage tank
CBTEX = cumene (isopropylbenzene), benzene, toluene, ethylbenzene, and xylenes
HAPSITE = Hazardous Air Pollutants on Site (field portable gas chromatograph mass spectrometer)
NPLS = North Parking Lot Sump
SMAART = Systematic Application of Advanced Remedial Technologies
TCE = trichloroethene
UST = underground storage tank
VOC = volatile organic compound
ZVI = zero-valent iron

Table 2-2. Key Areas and Historically Observed Impacts

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Area	Soil	Shallow Water-bearing Zone	Deep Water-bearing Zone
North Parking Lot Sump Area[a]	CVOCs	CVOCs	CVOCs
	CBTEX		
	PCBs		
Former Underground Storage Tank Area	CBTEX	CBTEX/TMB	None
	Bis(2-ethylhexyl)phthalate		
Former Aboveground Storage Tank/Underground Storage Tank Area[a]	CBTEX	CBTEX	None
		CVOCs	
West Building[a]	None	CBTEX	CBTEX (minor)
Plant 5 Building	Not assessed	CVOCs (northern)	CVOCs
		CBTEX (southern)	Acetone
Offsite North and East	Not assessed	CVOCs	CVOCs
			Acetone

CBTEX = cumene, benzene, toluene, ethylbenzene, and xylenes
CVOC = chlorinated volatile organic compound
PCB = polychlorinated biphenyl
TMB - 1,2,4,-trimethylbenzene and 1,3,5-trimethylbenzene

Notes:

[a]Observed impacts updated based on 2016 and 2017 Data Gap Evaluation findings (CH2M, 2016a, 2017a).

Table 2-3. Remedial Action Objectives

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Media	Parameter	RAO from 1994 ROD
Soil	Total VOCs	10 ppm
	Each Individual VOC	1 ppm
	Total SVOCs	500 ppm
	Each Individual SVOC	50 ppm
	PCBs	10 ppm
Groundwater	Trans-1,2-DCE	5 ppb
	TCE	5 ppb
	Vinyl Chloride	5 ppb
	Ethylbenzene	5 ppb
	Toluene	5 ppb
	Xylene	5 ppb
	PCB	0.1 ppb
	Other Compounds	NYSDEC Ambient Groundwater Quality Standard[a]

[a] Current NYSDEC Ambient Groundwater Quality Standards for other compounds commonly found at the site include: acetone – 50 µg/L; benzene – 1 µg/L; cis-1,2-DCE – 5 µg/L; 2-butanone (methyl ethyl ketone) – 50 µg/L; 1,1-DCE – 5 µg/L; isopropylbenzene (cumene) – 5 µg/L; 1,2,4-trimethylbenzene - 5 µg/L; 1,3,5-trimethylbenzene - 5 µg/L

NYSDEC = New York State Department of Environmental Conservation
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
RAO = Remedial Action Objective
ROD = Record of Decision
SVOC = semivolatile organic compound
VOC = volatile organic compound

Table 2-4. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)			
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17
GP-1D	769410.87	977332.05	1278.32	30	34	Deep	NM	NM	NM	NM
GP-1S	769418.53	977328.64	1278.34	8	12.8	Shallow	1269.46	NM	NM	1268.36
GP-2D	769380.34	977348.27	1278.03	30	34.8	Deep	1265.62	NM	NM	1265.11
GP-2S	769379.13	977344.67	1277.97	2.6	12.6	Shallow	1269.35	NM	NM	1269.57
GP-3D	769435.18	977388.08	1278.15	34	38.8	Deep	NM	NM	1264.70	1264.33
GP-3S	769439.01	977385.71	1278.25	4	14	Shallow	NM	NM	1266.85	1266.61
GP-4D	769400.36	977281.12	1277.48	39	43.8	Deep	1264.16	1264.39	1258.84	1262.67
GP-4S	769402.76	977283.85	1277.43	10.8	15.8	Shallow	1268.64	1268.92	1268.40	1271.43
GP-5D	769467.41	977310.00	1276.30	36	40.8	Deep	NM	NM	NM	NM
GP-5S	769466.37	977307.37	1276.79	7	11.8	Shallow	NM	NM	NM	NM
GP-7	769539.53	977376.36	1276.17	9	14.8	Shallow	NM	NM	NM	NM
HW-1	769310.73	977237.35	1278.46	--	--	--	NM	NM	NM	NM
HW-2	769407.31	977201.19	1280.57	--	--	Shallow	NM	1268.87	1268.40	1268.56
HW-3	769259.85	977127.74	1282.60	--	--	--	NM	NM	NM	1270.65
HW-6	769321.82	977304.10	1280.98	6	16	Shallow	1269.47	NM	NM	1269.30
HW-6A	769317.15	977304.53	1279.85	--	--	--	NM	NM	NM	1269.65
HW-8	769356.63	977469.24	1277.18	6	16	Shallow	1263.92	1270.59	1269.97	1270.14
HW-9	769334.70	977479.33	1280.35	6	16	Shallow	1270.40	1270.38	1269.14	1269.90
HW-10	769233.13	977139.27	1279.43	7	17	Shallow	1270.78	1270.83	1270.73	1273.69
MW-1	769311.21	977562.85	1280.10	15	20	Shallow	NM	NM	NM	1267.33
MW-10	769402.92	977316.21	1277.28	8.5	18.5	Shallow	1268.87	1269.23	1268.82	1274.63
MW-11	769378.08	977235.76	1277.13	5	15	Shallow	1268.60	1268.96	1267.08	1266.78
MW-11D	769381.99	977233.72	1277.17	35	45	Deep	1264.56	1265.15	1264.32	1263.22
MW-12	769328.16	977258.42	1277.51	4	14	Shallow	1268.96	1269.51	1268.84	1268.96
MW-13	769254.15	977431.38	1277.65	8	18	Shallow	1268.20	1268.49	1267.96	1267.57
MW-14D	769491.93	977221.65	1279.40	40	50	Deep	1263.57	1265.85	1264.58	1263.75
MW-14S	769493.34	977227.86	1279.64	10	20	Shallow	1266.53	1268.09	1266.49	1266.44
MW-15D	769533.32	977340.57	1278.90	34	44	Deep	1264.25	1265.91	1264.50	1263.72
MW-15S	769538.87	977337.64	1279.00	10	20	Shallow	1266.30	1266.99	1265.30	1265.74
MW-16D	769618.24	977288.15	1278.47	36	46	Deep	1264.82	1266.14	1264.64	1264.39
MW-16S	769621.11	977287.09	1278.74	7	17	Shallow	1266.54	1266.79	1265.85	1266.28
MW-17	769386.50	977119.12	1278.01	25	30	Deep	NM	NM	1267.27	1265.44
MW-18	769558.19	977549.59	1275.05	5	15	Shallow	1265.75	1265.50	1264.90	1265.09
MW-19D	769481.56	977468.50	1275.64	34	44	Deep	1265.54	1265.69	1265.64	1263.68

Table 2-4. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)			
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17
MW-19S	769486.62	977468.82	1275.95	9	19	Shallow	1266.40	1266.10	1265.40	1265.69
MW-2	769235.80	977145.80	1279.09	6	16	Shallow	NM	1270.99	NM	NM
MW-20	769381.21	977365.24	1278.10	6.5	11.5	Shallow	1269.59	1269.20	1268.40	1268.85
MW-21D	769507.36	977414.36	1275.61	31.5	41	Deep	1265.61	1265.88	1265.02	1264.19
MW-22D	769584.11	977467.04	1275.53	32.5	42	Deep	1266.08	1265.61	1264.98	1265.16
MW-23D	769324.69	977431.09	1277.36	28	37.5	Deep	1267.56	1266.57	1265.73	1265.55
MW-23S	769330.65	977429.42	1277.30	5	14.5	Shallow	1270.75	1270.66	1269.59	1270.20
MW-24S	769295.26	977357.27	1278.25	5	14.5	Shallow	NM	1270.18	1269.55	1272.65
MW-25D	769596.57	977648.45	1274.50	31	41	Deep	1264.90	1264.75	1263.58	1264.20
MW-25S	769599.31	977655.01	1274.30	7	17	Shallow	1264.90	1264.50	1263.98	1264.15
MW-26S	769402.60	977514.59	1277.09	5	15	Shallow	1268.67	1268.14	1268.08	1267.81
MW-27S	769420.49	977594.25	1276.46	10	20	Shallow	1267.16	1267.63	1266.39	1267.84
MW-28S	769383.88	977607.30	1276.87	7	17	Shallow	1266.57	1267.51	1267.25	1267.36
MW-29S	769267.33	977370.58	1278.35	4	14	Shallow	1270.03	1269.45	1269.50	1272.63
MW-30S	769261.22	977342.56	1278.47	10	16	Shallow	1269.65	1269.64	1269.09	1269.11
MW-31S	769248.04	977369.79	1278.29	10	15	Shallow	1269.84	1269.97	1269.54	1269.51
MW-101S	769495.85	977385.68	1275.68	8	18	Shallow	1266.33	1266.03	1265.18	1265.54
MW-102S	769527.50	977462.33	1275.43	9	14	Shallow	1266.18	1265.88	1265.13	1265.43
MW-103S	769581.66	977463.10	1275.32	8	18	Shallow	1266.17	1265.87	1265.12	1265.39
MW-104S	769708.58	977409.23	1279.22	9	14	Shallow	1266.91	1266.94	1266.92	1266.84
MW-105S	769762.88	977561.18	1278.79	8	18	Shallow	1265.29	1264.76	1263.89	1264.47
MW-106S	769641.05	977554.52	1275.29	10	15	Shallow	1265.59	1265.10	1264.29	1264.76
MW-106D	769644.34	977553.22	1275.19	24	34	Deep	1264.94	1264.21	1263.74	1263.76
MW-107S	769669.94	977845.78	1272.98	9	19	Shallow	1263.78	1263.57	1262.35	1263.19
MW-108S	769725.67	977754.10	1274.30	7	17	Shallow	1263.90	1263.67	1262.39	1263.23
MW-109S	769813.86	977747.51	1275.19	7	12	Shallow	1263.69	1263.65	1263.64	NM
MW-109D	769810.78	977743.91	1275.04	28	38	Deep			Not Yet Installed	37.99
MW-110D	769637.03	977446.46	1275.75	28	38	Deep	1265.40	1265.45	1264.20	1264.23
MW-111D	769320.09	977274.77	1277.59	32	42	Deep	1264.54	1265.54	1263.94	1263.44
MW-112S	769273.84	977338.29	1278.59	6	16	Shallow	1269.78	1269.79	1269.17	1269.39
MW-113D	769254.29	977349.06	1278.47	29	39	Deep	1265.59	1266.77	1266.32	1265.96
MW-114S	769203.86	977244.48	1279.15	8	13	Shallow	1269.30	1269.44	1269.33	1269.26
MW-115D	769212.79	977155.02	1279.03	35	40	Deep	1270.42	1269.58	1269.92	1269.87
MW-116S	769162.39	977173.32	1278.91	8	13	Shallow	1269.41	1269.73	1269.65	1269.59

Table 2-4. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)			
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17
MW-117S	769220.98	769220.98	1278.14	6	16	Shallow	1269.41	1269.73	1269.46	1269.33
MW-118D	769419.08	977325.34	1278.15	24	34	Deep			Not Yet Installed	1264.97
MW-119D	769496.13	977235.78	1276.37	22	32	Deep			Not Yet Installed	1265.06
MW-120D	769783.18	977493.70	1277.60	28	38	Deep			Not Yet Installed	1263.75
MW-121D	769891.60	977620.85	1272.09	28	38	Deep			Not Yet Installed	1262.07
MW-122D	769550.68	977553.25	1275.07	22	32	Deep			Not Yet Installed	1264.42
MW-123D	769431.82	977294.35	1276.86	25	35	Deep			Not Yet Installed	1262.65
MW-4	769170.13	977100.42	1280.70	13	18	Shallow	NM	1271.45	1271.28	NM
MW-6	769420.79	977237.79	1277.28	9.9	19.9	Shallow	1268.99	1268.48	1266.74	1266.63
MW-7D	769437.24	977291.46	1277.12	35	45	Deep	1268.70	1264.82	1263.44	NM
MW-7DD	769435.52	977293.59	1277.09	90	100	Glacial Till	1275.79	1275.79	1275.69	1275.64
MW-7S	769440.65	977291.06	1277.04	10	20	Shallow	NM	1268.29	1268.25	1268.39
MW-8	769407.61	977252.34	1277.30	39.6	49.6	Deep	1264.04	1264.34	1263.79	NM
PZ-11D	769432.94	977590.25	1276.14	21.3	41.3	Deep	1266.39	1265.91	1265.39	NM
PZ-1D	769442.95	977285.37	1277.23	25	45	Deep	1260.48	NM	NM	1265.83
PZ-1S	769443.57	977282.97	1277.25	7	17	Shallow	1268.65	NM	NM	1268.55
PZ-2D	769442.57	977286.80	1277.14	25	45	Deep	1257.02	NM	NM	1264.94
PZ-3D	769416.94	977325.13	1278.35	20	40	Deep	1266.05	NM	NM	1265.80
PZ-4D	769419.63	977320.19	1278.24	25	45	Deep	1258.14	NM	NM	1260.09
PZ-5D	769418.77	977464.00	1275.88	21.5	41.5	Deep	1268.37	1266.23	1264.98	1264.90
PZ-5S	769422.15	977463.92	1275.92	5.5	12	Shallow	1268.50	1267.57	1267.02	1267.29
PZ-6D	769456.59	977464.40	1275.91	25.5	45.5	Deep	1267.90	1264.52	1264.71	1263.96
PZ-6S	769459.23	977464.52	1276.09	8.5	13.5	Shallow	1268.24	1266.79	1265.59	1266.40
PZ-7D	769559.50	977553.39	1275.19	22	42	Deep	1265.14	1265.08	1263.94	NM
RW-1D	769375.07	977258.14	1275.87	32	57	Deep	1264.27	1264.57	1263.97	1263.91
RW-1S	769386.12	977269.36	1275.36	10.5	16	Shallow	1265.05	1268.96	1268.47	1266.56
RW-2D	769444.16	977280.70	1275.92	27	42	Deep	1250.52	1241.92	1250.93	1265.12
RW-2S	769438.98	977265.94	1275.89	10	15.5	Shallow	1266.69	1266.29	1264.91	1267.29
RW-3S	769245.55	977167.43	1277.72	9	13.5	Shallow	1269.97	1268.77	1270.32	NM
RW-5S	769390.30	977475.71	1276.83	7	10	Shallow	1269.44	1269.33	1269.02	NM
RW-6D	769525.89	977464.22	1274.95	--	--	Deep	1260.70	1261.77	1260.50	1262.95
VP-1S	769423.04	977327.44	1278.26	--	--	Shallow	NM	NM	NM	NM
VP-4S	769357.39	977390.18	1278.25	--	--	Shallow	NM	NM	NM	NM
VP-5D	769366.31	977241.12	1277.53	12.5	34.3	Deep	1266.52	NM	NM	NM

Table 2-4. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)			
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17
VP-6D	769487.64	977538.82	1276.11	29.5	39.5	Deep	NM	1265.72	1265.25	1265.20
VP-6S	769483.33	977539.59	1276.08	18.3	24	Shallow	1266.31	1265.98	1266.25	1265.98
VP-7D	769294.32	977519.73	1278.22	20.4	39.3	Deep	1266.67	1265.85	1265.43	1267.97
VP-8D	769465.51	977305.11	1276.69	20	39	Deep	1265.74	1266.94	1266.21	1265.61

1. All wells were located on the north edge of the steel casing.

2. Horizontal Datum: NY West State Plane Coordinate System, NAD83(2011), Epoch: 2010.00

3. Vertical Datum: NAVD88, Geoid12B, derived using OPUS Post processing and RTK GNSS to local NGS Benchmark U-88

4. To convert an NGVD29 elevation to and NAVD88 elevation, subtract 0.51 feet.

-- = Data unavailable or unknown

AMSL = Above mean sea level

GP = Geoprobe Piezometer, HW = Monitoring Well (Hope Well), MW = Monitoring Well, PZ = Piezometer, RW = Recorvery Well, VP = vapor probe

NM = Not measured (innaccessible or unable to locate during gauging activitites)

Table 2-5. Summary of Exceedances in Soil

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Depth	COC	RAO (mg/kg)	Maximum Concentration (mg/kg)	No. Samples > RAO	No. Samples < RAO[a]
Vadose Zone	**VOCs**				
	Naphthalene	1	6.0	2	35
	p-isopropyltoluene	1	3	1	36
	1,2,4-trimethylbenzene	1	2.4	1	36
	1,3,5-trimethylbenzene	1	1.0	1	36
	TCE	1	18	8	29
	Total Xylenes	1	2.2	4	33
	Total VOCs	10	23	2	35

COC = constituent of concern
mg/kg = milligrams/kilogram
No. = number
RAO = remedial action objective
TCE = trichloroethene
VOCs = volatile organic compounds

[a]Sample counts on this column include all non-detects, even those with reporting limits above the respective RAO.

Note:
2016 and 2017 soils data from on-site samples collected above water table included in counts

Table 2-6. Summary of Exceedances in Groundwater

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Water-bearing Zone	COC	RAO (µg/L)	Maximum Concentration (µg/L)	No. Wells > RAO	No. Wells < RAO[a]
Shallow (7 to 15 feet bgs)	**Chlorinated VOCs**				
	cis-1,2-dichloroethene	5	730 (RW-1S)	15	24
	Trichloroethene	5	510 (MW-101S)	18	21
	Vinyl chloride	5	250 (HW-6)	3	36
	Petroleum-Related Compounds				
	Benzene	1	21 (MW-29S)	4	35
	sec-butylbenzene	5	15 J (MW-26S)	2	37
	tert-butylbenzene	5	5.3 (HW-10)	1	38
	Cumene	5	160 (MW-29S)	9	30
	Ethylbenzene	5	2,100 (MW-30S)	7	32
	Naphthalene	10	91 J (MW-30S)	5	34
	n-propylbenzene	5	510 (MW-26S)	7	32
	Toluene	5	29 (MW-117S)	2	37
	1,2,4-Trimethylbenzene	5	3,900 (MW-26S)	10	29
	1,3,5-Trimethylbenzene	5	1,100 (MW-26S)	3	36
	Total Xylenes	5	7,000 J (MW-30S)	7	32
Deep (25 to 50 feet bgs)	**Chlorinated VOCs**				
	1,2-dichloroethane	0.6	1.8 J (MW-118D)	1	26
	1,1-dichloroethene	5	330 (MW-123D)	7	20
	cis-1,2-dichloroethene	5	180,000 (MW-118D)	14	13
	trans-1,2-dichloroethene	5	120 (MW-119D)	2	25
	Trichloroethene	5	160,000 (MW-123D)	11	16
	Vinyl chloride	5	40,000 (MW-21D)	14	13
	Ketones				
	Acetone	50	19,000 (RW-6D)	2	25
	Petroleum-Related Compounds				
	Benzene	1	82 J (PZ-3D)	6	21
	Toluene	5	28 (MW-118D)	1	26
	Total Xylenes	5	20 J (MW-118D)	1	26

COC = constituent of concern
J = Estimated detection
µg/L = micrograms per liter
No. = number
RAO = remedial action objective
VOCs = volatile organic compounds

[a]Well counts on this column include all non-detects, even those with reporting limits above the respective RAO.

Note:

Monitoring well and Extraction well results from February, August, September, and October 2017 included in counts

Table 4-1. Inspection, Maintenance, Monitoring and Sampling Schedule
Site Management Plan, NYSDEC Site Number: 907015
Essex/Hope Site, Jamestown, New York

System	Routine (Biweekly or As Needed)	Monthly	Quarterly	Semiannual	Annual	As Required
GWE&T System Treatment Plant Building	Cartridge filter inspection/replacement (Sec. 2.4)					
	Inspect Carbon vessels (Sec. 2.4)	Obtain monthly samples and pH readings per Wastewater Discharge Permit (Sec. 5.1)				Replace GAC (Sec. 2.4, Table 5.0)
	Check transfer pump-flow rate (Sec. 2.4)					
	Inspect piping/valves (Sec. 2.4)					Clean flow meters (Sec. 2.4)
	Inspect storage tank (Sec. 2.4)					Clean out storage tank (Sec. 2.4)
	Record recovery well/system flow-rates (Sec. 5.1)					
	Record System pressure readings (Sec. 5.1)					Backflush carbon vessels (Sec. 2.4)
GWE&T System Recovery Wells	Confirm recovery wells are operating properly (Sec. 2.4)			Inspection/maintenance (Sec. 2.4)		Flush piping system (Sec. 2.4)
				Obtain analytical samples per SMP (Sec. 5.1)		Clean pumps/level controls (Sec. 2.4)
					Well redevelopment (Sec. 2.4)	
SSD/VIM System Residence at 159 Hopkington Avenue		Ensure system is in operation (Sec. 4.3)			Inspection/maintenance (Sec. 4.3)	Maintenance (Sec. 4.3)
Asphalt & Concrete Caps			Inspection (Sec. 3.2)			Maintenance (Sec. 3.2)
Monitoring Well System		Measure water levels (Sec. 5.2)			Obtain analytical samples in accordance with SMP (Sec. 5.2)	
		Inspect well integrity (Sec. 5.2)				

GAC = Granular Activated Carbon
GWE&T = Groundwater Extraction and Treatment
Sec. = Section
SSD/VIM = Subslab Depressurization/Vapor Intrusion Mitigation

Note:

Sections and Appendices referrenced on this table pertain to the latest O&M Plan for the Site, contained in Appendix G of this report.

Table 4-2. Remedial System Sampling Requirements and Schedule

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

GWE&T System Component	Sampling Location	Analytical Parameters		Schedule
		VOCs (USEPA SW8260)	**pH** (USEPA 150.2)	
System Influent/Effluent	Pre-carbon (Influent)	X		Monthly
	Primary Effluent	X		
	Post-carbon (Effluent)	X	X	
Recovery Wells	RW-1S	X		Semiannually (alternating seasons)
	RW-2S	X		
	RW-3S	X		
	RW-2D	X		
	RW-6D	X		

GWE&T = Groundwater Extraction and Treatment
VOC = volatile organic compound
USEPA = United States Environmnetal Protection Agency

Notes:

· Pre-carbon sample – collected from the sample port valve located on the Decon-3 piping package
· Primary effluent sample – immediately following carbon treatment from the first GAC bed
· Post-carbon samples – immediately following carbon treatment from the second GAC bed
  - Consisting of four separate grab samples collected 30 minutes apart (to satisfy BPU discharge permit requirement of "at least 4 grab samples collected during a typical production day")
  - These samples are physically composited by the laboratory prior to analysis
  - Post-carbon analytical results are reported from the resulting composite

City of Jamestown Board of Public Utilities Discharge Limit is 2,130 µg/L total toxic organics, as per 2017 Permit No. 26 (Appendix D)

Table 4-3. Remediation Media Sampling Requirements and Schedule

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Media	Sampling Location	Analytical Parameters		Schedule
		VOCs (USEPA SW8260)	**VOCs** (USEPA TO-15)	
Soil	TBD	TBD		As needed
Groundwater	Total of 21 Annual Performance Monitoring Wells in Table 4-4 and shown on Figure 4-1	X		Annually
Subslab Soil Vapor/Indoor Air	TBD		TBD	As needed

TBD = To be determined. Sampling will be performed on an as needed basis and schedule to further refine conceptual site model and/or assess effectiveness of remedial measures.

USEPA = United States Environmnetal Protection Agency

VOC = volatile organic compound

Table 4-4. Annual Performance Monitoring Well Program

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Monitoring Well ID	Water-Bearing Zone	Location	Plume Monitored	Rationale	Question	Decision
VP-6S	Shallow	Offsite	TMB	Sentinel well for MW-26S contamination	Is trimethylbenzene plume migrating off-site to northeast?	If COCs are detected in MW, plume is migrating to northeast
MW-26S	Shallow	Onsite	TMB	Plume trends at source	Is trimethylbenzene plume attenuating?	If COC concentrations are decreasing, plume is attenuating
MW-30S	Shallow	Onsite	CBTEX	Plume trends at source	Is CBTEX plume attenuating?	If COC concentrations are decreasing, plume is attenuating
MW-118D	Deep	Onsite	TCE	Plume trends at source; monitor potential NAPL	Is Deep TCE plume attenuating? Is NAPL present?	If COC concentrations are decreasing, plume is attenuating
MW-27S	Shallow	Onsite	TMB	Sentinel/plume fringe well for MW-26S contamination	Is trimethylbenzene plume migrating to east?	If COCs are detected in MW, plume is migrating to east
MW-20	Shallow	Onsite	CBTEX	Sentinel well for plume under West Building	Is CBTEX plume migrating to northeast?	If COCs are detected in MW, CBTEX plume is migrating to northeast
MW-23S	Shallow	Onsite	CBTEX	Sentinel well for plume under West Building	Is CBTEX plume migrating to east?	If COCs are detected in MW, CBTEX plume is migrating to east
MW-117S	Shallow	Onsite	CBTEX	Plume fringe well	Is CBTEX plume migrating to south (due to groundwater mounding)?	If COC concentrations are increasing, plume migrating to south
MW-108S	Shallow	Offsite	TCE	Plume fringe well for downgradient shallow TCE	Is downgradient portion of TCE plume attenuating, near residential SSDS?	If COC concentrations decreasing, plume is attenuating
MW-101S	Shallow	Onsite	TCE	Plume well downgradient of hydraulic containment system; plume trends	Is shallow TCE plume downgradient of hydraulic containment system attenuating?	If COC concentrations decreasing, plume is attenuating
MW-109D	Deep	Offsite	TCE	Sentinel well for Deep plume	Is Deep TCE plume migrating to northeast outside hydraulic containment system?	COC detections/increasing concentrations would indicate plume migration
MW-120D	Deep	Offsite	TCE	Sentinel well for Deep plume	Is Deep TCE plume migrating north outside hydraulic containment system?	COC detections/increasing concentrations would indicate plume migration
MW-121D	Deep	Offsite	TCE	Sentinel well for Deep plume	Is Deep TCE plume migrating north outside hydraulic containment system?	COC detections/increasing concentrations would indicate plume migration
MW-25D	Deep	Offsite	TCE	Sentinel well for Deep plume	Is Deep TCE plume migrating east outside hydraulic containment system?	COC detections/increasing concentrations would indicate plume migration
MW-16D	Deep	Offsite	TCE	Sentinel well for Deep plume	Is Deep TCE plume migrating north, outside of hydraulic containment system?	COC detections/increasing concentrations would indicate plume migration
MW-119D	Deep	Offsite	TCE	Plume fringe well for Deep plume	Are COC concentrations increasing or decreasing in area north of RW-2D near capture limits of hydraulic containment system?	Increasing concentrations would indicate hydraulic containment system may be allowing COC migration outside capture zone
MW-110D	Deep	Offsite	TCE	Plume fringe well for Deep plume	Are COC concentrations increasing or decreasing in area northeast of RW-6D near capture limits of hydraulic containment system?	Increasing concentrations would indicate hydraulic containment system may be allowing COC migration outside capture zone
MW-106D	Deep	Offsite	TCE	Plume fringe well for Deep plume	Are COC concentrations increasing or decreasing in area northeast of RW-6D near capture limits of hydraulic containment system?	Increasing concentrations would indicate hydraulic containment system may be allowing COC migration outside capture zone
MW-122D	Deep	Offsite	TCE	Plume fringe well for Deep plume	Are COC concentrations increasing or decreasing in area east of RW-6D near capture limits of hydraulic containment system?	Increasing concentrations would indicate hydraulic containment system may be allowing COC migration outside capture zone
MW-013	Shallow	Onsite (upgradient)	Upgradient	Monitor upgradient well with recent TCE detections	Are there upgradient contributions of TCE to the site?	Continued detections or increasing concentrations may indicate upgradient contributions
MW-104S	Shallow	Offsite	TCE	Monitor potential off-site source of TCE impacts to shallow groundwater	Are there off-site contributions of TCE to shallow off-site plume?	Detections, in combination with continued hydraulic monitoring to determine groundwater flow direction, may indicate non-site related contribution to off-site TCE plume

Sampling frequency for the 21 monitoring wells listed above is annual.

TMB - 1,2,4-Trimethylbenzen and 1,3,5-Trimethylbenzene
TCE - Trichloroethene
CBTEX - Cumene, benzene, toluene, ethylbenzene, xylenes

Table 5-1. Remedial Systems Operating Requirements

Site Management Plan, NYSDEC Site Number: 907015

Essex/Hope Site, Jamestown, New York

Remedial System	Component	Criteria/Units	Operating Requirements
GWE&T System	RW-1S	Flow rate/gpm (within 10%)[a]	0.4
	RW-2S		1.1
	RW-2D		2.5
	RW-6D		0.7
	Storage/Holding Tank	Water level/gal[b]	900 - 1,400
	Transfer Pump	Flow rate/gpm	8 - 13
	Cartridge Filters (2)	Pressure/psi	10 - 20
		Flow rate/gpm (maximum)	20
	Carbon Vessels (2)	Pressure/psi (maximum)[c]	15
SSD/VIM System	Fan	Static pressure/wci	0.5
		Temperature/°F	20 - 120
		Rotation/rpm	3,000

[a] Recovery Well pumping rates should be periodically re-evaluated to maintain hydraulic control. Build-up of sediment or solid particles in the liquid stream may cause a restriction in flow that may make pump cleaning and maintenance.

[b] Pumping from the storage tank is controlled by a liquid level control system consisting of a control box, electrode fitting, and four electrode sensors positioned at fixed levels. Water level range provided above actuates the transfer pump.

[c] If the pressure differential through the vessel reaches 15 to 20 psi, the vessel should be taken offline and a backwash should be initiated.

% = percent
°F = Degrees Fahrenheit
gal = U.S. gallons
gpm = galloms per minute
GWE&T = Groundwater Extraction and Treatment
psi = pounds per square inch
SSD/VIM = Subslab Depressurization/Vapor Intrusion Mitigation
rpm = Revolutions per minute
RW = Recovery Well
wci = water column inch

Table 7-1. Interim Reporting Summary/Schedule

Site Management Plan, NYSDEC Site Number: 907015

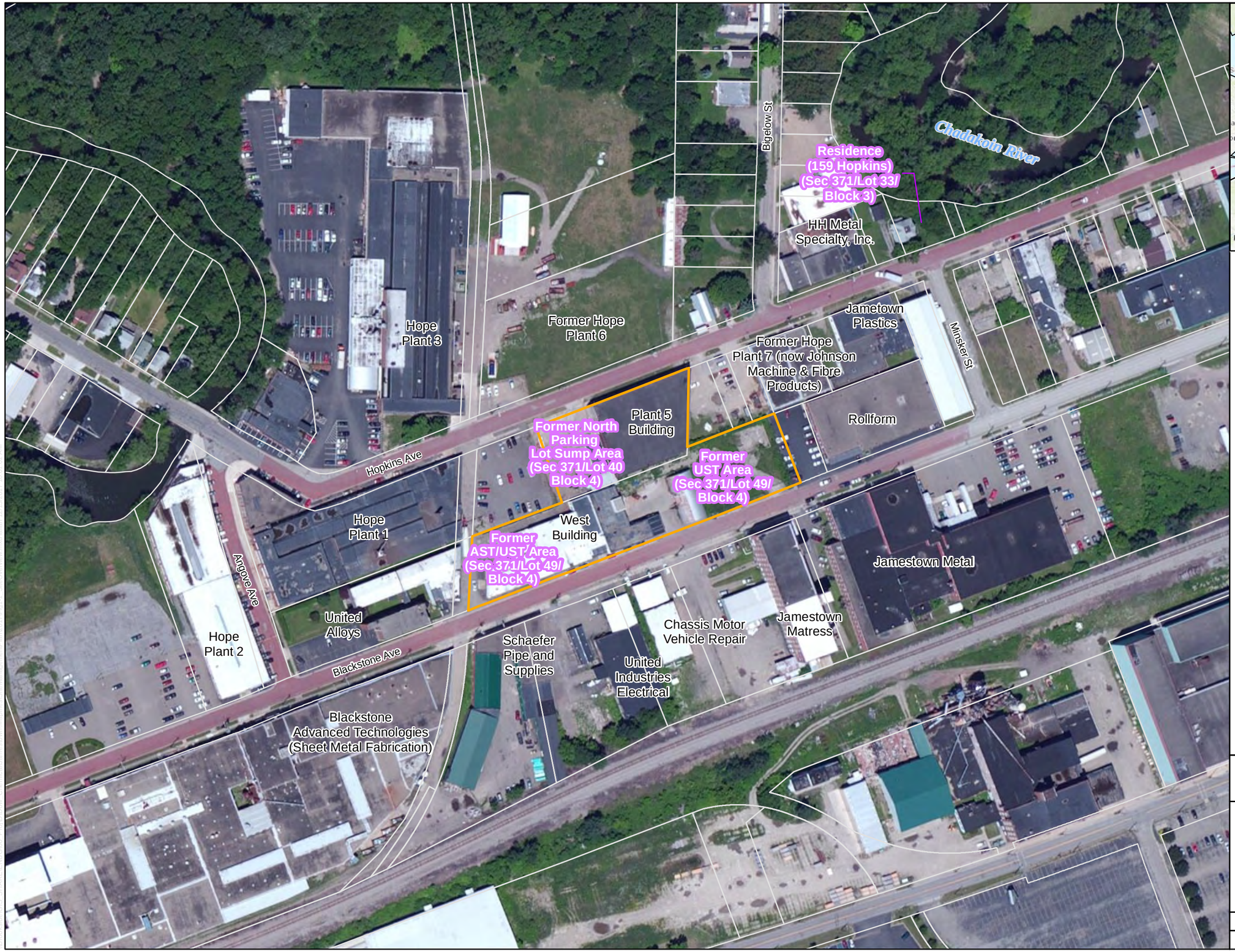
Essex/Hope Site, Jamestown, New York

Task/Report	Reporting Frequency*
Self-Monitoring Report (January through June, and July through December)	Semiannually or as otherwise determined by the City of Jamestown BPU
Performance Monitoring Report (PMR, covering January though June)	Annually or as otherwise determined by NYSDEC
Periodic Review Report (PRR, covering January though December)	Annually or as otherwise determined by NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

BPU = Board of Public Utilities
NYSDEC = New York State Department of Environmental Conservation

Figures



Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 1-1
Site Location and Layout Map
Site Management Plan

CREATED BY: LA

REVIEWED BY: MV

ch2m

Chautauqua County Tax Parcels

Soil Vapor Extraction/Air Sparging System (1993-2007)

- Sparge Injection Well
- Vapor Extraction Well

Institutional Controls

- Site Boundary (Declaration of Deeds and Covenants)

Engineering Controls

- Monitoring Well
- Recovery Well - Abandoned
- Recovery Well - Active
- Asphalt and Concrete Caps
- Groundwater Treatment and Extraction System
- Subslab Depressurization System

Remedial Actions

- In situ chemical oxidation (ISCO) injections (2012)
- Pilot Testing ZVI PRB Injections (2000)
- Sump Removal and Excavation Area (1996)
- Biochemical oxidation, Soil Excavation and UST removal, Removal of three drywells and re-paving

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; Tax Parcel Source: Chautauqua County Department of Information Services. Last updated July 7th, 2017.

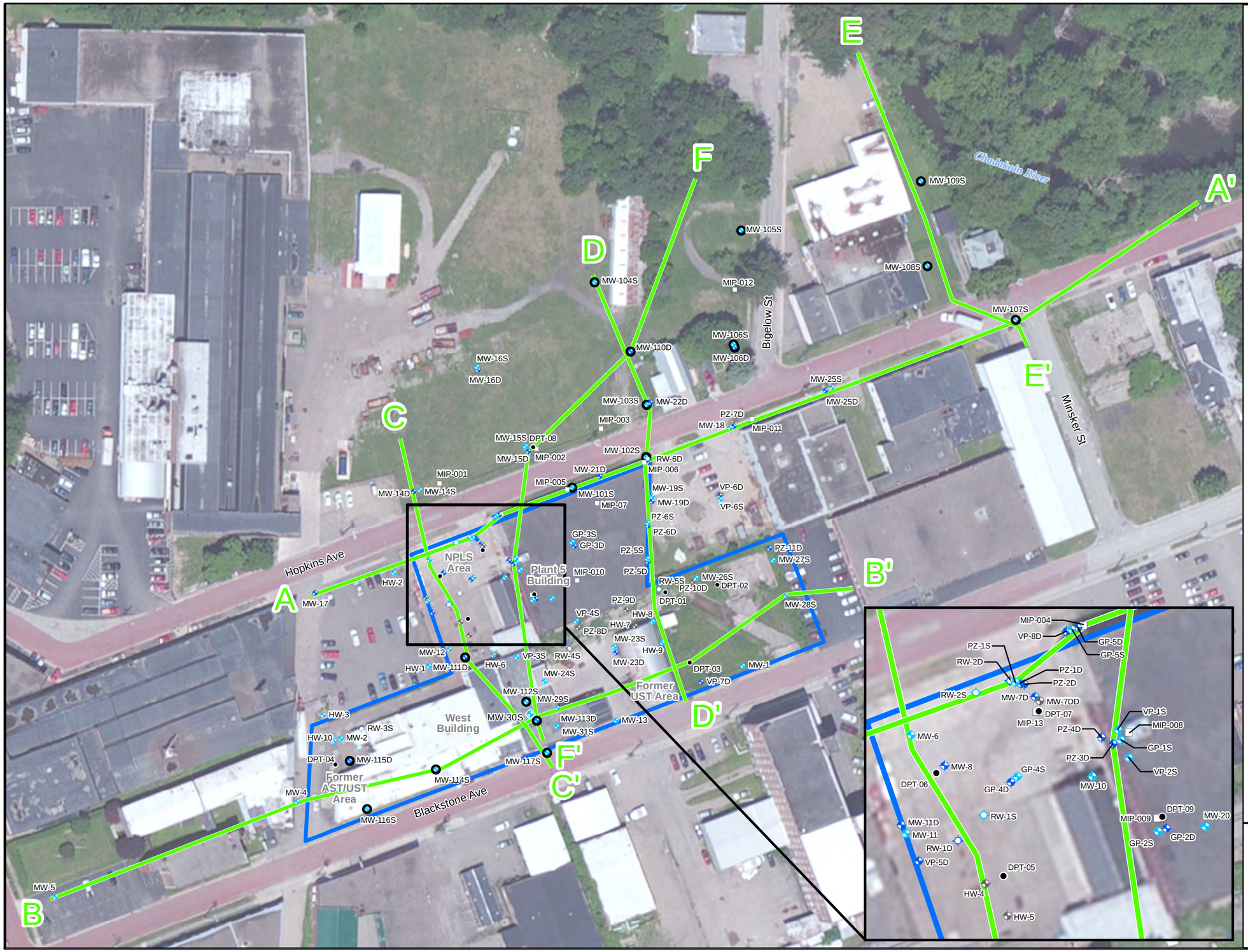
0 50 100 200
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE 2-1
Remediation Areas and Institutional and Engineering Control Boundaries
Site Management Plan

CREATED BY: LA	ch2m:
REVIEWED BY: MV	

\\Brookside\GIS_SHARE\ENBG\00_Proj\D\Dow_Chemical\Jamestown\Mapfiles\CSM\2016\Final\Fig4-1_CrossSectionLocations.mxd lallan 2/24/2017



Legend

- Cross Section
- Approximate Site Boundary

Sample Type

- Monitoring Well
- Piezometer
- Recovery Well
- Direct Push Location
- MIP Location

Well Depth

- NA (Abandoned)
- Shallow Water Bearing Zone
- Deep Water Bearing Zone
- Deepest Water Bearing Zone

Black shading behind location indicates new monitoring well installed in October 2016

Acronyms and Abbreviations
NPLS - North Parking Lot Sump
UST - Underground Storage Tank
AST - Aboveground Storage Tank

N

0 100 200 Feet

1 inch = 100 feet

FIGURE 2-2A
Cross-Section Location Map
Site Management Plan

JAMESTOWN, NEW YORK

ch2m

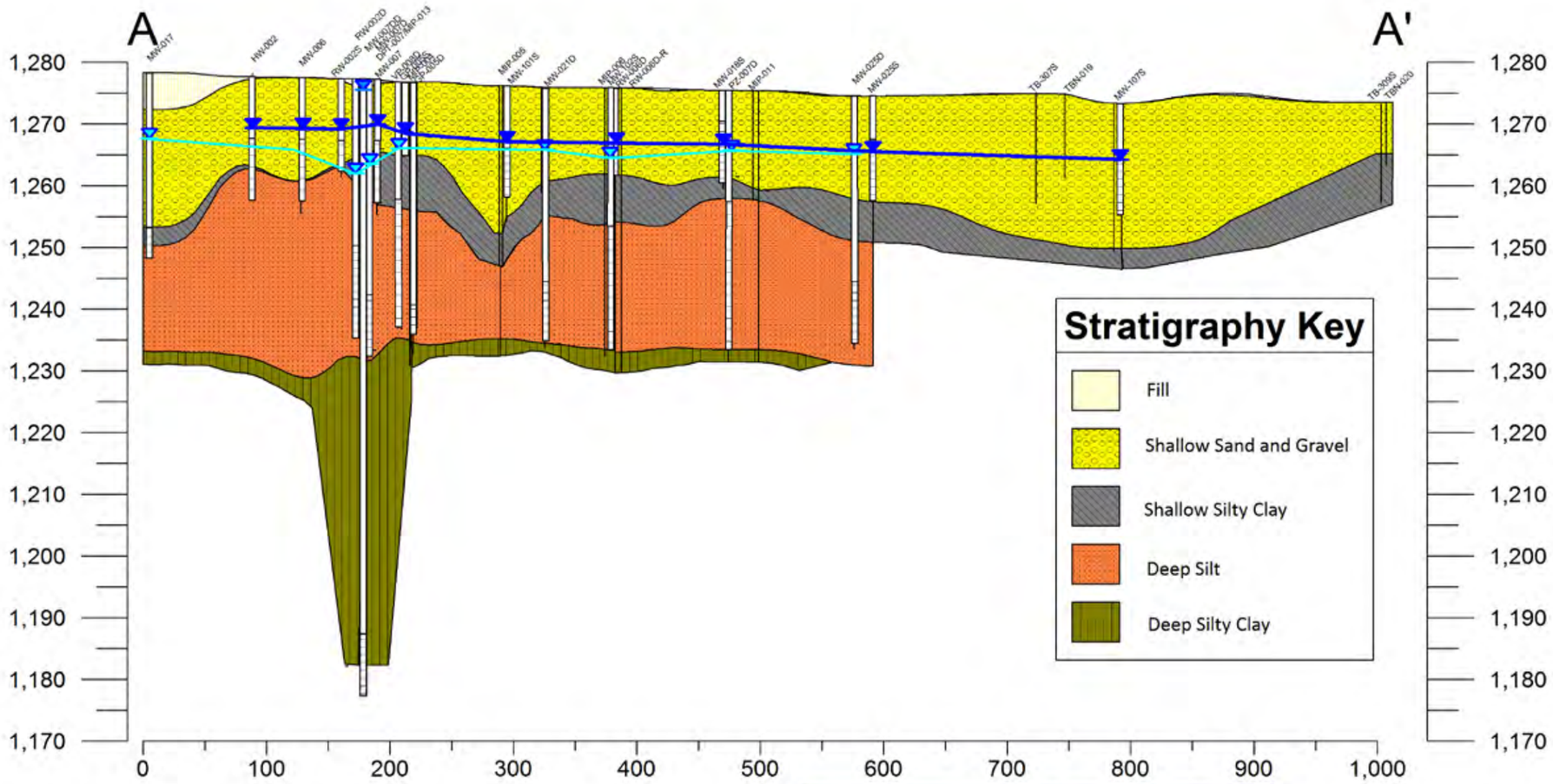
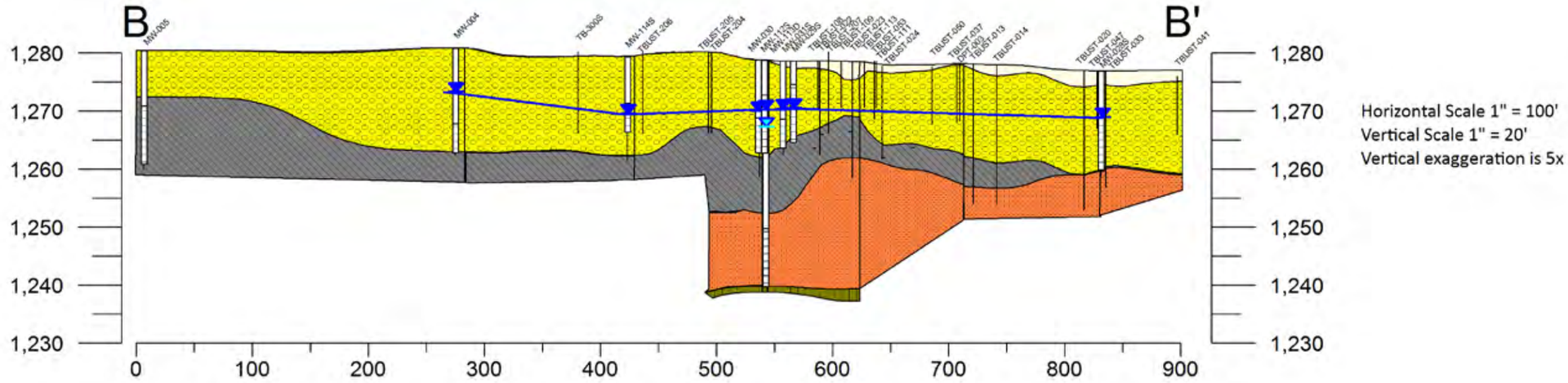
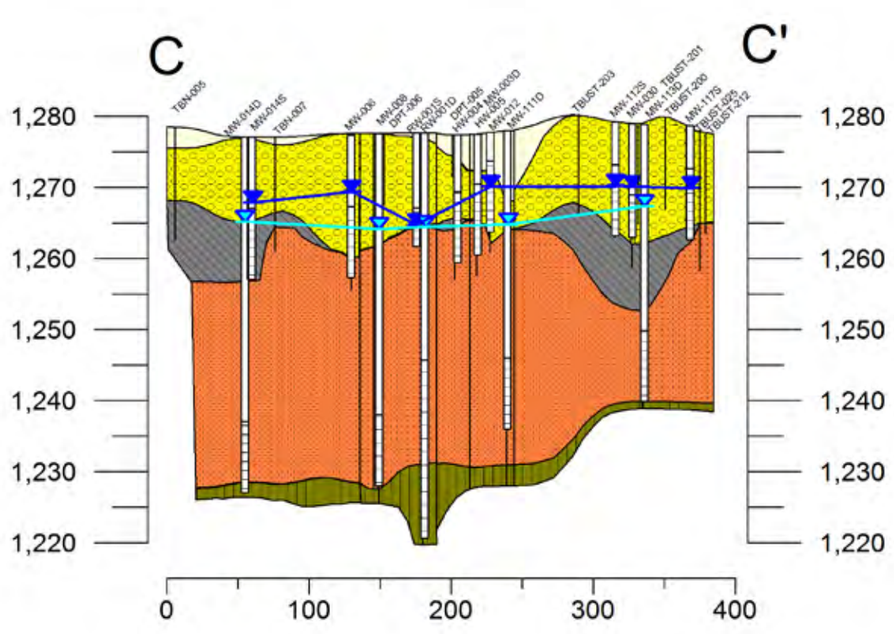


FIGURE 2-2B
Cross-Section A-A'
Site Management Plan
Jamestown, New York





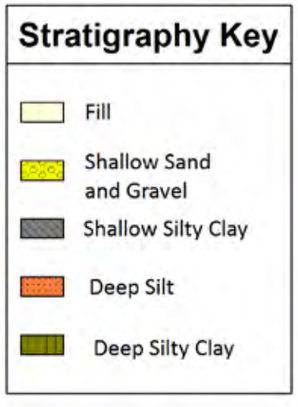
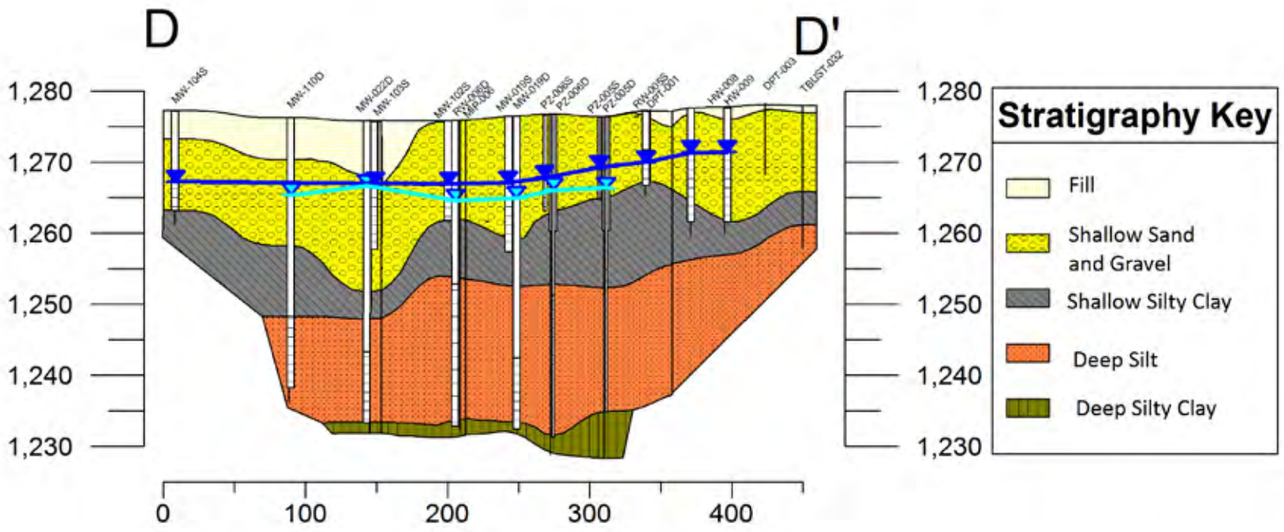
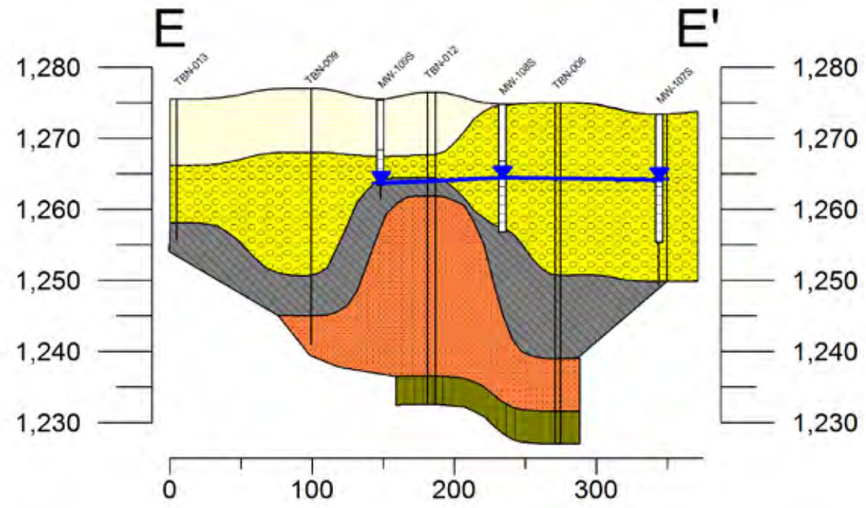


FIGURE 2-2C
Cross-Sections B-B' and C-C'
Site Management Plan
Jamestown, New York



Horizontal Scale 1" = 100'
Vertical Scale 1" = 20'
Vertical Exaggeration is 5X



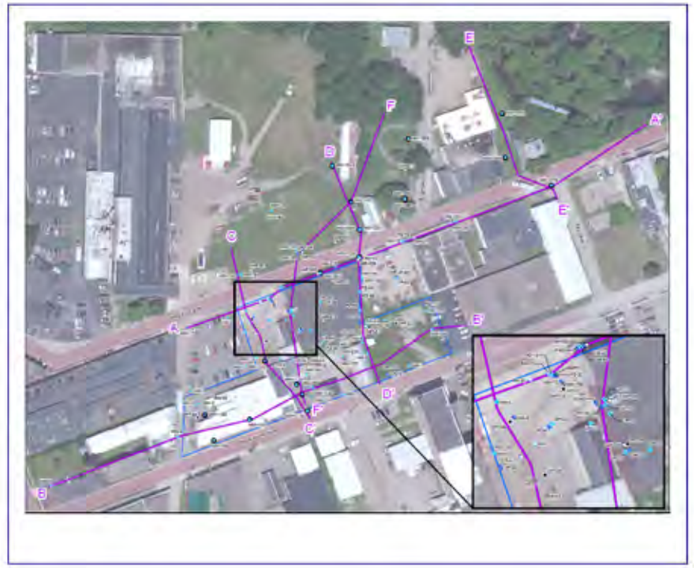
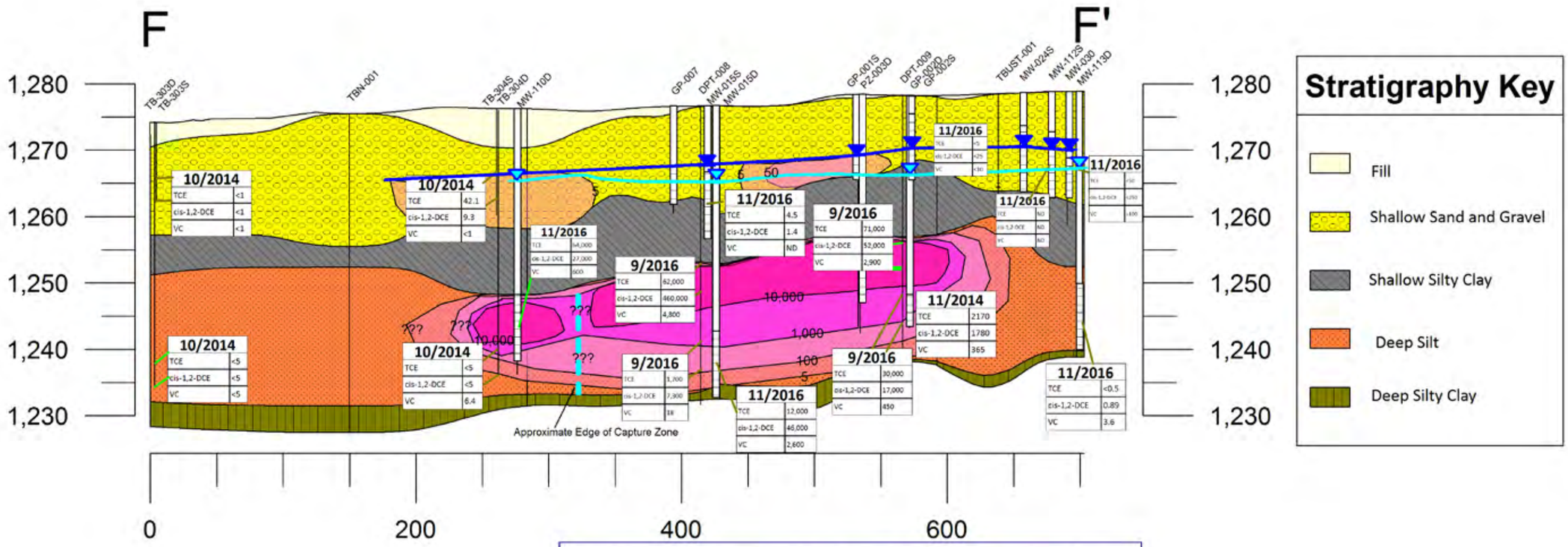


FIGURE 2-2D
Cross-Sections D-D' and E-E'
Site Management Plan
Jamestown, New York



Vertical Scale 1" = 100'
Horizontal Scale 1" = 20'
Vertical exaggeration is 5x

FIGURE 2-2E
Cross-Section F-F'
Site Management Plan
Jamestown, New York

Shallow Sampling Points

- Monitoring Well
- Piezometer
- Recovery Well
- Groundwater Elevation Contour
- Extent of Capture Zone
- Approximate Site Boundary

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. Oct 2017 pumping rates (gpm):
RW-1S: 0.08 gpm
RW-2S: 1.42 gpm
3. gpm = gallons per minute
4. HW-10, GP-4S, and MW-10 appear to be anomalous and not included in contours.

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE 2-3A
Shallow WBZ Potentiometric Surface Map, October 16th, 2017
Site Management Plan

CREATED BY: LA	ch2m:
REVIEWED BY: FR	

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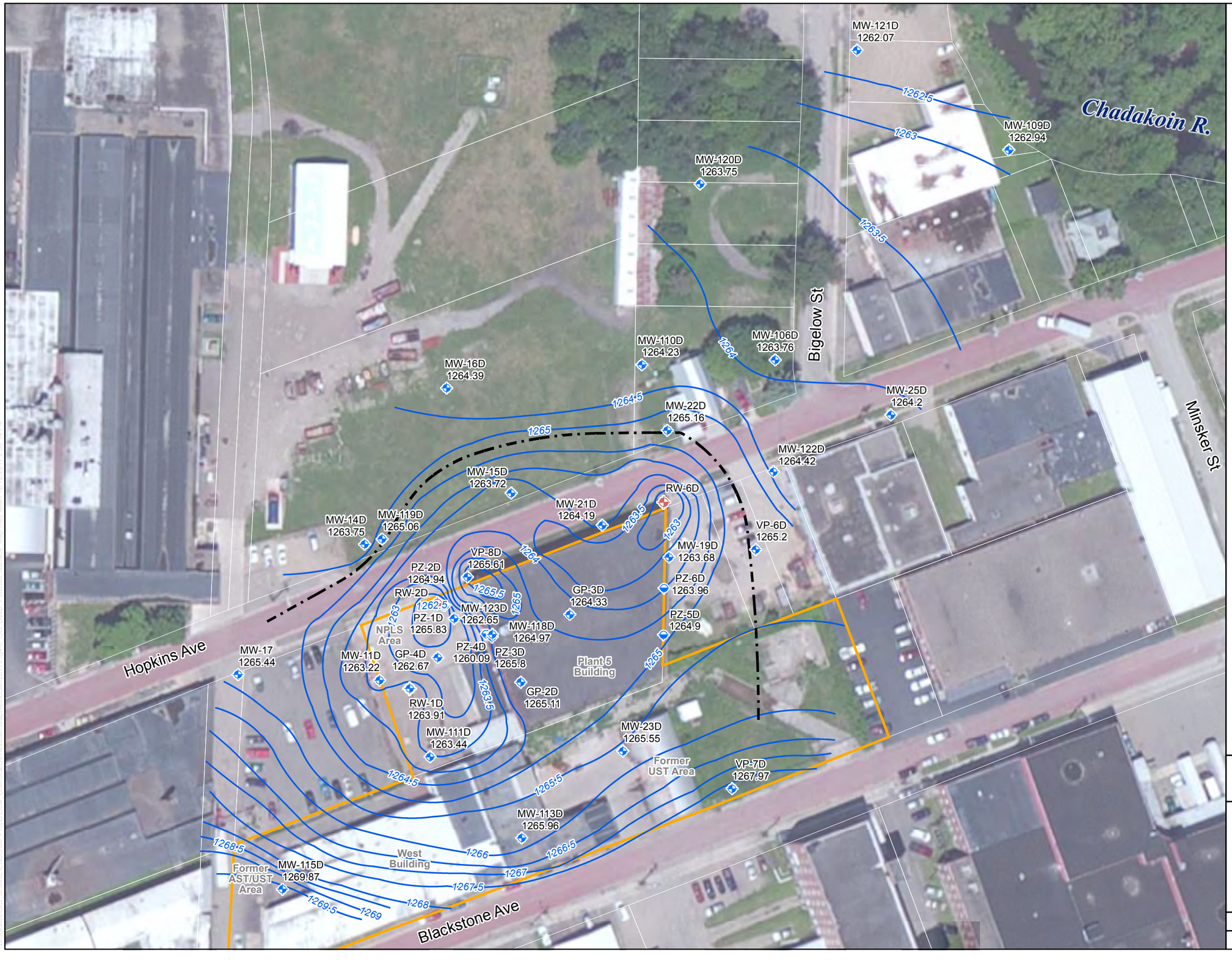


Deep Sampling Points

- Monitoring Well
- Piezometer
- Recovery Well
- Extent of Capture Zone
- Groundwater Elevation Contour
- Approximate Site Boundary

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. Oct 2017 pumping rates (gpm):
RW-2D: 2.3 gpm
RW-6D: 0.3 gpm
3. gpm = gallons per minute
4. PZ-1D, PZ-2D, PZ-3D, and PZ-4D appear to be anomalous, not included in contouring.
5. MW-14D not included in contouring.

N

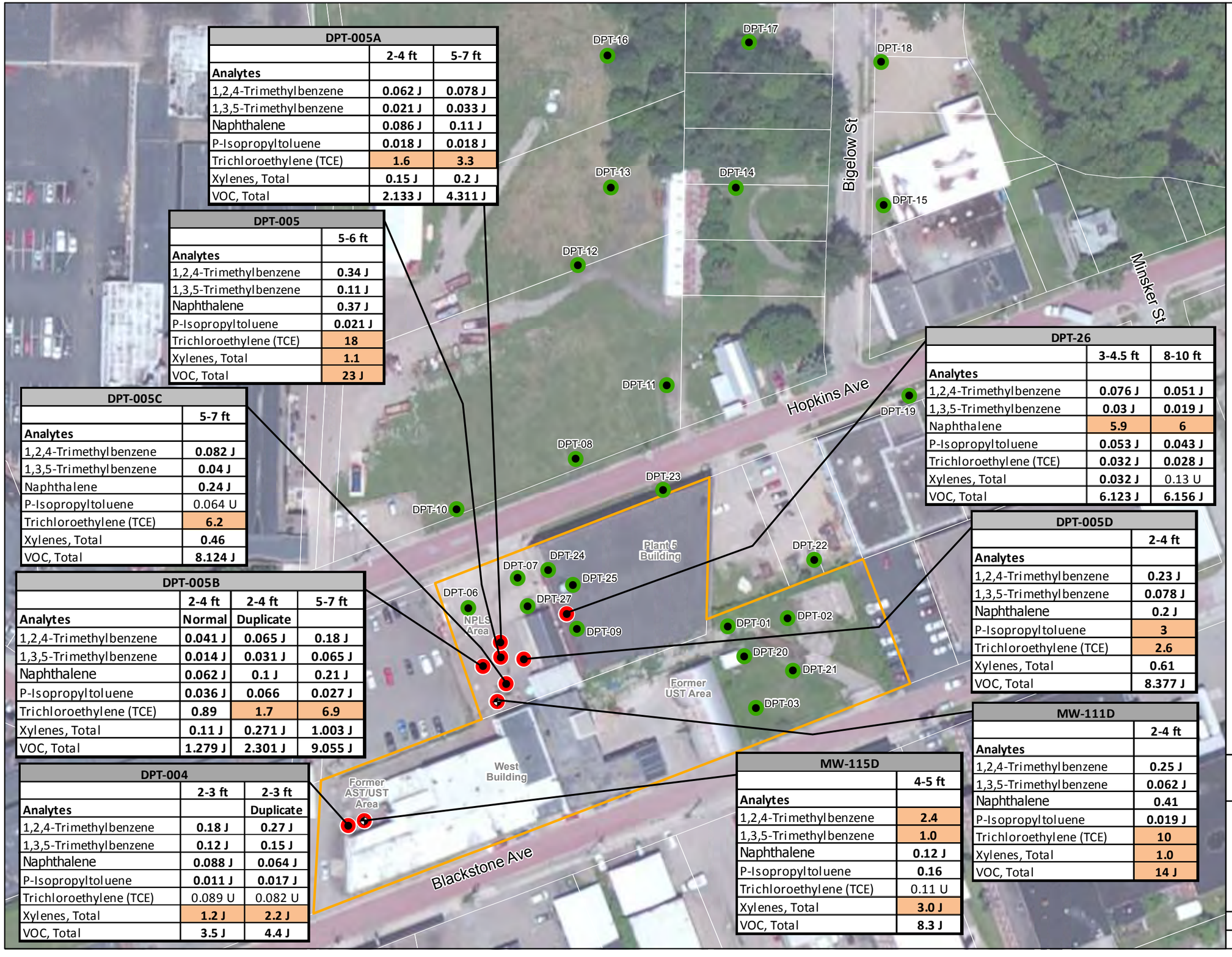
BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE 2-3B
Deep WBZ Potentiometric Surface Map, October 16th, 2017
Site Management Plan

CREATED BY: LA	ch2m.
REVIEWED BY: FR	



DPT-005A		
	2-4 ft	5-7 ft
Analytes		
1,2,4-Trimethylbenzene	0.062 J	0.078 J
1,3,5-Trimethylbenzene	0.021 J	0.033 J
Naphthalene	0.086 J	0.11 J
P-Isopropyltoluene	0.018 J	0.018 J
Trichloroethylene (TCE)	1.6	3.3
Xylenes, Total	0.15 J	0.2 J
VOC, Total	2.133 J	4.311 J

DPT-005	
	5-6 ft
Analytes	
1,2,4-Trimethylbenzene	0.34 J
1,3,5-Trimethylbenzene	0.11 J
Naphthalene	0.37 J
P-Isopropyltoluene	0.021 J
Trichloroethylene (TCE)	18
Xylenes, Total	1.1
VOC, Total	23 J

DPT-005C	
	5-7 ft
Analytes	
1,2,4-Trimethylbenzene	0.082 J
1,3,5-Trimethylbenzene	0.04 J
Naphthalene	0.24 J
P-Isopropyltoluene	0.064 U
Trichloroethylene (TCE)	6.2
Xylenes, Total	0.46
VOC, Total	8.124 J

DPT-005B			
	2-4 ft	2-4 ft	5-7 ft
Analytes	Normal	Duplicate	
1,2,4-Trimethylbenzene	0.041 J	0.065 J	0.18 J
1,3,5-Trimethylbenzene	0.014 J	0.031 J	0.065 J
Naphthalene	0.062 J	0.1 J	0.21 J
P-Isopropyltoluene	0.036 J	0.066	0.027 J
Trichloroethylene (TCE)	0.89	1.7	6.9
Xylenes, Total	0.11 J	0.271 J	1.003 J
VOC, Total	1.279 J	2.301 J	9.055 J

DPT-004		
	2-3 ft	2-3 ft
Analytes		Duplicate
1,2,4-Trimethylbenzene	0.18 J	0.27 J
1,3,5-Trimethylbenzene	0.12 J	0.15 J
Naphthalene	0.088 J	0.064 J
P-Isopropyltoluene	0.011 J	0.017 J
Trichloroethylene (TCE)	0.089 U	0.082 U
Xylenes, Total	1.2 J	2.2 J
VOC, Total	3.5 J	4.4 J

DPT-26		
	3-4.5 ft	8-10 ft
Analytes		
1,2,4-Trimethylbenzene	0.076 J	0.051 J
1,3,5-Trimethylbenzene	0.03 J	0.019 J
Naphthalene	5.9	6
P-Isopropyltoluene	0.053 J	0.043 J
Trichloroethylene (TCE)	0.032 J	0.028 J
Xylenes, Total	0.032 J	0.13 U
VOC, Total	6.123 J	6.156 J

DPT-005D	
	2-4 ft
Analytes	
1,2,4-Trimethylbenzene	0.23 J
1,3,5-Trimethylbenzene	0.078 J
Naphthalene	0.2 J
P-Isopropyltoluene	3
Trichloroethylene (TCE)	2.6
Xylenes, Total	0.61
VOC, Total	8.377 J

MW-115D	
	4-5 ft
Analytes	
1,2,4-Trimethylbenzene	2.4
1,3,5-Trimethylbenzene	1.0
Naphthalene	0.12 J
P-Isopropyltoluene	0.16
Trichloroethylene (TCE)	0.11 U
Xylenes, Total	3.0 J
VOC, Total	8.3 J

MW-111D	
	2-4 ft
Analytes	
1,2,4-Trimethylbenzene	0.25 J
1,3,5-Trimethylbenzene	0.062 J
Naphthalene	0.41
P-Isopropyltoluene	0.019 J
Trichloroethylene (TCE)	10
Xylenes, Total	1.0
VOC, Total	14 J

Approximate Site Boundary

Sampling Points

Monitoring Well

Direct Push

Sampling Results

Location with RAO exceedance

Location without RAO exceedance

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 2-4
Summary of Exceedances in Soil
(October 2017 Sampling)
Site Management Plan

CREATED BY: LA

REVIEWED BY: FR

ch2m

DPT-020 (10-15'bgs)	
Analytes	
1,2,4-TRIMETHYLBENZENE	**3400**
1,3,5-TRIMETHYLBENZENE	120 U
BENZENE	25 U
CUMENE	**130**
ETHYLBENZENE	**610**
TOLUENE	120 U
XYLENES, Total	**43 J**

MW-26S	
Analytes	
1,2,4-TRIMETHYLBENZENE	**2800**
1,3,5-TRIMETHYLBENZENE	**660**
BENZENE	10 U
CUMENE	**82**
ETHYLBENZENE	**270**
TOLUENE	50 U
XYLENES, Total	**440**

DPT-022 (10-15'bgs)	
Analytes	
1,2,4-TRIMETHYLBENZENE	12 U
1,3,5-TRIMETHYLBENZENE	12 U
BENZENE	2.5 U
CUMENE	**25**
ETHYLBENZENE	12 U
TOLUENE	12 U
XYLENES, Total	12U

MW-112S	
Analytes	
1,2,4-TRIMETHYLBENZENE	**1.4 J**
1,3,5-TRIMETHYLBENZENE	2.5 U
BENZENE	**0.30 J**
CUMENE	**12**
ETHYLBENZENE	2.5 U
TOLUENE	2.5 U
XYLENES, Total	2.5 U

RW-5S (March 2017)	
Analytes	
1,2,4-Trimethylbenzene	**20**
1,3,5-Trimethylbenzene	**4.7**
Benzene	.050 U
Cumene	2.5 U
Ethylbenzene	**0.76 J**
Toluene	2.5 U
XYLENES, Total	**1.2 J**

MW-27S	
Analytes	
1,2,4-TRIMETHYLBENZENE	**14**
1,3,5-TRIMETHYLBENZENE	2.5 U
BENZENE	0.50 U
CUMENE	**9.6**
ETHYLBENZENE	2.5 U
TOLUENE	2.5 U
XYLENES, Total	2.5 U

MW-30S	
Analytes	
1,2,4-TRIMETHYLBENZENE	**150**
1,3,5-TRIMETHYLBENZENE	120 U
BENZENE	25 U
CUMENE	**41 J**
ETHYLBENZENE	**2100**
TOLUENE	120 U
XYLENES, Total	**6950 J**

DPT-021 (10-15'bgs)	
Analytes	
1,2,4-TRIMETHYLBENZENE	**170**
1,3,5-TRIMETHYLBENZENE	2.5 U
BENZENE	0.50 U
CUMENE	**28**
ETHYLBENZENE	**7.4**
TOLUENE	2.5 U
XYLENES, Total	**1.0 J**

RW-3S (August 2017)	
Analytes	
1,2,4-Trimethylbenzene	2.5 U
1,3,5-Trimethylbenzene	2.5 U
Benzene	**1.4**
Cumene	**1.0 J**
Ethylbenzene	2.5 U
Toluene	2.5 U
XYLENES, Total	2.5 U

MW-24S	
Analytes	
1,2,4-TRIMETHYLBENZENE	**12**
1,3,5-TRIMETHYLBENZENE	**2.8 J**
BENZENE	**0.55 J**
CUMENE	**34**
ETHYLBENZENE	**41**
TOLUENE	6.2 U
XYLENES, Total	**684**

MW-117S	
Analytes	
1,2,4-TRIMETHYLBENZENE	**1.9 J**
1,3,5-TRIMETHYLBENZENE	2.5 U
BENZENE	**0.64**
CUMENE	**13**
ETHYLBENZENE	**51**
TOLUENE	**3**
XYLENES, Total	**120**

MW-29S		
Analytes	**N**	**FD**
1,2,4-TRIMETHYLBENZENE	**13**	**13 J**
1,3,5-TRIMETHYLBENZENE	12 U	25 U
BENZENE	**21**	**21**
CUMENE	**160**	**160**
ETHYLBENZENE	**1500**	**2000**
TOLUENE	**7.6 J**	**11 J**
XYLENES, Total	**1230**	**1680**

Chadakoin R.

Bigelow St

Hopkins Ave

Blackstone Ave

Plant 5 Building

NPLS Area

Former AST/UST Area

West Building

Former UST Area

MW-109S, MW-108S, MW-107S, MW-106S, MW-25S, MW-18, MW-104S, DPT-12, DPT-11, MW-103S, MW-15S, MW-102S, MW-101S, MW-19S, VP-6S, MW-14S, RW-2S, MW-7S, MW-6, GP-1S, RW-1S, MW-20, RW-5S, MW-28S, DPT-20, HW-8, MW-12, HW-6, MW-23S, MW-112S, MW-30S, MW-13, HW-10, MW-114S, MW-116S

Approximate Site Boundary

Shallow Sampling Points

- Monitoring Well
- Recovery Well
- Direct Push Location

Samping Results

- At least one exceedance of CBTEX/trimethylbenzenes/ t-butylbenzene
- At least one exceedance of TCE/cis/VC/acetone
- Exceedances of both TCE/ cis/VC/acetone and CBTEX/ Trimethylbenzenes
- No exceedances of compounds

Notes:

1. Only locations with RAO exceedances of CBTEX displayed.
2. Measurements in µg/L.
3. RAOs for total xylenes, ethylbenzene, toluene and Cumene are all 5 µg/L. RAO for benzene, is 1 µg/L.
4. HW-10 had a t-butylbenzene detect of 5.3 ug/L, above RAO of 5.0 ug/L, no other exceedances.

Acronyms and Abbreviations:

µg = Microgram(s)
CBTEX = Cumene, Benzene, Toluene, Ethylbenzene, and Xylenes
L = Liter
RAO = Remedial Action Objective
J = Estimated

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

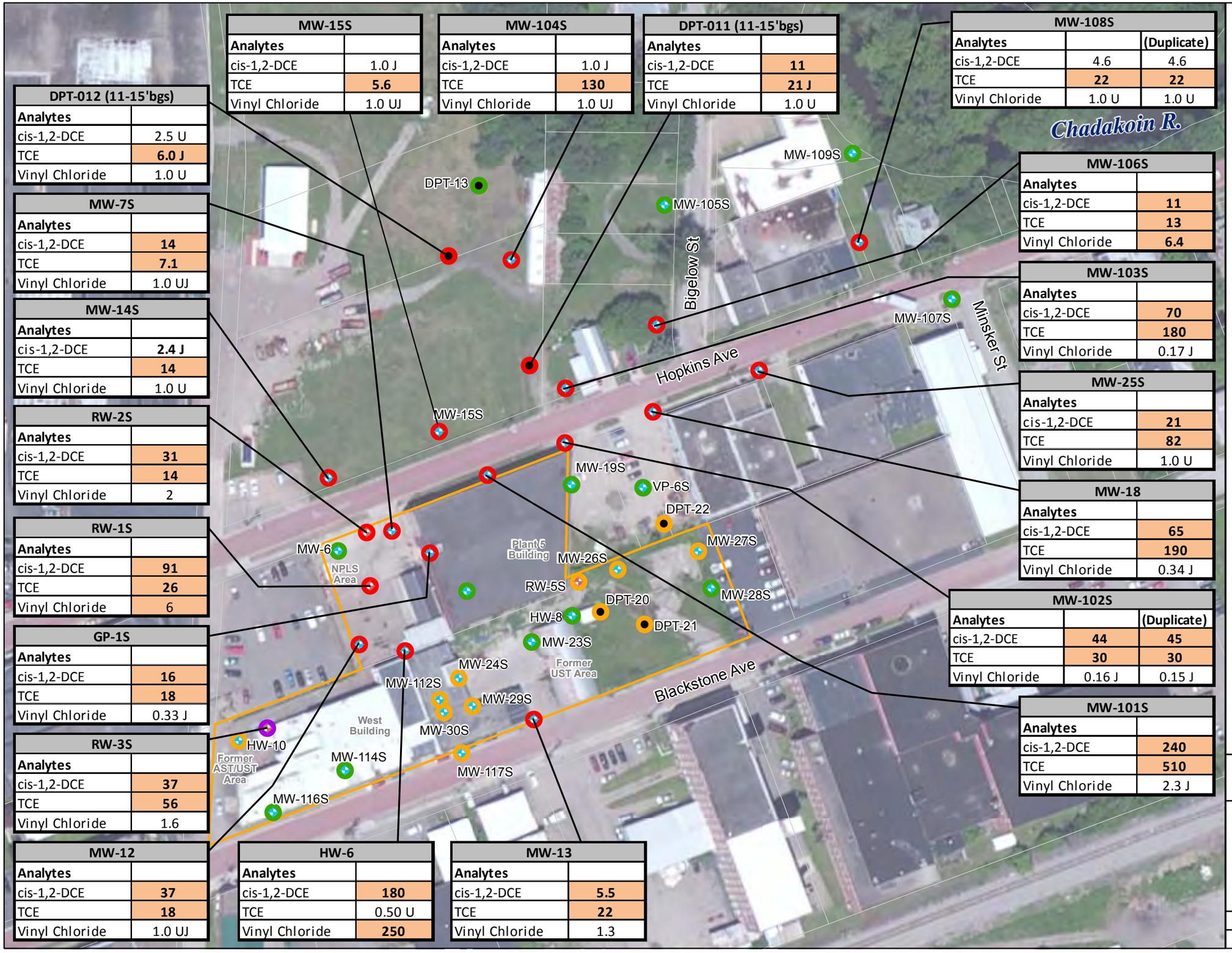
Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 2-5A
Summary of Exceedances in Groundwater in the Shallow WBZ
(CBTEX, October 2017Sampling)
Site Management Plan

CREATED BY: LA
REVIEWED BY: FR

ch2m



DPT-012 (11-15'bgs)	
Analytes	
cis-1,2-DCE	2.5 U
TCE	**6.0 J**
Vinyl Chloride	1.0 U

MW-7S	
Analytes	
cis-1,2-DCE	**14**
TCE	**7.1**
Vinyl Chloride	1.0 UJ

MW-14S	
Analytes	
cis-1,2-DCE	**2.4 J**
TCE	**14**
Vinyl Chloride	1.0 U

RW-2S	
Analytes	
cis-1,2-DCE	**31**
TCE	**14**
Vinyl Chloride	2

RW-1S	
Analytes	
cis-1,2-DCE	**91**
TCE	**26**
Vinyl Chloride	6

GP-1S	
Analytes	
cis-1,2-DCE	**16**
TCE	**18**
Vinyl Chloride	0.33 J

RW-3S	
Analytes	
cis-1,2-DCE	**37**
TCE	**56**
Vinyl Chloride	1.6

MW-12	
Analytes	
cis-1,2-DCE	**37**
TCE	**18**
Vinyl Chloride	1.0 UJ

MW-15S	
Analytes	
cis-1,2-DCE	1.0 J
TCE	**5.6**
Vinyl Chloride	1.0 UJ

MW-104S	
Analytes	
cis-1,2-DCE	1.0 J
TCE	**130**
Vinyl Chloride	1.0 UJ

DPT-011 (11-15'bgs)	
Analytes	
cis-1,2-DCE	**11**
TCE	**21 J**
Vinyl Chloride	1.0 U

HW-6	
Analytes	
cis-1,2-DCE	**180**
TCE	0.50 U
Vinyl Chloride	**250**

MW-13	
Analytes	
cis-1,2-DCE	**5.5**
TCE	**22**
Vinyl Chloride	1.3

MW-108S		
Analytes		**(Duplicate)**
cis-1,2-DCE	4.6	4.6
TCE	**22**	**22**
Vinyl Chloride	1.0 U	1.0 U

MW-106S	
Analytes	
cis-1,2-DCE	**11**
TCE	**13**
Vinyl Chloride	**6.4**

MW-103S	
Analytes	
cis-1,2-DCE	**70**
TCE	**180**
Vinyl Chloride	0.17 J

MW-25S	
Analytes	
cis-1,2-DCE	**21**
TCE	**82**
Vinyl Chloride	1.0 U

MW-18	
Analytes	
cis-1,2-DCE	**65**
TCE	**190**
Vinyl Chloride	0.34 J

MW-102S		
Analytes		**(Duplicate)**
cis-1,2-DCE	**44**	**45**
TCE	**30**	**30**
Vinyl Chloride	0.16 J	0.15 J

MW-101S	
Analytes	
cis-1,2-DCE	**240**
TCE	**510**
Vinyl Chloride	2.3 J

Approximate Site Boundary

Shallow Sampling Points

- Monitoring Well
- Recovery Well
- Direct Push Location

Samping Results

- At least one exceedance of CBTEX/trimethylbenzenes/ t-butylbenzene
- At least one exceedance of TCE/cis/VC/acetone
- Exceedances of both TCE/ cis/VC/acetone and CBTEX/ Trimethylbenzenes
- No exceedances of compounds

Notes:
1. Only wells withi exceedances of RAOs displayed.
2. RAOs for TCE, cis-1,2-DCE and VC area all 5 µg/L.
3. Measurements in µg/L.
4. Most recent 2017 result depicted (March, Aug, Sep, and Oct 2017).

Acronyms and Abbreviations:
µg = Microgram(s)
1,1-DCE = 1,1-dichloroethene
cis-1,2-DCE = cis-1,2-dichloroethene
L = Liter
TEC = Trichloroethen
RAO = Remedial Action Objective
J = Estimated Value
CVOC = Chorinated volatile organic compound
U = Not Detected

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

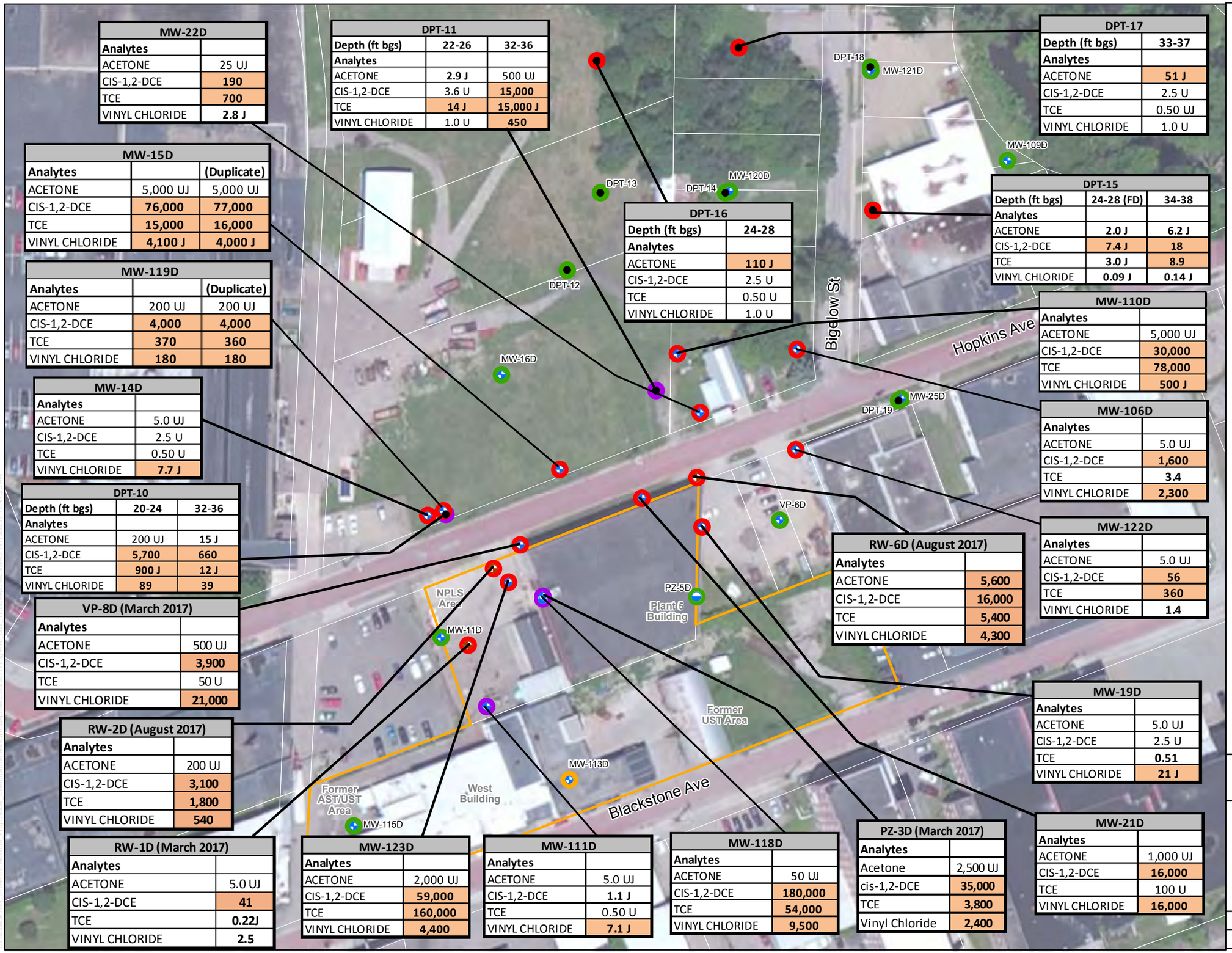
Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 2-5A
Summary of Exceedances in Groundwater in the Shallow WBZ
(CVOCs, October 2017 Sampling)
Site Management Plan

CREATED BY: LA
REVIEWED BY: FR

ch2m



MW-22D	
Analytes	
ACETONE	25 UJ
CIS-1,2-DCE	**190**
TCE	**700**
VINYL CHLORIDE	**2.8 J**

DPT-11		
Depth (ft bgs)	**22-26**	**32-36**
Analytes		
ACETONE	**2.9 J**	500 UJ
CIS-1,2-DCE	3.6 U	**15,000**
TCE	**14 J**	**15,000 J**
VINYL CHLORIDE	1.0 U	**450**

DPT-17	
Depth (ft bgs)	**33-37**
Analytes	
ACETONE	**51 J**
CIS-1,2-DCE	2.5 U
TCE	0.50 UJ
VINYL CHLORIDE	1.0 U

MW-15D		
Analytes		**(Duplicate)**
ACETONE	5,000 UJ	5,000 UJ
CIS-1,2-DCE	**76,000**	**77,000**
TCE	**15,000**	**16,000**
VINYL CHLORIDE	**4,100 J**	**4,000 J**

DPT-16	
Depth (ft bgs)	**24-28**
Analytes	
ACETONE	**110 J**
CIS-1,2-DCE	2.5 U
TCE	0.50 U
VINYL CHLORIDE	1.0 U

DPT-15		
Depth (ft bgs)	**24-28 (FD)**	**34-38**
Analytes		
ACETONE	**2.0 J**	**6.2 J**
CIS-1,2-DCE	**7.4 J**	**18**
TCE	**3.0 J**	**8.9**
VINYL CHLORIDE	**0.09 J**	**0.14 J**

MW-119D		
Analytes		**(Duplicate)**
ACETONE	200 UJ	200 UJ
CIS-1,2-DCE	**4,000**	**4,000**
TCE	**370**	**360**
VINYL CHLORIDE	**180**	**180**

MW-110D	
Analytes	
ACETONE	5,000 UJ
CIS-1,2-DCE	**30,000**
TCE	**78,000**
VINYL CHLORIDE	**500 J**

MW-14D	
Analytes	
ACETONE	5.0 UJ
CIS-1,2-DCE	2.5 U
TCE	0.50 U
VINYL CHLORIDE	**7.7 J**

MW-106D	
Analytes	
ACETONE	5.0 UJ
CIS-1,2-DCE	**1,600**
TCE	**3.4**
VINYL CHLORIDE	**2,300**

DPT-10		
Depth (ft bgs)	**20-24**	**32-36**
Analytes		
ACETONE	200 UJ	**15 J**
CIS-1,2-DCE	**5,700**	**660**
TCE	**900 J**	**12 J**
VINYL CHLORIDE	**89**	**39**

RW-6D (August 2017)	
Analytes	
ACETONE	**5,600**
CIS-1,2-DCE	**16,000**
TCE	**5,400**
VINYL CHLORIDE	**4,300**

MW-122D	
Analytes	
ACETONE	5.0 UJ
CIS-1,2-DCE	**56**
TCE	**360**
VINYL CHLORIDE	**1.4**

VP-8D (March 2017)	
Analytes	
ACETONE	500 UJ
CIS-1,2-DCE	**3,900**
TCE	50 U
VINYL CHLORIDE	**21,000**

MW-19D	
Analytes	
ACETONE	5.0 UJ
CIS-1,2-DCE	2.5 U
TCE	**0.51**
VINYL CHLORIDE	**21 J**

RW-2D (August 2017)	
Analytes	
ACETONE	200 UJ
CIS-1,2-DCE	**3,100**
TCE	**1,800**
VINYL CHLORIDE	**540**

MW-21D	
Analytes	
ACETONE	1,000 UJ
CIS-1,2-DCE	**16,000**
TCE	100 U
VINYL CHLORIDE	**16,000**

RW-1D (March 2017)	
Analytes	
ACETONE	5.0 UJ
CIS-1,2-DCE	**41**
TCE	**0.22J**
VINYL CHLORIDE	**2.5**

MW-123D	
Analytes	
ACETONE	2,000 UJ
CIS-1,2-DCE	**59,000**
TCE	**160,000**
VINYL CHLORIDE	**4,400**

MW-111D	
Analytes	
ACETONE	5.0 UJ
CIS-1,2-DCE	**1.1 J**
TCE	0.50 U
VINYL CHLORIDE	**7.1 J**

MW-118D	
Analytes	
ACETONE	50 UJ
CIS-1,2-DCE	**180,000**
TCE	**54,000**
VINYL CHLORIDE	**9,500**

PZ-3D (March 2017)	
Analytes	
Acetone	2,500 UJ
cis-1,2-DCE	**35,000**
TCE	**3,800**
Vinyl Chloride	**2,400**

Approximate Site Boundary

Deep Sampling Points

- Monitoring Well
- Direct Push Location
- Recovery Well
- Piezometer

Samping Results

- At least one exceedance of CBTEX/trimethylbenzenes/ t-butylbenzene
- At least one exceedance of TCE/cis/VC/acetone
- Exceedances of both TCE/ cis/VC/acetone and CBTEX/ Trimethylbenzenes
- No exceedances of compounds

Notes:
1. RAOs for TCE, cis-1,2-DCE, and VC are all 5 µg/L
2. RAO for acetone is 50 µg/L.
3. Measurements in µg/L.

