REMEDIAL SYSTEM OPTIMIZATION REPORT

MOHONK ROAD INDUSTRIAL PLANT
SITE NO. 356023

WORK ASSIGNMENT NO. D007619-34

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC Project No. 3617157346

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
Aztech	Aztech Environmental Technologies, Inc.
bgs	below ground surface
COCs	contaminants of concern
CSM	conceptual site model
DCA	dichloroethane
DCE	dichloroethene
FDR	Field Data Record
FS	feasibility study
ft	foot or feet
gpm	gallon(s) per minute
GWETS	groundwater extraction and treatment system
HPFM	heat pulse flow meter
IDW	investigation-derived waste
K	hydraulic conductivity
lbs	pounds
LMS	Lawler, Matusky & Skelly Engineers
LTM	long term monitoring
MACTEC	MACTEC Engineering and Consulting, P.C.
MIP	membrane interface probe
MRIP	Mohonk Road Industrial Plant
msl	mean sea level

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
PCE	tetrachloroethene
PID	photoionization detector
ppb	parts per billion
QAPP	Quality Assurance Program Plan
RI	remedial investigation
ROD	Record of Decision
RSO	Remedial System Optimization
SCO	Soil Cleanup Objective
Site	Mohonk Road Industrial Plant
SVE	soil vapor extraction
TCA	trichloroethane
µg/kg	microgram(s) per kilogram
µg/L	microgram(s) per liter
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

MACTEC Engineering and Consulting, P.C. (MACTEC) performed a Remedial System Optimization (RSO) Study for the Mohonk Road Industrial Plant (MRIP) (Site) in the Hamlet of High Falls, Ulster County, New York (see Figure 1.1). This work was completed for the New York State (NYS) Department of Environmental Conservation (NYSDEC) under Work Assignment No. D007619-34 and is in accordance with the April 2011 Superfund Standby Contract No. D007619 between the NYSDEC and MACTEC. The Site was assigned Site No. 356023 by the NYSDEC.

1.1 SITE OVERVIEW

The Site is currently classified as a Class 2 site that poses a significant threat to the public health and environment. The Site has been identified as a source of volatile organic compounds (VOCs), primarily 1,1,1-trichloroethane (1,1,1-TCA), detected in soil, groundwater, and soil vapor. The selected remedy for the Site includes groundwater extraction, on-site treatment, and discharge to surface water. Remedial measures are currently in operation.

1.2 PROJECT OBJECTIVES

The following RSO Report presents a modified Conceptual Site Model (CSM), the findings of the RSO evaluation, and recommendations for how to improve the remedial program at the Site. RSO activities were performed in accordance with the NYSDEC Work Assignment D007619-34 objectives, which included;

1) A literature and record review to determine if site characterization data gaps exist;
2) Review of in-place groundwater pumping and treatment systems and the remedial program objectives, an evaluation of the status, progress and effectiveness of the selected remedy, and a technical assessment of the appropriateness of the remedial program; and
3) Review of the near field bedrock monitoring/extraction well network.

The updated CSM and RSO are presented based on MACTEC's current Site understanding, which has evolved since the NYSDEC work assignment issuance in February of 2015. An outline of MACTEC's involvement to date is found below, and summarized in detail in the following subsections 1.2.1 and 1.2.2.

- Desktop File Review (Spring 2015): Collected and reviewed existing Site documents.
- CSM and Data Gap Review (July 2015): Prepared letter report, *Conceptual Site Model and Data Gap Review Report, Mohonk Road Industrial Plant, NYSDEC Site No. 356023*, based on existing and historical information. Letter report presents initial CSM and identifies data gaps to be filled in during the upcoming RSO field program.
- Data Gap Investigation Field Activities Plan (July 2015): Presented objectives and methods of Data Gap Investigation.
- Data Gap Investigation Field Activities (September/October 2015): Conducted field activities to fill in previously identified data gaps for the purpose of updating the CSM.
- CSM/RSO (June 2016): Presents Data Gap Investigation results, refined CSM, and RSO.

1.2.1 2015 CSM and Data Gap Review

Following a comprehensive literature and record review, MACTEC submitted the 2015 CSM and Data Gap Review Report, which summarizes the subsurface conditions, the adequacy of the current monitoring network, contamination migration and pathways, and also a description of identified data gaps (included as Appendix A; MACTEC, 2015a). The subsequent Data Gap Investigation was planned and conducted in order to better understand the contaminant distribution at the Site, fill in the previously identified data gaps, and provide additional data needed to evaluate the existing remedial action program's effectiveness. The Data Gap Investigation was conducted to meet the following objectives in accordance with the Field Activities Plan (included as Appendix B; MACTEC, 2015b):

1) Evaluate the potential presence of residual VOC contamination (primarily 1,1,1-TCA) within the overburden and in the bedrock matrix in the interpreted source area (i.e. in the previously excavated former septic tank area, the area between the former septic tank and the MRIP building, the septic piping termini, and beneath the Site building).
2) Evaluate the hydrostratigraphic migration pathways on-site and contaminant concentrations in the source area groundwater zones.
3) Evaluate the hydraulic properties of the deeper overburden and shallow bedrock within the source area to aid in determining if the existing system can be modified to control or mitigate contaminate mass and mobility, or if other remedial options should be considered.

1.2.2 2016 CSM Update and RSO

The CSM update and RSO scope of work consisted of a review of the Data Gap Investigation results, and historical records review of treatment system operation, design, maintenance, performance, and monitoring information provided by NYSDEC and Aztech Environmental Technologies, Inc. (Aztech), the current Groundwater Extraction and Treatment System (GWETS) operator.

The objectives of the RSO evaluation are the following:

1. Refine CSM based on evaluation of Data Gap Investigation results,
2. Review remedial program objectives,
3. Evaluate overall system operation, effectiveness and progress of the remedy,
4. Assess the selected remedy applicability to meeting remedial action objectives and goals as well as the appropriateness of remedial program for the Site,
5. Identify potential modifications to the existing remedial program and treatment system, and
6. Provide recommendations for new remedial programs to assist in meeting the remedial action objectives (RAOs).

1.3 REPORT OVERVIEW

This report has been prepared and organized as follows:

- Section 2.0 provides a background of the Site, history of contamination, remedial action objectives, and initial remedial response.
- Section 3.0 provides a summary of the data gap investigation results and an update to the CSM.
- Section 4.0 provides a comprehensive overview of existing remedial systems and operation and maintenance (O&M).
- Section 5.0 presents an evaluation of potential modifications to the existing remedial system.
- Section 6.0 presents recommendations for RSO.

2.0 SITE BACKGROUND AND REMEDIAL HISTORY

This section presents Site information summarized by MACTEC in the July 2015 letter entitled *Conceptual Site Model and Data Gap Review Report, Mohonk Road Industrial Plant, NYSDEC Site No. 356023,* found in Appendix A.

2.1 SITE LOCATION AND PHYSICAL SETTING

The Site is located in the Hamlet of High Falls, the Towns of Marbletown and Rosendale, Ulster County, New York, approximately seven miles north-northwest of the Village of New Paltz and ten miles south-southwest of the City of Kingston (see Figure 1.1). The Site includes the original MRIP property at 186 Mohonk Road and all surrounding properties impacted by the contaminated groundwater plume emanating from the MRIP property.

The original MRIP property consisted of approximately 14.5 acres with a 43,000-square-foot (ft) building in its southern corner (see Figure 2.1). The current MRIP property now consists of approximately seven acres of the original 14.5 acres. The property currently contains the single-story building, where a septic field was used to dispose of hazardous wastes, such as solvents and wastes from paint and metal-working operations. Drums, paint sludge, and other wastes were also buried in several locations on the MRIP Property. Historically, two production wells were used and were located within the building footprint (MRPW-1 and MRPW-2, see Figure 2.1).

The property has been used for industrial and commercial activities since the early 1960s. These activities included metal finishing, wet spray painting and the manufacturing of store display fixtures, card punch machines and computer frames. Wastes from these operations were typically discharged into the on-property septic system. The property is currently occupied by several commercial or light industrial businesses.

2.2 REMEDIAL INVESTIGATIONS

In April 1994, a residential well near the MRIP property was sampled and found to contain elevated levels of VOCs above the NYS Class GA drinking water standards. Subsequent sampling identified

70 other homes or businesses downgradient of the Site with VOCs above the aforementioned standards for drinking water. NYSDEC began investigating the Site in 1994, and as an interim action, installed 70 dual unit granular activated carbon (GAC) filters at homes or businesses whose wells exceeded the NYS Class GA Standards (5 micrograms per liter [µg/L] for individual VOCs). In 1994, NYSDEC designated the Site as Class 2 on the NYS Registry of Inactive Hazardous Waste Sites, indicating that the MRIP posed a significant threat to public health and the environment.

In the fall of 1996, an Immediate Investigation Work Assignment was implemented, and groundwater sampling results demonstrated that background overburden/bedrock interface and bedrock wells contained no detectable VOCs (Lawler, Matusky & Skelly Engineers LLP [LMS], 1997). Other on-site interface and bedrock wells, and the in-service production wells, all had 1,1,1-TCA and other compounds above groundwater standards, with the highest levels found in the overburden/bedrock interface wells directly downgradient of the underground septic tank area (i.e. MW-4; 82,000 µg/L, see Figure 2.1 for location).

Groundwater sampling results collected during a Remedial Investigation/Feasibility Study (RI/FS), indicated that downgradient private water supplies contained 1,1,1-TCA concentrations ranging from non-detectable to 880 parts per billion (ppb), and total VOC concentrations ranging from 1.6 ppb to 1,077 ppb (LMS, 1998b). In addition, groundwater in the bedrock aquifer beneath the MRIP property exhibited VOC concentrations above the United States Environmental Protection Agency (USEPA) Maximum Contaminant Level, and NYS Class GA Water Standards.

The following areas of known soil contamination on the MRIP property were identified as areas potentially requiring remedial action (see Figure 2.1):

- <u>Area of Concern (AOC)-A</u>: PCE, benzene, toluene, ethylbenzene, and xylene compounds located beneath the gravel parking area west of the MRIP building and south of the groundwater treatment building.
- <u>AOC-B</u>: Paint waste located south of Paint Waste Pit # 1 and north of the MRIP building.
- <u>AOC-C</u>: Paint waste located immediately east of Paint Waste Pit # 1.
- <u>AOC-D</u>: 1,1,1-TCA located in the vicinity of the former MRIP building septic tank, north of the MRIP building.

Based on the findings of the initial investigations, 1,1,1-TCA, 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), trichloroethene (TCE), tetrachloroethene (PCE), ethylbenzene and xylenes were identified as contaminants of concern (COCs) in Site soils. Data collected from groundwater sampling indicated that a dissolved-phase VOC plume extended approximately one mile north-northeast from the MRIP property.

2.3 REMEDIAL ACTIONS, CLEAN-UP GOALS AND SITE CLOSURE CRITERIA

The USEPA assumed the role as lead agency with the issuance of the Record of Decision (ROD) in 2000, which included the following RAOs (USEPA, 2000):

- eliminate inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet federal or state drinking water standards;
- restore the bedrock aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- prevent or minimize cross-media impacts from COCs in contaminated soil to the underlying groundwater, which will also eliminate potential future soil exposure (Site soil cleanup objectives (SCOs) for COCs would be based on NYSDEC's Technical and Administrative Guidance Memorandum 4046 for groundwater protection); and
- eliminate further off-MRIP property contaminated bedrock groundwater migration.

The selected remedy of the 2000 ROD included the following components.

- Extraction of contaminated groundwater in the near field and far field plume to restore the aquifer to its most beneficial use (as a potable water supply), treatment with an air stripper, and discharge of the treated water to the nearby Rondout Creek and Coxing Kill Creek. The "near field plume" refers to that portion of the groundwater plume with total VOC concentrations greater than 1,000 ppb, while the "far field plume" refers to the component of the groundwater plume with 10 ppb to 1,000 ppb total VOCs.
- The construction of a public water supply system to provide potable water to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells. The primary water supply for the system will be the Catskill Aqueduct. In addition, the individual GAC filtration systems currently in use will be operated until the new public water supply system is operational.
- Implementation of a groundwater monitoring program to evaluate the effectiveness of the remedy.
- Institutional controls may be employed to prevent future use of the bedrock aquifer in the impacted or threatened area.
- Excavation of VOC-contaminated soils with concentrations above the cleanup criteria to prevent or minimize cross-media impacts from COCs in soil to groundwater.
- Off-site disposal of the contaminated soil at appropriately permitted facilities.

In September 2008, USEPA issued a ROD Amendment in which the far field treatment system component of the groundwater remedy was replaced by monitored natural attenuation (USEPA, 2008). The RAOs were updated to reflect activities completed to date including:

- Restoring the aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- Eliminating further off-MRIP property contaminated groundwater migration; and
- Eliminating inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet state or federal drinking water standards.

A chronological summary of remedial investigations and actions to date is presented in Table 2.1. Remedy implementation and performance at the Site is also summarized in greater detail within the attached CSM and Data Gap Review Report (Appendix A).

2.4 CURRENT OPERATION

The operating on-site GWETS includes three five-horsepower extraction well pumps, located in wells MW-7R, ERT-1 and MW-5R. Pumping is controlled by submersible pressure transmitters installed in each well, programmed to cycle on and off when the water level in the well either reaches the maximum set-point or upon reaching the minimum set-point (approximately five ft above the pump intake).

As outlined in the 2005 Remediation System Evaluation, extracted groundwater was originally treated via sulfuric acid addition, air stripping and GAC adsorption (United States Army Corps of Engineers, 2005). Vapor phase GAC was used to scrub air stripper off-gas and liquid phase GAC to polish the effluent. Maladies in the existing air-strippers have resulted in the decision to operate the plant using only GAC (Aztech, 2014a). Acid addition was also eliminated from the process. In February 2014, it was reported that the existing GAC vessels were beginning to show distress, as contaminant break-through was observed after 6 months of operation.

Consequently, NYSDEC tasked Aztech (the Department’s current GWETS contract operator) with conducting a phased pilot test for the purpose of determining whether the type and capacity of the air-stripper and its components are appropriate for the current groundwater conditions. The pilot testing included the following phases, as detailed in Aztech’s 2015 Annual Site Status Report (Aztech, 2016).

1. Phase 1 – Installing a rented air-stripper along with an anti-fouling additive (Redux 390). This combination was operated for about two months, and found to run well.
2. Phase 2 – Running the aforementioned rented air-stripper was then run without anti-fouling additive, and found to perform well.
3. Phase 3 – Installing rented GAC vessels with Redux 390.

Phase 1 of the pilot utilizing a portable air stripper along with Redux 390 took place from June 12 to October 13th, 2014. This phase successfully batch-treated influent flows as high as 55 gallons per minute (gpm) and no calcium scaling was observed in the air stripper. On October 13, 2014, the use of Redux was discontinued and Phase 2 operated through January 2, 2015. No noticeable scaling was observed on the air stripper at the end of Phase 2.

On January 15, 2015, the third phase of the pilot test began with two rented 1,000-pound carbon vessels and with Redux injected into the influent to prevent calcium scaling. Contaminant breakthrough occurred April 2015. The carbon vessels were cleaned with an acid wash and system operation resumed in May 2015. The system continued operating through September 8, 2015 until analytical results from an August 2015 sampling event indicated that breakthrough occurred. Based on the repeated failure of the granular carbon, it was determined that an air stripper unit would be utilized for primary treatment at the site. The carbon in both vessels was emptied and replaced on October 8, 2015, and operation resumed in conjunction with treatment system upgrades. Breakthrough was again detected on January 21, 2016 and the system was shut down.

On March 2, 2016, the system was upgraded by installing an air stripper and subsequent treatment process began operating (Aztech, 2016).

3.0 DATA GAP INVESTIGATION

3.1 BACKGROUND

MACTEC's initial CSM of the Site was drafted based on a comprehensive historical data records review, and focused largely on the former septic system zone and the potential for residual COC contamination in this area (Appendix A).

Historical operation of a soil vapor extraction (SVE) system (implemented December 2006), showed that low water table conditions allowed accelerated COC recovery from unsaturated bedrock fracture zones in the former septic area while periods of high water table decreased COC recovery. Fluctuations with COC recovery in response to seasonal variations in groundwater level were continuously observed during the operation of the SVE system (USEPA, 2014). However, prior to the transfer of Site operations to the NYSDEC in 2011, the USEPA assessed the SVE system efficiency during a period of high water tables, and terminated operation of the system despite effective COC recovery during periods of low groundwater levels. Following the discontinuation of the SVE remedial system, there was an uncharacteristic increase in 1,1,1-TCA concentrations in groundwater samples collected from source area monitoring wells (MW-4, MW-5B, and ERT-4) and current extraction wells (ERT-1, MW-7R, and MW-5R) (Figure 2.1). Concentrations of 1,1,1-TCA at these locations were greater than they had been since 2008-2009.

In addition, in October 2014, groundwater samples were collected from the source zone bedrock SVE wells. These wells are not routinely sampled under the USEPA long term monitoring (LTM) program and showed elevated concentrations of 1,1,1-TCA, as summarized below.

Well ID	**1,1,1-TCA (μg/L)**	**1,1-DCA (μg/L)**	**1,1-DCE (μg/L)**	**TCE (μg/L)**
SVE-19	7,900	46	1,300	250
SVE-20	31,000	320	2,600	1,500
SVE-21	27,000	110	1,500	1,500
SVE-22	8,400	75	580	470
SVE-23	13,000	480	2,400	270

Based on the historical source zone data presented above, MACTEC confirmed that the 1,1,1-TCA found in nearby groundwater samples is resulting from a residual source of contamination causing persistent concentrations of 1,1,1-TCA in the bedrock SVE wells and extraction wells. An investigation to evaluate the presence, distribution, and migration of the residual source was conducted, as detailed further in Section 3.2.

3.2 DATA GAP INVESTIGATION

Based on the initial CSM, and identification of Site data gaps, the Data Gap Investigation was implemented in the fall of 2015. The Field Activities Plan governing the investigation is included in Appendix B, and is summarized below.

3.2.1 Objectives and Purpose

The Data Gap Investigation was conducted to meet the following objectives:

1) Evaluate the potential presence of residual 1,1,1-TCA contamination within the interpreted source area. Specifically, evaluate the presence of 1,1,1-TCA in the overburden and in the bedrock matrix of the previously excavated former septic tank area, the area between the former septic tank and the building, the septic piping termini and under the Site building.
2) Evaluate the hydrostratigraphic migration pathways on-site and contaminant concentrations in the source area groundwater zones.
3) Evaluate the hydraulic properties of the deeper overburden and shallow bedrock at the Site to aid in determining if the existing system can be modified to control or mitigate contaminant mass and mobility, or if other remedial options should be considered

3.2.2 Field Activities and Methodology

Field activities including health and safety, access and clearance, decontamination, mobilization, air monitoring, and handling of investigation derived wastes (IDW), are comprehensively detailed in MACTEC's Program Quality Assurance Program Plan (QAPP) (MACTEC, 2011a) and Health and Safety Plan (MACTEC, 2011b).

Subcontractors selected to support the field activities included:

- Northeast Geophysical Services – Downhole bedrock borehole geophysics
- Northeast Geophysical Services – Packer testing / discrete depth groundwater sampling

- TestAmerica – Performance of laboratory services for soil and groundwater analysis
- Global Remediation Services, Inc. – Transportation and disposal of IDW
- Zebra Technical Services – membrane interface probe (MIP) sampling / direct-push borings
- GeoLogic, NY, Inc. – Test pitting
- Shumaker – Survey

Fieldwork was conducted as described in the following subsections, and in accordance with the specifications presented in the QAPP (MACTEC, 2011a) and companion documents noted above.

3.2.2.1 Test Pitting

Five test pits were excavated on September 15, 2015 by GeoLogic, NY Inc. utilizing a Kobelco excavator. The test pits (TP-01 through TP-05, see Figure 3.1) were advanced until refusal was met. The principal objective of the test pits was to evaluate soils along points of the Orangeburg piping system leading from the former septic tank distribution box to assess whether residual contamination is, or is not present in deeper overburden and providing an on-going source of groundwater contamination.

The soil samples collected during test pitting were screened with a photoionization detector (PID) and observations were recorded on a Field Data Record (FDR). A total of nine soil samples were collected and submitted to TestAmerica for VOC analysis by USEPA Method 5035a/8260C. The analytical results are summarized in Section 3.2.3. Test pitting records are provided in Appendix C.

3.2.2.2 Sub-Slab Soil Sampling

Five sub-slab soil samples were collected from four locations (SS-01 through SS-04, see Figure 3.1) in the vicinity of the elevated concentrations of 1,1,1-TCA previously identified in sub slab soil gas points (i.e., Port #3, T2-001 and T2-003) (Appendices A and B). Sampling was conducted at locations agreed upon with the Site owner using hand-driven sampling tubes (e.g., slam-bar with macro-core sampler) to evaluate possible residual contaminant sources under the building. Samples were collected between zero to five ft below the concrete slab and were screened using a PID. Five samples were submitted for laboratory analysis of VOCs by USEPA Method 5035A/8260. The analytical results are summarized in Section 3.2.3.

3.2.2.3 MIP Sampling

To evaluate the subsurface soils between the former septic tank and the Site building, as well as to better define the stratigraphy of the source area, fifteen MIP sampling points (MP-01 through MP-15) were advanced from September 30 through October 2, 2015 using a 7822DT track-mounted Geoprobe (see Figure 3.1).

The MIP sampler provided real-time detection of VOCs via a flame ionization detector and PID, soil electrical conductivity, and hydraulic conductivity (K). The MIP technology also provided chemical (iHalogen Specific Detector tool) and hydrophysical (hydrophysical tool) data with the principal objective of evaluating subsurface materials, hydraulic properties, and contaminant distribution. Data were plotted in respect to depth below ground surface (bgs) on a continuous vertical log. MIP records are included in Appendix D.

3.2.2.4 Direct-Push Soil Sampling

Following completion of the MIP survey, eight corresponding direct-push soil borings (DP-03 through DP-07, DP-11, DP-12 and DP-13) were installed on October 2, 2015 for the purpose of collecting confirmatory soil samples for laboratory analysis to ground-truth the MIP data (see Figure 3.1). The direct-push soil borings (DP) were offset approximately one foot from their corresponding MIP boring (MP) (i.e. DP-03 corresponds to MP-03). Discrete soil samples were collected with a macro-core sampler, field screened with a PID, classified according to the Unified Soil Classification System, and recorded on an FDR (Appendix C). Specific sample locations were selected to represent one of the following conditions:

- a zone where MIP logging indicated significant contamination (e.g., plume core);
- a zone where contamination is less than observed in the plume's core; and
- a sample where contamination is near or at the detection limit of the MIP system.

A total of fifteen soil samples were collected (between one to three discrete samples collected from each boring) and submitted for laboratory analysis of VOCs by USEPA Method 5035A/8260. Analytical results are summarized in Section 3.2.3.

3.2.2.5 Borehole Geophysics

A series of standard geophysical logging surveys were conducted from September 8 to September 11, 2015 at bedrock SVE wells (SVE-19, SVE-20 and SVE-21) and extraction wells (MW-5R, MW-7R, and ERT-1) to identify fractures, dominant flow zones, and possible changes in bedrock stratigraphy that could be serving as contaminant migration pathway(s) (see Figure 3.2). Extraction well ERT-4 was originally included in the Field Activities Plan for geophysical logging however it was revealed in the field that the well is fully cased and screened with polyvinyl chloride, therefore, bedrock geophysics was not possible at ERT-4. SVE-19 was added to the program as a replacement for ERT-4 (Figure 3.3). Downhole geophysical logging included borehole caliper, single point resistivity, spontaneous potential, acoustic televiewer (ATV), optical televiewer (OTV), heat pulse flow meter (HPFM), and natural gamma ray logging.

Prior to the geophysical survey, the existing treatment system was shut-down on September 7, 2015 to allow time for groundwater recovery and stabilization. Following shut-down, well pumps were removed from the extraction wells one-day prior to logging activities. Field water level measurements (as described in Section 3.2.2.7) and geophysical logging indicated that Site groundwater levels were rising during the week of geophysical logging. This water level response is evidenced by an upward groundwater flow in the extraction wells recorded by the HPFM during geophysical logging (see Appendix E for geophysical logs).

3.2.2.6 Packer Testing

Based on the geophysical logging, fracture zones in bedrock wells ERT-1, MW-5R, and MW-7R were targeted for packer sampling. Fracture zones were selected based on borehole caliper deviations, heat-pulse flow meter readings, and fluid temperature shifts (Appendix E). Geophysical logging indicated there was less than ten ft of water in SVE wells (SVE-19, SVE-20, and SVE-21), which was unsuitable for packer sampling. As a result, packer testing was not performed at SVE-19, SVE-20, and SVE-21. The specific packer sampling zones selected subsequent to the geophysical logging are summarized below (relative to ft below top of casing):

- ERT-1: 73-83’, 110-120’, and 172-182’
- MW-5R: 89-99’ and 110-120’
- MW-7R: 73-83’, 92.5-102.5’, 137-147’, and 164-174’

Packer sampling was conducted by Northeast Geophysical Services between September 22 and September 24, 2015. Packer sampling was completed by sealing off both ends of a ten-ft zone of the borehole with inflatable packers. Packers were inflated to approximately 150 pounds (lbs) per square inch, and once the packer seals were in place, groundwater samples were collected for VOC analysis using low flow sampling procedures as outlined in section 4.5.4.3 of the QAPP (MACTEC, 2011a). Additionally, water levels above the packers were monitored during sampling activities to verify that a good seal was established. Analytical results are summarized in Section 3.2.3 below.

3.2.2.7 Groundwater Level Measurement

Synoptic groundwater level gauging events were completed at accessible on-site and off-site monitoring wells, SVE wells, and extraction wells. Groundwater elevation data were measured at the same set of wells simultaneously under non-pumping and pumping conditions. Water levels under non-pumping conditions were recorded by MACTEC on September 14, 2015. As noted in Section 3.2.2.5, groundwater levels were in a recovery period the week of geophysical logging, therefore MACTEC allowed additional time for groundwater levels to stabilize before completing a synoptic gauging event seven days following system shutdown (see Table 3.1). Groundwater levels were observed to be differentially recovering throughout the entire system shutdown period, therefore the September 2015 groundwater measurements are not representative of static water level conditions.

Following the September/October 2015 Data Gap Investigation, Aztech turned the GWETS back on in October. The USEPA contractor (Tetra Tech) and NYSDEC completed an on-site gauging event on November 19 and November 20, 2015. These measurements were completed in conjunction with LTM in an effort to record groundwater levels representative of pumping conditions. However, Aztech was intermittently shutting down the system, reportedly for periods of several hours then turning the system back on, prior to the groundwater gauging event. For this reason, groundwater levels measured in November 2015 are not considered representative of normal pumping conditions (see Table 3.1). The most accurate data set representing groundwater levels under non-pumping conditions was collected on February 3, 2016 by the NYSDEC. This groundwater gauging event was completed toward the end of a two week system shut down period and during a groundwater recharge event when the area received approximately 0.95 in. of rainfall (National Oceanic and Atmospheric Administration, 2016).

These groundwater data sets were compared to historical data records and subsequently used for interpretive groundwater contouring (Figures 3.4 and 3.5) and for the purpose of better defining groundwater flow under the current pumping regime. A combination of 2015 and 2016 groundwater level data and historical data were used for the purposes of updating the CSM and completing the RSO evaluation.

3.2.2.8 Survey

On October 2, 2015, Shumaker surveyed the locations of the MIP/direct-push sampling points, test pits, and nearby SVE wells. Horizontal locations were tied to the NYS Plane Coordinate System using North American Datum of 1983 to an accuracy of 0.1 ft. Vertical elevations of groundwater wells were tied to existing monitoring well data, which is based on msl, using North American Vertical Datum of 1988, and measured to an accuracy of 0.01 ft. The survey report provided by Shumaker is provided in Appendix F.

3.2.2.9 Investigation Derived Wastes (IDW)

Soil IDW generated during the soil boring and well installation activities was collected in 55-gallon drums. One drum of soil was removed from the Site by Global Remediation on December 30, 2015 and shipped as non-hazardous waste based on waste profile details. Documentation regarding the soil removal is included in Appendix G. Water generated during the investigation activities was collected and transferred to the on-site groundwater treatment system.

3.2.3 Investigation Results

3.2.3.1 Former Septic Area Source Zone Soils

The following section provides a summary of the soil investigative activities presented above, and the collective findings in the former septic area source zone.

A total of 29 soil samples were collected from the former septic area source zone, between the Site building and the septic zone, and from underneath the Site building. Samples were submitted for VOC analysis and results are presented in Table 3.2 (test pit VOC results), Table 3.3 (direct-push VOC results) and Table 3.4 (sub-slab soil VOC results). Figure 3.3 presents exploration locations and contaminant SCO exceedances in the former septic tank source area soil. Soil analytical results underwent a chemist review and data are included in Appendix H. Soil VOC results were compared to the 6 New York Codes Rules and Regulations Part 375 SCOs (NYS, 2006).

Concentrations of 1,1,1-TCA and TCE were detected above the Protection of Groundwater SCO at points along the former septic sanitary line (Figure 3.3). The greatest concentrations of VOCs were observed beneath the previously excavated source area; 11,000 micrograms per kilogram (µg/kg) 1,1,1-TCA at 7 ft bgs at MP/DP-12 and 2,200 µg/kg 1,1,1-TCA at 7 ft bgs at TP-03 (compared to the SCO of 680 ug/kg). Refusal was encountered at 10.3 ft bgs in MP/DP-12 and 7.5 ft bgs in TP-3.

In DP-12, the soil encountered consisted of silt to a depth of approximately 8.5 ft. From 8.5 to refusal at 10.3 ft bgs, there was an observed increase in the clay content of the soil. Given that the sample collected in MP/DP-12 from a depth of 10 ft indicated a sharp decline in 1,1,1-TCA concentration (190 µg/kg), it appears that the clayey silt layer is retarding the downward migration of 1,1,1-TCA. It is also probable that the zone of transition between the silt and clayey-silt in MP/DP-12 at approximately 8.5 ft bgs contains concentrations similar to that detected in the sample from a depth of 7 ft bgs. Because clay tends to absorb contaminants (via diffusion), the clay at the transition zone likely acts as a residual source (via back diffusion) of 1,1,1-TCA contamination observed in source-zone groundwater.

1,1,1-TCA was not detected in soil samples collected from direct-push points advanced between the former septic tank area and the building, nor underneath the building. Its localized occurrence suggests that any residual soil contamination is the result of discharging in the former septic tank area.

<u>3.2.3.2 Borehole Geophysical Logging Results</u>

Water-bearing zones were identified in four of the six borings (MW-7R, ERT-1, MW-5R, and SVE-21) and were logged through the use of caliper, single point resistance, ATV, OTV and HPFM logging tools. The HPFM functions only within the water column. At the time of logging, the surface of the groundwater had been depressed due to prior pumping of the extraction wells. As noted in Section 3.2.2.5, the extraction well pumps had been shut down for a period of 24-hours prior to geophysical logging, however bedrock water levels were still rising during the week of geophysical logging.

The HPFM logs showed upward groundwater flow in the extraction wells, indicating that a transmissive bedrock fracture at or near the bottom of the well was contributing water to the borehole. The measured upward flow is due to the fact that the wells were not in hydraulic equilibrium at the time of HPFM logging.

Bedrock groundwater levels in the SVE well area were measured at a depth of approximately 40 ft at the time of testing. Again, these wells were still recovering from the extraction wells being shut down. The geophysical logging conducted at SVE-19 and SVE-20 did not identify highly transmissive fractures at or below the water table (deeper than 40 ft) as indicated by the HPFM; however, similar to the extraction wells, water was entering slowly into the boreholes from deeper fractures. It should be noted that SVE-20 showed the highest concentration of 1,1,1-TCA (31,000 ug/L) of any of the bedrock SVE-wells in October 2014.

Fractures were identified above the apparent water table in all the borings that were geophysically logged. Because of the limitations of the HPFM tool, the contribution (if any) from these fractures could not be determined at this time due to the water table being below its static level.

It is interpreted that transmissive fractures located shallower than the apparent (i.e., recovering) water table do not only contribute water to the borehole during recharge events, but likely are the pathway by which contamination in and around the immediate source area makes its way into the bedrock groundwater system. Evidence of water yielding fractures higher in the borehole (i.e., above the water level recorded at the time of geophysical logging) can be seen in the OTV logs of the two most contaminated SVE-wells. Specifically, SVE-20 shows an active seep and what appears to be manganese staining at a depth of 27.5 ft. Manganese staining can also be seen between depths of 20 and 24.5 ft. In SVE-21, significant manganese staining can be seen beginning at a depth of 19.5 ft.

Of the wells in which water-bearing (i.e., submerged) fractures were identified, the general direction of fracture strike is to the northeast-southwest with a dip direction to the northwest. This orientation is consistent with bedding plane fractures. The water-bearing fractures have an average dip of less than 10 degrees (Table 3.5). The northward migration of contaminants reflects migration along bedrock strike.

3.2.3.3 Groundwater Packer Sampling Results

Groundwater packer sampling was conducted following the results of the borehole geophysics. Sampling results are presented in Table 3.6 and Figure 3.2 compared to the NYS groundwater standards (NYS, 1999). 1,1,1-TCA and its breakdown products (1,1-DCA and 1,1-DCE) were observed in all ten of the groundwater samples collected, however, trends in 1,1,1-TCA concentrations were observed between the packer zones in each well.

Packer sampling results show that groundwater contamination generally decreases with depth, with the greatest concentrations of VOCs (1,1,1-TCA at 94 to 170 µg/L) being observed in fractures from 80 to 100 ft bgs. As previously mentioned, packer sampling did not occur in the SVE-wells. The elevated concentrations detected in ground water samples from SVE-20 and SVE-21 (October 2014) indicate that residual has migrated into the shallow bedrock at these locations. The presence of bedrock fractures in these wells are contributing to the slow diffusion of contamination into the groundwater. The bedrock SVE well locations, along with the area of contaminated soil (i.e., MP/DP-12) that was identified, indicates the residual source area is the cause of persistent concentrations of 1,1,1-TCA in the extraction wells, and there does not appear to be a separate contributing source area. Groundwater analytical results underwent a chemist review and data are included in Appendix H.

During the packer sampling, depth to water and pumping rate were recorded and specific capacities of sampled zones were calculated and transmissivities were estimated (Table 3.5). Specific capacity derived transmissivity tends to under predict the values because of well loss. Regardless, the values when compared in a relative sense show the variability in transmissivity across the bedrock fracture zones tested. The highest relative transmissivity was identified in MW-5R at a depth of 92.9 ft. This water bearing fracture dips to the southwest and is cross-cutting bedding plane fractures which likely explains the high apparent transmissivity in this well. It is not the relatively high transmissivity that limits the flow rate in this extraction well but the limited recharge the well receives.

3.3 CSM UPDATE

The information collected as part of the Data Gap Investigation was evaluated and used to update the existing CSM for the Site and relevant information is provided below.

3.3.1 Physical Site Setting

Topography

The topography in the vicinity of the MRIP property is controlled by the structural geology of the region. The Site is positioned on a ridge along the crest of an anticline that plunges north-northeast and is located directly within a recharge zone of the underlying bedrock. The floor slab in the MRIP building is the topographic high point on the Site property, approximately 340 ft above mean sea level (msl). The floor slab is about 3 ft above grade at the east end of the building and the ground surface along the north side of the building slopes approximately 10 ft across its length. Bedrock is exposed at approximately 330 ft above msl at the northwestern corner of the building.

Surface Water Hydrology

Surface water drainage discharges to Rondout Creek via four primary pathways listed below:

- Site drainage predominantly flows north along a swale that passes through several downgradient residential properties before discharging into a small pond and subsequently to Rondout Creek.
- A portion of the drainage near the building flows to a ditch culvert along Mohonk Road, which ultimately discharges to Rondout Creek.
- The lawn area and a portion of the driveway south of the building drain to a culvert that passes beneath Mohonk Road. Water passing through the culvert eventually flows into Coxing Kill.
- Some of the drainage from the gravel driveway west of the building flows west within a small swale and discharges directly to Rondout Creek.

Geology

Depth to on-site bedrock ranges from ground surface to approximately 30 ft at MW-11 (approximately 650 ft northeast of the MRIP building) (See Appendix I – Conceptual Cross Sections). It should be noted that the cross sections presented in Appendix I are representative of our current Site understanding, and are conceptual in nature. Overburden material consists of lodgement till, predominantly brown silt and clayey silt, little fine-sand, and trace gravel. The gravel content consists primarily of shale and was observed to increase with depth to some gravel and cobbles in interface well borings (LMS, 1997). Bedrock core samples collected during previous investigations revealed white to gray orthoquartzite consisting of quartz pebble conglomerate and arenite of the Shawangunk Formation. Fractures have been observed during historical bedrock coring activities and were also identified during geophysical logging surveys conducted at bedrock SVE wells (SVE-19, SVE-20 and SVE-21) and extraction wells (MW-5R, MW-7R, and ERT-1). Some of the fractures in the SVE wells showed evidence of groundwater seeps and manganese staining above the apparent water table surface (measured at the time of geophysical logging). Given the proximity of the SVE wells to the source area, and the high concentration of 1,1,1-TCA detected in the SVE wells, the fractures identified near the bedrock surface (approximately 18 to 28 ft. bgs within the boreholes) are groundwater pathways from overburden soils in the source area to the bedrock groundwater (See Appendix I – Conceptual Cross Sections).

3.3.2 Hydrogeology

Previous investigations at the Site and the fall 2015 Data Gap Investigation have identified three hydrostratigraphic zones. These include an overburden flow zone, a bedrock interface zone, and a bedrock flow zone, as detailed below and presented in Appendix I – Conceptual Cross Sections.

Overburden Flow Zone

The overburden flow zone is characterized by groundwater flow in thin deposits of unconsolidated glacial lodgement, ablation, and weathered till, sand, silt, and clay lenses, and fill. The till is approximately 7 to nearly 30 ft thick on the MRIP. The flux of groundwater through this flow zone is highly dependent upon precipitation events and seasonal fluctuations in groundwater recharge. Historical groundwater level measurements have confirmed a large fluctuation in groundwater level on a seasonal and/or recharge basis (i.e. approximately 6 ft variations between sampling events in MW-4). At certain times of the year, this overburden unit is seasonally perched, or fully saturated. The water table is typically found in this zone and responds quickly to precipitation events. Besides being a perched system, with wide ranges in water table elevations, there are an insufficient number of wells in the overburden to construct a meaningful groundwater potentiometric surface map of the overburden flow zone.

Based on topography and the location of the site within the watershed, the principal direction of horizontal overburden groundwater flow is interpreted to be to the north. Estimates of K developed during the RI/FS indicated permeability of the overburden flow unit in the range of 1×10^{-6} to 1×10^{-1} ft/day. The MIP sampling data recorded during the Data Gap Investigation reported shallow overburden conductivities in the range of 50 to 150 ft/day at approximate depths between 1 to 4 ft bgs. At deeper depths within the less transmissive glacial till unit, the K decreases to permeability estimates consistent with the reported values from the RI/FS. Groundwater in this overburden flow zone also exhibits a downward component of flow into the bedrock interface zone and subsequently to the bedrock flow zone. Thus, any waste disposed in this zone is anticipated to migrate downward through the glacial till unit.

Bedrock Interface Flow Zone

The interface zone between the unconsolidated overburden material and the underlying bedrock consists of sand, gravel, cobbles, boulders, and weathered bedrock. Interpreted bedrock interface zone surface contours were produced using the results of the MIP and direct-push soil sampling field activities. Surface contours are depicted in Figure 3.6. This zone appears to be in direct hydraulic connection with the underlying bedrock flow zone in certain areas of the Site, and it appears to be confined, or partially confined, by the overlying glacial till unit. This zone is interpreted to be more permeable than the overlying overburden. The vertical groundwater flow gradients for this zone are strongly downward, ranging from 0.14 to 0.46 ft/ft (RI/FS) indicating that the MRIP Site is located in a recharge zone of the deeper bedrock flow zone. Average linear groundwater velocity within this zone was estimated to be approximately 1.33×10^{-3} ft/day based on pump testing (LMS, 1998a).

Bedrock Flow Zone

The bedrock flow zone represents the principal source of drinking water for the Site area. The flow zone is encountered in highly competent orthoquartzites of the Upper Member of the Shawangunk Formation, and also in gray shale deposits (specifically north of the MRIP building in the former septic system area). This unit has little to no remaining primary porosity, but is cut by various fractures. Fracture orientation varies with the general direction of fracture strike to the northeast-southwest and dip direction to the northwest (Table 3.5), which is consistent with the Site's position along the crest of an anticline that plunges to the northeast. These fractures are the primary storage for groundwater and the expected pathways for contaminant transport.

The Site is located at a topographic high, and serves as a recharge area for the fractured bedrock aquifer. Vertical gradients are primarily downward within the bedrock flow zone, and recharge to the bedrock aquifer predominantly occurs from the bedrock interface flow zone (Appendix I). Estimates of K developed during the RI/FS indicated permeability of the bedrock flow zone in the range of 0.24 to 0.46 ft/day. Based on the regional groundwater gradient and estimated porosity, the average linear groundwater velocity in bedrock was calculated to be approximately 0.26 ft/day (LMS, 1998a).

The primary horizontal direction of regional bedrock groundwater flow emanating the Site is to the north toward Rondout Creek. As depicted on Figure 3.4, a bedrock groundwater contour map was constructed following water level gauging completed in September 2015. Figure 3.4 shows a divide that bisects the source area with most of the groundwater flowing to the north, northeast, and northwest; however, a portion of groundwater at the source area flows to the south. As mentioned previously, the water levels during the September gauging event were still rising following extraction well shutdown. A second gauging event took place in February 2016 and more closely reflects static conditions in the bedrock aquifer (Figure 3.5). Figure 3.5 illustrates that the divide is more established with groundwater flowing radially from the source area. Because of the limited recharge to the aquifer, when the extraction wells are pumping, the water table is depressed and the divide migrates southward as the aquifer responds to the demand for more water. As a result, under pumping conditions, the divide is located south of the source area and groundwater in the source area flows semi-radially (north, northeast and northwest).

Because of the MRIP location on a topographic high, with surface water features on two sides, the MRIP property is analogous to a sole source aquifer in that there is limited flow-through of groundwater originating from an upgradient location. The movement of groundwater at the Site is driven primarily by recharge due to precipitation events. Groundwater movement in the bedrock is anisotropic and limited by the fracture orientation and interconnectivity.

Borehole geophysical logging indicated that the predominant dip direction of water-bearing fractures in the northeasterly plunging anticline is to the northwest, with most having a dip of less than 10 degrees and the recorded water-bearing fractures having a dip less than 27 degrees. Bedrock groundwater would preferentially flow down-dip (northwest) or along strike (northeast) of fractures (Appendix I – Conceptual Cross Section (A-A'). The paucity of obvious shallow water-bearing fractures in the SVE-wells, located in the source area, have created a condition by which high concentration residual 1,1,1-TCA is trapped at the overburden and shallow bedrock interface. Recharge events provide the hydraulic gradient for its slow migration downward and deeper into the groundwater flow system. Although HPFM logging indicated that flow within the boreholes was upward, this was an artifact of slow recharge in response to shutting off the extraction wells 24-hours prior to logging. Given the elevation of the source area and the elevation of the surrounding streams, downward vertical gradients would be anticipated under hydraulically static conditions.

3.3.3 Contaminants of Concern and Source Areas

As a result of the historic use of solvents and other chemicals at the MRIP property, Site soils and groundwater contain elevated levels of VOCs above the NYSDEC SCOs and NYS Class GA Standards, respectively. The COCs specifically identified as a result of historic investigations at this Site include the following contaminants:

1. 1,1,1-TCA, an industrial solvent, the contaminant typically found in highest concentrations at the Site;
2. 1,1-DCA, a breakdown product of 1,1,1-TCA;
3. 1,1-DCE, a breakdown product of 1,1,1-TCA; and
4. TCE, an industrial solvent.

The primary contaminant at the Site is 1,1,1-TCA. The breakdown products 1,1-DCE (abiotic) and 1,1-DCA (biotic) have also been detected in both the overburden and bedrock groundwater systems, although the concentrations have been low in comparison to 1,1,1-TCA, indicating that the degradation process is not robust.

The specific gravity of 1,1,1-TCA in liquid form is 1.31, indicating that its density causes it to sink within groundwater systems if it exists at concentrations that exceed its solubility. When evaluating the possible presence of Dense Non-Aqueous Phase Liquids (DNAPL) the "1 percent of solubility" rule-of thumb (USEPA, 1992) is often applied. Under this approach, DNAPL is suspected present when the concentration of a chemical in groundwater is greater than 1 percent of its pure-phase solubility. The equilibrium solubility of 1,1,1-TCA is 1,334,000 µg/L, resulting in the 1% solubility equal to 13,340 µg/L. In conjunction with the June 2001, January 2002 and August 2002 sampling events, 1,1,1-TCA was detected in ERT-4 at borderline DNAPL concentrations of 13,800, 16,900 and 16,000 µg/L, respectively (USEPA, 2014). More recently, in October 2014, 1,1,1-TCA was detected in the former SVE wells at 31,000 µg/L (SVE-20), 27,000 µg/L (SVE-21) and 13,000 µg/L (SVE-23). Additionally, in November 2015, a passive diffusion bag was deployed in SVE-20 at a depth of approximately 42 ft bgs, and produced a 1,1,1-TCA concentration in groundwater of 9,600 µg/L.

Given the time that has elapsed since the introduction of the 1,1,1-TCA to the environment, the chemical is no longer present as a DNAPL. It is likely that 1,1,1-TCA diffused into the surrounding overburden and/or bedrock at DNAPL concentrations. The 1,1,1-TCA appears to reside in the deeper overburden and shallow bedrock aquifer where it is slowly diffusing back into groundwater due to a chemical gradient between the pore water in the affected matrix and the flux of relatively clean groundwater migrating past the affected pore space.

Results from the Data Gap Investigation confirmed the previous studies that the source of 1,1,1-TCA found in nearby groundwater samples is a result of vertical migration of 1,1,1-TCA from the shallow soils of the former septic tank area to deeper overburden soil beneath, and subsequently to the overburden/bedrock interface zone, and into localized fractures within the bedrock.

The confirmation of the former septic tank area as the source zone was further evidenced by direct-push and test-pit soil sampling below the previously excavated septic tank area, showing 1,1,1-TCA concentrations of 2,200 µg/kg at TP-03 and 11,000 µg/kg at MP/DP-12 (compared to the Protection of Groundwater SCO of 680 ug/kg) An upgradient source of 1,1,1-TCA was not identified, as soil sampling between the former septic tank area and the Site building, and also beneath the building slab, revealed concentrations of 1,1,1-TCA either non-detect or significantly less than the source zone. Contaminant distribution and migration is discussed in more detail in Section 3.3.4.

3.3.4 Contaminant Distribution and Migration

The Data Gap Investigation confirmed that residual contamination exists and is limited in extent and defined by the area bordered by MP/DP-12 and the SVE wells. Figure 3.7 and the conceptual cross sections included in Appendix I depict the interpreted distribution of 1,1,1-TCA concentrations in groundwater. The high concentration of residual 1,1,1-TCA in the former septic tank area is localized to deep overburden at the bedrock interface flow zone, and within the shallow bedrock aquifer. Precipitation will drive the contaminant deeper into bedrock through a limited network of vertical joints and bedding plane fractures. Pumping at extraction well MW-5R, located down strike from the source area, and ERT-1 and MW-7R, located down dip from the source area, have drawn contaminants deeper into the bedrock aquifer through their prolonged operation.

The current extraction wells, which all were drilled to depths greater than 100 ft, have multiple water-bearing fractures identified throughout their vertical extent (Table 3.5). However, the concentrations currently seen at the extraction wells by packer sampling are an order of magnitude lower than what has historically been measured in the source area. This suggests that the hydraulic connection between the source area and the deeper more conductive fractures is poor, indicating that residual contamination is residing in the shallow aquifer matrix. As a result of chemical diffusion, the 1,1,1-TCA will move from the aquifer matrix to conductive fractures, in which it will migrate, become diluted, and eventually discharge to surface water. Operation of the extraction wells exerts hydraulic control of the diluted 1,1,1-TCA plume after it has migrated vertically from the source area into more conductive bedrock fractures contributing to the migration of contaminants deeper into the bedrock flow zone. Given the historically high 1,1,1-TCA concentration in groundwater in SVE-20 and 21, and the apparent low K of the bedrock in that area, it is likely that groundwater contamination will persist at similar concentrations indefinitely unless the residual source area is treated to reduce overall concentrations.

3.3.5 Exposure Pathways

Public water is supplied to the residences and businesses in the Towns of Marbletown and Rosendale, NY with impacted or threatened private supply wells; therefore, there is no current exposure to groundwater via ingestion. The near-surface contaminated soil has been removed, thus eliminating the potential direct contact threat to VOC-contaminated soil. Vapor intrusion at the nearby residences was evaluated and shown not to require mitigation. Vapor intrusion within the MRIP building is currently being remediated with sub-slab depressurization systems.

4.0 EXISTING GROUNDWATER EXTRACTION REMEDIAL SYSTEM

The near field GWETS continues to operate to provide hydraulic control of the 1,1,1-TCA plume. The treatment system itself has gone through several changes over the past two years while piloting several treatment options. Modifications are currently being completed and evaluated by Aztech based on the results of the pilot testing. The extraction portion of the system, however, has not changed. Groundwater continues to be extracted from three extraction wells: ERT-1, MW-5R and MW-7R. Historically through December 2015, the water was pumped to an equalization tank and then treated in batches through an air stripper and/or activated carbon to remove the VOCs from the groundwater.

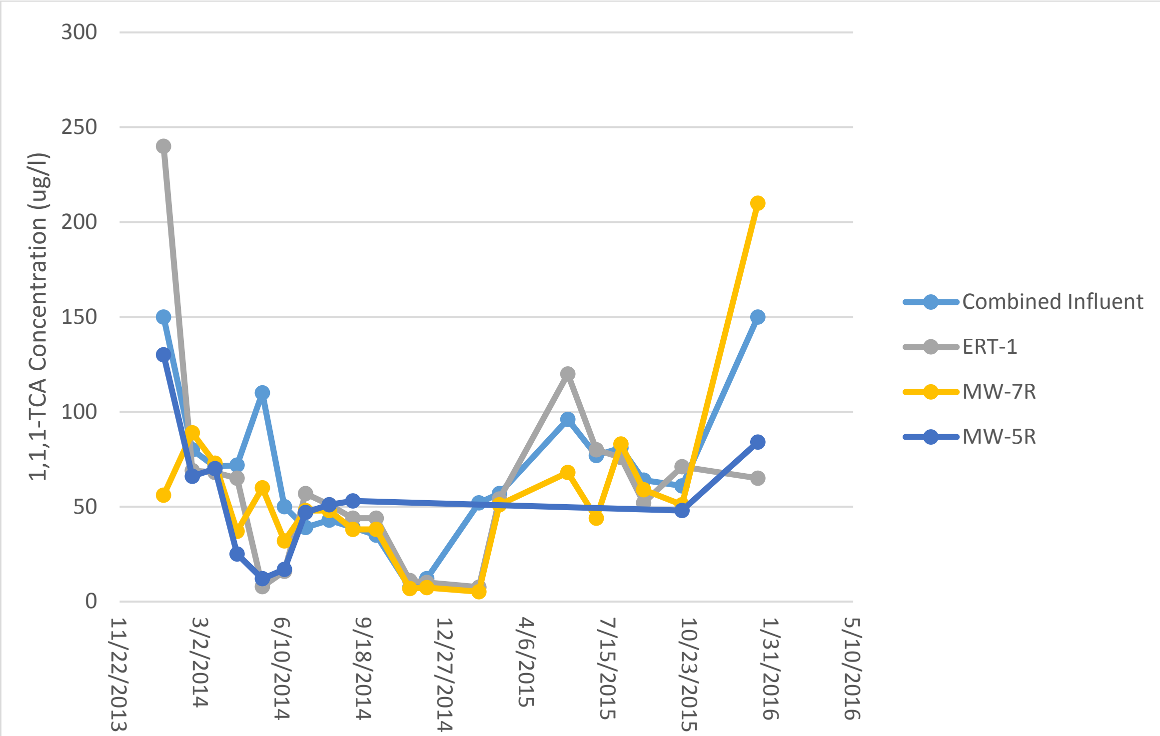
4.1 GROUNDWATER EXTRACTION AND TREATMENT RATES

MACTEC has reviewed and tabulated groundwater extraction and treatment quantities from the near field GWETS over the previous two years using information presented in Aztech's 2014 quarterly reports (Aztech, 2014a; Aztech, 2014b; and Aztech, 2015) as well as raw laboratory data and the extraction system's programmable logic control data for operations in 2015. On average, the GWETS system has treated groundwater at an average flow rate of 17 gpm over the two year period. This average flow rate includes periods of system shutdown. While in operation, the flow rate through the GWETS system has ranged from 9 to 44 gpm with an average flow rate of 22.5 gpm. Based on the extraction quantities at the individual wells, extraction well MW-7R is the most productive well, followed by ERT-1, and then extraction well MW-5R. MW-5R which is shallower than the others, frequently runs dry at its current pumping rate.

4.2 GWETS VOC CONCENTRATIONS

Laboratory results of total 1,1,1-TCA concentrations in the GWETS combined influent samples over the 2014-2015 period have ranged from 7.4 µg/l to 150 µg/l. The concentrations of the individual extraction wells have generally followed a similar trend when compared to the combined influent concentrations, as depicted on Figure 4.1. These concentrations are significantly lower than the concentrations observed from the SVE wells located in the source area in October 2014, which ranged from 7,900 µg/l at SVE-19 to 31,000 µg/l at SVE-20 (Section 3.1)

Figure 4.1: 1,1,1-TCA Concentrations in Extraction Wells



4.3 GWETS MASS REMOVAL AND PERFORMANCE

Based on the quantity of groundwater processed through the GWETS and the associated concentrations discussed above, a total of approximately 14 lbs of VOCs have been removed from the near field groundwater extraction system from 2014 through 2015. Although the updated CSM supports that the operation of the GWETS is effective at maintaining hydraulic control, considering the distance from the extraction wells to the source area, the relatively low 1,1,1-TCA concentrations in the extraction wells, and the poor hydraulic connection between the source area and the extraction wells, the GWETS would need to operate indefinitely to reach the remedial goals (Section 2.3).

5.0 EVALUATION OF POTENTIAL MODIFICATIONS

This section presents MACTEC's recommendation for implementation of measures to: 1) achieve remedial action objectives; 2) improve system performance; and/or 3) improve sustainability. Some of the recommendations can be placed in more than one category, but are described in only one.

5.1 EVALUATION OF OPTIONS TO ACHIEVE THE REMEDIAL ACTION OBJECTIVES

Options to achieve or accelerate Site closure generally cover additional Site analysis and/or remedial actions that could potentially accelerate cleanup, or development of alternative cleanup criteria that are protective of human health and the environment such that Site closure can be achieved sooner than would otherwise be possible. These measures generally require an initial investment of additional capital for Site characterization, equipment, or additional remedial actions with the goal of reducing life-cycle costs by minimizing future O&M costs. Site closure refers to a Site condition in which protection of human health and the environment has been achieved and will be maintained without further monitoring or remedial actions.

5.1.1 Modification of On-Site Extraction System

As previously described, the existing GWETS system is currently undergoing upgrades to improve efficiency based on results of phased pilot testing, as such, no additional modifications to the treatment system are recommended at this time. However, modification to the existing groundwater extraction wells and installation of additional well(s) could more effectively remediate the Site.

<u>5.1.1.1 Existing Wells</u>

As identified in the CSM, the current extraction wells have multiple water-bearing fractures identified throughout their vertical extent, but the hydraulic connectivity between the source area and the deeper more conductive fractures is poor. If pumping was conducted at shallower depths, the extraction zone would better target the residual contamination residing in the shallow portion of the aquifer. This would also minimize the tendency to draw the impacted groundwater deeper into the bedrock flow zone. The total volume of water extracted would decrease, but it is expected that this water would be more concentrated and therefore overall mass removal would have little change.

Extraction well modification is recommended as a phased approach to evaluate shallower fractures in the extraction wells that were dry during geophysical logging, and otherwise normally saturated under static water level conditions (Section 3.2.3.2). First, packers would be used to seal off the deeper portions of the extraction wells. Pumping tests would then be conducted at shallower depths and variable pumping rates, to assess hydraulic control of the near field plume and to determine well yield. Following the pumping tests, monitoring data would be evaluated and subsequently used to determine the effectiveness and productivity of pumping at shallower depths. Depending on the results of this analysis, permanently sealing the deeper fracture zones of the wells with cement grout would be evaluated.

5.1.1.2 Proposed Additional Wells

The primary objective of the existing GWETS is for hydraulic containment, for which it is effective. However, given the low concentrations in the extracted groundwater, and the poor K between the source area and the extraction wells, this system alone would need to operate indefinitely to achieve clean-up objectives. It is recommended, in efforts to accelerate remediation, that groundwater extraction from the source area is considered.

The existing SVE wells located in the source area could be used and connected to the existing GWETS. Alternatively, an extraction well slightly deeper than the SVE wells and screened through the overburden, bedrock interface, and bedrock flow zones (hybrid well) may be better suited for contaminant capture and could also depress the groundwater elevation to potentially reinstate the SVE system, as discussed in the next section. Given that the source area is located in a recharge area, and groundwater flow is significantly affected by precipitation events, a groundwater extraction well located in the source area and screened in the overburden/perched groundwater and in the bedrock, would likely minimize contaminant migration and flow to the current extraction wells. It is not likely that the addition of an extraction well would significantly increase the total amount of flow through the GWETS based on low K values and limited recharge, as detailed in the updated CSM. The overall influent VOC concentration would however go up, which, depending on the specifications of the recently upgraded system, specifically the air stripper, may impact treatability of the water. In which case, the quantity of water extracted from the source zone would need to be restricted as applicable, or the treatment equipment would need to be modified.

5.1.2 Source Area Remediation via Soil Vapor Extraction and Groundwater Control

An SVE system operated on Site from February 2008 until late 2011 or early 2012. The system, although reportedly effective at removing contaminant mass under low groundwater conditions, was terminated because of its inability to operate during seasonal high water conditions (Section 3.1). There is minimal operational data available regarding the former system in terms of air flow, vacuum area of influence, vapor concentrations, and how the vapor was treated prior to discharge. It is recommended that pilot testing on the existing SVE wells be conducted to gather data to assess the applicability of reinstating the SVE system. It is anticipated that SVE could be enhanced with groundwater extraction in the source area to expose more impacted surface area to SVE and maintain extraction during precipitation recharge events. Water could be pumped from the individual SVE wells, or potentially through a single groundwater extraction hybrid well screened through the overburden, bedrock interface, and bedrock flow zones, installed approximately 10-15 ft deeper than the SVE wells near the center of the source area. This well would be located in close proximity to MW-4 (Figure 2.1). An extraction well of this design would minimize infiltration to the SVE wells during precipitation events and periods of recharge.

As mentioned, a pilot test would be required to determine an average pumping rate required to keep the groundwater level depressed in order for SVE to operate successfully, and whether multiple extraction wells would be needed. The pumping rate and associated concentrations would need to be evaluated against the existing groundwater treatment system to determine if any additional upgrades would be required to treat the additional influent volume or VOC concentration. Vacuum testing would be conducted to determine vacuum area of influence at each SVE well, and average flows at the individual wells under various vacuum pressures in order to appropriately size a blower and other treatment equipment. Vapor monitoring points (VMP) would need to be added to assist with the vacuum testing. These VMPs could later be used to monitor effectiveness of the SVE system.

Based on the understanding that the former SVE system was effective at removing contaminant mass under low groundwater conditions, the operation of an SVE system in the source area would likely remove contaminant mass at a higher rate than the existing groundwater extraction system.

5.1.3 Continued Long-term Monitoring

Currently, LTM is conducted on an annual basis by a USEPA contractor. In consideration of the proposed modifications to the extraction system, we do not recommend a reduction in location or frequency of LTM locations at this time. LTM monitoring would continue to be conducted in an effort to demonstrate hydraulic control during implementation of the recommended system modifications. The LTM data is used to monitor 1,1,1-TCA concentration trends at the site and at downgradient locations, and should continue until groundwater standards are achieved.

5.2 EVALUATION OF OPTIONS TO IMPROVE SYSTEM PERFORMANCE

Evaluating options to improve system performance requires a thorough review of system efficiencies, and required O&M activities to reach the target discharge requirements. Based on this information, recommendations for equipment modifications or significant change in capital equipment could be made to improve system performance. As previously discussed, the treatment system is currently being upgraded by Aztech based on recent pilot testing results. Therefore, MACTEC has not conducted an evaluation to improve system performance.

5.3 EVALUATION OF OPTIONS TO IMPROVE SUSTAINABILITY

Options to improve sustainability cover those measures that can be implemented to reduce energy consumption or impacts on natural resources.

5.3.1 Cycled System Operation with Plume Monitoring

Over the past two years of operation, there have been several occasions where the system was shut down for more than one week at a time. On at least one occasion the system was shut down for over a month (April 2015). There is no indication that these prolonged shut downs resulted in loss of hydraulic control, however, monitoring data was not captured sufficiently during these shutdown periods to fully evaluate the hydraulic effect of the shutdowns. A controlled shutdown with comprehensive monitoring and evaluation of monitoring data would be needed to demonstrate that a cycled extraction system remains protective of human health and the environment. This would include water level monitoring via pressure transducers in a comprehensive well network before, during, and after the shutdown and an evaluation of the data to demonstrate hydraulic control is maintained. Switching from constant operation to cycling of the system would reduce O&M costs as well as electricity requirements and decrease the overall quantity of groundwater consumption.

5.3.2 Decrease Pumping Depths

As discussed in Section 5.1.1.1, decreasing the pumping depths in the groundwater extraction zones may decrease the overall quantity of groundwater withdrawal and treatment, which could reduce both natural resource use and electricity consumption, while still meeting the hydraulic control objectives.

6.0 RECOMMENDATIONS FOR IMPLEMENTATION

This section summarizes the recommendations pursuant of the evaluations of the prior sections.

1. Once the evaluation of the existing system is completed, upgrades to the system are implemented, and the system is fully commissioned, MACTEC recommends installing packers in the extraction wells and testing to determine if targeting shallower, conductive bedrock fracture zones would be suitable for maintaining hydraulic control while improving contaminant recovery.
    a. If pumping at the shallower depths proves to be successful at maintaining hydraulic control, the extraction wells would be permanently modified to isolate pumping zones.
    b. Otherwise, if hydraulic control is not met by reconfiguring the pumping depths, continue pumping at current depths, but conduct a controlled/monitored shut-down to evaluate cycled operation of the GWETS.
2. Install a groundwater extraction well in the source area and incorporate it into the existing GWETS.
3. Conduct pilot testing to gather sufficient data to design and install an effective SVE system using existing SVE wells and, if possible, complete in conjunction with recommendation No.2.