Acronyms and Abbreviations:
µg = Microgram(s)
cis-1,2-DCE = cis-1,2-dichloroethene
L = Liter
RAO = Remedial Action Objective
J = Estimated
U = Not Detected

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

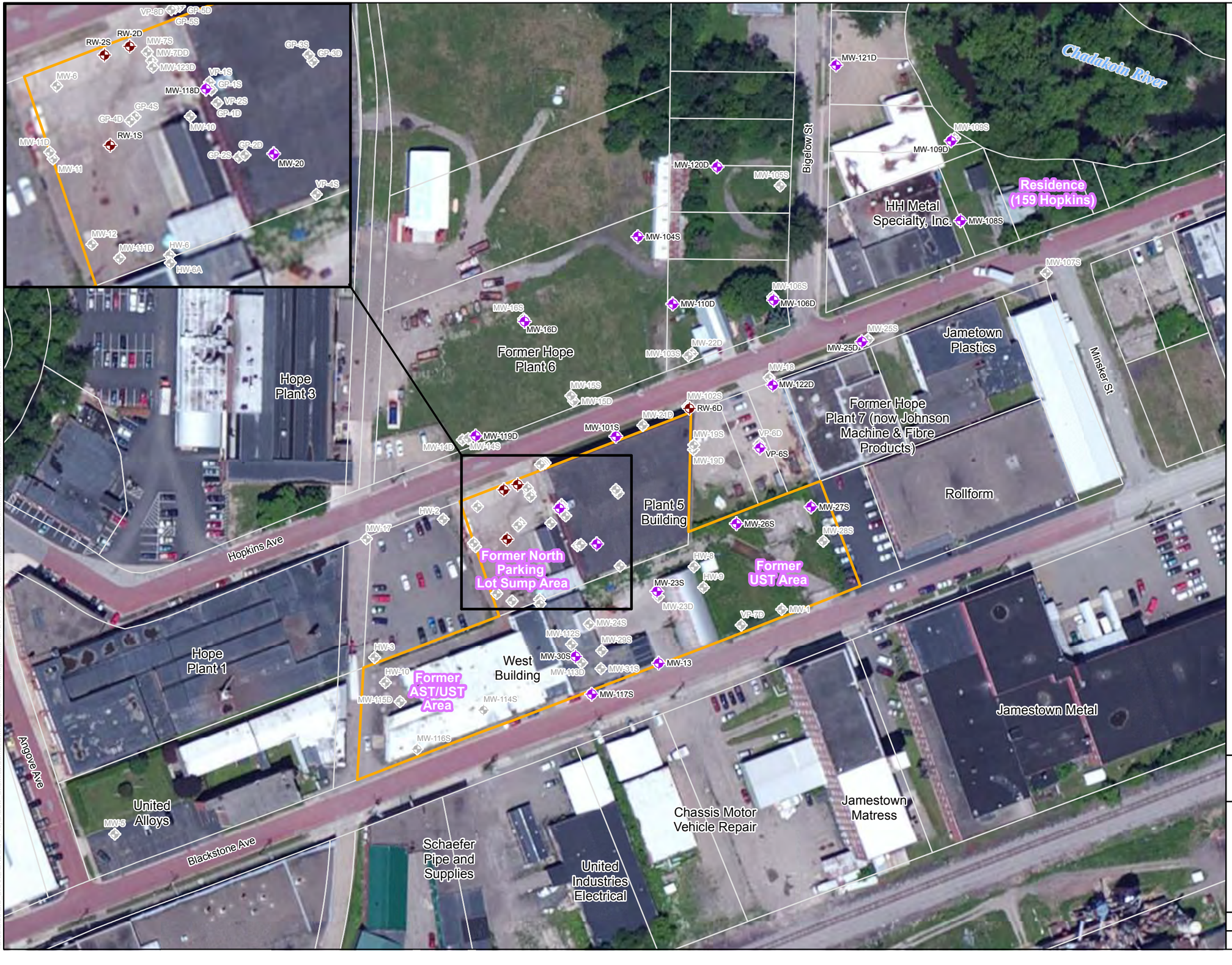
Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 2-5B
Summary of Exceedances in Groundwater in the Deep WBZ
(CVOCs, October 2017 Sampling)
Site Management Plan

CREATED BY: LA
REVIEWED BY: FR

ch2m



Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 4-1
Remediation Media Monitoring Locations
Site Management Plan

CREATED BY: LA

REVIEWED BY: MV

ch2m

Appendix A
Declaration of Covenants and Restrictions

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2014001901

Receipt#: 201406103201
Clerk: KS
Rec Date: 03/14/2014 12:50:06 PM
Doc Grp: D
Descrip: DECLAR-DEEDS
Num Pgs: 8
Rec'd Frm: NORM HOOVLER

Party1: CUSTOM PRODUCTION MANUFACTURING INC
Party2: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Town: CITY OF JAMESTOWN

Recording:

Cover Page	5.00
Recording Fee	55.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
Total:	80.00

**** NOTICE: THIS IS NOT A BILL ****

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

NORM HOOVLER
URS CORPORATION
652 2ND STREET #3
FAIRPORT HARBOR, OHIO 44077-5787

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the 24 day of FEBRUARY 2014 by Essex Specialty Products LLC (formerly Essex Specialty Products Inc.), a wholly-owned subsidiary of The Dow Chemical Company, a corporation organized and existing under the laws of the State of New Jersey and having an office for the transaction of business at 1250 Harmon Road, Auburn Hills, Michigan 48326.

WHEREAS, Essex/Hope Site (Site #907015) is the subject of an Order on Consent executed by Essex Specialty Products Inc, now Essex Specialty Products LLC, a wholly-owned subsidiary of The Dow Chemical Company as part of the New York State Department of Environmental Conservation's (the "Department's) State Superfund Program, namely that parcel of real property located at the address of 117-147 Blackstone Avenue in the City of Jamestown, County of Chautauqua, State of New York, being the same as (or part of) that property conveyed to Custom Production Manufacturing Inc. by Lilly Industries USA Inc. by deed(s) dated July 16, 1999 and recorded on August 2, 1999 in the Chautauqua County County Clerk's Office in Liber and Page Book 2419 page 347, and being more particularly described in Schedule "A," attached to this declaration and made a part hereof, and hereinafter referred to as "the Property"; and

WHEREAS, the Department approved a remedy to eliminate or mitigate all significant threats to the environment presented by the contamination disposed at the Property and such remedy requires that the Property be subject to restrictive covenants.

NOW, THEREFORE, Custom Production Manufacturing Inc., for itself and its successors and/or assigns, covenants that:

First, the Property subject to this Declaration of Covenants and Restrictions is as shown on a map attached to this declaration as Schedule "B" and made a part hereof.

Second, unless prior written approval by the Department or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency," is first obtained, where contamination remains at the Property subject to the provisions of the Site Management Plan ("SMP"), there shall be no construction, use or occupancy of the Property that results in the disturbance or excavation of the Property which threatens the integrity of the engineering controls or which results in unacceptable human exposure to contaminated soils. The SMP may be obtained from the New York State Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233.

Third, the owner of the Property shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of engineering controls required for the Remedy, which are described in the SMP, unless in each instance the owner first obtains a written waiver of such prohibition from the Department or Relevant Agency.

Fourth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for **its current use as industrial** without the express written waiver of such prohibition by the Department or Relevant Agency.

Fifth, the use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Chautauqua County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.

Sixth, the owner of the Property shall provide a periodic certification, prepared and submitted by a professional engineer or environmental professional acceptable to the Department or Relevant Agency, which will certify that the institutional and engineering controls put in place are unchanged from the previous certification, comply with the SMP, and have not been impaired.

Seventh, the owner of the Property shall continue in full force and effect any institutional and engineering controls required for the Remedy and maintain such controls, unless the owner first obtains permission to discontinue such controls from the Department or Relevant Agency, in compliance with the approved SMP, which is incorporated and made enforceable hereto, subject to modifications as approved by the Department or Relevant Agency.

Eighth, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property, and shall provide that the owner and its successors and assigns consent to enforcement by the Department or Relevant Agency of the prohibitions and restrictions that the Order on Consent requires to be recorded, and hereby covenant not to contest the authority of the Department or Relevant Agency to seek enforcement.

Ninth, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Department or Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

By: Carlo J Montisano

Print Name: CARLO J. MONTISANO

Title: PRESIDENT Date: 24 FEB. 2014

Grantor's Acknowledgment

STATE OF NEW ~~YORK~~ JERSEY)

) s.s.:

COUNTY OF MONMOUTH)

On the 24 day of Feb., in the year 201_, before me, the undersigned, personally appeared Carlo J. Montisano personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Diane J. D'Aiessio

Notary Public State of New ~~York~~ JERSEY

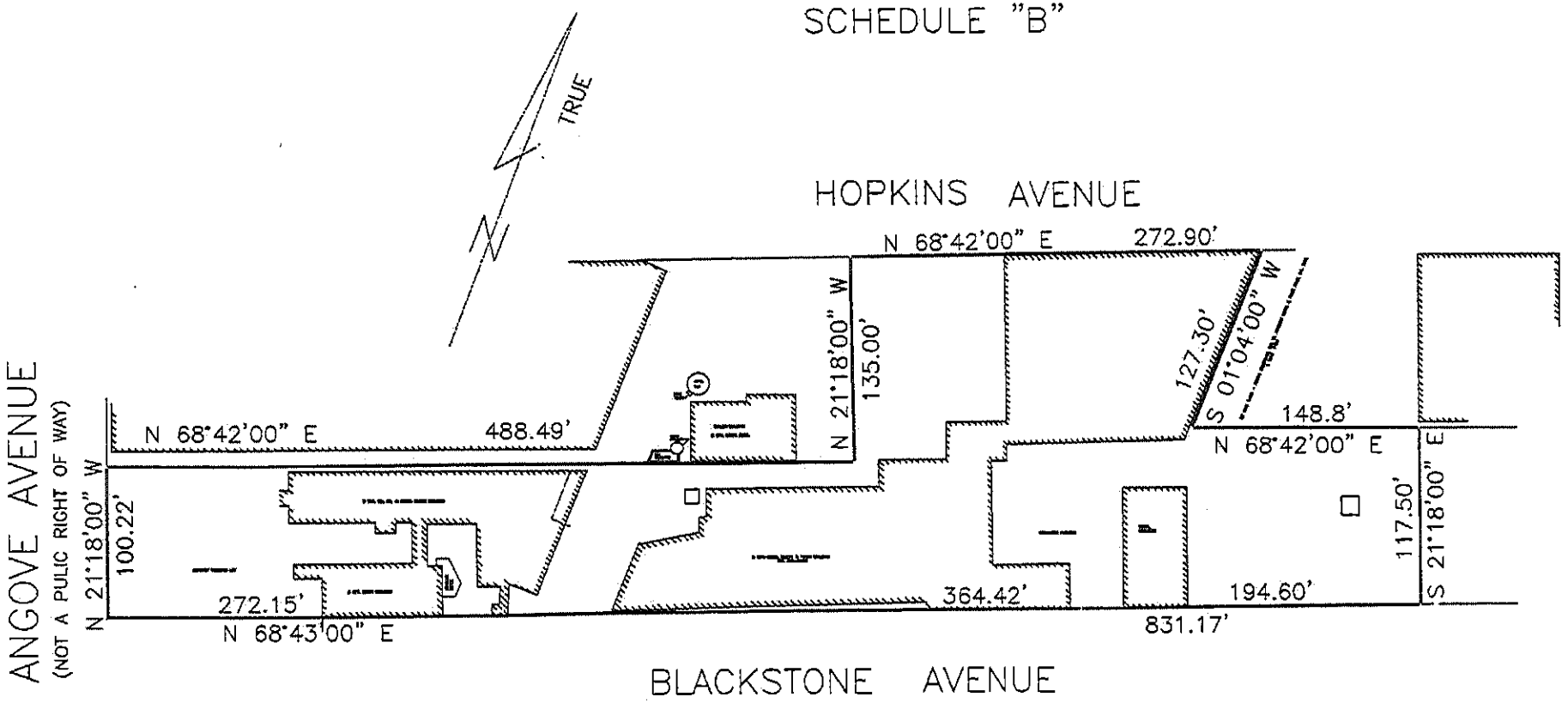
Diane J D'Aiessio
Notary Public
New Jersey
My Commission Expires 6-8-14

SCHEDULE "A"

Enter Property Description

SEE ATTACHED

SCHEDULE "B"



BOUNDARY SURVEY
for
CUSTOM PRODUCTION MFG., INC.

125 BLACKSTONE AVENUE
CITY OF JAMESTOWN
COUNTY OF CHAUTAUQUA
STATE OF NEW YORK

SURVEY BY: MICHAEL J. RODGERS AND ASSOCIATES, APRIL 1992
LAND SURVEYORS BEMUS POINT, N.Y.

SURVEY UPDATE BY: URS CORPORATION FEBRUARY 2014

Norman R. Hoovler 02/24/14

NORMAN R. HOOVLER, URS CORPORATION, P.L.S.

SCHEDULE "B"

SEE ATTACHED

Stamps $140.00

THIS INDENTURE

Made the 16 day of July, Nineteen Hundred and Ninety Nine

BETWEEN LILLY INDUSTRIES (USA), INC.
733 South West Street
Indianapolis, Indiana 46225

party of the first part, and

CUSTOM PRODUCTION MFG., INC.
80 Board Street, Suite 14M
Red Bank, New Jersey 07701

party of the second part,

WITNESSETH that the party of the first part in consideration of One and 00/100 Dollars ($1.00) lawful money of the United States, paid by the party of the second part, does hereby remise, release, and quitclaim unto the party of the second part, its heirs, successors and assigns forever,

– SEE ATTACHED DESCRIPTION –

TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises,

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, its heirs, successors and assigns forever.

AND, said party of the first part covenants that it has not done or suffered anything whereby said premises have been encumbered in any way whatever; provided that, said premises are conveyed subject to i) all local zoning enactments, ii) all easements, highways, rights-of-way, liens, covenants, conditions, restrictions and other matters, apparent or of record, iii) all current, non-delinquent real estate taxes and assessments and iv) all matters that would be disclosed by an accurate survey or physical inspection of the property.

IN WITNESS WHEREOF, the party of the first part have hereunto set their hands and seals the day and year first above written.

IN PRESENCE OF

LILLY INDUSTRIES (USA), INC.

BY: Kenneth S. Mills
Secretary

CHAUTAUQUA COUNTY TAX MAP
Parcel 060800 3-3-9.1-2 & 5
Same as 3 Sec 3 Blk 8 Lot 2

State of Indiana : SS:
County of Marion :

On this 16 day of July, Nineteen Hundred and Ninety Nine, before me personally came Kenneth S. Mills, to me known, who being by me duly sworn, did depose and say that he/she resides in Marion County that he/she is the Secretary of Lilly Industries (USA), Inc., the corporation described in and which executed the above instrument and that he/she signed his/her name thereto by like order of the Board of Directors.

Diane S. Rizzo
NOTARY PUBLIC

DIANE S. RIZZO
NOTARY PUBLIC STATE OF INDIANA
JOHNSON COUNTY
MY COMMISSION EXP. AUG. 29, 2001

CHAUTAUQUA COUNTY TAX MAP
Parcel 060800 3 Sec 3 Blk 14 Lot 1.4.3

501571.1

DEPT. OF ASSESSMENTS CITY OF JAMESTOWN, NY
REGISTERED Aug 2 1999
LIBER 133
NO. Ble E Voigt

Lawyers Title Insurance Corporation

NATIONAL HEADQUARTERS
RICHMOND, VIRGINIA

SCHEDULE A cont'd.

All that tract or parcel of land situate in the City of Jamestown, County of Chautauqua, State of New York described as follows: Beginning at a point on the northerly line of Blackstone Avenue 300 feet westerly from the westerly line of Caroline Street; running thence northerly at right angles to Blackstone Avenue 117.5 feet; thence westerly 148.8 feet to a point in Tiffany's west line; thence southwesterly along said line 127.4 feet to Blackstone Avenue; thence easterly 194.6 feet to the place of beginning. And also being known as Lots 88, 89 and 90 on a map of Tiffany Farm Allotment "B" and also being shown on the official tax map of the City of Jamestown as Parcels Nos. 312116, 312117 and 312118.

Also all that tract or parcel of land situate in the City of Jamestown, County of Chautauqua and State of New York being part of the "Driving Park, Jamestown, N.Y." which is part of the middle third of Lot No. 18, Town 2, Range 11 of the Holland Land Company's Survey, bounded and described as follows: Beginning at an iron stake at the intersection of the northerly line of Blackstone Avenue with the easterly line of Angove Avenue, formerly known as Driving Park Avenue (which latter avenue is mentioned as Hopkins Avenue in a release of the Safe Deposit & Trust Company of Pittsburg of a part of the mortgaged premises relating to the premises herein described) and running thence north 68° 43' east along the said northerly line of Blackstone Avenue 272.15 feet to an iron stake in the westerly line of the Erie Railroad Company's right of way for a spur track, extending northerly from the Erie Railroad Company's main line through the said middle third of Lot 18; thence north 1° 5' east along the westerly line of said right of way 108.14 feet to an iron stake; thence south 68° 43' west parallel with the said Blackstone Avenue 313.3 feet to an iron stake in the easterly line of the said Angove Avenue (formerly known as Driving Park Avenue) thence south 21° 17' east along the said easterly line of Angove Avenue, formerly known as Driving Park Avenue, 100 feet to the place of beginning.

036-0-999.0000/1

ORIGINAL

This is U.S.A.

Lawyers Title Insurance Corporation

NATIONAL HEADQUARTERS
RICHMOND, VIRGINIA

SCHEDULE A cont'd.

Also all that tract or parcel of land situate in the City of Jamestown aforesaid, lying and being on the tract commonly known as "Driving Park of Jamestown, N.Y." more particularly described as follows: Beginning at a point in the intersection of the easterly boundary line of the right of way of the Erie Railroad Company and the northerly boundary line of Blackstone Avenue; running thence northeasterly along the northerly boundary line of Blackstone Avenue 364.42 feet to the easterly boundary line of said "Driving Park of Jamestown, N.Y." thence northeasterly along the easterly boundary of the said "Driving Park of Jamestown, N.Y.", 108.14 feet; thence southwesterly parallel to the northerly boundary line of Blackstone Avenue 364.42 feet to the easterly boundary line of the right of way of the Erie Railroad Company; thence southwesterly along the easterly boundary line of the right of way of the Erie Railroad Company 108.14 feet to the place of beginning.

Also all that certain plot, place or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the City of Jamestown, County of Chautauqua and State of New York being part of Lot 18, Town 2, Range 11 of the Holland Land Company's survey and bounded and described as follows: Beginning at an iron stake in the southerly street line of Hopkins Avenue at its intersection with the former easterly bounds of the Vandergriff Realty Company premises and the east line of middle third of said Lot 18; running thence South 1° 04' west along said easterly bounds of the former Vandergriff Realty Company, 145.98 feet to a post; thence South 68° 42' west parallel to Hopkins Avenue and 135 feet distant southerly measured at right angles therefrom, 217.35 feet to an iron stake; thence North 21° 18' west, 135 feet to an iron stake in the southerly street line of Hopkins Avenue; thence North 68° 42' east along said southerly street line of Hopkins Avenue, 272.90 feet to the point of beginning.

039-0-999-0000/1

ORIGINAL

Litho in U.S.A.

Lawyers Title Insurance Corporation

NATIONAL HEADQUARTERS
RICHMOND, VIRGINIA

SCHEDULE A cont'd.

Also a right of way as set forth in a Bargain and Sale Deed dated June 20, 1978 and recorded in the Chautauqua County Clerk's Office in Liber 1790 of Deeds at Page 100 on August 22, 1978 and described as a fifteen (15) foot Right of Way along the westerly boundary of the following described property: Also, all that other tract or parcel of land, situate in the City of Jamestown, County of Chautauqua and State of New York, being part of Lot 18, Town 2, Range 11 of the Holland Land Company's Survey and described as follows: Commencing at a stake at the southwest corner of Hopkins Avenue adjoining the property of the Vandergriff Realty Company, formerly owned by Solomon Jones; running thence easterly along Hopkins Avenue 33 feet; thence southerly at right angles with Hopkins Avenue 117½ feet; thence westerly and parallel with Hopkins Avenue 98 feet to the west line of the Vandergriff Realty Company's east line; thence northerly along said last mentioned line of the Vandergriff Realty Company's east line to Hopkins Avenue 127 feet to the place of beginning as shown on map of Tiffany's Farm, Section "B", on file in Chautauqua County Clerk's Office, and also being shown on the Official Tax Map of the City of Jamestown as Parcel No. 312101.

Also all that piece or parcel of land, situate in the City of Jamestown, County of Chautauqua and State of New York, described as follows: Beginning at an iron stake located in the northerly boundary of Blackstone Avenue; thence North 00° 56' 46" East, 108 feet more or less to a point on the southerly boundary of property now or formerly owned by Roblin Hopes Industries, Inc.; thence North 68° 41' 00" East, 28.09 feet to a point; thence South 00° 56' 40" West, 108 feet more or less to an iron stake located in the northerly boundary of Blackstone Avenue; thence South 68° 41' 00" West, 28.09 feet to the point and place of beginning. Said parcel being a 26 foot wide right of way acquired by the City of Jamestown from the Consolidated Rail Corporation by deed recorded in Liber 1922 of Deeds at page 290 in the Chautauqua County Clerk's Office.

ORIGINAL

Title in U.S.A.

Appendix B
List of Site Contacts

Appendix B. List of Site Contacts

Site Management Plan, NYSDEC Site Number: 907015
Essex/Hope Site, Jamestown, New York

Site Contacts

Remedial Party	**Site Owner**
Essex Specialty Products, Inc.	**Custom Production Manufacturing, Inc.**
Name: Tim King (Remediation Manager)	Name: Carlos Montisano
email: kingta@dow.com	email: cmontisano@cpmin-usa.com
Phone: 302-791-6738	Phone: 716-665-3515
Operator of Record/CH2M	**Project Manager/CH2M**
Name: Jon Gowing	Name: Kyle Block
email: Jon.Gowing@ch2m.com	email: kyle.block@ch2m.com
Phone: 519-497-2011	Phone: 617-626-7013
Project Professional Engineer (NY License)	**City of Jamestown Board of Public Utilities**
Name: Key Rosebrook	Name: Michael Saar (Deputy General Manager)
email: Key.Rosebrook@ch2m.com	email: MSAAR@jamestownbpu.com
Phone: 703-376-5069	Phone: 716-661-1673

Agency/Regulatory Contacts

NYSDEC	**NYSDOH**
Project Manager (DER)	**Public Health Specialist**
Name: Maurice Moore	Name: Angela Martin
email: maurice.moore@dec.ny.gov	email: Angela.Martin@health.ny.gov
Phone: 716-851-7220	Phone: 518-402-7860

CH2M = CH2M HILL Engineers, Inc. (Environmental Consultant)
DER = Division of Environmental Remediation
NY = New York
NYSDEC = New York State Department of Environmental Conservation
NYSDOH = New York State Department of Health

Appendix C
Responsibilities of Owner and Remedial Party

APPENDIX C

Responsibilities of Owner and Remedial Party

The responsibilities for implementing the Site Management Plan (SMP) for the Essex/Hope Site (the "Site") in Jamestown, New York, Site No. 907015, are divided between the site owner(s) and a Remedial Party, as defined below. The owner(s) is/are currently listed as:

Custom Production Manufacturing, Inc. (CPM; the "owner")
Name: Carlos Montisano
email: cmontisano@cpmin-usa.com
Phone: 716-665-3515

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

Essex Specialty Products, Inc.
Name: Tim King (Remediation Manager)
email: kingta@dow.com
Phone: 302-791-6738

Nothing on this page shall supersede the provisions of a Declaration of Covenants and Restrictions, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the Site.

C.1 Site Owner's Responsibilities:

1. The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the Site.
2. In the event the Site is delisted, the owner remains bound by the Declaration of Covenants and Restrictions and shall submit, upon request by the NYSDEC, a written certification that the Declaration of Covenants and Restrictions is still in place and has been complied with.
3. The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and ensuring compliance with the SMP.
4. The owner is responsible for ensuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the Site's RP in accordance with the timeframes indicated in Section 1.3, *Notifications*, of this SMP.
5. In the event some action or inaction by the owner adversely impacts the Site, the owner must notify the Site's RP and the NYSDEC in accordance with the timeframe indicated in Section 1.3, *Notifications*, of this SMP and coordinate the performance of necessary corrective actions with the RP.
6. The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site properties. 6 *New York Codes, Rules, and Regulations* Part 375 contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: 60 days' prior written notification

must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3, *Notifications*, of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

7. Until such time as the NYSDEC deems the vapor mitigation system unnecessary, the owner shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the RP and the NYSDEC.
8. In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion (VI) data that is produced with respect to structures and that exceeds New York State Department of Health or Occupational Safety and Health Administration guidelines on the Site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

C.2 Remedial Party Responsibilities

1. The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the Site.
2. In accordance with a periodic timeframe determined by the NYSDEC, the RP shall periodically certify, in writing, that all institutional controls set forth in a Declaration of Covenants and Restrictions remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, to allow the RP to include the certification in the Site's Periodic Review Report (PRR) certification to the NYSDEC.
3. The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, PRRs and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.
4. Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.
5. If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).
6. The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (engineering controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .
7. The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3, *Notifications*, of the SMP.
8. The RP is responsible for the proper maintenance of any installed VI mitigation systems associated with the site, as required in Section 5, *Operations and Maintenance Plan*, and Appendix G, *Quality Assurance Project Plan*, of the SMP.
9. Prior to a change in use that impacts the remedial system or requirements and/or responsibilities

for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

10. Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

Appendix D
POTW Discharge Permit

JAMESTOWN BOARD OF PUBLIC UTILITIES

PO Box 700
Jamestown, NY 14702-0700
Phone (716) 661-1673
Fax (716) 661-1617

ELECTRIC
DISTRICT HEAT
WATER
WASTEWATER
SOLID WASTE

November 2, 2017

Mr. Kyle Block
CH2M
18 Tremont St
Boston, MA 02108

Dear Mr. Block:

Please find enclosed a copy of your firm's renewed Industrial Waste Discharge Permit governing the wastewater discharge (s) from your facility to the Jamestown Publicly Owned Treatment Works (POTW). The effective dates of the permit are shown on the first page of the permit. This permit is subject to change should there be any additions and/or deletions made to the industrial pretreatment programs as established by the Environmental Protection Agency.

Please review your permit carefully as it may include changes from your previous permit. Should you have any questions or comments concerning your permit, please do not hesitate to contact this office.

Sincerely,

Michael V Saar, P.E.
Deputy General Manager

CITY OF JAMESTOWN
BOARD OF PUBLIC UTILITIES
INDUSTRIAL WASTEWATER DISCHARGE PERMIT

PERMIT NUMBER	26
INDUSTRY NAME	Essex Specialty Products, Inc
INDUSTRY ADDRESS	124 Blackstone Avenue, Jamestown
SIC NUMBER	Groundwater Remediation
DATE ISSUED	11/4/17
EXPIRATION DATE	11/3/22

Essex Specialty Products, Inc. as a Significant Industrial User (SIU) of the City of Jamestown Publicly Owned Treatment Works (POTW), is hereby issued an industrial wastewater discharge permit pursuant to Chapter 24A of the Jamestown City Code (Jamestown Sewer Use Ordinance) and also with any applicable provisions of federal or state law(s) or regulation(s). Said permit shall be effective for a period of five years from the date of issuance hereof.

This permit is granted in accordance with the application filed on March 12,1996 and notice of process modifications submitted on N/A and in conformity with the plans, specifications, semi-annual self monitoring reports, and other data submitted to the City in support of the above application, all of which are filed with and considered as part of this permit, together with the following named conditions and requirements:

Effective this 4th day of November , 2017
To expire the 3th day of November , 2022

Deputy General Manager - Board of Public Utilities

RIGHT OF ENTRY

The permittee shall allow duly authorized employees or representatives of the City to enter the permittee's premises for the purpose of inspection, observation, measurement, sampling, and testing in accordance with Article VIII of the Jamestown Sewer Use Ordinance.

SAMPLING MANHOLE REQUIREMENTS

If, in the opinion of the General Manager, there are not adequate facilities for the acquisition of representative samples and accurate flow measurements, the General Manager may require that a sampling manhole with flow measuring device be installed by the permittee at his expense. This sampling manhole shall be approved by this office before installation. The permittee shall be responsible for all maintenance of the sampling manhole and calibration of the monitoring equipment.

BOARD OF PUBLIC UTILITES MONITORING

Compliance with the Jamestown Sewer Use Ordinance will be monitored via wastewater discharge monitoring. The City of Jamestown will monitor each SIU four times per year. Results will be transmitted to each SIU.

SELF MONITORING

Essex Specialty Products, Inc. must conduct monthly self-monitoring and report results to the City in accordance with applicable federal and local regulations. Monthly reports are due each **August 1** (including months January through June) and **February 1** (including months July through December). Essex Specialty Products, Inc. must notify the City of any violation of its self-monitoring within 24 hours. Such notification shall include a phone call followed up by a letter. All permit limits set forth in this permit are enforceable effluent limitations.

MONITORING LOCATION
SAMPLING VALVE

PARAMETER	SAMPLE	LOCAL
	Monthly	LIMIT
		MG/L
PH (4 grabs)	X	5.5-10.0
TSS (comp)		350
OIL & GREASE		100
CADMIUM (comp)		0.30
CHROMIUM (comp)		4.00
COPPER (comp)		1.25
LEAD (comp)		0.30
NICKEL (comp)		0.90
SILVER (comp)		0.20
ZINC (comp)		3.00
CYANIDE (comp)		0.65
Volatile Organics (4 grabs)	X	2.13

Notes :

1. Samples should be taken as **composites** of at least 4 grab samples collected during a typical production day except for pH. Four separate samples must be taken and **individually analyzed for pH.**
2. All analysis shall be preformed by a New York State Department of Health Certified Environmental Laboratory.
3. All analysis shall be performed in accordance with the latest edition of the following references:
   a. Standard Methods for the Examination of Water and Wastewater
   b. Method for Chemical Analysis of Water and Wastes, USEPA, technology Transfer, 1983

PROHIBITED DISCHARGES

The following should not be introduced into the City Sewer system:

(1) Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, wastestreams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21.
(2) Pollutants which will cause corrosive structural damage to the POTW, but in no case Discharges with pH lower than **5.5** or greater than **10.0**;
(3) Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference;
(4) Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a Discharge at a flow rate and/or pollutant concentration which will cause Interference with the POTW.
(5) Heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW Treatment Plant exceeds 40 deg.C (104 deg.F) unless the Approval Authority, upon request of the POTW, approves alternate temperature limits.
(6) Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;
(7) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems;
(8) Any trucked or hauled pollutants, except at discharge points designated by the POTW.
(9) The discharge of concentrated solutions without pretreatment is strictly prohibited. Any request to discharge such wastes must be submitted to this office and is subject to the approval of the General Manager on a case by case basis.
10) Any water or waste containing fats, wax, grease, oils, or oil products, whether emulsified or not, in excess of **100 mg/l**.

HAZARDOUS WASTE DISCHARGE NOTIFICATION

For discharges of listed and characteristic hazardous wastes which are not already reported in periodic self-monitoring reports and which exceed 15 kilograms per month, the regulations require that all industrial users notify USEPA, NYSDEC, and the City of Jamestown as to the constituents of these wastes and the anticipated discharge volume of such wastes on both a monthly and an annual basis.

CHANGE IN WASTEWATER DISCHARGE

All discharges authorized herein shall comply with the terms and conditions of this permit. Any industrial facility expansions, production increases, or process modifications which result in new, different, or increased discharges of pollutants must be reported by submission of a new industrial waste disposal questionnaire. This permit may be modified to specify and limit any pollutants not previously limited. The discharge of any pollutant more frequently than or at a level in excess of that specified and authorized by this permit shall constitute a violation of the terms and conditions of this permit.

RECORDKEEPING

The permittee shall retain all records of monitoring activities and results (whether or not required by this permit) for a minimum of 3 years. These records shall be made available for inspection and copying to duly authorized employees or representatives of the City. This period of retention shall be extended during any unresolved litigation.

PERMIT MODIFICATIONS

After sufficient notice to the permittee, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

(a) Violation of any terms or conditions of this permit.
(b) A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
(c) If an effluent standard is established under any state or federal law for a pollutant which is present in the discharge and such standard or prohibition s more stringent that any limitation for such pollutant in this permit.

PERMIT TRANSFER

Sewer Use Permits are issued to a specific User for a specific operation. A wastewater discharge permit shall not be reassigned or, transferred, or sold to a new owner, new User, different premise, or a new or changed operation without the approval of the City. Any succeeding Owner or User shall also comply with the terms and conditions of the existing permit.

NOTICE OF NON-COMPLIANCE

The permittee shall notify the operator of the Jamestown Wastewater Treatment Plant **immediately,** by telephone (665-3980), so that the operator can take the necessary steps to prevent damage to the wastewater treatment process and equipment in the event the permittee:

(1) Does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit.
(2) Discharges or may discharge any wastewater which may cause a slug loading to the Jamestown Wastewater Treatment Plant. This includes wastewater which may cause pass through or interference with wastewater treatment plant operations.
(3) Discharges or may discharge any material or wastewater which is prohibited from discharge as described in the City of Jamestown Local Sewer Use Ordinance or this permit.

These non-complying discharges or possible discharges may be due to:

Breakdown of industrial wastewater pretreatment equipment;
Accidents caused by human error or negligence; or
Other causes, such as acts of nature.

The General Manager shall be notified by telephone within 24 hours, and in writing within five (5) days and said notification shall include the following pertinent information:

(1) A description of the non-complying discharge;
(2) Cause of non-compliance;
(3) Anticipated time the condition of non-compliance is expected to continue, or if such condition has been corrected, the duration of the period of non-compliance;
(4) Steps taken by the permittee to reduce and eliminate the non-complying discharge; and
(5) Steps to be taken by the permittee to prevent reoccurrence of the condition of non-compliance.

The permittee must also repeat sampling for all parameters exceeding discharge limitations and submit the results of the repeat analysis within thirty (30) days of the violation(s).

Nothing in this permit shall be construed to relieve the permittee from the penalties for non-compliance of this permit for any reason subject to Article (IX) (Penalties) of the Jamestown Sewer Ordinance.

SCHEDULE OF COMPLIANCE

The permittee shall comply with the following schedule if the present discharge does not conform to the effluent limitations described within this permit:

a. By _____ the permittee shall have a registered Professional Engineer contact this office.
b. By _____ the permittee shall complete an engineering report and submit it to this office.
c. By_____ the permittee shall complete final plans and specifications for pretreatment facilities and submit them to this office for review and approval.
d. By _____ the permittee shall start construction of its approved pretreatment facilities.
e. By _____ the permittee shall complete construction of the pretreatment facilities.
f. By _____ the permittee shall attain operational levels required to achieve the effluent limits specified within this permit.

CIVIL AND CRIMINAL PENALTIES

A permittee found violating applicable local, state or federal regulations may be subject to administrative penalties, civil action, and/or criminal prosecution. If administrative penalties are warranted, a fine in an amount not exceeding $1000.00 per day per violation may be assessed. If criminal penalties are assessed, a fine in an amount not exceeding $1,000.00 per violation per day may be assessed, imprisonment for not more than 6 months, or both. Any person violating applicable local, state or federal regulations that results in expense, loss or damage to the City and its property shall be liable for all costs.

Appendix E
Monitoring Well Boring and Construction Logs

RADIAN INTERNATIONAL

TEST BORING GP-1D

PAGE 1 OF 1

PROJECT NAME ESSEX/HOPE — PROJECT NO. 60-10-41

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

BY KD — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

DATE 01-26-00 — DRILLING METHOD GEOPROBE 2 1/4-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200

CHK BY ____ — DRILLING START DATE 01-26-00 — DRILLING COMPLETION DATE 01-27-00

DATE ____ — SURFACE ELEVATION ____ — STICK-UP ELEVATION ____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	46		0.5 CONCRETE FILL - DK BROWN SILT, SOME COARSE SAND AND GRAVEL (1/4 TO 1/2-IN) - DAMP	ML/SM		0 PPM		
				2.8 BROWN SILT SOME CLAY, TRACE FINE SAND - DAMP	ML		0		
5	SS-2	39		4.2 BROWN SILT AND GRAVEL (1/2 TO 1-1/2-IN), LITTLE MEDIUM TO COARSE SAND - DAMP	ML/GM		0 PPM		
	SS-3	32		8.0 AS ABOVE, WET			0 PPM		
10				10.7 AS ABOVE, SATURATED					
	SS-4	36		12.8 GRAY TO GREEN STIFF CLAYEY SILT - MOIST	ML/CL		0 PPM		
15	SS-5	48		19.0 MEDIUM STIFF SILT, SATURATED			0 PPM		
20	SS-6	48		20.0 GRAY SOFT SILT, TRACE FINE SAND - MOIST 21.0 AS ABOVE, LITTLE FINE SAND - WET, BECOMES SATURATED WITH DEPTH	ML		46.9 PPM		SAMPLED
	SS-7	48		24.0 GRAY LOOSE FINE SAND, LITTLE SILT - SATURATED	SP		206 PPM		SCREENED INTERVAL
25	SS-8	48		28.0 AS ABOVE, TRACE SILT			200 PPM		
30	SS-9	48		32.0 GRAY LOOSE TO MEDIUM DENSE FINE SAND, TRACE SILT - WET			200 PPM		LOST SAMPLE TUBE FOR 36 TO 40-FT INTERVAL IN HOLE FROM 32 TO 36-FT
35				36.0 REFUSAL (DENSE FINE SAND)					

ADDITIONAL REMARKS

FILE: \FORMATS\TE

WELL COMPLETION LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

PAGE 1 OF 1

WELL NO. GP-1D
HOLE NO. ____

PROJECT NAME ESSEX/HOPE
PROJECT NO. 80104.11

BY KD
DATE 01-27-00
CHK BY ____
DATE ____

LOCATION JAMESTOWN NY
DRILLING CONTRACTOR SIC
DRILLING METHOD GEOPROBE - 2¼-IN DIRECT PUSH TUBE
DRILLING FLUID N/A
DRILLING START DATE 01-27-00

GEOLOGIST KEITH DOERR
DRILLER JERRY JONES
RIG TYPE SIMCO EARTH PROBE 200
DRILLING COMPLETION DATE 01-27-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ____
SURFACE PAD ELEV. ____
HOLE DEPTH ____
WELL DEPTH ____
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0 TO 36 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM / PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5 FT
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 26.4 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 26.4 TO 31.4 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 31.2 TO 31.4

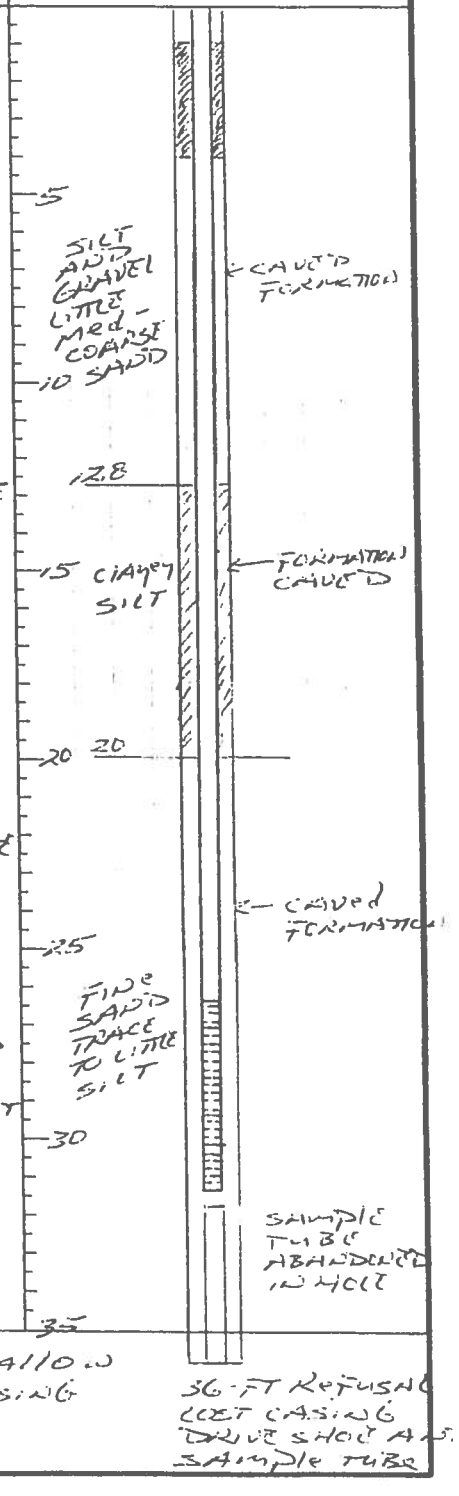
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL 0 TO 1 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY ____
DEPTH INTERVAL 1 TO 4 FT

FILTER PACK
INSTALL. METHOD ____
MATERIAL FORMATION SAND
QUANTITY ____
DEPTH INTERVAL 20 TO 36 FT

DEVELOPMENT
METHOD BAIL
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
NOTE! BENTONITE BRIDGED IN 2¼ CASING, ALLOW FORMATION TO CAVE AROUND Ø1-IN CASING

DEPTH TO WATER (1-31-00): 11.42 FT TOC

FILE: \WELL-LOG

WELL COMPLETION LOG

RADIAN INTERNATIONAL — A DAMES & MOORE GROUP COMPANY

PAGE 1 OF 1

WELL NO. GP-15

HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 80410911

BY KD — LOCATION JAMESTOWN, NEW YORK — GEOLOGIST KEITH DOERR

DATE 01-27-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

CHK BY _____ — DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200

DATE _____ — DRILLING FLUID N/A

DRILLING START DATE 01-27-00 — DRILLING COMPLETION DATE 01-27-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0 TO 36-FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5 FT
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 8 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 8 TO ~~13.5~~ 12.8 KD

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL ~~13 TO 13.2~~ 12.8 TO 13.0

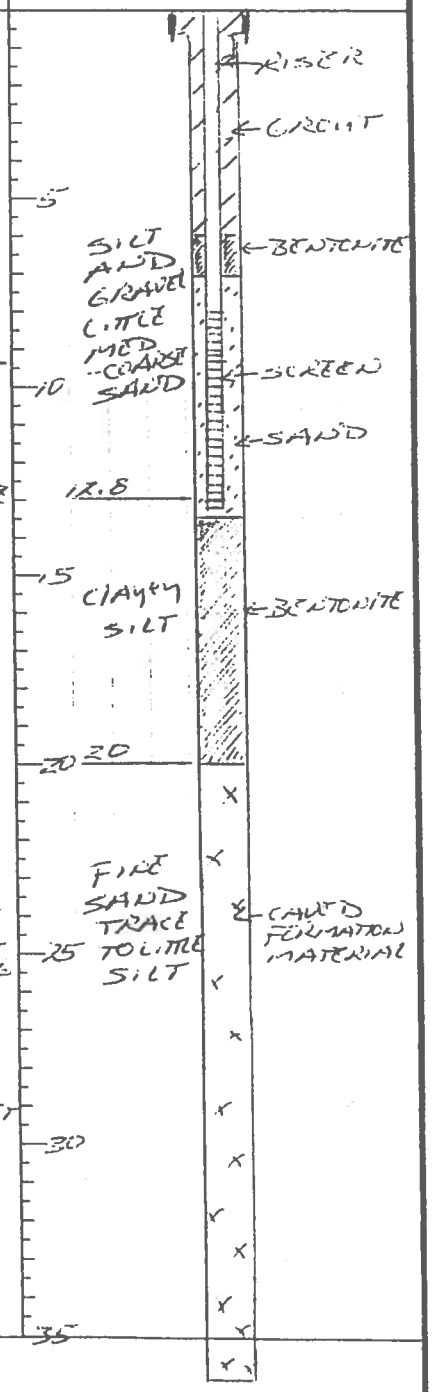
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 TO 6 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY _____
DEPTH INTERVAL 6 TO 7 FT
13.5 TO 20 FT THROUGH CASING

FILTER PACK
INSTALL. METHOD CASING
MATERIAL MORIE #0
QUANTITY _____
DEPTH INTERVAL 7 TO 13.5 FT

DEVELOPMENT
METHOD BAIL
TIME _____
PRODUCTION LOW

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (1-31-00): 9.27 FT TOC

FILE: \WELL-LOG

RADIAN INTERNATIONAL

TEST BORING GP-2D

PROJECT NAME ESSEX/HOPE
PROJECT NO 60401
LOCATION JAMESTOWN NY
GEOLOGIST RACHEL DUPUIS / KEITH DODRILL
BY KD
DRILLING CONTRACTOR SLC
DRILLER JERRY JONES
DATE 01-26-00
DRILLING METHOD GEOPROBE 2 1/4-IN DUAL TUBE
RIG TYPE SIMCO EARTH PROBE 200
CHK BY
DRILLING START DATE 01-26-00
DRILLING COMPLETION DATE 01-26-00
DATE
SURFACE ELEVATION
STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	12		0.5 CONCRETE DK BROWN MED STIFF CLAYEY SILT, SOME MEDIUM TO COARSE SAND AND GRAVEL (1/2 TO 1-IN) - MOIST	ML/CL		1.7 PPM		
5	SS-2	26		8.0 AS ABOVE - WET			3.2 PPM		
				8.5 BROWN TO TAN CLAYEY SILT MED STIFF TO STIFF - MOIST			3.7		
10	SS-3	41		GRAY TO GREEN STIFF CLAYEY SILT - MOIST 12.0 AS ABOVE, SOFT - SATURATED			0 PPM		
				12.8 GRAY TO GREEN STIFF CLAYEY SILT - MOIST			0		
	SS-4	36		14.4 GRAVEL (>2-IN)			0 PPM		
15				16.0			0		
	SS-5	32		GRAY MED STIFF SILT 16 TO 16.5 SATURATED 16.5 MOIST	ML		0 PPM		
20	SS-6	48		20.0 AS ABOVE, GRADES TO TRACE FINE SAND - MOIST			400 PPM		
				23.0 GRAY LOOSE TO MED DENSE FINE SAND, TRACE SILT SATURATED			400		
25	SS-7	48		25.0 AS ABOVE, LITTLE SILT			>1,000 PPM		
	SS-8	48		28.0 TO 29.5 AS ABOVE, TRACE SILT 29.5 TO 31.0 FINE SAND, LITTLE SILT - SATURATED	SP		53 PPM		
30				31.0 TO 32.0 M. DENSE FINE SAND TRACE SILT - WET					
	SS-9	0		32.0 NO RECOVERY, ADVANCEMENT DIFFICULT (DENSE FINE SAND) SAMPLE TUBE COLLAPSED ON DRIVE SHOE END.			N/A		
35									

ADDITIONAL REMARKS

FILE: \FORMATS\TE

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. GP-2D
HOLE NO. _____

BY KD
DATE 01-28-00
CHK BY _____
DATE _____

PROJECT NAME ESSEX/HOPIT
LOCATION SARATOGA NY
DRILLING CONTRACTOR SLC
DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE
DRILLING FLUID N/A
DRILLING START DATE 01-28-00

PROJECT NO. 604041
GEOLOGIST KEITH DOBILL
DRILLER JERRY JONES
RIG TYPE SIMCO EARTH PROBE 200
DRILLING COMPLETION DATE 01-28-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0-36 FT
_____	_____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 30 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 30 TO 34.6 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 34.6 TO 35

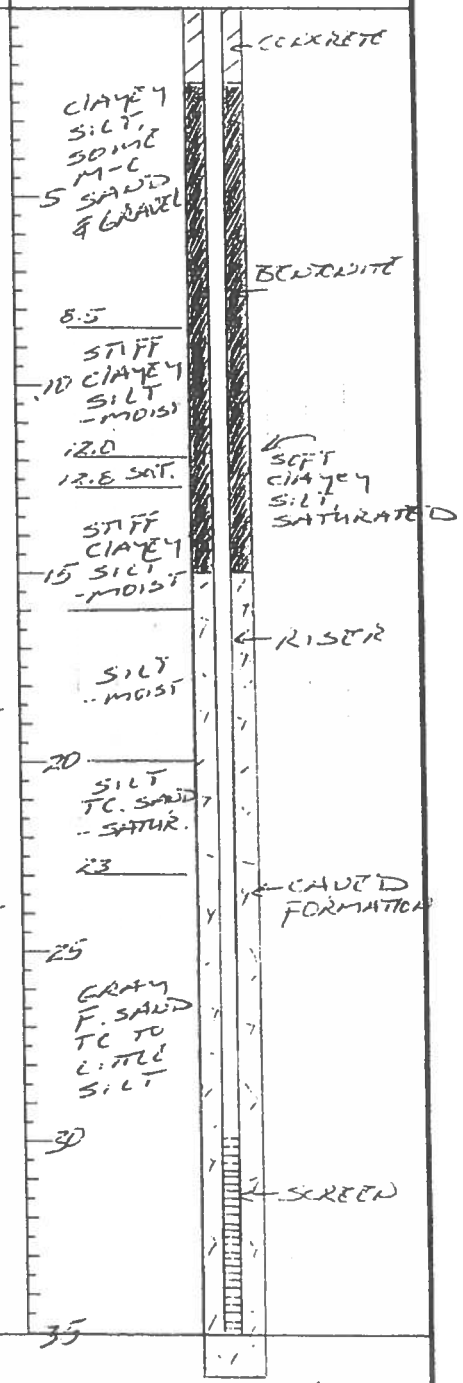
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 TO 2-FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY _____
DEPTH INTERVAL 2 TO 15 FT

FILTER PACK N/A
INSTALL. METHOD _____
MATERIAL FORMATION
QUANTITY _____
DEPTH INTERVAL _____

DEVELOPMENT
METHOD BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (1-31-00): 11.09 FT TOC

FILE: \WELL-LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. GP-23
HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 80740.11

BY KD — LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

DATE 01-28-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

CHK BY _____ — DRILLING METHOD GEOPROBE 2¼-IN DIA TUBE — RIG TYPE SIMCO EARTH PROBE 200

DATE _____ — DRILLING FLUID N/A

DRILLING START DATE 01-28-00 — DRILLING COMPLETION DATE 01-28-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2½-IN	0 TO 24-FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 12.6 TO 24.6 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 12.4 - 12.6

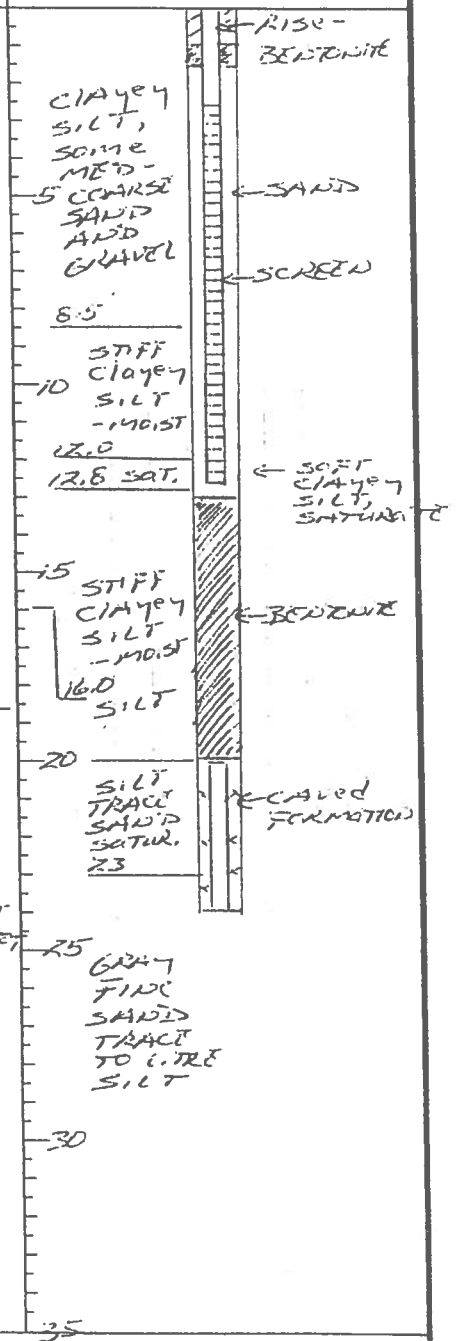
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 TO 1.0 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 1.0 TO 1.5 FT
13.0 TO 20.0 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL MORIE NO. 0
QUANTITY _____
DEPTH INTERVAL 1.5 TO 12.6

DEVELOPMENT
METHOD BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (1-31-00): 7.77 FT TOC

FILE: \WELL-LOG

RADIAN INTERNATIONAL

TEST BORING GP-3D

PROJECT NAME ESSEX/HOPE — PROJECT NO. 604041

LOCATION JAMESTOWN NY — GEOLOGIST RACHEL RUPPERT / KEITH DODRILL

BY KD — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

DATE 02-02-00 — DRILLING METHOD SIMCO EARTH PROBE 200 — RIG TYPE

CHK BY — DRILLING START DATE 01-31-00 — DRILLING COMPLETION DATE 02-02-00

DATE — SURFACE ELEVATION — STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	36		0.5 CONCRETE BROWN SILT AND MEDIUM TO COARSE SAND, SOME GRAVEL (½ TO >1-IN) - MOIST	SM		0 PPM		
5	SS-2	36					1.0 PPM		
	SS-3	36		8.0 BROWN MEDIUM TO COARSE SAND AND SILT, SOME GRAVEL (½ TO 1-IN) 11.0 AS ABOVE, SATURATED			55 PPM		
10				11.25 GRAY LOOSE MEDIUM TO COARSE SAND AND GRAVEL (½ TO >1-IN), SOME SILT - SATURATED			6		
	SS-4	30		14.25 BROWN CLAYEY SILT, STIFF-WET			51 PPM		
15				14.5 AS ABOVE, GRAY					
	SS-5	0			ML/CL		N/A		
20	SS-6	0					N/A		
				24.0					
25	SS-7	24		GRAY DENSE FINE SAND, LITTLE SILT - SATURATED			0 PPM		
	SS-8	48		27.5 AS ABOVE, SOME SILT, SATURATED	SP/SM		98 PPM		
30	SS-9	24		31.0 AS ABOVE, LITTLE SILT TO 36.0			0 PPM		
	SS-10	18					145 PPM		
35									

36

ADDITIONAL REMARKS

ABANDON GP-3S DRILLED ON 01-31-00 DUE TO NO GROUNDWATER YIELD (SCREEN BLOCKED) CLEAN OUT HOLE & ADVANCE TO 39-FT & INSTALL GP-3D ON 02-02-00

FILE: \FORMATS\TB

RADIAN INTERNATIONAL

TEST BORING GP-3D

PROJECT NAME ESSEX/HOPE
PROJECT NO. 804041
LOCATION JAMESTOWN NY
GEOLOGIST RACHEL RUPIPER / KEITH DODRILL
BY KD
DRILLING CONTRACTOR SLC
DRILLER JERRY JONES
DATE 02-02-00
DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE
RIG TYPE SIMCO EARTH PROBE 200
CHK BY
DRILLING START DATE 01-31-00
DRILLING COMPLETION DATE 02-02-00
DATE
SURFACE ELEVATION
STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
35	SS-11	27		GRAY DENSE FINE SAND, LITTLE SILT, SATURATED	SP		0 ppm		
40				39.0 REFUSAL (DENSE SAND)					

ADDITIONAL REMARKS

FILE: \FORMATS\TB

WELL COMPLETION LOG

RADIAN INTERNATIONAL
DCM GROUP — A DAMES & MOORE GROUP COMPANY

WELL NO. GP-3D
HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. E041041
BY KD — LOCATION JAMESTOWN, NY — GEOLOGIST KEITH DOERR
DATE 02-02-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES
CHK BY _____ — DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200
DATE _____ — DRILLING FLUID N/A
DRILLING START DATE 02-02-00 — DRILLING COMPLETION DATE 02-02-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0 TO 39 FT
_____	_____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5 FT
SURFACE PAD DIMENSIONS 8-IN DIA.

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 34 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 34 TO 38 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 38.8 TO 39 FT

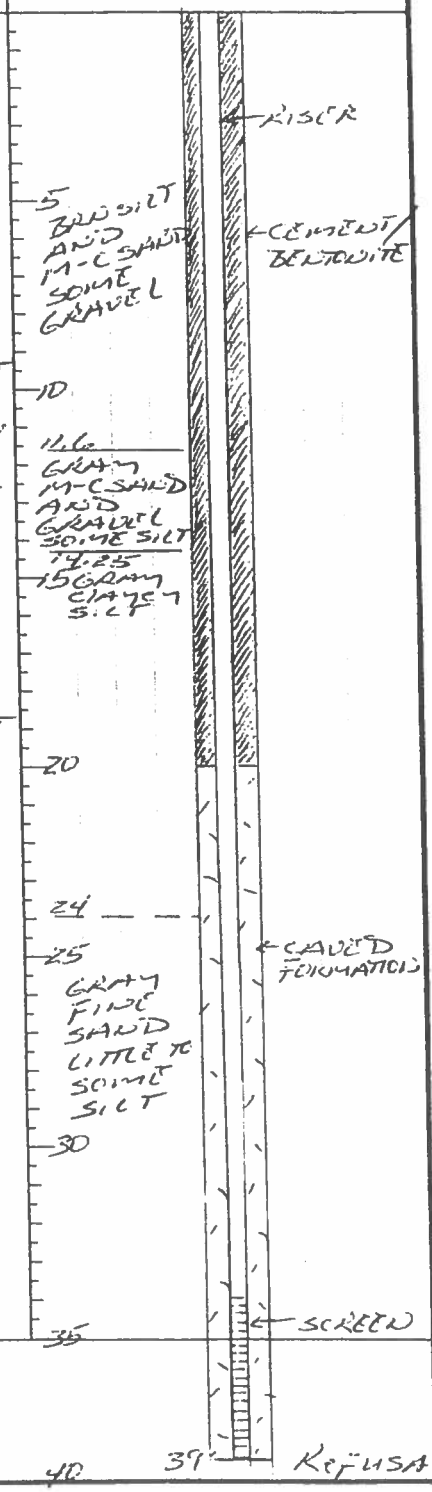
ANNULAR GROUT CASING/
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 TO 20 FT

ANNULAR SEAL N/A
INSTALL. METHOD _____
MATERIAL _____
QUANTITY _____
DEPTH INTERVAL _____

FILTER PACK N/A
INSTALL. METHOD _____
MATERIAL _____
QUANTITY _____
DEPTH INTERVAL _____

DEVELOPMENT
METHOD BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-3-00): 11.49 FT TOC

KEY USA

FILE: \WELL-LOG

WELL COMPLETION LOG

RADIAN INTERNATIONAL — A DAMES & MOORE GROUP COMPANY

PAGE OF

WELL NO. GP-35
HOLE NO.

PROJECT NAME ESSEX/HOPE — PROJECT NO. 804041

BY KD — LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

DATE 02-03-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

CHK BY — DRILLING METHOD Geoprobe 2-IN MACRO CORE — RIG TYPE SIMCO EARTH PROBE 200

DATE — DRILLING FLUID N/A

DRILLING START DATE 02-03-00 — DRILLING COMPLETION DATE 02-03-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV.
SURFACE PAD ELEV.
HOLE DEPTH
WELL DEPTH
WELL RISER (TOP)
PROTECTIVE CASING (TOP)

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2 1/4	0 TO 16 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM / PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL
DIAMETER
JOINT TYPE
DEPTH INTERVAL

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER Ø 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 4 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 4 TO 14 FT

BLANK CASING N/A
MATERIAL
DIAMETER
JOINT TYPE
DEPTH INTERVAL

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 13.8 TO 14.0

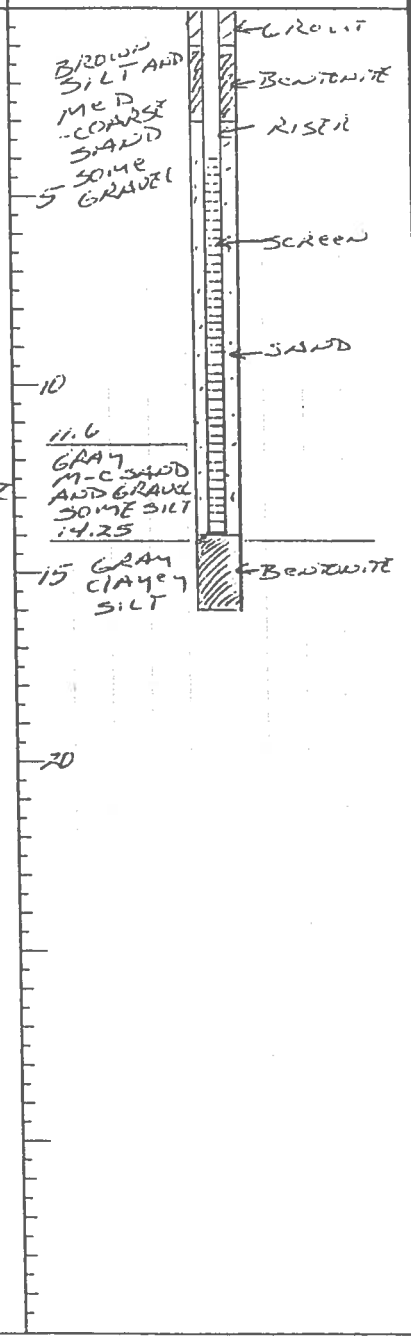
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS
QUANTITIES
DEPTH INTERVAL 0 TO 1 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR-BENTONITE
QUANTITY
DEPTH INTERVAL 1 TO 3 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL MORRIE NO. 1
QUANTITY
DEPTH INTERVAL 3 TO 14 FT

DEVELOPMENT
METHOD BAIL
TIME
PRODUCTION

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-3-00): 9.57 FT TOC

FILE: \WELL-LOG

RADIAN INTERNATIONAL

TEST BORING GP-4D

PROJECT NAME ESSEX/HOPE — PROJECT NO. 804041

LOCATION JAMESTOWN NY — GEOLOGIST RACHEL RUPISER / KEITH DODRILL

BY KD — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

DATE 02-02-00 — DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200

CHK BY ____ — DRILLING START DATE 02-02-00 — DRILLING COMPLETION DATE 02-02-00

DATE ____ — SURFACE ELEVATION ____ — STICK-UP ELEVATION ____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	24		FILL - BROWN MEDIUM SAND AND GRAVEL, TRACE SILT, MOIST			0 PPM		
				4.0 BROWN SILT, TRACE FINE SAND - MOIST					
5	SS-2	48		5.3 BROWN MEDIUM TO COARSE SAND AND GRAVEL, SOME SILT - DAMP	SM		0 PPM		
10	SS-3	28		10.6 AS ABOVE, SATURATED			0 PPM		
				11.3 TO 11.8 AS ABOVE, GREENISH GRAY					
15	SS-4	28		11.8 TO 15.8 BROWN SAND AND GRAVEL, SOME SILT - SATURATED			0 PPM		
				15.8 BROWN CLAY, SOME FINE SAND - WET					
	SS-5	0		16.0 TO 20.0 NO RECOVERY	CL		N/A		
20				20.0 GRAY FINE SAND, TRACE SILT - SATURATED (MED DENSE)					
	SS-6	48		23.25 AS ABOVE, DENSE, WET			0 PPM		
25	SS-7	48		24 TO 26 AS ABOVE, MED DENSE, WET			0 PPM		
				26 AS ABOVE, DENSE, WET	SP				
30	SS-8	48		32 AS ABOVE, SOME SILT			0 PPM		
	SS-9	48		34.5 TO 35.5 GRAY SILT, SOME FINE SAND	ML		0 PPM		
35									

ADDITIONAL REMARKS

ILE:\FORMATS\TB

RADIAN INTERNATIONAL

TEST BORING GP-4D

PROJECT NAME ESSEX/HOPE
PROJECT NO. 8040-11
LOCATION JAMESTOWN NY
GEOLOGIST RACHEL RUPPER / KEITH DODRILL
BY KD
DRILLING CONTRACTOR SLC
DRILLER JERRY JONES
DATE 02-02-00
DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE
RIG TYPE SIMCO EARTH PROBE 200
CHK BY
DRILLING START DATE 02-02-00
DRILLING COMPLETION DATE 02-02-00
DATE
SURFACE ELEVATION
STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
35	SS-10	24		GRAY SILTY FINE SAND, WET MED. DENSE	ML / SM		0		
	SS-11	24		GRAY FINE SAND, TRACE SILT WET - DENSE			0		
40	SS-12	24		GRAY LOOSE FINE TO MEDIUM SAND, GRADES TO FINE W/ DEPTH - SATURATED	SP		0		
	SS-13	24		40.0 GRAY FINE TO MEDIUM SAND			0		
				42.0 AS ABOVE, TRACE SILT					
45				44.0 CASING REFUSAL					

ADDITIONAL REMARKS

FILE: \FORMATS\TB

WELL COMPLETION LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

PAGE 1 OF 1

WELL NO. GP-4D
HOLE NO. _____

PROJECT NAME ESSEX/HOPE
PROJECT NO. 80410411

BY ILD
DATE 02-02-00
CHK BY _____
DATE _____

LOCATION JAMESTOWN NY
DRILLING CONTRACTOR SLC
DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE
DRILLING FLUID N/A
DRILLING START DATE 02-02-00

GEOLOGIST KEITH DORRILL
DRILLER JERRY JONES
RIG TYPE SIMCO EARTH PROBE 200
DRILLING COMPLETION DATE 02-02-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0 TO 44 FT
_____	_____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5 FT
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 39 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 39 TO 43.8 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 43.8 TO 44 FT

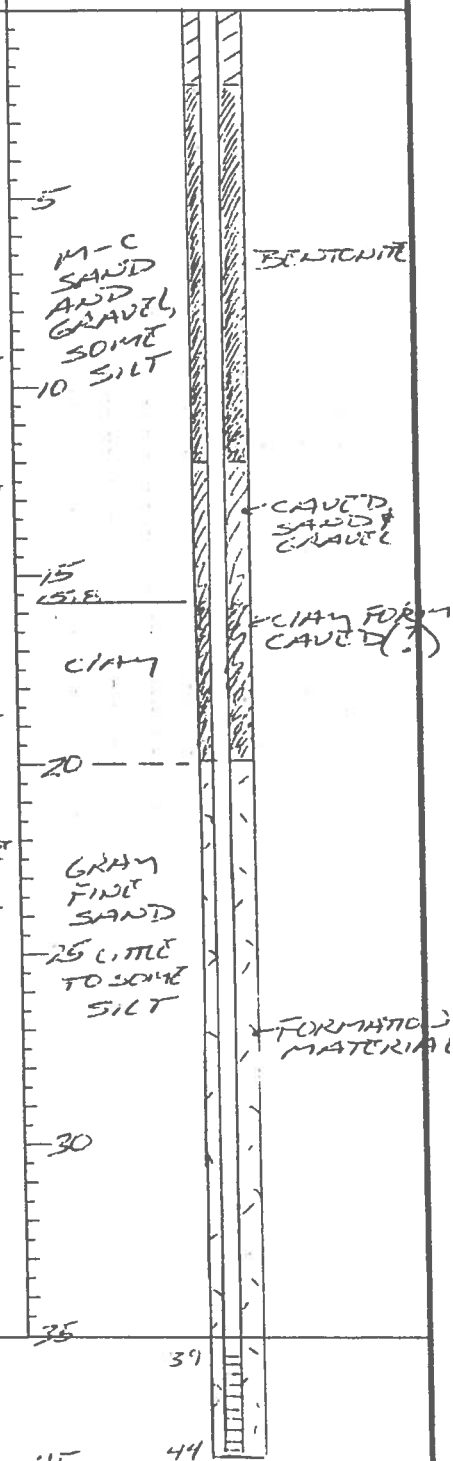
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 TO 2 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 2 TO 12 FT

FILTER PACK N/A
INSTALL. METHOD _____
MATERIAL _____
QUANTITY _____
DEPTH INTERVAL _____

DEVELOPMENT
METHOD BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-3-00): 10.31 FT TOC

FILE: \WELL-LOG

WELL COMPLETION LOG

RADIAN INTERNATIONAL
DCM GROUP — A DAMES & MOORE GROUP COMPANY

WELL NO. GP-45
HOLE NO. _____

PROJECT NAME Essex/Hope — PROJECT NO. 804041

BY KD — LOCATION Jamestown, NY — GEOLOGIST KEITH DODRILL
DATE 02-02-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES
CHK BY _____ — DRILLING METHOD Geoprobe 2-in — RIG TYPE Simco EARTH PROBE 200
DATE _____ — DRILLING FLUID N/A
DRILLING START DATE 02-02-00 — DRILLING COMPLETION DATE 02-02-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2½-IN	0 TO 16.0 FT

PROTECTIVE CASING
TYPE Flush Mount
MATERIAL Aluminum
DIAMETER 4-IN
DEPTH INTERVAL _____
SURFACE PAD DIMENSIONS 8-IN Diameter

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE Flush Thread
DEPTH INTERVAL 0 TO 10.8 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE Flush Thread
OPENINGS 0.01-IN
DEPTH INTERVAL 10.8 TO 15.8 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE Flush Thread
DEPTH INTERVAL 15.8 TO 16.0

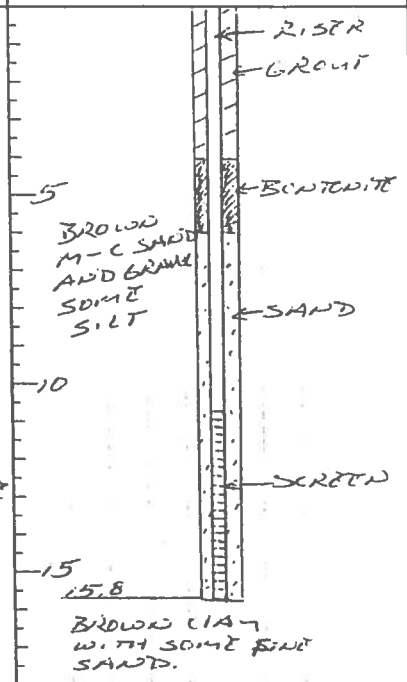
ANNULAR GROUT
INSTALL. METHOD Through Borehole
MATERIAL Cement Bentonite
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 TO 4 FT

ANNULAR SEAL
INSTALL. METHOD Through Casing
MATERIAL Bentonite (Granular)
QUANTITY _____
DEPTH INTERVAL 4 TO 6 FT

FILTER PACK
INSTALL. METHOD Through Casing
MATERIAL Morie #0
QUANTITY _____
DEPTH INTERVAL 6 TO 16

DEVELOPMENT
METHOD Bail
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-3-00): 8.61 FT TOC

FILE: \WELL-LOG

RADIAN INTERNATIONAL

TEST BORING GP-5D

PROJECT NAME ESSEX/HOPE — PROJECT NO. 604041

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

BY KD — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

DATE 02-07-00 — DRILLING METHOD GEOPROBE 2 1/4-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200

CHK BY ____ — DRILLING START DATE 02-07-00 — DRILLING COMPLETION DATE 02-07-00

DATE ____ — SURFACE ELEVATION ____ — STICK-UP ELEVATION ____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	45		BROWN MED. STIFF SILT SOME MEDIUM TO COARSE SAND AND GRAVEL (½-IN) -DAMP			0 PPM		
5	SS-2	30		BROWN MED. DENSE SILTY MEDIUM TO COARSE SAND AND GRAVEL (½ TO 1-IN) -MOIST			6.6 PPM		
				8.0 WET					
10	SS-3	44		10.8 SATURATED			616 PPM		
				BROWN MED TO COARSE SAND AND GRAVEL, LITTLE SILT-SAT (½ TO 1-IN) 12.0			110		
	SS-4	38		GRAY STIFF SILT - MOIST					
15				13.5 TO 14.2 GRAY FINE SANDY SILT, SATURATED			64 PPM		
				14.2 - 16 GRAY STIFF SILT - MOIST 16.0					
	SS-5	20		GRAY STIFF CLAY - WET			48 PPM		
20				20.4					
	SS-6	48		GRAY MED. DENSE SILTY FINE SAND - SATURATED			1465 PPM		
				24.0 AS ABOVE, DENSE					
25	SS-7	48		26.5 TO 28 SILT DECREASES WITH DEPTH ~ 35% - WET			457 PPM		
				28.0					
	SS-8	48		GRAY MEDIUM DENSE FINE SAND, SOME SILT SATURATED			106 PPM		
30									
	SS-9	48					14 PPM		
35									

ADDITIONAL REMARKS

FILE: \FORMATS\T

RADIAN INTERNATIONAL

TEST BORING GP-5D

PROJECT NAME ESSEX/HOPE PROJECT NO. 804041

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR SLC DRILLER JERRY JONES

DATE 02-07-00 DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE RIG TYPE SIMCO EARTH PROBE 300

CHK BY _____ DRILLING START DATE 02-07-00 DRILLING COMPLETION DATE 02-07-00

DATE _____ SURFACE ELEVATION _____ STICK-UP ELEVATION _____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
35	SS-10	48		GRAY MED. DENSE FINE SAND, SOME SILT - SATURATED			26 PPM		
40	SS-11	48		40.0 BROWN-GRAY FINE TO MED. SAND, TR SILT - SATURATED 40.6 GRAY MED STIFF SILT, TRACE FINE SAND - MOIST 42.3 TO 42.9 AS ABOVE, LIME SILT 42.9 TO 44 GRAY STIFF SILT, TR F. SAND - MOIST			3 / 1 PPM		
45				44.0 BASE OF BOREHOLE					

ADDITIONAL REMARKS

FILE: \FORMATS\

WELL COMPLETION LOG

RADIAN INTERNATIONAL — A DAMES & MOORE GROUP COMPANY

PAGE 1 OF 1

WELL NO. GP-5D
HOLE NO. ____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 80410-11

BY J.D — LOCATION JAMESTOWN ND — GEOLOGIST KEITH DODRILL
DATE 2-7-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES
CHK BY ____ — DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200
DATE ____ — DRILLING FLUID N/A
DRILLING START DATE 2-7-00 — DRILLING COMPLETION DATE 2-7-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ____
SURFACE PAD ELEV. ____
HOLE DEPTH ____
WELL DEPTH ____
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0 TO 44 FT
____	____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5 FT
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 36 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 36 TO 40.8 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 40.8 TO 41 FT

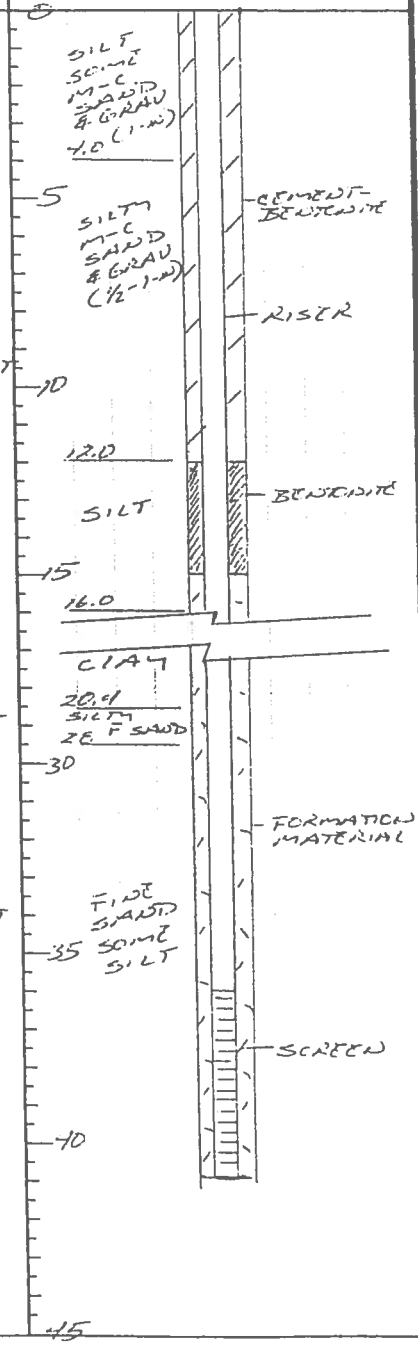
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENT.
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL 0 TO 12 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY ____
DEPTH INTERVAL 12 TO 15 FT

FILTER PACK N/A
INSTALL. METHOD ____
MATERIAL ____
QUANTITY ____
DEPTH INTERVAL ____

DEVELOPMENT
METHOD BAIL
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-8-00): 9.68 FT TOC

FILE: \WELL-LOG

WELL COMPLETION LOG

RADIAN INTERNATIONAL
DCM GROUP — A DAMES & MOORE GROUP COMPANY

WELL NO. GP-5S
HOLE NO. ____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 8040411

BY KD — LOCATION JAMESTOWN, NY — GEOLOGIST KEITH DODRILL
DATE 2-7-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES
CHK BY ____ — DRILLING METHOD GEOPROBE 2¼-IN DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200
DATE ____ — DRILLING FLUID N/A
DRILLING START DATE 2-7-00 — DRILLING COMPLETION DATE 2-7-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ____
SURFACE PAD ELEV. ____
HOLE DEPTH ____
WELL DEPTH ____
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼-IN	0 TO 12-FT
____	____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5-FT
SURFACE PAD DIMENSIONS 8-IN DIA

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 7-FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 7 TO 12 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 11.8 TO 12FT

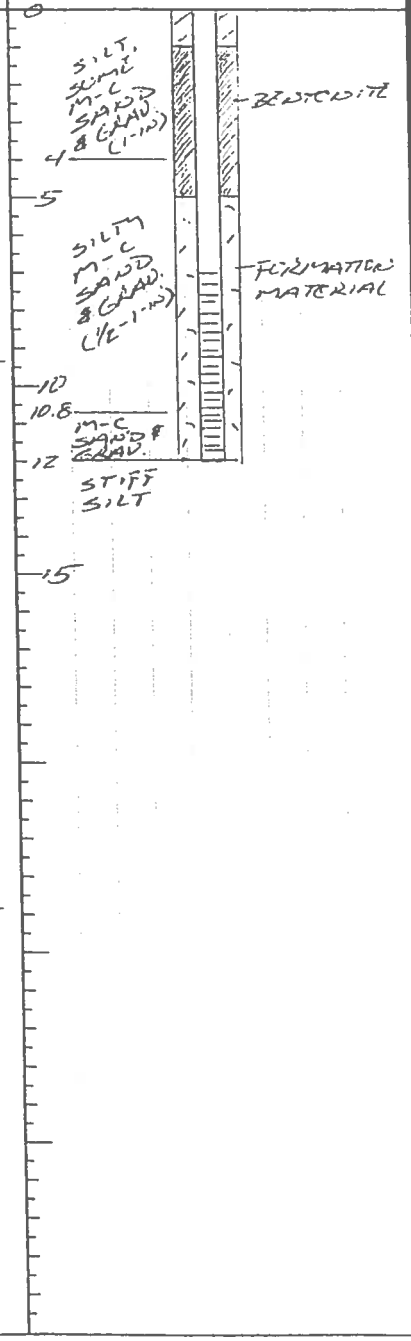
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENT
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL 0 TO 1 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY ____
DEPTH INTERVAL 1 TO 5-FT

FILTER PACK N/A
INSTALL. METHOD ____
MATERIAL ____
QUANTITY ____
DEPTH INTERVAL ____

DEVELOPMENT
METHOD BAIL
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-8-00): 8.60 FT TOC

FILE: \WELL-LOG

RADIAN INTERNATIONAL

TEST BORING GP-6

PROJECT NAME ESSEX/HOPE — PROJECT NO. 804041

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

BY KD — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

DATE 02-03-00 — DRILLING METHOD GEOPROBE 2¼-in DUAL TUBE — RIG TYPE SIMCO EARTH PROBE 200

CHK BY ____ — DRILLING START DATE 02-03-00 — DRILLING COMPLETION DATE 02-03-00

DATE ____ — SURFACE ELEVATION ____ — STICK-UP ELEVATION ____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	25							
5	SS-2	25		BROWN MEDIUM TO COARSE SAND AND GRAVEL, SOME SILT - MOIST	SM				
10	SS-3	27		11.5 AS ABOVE, SATURATED					
	SS-4	26							
15				16.0					
	SS-5	32		GRAY MED. STIFF CLAY, TRACE SILT, MOIST GRADES TO LITTLE SILT AT 19.5 FT	CL				
20				20.0					
	SS-6	48		GRAY SILTY FINE SAND, SATURATED					
25	SS-7	48			SM				
30	SS-8	48							
	SS-9	48							
35									

ADDITIONAL REMARKS

BORING LOCATION: BETWEEN MW-14S/14D AND MW-15S/15D WELL CLUSTERS. (CENTER OF PROPOSED DRW)

FILE: \FORMATS\T

RADIAN INTERNATIONAL

TEST BORING GP-6

PROJECT NAME ESSEX/HOPE PROJECT NO. 804041

LOCATION JAMESTOWN, NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR SLC DRILLER JERRY JONES

DATE 02-03-00 DRILLING METHOD GEOPROBE 2 1/4-IN DUAL TUBE RIG TYPE SIMCO EARTH PROBE 200

CHK BY _____ DRILLING START DATE 02-03-00 DRILLING COMPLETION DATE 02-03-00

DATE _____ SURFACE ELEVATION _____ STICK-UP ELEVATION _____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
35	SS-10	45		GRAY SILTY FINE SAND, SATURATED	SM				
40				40.1					
	SS-11	39		GRAY CLAY, TRACE SILT, WET	CL				
45				44.0 BASE OF BOREHOLE					

ADDITIONAL REMARKS

FILE: \FORMATS\TB

TEST BORING GP-7

PAGE 1 OF 1

RADIAN INTERNATIONAL

PROJECT NAME ESSEX/HOPE — PROJECT NO. 804041

LOCATION JAMESTOWN, NY — GEOLOGIST RACHEL RUPPE-KEITH DOOLITTLE

BY KD — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES

DATE 02-03-00 — DRILLING METHOD GEOPROBE, 2-IN MACROCORE, DUAL TUBE — SAMPLING TYPE SIMCO EARTH PROBE 200

CHK BY ____ — DRILLING START DATE 02-03-00 — DRILLING COMPLETION DATE 02-03-00

DATE ____ — SURFACE ELEVATION ____ — STICK-UP ELEVATION ____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
0	SS-1	40		BRICK FRAGMENT FILL			0 PPM		
				2.5					
5	SS-2	31		BROWN MEDIUM TO COARSE SAND AND GRAVEL (½ TO 1-IN), SOME SILT - MOIST	SM		0 PPM		
10	SS-3	28				▽ 11.5 02/03	0 PPM		
	SS-4	48		14.25					
15				GRAY MED. STIFF CLAY, TRACE SILT - MOIST	CL		0 PPM		
				16.0 BASE OF BOREHOLE					
20									

ADDITIONAL REMARKS

FILE: \FORMATS\TB

RADIAN INTERNATIONAL
DCM GROUP — A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. GP-7
HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 80410411
BY KD — LOCATION JAMESTOWN, NY — GEOLOGIST KEITH DODRILL
DATE 2-3-00 — DRILLING CONTRACTOR SLC — DRILLER JERRY JONES
CHK BY _____ — DRILLING METHOD GEOPROBE 2 1/4-IN DIAM TUBE — RIG TYPE SIMCO EARTH PROBE 200
DATE _____ — DRILLING FLUID N/A
DRILLING START DATE 02-03-00 — DRILLING COMPLETION DATE 02-03-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2 1/4-IN	0 TO 16

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ALUMINUM/PVC
DIAMETER 4-IN
DEPTH INTERVAL 0 TO 0.5 FT
SURFACE PAD DIMENSIONS _____

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 TO 9 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 9 TO 14.8 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 14.8 TO 15 FT

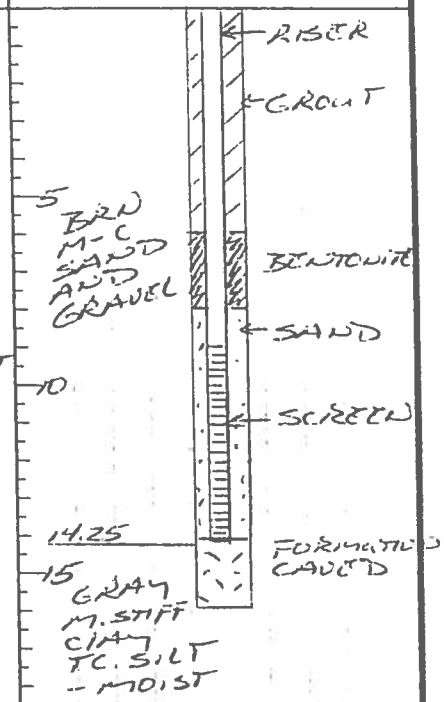
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT/BENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 1 TO 6 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 6 TO 8 FT

FILTER PACK KD
INSTALL. METHOD BOREHOLE
MATERIAL MORIE #0
QUANTITY _____
DEPTH INTERVAL 8 TO 14 FT

DEVELOPMENT
METHOD _____
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
DEPTH TO WATER (2-8-00): 10.90 FT TOC

FILE: \WELL-LOG

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING HW-4 PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER 2" Split Spoon	LOCATION: 5' South of Sump
PROJECT LOCATION: Jamestown, New York	HAMMER: 140 lbs.	START DATE: 3/26/92 END DATE: 3/27/92
FILE NO.: 2576.011.220	FALL: 30"	
BORING COMPANY: Buffalo Drilling FOREMAN: Larry Schroeder OBG GEOLOGIST: OBG oversight by John Mason		LEGEND: Grout, Sand Pack, Pellets, Scre, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTI PID	FIELD TESTI HEA SPA
0	1	0-2		2'/1'		Damp, black, medium SAND, some gravel, trace slag				
1										
2	2	2-4	7-12-18-21	2'/0.25'	30	Rock (probably sandstone)				
3										
4	3	4-6	7-10-12-14	2'/0	22	No recovery (Augering gravel)				
5										
6	4	6-8		2'/0		No recovery (Augering gravel) Wet				
7										
8	5	8-10	10-12-14-18	2'/1'	26	Wet, light to medium brown, medium SAND and GRAVEL, trace black oily layer				
9										
10	6	10-12		2'/0.25'		Same as above to light gray, laminated, clayey SILT				
11										
12	7	12-14		2'/2'		Same as above to Wet, light gray, very fine to fine SAND	13.5'			
13										
14	8	14-16		2'/2'		Same as above				
15										
16	9	16-18		2'/2'		Same as above				
17										
18	10	18-20		2'/2'		Same as above				
19										
20						Bottom of boring 20 ft.				

- 10 slot 2" PVC well screen
- Morie #NOO sand
- Flush mount

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING HW-5 PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, New York	HAMMER: 140 lbs.	START DATE: 3/31/92 END DATE: 3/31/92
FILE NO.: 2576.011.220	FALL: 30"	
BORING COMPANY: Buffalo Drilling FOREMAN: Larry Schroeder OBG GEOLOGIST: OBG oversight by John Mason		LEGEND: Grout, Sand Pack, Pellets, Scre, Rise

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION
0	1	0–2	6-2-2-3	2'/0.5'	4	Damp, black to brown, fine to coarse SAND, some silt and fine gravel, trace clay (fill)
1						
2	2	2–4	3-5-4-1	2'/0.15'	9	Same as above
3						
4	3	4–6	1-2-1-4	2'/0.5'	3	Damp to moist, black fine to medium SAND and fine to medium GRAVEL, some to little silt and very fine sand, trace cinder
5						
6	4	6–8	3-10-13-7	2'/1'	23	Moist to wet, same as above, no cinders
7						
8	5	8–10	9-5-4-5	2'/1'	9	Same as above, wet
9						
10	6	10–12	22-22-17-14	2'/1.5'	39	Wet, brown to light gray, fine to medium GRAVEL, some fine to coarse sand, little silt
11						
12	7	12–14	8-8-12-17	2'/2'	20	Wet, light gray, very fine SAND and SILT, some clay (laminated)
13						
14	8	14–16	6-8-7-13	2'/2'	15	Same as above
15						
16	9	16–18	5-12-14-18	2'/2'	26	Same as above, vaguely laminated
17						
18	10	18–20	3-7-9-11	2'/1.5'	16	Same as above
19						
20						Bottom of boring 20.0 ft.

STRATUM CHANGE GENERAL DESCRIPT

EQUIPMENT INSTALLED

FIELD TESTI: PID, HEA SPA

- 10 slot, 2" PVC well screen
- Morie #NOO sand
- Stick up

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING HW-6
		PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION: 25' South of MW-3
PROJECT LOCATION: Jamestown, New York	HAMMER: 140 lbs.	START DATE: 3/2/92
		END DATE: 3/2/92
FILE NO.: 2576.011.220	FALL: 30"	
BORING COMPANY: Buffalo Drilling		LEGEND: Grout, Sand Pack, Pellets, Scree, Riser
FOREMAN: Larry Schroeder		
OBG GEOLOGIST: OBG oversight by John Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTI PID	FIELD TESTI HEA SPAC
0	1	0-2	2-3-5-5	2'/0	8	No recovery				
1										
2	2	2-4	2-3-3-7	2'/1'	6	Damp to moist, dark brown to bleak, fine to coarse SAND, some silt, little clay				
3										
4	3	4-6	12-12-14-16	2'/1'	26	Same as above, some gravel				
5										
6	4	6-8	———	2'/1'	—	Wet, medium brown, medium SAND and GRAVEL, some silt to fine sand				
7										
8	5	8-10	6-7-14-13	2'/1'	21	Wet, light gray, medium to coarse SAND and GRAVEL				
9										
10	6	10-12	10-12-10-12	2'/1'	22	Same as above				
11										
12	7	12-14	5-7-8-12	2'/1'	15	Same as above, to wet, light gray, laminated clayey silt				
13										
14	8	14-16	8-10-11-11	2'/1'	21	Same as above, trace to little very fine sand				
15										
16	9	16-18	7-6-8-11	2'/1.5'	14	Wet, light gray, laminated, clayey SILT, lense of very fine sand				
17										
18	10	18-20		2'/2'		Same as above		HOLE CAVED		
19										
20						Bottom of boring 20.0 ft.				

– 10 slot 2" PVC well screen
– Morie #NOO sand
– Stick up

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING HW-7
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	PAGE 1 OF 1 LOCATION:
PROJECT LOCATION: Jamestown, New York	HAMMER: 140 lbs.	START DATE: 3/31/92
FILE NO.: 2576.011.220	FALL: 30"	END DATE: 3/31/92

BORING COMPANY: Buffalo Drilling
FOREMAN: Larry Schroeder
OBG GEOLOGIST: OBG oversight by John Mason

LEGEND: Grout; Sand Pack; Pellets; == Scre; Ree

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTI PID	FIELD TESTI HEA SPA
0	1	0–2	13–11–	2'/1.5'	24	Dry, light brown to gray, fine to medium SAND, some fine to medium, angular gravel, little silt				
			13–7							
1										
2	2	2–4	4–3–2–2	2'/0.5'	5	Dry to damp, light gray to green gray, very fine to fine SAND, some silt, trace to little gravel				
3										
4	3	4–6	2–2–2–1	2'/0.25'	4	Damp to moist, light gray to green gray, fine to medium SAND, some silt, little fine gravel, trace coarse sand				
5										
6	4	6–8	WOH–2–2–3	2'/0.5'	4	Wet, green gray to black, fine to medium SAND and fine GRAVEL, little silt				
7										
8	5	8–10	5–7–6–7	2'/1'	13	Same as above, fine to medium GRAVEL, strong petroleum odor				
9										
10	6	10–12	6–10–11–6	2'/1'	21	Wet, green to gray, medium SAND and fine to medium GRAVEL, little fine sand, petroleum odor				
11										
12	7	12–14	7–9–18–20	2'/1'	27	Same as above to Light gray, clayey SILT, laminated, trace rounded gravel	12.8'			
13										
14	8	14–16	7–13–	2'/1.5'	30	Same as above, 0.3' sandy gravel lense at top				
			17–17							
15										
16	9	16–18	5–6–9–11	2'/1.5'	15	Same as above, 5 – 1" layers of sandy gravel				
17										
18	10	18–20	5–9–14–18	2'/1.5'	23	Same as above				
19										
20						Bottom of boring 20.0 ft.				

– 10 slot, 2" PVC well screen
– Morie #NOO sand
– Stick up

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING HW-8 PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, New York	HAMMER: 140 lbs.	START DATE: END DATE:
FILE NO.: 2576.011.220	FALL: 30"	
BORING COMPANY: Buffalo Drilling FOREMAN: Larry Schroeder OBG GEOLOGIST: OBG oversight by John Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HEAD-SPACE
0	1	0-2	4-30-	2'/1'	52	Dry, light brown, fine to medium SAND and GRAVEL, some silt				
			22-11							
1										
2	2	2-4	3-3-8-9	2'/1'	11	Dry to damp, light brown to gray, fine SAND, some silt and very fine sand, trace gravel				
3										
4	3	4-6	8-20-	2'/1'	46	Same as above, little gravel, damp to wet				
			26-19							
5										
6	4	6-8	13-17-	2'/1.5'	40	Same as above, wet, little to some gravel, petroleum odor				
			23-23							
7										
8	5	8-10	14-26-	2'/1'	61	Wet, green to gray, medium SAND and fine to medium GRAVEL, little to some silt, sheen and petroleum odor noted				
			35-41							
9										
10	6	10-12	9-10-	2'/0.5'	21	Same as above				
			11-11							
11										
12	7	12-14	9-6-4-6	2'/1'	10	Same as above to light gray clayey SILT at bottom of spoon				
13										
14	8	14-16	3-8-10-12	2'/1'	18	Wet, light gray, laminated clayey SILT, trace fine rounded gravel				
15										
16	9	16-18	7-10-	2'/1.5'	21	Same as above, 1" thick lenses of medium to coarse sand				
			11-14							
17										
18						Bottom of boring 18.0 ft.				
19										
20										

- 10 slot, 2" PVC well screen
- Morie #NOO sand
- Stick up

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING HW-9 PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER 2" Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, New York	HAMMER: 140 lbs.	START DATE: 4/1/92 END DATE: 4/1/92
FILE NO.: 2576.011.220	FALL: 30"	
BORING COMPANY: Buffalo Drilling FOREMAN: Larry Schroeder OBG GEOLOGIST: OBG oversight by John Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HEAD-SPACE
0	1	0-2'	2-4-2-2	2'/1'	6	Dry to damp, brown to black, medium SAND, some fine to medium gravel, little silt to fine sand, trace cinders				
1										
2	2	2-4'	6-10-	2'/1.5'	29	Dry, light brown, fine to medium SAND, some fine to medium gravel, little silt				
			19-25							
3										
4	3	4-6'	17-23-	2'/1'	46	Same as above, dry to damp, augering through large gravel				
			23-17							
5										
6	4	6-8'	13-16-	2'/1.5'	34	Same as above, wet				
			18-22							
7										
8	5	8-10'	12-16-	2'/1.5'	31	Same as above, augering easier, light gray				
			15-19							
9										
10	6	10-12'	12-16-	2'/1.5'	30	Same as above				
			14-32							
11										
12	7	12-14'	15-27-	2'/1'	51	Same as above				
			24-27							
13										
14	8	14-16'	20-39-	2'/1'	85	Same as above				
			46-25							
15										
16	9	16-18'	7-12-	2'/1.5'	29	Light gray, laminated clayey SILT, trace fine to medium round gravel				
			17-26							
17										
18						Bottom of boring 18.0 ft.				
19										
20										

- 10 slot, 2" PVC well screen
- Morie #NOO sand
- Stick up

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING HW-10
PAGE 1 OF 1

CLIENT: Essex Specialty Products
SAMPLER: 2" Split Spoon
LOCATION:

PROJECT LOCATION: Jamestown, New York
HAMMER: 140 lbs.
START DATE: 3/30/92

FILE NO.: 2576.011.220
FALL: 30"
END DATE: 3/30/92

BORING COMPANY: Buffalo Drilling
FOREMAN: Larry Schroeder
OBG GEOLOGIST: OBG oversight by John Mason

LEGEND: Grout, Sand Pack, Pellets, Scree, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION
0	1	0–2	13–21–	2'/0.1'	34	Damp to moist, light to medium brown, medium SAND, some fine to coarse sand, little fine gravel
			13–8			
1						
2	2	2–4	3–5–3–10	2'/1'	8	Damp to moist, light brown to light gray, very fine to fine SAND, some silt, little to trace clay
3						
4	3	4–6	10–20–	2'/1'	39	Same as above, moist, little fine to medium gravel
			19–14			
5						
6	4	6–8	7–12–	2'/1'	36	Moist to wet, light to medium gray, fine to medium SAND, some fine to medium gravel, trace silt to very fine sand
			24–19			
7						
8	5	8–10	12–14–	2'/1'	24	Same as above, wet, strong petroleum odor
			10–10			
9						
10	6	10–12	9–9–7–8	2'/1'	16	Wet, light gray, medium SAND and fine to medium GRAVEL, strong odor
11						
12	7	12–14	11–16–	2'/0.5'	33	Same as above
			17–10			
13						
14	8	14–16	7–6–5–2	2'/1'	11	Same to wet, light to medium gray, very fine to fine SAND
15						
16	9	16–18	WOH–2–3–3	2'/1'	5	Wet, light gray, medium SAND and fine to medium GRAVEL, strong odor
17						
18						Bottom of boring 18.0 ft.
19						
20						

STRATUM CHANGE GENERAL DESCRIPT

EQUIPMENT INSTALLED

FIELD TESTI

PID

HEA SPA

- 10 slot, 2" PVC well screen
- Morie #NOO sand
- Stick up

LOCATION MAP

ERM—MIDWEST WELL LOG

page 1 of 1

BORE NUMBER ▶ SB-1/MW-1	LOCATION ▶ SOUTH OF TANK FARM
DATE ▶ 4-14-87	WEATHER ▶ SUNNY & COOL
LOGGED BY ▶ R. DOWNEY	DRILLED BY ▶ EMPIRE SOILS INVESTIGATIONS
DRILLING METHOD ▶ HOLLOW STEM AUGER	SAMPLING METHOD ▶ SPLIT SPOON
GRAVEL PACK ▶ 19.5 - 10.0'	SEAL ▶ 10.0 - 8.0'

ELEVATION ▶ 1279.58 GROUND
1281.89 RISER
1282.08 COVER

CASING ▶ TYPE STAINLESS STEEL DIAMETER 2" LENGTH 15'

SCREEN ▶ TYPE STAINLESS STEEL SLOT 10 DIAMETER 2" LENGTH 5'

HOLE DIA 2 1/4" & 4 1/4"

TOTAL DEPTH 14.0'

MOISTURE CONTENT	STRATA	DENSITY	PLASTICITY	SAMPLE NO.	HNU (ppm)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE	LITHOLOGY / REMARKS	GRAPHIC LOG
						0				
								3	FILL	
						1		5		
								3		
					0	2		3		
								5		
						3		10		
					0			10	BROWN - GREY SANDY LOAM w/ SOME GRAVEL	
						4		12		
								12		
						5		24		
								28		
					0	6		22		
								12		
						7		13		
								12		
					0	8		18		
								11		
						9		10		
								9		
					0	10		6		
								3	BROWN GRAVELLY LOAM	
						11		5		
								8		
					0	12		12		
								8		
						13		10		
								12		
					0	14		15		
								8		
						15		7		
								14		
					0	16		35	GREY WET COARSE ANGULAR GRAVEL	
						17			BTH 16.0'	
						18			WATER @ 10'8" UPON COMPLETION	
						19				
						20				

LOCATION MAP

ERM–MIDWEST WELL LOG

BORE NUMBER ▶ SB-6/MW-2 | LOCATION ▶ FORMER TANK FARM AREA

DATE ▶ 4-18-89 | WEATHER ▶ CLOUDY & COOL

LOGGED BY ▶ R. DOWNEY | DRILLED BY ▶ EMPIRE SOIL INVESTIGATIONS

DRILLING METHOD ▶ HOLLOW STEM AUGER | SAMPLING METHOD ▶ SPLIT SPOON

ELEVATION ▶ 1281.35 RISER, 1281.45 GROUND | GRAVEL PACK ▶ 14.79 - 8.0' | SEAL ▶ 8.0 - 6.5'

CASING ▶ TYPE STAINLESS STEEL | DIAMETER 2" | LENGTH 10' | HOLE DIA 4¼"

SCREEN ▶ TYPE STAINLESS STEEL SLOT 10 | DIAMETER 2" | LENGTH 5' | TOTAL DEPTH 14.0'

MOISTURE CONTENT	SOIL ODOR	DENSITY	PLASTICITY	SAMPLE NO.	PID (ppm)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE	LITHOLOGY / REMARKS	GRAPHIC LOG
						0				
						1		8	BROWN F-C SAND W/SOME GRAVEL	
								12		
								9		
					0			5		
								4	GREY-BROWN SANDY LOAM	
						3		4		
								6		
					2	4		8		
								4		
						5		4		
								5		
					150	6		5		
								8		
						7		10		
								14		
					300	8		17		
								5		
						9		10		
								10		
					320	10		11		
								7		
						11		10	GREY MOIST GRAVELLY LOAM	
								10		
					---	12		10		
								5		
						13		7		
								10		
					---	14		14		
								8		
						15		5		
								8		
					---	16		3	GREY WET FINE SAND	
						17			BTH 16.0'	
						18			WATER @ 9.0' DURING DRILLING	
						19			SOLVENT ODOR @ 9.0'	
						20				

LOCATION MAP

ERM–MIDWEST WELL LOG

BORE NUMBER ▶ SB-7/MW-3	LOCATION ▶ NORTH PARKING LOT
DATE ▶ 4-18-89	WEATHER ▶ CLOUDY & COOL
LOGGED BY ▶ R. DOWNEY	DRILLED BY ▶ EMPIRE SOIL INVESTIGATIONS
DRILLING METHOD ▶ HOLLOW STEM AUGER	SAMPLING METHOD ▶ SPLIT SPOON
GRAVEL PACK ▶ 19.0 - 10.0'	SEAL ▶ 10.0 - 8.0'

ELEVATION ▶ 1282.00 COVER
1281.83 RISER
1279.34 GROUND

CASING ▶ TYPE STAINLESS STEEL DIAMETER 2" LENGTH 16' HOLE DIA 4¼"

SCREEN ▶ TYPE STAINLESS STEEL SLOT 10 DIAMETER 2" LENGTH 5' TOTAL DEPTH 19.0'

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	HNU (ppm)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE	LITHOLOGY / REMARKS	GRAPHIC LOG
						0				
						1		8	BROWN F-C SAND W/ SOME GRAVEL	
						2		8		
								4		
						3		4		
								3		
						4		6		
								6		
						5		3		
								4		
						6		7		
								12	BROWN-GREY GRAVELLY LOAM	
						7		5		
								5		
						8		8		
								8		
						9		5		
								8		
						10		10		
								12	GREY WET COARSE ANGULAR GRAVEL	
						11		12		
								17		
								100/0"		
						12			BROWN-GREY WET FINE SAND	
						13				
						14				
						15				
						16			GREY WET COARSE ANGULAR GRAVEL	
						17				
						18				
						19				
						20			BTH 19.0'	

DRAFT

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-3D PAGE 1 OF 3
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION: ~10 ft. South of Sump
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 2/9/93 END DATE: 2/10/93
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Doug Richmond OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, Sc, Ri

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TEST PID
0	1	0–2	2–21–5–4	1.5'/1'	26	Dry, medium brown to black SILT to medium SAND, little gravel, trace cinders			7
1									
2	2	2–4	4–3–2–8	2'/0.5'	5	Damp, black to dark brown, medium SAND, some medium to fine gravel, trace cinders			2
3									
4	3	4–6	9–11–12–11	2'/1.5'	23	Moist, medium brown, medium to coarse SAND, some fine to medium gravel, little silt			1
5									
6	4	6–8	11–8–8–8	2'/0.5'	16	Moist to wet, medium brown to green gray, medium to coarse SAND, some fine gravel, little silt and medium gravel			1
7									
8	5	8–10	4–7–8–5	2'/1'	15	Wet, same as above			25
9									
10	6	10–12	5–8–5–6	2'/2'	13	Wet, same as above – black, oily layers noted, changes to wet, green gray, clayey SILT (vague laminations) at 11.9 ft.			400
11									
12	7	12–14	9–11–9–14	2'/1'	20	Wet, light gray, very fine to fine SAND, trace silt, slight brown oily patches noted in spoon			350
13									
14	8	14–16	9–10–9–9	2'/2'	19	Wet, same as above			350
15									
16	9	16–18	10–13–21–24	2'/2'	34	Wet, same as above			400
17									
18	10	18–20	6–10–8–8	2'/2'	18	Wet, same as above			400
19									

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O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-3D
PAGE 2 OF 3

CLIENT: Essex Specialty Products
PROJECT LOCATION: Jamestown, NY
FILE NO.: 2576.010

SAMPLER: 2" Split Spoon
HAMMER: 140 lbs.
FALL: 30"

LOCATION: ~10 ft. South of Sump
START DATE: 2/9/93
END DATE: 2/10/93

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Doug Richmond
OBG GEOLOGIST: John M. Mason

LEGEND: Grout; Sand Pack; Pellets; Sc; Ri

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TEST PID
20	11	20–22	WOR–4–	2'/2'	11	Wet, same as above – laminated, very fine			120
			7–10			sand and silt at 21.9 ft.			
21									
22	12	22–24	10–12–	2'/2'	24	Wet, light gray, very fine to fine			60
			12–13			SAND, little silt			
23									
24	13	24–26	WOR–4–	2'/2'	11	Same as above			25
			7–11						
25									
26	14	26–28	8–9–	2'/2'	19	Same as above			25
			10–11						
27									
28	15	28–30	WOR–4–	2'/2'	9	Same as above, trace laminated silt			5
			5–6						
29									
30	16	30–32	3–3–9–12	2'/2'	12	Same as above, trace laminated silt			5
31									
32	17	32–34	5–9–	2'/2'	23	Same as above, trace laminated silt			4
			14–13						
33									
34	18	34–36	WOR–WOR–	2'/2'	—	Same as above, trace medium sand at bottom			2
			WOH–3			of spoon			
35									
36	19	36–38	6–10–	2'/1'	23	Wet, light to medium gray, fine to medium			1
			13–15			SAND, trace fine gravel			
37									
38	20	38–40	6–9–	2'/2'	20	Same as above			1
			11–12						
39									

WOR – weight of rods
WOH – weight of hammer

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O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-3D
PAGE 3 OF 3

CLIENT: Essex Specialty Products
PROJECT LOCATION: Jamestown, NY
FILE NO.: 2576.010

SAMPLER: 2" Split Spoon
HAMMER: 140 lbs.
FALL: 30"

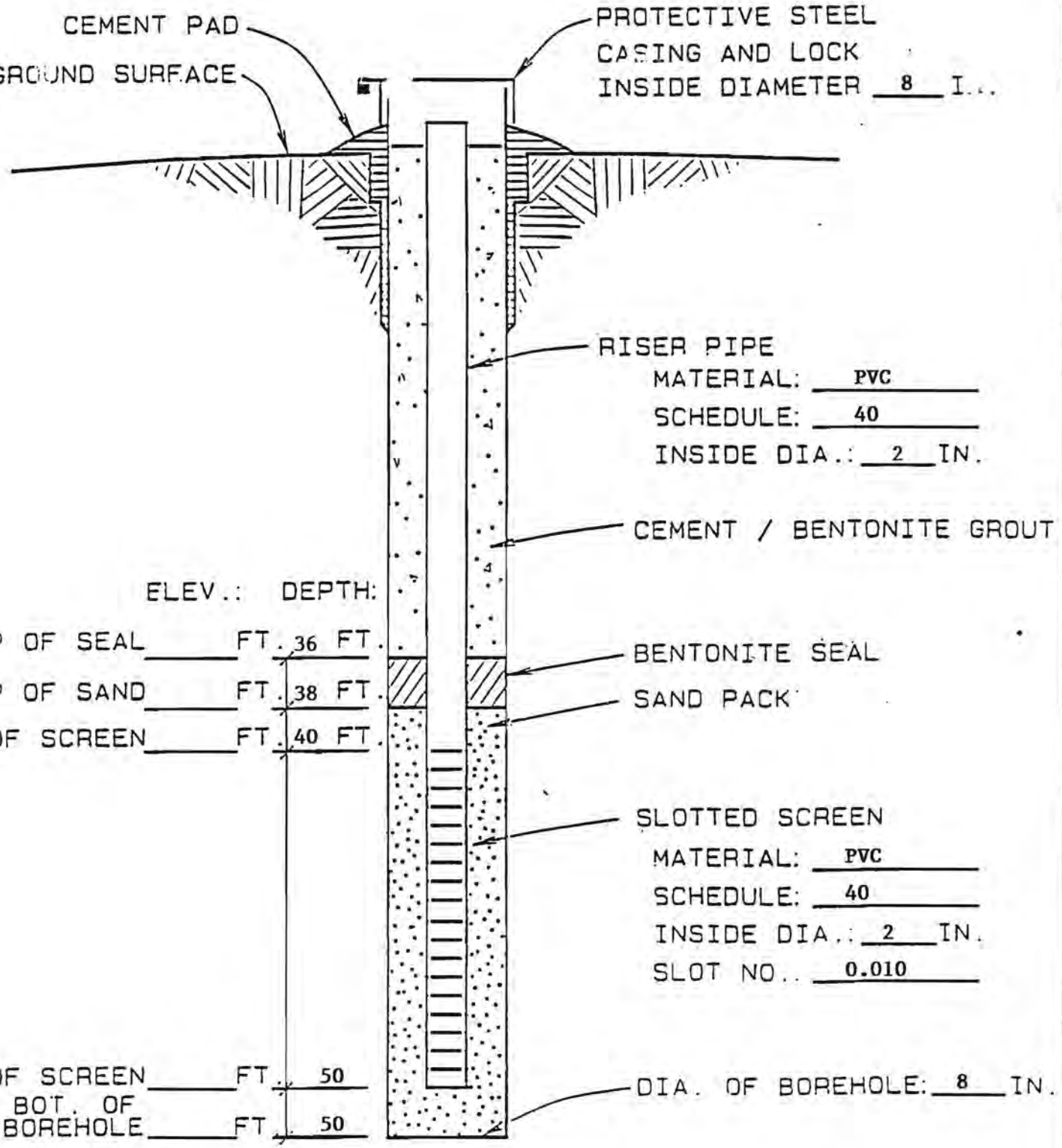
LOCATION: ~10 ft. South of Sump
START DATE: 2/9/93
END DATE: 2/10/93

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Doug Richmond
OBG GEOLOGIST: John M. Mason

LEGEND: Grout; Sand Pack; Pellets; Sc; Ri

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TEST PID
40	21	40–42	6–12–	2'/1.5'	26	Wet, light to medium gray, fine to medium			1
			14–11			SAND, trace fine gravel			
41									
42	22	42–44	13–15–	2'/1.5'	34	Wet, light to medium gray, fine SAND,			0
			19–21			some to little medium sand, trace very fine			
43						sand and silt			
44	23	44–46	19–21–	2'/1.5'	29	Same as above, little medium and very fine			0
			8–12			sand			
45									
46	24	46–48	12–16–	2'/1.5'	37	Same as above			0
			21–14						
47									
48	25	48–50	5–9–	2'/1'	20	Dry, light gray, clayey SILT, laminated,			0
			11–11			trace fine gravel			
49									
50						Bottom of boring 50 ft.			
51									
52									
53									
54									
55									
56									
57									
58									
59									

PRIVILEGED and CONFIDENTIAL



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Essex Specialty Products
Jamestown, NY
MW-3D

Environmental Resources Management

Drilling Log

Project: Essex Specialties Prod. Owner:

Location: Jamestown, NY W.O. Number:

Well Number: MW-4 Total Depth: Diameter:

Surface Elevation: Water Level: Initial: 10.5' 24-hrs:

Screen: Dia. 2 in Length: 5 ft Slot Size:

Casing: Dia. 2 in Length: Type: Stainless Steel

Drilling Company: Empire Soils Drilling Method: 4 1/4 in - HSA

Driller: Ken Fuller Log By: Glenn Wygant Date Drilled: 3/22/89

Sketch Map

Notes: GRND = 1281.46

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)
0				ASPHALT 0.3 ft
1				FILL 0.9 ft
2				Brown c f GRAVEL, some c-f Sand; little Silt; dry (observed in sides of hole)
3				
4				
5		Grout	S-1	Greyish Brown f GRAVEL, little (+) c-m-f Sand, little Clay & Silt; moist; 18 in Recovery; 7-14-17-20.
6				
7				
8				
9				
10				
11			S-2	SAME; wet (10.5 ft); 21 in Recovery; 14-11-12-9.
12				
13				
14				
15				
16			S-3	SAME; wet; 14-11-12-9.
17				
18			S-4	SAME; Occasional thin laminae of c SAND; 1-2-9-7.
19				Bottom of Auger Hole 18.5 ft

Notes:
1) flush-mount casing installed
2) Occasional cobbles encountered during drilling
3) Sand pack was carefully emplaced to 10', at which point augers were lifted to 7' so a seal could be emplaced. Hole then collapsed to 7'.

Environmental Resources Management

Drilling Log

Project: Essex Specialties Prod. Owner:

Location: Jamestown NY W.O. Number:

Well Number: MW-5 Total Depth: Diameter:

Surface Elevation: Water Level: Initial: 10' 24-hrs.:

Screen: Dia.: 2 in Length: 10 ft Slot Size:

Casing: Dia.: 2 in Length: Type: Stainless Steel

Drilling Company: Empire Soils Drilling Method: HSA

Driller: Ken Fuller Log By: Glenn Wygant Date Drilled: 5/22/89

Sketch Map

Notes: GWD 1280.98

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)
0				ASPHALT 0.4 ft
1				BASE 0.6 ft
2				Brown c f GRAVEL, some c-m f Sand; dry (observed - sides of hole)
3				
4				
5		Grout	S-1	Greyish Brown f GRAVEL, some (+) c-m f Sand, little Clayey Silt; moist; 20 in Recovery; 11-17-15-2.
6				
7				
8				1272.98 — 8.0 ft
9				
10			S-2	Grey SILT & CLAY; wet; 24 in Recovery; 7-9-12-11.
11				
12				
13				
14				
15			S-3	SAME; 6-7-10-10
16				
17				
18				8.0 ft.
19				Grey Clayey SILT, little (+) f Sand; wet; 24 in Recovery; 4-5-7-9.
20			S-4	
21				Bottom of Auger Hole 20.5 ft

Notes: 1) flush-mount casing installed

2) Samples S-2, S-3, & S-4 were all "1 cut" and were removed from the split spoon as a single intact piece.

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. MW-6 Sheet 1 of 1
Project Location: Jamestown, New York	SAMPLER	Ground Water Depth / Date
Client: Essex Specialty Products	Type: Split Spoon	Depth / Date
	Hammer: 140 lbs. Fall: 30 inches	File No.: 2576.007

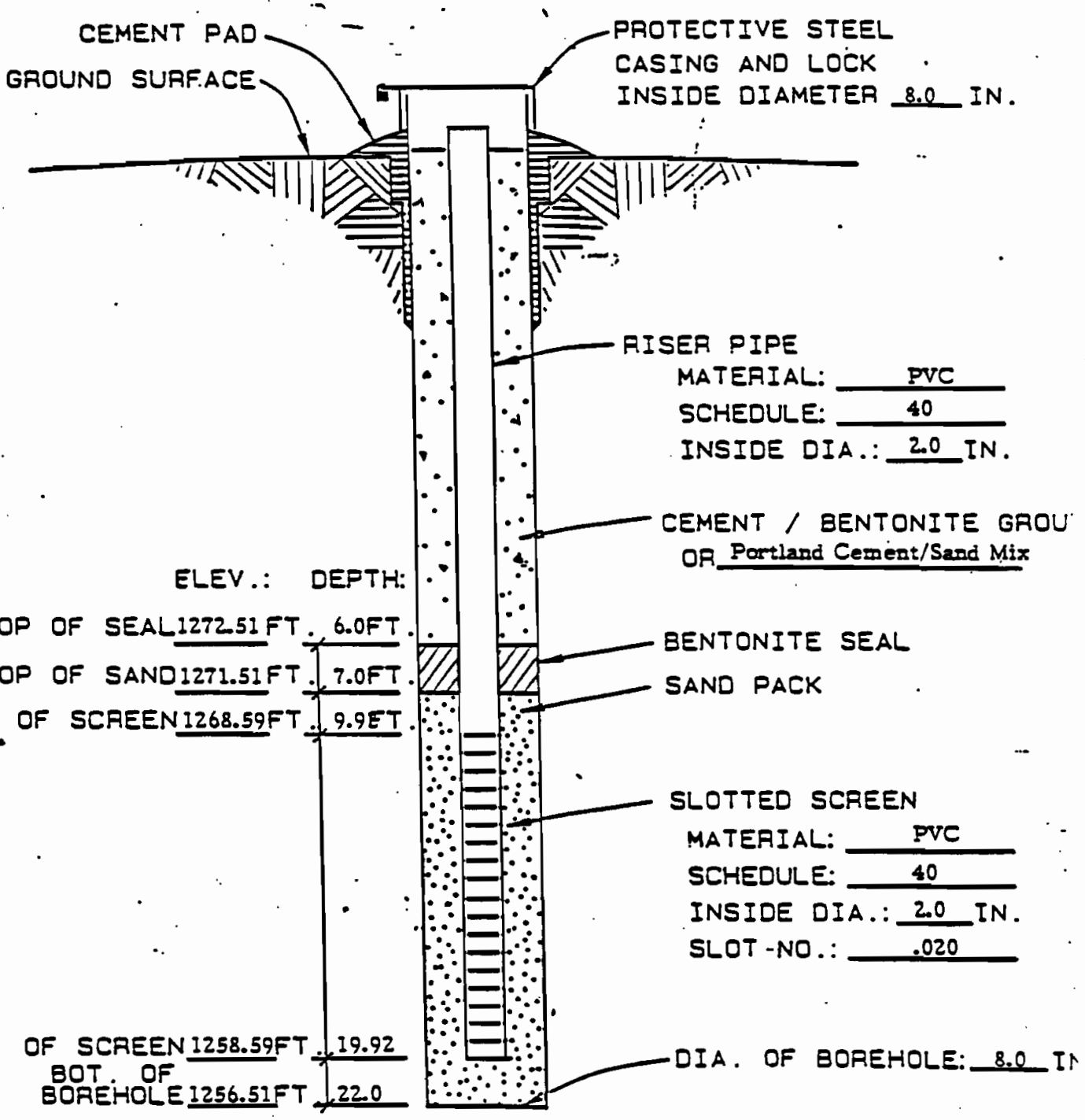
Boring Co.: Parratt-Wolff
Foreman: Barney Waters
O&G Geologist: Tim Eddy

Boring Location:
Ground Elevation: 1278.70'
Dates: Started: 8/22/89 Ended: 8/22/89

Depth	Sample No	Sample Depth	Sample Blows /6"	Sample Penetr/ Recovry	Sample "N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Field Testing Sp Cond	Field Testing HNU
0				GRAB		Black, medium SAND, some fine/medium gravel.					
5	1	5-7'	8-16-11-13	2'/0.6'	27	Black/brown, medium dense, moist, medium, SAND, some medium gravel, little silt.					
10	2	10-12'	4-3-4-3	2'/1'	7	Wet, gray, loose, medium/coarse gravelly coarse SAND, little silt.					
15	3	15-17'	6-7-6-10	2'/1.3'	13						
						Brown, medium stiff, wet SILT, little fine sand.	17.0'				
20	4	20-22'	5-9-10-15	2'/1'	19	Gray, wet, stiff, SILT, trace fine sand. Bottom of boring at 22.0 ft.					

MAE. KJK
8/29/89

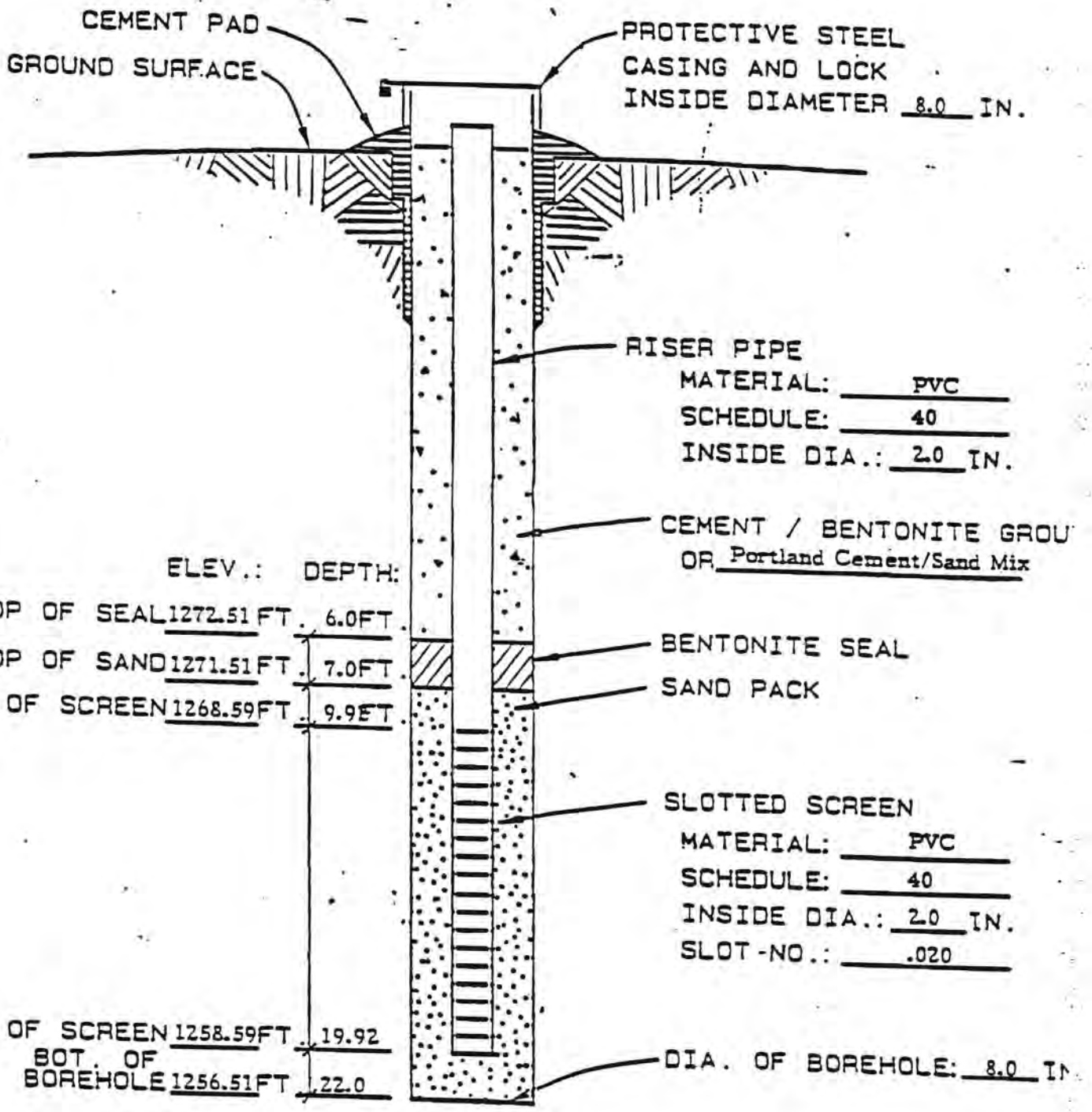
MW-6



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-6



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

O'BRIEN & GE

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. MW-7 Sheet 1 of 1
Project Location: Jamestown, New York Client: Essex Specialty Products	SAMPLER Type: Split Spoon Hammer: 140 lbs. Fall: 30 inches	Ground Water Depth Date Depth Date File No.: 2576.007

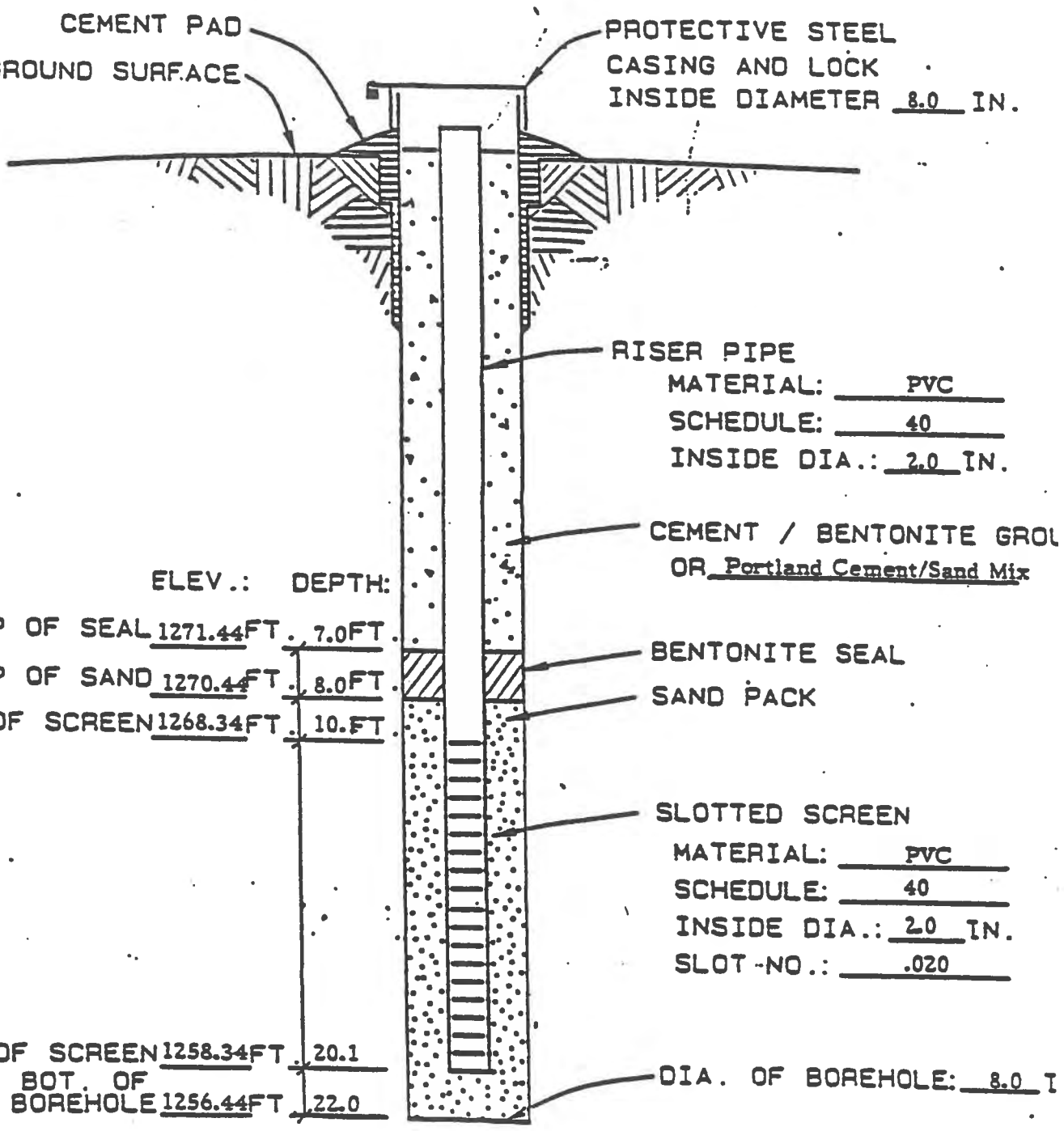
ing Co.: Parratt-Wolff
rvesan: Barney Waters
& Geologist: Tim Eddy

Boring Location:
Ground Elevation: 1278.71'
Dates: Started: 8/22/89 , Ended: 8/23/89

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Field Testing Sp Cond	Field Testing HNU
0				SPOON		Black, medium SAND, some coarse/medium gravel, damp.					
5	1	5-7'	11-24- 25-22	2'/1'	49	Brown with mottled gray patches, dense, moist, fine/medium SAND, some medium gravel little silt.					
10	2	10-12'	6-7-9-19	2'/1.3'	16	Brown, wet, loose, medium SAND, some silt some medium gravel. 1" of gray silty clay at bottom of spoon.					
15	3	15-17'	4-8-9-14	2'/1.5'	17	Gray, wet, medium, SILT, little clay, trace fine sand.	16.5'				
20	4	20-22'	4-9- 9-18	2'/1'	18	- Same as above. Bottom of boring at 22.0 ft.					

MW7.KJK
8/29/89

MW-7



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

Report of Boring No. MW-7D
Sheet 1 of 1

Project Location: Jamestown, New York

Client: Essex Specialty Products

SAMPLER
Type: Split Spoon
Hammer: 130 lbs. Fall: 24"

Ground Water Depth Date
Depth Date
File No.: 2576.008.622

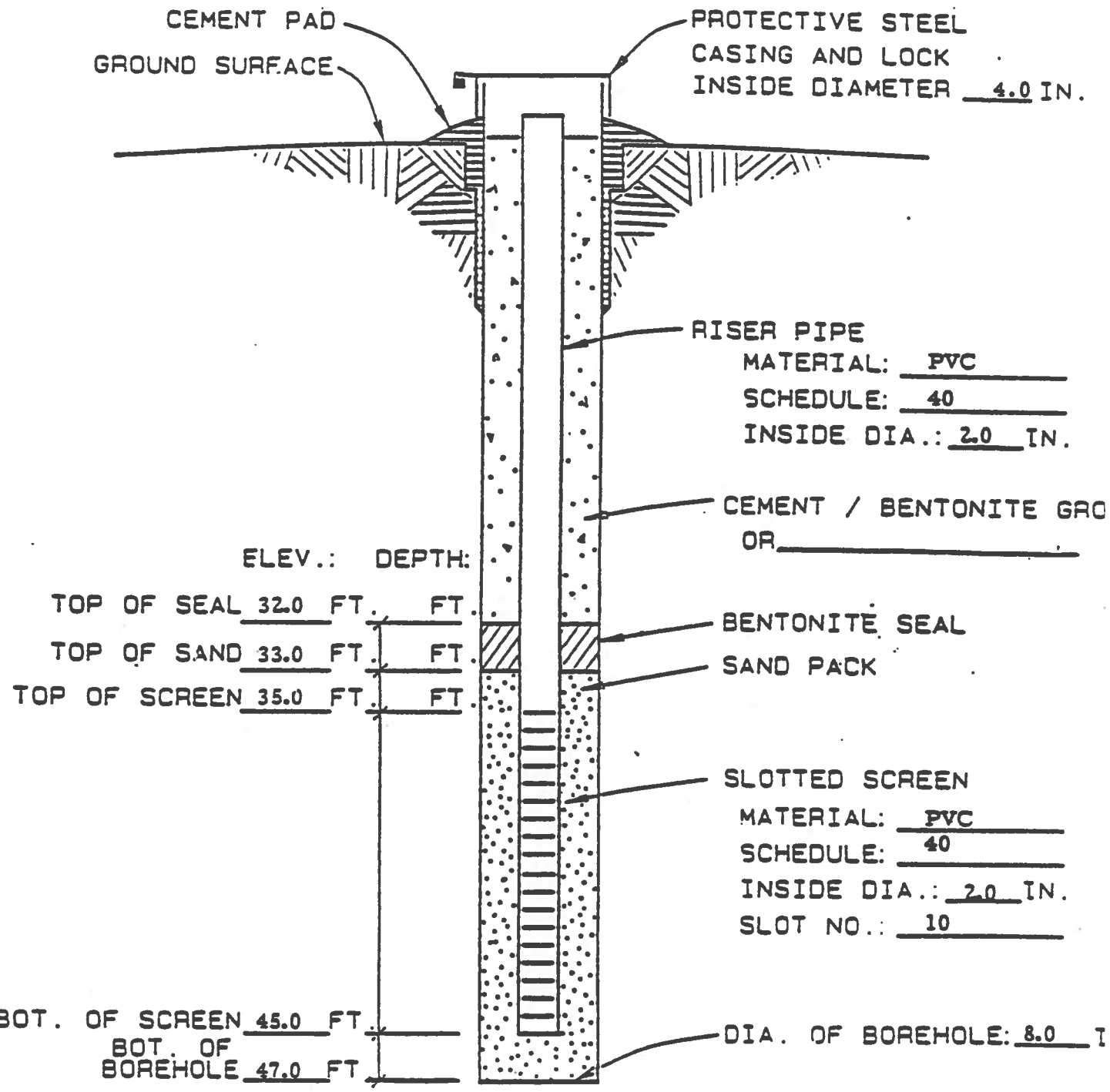
ing Co.: Parratt-Wolff, Inc.
man: P. Waters
Geologist: Susan Cox

Boring Location: Near MW-7 and building
Ground Elevation:
Dates: Started: 2/1/90 Ended: 2/1/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Field Testing Sp Cond	Field Testing HNU
						0-20 ft. See log for MW-7					
20	1	20-22'	2-4-7-9	12	11	Saturated, gray SILT, some fine sand.					
							21.8'				
						Same as above with little clay.					
25	2	25-27'	9-10-	18	20	Saturated, gray SILT, some fine sand, trace of clay.					
			10-10								
30	3	30-32'	8-10-	18	20	Same as above.					
			10-12								
35	4	35-37'	8-9-7-8	18	16	Same as above.					
40	5	40-42'	7-10-	18	22		40.5'				
			12-13			Saturated, gray, fine to medium SAND, little silt, loose.					
45	6	45-47'	7-10-	12	28		45.5'				
			18-18			Wet, gray SILT, some clay, trace of fine sand.					
						Bottom of boring 45.5 ft.					

MW7D.KJF
3/29/90

Lilly Industrial Coatings
MW-7D



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-7DD
		PAGE 1 OF 3
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION: South of MW-7D
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/20/92
		END DATE: 1/20/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc.		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser
FOREMAN: Barney Waters		
OBG GEOLOGIST: John M. Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0										
						Dry, brown to olive gray, very fine SAND and				
2						SILT, some medium to fine gravel, layers of				
	1	3–5	8–13–	2'/1.5'	30	silt at bottom, trace to little fine gravel				0
4			17–29							
	2	5–7	5–20–	2'/1.5'	41	Same as above, damp to moist, little fine to				0
6			21–17			medium gravel				
8										
10	3	10–12	5–6–8–8	2'/0.5'	14	Dry to moist, gray to olive, laminated (mm),				8
						clayey SILT, trace coarse gravel (dropstone)				
12										
14										
	4	15–17	3–6–10–8	2'/1.5'	16	Same as above, wet				5
16										
18										
20	5	20–22	3–5–8–12	2'/2'	13	Wet, light gray, silty CLAY, changes to Wet,				150
						light gray, very fine SAND, little very fine				
22						sand				
24										
	6	25–27	5–6–6–2	2'/2'	12	Wet, light gray, very fine SAND, little silt,				50
26						laminated (mm)				
28										
30	7	30–32	WOH–4–5–6	2'/2'	9	Same as above				0
32										
34										
	8	35–37	7–9–10–9	2'/2'	19	Same as above				10
36										
38										

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-7DD
		PAGE 2 OF 3
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION: South of MW-7D
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/20/92
		END DATE: 1/20/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc.		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser
FOREMAN: Barney Waters		
OBG GEOLOGIST: John M. Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
40	9	40–42	WOH–5–	2'/2'	14	Wet, light gray, fine SAND, little very fine				4
			9–10			sand, trace medium sand				
42										
44										
	10	45–47	7–10–8–8	2'/2'	18	45–46' Same as above, some medium sand				0
46						46–47' Wet, light gray, very fine SAND,				
						trace to little silt				
48										
50	11	50–52	10–13–	2'/2'	34	50–51' Same as 40–42'				0
			21–27			51–52' Damp, light gray, laminated SILT,				
52						little clay and very fine sand, angular gravel				
						clast at bottom of spoon				
54										
	12	55–57	8–11–	2'/2'	24	Same as 51–52', some clay				0
56			13–21							
58										
60	13	60–62	7–9–	2'/2'	22	Same as 46–47'				0
			13–15							
62										
64										
	14	65–67	7–9–	2'/1'	19	Damp, light gray, clayey SILT, laminated				0
66			10–10							
68										
70	15	70–72	7–7–	2'/1'	17	Same as above, dry to damp				0
			10–12							
72										
74										
	16	75–77	WOH–4–4–3	2'/2'	8	Damp, to wet, light gray, silty CLAY, laminated				0
76										
78										

JMM:cmb/ESP010.2

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-7DD
PAGE 3 OF 3

CLIENT: Essex Specialty Products

SAMPLER: Split Spoon

LOCATION: South of MW-7D

PROJECT LOCATION: Jamestown, NY

HAMMER: 140 lbs.

START DATE: 1/20/92
END DATE: 1/20/92

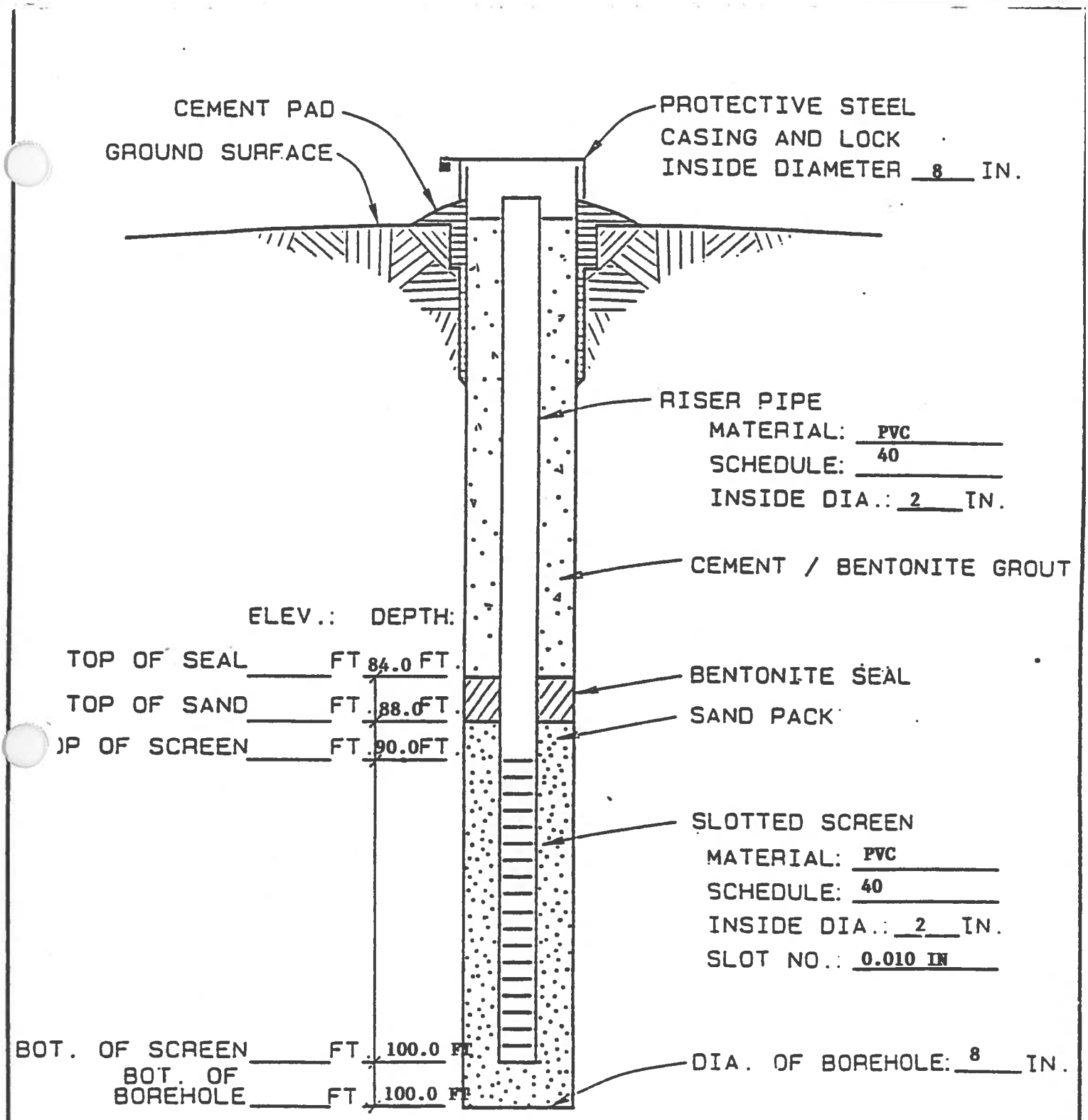
FILE NO.: 2576.010

FALL: 30"

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
80	17	80–82	WOH-4-5-9	2'/2'	9	Same as above				0
82										
84										
	18	85–87	4-5-6-16	2'/2'	11	Same as above, 1" medium sand lense near				0
86						bottom, gravel and clay at bottom				
88										
90	19	90–92	WOH-6-6-8	2'/1'	12	Same as above				0
92										
94										
	20	95–97	- -	2'/1.5'	16	Same as above, changes to wet, light brown,				0
96			16-31			very fine to coarse SAND, some silt, little				
						gravel and clay				
98	21	98–100	16-31-	2'/1.2'	31+	Wet, light brown, very fine to coarse SAND				
			50/.2			some silt, little gravel and clay				
100						Bottom of boring 100.0'				



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-7DD

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. MW-8 Sheet 1 of 2
Project Location: Jamestown, New York	SAMPLER	Ground Water Depth - Date
Client: Essex Specialty Products	Type: Split Spoon Hammer: 140 lbs. Fall: 30 inches	Depth Date File No.: 2576.007

Drilling Co.: Parratt-Wolff
Foreman: Barney Waters
Engr./Geologist: Tim Eddy

Boring Location:
Ground Elevation: 1278.56' 1277.52
Dates: Started: 8/23/89 Ended: 8/23/89

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Field Testing Sp Cond	Field Testing HNU	Remarks
0				GRAB		Black, medium SAND, moist, some medium gravel.						
5	1	5-7'	22-25-17-23	2'/0.8'	42	Brown, moist, medium dense medium SAND, some fine/medium gravel, trace silt.						
10	2	10-12'	4-7-7-8	2'/1.3'	14	Brown, gray, loose, wet, gravelly, medium SAND.						
15	3	15-17'	7-11-10-18	2'/1.4'	21	Wet, gray, stiff, SILT, trace fine sand.	16.0'					
20	4	20-22'	6-9-12-13	2'/2'	21	- Same as above.						
25	5	25-27'	7-10-11-14	2'/2'	21	- Same as above.						
30	6	30-32'	4-7-9-25	2'/2'	16	Gray, stiff, wet, SILT, little fine sand, trace clay.						

1988.KJK
8/29/89

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

Report of Boring No. MW-8
Sheet 2 of 2

Project Location: Jamestown, New York
Client: Essex Specialty Products

SAMPLER
Type: Split Spoon
Hammer: 140 lbs. Fall: 30 inches

Ground Water Depth
Depth
Date
Date
File No.: 2576.007

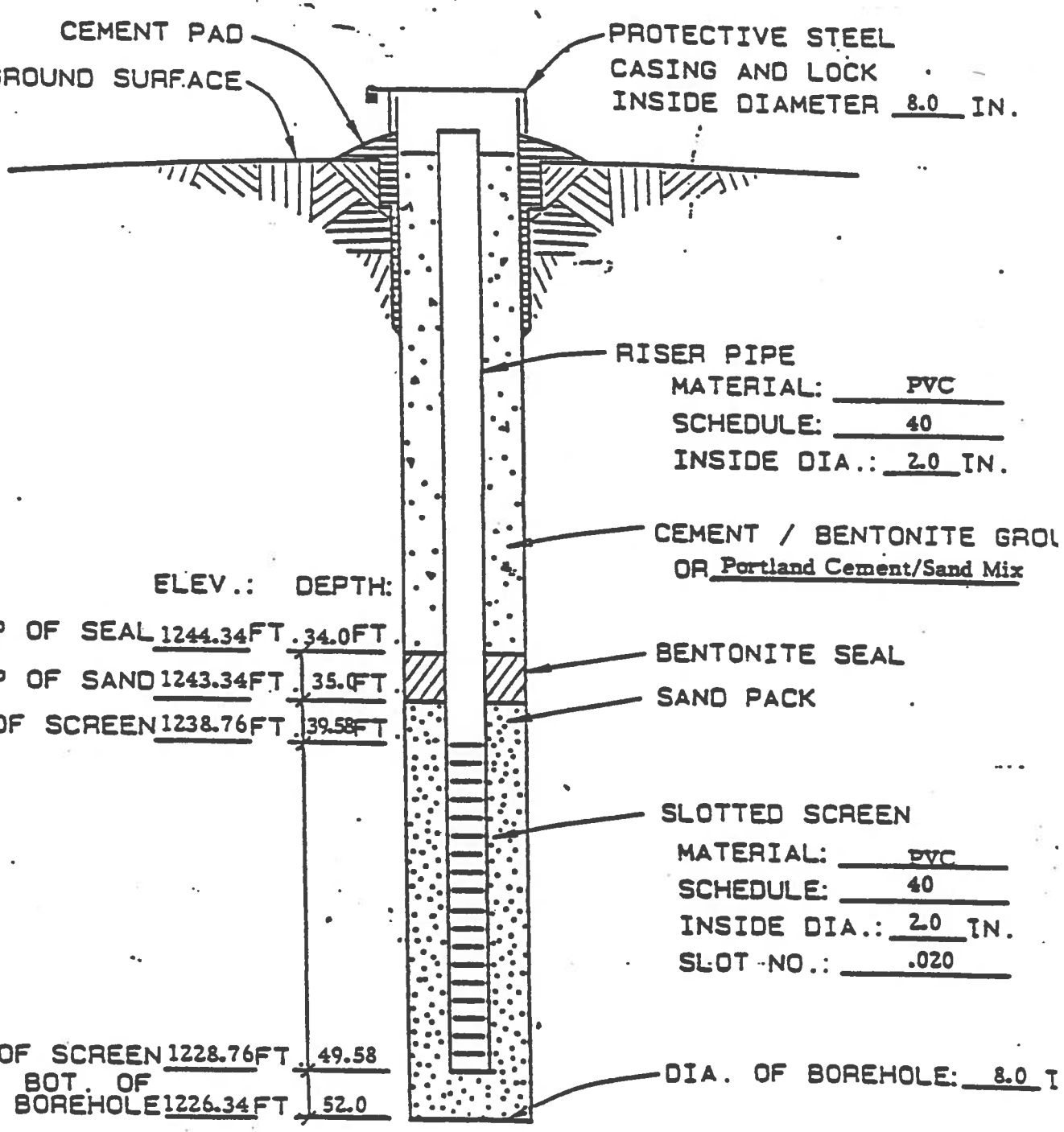
ing Co.: Parratt-Wolff
man: Barney Waters
Geologist: Tim Eddy

Boring Location:
Ground Elevation: 1278.56'
Dates: Started: 8/23/89 Ended: 8/23/89

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU
35	7	35-37'	WOR-WOR- 4-9	2'/2'	—	- Same as above with fine sand at bottom of spoon.					
							38.0'				
40	8	40-42'	8-14- 16-23	2'/2'	30	Gray, wet, medium dense, fine SAND, little silt.					
45	9	45-47'	8-12- 14-31	2'/1.1'	26	- Same as above.					
							50.0'				
50	10	50-52'	8-17- 16-23	2'/2'	33	Gray, wet, very stiff, SILT, some clay, little fine sand.					
						Bottom of boring at 52.0 ft.					

2576.KJK
8/29/89

MW-8



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

O'BRIEN & G

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

Report of Boring No. MW-9
Sheet 1 of 1

Project Location: Jamestown, New York

Client: Essex Specialty Products

SAMPLER
Type: Spilt Spoon
Hammer: 130 lbs. Fall: 24"

Ground Water Depth Date
Depth Date
File No.: 2576.008.622

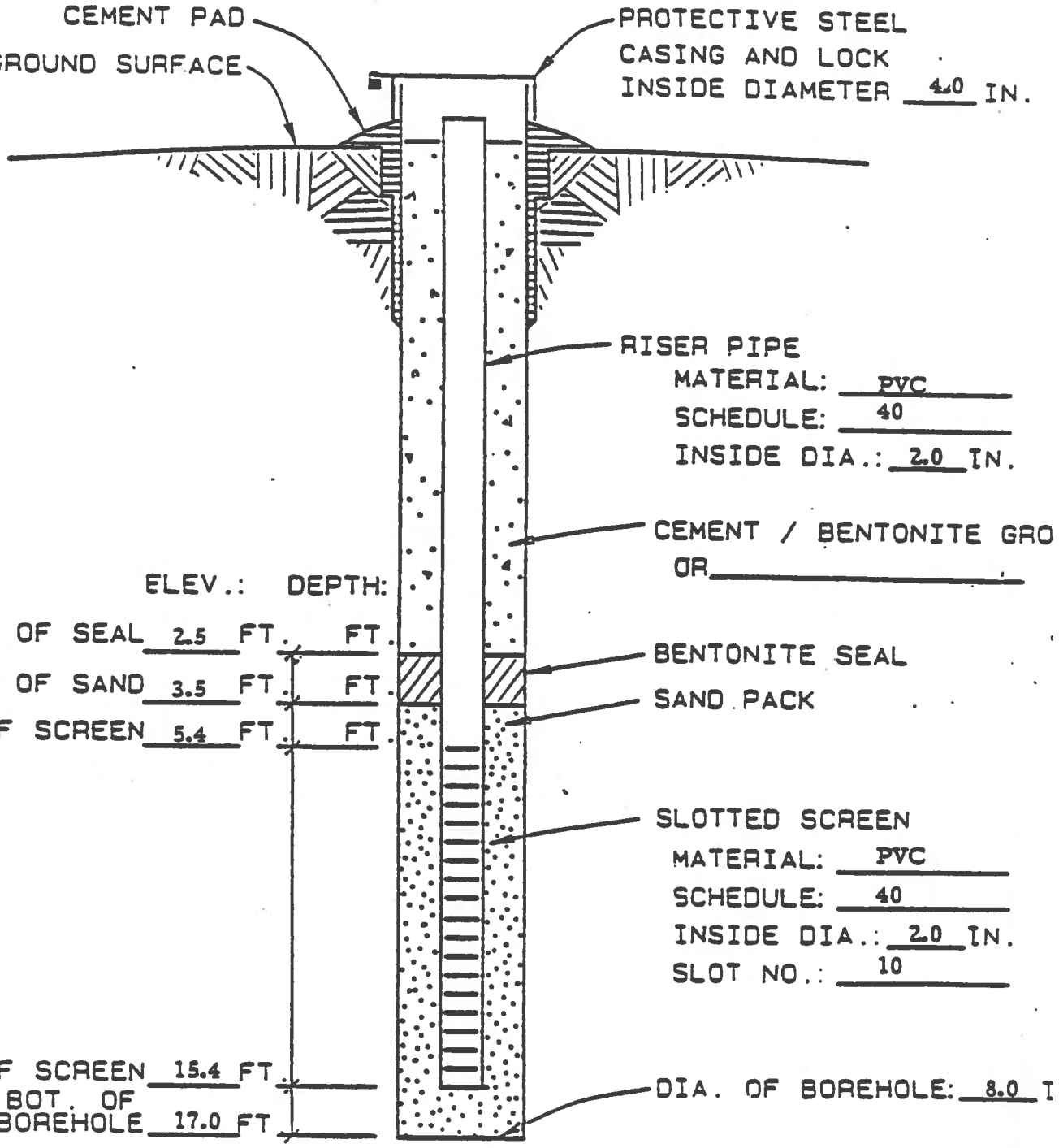
Drilling Co.: Parratt-Wolff, Inc.
Foreman: P. Waters
Geologist: Susan Cox

Boring Location: Near Hopkins Ave.
Ground Elevation:
Dates: Started: 1/30/90 Ended: 1/30/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU	Remarks
0	1	0-2'	8-7-5-4	12	12	Damp, brown/black SILT, some fine to medium sand, little fine to coarse gravel, trace of clay, loose.						
5	2	5-7'	5-15-17-16	12	32	Moist, brown/black SILT, some fine to coarse sand and gravel, loose.						
10	3	10-12'	3-3-5-3	6	8	Wet, brown, fine to coarse SAND and GRAVEL.						
15	4	15-17'	7-6-9-9	12	15							
						Moist, light brown SILT, some fine sand, trace of clay, stiff.	16.0'					
						Bottom of boring 16.0 ft.						

MW9.KJF
3/29/90

Lilly Industrial Coatings
MW-9



TYPICAL OVERBURDEN MONITORING WELL

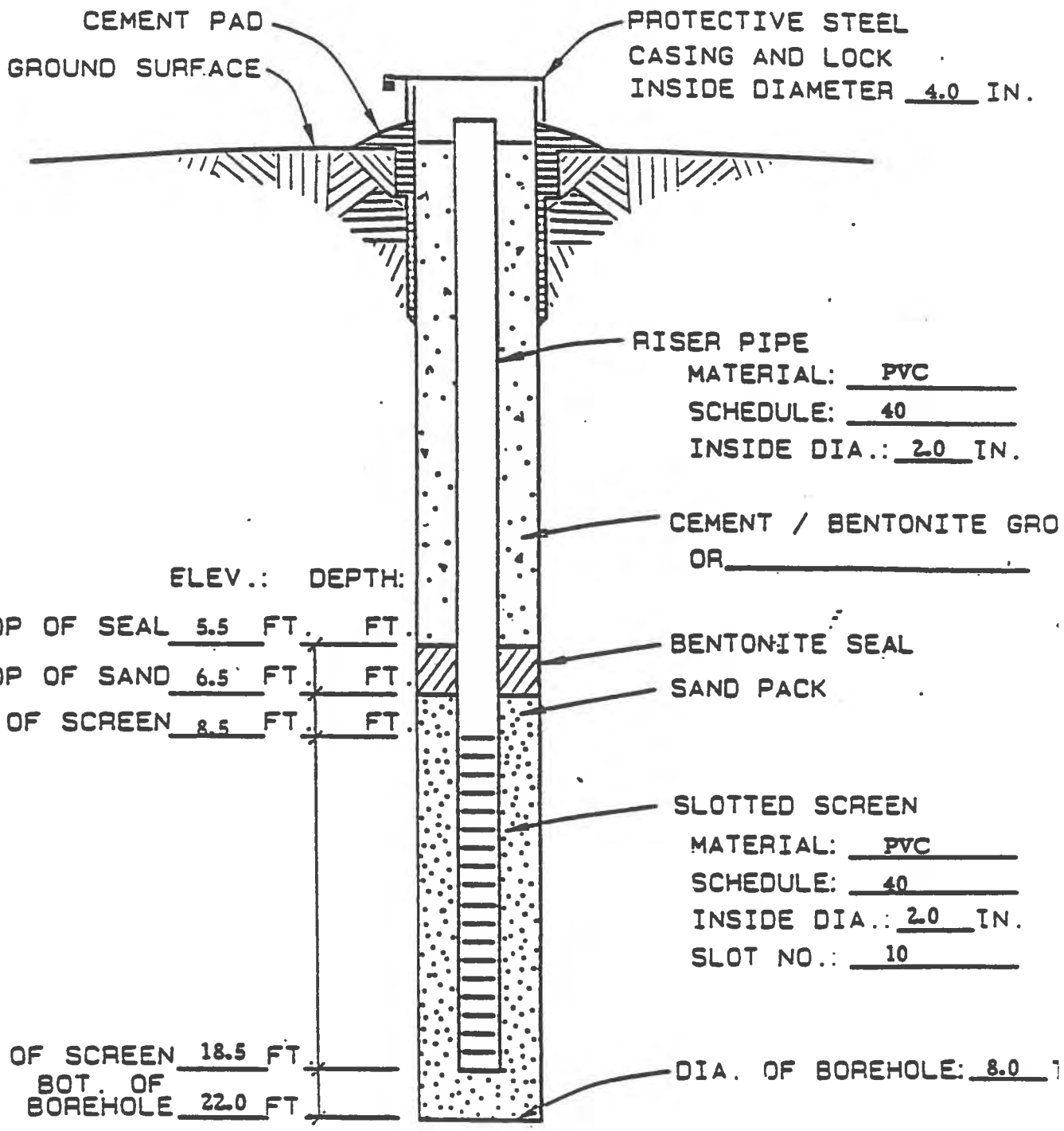
N.T.S.

[illegible] & Wehr ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. MW-10 Sheet 1 of 1
Project Location: Jamestown, New York Client: Essex Specialty Products	SAMPLER Type: Split Spoon Hammer: 130 lbs. Fall: 24"	Ground Water Depth - Date Depth Date File No.: 2576.008.622
ing Co.: Parratt-Wolff, Inc. ain: P. Waters Geologist: Susan Cox	Boring Location: Near garage door Ground Elevation: Dates: Started: 1/30/90	Ended: 1/31/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU	Remarks
0	1	0-2'	5-5-5-9	12	10	Damp, dark brown/black SILT, little clay, hard, stiff.						
5	2	5-7'	7-16-10-11	18	26	Damp, light to medium brown SILT, some fine to medium sand and gravel, trace of clay.						
10	3	10-12'	15-9-7-14	4	16	Same as above with more medium sand.						
15	4	15-17'	7-7-8-11	12	15	Saturated, gray CLAY, little silt, stiff, hard.	16.0'					
20	5	20-22'	4-6-11-15	12	17	Same as above. Bottom of boring 22.0 ft.						

MW10.KJF
3/29/90

Lilly Industrial Coatings
MW-10



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

OBRIEN&GO

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. MW-11 Sheet 1 of 1
Project Location: Jamestown, New York	SAMPLER	Ground Water Depth Date
Client: Essex Specialty Products	Type: Spilt Spoon	Depth Date
	Hammer: 130 lbs. Fall: 24"	File No.: 2576.008.622

ing Co.: Parratt-Wolff, Inc.
man: P. Waters
Geologist: Susan Cox

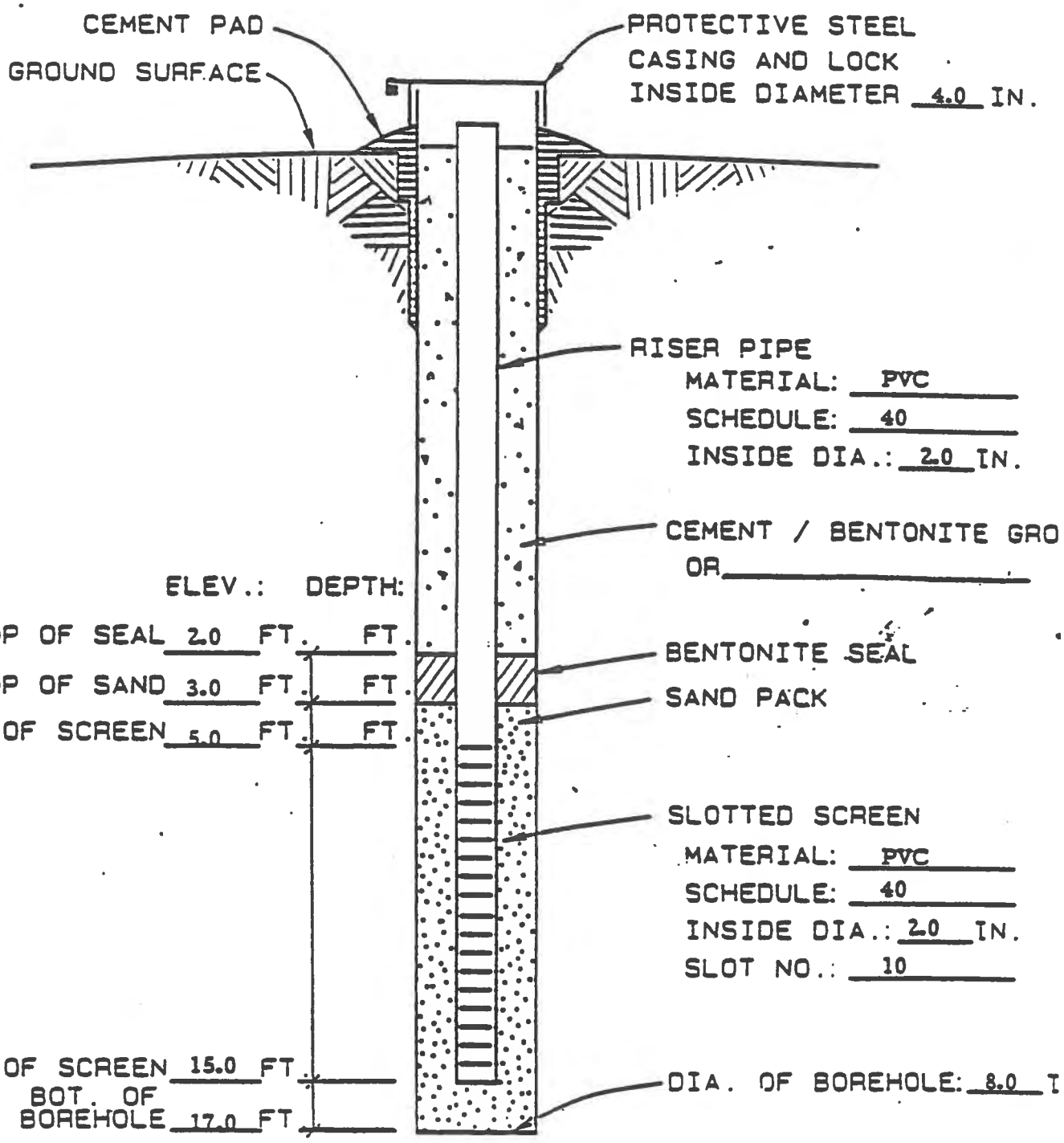
GRND 1277.67'

Boring Location: Near property boundary
Ground Elevation:
Dates: Started: 2/2/90 Ended: 2/2/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratus Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU	Remarks
0	1	0-2'	25-21-	18	35	Dry, brown/black SILT, some fine to medium sand, little fine to medium gravel.						
			14-12									
5	2	5-7'	17-15-	12	29	Moist, brown, fine to coarse GRAVEL and SAND, little silt, thin layer of sandstone, loose.						
			14-12									
							8.0'					
						Saturated, brown, fine to coarse SAND and GRAVEL.						
10	3	10-12'	14-16-	12	44							
			28-31				11.8'					
						Wet, brown SILT, some fine sand.						
15	4	15-17'	5-7-11-14	12	18							
							16.0'					
						Wet, gray SILT, some fine sand.						
						Bottom of boring 17.0 ft.						

MW11.KJF
3/29/90

Lilly Industrial Coatings
MW-11



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. MW-11D Sheet 1 of 1
Project Location: Jamestown, New York Client: Essex Specialty Products	SAMPLER Type: Spilt Spoon Hammer: 130 lbs. Fall: 24"	Ground Water Depth Date Depth Date File No.: 2576.008.622

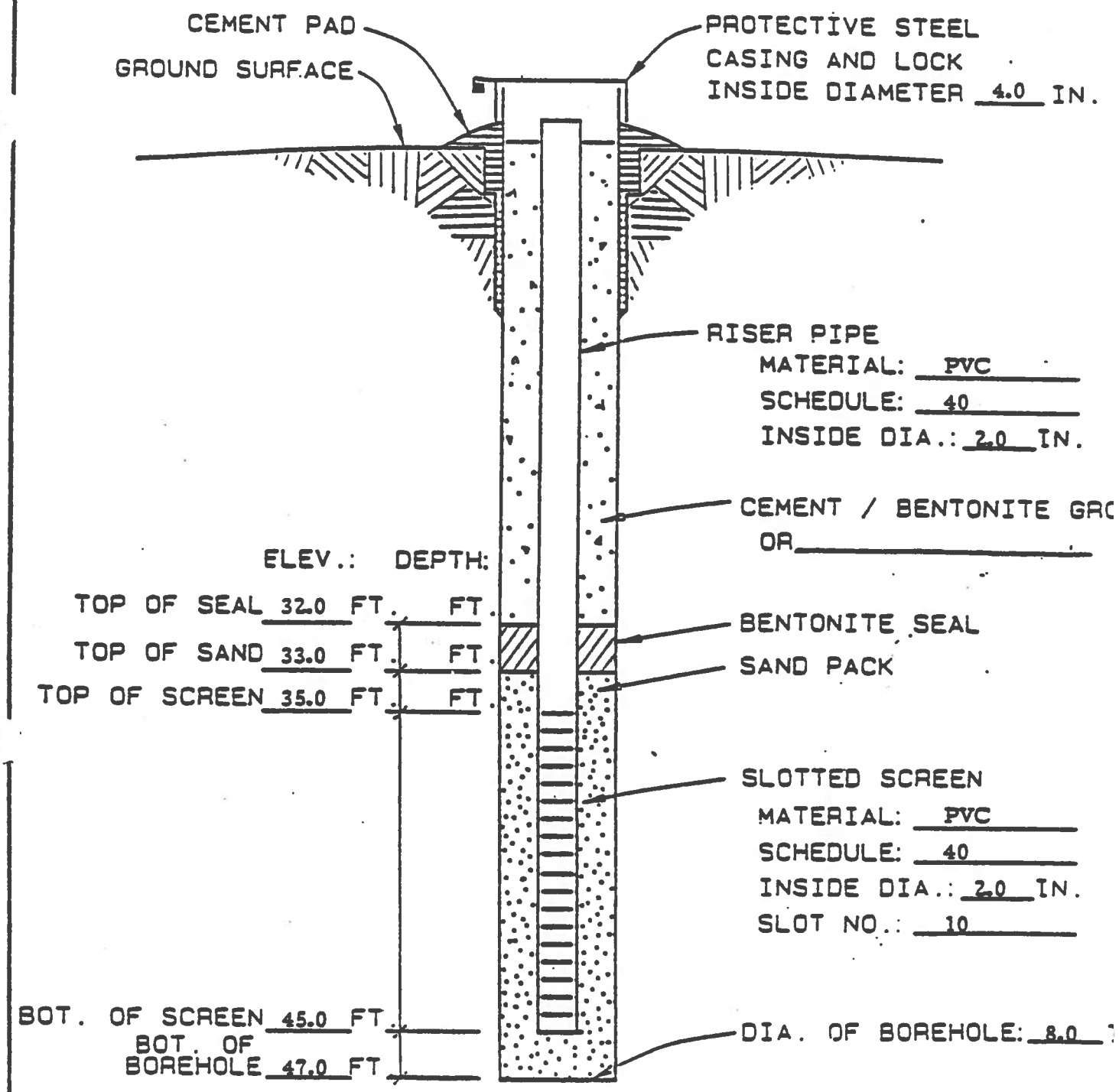
ing Co.: Parratt-Wolff, Inc.
team: P. Waters
J Geologist: Susan Cox

Boring Location:
Ground Elevation:
Dates: Started: 2/2/90 Ended: 2/2/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Field Testing Sp Cond	Field Testing HNU
						For 0-20 ft. See log for MW-11.					
20	1	20-22'	5-10-	12	22	Saturated, gray SILT, some fine sand.					
			12-16								
25	2	25-27'	6-6-8-14	24	14	Same as above.					
30	3	30-32'	0-0-4-5	18	4						
						Saturated, gray SILT, some fine to medium sand, loose.	31.5'				
35	4	35-37'	12-16-	12	32						
			16-17			Wet, gray SILT, some fine sand, trace of clay.	36.5'				
40	5	40-42'	9-14-	12	29						
			15-18								
45	6	45-47'	13-17-	18	37	Damp, gray SILT, some clay, little fine sand, stiff.	45.0'				
			20-29			Bottom of boring 45.0 ft.					

MW11D.KJF
3/29/90

MW-11D



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

OBRIEN&GERE

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

Report of Boring No. MW-12
Sheet 1 of 1

Project Location: Jamestown, New York

Client: Essex Specialty Products

SAMPLER
Type: Spilt Spoon
Hammer: 130 lbs. Fall: 24"

Ground Water Depth Date
Depth Date
File No.: 2576.008.622

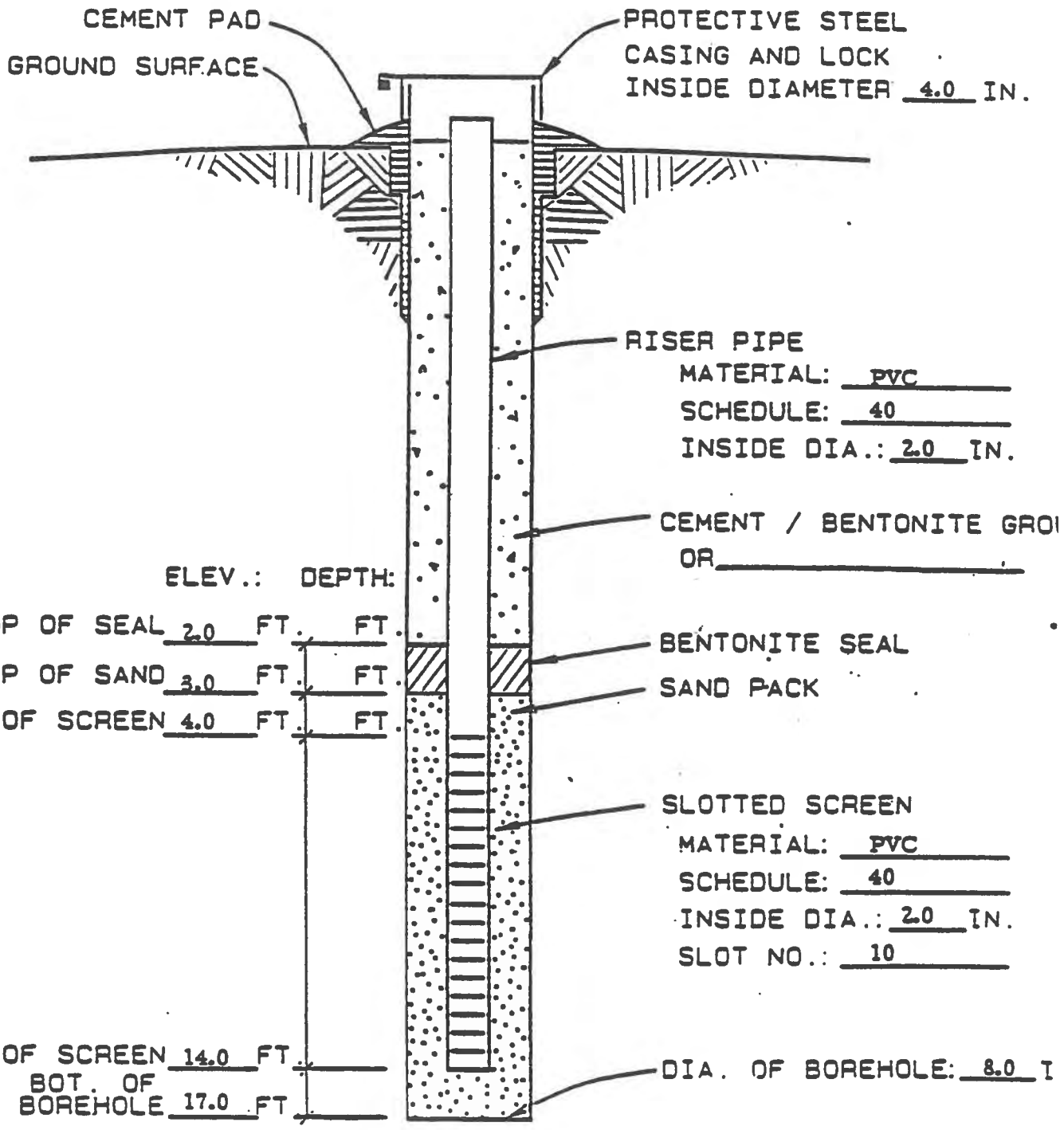
ng Co.: Parratt-Wolff, Inc.
man: P. Waters
Geologist: Susan Cox

Boring Location:
Ground Elevation:
Dates: Started: 2/2/90 Ended: 2/2/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU	Remarks
0	1	0-2'	11-9-9-7	12	18	Damp, brown/black SILT, some fine to coarse sand and gravel.						
5	2	5-7'	7-9-10-8	12	19							
						Saturated, brown SILT, some fine to coarse sand and gravel, trace of clay, loose.	6.5'					
10	3	10-12'	10-18-20-12	18	30	Saturated SILT, some fine sand, little fine to medium gravel, trace of clay.						
15	4	15-17'	8-11-12-12	12	23	Wet, gray SILT, some fine sand.	15.5'					
						Bottom of boring 17.0 ft.						

MW12.KJF
3/29/90

Lilly Industrial Coatings
MW-12



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-13
PAGE 1 OF 1

CLIENT: Essex Specialty Products
PROJECT LOCATION: Jamestown, NY
FILE NO.: 2576.010

SAMPLER: Split Spoon
HAMMER: 140 lbs.
FALL: 30"

LOCATION:
START DATE: 1/23/92
END DATE: 1/23/92

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

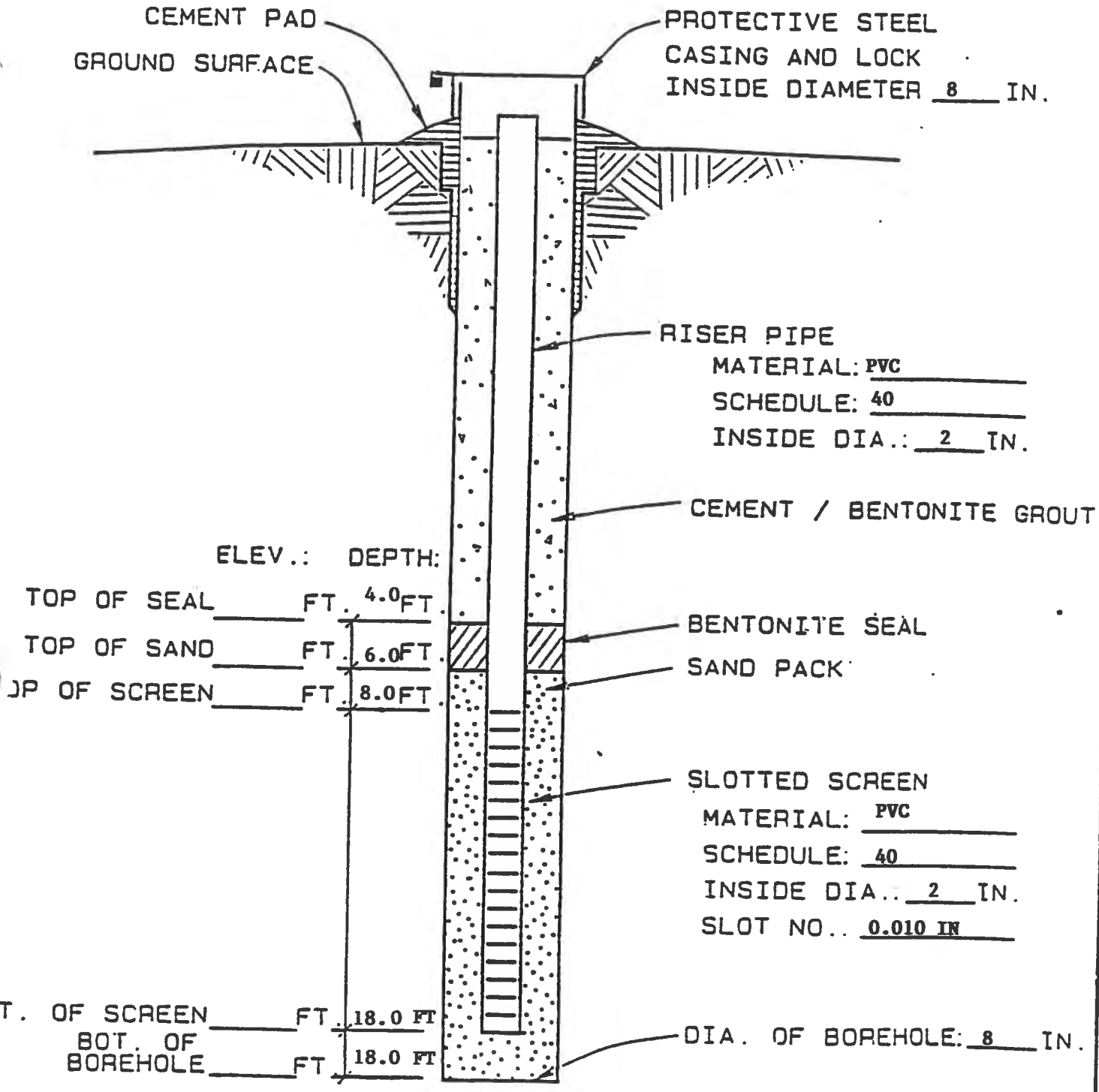
DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0						CONCRETE to ~6"				
1										
2										
3	1	3-5	8-13-16-16	2'/1'	29	Dry to damp, light to medium brown to olive, very fine SAND, some silt, little clay, trace coarse gravel				0
4										
5										
6										
7										
8	2	8-10	4-7-10-10	2'/1'	17	Same as above, moist to wet, little to some clay, little fine, rounded gravel				0
9										
10	3	10-12	5-9-9-11	2'/0"	18	No recovery				—
11										
						1266.59				
12	4	12-14	9-14-13-16	2'/1'	27	Wet, light gray, clayey SILT, little very fine sand, laminated				0
13										
14	5	14-16	6-7-7-8	2'/1'	14	Same as above, trace gravel				0
15										
16	6	16-18	8-10-11-11	2'/0.5'	21	Same as above				0
17										
18						Bottom of boring 18.0'				
19										
20										

JMM:cmb/ESP010.4

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-13
		PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/23/92
		END DATE: 1/23/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc.		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser
FOREMAN: Barney Waters		
OBG GEOLOGIST: John M. Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0						CONCRETE to ~6"				
1										
2										
3	1	3-5	8-13-	2'/1'	29	Dry to damp, light to medium brown to olive,				0
			16-16			very fine SAND, some silt, little clay, trace				
4						coarse gravel				
5										
6										
7										
8	2	8-10	4-7-	2'/1'	17	Same as above, moist to wet, little to some				0
			10-10			clay, little fine, rounded gravel				
9										
10	3	10-12	5-9-9-11	2'/0'	18	No recovery				—
11										
						1266.59				
12	4	12-14	9-14-	2'/1'	27	Wet, light gray, clayey SILT, little very				0
			13-16			fine sand, laminated				
13										
14	5	14-16	6-7-7-8	2'/1'	14	Same as above, trace gravel				0
15										
16	6	16-18	8-10-	2'/0.5'	21	Same as above				0
			11-11							
17										
18						Bottom of boring 18.0'				
19										
20										

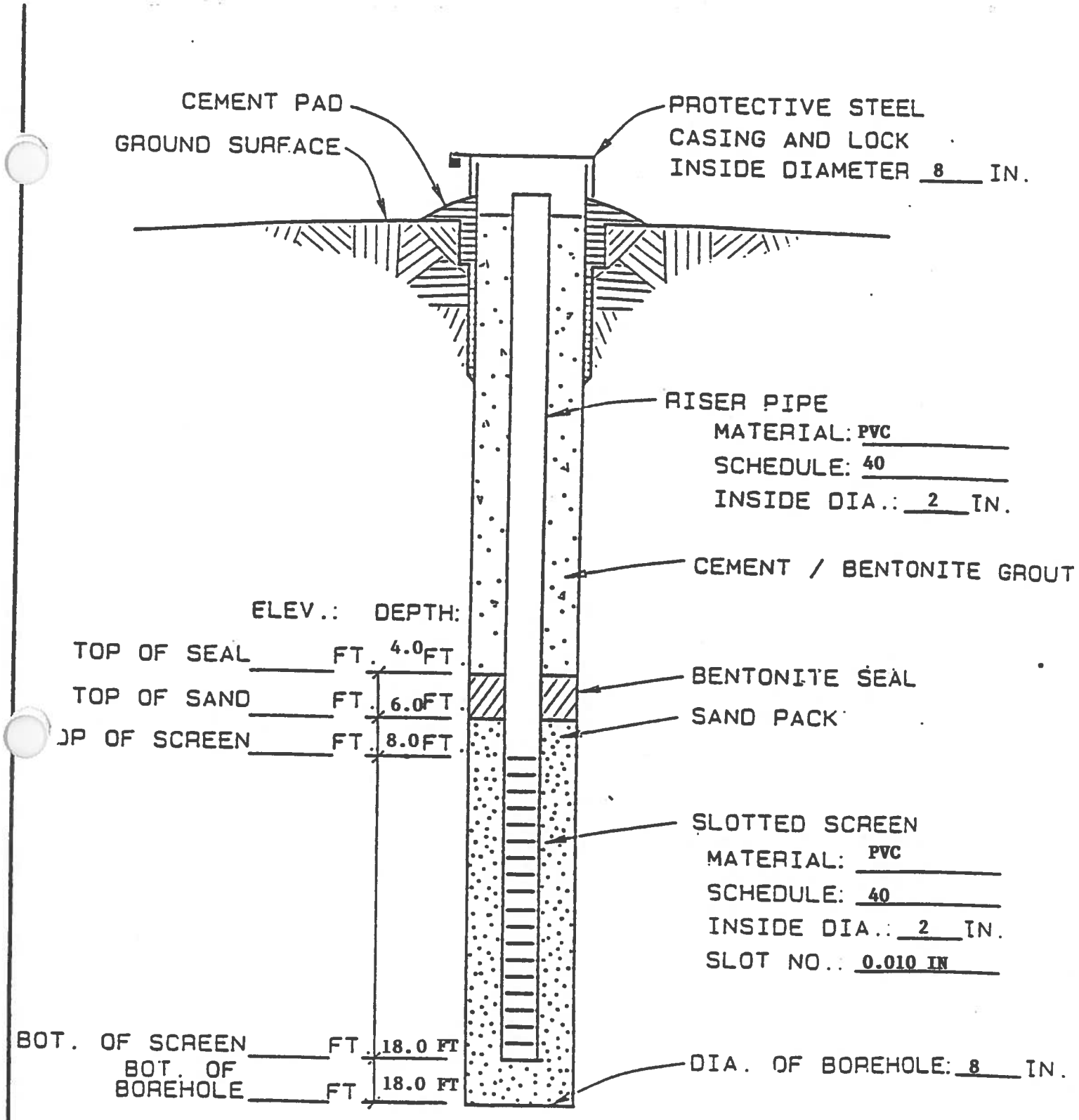
JMM:cmb/ESP010.4



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-13



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-13

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-14D
PAGE 1 OF 2

CLIENT: Essex Specialty Products
PROJECT LOCATION: Jamestown, NY
FILE NO.: 2576.010

SAMPLER: Split Spoon
HAMMER: 140 lbs.
FALL: 30"

LOCATION:
START DATE: 1/27/92
END DATE: 1/28/92

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

GRND Surface 1277.64

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0	1	0-2	6-12-	2'/1'	24	Dry, light brown, fine SAND, some silt, little medium sand, trace brick and concrete? Hard drilling from 2-4'				0
			12-17							
2										
4										
	2	5-7	20-18-	2'/1'	37	Dry, light brown, medium SAND, some fine sand and gravel, changes to Dry, dark brown SILT, little fine to medium, gravel				0
6			19-10							
8										
10	3	10-12	7-10-	2'/1.5'	24	Wet, light to medium brown, coarse SAND, some medium sand, little to some gravel, changes to Wet, olive gray SILT, some very fine sand, little fine to medium gravel				1
			14-18							
12										
14										
	4	15-17	2-5-4-8	2'/1'	9	Wet, light gray, laminated SILT, little to some clay, little very fine to fine sand lenses (~1-2" thick)				20
16										
18										
20	5	20-22	3-4-8-9	2'/2'	12	Wet, light gray, very fine to fine SAND, little to trace silt and clay				30
22										
24										
	6	25-27	4-6-9-8	2'/2'	15	Same as above, wet, some very fine sand, trace silt and clay				0
26										
28										
30	7	30-32	3-7-8-9	2'/2'	15	Same as above				0
32										
34										
	8	35-37	3-9-11-8	2'/2'	20	Wet, light gray, very fine to fine SAND, little clayey silt lenses				0
36										
38										

JMM:cmb/ESP010.6

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-14D
PAGE 2 OF 2
LOCATION:

CLIENT: Essex Specialty Products

PROJECT LOCATION: Jamestown, NY

FILE NO.: 2576.010

SAMPLER: Split Spoon

HAMMER: 140 lbs.