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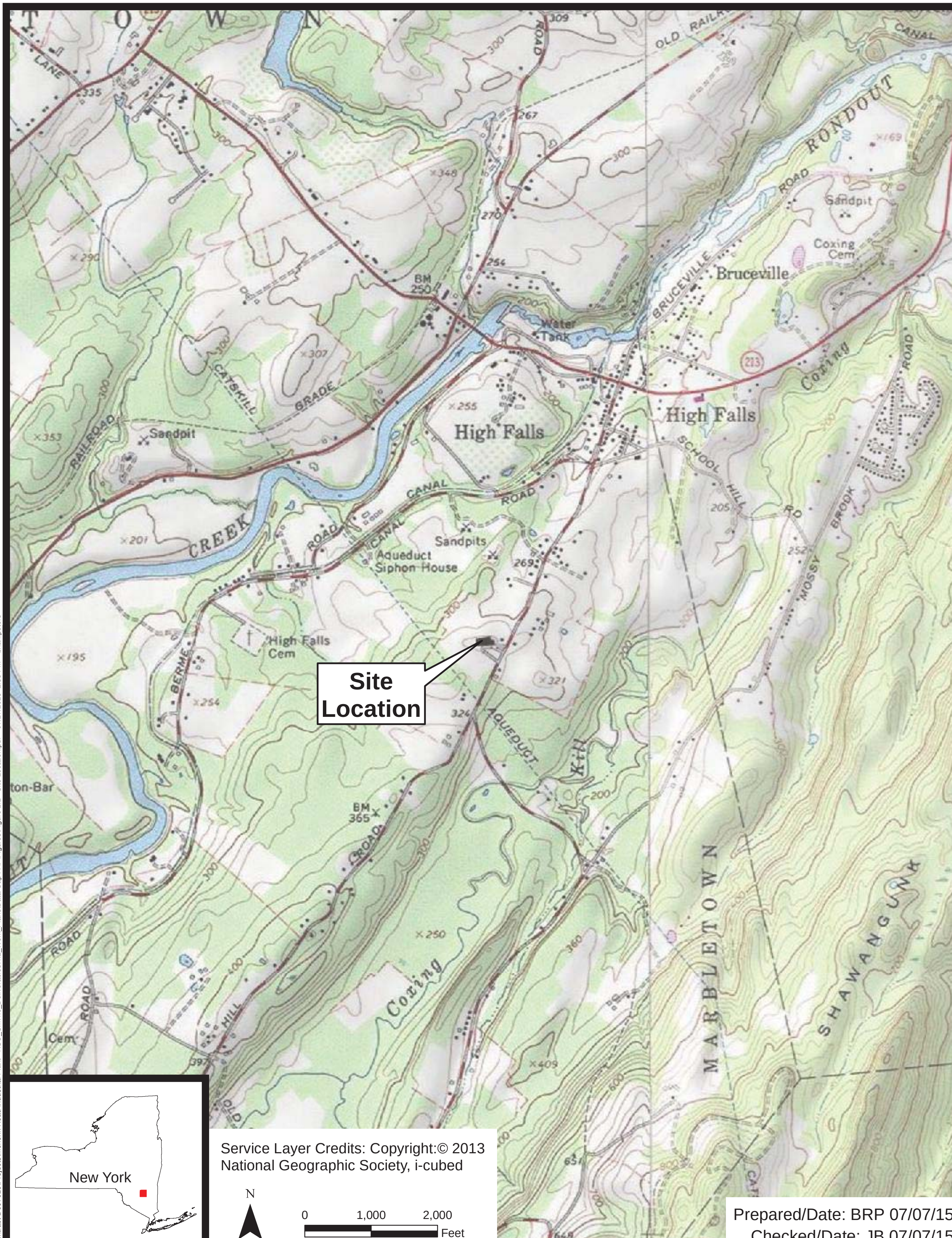
FIGURES



New York

Service Layer Credits: Copyright:© 2013
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N

0 1,000 2,000
Feet

Prepared/Date: BRP 07/07/15
Checked/Date: JB 07/07/15

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Site Location Map

Project 3617157346 Figure 1.1

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PDF: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.2_Work_Plans\Data Gap FAP\Figures\Figure 1.1 - Site Location.pdf 07/17/2015 2:33 PM brian.peters

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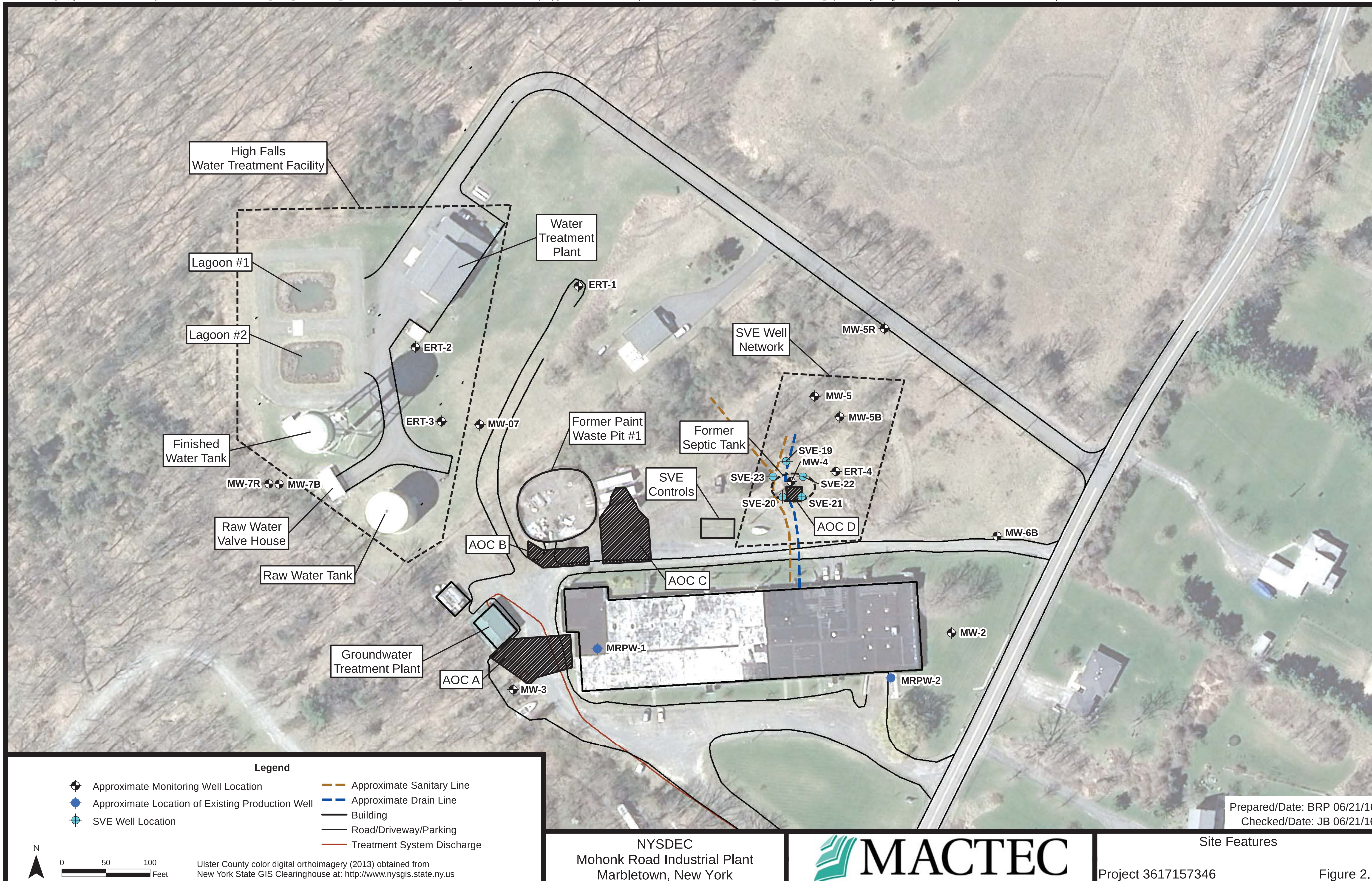

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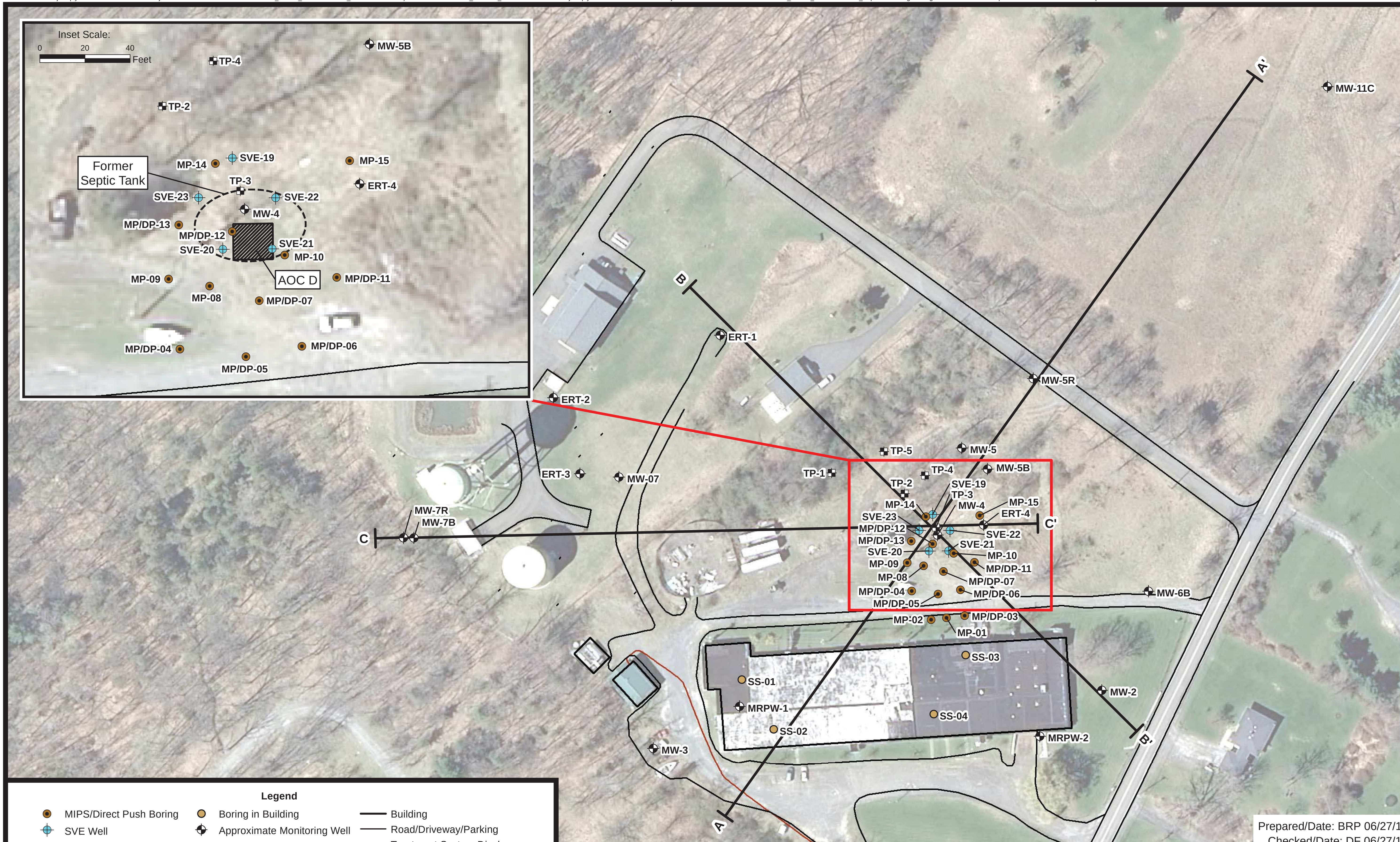

Legend

- MIPS/Direct Push Boring
- SVE Well
- Test Pit
- Boring in Building
- Approximate Monitoring Well
- Cross Section Orientation
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 50 100 Feet

Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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NYSDEC
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Marbletown, New York

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Site Overview
and Conceptual Cross Section Locations
Project 3617157346 Figure 3.1

ERT-1	
Interval (ft)	1,1,1-TCA (µg/L)
73 - 83	170
110 - 120	81
172 - 182	64

MW-5R	
Interval (ft)	1,1,1-TCA (µg/L)
89 - 99	94
110 - 120	37

MW-7R	
Interval (ft)	1,1,1-TCA (µg/L)
73 - 83	35
92.5 - 102.5	130
137 - 147	45
164 - 174	16

Legend

- SVE Well
- Approximate Monitoring Well
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 50 100 Feet

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Groundwater 1,1,1-TCA Distribution in Extraction Wells

Project 3617157346

Figure 3.2

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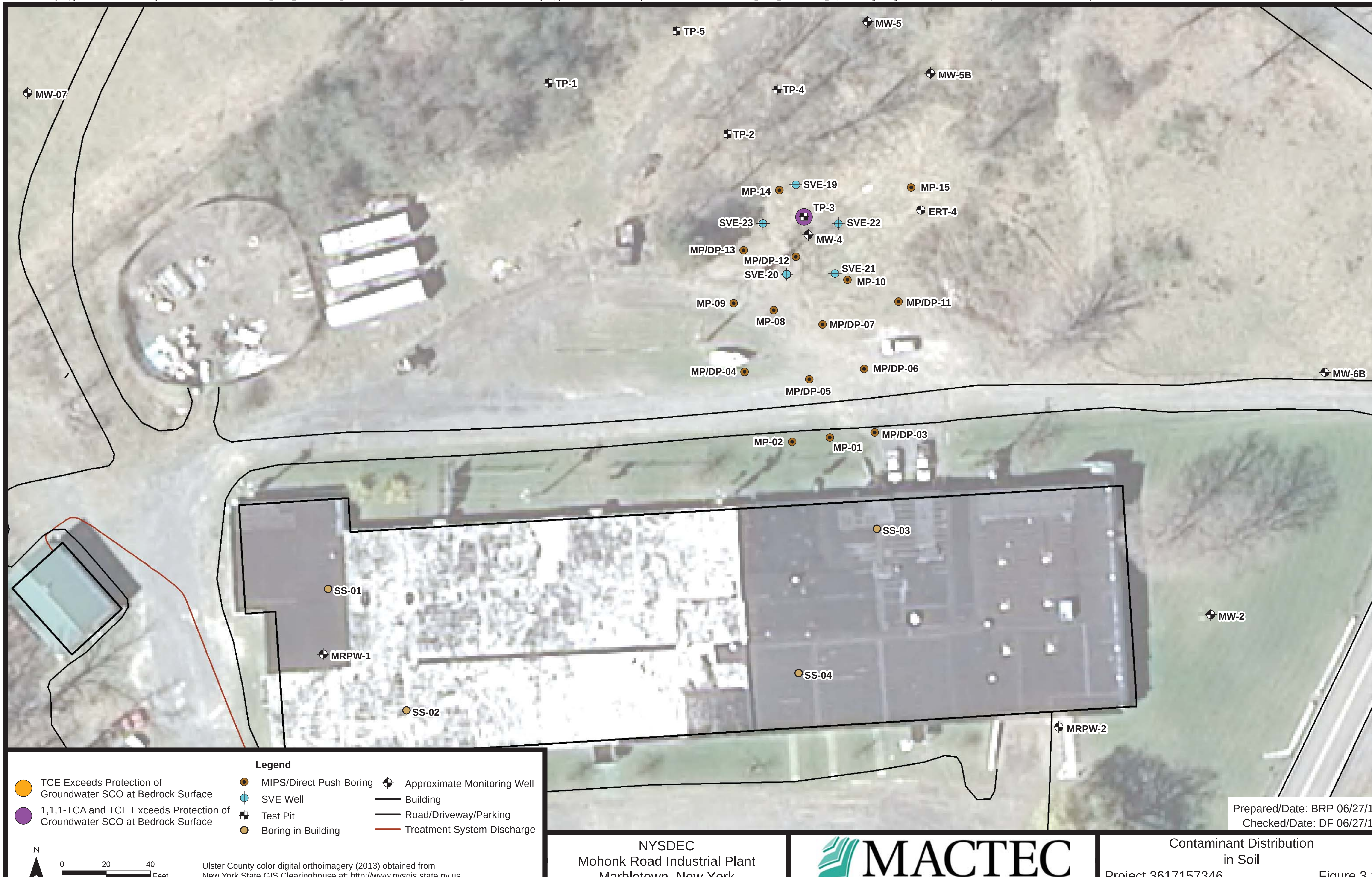

Legend

- TCE Exceeds Protection of Groundwater SCO at Bedrock Surface
- 1,1,1-TCA and TCE Exceeds Protection of Groundwater SCO at Bedrock Surface
- MIPS/Direct Push Boring
- SVE Well
- Test Pit
- Boring in Building
- Approximate Monitoring Well
- Building
- Road/Driveway/Parking
- Treatment System Discharge

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Marbletown, New York

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Contaminant Distribution in Soil

Project 3617157346

Figure 3.3

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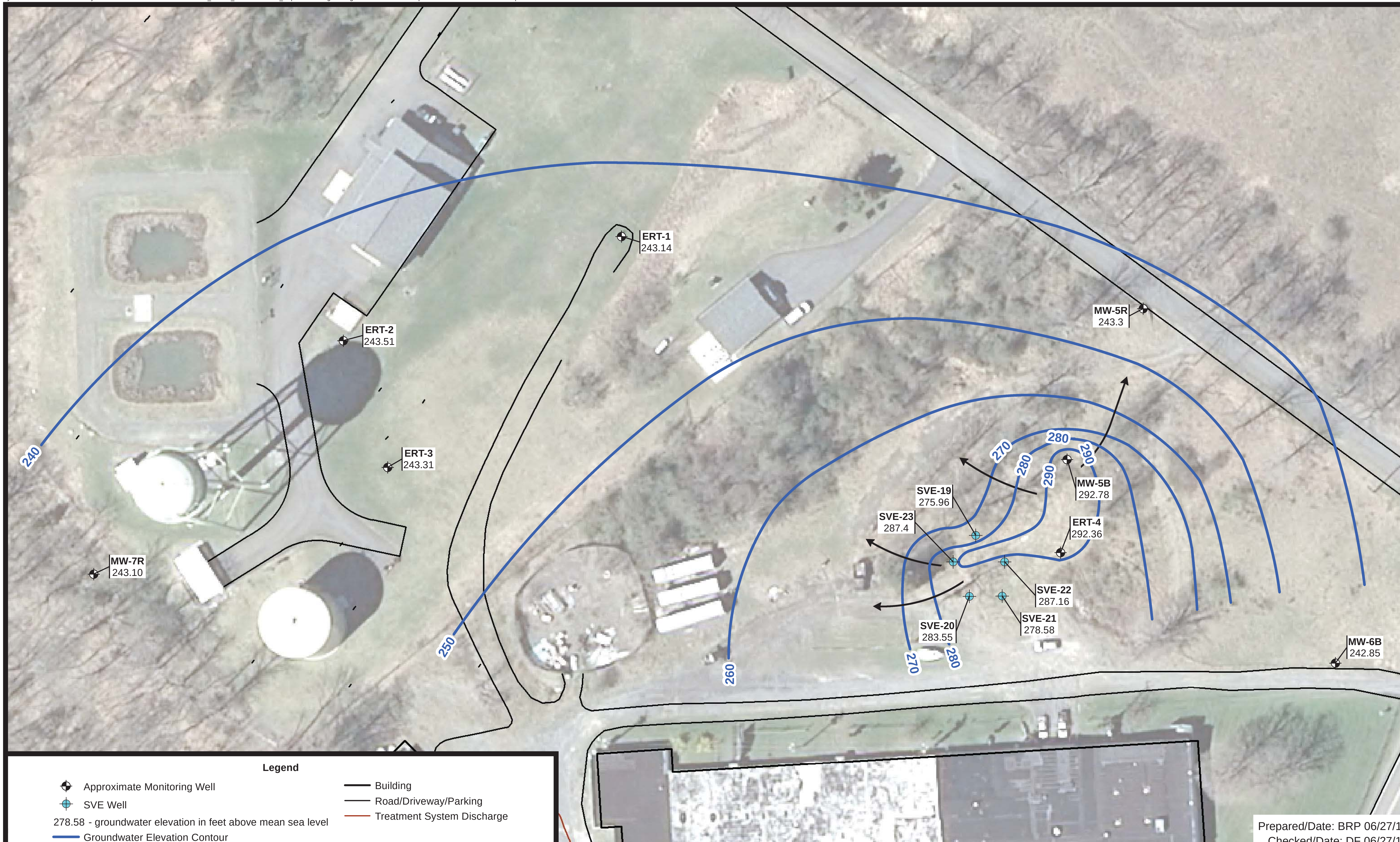

Legend

- Approximate Monitoring Well
- SVE Well
- 278.58 - groundwater elevation in feet above mean sea level
- Groundwater Elevation Contour
- Groundwater Flow
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 30 60 Feet

Ulster County color digital orthoimagery (2013) obtained from
New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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Interpreted Bedrock Groundwater
Elevation Contours - September 2015
Project 3617157346 Figure 3.4

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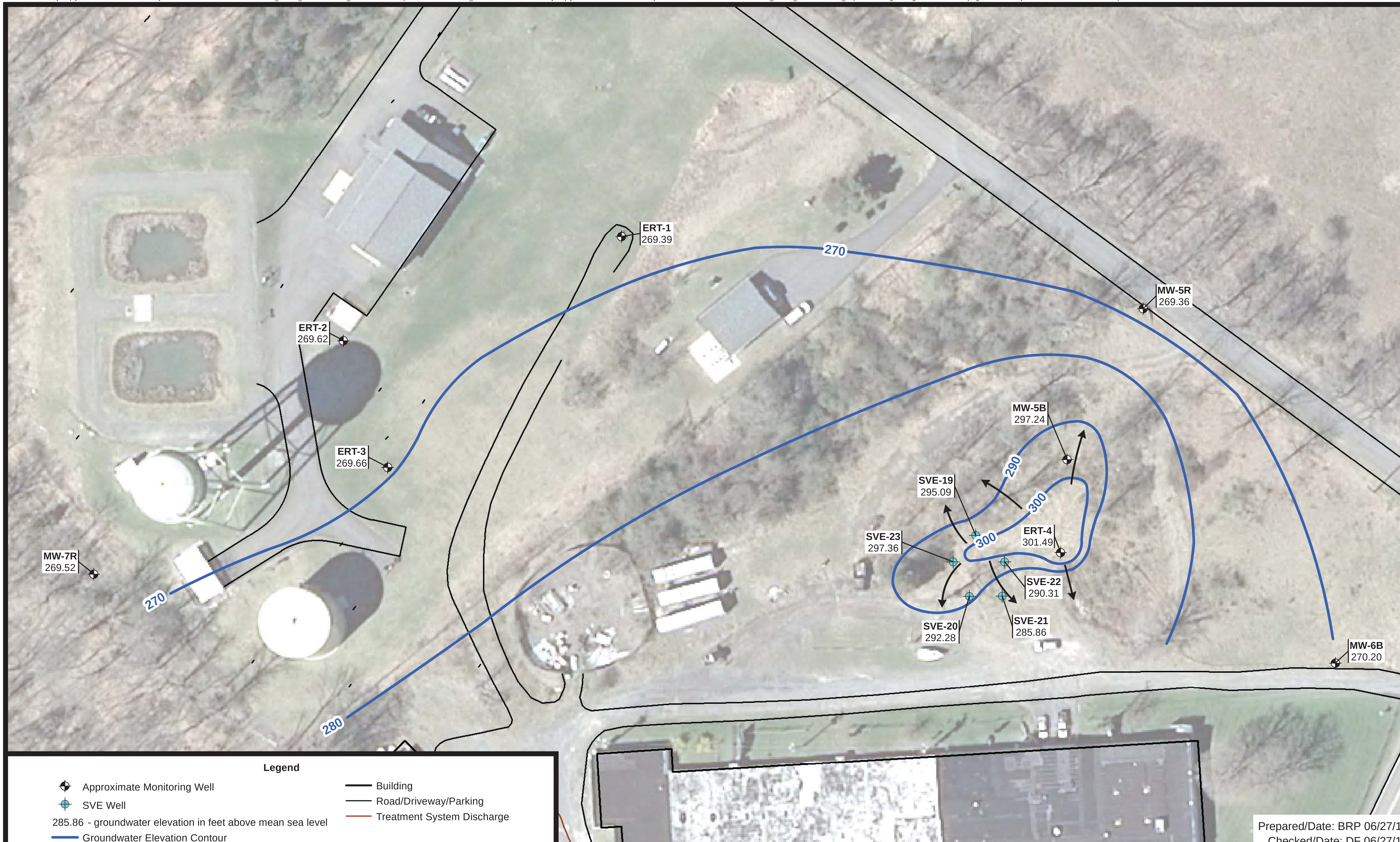

Legend

- Approximate Monitoring Well
- SVE Well
- 285.86 - groundwater elevation in feet above mean sea level
- Groundwater Elevation Contour
- Groundwater Flow
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 30 60 Feet

Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

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Interpreted Non-Pumping Bedrock Groundwater Elevation Contours - February 2016

Project 3617157346 Figure 3.5

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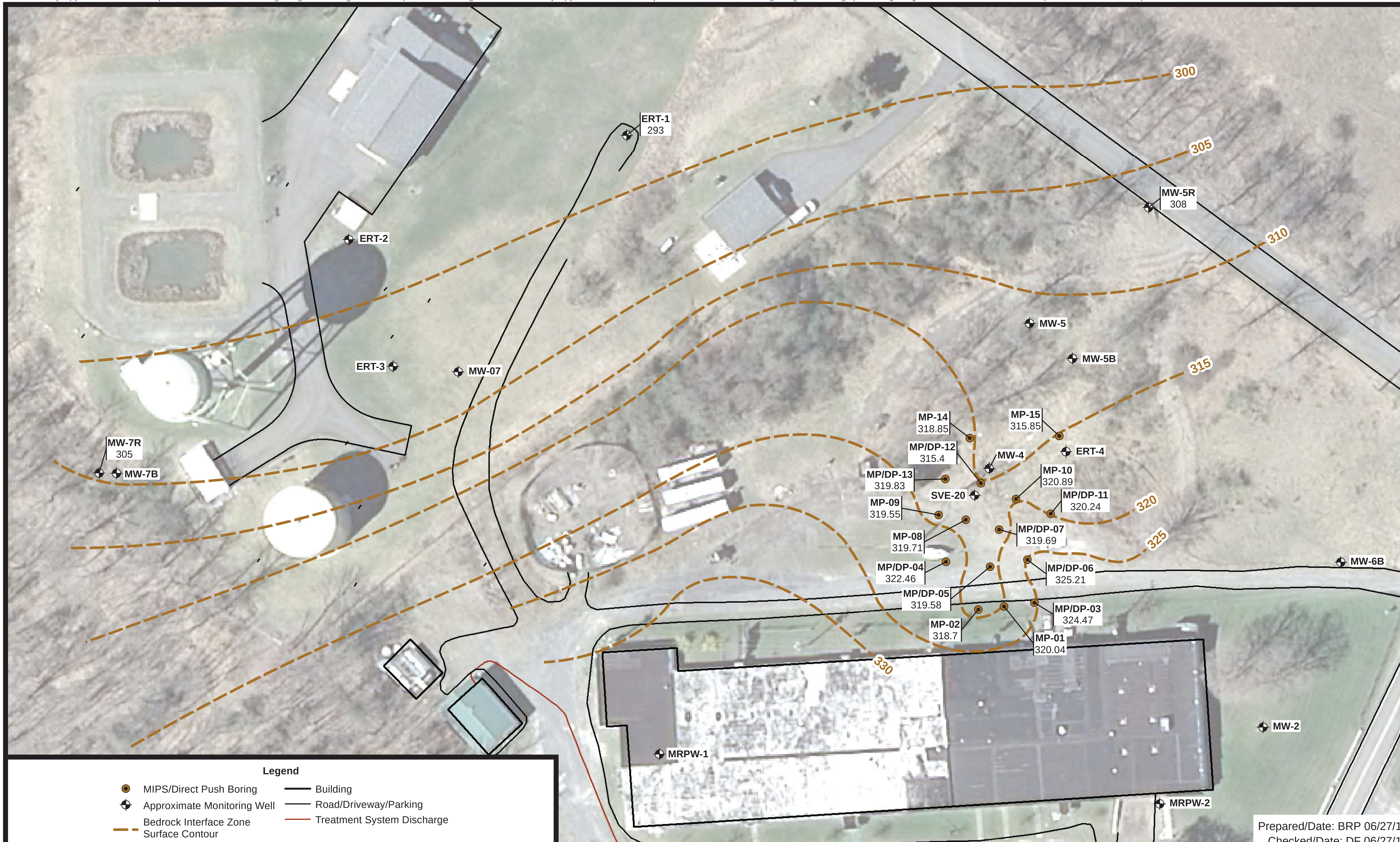

Legend

- MIPS/Direct Push Boring
- Approximate Monitoring Well
- Bedrock Interface Zone Surface Contour
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 30 60 Feet

Notes:
1. Bedrock interface zone surface is interpreted based on refusal depths from September/October 2015 Direct Push Investigation
2. Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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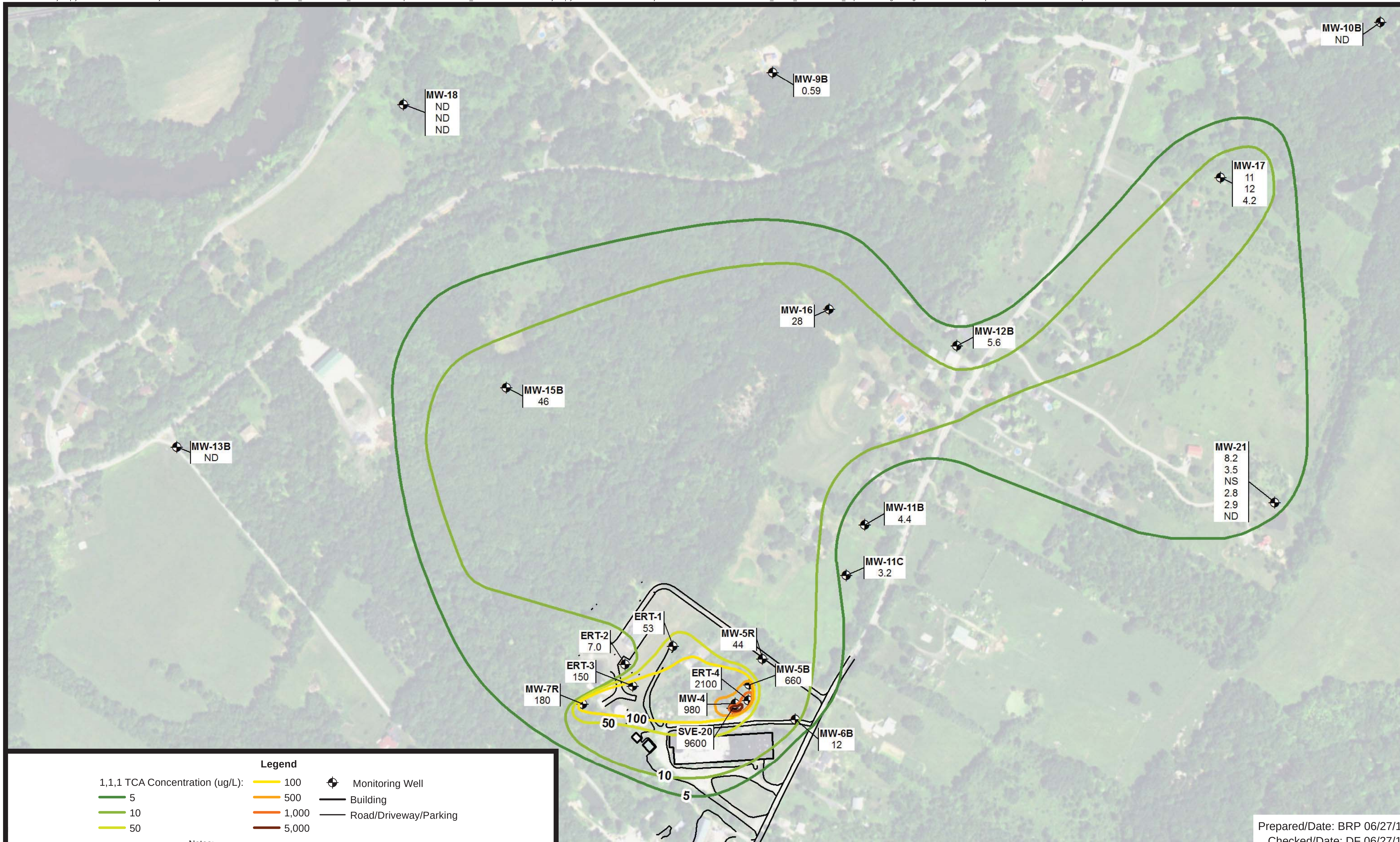
Interpreted Bedrock Interface Zone Surface Contours

Project 3617157346

Figure 3.6



Legend

1,1,1 TCA Concentration (ug/L):
- 5
- 10
- 50
- 100
- 500
- 1,000
- 5,000

Monitoring Well

Building

Road/Driveway/Parking

Notes:
1. MW-17 and MW-21 contained depth-discrete samples (multi-channel)
2. Data Source: TetraTech Long Term Monitoring, November 2015
3. Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N

0 175 350 Feet

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NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

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1,1,1-TCA in Groundwater
November 2015
Project 3617157346

Figure 3.7

TABLES

Table 2.1: Summary of Remedial Investigations and Actions

Chronology	Investigation / Action	Summary
1994	**Initial Identification of Contamination**	In April 1994, the Ulster County Health Department sampled residential and business wells downgradient of the Mohonk Road Industrial Plant (MRIP) (Site), and found levels of volatile organic compounds (VOCs) above federal and/or New York State (NYS) maximum contaminant levels (MCLs) for drinking water. Subsequently, NYS Department of Environmental Conservation (NYSDEC) installed point of entry treatment (POET) systems at homes or businesses whose potable water supply exceeded the NYS MCLs (5 parts per billion) for the individual VOCs.
1996 - 1997	**IIWAs 1 and 2**	NYSDEC contracted Lawler, Matusky & Skelly Engineers LLP (LMS) in 1996 to conduct two Immediate Investigation Work Assignments (IIWAs), and field activities consisted of the collection of soil gas and subsurface soil samples; installation and collection of groundwater samples (MW-01 through MW-05 installed within overburden and bedrock); collection of groundwater samples from the two supply wells at the Site (MRPW-1 and MRPW-2); performance of a fracture trace and lineament study; and collection of water and sludge samples from within an abandoned 1,000-gallon septic tank located north of the MRIP building. Based on the findings of the IIWAs, two sources of VOC contamination were identified on the Site: Subsurface soil beneath the gravel driveway at the western end of the MRIP building, which exhibite elevated concentrations of tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-1,2-DCE) and 1,1,1-trichloroethane (1,1,1-TCA); and the abandoned septic tank, containing sludge which exhibited elevated concentrations of 1,1,1-TCA (26 percent) and 1,1-DCE (1.8 percent).
1998	**RI / FS / Underground Tank Removal Interim Remedial Measure (IRM)**	NYSDEC contracted LMS to conduct a Remedial Investigation (RI)/Feasibility Study (FS). As an IRM during the RI, the abandoned septic tank, its contents, and 25 tons of surrounding contaminated soil were excavated and removed from the Site. The RI results indicated that VOC contamination, including PCE, trichloroethene, 1,1,1-TCA, 1,1-DCE, 1,1-dichloroethane, ethylbenzene, and xylenes, existed in soils at the Site; the dissolved-phase groundwater VOC plume was found to extend approximately 4,000 feet north-northeast from the MRIP; and downgradient private water supplies, as well as groundwater in the aquifer beneath the MRIP property, exhibited VOC concentrations above United States Environmental Protection Agency (USEPA) Removal Action Levels, federal and NYS MCLs, and NYSDEC Class GA Drinking Water Standards. In March 1999, NYSDEC released a FS which evaluated cleanup alternatives for the entire Site including alternative water supplies, source control measures (excavation scenarios) and groundwater responses (extraction).
2000	**ROD Issuance**	NYSDEC a proposed a remedial plan in November 1999, and the USEPA assumed the role as lead agency, and issued the Record of Decision (ROD) with major components of the selected remedy including: - construction of a new public water treatment plant and distribution system to serve the impacted area in High Falls; - extraction of groundwater on and off the MRIP property, with treatment via air stripping and granular activated carbon (GAC); and, - excavation of approximately 500 cubic yards of contaminated soils on the MRIP property and disposal off-Site.
2000	**Near Field Groundwater Extraction and Treatment**	USEPA authorized the construction of the near-field groundwater extraction and treatment in 1999, and in 2000, extraction and treatment plant began operating 24 hours a day, seven days a week. The extraction system consists of three active extraction wells and associated buried piping: MW-5R (125 feet [ft.]), MW-7R (180 ft.), and ERT-1 (195ft.) (see Figure 2.1). The extraction wells are constructed of six-inch diameter casing installed into bedrock with open-hole construction at depth below the casing. Extraction well flow rates vary, but are typically in the range of 5-9 gallons per minute (gpm) per well. ERT-1 tends to produce slightly more than the other two extraction wells. The total combined influent is approximately 15-20 gpm, however this is much less than the design capacity of the treatment plant.
2000	**Contaminated Soils Excavation**	USEPA excavated contaminated soil from area of concern (AOC) A and contaminated soil, paint waste and debris from AOCs B and C totaling 2,036 tons and disposed of the material off-Site. Prior to backfilling with clean fill, analytical results for post-excavation soil samples indicated that no cleanup levels were exceeded in soils remaining within the excavations
2005	**Soil Vapor Intrusion (VI) Investigation and On-Site VI Mitigation**	Sub-slab soil gas sampling ports were installed in 34 residential and 9 non-residential locations, with soil gas samples collected and analyzed for VOCs. The sampling determined that the concentrations of VOCs at all residential locations were below health-based screening levels. Therefore, no further evaluation and/or action was deemed necessary at the residential locations. However, samples obtained in the commercial building on the MRIP property indicated the need to install a vapor mitigation system. Between January 29 and February 1, 2007, six sub-slab ventilation systems, with venting to the outside air, were installed in the sub-surface layer underneath the building's concrete floor slab.
2006	**SVE System Installation**	In order to enhance the VOC removal provided by the excavations and the extraction and treatment system, 18 overburden soil vapor extraction (SVE) wells (SVE-1 through SVE-18) were installed in 2006 on the MRIP property immediately north of the commercial building and near the former underground septic tank and original septic field. All wells were installed at depth of refusal.
2008 - 2011	**SVE System Operation**	The SVE system was fully operational by February 2008. In 2009, an additional five SVE wells (SVE-19 through SVE-23) were installed in the vicinity of the pre-existing septic tank at greater depths within the bedrock aquifer (approximately 55 below ground surface) (Figure 3). However, during late 2011/early 2012 the USEPA terminated the operation of the SVE system. The newer SVE wells were capped and left in place and are used for groundwater monitoring.

Prepared by: JWB 06/21/2016
Checked by: JPC 06/23/2016

Table 2.1: Summary of Remedial Investigations and Actions

Chronology	Investigation / Action	Summary
2007	**Construction of Public Water Supply System**	The construction of the water treatment plant and water distribution system called for in the ROD began in the fall of 2005 and was completed in 2007. The water treatment plant and accompanying water tower occupy approximately seven acres of land in the northern section of the MRIP property. The system is connected to the pressurized Catskill Aqueduct, which is part of the New York City reservoir system. Connection of homes and businesses within the water district to the public water supply was completed in November 2007. The MRIP building was also connected to the public water supply. Concurrently, POET systems were removed, associated well lines were capped, and well pumps' piping and power were disconnected. An ordinance within the High Falls Water District prohibits residents from establishing or maintaining a source of drinking and domestic water separate from the public water supply, yet allows existing separate water sources to be used for purposes other than drinking and domestic use.
2008	**ROD Amendment**	In September 2008, the USEPA issued a ROD Amendment in which the far field treatment system component of the groundwater remedy was removed and replaced with a monitored natural attenuation (MNA) remedy to restore the aquifer to its most beneficial use (as a potable water supply) and continued extraction and treatment (air stripper and GAC adsorption) of contaminated groundwater in the near field plume on the Site. The amendment also included continued operation of the SVE system and Site building vapor mitigation system.
2016 (present)	**Institutional Controls**	Institutional controls (ICs) are being relied upon to prevent the future use of the aquifer within the High Falls Water District (HFWD) until cleanup levels have been attained. These ICs consist of existin ordinances of the Towns of Marbletown and Rosendale which prohibit the establishment or maintenance of a source of drinking or domestic water separate from the public water system of the HFWD. These ICs would no longer be necessary following the restoration of groundwater to beneficial use.
2016 (present)	**Operation, maintenance and monitoring**	Currently, the extraction and treatment plant is being operated and maintained by NYSDEC via the September 2011 Site transfer agreement with the USEPA Region 2. The ongoing operations consist of extraction of the contaminated groundwater, treatment by air stripper and discharge of the treated groundwater to the Coxing Kill. As part of monitoring program, the influent and effluent concentrations of the extraction and treatment system, as well as extraction wells ERT-1, MW-5R and MW-7R, are routinely sampled. The various monitoring wells throughout the Site area (both on-property and off-property) are sampled annually by the USEPA through an Interagency Agreement with the United States Army Corps of Engineers and its contractors, as part of the long-term response action for the MNA remedy, as identified in the September 2008 ROD Amendment.

Acronyms and Abbreviations

AOC	area of concern
DCE	1,2-Dichloroethene
FS	Feasibility Study
ft.	feet (or foot)
GAC	granular activated carbon
gpm	gallon(s) per minute
HFWD	High Falls Water District
IC	institutional control
IIWA	Immediate Investigation Work Assignment
IRM	Interim Remedial Measure
LMS	Lawler, Matusky & Skelly Engineers LLP
MCLs	Maximum Contaminant Levels
MNA	monitored natural attenuation
MRIP	Mohonk Road Industrial Plant
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
PCE	Tetrachloroethene
POET	point-of-entry treatment
RI	Remedial Investigation
ROD	Record of Decision
Site	Mohonk Road Industrial Plant site
SVE	Soil Vapor Extraction
TCA	1,1,1-Trichloroethane
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

Prepared by: JWB 06/21/2016
Checked by: JPC 06/23/2016

Table 3.1: Field Groundwater Measurements

			Non-pumping conditions		Pumping conditions		Non-pumping conditions[4]	
Location ID	**Ground Surface Elevation**	**Measuring Point (mp) Elevation**	**Depth to Water (09/14/2015)[2] (ft bmp)**	**Water Elevation (ft msl)**	**Depth to Water (11/20/15)[3] (ft bmp)**	**Water Elevation (ft msl)**	**Depth to Water (02/03/2016)[5] (ft bmp)**	**Water Elevation (ft msl)**
MW-5R	313.63	313.63	**70.33**	243.30	**65.65**	247.98	**44.27**	269.36
MW-7R	314.30	314.3	**71.20**	243.10	**62.28**	252.02	**44.78**	269.52
ERT-1	303.94	303.94	**60.80**	243.14	**54.95**	248.99	**34.55**	269.39
ERT-2	309.81	309.81	**66.30**	243.51	**57.89**	251.92	**40.19**	269.62
ERT-3	315.89	315.89	**72.58**	243.31	**64.09**	251.80	**46.23**	269.66
ERT-4	326.67	326.67	**34.31**	292.36	**25.30**	301.37	**25.18**	301.49
MW-1[1]	NA	NA	**10.12**	323.41	**NA**	NA	**4.88**	NA
MW-1B	333.53	333.53	**66.00**	267.53	**54.81**	278.72	**49.72**	283.81
MW-2[1]	331.00	NA	**14.45**	NA	**NA**	NA	**10.51**	NA
MW-4	329.21	329.21	**18.05**	311.16	**3.42**	325.79	**4.55**	324.66
MW-5B	322.00	325.3	**32.52**	292.78	**24.27**	301.03	**28.06 [6]**	NA
MW-6B	323.00	323.95	**81.10**	242.85	**70.59**	253.36	**53.74**	270.21
MW-11	NA	282.43	**37.81**	244.62	**NA**	NA	**NA**	NA
MW-11B	NA	281.72	**NA**	NA	**30.21**	251.51	**NA**	NA
MW-11C [7]	NA	284.58	**NA**	NA	**32.10**	252.48	**18.42**	266.16
SVE-19	325.41	326.78	**50.82**	275.96	**25.51**	301.27	**31.69**	295.09
SVE-20	327.75	328.95	**45.40**	283.55	**36.44**	292.51	**36.67**	292.28
SVE-21	327.23	328.57	**49.99**	278.58	**26.12**	302.45	**42.71**	285.86
SVE-22	326.17	327.31	**40.15**	287.16	**34.45**	292.86	**37.00**	290.31
SVE-23	326.07	327.33	**39.93**	287.40	**27.82**	299.51	**29.97**	297.36

Notes:
MW = monitoring well
ft bmp = feet below measuring point (top of casing)
msl = mean sea level
1 = No survey data available
2 = Water levels under non-pumping conditions were recorded 9/14/15 by MACTEC after system shutdown.
3 = Water levels representing pumping conditions were recorded 11/20/15 by Tetra Tech following LTM groundwater sampling
4 = Pumps were down since Friday 1/22/16
5 = Weather on 2/3/16 was unseasonably warm and wet (high 58°F, 0.95" rain, Wunderground - Stone Ridge, NY [KNYSTONE6])
6 = Measured from top of rubber fernco. SWL from top of PVC is 27.86 ft
7 = SWL collected from well labeled MW-11C is in middle of field on property north of MRIP site (not the well along adjacent driveway

Prepared By: DF 02/22/15
Checked By: HA 03/09/16

Table 3.2: Source Zone Test Pit - Soil VOC Results

	SCO	**Loc Name**	**TP-01**		**TP-01**		**TP-02**		**TP-02**	
		Field Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015	
		Field Sample ID	356023TP0102		356023TP0107		356023TP0207		356023TP0203	
		Sample Depth (ft bgs)	2		7		7		3	
		Qc Code	FS		FS		FS		FS	
VOCs	**Pro. GW**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	680	ug/kg	27	J	64	U	**110**		**99**	
1,1-Dichloroethane	270	ug/kg	68	U	64	U	23	J	33	J
1,1-Dichloroethene	330	ug/kg	68	U	64	U	55	J	29	J
1,4-Dichlorobenzene	1800	ug/kg	68	U	64	U	56	U	38	J
Acetic acid, methyl ester	NA	ug/kg	66	J	**71**		56	U	**61**	
Ethylbenzene	1000	ug/kg	68	U	64	U	56	U	58	U
Tetrachloroethene	1300	ug/kg	68	U	64	U	56	U	58	U
Toluene	700	ug/kg	68	U	64	U	56	U	18	J
Trichloroethene	470	ug/kg	68	U	64	U	26	J	21	J
Xylenes, Total	1600	ug/kg	140	U	130	U	110	U	120	U
Percent Solids	--	PERCENT	86		89		90		81	

	SCO	**Loc Name**	**TP-03**		**TP-03**		**TP-04**		**TP-05**		**TP-05**	
		Field Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015		9/15/2015	
		Field Sample ID	356023TP0307		356023TP0303		356023TP0404		356023TP0507		356023TP0503	
		Sample Depth (ft bgs)	7		3		4		7		3	
		Qc Code	FS		FS		FS		FS		FS	
VOCs	**Pro. GW**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	680	ug/kg	**2200**		**650**		20	J	63	U	90	U
1,1-Dichloroethane	270	ug/kg	23	J	69	U	61	U	63	U	90	U
1,1-Dichloroethene	330	ug/kg	**480**		86		61	U	63	U	90	U
1,4-Dichlorobenzene	1800	ug/kg	51	U	69	U	61	U	63	U	90	U
Acetic acid, methyl ester	NA	ug/kg	24	J	**75**		61	U	33	J	**90**	
Ethylbenzene	1000	ug/kg	51	U	69	U	61	U	63	U	90	U
Tetrachloroethene	1300	ug/kg	51	U	69	U	61	U	63	U	90	U
Toluene	700	ug/kg	77		30	J	61	U	63	U	90	U
Trichloroethene	470	ug/kg	**1500**		**520**		22	J	63	U	90	U
Xylenes, Total	1600	ug/kg	37	J	140	U	120	U	130	U	180	U
Percent Solids	--	PERCENT	90		82		90		89		74	

Notes:
Samples analyzed for VOCs by USEPA Method 8260C;
Results in micrograms per kilogram (ug/kg) (only detected compounds shown) (**detections in bold**)
Qualifier: U = compound not detected at concentration above reporting limit
Soil Cleanup Objective from NYCRR Part 375:
Highlighted gray cell exceeds one or more criteria
Pro. GW= for the protection of groundwater
NA = criteria not available

Prepared By: DF 12/17/15
Checked By: ICD 01/13/16

Table 3.3: Source Zone Direct-Push - Soil VOC Results

		Loc Name	**DP-3**		**DP-3**		**DP-4**		**DP-4**		**DP-5**	
		Field Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Field Sample ID	356023DP3004		356023DP3008		356023DP4003		356023DP4006		356023DP5005	
		Sample Depth (ft bgs)	4		8		3		6		5	
	SCO	**Qc Code**	FS		FS		FS		FS		FS	
VOCs	**Pro. GW**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	680	ug/kg	36	J	**100**		32	J	**97**		46	J
1,1-Dichloroethane	270	ug/kg	48	U	48	U	48	U	17	J	49	U
1,1-Dichloroethene	330	ug/kg	48	U	29	J	48	U	23	J	49	U
1,4-Dichlorobenzene	1800	ug/kg	48	U	48	U	48	U	50	U	49	U
Acetic acid, methyl ester	NA	ug/kg	48	U	48	U	48	U	50	U	49	U
Ethylbenzene	1000	ug/kg	48	U	48	U	48	U	50	U	49	U
Tetrachloroethene	1300	ug/kg	48	U	48	U	48	U	50	U	49	U
Toluene	700	ug/kg	48	U	48	U	48	U	50	U	49	U
Trichloroethene	470	ug/kg	48	U	48	U	48	U	28	J	**120**	
Xylenes, Total	1600	ug/kg	96	U	97	U	96	U	62	J	99	U
Percent Solids	--	PERCENT	85		86		86		86		88	

		Loc Name	**DP-5**		**DP-5**		**DP-6**		**DP-7**		**DP-7**	
		Field Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Field Sample ID	356023DP5011		356023DP5D		356023DP6004		356023DP7006		356023DP7009	
		Sample Depth (ft bgs)	11		11		4		6		9	
	SCO	**Qc Code**	FS		FD		FS		FS		FS	
VOCs	**Pro. GW**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	680	ug/kg	**130**		200	J	**130**		**82**		**230**	
1,1-Dichloroethane	270	ug/kg	18	J	47	U	50	U	47	U	44	U
1,1-Dichloroethene	330	ug/kg	42	U	47	U	50	U	47	U	26	J
1,4-Dichlorobenzene	1800	ug/kg	42	U	47	U	50	U	47	U	44	U
Acetic acid, methyl ester	NA	ug/kg	42	U	47	U	37	J	47	U	44	U
Ethylbenzene	1000	ug/kg	42	U	23	J	50	U	47	U	44	U
Tetrachloroethene	1300	ug/kg	42	U	47	U	50	U	47	U	44	U
Toluene	700	ug/kg	42	U	47	U	**87**		47	U	44	U
Trichloroethene	470	ug/kg	**370**		**560**		50	U	**390**		**860**	
Xylenes, Total	1600	ug/kg	83	J	220	J	99	U	93	U	110	
Percent Solids	--	PERCENT	90		91		87		88		91	

Notes:
Samples analyzed for VOCs by USEPA Method 8260C;
Results in micrograms per kilogram (ug/kg) (only detected compounds shown) (**detections in bold**)
Qualifier: U = compound not detected at concentration above reporting limit
Soil Cleanup Objective from NYCRR Part 375:
Highlighted gray cell exceeds one or more criteria
Pro. GW= for the protection of groundwater
NA = criteria not available

Prepared By: DF 12/17/15
Checked By: ICD 01/13/16

Table 3.3: Source Zone Direct-Push - Soil VOC Results

		Loc Name	**DP-11**		**DP-11**		**DP-12**		**DP-12**		**DP-13**	
		Field Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Field Sample ID	356023DP11007		356023DP11009		356023DP12007		356023DP12010		356023DP13006	
		Sample Depth (ft bgs)	7		9		7		10		6	
	SCO	**Qc Code**	FS		FS		FS		FS		FS	
VOCs	**Pro. GW**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	680	ug/kg	50	U	**160**		**11000**		**190**		**120**	
1,1-Dichloroethane	270	ug/kg	50	U	54	U	**110**		54	U	**130**	
1,1-Dichloroethene	330	ug/kg	50	U	28	J	**2100**		22	J	39	J
1,4-Dichlorobenzene	1800	ug/kg	50	U	54	U	45	U	54	U	46	U
Acetic acid, methyl ester	NA	ug/kg	50	U	54	U	45	U	**140**		46	U
Ethylbenzene	1000	ug/kg	50	U	54	U	45	U	54	U	46	U
Tetrachloroethene	1300	ug/kg	50	U	54	U	45	U	54	U	46	U
Toluene	700	ug/kg	50	U	54	U	45	U	54	U	46	U
Trichloroethene	470	ug/kg	50	U	**85**		**1900**		**170**		18	J
Xylenes, Total	1600	ug/kg	99	U	62	J	90	U	110	U	92	U
Percent Solids	--	PERCENT	86		91		92		82		89	

Notes:
Samples analyzed for VOCs by USEPA Method 8260C;
Results in micrograms per kilogram (ug/kg) (only detected compounds shown) (**detections in bold**)
Qualifier: U = compound not detected at concentration above reporting limit
Soil Cleanup Objective from NYCRR Part 375:
Highlighted gray cell exceeds one or more criteria
Pro. GW= for the protection of groundwater
NA = criteria not available

Table 3.4: Site Building Sub-slab - Soil VOC Results

	Loc Name	**SS01**		**SS02**		**SS02**		**SS03**		**SS04**	
	Field Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015		9/15/2015	
	Field Sample ID	356023SS0101		356023SS0201		356023SS0205		356023SS0302		356023SS0402	
	Sample Depth (ft bgs)	1		1		5		2		2	
	Qc Code	FS		FS		FS		FS		FS	
VOCs	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	ug/kg	48	U	48	U	43	U	43	U	51	U
1,1-Dichloroethane	ug/kg	**53**		48	U	43	U	43	U	51	U
1,1-Dichloroethene	ug/kg	48	U	48	U	43	U	43	U	51	U
1,4-Dichlorobenzene	ug/kg	48	U	48	U	43	U	43	U	51	U
Acetic acid, methyl ester	ug/kg	**61**		48	U	43	U	43	U	51	U
Ethylbenzene	ug/kg	48	U	48	U	43	U	43	U	51	U
Tetrachloroethene	ug/kg	15	J	48	U	43	U	43	U	51	U
Toluene	ug/kg	**48**		48	U	43	U	43	U	51	U
Trichloroethene	ug/kg	14	J	**420**		**410**		43	U	51	U
Xylenes, Total	ug/kg	96	U	95	U	87	U	86	U	100	U
Percent Solids	PERCENT	87		88		89		97		88	

Notes:
Samples analyzed for VOCs by USEPA Method 8260C;
Results in micrograms per kilogram (ug/kg) (only detected compounds shown) (**detections in bold**)
Qualifier: U = compound not detected at concentration above reporting limit
No Soil Cleanup Objectives were exceeded in surface soil samples
NA = criteria not available

Prepared By: DF 12/17/15
Checked By: ICD 01/13/16

Table 3.5: Summary of Water-Bearing Fractures

Bedrock Well	Water-Bearing Feature Depth	Fracture Strike (azimuth)	Fracture Dip & Direction	Packer Sample 1,1,1-TCA (µg/L)	Specific Capacity (S_c) (gpm/ft)	Estimated Transmissivity (T) (gpd/ft)
MW-7R	81.3	270	4N	35	0.50	1006.45
	93.7	27	11NW	130	0.21	420.44
	98.4	50	15NW			
	138.8	287	16NE	45	0.98	1960.00
	145.4	74	5NW			
	145.7	345	8SW			
	165.2	7	6NW	16	4.17	8333.33
	171.5	343	4SW			
ERT-1	74.4	48	7NW	170	0.01	28.74
	75.5	87	3NW			
	114.5	72	10NW	81	1.37	2747.66
	115.5	300	27NE			
	173.6	52	5NW	64	2.27	4545.45
	180.1	352	5SW			
	180.7	73	14NW			
MW-5R	92.9	275	13SW	94	15.62	31250.00
	114.6	23	3NW	37	4.27	8533.33
SVE-21	51.4	67	16NW	NS	NS	NS
	52.2	309	11NE	NS	NS	NS

NS = No Sample

Prepared By: DF 02/22/16
Checked By: HA 02/26/16

Table 3.6: Extraction Well Packer Testing - Groundwater VOC Results

		Loc Name	**ERT-1**		**ERT-1**		**ERT-1**		**MW-5R**		**MW-5R**		**MW-5R**	
		Media	GW		GW		GW		GW		GW		GW	
		Field Sample Date	9/23/2015		9/23/2015		9/23/2015		9/22/2015		9/22/2015		9/22/2015	
		Field Sample ID	356023ERT01175		356023ERT01115		356023ERT01075		356023MW05R115		356023MW05R115XD		356023MW05R095	
		Top Depth (ft bgs)	172		110		73		110		110		89	
		Bottom Depth (ft bgs)	182		120		83		120		120		99	
	GA	**Qc Code**	FS		FS		FS		FS		FD		FS	
VOCs	**Standard**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	5	ug/L	**64**		**81**		**170**		**36**		**37**		**94**	
1,1-Dichloroethane	5	ug/L	**10**		**16**		**41**		**2.9**		**2.9**		**7.8**	
1,1-Dichloroethene	5	ug/L	**16**		**20**		**32**		**8.3**		**8.6**		**20**	
1,2-Dichloroethane	0.6	ug/L	1	U	1	U	0.52	J	1	U	1	U	1	U
Cis-1,2-Dichloroethene	5	ug/L	1	U	1	U	0.83	J	1	U	1	U	1	U
Trichloroethene	5	ug/L	**4.2**		**6.7**		**12**		**3.7**		**3.6**		**6.3**	

		Loc Name	**MW-7R**		**MW-7R**		**MW-7R**		**MW-7R**	
		Media	GW		GW		GW		GW	
		Field Sample Date	9/24/2015		9/24/2015		9/24/2015		9/25/2015	
		Field Sample ID	356023MW07R170		356023MW07R138		356023MW07R095		356023MW07R080	
		Top Depth (ft bgs)	164		137		92.5		73	
		Bottom Depth (ft bgs)	174		147		102.5		83	
	GA	**Qc Code**	FS		FS		FS		FS	
VOCs	**Standard**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,1,1-Trichloroethane	5	ug/L	**16**		**45**		**130**		**35**	
1,1-Dichloroethane	5	ug/L	**6.1**		**16**		**47**		**9.4**	
1,1-Dichloroethene	5	ug/L	**2.8**		**6.5**		**16**		**5.3**	
1,2-Dichloroethane	0.6	ug/L	1	U	1	U	1	U	1	U
Cis-1,2-Dichloroethene	5	ug/L	1	U	1	U	**1.8**		1	U
Trichloroethene	5	ug/L	0.47	J	**1.5**		**2.2**		**1.9**	

Notes:
VOCs = Volatile Organic Compounds:
VOCs analyzed by Method 8260
ug/L = micrograms per liter
(detections in bold)
Qual = Qualifier
U = not detected; J = estimated value
ft bgs= feet below ground surface
GA = Groundwater guidance or standard values from Technical and Operational Guidance Series (TOGS) 1.1.1, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, 1998).
Highlighted gray cell exceeds criteria
* = Guidance value

Prepared By: DF 12/17/15
Checked By: ICD 01/13/16

APPENDIX A

CONCEPTUAL SITE MODEL AND DATA GAP REVIEW REPORT

MACTEC

engineering and constructing a better tomorrow

July 8, 2015

Josh Haugh
Remedial Bureau E
NYSDEC Division of Environmental Remediation
625 Broadway, 12th Floor, Albany, NY12233-7017

RE: Conceptual Site Model (CSM) and Data Gap Review
Mohonk Road Industrial Plant, NYSDEC – Site No. 356023
MACTEC Engineering and Consulting, P.C., Project No. 3617157346

Dear Mr. Haugh:

This letter presents a Conceptual Site Model (CSM), a Data Gap Review and Recommendations for the Mohonk Road Industrial Plant (MRIP), New York State Department of Environmental Conservation (NYSDEC) Site 356023. The CSM is based on information that is currently available; it is considered a dynamic model that is expected to evolve as new information becomes available. The CSM will be updated if and when additional information is obtained regarding site hydrogeology and/or chemistry.

SITE BACKGROUND

History of Contamination and Initial Response

The MRIP (Site) is located in the Hamlet of High Falls, Ulster County, New York, approximately seven miles north-northwest of the Village of New Paltz (Figure 1). The Site includes the original MRIP property at 186 Mohonk Road and surrounding properties impacted by the contaminated groundwater plume emanating from the Site. Industrial activities have taken place at the Site since the early 1960's, which included metal finishing, wet spray painting and the manufacturing of store display fixtures, card punch machines and computer frames.

MACTEC Engineering and Consulting, P.C.
511 Congress Street • Portland, Maine 04101 • Phone: 207-775-5401 • Fax: 207-772-4762 www.mactec.com

The property currently contains a 43,000-square foot, single-story building. Two production wells are located within the building. A septic field serving this building was used to dispose of hazardous substance-containing wastes, such as solvents and wastes from paint and metal-working operations. Drums, paint sludge and other wastes were also buried in several locations on the MRIP Property.

In April 1994 a residential well near the MRIP property was sampled and was found to contain elevated levels of volatile organic compounds (VOCs) above the New York State (NYS) Class GA drinking water standards. NYSDEC began investigating the Site in 1994, and as an interim action, installed 70 dual unit granular activated carbon (GAC) filters at homes or businesses whose wells exceeded the NYS Class GA Standards (5 micrograms per liter [μg/L] for individual VOCs).

An Immediate Investigation Work Assignment was then implemented, and groundwater sampling results demonstrated that background overburden/bedrock interface and bedrock wells contained no detectable VOCs (Lawler, Matusky & Skelly Engineers LLP [LMS], 1997). Other on-site interface and bedrock wells, and the in-service production wells, all had 1,1,1-trichloroethane (1,1,1-TCA) and other compounds above groundwater standards, with the highest levels found in the overburden/bedrock interface wells directly downgradient of the underground septic tank area (i.e. MW-4; 82,000 μg/L).

Groundwater sampling results collected during a Remedial Investigation/Feasibility Study (RI/FS), indicated that downgradient private water supplies contained 1,1,1-TCA concentrations ranging from non-detectable to 880 parts per billion (ppb), and total VOC concentrations ranging from 1.6 ppb to 1,077 ppb (LMS, 1998b). In addition, groundwater in the bedrock aquifer beneath the MRIP property exhibited VOC concentrations above the United States Environmental Protection Agency (USEPA) Maximum Contaminant Level, and NYS Class GA Water Standards.

Based on the findings of the initial investigations, 1,1,1-TCA, 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), trichloroethene (TCE), tetrachloroethene (PCE), ethylbenzene and xylenes were identified as contaminants of concern (COCs) in Site soils. Data collected from groundwater sampling indicated that a dissolved-phase VOC plume extended approximately one mile north-northeast from the MRIP property.

Remedial Actions

USEPA assumed the role as lead agency with the issuance of the Record of Decision (ROD) in March 2000, which included the following remedial action objectives (RAOs) (USEPA, 2000):

- eliminate inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet federal or state drinking water standards;
- restore the bedrock aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- prevent or minimize cross-media impacts from COCs in contaminated soil to the underlying groundwater, which will also eliminate potential future soil exposure (Site soil cleanup objectives (SCOs) for COCs would be based on NYSDEC's Technical and Administrative Guidance Memorandum 4046 for groundwater protection); and
- eliminate further off-MRIP property contaminated bedrock groundwater migration.

The selected remedy of the 2000 ROD included the following components.

- Extraction of contaminated groundwater in the near field and far field plume to restore the aquifer to its most beneficial use (as a potable water supply), treatment with an air stripper, and discharge of the treated water to the nearby Rondout Creek and Coxing Kill Creek. The "near field plume" refers to that portion of the groundwater plume with total VOC concentrations greater than 1,000 ppb, while the "far field plume" refers to the component of the groundwater plume with 10 ppb to 1,000 ppb total VOCs.
- The construction of a public water supply system to provide potable water to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells. The primary water supply for the system will be the Catskill Aqueduct. In addition, the individual GAC filtration systems currently in use will be operated until the new public water supply system is operational.
- Implementation of a groundwater monitoring program to evaluate the effectiveness of the remedy.
- Institutional controls may be employed to prevent future use of the bedrock aquifer in the impacted or threatened area.
- Excavation of VOC-contaminated soils with concentrations above the cleanup criteria to prevent or minimize cross-media impacts from COCs in soil to groundwater.
- Off-Site disposal of the contaminated soil at appropriately permitted facilities.

In September 2008, USEPA issued a ROD Amendment in which the far field treatment system component of the groundwater remedy was replaced by monitored natural attenuation (USEPA, 2008). The RAOs were updated to reflect activities completed to date including:

- Restoring the aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- Eliminating further off-MRIP property contaminated groundwater migration; and
- Eliminating inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet state or federal drinking water standards.

Remedy Implementation and Performance

The following remedies were implemented to address the contamination originating from the MRIP Site. Each remedy is summarized in greater detail within the attached Table 1.

- Near field groundwater extraction and treatment system
- Contaminated soils excavation
- Soil vapor extraction system (SVE)
- Vapor intrusion mitigation system
- Institutional controls
- Operation, maintenance and monitoring

HYDROGEOLOGY

The MRIP and surrounding areas are located in the Shawangunk Mountains and are underlain by the Silurian Shawangunk Formation. Previous investigations at the Site have identified several hydrostratigraphic zones. These zones consist of an overburden flow zone, a bedrock interface zone, and a bedrock flow zone, as detailed below and presented in Attachment 1 – Cross Section.

Overburden Flow Zone

The overburden flow zone is characterized by groundwater flow in thin deposits of unconsolidated glacial lodgment, ablation, and weathered till, sand lenses, and fill. Some thicker (up to 50 feet) deposits of unconsolidated materials exist in an area just north of the Site. The till is approximately 9 to nearly 30 feet thick on the MRIP. The flux of groundwater through this flow zone is dependent upon precipitation events and seasonal fluctuations in groundwater recharge. At certain times of the year, this overburden unit may be seasonally perched, or fully saturated. The water table is typically found in this zone and responds quickly to precipitation events. Groundwater levels historically fluctuate greatly (i.e. approximately 6 foot [ft] variations between sampling events in MW-4).

The principal direction of horizontal overburden groundwater flow is predominantly to the north. Based on visual inspection of soils, estimates of hydraulic conductivity developed during the RI/FS indicated permeability of the overburden flow unit in the range of 1 x 10^{-6} to 0.1 ft/day. Average linear groundwater velocity was calculated to be approximately 1 x 10^{-4} ft/day (LMS, 1998a). Groundwater in this overburden flow zone also exhibits a downward component of flow into the bedrock interface and bedrock flow zones. Thus, any waste disposed in this zone is anticipated to migrate downward through more conductive sand lenses or fractures within the glacial till unit.

Bedrock Interface Flow Zone

The transition from unconsolidated material to the underlying bedrock includes a bedrock interface zone consisting of sand, gravel, and weathered rock fragments. This zone appears to be in direct hydraulic connection with the underlying bedrock flow zone in certain areas of the site, and it appears to be confined, or partially confined, by the overlying glacial till unit. This zone is anticipated to be more conductive than the overlying overburden. The vertical groundwater flow gradients for this zone are strongly downward, ranging from 0.14 to 0.46 ft/ft (RI/FS) indicating that the MRIP site is located in a recharge zone of the deeper bedrock flow zone. Average linear groundwater velocity within this zone was estimated to be approximately 1.33 x 10^{-3} ft/day (LMS, 1998a).

Bedrock Flow Zone

The bedrock flow zone represents the principal source of drinking water for the High Falls area. The flow zone is encountered in highly competent orthoquartzites of the Upper Member of the Shawangunk Formation, and also in gray shale deposits (specifically north of the site in the former septic system area). This unit has little to no remaining primary porosity, but is cut by various fractures. Fracture orientation varies from near vertical to near horizontal. These fractures are the primary storage for groundwater and the anticipated pathways for contaminant transport.

The Site is located near a topographic high, and serves as a recharge area for the fractured bedrock aquifer. Vertical gradients are primarily downward within the bedrock flow zone, and recharge to the bedrock aquifer predominantly occurs from the bedrock interface flow zone where permeable glacial overburden overlies the fractured bedrock interface zone. Estimates of hydraulic conductivity developed during the RI/FS indicated permeability of the bedrock flow zone in the range of 0.24 to 0.46 ft/day. Based on the regional groundwater gradient and estimated porosity, the average linear groundwater velocity in bedrock was calculated to be approximately 0.26 ft/day (LMS, 1998a). The primary horizontal direction of bedrock groundwater flow emanating the site is to the north toward Rondout Creek, with minor components of lateral flow to the northeast and northwest.

CONTAMINANTS OF CONCERN (COCs)

As a result of the historic use of solvents and other chemicals at the MRIP Property, Site groundwater contains elevated levels of VOCs above the NYS Class GA Standards. The COCs specifically identified as a result of historic investigations at this site include the following contaminants:

1. 1,1,1-TCA, an industrial solvent, the contaminant typically found in highest concentrations at the site;
2. 1,1-DCA, a breakdown product of 1,1,1-TCA;
3. 1,1-DCE, a breakdown product of 1,1,1-TCA; and
4. TCE, an industrial solvent.

The primary contaminant at the site is 1,1,1-TCA. The breakdown products 1,1-DCE (abiotic) and 1,1-DCA (biotic) have also been detected in both the overburden and bedrock groundwater systems, although the concentrations have been low in comparison to 1,1,1-TCA, indicating that the degradation process is not robust.

The specific gravity of 1,1,1-TCA in liquid form is 1.31, indicating that its density causes it to sink within groundwater systems. When evaluating the possible presence of Dense Non-Aqueous Phase Liquids (DNAPL) the "1 percent of solubility" rule-of thumb (USEPA, 1992) is often applied. Under this approach, DNAPL is suspected present when the concentration of a chemical in groundwater is greater than 1 percent of its pure-phase solubility. The equilibrium solubility of 1,1,1-TCA is 1,334,000 µg/L, resulting in the 1% solubility equal to 13,340 µg/L. In conjunction with the June 2001, January 2002 and August 2002 sampling events, 1,1,1-TCA was detected in ERT-4 at borderline DNAPL concentrations of 13,800, 16,900 and 16,000 µg/L, respectively (USEPA, 2014). However, given the time that has elapsed since the introduction of the 1,1,1-TCA to the environment, it is likely that the chemical is no longer present as a DNAPL, and may have dissolved and diffused at high concentrations into the bedrock matrix and/or low permeability silts overburden soil.

SOURCE AREAS and POINTS OF ENTRY (for the COCs)

Based on data collected by NYSDEC, four areas of concern (Areas of concern [AOCs]-A, B, C, and D) of known soil contamination on the MRIP property were identified and remedial actions were put in place. Table 1 and Figure 2 present the areas of soil contamination on the MRIP property that were identified as requiring removal and disposal (USEPA, 2014).

PCE, benzene, toluene, ethylbenze, xylene (BTEX) compounds, and paint related waste were excavated and disposed from the subsurface in AOCs A, B, and C. However, based on the concentration of 1,1,1-TCA (26%) in the sludge remaining in the onsite underground septic tank, and the prominence of 1,1,1-TCA as a COC, AOC D was likely the primary source disposal zone. AOC D consisted of a 1,000 gallon steel cylindrical tank, and Orangeburg piping (a bitumenized fiber pipe made from layers of wood pulp and pitch) tracing from the building to the septic tank, and subsequently to a distribution box from which two outlet laterals discharged (eastern and western lateral) (see Figure 3). Soil samples collected along the laterals and at their terminal ends revealed little or no contamination. A cross section of the excavated area surrounding the former septic tank is shown in Attachment 1.

The finding of little to no contamination from the laterals led to the conclusion that the underground tank had likely leaked and continued to be a source of contamination to the underlying aquifer. Consequently, an interim remedial measure was implemented consisting of the removal of the tank and contents, and investigation of the soil beneath the tank (LMS, 1998b). The contents of the tank were pumped and the tank itself was completely removed. Upon removal, it was apparent that the tank had corroded and contained large holes in its bottom. Soil sampling was conducted in the excavated area. One sample was collected from stained soil below the area of the tank showing the most severe corrosion. The results from this sample showed no detectable VOCs, however due to the possible mismanagement of the confirmatory soil samples, LMS considered the sample unrepresentative. Eight additional samples were collected from the sidewalls and bottom of the excavated area, however these also showed no VOC detections above the NYS SCOs.

Although approximately 20 cubic yards of soil was excavated from this former septic tank area, and confirmatory sampling at the limits of the excavation showed that the soil cleanup goals for the COCs were met, it is likely that the source of 1,1,1-TCA found in nearby groundwater samples is a result of vertical migration of 1,1,1-TCA from the shallow source area to deeper overburden soil and subsequently to the shallow overburden/bedrock interface zone, and into localized shale deposits or fractures within bedrock.

The vertical migration of 1,1,1-TCA from the former septic system area, and distribution within the bedrock interface flow zone is further evidenced by observations of the historical overburden SVE system (SVE wells 1 – 18). It became apparent that during periods of relatively low groundwater levels, the SVE system recovered substantially more mass of COCs than during periods of high groundwater. Low water tables allowed accelerated SVE recovery from open fracture zones. Hence, during the period from 2006 until early 2011, at times of low water table, there was substantial VOC recovery from the vadose zone.

However, in September 2011, prior to the transfer of Site operations to NYS, the USEPA removal program evaluated the effectiveness of the SVE system in continuing to clean up the vadose zone of residual VOC contamination in the area of the former septic tank. During this evaluation, sample results collected during a period of high water tables at the Site area showed VOC recovery from the vadose zone had diminished dramatically. As a result, the USEPA interpreted that the system was no longer effective at removing VOC mass from the vadose zone, and therefore, the USEPA terminated the operation of the overburden SVE system, and eventually dismantled and removed it from the Site. The recently installed bedrock SVE wells (SVE 19 – 23) are currently capped and in place and are used for groundwater monitoring.

Monitoring wells located within the former septic area have historically showed a consistent downward trend in contaminant concentrations. However, in 2013, following the 2011 shutdown of the SVE system and a temporary period when the extraction/treatment plant was in shutdown mode, source wells (MW-4, MW-5B, and ERT-4) and extraction wells (ERT-1, MW-7R, and MW-5R) had an uptick in concentrations at levels higher than they have exhibited since 2008-2009 (see Figures 4 and 5 below). Three of these wells are those with the shallowest completion depths (MW-4 at 21.5' below ground surface [bgs], MW-5B at 36.2' bgs, and ERT-4 at 50' bgs), with sampling depths located closest to the bedrock interface flow zone in the vicinity of the former septic storage tank. The increase in COC concentrations in these source-area wells suggests residual source material remains in the former septic system area.

Figure 4: 1,1,1-TCA Concentrations (µg/L) in Bedrock Extraction Wells

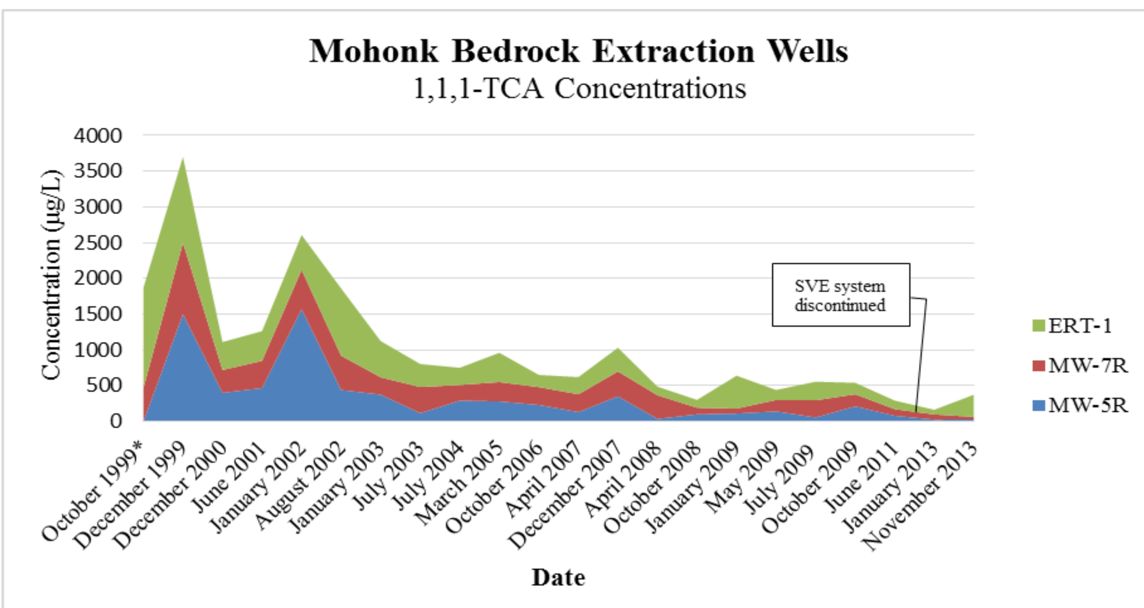
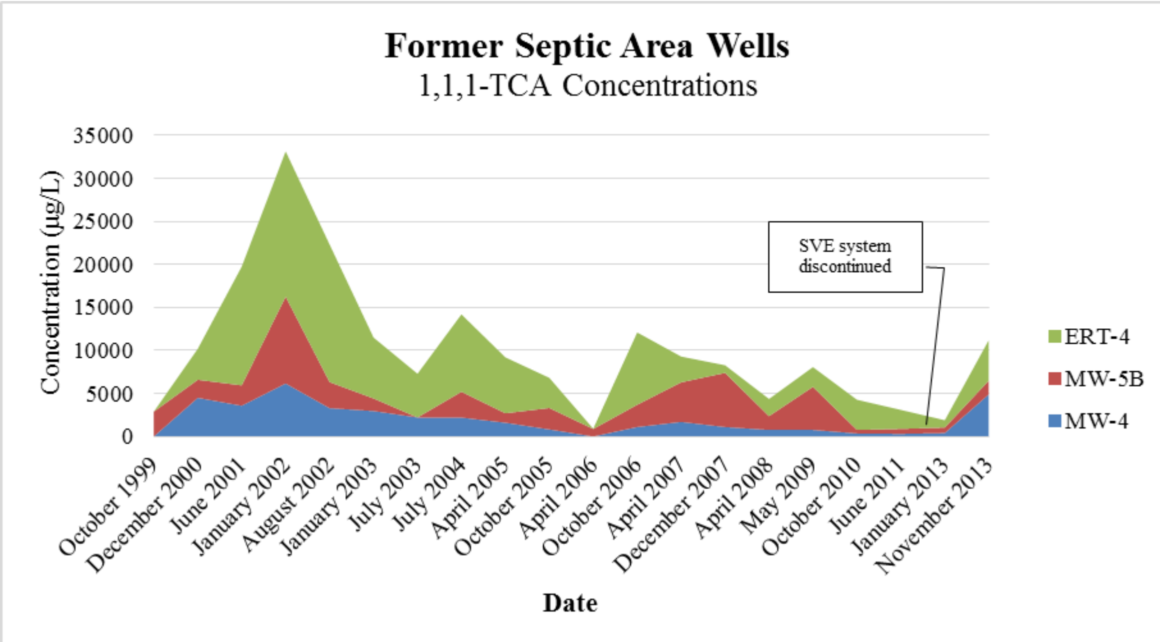


Figure 5: 1,1,1-TCA Concentrations (µg/L) in Former Septic Area Wells



It is also possible that a point of entry may have occurred within the building, or from the 4-inch Orangeburg piping connecting the building septic drains to the underground settling tank. Soil gas data obtained upgradient of the former septic system, within and under the MRIP site building, showed detections of 1,1,1-TCA ranging from non-detectable to 3,500,000 ppb by volume (ppbv) (Lockheed 2006). Based on information reviewed and compiled from studies in NYS, currently, the NYS Department of Health defines typical levels of 1,1,1-TCA around 3 micrograms per cubic meter (µg/m^3) (0.54 ppbv) in the indoor air of homes and office settings, and less than 3 µg/m^3 (0.54 ppbv) in outdoor air. With regards to these typical levels, elevated concentrations of 1,1,1-TCA were localized within and around the MRIP building, and approximate locations are shown in Attachment 2. Six sub-slab ventilation systems, with venting to the outside air, were installed in the sub-surface layer underneath the building's concrete floor slab and currently mitigate vapor intrusion to the Site building.

MIGRATION PATHWAYS

The near-surface contaminated soil within the source area was remediated, effectively eliminating any surface runoff pathway. The overburden glacial till consists predominantly of sandy silt, and contaminant migration within the till is likely controlled by the factors that govern porous media flow. As such, the movement of COCs in the till is likely to be slow. The bedrock interface zone, which is likely weathered, may also act as a porous media. However, it is more likely that the contaminant migration in the bedrock interface zone will behave as a dual porosity model (i.e., fractured and porous media flow). Migration in the underlying fractured bedrock will be controlled by fracture aperture, hydraulic gradients, and total organic carbon content.

The downward vertical hydraulic gradients, coupled with denser-than-water COCs and extended pumping from bedrock extraction wells MW-5R, MW-7R, and ERT-1 appear to have resulted in the vertical migration of COCs through the overburden aquifer into the bedrock aquifer. Additionally, the finding of 1,1,1-TCA in wells upgradient of the former septic system is likely attributed to historical pumping of the MRIP production wells (MRPW-1 and MRPW-2), the pumping of residential wells in the area, and the possible existence of fractures that extend from the area of the tank to these wells. MRPW-1 is located at the west end of the building and MRPW-2 is located at the east end of the building (Figure 3). MRPW-2 was pump tested for 48-hours at a rate of 16 gallons per minute indicating that it intercepts a highly transmissive fracture. MRPW-1 at one time contained 1,1,1-TCA at a concentration of 200 µg/L (LMS, 1998a).

EXPOSURE PATHWAYS

Public water is supplied to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells; therefore, there is no current exposure to groundwater via ingestion. The near-surface contaminated soil has been removed, thus eliminating the potential direct contact threat to VOC-contaminated soil. Vapor intrusion at the nearby residences was evaluated and shown not to require mitigation. Vapor intrusion within the MRIP building is currently being remediated with sub-slab depressurization systems. The highest sub-slab concentration in the building is located at its west end, at Sample Port #3 (See Attachment 2). Other sub-slab sampling points in closer proximity to where the Orangeburg piping exits the building to the former septic system showed lower concentrations than Port #3. The source of the elevated soil gas concentrations at Port #3 has not been identified.

DATA GAPS and RECOMMENDATIONS

Concentrations of 1,1,1-TCA above the NYS Class GA Standards have been continually detected in groundwater in source area overburden/bedrock interface and bedrock wells (i.e. MW-4 and MW-5B). Recent first time testing of bedrock groundwater in shallow bedrock SVE-wells (SVE-19 through 23), which are located between the former septic tank and the on-site building, revealed concentrations as high as 8 parts per million for 1,1,1-TCA. It is uncertain at this point as to whether the apparent residual contamination resides in the overburden, at the bedrock interface, or within shallow bedrock fractures (e.g., matrix diffusion).

The concentration rebound in the treatment plant influent following shutdown for carbon change out suggests that, at least in part, matrix diffusion may be occurring. However, matrix diffusion is not limited to bedrock, it can also occur in low permeable unconsolidated deposits such as glacial tills. A soil gas survey conducted in 2006 identified 1,1,1-TCA concentrations indicative of a source area at location SG-9 (3,500,000 ppbv), which was located approximately 10-feet north of the building in proximity to the former septic discharge line (Lockheed, 2006). Soil gas results north of the building ranging from 33,000 to 3,500,000 ppbv combined with the high concentration in the shallow bedrock SVE wells points to a source of contamination that is localized and anticipated to be associated with the former septic system (AOC D). It should be noted that changes in barometric pressure and soil vapor pressure in the vadose zone (i.e., from fluctuating water levels) can result in the migration of contaminated soil gas. As a result, the location of elevated soil gas concentrations are not always associated with areas of residual soil contamination. Confirmatory sampling is recommended when relying on soil gas concentrations to delineate potential source areas.

The former septic system consisted of an outflow pipe from the building that feeds into the septic tank; an outflow pipe from the septic tank that leads to a distribution box; and two, apparently open-ended pipes that lead from the distribution box into a depression a couple hundred feet northeast and northwest of the distribution box. Sludge within the septic tank contained 1,1,1-TCA at a concentration of 260,000 milligrams per kilogram (26%) (LMS, 1997). The tank upon removal showed holes due to corrosion, and soil from around and beneath the tank was removed for disposal; however, there were no indications that the soil removed was contaminated above NYSDEC SCO's. Similarly, one test pit (TP-09) was previously conducted along the Orangeburg piping that led from building to the former septic tank. However, sampling was limited to one sample collected at a depth of 3.5 feet, immediately at the base of the piping. 1,1,1-TCA was detected, but not at concentrations suggestive of a source area.

Based on the above, it is likely that a source of contamination resides in the area between the MRIP building and the SVE wells. Contamination may exist within the overburden, at the bedrock interface, or within the matrix of the bedrock. Recommendations to address this data gap are presented below, and include:

- ✓ a membrane interface probe (MIP) be used via direct-push drilling to screen soil in the area between the former septic tank and the building for the presence of chlorinated solvents for the purpose of identifying residual source areas;
- ✓ collection of confirmatory soil samples via direct push in areas showing the highest concentration of contamination based on the MIP survey;
- ✓ a down-hole geophysical survey be conducted of select on-site bedrock wells including the deeper and most-contaminated bedrock SVE wells and extraction well ERT-4 to identify fractures and possible changes in bedrock stratigraphy that could be serving as contaminant migration pathway(s). Downhole geophysical logging is expected to include borehole caliper, single point resistivity, acoustic televiewer, optical televiewer, heat pulse flow meter, and gamma ray logging;
- ✓ packer testing of select SVE and/or bedrock extraction well(s) subsequent to the results of the down-hole geophysical logging, and the collection of discrete samples for VOCs from each packer interval;
- ✓ limited test pitting be conducted along several points of the Orangeburg piping that leads from the former distribution box, including at the piping terminus area to assess whether residual contamination is present and provides an on-going source of groundwater contamination; and
- ✓ sub-slab soil sampling be conducted using hand driven sampling tubes (e.g., slam-bar with macro core sampler) in the vicinity of the elevated concentrations of 1,1,1-TCA in subslab soil gas points (i.e., Port #3, T2-001 and T2-003) to evaluate possible residual contaminant sources that may exist under the building (Attachment 2).

Contaminant distribution within the overburden and bedrock is not sufficiently understood to optimize remedial measures at this time. The use of combined probe MIP technology will permit collection of chemical (i.e., XSD tool), hydrophysical (i.e., HPT tool) and stratigraphic (lithologic) (EC tool) data that will be used to evaluate the remedy and options for remedial system optimization. Down-hole geophysical logging, combined with packer sampling will provide information regarding the location of transmissive fractures and contaminant concentrations within those fractures. The logging and packer sampling results will be used to potentially re-configure and optimize the location of extraction wells, along with targeting specific elevations within boreholes for contaminant removal.

MACTEC recommends implementing a data gap investigation to provide a better understanding of potential source material remaining, hydrostratigraphic migration pathways, and hydraulic properties at the Site which can further assist in focusing and refining remedial activities.

Please do not hesitate to call me at 207-775-5401 if you have any questions regarding this deliverable.

Sincerely,

MACTEC Engineering and Consulting, P.C.

Jayme Connolly
Project Manager

Hank Andolsek, C.G.
Senior Hydrogeologist

Bryanna Chute w/permission by J.B.

Joshua Bowe, C.G., P.G.
Senior Geologist/Technical Review

Enclosures (2)

Attachment 1: Cross Section
Attachment 2: Soil Gas Data

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USEPA, 2008. Record of Decision Amendment – Mohonk Road Industrial Plant Superfund Site. September 2000.

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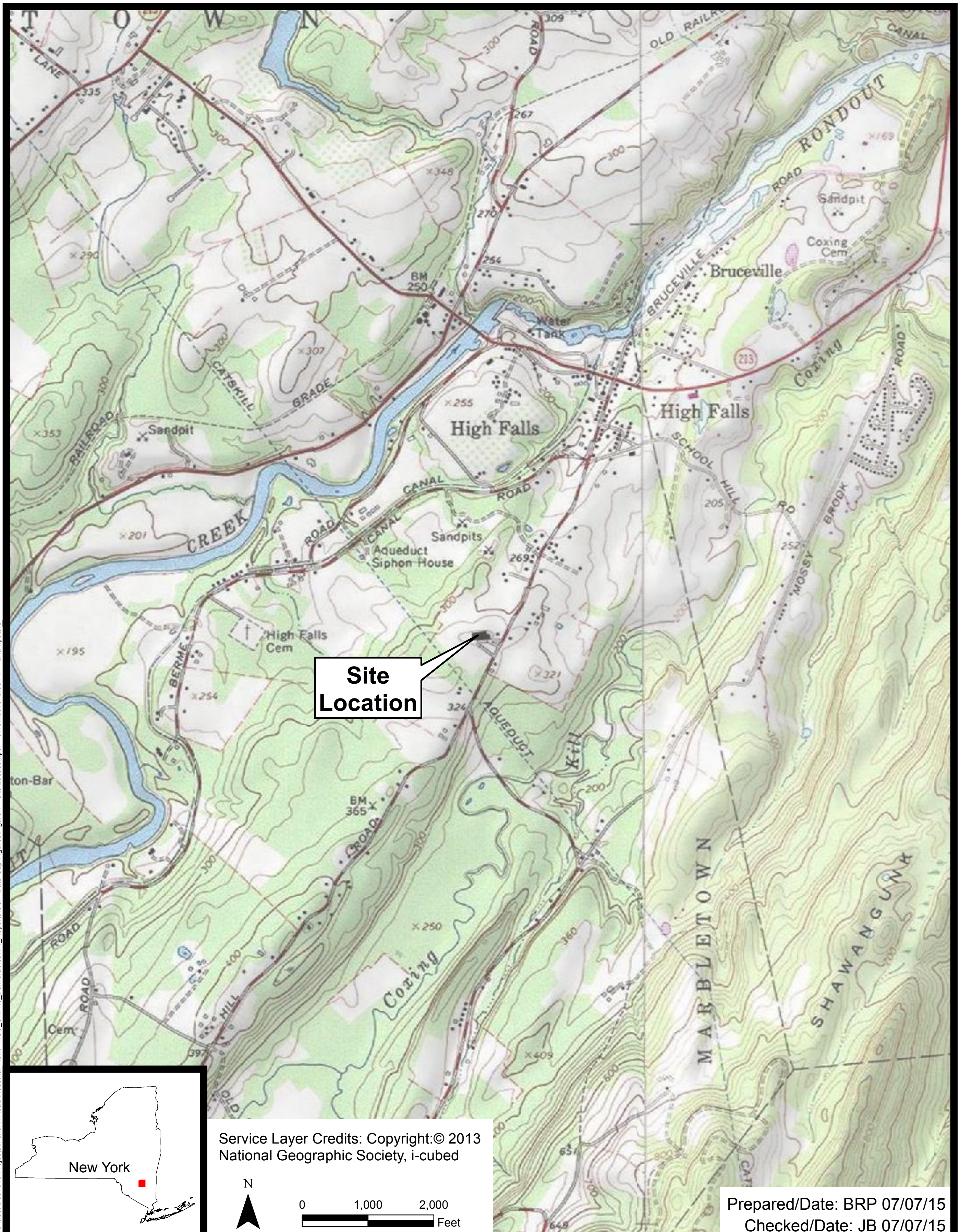
TABLES

Table 1: Summary of MRIP Remedies To Date

Remedy	Matrix	Summary
Near field groundwater extraction and treatment	**Groundwater**	In 2000, the EPA constructed and operated a groundwater treatment system until September 2011 when the EPA transferred responsibility of the ongoing O&M of the near field extraction and treatment system to NYSDEC. Over 100 million gallons of VOC-contaminated groundwater have been extracted, treated and discharged during the remedial program. The extraction system currently consists of three active extraction wells and associated buried piping: MW-5R (125 ft.), MW-7R (180 ft.), and ERT-1 (195ft.) (see Figure 2). The extraction wells are constructed of six-inch casing installed into bedrock with open-hole construction at depth below the casing. Extraction well flow rates vary, but are typically in the range of 5-9 gpm per well. ERT-1 tends to produce slightly more than the other two extraction wells. The total combined influent is approximately 15-20 gpm, however this is much less than the design capacity of the treatment plant.
Contaminated soils excavation	**Soil**	As prescribed by the 2000 ROD, additional removal and disposal of contaminated soil was performed. Soil cleanup levels were also established in the 2000 ROD. The following areas of known soil contamination on the MRIP property were identified as areas potentially requiring remedial action (see Figure 2): **AOC-A** PCE and BTEX compounds located beneath the gravel parking area west of the MRIP building and south of the groundwater treatment building **AOC-B** Paint waste located south of Paint Waste Pit #1 and north of the MRIP building **AOC-C** Paint located waste immediately east of Paint Waste Pit #1. **AOC-D** 1,1,1-TCA located in the vicinity of the former MRIP building septic tank, north of MRIP building During November-December 2000, the EPA excavated contaminated soil from AOC-A and contaminated soil, paint waste and debris from AOC-B and AOC-C. Prior to backfilling of AOCs-A, B and C with clean fill, post-excavation soil samples indicated that no action levels were exceeded in soils remaining within the excavation. During the remedial action, approximately 2,000 tons of contaminated soils, paint waste and debris were removed and disposed of off-site. In September 1997, NYSDEC implemented a removal of the tank, tank contents, and adjacent soil at AOC-D. The soils adjacent to the corroded portions of the tank were heavily stained, and about 25-cy of soil was removed from the excavation and disposed of as non-hazardous soil in November 1997.
Soil vapor extraction system (SVE)	**Soil vapor**	In order to enhance the VOC removal provided by the excavations and the extraction and treatment system, 18 overburden SVE wells (SVE-1 through SVE-18) were installed in 2006 on the MRIP property immediately north of the commercial building and near the former underground septic tank and original septic field. All wells were installed until refusal was encountered, and the system was fully operational by February 2008. In 2009, an additional five SVE wells (SVE-19 through SVE-23) were installed in the vicinity of the pre-existing septic tank at greater depths within the bedrock aquifer (approximately 55 bgs) (Figure 3). However, during late 2011/early2012 the EPA terminated the operation of the SVE system. The newer SVE wells were capped and left in place and are used for groundwater monitoring.
Vapor intrusion mitigation system	**Soil vapor**	In February 2005, the EPA initiated a vapor intrusion investigation to determine if the subsurface groundwater contamination, originating from the MRIP property, was affecting the soil gas and indoor air at nearby residences and businesses. Sub-slab soil gas ports were installed in nearby residential non-residential (41 locations total). The soil vapor sampling determined that, since contaminant concentrations when detected were below the health-based screening levels, no further vapor intrusion evaluation or action was deemed necessary at the residential properties. However, after evaluating the soil gas data obtained in MRIP site building, the EPA recommended that appropriate vapor mitigation systems be installed at various locations in the building to prevent exposure. Between January 29 and February 1, 2007, six sub-slab ventilation systems, with venting to the outside air, were installed in the sub-surface layer underneath the building’s concrete floor slab. Sub-slab mitigation systems, SS-1 and SS-2, are located on the west side of the building; SS-3, SS-4 and SS-5 are located on the north side of the building; and SS-6 is located on the east side of the building (see Figure 4).
Institutional Controls	**Groundwater**	Institutional controls (ICs) are being relied upon to prevent the future use of the aquifer within the HFWD until cleanup levels have been attained. These ICs consist of existing ordinances of the Towns of Marbletown and Rosendale which prohibit the establishment or maintenance of a source of drinking or domestic water separate from the PWS system of the HFWD. These ICs would no longer be necessary following the restoration of groundwater to beneficial use.
Operation, maintenance and monitoring	**Groundwater**	Currently, the extraction and treatment plant is being operated and maintained by NYSDEC via the September 2011 Site transfer agreement with the EPA Region 2. The ongoing operations consist of extraction of the contaminated groundwater, treatment through carbon filters and discharge of the treated groundwater to the Coxing Kill. As part of monitoring program, the influent and effluent concentrations of the extraction and treatment system, as well as extraction wells ERT-1, MW-5R and MW-7R, are routinely sampled. The various monitoring wells throughout the Site area (both on-property and off-property) are sampled annually by the EPA through an Interagency Agreement with the United States Army Corps of Engineers (Army Corps) and its contractors, as part of the long-term response action for the MNA remedy, as identified in the September 2008 ROD Amendment.

Prepared by: DF 7/6/2015
Checked by: HA 7/6/2015

FIGURES



NYSDEC Mohonk Road Industrial Plant Marbletown, New York	MACTEC	Site Location Map Project 3617157346 Figure 1

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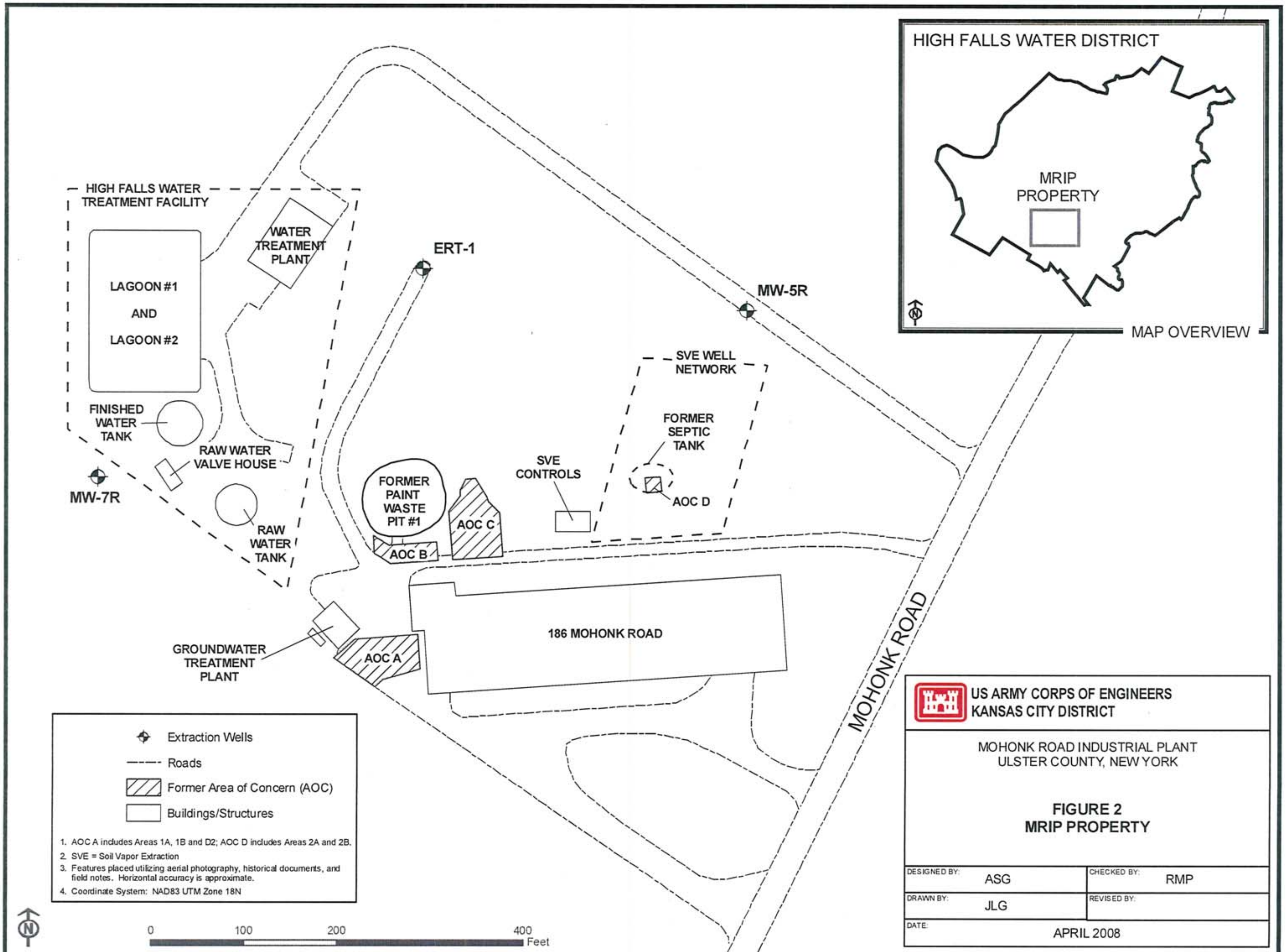
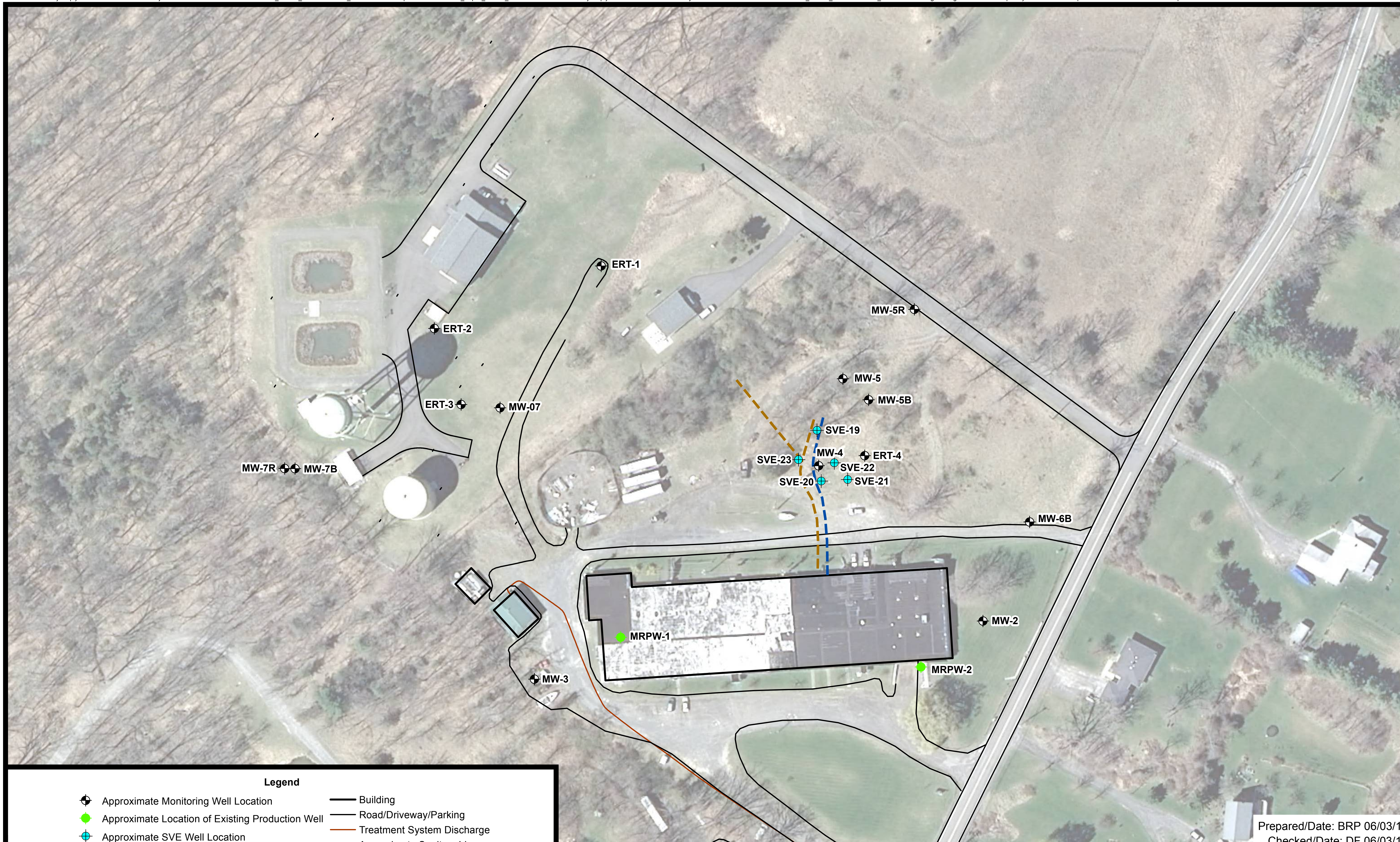

HIGH FALLS WATER DISTRICT
MRIP PROPERTY
MAP OVERVIEW
HIGH FALLS WATER TREATMENT FACILITY
WATER TREATMENT PLANT
LAGOON #1 AND LAGOON #2
ERT-1
MW-5R
SVE WELL NETWORK
FORMER SEPTIC TANK
AOC D
SVE CONTROLS
FINISHED WATER TANK
RAW WATER VALVE HOUSE
MW-7R
RAW WATER TANK
FORMER PAINT WASTE PIT #1
AOC C
AOC B
186 MOHONK ROAD
GROUNDWATER TREATMENT PLANT
AOC A
MOHONK ROAD
Extraction Wells
Roads
Former Area of Concern (AOC)
Buildings/Structures
1. AOC A includes Areas 1A, 1B and D2; AOC D includes Areas 2A and 2B.
2. SVE = Soil Vapor Extraction
3. Features placed utilizing aerial photography, historical documents, and field notes. Horizontal accuracy is approximate.
4. Coordinate System: NAD83 UTM Zone 18N
0
100
200
400
Feet
US ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT
MOHONK ROAD INDUSTRIAL PLANT
ULSTER COUNTY, NEW YORK
FIGURE 2
MRIP PROPERTY
DESIGNED BY: ASG
CHECKED BY: RMP
DRAWN BY: JLG
REVISED BY:
DATE: APRIL 2008

Document: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Former_Septic_Source_11x17LS.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.5_Databases\GIS\Figures\Figure 3 - Former Septic System Source Area.pdf 06/03/2015 10:15 AM brian.peters



Legend

- Approximate Monitoring Well Location
- Approximate Location of Existing Production Well
- Approximate SVE Well Location
- Building
- Road/Driveway/Parking
- Treatment System Discharge
- Approximate Sanitary Line
- Approximate Drain Line

Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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Checked/Date: DF 06/03/15

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Former Septic System Source Area

Project 3617157346

Figure 3

ATTACHMENT 1

CROSS SECTION

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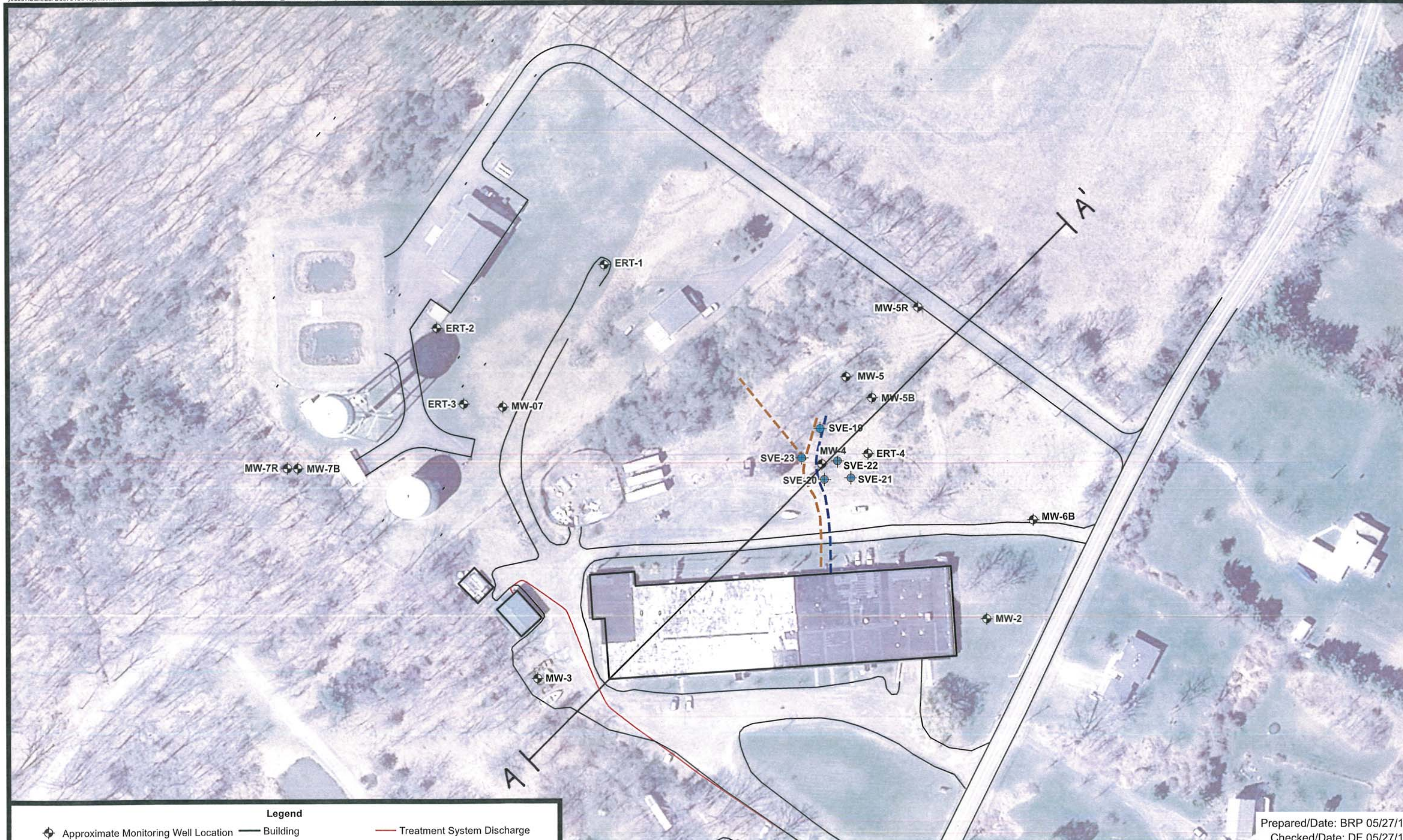

Legend

- Approximate Monitoring Well Location
- Approximate SVE Well Location
- Building
- Road/Driveway/Parking
- Treatment System Discharge
- Approximate Sanitary Line
- Approximate Drain Line

N

0 50 100 Feet

Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Site Overview - CROSS SECTION
Project 3617157346 ~~Figure X.X~~

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Edits Checked by: HA 6/3/15

Prepared/Date: WJW 07/06/15
Checked/Date: DF 07/06/15

NYDEC
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Marbletown, New York

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ATTACHMENT 1
CROSS SECTION A-A
Project 3617-15-7346
Figure 1

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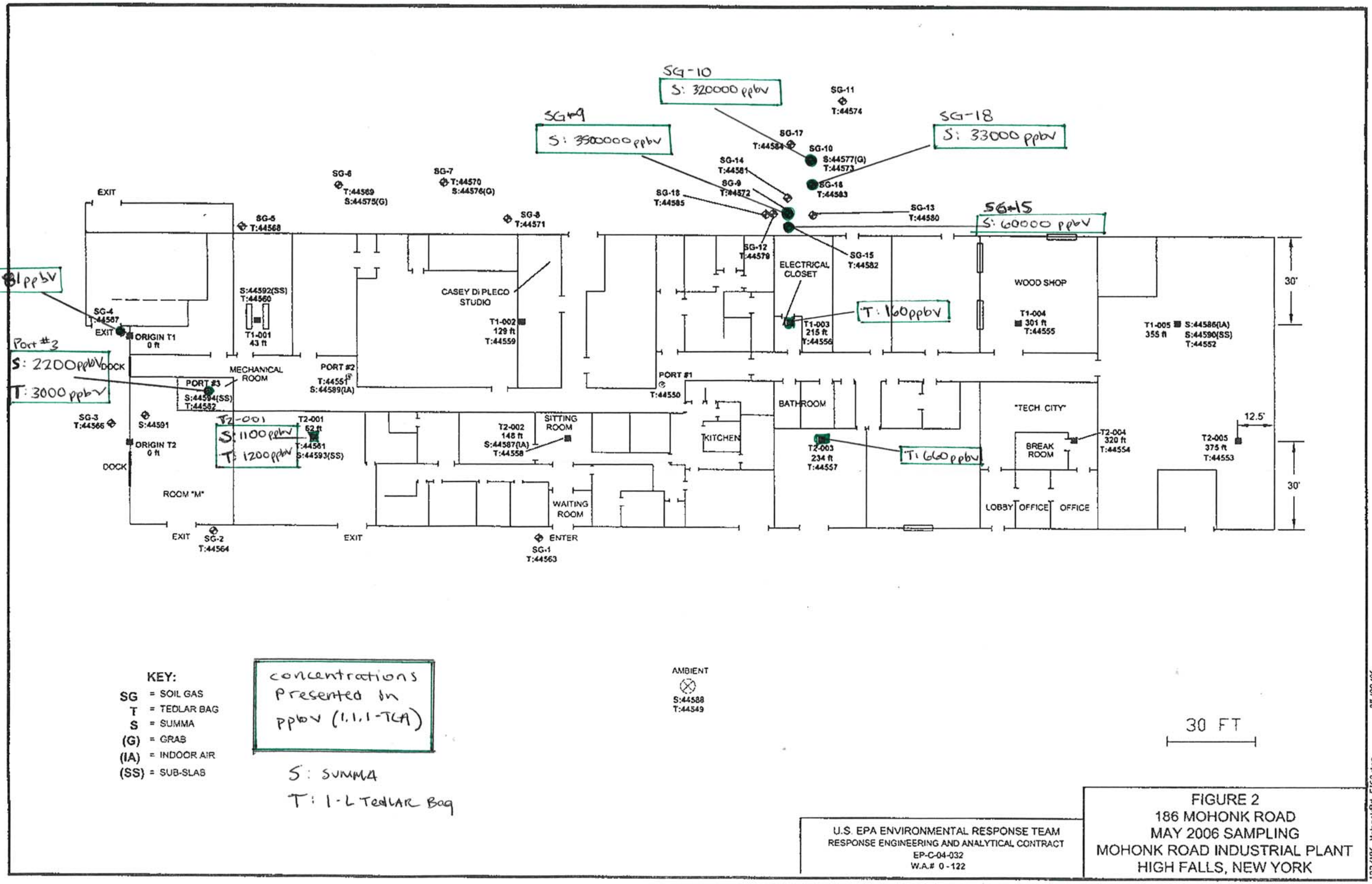
ATTACHMENT 2

SOIL GAS DATA



Edits Prepared by: DF 6/3/15
Edits Checked by: HA 6/3/15

Table: 1
Comparison of Current and Historical Sub-Slab Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Sampling Events:
February 2005, March 2006, May 2006

LOCATION	PORT #1				PORT #2			
SAMPLE #	17885	0-122-001	44550	44550	17886	0-122-002	44551	44551
SAMPLE TYPE	S	S	T	T	S	S	T	T
ANALYSIS	SUMMA	SUMMA	TAGA	GC/MS	SUMMA	SUMMA	TAGA	GC/MS
DATE	Feb-05	Mar-06	May-06	May-06	Feb-05	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	5.3	4.3	4.4	U	5.3	4.7	8.7	8.3
TCA	72	32	70	61	140	97	20	240

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
U = Not Detected

Table: 2
Comparison of Sub-Slab Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Sampling Event: May 2006

LOCATION	PORT #3		
SAMPLE #	44594	44562	44562
SAMPLE TYPE	S	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS
DATE	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	1600	1700	3200 D
TCA	2200	3000	2100

LOCATION	T1-001		
SAMPLE #	44592	44560	44560
SAMPLE TYPE	S	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS
DATE	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	1	0.87	U
TCA	21	19	19

LOCATION	T1-002	
SAMPLE #	44559	44559
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	0.4 J	U
TCA	5.4	7.3

LOCATION	T1-003	
SAMPLE #	44556	44556
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	9.6	14
TCA	160	260

LOCATION	T1-004	
SAMPLE #	44555	44555
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	0.24 J	U
TCA	87	74

LOCATION	T1-005		
SAMPLE #	44590	44552	44552
SAMPLE TYPE	S	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS
DATE	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	U	72	58
TCA	64	0.23J	U

LOCATION	T2-001		
SAMPLE #	44593	44561	44561
SAMPLE TYPE	S	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS
DATE	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	1500	1300	1400D
TCA	1100	1200	100D

LOCATION	T2-002	
SAMPLE #	44558	44558
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	3.9	5.2
TCA	95	130

LOCATION	T2-003	
SAMPLE #	44557	44557
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	4.9	0.22
TCA	660	1100 D

LOCATION	T2-004	
SAMPLE #	44554	44554
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	DL=0.22	U
TCA	29	23

LOCATION	T2-005	
SAMPLE #	44553	44553
SAMPLE TYPE	T	T
ANALYSIS	TAGA	GC/MS
DATE	May-06	May-06
ANALYTE	ppbv	ppbv
TCE	DL=0.22	U
TCA	54	57

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
J = Estimated Value
DL = Detection Limit
D = Sample Diluted
U = Not Detected

Table: 3
Comparison of Soil Gas Results
Tedlar Bag TAGA Analysis and SUMMA Canister Results
186 Mohonk Road
REAC Sampling Event: May 2006

LOCATION	SG-1	SG-2	SG-3	SG-4	SG-5	SG-6		SG-7	
SAMPLE #	44563	44564	44566	44567	44568	44569	44575	44570	44567
SAMPLE TYPE	T	T	T	T	T	T	G	T	G
ANALYSIS	TAGA	TAGA	TAGA	TAGA	TAGA	TAGA	SUMMA (TO-15)	TAGA	SUMMA (TO-15)
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	DL=0.11	0.3 J	19	43	DL=0.11	DL=0.11	U	DL=0.11	0.92
TCA	1.3	20	39	81	0.8	6.2	1.88	4	0.08 J

LOCATION	SG-8	SG-9	SG-10		SG-11	SG-12
SAMPLE #	44571	44572	44573	44577	44574	44579
SAMPLE TYPE	T	T	T	G	T	T
ANALYSIS	TAGA	TAGA	TAGA	SUMMA (TO-15)	TAGA	TAGA
DATE	May-06	May-06	May-06	6-May	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	0.2 J	380	69 J	0.6	DL= 55	DL= 22
TCA	6.4	3500000	320000	74.5	1700	5100

LOCATION	SG-13	SG-14	SG-15	SG-16	SG-17	SG-18
SAMPLE #	44580	44581	44582	44583	44584	44585
SAMPLE TYPE	T	T	T	T	T	T
ANALYSIS	TAGA	TAGA	TAGA	TAGA	TAGA	TAGA
DATE	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	DL= 22	DL= 22	DL= 55	0.43	0.2 J	DL= 22
TCA	820	10000	60000	95	100	33000

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
G = Grab
DL = Detection Limit
J = Estimated Value
SG = Soil Gas

Note: DL=X
indicates a non-detect, with the DL for that sample listed, for TAGA results.

Table: 4
Comparison of TAGA Monitoring and Indoor Air Sampling Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Monitoring/Sampling Events:
March 2006, May 2006

LOCATION	ROOM "M"		
TAGA FLAG/SAMPLE #	FG	R1S1	44591
ANALYSIS	TAGA	TAGA	SUMMA (TO-15)
DATE	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	0.9	1.3	0.91
TCA	NA	3.8	2.5

PORT #2		
P1E1	L1M1	44589
TAGA	TAGA	SUMMA (TO-15)
Mar-06	May-06	May-06
ppbv	ppbv	ppbv
0.98	0.53	0.4
NA	1.2	0.7

LOCATION	T2-002		
TAGA FLAG/SAMPLE #	DE	D1E1	44587
ANALYSIS	TAGA	TAGA	SUMMA (TO-15)
DATE	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	0.7	0.32	0.39
TCA	NA	0.84	0.71

T1-005		
NA	NA	44586
TAGA	TAGA	SUMMA (TO-15)
Mar-06	May-06	May-06
ppbv	ppbv	ppbv
NA	NA	0.2
NA	NA	0.47

Key:
NA = No Data Collected

APPENDIX B

DATA GAP FIELD ACTIVITIES PLAN

FIELD ACTIVITIES PLAN
DATA GAP INVESTIGATION

MOHONK ROAD INDUSTRIAL
(356023)

WORK ASSIGNMENT NO. D007619-34

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3617157346

July 2015

FINAL
FIELD ACTIVITIES PLAN
DATA GAP ANALYSIS
MOHONK ROAD INDUSTRIAL
SITE NO. 356023

WORK ASSIGNMENT NO. D007619-34

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, PC
Portland, Maine

MACTEC No. 3617157346

JULY 2015

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Senior Geologist

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Senior Hydrogeologist/Technical Review

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
AOC	area of concern
CAMP	Community Air Monitoring Plan
COCs	contaminants of concern
CSM	conceptual site model
bgs	below ground surface
DPT	Direct-Push Technology
EC	electrical conductivity
ºF	degrees Fahrenheit
FAP	Field Activity Plan
FDR	Field Data Record
FS	feasibility study
ft	foot or feet
HASP	Health and Safety Plan
HPT	Hydrophysical Tool
IDW	investigation-derived waste
K	hydraulic conductivity
LMS	Lawler, Matusky & Skelly Engineers
MACTEC	MACTEC Engineering and Consulting, P.C.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

MIP	membrane interface probe
MIPS	membrane interface probe sampling
MRIP	Mohonk Road Industrial Plant
msl	mean sea level
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PDF	portable data file
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
QAPP	Quality Assurance Program Plan
RI	remedial investigation
ROD	Record of Decision
Site	Mohonk Road Industrial Plant
SVE	soil vapor extraction
µg/L	microgram(s) per liter
$\mu g/m^3$	microgram(s) per cubic meter
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USDOT	United States Department of Transportation
VOC	volatile organic compound
WA	Work Assignment
XSD	Halogen Specific Detector

1.0 INTRODUCTION

MACTEC Engineering and Consulting, P.C. (MACTEC), is submitting this Field Activities Plan (FAP) to the New York State Department of Environmental Conservation (NYSDEC) for the Data Gap Investigation at the Mohonk Road Industrial Plant (MRIP) Site (Site) in the Hamlet of High Falls, Ulster County, New York (Figure 1.1). This FAP was prepared in response to Work Assignment (WA) No. D007619-34 (NYSDEC, 2015), and in accordance with the April 2011 Superfund Standby Contract No. D007619 between the NYSDEC and MACTEC.

The Site has been identified as a source of volatile organic compounds (VOCs), primarily 1,1,1-trichloroethane (1,1,1-TCA), which have been detected in soil, groundwater, and soil vapor. This FAP presents a technical scope of work to conduct data gap investigation activities to evaluate the remedy and options for remedial system optimization, including membrane interface probe (MIP) sampling, soil sampling, test pitting, downhole geophysics, groundwater level measurement, and packer groundwater sampling to determine whether the chosen technology will be effective at the Site. Work will be conducted in accordance with the NYSDEC Department of Environmental Remediation-10 Guidance (NYSDEC, 2010).

This FAP is organized into six sections as follows:

- *Section 1.0* – Introduction, WA Objectives, and Site background
- *Section 2.0* –Site Physical Setting – Describes the physical, geological, and hydrogeological setting of the Site.
- *Section 3.0* – Conceptual Site Model (CSM) – Presents a working conceptual model describing how contaminants may have been released into the environment, how the chemicals may migrate, and the receptors that may be affected.
- *Section 4.0* – Scope of Work - Describes the sampling and analysis that will be performed to assess contaminant distribution in groundwater, soil, and soil vapor.
- *Section 5.0* – References.

The FAP is supplemented by the following attached documents:

- *Appendix A – Cross Section*
- *Appendix B – Historical Soil Gas Data*
- *Appendix C* – MACTEC Short Form Site-Specific Health and Safety Plan (HASP)

1.1 DATA GAP INVESTIGATION OBJECTIVES

Based on an updated CSM for the Site and identified data gaps (MACTEC, 2015), additional information is needed to assess and/or modify the existing remedial measures in order to effectively remediate the contamination at the Site. The following objectives for the field program have been developed to address the uncertainty as to whether the apparent residual contamination resides in the overburden, at the bedrock interface, or within shallow bedrock fractures:

1) Evaluate the potential presence of residual VOC contamination (primarily 1,1,1-TCA) within the overburden and in the bedrock matrix in the interpreted source area (i.e. in the previously excavated former septic tank area, the area between the former septic tank and the MRIP building, the septic piping termini, and beneath the Site building).
2) Evaluate the hydrostratigraphic migration pathways on-site and contaminant concentrations in the source area groundwater zones.
3) Evaluate the hydraulic properties of the deeper overburden and shallow bedrock within the source area to aid in determining if the existing system can be modified to control or mitigate contaminate mass and mobility, or if other remedial options should be considered.

This FAP is prepared to provide the technical scope of work associated with the data gap investigation.

1.2 SITE BACKGROUND

The Site background is discussed in the following sub-sections.

1.2.1 Site Description

The Site is located in the Hamlet of High Falls, Ulster County, New York, approximately seven miles north-northwest of the Village of New Paltz (Figure 1.1). The Site includes the original MRIP property at 186 Mohonk Road and surrounding properties impacted by the contaminated groundwater plume emanating from the Site.

1.2.2 Site Background

Industrial activities have taken place at the Site since the early 1960s, which included metal finishing, wet spray painting and the manufacturing of store display fixtures, card punch machines and computer frames. The property currently contains a 43,000-square foot (ft), single-story building. A septic field serving this building was used to dispose of hazardous substance-containing wastes, such as solvents and wastes from paint and metal-working operations. Drums, paint sludge and other wastes were also buried in several locations on the MRIP Property.

In April 1994 a residential well near the MRIP property was sampled and was found to contain elevated levels of VOCs above the NYS Class GA drinking water standards. An Immediate Investigation Work Assignment was implemented in 1994, and groundwater sampling results demonstrated on-site interface and bedrock wells, and the in-service production wells, had 1,1,1-TCA and other compounds above groundwater standards, with the highest levels found in the overburden/bedrock interface wells directly downgradient of the underground septic tank area (i.e. MW-4; 82,000 micrograms per liter [µg/L]).

Groundwater sampling results collected during a Remedial Investigation/Feasibility Study (RI/FS), indicated that downgradient private water supplies contained 1,1,1-TCA concentrations ranging from non-detectable to 880 parts per billion (ppb), and total VOC concentrations ranging from 1.6 ppb to 1,077 ppb (Lawler, Matusky & Skelly Engineers [LMS], 1998b). In addition, groundwater in the bedrock aquifer beneath the MRIP property exhibited VOC concentrations above the United States Environmental Protection Agency (USEPA) Maximum Contaminant Level, and NYS Class GA Water Standards. Based on the findings of the initial investigations, 1,1,1-TCA, 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), trichloroethene, tetrachloroethene, ethylbenzene and xylenes were identified as contaminants of concern (COCs) in Site soils. Data collected from groundwater sampling indicated that a dissolved-phase VOC plume extended approximately one mile north-northeast from the MRIP property.

The Record of Decision (ROD) was signed in 2000 (USEPA, 2000). The description of the selected remedy in the ROD as it pertains to contaminant reduction includes:

- Extraction of contaminated groundwater in the near field and far field plume to restore the aquifer to its most beneficial use (as a potable water supply), treatment with an air stripper, and discharge of the treated water to the nearby Rondout Creek and Coxing Kill Creek.

The "near field plume" refers to that portion of the groundwater plume with total VOC concentrations greater than 1,000 ppb, while the "far field plume" refers to the component of the groundwater plume with 10 ppb to 1,000 ppb total VOCs.

- The construction of a public water supply system to provide potable water to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells. The primary water supply for the system will be the Catskill Aqueduct. In addition, the individual granular activated carbon filtration systems currently in use will be operated until the new public water supply system is operational.
- Implementation of a groundwater monitoring program to evaluate the effectiveness of the remedy.
- Institutional controls may be employed to prevent future use of the bedrock aquifer in the impacted or threatened area.
- Excavation of VOC-contaminated soils with concentrations above the cleanup criteria to prevent or minimize cross-media impacts from COCs in soil to groundwater.
- Off-Site disposal of the contaminated soil at appropriately permitted facilities.

In September 2008, USEPA issued a ROD Amendment in which the far field treatment system component of the groundwater remedy was replaced by monitored natural attenuation (USEPA, 2008). The RAOs were updated to reflect activities completed to date including:

- Restoring the aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- Eliminating further off-MRIP property contaminated groundwater migration; and
- Eliminating inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet state or federal drinking water standards.

The following remedies were implemented to address the contamination originating from the MRIP Site.

- Near field groundwater extraction and treatment system
- Contaminated soils excavation
- Soil vapor extraction (SVE) system
- Vapor intrusion mitigation system
- Institutional controls
- Operation, maintenance and monitoring

2.0 SITE PHYSICAL SETTING

The sections below describe the topography, climate, surface water, groundwater hydrology, and geology in the area of the Site.

2.1 TOPOGRAPHY

The topography in the vicinity of the MRIP site is controlled by the structural geology of the region. The MRIP site is situated along the crest of an anticline that plunges north-northeast. The floor slab in the MRIP building is the topographic high point on the site property, approximately 340 ft above mean sea level (msl). The floor slab is about 3 ft above grade at the east end of the building. The ground surface along the north side of the building slopes approximately 10 ft across its length. A plateau that extends out 100 ft from the toe of the slope may have been graded at the time of building construction.

Rondout Creek is located approximately 0.55 miles northwest of the site at an elevation of approximately 180 ft (msl). Coxing Kill is located 0.33 miles east of the site at an approximate elevation of 180 ft (msl).

2.2 CLIMATE

The climate of the area is characterized by moderately warm summers and cold winters. Mean monthly temperatures range from 22 degrees Fahrenheit (°F) in January to 71°F in July. Average annual precipitation is 50 inches, and average annual snowfall is 39 inches, according to the National Climatic Data Center: for the period of 1981-2010 (NOAA, 2015).

2.3 SURFACE WATER HYDROLOGY

Surface water drainage discharges to Rondout Creek via four primary pathways listed below:

- Site drainage predominantly flows north along a swale that passes through several downgradient residential properties before discharging into a small pond and subsequently to Rondout Creek.
- A portion of the drainage near the building flows to a ditch culvert along Mohonk Road, which ultimately discharges to Rondout Creek.

- The lawn area and a portion of the driveway south of the building drain to a culvert that passes beneath Mohonk Road. Water passing through the culvert eventually flows into Coxing Kill.
- Some of the drainage from the gravel driveway west of the building flows west within a small swale and discharges directly to Rondout Creek.

2.4 GEOLOGY

Depth to on-site bedrock ranges from 9 ft (MW-5B) to approximately 30 ft (MW-11). Overburden material consists of lodgement till, predominantly brown silt and clayey silt, little fine-sand, and trace gravel. The gravel content consists primarily of shale and was observed to increase with depth to some gravel and cobbles in interface well borings (LMS 1997a). Bedrock core samples revealed white to gray orthoquartzite consisting of quartz pebble conglomerate and arenite of the Shawangunk Formation. Fractures were present in most of the cores obtained. Some of the fractures had iron staining or fines in the apertures of the fractures, clearly indicating that these fractures are groundwater pathways. Site geology is detailed further in Section 2.5.

2.5 GROUNDWATER HYDROLOGY

Previous investigations at the Site have identified three hydrostratigraphic zones. These zones consist of an overburden flow zone, a bedrock interface zone, and a bedrock flow zone, as detailed below and presented in Appendix A – Cross Section.

Overburden Flow Zone The overburden flow zone is characterized by groundwater flow in thin deposits of unconsolidated glacial lodgment, ablation, and weathered till, sand lenses, and fill. Some thicker (up to 50 ft) deposits of unconsolidated materials exist in an area just north of the Site. The till is approximately 9 to nearly 30 ft thick on the MRIP. The flux of groundwater through this flow zone is dependent upon precipitation events. At certain times of the year, this overburden unit may be seasonally perched. The water table is typically found in this zone and responds quickly to precipitation events. Overburden groundwater levels historically fluctuate greatly (i.e. approximately 6 ft. variations between sampling events in MW-4), indicative of its perched nature.

The principal direction of horizontal overburden groundwater flow is predominantly to the north. Based on visual inspection of soils, estimates of hydraulic conductivity (K) developed during the RI/FS indicated permeability of the overburden flow unit in the range of 1 x 10^{-6} to 0.1 ft/day. Average linear groundwater velocity was calculated to be approximately 1 x 10^{-4} ft/day (LMS, 1998a). Groundwater in this overburden flow zone also exhibits a downward component of flow into the bedrock interface and bedrock flow zones. Thus, any waste disposed in this zone is anticipated to migrate downward through more transmissive sand lenses or fractures within the glacial till unit.

Bedrock Interface Flow Zone. The transition from unconsolidated material to the underlying bedrock includes a bedrock interface zone consisting of sand, gravel, and weathered rock fragments. This zone appears to be in direct hydraulic connection with the underlying bedrock flow zone in certain areas of the site, and it appears to be confined, or partially confined, by the overlying glacial till unit. This zone is anticipated to be more transmissive than the overlying overburden. The vertical groundwater flow gradients for this zone are strongly downward, ranging from 0.14 to 0.46 ft/ft (RI/FS) indicating that the MRIP site is located in a recharge zone of the deeper bedrock flow zone. Average linear groundwater velocity within this zone was estimated to be approximately 1.33 x 10^{-3} ft/day (LMS, 1998a).

Bedrock Flow Zone. The bedrock flow zone represents the principal source of drinking water for the High Falls area. The flow zone is encountered in highly competent orthoquartzites of the Upper Member of the Shawangunk Formation, and also in gray shale deposits (specifically north of the site in the former septic system area). This unit has little to no remaining primary porosity, but is cut by various fractures. Fracture orientation varies from near vertical to near horizontal. These fractures are the primary storage for groundwater and the anticipated pathways for contaminant transport.

The Site is located near a topographic high, and serves as a recharge area for the fractured bedrock aquifer. Vertical gradients are primarily downward within the bedrock flow zone, and recharge to the bedrock aquifer predominantly occurs from the bedrock interface flow zone where permeable glacial overburden overlies the fractured bedrock interface zone. Estimates of K developed during the RI/FS indicated permeability of the bedrock flow zone in the range of 0.24 to 0.46 ft/day. Based on the regional groundwater gradient and estimated porosity, the average linear groundwater velocity in bedrock was calculated to be approximately 0.26 ft/day (LMS, 1998a). The primary horizontal direction of bedrock groundwater flow emanating from the site is to the north toward Rondout Creek, with minor components of lateral flow to the northeast and northwest.

3.0 CONCEPTUAL SITE MODEL

A CSM was formulated using information available (MACTEC, 2015). The CSM is considered a dynamic model, subject to modification as more data become available. The CSM presented below will be used to focus, explain and modify data gathering activities as well as subsequent report-writing activities. Staff collecting samples will evaluate conditions to determine if what is observed in the field is consistent with the CSM. If it is not, then the project team will re-evaluate the sampling approach to ensure that the samples collected meet the project objectives. The CSM will be updated when information from field activities and/or laboratory analyses demonstrate the need for its modification.

3.1 SITE BACKGROUND

The Site property had been used for industrial and commercial activities since the early 1960s. These activities included metal finishing, wet spray painting and the manufacturing of store display fixtures, card punch machines and computer frames. Wastes from these operations were typically discharged into the on-property septic system. The MRIP property now consists of approximately seven acres of the original 14.5 acres and currently hosts mixed commercial businesses.

3.2 CONTAMINANTS OF CONCERN AND MEDIA AFFECTED

The primary contaminant at the site is 1,1,1-TCA. The breakdown products 1,1-DCE (abiotic) and 1,1-DCA (biotic) have also been detected in both the overburden and bedrock groundwater systems, although the concentrations have been low in comparison to 1,1,1-TCA. These contaminants have migrated through the source area till to bedrock, contaminating overburden and bedrock groundwater at and downgradient of the Site. These contaminants have also been detected in soil vapor within the Site building. The highest sub-slab concentration measured in the Site building is located at its west end, at Sample Port #3 (See Appendix B). Other sub-slab sampling points in closer proximity to where the Orangeburg piping exits the building to the former septic system showed lower concentrations than Port #3. The source of the elevated soil gas concentrations at Port #3 has not been identified.

3.3 SOURCE AREAS

Based on the concentration of 1,1,1-TCA (26%) detected in the sludge remaining in the onsite underground septic tank, and the prominence of 1,1,1-TCA as a COC, the former septic system area (Area of Concern [AOC] D) was likely the primary source disposal zone. AOC D is depicted on Figure 3.1. AOC D consisted of a 1,000 gallon steel cylindrical tank, and Orangeburg piping (a bitumenized fiber pipe made from layers of wood pulp and pitch) tracing from the building to the septic tank, and subsequently to a distribution box from which two outlet laterals discharged (eastern and western lateral) (see Figure 3.1). Soil samples collected along the laterals and at their terminal ends revealed little or no contamination. A cross section of the excavated area surrounding the former septic tank is shown in Appendix A.

3.4 CONTAMINANT OF CONCERN POINTS OF ENTRY

Although approximately 20 cubic yards of soil was excavated from the former septic tank area, and confirmatory sampling at the limits of the excavation showed that the soil cleanup goals for the COCs were met, it is anticipated that the source of 1,1,1-TCA found in nearby groundwater samples is a result of vertical migration of 1,1,1-TCA from a shallow source area to deeper overburden soil and subsequently to the shallow overburden/bedrock interface zone, and into localized shale deposits or fractures within bedrock.

3.5 HYDROGEOLOGY AND CONTAMINANT DISTRIBUTION

Based on the current understanding of the CSM, 1,1,1-TCA from the source area is anticipated to have migrated vertically downward through the overburden till and into bedrock. The 1,1,1-TCA present in soil and bedrock appears to be acting as a residual source of groundwater contamination. 1,1,1-TCA tends to be recalcitrant in the environment, and it is not unusual to find it persisting decades after its purported discontinued use. 1,1,1-TCA degrades through reductive dechlorination. Although the presence of daughter products resulting from dechlorination of 1,1,1-TCA suggests that subsurface site conditions may be suitable for its natural degradation, concentrations are not diminishing at a rapid rate.

The near-surface contaminated soil within the source area was remediated, effectively eliminating any surface runoff pathway. The overburden glacial till consists predominantly of sandy silt, and contaminant migration within the till may be controlled by the factors that govern porous media flow. As such, the movement of COCs in the till is anticipated to be slow. The weathered bedrock interface zone, can act as either a porous or fractured media. Therefore, contaminant migration in the bedrock interface zone is anticipated to behave as a dual porosity model (i.e., fractured and porous media flow). Migration in the underlying fractured bedrock will be controlled by fracture aperture, hydraulic gradients, and total organic carbon content.

The downward vertical hydraulic gradients, coupled with denser-than-water COCs and extended pumping from bedrock extraction wells MW-5R, MW-7R, and ERT-1 (Figure 3.1), appear to have resulted in the vertical migration of COCs through the overburden aquifer into the bedrock aquifer. Additionally, the finding of 1,1,1-TCA in wells upgradient of the former septic system may be attributed to historical pumping of the MRIP production wells (MRPW-1 and MRPW-2)or the pumping of residential wells in the area.MRPW-1 is located at the west end of the building and MRPW-2 is located at the east end of the building (Figure 3.1). MRPW-2 was pump tested for 48-hours at a rate of 16 gallons per minute, indicating that it intercepts a highly transmissive fracture. MRPW-1 at one time contained 1,1,1-TCA at a concentration of 200 µg/L (LMS, 1998a).

3.6 HUMAN EXPOSURE PATHWAYS

Public water is supplied to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells; therefore, there is no current exposure to groundwater via ingestion. The near-surface contaminated soil has been removed, thus eliminating the potential direct contact threat to VOC-contaminated soil. Vapor intrusion at the nearby residences was evaluated and shown not to require mitigation. Vapor intrusion within the MRIP building is currently being remediated with sub-slab depressurization systems.

4.0 SCOPE OF WORK

The selected remedy for the Site includes the existing pump and treat system. Based on the CSM and hydrogeology presented above, a data gap investigation will be conducted to better understand the contaminant distribution at the site, address identified data gaps, and provide additional data that can be used to effectively modify the existing remedial measure, if needed. The data gap investigation will be conducted to meet the following objectives:

1) Evaluate the potential presence of residual 1,1,1-TCA contamination within the source area. Specifically, evaluate the presence of 1,1,1-TCA in the overburden and in the bedrock matrix of the previously excavated former septic tank area, the area between the former septic tank and the building, the septic piping termini and under the Site building.
2) Evaluate the hydrostratigraphic migration pathways on-site and contaminant concentrations in the source area groundwater zones.
3) Evaluate the hydraulic properties of the deeper overburden and shallow bedrock within the source area to aid in determining if the existing system can be modified to control or mitigate contaminant mass and mobility, or if other remedial options should be considered.

A summary of these field tasks and methodologies, as well as sample IDs and analytical program, are described in more detail in Table 4.1, as well as in the following subsections. Proposed sample locations are shown on Figure 4.1.

4.1 GENERAL FIELD OPERATIONS

General field activities, including health and safety, access and clearance, decontamination, mobilization, air monitoring, and investigation derived wastes (IDW), are described in the following subsections. Companion documents to this FAP that will govern the execution of the field exploration activities include MACTEC's Program Quality Assurance Program Plan (QAPP) (MACTEC, 2011a) and HASP (MACTEC, 2011b). In addition to these program documents, Appendix C provides a Site-specific HASP.