FALL: 30"

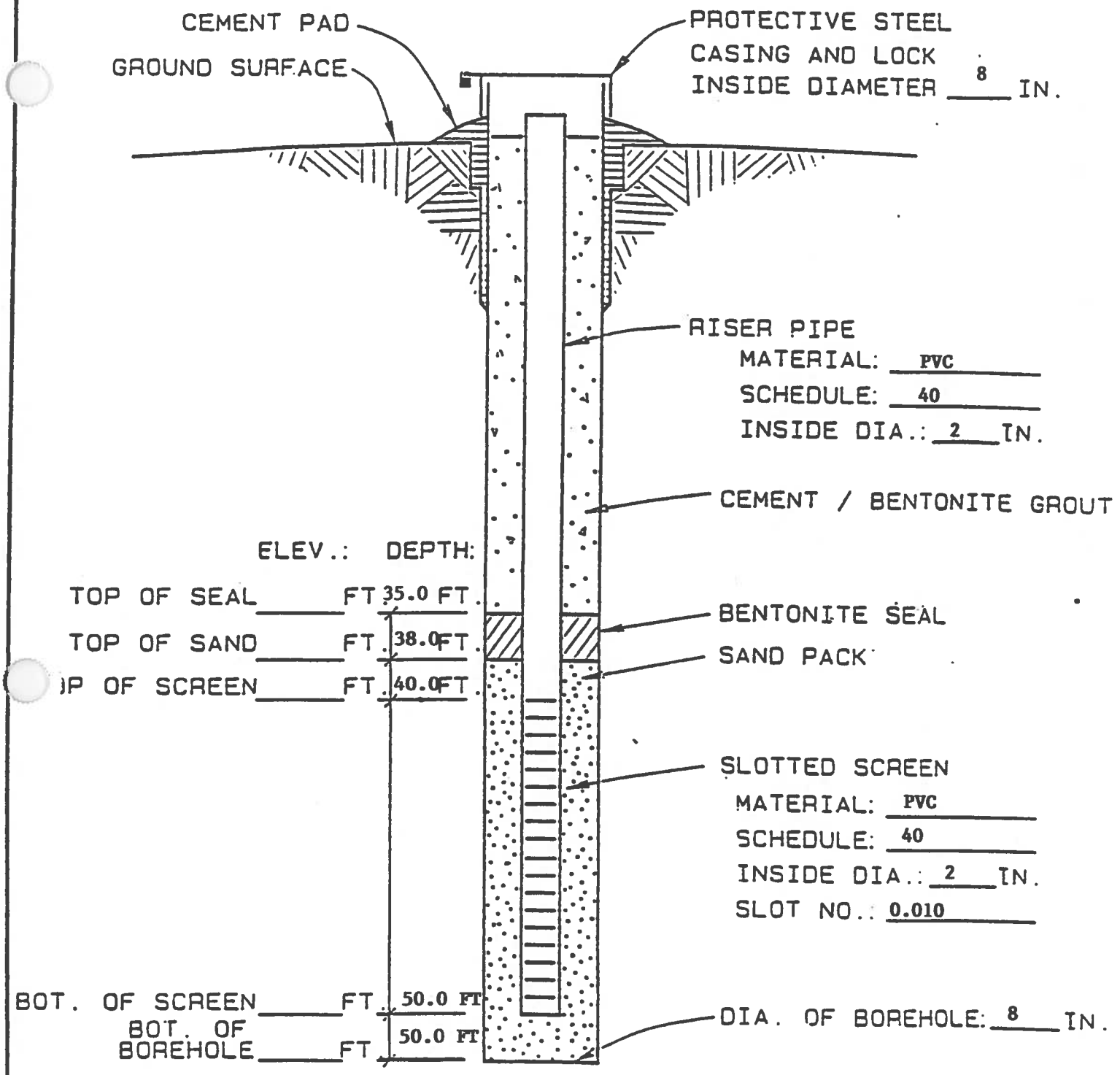
START DATE: 1/27/92
END DATE: 1/28/92

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
40	9	40–42	4–10–	2'/2'	25	Wet, light to medium gray, medium SAND, some				0
			15–13			fine sand, little to trace very fine sand				
42	10	42–44	10–15–	2'/2'	35	Same as above				0
			20–19							
44	11	44–46	5–12–	2'/2'	25	Same as above, lower 0.5' is slightly fine				0
			13–15			grained				
46	12	46–48	7–10–	2'/2'	21	Same as above, clayey SILT at bottom 1"				0
			11–17							
48	13	48–50	5–9–	2'/2'	22	48–48.5' Same as above; 48.5–50' Damp to moist				0
			13–19			light gray, clayey SILT, trace very fine sand				
50						Bottom of boring 50.0'				

JMM:cmb/ESP010.7



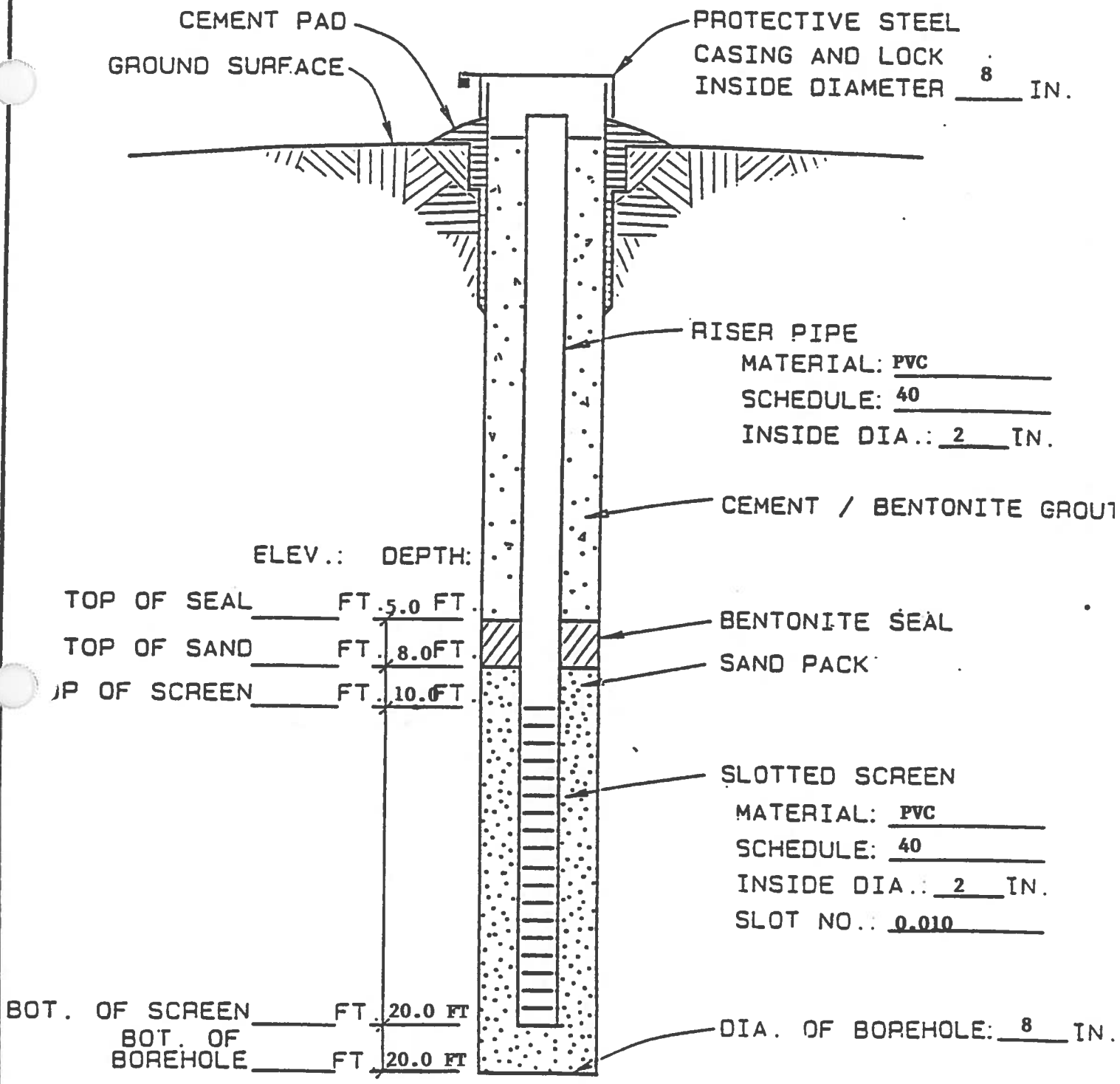
TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-14D

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-14S
		PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/28/92
		END DATE: 1/28/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc.		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser
FOREMAN: Barney Waters		
OBG GEOLOGIST: John M. Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0						0-8' See MW-14D				
1										
2										
3										
4										
5										
6										
7										
8	1	8-10	12-14-14-15	2'/1'	28	Wet, light brown to red, very fine grained SAND and SILT, some medium sand and fine gravel				3
9										
10	2	10-12	13-14-8-9	2'/1.5'	22	Same as above, wet, light brown				0
11										
12	3	12-14	10-9-13-15	2'/1'	22	Damp, light gray, laminated, clayey SILT, trace fine gravel				2
13										
14	4	14-16	4-4-7-8	2'/1.5'	11	Wet, light gray, very fine SAND and SILT, changes to damp to moist, laminated, clayey SILT				2
15										
16	5	16-18	7-5-7-7	2'/2'	12	Wet, light gray, very fine SAND and SILT, some to little laminated, clayey SILT				10
17										
18	6	18-20	6-6-12-11	2'/2'	18	Same as above, wet				260
19										
20						Bottom of boring 20.0'				



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-14S

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-15D
PAGE 1 OF 2

CLIENT: Essex Specialty Products
PROJECT LOCATION: Jamestown, NY
FILE NO.: 2576.010

SAMPLER: Split Spoon
HAMMER: 140 lbs.
FALL: 30"

LOCATION:
START DATE: 1/29/92
END DATE: 1/29/92

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

GRND = 1279.46 msl

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0	1	0–2	7–7–15–8	2'/1'	22	Dry, light brown SILT to medium SAND, some clay and fine to medium gravel, little brick				0
2										
4										
	2	5–7	18–12–	2'/1.5'	28	Same as above, dry to damp, light brown to red, some brick				4
6			16–12							
8										
10	3	10–12	8–8–8–5	2'/1.5'	16	Wet, light brown, medium SAND and fine to medium GRAVEL, little silt and fine sand				3
12										
14										
	4	15–17	2–3–5–2	2'/0'	8	No recovery, sheen noted on spoon, no HNU readings				—
16										
18										
20	5	20–22	3–5–7–9	2'/1.5'	12	Wet, light gray, laminated, clayey SILT, stringers of very fine sand, sheen noted (0 on HNU when spoon is screened)				1
22										
24										
	6	25–27	6–4–9–11	2'/2'	13	Wet, light gray, very fine SAND, some fine sand, little silt and clay				240
26										
28										
30	7	30–32	5–9–	2'/2'	20	Same as above, sheen noted				10
			11–12							
32										
34										
	8	35–37	WOH–	2'/1.5'	5	Wet, light gray, very fine SAND, little clayey silt, trace fine sand				
36			WOH–5–8							
38										

JMM:cmb/ESP010.9

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-15D
PAGE 2 OF 2

CLIENT: Essex Specialty Products

PROJECT LOCATION: Jamestown, NY

FILE NO.: 2576.010

SAMPLER: Split Spoon

HAMMER: 140 lbs.

FALL: 30"

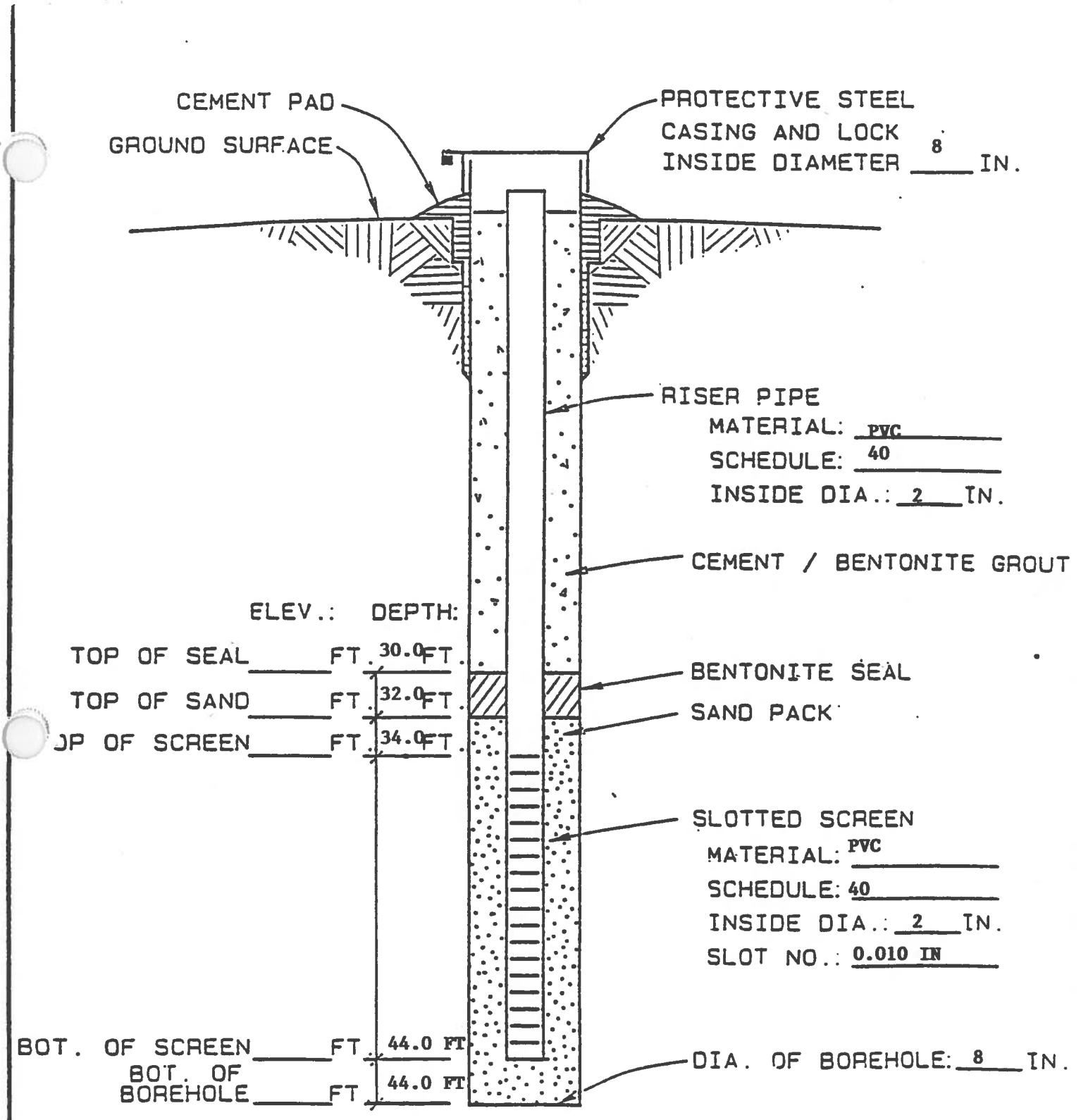
LOCATION:

START DATE: 1/29/92
END DATE: 1/29/92

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
40	9	40-42	4-4-6-5	2'/1.5'	10	Same as above, changing to damp, light gray, laminated, clayey SILT				1
42	10	42-44	6-6-8-8	2'/1.5'	14	Dry to damp, light gray, laminated, clayey SILT, trace to little very fine sand				0.5
44						Bottom of boring 44.0'				
46										
48										
50										



TYPICAL OVERBURDEN MONITORING WELL

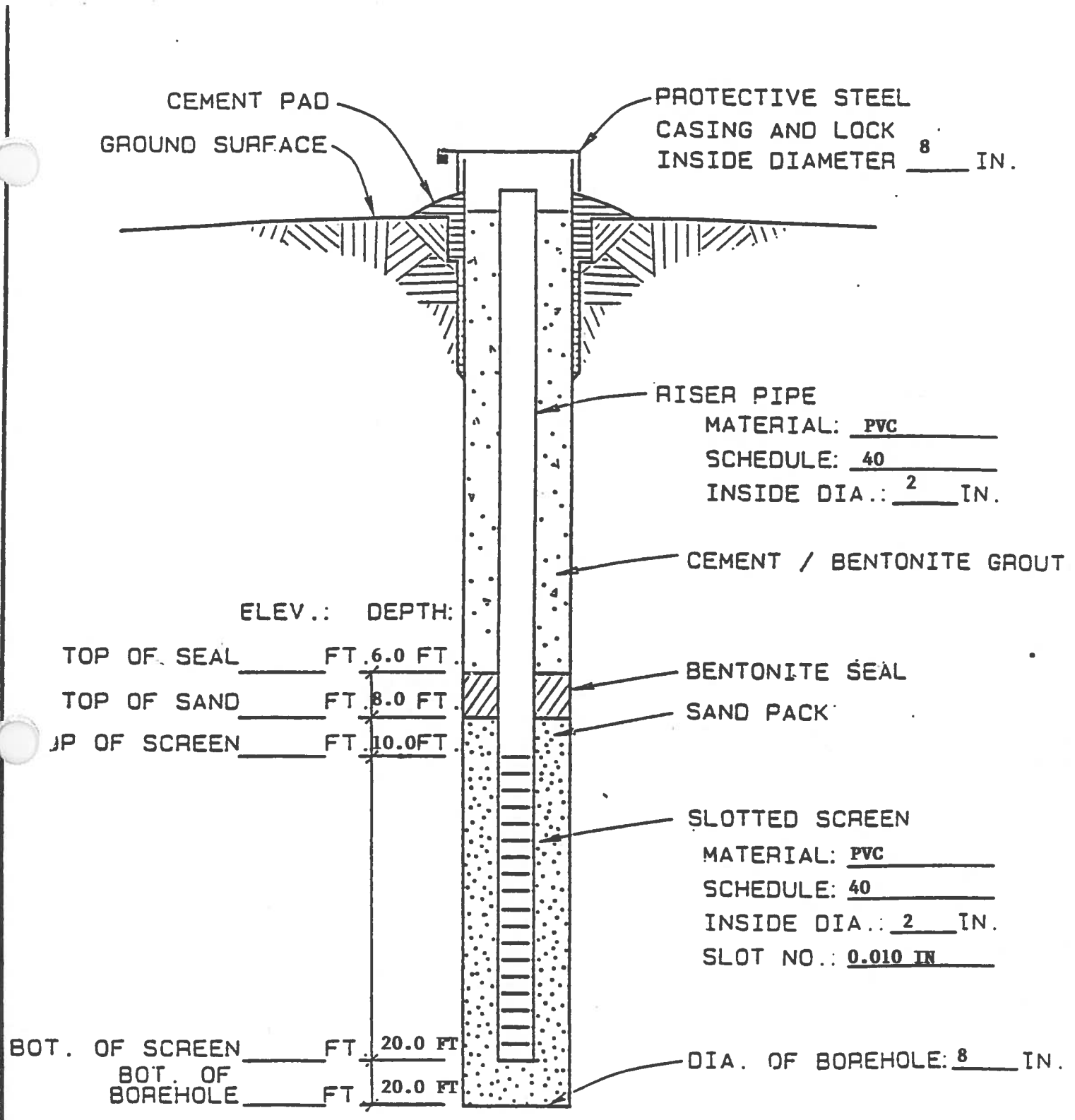
N.T.S.

MW-15D

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-15S PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/29/92 END DATE: 1/29/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Barney Waters OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0						0–10' See MW-15D				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10	1	10–12	9–11–12–9	2'/0.5'	23	Wet, red brown, fine to medium SAND and fine to medium GRAVEL, little silt				0
11										
12	2	12–14	7–6–4–10	2'/1.5'	10	Same as above, sheen noted				2
13										
14	3	14–16	3–3–5–3	2'/0.5'	8	Same as above, sheen noted				1
15										
16	4	16–18	5–6–5–4	2'/2'	11	16–17.5' Same as above 17.5–18' Damp, light to medium brown, clayey SILT, little very fine sand				0
17										
18	5	18–20	3–4–5–6	2'/1.5'	9	Same as 17.5–18', petroleum odor and sheen noted				2
19										
20						Bottom of boring 20.0'				

JMM:cmb/ESP010.8



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-15S

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-16D
		PAGE 1 OF 2
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/30/92
		END DATE: 1/30/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc.		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser
FOREMAN: Barney Waters		
OBG GEOLOGIST: John M. Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0	1	0–2	4–5–4–5	2'/0.5'	9	Damp, medium brown to black, very fine SAND and SILT, little concrete gravel, trace plastic and brick				0
2										
4										
	2	5–7	12–14–	2'/1.5'	21	Dry, light brown to red, fine to medium SAND, some silt and fine to medium gravel				0
6			7–14							
8										
10	3	10–12	8–9–9–7	2'/0.5'	18	Same as above				0
12										
14										
	4	15–17	7–6–	2'/0'	16	No recovery (wet), augering up medium SAND and fine to medium GRAVEL				—
16			10–10							
18										
20	5	20–22	3–5–5–6	2'/1.5'	10	Wet, light gray, laminated, clayey SILT, little very fine to fine sand				0
22										
24										
	6	25–27	4–6–7–12	2'/2'	13	Wet, light gray, very fine to fine SAND, little silt and clay				0
26										
28										
30	7	30–32	5–7–	2'/2'	19	Same as above				0
			12–11							
32										
34										
	8	35–37	5–12–	2'/2'	23	Wet, light gray, very fine to fine SAND, little to trace clay and silt				0
36			11–14							
38										

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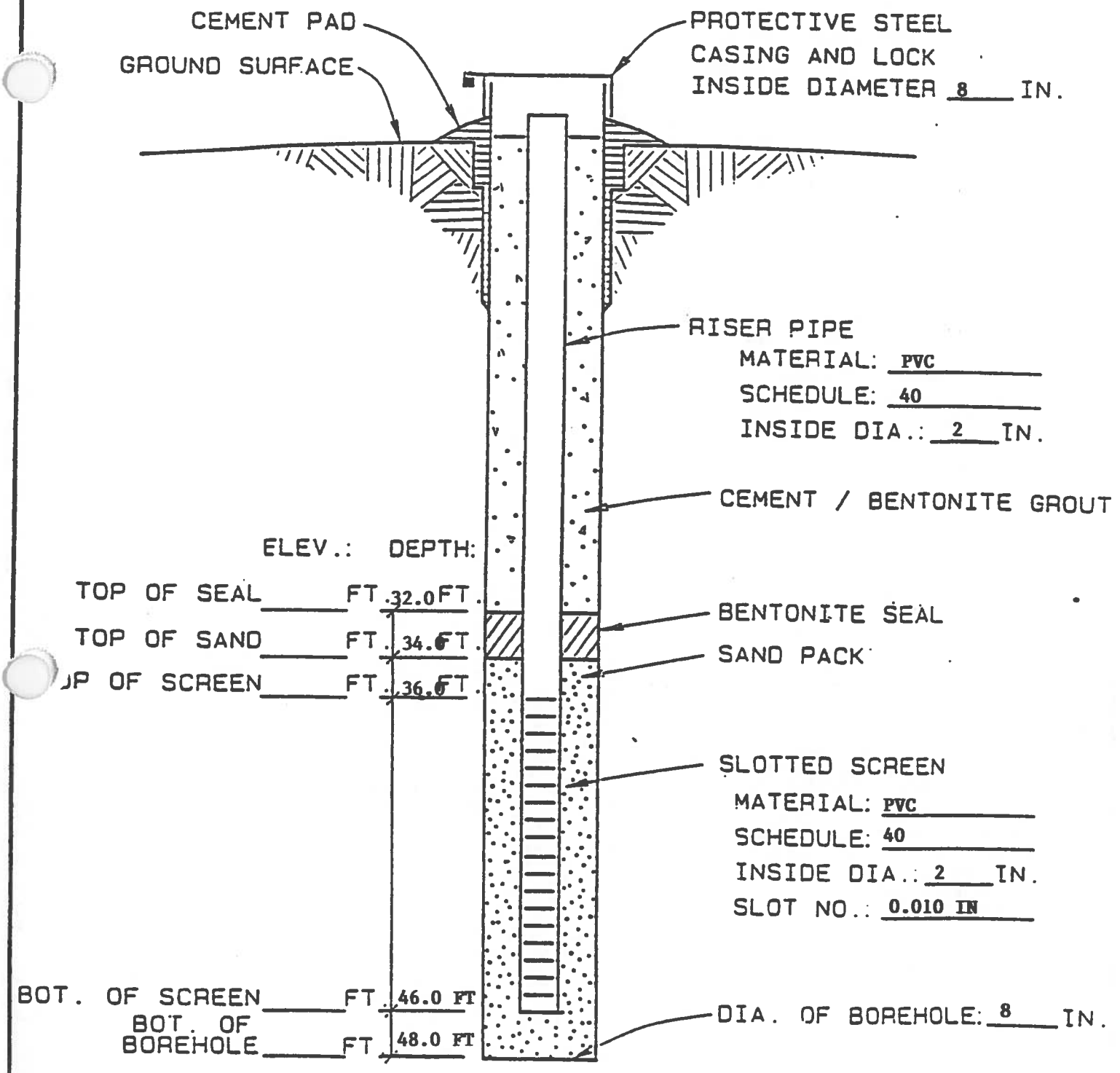
O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-16D PAGE 2 OF 2
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/30/92 END DATE: 1/30/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Barney Waters OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
40	9	40–42	5–9–	2'/2'	21	Same as above				0
			12–14							
42	10	42–44	13–16–	2'/2'	38	Same as above, sheen noted in cuttings				0
			22–19							
44	11	44–46	3–5–7–10	2'/2'	12	Damp, light gray, laminated, clayey SILT, little to trace very fine sand				0
46	12	46–48	12–12–	2'/2'	24	Same as above				0
			12–15							
48						Bottom of boring 48 ft.				
50										
52										



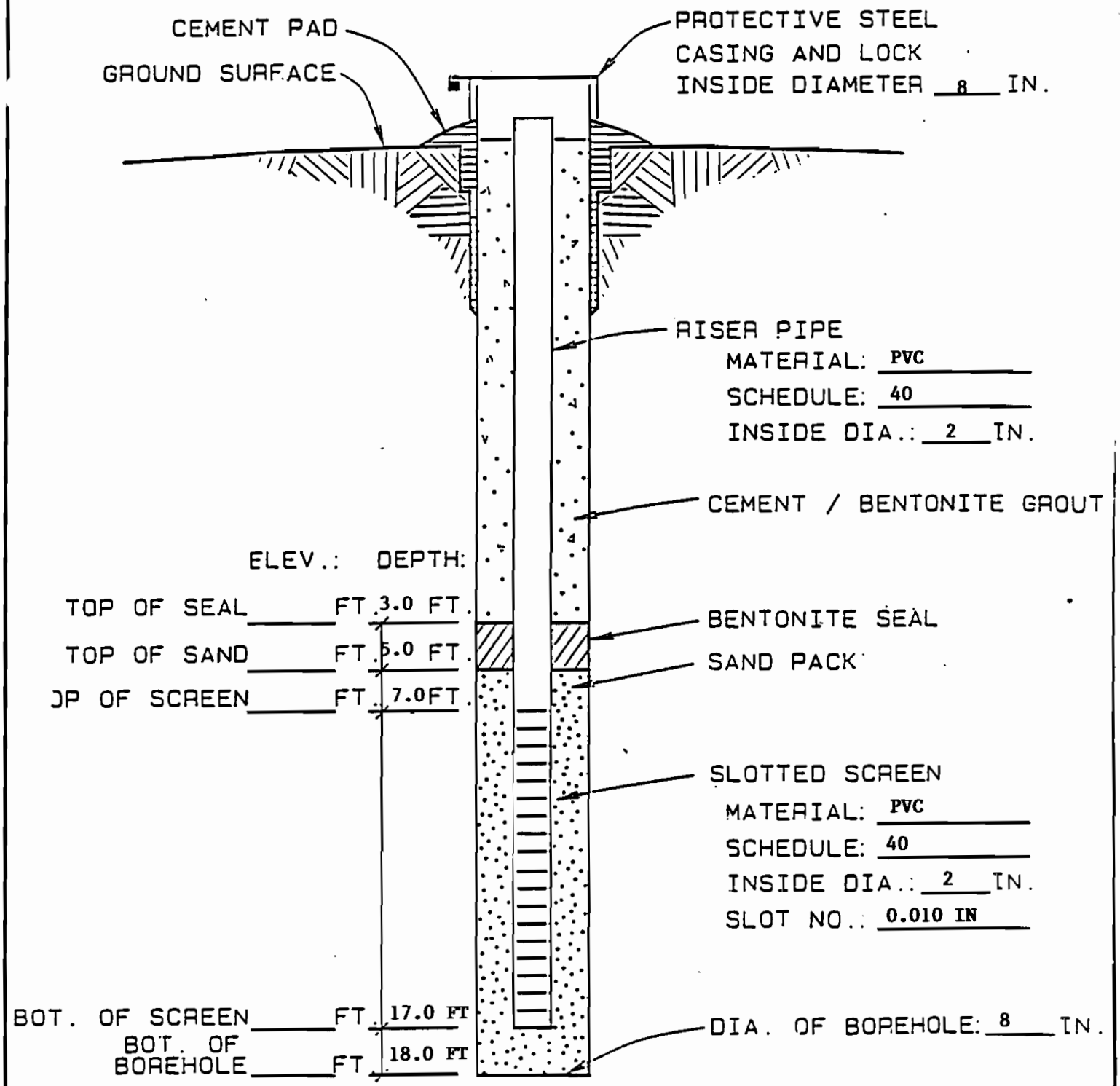
TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

MW-16D

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-16S
		PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 1/31/92
		END DATE: 1/31/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc.	GRND 1277.18	LEGEND: Grout, Sand Pack, Pellets, Screen, Riser
FOREMAN: Barney Waters		
OBG GEOLOGIST: John M. Mason		

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNU
0						0-10' See MW-16D				
10	1	10-12	9-11-8-7	2'/1'	19	Wet, light brown, medium to coarse SAND, some fine to medium gravel				0
12	2	12-14	9-9-8-8	2'/1'	17	Same as above, lower 2" is red brown SILT and very fine SAND				0
14	3	14-16	4-7-11-10	2'/1'	18	Damp, light gray, clayey SILT, little very fine sand				0
16	4	16-18	9-9-10-11	2'/1'	19	Same as above				0
18						Bottom of boring 18.0 ft.	18.0'			
20										



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

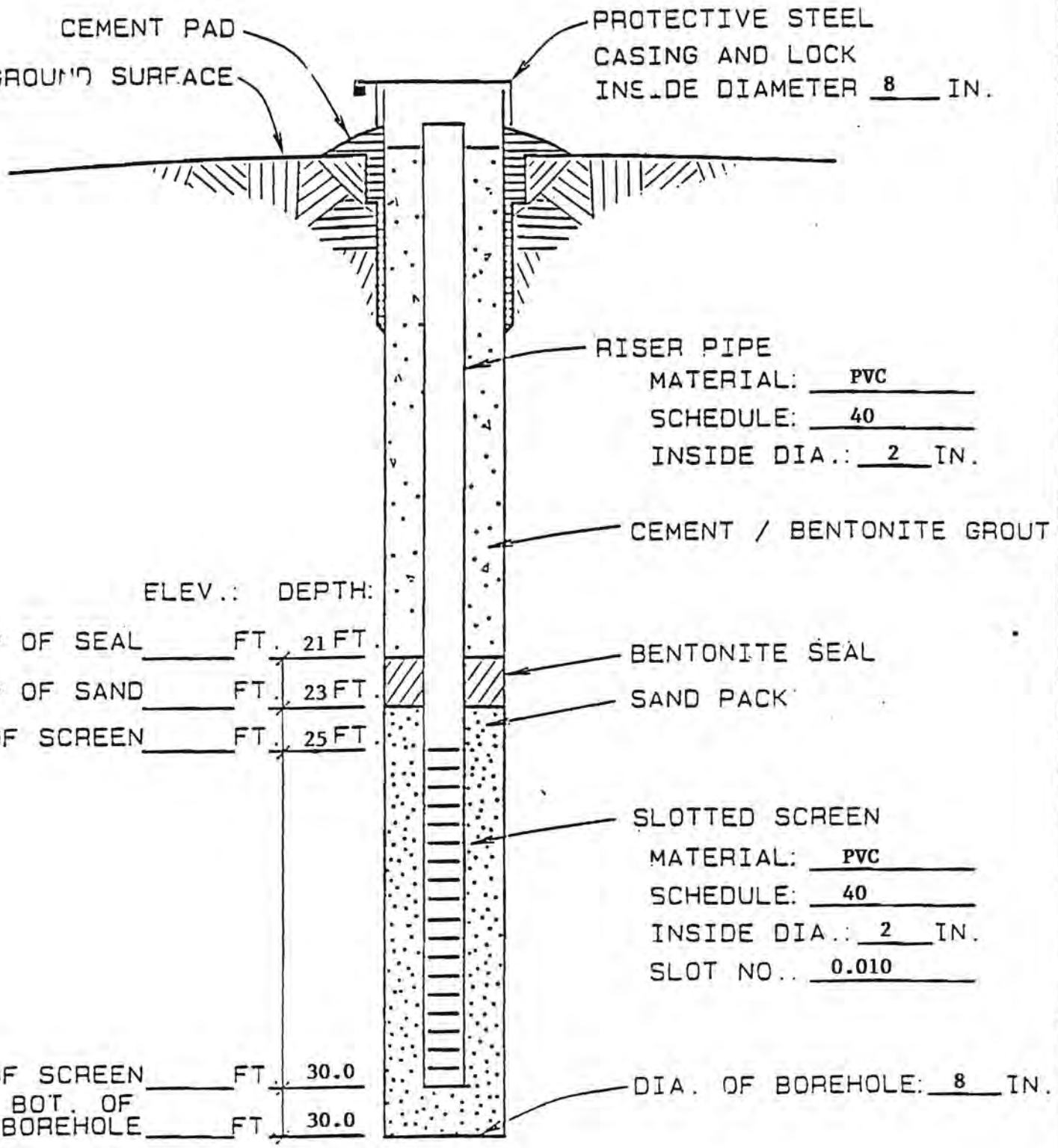
MW-16S

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-17S PAGE 1 OF 2
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 8/11/92 END DATE: 8/11/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Barney Waters OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNu (ppm)
0						ASPHALT				
	1	0.5-2	—24-18-8	1.5'/1'	42	Dry, light brown to black, fine to medium				0
1						SAND, some fine to coarse gravel, little silt				
2	2	2-4	7-6-6-7	2'/1.5'	12	Same as above changing to damp, dark brown				0
3						SILT, little to some cinders, trace slag (fill?)				
4	3	4-6	10-12-	2'/2'	21	Damp, light to medium brown, fine to medium				0
			9-9			SAND, some fine to medium gravel and silt,				
5						trace cinders and well sorted, medium sand pockets (fill?)				
6	4	6-8	12-11-	2'/1'	22	Damp to moist, same as above – little coarse				0
			11-12			gravel, trace clay (no cinders)				
7										
8	5	8-10	5-11-	2'/1.5'	22	Same as above changing to wet, light to medium				0
			11-6			brown, medium to coarse SAND and fine				
9						GRAVEL, little silt, trace clay				
10	6	10-12	9-8-6-5	2'/1.5'	14	Wet, light to medium brown, fine to medium				0
11						GRAVEL, some medium to coarse sand, little fine sand, trace silt and clay				
12	7	12-14	4-4-5-4	2'/1.5'	9	Same as above but coarse SAND and fine				0
13						GRAVEL, some medium gravel				
14	8	14-16	4-4-7-3	2'/1.5'	11	Same as above – little to medium sand, little				0
15						to trace silt and fine sand				
16	9	16-18	3-3-5-3	2'/1.5'	8	Same as above				0
17										
18	10	18-20	5-7-7-7	2'/2'	14	Wet, light brown, medium SAND and fine to				0
19						medium GRAVEL, some fine sand, little silt				

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-17S PAGE 2 OF 2
CLIENT: Essex Specialty Products	SAMPLER: Split Spoon	LOCATION:
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 8/11/92 END DATE: 8/11/92
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Barney Waters OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, == Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNu (ppm)
20	11	20-22	10-7-7-9	2'/2'	14	Same as above				0
21										
22	12	22-24	8-17-9-6	2'/2'	26	Wet, light to medium brown, fine GRAVEL, some coarse sand, little medium gravel, trace fine sand				0
23										
24	13	24-26	5-6-6-7	2'/2'	12	24'-25' Same as above 25'-26' Damp, light gray, laminated SILT, some clay, trace fine gravel				0
25										
26	14	26-28	7-9-9-12	2'/1.5'	18	Same as above - 3" lens of SILT with no laminations and little to some very fine sand				0
27										
28	15	28-30	5-5-9-12	2'/2'	14	Same as above - 2 lenses (1-2" thick) of silt and very fine sand (wet)				0
29										
30						Bottom of boring 30.0 ft.				



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Essex Specialty Products
Jamestown, NY
MW-17S

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-18S
PAGE 1 OF 1

CLIENT: Essex Specialty Products

SAMPLER: Split Spoon

LOCATION:

PROJECT LOCATION: Jamestown, NY

HAMMER: 140 lbs.

START DATE: 8/10/92
END DATE: 8/10/92

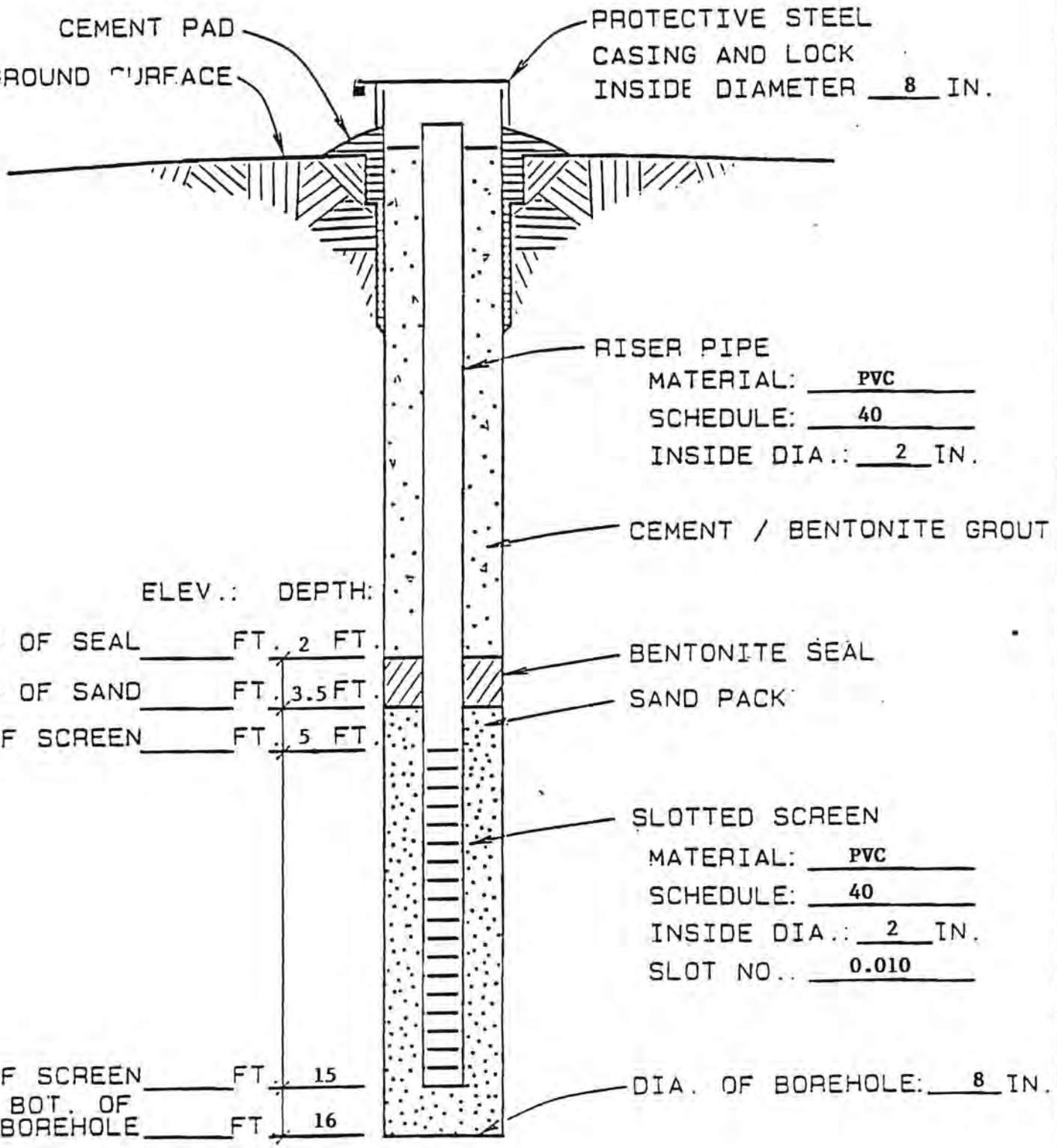
FILE NO.: 2576.010

FALL: 30"

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Barney Waters
OBG GEOLOGIST: John M. Mason

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HNu (ppm)
0	1	0–2	3–5–5–8	2'/2'	10	Dry, light brown to black, very fine SAND, some silt, trace wood, brick and clay				0
1										
2	2	2–4	9–19–	2'/2'	37	Dry to damp, light brown to gray, medium SAND, some silt and fine sand, little fine gravel to coarse sand				0
			18–17							
3										
4	3	4–6	12–22–	2'/2'	34	Dry to damp, same as above – trace to little gravel				0
			12–16							
5										
6	4	6–8	14–14–	2'/2'	31	Damp, same as above – little to some fine gravel and coarse sand				0
			17–21							
7										
8	5	8–10	7–11–	2'/1'	22	Moist to wet, brown, medium SAND and GRAVEL, some coarse sand, little fine sand and silt (wet at 9 ft.)				0
			11–20							
9										
10	6	10–12	11–12–	2'/1.5'	20	Same as above – wet				0.2
			8–7							
11										
12	7	12–14	7–4–7–7	2'/1.5'	11	Same as above – wet, no odor				7
13										
14	8	14–16	4–8–	2'/2'	18	Damp, light gray SILT, laminated, little very fine sand, little clay/silt laminations at bottom 0.2 ft.				0
			10–12							
15										
16						Bottom of boring 16.0 ft.				
17										
18										
19										
20										



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Essex Specialty Products
Jamestown, NY
MW-18

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-19D

PAGE 2 OF 2

CLIENT: Essex Specialty Products

SAMPLER: 2" Split Spoon

LOCATION: East side of Building

PROJECT LOCATION: Jamestown, NY

HAMMER: 140 lbs.

START DATE: 3/03/93

END DATE: 3/05/93

FILE NO.: 2576.010

FALL: 30"

BORING COMPANY: Parratt-Wolff, Inc.

FOREMAN: Doug Richmond

OBG GEOLOGIST: John M. Mason

LEGEND: Grout, Sand Pack, Pellets, Scre, Rise

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID
20	10	20-22	4-6-8-11	2'/1'	14	Wet, light gray, laminated, clayey SILT			0
21									
22	11	22-24	4-6-	2'/1.5'	16	Same as above, little stringers of very fine sand			0
			10-12						
23									
24	12	24-26	10-9-	2'/1'	18	Wet, light gray, very fine to fine SAND, trace lenses of laminated, clayey silt			0.2
			9-13						
25									
26	13	26-28	5-15-	2'/1'	38	Wet, same as above, no clayey silt			0.1
			23-17						
27									
28	14	28-30	6-7-9-8	2'/1.5'	16	Wet, same as above			0.5
29									
30	15	30-32	4-7-7-8	2'/0.1'	14	Wet, same as above			0
31									
32	16	32-34	9-7-9-9	2'/1'	16	Same as above			0.5
33									
34	17	34-36	7-9-9-10	2'/1'	18	Same as above			0
35									
36	18	36-38	6-8-	2'/1'	19	Same as above, trace laminated, clayey silt			0
			11-9						
37									
38	19	38-40	8-8-	2'/1.5'	22	Same as above			0
			14-19						
39									
40	20	40-42	7-9-	2'/1'	20	Same as above			0
			11-11						
41									
42	21	42-44	7-8-8-11		16	Same as above, changes to wet, light gray, laminated, clayey SILT			0
43									
44						Bottom of boring 44 ft			

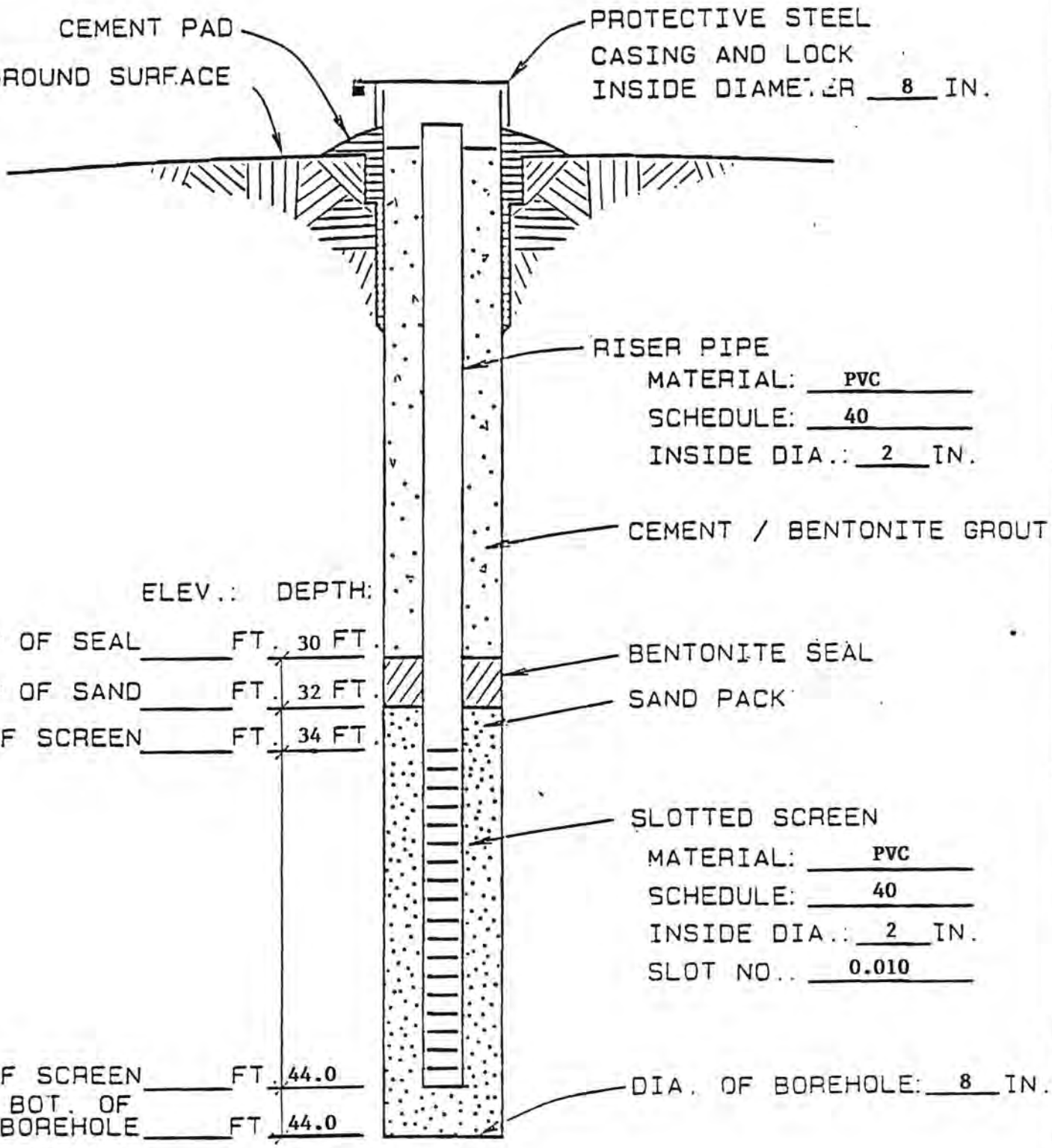
DRAFT

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-19D PAGE 1 OF 2
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION: East side of Building
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 3/03/93 END DATE: 3/05/93
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Doug Richmond OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID
0									
1									
2	1	2-4	8-8-9-10	2'/1'	17	Dry, light to medium brown, fine to medium SAND and GRAVEL, little to some silt			0
3									
4	2	4-6	15-13-11-12	2'/1.5'	24	Same as above, damp			0
5									
6	3	6-8	14-12-10-10	2'/1.5'	22	Same as above, moist, little coarse sand			0
7									
8	4	8-10	12-17-13-9	2'/2'	30	Same as above, moist, little layer of medium, brown silt			0
9									
10	5	10-12	12-6-5-10	2'/1'	11	Same as above, changes to wet, medium brown to gray, medium SAND, little fine sand			0
11									
12	6	12-14	9-8-6-7	2'/1'	14	Wet, light brown, medium SAND and GRAVEL, little fine to coarse sand			0
13									
14	7	14-16	6-4-3-8	2'/1'	7	Wet, same as above			0
15									
16	8	16-18	6-4-3-6	2'/1'	7	Wet, same as above, changes to wet, light brown to light gray, laminated, clayey SILT, trace black oily layer noted in sand and gravel (no sheen)			0
17									
18	9	18-20	4-5-6-8	2'/1.5'	11	Wet, light gray, laminated, clayey SILT, trace very fine sand			0
19									

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-19D PAGE 2 OF 2
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION: East side of Building
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 3/03/93 END DATE: 3/05/93
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Doug Richmond OBG GEOLOGIST: John M. Mason	DRAFT	LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID
20	10	20–22	4–6–8–11	2'/1'	14	Wet, light gray, laminated, clayey SILT			0
21									
22	11	22–24	4–6–10–12	2'/1.5'	16	Same as above, little stringers of very fine sand			0
23									
24	12	24–26	10–9–9–13	2'/1'	18	Wet, light gray, very fine to fine SAND, trace lenses of laminated, clayey silt			0.2
25									
26	13	26–28	5–15–23–17	2'/1'	38	Wet, same as above, no clayey silt			0.1
27									
28	14	28–30	6–7–9–8	2'/1.5'	16	Wet, same as above			0.5
29									
30	15	30–32	4–7–7–8	2'/0.1'	14	Wet, same as above			0
31									
32	16	32–34	9–7–9–9	2'/1'	16	Same as above			0.5
33									
34	17	34–36	7–9–9–10	2'/1'	18	Same as above			0
35									
36	18	36–38	6–8–11–9	2'/1'	19	Same as above, trace laminated, clayey silt			0
37									
38	19	38–40	8–8–14–19	2'/1.5'	22	Same as above			0
39									
40	20	40–42	7–9–11–11	2'/1'	20	Same as above			0
41									
42	21	42–44	7–8–8–11		16	Same as above, changes to wet, light gray, laminated, clayey SILT			0
43									
44						Bottom of boring 44 ft.			



TYPICAL OVERBURDEN MONITORING WELL

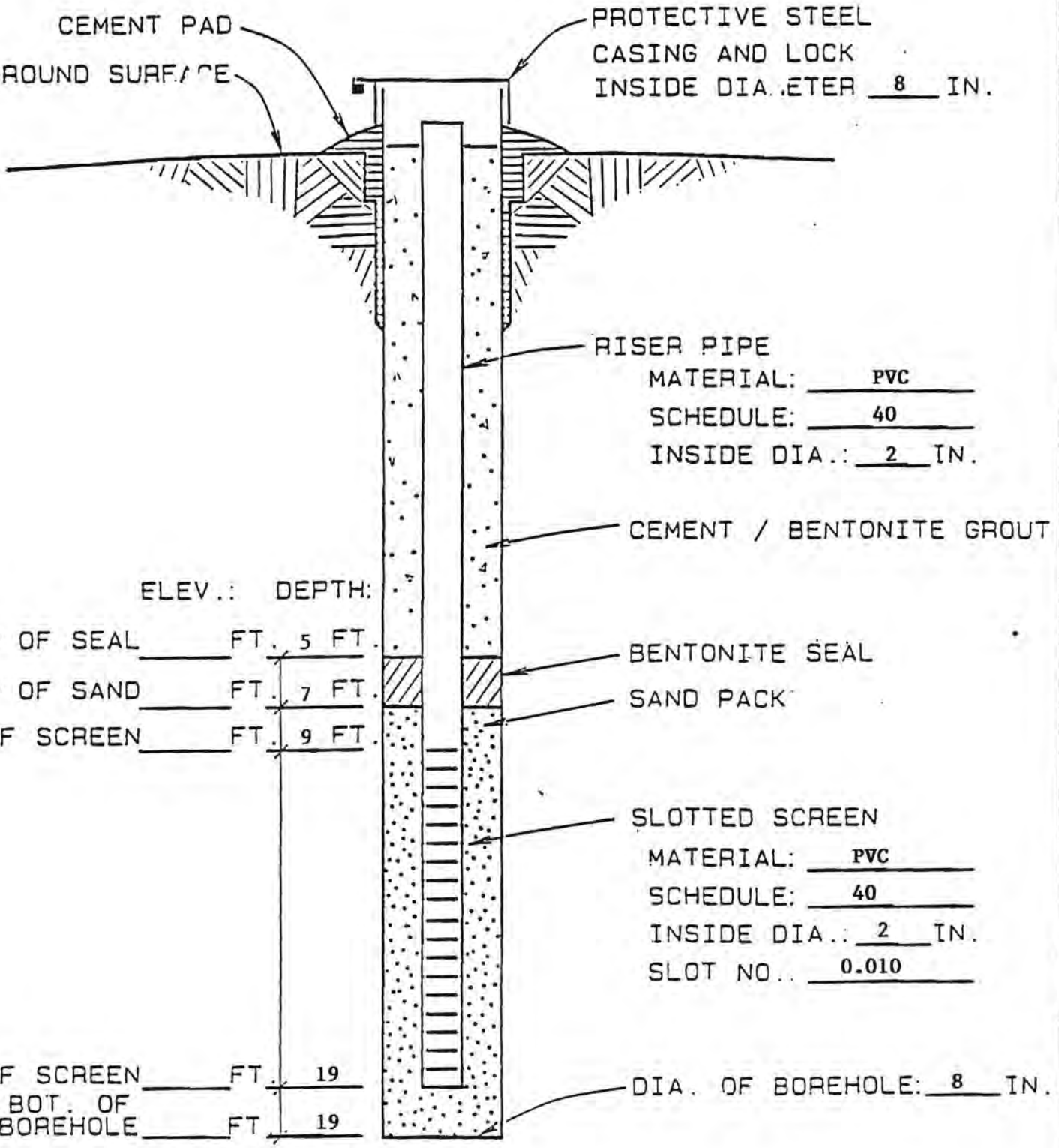
N.T.S.

Essex Specialty Products
Jamestown, NY
MW-19D

DRAFT

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING MW-19S PAGE 1 OF 1
CLIENT: Essex Specialty Products	SAMPLER: 2" Split Spoon	LOCATION: East side of Building
PROJECT LOCATION: Jamestown, NY	HAMMER: 140 lbs.	START DATE: 3/03/93 END DATE: 3/03/93
FILE NO.: 2576.010	FALL: 30"	
BORING COMPANY: Parratt-Wolff, Inc. FOREMAN: Doug Richmond OBG GEOLOGIST: John M. Mason		LEGEND: Grout, Sand Pack, Pellets, ==== Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID
0									
1									
2	1	2-4	8-8-9-10	2'/1'	17	Dry, light to medium brown, fine to medium SAND and GRAVEL, little to some silt			0
3									
4	2	4-6	15-13-11-12	2'/1.5'	24	Same as above, damp			0
5									
6	3	6-8	14-12-10-10	2'/1.5'	22	Same as above, moist, little coarse sand			0
7									
8	4	8-10	12-17-13-9	2'/2'	30	Same as above, moist, little layer of medium, brown silt			0
9									
10	5	10-12	12-6-5-10	2'/1'	11	Same as above, changes to wet, medium brown to gray, medium SAND, little fine sand			0
11									
12	6	12-14	9-8-6-7	2'/1'	14	Wet, light brown, medium SAND and GRAVEL, little fine to coarse sand			0
13									
14	7	14-16	6-4-3-8	2'/1'	7	Wet, same as above			0
15									
16	8	16-18	6-4-3-6	2'/1'	7	Wet, same as above, changes to wet, light brown to light gray, laminated, clayey SILT, trace black oily layer noted in sand and gravel (no sheen)			0
17									
18	9	18-19	4-5-6-8	2'/1.5'	11	Wet, light gray, laminated, clayey SILT, trace very fine sand			0
19						Bottom of boring 19 ft.			
20									



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Essex Specialty Products
Jamestown, NY
MW-19S

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-20
PAGE 1 OF 1

CLIENT: Essex Specialty Products

PROJECT LOCATION: Jamestown, NY

FILE NO.: 2576.010

SAMPLER: 2" Split Spoon

HAMMER: 140 lbs.

FALL: 30"

LOCATION: ~15 ft. East of Diptank

START DATE: 3/06/93
END DATE: 3/06/93

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Doug Richmond
OBG GEOLOGIST: John M. Mason

GRND 1278.92

LEGEND: Grout, Sand Pack, Pellets, Scre, Rise

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTIN PID
0	-	-							
	1	0.5-2	- 7-9-2	2'/1'	16	Dry, light to medium brown, fine SAND and GRAVEL, some silt to medium sand			0
1									
2	2	2-4	6-7-8-8	2'/2'	15	Dry to damp, tan brown SILT, mottled, trace very fine sand			0
3									
4	3	4-6	41-43-	2'/1.5'	90	Same as above, changes to moist, light to medium brown, medium to coarse SAND, some gravel, little fine sand			0
			47-36						
5									
6	4	6-8	42-40-	2'/1.5'	71	Moist to wet, medium brown, medium to coarse SAND, some gravel			8
			31-25						
7									
8	5	8-10	26-17-	2'/1'	43	Wet, medium gray, fine to medium SAND, little to some gravel, trace silt			12
			26-25						
9									
10	6	10-12	11-11-	2'/1.5'	17	Wet, same as above, changes to wet, medium brown, laminated, clayey SILT			20
			6-4						
11									
12	7	12-14	6-14-	2'/1'	33	Wet, medium brown to light gray, laminated, clayey SILT, trace fine gravel			1
			19-19						
13									
14						Bottom of boring 14 ft.			
15									
16									
17									
18									
19									
20									

1267.92

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING MW-20
PAGE 1 OF 1

CLIENT: Essex Specialty Products
PROJECT LOCATION: Jamestown, NY
FILE NO.: 2576.010

SAMPLER: 2" Split Spoon
HAMMER: 140 lbs.
FALL: 30"

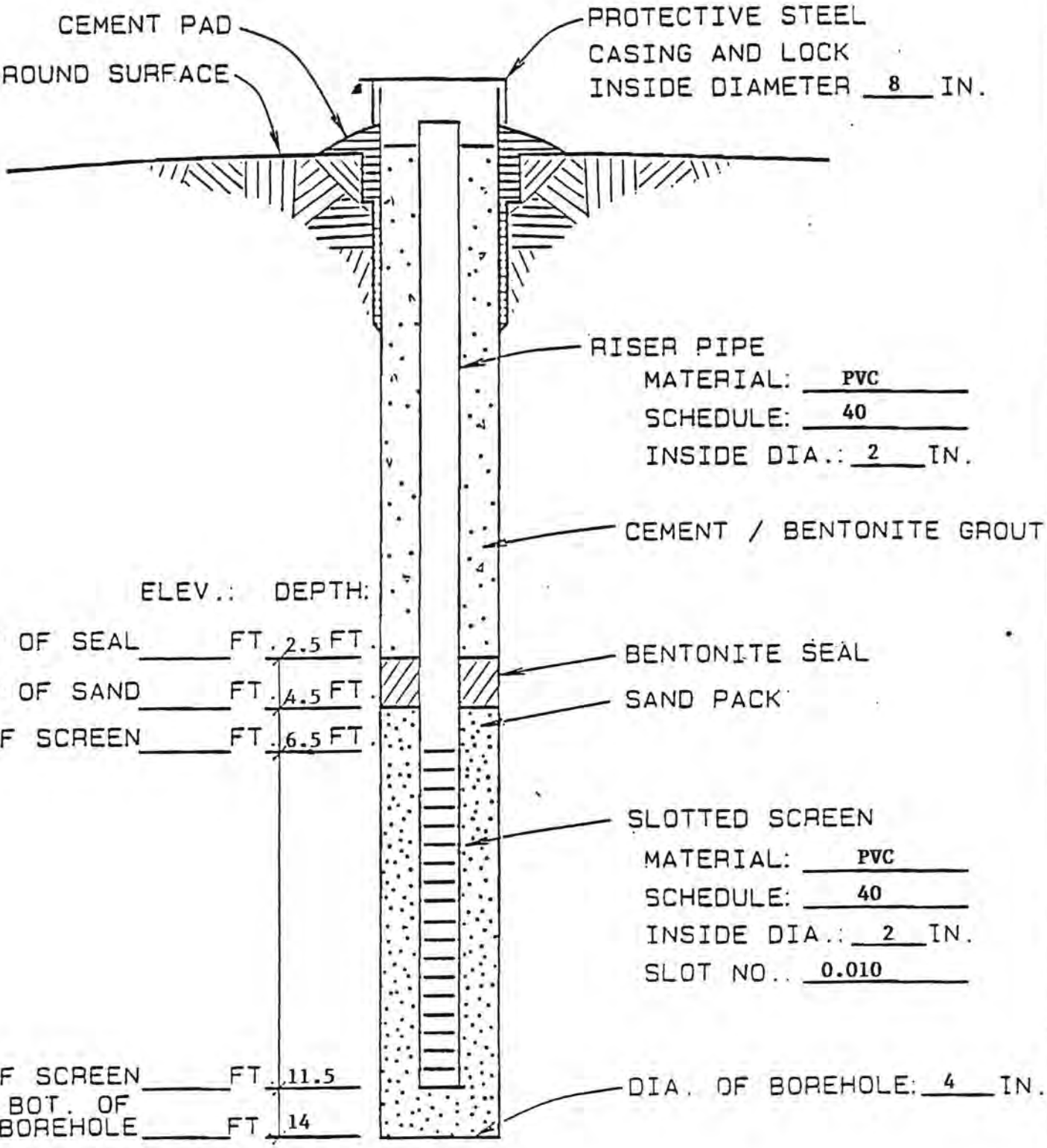
LOCATION:
START DATE: 3/06/93
END DATE: 3/06/93

BORING COMPANY: Parratt-Wolff, Inc.
FOREMAN: Doug Richmond
OBG GEOLOGIST: John M. Mason

DRAFT

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID
0									
	1	0.5–2	– 7–9–2	2'/1'	16	Dry, light to medium brown, fine SAND and GRAVEL, some silt to medium sand			0
1									
2	2	2–4	6–7–8–8	2'/2'	15	Dry to damp, tan brown SILT, mottled, trace very fine sand			0
3									
4	3	4–6	41–43–	2'/1.5'	90	Same as above, changes to moist, light to medium brown, medium to coarse SAND, some gravel, little fine sand			0
			47–36						
5									
6	4	6–8	42–40–	2'/1.5'	71	Moist to wet, medium brown, medium to coarse SAND, some gravel			8
			31–25						
7									
8	5	8–10	26–17–	2'/1'	43	Wet, medium gray, fine to medium SAND, little to some gravel, trace silt			12
			26–25						
9									
10	6	10–12	11–11–	2'/1.5'	17	Wet, same as above, changes to wet, medium brown, laminated, clayey SILT			20
			6–4						
11									
12	7	12–14	6–14–	2'/1'	33	Wet, medium brown to light gray, laminated, clayey SILT, trace fine gravel			1
			19–19						
13									
14						Bottom of boring 14 ft.			
15									
16									
17									
18									
19									
20									



TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Essex Specialty Products
Jamestown, NY
MW-20

21D.

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. MW-21D
HOLE NO. _____

BY KD
DATE 11-11-03
CHK BY _____
DATE _____

PROJECT NAME ESSEX/HOPE
LOCATION JAMESTOWN, NY
DRILLING CONTRACTOR NOTHNAGLE
DRILLING METHOD 10¼ HSA/6" DRIVEN CASING
DRILLING FLUID WATER
DRILLING START DATE 11-10-03

PROJECT NO 50410-11.21
GEOLOGIST KEITH DODGIN
DRILLER STEVE LORMONT
RIG TYPE CME-85
DRILLING COMPLETION DATE 11-11-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
12-IN	0-17 FT
4-IN	17-41.5 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0-1 FT
SURFACE PAD DIMENSIONS 18-IN DIA x 6-IN

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 6-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-17 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-31.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 31.5-41 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 41-41.5 FT

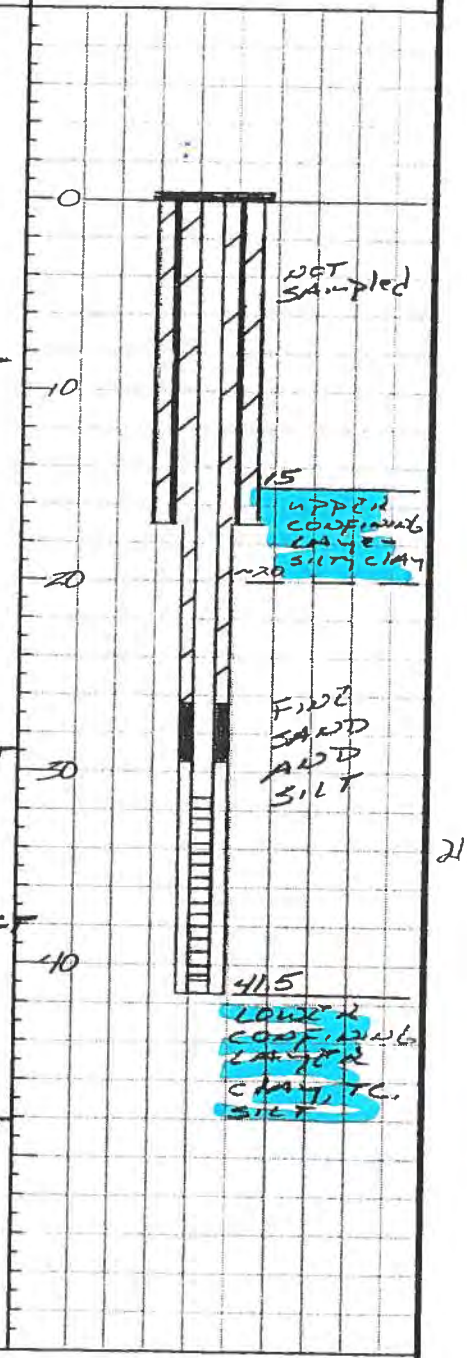
ANNULAR GROUT
INSTALL. METHOD TREMIE
MATERIAL CEMENT/BENT
MIX PROPORTIONS 94 lb PORTLAND 5% BENTONITE 6 Gal H2O
QUANTITIES _____
DEPTH INTERVAL 0-17 FT
0.5-26.5 FT

ANNULAR SEAL
INSTALL. METHOD TREMIE
MATERIAL BENTONITE PELLETS
QUANTITY _____
DEPTH INTERVAL 26.5-29.5 FT

FILTER PACK
INSTALL. METHOD TREMIE
MATERIAL RICCI #00
QUANTITY _____
DEPTH INTERVAL 29.5-41.5 FT

DEVELOPMENT
METHOD _____
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
CONFIRMATORY SAMPLES COLLECTED FROM 15-17 FT & 36-42 FT

FILE: \WELL-LOG

21D.

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. MW-21D
HOLE NO. _____

BY KD
DATE 11-11-03
CHK BY _____
DATE _____

PROJECT NAME ESSEX/HOPE
LOCATION JAMESTOWN, NY
DRILLING CONTRACTOR NOTHNAGLE
DRILLING METHOD 10¼ HSA/6" DRIVEN CASING
DRILLING FLUID WATER
DRILLING START DATE 11-10-03

PROJECT NO 50410-11.21
GEOLOGIST KEITH DODGIN
DRILLER STEVE LORMONT
RIG TYPE CME-85
DRILLING COMPLETION DATE 11-11-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH _____
WELL DEPTH _____
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
12-IN	0-17 FT
4-IN	17-41.5 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0-1 FT
SURFACE PAD DIMENSIONS 18-IN DIA x 6-IN

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 6-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-17 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-31.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 31.5-41 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 41-41.5 FT

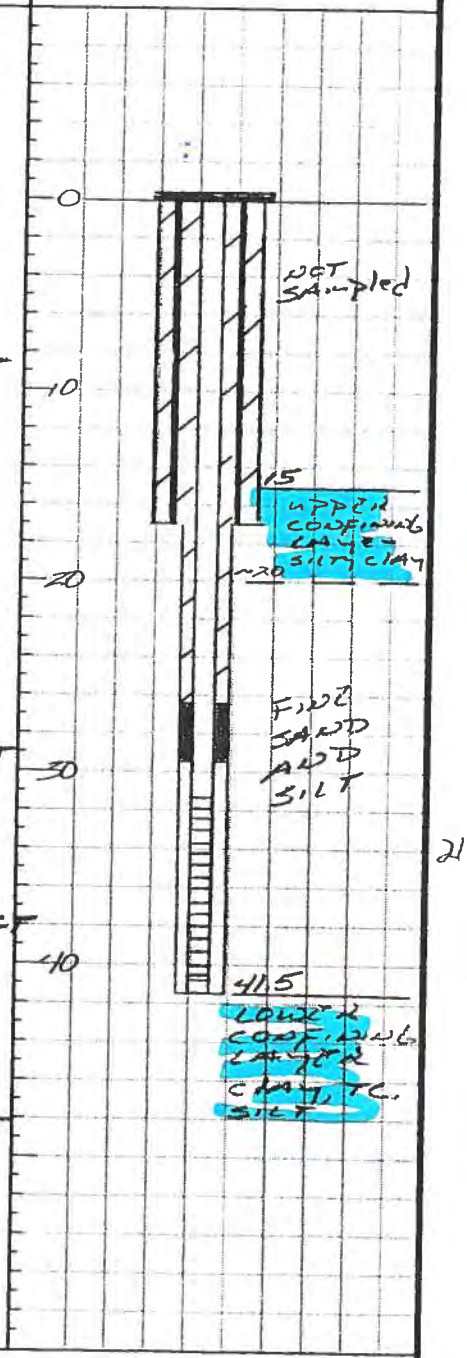
ANNULAR GROUT
INSTALL. METHOD TREMIE
MATERIAL CEMENT/BENT
MIX PROPORTIONS 94 lb PORTLAND 5% BENTONITE 6 Gal H2O
QUANTITIES _____
DEPTH INTERVAL 0-17 FT
0.5-26.5 FT

ANNULAR SEAL
INSTALL. METHOD TREMIE
MATERIAL BENTONITE PELLETS
QUANTITY _____
DEPTH INTERVAL 26.5-29.5 FT

FILTER PACK
INSTALL. METHOD TREMIE
MATERIAL RICCI #00
QUANTITY _____
DEPTH INTERVAL 29.5-41.5 FT

DEVELOPMENT
METHOD _____
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:
CONFIRMATORY SAMPLES COLLECTED FROM 15-17 FT & 36-42 FT

FILE: \WELL-LOG

22D

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. MW-22D
HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 604041.21
BY KD — LOCATION JAMESTOWN, RI — GEOLOGIST KEITH DODGE, II
DATE 11-6-03 — DRILLING CONTRACTOR GEOTHERMAL — DRILLER STEVE CONCANNON
CHK BY _____ — DRILLING METHOD 10 1/4 HSA/6 1/4" ROLLER BIT CASING — RIG TYPE CME 75
DATE _____ — DRILLING FLUID WATER
DRILLING START DATE 11-5-03 — DRILLING COMPLETION DATE 11-6-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH 42.5
WELL DEPTH 42.5
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
12-IN	0 - 26 FT
4-IN	26 - 42.5 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0 - 1
SURFACE PAD DIMENSIONS 18-IN DIA x 6-IN

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 6-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5 - 26 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5 - 32.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 32.5 - 42 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 42 - 42.5 FT

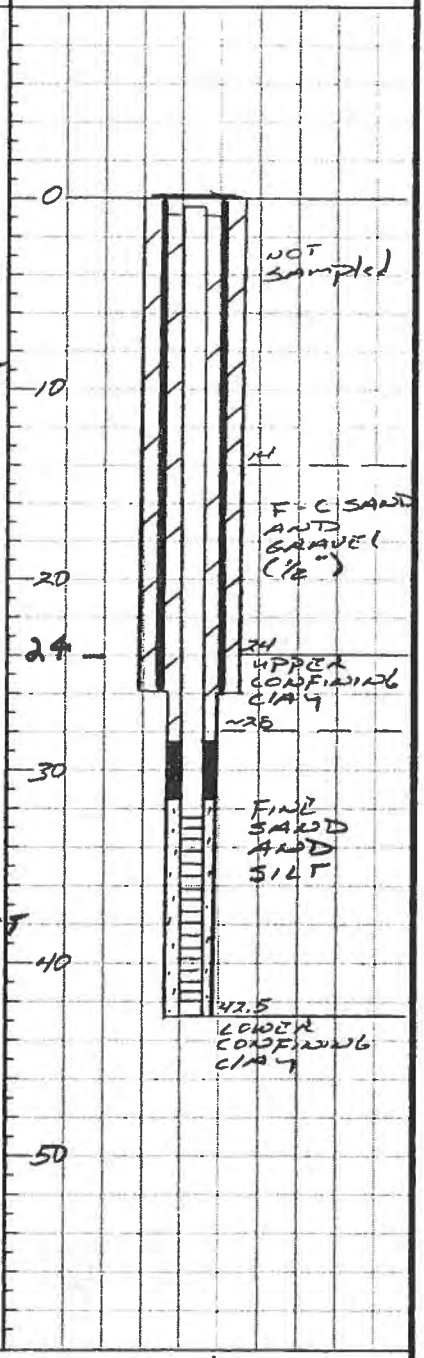
ANNULAR GROUT
INSTALL. METHOD TREMIE
MATERIAL CEMENT/BENT.
MIX PROPORTIONS 94 lb PORT LAND CEMENT, 5% BENT, 6 GAL H2O
QUANTITIES _____
DEPTH INTERVAL 0 - 26 FT, 0 - 25.5 FT

ANNULAR SEAL
INSTALL. METHOD TREMIE
MATERIAL BENTONITE PELLETS
QUANTITY _____
DEPTH INTERVAL 25.5 - 31.5 FT

FILTER PACK
INSTALL. METHOD TREMIE
MATERIAL RICCI OOW
QUANTITY _____
DEPTH INTERVAL 31.5 - 42.5

DEVELOPMENT
METHOD _____
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: CONFIRMATORY SPLIT SPOON SAMPLES COLLECTED FROM 14 TO 28 FT AND 36 TO 44 FT

FILE: \WELL-LOG

22D

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. MW-22D
HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 604041.21
BY KD — LOCATION JAMESTOWN, RI — GEOLOGIST KEITH DODGE, II
DATE 11-6-03 — DRILLING CONTRACTOR GEOTHERMAL — DRILLER STEVE CONCANNON
CHK BY _____ — DRILLING METHOD 10 1/4 HSA/6 1/4" ROLLER BIT CASING — RIG TYPE CME 75
DATE _____ — DRILLING FLUID WATER
DRILLING START DATE 11-5-03 — DRILLING COMPLETION DATE 11-6-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH 42.5
WELL DEPTH 42.5
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
12-IN	0 - 26 FT
4-IN	26 - 42.5 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0 - 1
SURFACE PAD DIMENSIONS 18-IN DIA x 6-IN

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 6-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5 - 26 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5 - 32.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 32.5 - 42 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 42 - 42.5 FT

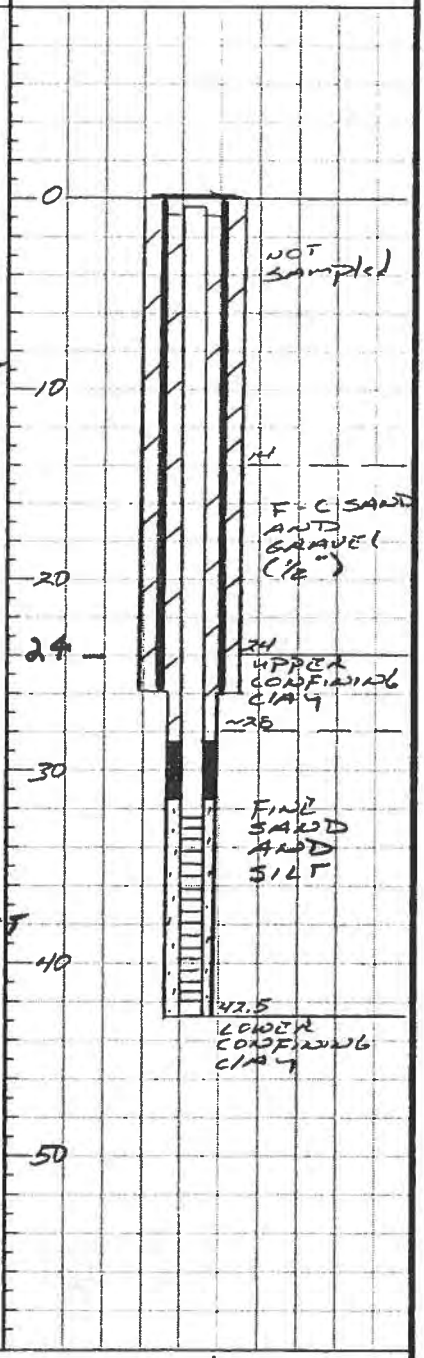
ANNULAR GROUT
INSTALL. METHOD TREMIE
MATERIAL CEMENT/BENT.
MIX PROPORTIONS 94 lb PORT LAND CEMENT, 5% BENT, 6 GAL H2O
QUANTITIES _____
DEPTH INTERVAL 0 - 26 FT, 0 - 25.5 FT

ANNULAR SEAL
INSTALL. METHOD TREMIE
MATERIAL BENTONITE PELLETS
QUANTITY _____
DEPTH INTERVAL 25.5 - 31.5 FT

FILTER PACK
INSTALL. METHOD TREMIE
MATERIAL RICCI OOW
QUANTITY _____
DEPTH INTERVAL 31.5 - 42.5

DEVELOPMENT
METHOD _____
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: CONFIRMATORY SPLIT SPOON SAMPLES COLLECTED FROM 14 TO 28 FT AND 36 TO 44 FT

FILE: \WELL-LOG

WELL COMPLETION LOG

WELL NO. MW-23D

HOLE NO. _____

PROJECT NAME ESSEX/HOPE PROJECT NO. 2041.21

BY KD LOCATION JAMESTOWN, NY GEOLOGIST KEITH DODRILL

DATE 11-6-03 DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE CORENTY

CHK BY _____ DRILLING METHOD 10¼ HSA/4" DRIVEN CASING RIG TYPE CME 85

DATE _____ DRILLING FLUID WATER

DRILLING START DATE 11-4-03 DRILLING COMPLETION DATE 11-6-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. _____
SURFACE PAD ELEV. _____
HOLE DEPTH 38-FT
WELL DEPTH 38-FT
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
12-IN	0-19 FT
4-IN	19-38 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0-1 FT
SURFACE PAD DIMENSIONS 12-IN (IN CONCRETE SLAB)

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 6-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-19 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-28 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 28-37.5

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 37.5-38 FT

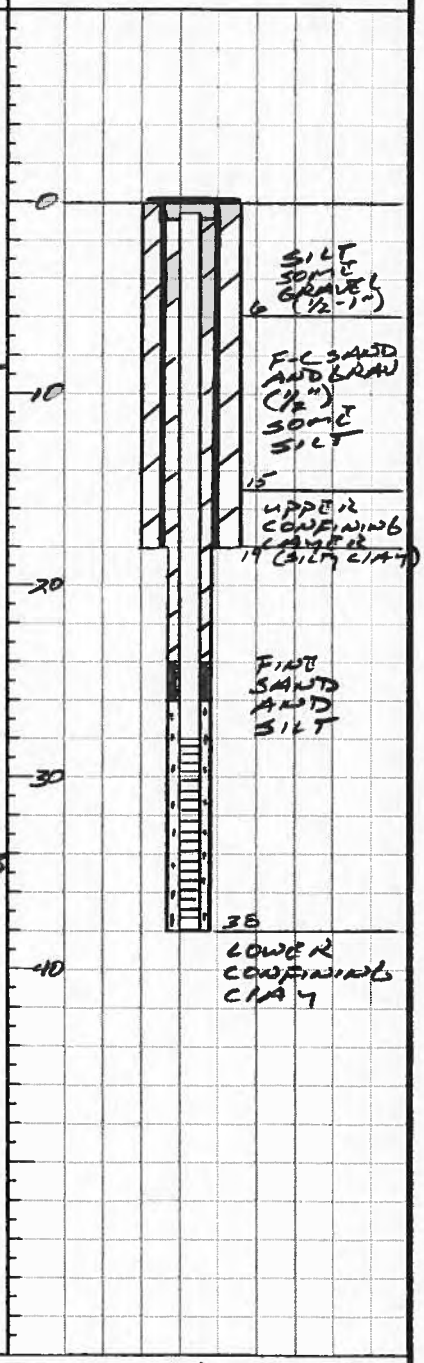
ANNULAR GROUT
INSTALL. METHOD TREMIE
MATERIAL CEMENT/BENT
MIX PROPORTIONS 94 lbs PORTLAND 5% BENT 6 Gal H2O
QUANTITIES _____
DEPTH INTERVAL 0-19 FT 0-24 FT

ANNULAR SEAL
INSTALL. METHOD TREMIE
MATERIAL BENTONITE PELLETS
QUANTITY _____
DEPTH INTERVAL 24-26 FT

FILTER PACK
INSTALL. METHOD TREMIE
MATERIAL RICCI 00N
QUANTITY _____
DEPTH INTERVAL 26-38 FT

DEVELOPMENT
METHOD _____
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: CONFIRMATORY SPLIT SPOON SAMPLES COLLECTED FROM 15 TO 22 FT AND 36 TO 40 FT

FILE: \WELL-LOG

WELL COMPLETION LOG

WELL NO. MW-23S
HOLE NO. ____

BY KD
DATE 11-7-03
CHK BY ____
DATE ____

PROJECT NAME ESSEX/MOPIC
LOCATION JAMESTOWN, NY
DRILLING CONTRACTOR NORTHERN GEO
DRILLING METHOD 10¼" HSA / 4" ID DRIVEN CASING
DRILLING FLUID WATER
DRILLING START DATE 11-7-03

PROJECT NO. 20410411.21
GEOLOGIST KEITH DOERR
DRILLER STEVE LORENZ
RIG TYPE CME 85
DRILLING COMPLETION DATE 11-7-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ____
SURFACE PAD ELEV. ____
HOLE DEPTH 15 FT
WELL DEPTH 15 FT
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
8-IN	0-15 FT
____	____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0-1
SURFACE PAD DIMENSIONS N/A (INSTALLED IN CONCRETE SLAB)

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 5-14.5 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 14.5-15 FT

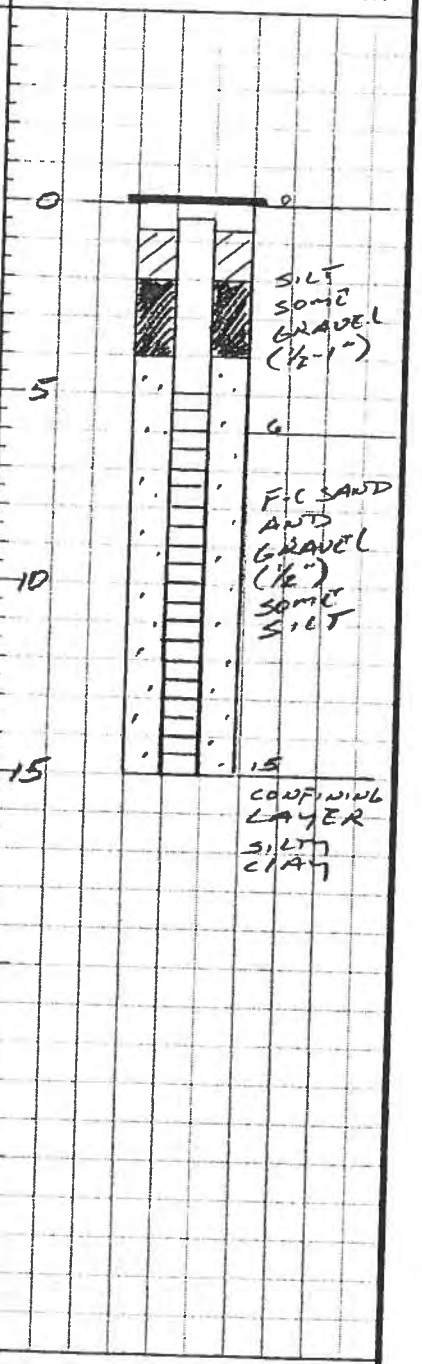
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT/BENT
MIX PROPORTIONS 94 lb PORTLAND 5% BENT 6 GAL H2O
QUANTITIES ____
DEPTH INTERVAL 0-2 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE PELLETS
QUANTITY ____
DEPTH INTERVAL 2-4 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL RICCI 00W
QUANTITY ____
DEPTH INTERVAL 4 TO 15 FT

DEVELOPMENT
METHOD ____
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

WELL COMPLETION LOG

WELL NO. MW-23S
HOLE NO. ____

BY KD
DATE 11-7-03
CHK BY ____
DATE ____

PROJECT NAME ESSEX/MOPIC
LOCATION JAMESTOWN, NY
DRILLING CONTRACTOR NORTHERN GEO
DRILLING METHOD 10¼" HSA / 4" ID DRIVEN CASING
DRILLING FLUID WATER
DRILLING START DATE 11-7-03

PROJECT NO. 20410411.21
GEOLOGIST KEITH DOERR
DRILLER STEVE LORENZ
RIG TYPE CME 85
DRILLING COMPLETION DATE 11-7-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ____
SURFACE PAD ELEV. ____
HOLE DEPTH 15 FT
WELL DEPTH 15 FT
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
8-IN	0-15 FT
____	____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8-IN
DEPTH INTERVAL 0-1
SURFACE PAD DIMENSIONS N/A (INSTALLED IN CONCRETE SLAB)

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 5-14.5 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 14.5-15 FT

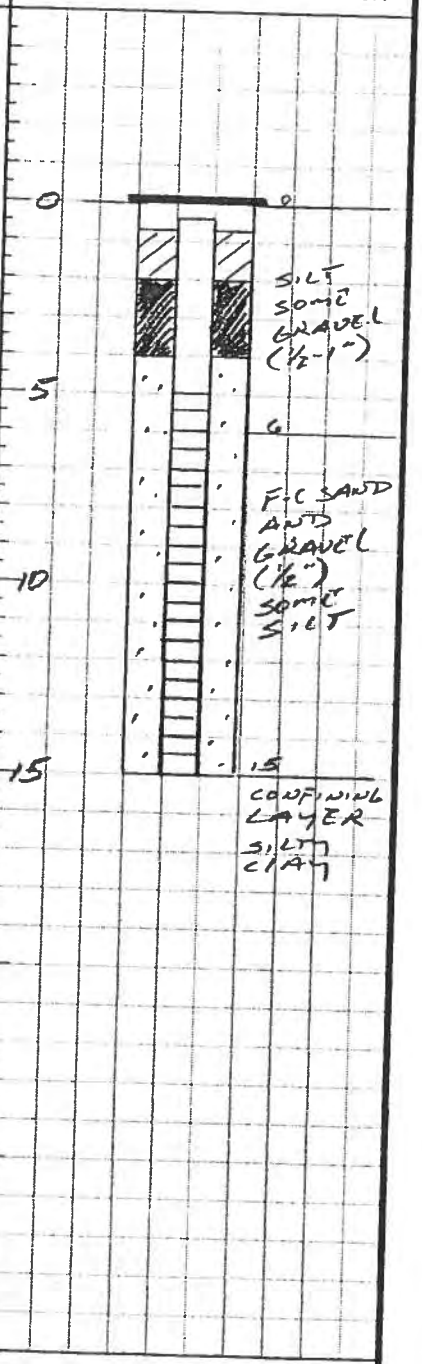
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT/BENT
MIX PROPORTIONS 94 lb PORTLAND 5% BENT 6 GAL H2O
QUANTITIES ____
DEPTH INTERVAL 0-2 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE PELLETS
QUANTITY ____
DEPTH INTERVAL 2-4 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL RICCI 00W
QUANTITY ____
DEPTH INTERVAL 4 TO 15 FT

DEVELOPMENT
METHOD ____
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. MW-24S
HOLE NO. TBUST 10

BY KD
DATE 11-4-03
CHK BY
DATE

PROJECT NAME ESSEX/HOPE
LOCATION JAMESTOWN, RI
DRILLING CONTRACTOR NOTHNAGLE
DRILLING METHOD 7¼ HSA
DRILLING FLUID N/A
DRILLING START DATE 11-4-03

PROJECT NO. 5040.11.21
GEOLOGIST KEITH DOOR, II
DRILLER STEVE LORENTZ
RIG TYPE CME 85
DRILLING COMPLETION DATE 11-4-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV.
SURFACE PAD ELEV.
HOLE DEPTH
WELL DEPTH
WELL RISER (TOP)
PROTECTIVE CASING (TOP)

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
8-IN	0-15 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL Steel
DIAMETER 8-IN
DEPTH INTERVAL 0-1 FT
SURFACE PAD DIMENSIONS N/A
IN CONCRETE N/A

OUTER CASING
N/A
MATERIAL
DIAMETER
JOINT TYPE
DEPTH INTERVAL

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 5-14.5 FT

BLANK CASING N/A
MATERIAL
DIAMETER
JOINT TYPE
DEPTH INTERVAL

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 14.5-15 FT

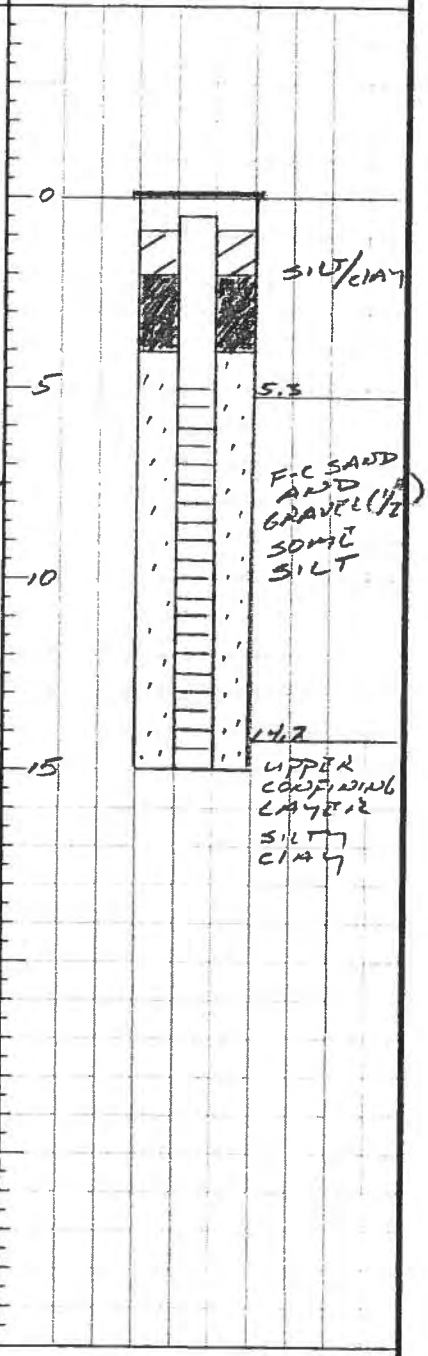
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT/BENTONITE
MIX PROPORTIONS
94 lbs PORTLAND
5% BENTONITE
6 GAL H_2O
QUANTITIES
DEPTH INTERVAL 0-2 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE PELLETS
QUANTITY
DEPTH INTERVAL 2-4 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL RICCI 00W
QUANTITY
DEPTH INTERVAL 4-15 FT

DEVELOPMENT
METHOD
TIME
PRODUCTION

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. MW-24S
HOLE NO. TBUST 10

BY KD
DATE 11-4-03
CHK BY
DATE

PROJECT NAME ESSEX/HOPE
LOCATION JAMESTOWN, RI
DRILLING CONTRACTOR NOTHNAGLE
DRILLING METHOD 7¼ HSA
DRILLING FLUID N/A
DRILLING START DATE 11-4-03

PROJECT NO. 5040.11.21
GEOLOGIST KEITH DOOR, II
DRILLER STEVE LORENTZ
RIG TYPE CME 85
DRILLING COMPLETION DATE 11-4-03

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV.
SURFACE PAD ELEV.
HOLE DEPTH
WELL DEPTH
WELL RISER (TOP)
PROTECTIVE CASING (TOP)

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
8-IN	0-15 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL Steel
DIAMETER 8-IN
DEPTH INTERVAL 0-1 FT
SURFACE PAD DIMENSIONS N/A
IN CONCRETE N/A

OUTER CASING
N/A
MATERIAL
DIAMETER
JOINT TYPE
DEPTH INTERVAL

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0.5-5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 5-14.5 FT

BLANK CASING N/A
MATERIAL
DIAMETER
JOINT TYPE
DEPTH INTERVAL

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL 14.5-15 FT

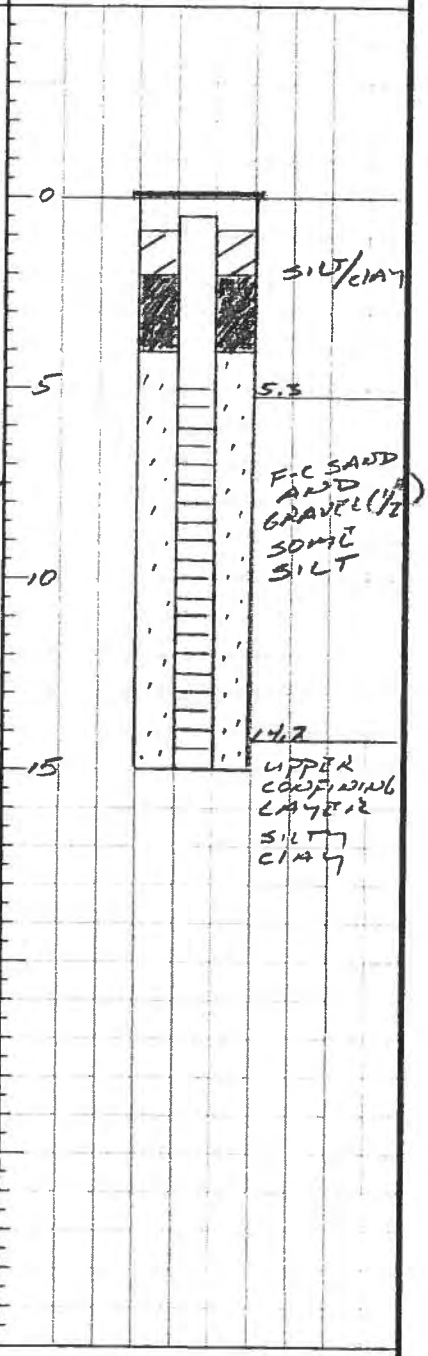
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT/BENTONITE
MIX PROPORTIONS
94 lbs PORTLAND
5% BENTONITE
6 GAL H_2O
QUANTITIES
DEPTH INTERVAL 0-2 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE PELLETS
QUANTITY
DEPTH INTERVAL 2-4 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL RICCI 00W
QUANTITY
DEPTH INTERVAL 4-15 FT

DEVELOPMENT
METHOD
TIME
PRODUCTION

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

URS

TEST BORING ID	MW-26S
Project Name	Essex -Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/18/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/18/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0 - 1 - 2	18	0' to 6" - organic Silt (topsoil), dark brow. 6" to 1' 6" - fine to coarse Sand and fine Gravel, moist.			0 - 1 - 2	Blow counts - 2, 3, 4, 5
2 - 3 - 4	22	2' to 2' 6" - fine to coarse Sand with Gravel, brown. 2' 6" to 3' 6" - clayey Silt, brown, stiff, moist.			2 - 3 - 4	Blow counts - 5, 4, 3, 6
4 - 5 - 6	20	4' to 4' 6" - fine to coarse Sand, brown. 4' 6" to 5' - clayey Silt, brown, stiff. 5' to 6' - fine to coarse silty Sand and Gravel (.5"), moist.			4 - 5 - 6	Blow counts - 8, 6, 6, 10
6 - 7 - 8	20	6' to 7' 8" - fine to coarse silty Sand and Gravel (.25" - .5"), brown, wet, chemical odor.			6 - 7 - 8	Blow counts - 7, 10, 10, 10
8 - 9 - 10	14	8' to 9' 2" - SAA. Water at 8'.			8 - 9 - 10	Blow counts - 5, 6, 5, 9
10 - 11 - 12	12	10' to 11' - SAA.			10 - 11 - 12	Blow counts - 5, 7, 9, 9
12 - 13 - 14	10	12' to 12' 10" - SAA.			12 - 13 - 14	Blow counts - 4, 3, 6, 6
14 - 15 - 16	14	14' to 14' 4" - SAA. 14' 4" to 15' 2" - clayey Silt, gray , stiff, wet. Confining bed.			14 - 15 - 16	Blow counts - 7, 4, 5, 9
16 - 17 - 18		End boring at 16"			16 - 17 - 18	
18 - 19 - 20					18 - 19 - 20	
20 - 21 - 22 - 23 - 24					20 - 21 - 22 - 23 - 24	