Subcontractors selected to support the field activities include:

- Northeast Geophysical Services – Downhole bedrock borehole geophysics
- GeoLogic, NY, Inc. – Packer Groundwater Sampling

- TestAmerica – Performance of laboratory services for soil and groundwater
- Investigation Derived Waste (OP-TECH) – Transportation and Disposal of IDW Drums
- Subcontractor to be determined – MIP Sampling (MIPS)
- Subcontractor to be determined – Test Pitting
- Subcontractor to be determined – Survey

4.1.1 Health and Safety

The Site-specific HASP is provided as Appendix C to this document. MACTEC anticipates that the fieldwork will be conducted in Level D personal protection. Specific investigation activities, utility clearance procedures, and required level of personal protection are set forth in the Site-specific HASP. Criteria for upgrading or downgrading the specified level of protection are also provided in the Site-specific HASP. Additional health and safety requirements are set forth in the Program HASP (MACTEC, 2011b). Should Site conditions pose a threat to those present on-Site, and/or should Site conditions warrant an upgrade from Level D, as defined by the HASP, work will stop and the situation will be reevaluated by the NYSDEC and MACTEC. The NYS Department of Health (NYSDOH) Community Air Monitoring Plan (CAMP) will also be followed.

4.1.2 Access and Clearance

Exploration locations will be placed on the Site property. The NYSDEC will be responsible for coordinating initial Site access. MACTEC will coordinate logistics and access to sampling points with Site building owner(s) and/or tenants.

For clearing exploration locations of utilities, the drilling contractor will be responsible for marking locations in the field and coordinating utility clearance with Dig Safely – New York. MACTEC will confirm drilling locations and utility clearance prior to conducting drilling activities.

4.1.3 Community Air Monitoring Plan

4.1.3.1 Purpose

The purpose of the CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases as a result of remedial work activities performed at the Site. Site-specific procedures described below are consistent with the NYSDOH generic CAMP (NYSDEC, 2010). The proposed borings are located in a commercial parking lot, or landscaped area adjacent to the parking lot.

4.1.3.2 Particulate Air Monitoring

Particulate monitoring will be conducted continuously during ground intrusive activities (e.g., test pitting and MIPS direct-push activities). Dust/particulate monitoring will be conducted in the vicinity of the excavation/drilling activities. Dust monitoring may be suspended during periods of heavy precipitation.

Particulate air monitoring will be conducted with a TSI DustTrak 8520 Aerosol Monitor (or a similar device). This instrument is equipped with an audible alarm (indication of exceedance) and is capable of measuring particulate matter less than 10 micrometers in size (PM-10). The TSI DustTrak 8520 will continually record emissions (calculating 15-minute running average concentrations) generated during field activities. The dust monitoring device will be checked periodically throughout each day of intrusive activities to assess emissions and the need for corrective action.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities. As work and weather conditions change throughout the day, the locations where the dust monitoring devices are set up may be adjusted accordingly.

Particulate monitoring response and action levels include:

- If the PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that the PM-10 particulate levels do not exceed 150 μg/m^3 above background level and provided that no visible dust is migrating from the work area.

- If after implementation of dust suppression techniques, the PM-10 particulate levels are greater than 150 μg/m^3 above background, work will be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the PM-10 particulate concentration to within 150 μg/m^3 of the background level and in preventing visible dust migration.

<u>4.1.3.3 VOC Air Monitoring</u>

VOC air monitoring will be conducted in conjunction with the dust monitoring program. VOC air monitoring will be conducted using a RAE Systems MiniRAE 2000 VOC instrument (or a similar photoionization detection [PID] device). This will provide real-time recordable air monitoring data.

VOC monitoring will be conducted for ground intrusive (continuous monitoring) and non-intrusive activities (periodic monitoring).

VOCs will be continuously monitored in the vicinity of drilling and test pitting operations. Upwind/background concentrations will be measured before field activities commence and periodically throughout the day to confirm background conditions. The work area VOC monitoring device will also be checked periodically throughout the day to assess emissions and the need for corrective action.

VOC monitoring response and action levels include:

- If the ambient air concentration of total organic vapors at the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Work activities can resume provided the total organic vapor level 200 ft downwind of the work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 ft, is below 5 ppm over background for the 15 minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shut down.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities. As work and weather conditions change throughout the day, the locations of the VOC monitoring devices may be adjusted accordingly.

4.1.4 Mobilization

Mobilization will include obtaining utility clearances for proposed locations, procurement of subcontractors, and the acquisition and coordination of health and safety and sampling supplies and equipment. The NYSDEC will be responsible for obtaining access to the Site.

4.1.5 Decontamination

Sampling methods and equipment for this field program have been chosen to minimize IDW, reducing the potential for cross-contamination. Disposable sampling equipment will be used as much as practical to minimize decontamination time and water disposal. Non-disposable sampling equipment will be decontaminated before and after the collection of each sample. Decontamination methods and materials are described in detail in Subsection 4.3 of the QAPP.

Non-disposable sampling equipment will be decontaminated by 1) washing the sample collection equipment with potable water and Liquinox, rinsing with potable water, rinsing with deionized water, and then allowing the equipment to air dry, or 2) steam cleaning the equipment and then allowing the equipment to air dry. Drilling equipment (i.e. drill rods and casing) will be decontaminated by steam cleaning with potable water on a temporary decontamination pad constructed at the Site, prior to each boring and before leaving the Site. Decontamination water will be collected, containerized, and stored on-site in labeled United States Department of Transportation (USDOT)-approved containers in an area with secondary containment awaiting on-site treatment and/or proper disposal based on IDW characterization sampling results.

4.1.6 Investigation Derived Wastes

The method of disposing of IDW will be based upon whether the wastes are considered hazardous or non-hazardous. USDOT-approved 55-gallon containers filled during the field investigation will be staged on-site in an area designated by the NYSDEC. Transport and disposal of these containers will be arranged by MACTEC on behalf of the NYSDEC and will be in accordance with the Site Management Plan.

In general, soil cuttings will be segregated by boring. Soil from multiple borings can be combined into one drum if the borings are in the same area (i.e., within the former source area, or outside the former source area), or PID readings from the soil cuttings are similar (i.e. don't mix soils with elevated PID readings, with soils where PID readings do not exceed background). If soil samples were not collected during the installation of the borings, then samples will be collected from the containerized waste for analysis of VOCs by USEPA Method 8260, to characterize the waste for off-site disposal. Wastes will be sampled such that there are representative samples from areas that may be contaminated, and those areas that are less likely to be contaminated. Wastes will then be manifested for disposal based on non-hazardous, a "contained in" determination, hazardous, or hazardous requiring pre-treatment.

IDW water (i.e., decontamination water, development water, purge water) will be collected, containerized, and stored on-site in labeled USDOT-approved containers in an area with secondary containment awaiting on-site treatment and/or proper disposal based on IDW characterization sampling results.

4.2 INVESTIGATION ACTIVITIES

The fieldwork is anticipated to be conducted as described in the following subsections. The fieldwork methodology will be conducted in accordance with the specifications presented in the QAPP (MACTEC, 2011a), a stand-alone document.

Field work will include the following items:

1) MIPS via direct-push drilling to screen soil in the area between the former septic tank and the building for the presence of VOCs for the purpose of identifying residual source areas.

2) Confirmatory soil sampling via direct push in areas showing the highest concentration of contamination based on the MIPS survey.
3) Test pit excavation along points of the Orangeburg piping that leads from the former distribution box, including the eastern and western piping termini areas to assess whether residual contamination is or is not present and providing an on-going source of groundwater contamination.
4) Down-hole geophysical survey of on-site bedrock wells including the deeper and most-contaminated bedrock SVE wells (SVE-20 and SVE-21) and extraction wells (ERT-4, MW-5R, MW-7R, and ERT-1) to identify fractures, dominant flow zones, and possible changes in bedrock stratigraphy that could be serving as contaminant migration pathway(s). Downhole geophysical logging will include borehole caliper, single point resistivity, acoustic televiewer, optical televiewer, heat pulse flow meter, and gamma ray logging;
5) Packer testing of select SVE and/or bedrock extraction well(s) subsequent to the results of the down-hole geophysical logging, and the collection of discrete samples for VOCs from each packer interval;
6) Sub-slab soil sampling in the vicinity of the elevated concentrations of 1,1,1-TCA in previous subslab soil gas points (i.e., Port #3, T2-001 and T2-003 (Appendix B)), conducted using hand driven sampling tubes (e.g., slam-bar with macro core sampler) to evaluate possible residual contaminant sources that may exist under the building.
7) Completion of a simultaneous groundwater level gauging event at all accessible monitoring wells, SVE wells, and extraction wells under pumping conditions.

4.2.1 Membrane Interface Probe (MIP) Sampling

To evaluate the potential that VOC contamination exists in the soils in the area between the former septic tank and the Site building, as well as to better evaluate the stratigraphy of the source area, MIP sampling will be implemented using direct push technology (DPT).

The MIP sampler fits onto conventional DPT equipment and is inserted into the target investigation zone in a manner similar to typical DPT sampling to provide real-time detection of VOCs or non-aqueous phase liquid in the vadose and saturated zones. The tool tip has a membrane that is permeable to VOCs, and a built-in heating element that causes VOCs near the MIP to volatilize from soil or groundwater. The volatilized VOCs pass through the membrane, where a carrier gas transports the VOCs through sealed tubing to one or more truck-mounted detectors (e.g., a Flame Ionization Detector, Electron Capture Detector, or PID). The detectors measure total VOCs in the carrier gas and provide this information in real-time as an instrument response. The detectors do not provide a quantitative concentration of VOCs in the groundwater or soil. However, the response level from the detector corresponds to the amount of VOCs present in the carrier gas, which is proportional to the mass of VOCs in the soil or groundwater at the MIP location. A greater response from the detector indicates greater VOC concentrations in the subsurface.

The MIP also measures soil electrical conductivity (EC) and hydraulic conductivity (K) and reports these parameters along with the output from the VOC detectors. Data are plotted in respect to depth below ground surface (bgs) on a continuous log. The use of MIP technology will permit collection of chemical (i.e., Halogen Specific Detector [XSD] tool), hydrophysical (i.e., Hydrophysical [HPT] tool) and stratigraphic (EC tool) data with the principal objective of evaluating subsurface materials, hydraulic properties, and contaminant distribution.

Field observations will be used to determine specific locations and number of MIP sampling points. Observations will be recorded on the Field Data Record (FDR). For planning purposes, MACTEC is anticipating to perform MIP sampling at approximately fifteen locations, with the primary goal of analyzing the soil in the area between the former septic tank and the building for the presence of VOCs. The proposed MIP sampling points are depicted on Figure 4.1 and summarized in Table 4.1. The results of the MIP investigation will assist in determining the horizontal and vertical extent of high-concentration contaminant source areas in soil or groundwater. It is anticipated that the MIPS sampling will be completed over a period of approximately two days.

4.2.2 Soil Sampling

Following completion of the MIP survey, five direct-push soil borings will be installed for the purpose of collecting soil samples for laboratory analysis to ground-truth the MIP data. The direct-push soil borings will be offset as close as possible to the corresponding MIP boring (within 12 inches). Discrete soil samples will be collected with a Macro-Core sampler, field screened with a PID and classified according to the USCS. Up to three samples from each boring will be submitted for laboratory analysis of VOCs by EPA Method 5035A/8260. Specific locations and depths of the soil samples will be chosen in the field and will represent:

- a zone where MIP logging indicates significant contamination (e.g., plume core);
- a zone where contamination is less than observed in the plume's core; and
- a sample where contamination is near or at the detection limit of the MIP system.

PID headspace readings and boring observations will be recorded on the FDR and as discussed in Subsection 4.4.3 of the QAPP.

4.2.3 Test Pits

Test pits will be conducted by a standby subcontractor and will extend as deep as the excavation equipment will allow (up to approximately 12 ft bgs, or until the water table is encountered). Soil will be logged using the USCS. It is estimated that four test pits will be excavated, with the principal objectives of determining the depth and character of underlying native soil, and whether VOC contamination is present along and at the eastern and western termini of the septic system laterals. PID headspace readings and excavation observations will be recorded on the FDR and as discussed in Subsection 4.5.1 of the QAPP. Samples will be collected at discrete depths based on field observations of soil, groundwater, and/or the potential presence for VOC contamination (i.e. stained soils and/or elevated PID headspace readings) within each test pit. MACTEC estimates that up to three soil samples will be collected per test pit based on field observations. Sample locations are shown on Figure 4.1, and the proposed field tasks, methodologies, and sample identification and analysis are included in Table 4.1.

4.2.4 Borehole Geophysics

A series of standard geophysical logging suites will be completed by Northeast Geophysical Services within individual open bedrock boreholes to identify fractures and possible changes in bedrock stratigraphy that could be serving as contaminant migration pathway(s). MACTEC will perform borehole geophysical surveys at the most-contaminated bedrock SVE wells including SVE-20 and SVE-21, and extraction wells ERT-4, ERT-1, MW-5R, and MW-7R. Well locations proposed for borehole geophysics are shown on Figure 4.1. MACTEC recommends shutting down the existing treatment system in advance of conducting borehole geophysics as to not interfere with heat-pulse flowmeter logging. The system will need to be shut-down to allow for groundwater stabilization and well pumps removed from the extraction wells at a minimum of two days prior to logging activities.

These geophysical logging suites include the following and will be generally completed in the following sequence:

1) **Caliper** data will be used to measure the diameter of the borehole. Deviations in borehole diameter indicate the presence of fractures leaving breakouts in the borehole wall. Caliper data will also be used to locate packer intervals for a proper seal.
2) **Natural gamma data** will also be recorded. These data values are correlated with single-point resistance logs when distinguishing sandy versus clayey strata, and are obtained with the same logging probe that records single-point resistance and spontaneous potential data.
3) **Electrical logs** indicate the presence of hydraulically active fractures and possible changes in lithology.
4) **Acoustic televiewer and optical televiewer** data will be collected to determine the location and attitude of fractures exposed in each bedrock borehole.
5) **Heat-pulse flowmeter** logging completed under non-pumping (ambient) and pumping conditions will be used to determine the location of water bearing fractures under non-stressed and stressed conditions.

4.2.5 Packer Testing

Based on the geophysical logging, fracture zones in bedrock wells SVE-20, SVE-21, and extraction wells ERT-4, ERT-1, MW-5R, and MW-7R will be identified and targeted for packer sampling (Figure 4.1). Packer sampling will be conducted by GeoLogic, NY of Homer, NY. Packer sampling will be completed by sealing off both ends of a ten-ft zone of the borehole with inflatable packers. Packers will be inflated to approximately 150 pounds per square inch. Once the packer seals are in place, groundwater samples will be collected for VOC analysis using low flow sampling procedures as outlined in section 4.5.4.3 of the QAPP (MACTEC, 2011a). Additionally, water levels above the packers will be monitored during sampling activities. Depending on the space available in the packer rods, water levels may be measured using a transducer.

Upon completion of the sampling, the pumping rate will be increased and water levels will be recorded within and outside of the packered zone. One pumping rate will be evaluated to assess the connectivity of the packered zone to well(s) in the immediate vicinity. Groundwater levels will be measured above the packers during pumping and in nearby wells to assess vertical fracture connectivity. It is estimated that approximately two hours will be spent conducting sampling on each zone, so that the packer sampling of the bedrock wells will be completed in approximately three working days. MACTEC anticipates up to three packer tests/groundwater sampling intervals per well. The actual number of fracture and packer zones will be determined based on the results of the geophysical logging.

4.2.6 Sub-Slab Soil Sampling

Sub-slab soil samples will be collected in the vicinity of the elevated concentrations of 1,1,1-TCA previously identified in sub slab soil gas points shown in Appendix B (i.e., Port #3, T2-001 and T2-003) Sampling will be conducted by MACTEC personnel using hand-driven sampling tubes (e.g., slam-bar with macro core sampler) to evaluate possible residual contaminant sources that may exist under the building. If feasible, samples will be collected between zero to two feet below the slab and will be screened using a PID. One discrete sample will be collected from the depth with visual/olfactory signs of contamination, or PID readings above background; unless field screening suggests otherwise, analytical samples will be collected within the top two ft below the slab. Samples will be submitted for laboratory analysis of VOCs by EPA Method 5035A/8260. Following coring, the hole will be backfilled and the floor will be patched. Four sub-slab soil sampling locations (SS-01, SS-02, SS-03, and SS-04) are depicted on Figure 4.1 and are summarized in Table 4.1.

4.2.7 Groundwater Level Measurement

Comprehensive groundwater level gauging events will be completed at accessible on-site and off-site monitoring wells, SVE wells, and extraction wells, extending from MW-2 and MW-3 to the South to MW-11, 11B, and 11C to the North Groundwater elevation data will be measured at the same set of wells simultaneously under non-pumping and pumping conditions. MACTEC recommends measuring groundwater levels under pumping conditions prior to shutting down the existing treatment system in advance of conducting borehole geophysics (Section 4.2.4). Groundwater levels under non-pumping conditions will be collected approximately two-days following system shut-down once groundwater levels have stabilized.

These data will be used for groundwater contouring and for the purpose of better defining horizontal and vertical groundwater flow in the subsurface under the current pumping regime. It is anticipated that a complete set of groundwater data will be used to update the CSM.

4.2.8 Survey

MACTEC's subcontractor will survey the location of the MIPS sampling points, subsurface soil samples, and test pits. Horizontal locations will be tied to the NYS Plane Coordinate System using North American Datum of 1983 to an accuracy of 0.1 ft. Vertical elevations of groundwater wells will be tied to existing monitoring well data, which is based on msl, using North American Vertical Datum of 1988, and measured to an accuracy of 0.01 ft.

4.3 DELIVERABLE

Data obtained from the data gap investigation will be reviewed and summarized in a Data Gap Investigation Letter Report. Laboratory analytical results will undergo a limited chemist review and be compared to applicable NYS groundwater standards (NYS, 1999) and soil cleanup objectives (NYS, 2006). Boring logs, geophysical data, and environmental sampling data will be included as appendices to the report. Results will be used to update the CSM and aid in the evaluation of remedial system optimization.

The report will be submitted in draft to the NYSDEC for review and comment. Upon receipt of NYSDEC comments, MACTEC will address the comments and submit a final report in PDF format. Analytical data will be uploaded to EQuIS, and laboratory deliverables will also be submitted electronically (PDF and electronic data deliverable) with the Data Gap Report.

5.0 REFERENCES

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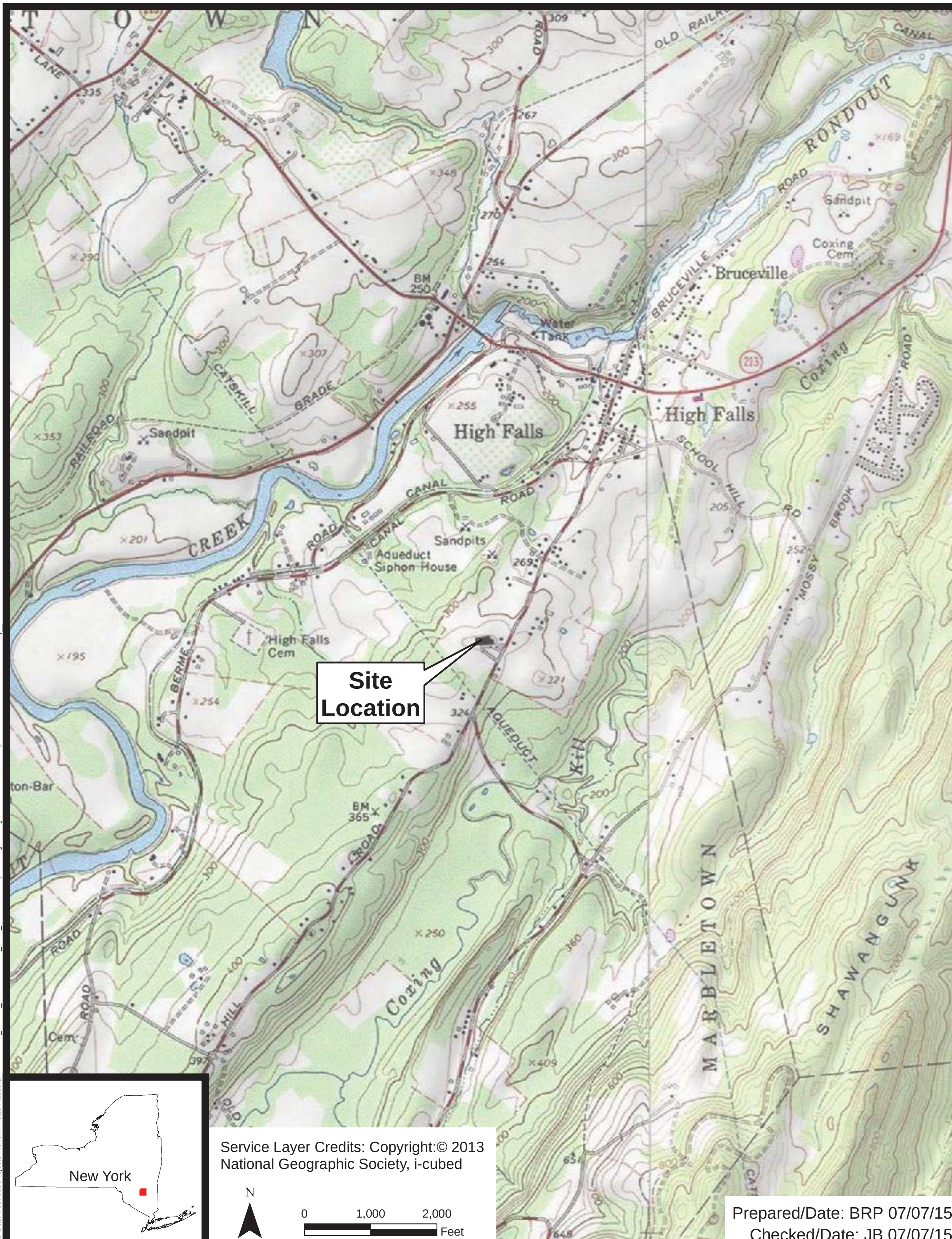
FIGURES



NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Site Location Map

Project 3617157346

Figure 1.1

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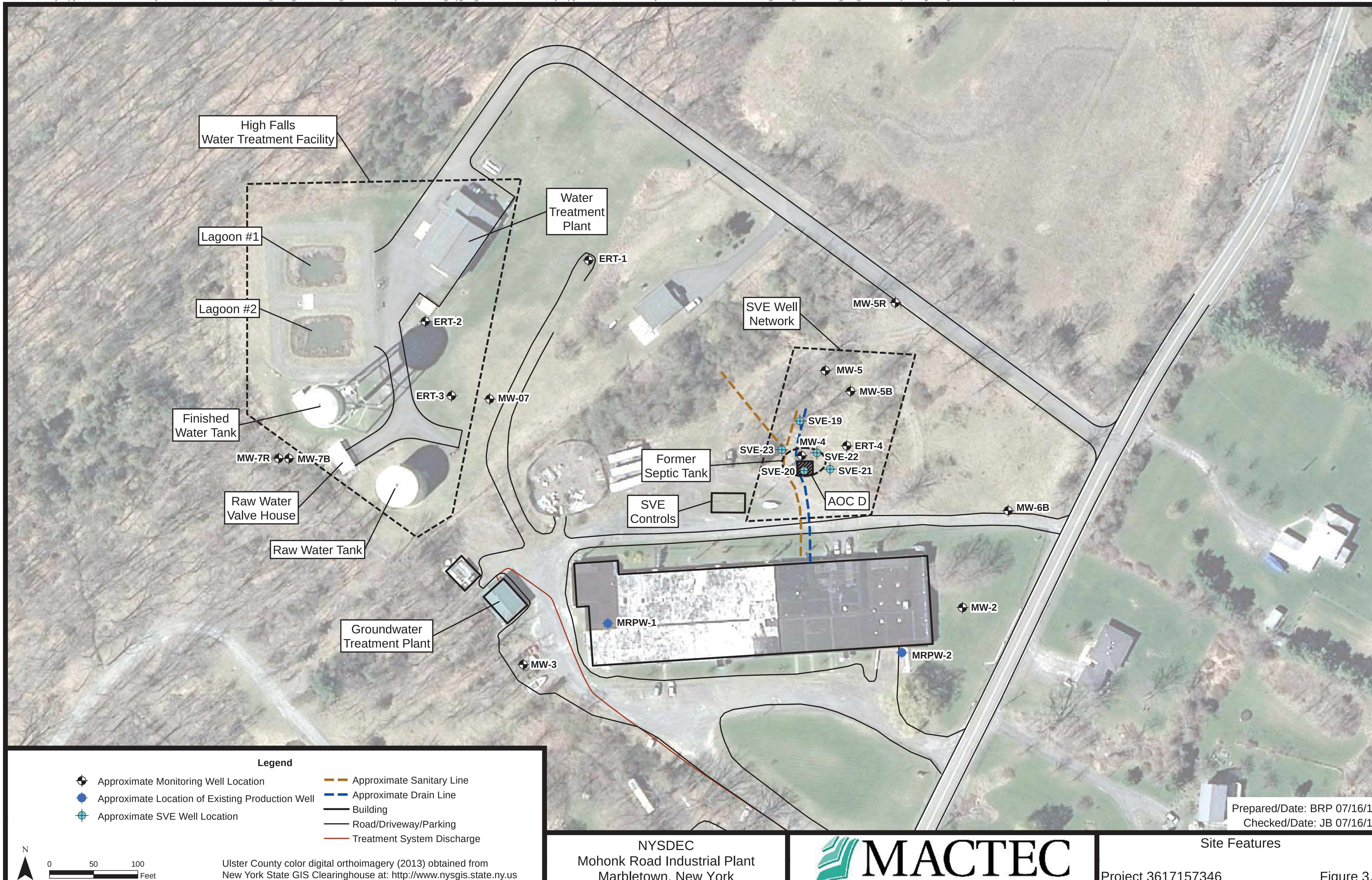
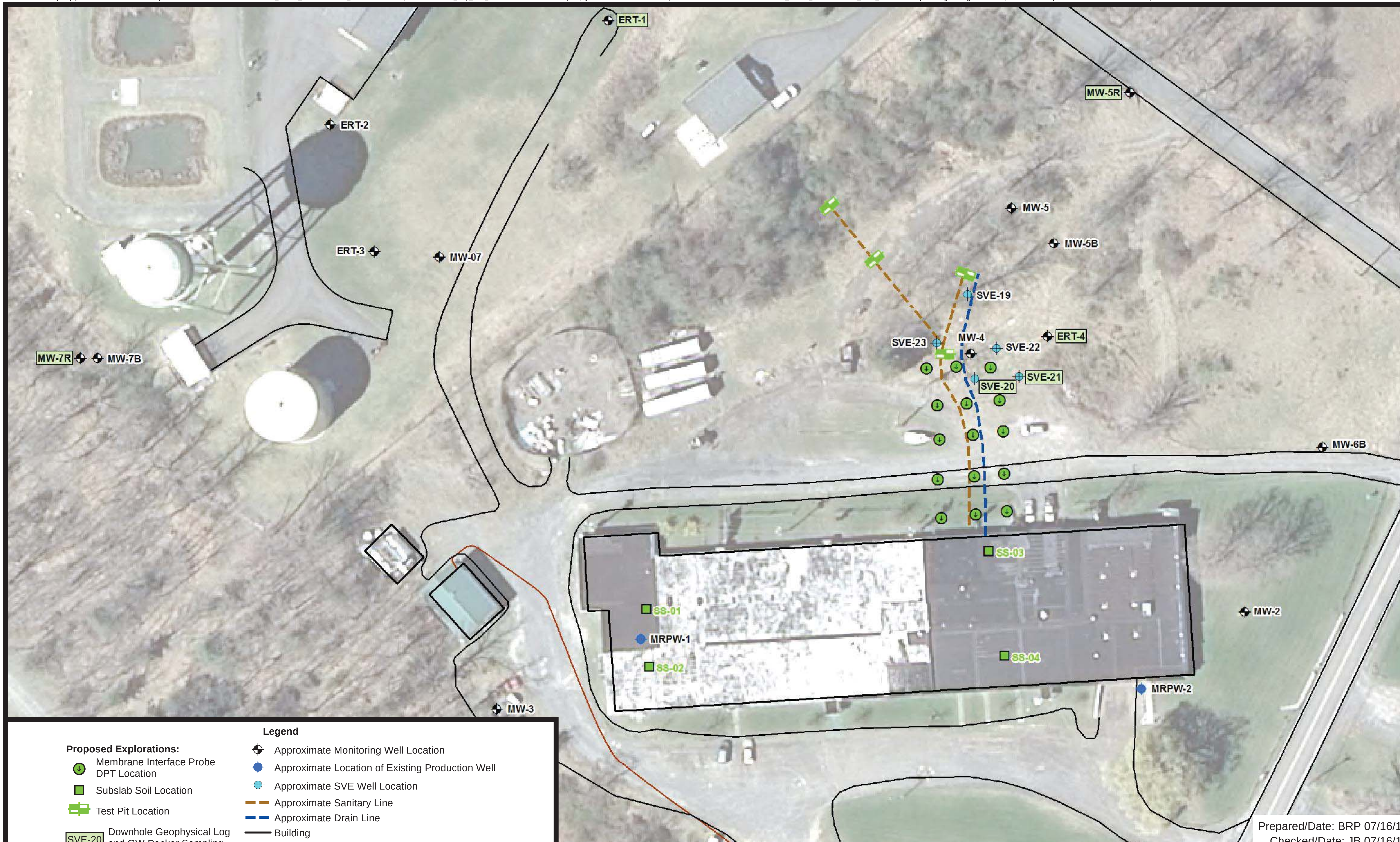


Site Features

Figure 3.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Data_Gap_FAP_11x17LS.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.2_Work_Plans\Data Gap FAP\Figures\Figure 4.1 - Proposed Locations.pdf 07/16/2015 2:12 PM brian.peters



Legend

Proposed Explorations:

- Membrane Interface Probe DPT Location
- Subslab Soil Location
- Test Pit Location
- SVE-20 Downhole Geophysical Log and GW Packer Sampling

- Approximate Monitoring Well Location
- Approximate Location of Existing Production Well
- Approximate SVE Well Location
- Approximate Sanitary Line
- Approximate Drain Line
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 30 60 Feet

Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 07/16/15
Checked/Date: JB 07/16/15

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Proposed Sample Locations

Project 3617157346

Figure 4.1

TABLES

Table 4.1: Proposed Sample Methodology, Rationale, Identification, and Analytical Schedule

Methodology	Evaluation Rationale	Loc I.D.	Medium	Depth bgs ft.	Sample I.D.		VOCs
						method water	8260C
						method soil	5035A/8260C
						groundwater DL needed * ppb	0.5
						soil DL needed ** ppm	0.05 (1)
						Validation Level	Chem Review
MIP Sampling MIP sampling using direct push at approximately 15 locations to an estimated depth of 20 feet (depth will be selected based on field observations or refusal).	To screen soil in the area between the former septic tank and the building for the presence of VOCs for the purpose of identifying residual source areas and measuring soil hydraulic properties.	MP-01	Soil	0 - 20	356023MP01___		
		MP-02	Soil	0 - 20	356023MP02___		
		MP-03	Soil	0 - 20	356023MP03___		
		MP-04	Soil	0 - 20	356023MP04___		
		MP-05	Soil	0 - 20	356023MP05___		
		MP-06	Soil	0 - 20	356023MP06___		
		MP-07	Soil	0 - 20	356023MP07___		
		MP-08	Soil	0 - 20	356023MP08___		
		MP-09	Soil	0 - 20	356023MP09___		
		MP-10	Soil	0 - 20	356023MP10___		
		MP-11	Soil	0 - 20	356023MP11___		
		MP-12	Soil	0 - 20	356023MP12___		
		MP-13	Soil	0 - 20	356023MP13___		
		MP-14	Soil	0 - 20	356023MP14___		
		MP-15	Soil	0 - 20	356023MP15___		
Direct Push Soil Sampling Collect direct push samples from 5 of the MIP survey locations. Collect samples for off-site laboratory analysis from up to 3 depths per boring (15 total samples).	MIP confirmation, contaminant characterization, and soil classification.	DP-01	Soil		356023DP01___		1
			Soil		356023DP01___		1
			Soil		356023DP01___		1
		DP-02	Soil		356023DP02___		1
			Soil		356023DP02___		1
			Soil		356023DP02___		1
		DP-03	Soil		356023DP03___		1
			Soil		356023DP03___		1
			Soil		356023DP03___		1
		DP-04	Soil		356023DP04___		1
			Soil		356023DP04___		1
			Soil		356023DP04___		1
		DP-05	Soil		356023DP05___		1
			Soil		356023DP05___		1
			Soil		356023DP05___		1

Table 4.1: Proposed Sample Methodology, Rationale, Identification, and Analytical Schedule

Methodology	Evaluation Rationale	Loc I.D.	Medium	Depth bgs ft.	Sample I.D.		VOCs
						method water	8260C
						method soil	5035A/8260C
						groundwater DL needed * ppb	0.5
						soil DL needed ** ppm	0.05 (1)
						Validation Level	Chem Review
Test Pits Install 4 test pits and collect samples for off-site laboratory analysis from up to 3 depths (12 total samples) per test pit as follows:	Along points of the Orangeburg piping that leads from the former distribution box, including the eastern and western piping termini areas to assess whether residual contamination is or is not present and providing an on-going source of groundwater contamination	TP-01	Soil		356023TP01___		1
			Soil		356023TP01___		1
			Soil		356023TP01___		1
		TP-02	Soil		356023TP02___		1
			Soil		356023TP02___		1
			Soil		356023TP02___		1
		TP-03	Soil		356023TP03___		1
			Soil		356023TP03___		1
			Soil		356023TP03___		1
		TP-04	Soil		356023TP04___		1
			Soil		356023TP04___		1
			Soil		356023TP04___		1
Down-Hole Geophysical Survey Downhole geophysical logging of on-site bedrock wells (including select SVE and Extraction wells). Survey suite will include borehole caliper, single point resistivity, acoustic televiewer, optical televiewer, heat pulse flow meter, and gamma ray logging.	To identify fractures and possible changes in bedrock stratigraphy that could be serving as contaminant migration pathway(s)	ERT-1					
		ERT-4					
		MW-5R					
		MW-7R					
		SVE-20					
		SVE-21					

Created by: DF 7/9/15
Checked by: JB 7/16/15

Table 4.1: Proposed Sample Methodology, Rationale, Identification, and Analytical Schedule

Methodology	Evaluation Rationale	Loc I.D.	Medium	Depth bgs ft.	Sample I.D.		VOCs
						method water	8260C
						method soil	5035A/8260C
						groundwater DL needed * ppb	0.5
						soil DL needed ** ppm	0.05 (1)
						Validation Level	Chem Review
Groundwater Packer Sampling Packer sampling of select SVE and/or bedrock extraction well(s) subsequent to the results of the down-hole geophysical logging, and the collection of discrete samples for VOCs from each packer interval.	To sample bedrock fracture zones and determine depth and migration of VOC contamination	ERT-4	Water		356023ERT04___		1
			Water		356023ERT04___XD		1
			Water		356023ERT04___MS		1
			Water		356023ERT04___MD		1
		ERT-1	Water		356023ERT01___		1
			Water		356023ERT01___		1
			Water		356023ERT01___		1
		MW-5R	Water		356023MW05R___		1
			Water		356023MW05R___		1
			Water		356023MW05R___		1
		MW-7R	Water		356023MW07R___		1
			Water		356023MW07R___		1
			Water		356023MW07R___		1
		SVE-20	Water		356023SVE20___		1
			Water		356023SVE20___		1
			Water		356023SVE20___		1
		SVE-21	Water		356023SVE21___		1
			Water		356023SVE21___		1
			Water		356023SVE21___		1
Sub-Slab Soil Sampling Sub-slab soil samples will be collected in the vicinity of the elevated concentrations of 1,1,1-TCA in sub-slab soil gas points (i.e., Port #3, T2-001 and T2-003) using hand driven sampling tubes.	To evaluate possible residual contaminant sources that may exist under the building.	SS-01	Soil		356023SS01___		1
			Soil		356023SS01___		1
			Soil		356023SS01___		1
		SS-02	Soil		356023SS02___		1
			Soil		356023SS02___		1
			Soil		356023SS02___		1
		SS-03	Soil		356023SS03___		1
			Soil		356023SS03___		1
			Soil		356023SS03___		1
		SS-04	Soil		356023SS04___		1
			Soil		356023SS04___		1
			Soil		356023SS04___		1

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Created by: DF 7/9/15
Checked by: JB 7/16/15

Table 4.1: Proposed Sample Methodology, Rationale, Identification, and Analytical Schedule

Methodology	Evaluation Rationale	Loc I.D.	Medium	Depth bgs ft.	Sample I.D.		VOCs
						method water	8260C
						method soil	5035A/8260C
						groundwater DL needed * ppb	0.5
						soil DL needed ** ppm	0.05 (1)
						Validation Level	Chem Review

NOTES:

PCBs	(1)- 0.02 vinyl chloride, 1,2 dichloroethane	PCBs analyzed by USEPA Method 8082.
VOCs	(2)- 0.33 ppm for dibenz(ah)anthracene, cresol	VOCs 5035A/8260C (soils), 8260C (water)
SVOCs	(m,p,& o), phenol; 80 ppm for pentachlorophenol	SVOCs 8270C (soils and water)
Metals	(3)- 0.0033 ppm DDT, DDD, DDE	TAL Metals by USEPA 6010/(7471-soil, 7470-water)
DL		Detection Limit
bgs		below ground surface
MP		Membrane Interface Probe Sample
DP		Direct Push
TP		Test Pit
ERT		Extraction Well
SVE		Soil Vapor Extraction
XD		Duplicate
MS		Matrix Spike
MD		Matrix Spike Duplicate
___		placeholder for sample depth (two digits)

Detection limits should be low enough to achieve the following comparisons:

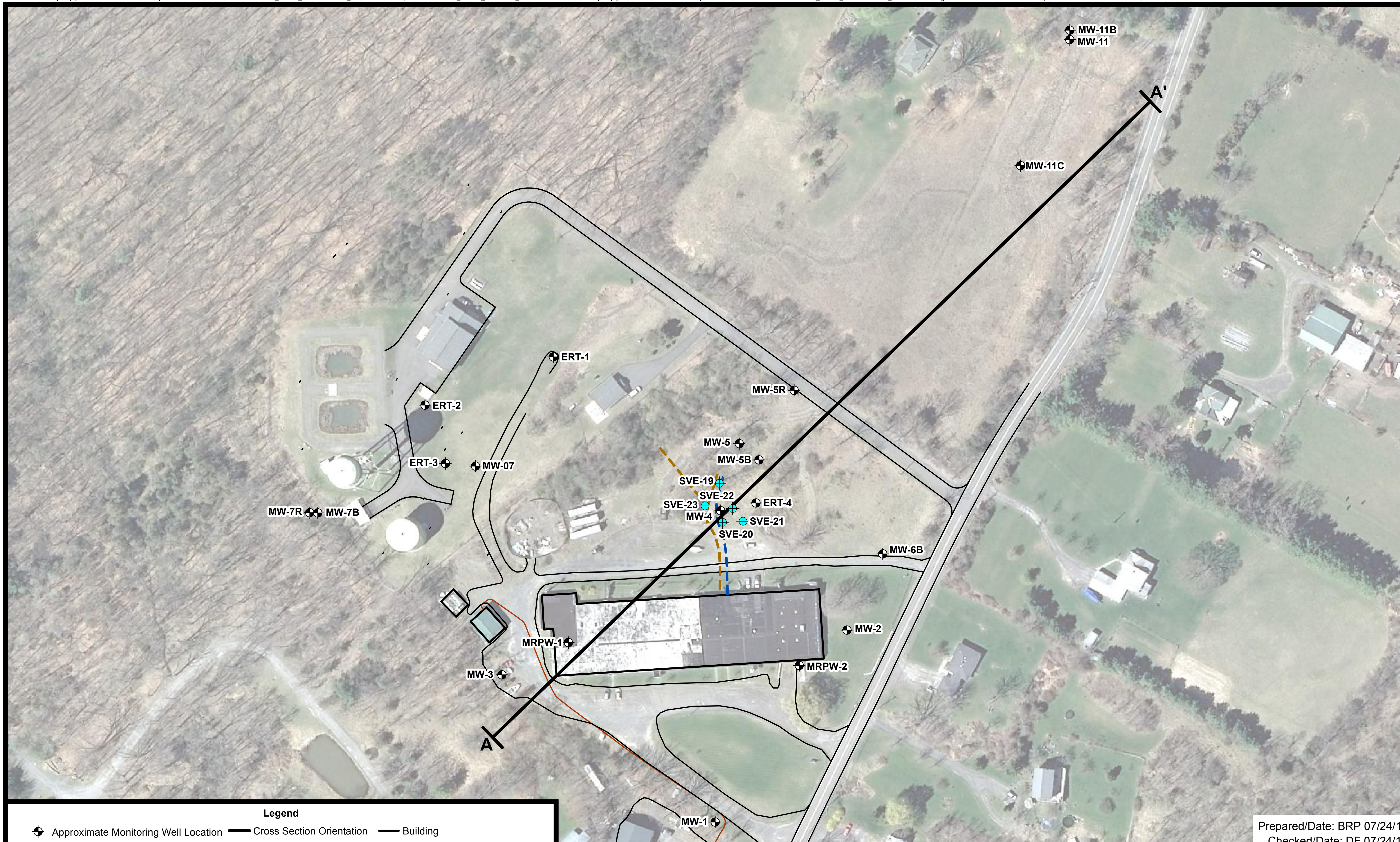
* -Soil analytical results will be compared to the 6 NYCRR Part 375 Soil Cleanup Objectives for Unrestricted Use.

** -Water analytical results will be compared to The NYS Class GA Groundwater Quality Standards from 6 NYCRR Parts 700-705.

APPENDIX A

CROSS SECTION

Document: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Cross_Section_Orientation_11x17LS.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM\4.0_Deliverables\4.5_Databases\GIS\Figures\Site Overview - Cross Section.pdf 07/24/2015 1:59 PM brian.peters



Legend

- Approximate Monitoring Well Location
- Approximate SVE Well Location
- Cross Section Orientation
- Approximate Sanitary Line
- Approximate Drain Line
- Building
- Road/Driveway/Parking
- Treatment System Discharge

N

0 65 130 Feet

Ulster County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 07/24/15
Checked/Date: DF 07/24/15

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Site Overview - Cross Section

Project 3617157346

Prepared/Date: WJW 07/06/15
Checked/Date: DF 07/06/15

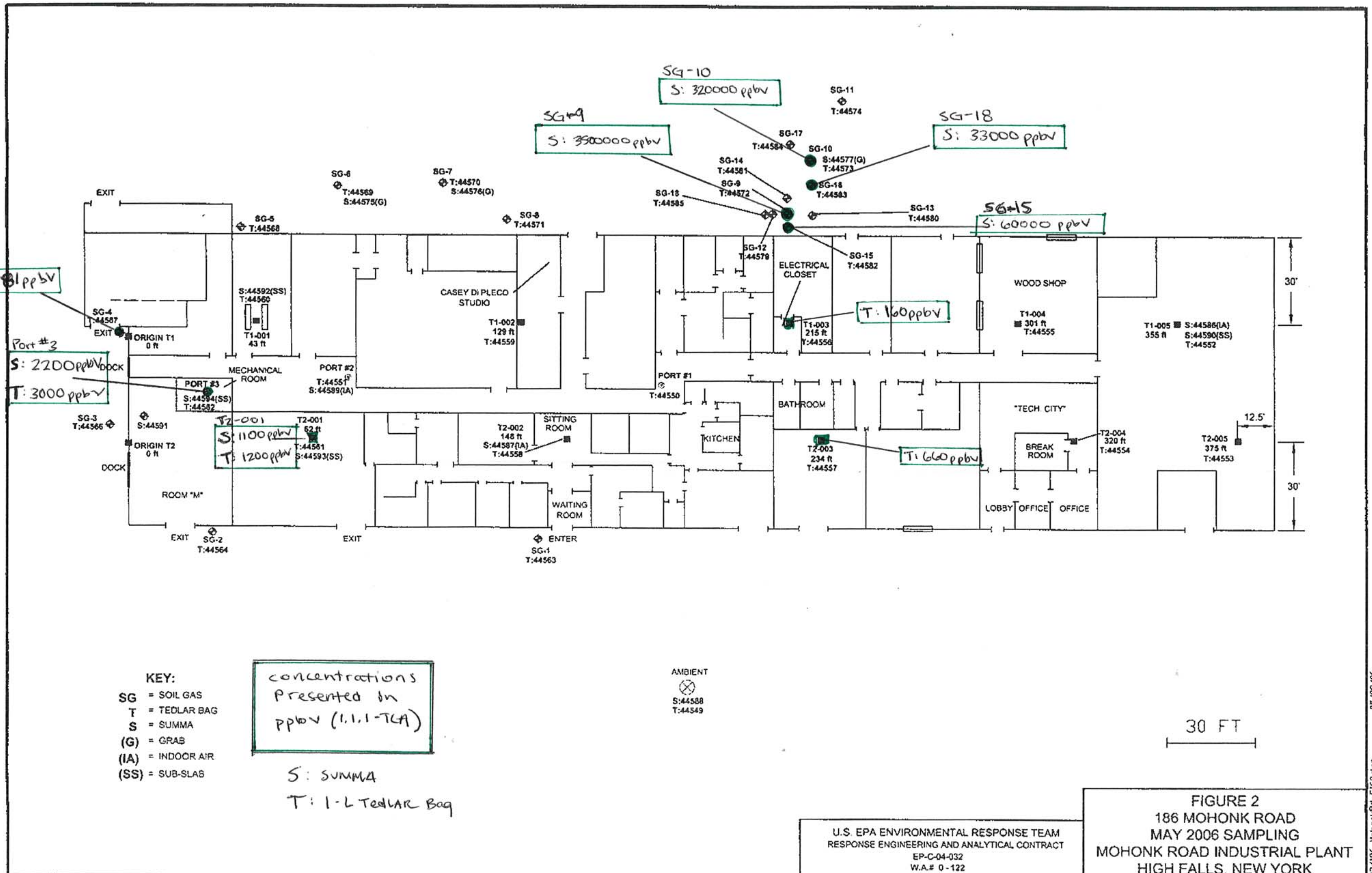
NYDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

ATTACHMENT 1
CROSS SECTION A-A
Project 3617-15-7346
Figure 1

APPENDIX B

HISTORICAL SOIL GAS DATA



Edits Prepared by: DF 6/3/15
Edits Checked by: HA 6/3/15

Table: 1
Comparison of Current and Historical Sub-Slab Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Sampling Events:
February 2005, March 2006, May 2006

LOCATION	PORT #1				PORT #2			
SAMPLE #	17885	0-122-001	44550	44550	17886	0-122-002	44551	44551
SAMPLE TYPE	S	S	T	T	S	S	T	T
ANALYSIS	SUMMA	SUMMA	TAGA	GC/MS	SUMMA	SUMMA	TAGA	GC/MS
DATE	Feb-05	Mar-06	May-06	May-06	Feb-05	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	5.3	4.3	4.4	U	5.3	4.7	8.7	8.3
TCA	72	32	70	61	140	97	20	240

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
U = Not Detected

Table: 2
Comparison of Sub-Slab Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Sampling Event: May 2006

LOCATION	PORT #3			T1-001			T1-002		T1-003		T1-004	
SAMPLE #	44594	44562	44562	44592	44560	44560	44559	44559	44556	44556	44555	44555
SAMPLE TYPE	S	T	T	S	T	T	T	T	T	T	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS	SUMMA (TO-15)	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	1600	1700	3200 D	1	0.87	U	0.4 J	U	9.6	14	0.24 J	U
TCA	2200	3000	2100	21	19	19	5.4	7.3	160	260	87	74

LOCATION	T1-005			T2-001			T2-002		T2-003		T2-004		T2-005	
SAMPLE #	44590	44552	44552	44593	44561	44561	44558	44558	44557	44557	44554	44554	44553	44553
SAMPLE TYPE	S	T	T	S	T	T	T	T	T	T	T	T	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS	SUMMA (TO-15)	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	U	72	58	1500	1300	1400D	3.9	5.2	4.9	0.22	DL=0.22	U	DL=0.22	U
TCA	64	0.23J	U	1100	1200	100D	95	130	660	1100 D	29	23	54	57

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
J = Estimated Value
DL = Detection Limit
D = Sample Diluted
U = Not Detected

Table: 3
Comparison of Soil Gas Results
Tedlar Bag TAGA Analysis and SUMMA Canister Results
186 Mohonk Road
REAC Sampling Event: May 2006

LOCATION	SG-1	SG-2	SG-3	SG-4	SG-5	SG-6		SG-7	
SAMPLE #	44563	44564	44566	44567	44568	44569	44575	44570	44567
SAMPLE TYPE	T	T	T	T	T	T	G	T	G
ANALYSIS	TAGA	TAGA	TAGA	TAGA	TAGA	TAGA	SUMMA (TO-15)	TAGA	SUMMA (TO-15)
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	DL=0.11	0.3 J	19	43	DL=0.11	DL=0.11	U	DL=0.11	0.92
TCA	1.3	20	39	81	0.8	6.2	1.88	4	0.08 J

LOCATION	SG-8	SG-9	SG-10		SG-11	SG-12
SAMPLE #	44571	44572	44573	44577	44574	44579
SAMPLE TYPE	T	T	T	G	T	T
ANALYSIS	TAGA	TAGA	TAGA	SUMMA (TO-15)	TAGA	TAGA
DATE	May-06	May-06	May-06	6-May	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	0.2 J	380	69 J	0.6	DL= 55	DL= 22
TCA	6.4	3500000	320000	74.5	1700	5100

LOCATION	SG-13	SG-14	SG-15	SG-16	SG-17	SG-18
SAMPLE #	44580	44581	44582	44583	44584	44585
SAMPLE TYPE	T	T	T	T	T	T
ANALYSIS	TAGA	TAGA	TAGA	TAGA	TAGA	TAGA
DATE	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	DL= 22	DL= 22	DL= 55	0.43	0.2 J	DL= 22
TCA	820	10000	60000	95	100	33000

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
G = Grab
DL = Detection Limit
J = Estimated Value
SG = Soil Gas

Note: DL=X
indicates a non-detect, with the DL for that sample listed, for TAGA results.

Table: 4
Comparison of TAGA Monitoring and Indoor Air Sampling Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Monitoring/Sampling Events:
March 2006, May 2006

LOCATION	ROOM "M"			PORT #2		
TAGA FLAG/SAMPLE #	FG	R1S1	44591	P1E1	L1M1	44589
ANALYSIS	TAGA	TAGA	SUMMA (TO-15)	TAGA	TAGA	SUMMA (TO-15)
DATE	Mar-06	May-06	May-06	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	0.9	1.3	0.91	0.98	0.53	0.4
TCA	NA	3.8	2.5	NA	1.2	0.7

LOCATION	T2-002			T1-005		
TAGA FLAG/SAMPLE #	DE	D1E1	44587	NA	NA	44586
ANALYSIS	TAGA	TAGA	SUMMA (TO-15)	TAGA	TAGA	SUMMA (TO-15)
DATE	Mar-06	May-06	May-06	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	0.7	0.32	0.39	NA	NA	0.2
TCA	NA	0.84	0.71	NA	NA	0.47

Key:
NA = No Data Collected

APPENDIX C

HEALTH AND SAFETY PLAN

MACTEC, Inc.

MACTEC Short Form HASP

Site: Mohonk Road Industrial Plant Job #/Task # 3617157346.02
Street Address: 186 Mohonk Road, Hamlet of High Falls, Marbletown, Ulster County, NY
Proposed Date(s) of Investigation: August 2015 – September 2015
Prepared by: Danielle Lerner Date: 7/7/2015
*Approved by: Kendra Bavor, CSP Date: 7/20/2015
Site Description: **(attach map)** The Mohonk Road Industrial Plant site is located on approximately 114 acres in the town of Marbletown, NY. This site is bordered to the southeast by Mohonk Road and large wooden lots in all other directions. A groundwater treatment system consisting of on-site extraction wells and an air stripper is currently in operation to remove volatile organic compounds. The site is active.

General Scope: The scope of work for the Mohonk Road Industrial Plant site includes a down-hole geophysical survey, environmental sampling of test pits, sampling of surface soils, sub-slab soils, and groundwater, and direst-push MIP sampling/drilling. Work will be inside and outside.

*Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

Tasks:

AMEC	Other contractor	Task Description
☒	☒	Overall inspection of the site
☒	☒	Geophysical Survey
☒	☒	Mobilization/demobilization
☒	☒	Test pitting
☒	☐	Surface soil sampling
☒	☐	Water level measurements
☒	☐	Groundwater sampling
☒	☒	Underground utility clearance
☒	☒	DirectPush MIP Sampling/Drilling
☒	☐	Sub-Slab Soil Sampling

Dates of Required Training and Medical Surveillance (add additional training topics, as required):

Job duties:	Field Team Lead	HSO/ Field Team	Field Team
Names:	**Josh Bowe**	**Brad Wolfe**	**Dylan Farrell**
	Dates	**Dates**	**Dates**
Medical Surveillance	5/11/15	8/19/2014	5/12/15
40-Hour Initial	5/19/06	5/23/1997	5/5/14
8-Hour Supervisor [1]	12/15/11		
8-Hour Refresher	3/10/15	8/21/2014	TBD
First Aid[2]	4/17/13	2/21/2014	8/23/14
CPR[2]	4/17/13	2/22/2014	8/23/14
Hazard Communication			3/26/14

[1] Required for Field Lead and Site Health and Safety Officer
[2] At least one worker must be trained in First Aid/CPR and should have received Bloodborne Pathogen Training

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern (COC) (Attach Fact Sheets*)	Maximum Concentrations		PEL/TLV
	Soil (mg/kg)	Water/Groundwater (µg/l)	
1,1,1-TCA	Unknown	Unknown	350 ppm/ STEL 450ppm
1,1-DCE	Unknown	Unknown	No PEL/1 ppm
1,1-dichloroethane (1,1-DCA)	Unknown	Unknown	100 ppm
Trichloroethene (TCE)	Unknown	Unknown	10 ppm/ STEL 100/ C 200 ppm
PCE	Unknown	Unknown	25 ppm/ STEL 100ppm/ C 200ppm
Ethylbenzene	Unknown	Unknown	100 ppm/ STEL 125ppm
Xylene	Unknown	Unknown	100 ppm/ STEL 150 ppm

*Workers must be made aware of the signs, symptoms, and first aid for each COC. Information is located on the COC fact sheets.

Air Monitoring Action Levels:

PID/FID Reading[1]	Detector Tube[1]	Dust Meter[1]	LEL[2]/O_2[1]	Action
≥ 5 ppm		Visible Dust		Use control measures for nuisance dust (ie. Spray with water) continue to monitor breathing zone with PID and dust meter. Backoff and reassess as Level C PPE required.
			≥ 10% LEL	Stop work. Evacuate area. Consider return with ventilation system and spark proof/intrinsically safe equipment.
			≤19.5% O_2	Stop work and evacuate area.

[1] Sustained readings measured in the breathing zone
[2] Readings at measured at the source (borehole, well, etc.)

Activity Specific AHAs:

☒	Mobilization/Demobilization and Site Preparation
☒	Field Work – General
☒	Field Work – Oversight
☒	Decontamination
☒	Utility Clearance Activities
☒	Groundwater Sampling
☒	Soil Sampling
☒	Environmental Drilling Operation
☒	Poisonous Plants
☒	Excavations and Backfilling

Hazard Specific AHAs:

☒	Insect Stings and Bites
☒	Geophysical Survey
☒	Working with Preservatives (Acids)
☒	Geoprobe Soil Sampling
☐	
☐	
☐	
☐	

HAZARD IDENTIFICATION SUMMARY

Complete the checklist for summarizing the hazards identified in the JHAs

Standard Hazards			
☐ Falling Objects	☒ Slips and trips	☒ Pinch points	☒ Rotating equipment
☒ Falls	☒ Power equipment/tools	☐ Elevated work surfaces	☐ ________________

Eye Hazards

☒ Particulates	☒ Liquid splashes	☐ Welding Arc	☐ ________________

Hearing Hazards

☐ None	☒ Impact noise	☒ High frequency noise	☒ High ambient noise

Respiratory Hazards

☐ None	☒ Dust/aerosols/particulates	☒ Organic Vapors	☐ Acid Gases	☐ O_2 deficient	☐ Metals	☐ Asbestos

Chemical Hazards

☐ None	☒ Organic solvents	☐ Reactive metals	☐ PCBs
☒ Acids / bases	☐ Oxidizers	☒ Volatiles/Semi-volatiles	☐ _________________

Environmental Hazards

☐ None	☒ Cold Stress	☒ Heat Stress	☒ Wet location	☒ Bio hazards (snakes, insects, spiders, poisonous plants, etc.)
☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	☐ _________________	

Electrical Hazards

☐ None	☐ Energized equipment or circuits	☒ Overhead utilities	☒ Underground utilities	☐ Wet location

Fire Hazards

☒ None	☐ Cutting, welding, or grinding generated sparks or heat sources	☐ Flammable materials present	☐ Oxygen enriched location

Ergonomic Hazards

☒ Lifting	☒ Bending	☐ Twisting	☐ Pulling/tugging	☐ Repetitive motion	☒ Carrying
Computer Use in the: ☐ Office ☒ Field			☐ ________________	☐ ________________	

Radiological Hazards

☒ None	☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron	☐ Radon	☐ Non-Ionizing

Other Hazards

☐

PPE and Monitoring Instruments

Initial Level of PPE *

☐ Level D	☒ Modified Level D	☐ Level C	* Cannot use Short Form HASP for Level B or A work

Standard PPE

☒ Hard Hat	☒ Safety boots	☒ Safety glasses	☐ Chem. Resistant Boots	☒ High visibility vest	☐ Other:_____

Eye and Face Protection

☐ Face shield	☐ Vented goggles	☐ Unvented goggles	☐ Indirect vented goggles

Hearing Protection

☒ Ear plugs	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other ______________

Respiratory Protection

☒ None	☐ Dust mask	☐ Full Face APR	☐ Half Face APR	Cartridge Type: _____	Change Cartridges: _____

Protective Clothing			
☒ Work uniform	☐ White uncoated Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex®
☐ Boot covers	☒ Reflective vest	☐ Chaps or Snake Legs	☐ Other ___

Hand Protection					
☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Glove liners	☐ Cut-resistant gloves	☐ Other ______________
☒ Outer Gloves: List Type______Nitrile_________			☒ Inner Gloves: List Type__Nitrile_____________		

Monitoring Instruments Required*

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

- When work begins on a different portion of the site.
- When contaminants other than those previously identified are being handled.
- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.)
- When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)

☒ LEL/O2 Meter	☒ PID:	☐ 10.0-10.6 eV Lamp ☒ 11.7 eV Lamp	☐ FID	☐ Hydrogen Sulfide/Carbon Monoxide
☐ Dräger Pump (or equivalent) List Tubes _____	☐ Dust Meter:	☐ Respirable dust ☐ Total dust	☐ Other Micro Rem Radiation Meter	

*Monitoring instruments will be calibrated daily in accordance with manufacturer's instructions. Results will be recorded in the field logbook.

Chemicals Brought to the Site:
List all chemicals brought to the site (e.g., preservatives, decon solutions, calibration gases, gasoline, etc.).

Chemicals (Note: Name listed must match name on label and MSDS)	**SDS Attached?**
HYDROCHLORIC ACID	☒
NITRIC ACID	☒
ISOBUTYLENE IN AIR	☒
LIQUINOX	☒
HANNA PH 4 BUFFER SOLUTION PH 4.01	☒
HANNA PH 7 BUFFER SOLUTION PH 7.01	☒
HANNA 1413 CONDUCTIVITY CALIBRATION SOLUTION	☒
HI 7021 240 MV ORP SOLUTION	☒
OAKTON ZERO OXYGEN SOLUTION	☒

Chemicals will be kept in their original containers. If transferred to another container, aside from days use by one individual, the new container will be labeled with the name of the chemical and the hazard warnings.

Work Zones:
The work zones will be defined relative to the location of the work activity. The Exclusion Zone is considered the area within a 10-foot diameter of the sampling location. The Contamination Reduction Zone is considered to be the area with in a 20-foot diameter of the sampling location. The decontamination zone is to be located upwind of the work area. Work zones will be maintained through the use of:

☒ Warning Tape
☒ Cones and Barriers
☒ Visual Observations

Decontamination Procedures and Equipment:
Note: See Decontamination JHA for further information

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Gloves Wash and Rinse	Scrub outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Glove Removal	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-

		down station may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots (if worn), outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	Remove outer boots (if worn) and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask (Level C only) Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	Boots (if worn), chemical resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6:	Face Piece Removal (Level C only)	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Site Communication:

☒ Verbal
☐ Two-way radio
☒ Cellular telephone
☒ Hand signals

- Hand gripping throat ____________ Out of air, can't breathe
- Grip partner's wrist or both hands around waist ____________ Leave area immediately
- Hands on top of head ____________ Need assistance
- Thumbs up ____________ OK, I am all right, I understand
- Thumbs down ____________ No, negative

☐ Horn
☐ Siren
☐ Other:

EMERGENCY CONTACTS

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Fire Department:	911		
Hospital: St. Luke's Cornwall Hospital Center	845-256-0253		
WorkCare (Early case management)	1-888-449-7787		
Police Department:	911		
	Office	**Cell**	
Site Health And Safety Officer: Bradley Wolfe	207-828-2627	925-323-4082	

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Client Contact: Joshua Haugh	518-402-9814		
Project Manager: Jayme Connolly	207-828-3455	207-205-3155 (Cell)	
*Division EH&S Manager: Cindy Sundquist	207-828-3309	207-650-7593 (Cell) 207-892-4402 (Home)	
Kendra Bavor, HSE Coordinator	207-775-5401	207-650-8671 (cell)	
Corporate VP of HSE – Vlad Ivensky	610-877-6144	484-919-5175 (Cell) 215-947-0393 (Home)	
EPA/DEP (if applicable):			
OTHER: Ambulance	911		

*See Incident Flow Chart for additional Group HSE Manager's Contact Information

Emergency Equipment:
The following emergency response equipment is required for this project and shall be readily available:

- ☒ Field First Aid Kit (including bloodborne pathogen kit/supplies)
- ☐ Fire Extinguisher (ABC type)
- ☐ Eyewash (Note: 15 minutes of free-flowing fresh water)
- ☐ Other: ______

EMERGENCY PROCEDURES

- The HSO (or alternate) should be immediately notified via the on-site communication system. The HSO assumes control of the emergency response.
- The HSO notifies the Project Manager and client contact of the emergency.
- If the emergency involves an injury to an AMEC employee, the HSE Coordinator or Field Lead are to implement the AMEC Early Injury Case Management program. See procedures and Flow Diagram below:
- If applicable, the HSO shall notify off-site emergency responders (e.g. fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the HSO evacuates the site. Site workers should move to the predetermined evacuation point (See Site Map).
- For small fires, flames should be extinguished using the fire extinguisher. Large fires should be handled by the local fire department.
- In an unknown situation or if responding to toxic gas emergencies, appropriate PPE, including SCBAs (if available), should be donned. If appropriate PPE is unavailable, site workers should evacuate and call in emergency personnel.
- For chemical spills, follow the job specific JHA for spill containment
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash and wash affected area. Site worker should shower as soon as possible after incident.
- If the emergency involves toxic gases, workers will back off and reassess. Prior to re-entering the work zone, the area must be determined to be safe. Entry will be using Level B PPE and utilize appropriate monitoring

equipment to verify that the site is safe.

- An injured worker shall be decontaminated appropriately.
- Within 24 hours after any emergency response, the Incident Analysis Report (and Vehicle Incident Report if vehicle incident) shall be completed and returned to the Group HSE Manager. Injuries requiring medical treatment beyond first aid (as well as work-related vehicle incidents) will require the employee to submit a post incident drug test.

AMEC Early Injury Case Management Program

NON-EMERGENCY INCIDENT	EMERGENCY INCIDENT
Steps 1 & 2 must be completed before seeking medical attention other than local first aid. 1. Provide first-aid as necessary. Report the situation to your immediate supervisor AND HSE coordinator (all incidents with the apparent starting event should be reported within 1 hour of occurrence). 2. Injured employee:	1. Provide emergency first aid. Supervisor on duty must immediately call 911 or local emergency number; no employee may respond to outside queries without prior authorization. Any outside media calls concerning this incident must be referred immediately to Lauren Gallagher at 602-757-3211. 2. Once medical attention is sought and provided, the supervisor must:
Call WorkCare 24/7 Hotline* (888) II-XPRTS or (888) 449-7787	
WorkCare will assess the situation and determine whether the incident requires further medical attention. During this process, WorkCare will perform the following: • Explain the process to the caller. • Determine the nature of the concern. • Provide appropriate medical advice to the caller. • Determine appropriate path forward with the caller. • Maintain appropriate medical confidentiality. • Help caller to execute path forward, including referral to the appropriate local medical facility. • Send an email notification to the Corporate HSE Department.	WorkCare will be responsible for performing the following: • Contact the treating physician. • Request copies of all medical records from clinic. • Send an email update to the Corporate HSE Department.

3. IMMEDIATELY after contacting WorkCare send a brief email notification AND inform verbally (direct contact is required) ONE of HSE corporate representatives See Figure 11.3.
4. Make all other local notifications and client notifications.
5. Local Supervisor, HSE Coordinator, SSHO and any applicable safety committees to complete preliminary investigation, along with the initial Incident Report within 24 hours.
6. Corporate Loss Prevention Manager to complete Worker's Compensation Insurance notifications as needed.
7. Corporate HSE to conduct further incident notifications, investigation, include in statistics, classify, and develop lessons learned materials.

* - **NOTE: Step 2 is only applicable to the North-American operations and to incidents involving AMEC personnel. High potential near misses, subcontractors' incidents, regulatory inspections, spills and property damages above $1,000 should be reported immediately, following directions from Step 3.**

Site Specific Procedures are as follows:

Site personnel will not enter test pits. Any samples will be collected from the backhoe bucket or some other means of remote sampling.
Control work zone to protect workers, general public, and site workers.

INCIDENT FLOW CHART

Incident Flow Chart

amec

Call Immediately

Incident Occurs → Emergency → CALL 911 Emergency → Supervisor Immediately Calls After Medical Attention is Sought and Provided → Contact Supervisor, HSE Coordinator and WorkCare 24/7 Hotline (888) 449-7787

Incident Occurs → Non-Emergency → Contact Supervisor, HSE Coordinator and WorkCare 24/7 Hotline (888) 449-7787

Verbally Contact One HSE Representative Below Within 2 Hours

E&I Corporate HSE Department Contact List

Name/Email	Office Location	Contact Information
Bruce Voss bruce.voss@amec.com	Cathedral City, CA	760.202.3737 (office) 951.897.6381 (cell)
Chad Barnes chad.barnes@amec.com	Phoenix, AZ	602.733.6000 (office) 480.495.9846 (cell)
Cindy Sundquist cynthia.sundquist@amec.com	Portland, ME	207.828.3309 (office) 207.650.7593 (cell) 207.892.4402 (home)
Don Kubik don.kubik@amec.com	Oakland, CA	510.663.4100 (office) 510.368.6433 (cell)
Gabe Sandholm gabe.sandholm@amec.com	Minneapolis, MN	612.252.3785 (office) 206.683.9190 (cell)
John Mazur john.mazur@amec.com	Wilmington, NC	910.444.2978 (office) 910.431.2330 (cell) 910.681.0538 (home)
Lori Dowling lori.dowling@amec.com	Prince George, BC	250.564.3243 (office)
Philip Neville philip.neville@amec.com	Thorold, ON	905.687.6616 (office) 905.380.4465 (cell)
Tim Kihn tim.kihn@amec.com	Edmonton, AB	780.944.6363 (office) 780.717.5058 (cell)
Vladimir Ivensky (can call 247) vladimir.ivensky@amec.com	Plymouth Meeting, PA	610.877.6144 (office) 484.919.5175 (cell) 215.947.0393 (home)
Kirby Lastinger kirby.lastinger@amec.com	Lakeland, FL	836-667-2345 x207 (office) 863-272-4775 (cell)

**High potential near misses, subcontractor incidents, regulatory inspections, spills, and property damage should be reported within 60 minutes to one of the above HSE Representatives.*

Revised Sept2014-hb

FIELD TEAM REVIEW: I acknowledge that I understand the requirements of this HASP, and agree to abide by the procedures and limitations specified herein. I also acknowledge that I have been given an opportunity to have my questions regarding the HASP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Name: ______________________________ Date: ____________________

Name: ______________________________ Date: ____________________

Name: ______________________________ Date: ____________________

Name: ______________________________ Date: ____________________

Name: ______________________________ Date: ____________________

MACTEC, Inc.