Additional Remarks:

URS

TEST BORING ID	MW-26S
Project Name	Essex -Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/18/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/18/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0 - 1 - 2	18	0' to 6" - organic Silt (topsoil), dark brow. 6" to 1' 6" - fine to coarse Sand and fine Gravel, moist.			0 - 1 - 2	Blow counts - 2, 3, 4, 5
2 - 3 - 4	22	2' to 2' 6" - fine to coarse Sand with Gravel, brown. 2' 6" to 3' 6" - clayey Silt, brown, stiff, moist.			2 - 3 - 4	Blow counts - 5, 4, 3, 6
4 - 5 - 6	20	4' to 4' 6" - fine to coarse Sand, brown. 4' 6" to 5' - clayey Silt, brown, stiff. 5' to 6' - fine to coarse silty Sand and Gravel (.5"), moist.			4 - 5 - 6	Blow counts - 8, 6, 6, 10
6 - 7 - 8	20	6' to 7' 8" - fine to coarse silty Sand and Gravel (.25" - .5"), brown, wet, chemical odor.			6 - 7 - 8	Blow counts - 7, 10, 10, 10
8 - 9 - 10	14	8' to 9' 2" - SAA. Water at 8'.			8 - 9 - 10	Blow counts - 5, 6, 5, 9
10 - 11 - 12	12	10' to 11' - SAA.			10 - 11 - 12	Blow counts - 5, 7, 9, 9
12 - 13 - 14	10	12' to 12' 10" - SAA.			12 - 13 - 14	Blow counts - 4, 3, 6, 6
14 - 15 - 16	14	14' to 14' 4" - SAA. 14' 4" to 15' 2" - clayey Silt, gray , stiff, wet. Confining bed.			14 - 15 - 16	Blow counts - 7, 4, 5, 9
16 - 17 - 18		End boring at 16"			16 - 17 - 18	
18 - 19 - 20					18 - 19 - 20	
20 - 21 - 22 - 23 - 24					20 - 21 - 22 - 23 - 24	

Additional Remarks:

URS

WELL COMPLETION LOG
WELL NO. MW-26S

BY	BAC	*PROJECT NAME*	Essex-Hope Jamestown	*PROJECT NO.*	41568904
DATE	10/20/2011	*LOCATION*	Jamestown, NY	*GEOLOGIST/ENGINEER*	M. Dowiak
CHK BY	MJD	*INSTALL COMPANY*	Nothnagle	*DRILLER*	Steve Lorenti
DATE	10/21/11	*DRILLING METHOD*		*RIG TYPE*	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/18/2011	*DRILLING COMPLETION DATE*	10/18/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	16 ft
WELL DEPTH	15 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 16 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 15 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	5 - 15 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	16 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2 ft

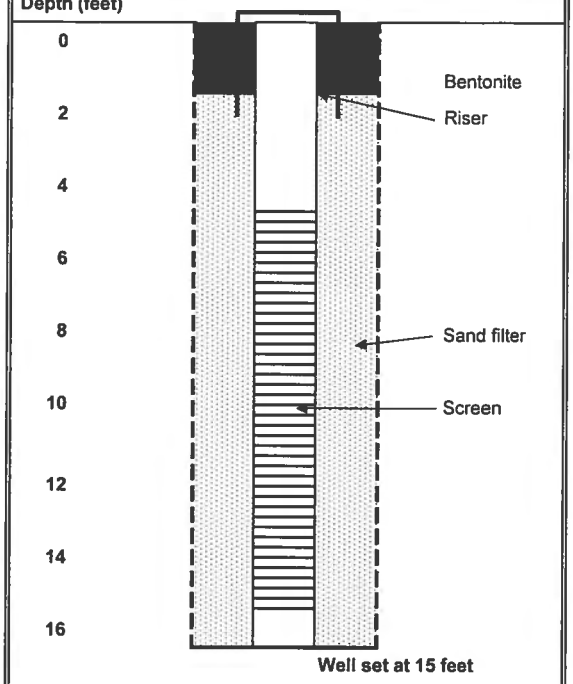
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand - Silica Qtz
QUANTITY	4 bags x 50 lb
DEPTH INTERVAL	2 - 16 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

WELL COMPLETION LOG
WELL NO. MW-26S

BY	BAC	*PROJECT NAME*	Essex-Hope Jamestown	*PROJECT NO.*	41568904
DATE	10/20/2011	*LOCATION*	Jamestown, NY	*GEOLOGIST/ENGINEER*	M. Dowiak
CHK BY	MJD	*INSTALL COMPANY*	Nothnagle	*DRILLER*	Steve Lorenti
DATE	10/21/11	*DRILLING METHOD*		*RIG TYPE*	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/18/2011	*DRILLING COMPLETION DATE*	10/18/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	16 ft
WELL DEPTH	15 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 16 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 15 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	5 - 15 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	16 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2 ft

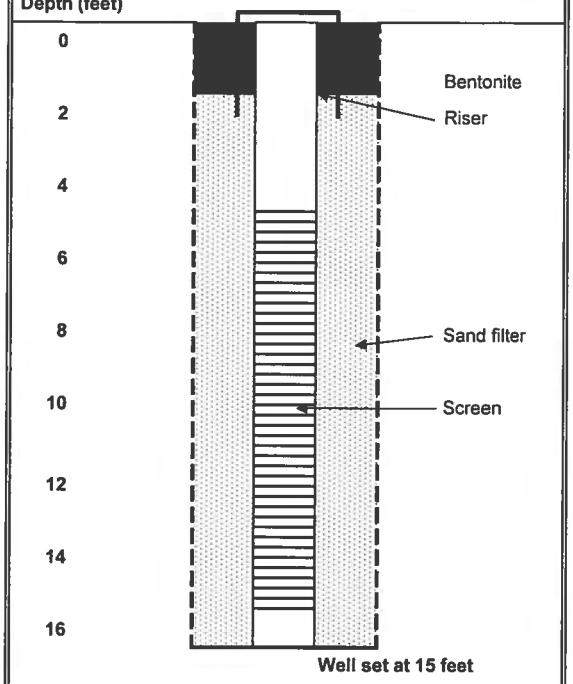
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand - Silica Qtz
QUANTITY	4 bags x 50 lb
DEPTH INTERVAL	2 - 16 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

TEST BORING ID	MW-27S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/17/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/17/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm$_v$)	DEPTH (feet)	REMARKS
0	18	0" to 3" - Topsoil and vegetation. 3" to 18" - fine to medium Sand, some Gravel, Brown.			0	Blow counts - 1, 2, 1, 3
2	18	2' to 2' 6" - Organic Silt, dark brown. 2' 6" to 3' 4" - medium Sand, med dry, brown. 3' 4" to 3' 6" - clayey Silt, brown.			2	Blow counts - 2, 3, 4, 4
4	6	4' to 4' 6" - Silt and Sand with Gravel fragments (granite), brown, moist.			4	Blow counts - 3, 9, 10, 26
6	14	6' to 7' 2" - Sand and Silt with Gravel fragments, brown-orange.			6	Blow counts - 8, 10, 8, 9
8	16	8' to 9' 4" - sandy Silt with Gravel (.25" - 1"), wet, brown-gray, no odor. Water at 8"			8	Blow counts - 16, 9, 6, 6
10	15	10' to 11' 3" - SAA.			10	Blow counts - 4, 4, 4, 5
12	3	12' to 12' 3" - sandy Silt with Gravel (.25" - 1"), gray, wet.			12	Blow counts - 5, 4, 3, 4
14	0	Silt with gravel, gray, wet.			14	Blow counts - 3, 3, 3, 1
16	0	Rock fragment in spoon, wet.			16	Blow counts - 4, 3, 3, 3
18	4	18' to 18' 4" - Silt with Gravel gray and brown, organic silt with roots dark brown.			18	Blow counts - 4, 3, 2, 1
20		End boring at 20'			20	
22					22	
24					24	

Additional Remarks:

URS

TEST BORING ID	MW-27S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/17/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/17/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm$_v$)	DEPTH (feet)	REMARKS
0	18	0" to 3" - Topsoil and vegetation. 3" to 18" - fine to medium Sand, some Gravel, Brown.			0	Blow counts - 1, 2, 1, 3
2	18	2' to 2' 6" - Organic Silt, dark brown. 2' 6" to 3' 4" - medium Sand, med dry, brown. 3' 4" to 3' 6" - clayey Silt, brown.			2	Blow counts - 2, 3, 4, 4
4	6	4' to 4' 6" - Silt and Sand with Gravel fragments (granite), brown, moist.			4	Blow counts - 3, 9, 10, 26
6	14	6' to 7' 2" - Sand and Silt with Gravel fragments, brown-orange.			6	Blow counts - 8, 10, 8, 9
8	16	8' to 9' 4" - sandy Silt with Gravel (.25" - 1"), wet, brown-gray, no odor. Water at 8"			8	Blow counts - 16, 9, 6, 6
10	15	10' to 11' 3" - SAA.			10	Blow counts - 4, 4, 4, 5
12	3	12' to 12' 3" - sandy Silt with Gravel (.25" - 1"), gray, wet.			12	Blow counts - 5, 4, 3, 4
14	0	Silt with gravel, gray, wet.			14	Blow counts - 3, 3, 3, 1
16	0	Rock fragment in spoon, wet.			16	Blow counts - 4, 3, 3, 3
18	4	18' to 18' 4" - Silt with Gravel gray and brown, organic silt with roots dark brown.			18	Blow counts - 4, 3, 2, 1
20		End boring at 20'			20	
22					22	
24					24	

Additional Remarks:

URS

WELL COMPLETION LOG
WELL NO. MW-27S

PAGE 1 OF 1

BY	BAC	*PROJECT NAME*	Essex-Hope Jamestown	*PROJECT NO.*	41568904
DATE	10/20/2011	*LOCATION*	Jamestown, NY	*GEOLOGIST/ENGINEER*	M. Dowiak
CHK BY	MJD	*INSTALL COMPANY*	Nothnagle	*DRILLER*	Steve Lorenti
DATE	10/21/11	*DRILLING METHOD*		*RIG TYPE*	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/17/2011	*DRILLING COMPLETION DATE*	10/17/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	20 ft
WELL DEPTH	20 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 20 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 10 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	10 - 20 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	20 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2 ft

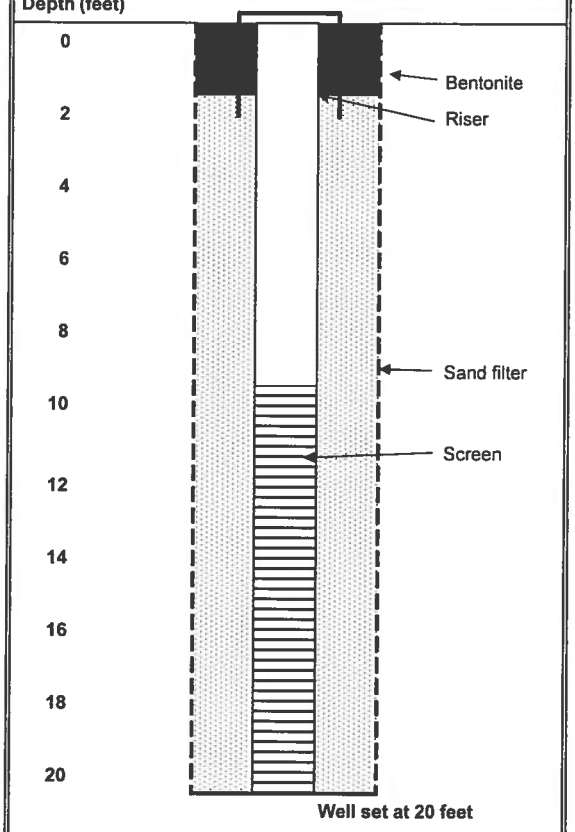
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	4 bag x 50 lb
DEPTH INTERVAL	2 - 20 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

WELL COMPLETION LOG
WELL NO. MW-27S

PAGE 1 OF 1

BY	BAC	*PROJECT NAME*	Essex-Hope Jamestown	*PROJECT NO.*	41568904
DATE	10/20/2011	*LOCATION*	Jamestown, NY	*GEOLOGIST/ENGINEER*	M. Dowiak
CHK BY	MJD	*INSTALL COMPANY*	Nothnagle	*DRILLER*	Steve Lorenti
DATE	10/21/11	*DRILLING METHOD*		*RIG TYPE*	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/17/2011	*DRILLING COMPLETION DATE*	10/17/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	20 ft
WELL DEPTH	20 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 20 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 10 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	10 - 20 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	20 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2 ft

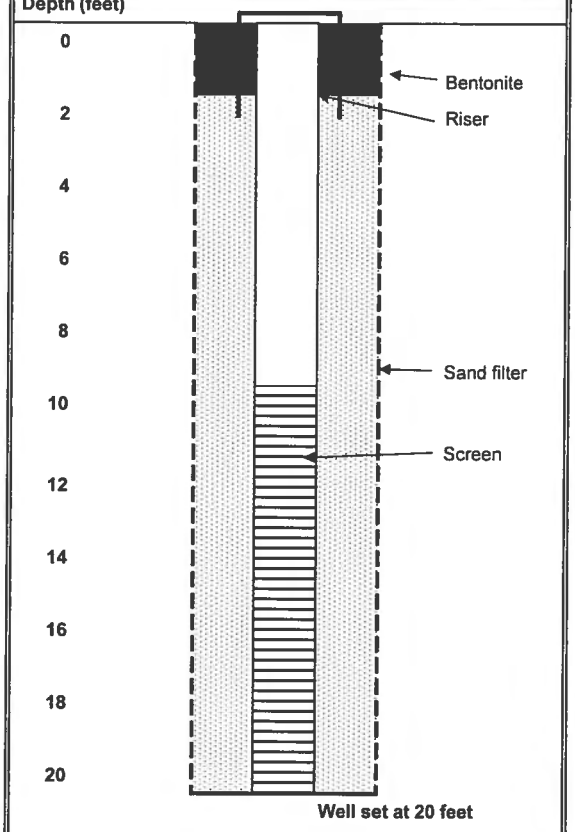
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	4 bag x 50 lb
DEPTH INTERVAL	2 - 20 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

TEST BORING ID	MW-28S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/17/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/17/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0	11	0" to 6" - organic Topsoil. 6" to 8" - Sand, brown to gray, moist.			0	Blow counts - 1, 2, 2, 4
2	16	2' to 2' 10" - organic Topsoil. 2' 10" to 2' 11" - rock fragments. 2' 11" to 3' 4" - med - coarse Sand, brown, moist.			2	Blow counts - 4, 4, 8, 4
4	14	4' to 5' 2" - fine Sand and Silt, brown, moist.			4	Blow counts - 3, 8, 10, 10
6	18	6' to 7' 6" - silty Sand and Gravel, brown-gray, wet, no odor.			6	Blow counts - 16, 15, 10, 11
8	12	8' to 8' 10" - SAA. 8' 10" to 9' - silty Sand and Gravel, gray, wet. Water at 8'.			8	Blow counts - 5, 7, 8, 10
10	10	10' to 10' 10" - SAA, slight chemical odor.			10	Blow counts - 3, 6, 5, 6
12	8	12' to 12' 8" - Silt and fine Sand with Gravel, gray, wet, slight chemical odor.			12	Blow counts - 4, 4, 5, 5
14	0	Silt, gray (SAA), mild chemical odor.			14	Blow counts - 5, 7, 7, 11
16	16	16' to 16' 3" - SAA. 16' 3" to 17' 4" - clayey Silt, gray, moist to wet, no odor. Confining bed.			16	Blow counts - 13, 6, 6, 11
18	4	18' to 18' 4" - Gravel with Sand, no odor.			18	Blow counts - 16, 15, 15, 12
20		End boring at 20'			20	
22					22	
24					24	

Additional Remarks:

URS

TEST BORING ID	MW-28S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/17/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/17/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0	11	0" to 6" - organic Topsoil. 6" to 8" - Sand, brown to gray, moist.			0	Blow counts - 1, 2, 2, 4
2	16	2' to 2' 10" - organic Topsoil. 2' 10" to 2' 11" - rock fragments. 2' 11" to 3' 4" - med - coarse Sand, brown, moist.			2	Blow counts - 4, 4, 8, 4
4	14	4' to 5' 2" - fine Sand and Silt, brown, moist.			4	Blow counts - 3, 8, 10, 10
6	18	6' to 7' 6" - silty Sand and Gravel, brown-gray, wet, no odor.			6	Blow counts - 16, 15, 10, 11
8	12	8' to 8' 10" - SAA. 8' 10" to 9' - silty Sand and Gravel, gray, wet. Water at 8'.			8	Blow counts - 5, 7, 8, 10
10	10	10' to 10' 10" - SAA, slight chemical odor.			10	Blow counts - 3, 6, 5, 6
12	8	12' to 12' 8" - Silt and fine Sand with Gravel, gray, wet, slight chemical odor.			12	Blow counts - 4, 4, 5, 5
14	0	Silt, gray (SAA), mild chemical odor.			14	Blow counts - 5, 7, 7, 11
16	16	16' to 16' 3" - SAA. 16' 3" to 17' 4" - clayey Silt, gray, moist to wet, no odor. Confining bed.			16	Blow counts - 13, 6, 6, 11
18	4	18' to 18' 4" - Gravel with Sand, no odor.			18	Blow counts - 16, 15, 15, 12
20		End boring at 20'			20	
22					22	
24					24	

Additional Remarks:

URS

WELL COMPLETION LOG
WELL NO. MW-28S

PAGE 1 OF 1

BY	BAC	PROJECT NAME	Essex-Hope Jamestown	PROJECT NO.	41568904
DATE	10/20/2011	LOCATION	Jamestown, NY	GEOLOGIST/ENGINEER	M. Dowiak
CHK BY	MJD	INSTALL COMPANY	Nothnagle	DRILLER	Steve Lorenti
DATE	10/21/11	DRILLING METHOD		RIG TYPE	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/17/2011	DRILLING COMPLETION DATE	10/17/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	20 ft
WELL DEPTH	17 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 20 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 7 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	7 - 17 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	20 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2, 17 - 20 ft

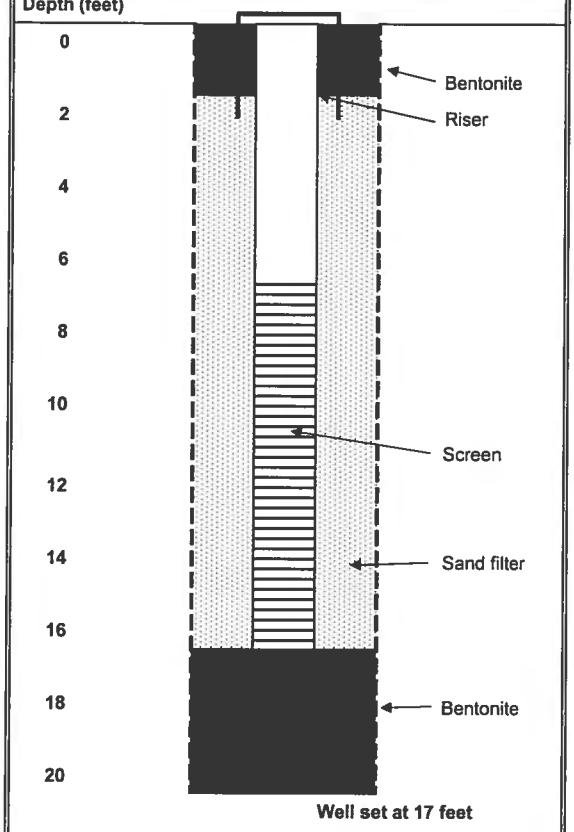
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	4 bags x 50 lb
DEPTH INTERVAL	4 - 17 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

WELL COMPLETION LOG
WELL NO. MW-28S

PAGE 1 OF 1

BY	BAC	PROJECT NAME	Essex-Hope Jamestown	PROJECT NO.	41568904
DATE	10/20/2011	LOCATION	Jamestown, NY	GEOLOGIST/ENGINEER	M. Dowiak
CHK BY	MJD	INSTALL COMPANY	Nothnagle	DRILLER	Steve Lorenti
DATE	10/21/11	DRILLING METHOD		RIG TYPE	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/17/2011	DRILLING COMPLETION DATE	10/17/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	20 ft
WELL DEPTH	17 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 20 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 7 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	7 - 17 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	20 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2, 17 - 20 ft

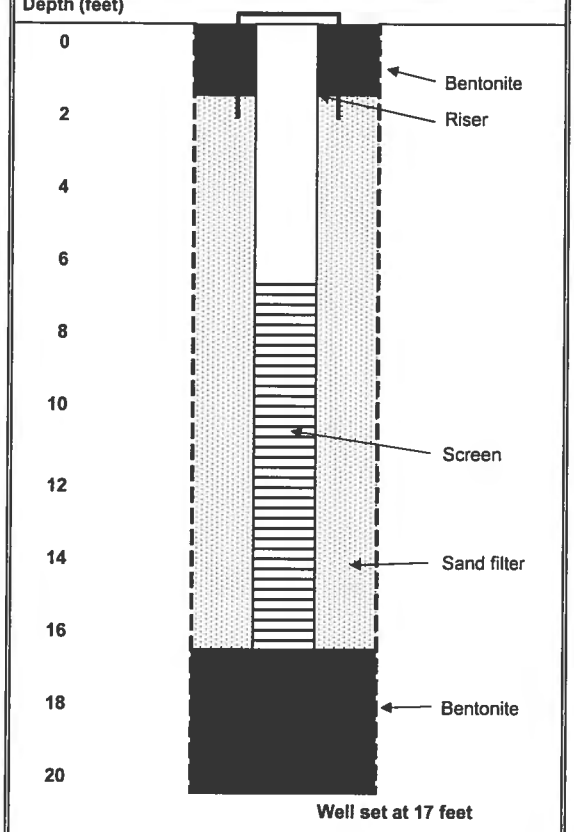
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	4 bags x 50 lb
DEPTH INTERVAL	4 - 17 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

TEST BORING ID	MW-29S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/18/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/18/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0	16	0" to 6" - Concrete. 6" to 1' 4" - fine to coarse Sand and Gravel, brown and gray, dry.			0	Blow counts - 5, 17, 15
2	2	Gravel in spoon.			2	Blow counts - 3, 5, 4, 10
4	14	4' to 5' 2" - Sand and Gravel, light brown, dry, no odor.			4	Blow counts - 9, 10, 12, 13
6	16	6' to 7' 4" - Sand and Gravel (.25" - 1"), lightbrown, some orange spotting, wet, chemical odor.			6	Blow counts - 7, 15, 15, 16
8	15	8' to 9' - SAA. 9' to 9' 3" - Sand, gray, wet, chemical odor. Water at 8'.			8	Blow counts - 6, 12, 7, 8
10	10	10' to 10' 10" - Sand and Gravel, gray, wet, chemical odor.			10	Blow counts - 5, 6, 5, 7
12	10	12' - 12' 8" - SAA. 12' 8" to 12' 10" - clayey Silt, gray stiff, wet. Confining bed.			12	Blow counts - 6, 9, 9, 11
14		End boring at 14"			14	
16					16	
18					18	
20					20	
22					22	
24					24	

Additional Remarks:

URS

TEST BORING ID	MW-29S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	10/18/2011

Page	1 1
Geologist/Engineer	MD
Driller	Steve Lorenti
Rig Type	CME 85
Completion Date	10/18/2011

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0	16	0" to 6" - Concrete. 6" to 1' 4" - fine to coarse Sand and Gravel, brown and gray, dry.			0	Blow counts - 5, 17, 15
2	2	Gravel in spoon.			2	Blow counts - 3, 5, 4, 10
4	14	4' to 5' 2" - Sand and Gravel, light brown, dry, no odor.			4	Blow counts - 9, 10, 12, 13
6	16	6' to 7' 4" - Sand and Gravel (.25" - 1"), lightbrown, some orange spotting, wet, chemical odor.			6	Blow counts - 7, 15, 15, 16
8	15	8' to 9' - SAA. 9' to 9' 3" - Sand, gray, wet, chemical odor. Water at 8'.			8	Blow counts - 6, 12, 7, 8
10	10	10' to 10' 10" - Sand and Gravel, gray, wet, chemical odor.			10	Blow counts - 5, 6, 5, 7
12	10	12' - 12' 8" - SAA. 12' 8" to 12' 10" - clayey Silt, gray stiff, wet. Confining bed.			12	Blow counts - 6, 9, 9, 11
14		End boring at 14"			14	
16					16	
18					18	
20					20	
22					22	
24					24	

Additional Remarks:

URS

WELL COMPLETION LOG
WELL NO. MW-29S

BY	BAC	*PROJECT NAME*	Essex-Hope Jamestown	*PROJECT NO.*	41568904
DATE	10/20/2011	*LOCATION*	Jamestown, NY	*GEOLOGIST/ENGINEER*	M. Dowiak
CHK BY	MJD	*INSTALL COMPANY*	Nothnagle	*DRILLER*	Steve Lorenti
DATE	10/21/11	*DRILLING METHOD*		*RIG TYPE*	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/18/2011	*DRILLING COMPLETION DATE*	10/18/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	14 ft
WELL DEPTH	14 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 14 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 4 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	4 - 14 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	14 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2 ft

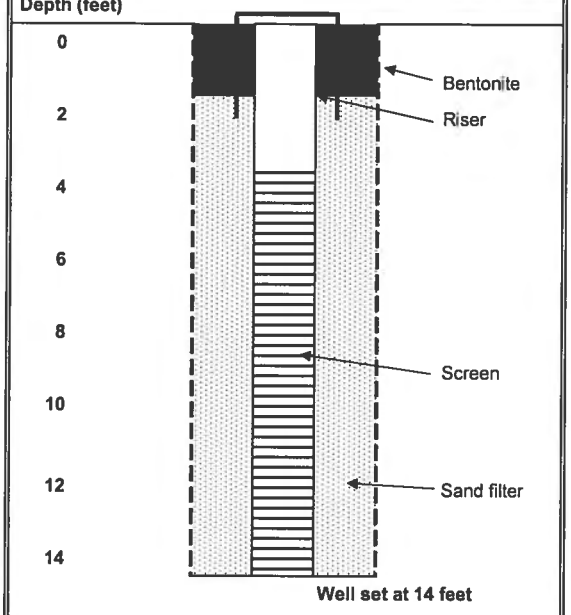
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	2 bags x 50 lb
DEPTH INTERVAL	2 - 14 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

WELL COMPLETION LOG
WELL NO. MW-29S

BY	BAC	*PROJECT NAME*	Essex-Hope Jamestown	*PROJECT NO.*	41568904
DATE	10/20/2011	*LOCATION*	Jamestown, NY	*GEOLOGIST/ENGINEER*	M. Dowiak
CHK BY	MJD	*INSTALL COMPANY*	Nothnagle	*DRILLER*	Steve Lorenti
DATE	10/21/11	*DRILLING METHOD*		*RIG TYPE*	CME 85
		DRILLING FLUID	N/A		
		DRILLING START DATE	10/18/2011	*DRILLING COMPLETION DATE*	10/18/2011

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	14 ft
WELL DEPTH	14 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 14 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 4 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	4 - 14 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	14 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	0 - 2 ft

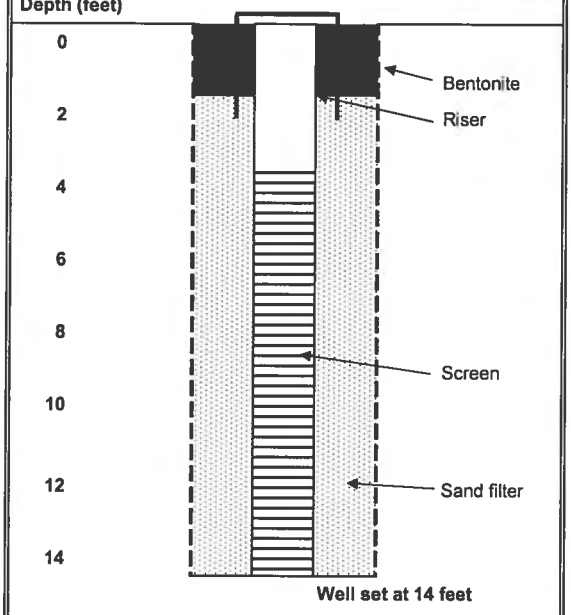
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	2 bags x 50 lb
DEPTH INTERVAL	2 - 14 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION

URS

TEST BORING ID	MW-30S
Project Name	Essex-Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	9/30/2014

Page	1 1
Geologist/Engineer	MD
Driller	Jeff Sweitzer
Rig Type	Geoprobe
Completion Date	9/30/2014

DEPTH (feet)	Soil Core Recovery/ Penetration (Inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
0 - 4	32	Br Clay-Silt with gravel, moist (Fill)			0 - 4	
4 - 8	36	Br Clay-Silt with gravel, Ang, moist (Fill), No chemical odor			4 - 8	
8 - 12	24	8" SAA, 8 - 24" Gr Silty Sand and Gravel, Ang Frags (1/2"-1") (Fill), 11' Water level, wet, chemical odor			8 - 12	
12 - 16	12	Gr Silty Sand and Gravel, wet			12 - 16	
16 - 20	36	1' SAA, 2' Gr Clay-Silt, stiff, wet (Aquitard)			16 - 20	
20 - 24		End boring at 20'			20 - 24	

Additional Remarks:

URS

WELL COMPLETION LOG

WELL NO. MW-30S

BY: BAC	PROJECT NAME: Essex-Hope Jamestown	PROJECT NO.: 41569123
DATE: 10/3/2014	LOCATION: Jamestown, NY	GEOLOGIST/ENGINEER: M. Dowiak
CHK BY: MJD	INSTALL COMPANY: Nothnagle	DRILLER: Jeff Sweitzer
DATE: 10/03/14	DRILLING METHOD:	RIG TYPE: Geoprobe
	DRILLING FLUID: N/A	
	DRILLING START DATE: 9/30/2014	DRILLING COMPLETION DATE: 9/30/2014

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	20 ft
WELL DEPTH	16 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 20 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 10 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	10 - 16 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	16 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	7 - 9 ft

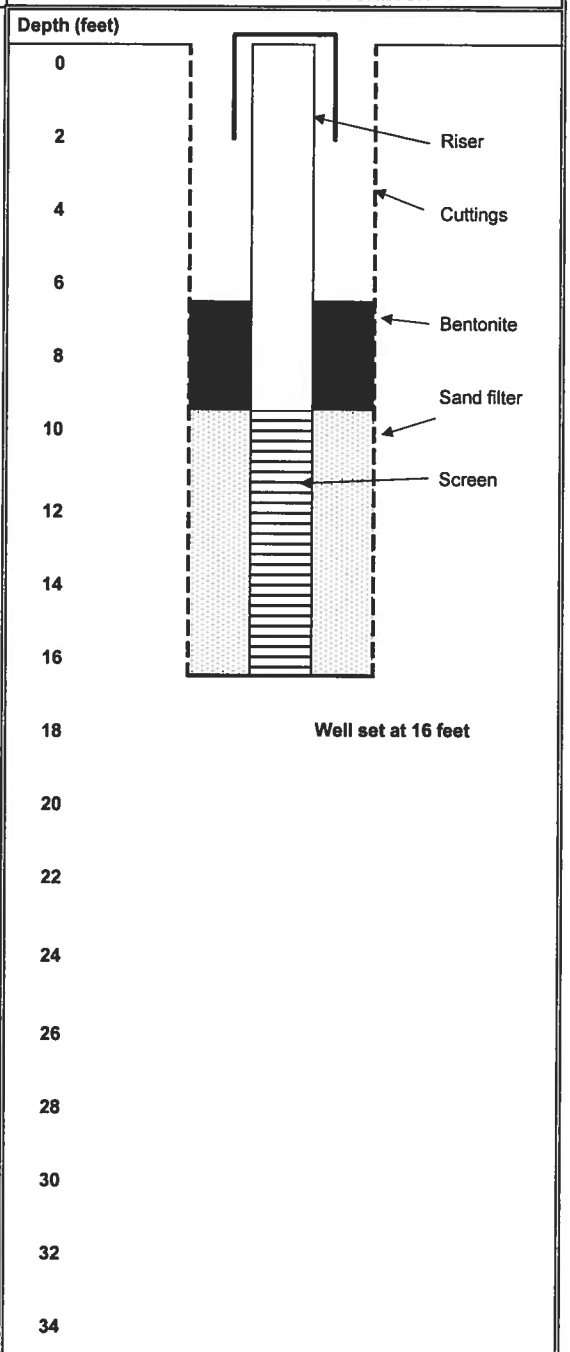
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand -Silica Qtz
QUANTITY	4 bag x 50 lb
DEPTH INTERVAL	9 - 16 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: Cuttings used to backfill hole from 0 to 7 feet

URS

TEST BORING ID	MW-31S
Project Name	Essex -Hope Jamestown
Drilling Contractor	Nothnagle
Drilling Method	
Start Date	9/30/2014

Page	1 1
Geologist/Engineer	MD
Driller	Jeff Sweitzer
Rig Type	Geoprobe
Completion Date	9/30/2014

DEPTH (feet)	Soil Core Recovery/ Penetration (inches)	VISUAL CLASSIFICATION AND DESCRIPTION	USCS Profile	PID (ppm_v)	DEPTH (feet)	REMARKS
- 0 - 1 - 2 - 3 - 4	40	Br - Dr Clay-Silt, some gravel, oily waste/sludge at about 2 feet (1-2')-(Fill), moist, no chemical odor			- 0 - 1 - 2 - 3 - 4	
- 5 - 6 - 7 - 8	35	(SAA) oily waste/sludge layer (2") at 8' bgs (Fill), moist, slight chemical odor			- 5 - 6 - 7 - 8	
- 9 - 10 - 11 - 12	24	1' (SAA), 1' Gray Sand and Gravel, silt, 11' water level, wet, chemical odor			- 9 - 10 - 11 - 12	
- 13 - 14 - 15 - 16	24	1' Gr Silty Sand and Gravel, wet, 1' Gr Clay-Silt (Aquitard), wet, stiff			- 13 - 14 - 15 - 16	
- 17 - 18		End boring at 16"			- 17 - 18	
- 19 - 20					- 19 - 20	
- 21 - 22 - 23 - 24					- 21 - 22 - 23 - 24	

Additional Remarks:

URS

WELL COMPLETION LOG
WELL NO. MW-31S

PAGE 1 OF 1

BY	BAC	PROJECT NAME	Essex-Hope Jamestown	PROJECT NO.	41569123
DATE	10/3/2014	LOCATION	Jamestown, NY	GEOLOGIST/ENGINEER	M. Dowiak
CHK BY	MJD	INSTALL COMPANY	Nothnagle	DRILLER	Jeff Sweitzer
DATE	10/03/14	DRILLING METHOD		RIG TYPE	Geoprobe
		DRILLING FLUID	N/A		
		DRILLING START DATE	9/30/2014	DRILLING COMPLETION DATE	9/30/2014

INSTALLATIONS

ELEVATION / DEPTH DATA

GROUND SURFACE ELEV.	NA
SURFACE PAD ELEV.	NA
HOLE DEPTH	16 ft
WELL DEPTH	15 ft
WELL RISER (TOP)	NA
PROTECTIVE CASING (TOP)	NA

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
4-inch	0 - 16 ft.

PROTECTIVE CASING

TYPE	Flush-mount manhole
MATERIAL	NA
DIAMETER	NA
DEPTH INTERVAL	NA
SURFACE PAD DIMENSIONS	NA

OUTER CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

WELL RISER

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	NA
DEPTH INTERVAL	0 - 10 ft

SCREEN

MATERIAL	PVC
DIAMETER	2-inch
JOINT TYPE	flush-threaded
OPENINGS	0.10 micron
DEPTH INTERVAL	10 - 15 ft

BLANK CASING

MATERIAL	NA
DIAMETER	NA
JOINT TYPE	NA
DEPTH INTERVAL	NA

BOTTOM CAP

MATERIAL	PVC
TYPE	Threaded
DEPTH INTERVAL	15 ft

ANNULAR GROUT

INSTALL. METHOD	NA
MATERIAL	NA
MIX PROPORTIONS	NA
QUANTITIES	NA
DEPTH INTERVAL	NA

ANNULAR SEAL

INSTALL. METHOD	Pour
MATERIAL	Bentonite
QUANTITY	1 bag x 50 lb
DEPTH INTERVAL	7 - 9 ft

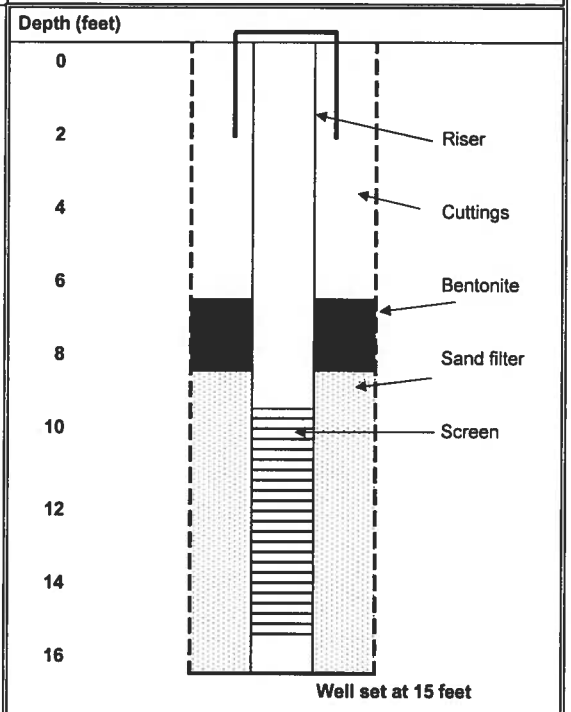
FILTER PACK

INSTALL. METHOD	Pour
MATERIAL	Sand - Silica Qtz
QUANTITY	4 bags x 50 lb
DEPTH INTERVAL	9 - 15 ft

DEVELOPMENT

METHOD	Pump
TIME	NA
Purge Volume	NA

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATIO Cuttings used to backfill hole from 0 to 7 feet

C:\Users\mark_dowiak\Documents\My Documents\DOW PROJECTS\EssexJames\Site Investigations\USTArea and Groundwater Investigations\Phase II RA_2014\Well Construction Logs_MW-30-31S_ 9-2014.xls

RADIAN INTERNATIONAL

TEST BORING PZ-5D

PROJECT NAME ESSEX / HOPE
PROJECT NO. 804041.21
LOCATION JAMESTOWN NY
GEOLOGIST K. DODRILL
BY KD
DRILLING CONTRACTOR URS SDS
DRILLER BEN BUTLER
DATE 07-19-00
DRILLING METHOD GEOPROBE
RIG TYPE POWER PROBE 9600 EC VIPER 3
CHK BY
DRILLING START DATE 07-19-00
DRILLING COMPLETION DATE 07-19-00
DATE
SURFACE ELEVATION
STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
	SS-1	48 IN		LT BROWN CLAYEY SILT (SOFT) - MOIST			209		
				3.2' LT BROWN CLAYEY SILT LITTLE M-C SAND & GRAVEL (¼-1 IN) MOIST				4	
5	SS-2	2.5 FT		4' BROWN F-C SAND & GRAVEL SOME SILT - MOIST WET AT 6 FT			815		
				8' TO 11.3' AS ABOVE GRADES TO OLIVE BROWN SATURATED				8	
10	SS-3	48 IN		11.3'-12 OLIVE BROWN SILTY CLAY, WET, LITTLE GRAVEL IN UPPER 0.2'			617		CL
				12-16' AS ABOVE, NO GRAVEL				12	
15	SS-4	1.8 FT					781		
				16-20' AS ABOVE, MOIST				16	
							854		
20				TD = 20 FT				20	

ADDITIONAL REMARKS - INSTALL 3 IN. CASING TO 16 FT DEPTH

FILE: \FORMA

RADIAN INTERNATIONAL

TEST BORING PZ-5D

PROJECT NAME ESSEX / HOPE

PROJECT NO. 804041.21

LOCATION JAMESTOWN NY

GEOLOGIST R. RUPIPER

BY RR

DRILLING CONTRACTOR URS SDS

DRILLER BEN BUTLER

DATE 08-04-00

DRILLING METHOD GEOPROBE

RIG TYPE VIPER 3

CHK BY

DRILLING START DATE 08-04-00

DRILLING COMPLETION DATE 08-04-00

DATE

SURFACE ELEVATION

STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		46"		20-24' GRAY SILTY CLAY, DAMP					CL
24		42"		24-28' GRAY FINE TO V. FINE SAND, LITTLE SILT, SATURATED			215.3	24	SAMPLE 24-28 FT
28		46"		28-32' AS ABOVE			276	28	
32		30"		32-36' AS ABOVE			33.4	32	
36		44"		36-38' AS ABOVE, WET 38-39.5' GRAY SILTY CLAY TRACE FINE SAND, V. STIFF 39.5-40' GRAY V. FINE SAND, DAMP			2.6	36 38 39.5	SAMPLE 36-38 FT
40		39"		40-41.25' AS ABOVE 41.25-44' GRAY SILTY CLAY			1.3	41.5	
44				44-48' AS ABOVE					

TOTAL DEPTH = 48 FT

ADDITIONAL REMARKS

FILE: \FORMAT

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-5D
HOLE NO. _____

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

BY RR — LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER
DATE 08-04-00 — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER
CHK BY _____ — DRILLING METHOD GEOPROBE — RIG TYPE POWER PROBE 9600 EC VIPER 3
DATE _____ — DRILLING FLUID _____
DRILLING START DATE 08-04-00 — DRILLING COMPLETION DATE 08-04-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1276.90
SURFACE PAD ELEV. _____
HOLE DEPTH 48'
WELL DEPTH 41.5'
WELL RISER (TOP) 1276.52
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2 1/4-IN	0 - 48 FT
_____	0 - 16 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN.
DEPTH INTERVAL 12 IN.
SURFACE PAD DIMENSIONS 2" x 2" x 6"

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN.
JOINT TYPE _____
DEPTH INTERVAL 0 - 16 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1 - IN.
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 - 21.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 - IN
DEPTH INTERVAL 41.5' - 21.5'

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

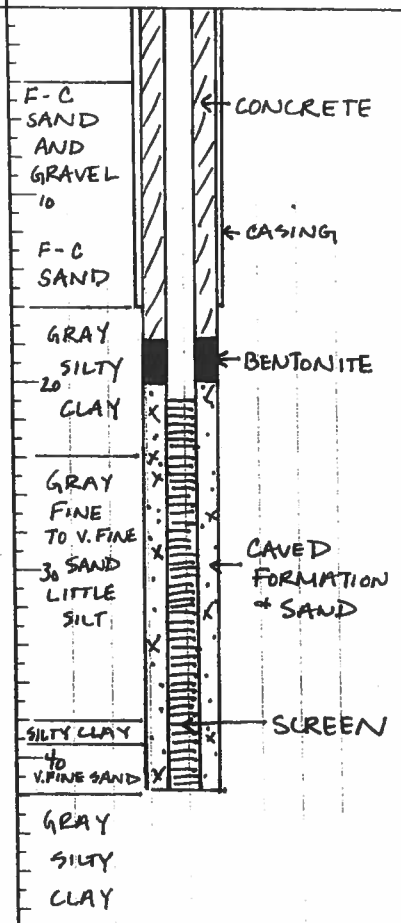
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 - 18 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY _____
DEPTH INTERVAL 18 - 20 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL FORMATION / SAND
QUANTITY _____
DEPTH INTERVAL 20 - 41.5 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-5S
HOLE NO. _____

BY RR
DATE _____
CHK BY _____
DATE _____

PROJECT NAME ESSEX / HOPE
LOCATION JAMESTOWN NY
DRILLING CONTRACTOR URS SDS
DRILLING METHOD GEOPROBE
DRILLING FLUID _____
DRILLING START DATE _____

PROJECT NO. 804041.21
GEOLOGIST R. RUPIPER
DRILLER B. BUTLER
RIG TYPE VIPER
DRILLING COMPLETION DATE _____

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1276.90
SURFACE PAD ELEV. _____
HOLE DEPTH 12 FT
WELL DEPTH 12 FT
WELL RISER (TOP) 1276.56
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼"	0-12 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS 2'x2'x6"

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1 IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-5.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1 IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 IN
DEPTH INTERVAL 12-5.5 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

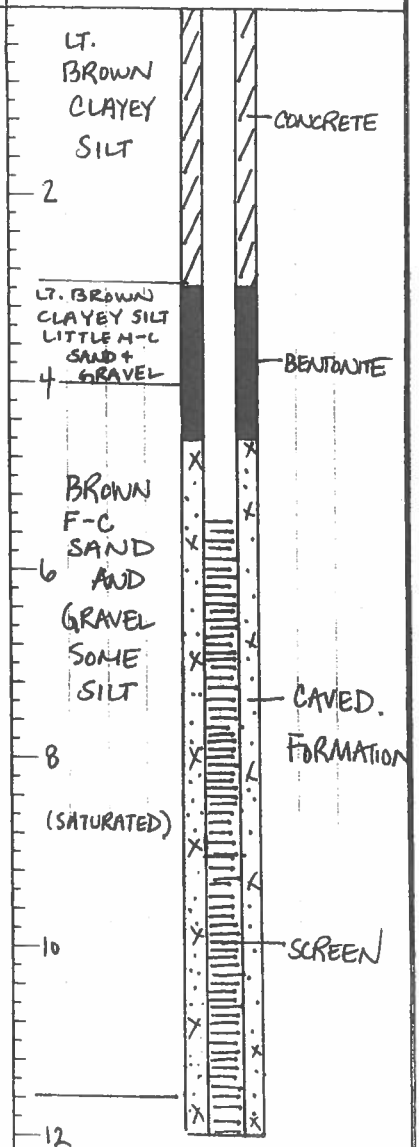
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0-3 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY _____
DEPTH INTERVAL 3-4.5 FT

FILTER PACK
INSTALL. METHOD —
MATERIAL CAVED FORMATION
QUANTITY _____
DEPTH INTERVAL 4.5-12 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

TEST BORING PZ-6D

PAGE 1 OF 3

PROJECT NAME ESSEX / HOPE

PROJECT NO. 804041.21

LOCATION JAMESTOWN NY

GEOLOGIST K. DODRILL

BY KD

DRILLING CONTRACTOR URS SDS

DRILLER B. BUTLER

DATE 07-31-00

DRILLING METHOD GEOPROBE

RIG TYPE VIPER 2

CHK BY

DRILLING START DATE 07-31-00

DRILLING COMPLETION DATE

DATE

SURFACE ELEVATION

STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				0-10" GRASS, DK BROWN ORGANIC RICH SILT, DAMP					
				10-20" LT BROWN CLAYEY SILT, MOIST					
2		38"		20-48" AS ABOVE, SOME M-C SAND AND GRAVEL 1 TO >2" DIAMETER MOIST					
4				48-96" LT BROWN TO OLIVE BROWN SILTY M-C SAND & GRAVEL (1/4 -> 2 IN) -DAMP					
6		36"							
8				96-118" AS ABOVE -DAMP -WET AT 9'2"					
10		43"		118-144 IN OLIVE BROWN M-C SAND & GRAVEL (1/4 - 1 IN) SOME SILT, SATURATED					
12				12-13FT 5 IN AS ABOVE, SATURATED					
				13'5" TO 16' OLIVE BROWN SILTY CLAY - WET					

ADDITIONAL REMARKS

INSTALL CASING (3") TO 16.5 FT

FILE: \FORMAT

TEST BORING PZ-6D

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER

BY RR — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER

DATE 08-07-00 — DRILLING METHOD GEOPROBE — RIG TYPE POWER PROBE 9600 EC

CHK BY ____ — DRILLING START DATE 08-07-00 — DRILLING COMPLETION DATE 08-07-00

DATE ____ — SURFACE ELEVATION ____ — STICK-UP ELEVATION ____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		46"		16-20' GRAY SILTY CLAY, V. SOFT 17-18.5'			0		
20		42"		20-24' AS ABOVE, MEDIUM STIFF			0	20	
24		46"		24-28' GRAY FINE TO V. FINE SAND SILTY CLAY FROM 26.1-26.3'			2.6	24	
28		39"		28-32' AS ABOVE SILTY CLAY 30.5-30.75'			1.3	28	
32		40"		32-36' AS ABOVE SILTY CLAY 35.5-35.75'			1.3	32	
36		43"		36-40' AS ABOVE SILTY CLAY (SOFT) AT 36.25-37' AND 38.75-39'			0	36	
40		0		40-44' NO RECOVERY (ALL LIQUID)				40	
44								44	

ADDITIONAL REMARKS

FILE: \FORMAT

RADIAN INTERNATIONAL

TEST BORING PZ-6D

PROJECT NAME ESSEX/HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER B. BUTLER

DATE 08-07-00 DRILLING METHOD GEOPROBE RIG TYPE POWER PROBE 9600 EC

CHK BY DRILLING START DATE 08-07-00 DRILLING COMPLETION DATE 08-07-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				44-45' GRAY SILTY CLAY, STIFF			0	45	
				45-45½' GRAY V. FINE SAND, WET			1.3	45½	
				45½-48' GRAY SILTY CLAY, STIFF			1.3		
48				TOTAL DEPTH = 48FT				48	

ADDITIONAL REMARKS

FILE: \FORMAT

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-6D
HOLE NO. _____

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

BY RR — LOCATION JAMESTOWN, NY — GEOLOGIST R. RUPIPER

DATE 08-07-00 — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER

CHK BY _____ — DRILLING METHOD GEOPROBE — RIG TYPE POWER PROBE 9600 EC V3

DATE _____ — DRILLING FLUID _____

DRILLING START DATE 08-07-00 — DRILLING COMPLETION DATE 08-07-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1276.96
SURFACE PAD ELEV. _____
HOLE DEPTH 48'
WELL DEPTH 45.5'
WELL RISER (TOP) 1276.57
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2"/4"	0-48'
	0-16.5'

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS 2" x 2" x 6"

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN
JOINT TYPE 1
DEPTH INTERVAL 0-16.5 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1 IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-25.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 45.5'-25.5'

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

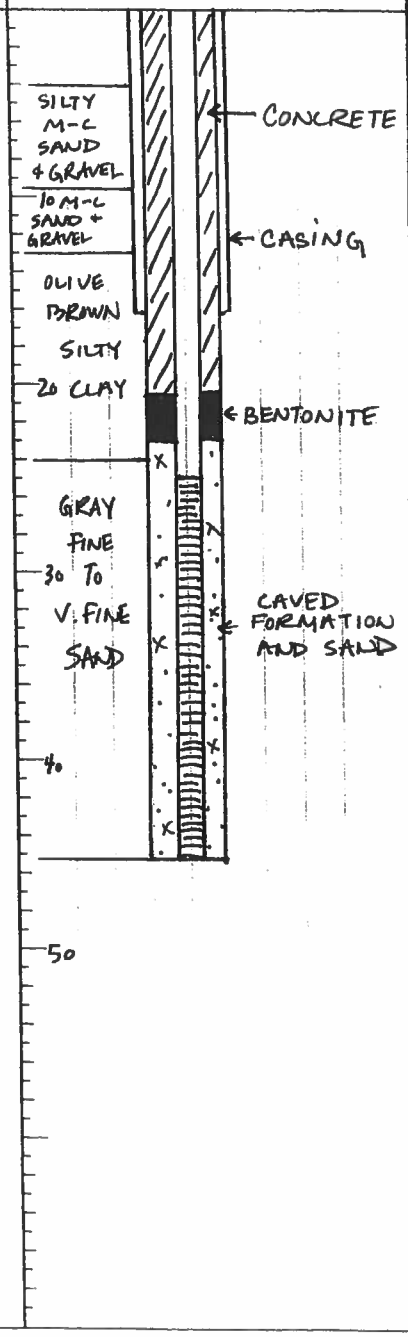
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL SURFACE TO 21'

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENT.
QUANTITY _____
DEPTH INTERVAL 21-23 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL FORMATION / SAND
QUANTITY _____
DEPTH INTERVAL 23-45.5 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-6S
HOLE NO. _____

BY RR
DATE _____
CHK BY _____
DATE _____

PROJECT NAME ESSEX/HOPE
LOCATION JAMESTOWN NY
DRILLING CONTRACTOR URS SDS
DRILLING METHOD GEOPROBE
DRILLING FLUID _____
DRILLING START DATE _____

PROJECT NO. 804041.21
GEOLOGIST R. RUPIPER
DRILLER B. BUTLER
RIG TYPE VIPER
DRILLING COMPLETION DATE _____

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1276.96
SURFACE PAD ELEV. _____
HOLE DEPTH 13.5 FT
WELL DEPTH 13.5 FT
WELL RISER (TOP) 1276.77
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼"	0 - 13.5 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN.
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS 2" x 2" x 6"

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN.
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 - 8.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 IN
DEPTH INTERVAL 8.5 - 13.5 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

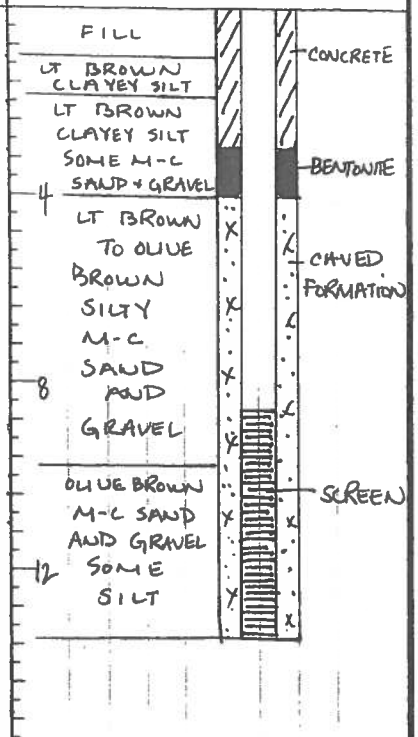
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0 - 3 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 3 - 4 FT

FILTER PACK
INSTALL. METHOD —
MATERIAL CAVED FORMATION
QUANTITY _____
DEPTH INTERVAL 4 - 13.5 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

TEST BORING PZ-7 PAGE 1 OF 2

PROJECT NAME ESSEX/HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER B. BUTLER

DATE 08-01-00 DRILLING METHOD GEOPROBE RIG TYPE POWER PROBE 9600EC V3

CHK BY DRILLING START DATE 08-01-00 DRILLING COMPLETION DATE 08-01-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				0-8" DK BROWN ORGANIC RICH SILT SOME SAND + GRAVEL (1/4" - 1/4 in) DAMP					
				8-19 1/2" BROWN CLAYEY SILT SOME SAND. LITTLE GRAVEL (1/4 IN)					
2				19 1/2" - 4' LT BROWN SILTY SAND AND GRAVEL (1/4 - 1 IN), DAMP					
4				4 - 4.7' AS ABOVE					
				4.7 - 5' AS ABOVE, LESS GRAVEL DAMP					
				5 - 5.3' GRAVEL (1/2 - 1"), LITTLE DK. BROWN SAND, DAMP					
6				5.3 - 8' DK BROWN CLAYEY SILT SOME SAND AND GRAVEL (1/4 - >1") MOIST					
				WET AT 8 FT					
8				8-12' AS ABOVE, SATURATED AT 8FT 11 IN					
10									
12				12-14' AS ABOVE					
				14 - 14.7' LT BROWN SILTY CLAY NO GRAVEL					
				14.7 - 16' GRAY SILTY CLAY					

ADDITIONAL REMARKS: INSTALL CASING TO 18 FT

FILE: \FORMAT

RADIAN INTERNATIONAL

TEST BORING PZ-7 PAGE 2 OF 2

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SOS DRILLER B. BUTLER

DATE 08-03-00 DRILLING METHOD GEOPROBE RIG TYPE VIPER 2

CHK BY DRILLING START DATE 08-03-00 DRILLING COMPLETION DATE 08-03-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				16-17.5' AS ABOVE					
		46"		17.5-20' GRAY V. FINE SAND. LITTLE SILT, DENSE, WET			24.4	17.5	SAMPLE 17.5-20'
20		46"		20-23.5' GRAY V. FINE SAND, TRACE SILT, SATURATED			10.7	20	
				23.5-24' AS ABOVE, BROWN			76	23.5	
24		46"		24-28' AS ABOVE, GRAY AT 24.25' GRADES TO LITTLE SILT			8.2	24	
28		46"		28-32' AS ABOVE			0	28	
32		2"		32-36' AS ABOVE ?				32	
36		46"		36-40' AS ABOVE			0	36	
40				40-42' AS ABOVE			0	40	SAMPLE 40-42'
				42-44' GRAY V. STIFF CLAY, LITTLE SILT			0	42	
44									

ADDITIONAL REMARKS

TOTAL DEPTH = 44 FT

FILE: \FORMAT

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-7D
HOLE NO. _____

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

BY RR — LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER
DATE 08-01-00 — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER
CHK BY _____ — DRILLING METHOD GEOPROBE — RIG TYPE POWERPROBE 9600EC V3
DATE _____ — DRILLING FLUID _____
DRILLING START DATE 08-01-00 — DRILLING COMPLETION DATE 08-01-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1276.13
SURFACE PAD ELEV. _____
HOLE DEPTH 44FT
WELL DEPTH 42FT
WELL RISER (TOP) 1275.83
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2"4"	0-44'

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS 2'x2'x6"

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN.
JOINT TYPE _____
DEPTH INTERVAL 0-18 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-22 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 42'-22'

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

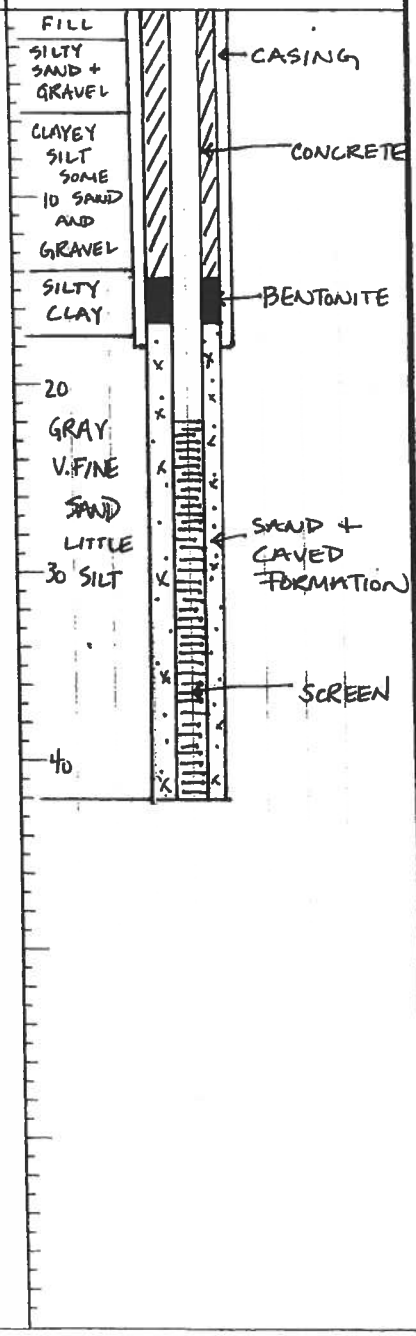
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL SURFACE - 14.5'

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 14.5'-16.75'

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL SAND/CAVED FORMATION
QUANTITY _____
DEPTH INTERVAL 16.75'-42'

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

TEST BORING PZ-8

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER

BY RR — DRILLING CONTRACTOR URS SDS — DRILLER R. MILLER

DATE 08-01-00 — DRILLING METHOD GEOPROBE — RIG TYPE VIPER 2

CHK BY — DRILLING START DATE 08-01-00 — DRILLING COMPLETION DATE 08-01-00

DATE — SURFACE ELEVATION — STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		44"		0-20" DK BROWN SAND & GRAVEL, DAMP 20"-2' DK BROWN TO BLACK SOFT CLAY, SOME SILT, MOIST 2-3' LT BROWN SILTY CLAY, STIFF 3-4' LT BROWN SILTY SAND AND GRAVEL (1/4-1 IN)			66.8 61.5	20" 3' 4.5'	
4		29"		4-4.5' AS ABOVE 4.5-8' AS ABOVE GRADING TO GRAY SATURATED			5565	8'	
8		32"		8-11'1" AS ABOVE, STRONG ODOR BLACK SHINY COATING ON GRAVEL (1/16-1/8 IN) 11'1"-12' GRAY CLAY, LITTLE SILT			9554	11'1"	CL?
12				TOTAL DEPTH = 12 FT					

ADDITIONAL REMARKS: INSTALL CASING TO 15 FT (3")

FILE\FORMAT

TEST BORING PZ-8 PAGE 2 OF 2

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER B. BUTLER

DATE 08-05-00 DRILLING METHOD GEOPROBE RIG TYPE VIPER 2

CHK BY DRILLING START DATE 08-05-00 DRILLING COMPLETION DATE 08-05-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		0		16-20' NO RECOVERY ?					CLAY?
20		34"		21-23' GRAY FINE TO V. FINE SAND, SATURATED			6816	20	SAMPLE 20-23 FT
				23-24' GRAY SILTY CLAY, V. STIFF			116.3	23	
24		40"		24-28' GRAY FINE TO V. FINE SAND, SATURATED			29.4	24	
28		41 1/2"		28-32' AS ABOVE, LITTLE SILT			4	28	
32		43"		32-35.5' AS ABOVE			6.6	32	
				35.5-36' GRAY SILTY CLAY			12.3	35.5	
36		44"		36-40' GRAY FINE TO V. FINE SAND, LITTLE SILT			2.6	36	
40		42"		40-40.75' MED TO COARSE SAND, SOME SILT TRACE GRAVEL (1/4-1/2 in)			43	40	SAMPLE 40-40.75 FT
				40.75-44' GRAY CLAYEY SILT V. STIFF			0	40.75	
44								44	

ADDITIONAL REMARKS

12-16 FT NO RECOVERY

TOTAL DEPTH = 44 FT

FILE: \FORMAT

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-8D
HOLE NO. _____

PROJECT NAME ESSEX / HOPE — PROJECT NO. B04041.21

BY RR — LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER

DATE 08-05-00 — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER

CHK BY _____ — DRILLING METHOD GEOPROBE — RIG TYPE VIPER 2

DATE _____ — DRILLING FLUID _____

DRILLING START DATE 08-05-00 — DRILLING COMPLETION DATE 08-05-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1278.93
SURFACE PAD ELEV. _____
HOLE DEPTH 44 FT
WELL DEPTH 41 FT
WELL RISER (TOP) 1278.63
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼"	0-44'

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS —

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN.
JOINT TYPE _____
DEPTH INTERVAL 0-15 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1 - IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-21 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 - IN
DEPTH INTERVAL 41' - 21'

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

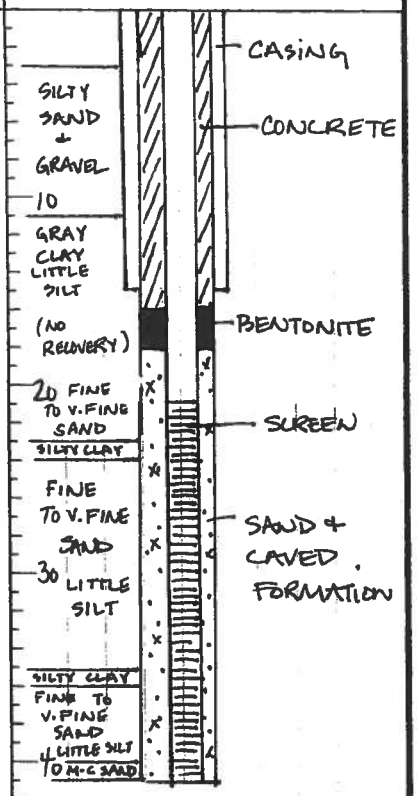
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0-16 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 16-18 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL SAND/CAVED FORMATION
QUANTITY _____
DEPTH INTERVAL 18-41 FT

DEVELOPMENT
METHOD SURGE + BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

TEST BORING PZ-9 PAGE 1 OF 3

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER R. MILLER

DATE 08-02-00 DRILLING METHOD GEOPROBE RIG TYPE POWER PROBE 9600 EC V3

CHK BY DRILLING START DATE 08-02-00 DRILLING COMPLETION DATE 08-02-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				DID NOT SAMPLE (CONCRETE)					
2				2-3' BROWN FINE TO COARSE SAND AND GRAVEL, SOME SILT, WET (1/4-1")			0	2	
								3	
4		16		3-6' YELLOW BRICK PIECES NO SEDIMENT					
6				6-9 1/4' AS ABOVE				6	
							0		
8		30"							
				9 1/4 - 10' LT BROWN V. STIFF CLAY, TRACE GRAVEL (1/2-1") TRACE SILT, MOIST				9.25	
							0		
10				10-10.25' AS ABOVE				10.25	
				10.25-14' GRAY SILTY CLAY, V. STIFF					
12		44					0		
14				TOTAL DEPTH = 14 FT				14	

ADDITIONAL REMARKS

INSTALL 3" CASING TO 12 FT

FILE: \FORMAT

TEST BORING PZ-9 PAGE 2 OF 3

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER R. MILLER

DATE 08-05-00 DRILLING METHOD GEOPROBE RIG TYPE POWER PROBE 9600EC V3

CHK BY DRILLING START DATE 08-05-00 DRILLING COMPLETION DATE 08-05-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		46		12-12.8' AS ABOVE 12.8-16' GRAY CLAYEY SILT V. STIFF					
16								16	
		42"		16-20' AS ABOVE GRADING TO LITTLE SAND AT 19FT			2.6		
20									
		39"		20-21.5' AS ABOVE 21.5-24' GRAY SILTY SAND SATURATED			268	21.5	
24								24	
		36"		24-28' GRAY V. FINE SAND LITTLE SILT, SATURATED SLIGHT ODOR			200.6		
28								28	SAMPLE 28-31.75'
		44"		28-31.75' AS ABOVE STRONG ODOR			1394	31.75	
32				31.75-32.25' GRAY V. STIFF SILTY CLAY			579	32.25	
		44"		32.25-36' GRAY FINE TO V. FINE SILTY SAND, TRACE CLAY			123.2		
36								36	SAMPLE 36-40'
		42"		36-38.75' AS ABOVE 38.75-40' GRAY SILTY CLAY, MED. STIFF			9.3		
40								40	

ADDITIONAL REMARKS

FILE:\FORMA

TEST BORING PZ-9 PAGE 3 OF 3

RADIAN INTERNATIONAL

PROJECT NAME ESSEX/HOPE PROJECT NO. 80401.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER R. MILLER

DATE 08-05-00 DRILLING METHOD GEOPROBE RIG TYPE

CHK BY DRILLING START DATE 08-05-00 DRILLING COMPLETION DATE 08-05-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		46"		40-44' GRAY SILTY CLAY, STIFF					
44				TOTAL DEPTH = 44 FT					

ADDITIONAL REMARKS

FILE: \FORMAT

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL COMPLETION LOG

WELL NO. PZ-9D
HOLE NO. _____

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

BY RR — LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER
DATE 08-05-00 — DRILLING CONTRACTOR URS SDS — DRILLER R. MILLER
CHK BY _____ — DRILLING METHOD GEOPROBE — RIG TYPE POWER PROBE 9600 EC V3
DATE _____ — DRILLING FLUID _____
DRILLING START DATE 08-05-00 — DRILLING COMPLETION DATE 08-05-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1278.34
SURFACE PAD ELEV. _____
HOLE DEPTH 44 FT
WELL DEPTH 39 FT
WELL RISER (TOP) 1278.04
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
24"	0-44"

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS —

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN
JOINT TYPE _____
DEPTH INTERVAL 0-12 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-19 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 IN.
DEPTH INTERVAL 39'-19'

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

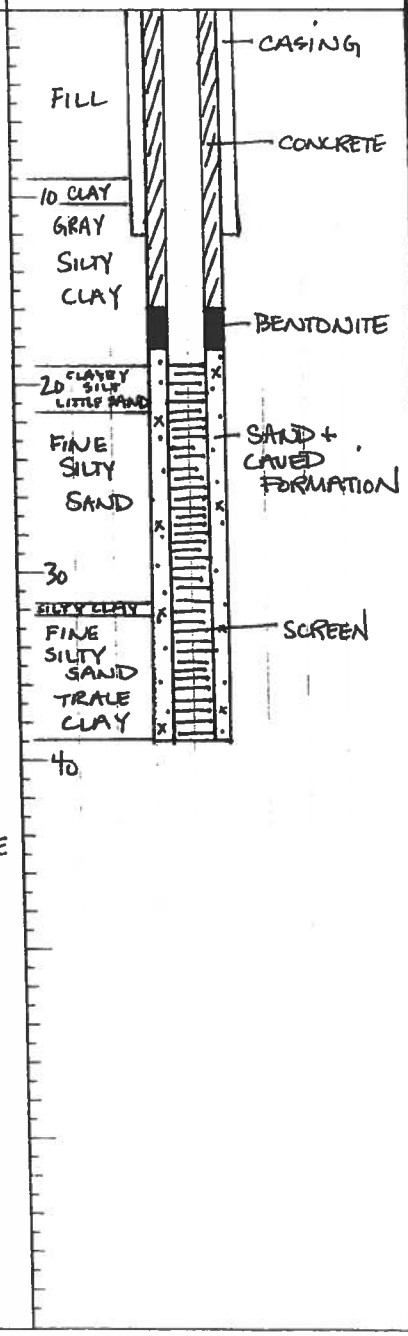
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0-18 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 16-18 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL CAVED FORMATION / SAND
QUANTITY _____
DEPTH INTERVAL 18-39 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

TEST BORING PZ-10

RAGUARD REMEDIATION

PROJECT NAME ESSEX/HOPE — PROJECT NO. 804041.21

LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER

BY RR — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER

DATE 08-02-00 — DRILLING METHOD GEOPROBE — RIG TYPE VIPER

CHK BY — DRILLING START DATE 08-02-00 — DRILLING COMPLETION DATE 08-02-00

DATE — SURFACE ELEVATION — STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN)	BL./6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				0-0.5' GRASS, SOIL				.5	
				0.5-2.5' BROWN FINE TO COARSE SAND AND GRAVEL (1/4-1")			1.3		
2		42"						2.5	
				2½-4' BROWN SILT, LITTLE CLAY GRAVEL (1-2") AT 3.5'					
4								4	
				4-7.25' BROWN MED TO COARSE SAND AND GRAVEL (1/4-2") WET			6		
6		41"							
				7.25-8' AS ABOVE, GRAY ODOR, SATURATED			238	7.5	
8								8	
				8-11' AS ABOVE LESS SAND					SAMPLE 11-12 FT
10		44"					1178		
				11-12' AS ABOVE, BLACK					
12							224	12	
				12-13' AS ABOVE GRADING TO SOME CLAY, GRAY				13	
		48"		13-16' GRAY CLAY, LITTLE SILT, STIFF			82.9		
16								16	

TOTAL DEPTH = 16 FT

ADDITIONAL REMARKS

INSTALL CASING (3") TO 16'

FILE: \FORMA...

TEST BORING PE-10 PAGE 2 OF 3

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SOS DRILLER R. MILLER

DATE 08-05-00 DRILLING METHOD GEOPROBE RIG TYPE POWER PROBE 9600EC V3

CHK BY DRILLING START DATE 08-05-00 DRILLING COMPLETION DATE 08-05-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		42"		16-20' GRAY SILTY CLAY					
20				20-20.9' AS ABOVE				20.9	
		38"		20.9-24 GRAY V. FINE SAND, SATURATED			0		
24				24-28' AS ABOVE			103.2	24	
		39½"							
28				28-32' AS ABOVE			208.6	28	SAMPLE 28-32'
		43"							
32				32-33' AS ABOVE			1.3	32	
		40"		33-33.5' GRAY SILTY CLAY					
				33.5-36' GRAY V. FINE SAND, LITTLE SILT					
36				36-39.5' AS ABOVE			2.6	36	
		46"							
				39.5-40' GRAY SILTY CLAY			1.3	39.5	
40				40-44' GRAY V. FINE SILTY SAND				40	
		42"					1.3		SAMPLE 40-44'
44								44	

ADDITIONAL REMARKS

FILE: \FORMA

TEST BORING PZ-10 PAGE 2 OF 2

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY. RR DRILLING CONTRACTOR URS SDS DRILLER R. MILLER

DATE 08-05-00 DRILLING METHOD GEOPROBE RIG TYPE POWER PROBE 9600 EC

CHK BY --- DRILLING START DATE 08-05-00 DRILLING COMPLETION DATE 08-05-00

DATE --- SURFACE ELEVATION --- STICK-UP ELEVATION ---

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		44"		44-45' GRAY SILTY CLAY 45-46.5' GRAY V. FINE SILTY SAND 46.5-48' GRAY SILTY CLAY			1.3 1.3 1.3	45 46.5 48	
48		48"		48-52' AS ABOVE					
52				TOTAL DEPTH = 52 FT					

ADDITIONAL REMARKS

FILE: \FORMA

WELL COMPLETION LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL NO. PZ-10D
HOLE NO. _____

PROJECT NAME ESSEX/HOPE — PROJECT NO. 804041.21

BY RR — LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER
DATE 08-05-00 — DRILLING CONTRACTOR URS SDS — DRILLER R. MILLER
CHK BY _____ — DRILLING METHOD GEOPROBE — RIG TYPE POWER PROBE 9600 EC
DATE _____ — DRILLING FLUID _____
DRILLING START DATE 08-05-00 — DRILLING COMPLETION DATE 08-05-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1277.88
SURFACE PAD ELEV. _____
HOLE DEPTH 52 FT
WELL DEPTH 46.5 FT
WELL RISER (TOP) 1277.58
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼"	0-52 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS 2'x2'x6"

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN
JOINT TYPE _____
DEPTH INTERVAL 0-16 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1 IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0-26.5 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 IN
DEPTH INTERVAL 46.5' - 26.5'

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL _____

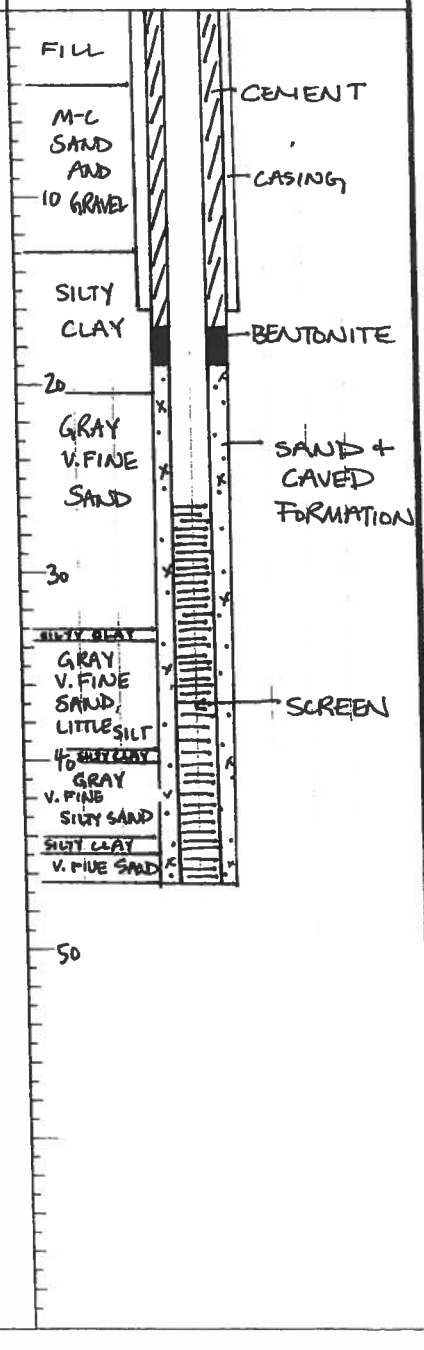
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 0-17 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY _____
DEPTH INTERVAL 17-19 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL SAND/CAVED FORMATION
QUANTITY _____
DEPTH INTERVAL 19-46.5 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME _____
PRODUCTION _____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

RADIAN INTERNATIONAL

TEST BORING PE-11

PAGE 1 OF 1

PROJECT NAME ESSEX / HOPE — PROJECT NO. 804041.21

LOCATION JAMESTOWN NY — GEOLOGIST R. RUPIPER

BY. RR — DRILLING CONTRACTOR URS SDS — DRILLER B. BUTLER

DATE 08-02-00 — DRILLING METHOD GEOPROBE — RIG TYPE VIPER

CHK BY — DRILLING START DATE 08-02-00 — DRILLING COMPLETION DATE 08-02-00

DATE — SURFACE ELEVATION — STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
				0 - 0.5' GRASS, SOIL				.5	
		44"		0.5 - 1.5' MED TO COARSE SAND AND GRAVEL (1/4") WET			0	1.5	
				1.5 - 4' BROWN SILT, LITTLE CLAY			0	4	
4				4 - 4.5' AS ABOVE			0	4.5	
		39"		4.5 - 6.5' FINE TO COARSE SAND AND GRAVEL (1/4 - >2"), BROWN				6.5	
				6.5 - 8' AS ABOVE, GRAY, SATURATED			2.6	8	
8				8 - 10.5' AS ABOVE				10.5	
		44"		10.5 - 11.5' MED TO COARSE SAND, LITTLE GRAVEL (1/4") WET			12.5	11.5	SAMPLE
				11.5 - 15' MED TO COARSE SAND AND GRAVEL (1/4 - 1") SATURATED, SHEEN (NO ODOR)			88.5 5.3	12	SAMPLE
		40"		15 - 16' AS ABOVE, MORE GRAVEL (1/2 - >2")			4	15	
16				16 - 20.75 AS ABOVE LESS GRAVEL (1/4 - 1")				16	
		36"					13.3	17	
								18	
20				20.75 - 21' OLIVE GRAY CLAY TRACE SILT, SOFT WET			0		
				21 - 24' GRAY V. FINE SAND			1.3		
24									

ADDITIONAL REMARKS

INSTALL 3" CASING TO 24 FT

FILE: \FORMA

TEST BORING PE-11 PAGE 2 OF 2

RADIAN INTERNATIONAL

PROJECT NAME ESSEX / HOPE PROJECT NO. 804041.21

LOCATION JAMESTOWN NY GEOLOGIST R. RUPIPER

BY RR DRILLING CONTRACTOR URS SDS DRILLER B. BUTLER

DATE 08-05-00 DRILLING METHOD GEOPROBE RIG TYPE VIPER

CHK BY DRILLING START DATE 08-05-00 DRILLING COMPLETION DATE 08-05-00

DATE SURFACE ELEVATION STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL / 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	OVA READING	DEPTH (FEET)	REMARKS
		36"		20-24' GRAY V. FINE SAND			0		
24								24	
		39"		24-28' AS ABOVE, LITTLE GRAVEL			1.3		
28								28	
		42"		28-32' AS ABOVE, NO GRAVEL CLAY ~½" thick at 28.5', 30.25', 31.5'			0		
32								32.5	
		40"		32-32.5' AS ABOVE 32.5-33.25' SILTY CLAY - GRAY 33.25-36' GRAY V. FINE SAND			26 1.3	33.25	
36								36	
		44"		36-37.25' AS ABOVE 37.25-39.5' GRAY SILTY CLAY 39.5-40' GRAY V. FINE SAND					
40								39.5	
		46"		40-41.25' AS ABOVE 41.25-44' GRAY SILTY CLAY			8.6	41.25	SAMPLE 39.5-41.25'
44									
		46"		44-48' AS ABOVE					
48									

ADDITIONAL REMARKS

TOTAL DEPTH = 48'

FILE\FORM...

WELL COMPLETION LOG

PAGE 1 OF 1

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL NO. PZ-11D
HOLE NO. ____

PROJECT NAME ESSEX / HOPE
PROJECT NO. 804041.21

BY RR
LOCATION JAMESTOWN NY
GEOLOGIST R. RUPIPER

DATE 08-05-00
DRILLING CONTRACTOR URS SDS
DRILLER B. BUTLER

CHK BY ____
DRILLING METHOD GEOPROBE
RIG TYPE VIPER

DATE ____
DRILLING FLUID ____

DRILLING START DATE 08-05-00
DRILLING COMPLETION DATE 08-05-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. ~1277.00
SURFACE PAD ELEV. ____
HOLE DEPTH 48 FT
WELL DEPTH 41.25 FT
WELL RISER (TOP) 1276.70
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
2¼"	0 - 48 FT

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL STEEL
DIAMETER 8 IN
DEPTH INTERVAL 12 IN
SURFACE PAD DIMENSIONS 2" x 2" x 6"

OUTER CASING
MATERIAL SCH 40 PVC
DIAMETER 3 IN
JOINT TYPE ____
DEPTH INTERVAL 0 - 24 FT

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 1 IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL 0 - 21.25 FT

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 1"
JOINT TYPE FLUSH THREAD
OPENINGS 0.01 IN
DEPTH INTERVAL 41.25' - 21.25'

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE FLUSH THREAD
DEPTH INTERVAL ____

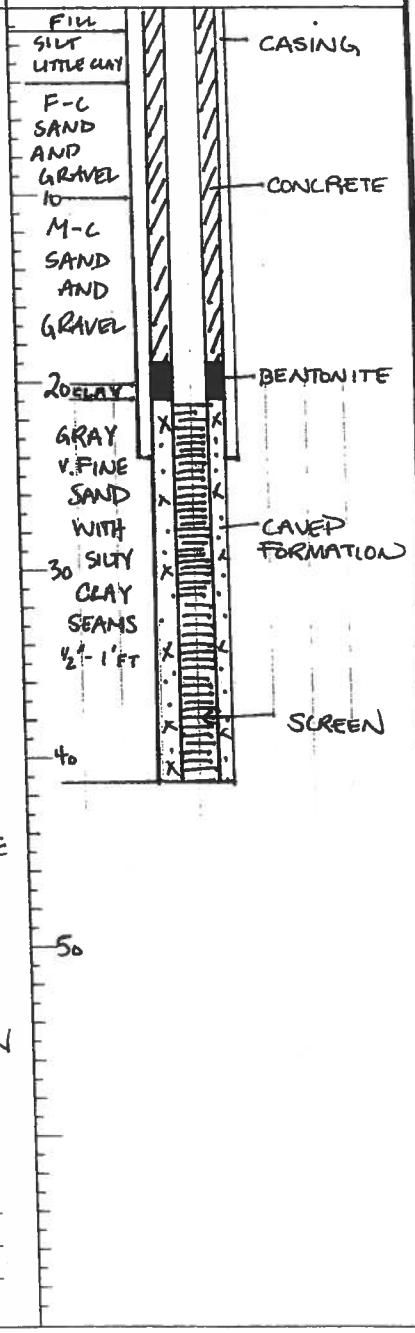
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL 0-19 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL GRANULAR BENTONITE
QUANTITY ____
DEPTH INTERVAL 19 - 21 FT

FILTER PACK
INSTALL. METHOD —
MATERIAL CAVED FORMATION
QUANTITY ____
DEPTH INTERVAL 21 - 41.25'

DEVELOPMENT
METHOD SURGE & BAIL
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION:

FILE: \WELL-LOG

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

REPORT OF BORING RW-1
PAGE 1 OF 2

CLIENT: Essex Specialty Products

SAMPLER: GRAB

LOCATION: 10' North of Sump

PROJECT LOCATION: Jamestown, New York

HAMMER:

START DATE: 1/30/91
END DATE: 1/31/91

FILE NO.: 2576.009.402

FALL:

BORING COMPANY: CATOH
FOREMAN: Bob Laimer
OBG GEOLOGIST: John Mason

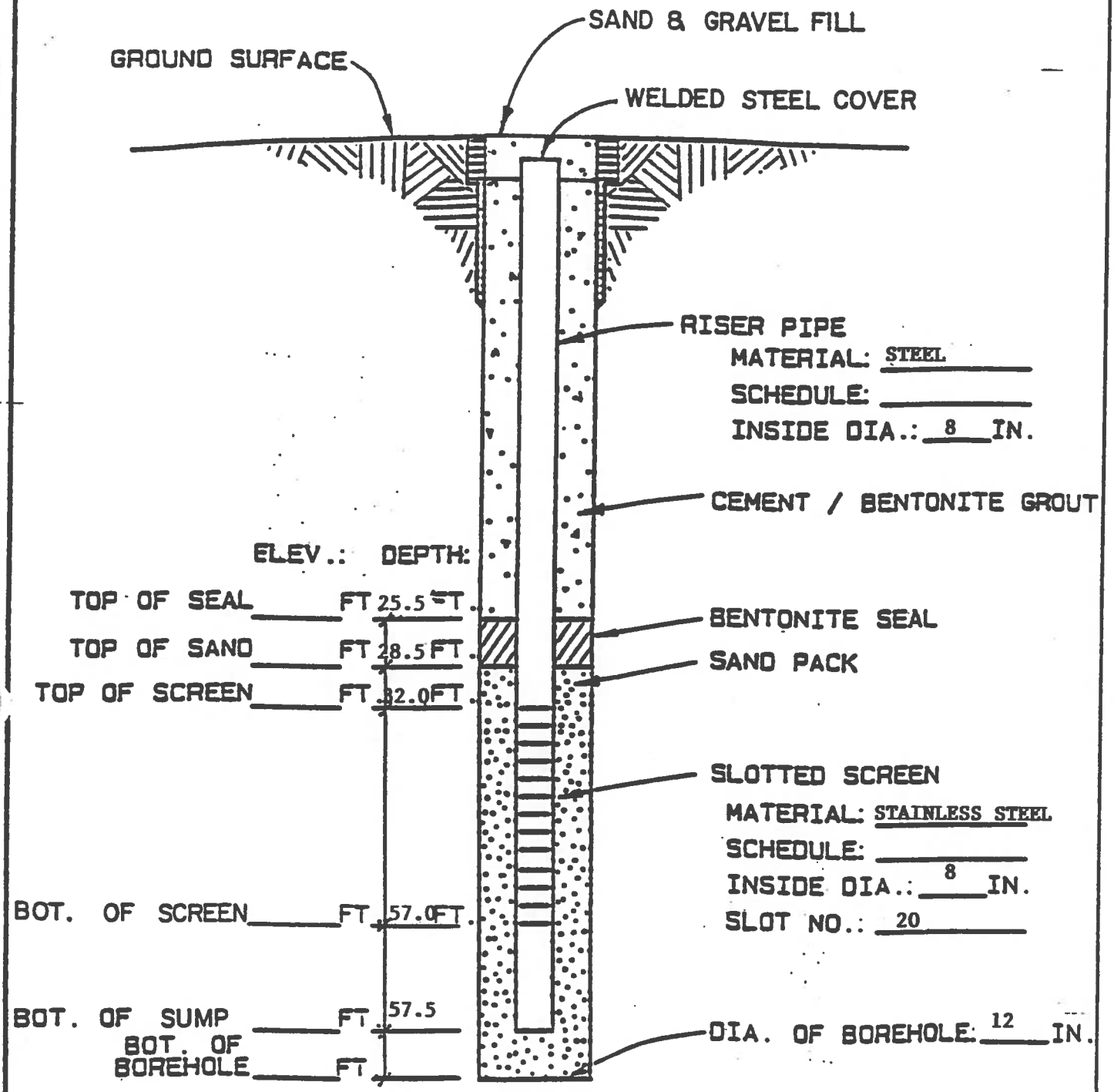
GWD 1278.39

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HEAD-SPACE
0										
	1	4.5–5				Dry to damp, white to brown, coarse to very coarse, subangular SAND and GRAVEL, some fine to medium sand, gravel 0.5–1 cm. in diameter				
5										
	2	9.5–10				Moist, brown, medium to very coarse, sub-angular SAND and GRAVEL, some fine sand, little silt				
10										
	3	14.5–15				Wet, light to medium brown, very fine to fine SAND, some silt, little subangular gravel and medium sand				
15										
	4	19.5–20				Wet, brown to green, very fine SAND and SILT, some clay, trace gravel				
20										
	5	24.5–25				Wet, brown to gray, very fine SAND and SILT, some medium sand and clay, little fine gravel				
25										
	6	29.5–30				Same as above				
30										
	7	34.5–35				Wet, brown to gray, very fine SAND and SILT, some clay, little medium sand, trace coarse sand				
35										

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	REPORT OF BORING RW-1 PAGE 2 OF 2
CLIENT: Essex Specialty Products	SAMPLER: GRAB	LOCATION: 10' North of Sump
PROJECT LOCATION: Jamestown, New York	HAMMER:	START DATE: 1/30/91 END DATE: 1/31/91
FILE NO.: 2576.009.402	FALL:	
BORING COMPANY: CATOH FOREMAN: Bob Laimer OBG GEOLOGIST: John Mason		LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

DEPTH BELOW GRADE	NO.	DEPTH (FEET)	BLOWS /6"	PENETR/ RECOVERY	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE GENERAL DESCRIPT	EQUIPMENT INSTALLED	FIELD TESTING PID	FIELD TESTING HEAD-SPACE
	8	39.5–40				Same as above				
40										
	9	44.5–45				Same as above				
45										
	10	49.5–50				Wet, gray to green, silty CLAY, some very fine sand, little medium to coarse sand				
50										
	11	54.5–55				Same as above				
55										
						Bottom of boring 58.0'				
60										



TYPICAL OVERBURDEN RECOVERY WELL

N.T.S.

RECOVERY WELL RW-1

O'BRIEN & GERE

RADIAN INTERNATIONAL LLC

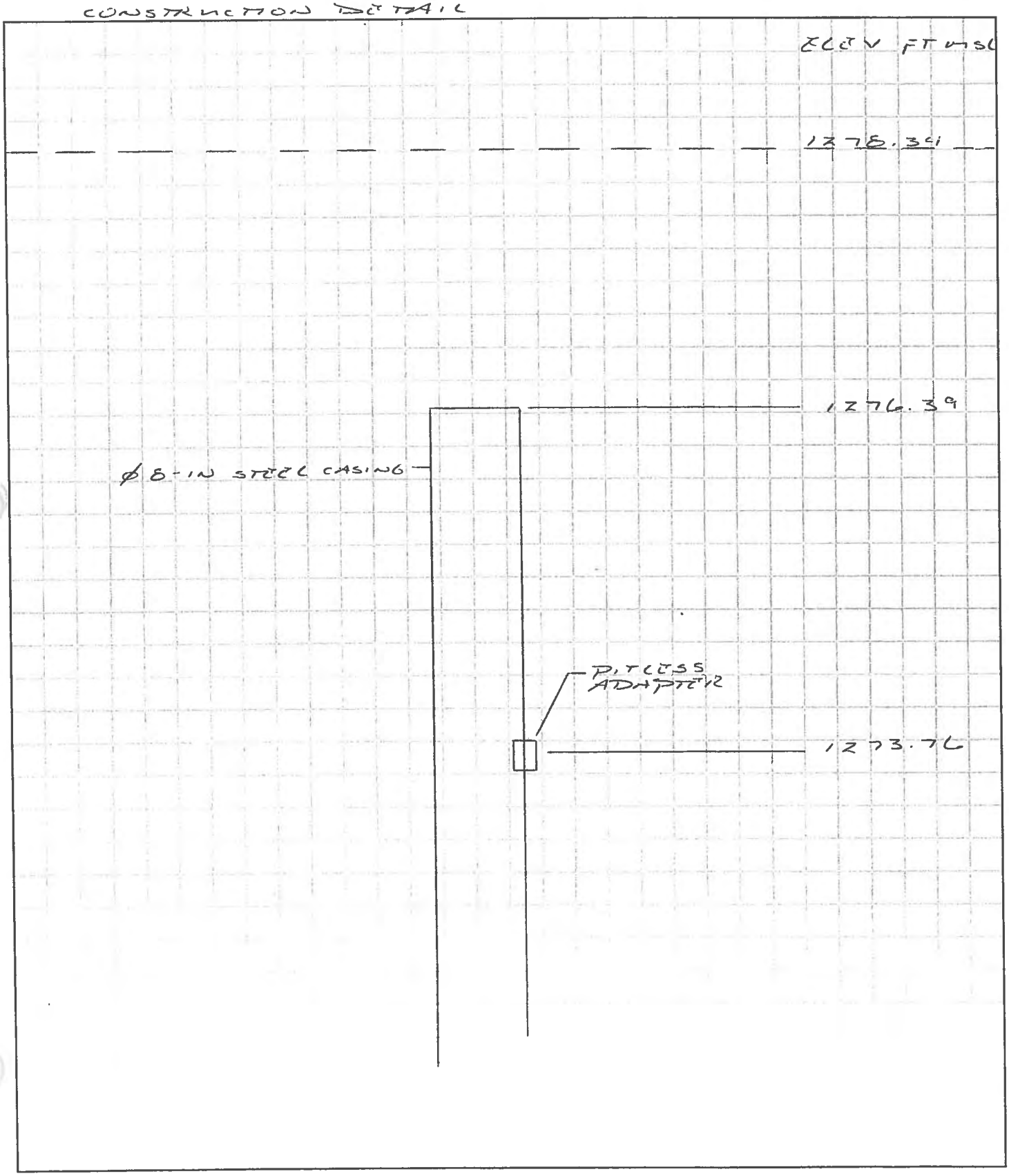
CALCULATION SHEET

CALC. NO. _____

SIGNATURE _____ DATE 1-4-97 CHECKED _____ DATE _____

PROJECT CTSSC x/MODC JOB NO. 007138

SUBJECT RW-1D PITLESS ADAPTER SHEET _____ OF _____ SHEETS
CONSTRUCTION DETAIL



HJP-3 38776 fm5

WELL NO. RW-15 PAGE 1 OF 1

PROJECT NAME ESSEX HOPE PROJECT NO. 7138

LOCATION JAMESTOWN, NEW YORK GEOLOGIST FERGUSON

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
										Ground Surface
0 2	—	—	—	BROWN, SILTY, SANDY (F-C) GRAVEL (M-C) DRY	FILL				12" HSA Guard Protective Cover	
2 4	1	1.5	13 3 5	M. DENSE, BLACK-BROWN, FLY ASH AND CLAY, FILL MOIST	FILL / CL					14:40 HNU-749
4 6	2	1.3	12 15 14 15	M. DENSE, LT BROWN, SILTY, VF-F, SAND AND M-C GRAVEL, MOIST TO LIGHTLY	SM/SW / SM	▽				14:46 HNU-5.4
6 8	3	1.2	6 12 12 12	M. DENSE, LT BROWN, SILTY, CLAYEY, VF-F SAND AND M-C GRAVEL, WET	SC/GC SW/GM					14:56 HNU-329
8 10	4	.90	5 10 11 14	M. DENSE, GRAY, SILTY, VF-FINE SAND AND F-C ANGULAR GRAVEL, WET	SM/GM SM/GM					15:02 HNU-27
10 12	5	.5	11 7 11 12	M. DENSE, GRAY, SILTY, SANDY F-C ANGULAR GRAVEL, WET	SM/GM SM/GM					15:15 HNU-5.4
12 14	6	1.0	24 25 25 12	V. DENSE, GRAY BROWN, SILTY, SANDY F-C ANGULAR GRAVEL, WET	SM/GM SM/GM					15:26 HNU-205
14 16	7	1.5	13 11 10 12	M. DENSE, BROWN-GRAY, SILTY VF-F SAND AND F-C GRAVEL → GRAY VF-F SANDY SILT (WET - MOIST)	SM/ML					15:34 HNU-1000
				BOTTOM OF BORING: 16.0'					• 4" Ø GRADE 304 SS SCREEN .010 SLOT 10.5' - 16' • #1 MORIE SANDPACK 8'-16' • Bentonite Allet SEAL 6'-8' • Portland Cement 3'-6'	

ADDITIONAL REMARKS

CONTRACTOR: EMPIRE SOILS
RIG: AKER SOIL MAX
DRILLER: RON FULLER
H.S.: TROY NEWSOME

- MONITORING WELL INSTALLED THROUGH 8 1/4" Ø HSA - I.D. WELL INSTALLED 7-21-95
- WELL CONSTRUCTED OF 4" Ø GRADE 304 STAINLESS STEEL WELL SCREEN .010 SLOT W/ 0 MORIE SAN

RADIAN INTERNATIONAL LLC

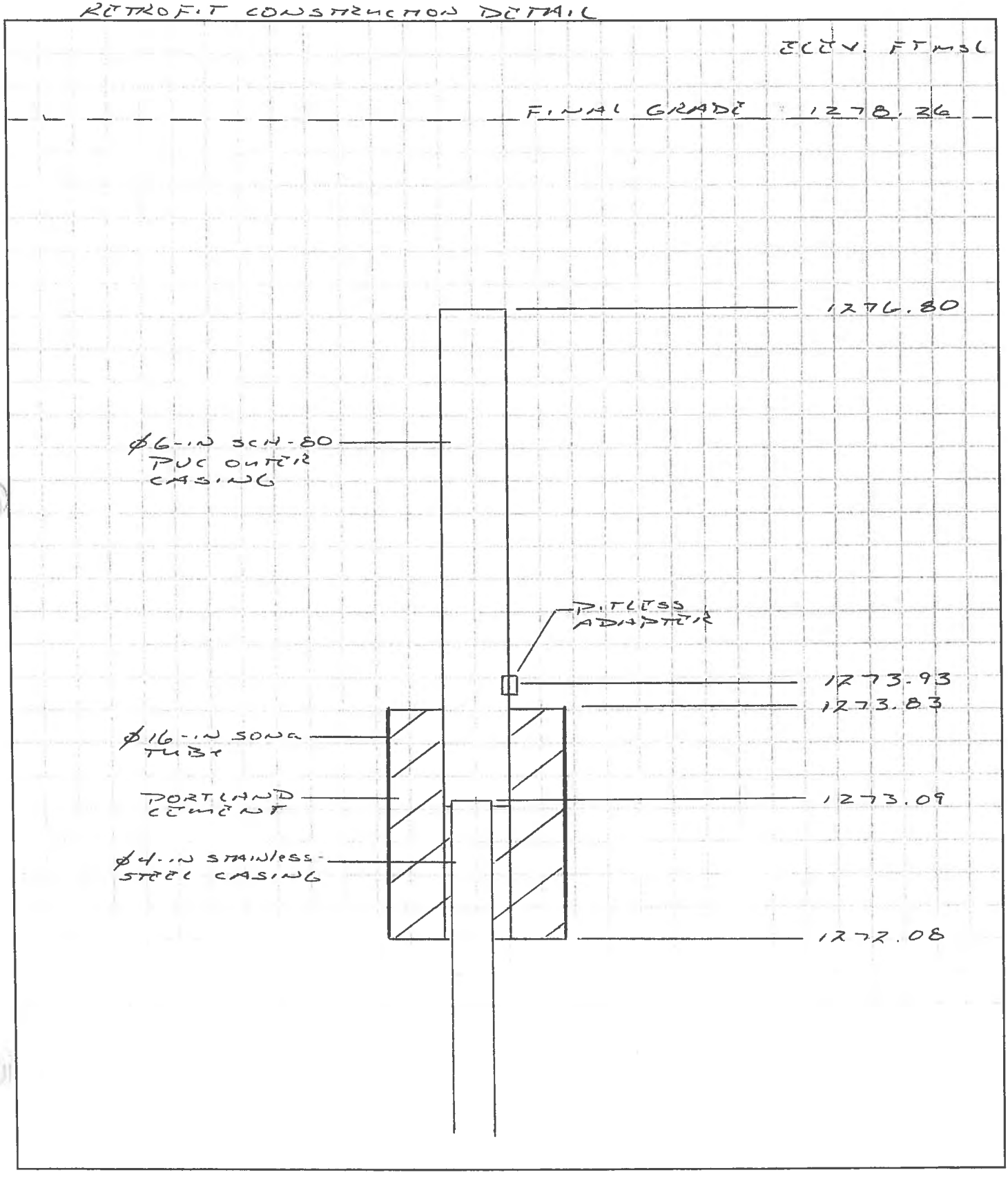
CALCULATION SHEET

CALC. NO. _____

SIGNATURE _____ DATE 1-7-96 CHECKED _____ DATE _____

PROJECT ESSEX/HOPE JOB NO. 007138

SUBJECT RW-15 6-IN OUTER CASING RETROFIT CONSTRUCTION DETAIL SHEET _____ OF _____ SHEETS



HJP-3 38776 fh5

WELL NO. RW-2D PAGE 1 OF 2

PROJECT NAME ESSEX HOPE PROJECT NO. 7133

LOCATION JAMESTOWN NEW YORK GEOLOGIST FERGUSON

GROUND ELEV ~ 1277.8 FT MSL

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
0					FILL					12" ø HSA HOLE
					FILL					9 5/8" PVC
2	1	1.3'	3 3 4 8	Very Stiff, Black - Brown, Fill (Ash, medium sand, gravel) Brown, Silt TR - some gravel moist	FILL					12:00 HNU - 0
4	2	1.0	8 18 22 33	Very Stiff - Dense, Dark Brown, Sandy VF Silt and Gravel,	GW					12:50 HNU - 0
6	3	1.15	35 56 33 16	Very Stiff - Dense, Dark Brown, Silty, Sandy VF-F, MEDIUM Gravel	GW	▽				13:00 HNU - 0
8 10	4	1.15	8 7 7 10	Very Stiff - Dense, Dark Brown Grey, Sandy VF Silty, Gravel	GW					13:20 HNU - 0
12	5	1.5	20 18 10 10	Very Stiff - Dense, Sandy VF, Silty F-M Gravel, Angular and grey Silt, to Fine	GW					13:30 HNU - 10.8
14	6	1.34	6 9 13 15	STIFF, GRAY, SILT, 13'-14' interval contains TR - Little VF-F sand (moist-wet)	ML					13:50 HNU - 0
16										7-12-95
18	7	1.2	6 8 9 10	Very STIFF - M Dense, GRAY, SILTY, VF sand and Silt (wet - moist)	SM/ML					16:45 HNU - 113
20	8	1.0	12 10 12 14	HARD, GRAY, SILT, moist	ML					16:55 HNU - 672
22	9	1.5	5 5 5 9	STIFF, GRAY, Silt and interbedded SILTY Very Fine Sand seams MOIST-WET-MOIST	ML/SM					17:05 HNU - 889
24	10	1.5	6 9 6 6	STIFF - M Dense, INTERBEDDED, GRAY Silt and Silty VF Sand moist-wet-moist-wet	ML/SM					17:20 HNU - 877
26	11	1.2	8 10 12 15	M Dense - Dense, SILTY, Very Fine Sand 2-5" silt laminae, wet	SM					17:32 HNU - 817
28	12	1.0	3 4 8 10	M Dense, Gray, SILTY, VF-F Sand, w/interbedded silt laminae 2"-5" wet	SM					10:10 HNU - 98
30	13	1.0	1 11 25 15	M Dense, GRAY, SILTY, VF-m Sand wet, dilatant	SM					10:20 HNU - 32
32	14	1.2	1 6 9 8	M Dense, Gray, Silty, VF-m Sand, dilatant wet	SM					10:27 7-13-95 HNU - 16
34	15	1.0	1 3 9 10	M. Dense, Gray, Silty, VF-m Sand, dilatant, wet	SM					10:39 HNU - 37
36	16	1.4	2 4 10 12	M Dense, Gray, Silty, VF-m Sand Gray 2" laminae - Silt @ 35.5' wet	SM					10:48 HNU - 20
38	17		4 10 11 11	M Dense, Gray, Silty, VF-m Sand, 3" silt laminae @ 36.5', dilatant wet	SM					11:19 HNU - 5
40	18		8 9 14 15	M Dense, Gray, Silty VF-m Sand, grading to a silty medium Sand @ 39.5'	SM/SP					11:28 HNU - 5

1260.8

1257.8

CONTRACTOR EMPIRE SOILS - HUNTINGDON 8 1/4" ø 12" OD HSA

ADDITIONAL REMARKS DRILLER KEN FULLER HELPER BOB TAYLOR RIG ACKER SOIL MAN

- water appears to prefer base of upper flow zone more permeable appearance from 10'-11'
- 2" SCH 40 PVC [illegible]

WELL NO. RW-2D PAGE 2 OF 2

PROJECT NAME Esser Hope PROJECT NO. 7138

LOCATION Jamestown - New York GEOLOGIST Ferguson

1234.8 —

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/ 6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/ CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
40										
41	19	1.8	4 5 7 9	M. Dense, Gray-Brown, Fine-medium Sand, Trace-Little silt, gravel (F) wet	SP					11:38 HNU-0
42	20	1.5	9 13 36 41	Dense, Gray, Silty medium Sand grade to gray moist silt	SP/SP ml					11:52 HNU-0
44	21	1.5	9 14 14 28	Very STIFF, Gray, SILT, Tr. angular gravel, moist	ml					13:08 HNU-0
46	22	1.75	13 14 23 30	Very STIFF, Gray, Silt, moist	ml ml					13:21 HNU-0
				BOTTOM OF BORING: 48.0'					• 4" ϕ Grade 304 SS .010 SLOT SCREEN 27'-42.5' • Sandpack #1 MORIE 24'-43' • BENTONITE PELLET SEAL 21'-24' • Portland Cement 1.5'-24'	

· 4¼" ϕ HSA FROM 16' TO 48' COMPLETED SOIL SAMPLING 7-13-95

ADDITIONAL REMARKS

RADIAN INTERNATIONAL LLC

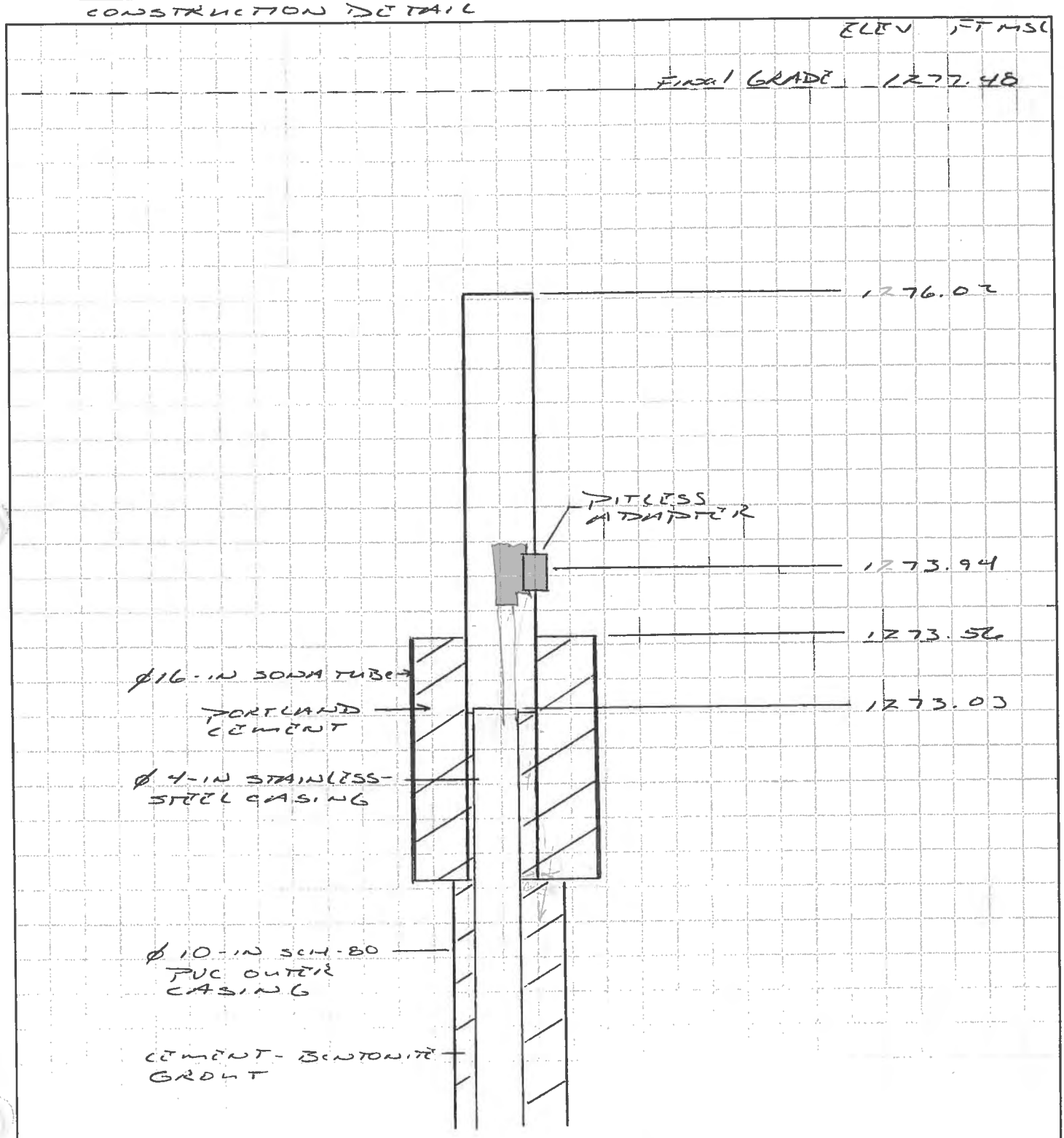
CALCULATION SHEET

CALC. NO. _____

SIGNATURE _____ DATE 1-7-97 CHECKED _____ DATE _____

PROJECT ESSC+/HOPI JOB NO. _____

SUBJECT RW-2D OUTER CASING RETROFIT CONSTRUCTION DETAIL SHEET _____ OF _____ SHEETS



HJP-3 38776 fh5

WELL NO. RW-2S PAGE 1 OF 1

PROJECT NAME ESSEX HOPE PROJECT NO. 7138

LOCATION JAMESTOWN NEW YORK GEOLOGIST FERGUSON

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
				?						Protective Cover
2 4	1	13	3 3 7 9	M Dense, Brown, Silty, VF-m Sand and Fine gravel, angular moist	SM/SC SC/GC					09:06 HNU-0
4 6	2	1.6	8 10 17 18	Dense, Brown, Silty, VF-F Sand and Angular Sandstone Gravel (F), moist	SC/GC SM/SM					09:33 HNU-0
6 8	3	1.3	12 12 9 15	Dense, Gray-Brown, Silty, Clayey, VF-F sand and gravel, Tr lignite, moist-wet	SM/SM SC/SC	▽				09:39 HNU-0
8 10	4	.95	5 6 9 19	M. Dense, Gray-Brown, Silty, VF-F, Sand and F-C Angular gravel, wet	SC/GC SM/SM					09:40 HNU-10.8
10 12	5	.5	38 38 33 27	V. Dense, Gray-Brown, Silty, Clayey, VF-Fine Sand and Angular F-C Gravel wet	SC/GC SM/SM					09:50 HNU-10.8
12 14	6	1.2	7 21 18 14	Very Dense, Gray-Brown, Silty, Clayey, Very Fine-Fine Sand and M-C Angular Gravel wet	SC/GC SM/SM					13:44 HNU-21.2
14 16	7	1.75	5 8 9 12	M. Dense, GRAY, MICACEOUS, SILTY Very Fine Sand and SILT, wet	SM/ML SM/ML					13:55 HNU-2078
				BOTTOM OF BORING 16.0'						

- 4" Ø GRADE 304 SS SCREEN 10'-15.5' .020 SLOT
- #1 MORIE SANDPACK 8'-16'
- Bentonite pellet SEAL 6'-8'
- Portland cement 3.5'-6'

ADDITIONAL REMARKS

CONTRACTOR EMPIRE SOILS
RIG: ACKER SOIL MAX
DRILLER: DAN FULLER
HELPER ROGER NEWSOME

- 8¼" Ø HSA - 12" O.D. Well Installed 7-20-95
- Well Constructed of 4" Ø GRADE 304 STAINLESS STEEL Well SCREEN .020 SLOT w/ #1 MORIE Sandpack

RADIAN INTERNATIONAL LLC

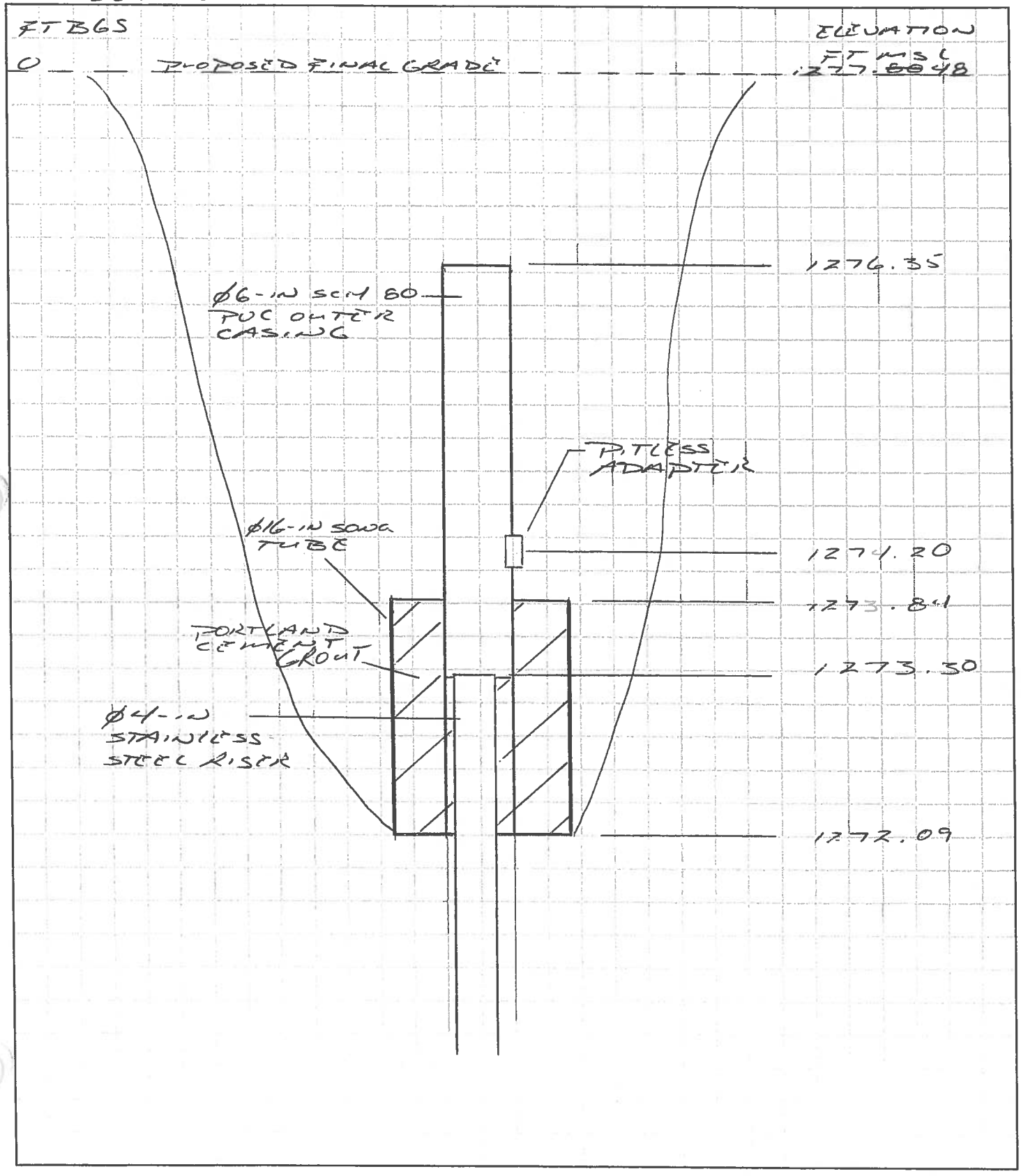
CALCULATION SHEET

CALC. NO. _____

SIGNATURE _____ DATE 1-7-97 CHECKED _____ DATE _____

PROJECT ESSEX/MOPC OUTER CASING JOB NO. 007138

SUBJECT RW-2S RETROFIT CONSTRUCTION DETAIL SHEET _____ OF _____ SHEETS



HJP-3 38776 fh5

RADIAN INTERNATIONAL LLC

WELL NO. RW-35 PAGE 1 OF 1

PROJECT NAME ESSEX/HOPE PROJECT NO. 7138.600

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR MAXIM DRILLER RON BROWN

DATE 8/29/96 DRILLING METHOD 8¼-IN ID HSA RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 8/29/96 DRILLING COMPLETION DATE 8/29/96

DATE _____ SURFACE ELEVATION 1280.10 FT MSL STICK-UP ELEVATION _____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
1	SS-1	15	6 8 9 8				LOOSE V. DK GRAYISH BROWN (2.5Y 3/2) FINE TO COARSE SAND AND GRAVEL (¼-½ IN) SOME SILT; DAMP	SM/GM				SEE WELL COMPLETION LOG	P.I.D = 1 ppm
2													
3	SS-2	18	12 8 7 8				AS ABOVE						P.I.D = 0 ppm
4							MED STIFF GRAYISH BROWN (2.5Y 5/2) CLAY, LITTLE F-C SAND AND GRAVEL (¼) DAMP	CL					
5	SS-3	15	10 12 16 16				MED DENSE LT. OLIVE BROWN (2.5Y 5/4) FINE TO COARSE SAND AND GRAVEL (1½-IN) SOME SILT; DAMP	SM/GM					P.I.D = 1 ppm
6													
7	SS-4	17	20 21 15 16				AS ABOVE; DAMP						P.I.D = 2 ppm
8							AS ABOVE; OLIVE GRAY (5Y 5/2); WET						
9	SS-5	12	13 10 8 7				MED DENSE GREENISH GRAY (GLEY 1 5/1) FINE TO COARSE SAND AND GRAVEL (½-1 IN) SATURATED AT 8.5 FT ODOR	SP/GP	▼ 8.5				P.I.D = 50 ppm
10													
11	SS-6	12	10 14 14 12				AS ABOVE; ODOR						P.I.D = 45 ppm
12													
13	SS-7	8	7 8 9 10				AS ABOVE; ODOR						P.I.D = 42 ppm
14							STIFF OLIVE (5Y 5/4) SILTY CLAY; MOIST	CL					
							STIFF GREENISH GRAY (GLEY 1 5/1) SILTY CLAY; DAMP IN NOSE OF SPOON	CL					
							TD = 14 FT						

ADDITIONAL REMARKS

RADIAN INTERNATIONAL LLC

WELL COMPLETION LOG

WELL NO. RW-35
HOLE NO. RW-35

PROJECT NAME ESSEX / HOPE — PROJECT NO. 007135

BY KD — LOCATION JAMESTOWN ND — GEOLOGIST KEITH DODRILL

DATE 8-29-96 — DRILLING CONTRACTOR MAXIM — DRILLER RON BROWN

CHK BY _____ — DRILLING METHOD 8¼-IN ID HSA — RIG TYPE CME-75

DATE _____ — DRILLING FLUID N/A

DRILLING START DATE 8-29-96 — DRILLING COMPLETION DATE 8-29-96

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1280.10
SURFACE PAD ELEV. _____
HOLE DEPTH 14 FT
WELL DEPTH 14 FT
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
10-IN	0 TO 14 FT

PROTECTIVE CASING N/A
TYPE _____
MATERIAL _____
DIAMETER _____
DEPTH INTERVAL _____
SURFACE PAD DIMENSIONS _____

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL TYPE 304 STAINLESS STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL +2.5 TO 9 FT

SCREEN
MATERIAL TYPE 304 STAINLESS-STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 9 TO 13.5 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL TYPE 304 STAINLESS STEEL
TYPE FLUSH THREAD
DEPTH INTERVAL 13.5 TO 14 FT

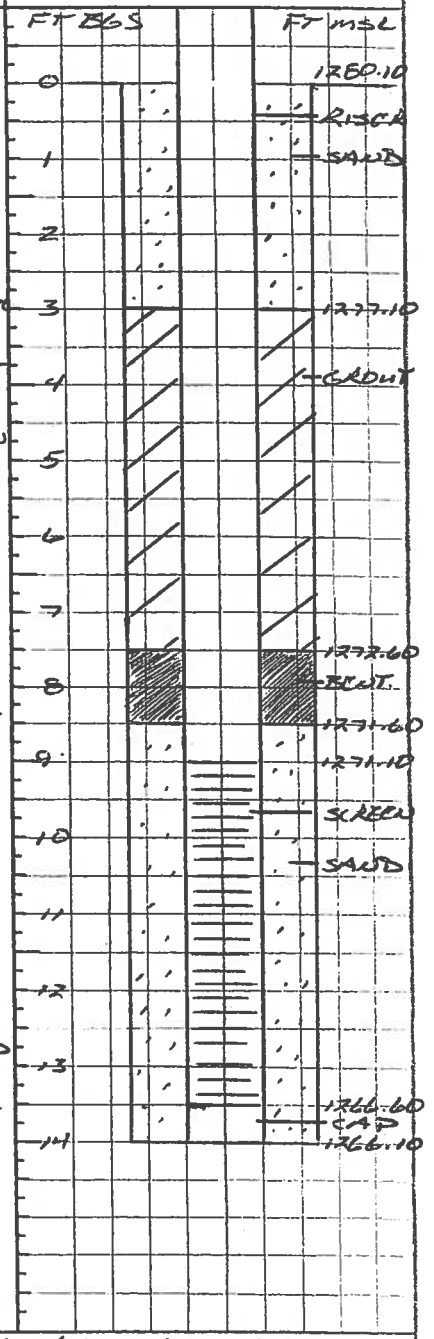
ANNULAR GROUT VIA AUGERS IN
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE-CEMENT
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 3 TO 7.5 FT

ANNULAR SEAL VIA AUGERS IN
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE CHIPS
QUANTITY _____
DEPTH INTERVAL 7.5 TO 8.5 FT

FILTER PACK VIA AUGERS IN
INSTALL. METHOD BOREHOLE
MATERIAL MORIE #0 SAND
QUANTITY _____
DEPTH INTERVAL 8.5 TO 14 FT

DEVELOPMENT
METHOD BAIL AND SURGE
TIME 6 HOURS
PRODUCTION < 5 GPM

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: WELL TO BE COMPLETED WITH Ø1-IN PITLESS ADAPTOR, Ø1-IN HDPE DISCHARGE LINE & PROTECTIVE CASING AT LATER DATE.

FILE: \WELL-LOG

RADIAN INTERNATIONAL LLC

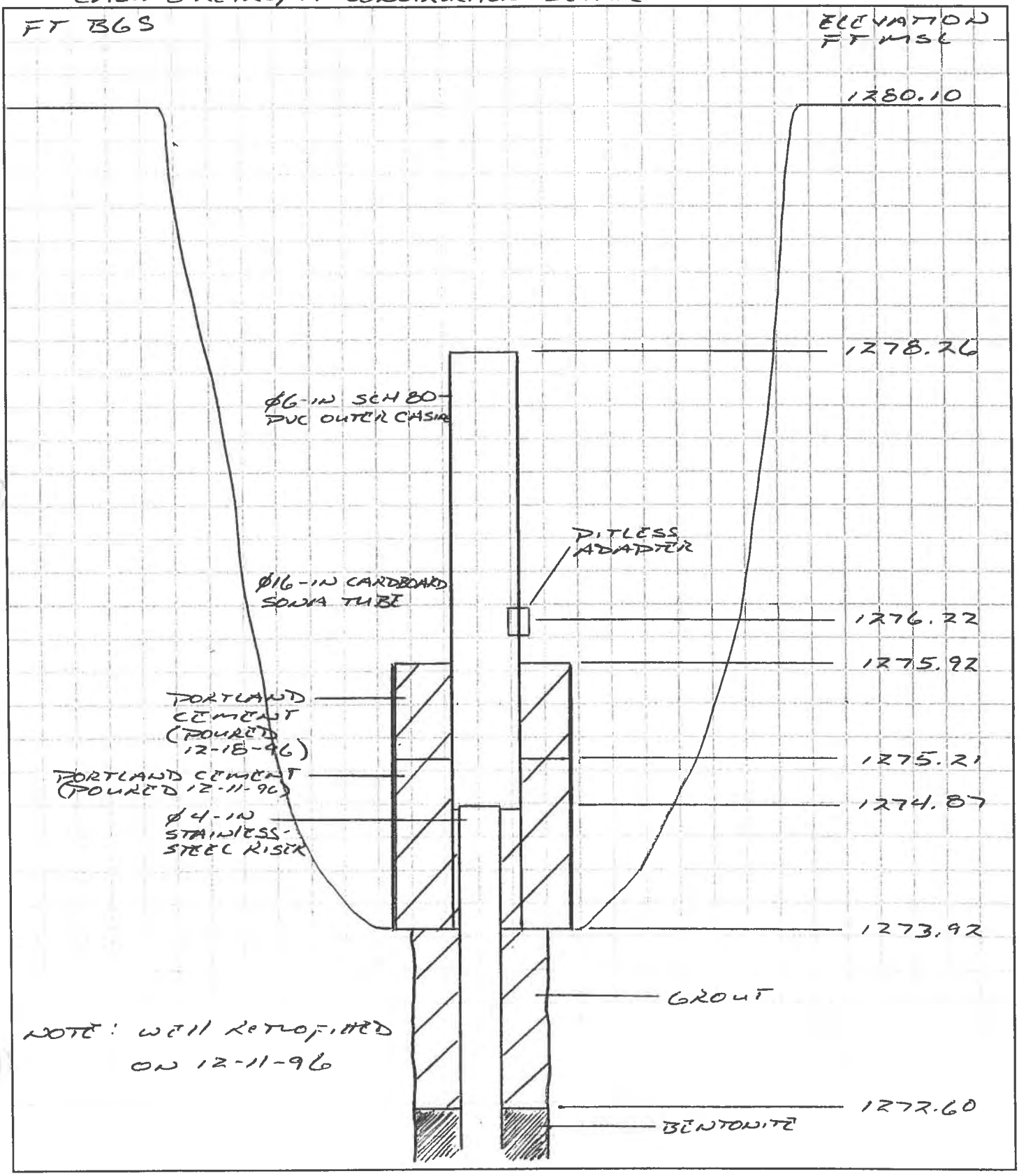
CALCULATION SHEET

REVISED 12-18-96

SIGNATURE _____ DATE 12-17-96 CHECKED _____ DATE _____ CALC. NO. _____

PROJECT ESSEX/HOPE JOB NO. _____

SUBJECT AST/MST AREA RW-3S OUTER CASING RETROFIT CONSTRUCTION DETAIL SHEET _____ OF _____ SHEETS



NOTE: WELL RETROFITTED ON 12-11-96

HJP-3 38776 fh5

RADIAN INTERNATIONAL LLC

WELL NO. RW-4S | PAGE 1 OF 1

PROJECT NAME ESSEX/HOPE | PROJECT NO. 007138

LOCATION JAMESTOWN NY | GEOLOGIST KEITH DODRILL

BY KD | DRILLING CONTRACTOR MAXIM | DRILLER RON BROWN

DATE | DRILLING METHOD 8¼-IN ID HSA | RIG TYPE CME-75

CHK BY | DRILLING START DATE 8-29-96 | DRILLING COMPLETION DATE 8-29-96

DATE | SURFACE ELEVATION 1278.92 FT MSL | STICK-UP ELEVATION

DEPTH FEET	SOIL SAMPLE NO.	SOIL SAMPLE REC. (IN.)	SOIL SAMPLE BL/6"	ROCK SAMPLE RUN (FT)	ROCK SAMPLE REC. (%)	ROCK SAMPLE RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
1	SS-1	6	9, 7, 7, 10		PID = 1 PPM		LOOSE DK GRAYISH BROWN (2.5Y 4/2) FINE TO COARSE SAND SOME SILT, TRACE GRAVEL (¼-½-IN); DAMP	SM				SEE WELL COMPLETION LOG	
3	SS-N	0	15, 12, 10, 10				GRAVEL FRAGMENT IN NOSE OF SPOON						
5	SS-M	6	2, 5, 9, 10		PID = 100 PPM		LOOSE DK GREENISH GRAY (GLEY 10Y 4/1) FINE TO COARSE SAND SOME SILT, TRACE GRAVEL (1-IN); WET ODOR	SM					4.5 FT AUGERS STRUCK STEEL OBJECT MOVED BOR. NG 5 FT SOUTH
7	SS-L	8	1/12, 1, 1		PID = 170 PPM		V. LOOSE DK GREENISH GRAY (GLEY 10Y 3/1) FINE TO COARSE SAND AND SILT; SATURATED ODOR	SM/ML	6.0				NEW BOREHOLE
9	SS-S	0	1/12, 1, 1										
11	SS-U	9	2, 2, 2, 2		PID = 179 PPM		V. LOOSE DK. GREENISH GRAY (GLEY 10Y 4/1) FINE TO COARSE SAND AND CLAYEY SILT, LITTLE GRAVEL (½-IN); SATURATED ODOR 11.5 FT (GLEY 10Y 4/1) CLAY, LITTLE F-C SAND; MOIST	SM					
13	SS-T	17	5, 7, 12, 12		PID = 30 PPM		STIFF DK GREENISH GRAY (GLEY 10Y 5/1) CLAYEY SILT; DAMP	ML					
14							TD = 14 FT						

1264.92

ADDITIONAL REMARKS

RADIAN INTERNATIONAL LLC

WELL COMPLETION LOG

WELL NO. RW-4S
HOLE NO. RW-4S

PROJECT NAME ESSEX/MOTE PROJECT NO. 007138

BY KD LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

DATE 8-29-96 DRILLING CONTRACTOR MAXIM DRILLER ROB BROWN

CHK BY _____ DRILLING METHOD 8¼-IN ID HSA RIG TYPE CME-75

DATE _____ DRILLING FLUID N/A

DRILLING START DATE 8-29-96 DRILLING COMPLETION DATE 8-29-96

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1278.92
SURFACE PAD ELEV. _____
HOLE DEPTH 14 FT
WELL DEPTH 12 FT
WELL RISER (TOP) _____
PROTECTIVE CASING (TOP) _____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
10-IN	0 TO 12.5 FT
2-IN	12.5 TO 14 FT

PROTECTIVE CASING N/A
TYPE _____
MATERIAL _____
DIAMETER _____
DEPTH INTERVAL _____
SURFACE PAD DIMENSIONS _____

OUTER CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

WELL RISER
MATERIAL TYPE 304 STAINLESS STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL +2.5 TO 7 FT

SCREEN
MATERIAL TYPE 304 STAINLESS STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 7 TO 11.5 FT

BLANK CASING N/A
MATERIAL _____
DIAMETER _____
JOINT TYPE _____
DEPTH INTERVAL _____

BOTTOM CAP
MATERIAL TYPE 304 STAINLESS STEEL
TYPE FLUSH THREAD
DEPTH INTERVAL 11.5 TO 12 FT

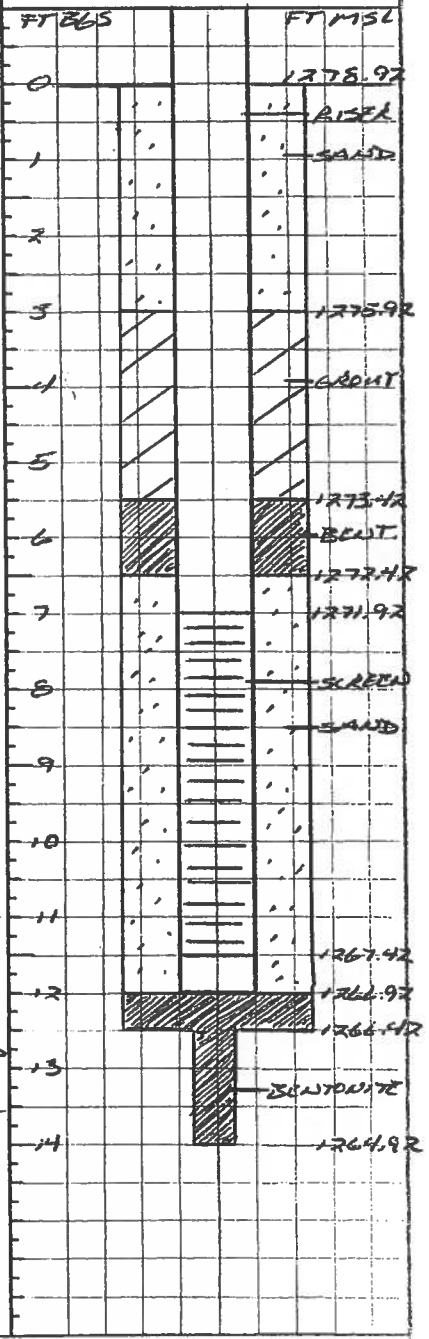
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS _____
QUANTITIES _____
DEPTH INTERVAL 3 TO 5.5 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE CHIPS
QUANTITY _____
DEPTH INTERVAL 5.5 TO 6.5 FT
12 TO 14 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL MORIE #0 SAND
QUANTITY _____
DEPTH INTERVAL 6.5 TO 12 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME 4 HOURS
PRODUCTION < 5 GPM

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: WELL TO BE COMPLETED WITH PITLESS ADAPTOR, Ø 1-IN HDPE DISCHARGE LINE, & PROTECTIVE CASING AT LATER DATE.

FILE: \WELL-LOG

RADIAN INTERNATIONAL LLC

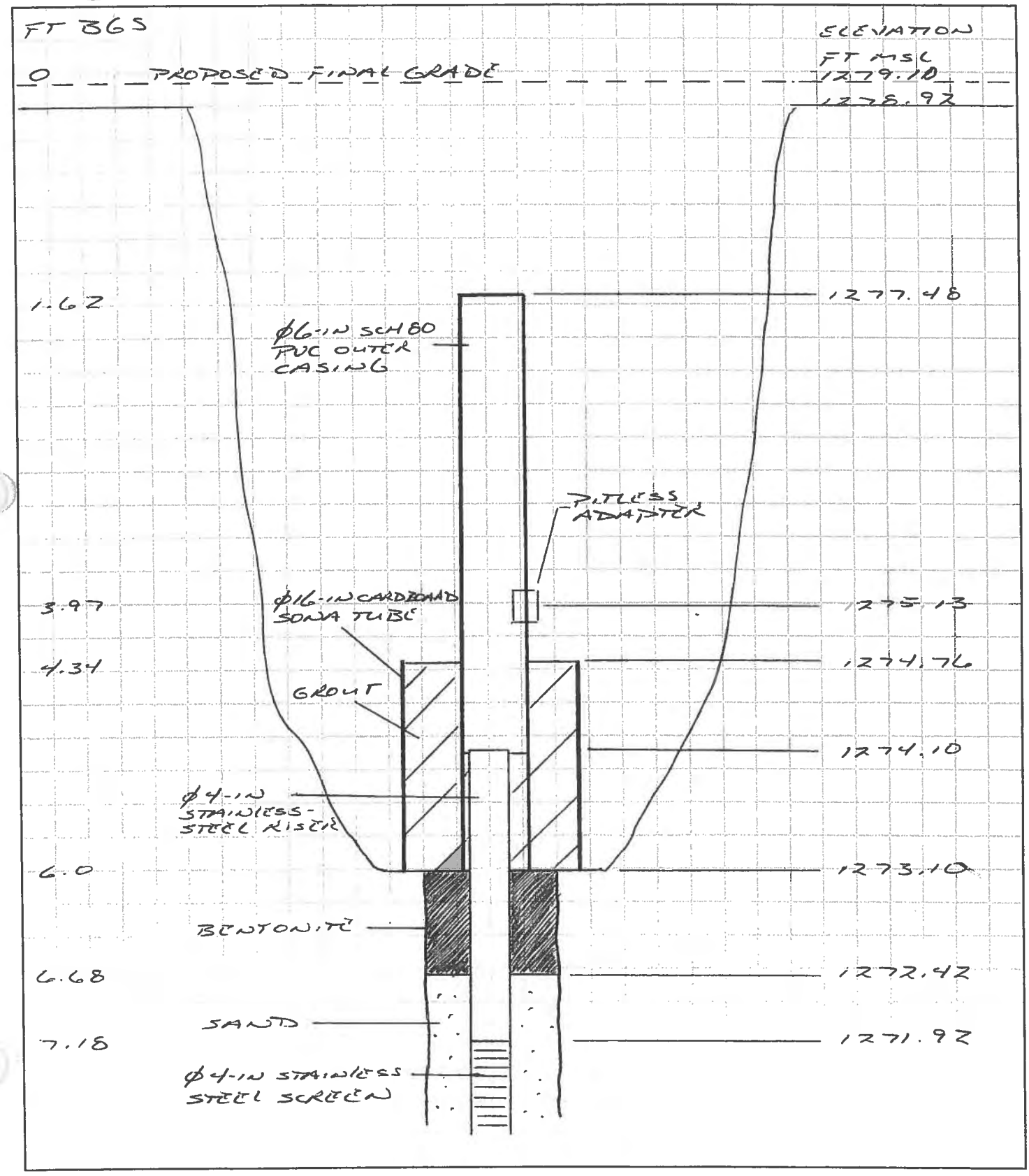
CALCULATION SHEET

CALC. NO. _____

SIGNATURE _____ DATE 12-9-96 CHECKED _____ DATE _____

PROJECT ESSEX/HOPE JOB NO. 007138

SUBJECT RW-4S OUTER CASING RETROFIT CONSTRUCTION DETAIL SHEET 1 OF 1 SHEETS



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RW 4S (NEAR T1)

RADIAN INTERNATIONAL LLC

WELL COMPLETION LOG

PAGE 1 OF 1

WELL NO. RW-4S
HOLE NO. RW-4S

PROJECT NAME ESSEX/HOPE — PROJECT NO. 007138
BY KD — LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL
DATE 8-29-96 — DRILLING CONTRACTOR MAXIM — DRILLER RON BROWN
CHK BY ____ — DRILLING METHOD 8¼-IN ID HSA — RIG TYPE CME-75
DATE ____ — DRILLING FLUID N/A
DRILLING START DATE 8-29-96 — DRILLING COMPLETION DATE 8-29-96

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1278.92
SURFACE PAD ELEV. ____
HOLE DEPTH 14 FT
WELL DEPTH 12 FT
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
10-IN	0 TO 12.5 FT
8-IN	12.5 TO 14 FT

PROTECTIVE CASING N/A
TYPE ____
MATERIAL ____
DIAMETER ____
DEPTH INTERVAL ____
SURFACE PAD DIMENSIONS ____

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL TYPE 304 STAINLESS STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL +2.5 TO 7 FT

SCREEN
MATERIAL TYPE 304 STAINLESS STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 7 TO 11.5 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL TYPE 304 STAINLESS STEEL
TYPE FLUSH THREAD
DEPTH INTERVAL 11.5 TO 12 FT

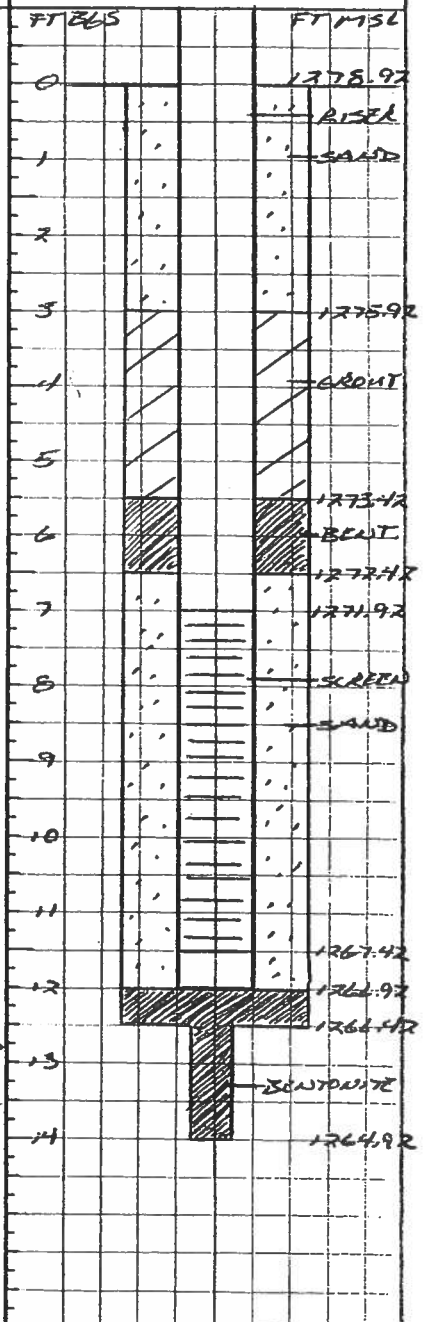
ANNULAR GROUT
INSTALL. METHOD BOREHOLE
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL 3 TO 5.5 FT

ANNULAR SEAL
INSTALL. METHOD BOREHOLE
MATERIAL BENTONITE CHIPS
QUANTITY ____
DEPTH INTERVAL 5.5 TO 6.5 FT, 12 TO 14 FT

FILTER PACK
INSTALL. METHOD BOREHOLE
MATERIAL MORIE #0 SAND
QUANTITY ____
DEPTH INTERVAL 6.5 TO 12 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME 4 HOURS
PRODUCTION < 5 GPM

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: WELL TO BE COMPLETED WITH PITLESS ADAPTOR, Ø 1-IN HDPE DISCHARGE LINE, & PROTECTIVE CASING AT LATER DATE.

FILE: \WELL-LOG

RADIAN INTERNATIONAL LLC

CALCULATION SHEET

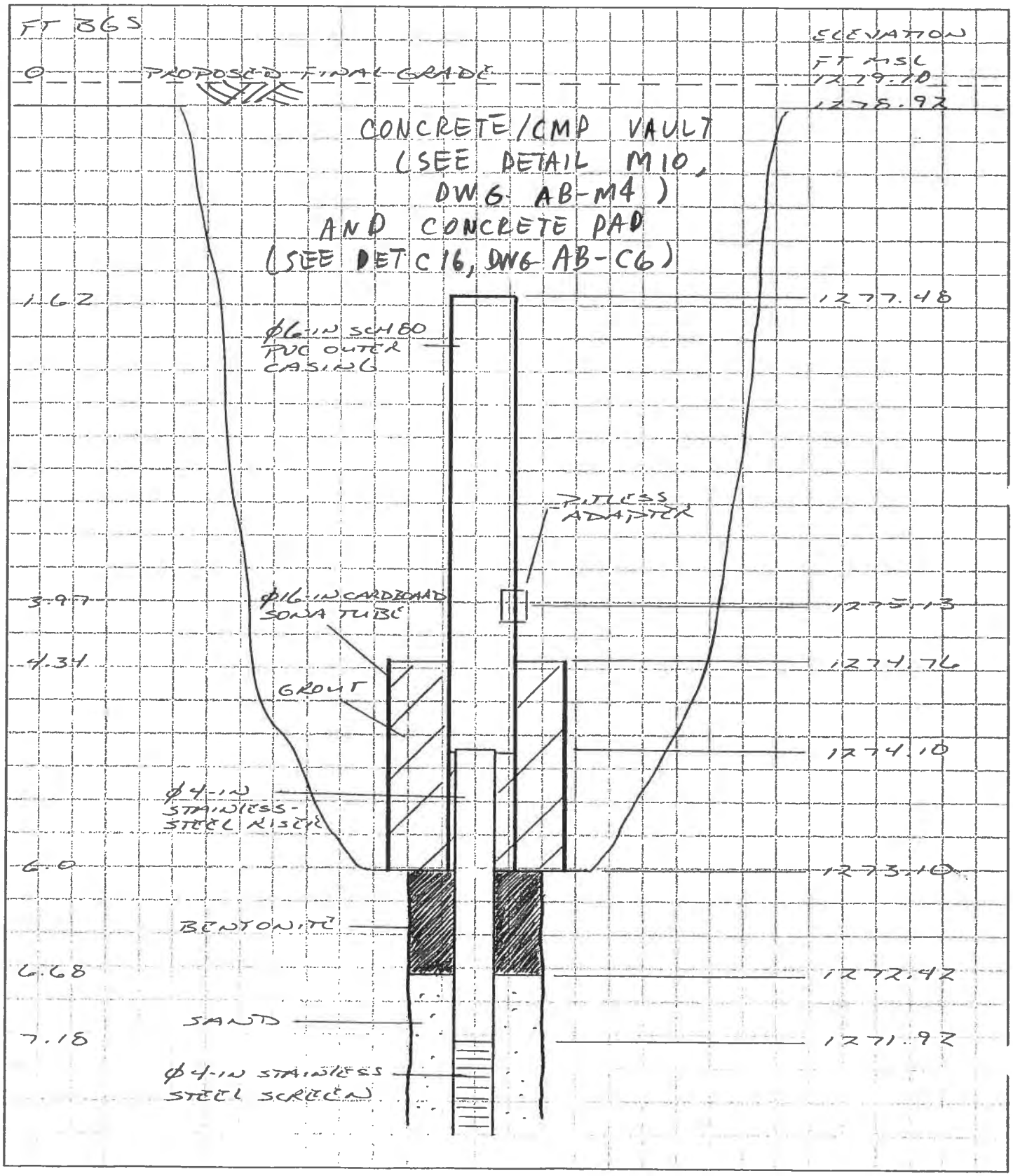
RW-45/55

CALC. NO. _____

SIGNATURE _____ DATE 12-9-96 CHECKED _____ DATE _____

PROJECT ESSEX/HOPE JOB NO. 007138

SUBJECT RW-45 OUTER CASING RETROFIT CONSTRUCTION DETAIL SHEET 1 OF 1 SHEETS



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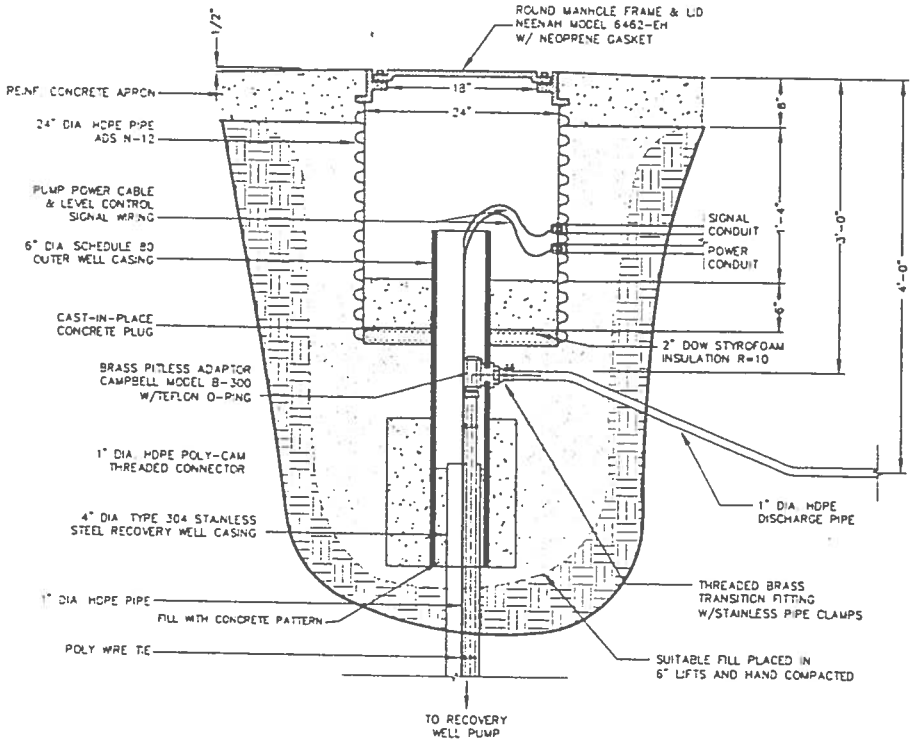
PLAN OF HEAT TRACE
AT PIPE ANCHOR



M10/M-1 RECOVERY WELL VAULT

NOT TO SCALE

Neenah Foundary Company
Box 729
Neenah, WI 54957
(414) 725-7000

2. Vault Riser Section consists of 2
by:

Advanced Drainage Systems, Inc
3300 Riverside Drive
Columbus, Ohio 43221
(614) 457-3051

3. Pitless Adaptor Model B-300 wit

Campbell Manufacturing, Inc.
Spring and Railrad Street
Bechtelsville, PA 19505
(800) 523-0224

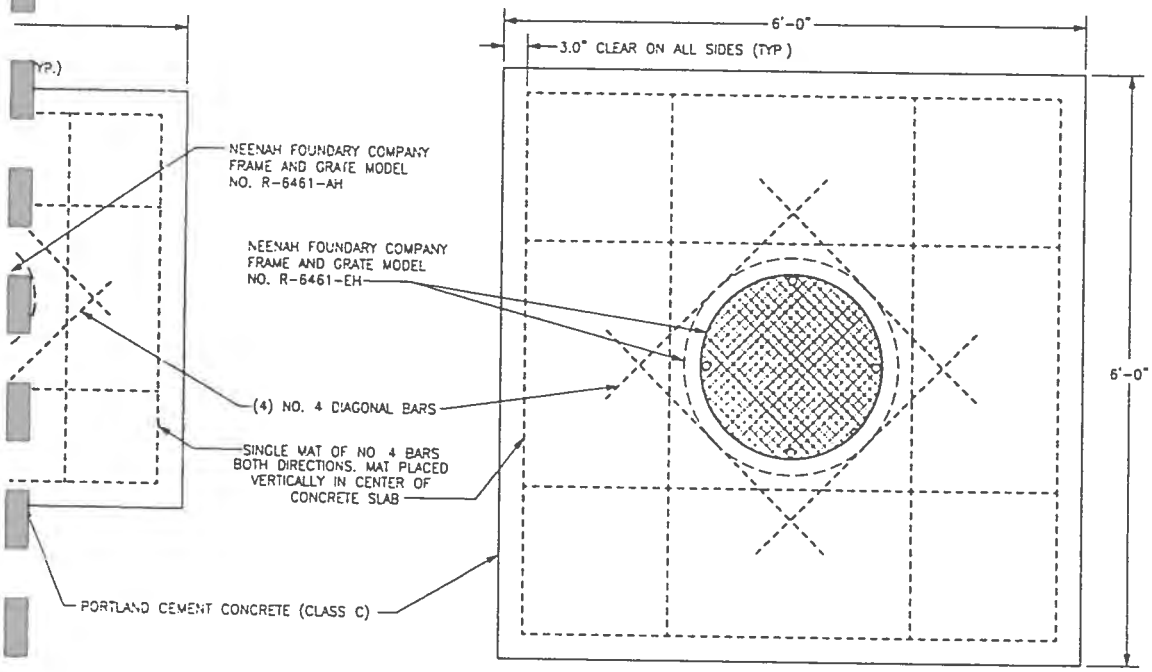
ISSUED
MAR 16 1998

RECORD COPY

TYP. @ RW-4 AND RW-5

PILE ACCESS ROAD

" = 5'



PROTECTION
CRETE SLAB

= 1'

LARGE – WELL PROTECTION
C16 REINFORCED CONCRETE SLAB
AB-C4

SCALE : 1" = 1'

ISSUED
MAR 16 1998

RECORD COPY

0	02/19/98	ISS
REV	DATE	ISSUE/
DESIGNED BY		DATE
DRAWN BY	KG	DATE
CHECKED BY	KD	DATE
APPROVED BY	JES	DATE

CONFIDENTIAL – ALL R

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PITTSBUF

CLIENT ESSEX SPECIAL
ESSEX\
JAMEST

REMEDIAL CONSTRUC
RECOR

TYP. PAD @ RW-4, RW-5

RADIAN INTERNATIONAL LLC

WELL NO. RW55 PAGE 1 OF 1

PROJECT NAME ESSEX/HOPE PROJECT NO. 7138.600

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR MAXIM DRILLER RON BROWN

DATE 8/27/97 DRILLING METHOD 8¼-INID HSA RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 8/27/97 DRILLING COMPLETION DATE 8-27-96

DATE _____ SURFACE ELEVATION 1277.61 FT MSL STICK-UP ELEVATION _____

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
1	SS-1	21	3 4 4 4	PID=0			SOFT OLIVE BROWN (2.5Y 5/4) SILTY CLAY; DAMP	CL				SEE WELL COMPLETION LOG	
2							LOOSE LT. OLIVE BROWN (2.5Y 5/1) FINE TO COARSE SAND AND SILT; TRACE GRAVEL; DAMP	SM					
3	SS-2	12	4 15 16 16	PID=0			VERY STIFF LT. OLIVE BROWN (2.5Y 5/3) SILTY CLAY; DAMP	CL					
4													
5	SS-3	12	10 21 15 16	PID=0			MED DENSE OLIVE BROWN (2.5Y 4/3) FINE TO COARSE SAND AND GRAVEL (1-IN) SOME SILT; DAMP	SM/GM					
6													
7	SS-4	18	10 14 14 16	PID=70			MED. DENSE DK GREENISH GRAY (GLEY 10Y 4/1) FINE TO COARSE SAND AND GRAVEL (½ TO 1-IN) SOME SILT; SATURATED AT 7.0 FT	SM/GM	▽ 7.0				
8													
9	SS-5	18	16 16 14 9	PID=30			AS ABOVE; ODOR						
10													
11	SS-6	13	6 7 8 11	PID=25			MED STIFF LT OLIVE BROWN (2.5Y 5/4) SILTY CLAY; DAMP	CL					
12							STIFF GREENISH GRAY (GLEY 10Y 5/1) SILTY CLAY; DAMP	CL					
							TD = 12 FT						

ADDITIONAL REMARKS

RADIAN INTERNATIONAL LLC

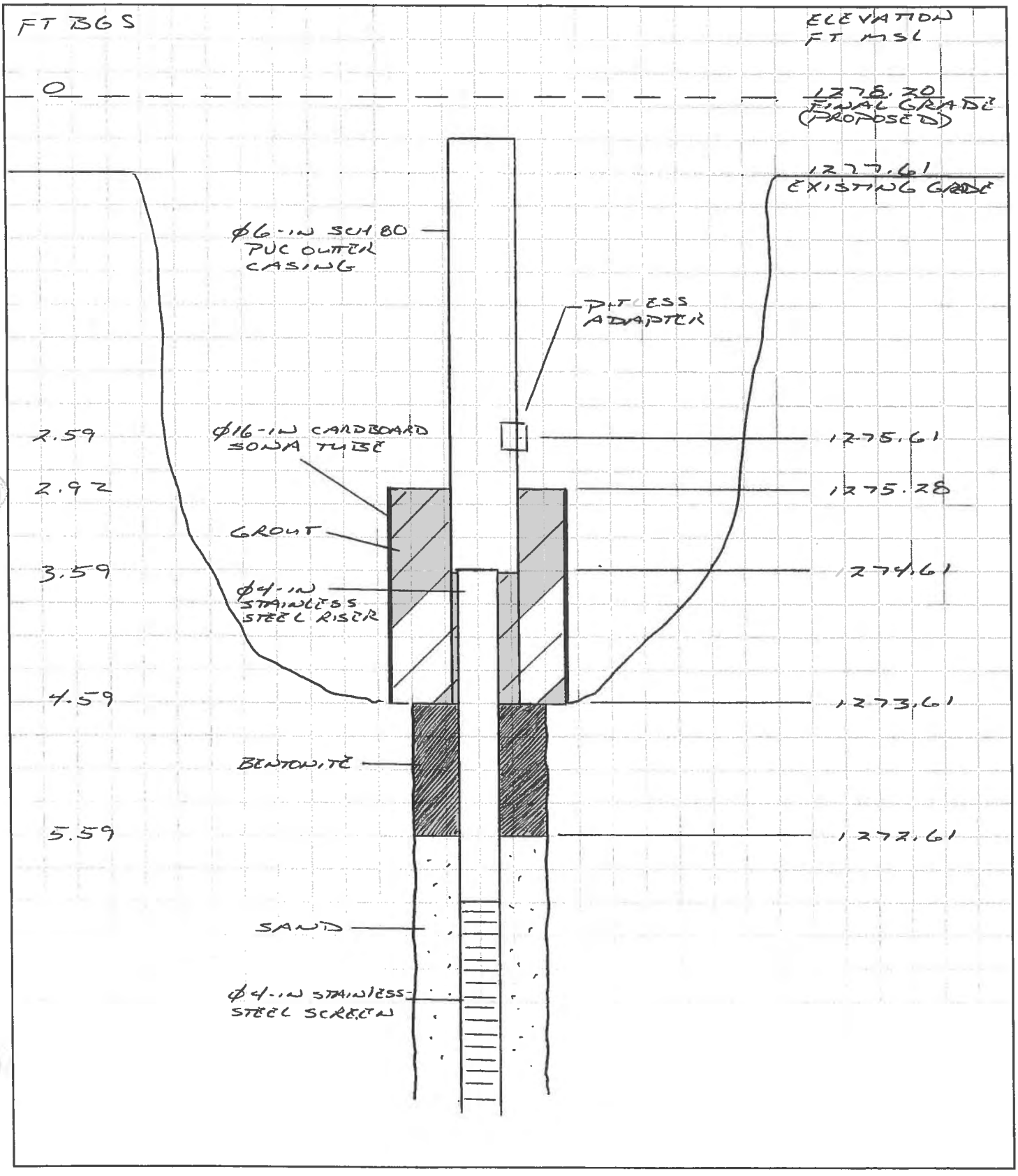
CALCULATION SHEET

CALC. NO. _____

SIGNATURE [signature] DATE 12-6-96 CHECKED _____ DATE _____

PROJECT ESSEX/HOPE JOB NO. 007138

SUBJECT RW-5S OUTER CASING RETROFIT CONSTRUCTION DETAIL SHEET 1 OF 1 SHEETS



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RADIAN INTERNATIONAL LLC

WELL COMPLETION LOG

WELL NO. RW-5S
HOLE NO. RW-5S

PROJECT NAME ESSEX/HOPE — PROJECT NO. 007138

BY KD — LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL
DATE 8-27-96 — DRILLING CONTRACTOR MAXIM — DRILLER RON BROWN
CHK BY ____ — DRILLING METHOD 8¼-IN ID HSA — RIG TYPE CME-75
DATE ____ — DRILLING FLUID N/A
DRILLING START DATE 8-27-96 — DRILLING COMPLETION DATE 8-27-96

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1277.61
SURFACE PAD ELEV. ____
HOLE DEPTH 10.5 FT
WELL DEPTH 10.5 FT
WELL RISER (TOP) ____
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
10-IN	0 TO 10.5 FT
____	____

PROTECTIVE CASING N/A
TYPE ____
MATERIAL ____
DIAMETER ____
DEPTH INTERVAL ____
SURFACE PAD DIMENSIONS ____

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL TYPE 304 STAINLESS-STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL +2.5 TO 5.5 FT

SCREEN
MATERIAL TYPE 304 STAINLESS STEEL
DIAMETER 4-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 5.5 TO 10 FT

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL TYPE 304 STAINLESS STEEL
TYPE FLUSH THREAD
DEPTH INTERVAL 10 TO 10.5 FT

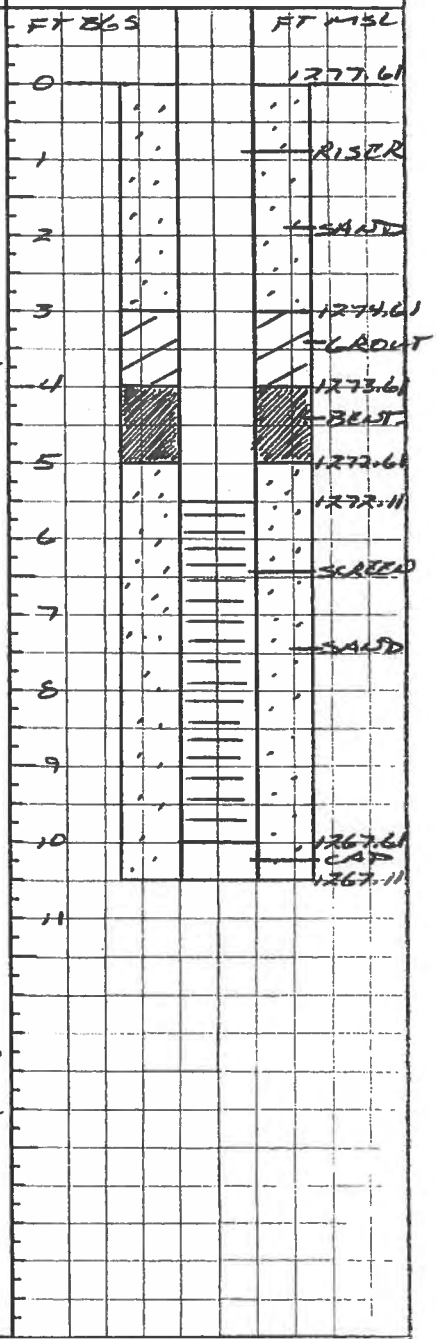
ANNULAR GROUT
INSTALL. METHOD VIA AUGER
MATERIAL CEMENT-BENTONITE
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL 3 TO 4 FT

ANNULAR SEAL
INSTALL. METHOD VIA AUGER
MATERIAL BENTONITE CHIPS
QUANTITY ____
DEPTH INTERVAL 4 TO 5 FT

FILTER PACK
INSTALL. METHOD VIA AUGER
MATERIAL MORIE #0 SAND
QUANTITY ____
DEPTH INTERVAL 5 TO 10.5 FT

DEVELOPMENT
METHOD SURGE & BAIL
TIME 4 HRS
PRODUCTION < 5 GPM

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: WELL TO BE COMPLETED WITH FLUSH ADAPTOR Ø 1-IN DISCHARGE LINE, & PROTECTIVE CASING AT LATER DATE.

FILE \WELL-LOG

RADIAN INTERNATIONAL

WELL NO. VP-5D PAGE 1 OF 3

PROJECT NAME ESSEX/HOPE - SMAART PROJECT NO. 804041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODGE, II

BY KD 10-2-00 DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORENTE

DATE 10-3-00 DRILLING METHOD 6¼ HSA/4-IN DRIVEN CASING RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-2-00 DRILLING COMPLETION DATE 10-3-00

DATE _____ SURFACE ELEVATION 1278.46 STICK-UP ELEVATION 1278.20

DEPTH FEET	SOIL SAMPLE NO.	SOIL SAMPLE REC. (IN.)	SOIL SAMPLE BL./6"	ROCK SAMPLE RUN (FT)	ROCK SAMPLE REC. (%)	ROCK SAMPLE RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
1	NOT SAMPLED												10-2-
2													Ø6¼-IN ID HSA
3	NOT SAMPLED												Ø10-IN BOREHOLE
4							MED DENSE SAND AND GRAVEL, LITTLE SILT (MW-11 LOG)						Ø5-IN STEEL CASING
5	NOT SAMPLED												CEMENT/ BENTONITE GROUT
6													
7	NOT SAMPLED												Ø2-IN PVC RISER
8							8.0				8		
9	SS-1		3 5 7 8	PID =	2 PPM		MED DENSE, BROWN MEDIUM TO COARSE SAND AND GRAVEL (¼ TO ½"), SOME SILT - WET	SM/GM					BENTONITE
10													
11	SS-2		8 8 5 8	PID =	2 PPM		10.7 STIFF TAN SILT - WET	ML			11.5		
12							12.2						12.5' 10-3
13	SS-3		3 5 7 9	PID =	6 PPM		SOFT GRAY SILTY CLAY - MOIST 12.45 MED DENSE, GRAY SILTY FINE SAND - SATURATED	CL			12.5		Ø4-IN FLUID ROTARY (NO ADDITIVES) DRIVEN CASING
14													
15	SS-4		5 7 8 8	PID =	4 PPM		AS ABOVE	SM					Ø4-IN BOREHOLE
16													Ø2-IN PVC 0.01-IN SCREEN
17	SS-5		5 7 9	PID =	13 PPM		AS ABOVE						SAND COOKICI
18			11										

ADDITIONAL REMARKS

NOTE: TEST BORING FROM 0 TO 20 FT ABANDONED WITH GROUT. DRILL OFFSET BORING TO 12.5-FT BGS AND SET Ø5-IN DERM STEEL CASING.

FILE: \FORMATS\FORM1.DWG

RADIAN INTERNATIONAL

WELL NO. VP-5D **PAGE** 2 **OF** 3

PROJECT NAME ESSEX/HOPE - SMART PROJECT NO. 804041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORENTZ

DATE 10-2-00 DRILLING METHOD 6¼-HSA/4-IN DRIVEN CASING RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-2-00 DRILLING COMPLETION DATE 10-3-00

DATE _____ SURFACE ELEVATION 1278.46 STICK-UP ELEVATION 1278.20

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
18													10-3-00 ↓
19	SS-6		5 7 8 11	PID= 19 ppm			MED DENSE, GRAY SILTY FINE SAND LITTLE CLAY - SATURATED	SM/SC					← 4-IN BOREHOLE
20							20.0						
21	SS-7	18	11 11 10 9	PID= 6.7 ppm			MED DENSE, GRAY SILTY FINE SAND - SATURATED	SM					← 2-IN PVC 0.01-IN SCREEN
23	SS-8		13 13 21 27	PID= 3.4 ppm 3" SPOON			AS ABOVE						← SAND 00 RICCI
24							24.0						
25	SS-9		8 16 20 23	PID= 3.2 ppm 3" SPOON			MED DENSE, GRAY SILTY FINE SAND. LITTLE CLAY - SATURATED	SM/SC					
26							26.5 MED DENSE, GRAY SILTY FINE SAND SATURATED						
27	SS-10		5 8 10 11	PID= 4.4 ppm 2" SPOON			AS ABOVE						
28								SM					
29	SS-11		9 10 18 18	PID= 2.1 ppm 3" SPOON			AS ABOVE						
30	SS-12		15 17 20 17	PID= 1.7 ppm 3" SPOON			AS ABOVE						
32							32.2				31.8		← FLUSH THREAD BLANK SECTION
33	SS-13		9 7 7 6	PID= 2.8 ppm 2" SPOON			MED. DENSE GRAY FINE SAND - SATURATED	SP			32.5		
34							34.5				31.3 34.5		BOTTOM CAP (SLIP)
35	SS-14		5 9 13 16	PID= 1.0 ppm 3" SPOON			V. STIFF GRAY SILT - DAMP	ML					
36													

ADDITIONAL REMARKS

FILE: \FORMATS\FORM1.DWG

RADIAN INTERNATIONAL

WELL NO. VP-5D

PROJECT NAME ESSEX/HOPE - SMAART PROJECT NO. 804041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORENTZ

DATE 10-3-00 DRILLING METHOD 6¼-HSA/4-½ DRIVEN CASING RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-2-00 DRILLING COMPLETION DATE 10-3-00

DATE _____ SURFACE ELEVATION 1278.46 STICK-UP ELEVATION 1278.20

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/ CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
35													
36													
37	SS-1	3 9 17 25		PID= 1.0 PPM			V. STIFF GRAY SILT - DAMP	ML				← Ø3" BOREHOLE ← SAND	
38							BORING TERMINATED AT 38-FT BGS						

ADDITIONAL REMARKS

FILE: \FORMATS\FORM1.DWG

RADIAN INTERNATIONAL

WELL NO. VP-6D

PROJECT NAME ESSEX/HOPE - SMMART
PROJECT NO. 6040-11.82
LOCATION JAMESTOWN NY
GEOLOGIST KEITH DODDRILL
BY KD
DRILLING CONTRACTOR NOTHNAGLE
DRILLER STEVE
DATE 10-2-00
DRILLING METHOD 6¼-IN HSA
RIG TYPE CME-75
CHK BY
DRILLING START DATE 10-2-00
DRILLING COMPLETION DATE 10-5-00
DATE
SURFACE ELEVATION 1276.94
STICK-UP ELEVATION 1276.71

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
0							GRAVEL FILL						
1	SS-1	12	14 11 8 7	PID = 1.9 PPM 2" SPOON			MED DENSE, BROWN FINE TO COARSE SAND AND GRAVEL (½-1"), LITTLE SILT - DAMP						← ϕ10-IN BOREHOLE (6¼-IN HSA)
2													
3	SS-2	16	9 11 13 16	PID = 2.4 PPM 2" SPOON			AS ABOVE						← ϕ5-IN STEEL CASING
4													← GROUT
5	SS-3	16	13 18 15 16	PID = 2.4 PPM 2" SPOON			AS ABOVE						
6													
7	SS-4	0	7 20 16 16	2" SPOON			NO RECOVERY, GRAVEL FRAG IN NOSE OF SPOON.	SM/CL					
8													
9	SS-5	12	9 11 11 9	PID = 3.0 PPM 2" SPOON			MED DENSE, BROWN FINE TO COARSE SAND AND GRAVEL (½-1") SOME SILT, MOIST						
10													
11	SS-6	6	5 13 13 10	PID = 2.1 PPM 2" SPOON			AS ABOVE, GRAVEL FRAG (>2 IN) IN SPOON						
12													
13	SS-7	8	3 3 4 4	PID = 3.8 PPM 2" SPOON			LOOSE, OLIVE BROWN F-C SAND & GRAVEL (¼-½") SOME SILT SATURATED						
14													
15	SS-8	6	6 8 3 5	PID = 3.8 PPM 2" SPOON			AS ABOVE						
16													
17	SS-9	6	3 2 2 5	PID = 4.0 PPM 2" SPOON			AS ABOVE				16		
18													

ADDITIONAL REMARKS

FILE: \FORMATS\FOR

RADIAN INTERNATIONAL

WELL NO. VP-6D PAGE 2 OF 3

PROJECT NAME ESSEX/HOPE - SMAART PROJECT NO. 604041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORENTE

DATE 10-2-00 / 10-4-00 DRILLING METHOD 6¼ HSA / 4-IN DRIVEN CASING RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-2-00 DRILLING COMPLETION DATE 10-5-00

DATE _____ SURFACE ELEVATION 1276.94 STICK-UP ELEVATION 1276.71

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
18							18.0						10-2-00 ↓
19	SS-10	9	2 3 4 3	PID = 3.8 PPM			MED STIFF TAN SILTY CLAY, WET 18.3 LOOSE OLIVE BROWN FINE-COARSE SAND AND GRAVEL (¼-1½") LITTLE SILT - SATURATED	CL			18.5		Ø5-IN STEEL CASING SET & GROUTED TO 18.5 FT
20				2" SPOON									
21	SS-11	14	5 5 5 6	PID = 3.8 PPM			AS ABOVE, GRAVEL (½ TO 2")	SM / GM					Ø4-IN BOREHOLE (Ø4-IN FLUID ROTARY / DRIVEN CASING) 10-4-00 ADVANCE THROUGH Ø3-IN GROUT PLUG (18.5 TO 24')
22				3" SPOON									
23	SS-12	6	5 6 7 12	PID = 3.8 PPM			AS ABOVE, BROWN SOME SILT, SATURATED						
24				2" SPOON			24.0						
25	SS-13	22	9 6 6 12	PID = 0 PPM			STIFF TAN CLAY, LITTLE SILT - WET 24.6 STIFF GRAY CLAY LITTLE SILT - WET	CL					10-4-00 ↓ SAMPLE
26				3" SPOON									BENTONITE SLURRY SEAL
27	SS-14	24	9 11 11 7	PID = 0 PPM			AS ABOVE, TRACE GRAVEL (1") AT 27 TO 28-FT	CL					
28				3" SPOON			28.3						
29	SS-15	12	3 16 9 12	PID = 1 PPM			MED DENSE GRAVEL (½-2"), SOME TAN CLAY - SATURATED 29.0	GC			28.5		Ø2-IN PVC RISER
30				3" SPOON			MED STIFF TAN CLAY - WET 29.5	CL / SM			29.5		Ø2-IN PVC 0.01-IN SCREEN
31	SS-16	24	5 9 10 16	PID = 0 PPM			MED DENSE GRAY SILTY FINE SAND - SAT 30.0 STIFF GRAY SILTY CLAY SOME FINE SAND - WET 30.6	CL					SAND PACK
32				3" SPOON			MED DENSE SILTY FINE SAND, GRAY - SATURATED	SM					
33	SS-17	24	5 7 9 9	PID = 0.5 PPM									
34				2" SPOON			34.0						
35	SS-18	24	9 7 5 5	PID = 0.6 PPM			MED STIFF GRAY SILTY CLAY, LITTLE FINE SAND - SATURATED 35.0	CL					
36				3" SPOON			MED. DENSE GRAY SILTY FINE SAND - SATURATED	SM					

ADDITIONAL REMARKS NOTE: SET Ø5-IN CASING AT 18.5-FT ON 10-2-00 BASED ON ENCOUNTERING THE UPPER CONFINING LAYER BETWEEN ~16 TO 20 FT AT PZ-7D, -10D, AND PZ-11D. CLAY ENCOUNTERED ON 10-4-00 BETWEEN 24 TO 29.5 FT

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RADIAN INTERNATIONAL

WELL NO. VP-6D

PROJECT NAME ESSEX/HOPE - SUMMARY PROJECT NO. 804041.62

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE CORCORAN

DATE 10-4-00 DRILLING METHOD GRAVITY/4-IN DRIVEN CASING RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-2-00 DRILLING COMPLETION DATE 10-5-00

DATE _____ SURFACE ELEVATION 1276.94 STICK-UP ELEVATION 1276.71

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL/6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
36							36.0					← ϕ4-IN BOREHOLE	
	SS-19	24	5	PID=			MED DENSE GRAY SILTY FINE SAND, SATURATED	SM				← ϕ2-IN 0.01-IN SCREEN	
37			11	0.4 ppm									
			9										
38			9	3" SPOON									
							38.3						
	SS-20	24	3	PID=			STIFF GRAY CLAY, TRACE SILT - DAMP	CL			39.5	← BOTTOM CAP	
39			6	0.3 ppm							39		
			5										
			7	3" SPOON									
40							BORING TERMINATED AT 40-FT				40		

ADDITIONAL REMARKS

RADIAN INTERNATIONAL

WELL NO. VP-6D **PAGE** 1 **OF** 3

PROJECT NAME ESSEX/HOPE - SMMART PROJECT NO. 804041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE

DATE 10-2-00 DRILLING METHOD 6¼-IN HSA RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-2-00 DRILLING COMPLETION DATE 10-5-00

DATE _____ SURFACE ELEVATION 1276.94 STICK-UP ELEVATION 1276.71

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
0							GRAVEL FILL						
1	SS-1	12	14 11 8 7	PID= 1.9 PPM			MED DENSE, BROWN FINE TO COARSE SAND AND GRAVEL (½-1"), LITTLE SILT - DAMP						ϕ10-IN BOREHOLE (6¼-IN HSA)
2				2" SPOON									ϕ5-IN STEEL CASING
3	SS-2	16	9 11 13 16	PID= 2.4 PPM			AS ABOVE						GROUT
4				2" SPOON									
5	SS-3	16	13 18 15 16	PID= 2.4 PPM			AS ABOVE						
6				2" SPOON									
7	SS-4	0	7 20 16				NO RECOVERY, GRAVEL FRAG IN NOSE OF SPOON.	SM / CL					
8			16	2" SPOON									
9	SS-5	12	9 11 11 9	PID= 3.0 PPM			MED DENSE, BROWN FINE TO COARSE SAND AND GRAVEL (½-1") SOME SILT, MOIST						
10				2" SPOON									
11	SS-6	6	5 13 13 10	PID= 2.1 PPM			AS ABOVE, GRAVEL FRAG (>2 IN) IN SPOON						
12				2" SPOON									
13	SS-7	8	3 3 4 4	PID= 3.8 PPM			LOOSE, OLIVE BROWN F-C SAND & GRAVEL (¼-½") SOME SILT SATURATED						
14				2" SPOON									
15	SS-8	6	6 8 3 5	PID= 3.8 PPM			AS ABOVE						
16				2" SPOON							16		
17	SS-9	6	3 2 2 5	PID= 4.0 PPM			AS ABOVE						
18				2" SPOON									

ADDITIONAL REMARKS

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RADIAN INTERNATIONAL

WELL NO. VP-6D — PAGE 2 OF 3

PROJECT NAME ESSEX/HOPE - SMEARTT — PROJECT NO. 604041.82

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

BY KD 10-2-00 — DRILLING CONTRACTOR NOTHNAGLE — DRILLER STEVE LORENTZ

DATE 10-4-00 — DRILLING METHOD 6¼ HSA / 4-IN DRIVEN CASING — RIG TYPE CME-75

CHK BY _____ — DRILLING START DATE 10-2-00 — DRILLING COMPLETION DATE 10-5-00

DATE _____ — SURFACE ELEVATION 1276.94 — STICK-UP ELEVATION 1276.71

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
18							18.0						
19	SS-10	9	2 3 4 3	PID = 3.6 PPM			MED STIFF TAN SILTY CLAY, WET 18.3	CL			18.5		10-2-00 ↓ Ø5-IN STEEL CASING SET & GROUTED TO 18.5 FT
20				2" SPOON			LOOSE OLIVE BROWN FINE-COARSE SAND AND GRAVEL (¼-½") LITTLE SILT - SATURATED						
21	SS-11	14	5 5 5 6	PID = 3.8 PPM			AS ABOVE, GRAVEL (½ TO 2")	SM/GM					Ø4-IN BOREHOLE (Ø4-IN FLUID ROTARY / DRIVEN CASING)
22				3" SPOON									10-4-00 ADVANCE THROUGH Ø3-IN GROUT PLUG (18.5 TO 24')
23	SS-12	6	5 6 7 12	PID = 3.8 PPM			AS ABOVE, BROWN SOME SILT, SATURATED						
24				2" SPOON			24.0						
25	SS-13	22	9 6 6 12	PID = 0 PPM			STIFF TAN CLAY, LITTLE SILT - WET 24.6	CL					10-4-00 ↓ SAMPLES
26				3" SPOON			STIFF GRAY CLAY LITTLE SILT - WET						BENTONITE SLURRY SEAL
27	SS-14	24	9 11 11 7	PID = 0 PPM			AS ABOVE, TRACE GRAVEL (1") AT 27 TO 28-FT	CL					
28				3" SPOON			28.3						
29	SS-15	12	3 16 9 12	PID = 1 PPM			MED DENSE GRAVEL (½-2"), SOME TAN CLAY - SATURATED 29.0	GC			28.5		Ø2-IN PVC RISER
30				3" SPOON			MED STIFF TAN CLAY - WET 29.5	CL/SM			29.5		Ø2-IN PVC 0.01-IN SCREEN
31	SS-16	24	5 9 10 16	PID = 0 PPM			MED DENSE GRAY SILTY FINE SAND - SAT. 30.0	CL					
32				3" SPOON			STIFF GRAY SILTY CLAY SOME FINE SAND - WET 30.6						SAND OO #1
33	SS-17	24	5 7 9 9	PID = 0.5 PPM			MED DENSE SILTY FINE SAND, GRAY - SATURATED	SM					
34				2" SPOON			34.0						
35	SS-18	24	9 7 5	PID = 0.6 PPM			MED STIFF GRAY SILTY CLAY, LITTLE FINE SAND - SATURATED 35.0	CL					
36				3" SPOON			MED. DENSE GRAY SILTY FINE SAND - SATURATED	SM					

ADDITIONAL REMARKS: NOTE: SET Ø5-IN CASING AT 18.5-FT ON 10-2-00 BASED ON ENCOUNTERING THE UPPER CONFINING LAYER BETWEEN ~16 TO 20 FT AT PZ-7D, -10D, AND PZ-11D. CLAY ENCOUNTERED ON 10-4-00 BETWEEN 24 TO 29.5 FT

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RADIAN INTERNATIONAL

WELL NO. VP-6D

PROJECT NAME ESSEX/NODE - SUMMARY

PROJECT NO. 804041.62

LOCATION JAMESTOWN NY

GEOLOGIST KEITH DODRILL

BY KD

DRILLING CONTRACTOR NOTHNAGLE

DRILLER STEVE LORENTZ

DATE 10-4-00

DRILLING METHOD 6¼ HSA / 4-IN DRIVEN CASING

RIG TYPE CME-75

CHK BY

DRILLING START DATE 10-2-00

DRILLING COMPLETION DATE 10-5-00

DATE

SURFACE ELEVATION 1276.94

STICK-UP ELEVATION 1276.71

DEPTH FEET	SOIL SAMPLE NO.	SOIL SAMPLE REC. (IN.)	SOIL SAMPLE BL/6"	ROCK SAMPLE RUN (FT)	ROCK SAMPLE REC. (%)	ROCK SAMPLE RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
36							36.0						
37	SS-19	24	5 11 9 9	PID=	0.4 ppm	3" SPOON	MED DENSE GRAY SILTY FINE SAND, SATURATED	SM					⌀4-IN BOREHOLE ⌀2-IN 0.01-IN SCREEN
38							38.3				39.5		
39	SS-20	24	3 6 5 7	PID=	0.3 ppm	3" SPOON	STIFF GRAY CLAY, TRACE SILT - DAMP	CL			39		BOTTOM CAP
40							BORING TERMINATED AT 40-FT				40		

ADDITIONAL REMARKS

WELL COMPLETION LOG

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

WELL NO. VP-6S
HOLE NO. ____

PROJECT NAME ESSEX/HOPE - SMMART PROJECT NO. 804041.82

BY K.D LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL
DATE 10-5-00 DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORENTZ
CHK BY ____ DRILLING METHOD 4¼-IN HSA RIG TYPE CME-75
DATE ____ DRILLING FLUID N/A
DRILLING START DATE 10-5-00 DRILLING COMPLETION DATE 10-5-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1276.94
SURFACE PAD ELEV. ____
HOLE DEPTH ____
WELL DEPTH ____
WELL RISER (TOP) 1276.62
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
8-IN	0 TO 24

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ____
DIAMETER ____
DEPTH INTERVAL ____
SURFACE PAD DIMENSIONS ____

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL ____

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 18.3 TO 23.8

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE SLIP
DEPTH INTERVAL 24.0-23.8

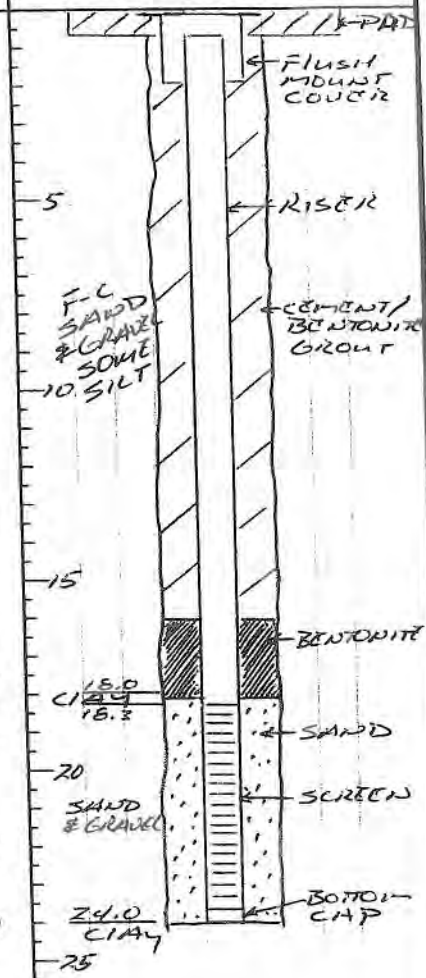
ANNULAR GROUT
INSTALL. METHOD HSA
MATERIAL CEMENT/BENT.
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL ____

ANNULAR SEAL
INSTALL. METHOD HSA
MATERIAL BENTONITE
QUANTITY ____
DEPTH INTERVAL 18.2 TO 16.0

FILTER PACK
INSTALL. METHOD HSA
MATERIAL RICCI NO. 00
QUANTITY ____
DEPTH INTERVAL 18.2 TO 24.0

DEVELOPMENT
METHOD ____
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: SEE VP-6D FOR GEOLOGIC LOG

FILE: \WELL-LOG

WELL COMPLETION LOG

RADIAN INTERNATIONAL GROUP — A DAMES & MOORE GROUP COMPANY

PAGE 1 OF 1

WELL NO. VP-6S
HOLE NO. ____

PROJECT NAME ESSEX/MODC - SMMART PROJECT NO. 804041.82

BY KD LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL
DATE 10-5-00 DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORENTZ
CHK BY ____ DRILLING METHOD 4¼-IN HSA RIG TYPE CME-75
DATE ____ DRILLING FLUID N/A
DRILLING START DATE 10-5-00 DRILLING COMPLETION DATE 10-5-00

INSTALLATIONS

ELEVATION / DEPTH DATA
GROUND SURFACE ELEV. 1276.94
SURFACE PAD ELEV. ____
HOLE DEPTH ____
WELL DEPTH ____
WELL RISER (TOP) 1276.62
PROTECTIVE CASING (TOP) ____

BOREHOLE DIMENSIONS

DIAMETER	DEPTH INTERVAL
8-IN	0 TO 24
____	____

PROTECTIVE CASING
TYPE FLUSH MOUNT
MATERIAL ____
DIAMETER ____
DEPTH INTERVAL ____
SURFACE PAD DIMENSIONS ____

OUTER CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

WELL RISER
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
DEPTH INTERVAL ____