Routes to Emergency Medical Facilities

HOSPITAL(for immediate emergency treatment):

Facility Name: St. Luke's Cornwall Hospital Center

Address: 279 Main Street, New Paltz, NY 12561

Telephone Number: (845) 256-0253

DIRECTIONS TO PRIMARY HOSPITAL (attach map):

CLINIC (for non-emergency medical treatment):

Facility Name: New Paltz Family Health Center

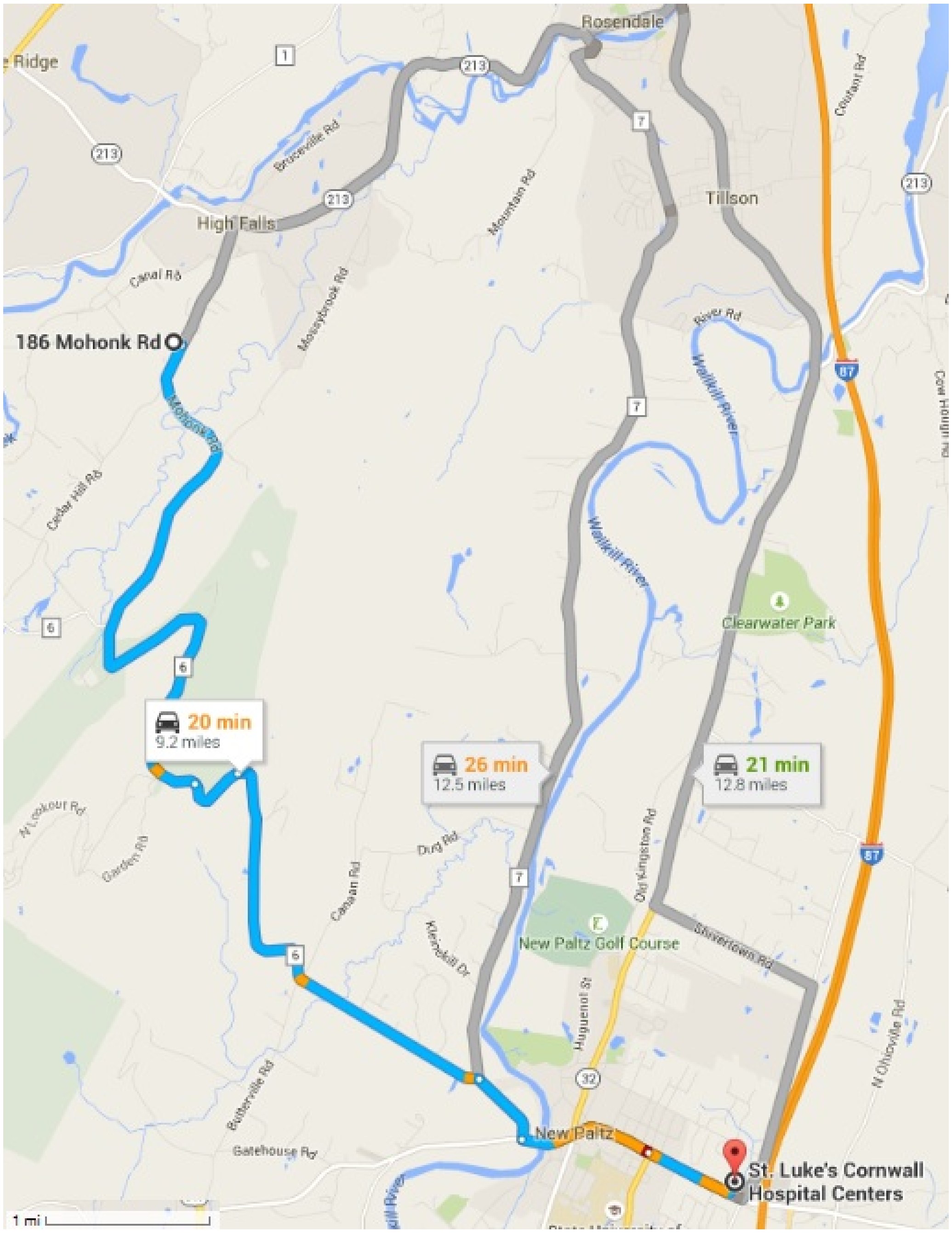
Address: 239 Golden Hill Drive, Kingston, NY 12401

Telephone Number: (845) 340-4000

DIRECTIONS TO CLINIC (attach map):

MACTEC, Inc.

Directions to Emergency Room at St. Lukes Cornwall Hospital Center:



Start:
186 Mohonk Rd
High Falls, NY 12440, US

End:
St. Lukes Cornwall Hospital Center
279 Main Street, New Paltz, NY 12561, US

Site-Specific Health and Safety Plan

Routes to Emergency Medical Facilities

PRIMARY HOSPITAL:

Facility Name: St. Luke's Cornwall Hospital Centers
Address: 279 Main Street, New Paltz, NY 12561, US
Telephone Number (845) 256-0253

via Mohonk Rd and Mountain Rest Rd — 20 min

16 min without traffic · Show traffic — 9.2 miles

186 Mohonk Rd
High Falls, NY 12440

Head southwest on Co Rd 6a/Mohonk Rd
Continue to follow Mohonk Rd
4.2 mi

Continue onto Mt Rest Rd
0.4 mi

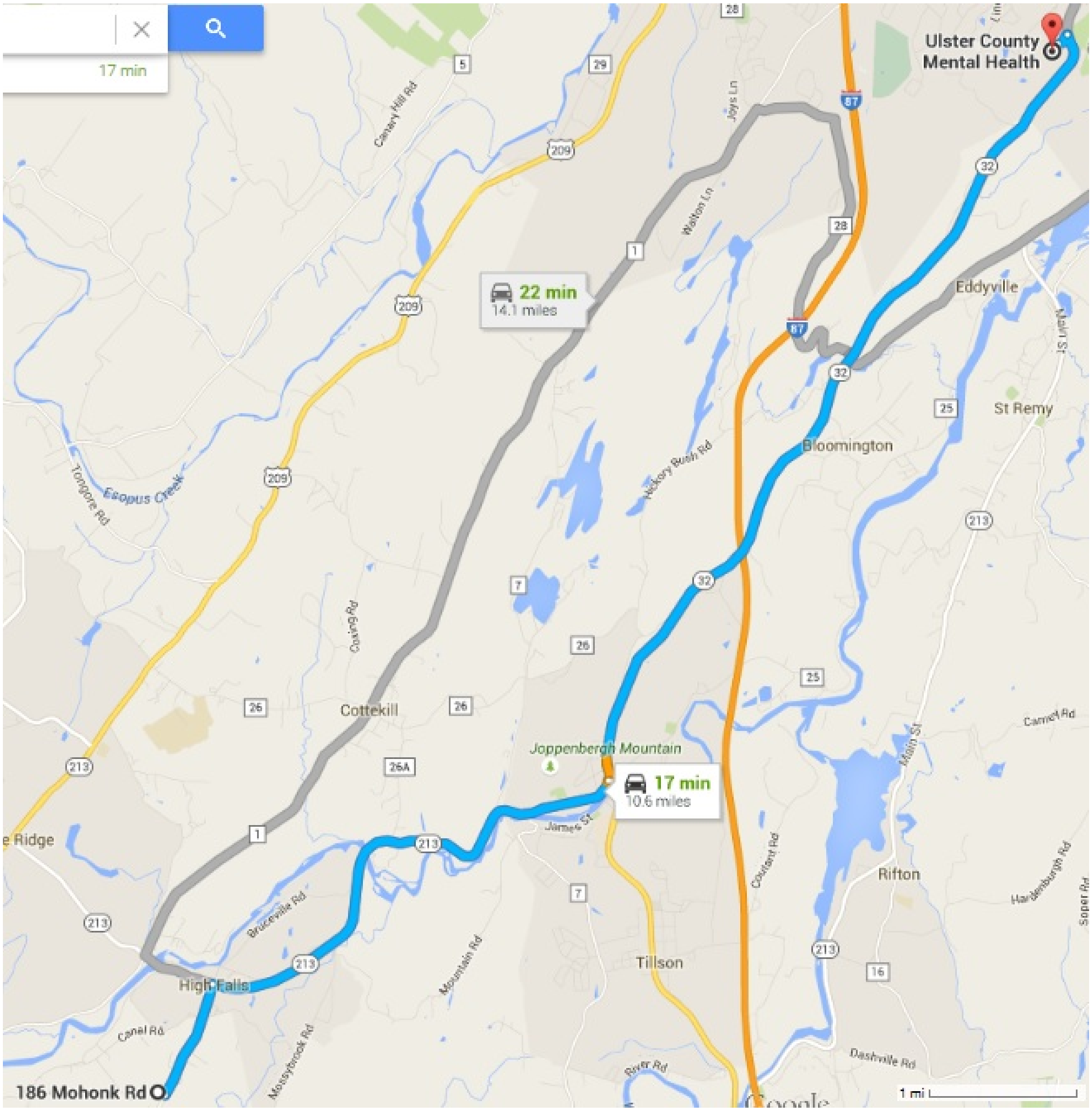
Continue onto Mountain Rest Rd
2.8 mi

Slight right onto Springtown Rd
0.5 mi

Turn left onto NY-299 E
0.8 mi

Continue straight onto NY-299 E/Main St
Destination will be on the left
0.5 mi

St. Luke's Cornwall Hospital Centers
279 Main Street #203, New Paltz, NY 12561



Start:
186 Mohonk Rd
High Falls, NY 12440, US

End:
Ulster County Mental Health
239 Golden Hill Dr, Kingston, NY 12401

MACTEC, Inc.

ALTERNATE HOSPITAL

Facility Name: Ulster County Mental Health
Address: 239 Golden Hill Drive, Kingston, NY 12401
Telephone Number (845) 340-4000

via NY-213 E and NY-32 N — 17 min
15 min without traffic · Show traffic — 10.6 miles

186 Mohonk Rd
High Falls, NY 12440

- Head northeast on Co Rd 6a/Mohonk Rd
  0.8 mi
- Turn right onto NY-213 E
  3.5 mi
- Turn right toward NY-213 W/NY-32 N
  112 ft
- Turn left onto NY-213 W/NY-32 N
  Continue to follow NY-32 N
  6.1 mi
- Turn left onto Golden Hill Dr
  0.1 mi
- Turn left to stay on Golden Hill Dr
  Destination will be on the right
  341 ft

Ulster County Mental Health
239 Golden Hill Drive, Kingston, NY 12401

Site-Specific Health and Safety Plan
DAILY TAILGATE SAFETY MEETING CHECKLIST

MACTEC, Inc.

Project: ______________________ Site: ______________________
Date: Location: ______________________

To be reviewed on the first day of site activities and when new workers arrive on site:

Alternate for Health & Safety: ______________________
Location of on-site HASP: ______________________
Site training requirements: See HASP
Specific medical surveillance requirements: See HASP

Agenda:

During the project, one or more of the agenda items could be selected for the required daily site training.

Date __ __ __ __ __ __ __

Check-off:

1.	Planned work for this day (discuss – include review of applicable JHAs)	☐	☐	☐	☐	☐	☐	☐
2.	Physical hazards and controls (discuss/review)	☐	☐	☐	☐	☐	☐	☐
3.	Chemical hazards and controls (discuss/review)	☐	☐	☐	☐	☐	☐	☐
4.	Biological hazards and controls (discuss/review)	☐	☐	☐	☐	☐	☐	☐
5.	Personal protective equipment Modified D	☐	☐	☐	☐	☐	☐	☐
6.	Personal protective equipment required per the hazard assessment in JHA:	☐	☐	☐	☐	☐	☐	☐

SPECIFY TYPE

Protective coveralls	______________________
Safety glasses/goggles	ANSI approved
Hard hat	ANSI approved
Foot protection	Safety toe boots & overboots
Work gloves	______________________
Chemical gloves	Nitrile outer, nitrile inner
Hearing protection	______________________
Other	______________________

7.	Review inspection, decon, and maintenance procedures and the limitations of the above stated PPE.	☐	☐	☐	☐	☐	☐	☐
8.	Decontamination procedure (discuss/review)	☐	☐	☐	☐	☐	☐	☐
9.	Exclusion zone maintained	☐	☐	☐	☐	☐	☐	☐
10.	Site emergency response plan (discuss/review)	☐	☐	☐	☐	☐	☐	☐
11.	Signs and symptoms of overexposure to chemicals anticipated on site	☐	☐	☐	☐	☐	☐	☐
12.	General health and safety rules	☐	☐	☐	☐	☐	☐	☐
13.	Specific health and safety requirements relating to site activities including: (discuss/review)	☐	☐	☐	☐	☐	☐	☐
14.	Drilling/boring	☐	☐	☐	☐	☐	☐	☐
15.	UST	☐	☐	☐	☐	☐	☐	☐
16.	Excavations (including UG utility locations)	☐	☐	☐	☐	☐	☐	☐
17.	Heavy equipment	☐	☐	☐	☐	☐	☐	☐
18.	Slips, trips, and falls	☐	☐	☐	☐	☐	☐	☐
19.	Lockout/tagout	☐	☐	☐	☐	☐	☐	☐
20.	Working in temperature extremes	☐	☐	☐	☐	☐	☐	☐
21.	Rain or other weather advisories	☐	☐	☐	☐	☐	☐	☐
22.	Other health & safety issues (discuss/note)	☐	☐	☐	☐	☐	☐	☐
23.	Issued Daily Work Permit	☐	☐	☐	☐	☐	☐	☐

I have participated in the daily safety meeting discussing the topics indicated and fully understand my responsibility for complying with all health and safety requirements. I have had the opportunity to have my questions on site health and safety issues and procedures answered.

Employee Name	**Employee Signature**	**Date**

PPE Selection Guidelines

When selecting the appropriate PPE for the job, consider the following:

- **Safety glasses** – general eye protection – source of hazard, typically coming from straight on, required at most sites
- **Tinted Safety Glasses** – same as above, but when working in direct sunlight. May need two both tinted and untinted if working in both sunlight and shade/overcast skys.
- **Safety goggles** – needed for splash hazard, more severe eye exposures coming from all directions. Non-vented or indirect venting for chemical splash, non-vented for hazardous gases or very fine dust, vented for larger particulates coming from all directions.
- **Face shield** – needed to protect face from cuts, burns, chemicals (corrosives or chemicals with skin notation), etc.
- **Safety boots** – needed if danger of items being dropped on foot that could injure foot
- **Hard hat** – danger from items falling on head – any overhead work, tools, equipment, etc that is above the head and could fall on head of item fails, or falls off work platform. Typically required at most sites as a general PPE
- **Thin, chemical protective inner gloves** (e.g., thin Nitrile, PVC – do not use latex – many people are allergic to latex) –needed to protect hands from incidental contact with low risk contamination at very low concentrations (ppb or low ppm concentrations in groundwater or soil) or used in combination with outer gloves as a last defense against contamination. Need to specify type
- **Outer gloves** – thicker gloves (e.g., Nitrile, Butyl, Viton, etc.) – used when potential for high concentrations of contaminants (e.g., floating product, percent ranges of contaminant, opening drums, handling pure undiluted chemicals, etc.). Need to specify type.
- **Leather gloves, leather palm, cotton** – good in protecting hands against cuts – no protection from chemicals. May be used in combination with chemical protective gloves.
- **Boot Covers –** when there is contamination in surface soils or waking surface in general. When safety boots need protection from contact with contaminants.
- **White (uncoated) Tyveks** – protect clothing from getting dirty, good for protection against solid, non-volatile chemicals (e.g., asbestos, metals) – no chemical protection.
- **Polycoated Tyveks** – least protective of chemical protective clothing. Used when some risk of contamination getting on skin or clothing. Usually, lower ppm ranges of contaminants.
- **Saranex** – Greater protection against contamination than Polycoated Tyveks. Used to protect against PCBs or higher concentrations of contaminants in the soil or groundwater.
- **Other Chemical protective clothing** – if significant risk of dermal exposure, contact H&S to determine best kind.
- **Long sleeved shirts, long pants** – if working in areas with poison ivy/oak/sumac, poisonous insects, etc. and no chemicals exposure. May want to use uncoated Tyveks for work in areas where poisonous plants are know to be to protect clothing.
- **Cartridge Respirator (Level C PPE)** – Need to calculate change schedule (contact Division EH&S Manager for this) to determine length of use. To be able to use cartridge respirators, need to know contaminants, estimate levels to be encountered in the breathing zone, need to ensure that cartridge will be effective against COCs, and need to be able to monitor for COCs using PID, FID, Dräger tubes, etc.. If can't do any of these, then Level B PPE is probably going to be needed.
- **High Visibility Vest** – needed for any road work (with in 15 feet of a road) or when working on a site with vehicular traffic or working around heavy equipment. Needed if work tasks would take employee concentration away from movement of vehicles and workers would have to rely on the other driver's ability to see the employee in order not to hit them. This includes heavy equipment as well as cars and trucks, on public roads or the jobsite. Not needed if wearing Polycoated Tyveks – as they are already high visibility.
- **Reflective Vest** – see above, but for use at night.
- **Hearing Protection** – needed if working at noise levels above 85 dBA on a time weighted average. If noise measurements are not available, use around noisy equipment, or in general, if you have to raise your voice to be heard when talking to someone standing two feet away.
- **Protective Chaps –** required when using a machete or chain saw or any other cut hazard to legs.

Incident Report Forms

Check one
Initial Report: ☐
Update: ☐
Final Report: ☐ ___

INCIDENT ANALYSIS REPORT
AMEC Environment & Infrastructure
Confidential - Privileged

Incident Potential
Letter: Select One
Number: Select One
Investigation Level: Select One

Group: Select One HSE Manager: ____ Incident Review Panel Team (if applicable): ____

Incident Date: _____ Report Date: _____

Section 1 – General Information

Employee Name: ____ Sex: ☐ M ☐ F Date of Birth: ____ Age Range: Select One Time of incident: ____ ☐ am | ☐ pm

Job Position: Select One Hire Date: ____ Time employee began work: _____

Business Line: Select One Department Number: ____ Project Manager: ____

Project Name: ____ Project Number: ____ Client: ____

Office where employee works from: ____ Immediate Supervisor: ____ Hours employee worked during last 7 days: ____ hrs

Location: Select One Is this a Company controlled work site: ☐ Yes ☐ Incident Assigned to: Select One

Location description: ____

Section 2 – Incident Type - Process (mark at least ONE BOLD TYPE and all that apply)

☐ **Fatality** ☐ **Environmental** ☐ **Injury/Illness Incident** If Injury/illness: Select One

☐ **Security** ☐ **Near Miss / Hazard ID** ☐ **Property Damage** If Damage: Select One ☐ 3rd Party?

☐ Hospitalization ☐ Regulatory Inspection ☐ Notice of Violation or Citation ☐ Agency Reportable?

☐ Motor Vehicle Incident Involving Injury ☐ Other (describe): ___

Outcome/Result: Select One Source of Hazard: Select One If "other", specify: ___ Immediate Cause: Select One

A. If **injury/illness**: Indicate the part of the body: Select One If "other", specify: ___
Indicate body part location: Select One If "other", specify: ___
Injury Type: Select One If "other", specify: ___ Illness Type: Select One If "other", specify: ___

B. If **property damage**: describe what happened and estimate ($) of damage to all objects involved? ___

C. If **environmental**: Type of Environmental incident?: Select One Name, CAS#, physical state and quantity? ___
Receiving Environment?: Select One Mechanism of Incident?: Select One If "other", specify: ___
Nature of Breach?: Select One Duration of Breach?: Select One

D. If **security**: Security Incident Type: Select One If Physical: Select One If Criminal: Select One If Intellectual: Select One

E. If an **inspection by a regulatory agency**, what agency, who were the inspectors, inspector contact information? ___

Section 3 – Incident Description

Attach and number additional pages, as needed, to ensure all details related to the incident are captured.

A. List the names of all persons involved in the incident, and employer information: ___

B. List the names of any witnesses, their employer, and a local/company telephone number or address: ___

C. Name of Employee's supervisor: ___ Contact phone number for supervisor: ___

D. What specific job/task or action was the employee(s) doing just prior to the incident: ___

E. Was a tool or equipment involved? ☐ Yes ☐ No What was it: ___ Last Inspection Date: ___Defects: ___

F. Explain in **detail** what happened: ___

G. Explain in **detail** what object or substance directly harmed the employee: ___

H. What were the weather conditions at time of incident?: ____

I. What was the lighting like at time of incident? Bright ☐ Shadows ☐ Dark ☐ Other: ____

J. List any damaged equipment or property (other than motor vehicles). Provide model and serial number **and** estimated costs to repair/replace damaged equipment or property, if applicable: ____

Section 4 - Incident Analysis

A. Was a Health and Safety Plan (HASP) or Activity Hazard Analysis (AHA) completed for the work being performed? ☐ Yes ☐ No
If "yes", Who prepared the document?: ____

B. Who and when was the last manager (Project, Unit, etc.) at the site of the incident?: ____

C. When and what safety training **directly related** to the incident has the person(s) involved had?: ____

D. List attached documentation (HASP acknowledgement forms, kickoff/daily/weekly meetings, inspections, photographs): ____

Section 5 - Incident Investigation Results and Corrective Actions

This section to be completed by the Group HSE Manager/IRP with support from location where incident occurred.

Causal Factors (Acts or Omissions / Conditions)

(Attach and number any additional pages as needed to completely address this section)

	IMMEDIATE CAUSE	IMMEDIATE CAUSE SUB-TYPE	DESCRIPTION
1	Select One	_____	_____
2	Select One	_____	_____
3	Select One	_____	_____
4	Select One	_____	_____

Root Cause(s) Analysis - The below items represents major root cause categories which have been determined to be Less Than Adequate (LTA). A more detailed determination of the root cause will be facilitated, if needed, by the applicable Group HSE Manager / IRP.

	ROOT CAUSE TYPE	ROOT CAUSE SUB-TYPE	DESCRIPTION
1	Select One	_____	_____
2	Select One	_____	_____
3	Select One	_____	_____
4	Select One	_____	_____

Corrective Actions

Root Cause #	Corrective Actions Taken (Attach additional pages as needed to completely address this section)	Responsible Person	Proposed Completion Date	Closed on Date	Verified by and Date Verified
_____	____	____	____	____	____
_____	____	____	____	____	____
_____	____	____	____	____	____
_____	____	____	____	____	____
_____	____	____	____	____	____

Section 6 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

Auto Insurance Carrier was called ☐ **Group HSE Manager Notified** ☐

WorkCare was called ☐ **Post-incident Drug/Alcohol Testing Performed** ☐

Incident Report prepared by: ___

Employee (s): ___	Date: ___	Employee's Supervisor: ___	Date: ___
HSE Coordinator/Project/Unit Manager: ___	Date: ___	Group HSE Manager:___	Date: ___

ATTACHMENT 2

VEHICLE INCIDENT REPORT

Confidential - Privileged

Section 1 - General Information Date of Incident: _____

Time incident occurred: _____ ☐ am | ☐ pm | Illumination: ☐ Dark ☐ Dusk ☐ Light | Road Condition: ☐ Dry ☐ Wet ☐ Icy/snow
Were police summoned to scene? ☐ Yes ☐ No Police Department and Location: _____
Report #; _____ Officer's Name: _____ Officer's Badge Number: _____

Section 2 - Company Driver and Vehicle

Driver's name: _____ D/L #: _____ State: _____

Driver's home office address: _____ Driver's Phone #: _____

Company Vehicle #: _____ Year: _____ Model: _____ License #: _____ State: _____

Company car?: ☐ Yes ☐ No Personal Vehicle?: ☐ Yes ☐ No Rental Vehicle?: ☐ Yes ☐ No

If rental, rented from: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage to vehicle: _____

Was an employee injured?: ☐ Yes ☐ No If yes, please describe: _____

Injuries to others?: ☐ Yes ☐ No If yes, please describe: _____

Vehicle was being used for: Company business ☐ Yes ☐ No Personal business ☐ Yes ☐ No

Towed?: ☐ Yes ☐ No If yes, by whom?: _____ To Where?: _____

Section 3 - Other Driver and Vehicle Information

Driver's Name: _____ D/L # : _____ State: _____

Current address: _____ City: _____ State: _____

Telephone: _____ Work: _____ Cell: _____

Registered Owner's Name: _____ Address: _____ City: _____ State: _____

(verify registration document)

The Other Vehicle: Make: _____ Model: _____ Year: _____ License #: _____ State: _____

Insurance company name: _____ Address: _____ Phone #: _____

Policy No.: _____ Contact Person: _____ Phone #: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage: (*Make note of pre-existing damage and take pictures if possible – you may attach additional pages if necessary):* _____

Injuries to other driver/passengers: _____

Section 4 – Approvals (signatures required)

Form completed by (please print): _____ Date: _____

Signature: ________________________________

Office/Project Manager (please print): _____ Date: _____

Signature: ________________________________

Things to Do First In The Event Of a Motor Vehicle Incident

GENERAL INFORMATION

1. Do not decide on your own whether a particular incident is "covered" by insurance. Should there be any doubt, it is always preferable to report an occurrence, as this allows underwriters, the Risk Management Department and insurance adjusters to determine if a covered loss has taken place.

2. Policy Conditions do require that all losses and occurrences, which may result in a claim be promptly reported.

3. Do not admit liability or offer your opinion of liability to anyone.

4. Complete this IAR/VIR form promptly and forward with all applicable supporting documentation. It is essential both division and location information be provided.

5. For automobile collisions within the **United States**, please indicate on the IAR form that you have contacted Zurich at:

Zurich Insurance Company
1-800-987-3373 or
1-877-928-4531
24 hours a day, 7 days a week

6. For automobile collisions within **Canada**, please indicate on the IAR form that you have contacted Zurich at:

Crawford Adjusters Canada
Claims Alert
1-888-218-2346
24 hours a day, 7 days a week

The more details you have the better but, don't delay reporting if you don't have all of the information - that may be obtained later. A Zurich trained operator will answer your call and ask for all relevant information regarding the incident. The initial information required includes:

- Your division,
- Office location and division contact name – advise that you are an AMEC Company
- Name, drivers license and phone number of the driver involved in the loss
- Description of the vehicle which he/she was driving (i.e., year, make, model, license plate number, serial number)
- Date, time and location of incident
- Passenger information (if applicable)
- Third party information (i.e., name, phone number, address, vehicle information, insurance information)
- If any injuries occurred (if applicable)
- Police information
- Witness information (if applicable)

Call 911 if there are serious injuries!

If you are injured or think you were injured, **contact your supervisor and call WorkCare at 888-449-7787**. Your supervisor will notify your HSE Coordinator and your Group HSE Manager. For additional instructions on what to do, go to AMEC's HSE website at:

http://ee.amecnet.com/she/sheweb/incident_reporting.htm

1. Call for an officer if the incident occurred on public property (streets, highways or roads). Disputes often arise between the parties involved as to who was at fault; therefore, a police report is important. If an officer is unable to attend the scene of the collision, a counter police report may be filed at most stations. Insurance companies rely on police reports to determine liability.
2. Complete the Incident Investigation Report and the Vehicle Incident Report forms. It is important that both these forms are completed in detail. Include a diagram of the incident on the provided sheet. Incomplete information may lead to delays in processing associated claims and in helping to prevent this type of incident from occurring again.
3. Give only information that is required by the authorities or as directed by AMEC contractual requirements.
4. Sign only those statements required by the authorities or as directed by AMEC contractual requirements. Do not sign away your or the company's rights.

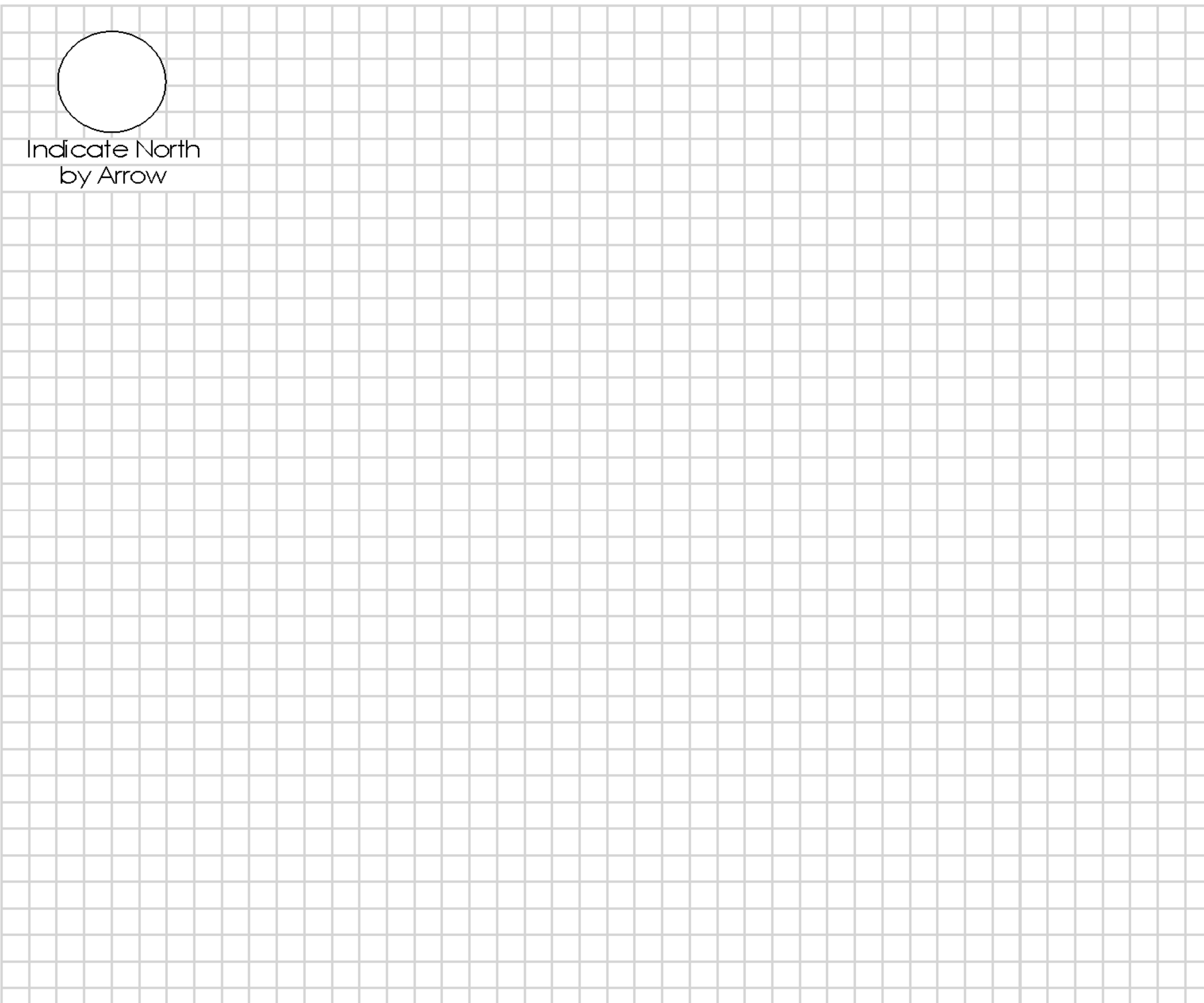
Vehicle Incident Diagram

This or a similar diagram <u>must be completed</u> with all VIRs

Instructions:

1. Number each vehicle and show directions 1 2
2. Use a solid line to show path before incident and use a dotted line to show path after incient

   1 (before) 1 (after)
3. Show pedestrian/non-motorist by:
4. Show railroad by:
5. Indicate north by arrow as:
6. Show street or highway names or numbers
7. Show signs, signals, warning and traffic controls.



Prepared by: ______________________ Date: ______________________

GROUND DISTURBANCE INCIDENT REPORT

AMEC Environment & Infrastructure

Section 1 – General Information

Employee Name: _____ Time of incident: _____ ☐ am | ☐ pm Time Reported:______☐ am | ☐ pm Report Date: _____

Project Name: _____ Project Number: _____ Client: _____

List of All Parties Present

Name	Company	Telephone No.	Role
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Describe the chronological description of Incident and response:_____

Section 2 – Date and Location of Event

A. *Date of Event: (MM/DD/YYYY)

B. ***Country** ***State** ***County** **City**

C. **Street address** **Nearest Intersection**

D. *Right of Way where event occurred

E. Public: ☐ City Street ☐ State Highway ☐ County Road ☐ Interstate Highway ☐ Public-Other

F. Private: ☐ Private Business ☐ Private Land Owner ☐ Private Easement

G. ☐ Pipeline ☐ Power /Transmission Line ☐ Dedicated Public Utility Easement

☐ Federal Land ☐ Railroad ☐ Data not collected ☐ Unknown/Other

List attached documentation (Public Utility Locates, Private Utility Locates, Copy of notifications submitted to Owner or other utility Owners, photographs): _____

Section 3 – Affected Facility Information

***What type of facility operation was affected?**

☐ Cable Television ☐ Electric ☐ Natural Gas ☐ Liquid Pipeline ☐ Sewer (Sanitary Sewer)

☐ Steam ☐ Telecommunications ☐ Water ☐ Unknown/Other

***What type of facility was affected?**

☐ Distribution ☐ Gathering ☐ Service/Drop ☐ Transmission ☐ Unknown/Other

Was the facility part of a joint trench?

☐ Unknown ☐ Yes ☐ No

Was the facility owner a member of One-Call Center?

☐ Unknown ☐ Yes ☐ No

Section 4 – Excavation Information

***Type of Excavator**

☐ Contractor ☐ County ☐ Developer ☐ Farmer ☐ Municipality ☐ Occupant
☐ Railroad ☐ State ☐ Utility ☐ Data not collected ☐ Unknown/Other

***Type of Excavation Equipment**

☐ Auger ☐ Backhoe/Trackhoe ☐ Boring ☐ Drilling ☐ Directional Drilling
☐ Explosives ☐ Farm Equipment ☐ Grader/Scraper ☐ Hand Tools ☐ Milling Equipment
☐ Probing Device ☐ Trencher ☐ Vacuum Equipment ☐ Data Not Collected ☐ Unknown/Other

***Type of Work Performed**

☐ Agriculture ☐ Cable Television ☐ Curb/Sidewalk ☐ Bldg. Construction ☐ Bldg. Demolition
☐ Drainage ☐ Driveway ☐ Electric ☐ Engineering/Survey ☐ Fencing
☐ Grading ☐ Irrigation ☐ Landscaping ☐ Liquid Pipeline ☐ Milling
☐ Natural Gas ☐ Pole ☐ Public Transit Auth. ☐ Railroad Maint. ☐ Road Work
☐ Sewer (San/Storm) ☐ Site Development ☐ Steam ☐ Storm Drain/Culvert ☐ Street Light
☐ Telecommunication ☐ Traffic Signal ☐ Traffic Sign ☐ Water ☐ Waterway Improvement
☐ Data Not Collected ☐ Unknown/Other

Section 5 – Pre-Excavation Notification

***Was the One-Call Center notified?**

☐ Yes ☐ No If Yes, which One-Call Center? Ticket number:

Was Private Contract Locator used?

☐ Yes ☐ No

Section 6 – Locating and Marking

***Type of Locator**

☐ Utility Owner ☐ Contract Locator ☐ Data Not Collected

***Were facility marks visible in the area of excavation?**

☐ Yes ☐ No ☐ Data Not Collected

***Were facilities marked correctly?**

☐ Yes ☐ No ☐ Data Not Collected

What technology was used to locate utilities?

☐ Maps ☐ Active(transmitter+receiver) ☐ Passive (receiver only) ☐ GPR
☐ Acoustic ☐ Magnetic ☐ Infrared ☐ Unknown/Other

What Factors affected the ability to locate services?

☐ Soil Type:___________ ☐ Non-Grounded ☐ Common Bonded ☐ Depth
☐ Electromagnetic interference ☐ Parallel facilities ☐ Congested facilities ☐ Unknown/Other

Section 7 – Excavator Downtime

Did Excavator incur down time?

☐ Yes ☐ No

If yes, how much time?

☐ Unknown ☐ Less than 1 hour ☐ 1 hour ☐ 2 hours ☐ 3 or more hours Exact Value ______If

Estimated cost of down time?

☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value ______

Section 8 – Description of Damage

***Was there damage to a facility?**
☐ Yes ☐ No (i.e. near miss)
***Did the damage cause an interruption in service?**
☐ Yes ☐ No ☐ Data Not Collected ☐ Unknown/Other
If yes, duration of interruption
☐ Unknown ☐ Less than 1 hour ☐ 1 to 2 hrs ☐ 2 to 4 hrs ☐ 4 to 8 hrs ☐ 8 to 12 hrs ☐12 to 24 hrs
☐ 1 to 2 days ☐ 2 to 3 days ☐ 3 or more days ☐ Data Not Collected Exact Value ________
Approximately how many customers were affected?
☐Unknown ☐ 0 ☐ 1 ☐ 2 to 10 ☐ 11 to 50 ☐51 or more Exact Value ________
Estimated cost of damage / repair/restoration
☐Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value _______
Number of people injured
☐ Unknown ☐0 ☐ 1 ☐ 2 to 9 ☐ 10 to 19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value ________
Number of fatalities
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10 to 19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value ________

Was there a Product Release?
Product Release: ☐ No ☐ Yes ☐ N/A Type: ____ **If Yes, Incident Type is Environmental Report.**
Volume: ____ Spill Controls: ____
Repair Process: ____

Section 9 – Description of the Root Cause

Please choose one

One-Call Notification Practices Not Sufficient
☐ No notification made to the One-Call Center
☐ Notification to one-call center made, but not sufficient
☐ Wrong information provided to One Call Center

Locating Practices Not Sufficient
☐ Facility could not be found or located
☐ Facility marking or location not sufficient
☐ Facility was not located or marked
☐ Incorrect facility records/maps

Excavation Practices Not Sufficient
☐ Failure to maintain marks
☐ Failure to support exposed facilities
☐ Failure to use hand tools where required
☐ Failure to test-hole (pot-hole)
☐ Improper backfilling practices
☐ Failure to maintain clearance
☐ Other insufficient excavation practices

Miscellaneous Root Causes
☐ One-Call Center error
☐ Abandoned facility
☐ Deteriorated facility
☐ Previous damage
☐ Data Not Collected
☐ Other

Section 10 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

One Call was called ☐ **Spills Reporting Agency Notified ☐**

Emergency Responders (Fire) was called ☐ **Post-incident Drug/Alcohol Testing Performed**

List of All Agencies Contacted

Name/Agency	Phone #	Date	Time

Incident Report prepared by: ____

Employee (s): ____	Date: ____	Employee's Supervisor: ____	Date: ____
HSE Coordinator/Project/Unit Manager: ____	Date: ____	Group HSE Manager:____	Date: ____

Utility Clearance Form

Site Name: Mohonk Road Industrial – Data Gap Investigation | Project No./Task No.: 3617157346.02
Site Address: 186 Mohonk Rd, High Falls, NY 12440-5228 | One Call Ticket No.: ______
Ticket Good until: ______
Project Manager Name: Jayme Connolly | PM Phone No.: ______
Locations cleared by facility? ______ | Date Cleared: ______

Utility Clearance:

Potential Utilities		Identified		Colors	Utility Company Name(s)	Utilities
Member of One Call	*Non Members	Utility Marked	Utility Responded not Present			
						WHITE - Proposed Excavation
						****PINK** - Temporary Survey Markings
						RED - Electric Power Lines, Cables, Conduit and Lighting Cables
						YELLOW - Gas, Oil, Steam, Petroleum or Gaseous Materials
						ORANGE - Communication, Alarm or Signal Lines, Cables or Conduit
						BLUE - Potable Water
						PURPLE - Reclaimed Water, Irrigation and Slurry Lines
						GREEN - Sewers and Drain Lines

*Contact local municipality
** Survey markings need to be protected. If disturbed or destroyed, replace markings.

Private Utility Locator/Geophysical Survey

Method to be used:
___ Pipe and Cable Location
___ Ground Penetrating Radar
___ Magnetics and Electromagnetics

Non-Destructive Excavation Method to be used

___ *Hand Dig
___ Soil Vacuum
___ Air Knife
___ Water Knife

* Use electrically insulated gloves if potential for power lines

Field Clues Observed/Evaluated:

___ Overhead power lines
___ Cell phone/radio antennas
___ Trench patches
___ Trench settlement
___ Trench drains
___ Utility manholes
___ Manholes just outside building
___ Valve risers
___ Floor cleanout covers
___ Floor drains

___ Patches in concrete floors
___ Drainage ditches in area
___ Utility vaults
___ Transformer pads
___ Conduits from power panels into slab
___ Above ground propane tanks
___ Fire protection rooms
___ Fire protection lines
___ Fire hydrant locations – valves in ground
___ Footings under structural columns

___ Guard shack – service utilities
___ Bathroom and kitchen facilities
___ Radiant heat systems in slabs (ask)
___ Cooling units outside building
___ Process water to equipment in factory
___ Sprinkler system landscaping
___ Grounding systems near perimeter
___ Water tower on site.
___ Foundation drains - building perimeter

Additional Notes/Remarks: ______

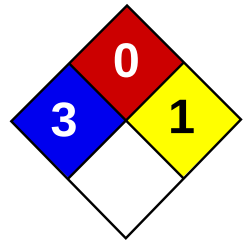
Confidence Level that All Utilities have been identified:

___ High ___ Medium High ___ *Moderate ___ *Medium Low ___ *Low

*Contact PM. Get PM and OM permission prior to proceeding

*Cleared by PM? ______ *Cleared by OM? ______

Safety Data Sheets



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

- **Health Hazard:** 3
- **Fire Hazard:** 0
- **Reactivity:** 1
- **Personal Protection:**

National Fire Protection Association (U.S.A.):

- **Health:** 3
- **Flammability:** 0
- **Reactivity:** 1
- **Specific hazard:**

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

Last Updated: 11/01/2010 12:00 PM

MSDS Number: N3660 * * * * * *Effective Date: 11/18/09* * * * * * *Supercedes: 11/07/08*

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO_3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial*

Ventilation, A Manual of Recommended Practices, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\--

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II

Information reported for product/size:

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	--Canada-- NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	------SARA 313------ List	------SARA 313------ Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

```
Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: Yes Pressure: No
Reactivity: No          (Mixture / Liquid)
```

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the

CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0 Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 14.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

PID ANALYZERS

hnu

Instrumentation for Environmental, Process & Industrial Hygiene Monitoring

Isobutylene in Air MSDS

Home

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS/**ISOBUTYLENE** IN AIR

PRODUCT NAME: 100 PPM ISOBUTYLENE/AIR (**100 PPM ISOBUTYLENE**/AIR) **MSDS**
Version:4 Date: January, 2004

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1. Chemical Product and Company Identification **PID ANALYZERS, LLC** 25 Walpole Park Drive South Walpole, MA 02081 TELEPHONE NUMBER: (508) 660-5001 **24-HOUR EMERGENCY NUMBER: 1-617-699-4307** FAX NUMBER: (508) 660-5040 E-MAIL: sales@hnu.com

PRODUCT NAME: ISOBUTYLENE (**100 PPM** – 0.9%) IN AIR
CHEMICAL NAME: Isobutylene in air

COMMON NAMES/ SYNONYMS: Calibration Gas

CLASSIFICATION: 2.2 WHIMIS CLASSIFICTATION: A, D2A, D2B

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2. COMPOSITION/ INFORMATION ON INGREDIENTS
INGREDIENT %: **Isobutylene** 0.0001-0.9/Air 99-99.9999
VOLUME:17L
PEL-OSHA: N/A
TLV-ACGIH: N/A
LD50or LC50Route/Species:N/A
FORMULA: C4H8/Air 99.0

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3. HAZARDS IDENTIFICATIONEMERGENCY OVERVIEW Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. **Isobutylene** may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:
Skin: No
Contact Skin: No
Absorption: No
Eye Contact: No
Inhalation: Yes
Ingestion:No

HEALTH EFFECTS:
Exposure Limits: Yes
Irritant: No
Sensitization: No
Reproductive Hazard: No
Mutagen: No
Carcinogenicity: No
NTP: No
IARC: No
OSHA: No

EYE EFFECTS: N/A.
SKIN EFFECTS: N/A.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS
PRODUCT NAME: **ISOBUTYLENE** (1 **PPM** – 0.9%) IN AIR
INGESTION EFFECTS: Ingestion unlikely. Gas at room temperature.
INHALATION EFFECTS: Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES HMIS HAZARD CODES RATING SYSTEM
Health: **1**
Flammability: **0**
Flammability: **0**
Reactivity: **0**

***0= No Hazard, 1= Slight Hazard, 2= Moderate Hazard, 3= Serious Hazard, 4= Severe Hazard**

---

4. FIRST AID MEASURES EYES: N/A

SKIN: N/A

INGESTION: Not required

INHALATION: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASED OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

---

5. FIRE-FIGHTING MEASURES These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be projected considerable distances - thereby hampering fire fighting efforts.

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6. ACCIDENTAL RELEASE MEASURES In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

---

7. HANDLING AND STORAGE Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130oF (54oC).

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION Use adequate ventilation for extended use of gas.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS PRODUCT NAME: ISOBUTYLENE (1 **PPM** – 0.9%) IN AIR

---

9. PHYSICAL AND CHEMICAL PROPERTIES PARAMETER: VALUE: Physical state : Gas Evaporation point : N/A pH : N/A Odor and appearance : Colorless, odorless gas

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10. STABILITY AND REACTIVITY Stable under normal conditions. Expected shelf life 24 months.

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11. TOXICOLOGICAL INFORMATION No toxicological damage caused by this product.

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12. ECOLOGICAL INFORMATION No ecological damage caused by this product.

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13. DISPOSAL INFORMATION Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured.

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14. TRANSPORT INFORMATION
United States DOT/Canada TDG PROPER SHIPPING NAME:
Compressed Gas N.O.S. Compressed Gas N.O.S. (**Isobutylene** in Air)
HAZARD CLASS: 2.2
IDENTIFICATION NUMBER: UN1956
SHIPPING LABEL: NONFLAMMABLE GAS

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15. REGULATORY INFORMATION Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

---

16. OTHER INFORMATION This **MSDS** has been prepared in accordance with the Chemicals

(Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of PID Analyzers, LLC , and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.
MSDS/S010/248/January, 2004

Top

LIQUINOX MSDS

Section 1 : MANUFACTURER INFORMATION

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/02/24

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

<u>Volatiles (%)</u>

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C):	100 (212F)
Freezing point (°C):	Not available.
pH:	8.5
Specific gravity @ 20 °C:	(water = 1). 1.083
Solubility in water (%):	Complete.
Coefficient of water\oil dist.:	Not available.
VOC:	None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability:	Not flammable.
Conditions of flammability:	Surrounding fire.
Extinguishing media:	Carbon dioxide, dry chemical, foam. Water Water fog.
Special procedures:	Self-contained breathing apparatus required. Firefighters should wear the usual protective gear. Use water spray to cool fire exposed containers.
Auto-ignition temperature:	Not available.
Flash point (°C), method:	None
Lower flammability limit (% vol):	Not applicable.
Upper flammability limit (% vol):	Not applicable.

Not available.

Sensitivity to mechanical impact:	Not available.
Hazardous combustion products:	Oxides of carbon (COx). Hydrocarbons.
Rate of burning:	Not available.
Explosive power:	Containers may rupture if exposed to heat or fire.

Section 5 : REACTIVITY DATA

Chemical stability:	Product is stable under normal handling and storage conditions.
Conditions of instability:	Extreme temperatures.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizing agents.
Hazardous decomposition products:	See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged and repeated contact may cause irritation.

Inhalation: May cause headache and nausea.

Ingestion: May cause vomiting and diarrhea.
May cause gastric distress.

Effects of chronic exposure: See effects of acute exposure.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available.

Exposure limit of material: Not available.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

First Aid

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
If irritation persists, seek medical attention.

Ingestion: Do not induce vomiting, seek medical attention.
Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.
Prevent entry into drains, sewers, and other waterways.
Wear appropriate protective equipment.
Small amounts may be flushed to sewer with water.
Soak up with an absorbent material.
Place in appropriate container for disposal.
Notify the appropriate authorities as required.

Waste disposal: In accordance with local and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing vapors/mists.
Wear personal protective equipment appropriate to task.

Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

HANNA instruments

HI 70004

Buffer Solution pH 4.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01

Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70004 Buffer Solution pH 4.01

Application: pH Buffer Solution, ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 70004C, HI 70004P, HI 7004P/5

Company Information (USA): Hanna Instruments, Inc. 584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET) +1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:

Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	**Odor:**	Odorless	**Density at 20° C:**	1.0 g/cm³ at 25°C
Melting Point:	NA	**Boiling Point:**	> 100 °C	**Solubility:**	Soluble
pH at 20° C:	4.01 at 25°C	**Explosion Limit:**	NA	**Flash Point:**	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 70007
Buffer Solution pH 7.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70007 Buffer Solution pH 7.01
Application: pH Buffer Solution
Additional Product Codes: HI 70007C, HI 70007P, HI 7007P/5

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)
International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)
E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	7.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

HANNA instruments

HI 70007
Buffer Solution pH 7.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA instruments

HI 7031

Conductivity Calibration Solution, 1413 µS/cm @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7031 Conductivity Calibration Solution

Application: For calibrating electrodes. 1413 µS/cm @ 25°C/77°F

Additional Product Codes: HI 7031/1G HI 7031L HI 7031L/C HI 7031M HI 7031/120ML

Company Information (USA): Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating (above boiling point). Stable in the recommended storage conditions.

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HI 7021

ORP Solution for Platinum and Gold Electrodes

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7021 ORP Solution

Additional Product Codes: HI 7021L
HI 7021M
HI 7021/G

Application: ORP Solution for Platinum and Gold Electrodes.
240 mV @ 25°C/77°F

Company Information (USA): Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information: 1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air.

After Skin Contact: Wash effected area with plenty of water.

After Eye Contact: Rinse out with water.

After Swallowing: Wash out mouth thoroughly with water and give plenty of water to drink. In severe cases obtain medical attention.

General Information: Remove contaminated, soaked clothing immediately and dispose of safely.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water spray, Carbon Dioxide, Dry Chemical Powder, Appropriate Foam.

Special Risks:

Non-combustible.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

NA

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Avoid formation of dusts. Do not inhale dusts. Avoid substance contact.

Environmental Precautions:

Do not discharge into the drains/surface waters/groundwater.

Additional Notes:

Take up dry. Clean up affected area and dispose according to local regulation. Avoid generation of dusts.

SECTION 7: HANDLING AND STORAGE

Handling:

Cannot be stored indefinitely.

Storage:

Tightly closed. Store at room temperature (+15 to +25 °C recommended). Protect from light.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled.

Respiratory Protection:

Required when vapors/aerosols are generated. Work under hood.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Yellow liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	ND	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

None

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

No toxic effects are to be expected when the product is handled appropriately.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data:

SECTION 12: ECOLOGICAL INFORMATION

No environmental hazard.

Further Data: Can be safely disposed off as an ordinary refuse.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: ***OTHER INFORMATION***

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

OAKTON® **MATERIAL SAFETY DATA SHEET**

Section 1. Chemical Product and Company Identification

Catalog Number(s) 00653-00	
Product Identity ZERO OXYGEN SOLUTION	
Manufacturer's Name RICCA CHEMICAL COMPANY	Emergency Telephone Number (24 hr) CHEMTREC®: 800-424-9300
Address (Number, Street, City, State, and ZIP Code) P.O. Box 13090	Telephone Number For Information 817-461-5601
Arlington, Texas 76094	Date Prepared 4-18-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits ACGIH TLV	Exposure Limits OSHA PEL
Sodium Sulfite	7757-83-7	4.5 – 5.5	N/A	N/A
Cobalt Chloride Hexahydrate	7791-13-1	< 0.01	0.02 mg/m^3 (as Co)	0.1 mg/m^3 (Dust as Co)
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆☆

EMERGENCY OVERVIEW

May cause irritation to the eyes, skin and respiratory tract. Contains Cobalt Chloride, a possible carcinogen according to International Agency for Research on Cancer (IARC). Wash areas of contact with water for at least 15 minutes. If ingested, dilute with water and call a physician. Although moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, broncho constriction and anaphylaxis.

☆☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin, respiratory tract.

EYE CONTACT: May cause irritation, redness, pain, and tearing.

INHALATION: May cause irritation. This solution is not expected to be harmful via inhalation.

SKIN CONTACT: May cause mild irritation.

INGESTION: May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression.

CHRONIC EFFECTS / CARCINOGENICITY: Chronic exposure may affect thyroid, heart, lungs and kidneys due to the Cobalt.
IARC – Not classifiable as to carcinogenicity to humans (Sodium Sulfite), Possible carcinogen, limited evidence in humans (Cobalt)
NTP – No
OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

Mutation data cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride and Sodium Sulfite.

REPRODUCTION INFORMATION:

Reproductive effects cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary.

SKIN CONTACT: Wash areas of contact with soap and water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Do not induce vomiting. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire (water, dry chemical, chemical foam).

FIRE & EXPLOSION HAZARDS: Not considered to be an explosion hazard. May emit irritating and corrosive gases in fire.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions. Poisonous gases may be produced in fire.

FIRE FIGHTING EQUIPMENT: Use protective clothing and NIOSH-approved self-contained breathing apparatus appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, etc.) and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves, Nitrile Rubber or Neoprene.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, colorless liquid	**pH:**	N/A
ODOR:	odorless	**BOILING POINT (°C):**	Approximately 100
SOLUBILITY IN WATER:	infinite	**MELTING POINT (°C):**	Approximately 0
SPECIFIC GRAVITY:	Approximately 1	**VAPOR PRESSURE:**	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage. This product absorbs Oxygen from the air.

INCOMPATIBILITY: Strong oxidizing agents, Acids (liberates Sulfur Dioxide), high temperatures.

HAZARDOUS DECOMPOSITION PRODUCTS: Emits toxic and irritating fumes, including Sulfur Oxides, when heated to decomposition.
HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Mouse: (Sodium Sulfite) 820 mg/kg, details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Whatever cannot be saved for recycling or recovery should be managed in an appropriate and approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: This item meets the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.
CERCLA REPORTABLE QUANTITY: Cobalt Chloride RQ 1 pound
SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No
SECTION 311/312 HAZARDOUS CATEGORIES: Acute, Chronic: Yes   Fire, Pressure, Reactivity: No
SECTION 313 TOXIC CHEMICALS: No
RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Special Notice Key: None**
HMIS® Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Protective Equipment: B (Protective eyewear, gloves)**

Rev 1, 03-25-2003: Reviewed and approved.
Rev 2, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

Contaminant of Concern Fact Sheets

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
1,1,1-Trichloroethane
CAS Number: 71-55-6
Synonyms:
Methyl chloroform; chlorothene

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: Chloroform-like

Odor Threshold: 100 ppm

Vapor Density: 5.5 g/L
Vapor Pressure: 100 mmHg
Ionization Potential (IP): 11.00 eV

IDLH: 700 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH ___

Skin absorbable: yes __ no X
Skin corrosive: yes X no ___

Signs/Symptoms of Acute Exposure:
Skin irritation, headaches, dizziness, nausea, vomiting, diarrhea

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	350 ppm		
ACGIH TLVs	350 ppm	450 ppm	
NIOSH RELs			350 ppm

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	11.7eV	Isobutylene 100 ppm	1	175 ppm

Checked by: Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Tychem, Teflon, Viton

Gloves: Teflon, Viton, PE/EVAL, Polyvinyl alchohol (Do not use in water)

Boots: Teflon, Viton

Service Limit Concentration (ppm): $\frac{1000}{1}$

MUC 1/2 Mask APR=TWA x 10= 1000 ppm
MUC Full-Face APR=TWA x 10= 1000 ppm

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: 7.5% / 12.5%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray ___ CO_2 X

Incompatibilities:
Strong caustics; strong oxidizers; chemically active metals such as: zinc, aluminum, magnesium powders, sodium, and potassium; water

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
1,1-Dichloroethene
CAS Number: 75-35-4
Synonyms:
Vinylidene chloride
1,1-Dichloroethylene (1,1-DCE)

HEALTH HAZARD DATA

Color: colorless

Physical State: Solid ___
Liquid X
Gas X (above 89^{o}F)

Odor: chloroform-like

Odor Threshold: 190ppm

Vapor Density: 4.0 g/L
Vapor Pressure 500 mmHg
Ionization Potential (IP): 10.00 eV

IDLH: unknown
1,2-DCE 1000 ppm

Carcinogen: OSHA ___
IARC ___
NTP ___
ACGIH ___
NIOSH X

Skin absorbable: yes __ no X
Skin corrosive: yes __ no X

Signs/Symptoms of Acute Exposure:
Irritation of skin and eyes, dizziness, headache, nausea, drunkeness and anesthesia.

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL			
ACGIH TLVs	1 ppm		
NIOSH RELs	Lowest Feasible		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6 eV	Isobutylene 100 ppm	1.18	0.6

Checked by:Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits Teflon

Gloves Teflon, Polyvinyl Alcohol
(do not use in water)

Boots Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR=TWA x 10= 6 ppm
MUC Full-Face APR=TWA x 10= 6 ppm

FIRE/REACTIVITY DATA

Flash Point: (-2^{o})F

LEL/UEL: 6.5%/15.5%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray ___ CO_2 X

Incompatibilities:
Aluminum, sunlight, air, copper, heat.

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
1,1-Dichloroethane (11DCA)
CAS Number: 75-34-3
Synonyms:
Ethylidene chloride
1,1-Ethylidene chloride
Asymmetrical dichloroethane

HEALTH HAZARD DATA

Color: colorless
Physical State: Solid ___ Liquid X Gas ___
Odor: chloroform-like
Odor Threshold: 120 ppm
Vapor Density: 4.0 g/L
Vapor Pressure: 182 mmHg
Ionization Potential (IP): 11.06 eV
IDLH: 3000 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH ___
Skin absorbable: yes __ no _X_
Skin corrosive: yes __ no _X_

Signs/Symptoms of Acute Exposure:
Central nervous system depression,
skin irritation, lung damage

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	100 ppm		
ACGIH TLVs	100 ppm		
NIOSH RELs	100 ppm		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Micro tip 11.7 eV	Isobutylene 100 ppm	1.67	83 ppm

Checked by: Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Tychem
Gloves: Viton; Polyvinyl Alcohol (do not use in water)
Boots: Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR=TWA x 10= 830 ppm
MUC Full-Face APR=TWA x 10= 830 ppm

FIRE/REACTIVITY DATA

Flash Point: 2°F

LEL/UEL: 5.4%/11.4%

Fire Extinguishing Media:
Dry Chemical _X_ Foam _X_
Water Spray ___ CO_2 _X_

Incompatibilities:
Strong oxidizers and strong caustics

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name: Trichloroethene
CAS Number: 79-01-6
Synonyms: Ethylene trichloride, TCE; Trichloroethylene, Trilene

HEALTH HAZARD DATA

Color:	Colorless
Physical State	Solid ___ Liquid X Gas ___
Odor:	Chloroform-like
Odor Threshold:	82 ppm
Vapor Density	4.5 g/L
Vapor Pressure	56 mmHg
Ionization Potential (IP)	9.45 eV
IDLH:	1000 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH X

Skin absorbable yes ___ no X
Skin corrosive yes ___ no X

Signs/Symptoms of Acute Exposure
Irritant to eyes and skin, headache, nausea, vomiting, dermatitis, vertigo, visual disturbance, fatigue, giddiness, sleepiness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		200 ppm
ACGIH TLVs	10 ppm	100 ppm	
NIOSH RELs	25 ppm		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6eV	Isobutylene 100 ppm	1.85	9 ppm
PID	11.7 eV	Isobutylene 100 ppm	2.33	11 ppm
Detector Tube	Drager 6828541	2 - 50 ppm		5 ppm

Checked by: Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials

Suits	Viton, PE/EVAL, Tychem, Barricade, Trellchem, Teflon, Responder
Gloves	Viton, Teflon, Polyvinyl alcohol (do not use in water)
Boots	Teflon, Viton

Service Limit Concentration (ppm) 1000

MUC 1/2 Mask APR = TWA x 10 = 90 ppm
MUC Full-Face APR = TWA x 10 = 90 ppm

FIRE/REACTIVITY DATA

Flash Point: Unknown

LEL/UEL: 8% / 10.5%

Fire Extinguishing Media

Dry Chemical	X	Alcohol resistant Foam	X
Water Spray	X	CO_2	X

Incompatibilities
Strong caustics and alkalis, chemically active metals (such as barium, lithium, sodium, magnesium, titanium, and beryllium

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name
Tetrachloroethene
CAS Number: 127-18-4
Synonyms:
tetrachloroethylene
Perchloroethylene (Perc

HEALTH HAZARD DATA

Color: colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: chloroform-like

Odor Threshold: 47 ppm

Vapor Density: 6.8 g/L

Ionization Potential (IP): 9.32 eV

IDLH: 150 ppm

Carcinogen:
- OSHA ___
- IARC ___
- NTP X
- ACGIH X
- NIOSH X

Skin absorbable: yes __ no X

Skin corrosive: yes __ no X

Signs/Symptoms of Acute Exposure
Irritation of eyes, nose, and throat
nausea; flushing of the face and neck
vertigo; dizziness; incoherence;
headache; sleepiness, and skin irritatio

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	100 ppm		200 ppm
ACGIH TLVs	25 ppm	100 ppm	
NIOSH RELs	Lowest Feasible		

AIR MONITORING

Type	Brand/Mode No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	RAE 10.6 eV	Isobutylene 100 ppm	1.58	9 ppm
PID	HNu 10.2 eV	Isobutylene 100 ppm	0.86	9 ppm
Detecor Tube	Drager 8101 501	2 - 40 ppm		12.5 ppm

Checked by: Cindy Sundquist   Date: 3/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials

Suits: Teflon, Viton, CPF3, Barricade, Responder, Trellchem, Tychem

Gloves: Viton, Teflon, and Polyviny Alcohol (do not use in (water)

Boots: Nitrile Rubber

Service Limit Concentration (ppm) 1000

MUC 1/2 Mask APR=TWA x 10= 90 ppm
MUC Full-Face APR=TWA x 10= 90 ppm

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA / NA

Fire Extinguishing Media
Dry Chemical X   Foam X
Water Spray X CO_2 X

Incompatibilities
Strong oxidizers, chemically-active metals
caustic soda, sodium hydroxide, and potas

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name: Ethylbenzene
CAS Number: 100-41-4
Synonyms: Ethylbenzol, Phenylethane

HEALTH HAZARD DATA

Color: Colorless
Physical State: Solid ___ Liquid X Gas ___
Odor: Aromatic
Odor Threshold: 0.092 - 0.6 PPM
Vapor Density: 3.66 g/L
Ionization Potential (IP): 8.76 eV
IDLH: 800 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH ___
Skin absorbable: yes ___ no X
Skin corrosive: yes ___ no ___

Signs/Symptoms of Acute Exposure:
Irritant to eyes, skin, and mucous membranes; dermatitis, and headache

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		
ACGIH TLVs	100 ppm	125 ppm	
NIOSH RELs	100 ppm	125 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6 eV	Isobutylene 100 ppm	1.63	163
PID	HNu 10.2 eV	Isobutylene 100 ppm		
FID	Foxboro TVA 1000 (10.6 eV)	Methane	3.7	370

Checked by: Emmet F. Curtis Date: 12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Viton, Barricade, Tychem Responder, Teflon
Gloves: Viton, teflon
Boots: Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR= TWA x 10 = 500 ppm
MUC Full-Face APR= TWA x 10 = 500 ppm

FIRE/REACTIVITY DATA

Flash Point: 55° F

LEL/UEL: 0.8% / 6.7%

Fire Extinguishing Media:
Dry Chemical X
Water Spray ___
Alcohol Resistant Foam X
CO_2 X

Incompatibilities:
Strong oxidizers

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Xylene 108-38-3,
CAS Number: 95-47-6, 106-42-3
Synonyms:
Dimethylbenzene, Xylo

HEALTH HAZARD DATA

Color: Colorless
Physical State: Solid X (below 56°F)
Liquid X
Gas
Odor: Aromatic
Odor Threshold: 20 ppm
Vapor Density: 4.3 g/L
Vapor Pressure 8 mmHg
Ionization Potential (IP): 8.56 eV
IDLH: 900 ppm

Carcinogen: OSHA
IARC
NTP
ACGIH
NIOSH
Skin absorbable: yes __ no X
Skin corrosive: yes __ no X

Signs/Symptoms of Acute Exposure
Irritant to eyes, skin, nose, throat,
dizziness, drowsiness, excitemen

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		
ACGIH TLVs	100 ppm	150 ppm	
NIOSH RELs	100 ppm	150 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	10.6 eV	Isobutylene 100 ppm	1.6	80 ppm
PID	HNu w/ 10.2 eV	Benzene 100 ppm	1.04	104 ppm

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials
Suits Teflon, Viton, PE/EVAL
Gloves Teflon, Viton
Polyvinyl Alcohol (Do no
use in water)
Boots Teflon, Viton

Service Limit Concentration (ppm) 1000 ppm

MUC 1/2 Mask APR=TWA x 10 = 480 ppm
*MUC Full-Face APR=TWA x 50 = 1000 ppm

FIRE/REACTIVITY DATA

Flash Point: 81° F
LEL/UEL: 0.9% / 6.7%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers
Strong Acids

Checked by: Cindy Sundquist Date: 4/27/10

*Use if conducted quantitative fit testing (Portacount), otherwise use MUC for 1/2 respirator if did qualitative fit testing (Irritant smoke)

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

Activity Hazard Analyses / Job Hazard Analyses

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for Site Visit	1A) N/A	1A) Prior to leaving for site ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site
	1B) Vehicle defects	1B) Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working
	1C) Insufficient emergency equipment, unsecured loads	1C) Insufficient emergency equipment, unsecured loads ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank
2. Operating vehicles – general	2A) Collisions, unsafe driving conditions	2A) Drive Defensively! ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions ▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary
3. Driving to the jobsite	3A) Dusty, winding, narrow roads	3A) Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.
	3B) Rocky or one-lane roads	3B) Rocky or one-lane roads ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.
	3C) Stormy weather, near confused tourists	3C) Stormy weather, near confused tourists ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) When angry or irritated	3D) When angry or irritated ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.
	3E) Turning around on narrow roads	3E) Turning around on narrow roads ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.
	3F) Sick or medicated	3F) Sick or medicated ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.
	3G) On wet or slimy roads	3G) On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.
	3H) Animals on road	3H) Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas
4. Gain permission to enter site	4A) Hostile landowner, livestock, pets	4A) Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area
5. Mobilization/ Demobilization of Equipment and Supplies	5A) Struck by Heavy Equipment/Vehicles	5A) Struck by heavy equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.
	5B) Struck by Equipment/Supplies	5B) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
	5C) Overexertion Unloading/Loading Supplies	5C) Overexertion Unloading/Loading Supplies ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.
	5D) Caught in/on/between	5D) Caught in/on/between ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	5E) Slip/Trip/Fall	5E) 1E). Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5F) Vehicle accident	5F) Vehicle accident ▪ Employees should follow MACTEC vehicle operation policy and be aware of all stationary and mobile vehicles.
6. Site Preparation	6A) Slip/Trip/Fall	6A) Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas
7. Installation of soil erosion and sediment controls	7A) Overexertion	7A) Overexertion ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.
	7B) Struck by Equipment/Supplies	7C) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
8. Driving back from the jobsite	8A) See hazards listed under item #3	8A) See safe work practices under item #3

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: hard hat, steel-toed boots, safety glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization/ Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation JHA	1A) See Mobilization/Demobilization and Site Preparation JHA
2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Review Emergency Evacuation Procedures (see below).
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.
	3C) Chemical/Toxicological Hazards	3C) Chemical/Toxicological Hazards ▪ See HASP for appropriate level of PPE ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labelled ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
	3D) Damage to eyes	3D) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses
	3E) Bee and wasp stings	3E) See JHA for Insect Stings and Bites
	3F) Ticks and infected mosquitos	3F) See JHA for Insect Stings and Bites
	3G) Wild Animals	3G) Wild Animals ▪ Avoid phyisical contact with wild animals ▪ Do not threaten and/or conrner animals ▪ Make noise to get the animal to retreat. ▪ Stay in or return to vehicle/equipment if in danger

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3H) Contact with poisonous plants or the oil from those plants:	3H) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Do not allow plant to touch any part of your body/clothing. ▪ Wear PPE as described in the HASP and wear Tyveks, gloves and boot covers if contact with plant is likely ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
		 POISON IVY (Rhus toxicondendron L.) POISON OAK (Rhus diversiloba) POISON SUMAC (Rhus toxicondendron vernix)
	3I) Back Injuries	3I) Back Injuries ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Split heavy loads in to smaller loads ▪ Team lifting should be utilized if mechanical devices are not available. ▪ Make sure that path is clear prior to lift.
	3J) Shoveling	3J) Shoveling ▪ Select the proper shovel for the task. A long handled, flat bladed shovel is recommend for loose material ▪ Inspect the handle for splinters and/or cracks ▪ Ensure that the blade is securely attached to the handle ▪ Never be more than 15 inches from the material you are shoveling ▪ Stand with your feet about hip width for balance and keep the shovel close to your body. ▪ Bend from the knees (not the back) and tighten your stomach muscles as you lift. ▪ Avoid twisting movements. If you need to move the snow to one side reposition your feet to face the direction the snow will be going. ▪ Avoid lifting large shoveling too much at once. When lifting heavy material, pick up less to reduce the weight lifted. ▪ Pace yourself to avoid getting out of breath and becoming fatigued too soon. ▪ Be alert for signs of stress such as pain, numbness, burning and tingling. Stop immediately if you feel any of these symptoms.
	3K) Slips/Trips/Falls	3K) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. ▪ Site SHSO inspect the entire work area to identify and mark hazards. ▪ Maintain three points of contact when climbing ladders or onto/off of equipment

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3L) Overhead Hazards	3L) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.
	3M) Dropped Objects	3M) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.
	3N) Noise	3N) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.
	3O) Eye Injuries	3O) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.
	3P) Heavy Equipment (overhead hazards, spills, struck by or against)	3P) Heavy Equipment ▪ All operators will be trained and qualified to operate equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Personel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading). ▪ Inspect rigging prior to each use.

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Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3Q) Struck by vehicle/equipment	3Q) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.
	3R) Struck/cut by tools	3R) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or worksurface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools.
	3S) Caught in/on/between	3S) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.
	3T) Contact with Electricity/Lightning	3T) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the “Hard” or “Extra Hard” service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All equipment will be locked out and tagged out and rendered in a zero energy state prior to commencing any operation that may exposed workers to electrical, mechanical, hydraulic, etc. hazards. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.
	3U) Equipment failure	3U) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.

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Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3V) Hand & power tool usage.	3V) Hand & power tool usage ▪ Daily inspections will be performed. ▪ Ensure guards are in place and are in good condition. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions. ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ See JHA for Power Tool Use - Electrical and Power Tool Use - Gasoline
	3W) Fire Protection	3W) Fire Protection ▪ Ensure that adequate number and type of fire extinguishers are present at the site ▪ Inspect fire extinguishers on a monthly basis – document ▪ All employees who are expected to use fire exinguishers will have received training on an annual basis. ▪ Obey no-smoking policy ▪ Open fires are prohibited ▪ Maintain good housekeeping. Keep rubbish and combustibles to a minimum. ▪ Keep flammable liquids in small containers with lids closed or a safety can. ▪ When dispensing flammable liquids, do in well vented area and bond and ground containers.
	3X) Confined Space Entry	3X) Confined Space Entry ▪ See JHA for Confined Space Entry

4. Environmental health considerations	4A) Heat Stress	4A) Take precautions to prevent heat stress
		▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load.
		▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action.
		NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments.
		▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability).
		▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization.
		▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements.
		  ▪ A reduction of work load markedly decreases total heat stress.
		  ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization.
		▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.

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Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 7/7/15

<table>
<tr><th>Key Work Steps</th><th>Hazards/Potential Hazards</th><th>Safe Practices</th></tr>
<tr><td></td><td>4B) Wet Bulb Globe Temperature (WBGT) Index</td><td>4B) WBGT
▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index).
▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed).
WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES
80-90 degrees F — Fatigue possible with prolonged exposure and physical activity.
90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity.
105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.</td></tr>
<tr><td></td><td>4C) Cold Extremes</td><td>4C) Take precautions to prevent cold stress injuries
▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages.
▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended.
▪ Take layers off as you heat up; put them on as you cool down.
▪ Wear head protection that provides adequate insulation and protects the ears.
▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia.
▪ Acclimate to the cold climate to minimize discomfort.
▪ Maintain adequate water/fluid intake to avoid dehydration.</td></tr>
<tr><td></td><td>4D) Wind</td><td>4D) Effects of the wind
▪ Wind chill greatly affects heat loss (see attached Wind Chill Index).
▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.</td></tr>
<tr><td></td><td>4E) Thunderstorms</td><td>4E) Thunderstorms
▪ Monitor weather channels to determine if electrical storms are forcased.
▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.)
▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.
▪ Only return to work 30 minutes after the after the last strike or sound of thunder</td></tr>
</table>

furnished by National Weather Service Gray, ME

Relative Humidity (%)

Heat Index (Apparent Temperature)

Air Temperature

°F	40	45	50	55	60	65	70	75	80	85	90	95	100
110	136												
108	130	137											
106	124	130	137										
104	119	124	131	137									
102	114	119	124	130	137								
100	109	114	118	124	129	136							
98	105	109	113	117	123	128	134						
96	101	104	108	112	116	121	126	132					
94	97	100	103	106	110	114	119	124	129	135			
92	94	96	99	101	105	108	112	116	121	126	131		
90	91	93	95	97	100	103	106	109	113	117	122	127	132
88	88	89	91	93	95	98	100	103	106	110	113	117	121
86	85	87	88	89	91	93	95	97	100	102	105	108	112
84	83	84	85	86	88	89	90	92	94	96	98	100	103
82	81	82	83	84	84	85	86	88	89	90	91	93	95
80	80	80	81	81	82	82	83	84	84	85	86	86	87

With Prolonged Exposure and/or Physical Activity

Extreme Danger
Heat stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

Wind Chill Chart

Temperature (°F)

Wind (mph) / Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes · 10 minutes · 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

MACTEC

Job Hazard Analysis Form

Job Title: Field Work - Oversight **Date of Analysis:** 7/7/15
Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for site visit	1A) N/A	▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Complete site specific/ client required training ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ First aid kits shall be available at the work site and on each transport vehicle. ▪ Familiarize yourself with route to the site ▪ Check weather forecast. Pack appropriate clothing and other items (e.g., sunscreen) for anticipated weather conditions ▪ Verify that subsurface utilities have been identified.
2. Traveling to the site by vehicle	2A) See JHA for Mobilization, Demobilization and Site Preparation	▪ See JHA for Mobilization, Demobilization and Site Preparation
3. Initial Arrival - Assess Site Conditions	3A) Communication with subcontractor and other site personnel	▪ Develop communication methods (agree on hand signals, warning alarms) ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the whereabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Hold and document Safety tailgate meetings ▪ Establish work zones, evacuation routes and rally locations.
	3B) Insect Bites and Stings	▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects. ▪ Inform crew members if allergic to insects and what to do if you need assistance. ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Carry identification of known allergies and necessary emergency medication. ▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails.

	3C) Poisonous plants	▪ Wear long sleeves, long pants and boots ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with high visibility spray paint if working at a fixed location. ▪ Look for signs of poisonous plants and demark area to aid in avoiding plant. ▪ Do not touch any plant part to any part of your body/clothing. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3D) Vermin, leaches, animal borne disease	▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Wear long sleeve shirt and full length pants ▪ Be aware of your surroundings. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Do not put hand/arm into/under an area that you cannot see into/under clearly ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers.
	3E) Chemical Hazards	▪ Wear chemical resistant PPE as identified in the HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labeled
	3F) Overhead Power Lines	▪ Identify the location of all overhead power lines at the site. ▪ Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others.) ▪ Re-locate work so it is not close to power lines ▪ Avoid storing materials under overhead power lines
	3G) Underground Utilities	▪ All utilities will be marked prior to excavation activities ▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet ▪ Use lineman's gloves when locating underground power lines ▪ Work at adequate offsets from utility locations ▪ Immediately cease work if unknown utility markings are discovered.

	3H) Cold Stress	▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration. ▪ Be aware of signs of hypothermia, its prevention, detection and treatment. ▪ Have extra protection available, in case of an emergency such as blankets and heating devices. ▪ Don't work under extremely adverse weather conditions ▪ Stay in tune to current weather and extended forecasts.
	3I) Heat Stress	▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.
	3J) Lightning and Thunder	▪ Monitor weather channels to determine if electrical storms are forecasted. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.
	3K) Severe Weather	▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Train workers about weather and appropriate precautions. ▪ Identify a shelter and a safe place in event of tornado etc
	3L) Sun	▪ Keep body protected ▪ Wear sunscreen, wide brimmed hat or hardhat. ▪ Schedule work for cool part of day. ▪ Take breaks in the shade.
	3M) High Crime Areas	▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone ▪ Do not work after dark.

	3N) Operations conducted at an active facility	▪ Stay well clear of operations being conducted at the facility ▪ Keep alert for moving materials, equipment or vehicles ▪ Determine client specific PPE needs prior to arriving at the site ▪ Determine client specific emergency response procedures and follow as appropriate ▪ Participate in client required safety training ▪ Get copies of Clients MSDSs for any client chemicals that workers may be exposed to. ▪ Provide MSDSs to client for all chemicals brought to the site.
	3O) Remote Locations	▪ Carry a two-way radio and know how to use it. ▪ Work in teams. Account for all at the end of the work day. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
	3P) Set up Decon Station	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
4. Walk around the Site	4A) Poisonous plants	▪ See section 3C above
	4B) Vermin, leaches, animal borne disease	▪ See Section 3 D above ▪
	4C) Chemical Hazards	▪ See Section 3 E above
	4D) Slips/Trips/Falls	▪ Wear slip resistant footwear preferably laced boots with a minimum 8" high upper and non-skid soles for ankle support and traction. ▪ Pay attention to where you place your feet ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Site SHSO will inspect the entire work area to identify and mark hazards. ▪ Clear area of trip hazards; mark or barricade those that cannot be moved; ▪ Use caution when walking around excavated areas ▪ Stay back at least 5 feet from excavated areas ▪ Use caution when walking on or around loose soil. ▪ Be aware of surroundings. Avoid muddy areas if possible.

5. Oversight during drilling, or construction operations	5A) Heavy Equipment/ Vehicles	▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the swing radius and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Personnel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Eye contact with operators will be made before approaching equipment.
	5B) Eye Injury	▪ Wear appropriate safety glasses (tinted for sun). ▪ Watch where you walk, especially around trees and brush with protruding limbs.
	5C) Foot Injury	▪ Wear steel toed boots ▪ Wear insulated steel toed boots during winter ▪ Ensure shoes/boots have good traction ▪ Pay attention to where you place your feet, especially when walking on uneven terrain
	5D) Head Injury	▪ Wear hardhat ▪ Do not walk or work under scaffolding or other elevated work unless there are guardrails and toeboards in place ▪ Flag or mark protruding objects at head level
	5E) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco.
	5F) Dust - particulates (respiratory)	▪ Use dust suppression methods ▪ Stand upwind of point of dust generation
	5G) Overhead Power Lines	▪ See Section 3F above.
	5H) Underground Utilities	▪ See Section 3G above
	5I) Standing/Static Posture	▪ Change posture on a frequent basis ▪ Stretch prior to any physical activity
	5J) Slips/`Trips/Falls	▪ See Section 4D above

	5K) Noise	▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs). ▪ All equipment will be equipped with manufacturer's required mufflers. ▪ Hearing protection shall be worn by all personnel working in or near heavy equipment. ▪ Hearing protection will be worn when workers need to shout when standing two feet away from each other. ▪ Segregate noisy equipment from the operators ▪ Use sound dampening around noisy equipment
	5L) Moving Equipment	▪ Clear area of obstructions and communicate with all workers involved that drilling is beginning ▪ Do not exceed manufacturer's recommended speed, force, torque, or other specifications. and penetrate the ground slowly with hands on the controls for at least the first foot of soil to minimize chance of auger kick-out ▪ Stay clear of rotating auger ▪ Use long-handled shovel to clear away cuttings when auger has stopped ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves and steel-toed boots (See HASP)
6. Sampling Oversight	6A) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco. ▪ Calibrate meters in a clean, well ventilated area ▪ Store calibration gases in well vented area. Ensure chemical labels and warnings are legible.
	6B) Personnel Decontamination	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
	6C) Lifting	▪ Good lifting techniques (lift with legs not back) ▪ Mechanical devices (e.g., hand truck, cart, forklift, etc.) should be used to reduce manual handling of materials and drums. ▪ Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lbs) ▪ Split heavy loads in to smaller loads ▪ Make sure that path is clear prior to lift. ▪ Redesign work area to avoid low lifts ▪ Stretch prior to lifting ▪ Maintain a healthy life style and level of physical fitness.

	6D) Hand Tools	▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools. ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service and tag out as defective ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ Do not use excessive force or impact ▪ Do not use tool improperly. Ensure all workers are trained
	6E) Slips/Trips/Falls	▪ See Section 4D above.
	6F) Struck by Vehicle	▪ Ground personnel in the vicinity of vehicles operations will be within the view of the operator at all times. ▪ Ground personnel will not stand directly behind vehicles when it is in operation ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary ▪ Place cones in the font and rear of the vehicle ▪ Prior to driving off, walk around vehicle to collect cones and identify any hazards - especially low level hazards that may be difficult to see when in the vehicle. ▪ Set up "Workers in the Road" or similar warning signs and cones to alert traffic. ▪ Use emergency flashers and roof top flashing light (recommended) to alert oncoming vehicular traffic. ▪ Remain alert at all times as to the traffic outside the vehicle. Step to the side of the road when distracted by by-standers. Keep unofficial personnel out of the work area. ▪ Exit vehicle with caution. ▪ Wear High Visibility Vest when outside the vehicle. ▪ Utilize vehicle as a shield from oncoming traffic, as practical
7. IDW pickup oversight	7A) Foot Injury	▪ See Section 5C above.
	7B) Chemical Hazards	▪ See Section 3E above.
	7C) Lifting	▪ See Section 6C above.
	7D) Slips/Trips/Falls	▪ See Section 4D above
8. Return to office/home	8A) See Mobilization/ Demobilization and Site Preparation JHA	**See Mobilization/ Demobilization and Site Preparation JHA**

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Decontamination **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Establish Decontamination Station	1A) Materials Handling	1A) Materials Handling ▪ Use proper lifting techniques ▪ Use mechanical aids, if available, to move heavy items.
2. Decontamination / Steam cleaning.	2A) Struck by steam/hot water/pressure washing	2A) Struck by steam/hot water ▪ Workers not directly engaged in steam cleaning operations must stay clear. ▪ Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owners/operators manual. ▪ Use face shield **and** safety glasses or goggles, if steam cleaning. ▪ Stay out of the splash/steam radius. ▪ Pressure washer must have dead man switch. ▪ Do not direct steam at anyone. ▪ Do not hold objects with your feet or hands. ▪ Ensure that direction of spray minimizes spread of contaminants of concern. ▪ Use shielding as necessary.
	2B) Exposure to contaminants	2B) Exposure to contaminants ▪ Conduct air monitoring (see HASP). ▪ Wear proper PPE (see HASP). ▪ See MSDSs for hazards associated with the decon solutions used (if other than water alone us used).
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
3. Vehicle Decontamination	3A) Vehicle traffic in and out of the CRZ	3A) Large Vehicle Traffic ▪ Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). ▪ Vehicle drivers are not to exit the vehicle in the CRZ. ▪ Identify an individual to communicate with vehicle drivers and maintain order ▪ Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. ▪ If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. ▪ If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.
	3B) Exposure to contaminants	3B) Exposure to contaminants ▪ Use safety glasses or goggles, Polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. ▪ Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. ▪ Conduct air monitoring (see HASP). ▪ See MSDSs for hazards associated with the decon solutions (if other than water alone is used).

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Decontamination **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Slips/Trips/Falls	3C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
4. Equipment and Sample Decontamination	4A) Chemical exposure when handling contaminated sample jars and equipment	4A) Chemical exposure ▪ Wear PPE as outlined in the HASP. ▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for contaminants ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP)
	4B) Materials Handling related injuries	4B) Materials Handling related injuries ▪ Use proper lifting techniques when lifting heavy equipment ▪ Use two person lift for heavy coolers

5. Personal Decontamination	5A) Exposure to contaminants	5A) Exposure to contaminants
		▪ Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ.
		▪ Removal of PPE will be performed by the following tasks in the listed order:
		  ▪ Gross boot wash and rinse and removal
		  ▪ Outer glove removal
		  ▪ Suit removal
		  ▪ Respirator removal (if worn).
		  ▪ Inner glove removal
		▪ Contaminated PPE is to be placed in the appropriate, provided receptacles.
		▪ Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag.
		▪ Employees will wash hands, face, and any other exposed areas with soap and water.
		▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials.
		▪ See MSDSs for hazards associated with the decontamination solutions used.
		▪ Decon solutions will be disposed of according to the work plan.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Utility Clearance Activities **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: High Visibility vest (in the field), work shoes
See Utility Clearance Procedure and Utility Clearance Form

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Pre-planning	1A) Property Access ▪ Animal bites ▪ Dangerous social areas/ violent neighborhoods ▪ Lost ▪ Electrocution	1A) Ensure communications with the property owner. Request pets and animals to be confined during the survey. ▪ Maintain communications via two way radios or cell phones. ▪ Learn animal posturing including how to identify rabid animals. ▪ Contract security as appropriate for safety and equipment theft. ▪ Be prepared with a map and compass as necessary. ▪ Be aware of overhead and underground utilities. Ensure Dig-Safe has been contacted. ▪ When working with electrical equipment avoid wet surfaces and exposed connections.
	1B) Utilities Not Cleared (damage to utilities, worker injury)	1B) Utilities Not Cleared. ▪ Provide sufficient time and budget to ensure that utilities have been adequately located, prior to the start of up of work. ▪ Contact One Call Utility identifier organization at least 6 days prior to the project start date. ▪ Cite or have subcontractor cite a start date of at least 3 working days prior to actual planned start date (provides window to inspect locations prior to job start-up. ▪ Verify via emails or phone that all utilities have visited the site and marked their respective utilities. ▪ If subcontractor calls One Call organization, require them to forward all e-mail responses from member utilities as they receive them. ▪ If verification cannot be done remotely, send worker to site to inspect ground for markings (cheaper to identify issues prior to mobilization to the site). ▪ Document all phone communications with driller about utility clearance issues and requests (e-mail the conversation highlights or document in a field notebook – it becomes part of the file record) ▪ Call any member utilities that have not responded indicating they have cleared or marked-out utilities. Place the call morning of ticket start date (e.g., 3 days prior to actual start date). Document the phone conversations in notes or e-mails to the file. ▪ If town services (e.g., sanitary sewer, storm sewer, water) aren't listed as a One Call member, contact the town office to schedule mark-out, obtain copies of utility networks, and identify the appropriate town contacts. ▪ If town maps have lateral connections to private lots marked and /or if we are drilling along road right-of way opposite developed properties, identify the locations of the lateral connections. This may mean contacting abutters and asking to look in basements for location of pipes. If possible do this during a site visit prior to field start. If not, it should occur during the first day of work so any issues can be identified and decisions made on the risk of proceeding. ▪ Walk all planned locations with the subcontractor, prior to start of excavation/drilling to identify marked utilities and note any uncertainties. Field Lead should call PM and relay any issues. Document this inspection in the field book and note subcontractor's responses to any MACTEC concerns.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Utility Clearance Activities **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	1C) Locating Utilties on Private Property	1C) Locating Utilities on Private Property ▪ Hire private utility locater company ▪ Locate underground utilities by ground penetrating radar, electromagnetic, deep metal detector, pipe transmitter, vibracator, etc ▪ Review locations with property owner, member of operations and maintenance. ▪ Check as built drawings when available. Be aware possible drawing error or construction drawings may not be representative of actual locations. ▪ Use field clues such as manhole covers, repaved areas, depressions, disturbed areas, signs and postings, etc. as indications of access to utilities or recently installed/moved utilities.
	1D) Lack of Reliable Data on Utility Locations	1D) Lack of Reliable Data on Utility Locations ▪ If the surveys are not providing reliable data, plan to use non-destructive means to drill/excavate e.g., soil vacuum, water jet, air knife and/or hand tools. ▪ Use caution and proper PPE when using hand tools (hand augers, posthole diggers, shovels, steel rods, etc.). ▪ Involve the Project Manager, Technical Lead and/or Office Manager to make a decision to proceed or move the location
	1E) Working Near Live Utilities	1E) Working Near Live Utilities ▪ If live utilities are known to be present near drilling/excavation location, if possible, move drilling/excavation to another location. ▪ Lockout/Tagout utilities, if possible. ▪ Use non-destructive means to drill/excavate (see # 1D) until safe to proceed.
2. Walking Around Site Identifying Utility Clearances.	2A) Slips/Trips/Falls	2A) Slips/Trips/Falls ▪ Keep work area free of excess material and debris ▪ Remove all trip hazards by keeping materials/objects organized and out of walkways ▪ Keep work surfaces dry when possible ▪ Wear appropriate PPE (see HASP) including non-slip rubber boots if working on wet or slick surfaces ▪ Install rough work surface covers where possible ▪ Stay aware of footing and do not run
	2B) Heat/Cold Stress	2B) Heat/Cold Stress ▪ Take breaks if feeling faint or overexerted ▪ Consume adequate food/beverages (water, sports drinks) ▪ If possible, adjust work schedule to avoid temperature extremes
	2C) Biological Hazards: Insects, Snakes, Wildlife, Vegetation	2C) Biological Hazards: Insects, Snakes, Wildlife, Vegetation ▪ Inspect work areas when arrive at site to identify hazard(s) ▪ Use insect repellant if observe mosquitoes/gnats ▪ Survey site for presence of biological hazards and maintain safe distance ▪ Wear appropriate PPE including leather gloves, long sleeves and pants, and snake chaps as warranted by site conditions
	2D) Traffic (including pedestrian)	2D) Traffic (including pedestrian) ▪ Notify attendant or site owner/manager of work activities and location ▪ Use cones, signs, flags or other traffic control devices ▪ Wear appropriate PPE including high visibility clothing such as reflective vest ▪ Inspect area behind vehicle prior to backing and use spotter

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Utility Clearance Activities **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	2E) Back strain due to lifting, pulling or tugging equipment	2E) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1A) See JHA Mobilization/Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2. General Site Hazards	2A) See JHA Field Work - General	2A) See JHA Field Work - General
	2B) Chemical exposure	2B) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	4A) Contact with poisonous plants or the oil from poisonous plants	4A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	4B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	4C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	4C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Immediately monitor breathing zone after opening well to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP ▪ Monitor headspace in well. After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	4D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4E) Foot injuries from dropped equipment	4E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear Steel toed boots
5. Collecting water samples	5A) Fire/Explosion/Contamination hazard from refueling generators	5A) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	5B) Electrocution	5B) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5C) Exposure to contaminants	5C) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	5D) Infectious water born diseases	5D) Infectious water born diseases ▪ Wear chemical resistant gloves and other PPE – as identified in HASP ▪ Prevent water from contacting skin ▪ Wash exposed skin with soap and water ASAP after sampling event ▪ Ensure that all equipment is adequately decontaminated using a 10% bleach solution
	5E) Exposure to water preservatives	5E) Exposure to water preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ When preserving samples always add acid to water, avoid the opposite. ▪ See JHA Working with Preservatives
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums for removal ▪ Wear good slip resistant footwear
	5G) Repetitive Motion and other Ergonomic Issues	5G) Ergonomic Issues ▪ Use mechanical means where possible to raise and lower equipment into well. ▪ Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. ▪ Use safe lifting techniques.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Sample Processing	6A) Contaminated water	6A) Contaminated water ▪ Wear appropriate PPE as identified in HASP ▪ Decontaminate outside of bottles ▪ Prevent water from contacting skin ▪ Work in well ventilated area – upwind of samples ▪ Waste will be returned to the operation office for storage and disposal
7. Shipping Samples	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage ▪ Wear appropriate chemical resistant gloves as identified in HASP. ▪ Wear leather or insulated gloves when handling dry ice. ▪ Follow safe lifting techniques – get help lifting heavy coolers. ▪ Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Mobilization	4A) See JHA Mobilization/Demobilization/Site Preparation	2A) See JHA Mobilization/Demobilization/Site Preparation
3. General Site Hazards	3A) See JHA Field Work - General	3A) See JHA Field Work - General
4. Carrying equipment to site location	4B) Back or muscle strain	4A) Back or muscle strain ▪ Use proper lifting techniques when lifting pumps or generators ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
5. Calibrate monitoring equipment	5A) Exposure to calibration gases	5A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
6. Preparing sampling location	6A) Contact with poisonous plants or the oil from poisonous plants	6A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP.
	6B) Contact with biting insects (i.e., spiders, bees, etc.)	6B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	6C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated soil); flammable atmospheres.	6C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	6D) Back strain due to lifting or moving equipment to sampling locations	6D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	6E) Foot injuries from dropped equipment	6E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots
7. Collecting soil samples	7A) Working around drill rigs	7A) See JHA - Drilling
	7B) Encountering underground or overhead utilities	7B) Have all utilities located.
	7C) Fire/Explosion/Contamination hazard from refueling generators	7C) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	7D) Electrocution	7D) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	7E) Exposure to contaminants	7E) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	7F) Exposure to preservatives	7F) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ Review MSDSs
	7G) Slips/trips/falls	7G) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	7H) Lifting Injury	7H) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	7I) Eye injury	7I) Eye Injury ▪ Wear eye protection when using picks or similar devices to loosen soil
	7J) Fire	7J) Fire ▪ When using gas powered auger, maintain fire watch whenever fueling or otherwise handling gasoline ▪ See JHA - Gasoline

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
8. Soil sampling using floor corer	8A) Back injury	8A) Back Injury ▪ Use proper lifting techniques when moving floor corer and generator ▪ Use mechanincal aids if available ▪ Use two person lift for heavy items.
	8B) Electric Shock	8B) Electric Shock ▪ Use electric cords free from defects ▪ Keep cords out of water ▪ Ensure all electrical equipment is properly grounded ▪ Use GFCI
	8C) Hearing	8C) Hearing ▪ Wear hearing protection
	8D) Fire	8D) Fire ▪ When using generator, maintain fire watch whenever refueling or otherwise handling gasoline ▪ See JHA - Gasoline
	8E) Contamination	8E) Contamination ▪ Use appropriate PPE for the contaminants of concern (see HASP). ▪ Minimize sample contact ▪ Label sample in accordance with procedures ▪ Monitor breathing zone levels.

MACTEC Job Hazard Analysis - HASP Format

Job Title: Environmental Drilling/Boring and Associated Soil and/or Bedrock Sampling **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: Steel Toed, Slip Resistant Safety Boots; Safety Glasses; Face Shield (if chipping bedrock to collect sample); Nitrile gloves; High visibility vest; Hard Hat; Hearing Protection; Insulated Gloves (if hand digging to identify underground utilities)
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. All Drilling/Boring Activities	1A) Slips, Trips, Falls	1A) Slips, Trips, Falls ▪ Keep work area free of excess material and debris ▪ Remove all trip hazards by keeping materials/objects organized and out of walkways ▪ Keep work surfaces dry when possible ▪ Wear appropriate PPE (See HASP) including non-slip rubber boots if working on wet or slick surfaces ▪ Install rough work surface covers where possible ▪ Be alert to conditions that can lead to slippery surfaces including high groundwater or heavy precipitation can result in muddy soils. ▪ Stay aware of footing and do not run
	1B) Heat/Cold Stress	1B) Heat/Cold Stress ▪ See Field Work – General JHA and HASP Appendix B.
	1C) Biological Hazards: Insects, Snakes, Wildlife, Vegetation	1C) Biological Hazards: Insects, Snakes, Wildlife, Vegetation ▪ Inspect work areas when arrive at site to identify hazard(s) ▪ Use insect repellant if observe mosquitoes/gnats ▪ Open enclosures slowly ▪ Survey site for presence of biological hazards and maintain safe distance ▪ Wear appropriate PPE including leather gloves, long sleeves and pants, and snake chaps as warranted by site conditions (See HASP). ▪ See also Insect Stings & Bites JHA.
	1D) Traffic (including pedestrian)	1D) Traffic (including pedestrian) ▪ Notify attendant or site owner/manager of work activities and location ▪ Set up exclusion zone surrounding work area using cones, signs, or flags. A police detail is necessary when working in locations that may disrupt or affect traffic on Route 119 ▪ Wear appropriate PPE including high visibility clothing and a reflective vest (See HASP) ▪ Inspect area behind vehicle prior to backing and use spotter
	1E) Struck By Rig	1E) Struck by Rig ▪ Ensure that drill rig backup alarm is working. If it is not, alert drilling supervisor immediately. This safety device must be working in order to operate the equipment on site ▪ Do not walk in the path of or behind a moving rig ▪ Do not walk behind the moving rig and always establish eye contact with the operator before approaching the equipment
	1F) Fire/ Explosion	1F) Fire/ Explosion ▪ Post No Smoking signs around work area ▪ Establish designated smoking area away from work area ▪ Ensure type ABC, 20-lb, fully charged fire extinguisher on-site and within inspection period ▪ Stop work if hazardous conditions (explosive atmosphere) are identified

MACTEC Job Hazard Analysis - HASP Format

Job Title: Environmental Drilling/Boring and Associated Soil and/or Bedrock Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
2. Ambient Air Monitoring	2A) Vapors/Contaminated Soil/Groundwater	2A) Vapors/Contaminated Soil/Groundwater ▪ Approach area where vapors are suspected from upwind direction and stay upwind/crosswind of from potential sources of vapors (use flagging or similar device to indicate wind direction) ▪ During drilling operations, always be aware of the possibility of encountering potentially hazardous materials, such as petroleum hydrocarbons, herbicides, pesticides, or solid waste materials ▪ In the event that any unknown or questionable materials are encountered, the drilling operations must be suspended immediately until further instructions are received from the Project Manager ▪ Do not handle any suspected contaminated materials unless trained to do so and proper protective methods are followed ▪ During drilling operations, always be aware of the possibility of striking an un-located or improperly located utility ▪ In the event a buried utility line is struck, drilling operations are to be suspended **immediately** - If the utility line is electric, keep personnel at least 10 feet from all metal surfaces connected with the drill rig. - If the utility is gas, then the area is to be evacuated and secured. Immediate notification to the utility company is MANDATORY. ▪ In the event of a gas or oil spill, the proper authorities are to be contacted immediately so that containment operations can be implemented
	2B) Ineffective Air Monitoring	2B) Ineffective Air Monitoring ▪ See Field Work – General JHA.
3. Concrete Coring	3A) Ignition Sources	3A) Ignition Sources ▪ Ensure electrical equipment properly grounded ▪ Apply water as necessary to address surface sparking potential
	3B) High Noise Levels	3B) High Noise Levels ▪ Hearing protection required when working around operating equipment including drill rigs
	3C) Airborne Particulates and Debris	3C) Airborne Particulates and Debris ▪ Use wet methods whenever possible. Water should be used to control dust in area ▪ Wear appropriate PPE including face shield or safety glasses with side shields, dust mask, leather gloves and long sleeves (See HASP)
	3D) Sharp Rough Materials	3D) Sharp Rough Materials ▪ Wear appropriate PPE including leather gloves, long sleeves and pants, and steel-toed boots (See HASP)
	3E) Impact to Subsurface Lines	3E) Impact to Subsurface Lines ▪ Ensure all underground features have been identified in area per SCP prior to start of activities
4. Drill Rig Set-Up	4A) Contact with Electric Lines and Other Overhead Obstacles	4A) Contact with Electric Lines and Other Overhead Obstacles ▪ Operator must position rig to avoid overhead utility lines by distance defined by voltage and local regulations ▪ Operator must use a spotter when raising mast to confirm clearance of overhead lines and other obstructions
	4B) Rig Movement	4B) Rig Movement ▪ Heavy equipment, including drill rigs, must be equipped with back-up alarm ▪ Stay clear of operating equipment and rig when moving
	4C) Sharp or Elevated Equipment	4C) Sharp or Elevated Equipment ▪ Wear appropriate PPE including steel-toed safety boots, leather gloves and hard hat (See HASP) ▪ Operator should establish communication system between him/her and the workers involved in moving/attaching sections of drill rod/augers

MACTEC **Job Hazard Analysis - HASP Format**

Job Title: Environmental Drilling/Boring and Associated Soil and/or Bedrock Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
5. Ground Disturbance: Auger/Boring Advancement	5A) Faulty or Inappropriate Equipment	5A) Faulty or Inappropriate Equipment ▪ Qualified driller must inspect drill rig prior to use, if faulty or inappropriate, drilling cannot proceed until repaired or replaced ▪ Driller must inspect all tools prior to use, if faulty or inappropriate, do not proceed until repaired or replaced. Tag out all defective tools
	5B) Moving Equipment	5B) Moving Equipment ▪ Clear area of obstructions and communicate with all workers involved that drilling is beginning ▪ Driller must not exceed manufacturer's recommended speed, force, torque, or other specifications. and penetrate the ground slowly with his/her hands on the controls for at least the first foot of soil to minimize chance of auger kick-out ▪ All personnel must stay clear of rotating auger ▪ Use long-handled shovel to clear away cuttings when auger has stopped ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves and steel-toed boots (See HASP)
	5C) Suspended Loads	5C) Suspended Loads ▪ Do not walk under suspended loads ▪ When possible, remove overhead hazards promptly ▪ Wear appropriate PPE including hard hat and steel-toed boots (See HASP)
	5D) High Noise Levels	5D) High Noise Levels ▪ Use hearing protection if within 20 feet of active drill rig
	5E) Ground Disturbance: Auger/Boring Advancement Vapors and Airborne	5E) Ground Disturbance: Auger/Boring Advancement Vapors and Airborne ▪ Monitor air concentrations using direct-reading, real-time instruments such as PID (See HASP for required monitoring instruments and action limits)
	5F) Particulates	5F) Particulates ▪ Stop work if hazardous conditions (explosive atmosphere, O2 deficient atmosphere) identified until precautions are taken (See HASP for required monitoring instruments and action limits) ▪ Wear appropriate PPE including face shield or safety glasses with side shields, dust masks or respirators, long sleeves and pants (See HASP) ▪ Stay upwind (use flagging or similar device to indicate wind direction)
	5G) Impact to Subsurface Lines/Tanks	5G) Impact to Subsurface Lines/Tanks ▪ In addition to Digsafe utility marking, hand digging to at least 5 feet at each boring location is required at the Conductorlab Site. Exact locations of recovery well pump utility locations are not detectable from the ground surface and the approximate locations can only be determined by a crude map ▪ Only drill in areas where underground features have been identified and cleared. If hole has to be moved, clear new location first ▪ Wear appropriate PPE including insulating gloves or stand on an insulating mat when in contact with drill rig
6. Ground Intrusion: Split Spoon	6A) Faulty Equipment	6A) Faulty Equipment ▪ Inspect rope/cable/rod for wear, fraying, oils and moisture prior to use, do not use if faulty until repaired or replaced. ▪ Inspect cathead for rust and rope grooves prior to use, do not use if faulty until repaired or replaced ▪ Report any defects to your supervisor

MACTEC Job Hazard Analysis - HASP Format

Job Title: Environmental Drilling/Boring and Associated Soil and/or Bedrock Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	6B) Moving Equipment	6B) Moving Equipment ▪ Do not wrap rope around any part of the hand or body ▪ Maintain distance of at least 18-inches from in-running points on running/reciprocating equipment ▪ Eliminate excess rope ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves (See HASP)
7. Soil Sampling	7A) Contaminated Materials	7A) Contaminated Materials ▪ Wear appropriate PPE including Nitrile gloves (See HASP)
	7B) Sharp Sampling Tools	7B) Sharp Sampling Tools ▪ When possible, have the driller open the sample sleeve. ▪ Place soil core on sturdy surface prior to cutting ▪ Use correct tools for opening sample sleeves ▪ When opening sleeve, cut away from body
	7C) Vapors	7C) Vapors ▪ Conduct monitoring in accordance with the HASP ▪ Wear appropriate PPE including respirator if conditions warrant
	7D) Sample Cross Contamination	7D) Sample Cross Contamination ▪ Decontaminate or dispose of sampling equipment between sampling locations ▪ Double-check sample labels to ensure accuracy and adhesion to containers
8. Bedrock Sampling	8A) Eye Injuries from Chipping Rock	8A) Eye Injuries from Chipping Rock ▪ Wear face shield and safety glasses while slowly chipping at the rock core to collect sufficient number of bedrock pieces to fill sample container ▪ Focus on the task, make sure no one is in the path of your hammer and watch where you are striking the rock. Keep all body parts out of the path of the hammer
	8B) Contact with Methanol in Sample Containers	8B) Contact with Methanol in Sample Containers ▪ Wear appropriate gloves as described in the HASP. ▪ Carefully place the pieces of rock into the sample container and minimize contact with the liquid. Avoid splashing liquid
9. Solid/Liquid Waste Management/ Disposal	9A) Vapors and Airborne Particulates	9A) Vapors and Airborne Particulates ▪ Monitor air concentrations using direct-reading, real-time instruments such as PID (See HASP for required monitoring instruments and action limits) ▪ Stop work if hazardous conditions (explosive atmosphere, O2 deficient atmosphere) identified until precautions are taken ▪ Wear appropriate PPE including safety glasses with side shields, dust masks and respirators (See HASP) ▪ Stay upwind (use flagging or similar device to indicate wind direction)
	9B) Contaminated Materials and Container Pinch Points	9B) Contaminated Materials and Container Pinch Points ▪ Wear appropriate PPE including Nitrile and leather gloves (See HASP) ▪ Position hands/fingers to avoid pinching/smashing/crushing when closing drum rings

Job Title: Environmental Drilling/Boring and Associated Soil and/or Bedrock Sampling **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	9C) Heavy Materials and Containers Lifting/ Moving	9C) Heavy Materials and Containers Lifting/ Moving ▪ Do not lift or move heavy containers without assistance ▪ Use proper bending/lifting techniques by lifting with arms and legs and not with back ▪ If possible, use powered lift truck, drum cart, or other mechanical means Take breaks if feeling faint or overexerted ▪ Spot drums in storage area prior to filling ▪ Wear appropriate PPE including leather gloves and steel-toed boots

The following information is meant to convey information about the hazards of a drill rig. Although MACTEC personnel will not be operating the drill rig, they will be stationed in the vicinity of the rig and must be aware of potential hazards. MACTEC has included the following information pertaining to safe operation of the drill rig as awareness to MACTEC personnel on the hazards of drilling. This must not be construed to mean that MACTEC is responsible for the drillers' safety.

Prior to operating the drill rig, the drill rig operator must:

- Inspect the rig prior to any work on site.
- Inspect the work area to confirm the presence of overhead or underground utilities.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, level the drill rig and stabilize it with leveling jacks and/or solid cribbing. The operator must re-level the rig immediately if settling occurs after the initial set-up.
- Before raising or lowering the mast (derrick), inspect the work area for potential safety hazards. All unnecessary drill rig personnel and visitors shall be cleared from the areas immediately to the rear, front, and the sides of the mast. Once the mast is raised into position, the mast or derrick locks will be secured. The rig shall not be operated unless mast locks are functional and are locked. Prior to lowering, mast hydraulic system(s) will be checked.
- Before raising the mast (derrick), double-check for overhead wires and obstructions. An observer shall be posted at a strategic location to ensure adequate clearance is maintained.
- Ensure that no personnel, other than the assigned rig crew, are allowed on or under an operating rig deck for any reason.
- Not move the drill rig from hole to hole with the mast (derrick) in the raised position.
- Operate a drill rig only from the driller's control station, and remain with the operating controls at all times when the rig is in operation.
- If it is necessary to drill within an enclosed area, make certain that rig exhaust gases are captured and discharged well out of the work area, and any area where people could be present. Provide sufficient ventilation.
- When using a mast or derrick ladder, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. The three-point of contact system (2 hands and 1 foot or 2 feet and 1 hand) shall be used when climbing. Always make sure that his/her shoe soles are clean and dry before attempting climbing or descending the mast.
- Ensure that anyone working on a derrick board, platform, or mast shall be provided with fall protection in accordance with OSHA fall protection regulations under 29 CFR 1926.
- When working on a mast or derrick platform, the operator must not guide drill rods or pipe into racks or other supports by taking hold of a moving hoisting line, traveling block, or other moving hoisting equipment. Rack only one pipe stand at a time. Always stay clear of moving hoisting line, traveling block, elevators, or hoisting plugs.

- Ensure that loose tools and similar items are not left on the derrick platform or on structural members of the derrick.
- Ensure that all unattended boreholes be adequately covered or otherwise protected to prevent people or animals from stepping or falling into the hole.

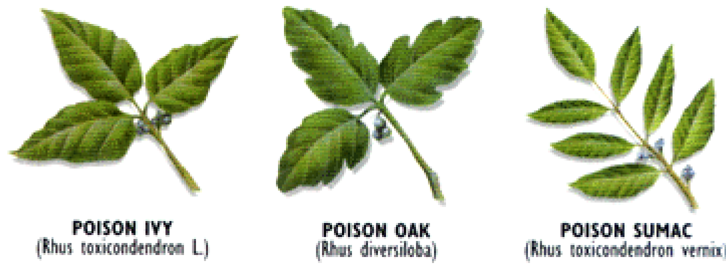
Other safety precautions the drill rig operator and his/her crew must follow are:

- Platforms, steps, handholds, and guardrails shall be provided on the equipment to assure safe access and footing. The platform and decks shall be coated with a nonskid surface.
- Rig personnel shall employ good ergonomic lifting techniques when lifting heavy objects, such as keeping the back straight, keeping weight close to the body, getting help when necessary and using mechanical assistance when possible.
- Personnel shall not ride the hoisting line, catline, traveling block, the traveling block hook, the elevators, or suspended equipment as a means of ascending or descending to or from the derrick.
- All rig steps, ladders, stairways, platforms, and walkways shall be free of mud, snow, ice, tools, and other materials that may cause slipping or tripping.

MACTEC

JOB HAZARD ANALYSIS - SHORT FORM HASP

Job Title: Poisonous Plants **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1) Mobilization	1A) See JHA Mobilization/ Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2) Preparation	2A) Training – Identifying Poisonous Plants	2A) Provide training on identifying the specific poisonous plants that could be present at the site
		
	2B) Poison Ivy 	2B) Poison Ivy: ▪ Grows everywhere in United States except Hawaii and Alaska. ▪ In the East, Midwest, and the South, it grows as a vine. ▪ In the Northern and Western United States, it grows as a shrub. ▪ Each leaf has three leaflets. ▪ Leaves are green in the summer and red in the fall. ▪ In the late summer and fall, white berries may grow from the stems.
	2C) Poison Oak 	2C) Poison Oak: ▪ Oak-like fuzzy leaves in clusters of three. ▪ It has two distinct kinds: ▪ Eastern poison oak (New Jersey to Texas) grows as a low shrub. ▪ Western poison oak (Pacific Coast) grows to six-foot-tall clumps or vines up to 30 feet long. ▪ It may have clusters of yellow berries.
	2D) Poison Sumac 	2D) Poison Sumac ▪ Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. ▪ Each leaf has clusters of seven to 13 smooth-edged leaflets. ▪ The plants can grow up to 15 feet tall. ▪ The leaves are orange in spring, green in summer and red, and orange or yellow in fall. ▪ There may be clumps of pale yellow or cream-colored berries.

MACTEC

JOB HAZARD ANALYSIS - SHORT FORM HASP

Job Title: Poisonous Plants **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	2E) Giant Hogweed  Giant Hogweed  Giant Hogweed Flower (clusters may reach up to 2.5 feet across)  Giant Hogweed Flower Leaves  Giant Hogweed Stem Thick stem with coarse hairs, Blistery dark purple splotches.	2E) Giant Hogweed ▪ Hogweed is a public health hazard. Its clear, watery sap has toxins that cause photo-dermatitis. Skin contact followed by exposure to sunlight produces painful, burning blisters that may develop into purplish or blackened scars. Contact with the eyes can cause temporary or permanent blindness. ▪ Since its introduction into North America, this plant has become established in rich moist soils along roadsides, stream banks and waste ground. In the eastern US, it is known to occur in Maine, New York, Pennsylvania, Connecticut, and now Massachusetts. ▪ A biennial or perennial herb growing 8 to 15 feet tall, giant hogweed usually has a taproot or occasionally fibrous root. The hollow stems are 2 to 4 inches in diameter with dark reddish-purple splotches and coarse white hairs. ▪ The deeply incised compound leaves grow up to 5 feet in width. Hairs on the underside of the leaf are stiff, dense and stubby. ▪ The large umbrella-shaped flower heads are up to 2 1/2 feet in diameter across a flat top with numerous small flowers produced in mid-May through July. ▪ Some plants die after flowering; others flower for several years. The plant produces flattened, 3/8 inch long, oval dry fruits that have a broadly rounded base and broad marginal ridges. Plants sprout in the early spring (or late winter in mild years) from the roots or from seed. ▪ Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. ▪ Each leaf has clusters of seven to 13 smooth-edged leaflets. ▪ The plants can grow up to 15 feet tall. ▪ The leaves are orange in spring, green in summer and red, and orange or yellow in fall. ▪ There may be clumps of pale yellow or cream-colored berries.

MACTEC

JOB HAZARD ANALYSIS - SHORT FORM HASP

Job Title: Poisonous Plants **Date of Analysis:** 7/7/15

Key Work Steps	**Hazards/Potential Hazards**	**Safe Practices**
3A) Contact with poisonous plants	3A) Hand Contact	3A) Hand Contact ▪ Apply IvyX (or similar product) to hands, forearms and other potentially exposed parts of the body, prior to starting work in the morning and again right after lunch. ▪ Leather Gloves must be worn at all times when digging, screening or carrying field equipment. ▪ Leather gloves should be of sufficient length to cover the entire wrist and cuff of the shirt. ▪ Carefully remove gloves, without touching the exterior surface, when taking notes and prior to lunch or restroom breaks. ▪ Gloves that become worn should be replaced immediately. ▪ Do not scratch or rub the face or other exposed skin while wearing gloves. ▪ Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.
	3B) Arm Contact	3B) Arm Contact ▪ Apply IvyX (or similar product) to hands, forearms and other potentially exposed parts of the body, prior to starting work in the morning and again right after lunch. ▪ Wear light weight, long sleeved shirts as the sleeves will provide a physical barrier between the skin and any urushiol oil encountered. Disposable gauntlets may we worn over arms to keep oil from clothing as well. ▪ Have the sleeves pulled down to the base of the hand, covering the forearm and wrist (all exposed skin). ▪ Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.
	3C) Leg Contact	3C) Leg Contact ▪ Wear long pants and boots. ▪ Assume boots are contaminated with the urushiol oil and only handle with gloved hands.
4) Handling Contaminated Equipment and Clothing	4A) Exposure from Handling Contaminated Equipment	4A) Exposure from Handling Contaminated Equipment ▪ Do not handle any field equipment that may have come in contact with poison ivy/oak/sumac without gloves. ▪ Decontaminate all equipment at the end of each workday with a solution of water and dish soap. ▪ Scrub all surfaces of the screens and shovels with a brush. ▪ Rinse with cool water using a portable garden sprayer.

MACTEC

JOB HAZARD ANALYSIS - SHORT FORM HASP

Job Title: Poisonous Plants **Date of Analysis:** 7/7/15

Key Work Steps	**Hazards/Potential Hazards**	**Safe Practices**
	4B) Exposure from Handling Contaminated Clothing	4B) Exposure from Handling Contaminated Clothing ▪ Wash clothing potentially contaminated with urushiol oil prior to wearing again. ▪ Handle contaminated clothing with gloves as the oil can remain on environmental surfaces for up to 5 years.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Excavation and Backfilling **Date of Analysis:** 8/20/07

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

<table>
<tr><th>Key Work Steps</th><th>Hazards/Potential Hazards</th><th>Safe Practices</th></tr>
<tr><td>1. Identify location of underground utilities</td><td>1A) Encountering electrical, gas, communications, water, or other underground utility lines</td><td>1A) Identify utility locations prior to mobilizing:
▪ Contact “Dig Safe” and obtain a permit (or one call center) to have underground utilities located and marked prior to any subsurface work on site.
▪ Use facility engineers and/or employ a private utility locator for utilities on private property</td></tr>
<tr><td>2. Excavation of soils</td><td>2A) Underground utilities</td><td>2A) Underground utilities
▪ Work at adequate offsets from utility locations
▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet
▪ Immediately cease work if unknown utility markings are discovered.
▪ Conform to utility clearances based on voltage of lines. For power lines of 50 KV or less stay at least 10 feet away. For power lines of > 50 KV see table below. Rule of thumb: Stay 10 feet away if power line <u>known</u> to be 50 KV or less. Stay 35 feet away for lines > 50 KV or if voltage is unknown.
United States Overhead Line Criteria<table><tr><th>Line Voltage (Kilovolts)</th><th>Minimum Safe Working Distance</th></tr><tr><td>0 – 50</td><td>10 feet</td></tr><tr><td>>50 – 200</td><td>15 feet</td></tr><tr><td>>200 – 350</td><td>20 feet</td></tr><tr><td>>350 – 500</td><td>25 feet</td></tr><tr><td>>500 – 750</td><td>35 feet</td></tr><tr><td>>750 – 1,000</td><td>45 feet</td></tr></table>Source: American National Standards Institute, Publication B30.5.</td></tr>
<tr><td></td><td>2B) Vapor/Dust Exposure</td><td>2B) Vapor/Dust Exposure
▪ Conduct breathing zone air monitoring as described in the HASP.
▪ Implement dust control measures as applicable.
▪ Wear proper PPE (see HASP).</td></tr>
<tr><td></td><td>2C) Odors</td><td>2C) Odors
▪ Implement odor control mitigation in accordance with the Site Management Plan.</td></tr>
<tr><td></td><td>2D) Heavy Equipment</td><td>2D) Heavy Equipment
▪ See General Site Hazards</td></tr>
<tr><td></td><td>2E) Cave-ins</td><td>2E) Cave-ins
Excavation work must be conduct in accordance with OSHA 1926 Subpart P (650-652) Excavations including but not limited to:
▪ Designate a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting for the excavation
▪ Walls and faces of trenches 5 feet or more deep, and all excavations in which employees may be exposed to danger from moving ground or cave-in shall be guarded by a shoring system, sloping of the ground, or some other equivalent means.
▪ Cordon-off the perimeter of the excavation to delineate cave-in hazard area.
▪ Construct diversion ditches or dikes to prevent surface water from entering excavation and provide good drainage of the areas surrounding the excavation.
▪ Collect ground water/rain water from excavation and dispose of properly</td></tr>
</table>

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Excavation and Backfilling **Date of Analysis:** 8/20/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
		▪ Store spoils, materials and equipment at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face. ▪ Inspect excavations (when personnel entry is required) daily, any time conditions change and document the inspection.
	2F) Slips/Trips/Falls	2F) Slips/Trips/Falls ▪ Provide sufficient egress (stairs, ladders, or ramps) when workers enter excavations over 4 feet in depth, and place these structures so that workers travel no more than 25 feet to reach ladders. Provide at least two means of exit for personnel working in excavations. ▪ Maintain minimum safe distance from the excavation and only approach the excavation on the short side.
	2G) Site Security	2G) Site Security ▪ Fill in excavation prior to leaving the site or provide barricades or fencing (able to withstand 200 lbs. of vertical pressure) to protect the excavation from the public and place warning signs on fence/barricade. ▪ Consider hiring a security guard ▪ If cover excavation with plywood or other material, ensure cover is labeled with the words “cover” or “hole.”
3). Backfilling of Soils	3A) Heavy Equipment	3A) Heavy Equipment ▪ See General Site Hazards (Heavy Equipment)
	3B) Cave-ins	3B) Cave-ins ▪ See 2E above.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Insect Stings and Bites **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: Long sleeved shirt and pants, light colored clothing
*See HASP for all required PPE

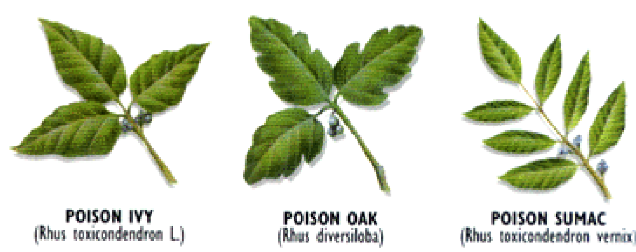
Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Traveling/working in areas with potential Tick Bites –Example outdoor wooded areas or fields.	1. Lyme Disease, Rocky Mountain Spotted Fever, etc.	▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Each outer garment should overlap the one above it. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails. ▪ Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. ▪ If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin with soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification, if the victim should have a reaction. Record dates of exposure and removal. ▪ Do not try to remove the tick by burning with a match or covering it with chemical agents. ▪ If you can not remove the tick, or the head detaches, seek propmt medical help. ▪ Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within two weeks of the attack. Symptoms specific to Lyme disease include: confusion, short-term memory loss, and disorientation.
2. Working/traveling in areas with potential bee and wasp stings-Example wooded areas and fields	2. Allergic reactions, painful stings	▪ Be alert to hives in brush or in hollow logs. Watch for insects travelling in and out of one location. ▪ If you or anyone you are working with is known to have allergic reactions to bee stings, tell the rest of the crew and your supervisor. Make sure you carry emergency medication with you at all times. ▪ Wear long sleeve shirts and trousers; tuck in shirt.. Bright colors and metal objects may attract bees. ▪ If you are stung, cold compresses may bring relief. ▪ If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. ▪ If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately. Give victim antihistime, (Benadryl, chlo-amine tabs).
3. Traveling/working in areas of potential Mosquito Bites-Example- Woods, fields, near bodies of water and etc.	3. Skin irritation, encephalitis	▪ Wear long sleeves and trousers. ▪ Avoid heavy scents. ▪ Use insect repellants. If using DEET, do not apply directly to skin, apply to clothing only. ▪ Carry after-bite medication to reduce skin irritation.

Job Hazard Analysis - HASP Format

Job Title: Geophysical Survey **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: Hard Hat, safety glasses, gloves, steel toe work boots, high visibility safety vest, hearing protection

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1a) See JHA for Mobilization/Demobilization Site Preparation	See JHA for Mobilization/Demobilization Site Preparation
2. Communication	2a) Safety, crew unity	Talk to each other: ▪ Log all workers and visitors on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the whereabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone
3. Site Walk Over	3a) Slips/Trips/Falls	Slips/Trips/Falls: ▪ Maintain work areas safe and orderly; mark or repair possible tripping hazards. ▪ Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3b) Exposure to poisonous plants and insects	Exposure to poisonous plants and insects: ▪ See JHA for Insect Stings and Bites ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Do not allow plant to touch any part of your body/clothing. ▪ If contact is unavoidable, see JHA – Poisonous Plants ▪ Wear PPE as described in the HASP and wear Tyveks, gloves and boot covers if contact with plant is likely ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
		
	3c) Struck by vehicle	Struck by vehicle: ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Use orange cones and signs if working within 15 feet of a road

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Geophysical Survey **Date of Analysis:** 7/7/15

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3d) Exposure to Contaminants	Chemical/Toxicological Hazards: ▪ See HASP for a list of contaminants of concern and the appropriate level of PPE ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Be familiar with hazards associated with site contaminants. ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
	3e) Overhead Power Lines	Overhead Power Lines: ▪ Do not work within 10 feet of an overhead power line.
4. Layout Survey Lines (applicable in setting up survey grids, seismic lines, and electrical resistivity lines)	4a) Slips/Trips/Falls	Slips/Trips/Falls: ▪ See 3a above. In addition, pay attention to the position of the electrodes as they will be low to the ground and could pose a tripping hazard ▪ See JHA Clearing Brush and Trees
	4b) Materials Handling – Sprains/ Strains	Materials Handling – Sprains/ Strains: ▪ Take precautions when handling heavy equipment. ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Split heavy loads in to smaller loads ▪ Team lifting should be utilized if mechanical devices are not available. ▪ Make sure that path is clear prior to lift.

Job Hazard Analysis - HASP Format

Job Title: Working with Preservatives (Acids) **Date of Analysis:** 7/7/15

Minimum Recommended PPE*: Safety glasses/goggles, nitrile gloves,
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Opening the box of ampoules	1A) Cuts or punctures with a knife	1A) Cuts or punctures with a knife ▪ Use appropriate techniques when handling a knife. Always cut away from you.
	1B) Broken ampoules in the box. Cuts from the broken glass.	1B) Broken ampoules in the box. Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Dispose of the preservative and broken glass by approved methods.
	1C) Broken ampoules in the box. Breathing fumes.	1C) Broken ampoules in the box. Breathing fumes. ▪ Wear safety goggles and protective gloves. ▪ Always work in a well-ventilated area.
2. Breaking top of glass ampoule	2A) Cuts from the broken glass.	2A) Cuts from the broken glass ▪ Wear safety goggles and protective gloves. ▪ Use a paper towel to wrap ampoule in to snap the top or use an ampoule breaker. ▪ Always point the ampoule away from you when you snap off the top.
	2B) Skin contact chemical burns.	2B) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves. ▪ Fumes may come into contact with the perspiration on your skin and rehydrate to form an acid. ▪ If your skin itches, flush affected area for 15 minutes with water.
	2C) Eye contact	2C) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	2D) Breathing fumes	2D) Breathing fumes ▪ HNO_3 and HCL have high vapor pressure. Always work in a well-ventilated area.
3. Adding acid to sample	3A) Chemical reaction	3A) Chemical reaction ▪ Wear safety goggles and protective gloves. Acid may react with high alkaline sample and fizz (releases CO_2).
	3B) Eye contact	3B) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	3C) Skin contact chemical burns.	3C) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves.
4. Ampoule disposal	4A) Cuts from the broken glass.	4A) Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Place used ampoules in an empty, non-reactive container in the field and bring it back to the office. Dispose of the preservative and broken glass by approved methods.

MACTEC

JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

Job Title: Mohonk Road Industrial Plant **Date of Analysis:** 7/7/15

Job Location: 186 Mohonk Road, Marbletown, NY **Proj. Mgr.:** Jayme Connolly

Minimum Recommended PPE*: Hard hat, steel-toed boots, chemically-resistant gloves, safety glasses and hearing protection (when Geoprobe is operating), and a high visibility vest.

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure 1B) Underground utilities	1A) Chemical Exposure ▪ Read HASP to determine air monitoring. ▪ Read HASP / JHA to determine PPE needs. 1B) Confirm that underground utilities have been clearly marked
2. Carrying equipment to site location (if inaccessible by field vehicle)	2A) Back or muscle strain	2A) Back or muscle strain ▪ Use proper lifting techniques when lifting heavy items ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
3. Calibrate air monitoring equipment (i.e. PID or FID)	1A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Preparing sampling location	4A) Watch out for other vehicles driving in the parking lot area.	4A) Watch out for other vehicles driving in the parking lot area. • Use flagging and/or traffic cones to delineate the hot zone (work zone) to prevent entry of unauthorized personnel • Wear high visibility vest. • Be aware of your surroundings at all times.
	4B) Mishaps due to loose equipment	4B) Mishaps due to loose equipment ▪ Maintain good housekeeping. ▪ Keep equipment out of the driving lanes. ▪ If necessary, wear protective netting over your head/face.
	4C) Unauthorized personnel in the hot zone (work zone)	4C) Use flagging and/or traffic cones to delineate the hot zone (work zone) to prevent entry of unauthorized personnel • Wear required PPE as described in the HASP / JHA once soil sampling activities begin.

MACTEC

JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4D) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated soil); flammable atmospheres.	4D) Exposure to hazardous substances ▪ Wear PPE as identified in HASP/ JHA once soil sampling activities commence. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4E) Back strain due to lifting or moving equipment to sampling locations	4E) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques
	4F) Foot injuries from dropped equipment	4F) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots
5. Collecting soil samples	5A) Working around Geoprobe rigs	5A) Be aware of the Geoprobe's operation and movements during all phases of sampling activities. Communicate project requirements to the operator prior to commencing sampling activities.
	5B) Encountering underground or overhead utilities	5B) Have all utilities located.
	5C) Electrocution	5C) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5D) Exposure to contaminants / low level radiation	5D) Exposure to Contaminants / low level radiation ▪ Stand up wind when sampling and do not breathe dust (if conditions are dusty) ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Continually monitor soil samples for low level radiation. ▪ Wear chemical resistant PPE as identified in HASP / JHA ▪ See section 4C) under Safe Practices above
	5E) Exposure to preservatives	5E) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP / JHA. ▪ Review MSDSs

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JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	5G) Lifting Injury	5G) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	5H) Eye injury	5H) Eye Injury ▪ Wear eye protection during operation of Geoprobe or if misc. debris may harm your eyes.
	5I) Fire	5I) Have an A-B-C rated fire extinguisher on hand in case of small equipment fires. Only individuals trained in fire extinguisher use should use a fire extinguisher.
6. Disposal of leftover soil.	6A) Contamination from impacted soil	6A) Properly dispose of any leftover soil sample ▪ Consult the Project Manager for proper disposal of soil. ▪ Don proper PPE when handling sample cores and disposing of soils. ▪ If soils are placed in a container (i.e. drum) properly label the drum.
7. Backfill Borehole.	7A) Contamination from impacted soil and/or groundwater	7A) Minimize contact with potentially impacted soil and/or groundwater ▪ Don proper PPE when backfilling the borehole. ▪ If the borehole is located in a paved area (i.e. asphalt/concrete), carefully patch the borehole using proper patching materials.