SCREEN
MATERIAL SCH 40 PVC
DIAMETER 2-IN
JOINT TYPE FLUSH THREAD
OPENINGS 0.01-IN
DEPTH INTERVAL 18.3 TO 23.8

BLANK CASING N/A
MATERIAL ____
DIAMETER ____
JOINT TYPE ____
DEPTH INTERVAL ____

BOTTOM CAP
MATERIAL SCH 40 PVC
TYPE SLIP
DEPTH INTERVAL 24.0 - 23.8

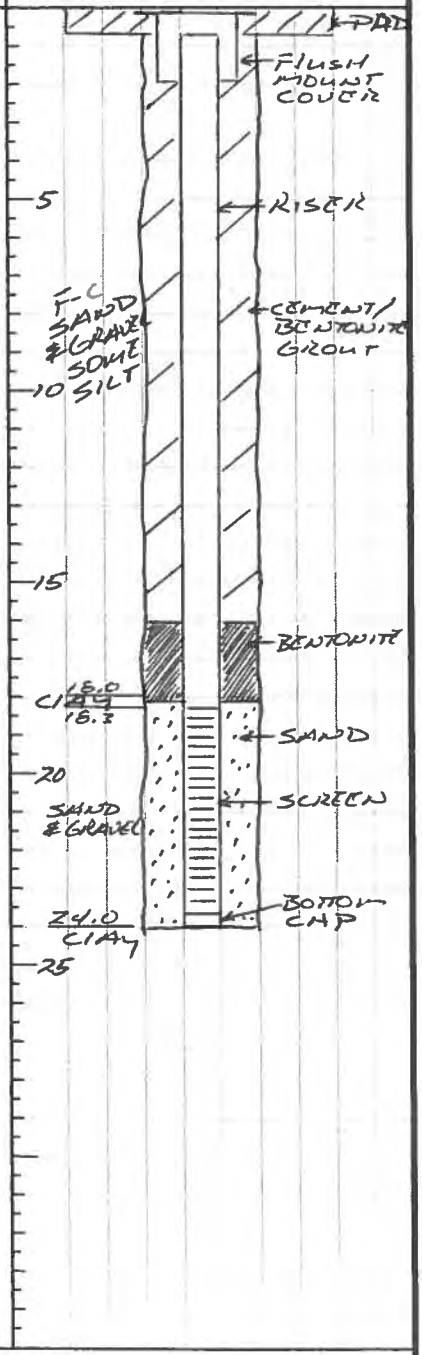
ANNULAR GROUT
INSTALL. METHOD HSA
MATERIAL CEMENT/BENT.
MIX PROPORTIONS ____
QUANTITIES ____
DEPTH INTERVAL ____

ANNULAR SEAL
INSTALL. METHOD HSA
MATERIAL BENTONITE
QUANTITY ____
DEPTH INTERVAL 18.2 TO 16.0

FILTER PACK
INSTALL. METHOD HSA
MATERIAL RICCI NO. 00
QUANTITY ____
DEPTH INTERVAL 18.2 TO 24.0

DEVELOPMENT
METHOD ____
TIME ____
PRODUCTION ____

WELL CONSTRUCTION SKETCH



ADDITIONAL INFORMATION: SEE VP-6D FOR GEOLOGIC LOG

FILE: \WELL-LOG

RADIAN INTERNATIONAL

WELL NO. VP-7D

PROJECT NAME ESSEX/HOPE - SMART — PROJECT NO. E04041.82

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DOBZILL

BY K.D — DRILLING CONTRACTOR NORTHWEST — DRILLER STEVE LORENTE

DATE 10-3-00 — DRILLING METHOD 6¼-IN HSA — RIG TYPE CME-75

CHK BY ____ — DRILLING START DATE 10-3-00 — DRILLING COMPLETION DATE 10-4-00

DATE ____ — SURFACE ELEVATION 1278.88 — STICK-UP ELEVATION 1278.87

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
0							GRASS						10-3-00 ↓
1	SS-1	9.5	3 4 4 6	PID = 1.6 ppm			STIFF, BROWN SILT - DAMP						ϕ 5-IN STEEL CASING SET TO 16.0 FT
2								ML					
3	SS-2	9.5	5 7 9 11	PID = 3.2 ppm									CEMENT BENTONITE GROUT
4							4.2						ϕ 6¼-IN HSA
5	SS-3	9	9 10 9 10	PID = 2.2 ppm			MED DENSE, BROWN FINE TO COARSE SAND & GRAVEL (½") SOME SILT - DAMP						ϕ 10-IN BORE HOLE
6													ϕ 2-IN PVC RISER
7	SS-4	8	7 9 7 8	PID = 2.0 ppm			AS ABOVE	SM/GM					
8							8.0						
9	SS-5	7	9 13 13 14	PID = 3.9 ppm			MED DENSE, BROWN TO TAN, FINE TO COARSE SAND AND GRAVEL (½ TO > 2") SOME SILT - MOIST ~9.8' (MOTTLED)						0930 HSA AT 10 FT CHECK BORE HOLE LEL 20% O2 21%
10							AS ABOVE, OLIVE BROWN NO MOTTLING. MOIST						
11	SS-6	13	5 9 12 12	PID = 6.30 ppm			10.0 AS ABOVE, SATURATED 11.2 MED DENSE BROWN SILTY F-C SAND & GRAVEL - WET						FID=160 PPM PID = 87 PPM
12							12.0						0935 LEL at 5% (GAS DISSIPATED)
13	SS-7	14	2 6 7 12	PID = 6.7 ppm			V. STIFF, GRAY-GREEN SILT - DAMP	ML					
14													HSA at 14 FT CHECK BOREHOLE LEL = 0% O2 = 21
15	SS-8	17	6 9 11 15	PID = 5.7 ppm			AS ABOVE						10-3-00
16							16.0				16		16.0 ←
17	SS-9	16	6 9 12 15	PID = 3.5 ppm			V. STIFF, GRAY-GREEN CLAY, TRACE SILT - DAMP	CL				BENTONITE	ϕ 4-IN FLUID 20% (WATER) DRILLED CASING 10-4-00
18				3" SPOON									

ADDITIONAL REMARKS

FILE: \FORMATS\FC VG

RADIAN INTERNATIONAL

WELL NO. VP-7D

PROJECT NAME ESSEX/HOPE - SUMMARY

PROJECT NO. 80-10-91.82

LOCATION JAMESTOWN NY

GEOLOGIST KEITH DOANE, II

BY KD

DRILLING CONTRACTOR

DRILLER STEVE LORENTE

DATE 10-4-00

DRILLING METHOD 6-1/4-IN HSA / 4-IN DRIVEN CASING

RIG TYPE CME-75

CHK BY

DRILLING START DATE 10-3-00

DRILLING COMPLETION DATE 10-4-00

DATE

SURFACE ELEVATION 1278.88

STICK-UP ELEVATION 1278.87

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
18	SS-1D	14	16 15 14 16	PID = 3.6 PPM 3" SPOON			V. STIFF, GRAY-GREEN CLAY, TRACE SILT - DAMP	CL					10-4-00 ↓ ϕ4-IN FLUID ROTARY DRIVEN CASING
19											19.5	← BENTONITE	
20							BASE OF UPPER CLAY 20.4				20.4		1030 CHECK BOREH 4-IN CASING AT 20 FT HOLE OPEN TO 24 LEL 20% O2 21% ATMOSPH LEL 0%
21	SS-1I	20	5 12 15 16	PID = 20.4-22' 3.8 PPM 3" SPOON			MED DENSE, GRAY SILTY FINE SAND - SATURATED						
22													
23	SS-1N	13	4 13 14 17	PID = 12 PPM 3" SPOON			AS ABOVE	SM				← ϕ4-IN BOREHOLE	
24												← ϕ2-IN PVC 0.01-IN SCREEN	
25	SS-1M	20	9 19 19 25	PID = 6 PPM 3" SPOON			AS ABOVE					← SAND OO RICCI	
26													
27	SS-1L	18	5 15 19 18	PID = 26-26.9: 6 PPM 26.9-28: 13.6 PPM 3" SPOON			26.9 MED DENSE GRAY SILTY FINE SAND INTERBEDDED W/ TH (4) 1/4-IN CLAY SEAMS - SAT	SM/SC					11:15 CHECK BOREH 4-IN CASING AT 28 FT HOLE OPEN TO 28 FT LEL = 0%
28							28.0 STIFF GRAY CLAY, LITTLE 28.5 SILT & FINE SAND	CL					
29	SS-1K	24	15 18 20 21	PID = 1.3 PPM 3" SPOON			MED DENSE GRAY FINE SAND AND SILT - SAT						
30							30.0						
31	SS-1J	24	6 20 23 21	PID = 6.3 PPM 3" SPOON			AS ABOVE, TO CLAY SATURATED	SM					
32							32.0						
33	SS-1I	24	8 13 16 18	PID = 1.2 PPM 3" SPOON			MED DENSE/DENSE GRAY SILTY FINE SAND - SATURATED						
34													
35	SS-1G	20	6 13 21	PID = 1.5 PPM 3" SPOON			MED DENSE GRAY FINE SAND AND SILT - SATURATED						
36			20										

ADDITIONAL REMARKS

FILE: \FORMATS\F WG

RADIAN INTERNATIONAL

WELL NO. VP-7D

PROJECT NAME Essex / Hope - SMART PROJECT NO. 604041.82

LOCATION Jamestown NY GEOLOGIST Keith Dodrill

BY KD DRILLING CONTRACTOR Nothnagle DRILLER Steve Lorentz

DATE 10-4-00 DRILLING METHOD 6¼ HSA / 4-in Driven Casing RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-3-00 DRILLING COMPLETION DATE 10-4-00

DATE _____ SURFACE ELEVATION 1278.88 STICK-UP ELEVATION 1278.87

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
36	SS-19	24	5	PID = 4.4 ppm			36.0 GRAY V. STIFF FINE SANDY SILT, TRACE CLAY - SATURATED	ML					⌀4-IN BOREHOLE
37			12				37.0 DENSE GRAY SILTY FINE SAND - SATURATED	SM					⌀2-IN PVC 0.01-IN SCREEN
			20										SAND OD RICCI
38			24	3" SPOON									
	SS-20	24	21	PID = 38-39.1: 3.4 ppm									
39			23										
			17	39.1-40: 2.9 ppm			39.1 V STIFF GRAY SILTY CLAY - DAMP	CL			39.3		FLUSH THREAD BOTTOM CAP
40			23	3" SPOON							40		
							BOREHOLE TERMINATED AT 40-FT BGS						

ADDITIONAL REMARKS

FILE: \FORMATS\FC VG

RADIAN INTERNATIONAL

WELL NO. VP-7D PAGE 1 OF 3

PROJECT NAME ESSEX/HOPE-SMART PROJECT NO. 604041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTH NAGLE DRILLER STEVE LORENTZ

DATE 10-3-00 DRILLING METHOD 6¼-IN HSA RIG TYPE CME-75

DATE 10-4-00

CHK BY DRILLING START DATE 10-3-00 DRILLING COMPLETION DATE 10-4-00

DATE SURFACE ELEVATION 1278.88 STICK-UP ELEVATION 1278.87

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
1	SS-1	9.5	3 4 4 6				PID = 1.6 ppm GRASS STIFF, BROWN SILT - DAMP						10-3-00 ↓ ← ϕ 5-IN STEEL CASING SET TO 16.0 FT
2								ML					
3	SS-2	9.5	5 7 9 11				PID = 3.2 ppm						← CEMENT-BENTONITE GROUT
4							4.2						ϕ 6¼-IN HSA
5	SS-3	9	9 10 9 10				PID = 2.2 ppm MED DENSE, BROWN FINE TO COARSE SAND & GRAVEL (½") SOME SILT - DAMP						← ϕ 10-IN BORE HOLE
6													
7	SS-4	8	7 9 7 8				PID = 2.0 ppm AS ABOVE						← ϕ 2-IN PVC RISER
8							8.0	SM/GM					
9	SS-5	7	9 13 13 14				PID = 3.9 ppm MED DENSE, BROWN TO TAN, FINE TO COARSE SAND AND GRAVEL (½ TO > 2") SOME SILT - MOIST ~9.8' (MOTTLED)						0930 HSA AT 10 FT CHECK BORE HOLE LEL 20% O2 21% PID 60 ppm PID = 87 ppm
10							AS ABOVE, OLIVE BROWN NO MOTTLING - MOIST						
11	SS-6	13	5 9 12 12				PID = 630 ppm 10.0 AS ABOVE, SATURATED 11.2 MED DENSE BROWN SILTY F-C SAND & GRAVEL - WET						0935 LEL at 5% (GAS DISSIPATED)
12							12.0						
13	SS-7	14	7 6 7 12				PID = 67 ppm V. STIFF, GRAY-GREEN SILT - DAMP	ML					
14													HSA at 14 FT CHECK BORE HOLE LEL = 0% O2 = 21
15	SS-8	17	6 9 11 15				PID = 57 ppm AS ABOVE						10-3-00
16							16.0				16		16.0 ←
17	SS-9	16	6 9 12 15				PID = 35 ppm 3" SPOON V. STIFF, GRAY-GREEN CLAY, TRACE SILT - DAMP	CL				BENTONITE →	ϕ 4-IN FLUID ROTARY (WATER) DRIVEN CASING 10-4-00
18													

ADDITIONAL REMARKS

FILE: \FORMATS\FORM1.DWG

RADIAN INTERNATIONAL

WELL NO. VP-7D — PAGE 2 OF 3

PROJECT NAME ESSEX/HOPE - SMART — PROJECT NO. 80401.82

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DOERR, II

BY KD — DRILLING CONTRACTOR — DRILLER STEVE LORENTZ

DATE 10-4-00 — DRILLING METHOD 6¼-IN HSA / 4-IN DRIVEN CASING — RIG TYPE CME-75

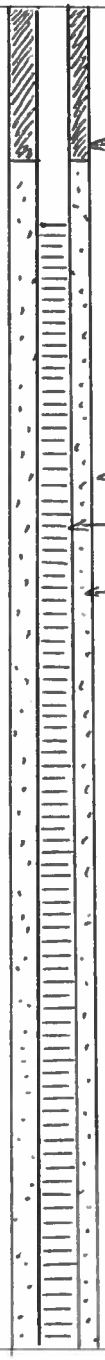
CHK BY — DRILLING START DATE 10-3-00 — DRILLING COMPLETION DATE 10-4-00

DATE — SURFACE ELEVATION 1278.88 — STICK-UP ELEVATION 1278.87

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE
18	SS-10	14	16 15 14 16	PID = 36 PPM	3" SPOON		V. STIFF, GRAY-GREEN CLAY, TRACE SILT - DAMP	CL
20							BASE OF UPPER CLAY 20.4	
20	SS-11	20	5 12 15 16	PID = 20.4-22' 3.8 PPM	3" SPOON		MED DENSE, GRAY SILTY FINE SAND - SATURATED	
22								
23	SS-12	13	4 13 14 17	PID = 17 PPM	3" SPOON		AS ABOVE	SM
24								
25	SS-13	20	9 19 19 25	PID = 6 PPM	3" SPOON		AS ABOVE	
26								
27	SS-14	18	5 15 19 18	PID = 26-26.9: 6 PPM 26.9-28: 13.6 PPM	3" SPOON		26.9 MED DENSE GRAY SILTY FINE SAND INTERBEDDED WITH (4) ¼-IN CLAY SEAMS - SAT 28.0	SM / SC
28							STIFF GRAY CLAY, LITTLE 28.5 SILT & FINE SAND	CL
29	SS-15	24	15 18 20 21	PID = 1.3 PPM	3" SPOON		MED DENSE GRAY FINE SAND AND SILT - SAT 30.0	
30								
31	SS-16	24	6 20 23 21	PID = 6.3 PPM	3" SPOON		AS ABOVE, TR CLAY SATURATED 32.0	SM
32								
33	SS-17	24	8 13 16 18	PID = 1.2 PPM	3" SPOON		MED DENSE/DENSE GRAY SILTY FINE SAND - SATURATED	
34								
35	SS-18	20	6 13 21 20	PID = 1.6 PPM	3" SPOON		MED DENSE GRAY FINE SAND AND SILT - SATURATED	
36								

STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)
		19.5
		20.4

WELL CONSTRUCTION DETAILS



REMARKS

10-4-00
Ø4-IN FLUID ROTARY DRIVEN CASING
1030 CHECK BOREHOLE 4-IN CASING AT 20 FT HOLE OPEN TO 24 LEL 20% O2 21% ATMOSPHERIC LEL 0%
11:15 CHECK BOREHOLE 4-IN CASING AT 28 FT HOLE OPEN TO 28 FT LEL = 0%

ADDITIONAL REMARKS

FILE: \FORMATS\FORM1.DWG

RADIAN INTERNATIONAL

WELL NO. VP-7D — PAGE 3 OF 3

PROJECT NAME ESSEX/HOPE - SMAART — PROJECT NO. 604041.82

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODRILL

BY KD — DRILLING CONTRACTOR NORTHWALL — DRILLER STEVE LORENTZ

DATE 10-4-00 — DRILLING METHOD 6¼ HSA / 4-IN DRIVEN CASING — RIG TYPE CME-75

CHK BY ____ — DRILLING START DATE 10-3-00 — DRILLING COMPLETION DATE 10-4-00

DATE ____ — SURFACE ELEVATION 1278.88 — STICK-UP ELEVATION 1278.87

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
36							36.0						
	SS-4	24	5	PID=			GRAY V. STIFF FINE SANDY SILT, TRACE CLAY - SATURATED	ML					← Ø4-IN BOREHOLE
37			12	4.4 PPM			37.0						← Ø2-IN PVC 0.01-IN SCREEN
			20				DENSE GRAY SILTY FINE SAND - SATURATED	SM					
38			24	3" SPOON									← SAND OORICCI
	SS-5	24	21	PID=									
			23	38 - 39.1:									
39			17	3.41 PPM			39.1						
				39.1 - 40:			V STIFF GRAY SILTY CLAY - DAMP	CL			39.3		← FLUSH THREAD BOTTOM CAP
40			23	2.9 PPM							40		
				3" SPOON			BOREHOLE TERMINATED AT 40-FT BGS						

ADDITIONAL REMARKS

FILE: \FORMATS\FORM1.DWG

RADIAN INTERNATIONAL

WELL NO. VP-8D

PROJECT NAME ESSEX/HOPE - SMART

PROJECT NO. 80410411.82

LOCATION JAMESTOWN NY

GEOLOGIST KEITH DODRILL

BY KD

DRILLING CONTRACTOR NOTHNAGLE

DRILLER STEVE LORENTE

DATE 10-3-00 / 10-5-00

DRILLING METHOD 6¼ HSA / 4-IN ROTARY DRIVEN CASING

RIG TYPE CME-75

CHK BY

DRILLING START DATE 10-3-00

DRILLING COMPLETION DATE 10-5-00

DATE

SURFACE ELEVATION 1277.50

STICK-UP ELEVATION 1277.37

DEPTH FEET	SOIL SAMPLE NO.	SOIL SAMPLE REC. (IN.)	SOIL SAMPLE BL./6"	ROCK SAMPLE RUN (FT)	ROCK SAMPLE REC. (%)	ROCK SAMPLE RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
0							MED STIFF BROWN SILT SOME MED-COARSE SAND & GRAVEL (½-IN) -DAMP (GP-5D LOG)	ML					10-3-00 ↓ Ø6¼-IN HSA ← Ø10-IN BOREHOLE
							4.0						
5							MED DENSE BROWN SILTY MED-COURSE SAND AND GRAVEL (½-1") -MOIST (GP-5D LOG)	SM/GM				← CEMENT/BENTONITE GROUT	
10							12.0						
							STIFF GRAY SILT -MOIST (GP-5D LOG)	ML					
15							16.0						
							STIFF GRAY CLAY -WET (GP-5D LOG)	CL			17.0	← SET Ø5-IN STEEL CASING AT 19.0 FT ← BENTONITE	
							STIFF GRAY CLAY - WET				19.0		10-5-00 ↓
20	S-1	18	6 7 12 12	PID = 288 PPM			20.0 MED DENSE SILTY FINE SAND - SATURATED				20		Ø4-IN FLUID ROTARY Ø4-IN DRIVEN CASING
	S-4			3" SPOON								← Ø4-IN BOREHOLE ← Ø2-IN PVC 0.01-IN SCREEN ← SAND OO RICCI	
25							28.0						
							MED DENSE GRAY FINE SAND, SOME SILT - SATURATED (GP-5D LOG)	SM					
30													
35													

10 SAMPLES COLLECTED

10 SAMPLES COLLECTED

ADDITIONAL REMARKS

RADIAN INTERNATIONAL

WELL NO. VP-8D

PROJECT NAME ESSEX/HOPE - SMART PROJECT NO 804041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE LORTON

DATE 10-5-00 DRILLING METHOD 6¼ HSA / Ø4-IN ROTARY DRIVEN CASING RIG TYPE CME-75

CHK BY _____ DRILLING START DATE 10-3-00 DRILLING COMPLETION DATE 10-5-00

DATE _____ SURFACE ELEVATION 1277.50 STICK-UP ELEVATION 1277.37

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./ 6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/ CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
35		NO SAMPLES COLLECTED					MED DENSE GRAY FINE SAND SOME SILT - SAT (GP-SD 10%)						Ø4-IN BOREHOLE
							38.0						Ø2-IN 0.01-IN SCREEN
	24	5 8 14 18	PID = 0.8 PPM 3" SPOON				MED STIFF GRAY SILT, SOME FINE SAND - SATURATED				39.9 39.7		FLUSH THREAD BOTTOM CAP
40							39.0				40		
							MED DENSE GRAY FINE SAND - SATURATED 39.8						
							STIFF GRAY SILT, TRACE FINE SAND AND GRAVEL (¼") - DAMP						
							BORING TERMINATED AT 40 FT BGS						

ADDITIONAL REMARKS

RADIAN INTERNATIONAL

WELL NO. VP-8D

PROJECT NAME ESSEX/HOPE - SMART PROJECT NO. 804041.82

LOCATION JAMESTOWN NY GEOLOGIST KEITH DODRILL

BY KD

DATE 10-3-00 – 10-5-00

DRILLING CONTRACTOR NOTHNAGLE DRILLER STEVE COURTNE

DRILLING METHOD 6¼ HSA / 4-IN ROTARY / DRIVEN CASING RIG TYPE CME-75

CHK BY _____

DATE _____

DRILLING START DATE 10-3-00 DRILLING COMPLETION DATE 10-5-00

SURFACE ELEVATION 1277.50 STICK-UP ELEVATION 1277.37

DEPTH FEET	SOIL SAMPLE NO.	SOIL SAMPLE REC. (IN.)	SOIL SAMPLE BL/6"	ROCK SAMPLE RUN (FT)	ROCK SAMPLE REC. (%)	ROCK SAMPLE RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
0							MED STIFF BROWN SILT SOME MED-COARSE SAND & GRAVEL (½-IN) -DAMP (GP-5D LOG)	ML					10-3-00 ↓ Ø6¼-IN HSA
4.0													Ø10-IN BOREHOLE
5							MED DENSE BROWN SILTY MED-COURSE SAND AND GRAVEL (½-1") -MOIST (GP-5D LOG)	SM/GM					CEMENT/BENTONITE GROUT
10							NO SAMPLES COLLECTED						
12.0							STIFF GRAY SILT -MOIST (GP-5D LOG)	ML					
15													
16.0							STIFF GRAY CLAY - WET (GP-5D LOG)	CL					SET Ø5-IN STEEL CASING AT 19.0 FT
17.0											17.0		BENTONITE
19.0							STIFF GRAY CLAY - WET				19.0		10-5-00 ↓
20	S-1	18	6 7 12 12	PID = 288 PPM			20.0 MED DENSE SILTY FINE SAND - SATURATED				20		Ø4-IN FLUID ROTARY Ø4-IN DRIVEN CASING
25							NO SAMPLES COLLECTED						Ø4-IN BOREHOLE Ø2-IN PVC 0.01-IN SCREEN
28.0							MED DENSE GRAY FINE SAND, SOME SILT - SATURATED (GP-5D LOG)	SM					SAND 00 RICCI
30													
35													

ADDITIONAL REMARKS

RADIAN INTERNATIONAL

WELL NO. VP-8D — PAGE 2 OF 2

PROJECT NAME ESSEX/HOPE - SUMMARY — PROJECT NO 804041.82

LOCATION JAMESTOWN NY — GEOLOGIST KEITH DODGE, II

BY KD — DRILLING CONTRACTOR NOTHNAGLE — DRILLER STEVE CORTER

DATE 10-5-00 — DRILLING METHOD 6¼ HSA / Ø4-IN ROTARY DRIVEN CASING — RIG TYPE CME-75

CHK BY _____ — DRILLING START DATE 10-3-00 — DRILLING COMPLETION DATE 10-5-00

DATE _____ — SURFACE ELEVATION 1277.50 — STICK-UP ELEVATION 1277.37

DEPTH FEET	SOIL SAMPLE NO.	REC. (IN.)	BL./6"	ROCK SAMPLE RUN (FT)	REC. (%)	RQD. (%)	VISUAL CLASSIFICATION AND REMARKS	PROFILE	STATIC WATER LEVEL (FT)	BORING/CASING DIA. (IN.)	DEPTH (FEET)	WELL CONSTRUCTION DETAILS	REMARKS
35		NO SAMPLES COLLECTED					MED DENSE GRAY FINE SAND SOME SILT - SAT (GP-SD L06)						Ø4-IN BOREHOLE
							38.0						Ø2-IN 0.01-IN SCREEN
	5	24	5	PID =			MED STIFF GRAY SILT, SOME FINE SAND - SATURATED				39.9		FLUSH THREAD BOTTOM CAP
40	5'-7'		8 14 18	0.8 PPM			39.0				39.7		
				3" SPOON			MED DENSE GRAY FINE SAND - SATURATED 39.8				40		
							STIFF GRAY SILT, TRACE FINE SAND AND GRAVEL (¼") - DAMP						
							BORING TERMINATED AT 40 FT BGS						

ADDITIONAL REMARKS

BORING LOG

BORING/WELL ID: MW - 101S

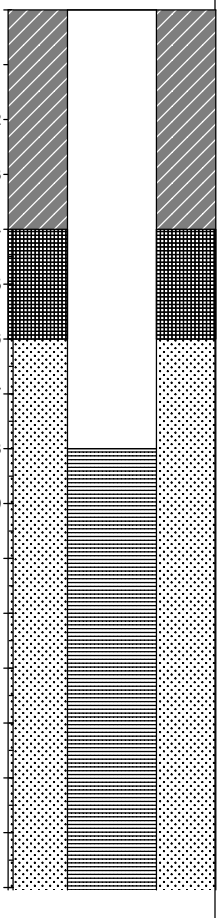
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/30/2016
NORTHING: 769495.8475 **EASTING:** 977385.6759

SURFACE ELEVATION: 1276.170 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.68 ft.
TOTAL DEPTH: 22 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/30/2016
APPROX. DEPTH TO WATER: N/A

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0							0			
	1	SS	N/A	2.0/2.0	0.3			ORGANIC MATERIAL		
					0.6			SAND, brown, some gravel and organics, dry, poorly graded, no odor present.		SP
					1.1					
	2	SS	N/A	1.0/2.0	1.5			No recovery.		
					1.1			SAND, brown, some gravel (less than 3-inch), dry, well graded, coarse, no odor present.		SW
	3	SS	N/A	1.0/2.0	0.9			No recovery.		
5					0.6		-5	SAND, brown, some gravel (less than 3-inch), dry, well graded, coarse, no odor present.		SW
	4	SS	N/A	1.0/2.0	0.8			No recovery.		
					1.1			SANDY GRAVEL, brown, less than 3-inch, dry, no odor present.		GW
	5	SS	N/A	1.5/2.0	1.6			No recovery.		
					0.5			SAND, brown, little gravel, moist, poorly graded, loose, no odor present.		SP
10					0.8					
	6	SS	N/A	1.5/2.0	0.6		-10	No recovery.		
					1.3			SAND, brown, little gravel, moist, poorly graded, loose, no odor present.		SP
					1.2			SAND, brown, little gravel (less than 3-inch), wet, well graded, loose, no odor present.		SW
	7	SS	N/A	1.5/2.0	0.9			No recovery.		SW
								SAND, brown, little gravel (less than 3-inch), wet, well graded, loose, no odor present.		
	8	SS	N/A	0.5/2.0				No recovery.		
15							-15	SANDY GRAVEL, brown, less than 3-inch, wet, loose, no odor present.		GW

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

PLASTIC SOILS DENSITY:
0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 101S

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/30/2016
NORTHING: 769495.8475 **EASTING:** 977385.6759

SURFACE ELEVATION: 1276.170 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.68 ft.
TOTAL DEPTH: 22 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/30/2016
APPROX. DEPTH TO WATER: N/A

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL	WELL CONSTRUCTION
	9	SS	N/A	1.0/2.0				No recovery.			16
								SAND, gray brown, little gravel (less than 3-inch), wet, well graded, coarse, no odor present.		SW	17
	10	SS	N/A	0.5/2.0				No recovery.			18
								SAND, gray brown, little gravel (less than 3-inch), wet, well graded, coarse, no odor present.		SW	19
20	11	SS	N/A	1.0/2.0			-20	No recovery.			20
								SAND, gray brown, little gravel (less than 3-inch), wet, well graded, coarse, no odor present.		SW	21
								End of augering. Tagged SILTY CLAY @ 22.0 ft. bgs.		CH	22

LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW-102S

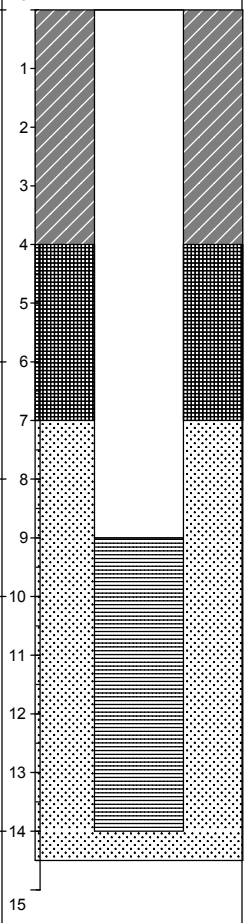
SHEET 1 OF 1

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Conventional, Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/11/16
NORTHING: 769527.4979 **EASTING:** 977462.326

SURFACE ELEVATION: 1275.680 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.43 ft.
TOTAL DEPTH: 14 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/11/16
APPROX. DEPTH TO WATER: approx. 8.5 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
	1	SS	N/A	0.67/2.0	0.5		1275	TOP SOIL, dark brown, silty, trace gravel, moist, loose.		
	2	SS	N/A	1.0/2.0	0.5					
	3	SS	N/A	0.75/2.0	0.5					
5							1270			
	4	SS	N/A	1.33/2.0	0.5			SAND AND GRAVEL, medium brown, some silt, dry, loose.		GP
	5	SS	N/A	0.67/2.0	0.5			SAND AND GRAVEL, medium brown, some silt, dry, loose, saturated.		GP
10	6		N/A				1265	No recovery.		
	7		N/A							
					0.4					
15										

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 103S

SHEET 1 OF 2

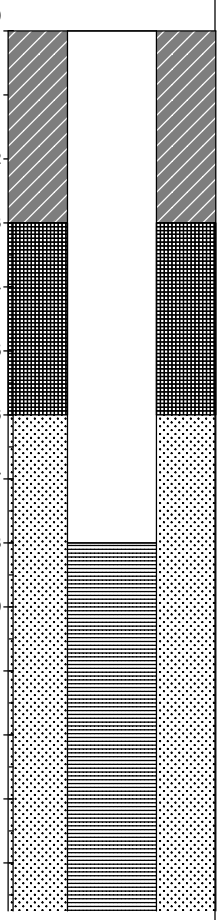
PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/14/16
NORTHING: 769581.6621 **EASTING:** 977463.0969

SURFACE ELEVATION: 1275.710 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.32 ft.
TOTAL DEPTH: 24 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/14/16
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	1.67/2.0	0.0		1275	TOP SOIL, dark brown, some sand and gravel, trace silt and clay, moist, loose.		
					0.0			SILT, dark to medium brown, few gravel and debris, trace sand and clay, moist, soft to firm.		ML
	2	SS	N/A	1.25/2.0	0.1					
					0.1					
	3	SS	N/A	1.0/2.0	0.0			SANDY GRAVEL, medium brown, trace silt, dry, loose.		GP
5							1270			
	4	SS	N/A	1.0/2.0	0.0			SANDY GRAVEL, dark brown, trace silt, moist, loose.		GP
								SANDY GRAVEL, medium brown, trace silt, dry, loose.		GP
	5	SS	N/A	1.25/2.0	0.7					
					0.1			SAND AND GRAVEL, medium dark brown, trace silt, wet, loose.		GW
10								SAND AND GRAVEL (less sand), medium dark brown, trace silt, wet, loose, saturated, compact.		GW
	6	SS	N/A	0.92/2.0	1.1		1265			GW
								SAND AND GRAVEL, medium dark brown, trace silt, wet, loose.		
	7	SS	N/A	0.92/2.0	1.7					

SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors.
ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:

0-4:	very loose
5-10:	loose
11-29:	medium dense
30-49:	dense
50+:	very dense

PLASTIC SOILS DENSITY:

0-2:	very soft
3-4:	soft
5-8:	medium soft
9-15:	stiff
16-30:	very stiff
>30:	hard

MOISTURE:
dry
moist
wet

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

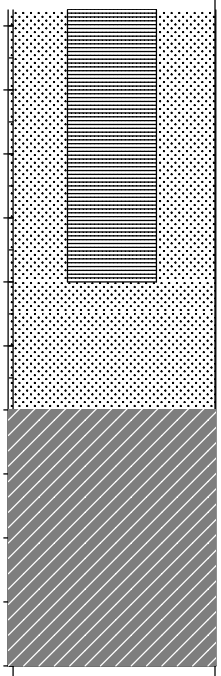
BORING/WELL ID: MW - 103S

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/14/16
NORTHING: 769581.6621 **EASTING:** 977463.0969

SURFACE ELEVATION: 1275.710 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.32 ft.
TOTAL DEPTH: 24 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/14/16
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
15	8	SS	N/A	0.67/2.0	0.8		1260			GW / GP
	9	SS	N/A	0.83/2.0	0.2					
	10	SS	N/A	0.5/2.0	0.4					
20	11	SS	N/A	0.67/2.0	0.3		1255	SAND, medium brown, some gravel and silt, well graded, coarse, loose, saturated.		SW
	12	SS	N/A	1.5/2.0	0.1 0.7					
25	13	SS	N/A	0.92/2.0	1.6		1250	SILTY CLAY, brown gray, trace sand and gravel, firm, saturated.		CH

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 104S

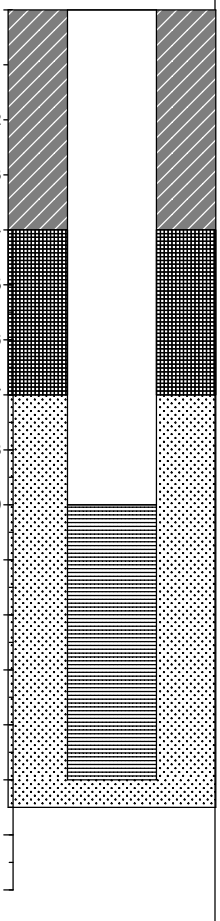
SHEET 1 OF 1

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/14/16
NORTHING: 769708.5764 **EASTING:** 977409.2259

SURFACE ELEVATION: 1279.450 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1279.22 ft.
TOTAL DEPTH: 16 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: JRG
FINISH DATE: 10/14/16
APPROX. DEPTH TO WATER: N/A

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	1.42/2.0	0.3			TOP SOIL, dark brown, some silty sand, moist, trace of debris (slag, glass, brick), loose.		SM
					0.6			SILTY SAND, medium to dark brown, some gravel and debris, moist, loose.		
					1.1					
	2	SS	N/A	0.92/2.0	1.5					SM
					1.1					SM
					0.9					
	3	SS	N/A	0.75/2.0			1275	SAND and GRAVEL, medium brown, some silt, dry, trace large factured stone, loose.		SW
5					0.6					
					0.8					
	4	SS	N/A	1.0/2.0				SAND and GRAVEL, medium brown, some silt, dry, trace large factured stone, compact.		SW
					1.1					
					1.6					
	5	SS	N/A	0.92/2.0						SW
					0.5					
					0.8		1270			
10										
	6	SS	N/A	1.1/2.0	0.6					
					1.3			SILTY CLAY, medium brown, firm, medium plasticity.		ML
					1.2			SAND SEAM, coarse,saturated.		SW
	7	SS	N/A	1.1/2.0	0.9			SAND, medium brown, some silt/clay, firm, saturated.		SW
	8	SS	N/A	1.33/2.0			1265	SILTY CLAY		CL
15										

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 105S

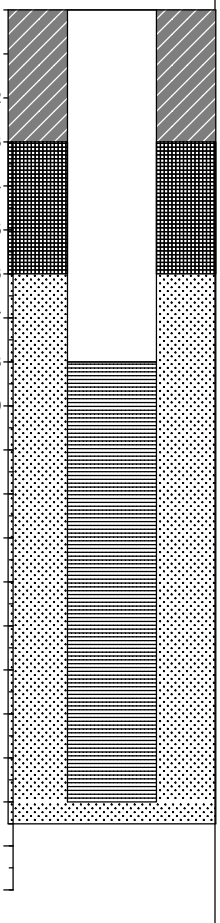
SHEET 1 OF 1

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/6/2016
NORTHING: 769762.8752 **EASTING:** 977561.1845

SURFACE ELEVATION: 1279.160 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.79 ft.
TOTAL DEPTH: 20 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/6/2016
APPROX. DEPTH TO WATER: approx. 12 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
	1	SS	N/A	0.0/2.0				No recovery		
								SAND AND GRAVEL, medium brown, trace silt and debris, dry, loose.		
	2	SS	N/A	0.92/2.0	0.0					GW
	3	SS	N/A	1.0/2.0	0.0		1275			
5	4	SS	N/A	1.1/2.0	0.0			SAND AND GRAVEL, medium brown, some larger stone, trace silt and debris, dry, loose.		GW
	5	SS	N/A	0.92/2.0	0.0					GW
							1270	SANDY SILT, medium brown, some gravel and large fractured stone, dry, loose.		ML
10	6	SS	N/A	0.92/2.0	0.4					
	7	SS	N/A	1.1/2.0	0.0					
								SANDY SILT, medium brown, some gravel, sand and large fractured stone, dry, loose.		ML
	8	SS	N/A	0.67/2.0	0.1		1265	SANDY SILT, medium brown, some gravel, and sand, wet, coarse, saturated.		ML
15										ML
	9	SS	N/A	0.5/2.0	0.0					
	10	SS	N/A	1.67/2.0	0.0					
							1260	SILTY CLAY, gray, firm, saturated, high plasticity.		CH
20										

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:

MOISTURE:	
dry	
moist	
wet	

0-4: very loose	
5-10: loose	
11-29: medium dense	
30-49: dense	
50+: very dense	

PLASTIC SOILS DENSITY:

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 106D

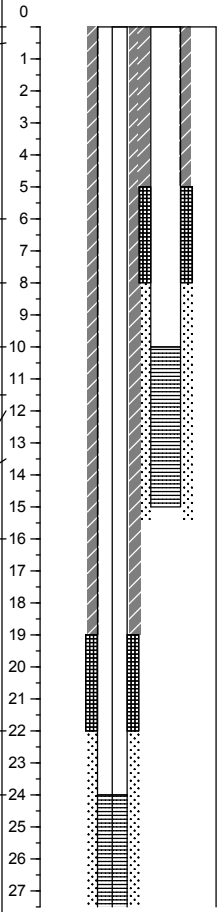
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 10/5/16
NORTHING: 769641.0458 **EASTING:** 977554.5197

SURFACE ELEVATION: 1275.520 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.29 ft.
TOTAL DEPTH: 46 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/5/16
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	1.1/2.0	4.3		1275	TOP SOIL, dark brown, some silt and gravel, trace sand and debris, moist, loose.		GW
					2.3					
	2	SS	N/A	0.75/2.0	2.4			SAND AND GRAVEL (fill material), medium brown, trace silt, dry, loose.		
	3	SS	N/A	0.75/2.0	1.3					
5							1270			
	4	SS	N/A	1.33/2.0	0.4			SAND AND GRAVEL, medium brown, trace silt, fine, dry, loose.		GW
	5	SS	N/A	1.25/2.0	0.2			SAND AND GRAVEL, medium brown, trace silt, fine, moist, loose.		GW
10	6	SS	N/A	1.33/2.0	2.3		1265	SAND AND GRAVEL, medium brown, some larger stone crushed, trace silt, fine, moist, loose.		SW
	SHELBY TUBE	ST	N/A	0.83/2.0				SAND AND GRAVEL, medium brown, some larger stone crushed, trace silt, fine, wet, loose.		SW
										GP
	7	SS	N/A	1.33/2.0	0.5			CLAYEY GRAVEL, medium brown, some larger stone crushed, trace silt, fine, wet, loose.		CH
15							1260	SILTY CLAY, gray, firm, saturated, medium-high plasticity.		
	8	SS	N/A	1.75/2.0	0.7			CLAY, gray, firm, saturated, high plasticity.		CH
	9	SS	N/A	2.0/2.0	2.2					
20	10	SS	N/A	0.75/2.0	2.1		1255			
	11	SS	N/A	1.33/2.0	1.8			CLAY, gray, some sand, firm, saturated, high plasticity.		CH
	12	SS	N/A	0.92/2.0	75.9			SAND, gray, some silt, loose, saturated, high plasticity.		SM
25							1250			
	13	SS	N/A	1.33/2.0	65.0					

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:

0-4:	very loose
5-10:	loose
11-29:	medium dense
30-49:	dense
50+:	very dense

PLASTIC SOILS DENSITY:

0-2:	very soft
3-4:	soft
5-8:	medium soft
9-15:	stiff
16-30:	very stiff
>30:	hard

MOISTURE:
dry
moist
wet

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:
MW-106D(left) and MW-106S(right) well construction

BORING LOG

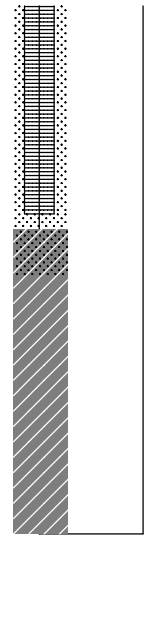
BORING/WELL ID: MW - 106D

PROJECT NAME:
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 10/5/16
NORTHING: 769641.0458 **EASTING:** 977554.5197

SURFACE ELEVATION: 1275.520 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.29 ft.
TOTAL DEPTH: 46 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/5/16
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
	14	SS	N/A	1.17/2.0	75.1					
30	15	SS	N/A	0.7/2.0	14.9		1245			
	16	SS	N/A	0.92/2.0	13.1					
	17	SS	N/A	0.75/2.0	6.0					
35							1240			
	18	SS	N/A	1.25/2.0	5.6			SILTY CLAY SEAM		CH
	19	SS	N/A	1.42/2.0	3.2			SAND, gray, some silt, loose, saturated, high plasticity.		SM
40	20	SS	N/A	0.75/2.0	41		1235			
	21	SS	N/A	1.33/2.0	2.8					
					1.5			SILTY CLAY, gray, firm, saturated, medium to high plasticity.		CH
	22	SS	N/A	1.33/2.0	0.9					
45							1230			

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

PLASTIC SOILS DENSITY:
0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:
MW-106D(left) and MW-106S(right) well construction

BORING LOG

BORING/WELL ID: MW - 107S

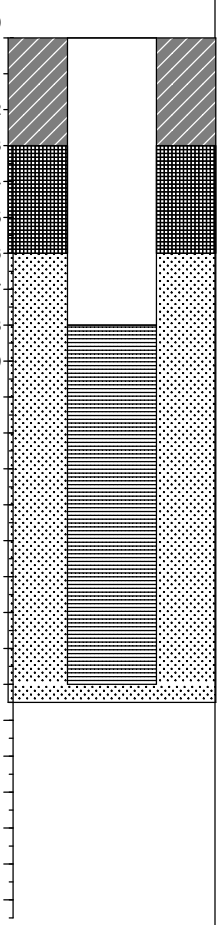
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/19/2016
NORTHING: 769669.9391 **EASTING:** 977845.7849

SURFACE ELEVATION: 1273.330 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1272.98 ft.
TOTAL DEPTH: 24 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 10/19/2016
APPROX. DEPTH TO WATER: approx. 9.5 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
	1	SS	N/A		0.4			SANDY GRAVEL, brown, dry, no odor present.		GP
	2	SS	N/A		0.3		1270			
5	3	SS	N/A	1.0/2.0	0.6			No recovery		GW
	4	SS	N/A	1.0/2.0	1.0			SANDY GRAVEL, brown, less than 3-inch, dry, well graded, no odor present.		SP
	5	SS	N/A	0.5/2.0	0.3		1265	No recovery.		
10	6	SS	N/A	0.5/2.0	0.4			SAND, brown, some gravel, moist, poorly graded, no odor.		SP
	7	SS	N/A	1.0/2.0	0.8			No recovery.		
	8	SS	N/A	1.0/2.0	0.5		1260	SAND, brown, some gravel, wet, poorly graded, no odor.		SP
15	9	SS	N/A	1.0/2.0	1.1			No recovery.		
	10	SS	N/A	1.0/2.0	0.7			SAND, brown, few gravel, wet, poorly graded, no odor present.		GW
	11	SS	N/A	0.0/2.0	1.2		1255	No recovery.		
20	12	SS	N/A	1.0/2.0	1.0			GRAVEL, brown gray, some sand, wet, well graded, no odor		SW
								No recovery		SW
								SAND, brown, few gravel, wet, well graded, coarse, no odor present.		SW
							1250	No recovery		
								SANDY GRAVEL, brown grey, less than 3-inch, wet, no odor present.		
								No recovery.		
								SANDY GRAVEL, brown grey, less than 3-inch, wet, no odor present.		SW / CH

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 107S

PROJECT NAME: Dow Jamestown
SURFACE ELEVATION: 1273.330 ft.
LOCATION: Jamestown, NY
MEASURING POINT: Top of Casing
PROJECT NUMBER: 674604.01.05
MEASURING POINT ELEVATION: 1272.98 ft.
CLIENT: Essex Specialty Products, Inc.
TOTAL DEPTH: 24 ft. bgs
DRILLING CONTRACTOR: Parratt Wolff Inc.
FOREMAN:
DRILLING METHOD: Hollow Stem Auger
DRILLING EQUIPMENT:
SAMPLING METHOD: Split Spoon
CH2M OBSERVER: Fred Roche
START DATE: 10/19/2016
FINISH DATE: 10/19/2016
NORTHING: 769669.9391 **EASTING:** 977845.7849
APPROX. DEPTH TO WATER: approx. 9.5 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL	WELL CONSTRUCTION
								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing			
								No recovery. SAND, brown grey, less than 3-inch, well graded, no odor present. SILTY CLAY, grey, wet, fine, no odor present. Bottom of boring @ 24.0 ft. bgs.			

LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 108S

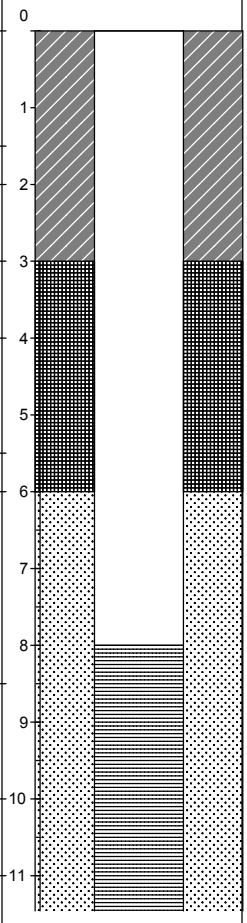
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/19/2016
NORTHING: 769725.6736 **EASTING:** 977754.0991

SURFACE ELEVATION: 1274.750 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1274.30 ft.
TOTAL DEPTH: 18 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 10/19/2016
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	0.5/2.0				No recovery		
					0.4			GRAVELY SAND, brown, some organics.		SP
	2	SS	N/A	1.0/2.0				No recovery.		
					0.8			SAND, brown, some gravel, dry, well graded, no odor.		SW
					0.6					
	3	SS	N/A	0.5/2.0				No recovery.		
5							1270			
					0.3			SAND, brown, few gravel, dry, poorly graded, no odor comment.		SP
	4	SS	N/A	0.0/2.0	0.2			No recovery.		
	5	SS	N/A	1.5/2.0						
					0.6			SAND, brown, some gravel, moist, poorly graded, no odor present.		SP
					0.7					
					11.1		1265			
10	6	SS	N/A	1.0/2.0				No recovery.		
					0.8			SAND, brown, some gravel, moist, poorly graded, no odor		SP

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 108S

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/19/2016
NORTHING: 769725.6736 **EASTING:** 977754.0991

SURFACE ELEVATION: 1274.750 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1274.30 ft.
TOTAL DEPTH: 18 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 10/19/2016
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL	WELL CONSTRUCTION
					0.9			present.			12
	7	SS	N/A	1.0/2.0				No recovery			
					1.2			SAND, brown, some gravel, wet, poorly graded, no odor present.		SP	13
					1.0			GRAVEL, brow, some sand, wet, well graded, no odor present.		GW	
	8	SS	N/A	1.5/2.0				No recovery			14
15					0.8		1260	SANDY GRAVEL, gray, less than 3-inch, wet, well graded, no odor present.		GW	
					1.6						15
					1.0						
	9	SS	N/A	2.0/2.0	0.4						16
					0.8						
					1.3			SILTY CLAY, gray, wet, soft, no odor present.		CH	17
					0.5						
								Bottom of boring @ 18.0 ft. bgs.			18

LEGEND:
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N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 109S

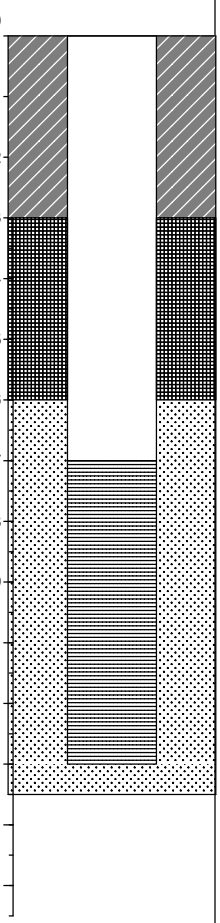
SHEET 1 OF 1

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 10/17/2016
NORTHING: 769813.8606 **EASTING:** 977747.5072

SURFACE ELEVATION: 1275.410 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.19 ft.
TOTAL DEPTH: 14 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 10/17/2016
APPROX. DEPTH TO WATER:

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	0.5/2.0			1275	No recovery		
					0.4			SAND, brown, little gravel, dry, poorly graded, no odor comment.		SP
	2	SS	N/A	1.0/2.0				No recovery.		
					0.8			SAND, brown, little gravel, dry, poorly graded, loose, no odor comment.		SP
					0.6					
	3	SS	N/A	1.0/2.0				No recovery.		
5							1270	BEDROCK MATERIAL, some gravel and organics, dry, poorly graded, loose, no odor comment.		GP
					0.3					
	4	SS	N/A	1.5/2.0	0.2			No recovery.		
								SAND, some gravel and organics, dry, poorly graded, loose, no odor comment.		SP
								SAND, some gravel and organics, dry, poorly graded, loose, wood chips, no odor comment.		SP
	5	SS	N/A	0.5/2.0				No recovery		
					0.6					
					0.7					
10					11.1			SAND, brown, few gravel, dry, poorly graded, fine, loose no odor comment.		SP
	6	SS	N/A	2.0/2.0			1265			
					0.8			SILTY CLAY, brown gray, some gravel, dry, firm, no odor present.		CL
					0.9					
	7	SS	N/A	1.0/2.0				No recovery		
					1.2			SILTY CLAY, brown gray, some gravel, dry, firm, no odor present.		CL
					1.0			Bottom of boring @ 14.0 ft. bgs.		

WELL CONSTRUCTION



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SAMPLE TYPES:
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A: Auger
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SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
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50+: very dense

0-2: very soft
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5-8: medium soft
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16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 110D

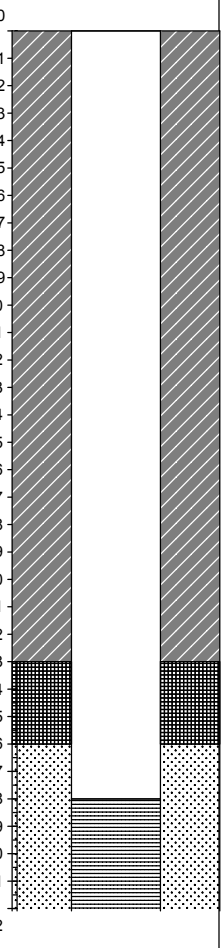
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 10/4/16
NORTHING: 769637.0266 **EASTING:** 977446.4566

SURFACE ELEVATION: 1276.250 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.75 ft.
TOTAL DEPTH: 40 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/4/16
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
0										
	1	SS	N/A	1.67/2.0	0.0		1275	TOP SOIL, dark brown, silty, some sandy and gravel, moist, hard.		GW
	2	SS	N/A	1.67/2.0	0.1 0.2			SILT, medium brown, some sand and gravel, dry to moist, firm.		
5	3	SS	N/A	0.92/2.0	0.2 0.3			SILT, medium brown, some sand, clay and gravel, dry to moist, firm.		
	4	SS	N/A	1.17/2.0	0.3		1270	SILTY SAND, medium brown, some clay and gravel, dry to moist, firm.		GW
	5	SS	N/A	1.0/2.0	0.8			SAND AND GRAVEL, medium brown, some silt, trace larger stone, dry, loose.		GW
10	6	SS	N/A	1.0/2.0	0.1		1265	SAND AND GRAVEL, medium brown, some silt, trace larger stone, wet, loose.		SW
	7	SS	N/A	1.5/2.0	0.2			SAND AND GRAVEL, medium brown, some silt, trace larger stone, wet to saturated, loose.		SW GP
15	8	SS	N/A	1.33/2.0	0.3			SAND, medium brown, some silt, trace gravel and larger stone, wet to saturated, loose.		SP
	9	SS	N/A	0.83/2.0	0.9		1260	SAND, medium brown, some silt, saturated, medium grained, poorly graded, loose.		SP
	10	SS	N/A	1.25/2.0	0.3			SAND, medium brown, some silt, gravel and crushed stone, saturated, medium grained, poorly graded, loose.		
20	11	SS	N/A	0.5/2.0	0.7		1255	SILTY SAND, medium brown, some gravel and crushed stone, saturated, fine, poorly graded, loose.		
	12	SS	N/A	1.0/2.0	0.4			SILTY CLAY, gray, saturated, firm, high plasticity.		CH
25	13	SS	N/A	0.0/2.0				SILT, gray, saturated, less plasticity. No recovery		
	14	SS	N/A	0.5/2.0	2.5		1250	SILTY CLAY, gray, some fine sand, saturated, firm, high plasticity.		CH
	15	SS	N/A	1.33/2.0	42.5			SAND, gray, some silt, saturated, poorly graded, loose, high dilitacy.		SP
30	16	SS	N/A	1.33/2.0	250		1245			

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 110D

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 10/4/16
NORTHING: 769637.0266 **EASTING:** 977446.4566

SURFACE ELEVATION: 1276.250 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1275.75 ft.
TOTAL DEPTH: 40 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/4/16
APPROX. DEPTH TO WATER: approx. 10 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL	WELL CONSTRUCTION
	17	SS	N/A	0.92/2.0	379			SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing			32
	18	SS	N/A	1.17/2.0	30.8						33
35											34
	19	SS	N/A	1.33/2.0	22.0		1240				35
											36
	20	SS	N/A	1.44/2.0	1.6						37
											38
											39
40											40
								CLAY SEAM, some clay		CH	
								SAND, gray, some silt, saturated, poorly graded, loose, high dilitacy.		SP	

LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:

0-4:	very loose
5-10:	loose
11-29:	medium dense
30-49:	dense
50+:	very dense

PLASTIC SOILS DENSITY:

0-2:	very soft
3-4:	soft
5-8:	medium soft
9-15:	stiff
16-30:	very stiff
>30:	hard

MOISTURE:
dry
moist
wet

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 111D

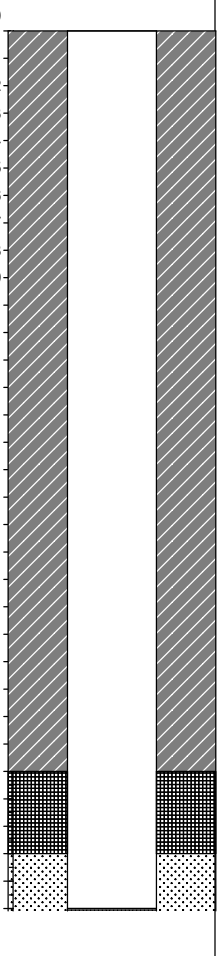
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Conventional, Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 10/12/16
NORTHING: 769320.091 **EASTING:** 977274.7704

SURFACE ELEVATION: 1277.980 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1277.59 ft.
TOTAL DEPTH: 50 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/13/16
APPROX. DEPTH TO WATER: approx. 12 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	1.0/2.0	0.8			ASPHALT		ML
	2	SS	N/A	0.83/2.0	1.5		1275	SANDY SILT, medium to dark brown, some gravel and debris (wire and brick), moist, firm.		
5	3	SS	N/A	0.0/2.0				No recovery- all wire.		
	4	SS	N/A	1.0/2.0	0.6			SANDY GRAVEL, medium brown, few silt and larger fractured stone fragments, moist, compact.		GP
	5	SS	N/A	0.0/2.0			1270			
10	6	SS	N/A	0.67/2.0	53.1			SANDY GRAVEL, medium brown and grey, some silt and larger fractured stone fragments, moist to wet, compact.		GP
	7	SS	N/A	0.5/2.0	7.1		1265	SANDY GRAVEL, medium brown and grey, some silt and larger fractured stone fragments, wet to saturated, compact, strong odors present.		GP
15	8	SS	N/A	1.25/2.0	1142			SAND, gray, some silt, saturated, fine grained, loose, high dilitacy.		SP
	9	SS	N/A	1.17/2.0	176			@14.5 "bgs-1" of black staining (some red in Sudan IV dye test)		
	10	SS	N/A	0.67/2.0	1.2		1260	SAND, gray, some silt, saturated, fine grained, loose, high dilitacy.		
20	11	SS	N/A	0.83/2.0	5.8					
	12	SS	N/A	1.17/2.0	1.0		1255			
25	13	SS	N/A	1.17/2.0	1.1					
	14	SS	N/A	1.44/2.0	1.1					
	15	SS	N/A	0.92/2.0	0.8		1250	SAND, gray, some silt and clay, saturated, fine grained, loose, high dilitacy.		SM
30	16	SS	N/A	1.33/2.0	2.2					

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 111D

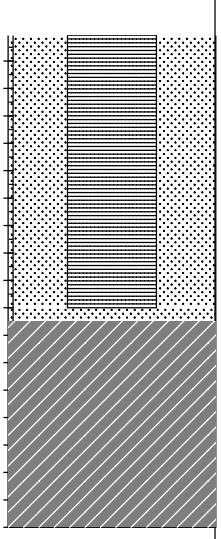
SHEET 2 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Conventional, Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 10/12/16
NORTHING: 769320.091 **EASTING:** 977274.7704

SURFACE ELEVATION: 1277.980 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1277.59 ft.
TOTAL DEPTH: 50 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Jon Gowing
FINISH DATE: 10/13/16
APPROX. DEPTH TO WATER: approx. 12 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
	17	SS	N/A	0.92/2.0	1.1		1245			
35	18	SS	N/A	1.25/2.0	1.1			SAND, gray, some silt, larger stone and clay, saturated, fine grained, loose, high dilitacy.		SM
	19	SS	N/A	1.44/2.0	0.7					
	20	SS	N/A	1.83/2.0	0.6		1240	SAND, gray, some silt, larger stone and clay, saturated, finer grained, loose, high dilitacy.		SM
40	21	SS	N/A	1.67/2.0	0.8					
	22	SS	N/A	1.5/2.0	0.7		1235			
45	23	SS	N/A	1.33/2.0	1.0					
	24	SS	N/A	1.33/2.0	0.6		1230	SILTY CLAY, gray, saturated, firm, medium to high plasticity.		CH
		SS	N/A							
50										

WELL CONSTRUCTION



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SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 112S

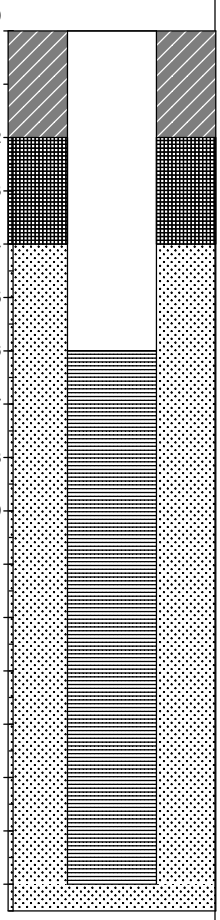
SHEET 1 OF 1

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/22/2016
NORTHING: 769273.8366 **EASTING:** 977338.2933

SURFACE ELEVATION: 1278.880 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.59 ft.
TOTAL DEPTH: 16 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/23/2016
APPROX. DEPTH TO WATER: approx. 9 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0								SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors. ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing		
	1	SS	N/A	1.5/2.0	1.1			No recovery		
					250			SAND, gray,some gravel, less than 3-inch gravel, poorly graded, no odor present.		SP
								GRAVEL, less than 3-inch, some sand, strong odor present.		GP
	2	SS	N/A	1.5/2.0	1.1					SP
					2.8			SAND, brown, some clay, poorly graded, coarse, no odor present.		SP
					13.4		1275	SAND, brown, few gravel, soft, poorly graded, dry, no odor present.		
	3	SS	N/A	0.5/2.0				No recovery.		
5					6.6			SAND, brown, few gravel, poorly graded, dry, no odor present.		SP
	4	SS	N/A	1.0/2.0	1.1			No recovery.		
					2.3			SAND, brown, few gravel, poorly graded, dry, no odor present.		SP
	5	SS	N/A	0.5/2.0	3.6			No recovery.		
					1.6		1270	SANDY GRAVEL, brown, less than 3-inch, poorly graded, moist, no odor present.		SP
10	6	SS	N/A	0.0/2.0	11.6			No recovery.		
	7	SS	N/A	1.0/2.0						
					20.6			SANDY GRAVEL, gray, less than 3-inch, few sand, poorly graded, wet, slight odor present.		SP
					25.8		1265			
	8	SS	N/A	2.0/2.0						
15								SILTY CLAY, firm, wet, no odor present.		CH
								Bottom of boring @ 16.0 ft. bgs.		

WELL CONSTRUCTION



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SAMPLE TYPES:
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SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
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PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 113D

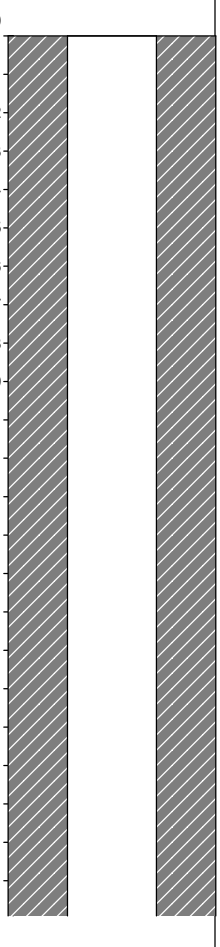
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 9/26/16
NORTHING: 769254.2912 **EASTING:** 977349.0618

SURFACE ELEVATION: 1278.860 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.47 ft.
TOTAL DEPTH: 40 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/27/16
APPROX. DEPTH TO WATER: 9 ft. bgs.

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	1/5-5	1.0/2.0	1.1			No recovery.		
								ORGANIC MATERIAL, some sand, less than 0.0029-inch, dry, no odor present.		OH
	2	SS	12-5/6-6	1.0/2.0	0.6			No recovery.		
					1.3			SAND, brown, few gravel, less than 3-inch, poorly graded, no odor present.		SP
	3	SS	11-5/12-16	1.5/2.0	0.6		1275	No recovery.		
5					0.9			SAND, brown, few gravel, less than 3-inch, poorly graded, no odor present.		SP
	4	SS	19-18/19-18	1.5/2.0	0.4			No recovery.		
					2.0			SAND, brown, few gravel, less than 3-inch, poorly graded, no odor present.		SP
	5	SS	6-7/12-11	1.0/2.0	1.6			No recovery.		
					0.8		1270	SAND, brown, few gravel, less than 3-inch, poorly graded, no odor present.		SP
10	6	SS	3-10/15-15	1.0/2.0	105			No recovery.		SP
					808			SAND, brown, few gravel, less than 3-inch, poorly graded, strong odor present.		SP
	7	SS	8-9/9-12	1.0/2.0	484			SAND, black brown, few gravel, less than 3-inch, wet, poorly graded, extremely strong odor present.		
					382			No recovery.		GW
	8	SS	10-15/16-17	1.0/2.0	450		1265	SAND, brown, less than 3-inch, well graded, coarse, loose, strong odor present.		
15					1330			No recovery.		GW
	9	SS	17-19/15-15	1.5/2.0	18.8			GRAVEL, gray, less than 3-inch, wet, well graded, loose, strong odor present.		GW
					15.6			No recovery.		CL
	10	SS	N/A	1.0/2.0	7.7		1260	GRAVEL, gray, less than 3-inch, some silt, wet, slight odor present.		ML
					18.6			No recovery.		
20	11	SS	N/A	1.0/2.0	1.1			GRAVEL, gray, less than 3-inch, some silt, wet, slight odor present.		ML
					0.8			SILTY CLAY, gray,wet, firm, slight odor present.		
	12	SS	8-10/12-12	1.0/2.0	0.8					
					1.2					

WELL CONSTRUCTION



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SAMPLE TYPES:
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SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
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0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 113D

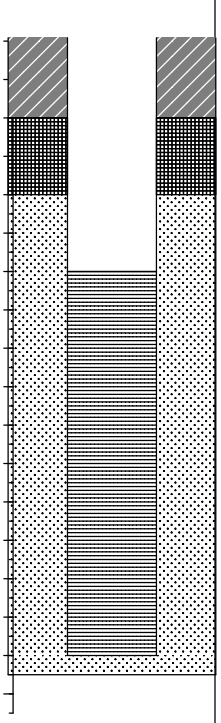
SHEET 2 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 9/26/16
NORTHING: 769254.2912 **EASTING:** 977349.0618

SURFACE ELEVATION: 1278.860 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.47 ft.
TOTAL DEPTH: 40 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/27/16
APPROX. DEPTH TO WATER: 9 ft. bgs.

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
					2.6		1255	No recovery.		
25	13	SS	18-12/12-12	20/2.0	1.0			SILT, gray, some clay, wet, soft, no odor present.		
					0.9			No recovery.		
	14	SS	10-10/16-16	65/2.0	1.1			SILT, gray, some clay, wet, soft, no odor present.		ML
					1.6			No recovery.		
	15	SS	14-14/19-20	00/2.0	1.4		1250	SANDY SILT, gray, little sand, wet, soft, no odor present.		
30					1.1			No recovery.		
	16	SS	25-19/22-20	00/2.0	0.6					
					0.9					
	17	SS	16-16/9-8	0.0/2.0						
							1245			
	18	SS	20-17/19/22	10/2.0	1.1			SILT, gray, little sand, wet, soft, no odor present.		SM
35					0.6					
	19	SS	24-17/21-22	10/2.0	0.8					
					2.0			CLAYEY SILT, gray, wet, soft, no odor present.		SM
	20	SS	10-7/7-10	1.0/2.0	0.9			No recovery.		
					1.3		1240	SILTY CLAY, gray, wet, hard, no odor present.		CH
40								Bottom of boring @ 40.0 ft. bgs.		

WELL CONSTRUCTION



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MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
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PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 114S

SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/22/2016
NORTHING: 769203.8574 **EASTING:** 977244.4775

SURFACE ELEVATION: 1279.400 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1279.15 ft.
TOTAL DEPTH: 18 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/22/2016
APPROX. DEPTH TO WATER: approx. 9 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	N/A	1.5/2.0				No recovery.		
					1.1			SAND, brown, few gravel, less than 3-inch, poorly graded, soft, dry, no odor present.		SP
					0.8					
	2	SS	N/A	1.5/2.0				No recovery.		
					1.1			SAND, brown, few gravel, less than 3-inch, poorly graded, soft, dry, no odor present.		SP
	3	SS	N/A	0.5/2.0				No recovery.		
							1275			
					1.5			SAND, gray, little gravel, less than 3-inch, poorly graded, dry, no odor present.		SP
5					2.2			SANDY GRAVEL, brown, less than 3-inch, dry, no odor present.		GW
	4	SS	N/A	1.0/2.0				No recovery.		
					0.8			SAND, gray, little gravel, less than 3-inch, poorly graded, dry, no odor present.		SP
					2.5			SAND, brown, little gravel, poorly graded, dry, no odor present.		SP
	5	SS	N/A	0.5/2.0				No recovery.		
					1.1			SAND, brown, little gravel, less than 3-inch, poorly graded, soft, moist, no odor present.		SP
							1270			
					1.4					SP
10	6	SS	N/A	0.0/2.0				No recovery.		

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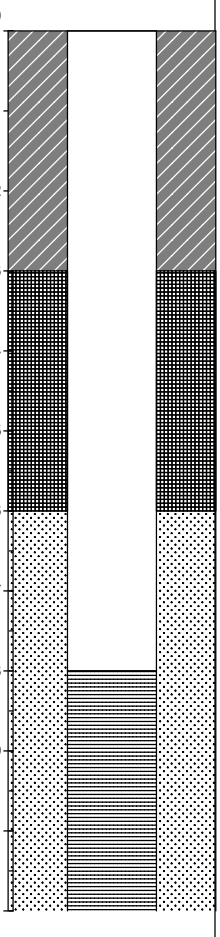

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Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
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NOTES:

BORING LOG

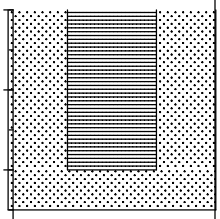
BORING/WELL ID: MW - 114S

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/22/2016
NORTHING: 769203.8574 **EASTING:** 977244.4775

SURFACE ELEVATION: 1279.400 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1279.15 ft.
TOTAL DEPTH: 18 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/22/2016
APPROX. DEPTH TO WATER: approx. 9 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
					0.8			SAND, brown, little gravel, less than 3-inch, poorly graded, soft, moist, no odor present.		SP
					0.6					
	7	SS	N/A	1.0/2.0	10.2			GRAVEL, gray, less than 3-inch,some sand, wet, slight odor present.		GW
					15.6					
	8	SS	N/A	2.0/2.0	1.1		1265			
15					2.3					
					8.6					
	9	SS	N/A	2.0/2.0	1.3					
					5.6			SILTY CLAY, gray, wet, soft, no odor present.		CH
					4.6					
								Bottom of boring @ 18.0 ft. bgs.		

WELL CONSTRUCTION



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MOISTURE:
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moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

PLASTIC SOILS DENSITY:
0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 115D

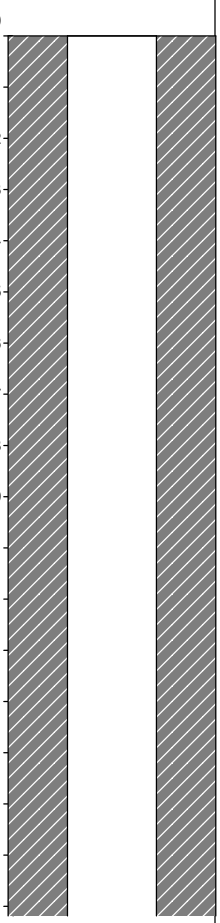
SHEET 1 OF 3

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Conventional, Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 9/29/16
NORTHING: 769212.7919 **EASTING:** 977155.0166

SURFACE ELEVATION: 1279.510 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1279.03 ft. (top of casing)
TOTAL DEPTH: 42 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/29/16
APPROX. DEPTH TO WATER: 9 ft. bgs.

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	1/5-5	1.0/2.0	1.1			No recovery.		
					0.8			SAND, black brown, little gravel, poorly graded, coarse, no odor present.		SP
	2	SS	12-5/6-6	1.0/2.0	0.9			No recovery.		
					1.4			SAND, brown, few gravel, less than 3-inch, poorly graded, no odor present.		SP
	3	SS	11-5/12-16	1.5/2.0	0.6					
					18.2		1275	SAND, brown, few gravel, less than 3-inch, poorly graded, strong odor present.		SP
5					55			SAND, brown, few gravel, less than 3-inch, poorly graded, strong odor present.		SP
	4	SS	19-18/19-18	1.5/2.0	2.1					
					2.1			SAND, brown, few gravel, less than 3-inch, poorly graded, coarse, loose, no odor present.		SP
	5	SS	6-7/12-11	1.0/2.0	1.6					
					1.1					
					1.3					
					1.6		1270	SAND, brown, few gravel, less than 3-inch, moist, poorly graded, coarse, loose, no odor present.		SP
10	6	SS	3-10/15-15	1.0/2.0	0.7			No recovery.		
					25.2			SAND, gray, few gravel, wet, well graded, coarse, loose, slight odor present.		SW
	7	SS	8-9/9-12	1.0/2.0	20.6					
					19.8			No recovery.		
					30.7			SANDY GRAVEL, gray, less than 3-inch, wet, poorly graded, slight odor present.		SP
	8	SS	10-15/16-17	1.0/2.0	1.1		1265	No recovery.		
15					3.1			SANDY GRAVEL, gray, less than 3-inch, wet, poorly graded, slight odor present.		SP
	9	SS	17-19/15-15	1.5/2.0	2.2			SAND, gray, fine, wet, soft, loose, no odor present.		SP
					2.9			No recovery.		

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

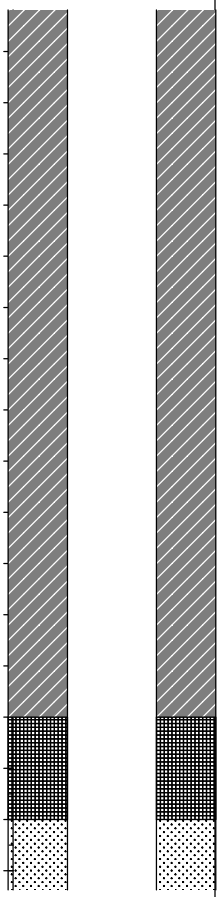
BORING/WELL ID: MW - 115D

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Conventional, Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 9/29/16
NORTHING: 769212.7919 **EASTING:** 977155.0166

SURFACE ELEVATION: 1279.510 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1279.03 ft. (top of casing)
TOTAL DEPTH: 42 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/29/16
APPROX. DEPTH TO WATER: 9 ft. bgs.

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
					1.6			SAND, gray, fine, wet, soft, loose, no odor present.		SP
	10	SS	N/A	1.0/2.0	1.7			SILTY CLAY, gray, wet, firm, no odor present.		CH
					1.3			No recovery.		
20							1260	SILTY CLAY, gray, wet, firm, no odor present.		CH
	11	SS	N/A	1.0/2.0	1.3					
					0.6			CLAYEY SILT, gray, wet, soft, loose, no odor present.		ML
	12	SS	8-10/12-12	1.0/2.0	1.4			No recovery.		
								SILTY CLAY, gray, wet, firm, no odor present.		CH
	13	SS	18-12/12-12	2.0/2.0			1255			
25										
	14	SS	10-10/16-16	5.5/2.0	1.1					
					0.8					
					0.0					
	15	SS	14-14/19-20	0.0/2.0	0.9					
					1.3					
					1.2		1250			
30	16	SS	25-19/22-20	0.0/2.0				No recovery.		
					0.9			SILTY CLAY, gray, wet, soft, no odor present.		CH
					2.1					
	17	SS	16-16/9-8	0.0/2.0	1.3					
					1.0					
					0.7					
	18	SS	20-17/19-22	1.0/2.0	1.7			SANDY SILT, gray, soft, loose, wet, no odor present.		SM
							1245			

WELL CONSTRUCTION



LEGEND:
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bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY:
0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

PLASTIC SOILS DENSITY:
0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

MOISTURE:
dry
moist
wet

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 115D

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Conventional, Hollow Stem Auger, Drive and Wash
SAMPLING METHOD: Split Spoon
START DATE: 9/29/16
NORTHING: 769212.7919 **EASTING:** 977155.0166

SURFACE ELEVATION: 1279.510 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1279.03 ft. (top of casing)
TOTAL DEPTH: 42 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/29/16
APPROX. DEPTH TO WATER: 9 ft. bgs.

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL	WELL CONSTRUCTION
35					2.0		1245				35
					0.8						36
	19	SS	24-17/21-22	2.0/2.0	0.6						37
					1.6						38
					0.8						39
	20	SS	10-7/7-10	1.0/2.0	0.7						40
					1.1						
					1.7		1240				
40					6.3			CLAYEY SILT, gray, soft, loose, wet, no odor present.		ML	41
								SILTY CLAY, gray, firm, wet, no odor present.		CH	42
								Bottom of boring @ 42.0 ft. bgs.			

SOILS: TYPE, color, secondary type, moisture, density/consistency, secondary structure general descriptors.
ROCK: rock type, hardness, major mineral types, color, weathering, and degree of fracturing

LEGEND:
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bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 116S

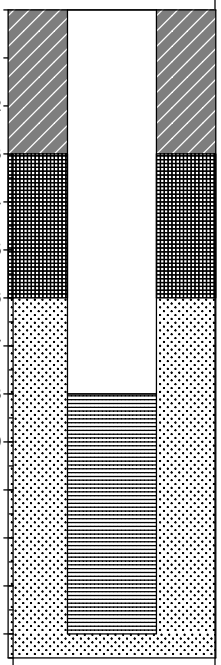
SHEET 1 OF 1

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/21/2016
NORTHING: 769162.3866 **EASTING:** 977173.3185

SURFACE ELEVATION: 1279.280 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.91 ft.
TOTAL DEPTH: 16 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/21/2016
APPROX. DEPTH TO WATER: approx. 9 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0							0			
	1	SS	N/A	1.5/2.0				No recovery		
					1.1			SAND, brown, few gravel, poorly graded, coarse, no odor present.		SP
	2	SS	N/A	1.5/2.0	1.0			No recovery.		
					0.8			SAND, brown, few gravel, poorly graded, coarse, no odor present.		SP
					0.4			No recovery.		
	3	SS	N/A	0.5/2.0	1.1					
5					0.7		-5	SAND, brown, few gravel, poorly graded, coarse, no odor present.		SP
	4	SS	N/A	1.0/2.0	1.8			SANDY GRAVEL, brown, less than 3-inch, well graded, no odor present.		SW
					1.6					
	5	SS	N/A	0.5/2.0				No recovery.		
					0.6			SAND, brown, few gravel, moist, poorly graded, no odor present.		SP
10	6	SS	N/A	0.0/2.0	1.3		-10	No recovery.		
					1.1			SAND, brown, few gravel, moist, poorly graded, no odor present.		SP
	7	SS	N/A	1.0/2.0	3.3			No recovery.		
					75.6			SANDY GRAVEL, gray, less than 3-inch, poorly graded, wet, odor present.		GP
					80.1					
	8	SS	N/A	2.0/2.0	25.6			SANDY SILT, gray, some clay, poorly graded, wet, slight odor present.		ML
15					30.2		-15	SILTY CLAY, gray, wet, firm, slight odor present.		CH
								Bottom of boring @ 16.0 ft. bgs.		

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
ND = not detected
NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

BORING/WELL ID: MW - 117S

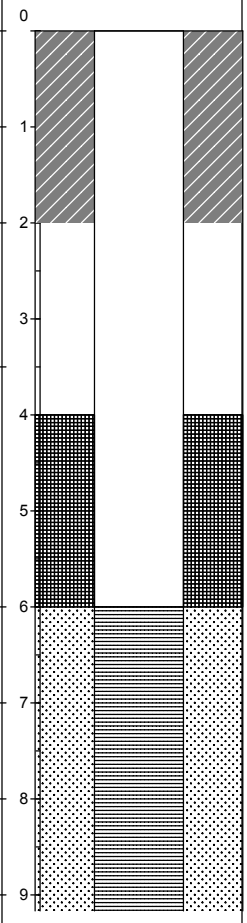
SHEET 1 OF 2

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/28/2016
NORTHING: 769220.9783 **EASTING:** 977359.8479

SURFACE ELEVATION: 1278.400 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.14 ft.
TOTAL DEPTH: 16 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/28/2016
APPROX. DEPTH TO WATER: approx. 9 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
0										
	1	SS	5-6/5-7	1.0/2.0	1.1			No recovery.		
					6.8			SAND, brown, little gravel, less than 3-inch, poorly graded, coarse, dry, no odor present.		SP
	2	SS	5-2/5-5	0.5/2.0				No recovery.		
							1275			
					1.1			SAND, brown, little gravel, less than 3-inch, poorly graded, coarse, dry, no odor present.		SP
	3	SS	11-11/14-14	2.0/2.0	1.2					
					0.9					
5					1.4					
					0.3					
	4	SS	8-9/12-16	1.0/2.0	0.3			No recovery.		
					0.7			SAND, brown, few gravel, less than 3-inch, poorly graded, loose, dry, no odor present.		SP
	5	SS	5-8/7-8	1.0/2.0				No recovery.		
							1270			

WELL CONSTRUCTION



LEGEND:
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ND = not detected
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SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

BORING LOG

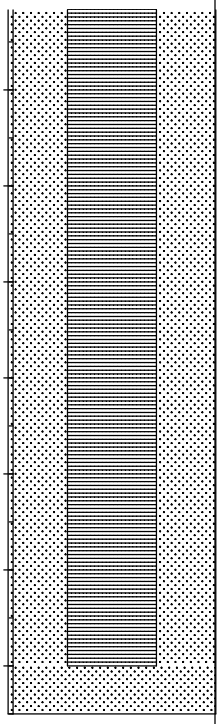
BORING/WELL ID: MW - 117S

PROJECT NAME: Dow Jamestown
LOCATION: Jamestown, NY
PROJECT NUMBER: 674604.01.05
CLIENT: Essex Specialty Products, Inc.
DRILLING CONTRACTOR: Parratt Wolff Inc.
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon
START DATE: 9/28/2016
NORTHING: 769220.9783 **EASTING:** 977359.8479

SURFACE ELEVATION: 1278.400 ft.
MEASURING POINT: Top of Casing
MEASURING POINT ELEVATION: 1278.14 ft.
TOTAL DEPTH: 16 ft. bgs
FOREMAN:
DRILLING EQUIPMENT:
CH2M OBSERVER: Fred Roche
FINISH DATE: 9/28/2016
APPROX. DEPTH TO WATER: approx. 9 ft. bgs

DEPTH (FT. BGS)	SAMPLE OR RUN DESIGNATION	SAMPLE TYPE	BLOWS PER 6 INCHES or CORE RUN (time/ft.)	RECOVERY/ PENETRATION (FT.)	PID	FID	ELEVATION (ft. MSL)	MATERIALS DESCRIPTION	GRAPHICAL LOG	USCS GROUP SYMBOL
					5.6			SAND, black brown, few gravel, less than 3-inch, poorly graded, wet, odor present.		SP
					182					
10	6	SS	5-7/6-7	1.0/2.0				No recovery.		SP
					95			GRAVEL, brown, less than 3-inch, some sand, some black gravel, wet, strong odor present.		GP
					282					
	7	SS	7-9/16-2	1.5/2.0				No recovery.		
					250			SAND, brown, few gravel, wet, poorly graded, strong odor present.		SP
					101		1265	GRAVEL, brown, less than 3-inch, some sand, some black gravel, wet, strong odor present.		GP
	8	SS	11-11/8-8	1.5/2.0				No recovery.		
					15.1			SILT, gray, some gravel, wet, slight odor present.		ML
15					10.2			SILTY CLAY, gray, firm, wet, no odor present.		CH
					2.3					
								Bottom of boring @ 16.0 ft. bgs.		

WELL CONSTRUCTION



LEGEND:
msl = mean sea level
bgs = below ground surface
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NM = not measured
N/A = not applicable

SAMPLE TYPES:
D: drive
W: washed
ST: Shelby Tube
A: Auger
HA: hand auger
C: cored
RC: rotasonic core

SOIL: GRANULAR SOILS DENSITY: PLASTIC SOILS DENSITY:

MOISTURE:
dry
moist
wet

0-4: very loose
5-10: loose
11-29: medium dense
30-49: dense
50+: very dense

0-2: very soft
3-4: soft
5-8: medium soft
9-15: stiff
16-30: very stiff
>30: hard

PROPORTIONS:
Trace: <5% Few: 16-30%
Little: 6-15% Some: 31-49%

Density designation based on blow counts for each 12" of penetration using a 140 lb. hammer w/30" drop
When blow counts were not possible, density descriptions, as included in the "Materials Description" are based upon a thumb penetration test

NOTES:

Appendix F
Excavation Work Plan

APPENDIX F

Excavation Work Plan

If future remedial actions at the Essex/Hope site (the Site) in Jamestown, New York (Site No. 907015) involve onsite or offsite excavation, this Excavation Work Plan (EWP) will be implemented. The associated Remedial Action Work Plan (RAWP) will be used in conjunction with this EWP and will provide additional details, as applicable, regarding soil screening and staging methods; materials excavation, transportation, reuse and/or disposal; fluids management; and asphalt and concrete covers restoration.

F.1 Notification

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Table 1-1 of the SMP includes contact information for the above notification. The information in Table 1-1 will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B, *List of Site Contacts*.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site regrading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of constituents of concern, potential presence of grossly contaminated media, and plans for any preconstruction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 *Code of Federal Regulations* (CFR) § 1910.120;
- A copy of the contractor's health and safety plan in electronic format;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

F.2 Soil Screening Methods

Visual, olfactory, and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils will be segregated based on previous environmental data and screening results into material that requires offsite disposal and material that requires testing to determine if the material can be reused

onsite as soil beneath a cover or if the material can be used as cover soil. Further discussion of offsite disposal of materials and onsite reuse is provided in Sections F.6 and F.7 of this EWP.

F.3 Soil Staging Methods

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters, and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC.

F.4 Materials Excavation and Load-out

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate federal, state, local, and New York State Department of Transportation requirements (and all other applicable transportation requirements).

A truck wash will be operated onsite, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete truck wash waters will be collected and disposed of offsite in an appropriate manner.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of offsite soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

F.5 Materials Transport Offsite

All transport of materials will be performed by licensed haulers in accordance with appropriate federal, state, and local regulations, including 6 *New York Codes, Rules, and Regulations* (NYCRR) Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes will be determined and described in the corresponding RAWP developed for any future remedial actions involving excavation. All trucks loaded with site materials will exit the vicinity of the Site using only these approved truck routes. The most appropriate route will take into account: (a)

limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting offsite queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed onsite in order to minimize offsite disturbance. Offsite queuing will be prohibited.

F.6 Materials Disposal Offsite

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, state (including 6 NYCRR Part 360), and federal regulations. If disposal of material from this Site is proposed for unregulated offsite disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated offsite management of materials from this Site will not occur without formal NYSDEC approval.

Offsite disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the corresponding Periodic Review Report (PRR). This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading, and facility receipts.

Nonhazardous historical fill and contaminated soils taken offsite will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Unrestricted Soil Cleanup Objectives (SCOs) is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

F.7 Materials Reuse Onsite

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain onsite. Contaminated onsite material, including historical fill and contaminated soil, that is acceptable for reuse onsite will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse onsite will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing onsite will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused onsite.

F.8 Fluids Management

All liquids to be removed from the Site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, state, and federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, and will be managed offsite, unless prior approval is obtained from the NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream, or river) will be performed under a State Pollution Discharge Elimination System permit.

F.9 Cover System Restoration

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the associated RAWP. The existing cover system comprises a minimum of 3.5 inches of asphalt and 8 inches of concrete. The demarcation layer, consisting of 6-ounce geotextile Typar 3601 or equal will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the corresponding PRR and in an updated SMP.

F.10 Backfill from Offsite Sources

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR § 375-6.7(d). Soils that meet “exempt” fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by the NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

F.11 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

F.12 Excavation Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (Target Analyte List metals; Target Compound List [TCL] volatiles and semivolatiles, TCL pesticides, and polychlorinated biphenyls), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the corresponding PRR.

F.13 Community Air Monitoring Plan

A figure showing the location of air sampling stations based on generally prevailing wind conditions will be included in the associated RAWP. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the Community Air Monitoring Plan will be reported to the NYSDEC and NYSDOH Project Managers.

F.14 Odor Control Plan

The odor control plan is capable of controlling emissions of nuisance odors offsite and onsite. Specific odor control methods to be used on a routine basis will be defined and detailed in the associated RAWP. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. The NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the corresponding PRR.

All necessary means will be employed to prevent onsite and offsite nuisances. These measures may include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to onsite conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

F.15 Dust Control Plan

A dust suppression plan that addresses dust management during invasive onsite work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated onsite water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

- Gravel will be used on roadways to provide a clean and dust-free road surface.
- Onsite roads will be limited in total area to minimize the area required for water truck sprinkling.

F.16 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work. A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

Appendix G
Quality Assurance Project Plan

Quality Assurance Project Plan, Site Management Plan, Essex-Hope Site, Jamestown, New York

Prepared for

Essex Specialty Products, Inc.

December 2017

ch2m

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Appendix

A Analytical Method Requirements

Acronyms and Abbreviations

µg/L	micrograms per liter
%R	percent recovery
°C	degrees Celsius
ASTM	American Society for Testing and Materials
CFR	*Code of Federal Regulations*
CH2M	CH2M HILL Engineers, Inc.
CLP	Contract Laboratory Program
CoC	chain-of-custody
DQO	data quality objective
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
FTL	field team leader
HCl	hydrochloric acid
ID	identification
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LIMS	Laboratory Information Management System
MDL	method detection limit
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NELAP	National Environmental Laboratory Accreditation Program
NYSDEC	New York State Department of Environmental Conservation
oz	ounce
PDF	portable document format
PM	project manager
QA	quality assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	quality control
RAO	remedial action objective
RL	reporting limit

ROD	Record of Decision
RPD	relative percent difference
RRF	relative response factor
Site	Essex/Hope Site
SMP	Site Management Plan
SOP	standard operating procedure
SOW	scope of work
VOC	volatile organic compound

SECTION 1

Project Management

This document presents the project-specific Quality Assurance Project Plan (QAPP) for routine monitoring being conducted at the Essex-Hope State Superfund site located at 125 Blackstone Avenue in Jamestown, New York (Site) in accordance with the Site Management Plan (SMP).

This QAPP has been prepared to provide the guidelines and procedures for implementing the analytical and field activities performed at the Site. This QAPP has been prepared in accordance with the U.S. Environmental Protection Agency's (EPA's) *Requirements for Quality Assurance Project Plans* (EPA, 2001).

This document specifies the policies, objectives, organization, functional activities, and quality assurance (QA) and quality control (QC) criteria designed to achieve data quality objective (DQO) goals of the field sampling and ensuing analytical laboratory support for the Site. This QAPP complements the project-specific work plan prepared separately (CH2M HILL Engineers, Inc. [CH2M], 2016) to provide a more-detailed understanding of the scope of work (SOW) and additional guidance on field procedures and protocols.

1.1 Project Objectives and Background

1.1.1 Site Description

The project objectives and background are provided in detail in Section 2, *Summary of Previous Investigations and Remedial Actions*, of the SMP.

1.1.2 Site History

The site history is provided in detail in Section 2 of the SMP.

1.1.3 Remedial Actions

The historical remedial actions taken at the site are provided in Section 2.3 of the SMP.

1.2 Project/Task Description

The investigation monitoring and sampling plan are provided in detail in Section 4, Monitoring and Sampling Plan, of the SMP.

1.3 Project Task/Organization

The project organization and responsibilities are presented Appendix B, *List of Site Contacts*, of the SMP.

1.3.1 Contract Laboratories

The selected laboratories are responsible for analyzing samples collected during field activities, in accordance with the QAPP, the laboratory's quality assurance manual (QAM), and the referenced methods. The laboratory project manager (PM) or client service manager acts as a liaison between the project chemist, the field and laboratory operations, and is responsible for the following:

- Receipt of sample custody from the field team members, verification of sample integrity, and transfer of sample fractions to the appropriate analytical departments
- Coordination of sample analyses to meet project objectives

- Preparation of analytical reports
- Review of laboratory data for compliance with method requirements
- Review of any QC deficiencies reported by the analytical department manager
- Coordination of necessary changes
- Completion of data package deliverables
- Communication with the project chemist pertaining to analytical and QC issues
- Response to questions from the project team during the data quality evaluation process

1.3.2 Subcontractors

Subcontractors may be used for any of the activities in the QAPP and are required to read and understand this document. These potential subcontractor activities will be addressed in the project-specific work plans.

1.4 Special Training Requirements/Certification

CH2M personnel engaged in field activities will have completed the Occupational Safety and Health Administration 40-hour health and safety training that meets the requirements of 29 *Code of Federal Regulations* (CFR) § 1910.120 and 8 CFR § 5192 and will have completed a site-specific safety training orientation with the CH2M technical or compliance managers. Subcontracted personnel will be notified by the health and safety manager on what requirements need to be met prior to sampling. Subcontracted project personnel will read the project-specific health and safety plan. Documentation will be maintained to demonstrate that requirements of the plan are followed.

Subcontracted laboratories and lower-tiered subcontracted laboratories participating in analytical services will be certified by the National Environmental Laboratory Accreditation Program (NELAP) and the state of New York for the requested parameters. The laboratory managers will be responsible for ensuring personnel have been properly trained and are qualified to perform their assigned tasks.

SECTION 2

Data Quality Indicators

2.1 Data Precision, Accuracy, Comparability, Completeness, and Sensitivity

Field QA/QC samples and laboratory internal QA/QC samples will be collected and analyzed to assess the data's usability. The laboratory's standard operating procedures (SOPs) provide acceptance criteria for precision and accuracy requirements for these QC samples to assess their usability. Completeness is the percentage of usable data obtained during the sampling event, and its acceptance criteria is project-specific.