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JOB HAZARD ANALYSIS
Soil Sampling - Geoprobe

Standard Hazards			
☐ Falling Objects	X Slips and trips	X Pinch points	☐ Rotating equipment
☐ Falls	X Geoprobe rig	X Underground utilities	☐ ____________________
Eye Hazards			
☐ Particulates	☐ Liquid splashes	☐ Welding Arc	X Potential hazard during Geoprobe rig operation
Hearing Hazards			
☐ None	X Impact noise during Geoprobe rig operation	☐ High frequency noise	☐ High ambient noise
Respiratory Hazards			
☐ None	☐ Dust/particulates	X Organic Vapors	☐ Acid Gases
☐ Oxygen deficient	☐ Welding fumes	☐ Aerosols/Particulates	☐ Be, Hg, Cr, Pb
☐ ____________________	☐ Radon	☐ Asbestos	☐ ____________________
Chemical Hazards			
☐ None	☐ Organic solvents	☐ Metals	☐ PCBs
☐ Acids / bases	☐ Oxidizers	X Volatiles / Semi-volatiles	☐ ____________________

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JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

Environmental Hazards			
☐ None	**X** Temperature extremes (Dress appropriately for the expected weather)	☐ Wet location	☐ Bio hazards (snakes, insects, spiders, bird / mouse droppings, fungus, etc.)
☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	☐ ____________________
Electrical Hazards			
☐ None	**X** Energized equipment or circuits	**X** Overhead utilities **X** Underground utilities ☐ Hidden utilities	☐ Wet location
Fire Hazards			
X None expected	☐ Cutting, welding, or grinding generated sparks or heat sources	☐ Flammable materials present	☐ Oxygen enriched location
Ergonomic Hazards			
X Lifting	**X** Bending	**X** Twisting	**X** Pulling/tugging
Computer Use in the: ☐ Office ☐ Field	☐ Repetitive motion	☐ ____________________	☐ ____________________
Radiological Hazards			
☐ None	☐ Loose contamination	☐ Fixed Contamination	**X** Low Level Radiation
☐ Airborne contamination	☐ Radon	☐ EMF	☐ Criticality
☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron
☐ Tritium	☐ TRU	☐ Depleted Uranium	☐ Enriched Uranium
Other Hazards			
X Hazards associated with working near moving vehicles in the parking lot area.			
☐			
☐			
☐			

Completed by: Danielle Lerner Date: 7/7/15

FORM ESH-2.9.1-3.3

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JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

PPE and Monitoring Requirements

Standard PPE (Level D)			
X Hard Hat	**X** Safety shoes	**X** Safety glasses (during operation of Geoprobe rig)	☐ Boot Covers
☐ Aprons	☐ Rubber Boots	**X** Other:_High visibility vest	☐ Other:_______________
Eye Protection			
☐ Welding glasses ☐ Welding helmet	☐ Face Shield	☐ Chemical goggles	☐ Welding screens
Hearing Protection			
X Ear plugs (during operation of Geoprobe rig)	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other _________________
Respiratory Protection			
X Follow air monitoring guidelines in HASP	☐ Dust mask	☐ Full Face APR ☐ Half Face APR Cart. Type ______________	☐ PAPR Cart. Type ______________
☐ SCBA	☐ Airline respirator	☐ _____________________	☐ _____________________
Protective Clothing			
☐ Tyvek® coveralls	☐ Poly-coated Tyvek® Coveralls (if splashing of water occurs)	☐ Saranex® Coveralls	☐ Fully encapsulating suit
☐ Cotton coveralls	☐ Modesty Clothing	☐ Fire resistant clothing	**X** Other: Long pants; long sleeve shirt
Hand Protection			
☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Glove liners
X Nitrile gloves ☐ Viton® gloves ☐ Butyl gloves ☐ Neoprene gloves	Surgical gloves ☐ Latex ☐ Non-Latex	☐ Cut-resistant gloves	☐ Other:
Monitoring Requirements			
☐ Oxygen	☐ Flammable gases/vapors	☐ Toxic Gas/vapors	☐ Hydrogen Sulfide/Carbon Monoxide
☐ Asbestos	☐ Full time IH coverage	☐ Part time IH coverage	☐ Be, Hg, Cr, Pb
☐ Metals Specify: ______________________________			
X Organic vapors : Use a PID calibrated to 100 ppm isobutylene or an FID during sampling activities			
☐ Radioactive air particulates	☐ TLD required	☐ CAM	☐ Radon
☐ Full time RCT coverage	☐ Part time RCT coverage	☐ Radioactive air particulates	☐ Other _________________
☐ Low Level Radiation : ______________________________		☐ Other ______________________________	

PPE and monitoring requirements completed by: Danielle Lerner Date: 7/7/15

MACTEC

JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

JHA Preparation Team

Mike Reust________________ ____________________________ __________________________

__________________________ ____________________________ __________________________

__________________________ ____________________________ __________________________

__________________________ ____________________________ __________________________

Effective Date From: 12-11-06____________ through TBD______________________

Approval Signatures

Job Supervisor	Date	LHSR	Date	RSO	Date
ES&H Manager	Date	Project Manager	Date	Other	Date

MACTEC

JOB HAZARD ANALYSIS

Soil Sampling - Geoprobe

Pre-Job Brief Attendance Sheet

Documents included in this briefing: ____

Print/Type Name	Signature	Date

Briefing presented by: ______________________ **Signature:** _______________________

APPENDIX C

FIELD DATA RECORDS

TEST PIT RECORD

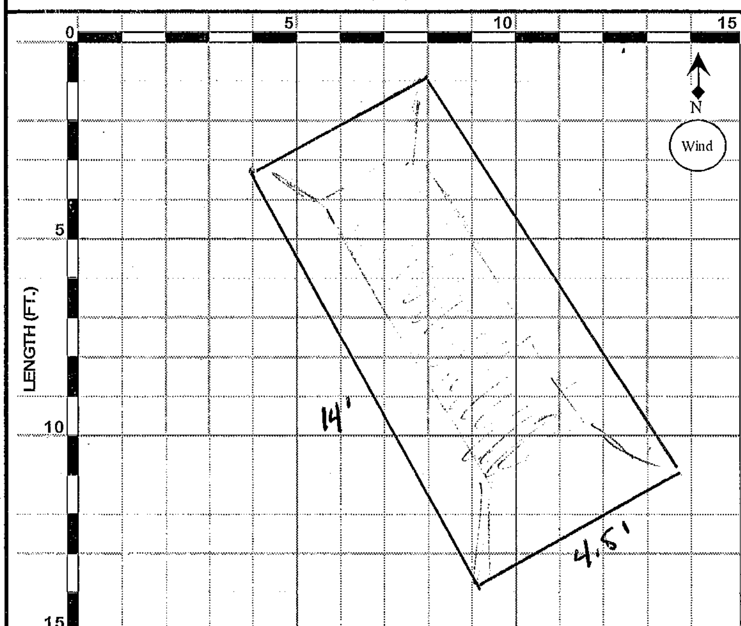
MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road Industrial		Test Pit ID:	TP-01
Project Location: Hamlet of High Falls, NY		Page No.	1
Project No.: 3617157346.02	Client: NYSDEC	of:	1

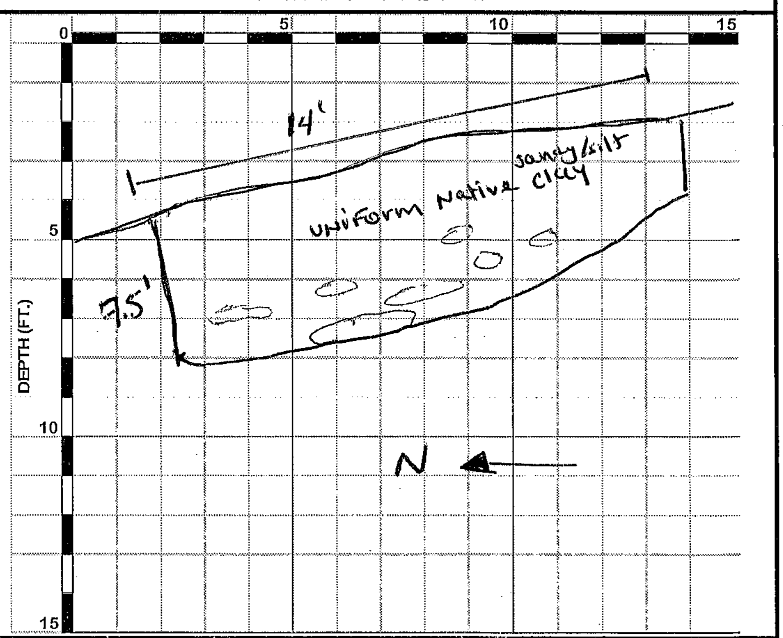
Test Pit Location: TP-01	Monitoring Equipment: Mini-Rae 2000 PID		**Location Sketch**
Weather: Sunny 70°F	Photographs (Y/N): Y	Protection Level: D	see Figure
Surface Conditions: Brush / Grass	Length of Exc: 14.5'	Width of Exc: 4.5'	N, Wind
Subcontractor: Geologic	Date Started: 09/15/15	Date Completed: 09/15/15	
Operator: Steve Laramee	Logged By: D. Farrell	Checked By: I. DESJARLAIS	
Equipment: Excavator	Refusal Depth: 7.5'	Total Depth: 7.5'	
Reference Elevation: NA /	Water Level: NA	Time: 0910 - 1045	

Depth (ft. bgs)	Sample No. & Type	Pocket Pen/ Torvane (Kg/cm²)	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID	Sample Description and Classification	USCS Group Symbol	Remarks
							0 - 0.5' Organic root mat		
1			0.0	—			0.5 - 7.5 Light Brown		• uniform clay throughout with slight marbeling
2	①		—		VOCs + % solids		sandy silt / clay (some roots present) well graded, including large cobbles	ML	• 2 samples: VOCs
3	1030 356023TP0102		0.0				slightly moist / damp non to slightly plastic		1030 - 356023TP0102
4			—				Native Till		1035 - 356023TP0107
5			—				→ Note: Increasing amount of large cobbles and small boulders with depth (5 - 7.5')		
6			0.0						
7	1035 ② 356023TP0107		0.0		VOCs + % solids		Refusal at 7.5'		
8									
9									
10									

PLAN VIEW



CROSS-SECTIONAL VIEW



NOTES: Pit backfilled with native soil

FIGURE 4.3
TEST PIT RECORD
NYSDEC QUALITY ASSURANCE PROGRAM PLAN

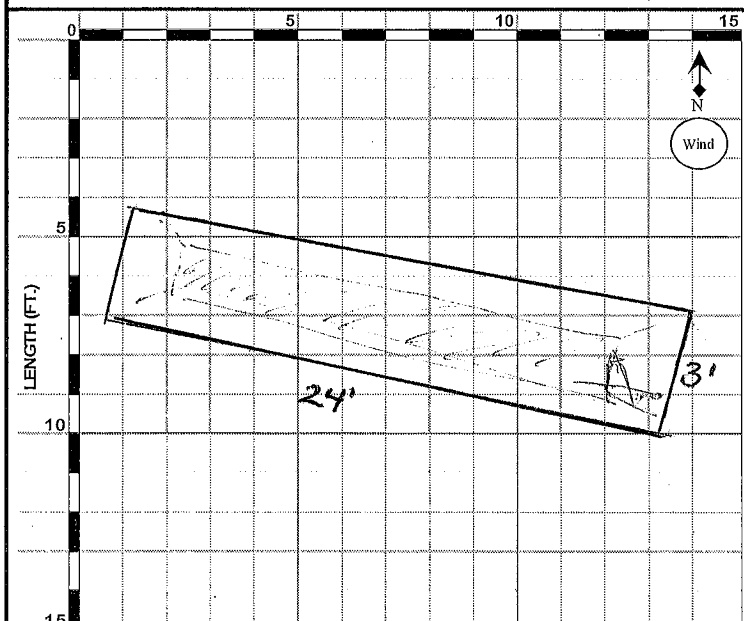
TEST PIT RECORD

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road Industrial		Test Pit ID: TP-02
Project Location: Hamlet of High Falls, NY		Page No. 1
Project No.: 3617157346.02	Client: NYSDEC	of: 1
Test Pit Location: TP-02	Monitoring Equipment: Mini-Rae 2000 PID	Location Sketch
Weather: Sunny 75°F	Photographs (Y/N): Y — Protection Level: D	See Figure
Surface Conditions: Grass	Length of Exc: 24' — Width of Exc: 3'	N / Wind
Subcontractor: Geologic	Date Started: 09/15/15 — Date Completed: 09/15/15	
Operator: Steve Laramee	Logged By: D. Farrell — Checked By: I. DESJARLAIS	
Equipment: Excavator	Refusal Depth: 8' — Total Depth: 8'	
Reference Elevation: NA	Water Level: NA — Time: 1100 - 1320	

Depth (ft. bgs)	Sample No. & Type	Pocket Pen/ Torvane (Kg/cm^2)	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID	Sample Description and Classification	USCS Group Symbol	Remarks
1			-	-			0-1' Organic root mat		
2			0.0				1-8' Light brown sandy silt/clay		- At 1-1.5', stone backfill and orangeburg
3	①		-		VOCs + % solids		well graded, large cobbles and small boulders slightly moist/damp	ML	piping encountered. Piping conduit was
4	1230 356023	TP0203	0.0				Non to slightly plastic Native Till		approximately 2.5' in diameter.
5	↳ From just under cobble backfill		0.0				→ From 1.5-3.5', cobble fill holding		- Stone surrounding pipe was leaking
6			-				orangeburg septic pipe encountered. Very wet.		water, and was very wet.
7	②		-		VOCs + % solids		- This is likely the pipe extending from distribution box; ~~prior to division into eastern/western laterals~~ DF		
8	1225 356023	TP0207	0.0				to the western lateral. Refusal at 8'		
9									
10									

PLAN VIEW



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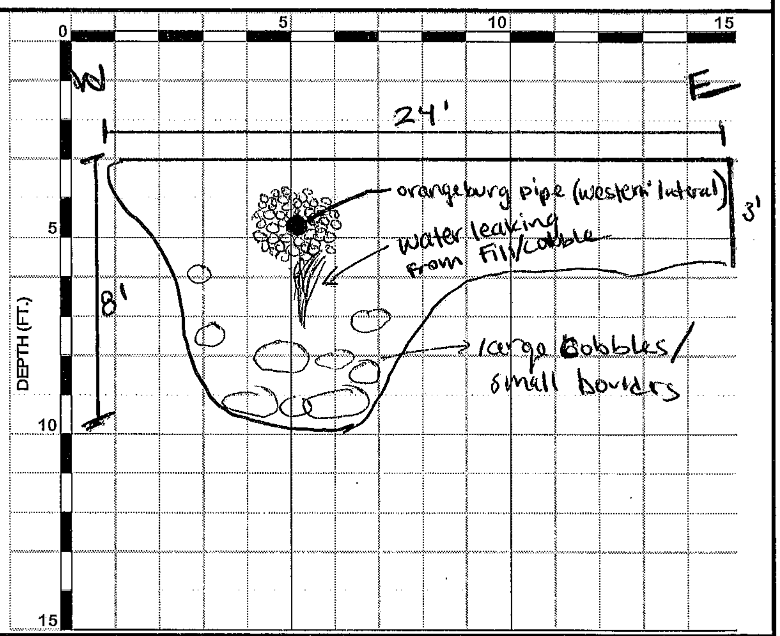


NOTES: Backfilled with native soil

FIGURE 4.3
TEST PIT RECORD
NYSDEC QUALITY ASSURANCE PROGRAM PLAN

TEST PIT RECORD

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road Industrial	Test Pit ID: TP-03
Project Location: Hamlet of High Falls, NY	Page No. 1
Project No.: 3617157346.02 Client: NYSDEC	of: 1

Test Pit Location: TP-03	Monitoring Equipment: Mini-Rae 2000 PID	
Weather: Sunny 75°F	Photographs (Y/N): Y	Protection Level: D
Surface Conditions: Grass	Length of Exc: 17'	Width of Exc: 3'
Subcontractor: Geologic	Date Started: 09/15/15	Date Completed: 09/15/15
Operator: Steve Laramee	Logged By: D. Farrell	Checked By: I. DESJARLAIS
Equipment: Excavator	Refusal Depth: 7.5'	Total Depth: 7.5'
Reference Elevation: NA	Water Level: NA	Time: 1400 - 1530

Location Sketch

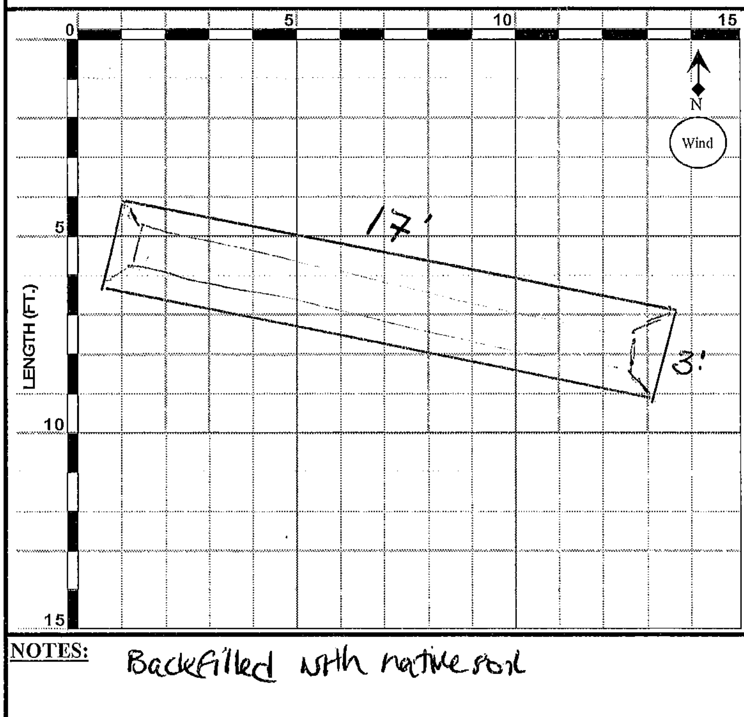
See Figure

N

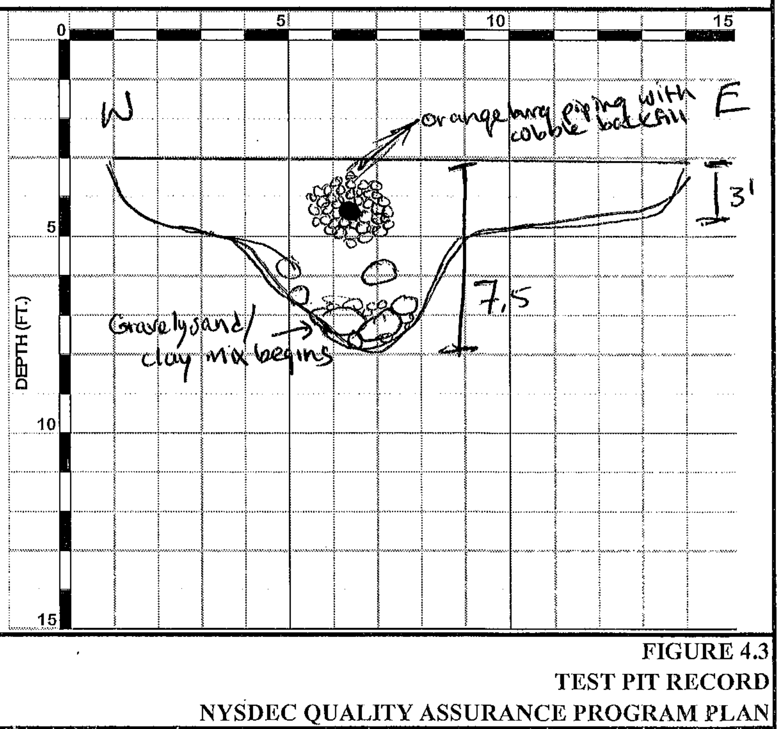
Wind

Sample Information			Monitoring						
Depth (ft. bgs)	Sample No. & Type	Pocket Pen/ Torvane (Kg/cm²)	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID	Sample Description and Classification	USCS Group Symbol	Remarks
							0 - 0.5 Root Mat, organic		
1							0.5 - 7.5 uniform		
2			0.0				light brown sandy/silt/clay with large cobbles		- At 1.0 - 1.5' bgs, stone backfill and
3			0.0				well graded, increasing concentration of large cobbles/small boulders with depth	ML	orangeburg piping encountered. This is
4	① 1435 356023TP0303 From just under cobble backfill		—				Non to slightly plastic		likely the piping that exits the distribution
5			0.0				Native Till		box, prior to the split into the eastern
6			0.8				Note: At 7.0', observe increased PID readings (4.0-7.0 ppm)		and western laterals
7	② 1430 356023TP0307		4.0 6.0 4.9				7.5 A larger sandy mix present, possibly top of overburden bedrock interface flow zone Refusal at 7.5'		
8									
9									
10									

PLAN VIEW



CROSS-SECTIONAL VIEW



NOTES: Backfilled with native soil

FIGURE 4.3
TEST PIT RECORD
NYSDEC QUALITY ASSURANCE PROGRAM PLAN

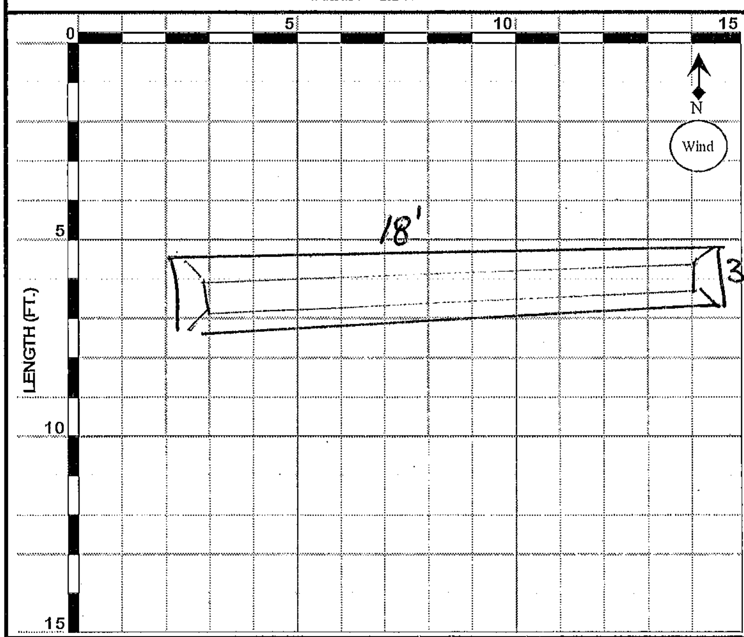
TEST PIT RECORD

MACTEC 511 Congress Street, Portland Maine 04101	Project Name: Mohonk Road Industrial	Test Pit ID: TP-04
	Project Location: Hamlet of High Falls, NY	Page No. 1
	Project No.: 3617157346.02 Client: NYSDEC	of: 1

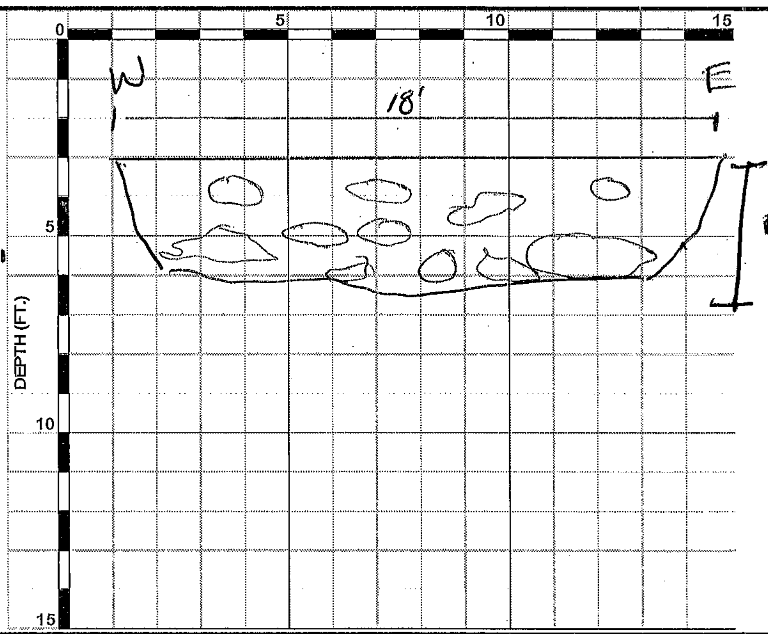
				Location Sketch
Test Pit Location: TP-04	Monitoring Equipment: Mini-Rae 2000 PID			See figure N Wind
Weather: Sunny 80°	Photographs (Y/N): Y	Protection Level: D		
Surface Conditions: Root Mat	Length of Exc: 18'	Width of Exc: 3'		
Subcontractor: Geologic	Date Started: 09/15/15	Date Completed: 09/15/15		
Operator: Steve Ldramee	Logged By: D. Farrell	Checked By: J. DESJARLAIS		
Equipment: Excavator	Refusal Depth: 4'	Total Depth: 4'		
Reference Elevation: NA	Water Level: NA	Time:		

Depth (ft. bgs)	Sample No. & Type	Pocket Pen/ Torvane (Kg/cm^2)	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID	Sample Description and Classification	USCS Group Symbol	Remarks
	Sample Information			Monitoring					
1			0.0				0-0.5' organic Root Mat 0.5-4' Light Brown sandy silt/clay		- Found the end of the eastern lateral piping in nearby pile of soil from a previous test pit
2			0.0				Large cobbles and small boulders present throughout test pit well graded		
3	① 1545		0.0		VOCs + % solids		slightly moist / damp Non to slightly plastic → Native Till		- Decide to extend test pit to what is believed to be immediate downgradient to eastern lateral terminus.
4	351023TP0404		0.0				Refusal at 4'		
5									
6									
7									
8									
9									
10									

PLAN VIEW



CROSS-SECTIONAL VIEW



NOTES: backfilled with native fill

FIGURE 4.3
TEST PIT RECORD
NYSDEC QUALITY ASSURANCE PROGRAM PLAN

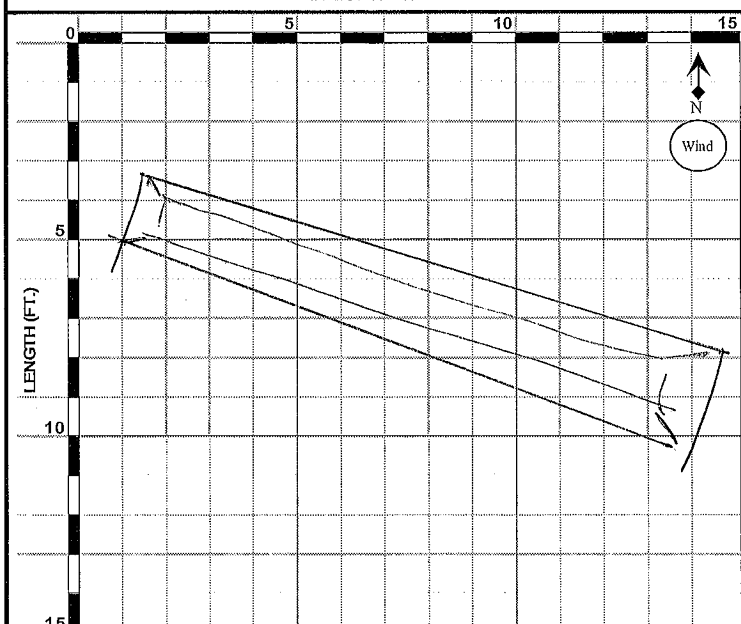
TEST PIT RECORD

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road Industrial		Test Pit ID: TP-05	
Project Location: Hamlet of High Falls, NY		Page No. 1	
Project No.: 3617157346.02	Client: NYSDEC	of: 1	
Test Pit Location: TP-05	Monitoring Equipment: Mini-Rae 2000 PID		Location Sketch
Weather: Sunny 75°F	Photographs (Y/N): Y	Protection Level: D	See Figure
Surface Conditions: Root Mat	Length of Exc: 15'	Width of Exc: 3'	N, Wind
Subcontractor: Geologic	Date Started: 09/15/15	Date Completed: 09/15/15	
Operator: Steve Laramee	Logged By: D. Farrell	Checked By: J. DESJARLAIS	
Equipment: Excavator	Refusal Depth: 8'	Total Depth: 8'	
Reference Elevation: NA	Water Level: NA	Time: 1610 - 1700	

Depth (ft. bgs)	Sample No. & Type	Pocket Pen/ Torvane (Kg/cm²)	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID	Sample Description and Classification	USCS Group Symbol	Remarks
1							0-1' organic root mat		
2							1-8' uniform light brown		
3							sandy/silt/clay Some large cobbles/small boulders present		At 3.5- Notice a collection of cobbles/
4	① 1655 356023TP0503						slightly damp Native till		boulders that appear to be at same depth
5							↳ A 3.5' - a small collection of damp cobbles (1'x1'x1')		as previously observed orangeburg conduit, however these are not the same cobbles
6									
7									
8	② 1650 356023TP0507						Refusal at 8'		
9									
10									

PLAN VIEW



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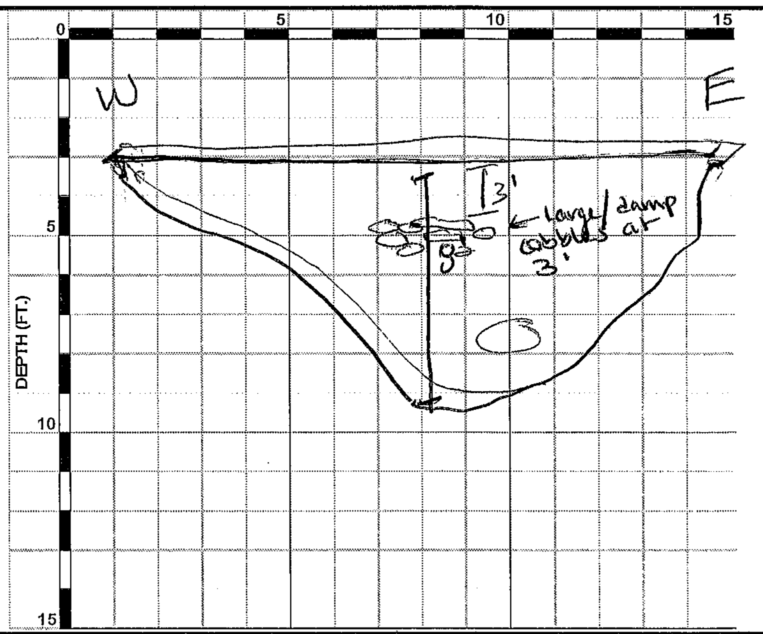


NOTES: Backfilled with native soil

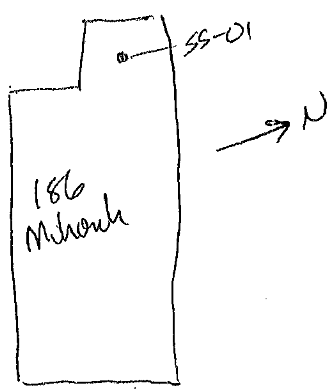
FIGURE 4.3
TEST PIT RECORD
NYSDEC QUALITY ASSURANCE PROGRAM PLAN

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road			Boring ID: SS-01
Project Location: High Falls, NY			Page No. 1
Project No.: 3617157346.02	Client: NYSDEC		of: 1
Boring Location: 186 Mohonk Rd / Back Bay	Refusal Depth: NA	Total Depth: 4.8	Bore Hole ID/OD: 1.5/2.5"
Weather: Sunny 80's	Soil Drilled: 4.8	Method: Hand tools	Casing Size: —
Subcontractor: —		Protection Level: D	Sampler: Geoprobe tools
Driller: —	Date Started: 9/15/15	Date Completed: 9/15/15	Sampler ID/OD: 1.0/1.5"
Rig Type/Model: Geoprobe Hand tools	Logged By: J. Rawcliffe	Checked By: 09/21/15	
Reference Elevation:	Water Level: >4.8	Time: —	

Depth (feet bgs)	Sample Number	Penetration/ Recovery (feet)			PID (ppm)	~~NA~~		Analytical Sample	Sample Description and Classification	USCS Group Symbol	Remarks
0.0									0-0.7' Concrete slab (8-9")		
1	S1 0.7	1.3/2.0			0.1			⊗	Top 0.8' Brown to dark brown to dark grayish brown fine sand and silt with some gravel and medium to coarse sand. Very moist.		1735 356023550101 (1.5') VOC 1x40ml vial/5ml MeOH %Solids
2	2.7								Bottom 0.5 Brown to light brown fine sand and silt with a trace of medium to coarse sand. Moist.		
3	S2 2.7	1.4/2.1			0.4				Brown to light brown fine sandy silt. Moist, some slight mottling. No staining or odors.		
4	4.8										
5									Bottom of Boring = 4.8' BGS No Refusal.		



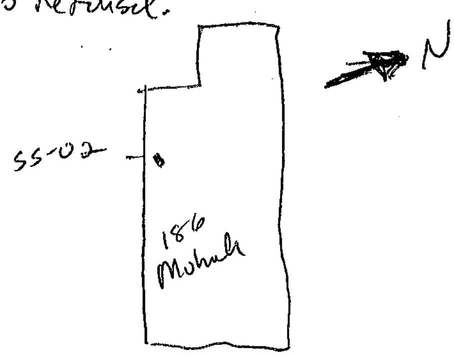
NOTES:

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road			Boring ID: SS-02
Project Location: High Falls, NY			Page No. 1
Project No.:3617157346.02	Client: NYSDEC		of: 1
Boring Location: 186 Mohonk / Plumbing Supply	Refusal Depth: NA	Total Depth: 5'	Bore Hole ID/OD: 1.5/2.5"
Weather: Sunny, 80's	Soil Drilled: 5'	Method: Hand tools	Casing Size: —
Subcontractor: —		Protection Level: D	Sampler: Geoprobe tubes
Driller: —	Date Started: 9/15/15	Date Completed: 9/15/15	Sampler ID/OD: 1.0/1.5"
Rig Type/Model: Hand tools/Geoprobe	Logged By: J. Rawcliffe	Checked By: 09/21/15	
Reference Elevation:	Water Level: NA	Time:	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)			PID (ppm) ~~NA~~			Analytical Sample	Sample Description and Classification	USCS Group Symbol	Remarks
									0-0.35' Concrete slab.		PID=8.1ppm on open hole.
1	S1 0.5	1.8/2.0			0.3-0.4				Brown fine sandy silt with traces of medium to coarse sand. Moist.		
2	↓ 2.5							⊗			356023SS0201 (1.5'BGS) (1435) VOC, 1x40ml vial (5ml MeOH) % Solids, 1x125ml poly
3	S2 2.5	2.0/2.5			0.2-0.4				Brown to light brown fine sandy silt. Slightly moist. Appears mottled at bottom.		
4											
5	↓ 5.0							⊗			356023SS0205 (1500) VOCs/%Solids
									Bottom of boring = 5' BGS No refusal.		



NOTES:

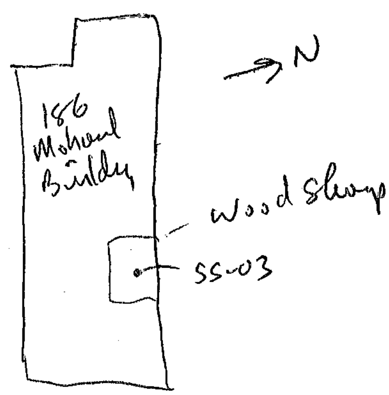
SOIL BORING LOG

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road		Boring ID: SS-03	
Project Location: High Falls, NY		Page No. 1	
Project No.:3617157346.02	Client: NYSDEC	of: 1	
Boring Location: 186 Mohonk/Wood Shop	Refusal Depth: NA	Total Depth: 4.4'	Bore Hole ID/OD: 1.5/2.5
Weather: Sunny 80's	Soil Drilled: 4.4'	Method: Handtools	Casing Size: NA
Subcontractor: —		Protection Level: D	Sampler: Geoprobe rod
Driller: —	Date Started: 9/15/15	Date Completed: 9/15/15	Sampler ID/OD: 1.0/1.5
Rig Type/Model: Hand Geoprobe tools	Logged By: J. Rawcliffe	Checked By: [signature] 09/21/15	
Reference Elevation:	Water Level: ≈3.5	Time: 9/15/15 1230	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID	~~NA~~	Analytical Sample	Sample Description and Classification	USCS Group Symbol	Remarks
			0.2-0.5			0-0.4' Concrete slab		
1, 2	S1 0.4 → 2.4	~~1.2~~ 1.3/2.0	0.0-0.4		X	0.5-1.0 Gravel brown to dark brown with fine to coarse sand. 1-2.4' Brown medium to coarse sand with a little gravel and fine sand. Moist.	Subgrade Fill	PID = 0-0.4 ppm; 356023SS0302 VOCs 1x40ml Soil/MeOH; % Solids 1x125ml poly
3, 4	S2 2.4 → 4.4	1.3/2.0	0.0			Brown medium to coarse sand with a little gravel Very moist, becomes wet at ≈3.5' BGS. Some trace fine sand and silt.	(Fill)	
						Bottom of boring 4.4' BGS No refusal		



J. Rawcliffe

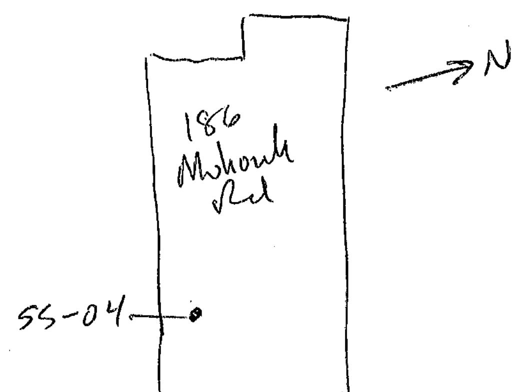
NOTES:

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: Mohonk Road		Boring ID: SS-04	
Project Location: High Falls, NY		Page No. 1	
Project No.:3617157346.02	Client: NYSDEC	of: 1	
Boring Location: 186 Mohonk Rd / Library	Refusal Depth: NA	Total Depth: 4.7'	Bore Hole ID/OD: 1.5/2.5"
Weather: Sunny 80's	Soil Drilled: 4.7'	Method: Geoprobe hand tools	Casing Size: —
Subcontractor: NA		Protection Level: D	Sampler: Geoprobe tools
Driller: —	Date Started: 9/15/15	Date Completed: 9/15/15	Sampler ID/OD: 1.0/1.5"
Rig Type/Model: Geoprobe hand tools	Logged By: Jerry Rawcliffe	Checked By: 09/21/15	
Reference Elevation:	Water Level: >4.7'	Time: —	

Depth (feet bgs)	Sample Number	Penetration/ Recovery (feet)	PID (ppm)	~~NA~~	Analytical Sample	Sample Description and Classification	USCS Group Symbol	Remarks
0.0						0.2' Concrete slab		
1	S1 0.3 – 2.3	1.6/2.0	0.1		X	Brown fine sandy silt with traces of medium to coarse sand. Moist top is lighter colored becomes darker with depth		356023 SS0401 1625 VOCs - 1x40ml vial/5ml MeOH %Solids
2								
3	S2 2.3 – 4.7	1.4/2.4	0.0			Brown to light brown fine sandy silt. Moist, no obvious structure.		
4								
5						Bottom of boring = 4.7' BGS. No Refusal		



J Rawcliffe

NOTES:

SOIL BORING LOG

SS-02:

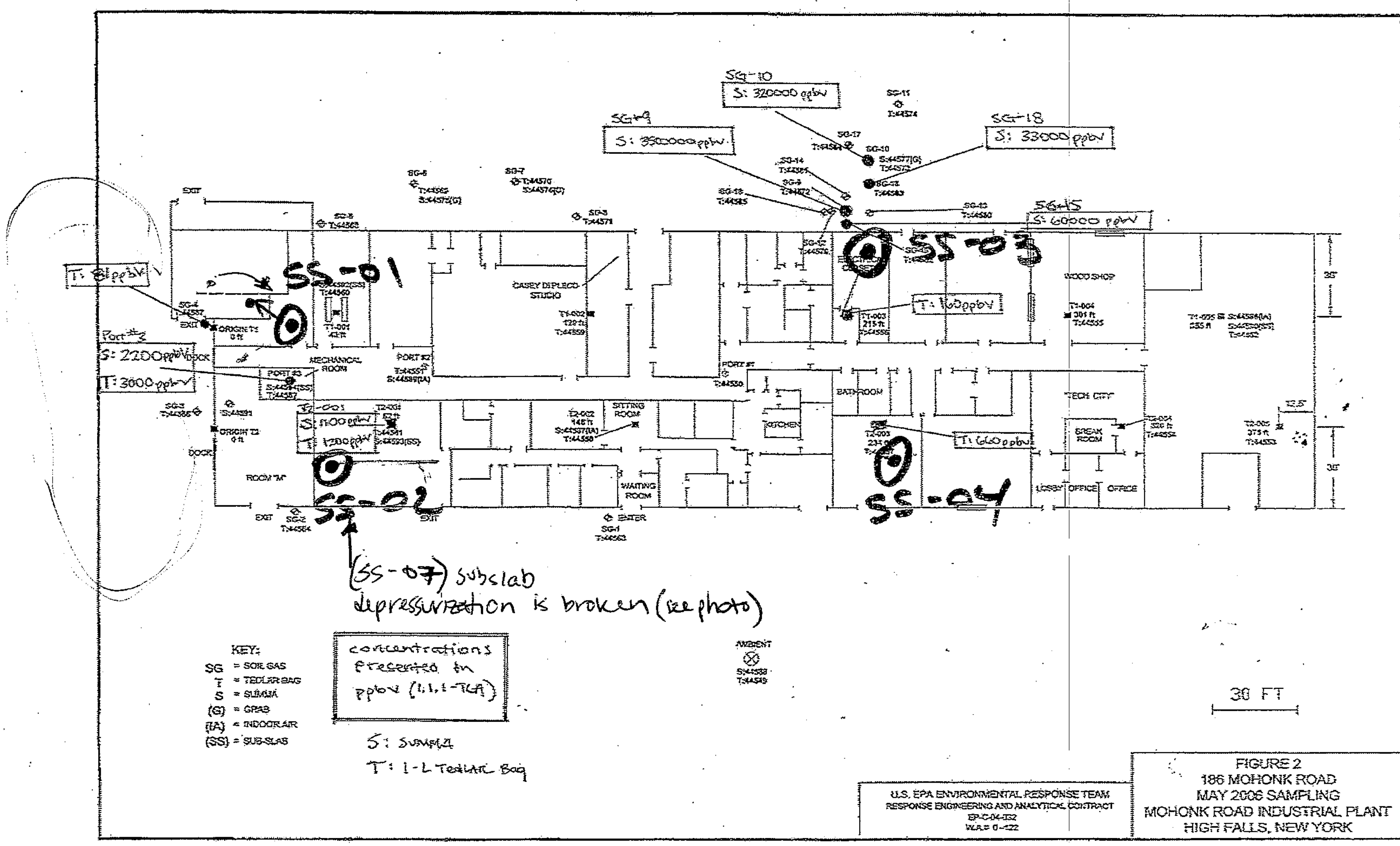


FIGURE 2
186 MOHONK ROAD
MAY 2006 SAMPLING
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

Edits Prepared by: DF 6/3/15
Edits Checked by: HA 6/3/15

SOIL BORING LOG

MACTEC 511 Congress Street, Portland Maine 04101	Project Name: MOHONK ROAD INDUSTRIAL PLANT		Boring ID: DP3
	Project Location: HIGH FALLS, NY		Page No. ONE
	Project No.: 3617157346	Client: NYSDEC	of: ONE
Boring Location: @ MP3	Refusal Depth: 8.3' BGS	Total Depth: 8.3' BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 8.3'	Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA		Protection Level: D	Sampler: MC. LINER
Driller: ZACH FOROLY/DAN B	Date Started: 10/2/15	Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE - TRACK	Logged By: I. DESJARLAIS	Checked By: [signature] 10/5/15	
Reference Elevation: —	Water Level: NA	Time: —	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	PID (ppm) ~~NA~~	Sample Description and Classification	USCS Group Symbol	Remarks
1				SILT: BROWN, DAMP, NON-PLASTIC, TRACE CLAY. (~5%)	ML	
2						
3				SAA, except with clay (15%)		0830 356023DP3004 VOC/% Solids
4		0830				
5			0.0 ppm	SILT; BROWN, MOIST, WITH FLAT PEBBLES, TRACE CLAY.	ML	
6						
7			0.1 ppm	CLAYEY SILT; BROWN, MOIST, ORANGE OXIDATION STAINING,	ML	
8		0838	0.2 ppm	WITH ROCK FRAGMENTS (WET) BLACK.		0838 356023DP3008 VOC/% Solids
9				TD = 8.3' BGS Refusal w/ Geoprobe BACKFILL WITH BENTONITE CHIPS		

NOTES:

SOIL BORING LOG

SOIL BORING LOG

MACTEC 511 Congress Street, Portland Maine 04101	Project Name: MOHONK RD INDUSTRIAL PLANT	Boring ID: DP4
	Project Location: HIGH FALLS, NY.	Page No. ONE
	Project No.: 3617157346 Client: NYSDEC	of: ONE
Boring Location: @ MP4	Refusal Depth: 7' BGS Total Depth: 7' BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 7.0' Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA	Protection Level: D	Sampler: 2' ACETATE
Driller: ZACK FORDLY/DAN BUBNICH	Date Started: 10/2/15 Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE-TRACK	Logged By: I. DESJARLAIS Checked By: [signature] 10/5/15	
Reference Elevation: —	Water Level: NA Time: —	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	Monitoring PID (ppm) ~~NA~~	Sample Description and Classification	USCS Group Symbol	Remarks
1				CLAYEY SILT; BROWN, DAMP, NON-PLASTIC, WITH PEBBLES (1-1.5cm)	ML	
2			0.0 ppm			
3		0850				0850 356023DP4003 voc/%Solids
4			0.3 ppm	SILT; BROWN MOIST, WITH SUB-ANGULAR PEBBLES (1-1.5cm)	ML	
5						
6		0852	0.3 ppm	SAA, except wet	ML	0852 356023DP4006 voc/%Solids
7				SAA, EXCEPT MOIST.		
				TD = 7' bgs Refusal with Geoprobe BACKFILL WITH BENTONITE CHIPS		

NOTES:

SOIL BORING LOG

SOIL BORING LOG

MACTEC 511 Congress Street, Portland Maine 04101	Project Name: MOHAWK ROAD INDUSTRIAL PLANT		Boring ID: DP5
	Project Location: HIGH FALLS, NY		Page No. ONE 1
	Project No.: 3617157346	Client: NYSDEC	of: ONE 1
Boring Location: MP5	Refusal Depth: 11.5' BGS	Total Depth: 11.5' BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 11.5'	Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA		Protection Level: D	Sampler: ACETATE SLEEVE
Driller: ZACH FERDLY/DAN BUBNICH	Date Started: 10/2/15	Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE - TRACK	Logged By: I. DESJARLAIS	Checked By: [signature] 10/5/15	
Reference Elevation: —	Water Level: —	Time: —	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	Monitoring NA	Sample Description and Classification	USCS Group Symbol	Remarks
1				SILT; BROWN, MOIST, NON-PLASTIC	ML	
2						
3				GRAVELS; FLAT, BROKEN, NO MATRIX, IMBRICATED	GP	
4				SILT; BROWN, MOIST, TRACE ORANGE MOTTLING; WITH SUB-ANGULAR GRAVELS		0905 3560+3DP5005 VOC/% Solids
5		0905	0.6 ppm			
6						
7						
8						
9			0.3 ppm	SILT: BROWN, DAMP, WITH SUB-ROUNDED PEBBLES (3cm)		
10				SILT; BROWN, MOIST, STIFF, WITH SUBROUNDED PEBBLES (0.5cm)		
11		0907	0.3 ppm			0907 3560+3DP5011 VOC/% Solids Dup/MS/MSD
12				TD = 11.5' Refusal w Geoprobe BACKFILL WITH BENTONITE CHIPS		

NOTES: COLLECT MS/MSD/D FROM LOCATION

SOIL BORING LOG

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: MOHONK ROAD INDUSTRIAL PLANT			Boring ID: DP6
Project Location: HIGH FALLS, NY			Page No. ONE 1
Project No.: 3617157346	Client: NYSDEC		of: ONE 1
Boring Location: MP6	Refusal Depth: ≈ 5.5 BGS	Total Depth: 5.5' BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 5.5'	Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA		Protection Level: D	Sampler: ACETATE SLEEVE
Driller: ZACH FOROLY/DAN BURMCH	Date Started: 10/2/15	Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE-TRACK	Logged By: I. DESJARLAIS	Checked By: [signature] 10/5/15	
Reference Elevation: –	Water Level: NA	Time: –	

Depth (feet bgs)	Sample Number	Penetration/ Recovery (feet)	Monitoring NA	Sample Description and Classification	USCS Group Symbol	Remarks
0.0						
1						
2				SILT; BROWN, DAMP, WITH SUB-ANGULAR PEBBLES.	ML	
3						
4		0925	1.0 ppm	SAA	ML	0925 356028 DP6004 VOC/%Solids
5				SAA		
6				TD = 5.5' BGS Refusal w Geoprobe BACKFILL WITH BENTONITE CHIPS.		

NOTES:

SOIL BORING LOG

SOIL BORING LOG

MACTEC 511 Congress Street, Portland Maine 04101	Project Name: MOHAWK RD INDUSTRIAL PLANT Project Location: HIGH FALLS, NY Project No.: 3617157346 Client: NYSDEC	Boring ID: DP7 Page No. ONE of: ONE
Boring Location: MP7	Refusal Depth: 9.5 BGS / Total Depth: 9.5 BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 9.5' / Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA	Protection Level: D	Sampler: ACETATE SLEEVE
Driller: ZACH FORDLY/DAN BUBNICH	Date Started: 10/2/15 / Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE - TRACK	Logged By: I. DESJARLAIS / Checked By: [signature] 10/5/15	
Reference Elevation: —	Water Level: NA / Time: —	

Depth (feet bgs)	Sample Number	Penetration/ Recovery (feet)	Monitoring (NA)	Sample Description and Classification	USCS Group Symbol	Remarks
0.0						
1						
2				SILT; BROWN, DAMP, TRACE SUB-ANGULAR PEBBLES.	ML	
3						
4				SAA, EXCEPT MOIST.	ML	
5						1003 3560230P7004 VOC/% Solids
6		1003				
7			0.5 ppm	SILT; BROWN, DAMP, STIFF, WITH SUB-ANGULAR PEBBLES (0.5-1CM)	ML	
8			0.6 ppm			
9						1006 3560230P7009 VOC/% Solids
		1006		TD=9.5 Refusal w/Geoprobe BACKFILL W/BENTONITE CHIPS.		
10						

NOTES:

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: MOHAWK RD. INDUSTRIAL PLANT		Boring ID: DP11	
Project Location: HIGH FALLS, NY		Page No. ONE 1	
Project No.: 3617157346	Client: NYSDEC	of: ONE 1	
Boring Location: MP11	Refusal Depth: 9' BGS	Total Depth: 9' BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 9'	Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA		Protection Level: D	Sampler: ACETATE SLEEVE
Driller: ZACH FOROLY / DAN BUBICH	Date Started: 10/2/15	Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE - TRACK	Logged By: I DESJARLAIS	Checked By: [signature] 10/5/15	
Reference Elevation:	Water Level: NA	Time:	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	Monitoring NA	Sample Description and Classification	USCS Group Symbol	Remarks
1				SILT: LIGHT BROWNISH YELLOW, DAMP, SLIGHT ORANGISH MOTTLING, TRACE CLAY. TRACE FINE PEBBLES, (0.5cm)	ML	
2						
3						
4						
5			0.0 ppm	SAA, EXCEPT MOIST	ML	
6						1045 3560023DP11007 VOCs/%Solids
7		1045	0.4 ppm	SAA		
8			0.4 ppm	SILT: BROWN, DAMP, NON-PLASTIC, WITH SUB-ANGULAR ROCK FRAGMENTS (1-2cm)	ML	
9		1050		TD = 9' BGS Refusal w Geoprobe		1050 3560023DP11009 VOC/%Solids
10				BACKFILL W/ BENTONITE CHIPS.		

NOTES:

SOIL BORING LOG

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

	Project Name: MOHONK RD INDUSTRIAL PLANT		Boring ID: DP12
	Project Location: HIGH FALLS, NY		Page No. ONE 1
	Project No.: 3617157346	Client: NYSDEC	of: ONE 1
Boring Location: MP12	Refusal Depth: 10.3' BGS	Total Depth: 10.3 BGS	Bore Hole ID/OD: 2.5"
Weather: OVERCAST	Soil Drilled: 10.3'	Method: DIRECT PUSH	Casing Size: NA
Subcontractor: ZEBRA		Protection Level: D	Sampler: ACETATE SLEEVE
Driller: ZACK FORDUK / DAN RUBNICH	Date Started: 10/2/15	Date Completed: 10/2/15	Sampler ID/OD: 2"
Rig Type/Model: GEOPROBE - TRACK.	Logged By: I. DESJARLAIS	Checked By: 10/5/15	
Reference Elevation: —	Water Level: NA	Time:	

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)			Monitoring NA			Sample Description and Classification	USCS Group Symbol	Remarks
1								SILT; BROWN, DAMP, NON-PLASTIC, TRACE FINE PEBBLES.	ML	
2										
3								SAA	ML	
4										
5								SAA, EXCEPT MOIST	ML	
6								SAA EXCEPT DAMP.	ML	
7			10	6	3	8	ppm			1016 356023DP12007 VOCs/%Solids
8										
9								CLAYEY SILT: BROWN, MOIST, SLIGHT PLASTICITY, TRACE SUB-ANGULAR ROCK FRAGMENTS.	ML	
10			10	19	0.	0	ppm			1019 356023DP12010 VOCs/%Solids
11								TD = 10.3' BGS Refusal w/Geoprobe BACKFILL WITH BENTONITE CHIPS.		

NOTES:

SOIL BORING LOG

SOIL BORING LOG

MACTEC
511 Congress Street, Portland Maine 04101

Project Name: MOHAWK RD INDUSTRIAL PLANT				Boring ID: DP13	
Project Location: HIGH FALLS, NY				Page No. ONE 1	
Project No.: 3617157346		Client: NYSDEC		of: ONE 1	
Boring Location: MP13	Refusal Depth: 6.5 BGS		Total Depth: 6.5 BGS	Bore Hole ID/OD: 2.5"	
Weather: OVERCAST	Soil Drilled: 6.5'		Method: DIRECT PUSH	Casing Size: NA	
Subcontractor: ZEBRA			Protection Level: D	Sampler: ACETATE SLEEVE	
Driller: ZACH FORDLY / DAN BUBNICH	Date Started: 10/2/15		Date Completed: 10/2/15	Sampler ID/OD: 2"	
Rig Type/Model: GEOPROBE-TRACK	Logged By: I. DESJARLAIS		Checked By: J Ruhoff 10/5/15		
Reference Elevation: —	Water Level: NA		Time: —		

Depth (feet bgs) 0.0	Sample Number	Penetration/ Recovery (feet)	Monitoring NA	Sample Description and Classification	USCS Group Symbol	Remarks
1				SILT; BROWN; DAMP, BRITTLE, TRACE FINE PEBBLES.	ML	
2						
3			0.0 ppm			HORIZONTAL "CRACKING"
4				SAA	ML	
5						
6			0.5 ppm	SAA	ML	1100 3560230PU13016 VOCs/%Solids
7		1100		TD = 6.5' BGS Refusal w/ Geoprobe BACKFILL W/ BENTONITE CHIPS		

NOTES:

ICD 10/2/15

SOIL BORING LOG

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID ERT-1

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/23/15
ACTIVITY	START 0750 END 1120	DRILLER	Wayne Campbell	GEOLOGIST	J. Rawcliffe

DEPTHS (All measurements to ~~ground surface~~ TOP OF CASING in feet)

TARGET TEST INTERVAL	172-182' TOC	TOP OF BEDROCK	≈21' TOC	TOP OF LOWER PACKER	182' TOC
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	197.2' TOC	BOTTOM OF UPPER PACKER	172' TOC
CASING STICKUP (above ground surface)	2.5'	INITIAL WATER LEVEL (W.L.)	51.64	LENGTH OF PACKERS (sealed test zone)	10'
BOTTOM OF CASING	24'	INITIAL W. L. IN ANNULUS	51.64	REFERENCE DATUM (for water levels)	TOR = TOC + 0.50

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
0837	165	—	—	Inflating packers							
0841	↓	52.03	52.04								
0848		51.96	52.10								
0852		51.96	52.10								
0855	↓	51.96	52.10								
0856	Installing Connectors										
0905	165	51.97	52.10	Start pump							
0909		52.02	52.55						ERT-2	= 57.04	5 Gallons
0913		52.05	52.59						PID = 0.4	on	10 Gall
0917		52.07	52.62						pressure		15 Gal
0921		52.08	52.64								20 Gal
0925	↓	52.09	52.65						ERT-2	= 57.06	25 Gal
1003	160	51.98	52.11	Install bladder pump and start purge							
1010		51.97	52.10	155 ml/min	14.1	0.689	7.0	9.0	228	2.7	
1015		51.96	52.10	165 ml/min	13.3	0.690	7.0	8.1	222	2.4	
1020		51.97	52.10	↓	13.1	0.676	7.0	7.0	207	1.2	
1025		51.96	52.10	185 ml/m	12.8	0.669	6.9	5.7	178	1.2	
1030		51.96	52.09	205	12.8	0.666	6.9	5.3	142	1.3	
1040		51.96	52.08	225	12.6	0.664	6.9	5.4	138	1.1	
1045		51.95	52.08	230	12.6	0.663	6.9	5.3	139	1.0	
1050		51.95	52.08	235	12.6	0.662	6.9	5.2	135	1.0	
1055		51.94	52.08	240	12.7	0.661	6.9	5.1	130	1.2	
1105	Bottle time	356023ERT01 175									

EQUIPMENT DOCUMENTATION

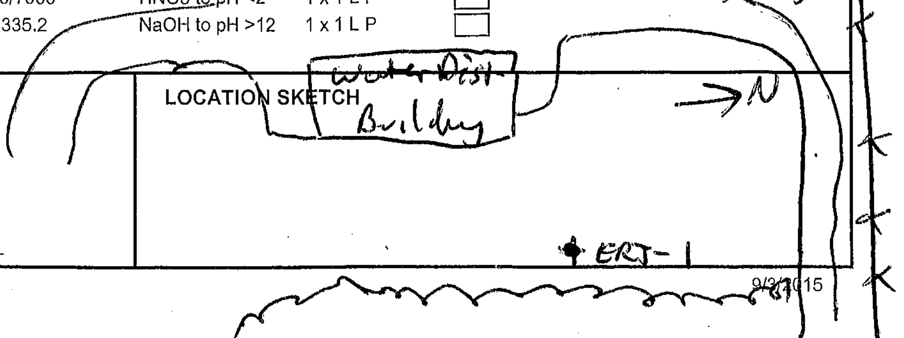
TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	~~4 DEG. C~~	~~1 X 500 ML P~~	☐
☐ TAL METALS	USEPA 6000/7000	~~HNO3 to pH <2~~	~~1 X 1 L P~~	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES:

LOCATION SKETCH



SIGNATURE: Jerry Rawcliffe

10/12/15

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID ERT-01

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/23/15
ACTIVITY	START 1120 END 1355	DRILLER	W. Campbell	GEOLOGIST	J. Rauchle

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	110-120 TOC	TOP OF BEDROCK	≈21' TOC	TOP OF LOWER PACKER	120 TOC
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	197.2' TOC	BOTTOM OF UPPER PACKER	110 TOC
CASING STICKUP (above ground surface)	2.5	INITIAL WATER LEVEL (W.L.)	51.64	LENGTH OF PACKERS (sealed test zone)	10'
BOTTOM OF CASING	24' TOC	INITIAL W. L. IN ANNULUS	57.64	REFERENCE DATUM (for water levels)	TOR = TOC + 0.50

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
1133		Inflating packers									
1140		52.88	52.96								
1148		51.83	51.96								
1152		51.82	51.95								
1158	Installed Grundfos										
1204		51.78	51.92	Start pump				ERT-2		56.80'	TOC
1205		51.81	52.81								5 gal
1208		51.83	52.91								10 gal
1212		51.84	52.96								15 gal
1214		51.85	52.98								20 gal
1217		51.85	52.99					ERT-2		57.07	25 gal
1233				Installed bladder pump							
1235		51.78	51.97	Start pump							
1254		51.72	51.94	180	16.2	0.700	7.1	7.9	214	5.6	
1300		51.72	51.93	200	13.8	0.678	7.0	7.1	160	3.2	
1310		51.69	51.94	210	13.2	0.669	6.96	6.9	143	2.96	
1315		51.68	51.92	210	13.16	0.669	6.97	6.8	137.9	2.34	
1320		51.68	51.92	210	13.10	0.669	6.97	6.77	135	2.45	
1325		51.66	51.92	210	12.96	0.669	6.98	6.38	132	2.11	
1330		51.66	51.92	210	12.89	0.667	6.98	6.36	131.2	2.0	
1335		51.66	51.92	210	12.9	0.667	6.98	6.14	130	2.0	
1340		51.64	51.91	210	12.9	0.666	6.98	6.25	128	1.64	
1345	Bottle time	356023ERT01115									

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
[ ]	[ ] HIGH DENSITY POLY	[X] STAINLESS STEEL	[X] TEFLON
[X] QED BLADDER	[X] OTHER LDPE	[ ] OTHER	[ ] OTHER

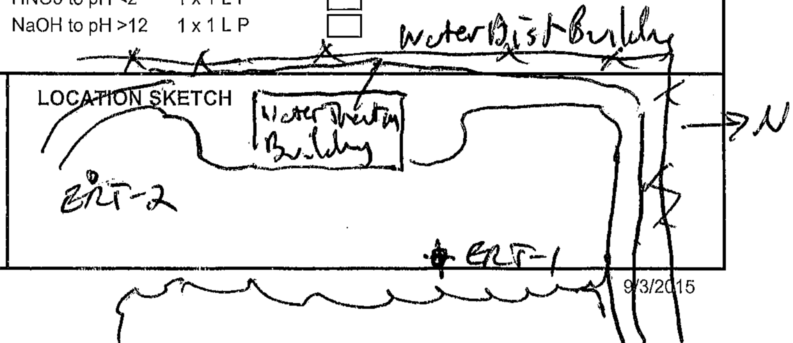
ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[X] VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	[X]
[ ] AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	[ ]
[ ] NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	[ ]
[ ] TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	[ ]
[ ] CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	[ ]

NOTES:

SIGNATURE: [signature]

LOCATION SKETCH



10/12/15

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID ERT-01

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/23/15
ACTIVITY	START 1355 END 1645	DRILLER	Wayne Campbell	GEOLOGIST	J. Rawcliffe

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	73-83' TOC	TOP OF BEDROCK	≈21' TOC	TOP OF LOWER PACKER	83' TOC
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	197.2	BOTTOM OF UPPER PACKER	73' TOC
CASING STICKUP (above ground surface)	2.5	INITIAL WATER LEVEL (W.L.)	51.64	LENGTH OF PACKERS (sealed test zone)	10'
BOTTOM OF CASING	24'	INITIAL W. L. IN ANNULUS	51.64	REFERENCE DATUM (for water levels)	TOR = TOC + 0.50

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
1407	125	Inflating packers									
1416	↓	51.71	51.31								
1420		51.67	51.39								
1425		51.64	51.48								
1435	120	51.58	50.58	Installed Grundfos Start purge							
1442		51.64	62.45	~~Start purge~~							2 Gal
1455		51.68	66.48								3.5 gal
1500											5 gal
1511		51.68	79.5								14 gal
1514		51.68	81.20								17 gal
1518				Pulled Grundfos							
1526			80.32	Installed Bladder pump							
1536	↓		79.84	6" borehole							
	Purging with bladder pump						7.1				
1553	120	51.70	79.42	140	13.8	0.710	~~9.0~~	9.0	100	10.6	
1600		51.69	79.46	165	13.5	0.696	7.2	7.7	81	5.5	
1605		51.69	79.38	120	14.1	0.698	7.2	7.7	80	5.0	
1610		51.69	79.27	120	14.4	0.698	7.2	7.7	81	4.4	
1615	↓	51.69	79.18	120	14.3	0.698	7.2	7.7	83	4.9	
1625	Bottle time 356023~~MW~~ERT01075										
			VOC (3x40ml/HCl)								

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

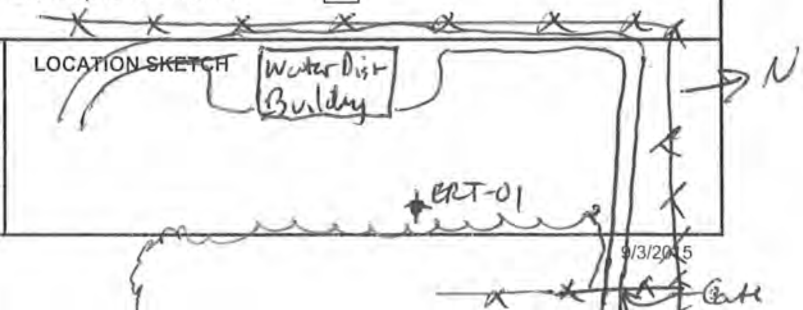
ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	☐
☐ TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES: Low recharge zone est. recharge at 250 ml/min.