2.1.1 Precision

Precision is a measure of reproducibility of analytical results. It can be defined as the degree of mutual agreement among individual measurements obtained under similar conditions. Total precision is a function of the variability associated with both sampling and analysis.

Precision of laboratory analysis will be assessed by comparing the analytical results between the laboratory control sample (LCS)/laboratory control sample duplicates (LCSDs), matrix spike (MS)/matrix spike duplicates (MSDs), and laboratory duplicates. The precision of the field sampling procedures will be assessed by reviewing field duplicate sample results. The relative percent difference (RPD) will be calculated for the duplicate samples using the following equation:

$$RPD = \{(S - D)/[(S + D)/2]\} \times 100$$

Where: S = First sample value (original value)
D = Second sample value (duplicate value)

A control limit of ± 30 percent for the RPD will be used for original and field duplicate concentrations greater than five times the reporting limit (RL) in water matrices. A control limit of ± two times the RL will be used for waters and ± four times the RL for soil when concentrations are reported as less than five times the RL.

A control limit ± 20 percent will be used for LCS/LCSD and MS/MSD precision criteria in water matrices associated with organic analyses. A control limit of ± 20 percent for both water and soil matrices will be used for inorganic analyses.

A control limit of ± 20 percent for water will be used for laboratory duplicate concentrations greater than five times the RL. A control limit of ± the RL for water and ± two times the RL for soil will be used when concentrations are less than five times the RL.

2.1.2 Accuracy

Accuracy is of the degree of agreement between an observed value and a "true" value (correctness) and includes a combination of the random error (precision) and systematic error (bias) components that result from the sampling and analytical procedures. It reflects the total error associated with a measurement. A measurement is considered accurate when the reported value agrees with the true value or known concentration of the spike or standard within acceptable limits.

Accuracy of laboratory results will be assessed for compliance with the established QC criteria using the analytical results of method blanks/field blanks, reagent/preparation blanks, LCS/LCSD samples, MS/MSD samples, and surrogate spikes. Laboratory results accuracy will be assessed for compliance with the established QC criteria described in the SOPs. The percent recovery (%R) of LCSs will be calculated using the following equation:

$$\%R = (A/B) \times 100$$

Where: A = The analyte concentration determined experimentally from the LCS
B = The known amount of concentration in the sample

The accuracy criteria for the QA/QC samples are those stated in Appendix A.

2.1.3 Completeness

The data completeness of laboratory analyses results will be assessed for compliance with the amount of data required for decision making. Complete data are data that are not rejected for projected use. Data qualified with qualifiers such as a "J" or a "UJ" are still deemed acceptable and can still be used to make project decisions. The completeness of the analytical data is calculated using the following equation:

$$\% \text{ Completeness} = [(\text{Valid data obtained}) / (\text{Total data planned})] \times 100$$

The completeness goal is 95 percent for aqueous samples.

2.1.4 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent facility conditions, and depends on sampling and analytical variability and the variability of environmental media at the facility. Representativeness is a qualitative "measure" of data quality.

The goal of achieving representative data in the field starts with a properly designed and executed sampling program that carefully considers the overall DQOs for the project. Proper location controls and sample handling are critical to obtaining representative samples.

The goal of achieving representative data in the laboratory is measured by assessing accuracy and precision. A laboratory will provide representative data when all the analytical systems are in control; therefore, representativeness is a redundant DQO for laboratory systems if proper analytical procedures are followed and holding times are met.

In addition, laboratories must demonstrate that the laboratory staffs are qualified to perform the analyses, are certified, and are proficient with analytical methods being employed.

2.1.4.1 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability is a qualitative "measure" of data quality.

The goal of achieving comparable data in the field starts with a properly designed and executed sampling program that carefully considers the overall DQOs for the project. Proper location controls and sample handling are critical to obtaining comparable samples.

The goal of achieving comparable data in the laboratory is measured by assessing accuracy and precision. A laboratory will provide comparable data when all the analytical systems are in control; therefore, comparability is a redundant DQO for laboratory systems if proper analytical procedures are followed and holding times are met.

2.1.4.2 Sensitivity

Sensitivity is defined as the ability of the method or instrument to detect the constituent of concern and other target compounds at the level of interest. Appropriate sampling and analytical methods that have method detection and quantification limits that support the achievement of the desired sensitivity and established performance criteria will be selected.

2.2 Method Detection Limits and Reporting Limits

2.2.1 Method Detection Limits

The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Each participating laboratory will determine the MDL for each method, matrix, and analyte for each instrument that will be used to analyze samples. The MDLs will be initially determined before analyzing samples, and will be verified at least annually in accordance with NELAP requirements.

2.2.2 Reporting Limits

RLs should be greater than two times the calculated MDL. RLs used by the laboratory should not be greater than the detection limit objectives presented in Appendix A.

Analytes that are not detected greater than the RL will be reported as not detected at the RL and flagged "U". Detects below the RL (but above the MDL) will be reported with the appropriate laboratory flag/qualifier ("J").

RLs, as well as sample results shall be reported to two significant figures if less than 10 and to three significant figures otherwise. RLs shall be reported on a dry-weight basis for soil samples.

SECTION 3

Data Generation and Acquisition

This section describes the procedures for collection, handling, measurement, data acquisition, and management activities to be performed in support of field investigations. It addresses the following aspects of measurement and data acquisition:

- Sampling process design
- Sampling method requirements
- Sample handling and custody requirements
- Analytical method requirements
- QC requirements
- Instrument and equipment testing, inspection, and maintenance requirements
- Instrument calibration and frequency
- Inspection and acceptance requirements for supplies and consumables
- Data acquisition requirements
- Field and laboratory instrument and equipment testing, inspection, and maintenance requirements
- Data management

3.1 Measurement Performance Criteria

Each measurement performance criterion is checked on several levels, as follows:

- Built-in QC standards
- Senior review
- Management controls

The measurement data will be given specific QC standards by which they must abide. If these standards are not met, the data will be qualified. The analytical data and the QC results will be checked by the bench chemist, the laboratory's QA manager, and a CH2M data validator.

3.2 Senior Review/Management Controls

All documents that pertain to the quality standards of the project are drafted by and reviewed internally by CH2M personnel with relevant technical experience. While performing field sampling activities, the field team leader (FTL) will supervise activities to assess if SOPs are being followed. Specific QC checks and corrective action measures for the data are described in Appendix A.

3.3 Sampling Process Design and Rationale

Project-specific sampling plans will be developed following the logical process provided in EPA's *Guidance on Systemic Planning using the Data Quality Objective Process* (EPA, 2006). The sampling design is a function of the matrix sampled, information about the sampling site, the type of data to be collected, and how the data are to be used. These sampling plans will be incorporated into the site work plan.

3.3.1 Sampling Method Requirements

Sampling methods are described in the work plan. Detailed SOPs for the common methods have been prepared and are in the work plan. These SOPs include instructions for the following procedures:

- Field parameter measurement
- Surface soil sample collection
- Subsurface soil sample collection
- Water sample collection
- Decontamination and cleaning of sampling equipment

3.4 Sample Handling and Custody Requirements

3.4.1 Sample Handling, Preservation, Transportation, and Storage Procedures

Laboratories will provide the required sample containers for all environmental and associated QC samples. Containers will be certified free of the analytes of concern for this project. No sample containers will be reused. The contract laboratory will add preservatives, if required, before shipping the sample containers to the field. Upon receipt of the samples, the laboratory will verify the adequacy of the preservation and add additional preservatives if necessary. Adjustments made by the laboratory will be documented on the appropriate sample receipt forms and noted in the case narrative. The analytical methods, sample containers, minimum quantities, required preservatives, and maximum holding times for select parameters are shown in Table 3-1. Extraction and preparatory methods are shown in Table 3-2.

Table 3-1. Required Analytical Method, Sample Containers, Preservation, and Holding Times
Essex-Hope Site, Jamestown, New York

Analyses	Analytical Method	Sample Matrix [a]	Container [b]	Qty	Preservative [c]	Holding Time [d]
VOCs	SW-846 8260C	W	40-mL, glass	3	HCl, pH<2; cool to 4°C	14 days
		S	5 g–Encore or equivalent sampling technique	3	Cool 4°C	48 hours from collection to preservation, 14 days to analysis
pH	SW-846 9040C/ 9045D	W	250-mL polyethylene	1	Cool 4°C	Within 24 hours of sample receipt
		S	4-oz glass	1	Cool 4°C	Within 7 days of sample collection

Notes:

Sample container, and volume requirements will be specified by the analytical laboratory performing the tests.

Three times the required volume should be collected for samples designated as MS/MSD samples.

[a] Sample matrix: S = surface soil, subsurface soil; W = surface water

[b] All containers will be sealed with Teflon-lined screw caps.

[c] All samples will be stored promptly at 4°C in an insulated chest.

[d] Holding times are from the time of sample collection.

°C = Degrees Celsius
ASTM = American Society for Testing and Materials
HCl = hydrochloric acid
mL = milliliter
NA = not applicable
oz = ounce
VOC = volatile organic compound

Table 3-2. Extraction and Digestion Methods
Essex-Hope Site, Jamestown, New York

Analytical Method	Parameter	Preparatory Methods
SW8260C	VOCs (water and soil)	SW5030C, SW5035

Sample containers should be received from the laboratory pre-labeled with the preservative. The sample identification (ID), and date and time of sampling will be entered on the label immediately after collection. The labels must be secured using clear tape to maintain the identification of each sample.

3.4.2 Transport

Sample coolers will be transported to the laboratory (an overnight courier may be used) immediately after sample collection. Intermediate stops should be avoided, with the exception of emergencies only, in which case the situation should be noted in the field notebooks. The laboratory should be notified that samples are being shipped.

3.4.2.1 Sample Packaging

Sample packaging and shipping procedures are designed to ensure the samples will arrive intact at the laboratory, along with the chain-of-custody (CoC) forms. Samples will be batched according to their analytical groups and sample locations in a manner to prevent cross-contamination of other samples. The procedures used to pack and ship samples are addressed in the field SOPs.

3.4.2.2 Shipping Airbills

If samples are shipped, airbills will be retained to provide a record for sample shipment to the laboratory. Completed airbills will accompany shipped samples to the laboratory and will be forwarded along with data packages. The airbill number will be documented on the CoC form accompanying the samples to the laboratory for sample tracking purposes. Airbills will be kept as part of the data packages in the project files.

3.5 Sample Custody

Sample custody is necessary to provide relevant and defensible data. Custody is addressed during field sample collection, data analyses in the laboratory, and through proper handling of project files. Persons will have custody of samples when samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured to prevent tampering. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

CoC forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. Field personnel designated as responsible for sample custody will fill out CoC forms at each sampling location, at a group of sampling locations, or at the end of each day of sampling. Whenever possible, sample tags and CoC forms will be produced by the project database management system. If the designated sampling person relinquishes samples to other sampling or field personnel, CoC forms will be signed and dated by the appropriate personnel to document the sample transfer. Original CoC forms will accompany samples to the laboratory, and copies will be forwarded to the project files. At a minimum, the CoC form must include the following:

- Site name
- Project manager name, telephone number, and fax number
- Unique sample ID
- Date and time of sample collection

- Source of sample (including name, location, sample type, and matrix)
- Number of containers
- Designation of MS/MSD
- Preservative used
- Analyses required
- Name of sampler
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratories
- Bill of lading or transporter tracking number (if applicable)
- Turnaround time
- Laboratory name, address, and contact information
- Any special instructions

Erroneous entries on CoC records will be corrected by drawing a single line through the error and entering the corrected information. The person performing the correction will date and initial each change made on the CoC form.

3.5.1 Field Custody

CoC forms will be required for all samples. The sampling crew in the field will initiate CoC forms. CoC forms will contain the sample's unique ID number, sample date and time, sample description, sample type, preservation (if any), and analyses required. Original CoC forms, signed by the sampling crew, will accompany the samples to the laboratory. A copy of relinquished CoC forms will be retained with the field documentation. CoC forms will remain with the samples at all times. Samples and signed CoC forms will remain in the possession of the sampling crew until samples are delivered to the express carrier (e.g., FedEx), or hand delivered to the laboratory, or placed in secure storage.

3.5.2 Laboratory Sample Custody

Laboratory custody procedures will be in place to ensure the integrity of sample and laboratory-produced data handling. Laboratory custody procedures are defined in their individual laboratory SOPs regarding sample custody.

3.5.2.1 Laboratory Sample Receipt

Upon sample receipt, the laboratory sample custodian will verify package seals, open the packages, check temperature blanks (and record temperatures), verify sample integrity, and inspect contents against CoC forms. Inspection procedures and corrective actions shall be in compliance with the laboratory's SOPs. The occurrence of any anomalies in the received samples and their resolution will be documented in laboratory records. The PM will be contacted to resolve any discrepancies between sample containers and CoC forms.

Along with sample receipt documentation, the following information will be documented on sample receipt forms by the sample custodian:

- Date samples received
- Temperature
- CH2M sample ID
- Laboratory sample ID
- Analytical tests requested for the sample batch
- Sample matrix
- Number of samples in the batch
- Container description and location in the laboratory
- Verification of sample preservation

Sample receipt documentation must be submitted to the project chemist within 48 hours of sample receipt.

Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. **Samples not analyzed in accordance with the requirements in this QAPP will be re-sampled and analyzed at no additional cost to CH2M.** Ideally, sample custody will be maintained using an internal custody system that requires samples to be kept in a secured and restricted area when not in use and to be checked out and checked back in by the analysts who use the samples. Internal custody records must be maintained by the laboratory as part of the documentation file for each sample. Specific instructions concerning the analysis specified for each sample will be communicated to the analysts. Analytical batches will be created, and laboratory QC samples will be introduced into each batch.

3.5.2.2 Laboratory Sample Storage

After the laboratory labels the samples, they will be stored in compliance with their SOP for sample storage. No samples or extracts will be disposed of without prior written approval from an appropriate member of the project team. The sample custodian will note sample disposal date in the sample ledger. The laboratory will dispose of samples in accordance with applicable regulations. The laboratory will be required to retain the sample for a minimum of 90 days and sample extracts for a minimum of 60 days after submission, pending the need for reanalysis.

3.5.2.3 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and document important aspects of the work, including associated quality controls. As such, all logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory. In addition, relevant information will be entered into the Laboratory Information Management System (LIMS) at the time information is generated.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Lining out unused portions and initialing by the person lining out the page will complete pages of logbooks that are not used.

The analyst will record information regarding the sample, analytical procedures performed, and results on laboratory forms or personal notebook pages and enter this information in LIMS. These notes will be dated and will also identify the analyst, instruments used, and instrument conditions.

Sufficient raw data records must be retained to permit reconstruction of initial instrument calibrations (e.g., calibration date, test method, instrument, analysis date, each analyte name, concentrations and responses, calibration curves, response factors, or unique equations or coefficients used to reduce instrument responses into concentrations).

Laboratory notebooks will be reviewed periodically by the laboratory group leaders for accuracy, completeness, and compliance with this QAPP. The laboratory group leader will verify all entries and calculations. If all entries on the pages are correct, the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

3.5.2.4 Laboratory Project File

Documentation will be placed in a single, secured project file that will be maintained by the laboratory PM. This file will consist of the following components, all filed chronologically:

- Agreements
- Correspondence
- Memorandums
- Notes and data

Reports (including QA reports) will be filed with correspondence. Analytical laboratory documentation and field data will be filed with notes and data. Filed materials may only be removed by authorized personnel on a temporary basis. The name of the person removing the file will be recorded. Laboratories will retain all project files and data packages for a minimum of seven years unless otherwise agreed upon.

3.5.2.5 Computer Tape and Hard Copy Storage

Electronic files will be maintained on CD-ROM (preferred), magnetic tape, or diskette for 7 years; hard copy data packages (including chromatograms) will be maintained in files for 7 years. The computer tape and hard copy storage should include notation of instrument run files and calibration.

3.6 Analytical Method Requirements

Once samples have been properly collected and documented, they will be submitted to the analytical laboratory. Samples will be analyzed in accordance with this QAPP and the specified EPA method. Target analyte lists and RL objectives for each method are specified in Appendix A. Requested RLs will be based on meeting NYSDEC unrestricted use soil cleanup objectives or water quality standards. (Note: NYSDEC soil cleanup objectives for unrestricted use [NYSDEC, 2006, 2010] are presented for selecting appropriate MDLs and RLs. Site-specific remedial action objectives [RAOs] were presented in the 1994 Record of Decision [ROD] and are the site cleanup goals). Required QC checks, minimum frequencies, acceptance criteria, corrective actions, and validation flagging criteria are also included in Appendix A.

Samples will be analyzed using EPA-approved methods or other recognized standard methods (EPA 1998a, 1998b). The principal sources for analytical methods are as follows:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, Third Edition, and its updates, 1998a)
- *Methods for Chemical Analysis of Water and Wastes* (EPA, 1983)
- *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (EPA, 1998b)

Deviations from specified methods will be communicated to the contractor's PM before initiating test procedures. Any deviations also must be addressed in the laboratory case narrative.

Samples must be analyzed undiluted or at the lowest possible dilution. The laboratory will contact the project chemist when dilutions are required because of matrix interference. When a target analyte's concentration exceeds the calibration range, a dilution analysis will be performed to accurately determine the analyte's concentration. The laboratory will report the undiluted/lowest dilution performed and any diluted analyses that are required.

3.7 Analytical Standard Operating Procedures

The laboratory uses analytical SOPs to ensure the samples submitted are accurately and precisely analyzed. The laboratory will follow their analytical SOP or the EPA method guidance when this QAPP does not specify QC criteria. If not otherwise stated within this QAPP, the QC criteria used during the analyses are those stated within the analytical SOPs.

3.8 Quality Control Requirements

The purpose and creation of field and laboratory QC samples is discussed and summarized below.

3.8.1 Field Quality Control Samples

Field QC samples will be collected to determine the accuracy and precision of the analytical results. The QC sample frequencies are as stated in this section below. All sampling activities will be conducted in accordance with the health, safety, and environment plan, and sample handling procedures will be performed in accordance to those specified in this QAPP.

3.8.1.1 Equipment Blanks

Equipment blanks are collected to monitor the cleanliness of sampling equipment and the effectiveness of decontamination procedures. Contamination from the sampling equipment can bias the analytical results high. Equipment blanks will be prepared by filling sample containers with analyte-free water that has been passed through a decontaminated sampling device. Equipment blanks will be sampled at a frequency of 1 for every 20 samples collected with **nondedicated** equipment and should be analyzed for the same parameters as the samples; however, certain parameters may not require equipment blanks. The results from the equipment blanks will be assessed for bias resulting from contamination. If bias is present, the usability of the associated analytical results will be further assessed and qualified, as appropriate.

3.8.1.2 Matrix Spike/Matrix Spike Duplicates

MS/MSDs will be used to assess the effects of sample matrix interference on the precision and accuracy of analyte recovery. MS/MSD pairs will be analyzed at a frequency of one pair for every 20 samples. The duplicate aliquots for MS/MSD analyses should be collected simultaneously or in immediate succession with the parent sample. They will be treated in the same manner as the parent sample during storage and shipment. The sampling locations for the MS/MSD will be documented in the field logbook.

3.8.1.3 Field Duplicates

Field duplicates are collected in the field from a single aliquot of sample to assess the precision and accuracy of the sampling procedures of the field team. *Technically, a VOC-in-soil sample is considered a "co-located" sample, not a "duplicate" because of the differences in homogenization; however, the term "duplicate" is applied in this document to simplify discussion.* A field duplicate will be collected and analyzed for the same parameters as the parent sample at a frequency of one duplicate for every 10 samples.

3.8.1.4 Trip Blanks

Trip blanks will be collected and analyzed to assess for possible VOC contamination that could occur during sample shipment. Trip blanks will be provided by the subcontracted laboratory. The trip blanks will consist of laboratory grade deionized water, preserved in hydrochloric acid. Trip blanks are used to assess the potential introduction of constituents from sample containers or during the transportation and storage procedures. One set of trip blanks will accompany each sample cooler containing one or more VOC samples.

3.8.1.5 Ambient Blank Samples

Ambient blanks are samples of ASTM Type II or laboratory grade water used in mimicking water sample collection procedures that involve the sample exposure to ambient air, such as surface water collection. The ambient blanks are designed to capture airborne contaminants that may get entrained in the sample while transferring the sample to the container. The blank shall be analyzed for the analyses deemed to be potentially impacted by site conditions. Individual site personnel should make a specific determination if the ambient blanks need to be collected for their sampling event. If so, one ambient blank will be collected for every 20 field water samples or per event if less than 20 samples collected.

3.8.2 Laboratory Quality Control Samples

The contracted analytical laboratory has a QC program to assess the reliability and validity of the analyses being performed. The purpose and creation of QC samples is discussed and summarized below. Laboratory QC checks indicate the state of control that prevailed at the time of sample analysis. QC checks that involve field samples, such as matrix, surrogate spikes, and field duplicates, also indicate the presence of matrix effects. Field-originated blanks provide a way to monitor for potential contamination to which field samples are subjected. This QAPP specifies requirements for method blanks, LCSs, surrogate spikes, field duplicates and MS/MSDs that laboratories participating in the data collection effort must follow.

All QC will be in accordance with method specifications including the following:

- Method blanks
- Hold time
- Initial calibrations
- Continuing calibrations
- Second source check samples
- Instrument tuning
- LCS
- MS/MSD
- Surrogate spikes
- Post-digestion spikes and serial dilutions
- Internal standards
- Retention time window studies

A laboratory QC batch is defined as a method blank, LCS, MS/MSD, or a sample duplicate, depending on the method and 20 or fewer environmental samples of similar matrix that are extracted or analyzed together. For gas chromatography/mass spectrometry volatile analyses, a method blank and LCS must be analyzed in each 12-hour period. The number of environmental samples allowed in the laboratory QC batch is defined by the remaining time in the method-prescribed, 12-hour tune period divided by the analytical run time. Each preparation or analytical batch will be identified in such a way as to be able to associate environmental samples with the appropriate laboratory QC samples.

3.9 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

3.9.1 Laboratory Equipment/Instruments

Only qualified personnel will service instruments and equipment. Repairs, adjustments, and calibrations will be documented in the appropriate logbook or data sheet.

3.9.1.1 Instrument Maintenance

Preventive maintenance of laboratory equipment will follow guidelines established by each laboratory's SOPs for instrument inspection and maintenance. The laboratory will maintain a sufficient supply of spare parts for its instruments to minimize downtime. Whenever possible, backup instrumentation will be on hand.

Whenever practical, analytical equipment should be maintained under a service contract. Such contracts allow for preventative system maintenance and repair on an "as-needed" basis. The laboratory should have sufficient trained staff to allow for the day-to-day maintenance of equipment. All laboratory instruments will be maintained in accordance with manufacturer's specifications and within the requirements of the laboratory QAM. Maintenance activities are required to be documented in the logbooks to provide a history of maintenance records.

3.9.1.2 Equipment Monitoring

On a daily basis, operation of balances, ovens, refrigerators, and water purification systems will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution. Specific laboratory preventative maintenance procedures are found in the laboratory's internal QAM.

3.10 Instrument Calibration and Frequency

3.10.1 Field Instruments

The field instruments to be used will be calibrated at least daily, or more frequently depending on manufacturer's recommendations or field performance questions. All calibrations will be performed by using factory-approved methods, and the calibration methods, times, and responses will be recorded in a field logbook. The serial numbers of the field instruments also will be recorded in the field logbooks at the time of calibration. The instruments include those that measure field conditions (pH, conductance, temperature, etc.) and health and safety conditions (photoionization detector, combustible gas indicator, etc.). Some field instruments have no applicable calibration procedure (such as water level indicators). These items will be evaluated and removed from service if performance issues arise.

3.10.2 Laboratory Instruments

The instrument calibration procedures are described in the internal laboratory SOPs. Records of calibrations will be filed and maintained by the laboratory. These records will be subject to QA audit. For all instruments, the laboratory will maintain trained repair staff with in-house spare parts or will maintain service contracts with vendors.

All standards used in the calibration of equipment will be traceable, directly or indirectly, to the National Institute of Standards and Technology. All standards received will be logged into standard receipt logs maintained by the individual analytical groups. Each group maintains a standards log that tracks the preparation of standards used for calibration and QC purposes.

3.11 Inspection/Acceptance Requirements for Supplies and Consumables

Subcontractor services must meet the project scope, specified levels of quality, and the submittal schedule. Project contractors or vendors should have contractual arrangements with their suppliers of materials.

Purchased or rented supplies and consumables will be inspected to assure the quality and function will adhere to the standards necessary to meet the project objectives. Field equipment will be checked and calibrated (if necessary) according to documentation provided. Performance assessment (calibration, trial checks, etc.) will be documented in field logbooks and will become part of the project record. Bottles will be checked to assure the quality is sufficient to meet the analytical needs as outlined in the certificate of analysis provided with each shipment. The documentation of certified cleanliness will become part of the project files. Chemicals (ASTM water for blanks, chemical preservatives, etc.) will be inspected to confirm that the required specifications needed to achieve project objectives are met. Inspection and acceptance requirements are the responsibility of the FTL or their designated agent.

3.12 Data Acquisition Requirements (Nondirect Measurements)

This subsection identifies the types of data needed for project implementation and decision-making that are not obtained from direct measurements.

The project objectives are first identified to assess what types of information are needed to implement a project plan to meet these proposed objectives. Project objectives are summarized in Section 1. Typically, the data needed to achieve the project objectives include facility maps, sampling location selection and sample identifiers, laboratory method selection and detection limit verification, analytical parameter lists and critical values, field measurement lists, and a project schedule.

3.13 Documentation of Records

3.13.1 Data Reporting

Portable document format (PDF) deliverables, in Level 3 summary format containing the necessary information to perform data evaluation/data validation are required for the annual groundwater samples and a Level 2 deliverable is required for the influent/effluent and recovery well samples. There may be instances where a different format is required. Any change to the report format will be documented in the laboratory SOW before sampling. Reporting formats similar to those specified in the latest versions of *EPA Contract Laboratory Program Statements of Work for Organics and Inorganics* are preferred (EPA, 2004). The laboratory data report will be organized in a format that facilitates identification and retrieval of data. Table 3-3 summarizes the requested data format.

3.13.1.1 Field Data Reporting

Field sampling activities will be recorded in field logbooks. Field logbook entries will be described with as much detail as possible so reviewers can reconstruct a particular situation without reliance on field personnel memory. Modifications to field sampling protocols must be documented in the field logbook. The FTL is responsible for ensuring modifications to sampling protocols are documented.

The field logbooks to be used will be bound field survey books or notebooks. Logbooks will be assigned to the field crew, but stored in a secure location when not in use. Project-specific document numbers will identify each logbook, the title page of which will contain the following:

- Name of the person to whom the logbook is assigned
- Logbook number
- Project name
- Project start date
- Project end date

At the beginning of each entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be documented. Specific information and observations will be recorded in the field notebook during all field investigation activities. The information to be documented includes the following:

- Names of all field team members present and the level of personal protective equipment
- Names of site visitors, field sampling or investigation team personnel, and the nature of their visit
- Equipment model and calibration information
- Groundwater sample locations, identification, analyses to be performed, method of collection, odor, visual descriptions, date and time of collection
- Groundwater sample physical data-purge rate, total volume removed, water levels, temperature, pH, dissolved oxygen, turbidity, specific conductance, and oxidation reduction potential
- Management of purge water
- Miscellaneous observations regarding other nearby site activities and equipment problems/troubleshooting measures

All entries will be made in ink, and no erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and initialed. Any blank or unused portions of a page will be crossed out with a single diagonal line and initialed by the field personnel. Blank pages will be noted as being intentionally blank in the same manner.

Samples will be collected following the sampling procedures documented in the SOPs or in the site-specific work plans. Sample collection equipment will be identified, along with the time of sampling, sample description, parameters being analyzed, and number of containers used. Unique sample ID numbers will be assigned to each sample and field duplicate samples, which will receive a unique sample ID, will be noted in the field logbook.

Field data calculations, transfers, and interpretations will be reviewed for accuracy by the FTL or project chemist. The appropriate task manager will review field documentation, data reduction, and accuracy of data entries into the data log. The data logs and documents will be checked for the following:

- General completeness
- Readability
- Use of appropriate procedures
- Whether modifications to sampling procedures are clearly stated
- Appropriate instrument calibration and maintenance records
- Reasonability of data collected
- Correctness of sample locations
- Correctness of reporting units, calculations, and interpretations

Field personnel will provide comprehensive documentation of all aspects of field sampling, field analysis, and sample COC. This documentation constitutes a record that allows for the reconstruction of all field events to aid in the data review and interpretation process. The documents, records, and information relating to the performance of the fieldwork will be retained in the project file.

3.13.1.2 Laboratory Data Reporting

Data reduction will be done manually or using appropriate application software. Quantitation procedures specified for each method must be followed. Calculations for analyses are based on regression analyses of calibration curves. Regression analysis is used to fit a curve through calibration standard data. Sample concentrations are calculated using the resulting regression equations. If data are

reduced manually, the documentation must include the formulas used. Any application software used for data reduction must have been previously verified by the laboratory for accuracy. Documentation of the software's verification must be maintained on file in the laboratory. The documentation of data reduction must allow recreation of the calculations.

Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data will be stored electronically, and a hard-copy file will be maintained. Laboratory data entered will be sufficient to document information used to arrive at reported values.

The data will undergo at least two levels of review at the laboratory before release. The analyst performing the tests initially will review 100 percent of the data. After the analyst's review has been completed, 100 percent of the data will be reviewed independently by a senior analyst or by the section supervisor for accuracy, compliance with calibration, and QC requirements, holding time compliance, and for completeness. Analyte identification and quantitation must be verified. Calibration and QC results will be compared with the applicable control limits. RLs should be reviewed to make sure they meet the project objectives. Results of multiple dilutions should be reviewed for consistency. Any discrepancies must be resolved and corrected. Laboratory qualifiers will be applied when there are nonconformances that could potentially affect data usability. These qualifiers must be properly defined as part of the deliverables. Issues relevant to the quality of the data must be addressed in a case narrative. A copy of the data package will be filed in the project file. Mailed data packages, along with applicable electronic data deliverables (EDDs), will be sealed in an appropriate shipping container with a custody seal and logged on a document mailing log.

Electronic data storage will be used when possible. Electronic data will be maintained in a manner that prevents inadvertent loss, corruption, and inappropriate alteration. Electronic data will be accessible and retrievable for a period of 10 years after project completion by the laboratory and The Dow Chemical Company.

Raw data will be examined to assess compliance with QC guidelines. Surrogate, MS, and QC check sample recoveries will be checked. In addition, samples and laboratory blanks will be checked for possible contamination or interferences. Chromatograms and concentrations will be checked to ensure sample results are within the calibration range; if necessary, dilutions will be performed as defined by the initial calibration range.

Deviations from guidelines will call for corrective action. Deviations determined to be caused by factors outside the laboratory's control, such as matrix interference, will be noted with an explanation in the report narrative. Calculations will be checked and the report reviewed for errors and oversights. The hard copy and electronic laboratory reports for samples and analyses will contain the information necessary to perform data evaluation.

Table 3-3. Data Package Deliverables

Essex-Hope Site, Jamestown, New York

All Analytical Fractions	
Case Narrative – A detailed case narrative per analytical fraction is required and will include explanation of any noncompliance and/or exceptions and corrective action. Exceptions will be noted for receipt, holding times, methods, preparation, calibration, blanks, spikes, surrogates (if applicable), and sample exceptions.	•
Sample ID Cross Reference Sheet (Lab IDs and Client IDs)	•
Completed CoC and any sample receipt information	•
Sample preparation (extraction/digestion) logs	•
Copies of nonconformance memos and corrective actions	•

Table 3-3. Data Package Deliverables

Essex-Hope Site, Jamestown, New York

Form *	Fractions	Level II	Level III	Level IV
	GC/MS Organic Fractions			
1	Sample results	•	•	• + raw
2	Surrogate Recovery Summary (w/ applicable control limits)	•	•	•
3	MS/MSD Accuracy & Precision Summary **	•	•	• + raw
3	LCS Accuracy Summary	•	•	• + raw
4	Method Blank Summary	•	•	• + raw
5	Instrument Tuning Summary (including tuning summary for applicable initial calibrations)		•	•
6	Initial Calibration Summary (including concentration levels of standards)		•	• + raw
7	Continuing Calibration Summary		•	• + raw
8	Internal Standard Summary (including applicable initial calibrations)		•	•
	GC/HPLC Organic Fractions			
1	Sample results	•	• ***	• + raw
2	Surrogate Recovery Summary (w/ applicable control limits)	•	•	•
3	MS/MSD Accuracy & Precision Summary **	•	•	• + raw
3	LCS Accuracy Summary	•	•	• + raw
4	Method Blank Summary	•	•	• + raw
6	Initial Calibration Summary (including concentration levels of standards) ***		•	• + raw
7	Continuing Calibration Summary ***		•	• + raw
7	Degradation Summary (Organochlorine Pesticides only) ***		•	• + raw
8	Analytical Sequence (including internal standard area performance where applicable) ***		•	•
10	Compound Identification Summary (where confirmation required) ***		•	•
	Metals Inorganic Fractions			
1	Sample Results	•	•	• + raw
2A	Initial and Continuing Calibration Summary		•	• + raw
3	Initial and Continuing Calibration Blanks and Method Blanks Summary	•	•	• + raw
4	Interference Check Standard Summary		•	• + raw
5A	Pre-digestion Matrix Spike Recoveries Summary	•	•	• + raw
5B	Post-digestion Spike Recoveries Summary		•	• + raw
6	Native Duplicate or MS/MSD Precision Summary **	•	•	• + raw
7	Laboratory Control Sample Recovery Summary	•	•	• + raw
8	Method of Standard Addition (if necessary)		•	• + raw
9	Serial Dilution		•	• + raw
10	Instrument or Method Detection Limit Summary		•	•
11	ICP Interelement Correction Factors		•	•
12	Linear Range Summary		•	•
13	Preparation Log Summary		•	• + raw
14	Analytical Run Sequence and GFAA Post-spike Recovery Summary		•	• + raw

Table 3-3. Data Package Deliverables
Essex-Hope Site, Jamestown, New York

Form *	Fractions	Level II	Level III	Level IV
General Chemistry Fractions: (Includes potentiometric, gravimetric, colorimetric, and titrimetric analytical techniques. Examples, TPH (418.1), TOC, etc.)				
1	Sample Results	•	•	• + raw
2A	Initial and Continuing Calibration Summary		•	• + raw
3	Initial and Continuing Calibration Blanks and Method Blanks Summary	•	•	• + raw
5A	Pre-digestion Matrix Spike Recoveries Summary	•	•	• + raw
6	Native Duplicate or MS/MSD Precision Summary **	•	•	• + raw
7	Laboratory Control Sample Recovery Summary	•	•	• + raw
10	Instrument or Method Detection Limit Summary		•	•

* Contract Laboratory Program (CLP) Form or summary form with equivalent information

** With RPD calculated according to method specifications (CLP using % recovery, SW-846 using concentration)

*** Including deliverables for primary and confirmation analysis (where applicable)

3.13.2 Electronic Analytical Record Format

Concurrently with the submittal of the hard copy deliverables, the laboratory will deliver electronic data in the EarthSoft EQuIS 6 format. There shall be no discrepancies between the PDF reports and the electronic reports.

3.13.3 Project Record Maintenance and Storage

Project records will be stored and maintained in accordance with CH2M's data management plan described below. Each project team member is responsible for filing all project information or providing it to the administrative assistant familiar with the project filing system. Individual team members may maintain separate files or notebooks for individual tasks but must provide such files to the project file room upon completion of each task.

The general project file categories are as follows:

- Correspondence
- Non-laboratory project invoices and approvals by vendor
- Original unbound reports
- Non-laboratory requests for proposal, bids, contracts, and SOWs
- Field data
- Data evaluation and calculations
- Facility reports from others
- Photographs
- Insurance documentation
- Laboratory analytical data and associated documents and memorandums
- Regulatory submittals, licensing, and permitting applications
- Facility and reference material
- Health, safety, and environment plans
- Figures and drawings
- Project Instructions
- Work plans

3.14 Data Quality Management

Data management entails storing, handling, accessing, and securing data collected during the project. Data gathered during this project will be consolidated and compiled into a project database that can be used to support project data reporting and exports. The following sections describe the project's data management process.

3.14.1 Archiving

Hard copy and electronic versions will be archived in project files and on electronic archive tapes for the duration of the project, 10 years, or as specified in contractual agreements.

3.14.2 Data Flow and Transfer

The data flow from the laboratory and field to the project staff and data users will be sufficiently documented to ensure that data are properly tracked, reviewed, and validated for use.

3.14.3 Record Keeping

In addition to the data management procedures outlined in Section 3.13 for analytical data, the laboratory will ensure that it maintains electronic and hard copy records sufficient to recreate each analytical event. The minimum records the laboratory will keep contain the following:

- Raw data, including instrument printouts, bench work sheets, and/or chromatograms with compound ID and quantitation reports
- Laboratory-specific written SOPs for each analytical method and QA/QC function in place at the time of analysis of project samples

3.14.4 Final Evidence File

The final evidence file will be the central repository for all documents that constitute evidence relevant to sampling and analysis activities. CH2M is the custodian of the evidence file and maintains the contents of the evidence files for the project, including relevant records, reports, logs, field notebooks, pictures, contractor reports, and data reviews in a secured, limited access area under the custody of CH2M.

CH2M will keep all records until project completion and project closeout. As necessary, records may be transferred to an off-facility records storage facility. The records storage facility must provide secure, access-controlled storage of records. Records of raw analytical laboratory data, QA data, and reports will be kept by the subcontract laboratory for a minimum of 7 years.

SECTION 4

Assessment and Oversight

4.1 Assessments and Response Actions

Field and laboratory assessments are performed to assess technical and procedural compliance with this QAPP. Performance and system audits are key to ensuring this compliance. Purposes of the audits are as follows:

- Confirm appropriate documents are properly completed and are kept current and orderly
- Ensure measurement systems are accurate
- Identify nonconformance or deficiencies and to initiate necessary corrective actions
- Verify that field and laboratory QA procedures called for in this QAPP are properly followed and executed

The project chemist and laboratory QAM are responsible for ensuring conformance with the QAPP. The FTL is responsible for ensuring conformance with field QA/QC requirements. Activities selected for audit will be evaluated against specified requirements, which will include an evaluation of the method, procedures, and instructions. Documents and records will be examined as necessary to evaluate whether the QA program is effective and properly implemented. Reports and recommendations must be prepared on all audits and submitted to the QA manager for retention in the project files.

4.1.1 Field Audits

Planning, scheduling, and conducting QA audits and surveillance are required to verify facility activities are being performed efficiently in conformance with approved plans, standards, federal and state regulatory requirements, sound scientific practices, and contractual requirements. Planned and scheduled audits may be performed to verify compliance with aspects of the QA program and to evaluate the effectiveness of the QA program. Audits include an objective examination of work areas, activities, processes, review of documents and records, interviews with project personnel, and review of plans and standards.

Internal review of the sampling program will be conducted after each sampling event by the FTL. The FTL will pay particular attention to the sampling program with respect to representativeness, comparability, and completeness of the specific measurement parameters involved.

Field documentation (e.g., CoC forms, field daily sheets, logbooks) will be reviewed as generated by the FTL or designee for accuracy, completeness, and compliance with QAPP requirements. The FTL will audit field sampling procedures periodically for compliance with QAPP procedures. The auditor will check for the following:

- Sampling protocols are being followed
- Samples are placed in proper containers
- Samples are stored and transported properly
- Field documentation is complete and accurate

4.1.2 Field Corrective Action

Any project team member may initiate a field corrective action process. The corrective action process consists of identifying a problem, acting to eliminate the problem, monitoring the effectiveness of the corrective action, verifying that the problem has been eliminated, and documenting the corrective action.

Corrective actions include correcting CoC forms; problems associated with sample collection, packaging, shipping, field record keeping; or additional training in sampling and analysis. Additional approaches may include resampling or evaluating and amending sampling procedures. The team member in charge of field operations (FTL) will summarize the problem, establish possible causes, and designate the person responsible for a corrective action. The FTL will verify that the initial action has been taken and whether it appears to be effective. The FTL will additionally follow up to verify that the problem has been resolved.

Technical staff and project personnel will be responsible for reporting suspected technical or QA nonconformances or suspected deficiencies to the FTL. The FTL will be responsible for assessing suspected problems in consultation with the QA manager and the PM as to whether the situation affects data quality. If it is concluded that the situation warrants a reportable nonconformance requiring corrective action, a nonconformance report will be initiated by the FTL.

The FTL will be responsible for ensuring that corrective action for nonconformances are initiated by the following:

- Evaluating all reported nonconformances
- Controlling additional work on nonconforming items
- Selecting disposition or action to be taken
- Maintaining a log of nonconformances
- Reviewing nonconformance reports and corrective actions taken
- Ensuring nonconformance reports are included in the final documentation in the project files

4.1.3 Laboratory Audits

The laboratory QA manager may conduct internal system audits. An internal audit is a qualitative evaluation of all components of the laboratory QC measurement system. The audit serves to determine if all measurement systems are being used appropriately. The system audits are conducted to evaluate the following:

- Sample handling procedures
- Calibration procedures
- Analytical procedures
- QC results
- Safety procedures
- Record keeping procedures
- Timeliness of analysis and reporting

In addition, laboratories are subject to external audits. The focus of these audits is to assess general laboratory practices and conformance to the QAPP. Laboratory audits may be performed before starting analyses for this project and at any time during the project as deemed necessary.

The laboratory QA manager will review internal laboratory performance and will evaluate laboratory precision and accuracy by comparing results of duplicate samples, QC samples, spikes, and blanks. When a beyond-control limit situation is encountered, the laboratory manager or other client services will check analytical results prior to distribution.

4.1.4 Laboratory Corrective Action

Corrective actions may be required for two classes of problems: analytical/equipment problems and noncompliance problems. Analytical/equipment problems may occur during sampling, sample handling, sample preparation, laboratory instrumental analysis, or data review.

For noncompliance problems, a corrective action program will be developed and implemented at the time the problem is identified. The person who identifies the problem will be responsible for notifying the proper project member. If the problem is analytical in nature, information on these problems will be communicated to the laboratory QAM and the QA manager, who will in turn direct information to proper project members. Implementation of corrective action will be confirmed through similar channels.

Implementation of all corrective actions will be documented. No staff member will initiate corrective action without prior communication of action needing correction and proposed corrective action through the proper channels. If corrective actions are insufficient, the PM or the QA manager may issue a stop work order.

Corrective actions are required whenever an out-of-control event or potential out-of-control event is noted. The investigative action taken is somewhat dependent on the analysis and the event. Laboratory personnel are alerted that corrective actions may be necessary if the following occurs:

- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in spike recoveries or RPD between duplicates
- Unusual changes in detection limits occur
- Inquiries concerning data quality are received
- Deficiencies are detected by the laboratory QA manager during internal or external audits or from results of performance evaluation samples

Corrective action procedures are often handled at the bench level by the analyst, who reviews preparation or extraction procedures for possible errors, checks instrument calibrations, spike and calibration mixes, and instrument sensitivity. If problems persist or cannot be identified, matters are referred to the laboratory supervisor, laboratory PM, and/or laboratory QA manager for further investigation. Once resolved, full documentation of the corrective action procedures is filed with the laboratory QA manager after approval by CH2M. Corrective action may include the following:

- Resampling and analyzing
- Evaluating and amending sampling procedures
- Evaluating and amending analytical procedures
- Accepting data and acknowledging the level of uncertainty
- Reanalyzing the samples, if sample or extract volume is adequate and holding time criteria permits

If resampling is deemed necessary because of laboratory problems, the PM must identify the appropriate approach, including cost recovery from the laboratory, for the additional sampling effort.

4.2 Reports to Management

If audits are conducted, audit reports will be submitted to the PM to address any QA issues or proposed corrective actions to maintain QA standards. In addition, after the sample results are received from the laboratory and validated, reduced, and tabulated, a comprehensive data evaluation report will be submitted documenting the field investigation.

SECTION 5

Data Validation and Usability

5.1 Data Review, Validation, and Verification Requirements

Data review and validation are processes whereby data generated in support of this project are reviewed against the QA/QC requirements. The data are evaluated for precision and accuracy against the analytical protocol requirements. Nonconformances or deficiencies that could affect the usability of data are identified as noted. The effect on the result is then considered when assessing whether the result is sufficient to achieve DQOs. **Deficiencies discovered as a result of data verification, review and/or validation, as well as corrective actions implemented in response, will be documented and submitted in the form of a written report.**

5.2 Verification and Validation Methods

5.2.1 Data Verification

Before the analytical results are released by the laboratory, both the sample and QC data will be reviewed carefully to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data will be reduced and spike recoveries will be included in control charts, and the resulting data will be reviewed to ascertain whether they are within the laboratory-defined limits for accuracy and precision. Any nonconforming data will be discussed in the data package cover letter and case narrative. The laboratory will retain all of the analytical and QC documentation associated with each data package.

As discussed previously, the data are also verified to assess whether the EDDs and the PDF data deliverables are consistent with one another to ensure an accurate database.

5.2.2 Data Validation

Depending upon the project-specific objectives, the analytical results of the data collection effort will be validated by CH2M. In general, there are four levels of validation that correspond to the reports described in Table 3-3. Monthly sampling of the groundwater treatment system will undergo a **Level 2** validation while the annual groundwater sampling event will undergo **Level 3** validation unless otherwise noted.

- **Level 1 –** Verification that samples were analyzed for the methods requested and review of the data for outliers and anomalies.
- **Level 2 –** Verification that samples were analyzed for the methods requested, review of the laboratory case narrative for events in the laboratory that affect the accuracy or precision of the data, review of QC indicator data, including method blank, LCS/LCSD, MS/MSD, and surrogate recoveries and a “sanity” review of the data.
- **Level 3 –** Validation of the analytical data as described below without review of any raw data or analyte verification.
- **Level 4 –** Validation of the analytical data will be performed as described below, including review of the analytical raw data.

5.2.3 Validation Procedures

Personnel involved in the data validation function will be independent of the data generation effort. The project chemist will be responsible for oversight of the data validation effort. Data validation will be carried out when the data packages are received from the laboratory. Project-specific plans will specify which samples require data validation and the extent of that validation. It will be performed on an analytical batch basis using the summary results of calibration and laboratory QC, as well as those of the associated field samples. Raw data will be reviewed when deemed necessary by the project chemist.

Level 2 data validation procedures will include the following:

- A review of the data set narrative to identify any issues that the lab reported in the data deliverable
- Review for compliance with holding time and QC frequency requirements
- An evaluation of basic QC measurements used to assess the accuracy, precision, and representativeness of data including method blanks, LCS, MS/MSD, surrogate recovery when applicable, and field or laboratory duplicate results
- A review of sample results, target compound lists, and detection limits to verify that project analytical requirements are met
- Initiation of corrective actions, as necessary, based on the data review findings
- Qualification of the data using appropriate qualifier flags, as necessary, to reflect data usability limitations.

Level 3 data validation procedures will include the following:

- Review of the data package for completeness
- Review of CoC records for discrepancies that might degrade data quality
- Review for compliance with holding time and QC frequency requirements
- Evaluation of all calibration and QC summary results against the project requirements
- Qualification of the data using appropriate qualifier flags, as necessary, to reflect data usability limitations
- Initiation of corrective actions, as necessary, based on the data review findings

Data validation will be patterned after the *National Functional Guidelines for Organic Superfund Methods Data Review* (EPA, 2017a), substituting method criteria and the QC criteria presented in this QAPP for those in the guidelines. QC requirements specified herein shall take precedence over the functional guidelines. When no specific guidance exists, method requirements will be used.

It is important to note that laboratory qualifying flags are included on the data summary forms (Form I) that are submitted to the project by the laboratory; however, during the data review and validation process, the laboratory qualifying flags are reviewed along with the project-specific validation flags to determine the final project qualifier applied to the data. Data qualifier flags, if required, are defined below and will be applied to the sample results. If multiple flags are required for a result, the most severe flag will be applied to the result.

- **U** Undetected. Samples were analyzed for this analyte, but it was not detected above the RL or was qualified as not detected due to blank contamination.
- **UJ** Not detected. Quantitation limit may be inaccurate or imprecise.
- **J** Estimated. The analyte was present, but the reported value may not be accurate or precise.
- **R** Rejected. The data are unusable. (Note: Analyte/compound may or may not be present.)

A data quality evaluation report will be generated and submitted to the PM after validation.

5.3 Reconciliation of Validated Data with Data Quality Objectives

The final data validation activity is assessing whether the data meet the planned DQOs for the project-specific activity. The final results, as adjusted for the findings of any data validation and data evaluation, will be checked against the DQOs, and an assessment will be made as to whether the data are of sufficient quality to support them. The decision as to data sufficiency may be affected by the overall precision, accuracy, and completeness of the data as demonstrated by the data validation process. If the data are sufficient to achieve project objectives, the PM will release the data and work may proceed. If not, corrective action will be required.

SECTION 6

References

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Appendix A
Analytical Method Requirements

Table A-1. Volatile Organic Compounds in Groundwater by Method SW8260C

Essex-Hope Site, Jamestown, New York

Parameter	CAS Number	Site-Specific Remedial Action Objective	NYSDEC Water Quality Standards[a] (µg/L)	Method Detection Limit (µg/L)	Reporting Limit (µg/L)
1,1,1,2-Tetrachloroethane	630-20-6		--	0.7	2.5
1,1,1-Trichloroethane	71-55-6		5.0	0.7	2.5
1,1,2,2-Tetrachloroethane	79-34-5		5.0	0.14	0.5
1,1,2-Trichloroethane	79-00-5		1.0	0.5	1.5
1,1-Dichloroethane	75-34-3		5.0	0.7	2.5
1,1-Dichloroethene	75-35-4		5.0	0.14	0.5
1,1-Dichloropropene	563-58-6		--	0.7	2.5
1,2,3-Trichlorobenzene	87-61-6		5.0	0.7	2.5
1,2,3-Trichloropropane	96-18-4		--	0.7	2.5
1,2,4-Trichlorobenzene	120-82-1		5.0	0.7	2.5
1,2,4-Trimethylbenzene	95-63-6		--	0.7	2.5
1,2-Dibromo-3-chloropropane	96-12-8		0.04	0.7	2.5
1,2-Dibromoethane	106-93-4		0.0006	0.65	2.0
1,2-Dichlorobenzene	95-50-1		3.0	0.7	2.5
1,2-Dichloroethane	107-06-2		0.6	0.13	0.5
1,2-Dichloropropane	78-87-5		1.0	0.13	1.0
1,3,5-Trimethylbenzene	108-67-8		--	0.7	2.5
1,3-Dichlorobenzene	541-73-1		3.0	0.7	2.5
1,3-Dichloropropane	142-28-9		--	0.7	2.5
1,4-Dichlorobenzene	106-46-7		3.0	0.7	2.5
1,4-Dioxane	123-91-1		--	41	250
2,2-Dichloropropane	594-20-7		--	0.7	2.5
2-Butanone	78-93-3		50	1.9	5.0
2-Chlorotoluene	95-49-8		--	0.7	2.5
2-Hexanone	591-78-6		50	1.0	5.0
4-Chlorotoluene	106-43-4		--	0.7	2.5
4-Methyl-2-pentanone	108-10-1		--	1.0	5.0
Acetone	67-64-1		50	1.5	5.0
Benzene	71-43-2		1.0	0.16	0.5
Bromobenzene	108-86-1		--	0.7	2.5
Bromochloromethane	74-97-5		5.0	0.7	2.5
Bromodichloromethane	75-27-4		50	0.19	0.5
Bromoform	75-25-2		50	0.65	2.0
Bromomethane	74-83-9		5.0	0.7	2.5
Carbon disulfide	75-15-0		60	1.0	5.0
Carbon tetrachloride	56-23-5		5.0	0.13	0.5
Chlorobenzene	108-90-7		5.0	0.7	2.5
Chloroethane	75-00-3		5.0	0.7	2.5
Chloroform	67-66-3		7.0	0.7	2.5
Chloromethane	74-87-3		--	0.7	2.5

Table A-1. Volatile Organic Compounds in Groundwater by Method SW8260C

Essex-Hope Site, Jamestown, New York

Parameter	CAS Number	Site-Specific Remedial Action Objective	NYSDEC Water Quality Standards[a] (µg/L)	Method Detection Limit (µg/L)	Reporting Limit (µg/L)
cis-1,2-Dichloroethene	156-59-2		5.0	0.7	2.5
cis-1,3-Dichloropropene	10061-01-5		0.4	0.14	0.5
Chlorodibromomethane	124-48-1		50	0.15	0.5
Dibromomethane	74-95-3		--	1.0	5.0
Dichlorodifluoromethane	75-71-8		5.0	1.0	5.0
Ethylbenzene	100-41-4	5.0	5.0	0.7	2.5
Hexachlorobutadiene	87-68-3		--	0.7	2.5
Isopropylbenzene	98-82-8		5.0	0.7	2.5
m,p-Xylene	179601-23-1	5.0	5.0	0.7	2.5
Methylene chloride	75-09-2		5.0	0.7	2.5
Methyl t-Butyl Ether (MTBE)	1634-04-4		--	0.7	2.5
n-Butylbenzene	104-51-8		--	0.7	2.5
n-Propylbenzene	103-65-1		--	0.7	2.5
Naphthalene	91-20-3		--	0.7	2.5
o-Xylene	95-47-6	5.0	5.0	0.7	2.5
p-Isopropyltoluene	99-87-6		--	0.7	2.5
sec-Butylbenzene	135-98-8		--	0.7	2.5
Styrene	100-42-5		5.0	0.7	2.5
tert-Butylbenzene	98-06-6		--	0.7	2.5
Tetrachloroethene	127-18-4		5.0	0.18	0.5
Toluene	108-88-3	5.0	5.0	0.7	2.5
trans-1,2-Dichloroethene	156-60-5	5.0	5.0	0.7	2.5
trans-1,3-Dichloropropene	10061-02-6		0.4	0.16	0.5
Trichloroethene	79-01-6	5.9	5.0	0.18	0.5
Trichlorofluoromethane	75-69-4		5.0	0.7	2.5
Vinyl acetate	108-05-4		--	1.0	5.0
Vinyl chloride	75-01-4	5.0	2.0	0.07	1

[a] NYSDEC *Ambient Water Quality Standards and Guidance Values* (1998) and 2000 Addendum

µg/L = micrograms per liter

Table A-2. Accuracy and Precision for Volatile Organic Compounds by Method SW8260C

Essex-Hope Site, Jamestown, New York

Parameter	LCS/LCSD/MS/MSD Accuracy Water (%R)		Precision Water (%RPD)	LCS/LCSD/MS/MSD Accuracy Soil (%R)		Precision Soil (%RPD)
	LCL	UCL		LCL	UCL	
1,1,1,2-Tetrachloroethane	64	130	≤ 20	70	130	≤ 30
1,1,1-Trichloroethane	67	130	≤ 20	70	130	≤ 30
1,1,2,2-Tetrachloroethane	67	130	≤ 20	70	130	≤ 30
1,1,2-Trichloroethane	70	130	≤ 20	70	130	≤ 30
1,1-Dichloroethane	70	130	≤ 20	65	135	≤ 30
1,1-Dichloroethene	61	145	≤ 20	70	130	≤ 30
1,1-Dichloropropene	70	130	≤ 20	70	130	≤ 30
1,2,3-Trichlorobenzene	70	130	≤ 20	70	130	≤ 30
1,2,3-Trichloropropane	64	130	≤ 20	68	130	≤ 30
1,2,4-Trichlorobenzene	70	130	≤ 20	70	130	≤ 30
1,2,4-Trimethylbenzene	70	130	≤ 20	70	130	≤ 30
1,2-Dibromo-3-chloropropane	41	144	≤ 20	68	130	≤ 30
1,2-Dibromoethane	70	130	≤ 20	70	130	≤ 30
1,2-Dichlorobenzene	70	130	≤ 20	70	130	≤ 30
1,2-Dichloroethane	70	130	≤ 20	70	130	≤ 30
1,2-Dichloropropane	70	130	≤ 20	70	130	≤ 30
1,3,5-Trimethylbenzene	64	130	≤ 20	70	130	≤ 30
1,3-Dichlorobenzene	70	130	≤ 20	70	130	≤ 30
1,3-Dichloropropane	70	130	≤ 20	69	130	≤ 30
1,4-Dichlorobenzene	70	130	≤ 20	70	130	≤ 30
1.4-Dioxane	56	162	≤ 20	65	136	≤ 30
2,2-Dichloropropane	63	133	≤ 20	70	130	≤ 30
2-Butanone (MEK)	63	138	≤ 20	70	130	≤ 30
2-Chlorotoluene	70	130	≤ 20	70	130	≤ 30
2-Hexanone	57	130	≤ 20	70	130	≤ 30
4-Chlorotoluene	70	130	≤ 20	70	130	≤ 30
4-Methyl-2-pentanone (MIBK)	59	130	≤ 20	70	130	≤ 30
Acetone	58	148	≤ 20	54	140	≤ 30
Benzene	70	130	≤ 20	70	130	≤ 30
Bromobenzene	70	130	≤ 20	70	130	≤ 30
Bromochloromethane	70	130	≤ 20	70	130	≤ 30
Bromodichloromethane	67	130	≤ 20	70	130	≤ 30
Bromoform	54	136	≤ 20	70	130	≤ 30
Bromomethane	39	139	≤ 20	57	147	≤ 30
Carbon disulfide	51	130	≤ 20	59	130	≤ 30
Carbon tetrachloride	63	132	≤ 20	70	130	≤ 30
Chlorobenzene	75	130	≤ 20	70	130	≤ 30
Chlorodibromomethane	63	130	≤ 20	70	130	≤ 30
Chloroethane	55	138	≤ 20	50	151	≤ 30
Chloroform	70	130	≤ 20	70	130	≤ 30

Table A-2. Accuracy and Precision for Volatile Organic Compounds by Method SW8260C

Essex-Hope Site, Jamestown, New York

Parameter	LCS/LCSD/MS/MSD Accuracy Water (%R)		Precision Water (%RPD)	LCS/LCSD/MS/MSD Accuracy Soil (%R)		Precision Soil (%RPD)
	LCS	UCL		LCS	UCL	
Chloromethane	64	130	≤ 20	52	130	≤ 30
cis-1,2-Dichloroethene	70	130	≤ 20	70	130	≤ 30
cis-1,3-Dichloropropene	70	130	≤ 20	70	130	≤ 30
Dibromomethane	70	130	≤ 20	70	130	≤ 30
Dichlorodifluoromethane	36	147	≤ 20	30	146	≤ 30
Ethylbenzene	70	130	≤ 20	70	130	≤ 30
Hexachlorobutadiene	63	130	≤ 20	67	130	≤ 30
Isopropylbenzene	70	130	≤ 20	70	130	≤ 30
Methylene Chloride	70	130	≤ 20	70	130	≤ 30
Methyl-t butyl ether	63	130	≤ 20	66	130	≤ 30
m,p-xylene	70	130	≤ 20	70	130	≤ 30
n-Butylbenzene	53	136	≤ 20	70	130	≤ 30
N-Propylbenzene	69	130	≤ 20	70	130	≤ 30
Naphthalene	70	130	≤ 20	70	130	≤ 30
o-xylene	70	130	≤ 20	70	130	≤ 30
p-Isopropyltoluene	70	130	≤ 20	70	130	≤ 30
sec-Butylbenzene	70	130	≤ 20	70	130	≤ 30
Styrene	70	130	≤ 20	70	130	≤ 30
tert-Butylbenzene	70	130	≤ 20	70	130	≤ 30
Tetrachloroethene	70	130	≤ 20	70	130	≤ 30
Toluene	70	130	≤ 20	70	130	≤ 30
trans-1,2-Dichloroethene	70	130	≤ 20	70	130	≤ 30
trans-1,3-Dichloropropene	70	130	≤ 20	70	130	≤ 30
Trichloroethene	70	130	≤ 20	70	130	≤ 30
Trichlorofluoromethane	62	150	≤ 20	70	139	≤ 30
Vinyl Acetate	70	130	≤ 20	70	130	≤ 30
Vinyl chloride	55	140	≤ 20	67	130	≤ 30
Surrogates						
1,2-Dichloroethane-d4	70	130	--	70	130	--
4-Bromofluorobenzene	70	130	--	70	130	--
Dibromofluoromethane	70	130	--	70	130	--
Toluene-d8	70	130	--	70	130	--

%R = percent recovery
RPD = relative percent difference

Table A-3. Calibration and QC Requirements for Volatile Organic Compounds by SW8260C

Essex-Hope Site, Jamestown, New York

QC Check	Frequency	Criteria	Corrective Action
BFB Tuning	Prior to initial calibration and calibration verification (every 12 hours)	Refer to criteria listed in the method	Retune instrument and verify
Multi-point initial calibration (minimum five points)	Prior to sample analysis, or when calibration verification fails	Average RF for all analytes ≥ 0.10[a] and one option below: Option 1: %RSD for all analytes $\leq 20\%$ Option 2: Least squares regression $r \geq 0.990$	Correct the problem and repeat the initial calibration.
Second-source calibration verification	Once for each multi-point initial calibration	All analytes within $\pm$30% of expected value	Correct the problem and repeat initial calibration.
Continuing calibration verification	At the start of each analytical sequence and every 12 hours thereafter	Average RF for all analytes ≥ 0.10[a] All analytes within + 20% of expected value.	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable continuing calibration verification.
Retention time window calculated for each analyte	Each analyte	Relative retention time of each analyte within + 0.06 relative retention time units of the continuing calibration verification	Not applicable (used for identification of analyte)
Internal Standards	Each sample and QC sample, method blank, MS/MSD and LCS	Retention time within $\pm$30 seconds from retention time of the daily continuing calibration verification standard. EICP area within –50% to +100% of the daily continuing calibration verification standard	Inspect mass spectrometer and gas chromatography for malfunctions; reanalyze all affected samples
Method Blank	At least one per analytical batch	No analytes detected at or above the reporting limit	Correct the problem, then re-prep and reanalyze all associated samples
Surrogate spike	Every standard, sample, method blank, MS/MSD and LCS	All surrogates in samples, method blank and LCS within limits specified in Accuracy and Precision table	Correct the problem and reanalyze (re-prep if necessary).
MS/MSD	One set per 20 project-specific samples	Within limits specified in Accuracy and Precision table	None
LCS	At least one per analytical batch	Within limits specified in Accuracy and Precision table	Correct the problem, then re-prep and reanalyze the LCS and all samples in the analytical batch.

[a]Average relative response factor (RRF) specific for each comment. See Table 4 in SW8260C method.

Table A-4. Data Qualifying Conventions—General

Essex-Hope Site, Jamestown, New York

QC Requirement	Criteria	Flag	Flag Applied To
Holding Time	Time exceeded for extraction or analysis	J for positive results; R or UJ for nondetects*	All analytes in the sample
Sample Preservation	Sample not preserved (if sample preservation was not done in the field but was performed at the laboratory upon sample receipt, no flagging is required)	J for positive results; R or UJ for nondetects*	Sample
Sample Integrity	Temperature out of control VOCs received with headspace >6mm	J for positive results; R or UJ for nondetects*	Sample
Initial Calibration*	All analytes must be within method specified RSD criteria	J for positive results; R or UJ for nondetects	All associated samples in analysis batch
	RRF <0.05 but >0.01	J for positive results; UJ for nondetects	
	RRF<0.01	J for positive results; R for nondetects	
Second Source Check or CCV*	All analytes must be within method specified %D criteria	High Bias: J for positive results, no flag for nondetects Low Bias: J for positive results, UJ for nondetects R for all nondetects greater than twice the control criteria	All associated samples in analysis batch
	RRF<0.05 but >0.01	J for positive results; UJ for nondetects	
	RRF<0.01	J for positive results; R for nondetects	
Low-level Calibration Check	All analytes must be within method specified criteria	High Bias: J positive results, no flag for nondetects Low Bias: J positive results, UJ nondetects R for all nondetects greater than twice the control criteria	All associated samples in analysis batch
Internal Standards	Area > upper control limit	J for positive results, no flag for nondetects	Sample
	Area < lower control limit	J for positive results; UJ for nondetects	
	Area < 20%	J for positive results; R for nondetects	
Surrogates	% R > upper control limit	J for positive results, no flag for nondetects	Sample
	%R < lower control limit	J for positive results; UJ for nondetects	
	%R <10%	J for positive results; R for nondetects	

Table A-4. Data Qualifying Conventions—General

Essex-Hope Site, Jamestown, New York

QC Requirement	Criteria		Flag	Flag Applied To
LCS	% R > upper control limit		J for positive results, no flag for nondetects	The specific analyte(s) in all samples in the associated batch
	%R < lower control limit		J for positive results; UJ for nondetects	
	%R <10%		J for positive results; R for nondetects	
Blanks (Method, Field, Equipment, Trip or Calibration)	Blank Result	Sample	Flag U and raise to RL	Sample
	< RL	<RL		
		≥ RL	Use professional judgment	
	≥ RL	<RL	Flag U and raise to RL	
		≥ RL but < blank result	U at sample concentration	
		≥ RL and ≥ blank result	Use professional judgment	
Field Duplicates	RPD > control limit		J for positive results, no flag for nondetects	The specific analyte(s) in the associated sample Note: No flagging is required for results less than the reporting limit
Laboratory Duplicates	RPD > control limit (20% GW; 35% soil)		J for positive results, no flag for nondetects	The specific analyte(s) in the associated sample
MS/MSD	%R > upper control limit		J for positive results, no flag for nondetects	The specific analyte(s) in the parent sample
	%R < lower control limit		J for positive results; UJ for nondetects	
	MS/MSD %R <10%		J for positive results; R for nondetects	
	MS/MSD RPD > control limit		J for positive results, no flag for nondetects	
	Sample concentration > 4 times the spike concentration		No flag required	
	Excessive dilution*		No flag required	

* Based on analyte-specific review. The RRF for certain compounds (1,4-dioxane, ketones, etc.) may not meet the specified method criteria due to nature of the compounds. Laboratory SOPs may need to be reviewed for exceptions to the method criteria.

%R = percent recovery
RRF = relative response factor

Appendix H
Field Sampling Plan

Field Sampling Plan
Essex/Hope Site, Jamestown, New York

Prepared for

Essex Specialty Products, Inc.

December 2017

ch2m

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Acronyms and Abbreviations

°C	degrees Celsius
BPU	City of Jamestown Board of Public Utilities
CBTEX	cumene, benzene, toluene, ethylbenzene, and xylenes
CH2M	CH2M HILL Engineers, Inc.
CoC	chain-of-custody
DCE	dichloroethene
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
HCl	hydrochloric acid
ID	identification
mL	milliliters
mL/min	milliliters per minute
MS	matrix spike
MSD	matrix spike duplicate
NTU	nephelometric turbidity unit
O&M	operations and maintenance
PID	photoionization detector
ppm	parts per million
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
Site	Essex/Hope site
SMP	Site Management Plan
SOP	standard operating procedure
TCE	trichloroethene
UST	underground storage tank
VOC	volatile organic compound

SECTION 1

Introduction

This document presents the project-specific Field Sampling Plan (FSP) for routine monitoring and sampling activities being conducted at the Essex/Hope State Superfund site located at 125 Blackstone Avenue in Jamestown, New York (the "Site"), in accordance with the Site Management Plan (SMP). This FSP is Appendix H to the SMP. The FSP is organized accordingly to the routine field sample collection or testing and/or laboratory testing, which have been identified as follows:

1. Monthly sampling
2. Quarterly and biannual sampling
3. Annual groundwater monitoring

This FSP provides the specific field-sampling locations and frequencies, equipment and procedures, and sample handling and analysis for tasks supporting the routing monitoring and sampling activities at the site as prescribed in the SMP.

This FSP should be used in conjunction with the Quality Assurance Project Plan (QAPP) (Appendix G of the SMP) to guide all field and laboratory sampling and measurement conducted during routine monitoring and sampling at the site. Together, the FSP and the QAPP compose the Sampling and Analysis Plan.

SECTION 2

Sample Location and Frequency

Each of the tasks requires sample collection or field analysis, as described in the following sections, organized by topic.

2.1 Monthly Sampling

Treatment system monitoring and sampling are performed in accordance with Section 4.3 of the SMP and the requirements of Industrial Wastewater Discharge Permit Number 26 for discharge to the City of Jamestown POTW (City of Jamestown Board of Public Utilities [BPU], 2017; included as Appendix D of the SMP). The Operations and Maintenance (O&M) Plan, included as part of the 2016 Annual PRR (CH2M, 2017), provides additional details and description of the system's design, components, and operation.

2.1.1 Influent/Effluent Laboratory Analytical Sampling

Monthly influent/effluent sampling is conducted to monitor treatment performance and efficacy, and to satisfy wastewater discharge permit requirements (Appendix D of the SMP). Samples are to be collected at the following locations:

- Pre-carbon sample – collected from the sample port valve located on the Decon-3 piping package
- Primary effluent sample – immediately following carbon treatment from the first carbon bed
- Post-carbon samples – immediately following carbon treatment from the second carbon bed

2.1.2 pH Sampling

pH is monitored monthly at each post-carbon sample location. A total of four pH measurements are obtained on the post-carbon sampling to ensure it is within 6 to 9 standard units, in accordance with the BPU wastewater discharge permit.

2.2 Quarterly and Biannual Sampling

2.2.1 Groundwater Level Measurements

Groundwater levels will be measured quarterly in all available monitoring wells (shown on Figure 4-1 of the SMP), and before each annual groundwater sampling event with a water level indicator or oil/water interface probe, as appropriate. The depth from the top of the well casing to water level will be recorded to the nearest 0.01-foot. If necessary, repeated measurements will be made to obtain a reliable water elevation. After the groundwater measurements of each monitoring well are collected, the water level indicator will be properly decontaminated to prevent cross-contamination.

2.2.2 Semiannual Recovery Well Sampling

Recovery well sampling is conducted quarterly in accordance with the SMP. Samples will be obtained directly from each well's sample port located on the recovery well piping manifold and sent to the offsite laboratory for analysis of volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method SW8260. Refer to the SMP for further details regarding sampling schedule and Figure 4-1 of the SMP for the recovery well locations.

2.3 Annual Groundwater Sampling

Groundwater sampling will be collected from a total of 21 groundwater monitoring wells annually. Because the Site has been investigated and sampled regularly since the remedial design was implemented, the location and trends of the plumes are generally well understood. Therefore, the groundwater sampling network has been developed to focus annual sampling on the key wells that inform plume trends and potential downgradient plume migration. Wells to be sampled are identified on Figure 4-1 of the SMP, and the sampling network has been designed based on the following criteria:

- The monitoring well sampling network was designed to monitor the shallow trichloroethene (TCE) plume, the shallow CBTEX plume under the West Building, the trimethylbenzene plume in the eastern underground storage tank (UST) area, and the deep TCE/cis-1,2-dichloroethene (cis-1,2-DCE)/vinyl chloride/acetone plume.
- Contaminant concentration trends near the plume sources will be monitored by the semiannual sampling of the extraction wells (described in Section 2.2.2), and annual sampling of monitoring wells in or near the source zones for the four plumes.
- Monitoring of sentinel wells (wells with little or no current impacts from constituents of concern) to assess potential downgradient plume migration of the deep TCE plume, the shallow CBTEX plume, and the shallow trimethylbenzene plume.
- Sampling of monitoring wells near the downgradient tails of the deep TCE plume and shallow TCE plume (plume fringe) to assess contaminant concentration trends.

SECTION 3

Field Sampling Collection Procedures

3.1 Influent/Effluent Sampling

3.1.1 Laboratory Analysis

Monthly influent/effluent sampling is conducted to monitor treatment performance and efficacy, and to satisfy wastewater discharge permit requirements (Appendix D of the SMP). The samples from the treatment system are collected according to the *Standard Methods for Examination of Water and Wastewater* (American Water Works Associations, 1999). Before sampling, the water is first purged to ensure the sample is coming directly from the site specified in the operating permits and not stagnant water in a sample line. Water samples will then be collected by submersing the sampling container directly beneath the spout of the discharge valve. Six samples are to be collected for VOC analysis via EPA Method SW8260 each month as follows:

- Pre-carbon sample – collected from the sample port valve located on the Decon-3 piping package
- Primary effluent sample – immediately following carbon treatment from the first carbon bed
- Post-carbon samples – immediately following carbon treatment from the second carbon bed
  - Consisting of four separate grab samples collected 30 minutes apart (to satisfy BPU discharge permit requirement of "*at least 4 grab samples collected during a typical production day*").
  - These samples are physically composited by the laboratory prior to analysis.
  - Post-carbon analytical results are reported from the resulting composite.

When collecting a sample, a low flow should be used to minimize turbidity and allow the valve to purge itself for approximately 30 seconds before sample collection. Total monthly flow and continuous flow, as measured by a totalizer that records instantaneous and total gallons discharged, must be recorded at time of sampling to ensure discharge is within design and permit flow limits.

3.1.2 pH Collection

pH is monitored monthly at each post-carbon sample (total of four pH measurements) to ensure it is within 6 to 9 standard units, in accordance with the BPU wastewater discharge permit. A pH meter, dedicated jars, and the respective calibration solutions are available onsite. The pH meter should be calibrated before collecting the required measurements during each sampling event. The pH readings and monthly sample collection details will be recorded accordingly in the inspection sheet included in the O&M Plan (CH2M, 2017).

3.2 Semiannual Recovery Well Sampling

Recovery well sampling is conducted quarterly in accordance with the SMP. Samples will be obtained directly from each well's sample port located on the recovery well piping manifold and sent to the offsite laboratory for analysis of VOCs by EPA Method SW8260. Refer to the SMP for further details regarding sampling schedule and Figure 4-1 of the SMP for the recovery well locations.

3.3 Groundwater Sampling

Annual groundwater sampling must be conducted at select monitoring wells (listed in Table 4-4 and shown on Figure 4-1 of the SMP) using the EPA Region 1 Low-Flow Protocol (EPA, 2010). Specifically, samples will be collected in accordance with the following:

- Monitoring wells will be purged at flow rates between 200 milliliters per minute (mL/min) and 500 mL/min.
- Monitor indicator parameters will be collected until stabilization for temperature, pH, specific conductance, redox potential/oxidation reduction potential, and dissolved oxygen (DO) using an in-line monitoring device and turbidity using a separate probe.
- Water level measurements will be recorded to ensure the drawdown does not exceed 0.3-foot.
- Data will be recorded a on a pre-made field sampling sheet (Attachment 1).
- Collect groundwater samples from the middle of the screened interval.
- Collect groundwater samples using a peristaltic pump to extract water from within the well.
- Groundwater sampling equipment will be decontaminated in accordance with Standard Operating Procedure (SOP) #001 (Attachment 2).

3.4 Field Tests

Various field tests may be performed during sampling activities. Water quality parameters that may be measured during field activities include pH, specific conductivity, redox potential, temperature, DO, and turbidity.

3.5 Equipment Calibration

Various instruments will be used in the field to collect data. Proper calibration, maintenance, and use of the instruments are important for collecting high-quality data. A record of calibration and maintenance activities is as important as the data record itself for verifying the delivery of high-quality data. As a result, the field team will complete a field calibration record form for each calibration performed for a sampling activity.

3.5.1 Field Equipment Calibration

The following field equipment to be used during investigations and sampling require calibration:

- pH meter
- Four-gas meter
- Photoionization detector (PID)
- Turbidity meter
- Multi-parameter groundwater parameter detectors (for example, YSI 556 for pH, conductivity, DO, temperature and redox potential)

The meters used for field measurements will be calibrated before each day's use. The standards that will be used to calibrate these instruments will be obtained as necessary and are listed in Table 3-1.

Table 3-1. Calibration Standards for Field Equipment

Instrument	Calibration Standards	Method
Turbidity Meter	0.1 NTU, 20 NTU	Per instrument instructions
Multi-parameter Groundwater Detector	Various	Per instruments instructions
PID	100 ppm Isobutylene gas	Per Instrument Instructions

NTU = nephelometric turbidity units
PID = photoionization detector
ppm = parts per million

If field personnel suspect an equipment malfunction, they must remove the meter from service and tag it to prevent inadvertent use. Staff members must notify the equipment manager or rental company so that a substitute piece of equipment can be used. Some backup equipment should be available in the field for use in case of a malfunction.

Equipment that fails calibration or becomes inoperable during use will be removed from service and tagged so it is not used inadvertently. Such equipment will be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced. The results of activities performed using equipment that has failed recalibration will be evaluated. If the results are affected adversely, the outcome of the evaluation will be documented and the proper personnel notified.

SECTION 4

Sample Handling and Analysis

Water samples will be collected using decontaminated, clean equipment. Each sample will be transferred into properly labeled, laboratory-prepared sampling containers filled and/or preserved as appropriate. Each sample will be cooled to approximately 4 degrees Celsius (°C) and shipped to the analytical laboratory under appropriate chain-of-custody (CoC) documentation procedures. If required by sampling protocol, the staff will field-filter samples before shipment to the laboratory for analysis. Field personnel will begin sampling at the least-contaminated area and proceed to the most-contaminated area.

All analytical testing, sample handling and quality assurance/quality control (QA/QC) will be performed in accordance with the QAPP and samples will be submitted for offsite analysis under a CoC.

A primary laboratory will be contracted to handle analytical testing. All chemical analyses will be performed by a New York State-certified laboratory. Table 4-1 lists the requirements for sample containers, preservation procedures, and maximum holding times of aqueous samples collected. The staff must confirm that the containers meet these requirements before field operations begin and the containers are supplied by the contracted laboratories.

All groundwater samples are to be analyzed for VOCs by EPA Method SW8260B.

Table 4-1. Required Analytical Method, Sample Containers, Preservation, and Holding Times

Analyses	Analytical Method	Sample Matrix[a]	Container[b]	Qty	Preservative[c]	Holding Time [d]
VOCs	SW-846 8260C	W	40-mL, glass	3	HCl, pH<2; cool to 4°C	14 days
pH	SW-846 9040C/ 9045D	W	250-mL polyethylene	1	Cool 4°C	Within 24 hours of sample receipt

Notes:

Sample container, and volume requirements will be specified by the analytical laboratory performing the tests.

Three times the required volume should be collected for samples designated as MS/MSD samples.

[a] Sample matrix: W = groundwater

[b] All containers will be sealed with Teflon-lined screw caps.

[c] All samples will be stored promptly at 4°C in an insulated chest.

[d] Holding times are from the time of sample collection.

°C = degrees Celsius

mL = milliliters

HCl = hydrochloric acid

4.1 Volatile Organic Compound Sampling

Samples requiring purgeable organic analysis follow the summary procedure below but are discussed in detail in *Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis* (EPA, 2003):

Collect grab samples in 40-mL septum vials. The procedure for filling and sealing sample containers is as follows:

1. Slowly fill each container to overflowing.
2. Carefully set the container on a level surface.

3. Place the septum Teflon side down on the convex sample meniscus.
4. Seal the sample with the screw cap.
5. To ensure that the sample has been properly sealed, invert the sample and lightly tap the lid on a solid surface to ensure there is no headspace.
6. The absence of entrapped air bubbles indicates a proper seal.
7. If air bubbles are present, open the bottle, add additional sample, and reseal in the same manner as stated above.
8. The sample must remain hermetically sealed until it is analyzed.
9. Maintain samples at 4°C (39 degrees Fahrenheit) during transport and storage prior to analysis.

If the sample is taken from a water tap, turn on the water and permit the system to flush. When the temperature of the water has stabilized, adjust the flow to about 500 mL/min and collect samples as outlined above.

4.2 Field Quality Control Samples

Field QC samples are collected at the frequency determined in the QAPP. Blank samples are introduced into the total measurement system at a variety of frequencies as a means of control and evaluation of the level of contamination and variability of results contributed by potential artifacts and interferences arising at any point in the measurement process. For the field sample collection activity, the types of blank samples—equipment, field, and travel blanks, as defined below—are designed to measure:

- The integrity of sample container and sample equipment cleaning
- The actual sample collection process
- Purity of sample preservation or additive reagents
- The influence of site environmental conditions (contamination)
- Cross-contamination of samples, Indeterminate artifacts introduced during the transport of samples, sample, and shipping containers, sample preservatives, cleaning agents, and sampling equipment

Field and travel blanks are required at a minimum rate of 5 percent per parameter group per day. These blanks must be composed of the same source water typically provided by the contract laboratory.

4.2.1 Travel (Trip) Blank

The travel blank is designed to address interferences derived from cross contamination during storage/ transport, and extraneous environmental conditions affecting the sampling event to and from the site, including delivery to the analyzing laboratory.

Travel blanks are composed in the appropriate sample container using source blank water. Preservatives or additives are added if required for that parameter group. Travel blanks are then sealed and stored in the ice chest where real samples will be stored and transported. Travel blanks are to originate at the facility providing the blank water for the equipment and field blanks. Travel blanks should not be prepared onsite because the sample would actually be a field blank. The frequency of travel blanks should be one per every VOC shipping container, only applicable to VOCs.

4.2.2 Field Duplicate Samples

Field duplicate samples will be collected during the annual groundwater sampling event. To collect duplicates, sampling personnel will fill two or more containers from a single sample source for each analyte category. These samples will be handled in the usual manner and analyzed in the laboratory to determine precision of the sampling technique. Frequency of the field duplicates should be 10 percent of the total number of samples per sampling event.

4.2.3 Matrix Spike Samples

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected during the annual groundwater sampling event and should be 5 percent of the total number of samples per event. The results of these sample analyses provide information about the possible influence of the matrix on either accuracy or precision of the measurements.

4.2.4 Temperature Blank

A temperature blank will be included in each cooler containing samples for analyses so the laboratory can record the temperature without disturbing the samples. The temperature blank will not be given sample identification nor listed on the CoC.

SECTION 5

Documentation

5.1 Sample Nomenclature

A systematic CoC and field sample identification nomenclature has been developed. Consistent nomenclature has been designed to facilitate entry, management, and manipulation of field and analytical data in the site-specific EQuIS™ database.

YYYYMMDD is the date the sample was collected.

5.1.1 Treatment System Samples

Treatment system samples will be identified as follows:

- PRE-CARB-YYYYMMDD
- PRIMARY-EFF-YYYYMMDD
- POST-CARB-YYYYMMDD_1
- POST-CARB-YYYYMMDD_2
- POST-CARB-YYYYMMDD_3
- POST-CARB-YYYYMMDD_4
- TRIPBLANK-YYYYMMDD

5.1.2 Recovery Well Samples

Recovery Well samples will be identified as follows:

- RW-XX-YYYYMMDD

Where XX is the recovery well number/ID (i.e. 1S, 2S, 2D, 3S, and 4D).

5.1.3 Groundwater Samples

Groundwater samples will be identified as follows:

- MW-XXX-YYYYMMDD

Where XXX is the monitoring well location number.

5.2 Sample Collection, Labeling, and Transportation

It is important that a minimum number of persons be involved in sample collection and handling. Guidelines established in this plan for sample collection, preservation, and handling are to be implemented. Field records are to be completed and signed or initialed by the sample collector(s) at the time the sample is collected. Field records are to contain the following information:

- Sample type (grab or composite)
- Date and time of collection
- Source of sample including name, location, and sample type
- Preservative used
- Required analyses
- Collector(s)' name(s) or initials(s)
- Pertinent field data (pH, specific conductivity, redox potential, temperature, DO, and turbidity)

5.2.1 Sample Labels

Each sampling container shipped to the laboratory for analysis will be identified with a sample label. This label will contain the following information:

- Project name
- Project number
- Sample location identification (including site)
- Date and time of sample collection
- Analysis required (method)
- Preservation
- Sampler initials
- Matrix

When the sample label information has been completed, the label will be placed on the appropriate sampling container. If a label is not available, the same information is to be affixed to the sample container with an indelible, waterproof marking pen.

5.2.2 Sample Transportation

Samples will be packed with ice (if required) and transported to a New York-certified laboratory for analysis. Samples may be shipped overnight, driven directly to the lab, or picked up by a courier from the lab. Shipping containers will be secured with strapping tape. A separate signed custody record will be enclosed in each shipping cooler. All employees will be fully trained in techniques for the proper handling of samples for analysis.

5.3 Field Documentation Form

All field sampling activities will be documented using field logs, checklists, and CoC procedures. Sample containers will be clean containers provided by the laboratory. Staff members will attach an identification label, indicating the sample number, station number, analysis to be performed, preservative used, data and time of sample collection, and the name of the responsible sampling team member, to each sample container. A sample checklist indicating the analysis to be performed, preservative used, data and time of sample collection, and the name of the responsible sampling team member will be used at each sampling event for a guarantee of completeness. Field documentation forms for each type of media are provided in in the O&M Plan (CH2M, 2017).

5.4 Transfer of Custody

The field custodian or, if a custodian has not been assigned, the field inspector is responsible for properly packaging and dispatching samples to the appropriate laboratory for analyses. This responsibility includes filling out, dating, and signing the appropriate portion of the CoC record.

All packages sent to the laboratory are to be accompanied by the CoC record and other pertinent forms. Copies (carbon or photocopy) of these forms are to be retained by the originating office and copies sent to the CH2M project manager after sample collection.

5.4.1 Chain-of-Custody and Shipping Procedures

It is imperative that written procedures are available and followed whenever samples are collected, transferred, stored, analyzed, or destroyed. The primary objective of these procedures is to create an accurate written record that can be used to trace the possession and handling of the sample from the moment of collection, through analyses, and until discarded. This information is useful, not only to verify compliance with the permit's effluent limitation and self-monitoring, but also because such records are

required should the need arise to support litigation. CH2M must be able to provide the CoC path of all samples that are offered for evidence or that form the basis of the analytical test results.

A sample is in someone's custody if:

- It is in one's actual physical possession
- It is in one's view after being in one's physical possession
- It is in one's physical possession, then locked up so that no one can tamper with it, or kept in a secured area restricted to authorized personnel only
- A person has signed the custody sheet to accept possession and thus cannot be relinquished until signed and delivered to another

After being collected, samples will be packed in coolers with ice for delivery to the laboratory. Ice will be double-bagged, and all samples and ice will be packaged in contractor bags to prevent samples and ice from leaking in the cooler. The coolers used to deliver the samples will be sealed with strapping tape. Evidence tape will be placed across the front and back of each lid to control tampering. The samples will be delivered to the laboratory at a frequency, usually at the end of each day, to ensure that holding times are not exceeded. However, there will undoubtedly be occasions when the use of a chest is inconvenient. On such an occasion, place a seal, which would indicate tampering if removed, around the cap of the individual sample container.

CoC forms contain general information about the location of the activity, the members of the sampling team, and specific information about the type of sample, sample location, number of sample containers from each location, and analyses to be performed. Each time the sample is relinquished or received, the party involved signs the form and notes the time and date. The CoC number shall be written and identified by MMDDYY-01 for the first cooler sent on that specific day. If there is an additional cooler sent on the same shipment day the number will be MMDDYY-02. Personnel must remember to record the tracking number for the cooler on a copy of the CoC form for use if the shipment is misplaced/lost.

SECTION 6

References

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Attachment 1
Field Sampling Sheet

Low-Flow Groundwater Sampling: Field Data Sheet

Well Number:		**Site:**	
Field Crew:		**Date:**	**Project #:**

		Diameter	Gal. Per Foot	Diameter	Gal. Per Foot
Well Depth (ft.):	Purge Methodology:				
DTW (ft.):	EPA Region I Procedures for low flow	2"	.163	5"	1.020
Water Column (ft.):	purging/sampling	3"	.367	6"	1.469
Well Diameter (in.):	Peristaltic Pump	4"	.653	8"	2.611
Gal. per ft.:	pumps with Teflon HDPE tubing				
Well Volume (gal.):	YSI, Lamotte				
Depth of Screen (ft.):	Turbidity meter				

Field Parameters

	Time	DTW (tic)	Flow Rate (ml/min)	Total Volume (gal)	pH (Std. Units)	Cond. (mS/cm)	Turbidity (NTU)	D.O. (mg/l)	Temp (C)	ORP (mV)	Turbidity - Lamotte (NTU)	Color/Odor
	Stabilization	< 0.3'	200 - 500		+/- 0.1	+/- 3 %	+/- 10%	+/- 10 mV		+/- 10 mV	+/- 10%	
Initial												

Remarks: Pump Intake Depth: Control Box Setting: Refill: Discharge: PSI:

SAMPLING

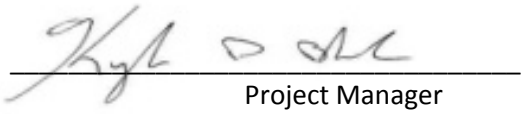
Depth to Water Before Sampling:	
Sample Methodology:	
Sample ID:	QC Sample:
Sample Date/Time:	
Sampler / Signature:	
Filtered Metals Collected: Y / N	Filter Size: NA
Sample Observations:	
Parameters:	

Attachment 2
Equipment Decontamination Standard Operating Procedure (#001)

Equipment Decontamination
July 16, 2012
Erik Spande/CH2M HILL

APPROVED:

Author — Date: 7/16/2012



Project Manager — Date: 12/15/2017

Annual Review Summary

Annual Reviewer				
Date of Review				

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Attachments

Attachment 1 – Equipment List

A. Purpose and Applicability

The purpose of this Standard Operating Procedure (SOP) is to establish uniform procedures for equipment decontamination. The procedures outlined in this SOP are applicable the decontamination of heavy equipment, drilling equipment, well materials, and sampling equipment.

B. Summary of Method

Decontamination procedures are summarized in this SOP.

C. Definitions

- AHA Activity Hazard Analysis
- FSP Field Sampling Plan
- FTL Field Team Leader
- HandS health and safety database
- OSHA Occupational Safety and Health Administration
- SSC Site Safety Coordinator
- USEPA United States Environmental Protection Agency

D. Health and Safety

CH2M HILL staff will have current Occupational Safety and Health Administration (OSHA) and 8-hour OSHA refresher training, as applicable. Staff will review and sign the site health and safety plan (HASP), will review and sign the activity hazard analysis (AHA) for the task, and understand and use personal protective equipment as specified in the HASP.

E. Personnel Qualifications

This SOP is written for CH2M HILL staff. The field team leader (FTL) will be responsible for the execution of the Work Plan and Field Sampling Plan. The FTL will be identified by the Project Manager before the start of the task. The site safety coordinator (SSC) will have completed the CH2M HILL-required SSC training and will be responsible for the execution of the HASP. All CH2M HILL staff will have current OSHA and 8-hour OSHA refresher training, as applicable. The SSC will verify that all HASP-required training using the HandS database and any lapsed training is updated before the start of the task, and that copies of training for each staff member are onsite.

F. Equipment and Supplies

Attachment 1 contains equipment and supplies for decontamination activities.

G. Procedural Steps

Sampling Equipment Decontamination

Dedicated and disposable equipment will not need to be decontaminated. All sampling equipment that will be reused will be decontaminated using these procedures. Sampling equipment may be steam-cleaned (or by using the procedure noted below.

- Clean disposable equipment (groundwater sampling tubing, bladders for pumps, sampling spoons, etc.) should be used when necessary to minimize cross-contamination. Disposable equipment does not have to be decontaminated.
- Conduct sampling equipment decontamination at the decontamination pad. If the pad is not present, then sampling equipment decontamination will occur within buckets that are placed on plastic sheeting.
- Wash sampling equipment such as low-flow pumps, bowls, spoons, augers, Geoprobe rods, and Macrocore samplers with potable water and then phosphate-free detergent (such as Alconox).
- Equipment will undergo an acid rinse consisting of a 10 percent solution of reagent grade nitric acid and deionized water if sampling for metals.
- Rinse with potable water and then rinse with distilled water.
- Between rinses, place equipment on plastic sheeting or aluminum foil, as needed.
- Decontaminated equipment will be wrapped in aluminum foil for storage or transportation from the decontamination area to the sampling area. Decontaminated equipment will not be placed on the ground.

H. Data and Records Management

Record the time and procedures used for decontamination in the field book or field form. Field data will be finalized the day of collection. Hardcopy records will be scanned and copied to a project directory at least weekly. Electronic records will be backed up on a laptop or similar device daily, and will be copied to a project directory at least weekly.

I. Quality Assurance and Quality Control

Follow and document procedures noted above and in accordance with quality assurance/quality control (QA/QC) procedures specified in the QAPP.

J. Attachments/Checklists

1. Equipment Checklist

Attachment 1 – Equipment List

- Alconox® solution (or equivalent)
- Potable water
- Deionized water
- Diluted reagent grade acid (Nitric Acid)
- Spray bottles for alconox solution, diluted acid, potable water, and distilled water. Each type of spray bottle used for decontamination will be labeled.
- Brushes
- 5-gallon buckets with lids
- Four or more 5-gallon buckets for decontamination of pumps
- Aluminum foil
- Protective gloves (nitrile or latex, per HASP)

Appendix I
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APPENDIX I

Remedial System Optimization for the Essex/Hope Site

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