SIGNATURE: [signature]

LOCATION SKETCH



10/12/15

Northeast Geophysical Services

ERT-1
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/09/15

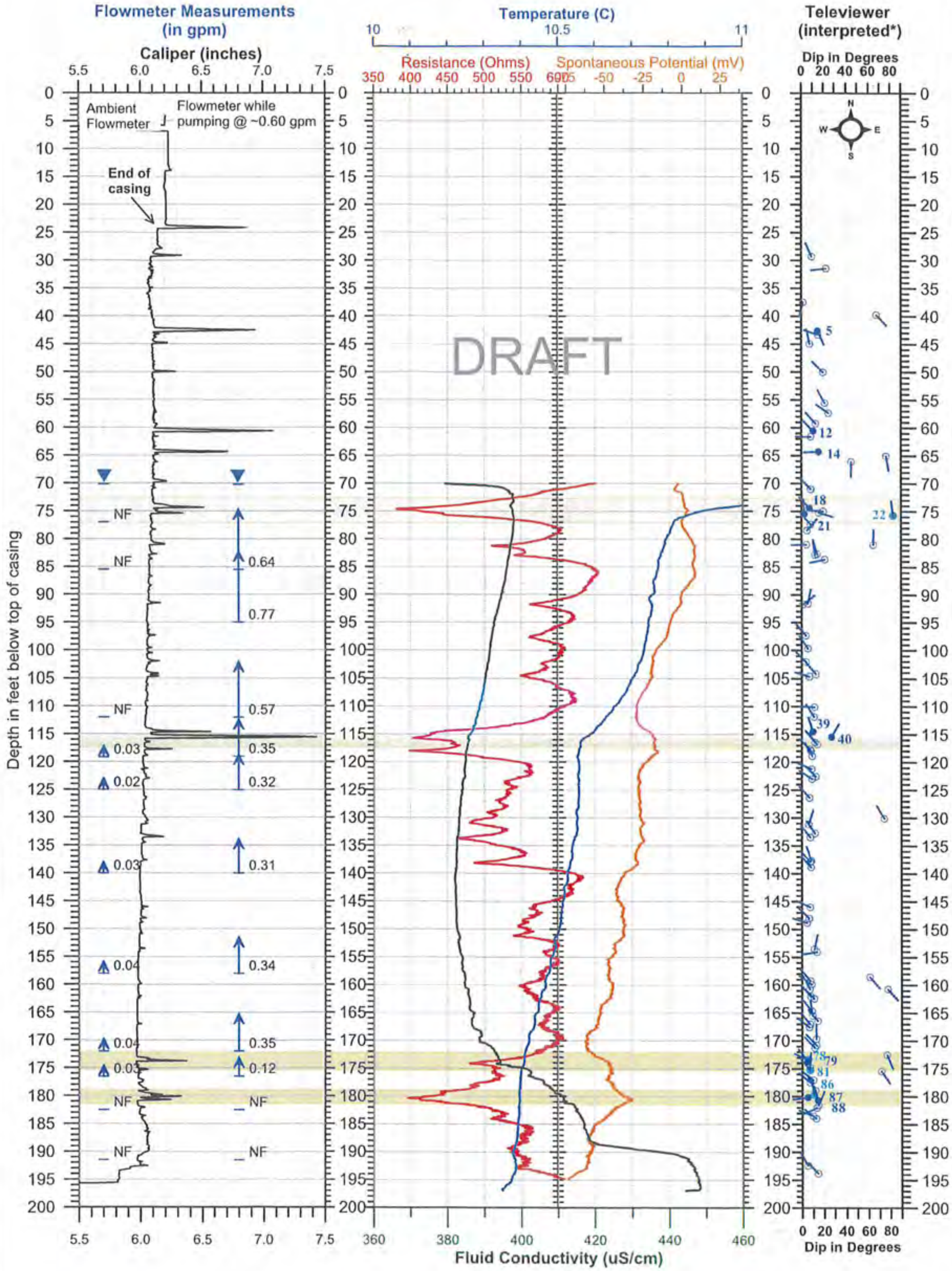


PLATE B-1
Borehole Geophysical Log
ERT-1
Mohonk Road Industrial Plant Site
High Falls, NY

= Likely transmissive zone

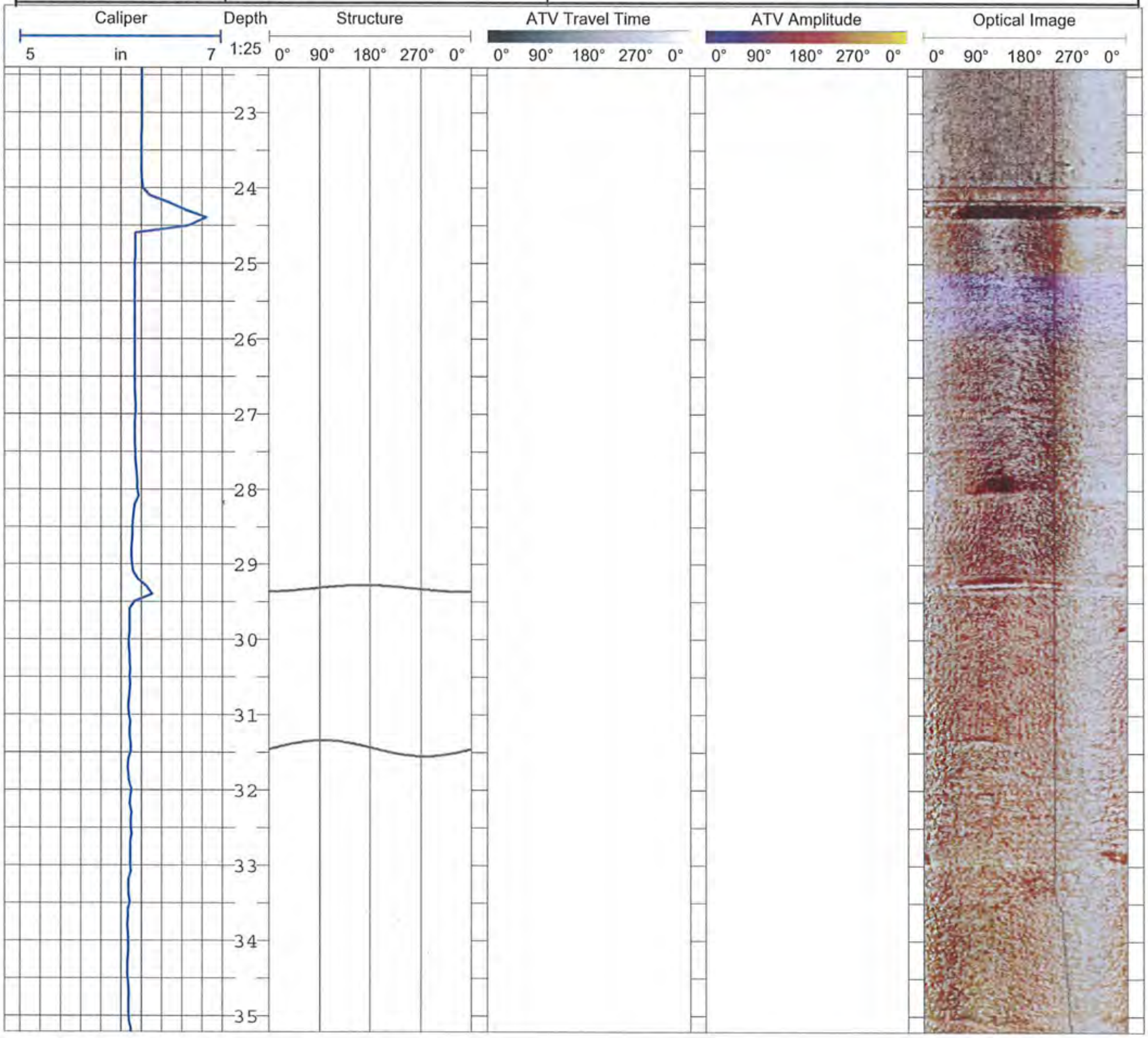
= possible transmissive zone

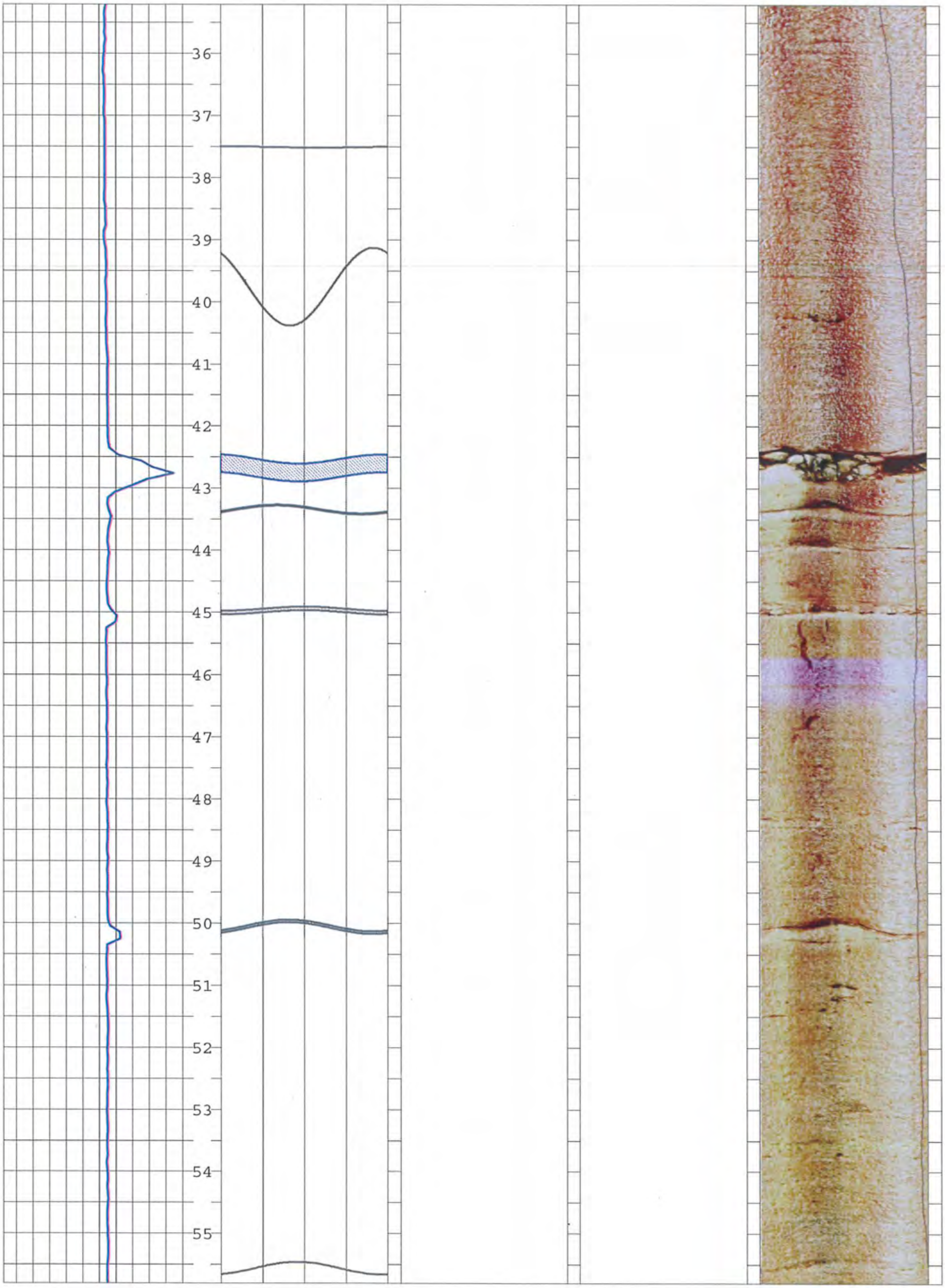
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

Date logged: 9/09/15

Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log:	**Plate B-4 Caliper & Televiewer Logs**		
Well:	**ERT-1**		
Site:	Mohonk Road Industrial Plant		
Date:	9/09/2015	**Location:**	High Falls, NY
Casing Depth:	24 ft	**For:**	AMEC Foster Wheeler
Casing Type:	6 in	**Logged by:**	R. Rawcliffe
Boring Depth:	197.2 ft	**Orientation:**	magnetic
Meas. From:	toc	**Structure Plots:**	
Stickup:	2.52 ft		black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Water Level:	70.48		

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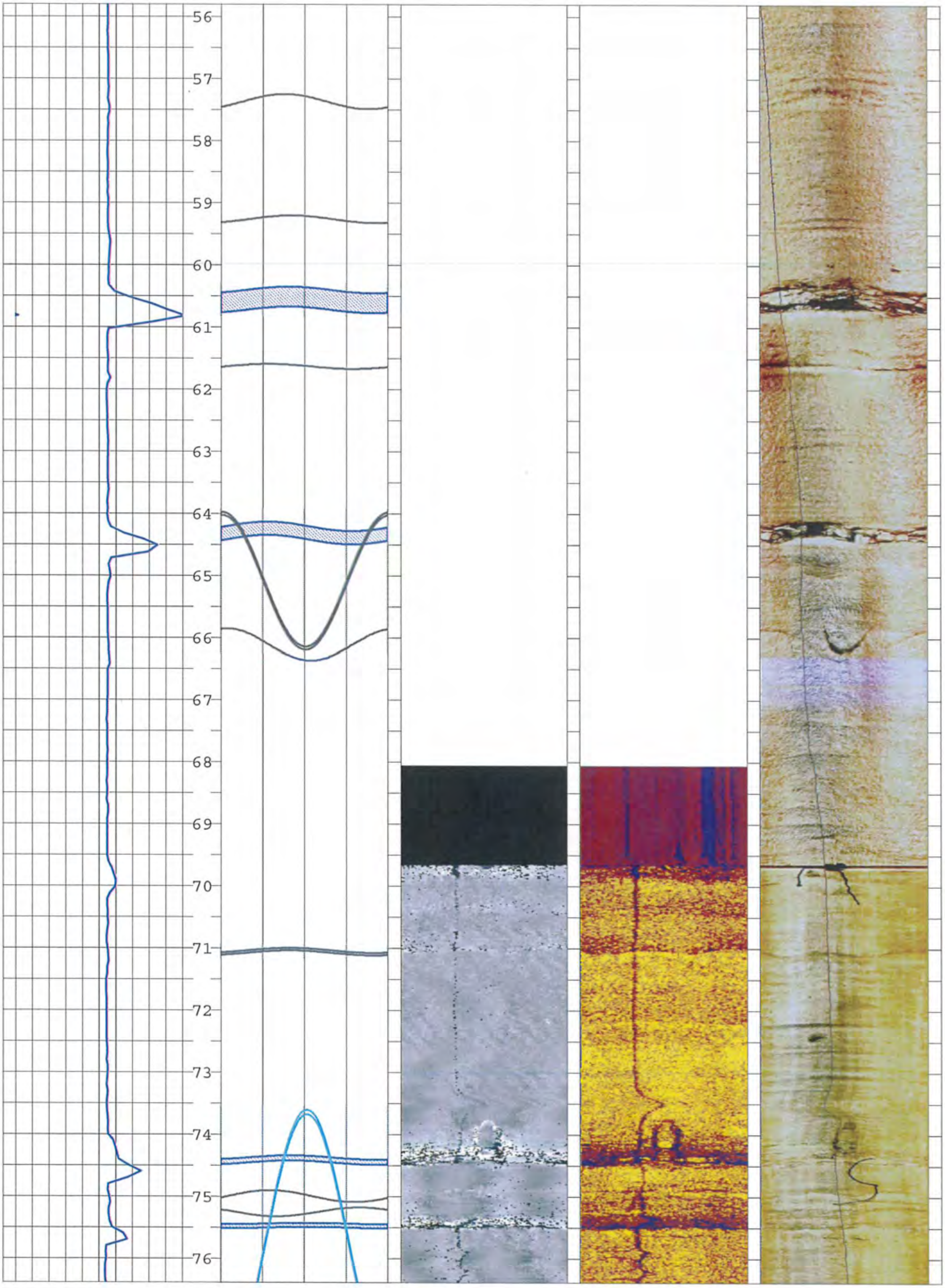
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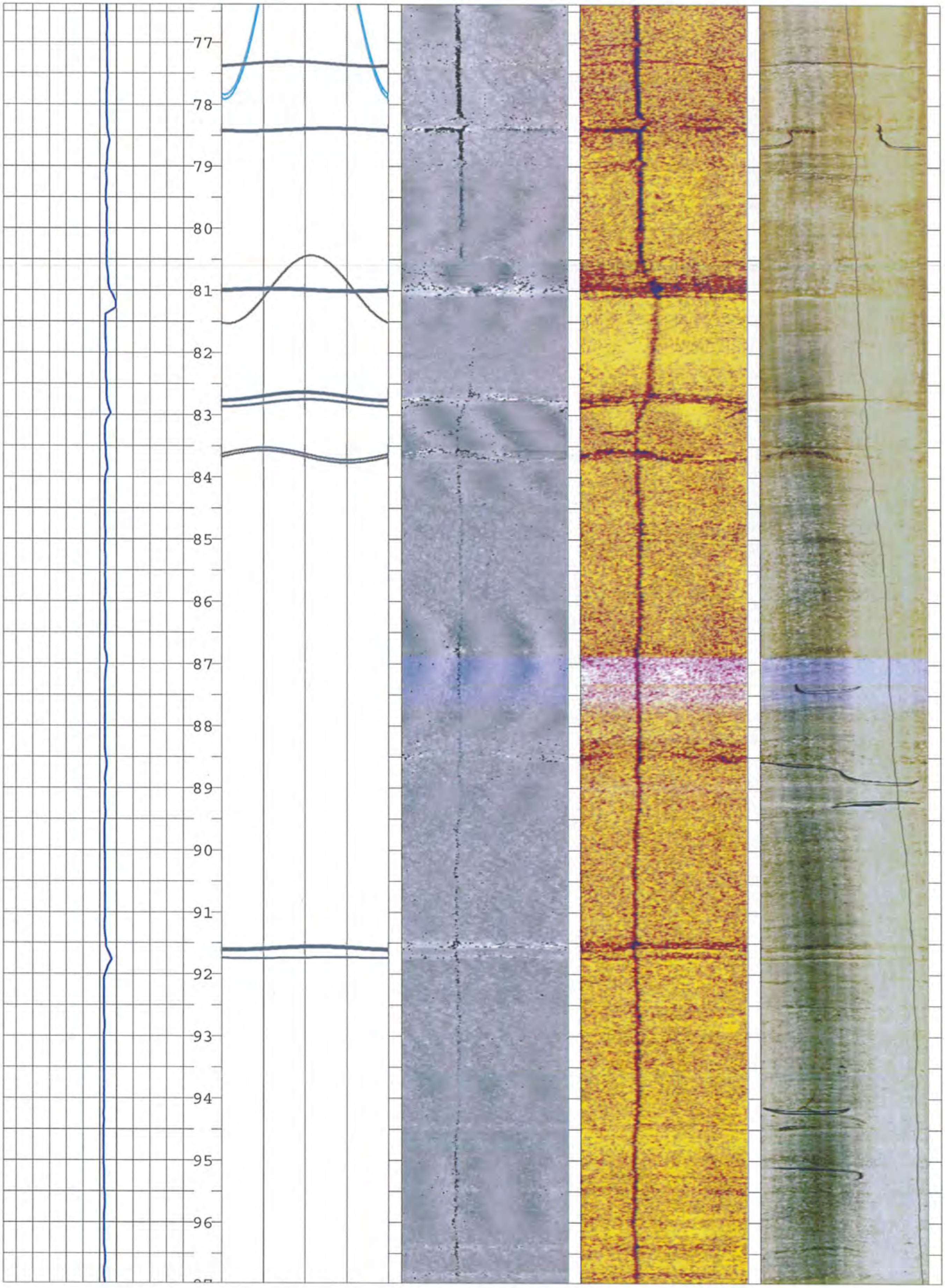

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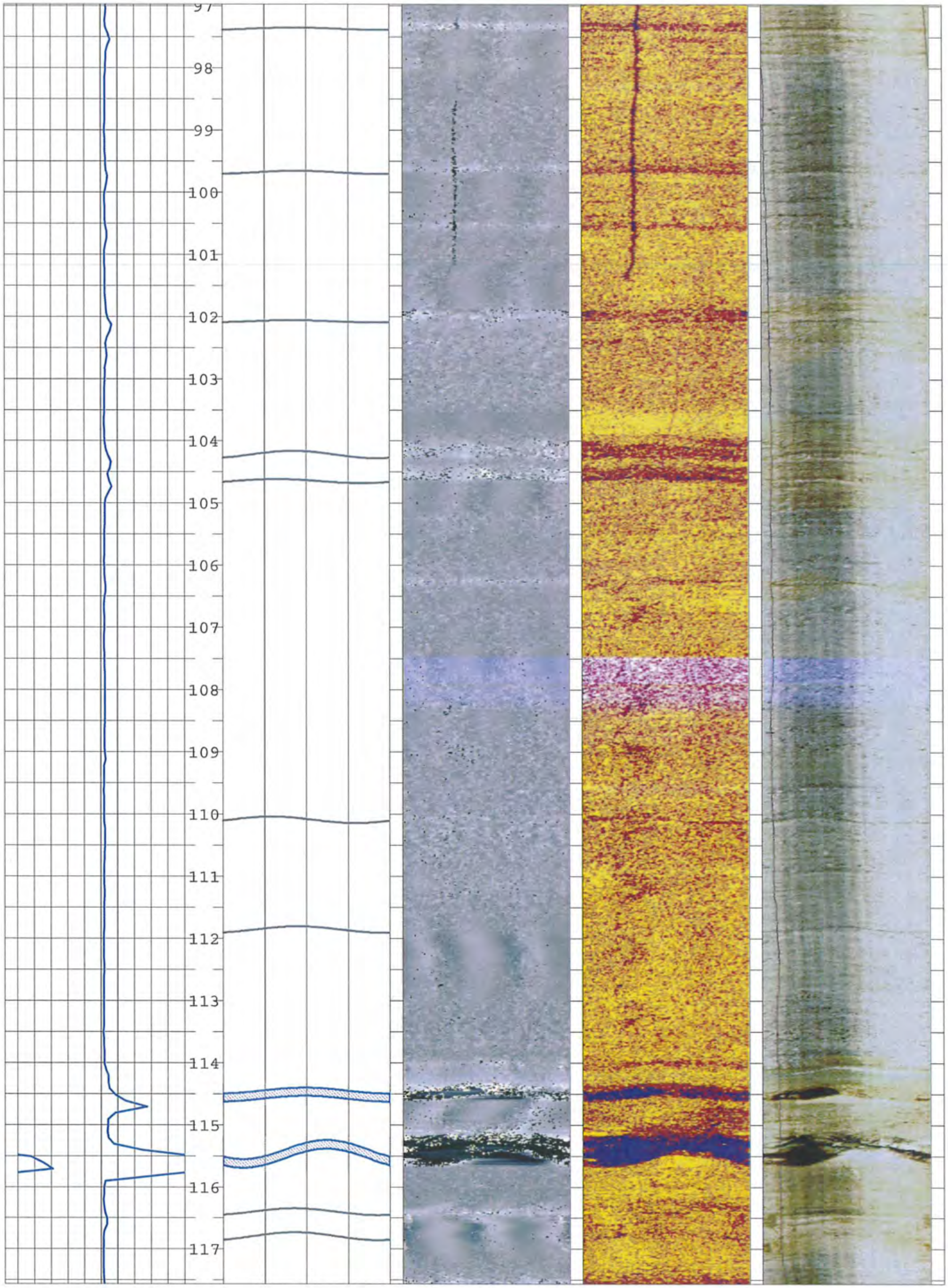
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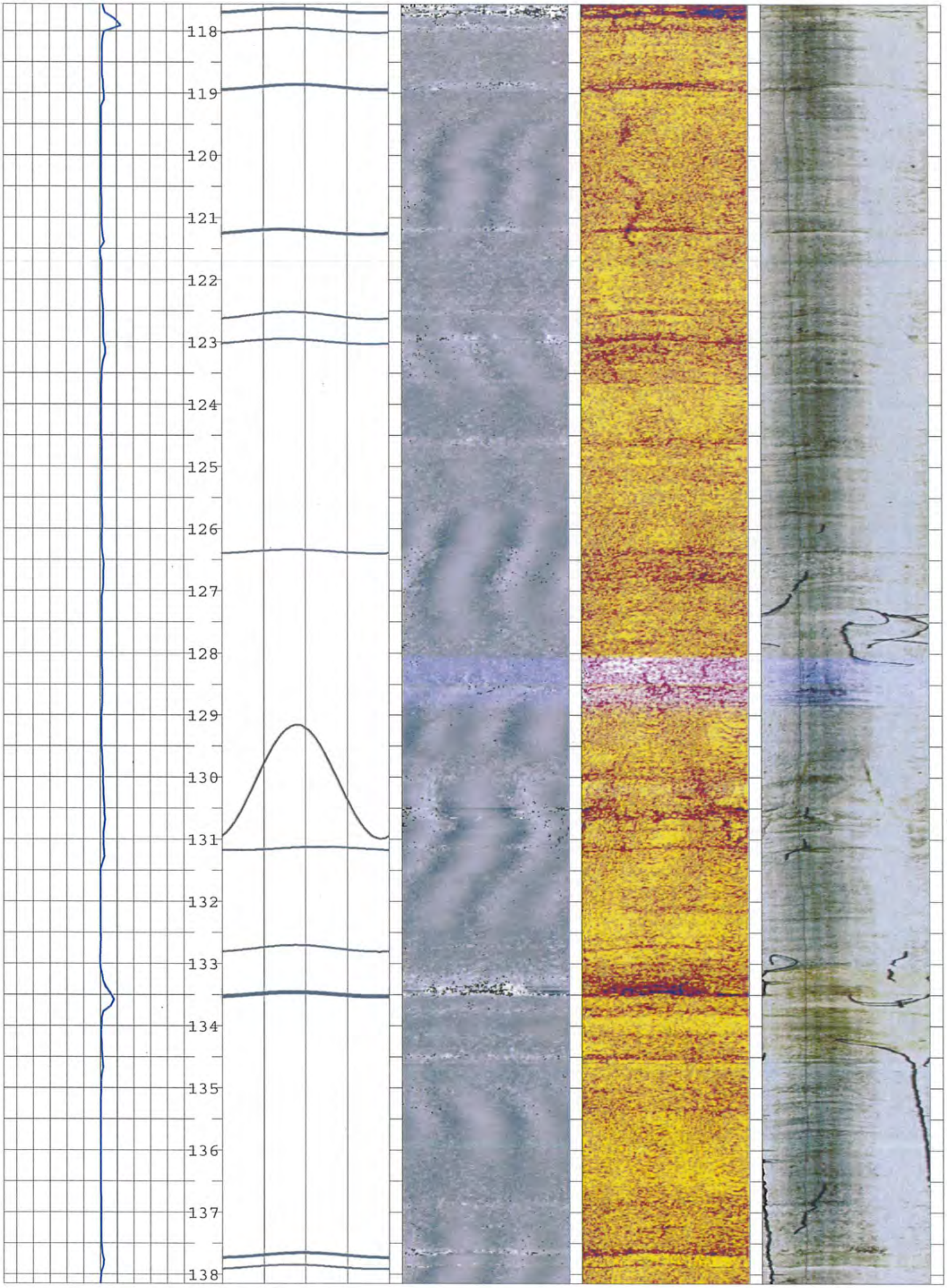
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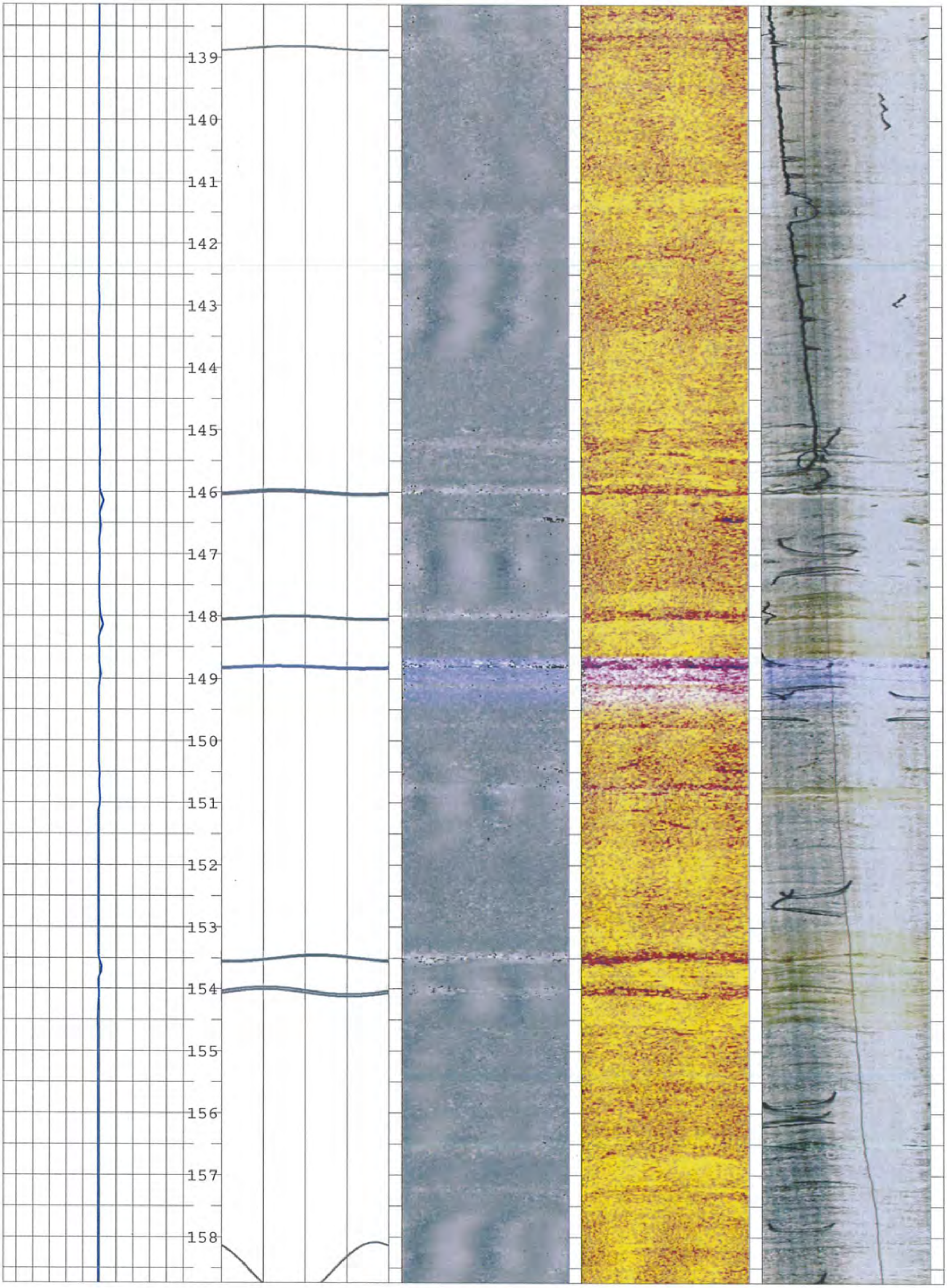
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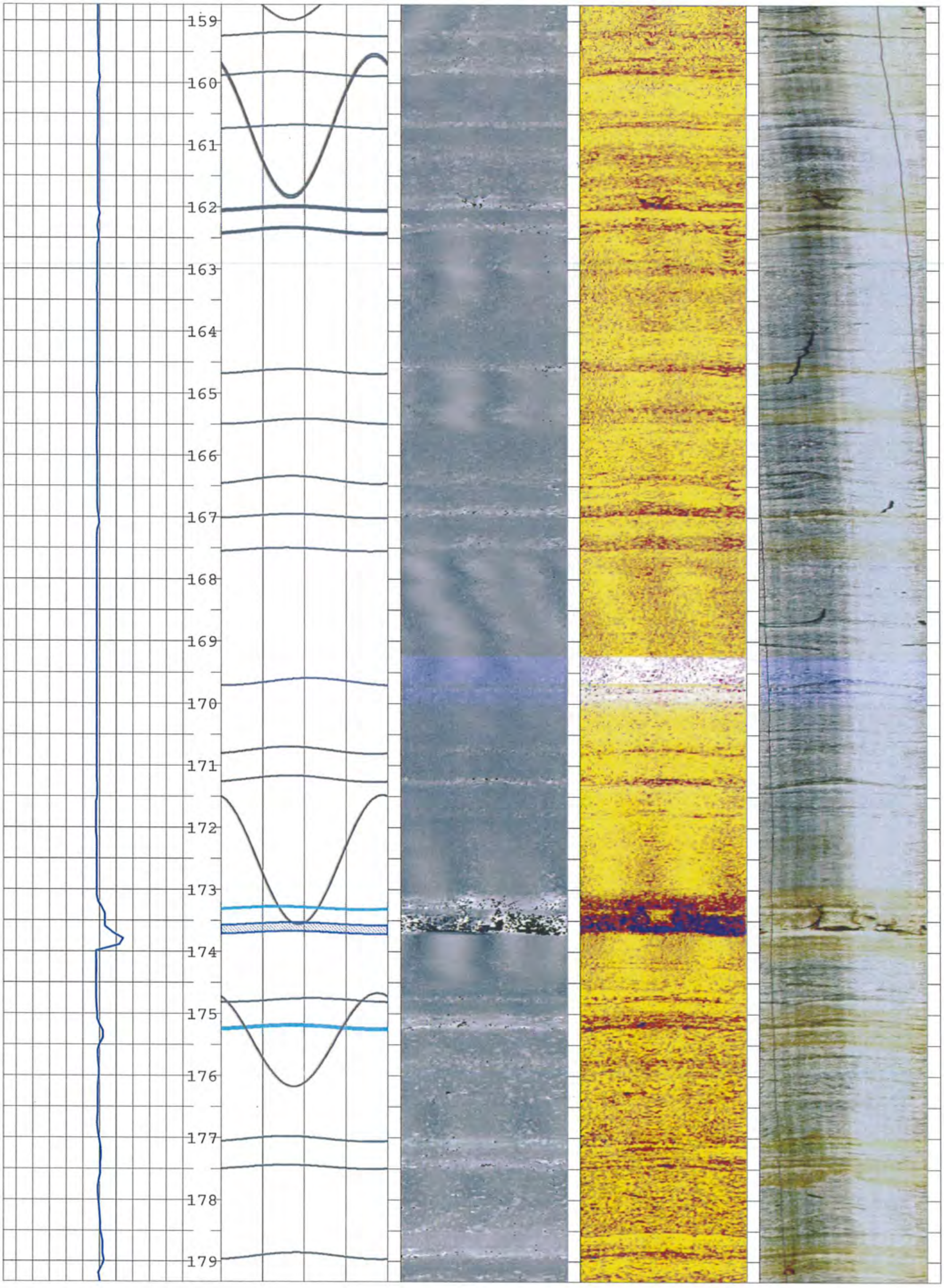
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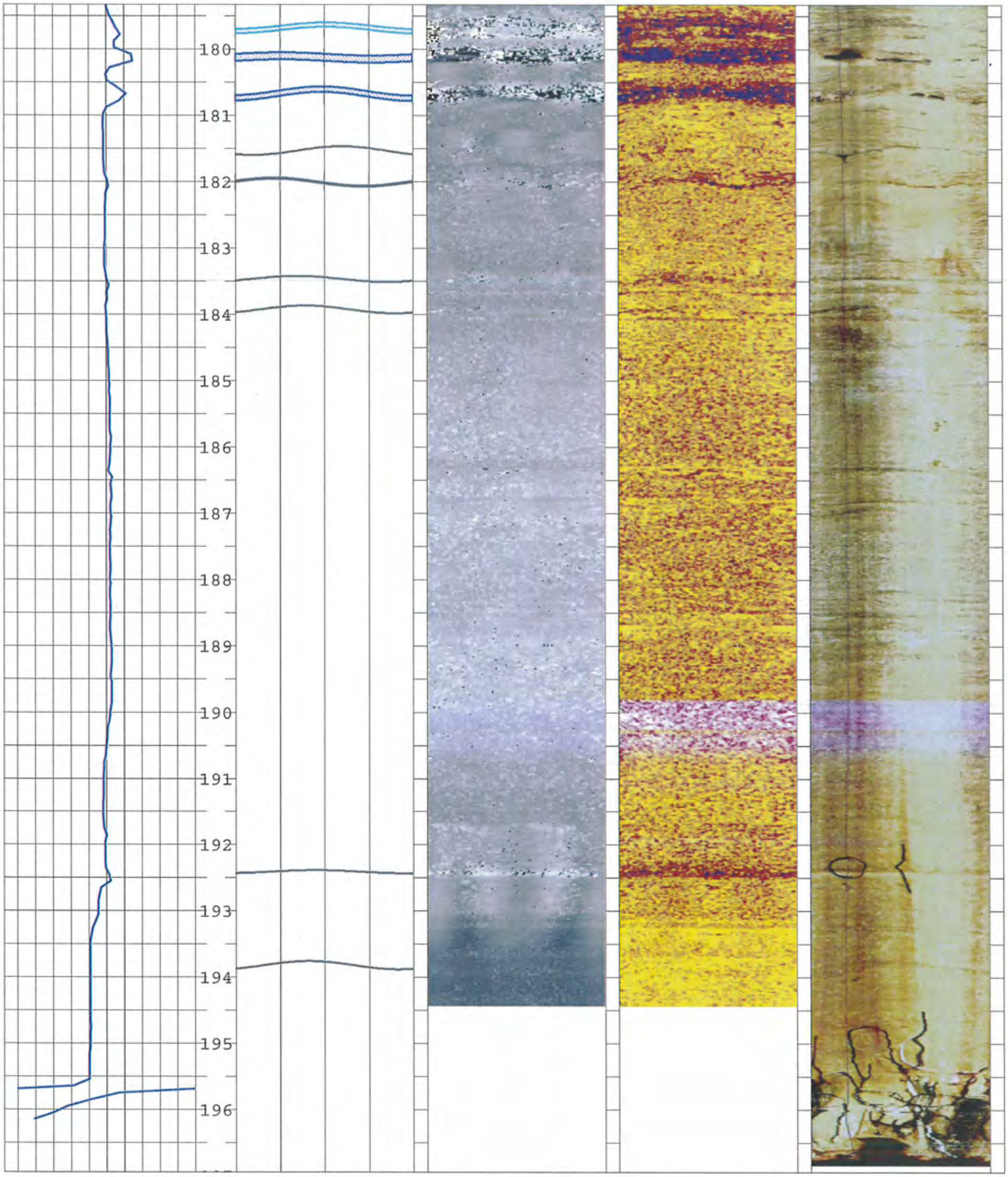
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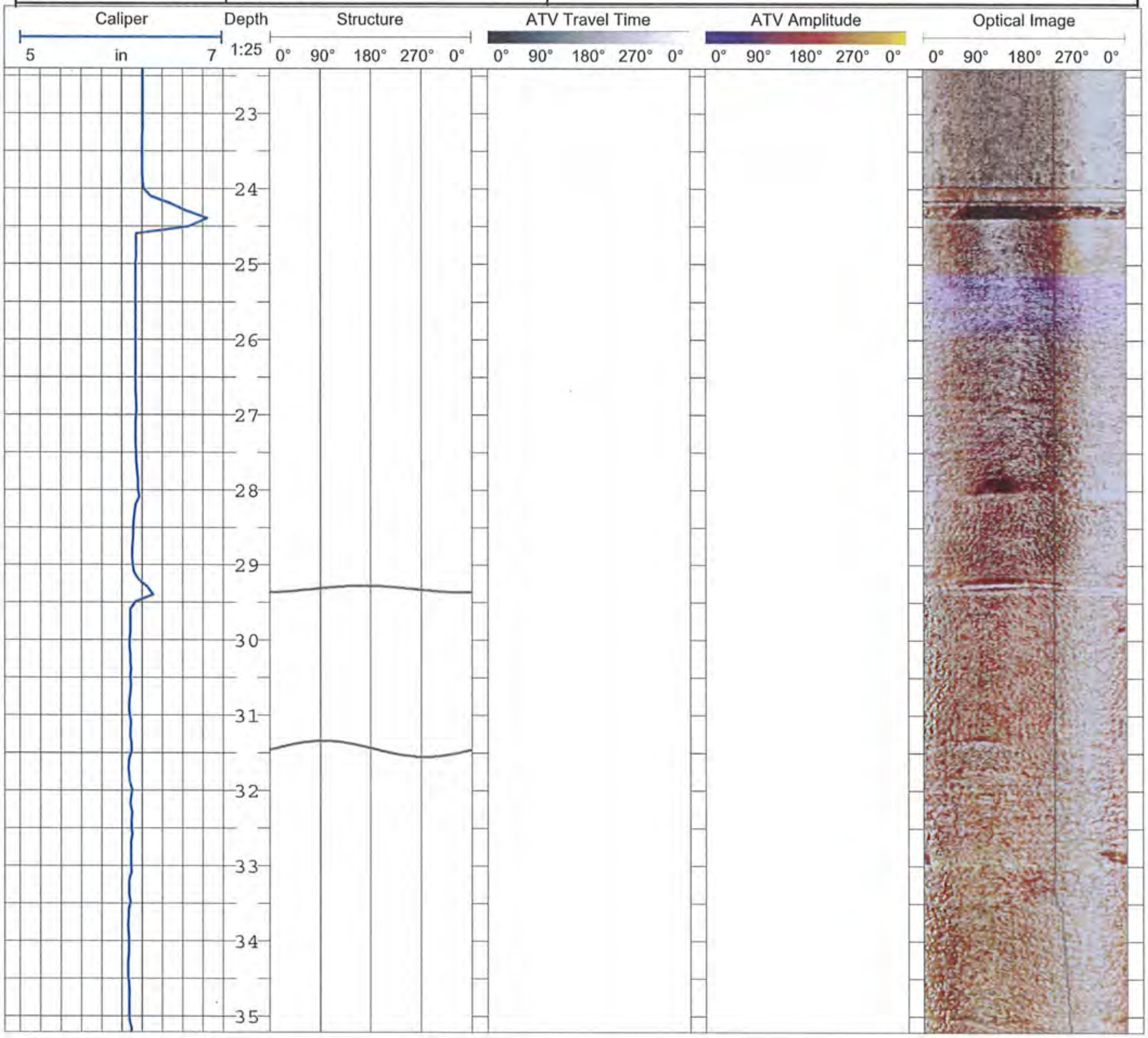
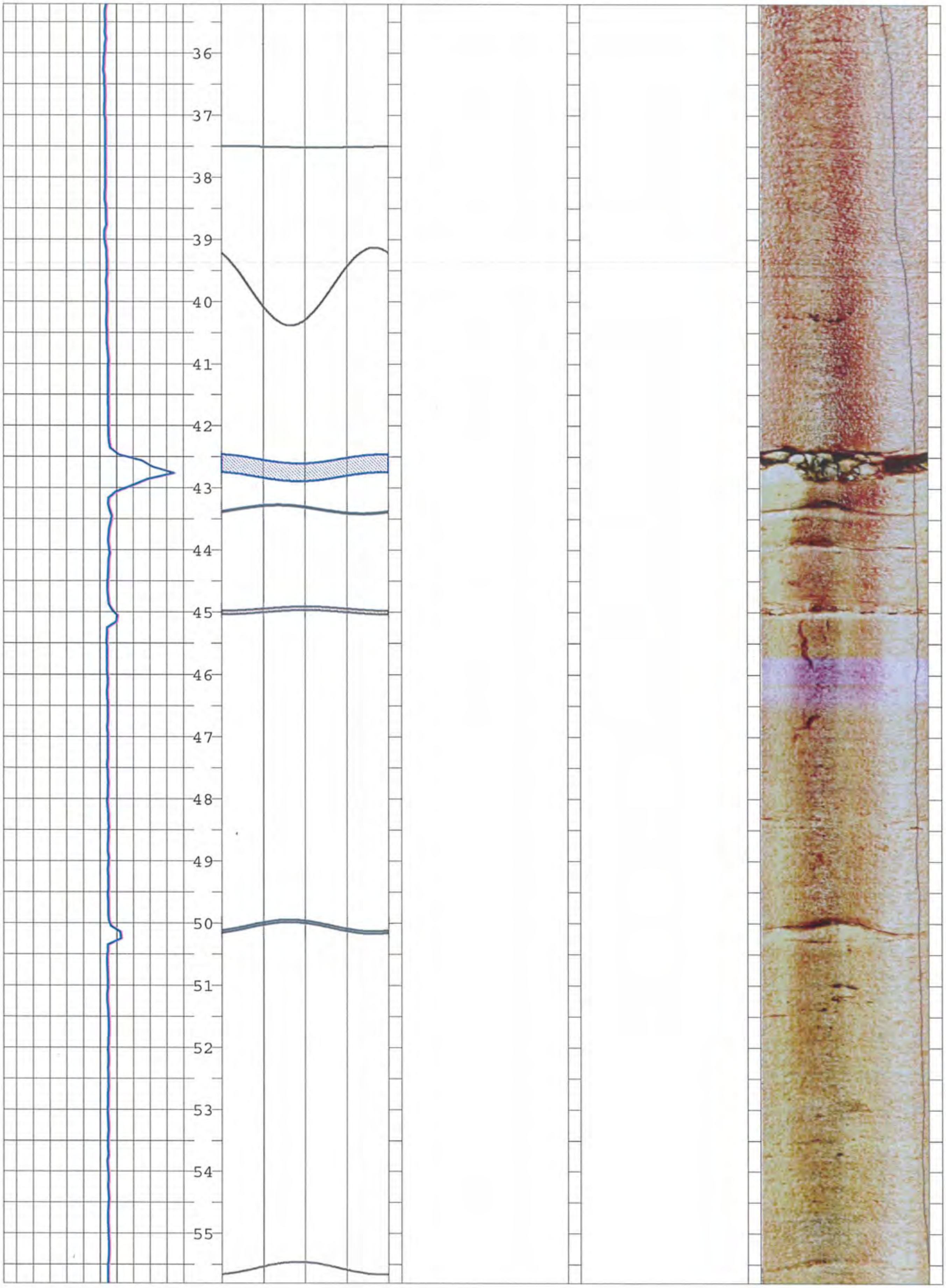
Northeast Geophysical Services 4 Union Street Bangor, Maine 04401 Tel. 207-942-2700 email: ngsinc@negeophysical.com	Log: Plate B-4 Caliper & Televiewer Logs
	Well: **ERT-1**
	Site: Mohonk Road Industrial Plant

Date:	9/09/2015	**Location:** High Falls, NY
Casing Depth:	24 ft	**For:** AMEC Foster Wheeler
Casing Type:	6 in	**Logged by:** R. Rawcliffe
Boring Depth:	197.2 ft	**Orientation:** magnetic
Meas. From:	toc	**Structure Plots:** black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	2.52 ft	
Water Level:	70.48	

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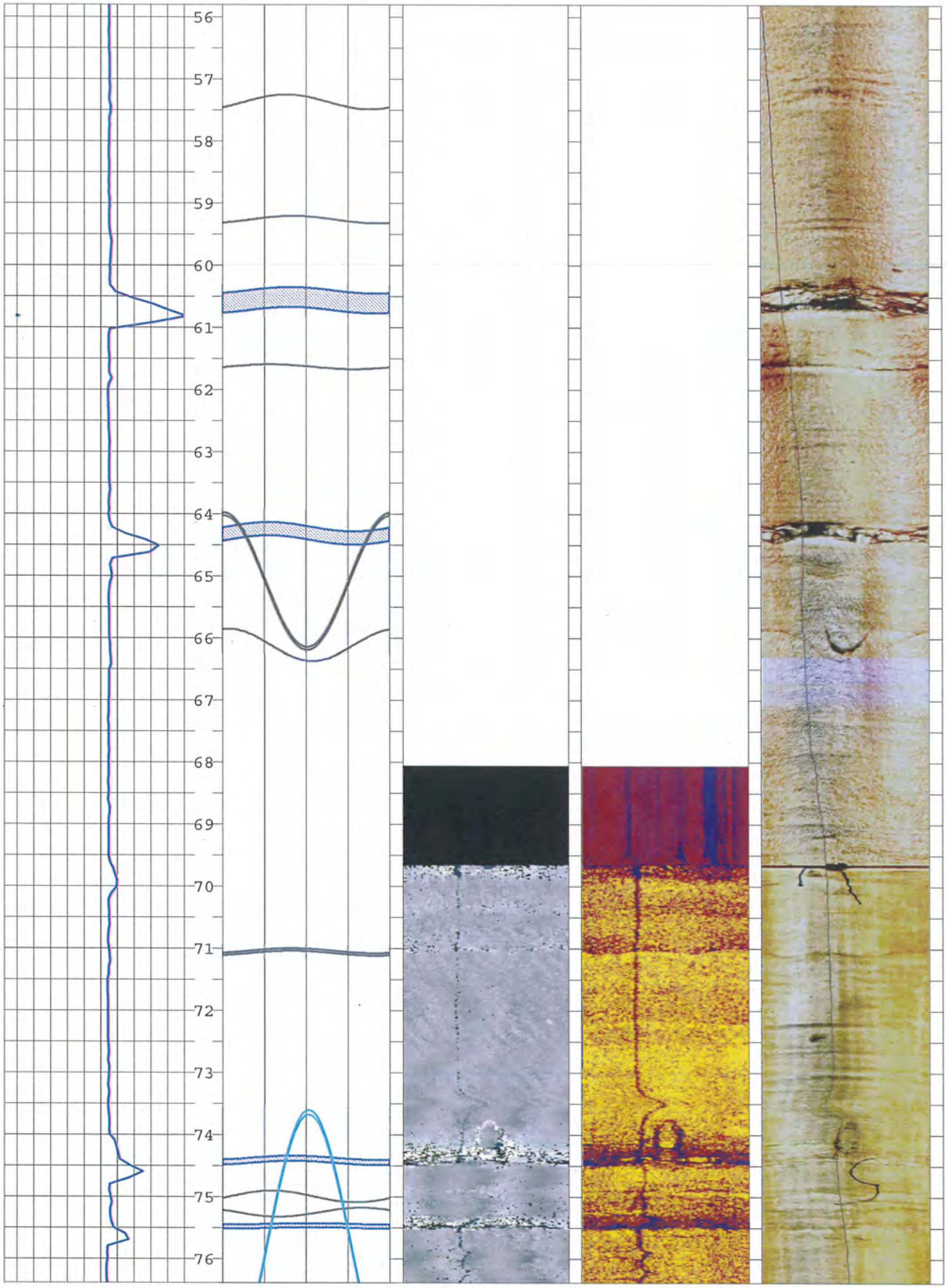
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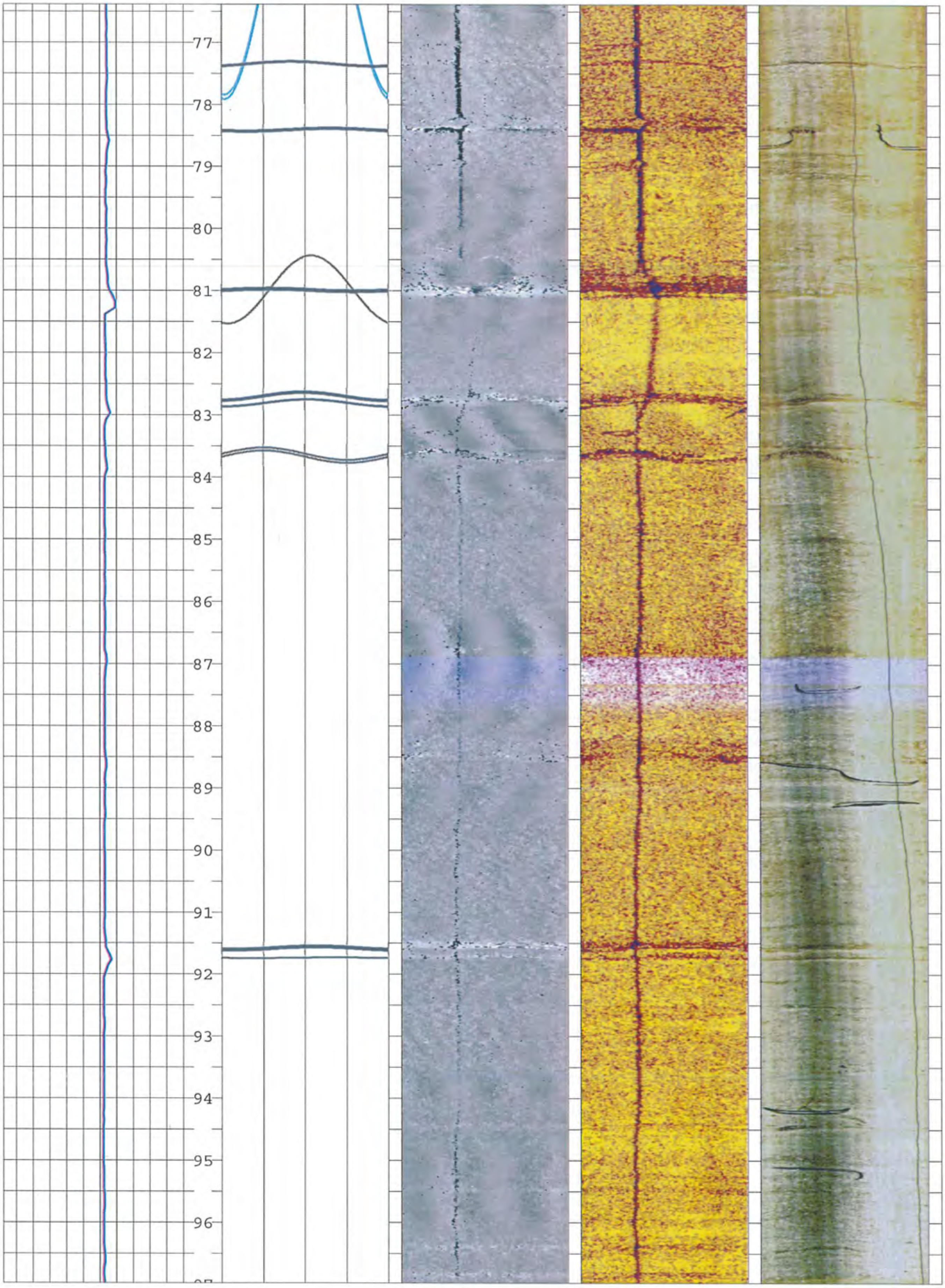
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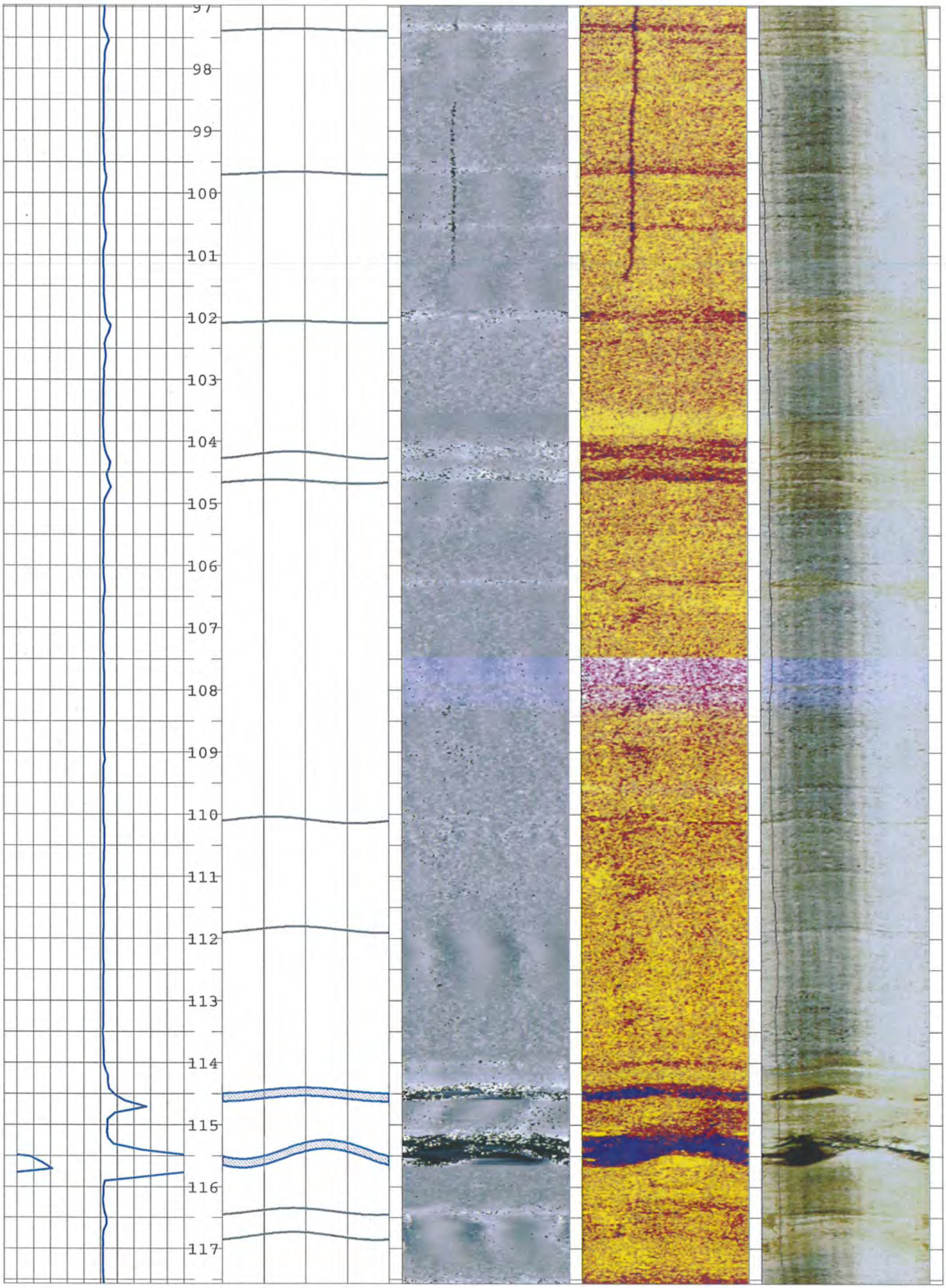
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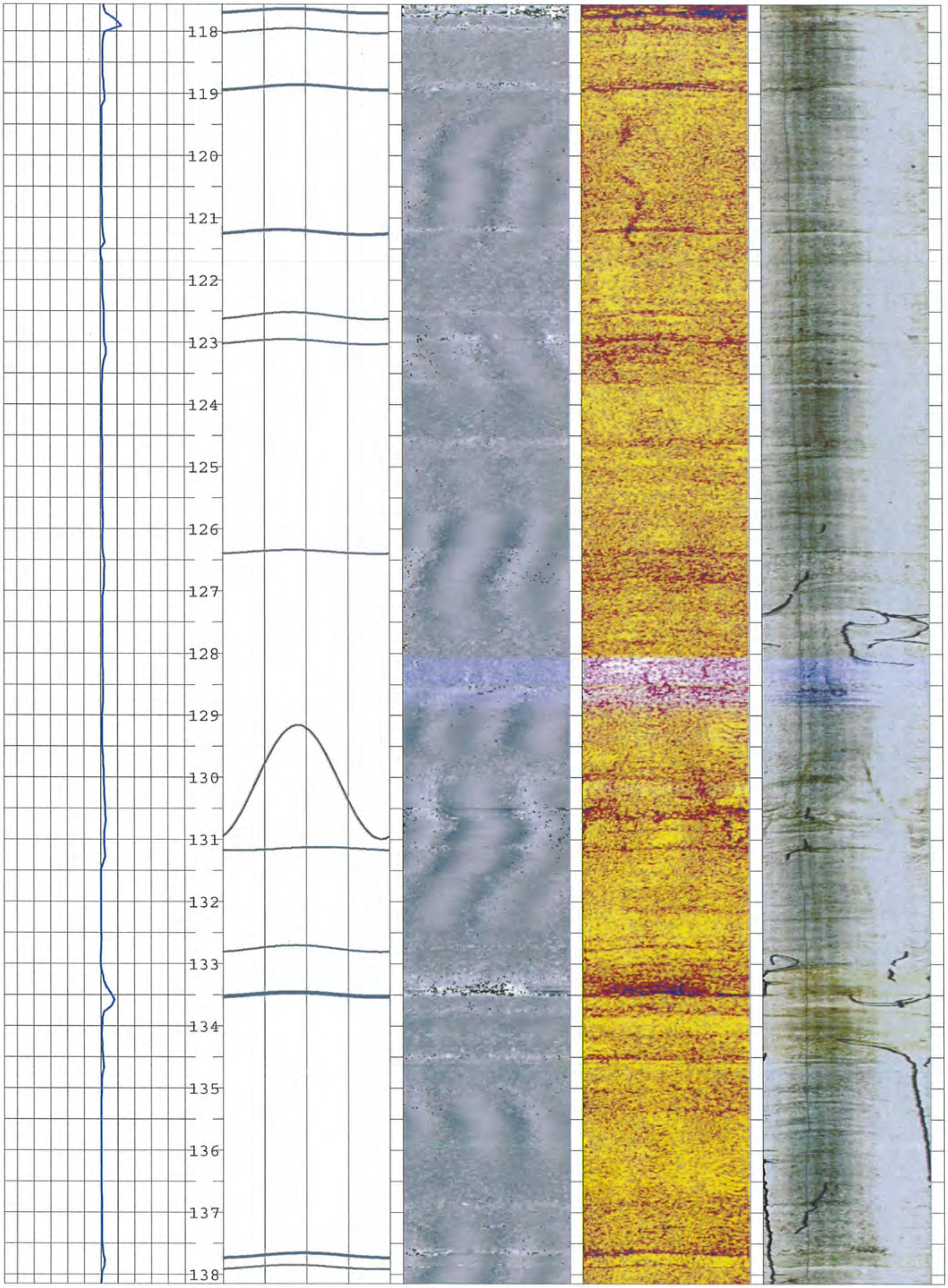
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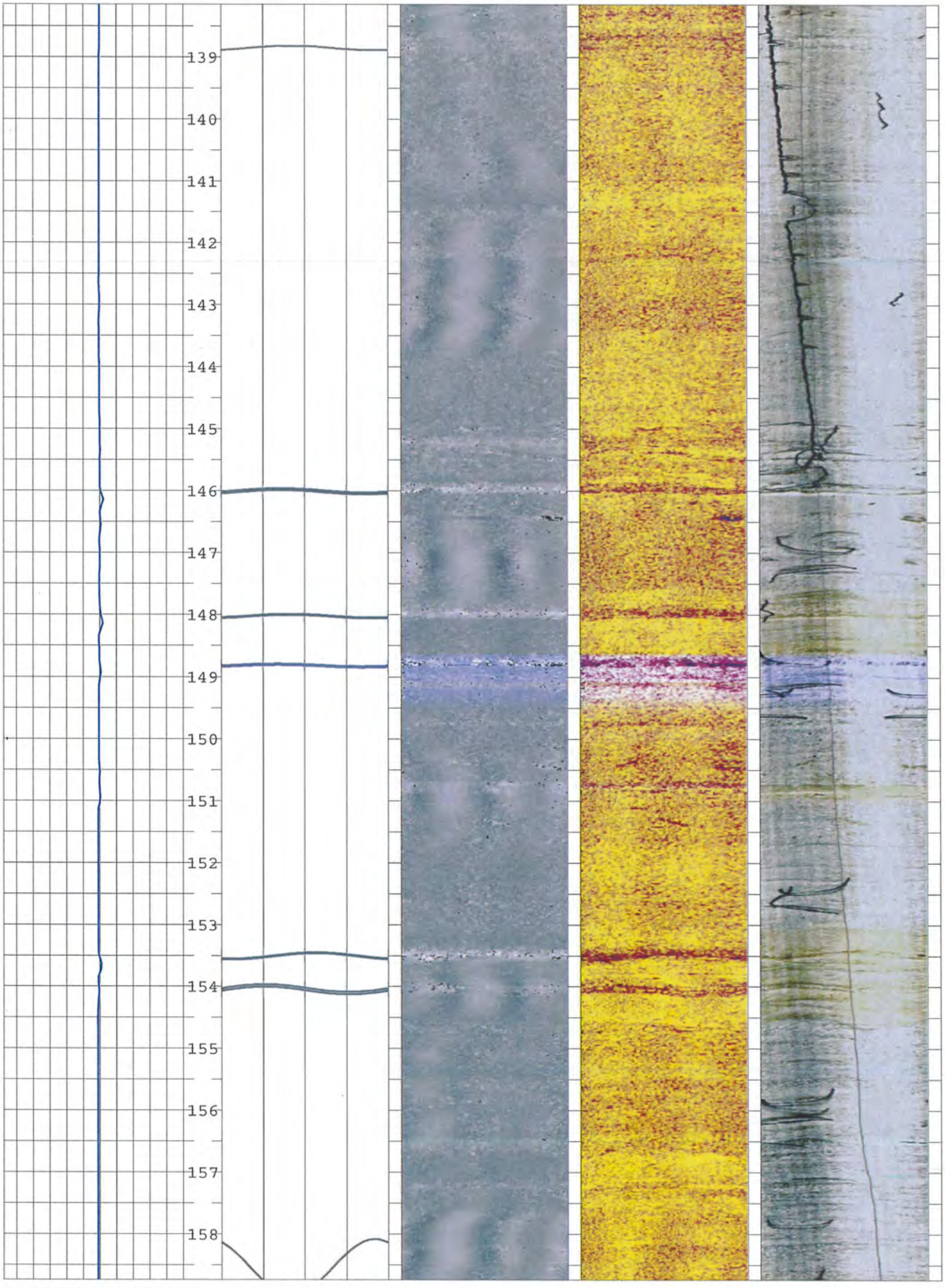
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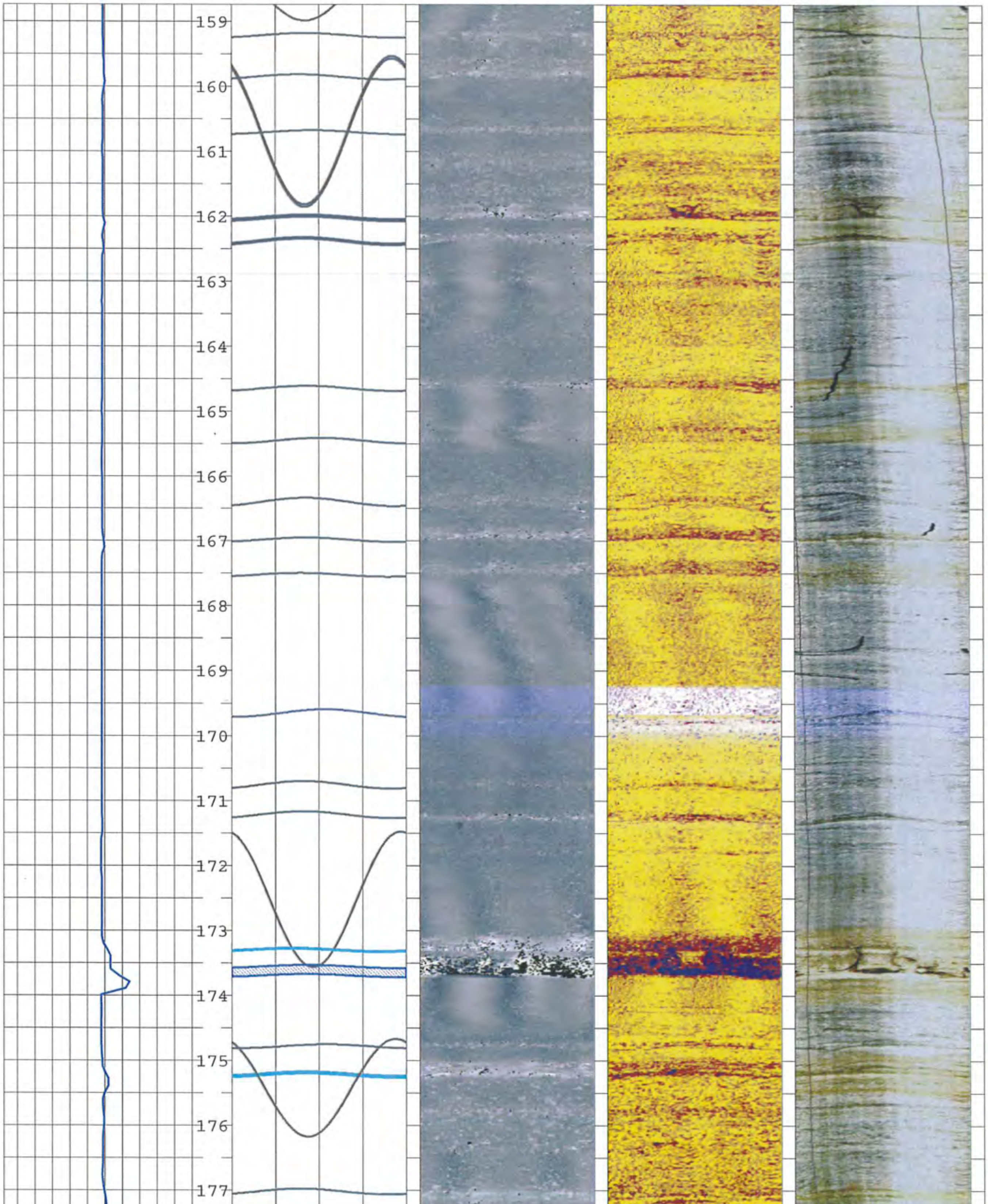
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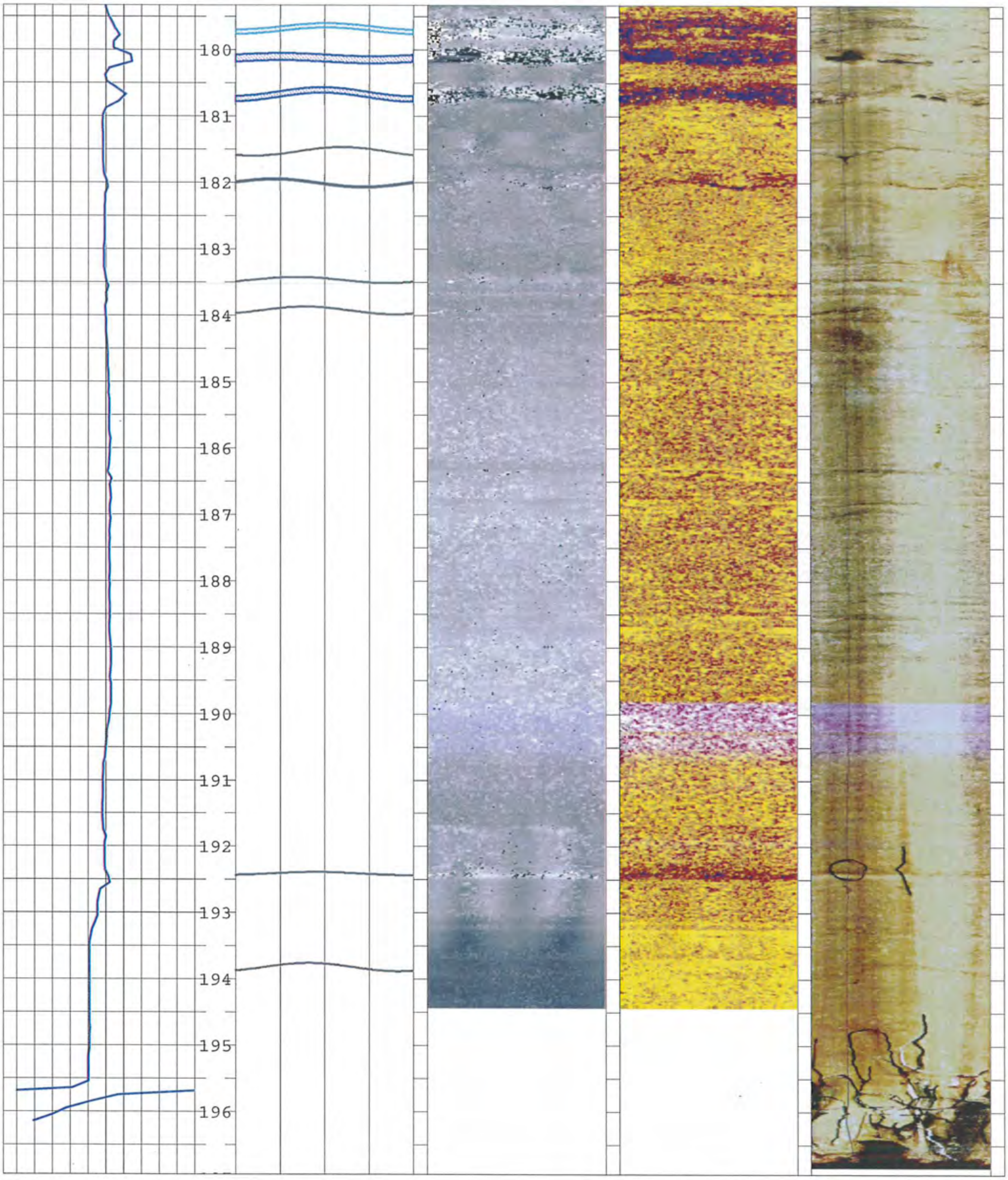
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FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID MW-5R

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/22/15
ACTIVITY	START 0800 END 1230	DRILLER	W. Campbell	GEOLOGIST	JKR/ID

DEPTHS (All measurements to ground surface in feet) Packer zone = 110-120.5

TARGET TEST INTERVAL	110-120.5 TOC	TOP OF BEDROCK	≈ 11' BGS	~~TOP~~ Bottom OF LOWER PACKER	110'
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	120.5' TOC	BOTTOM OF UPPER PACKER	NA
CASING STICKUP (above ground surface)	1.2'	INITIAL WATER LEVEL (W.L.)	62.39' TOC	LENGTH OF PACKERS (sealed test zone)	Single packer.
BOTTOM OF CASING	13' TOC	INITIAL W. L. IN ANNULUS	62.90	REFERENCE DATUM (for water levels)	TOR=TOC+0.51

COMMENTS Sampling with a single packer for the bottom of the boring
TOR = TOC + 0.51
Bottom of borehole = 120.5 TOC Packer zone = 110-120.5' TOC

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR/R)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER ERT-1
0929	125	62.90	62.90	Inflating packers.							Initial = 52.30 TOC
0935		62.88	62.90								
0940		62.88	62.89								
0945		62.88	62.89								
0950		62.88	62.89								
Installed Grundfos to purge zone (≈15 gallons per purge volume.)											
1005		62.88	62.90	Start purge							
1010		62.89	62.98			2.3					2.3 gallons
1015		62.90	62.99			5					5 gallons
1025		62.92	63.00			10 gallons					ERT-1 52.25 TOC
1033		62.93	63.03			15 gallons		Increased rate			
1041		62.94	63.04			20 gallons		Increased rate			
1044		62.95	63.05			25 gallons					ERT-1 52.25 TOC
Installed bladder pump											
1103	125	62.40	62.90	Start purge							
1120		62.86	62.88	140 ml/m	14.9	0.668	6.8	7.9	231	3.3	
1125		62.39	62.89		13.7	0.687	6.8	5.83	225	—	
1130		62.39	62.88		13.3	0.701	6.7	4.94	216	—	
1135	TOC	62.37	62.86	145 ml/m	13.1	0.716	6.9	4.5	206	—	
1140		62.36	62.87		13.0	0.720	6.9	4.4	200	—	
1145		62.36	62.85		13.0	0.722	6.9	4.4	202	—	
1150		62.36	62.84	135	13.0	0.720	6.9	4.2	202	—	
1155	125	62.82	62.84		13.2	0.719	6.9	4.2	203	2.5	

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

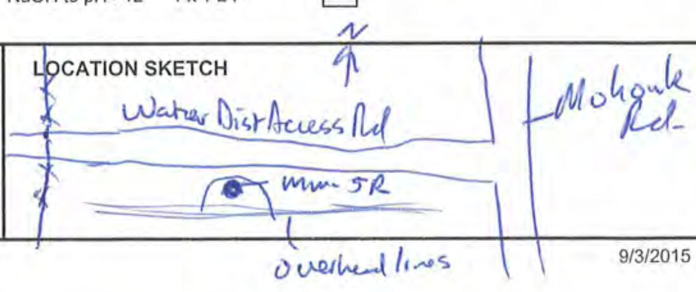
ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	☐
☐ TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES: Bottle time 1205
356023MW05R115 ~~[illegible]~~
356023MW05R115XD
356023MW05R115MS
356023MW05R115MD

SIGNATURE: Jerry [illegible]

LOCATION SKETCH



[illegible] 10/12/15

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING-BOREHOLE ID MW-5R

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/22/15
ACTIVITY	START 1230 END 1630	DRILLER	W. Campbell	GEOLOGIST	J. Rawcliff

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	89-99' TOC	TOP OF BEDROCK	≃ 11' BGS	TOP OF LOWER PACKER	≈99' TOC
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	120.5' TOC	BOTTOM OF UPPER PACKER	89' TOC
CASING STICKUP (above ground surface)	1.2'	INITIAL WATER LEVEL (W.L.)	62.67' TOC	LENGTH OF PACKERS (sealed test zone)	10'
BOTTOM OF CASING	13' TOC	INITIAL W. L. IN ANNULUS	62.67'	REFERENCE DATUM (for water levels)	TOR = TOC + 0.41'

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
1321	120	62.67	62.67	Inflating packers							
1325		62.56	62.63								
1330		62.55	62.62								
1335		62.56	62.64								
	Installed Comm (?) for										
1346	120	~~62.64~~	~~62.76~~	Start purge							
1350		62.64	62.76								4 Gal
1355		62.69	62.80								10 Gall.
1358		62.71	62.82								15 Gal
1402		62.73	62.83								20 Gal
1406		62.76	62.84								25 Gal
	Installing bladder pump.										EWT-1 = 52.10
1422	Start purge with bladder pump										
1428	120	62.67	62.62	190 ml/m	13.8	0.621	7.0	6.8	152	3.2	
1435		62.67	62.64	250	13.2	0.679	6.9	6.3	142	1.3	
1441		62.66	62.63	165	12.73	0.679	6.9	6.0	140	1.3	
1446		62.66	62.63	170	13.07	0.678	6.9	5.96	138	1.1	
1451		62.64	62.62	180	13.05	0.678	6.9	6.09	136	1.2	
1456		62.64	62.62	180	12.96	0.678	6.9	5.82	136	1.2	
1501		62.63	62.62	180	12.8	0.677	6.9	5.81	138	1.3	
1555		62.63	62.62	180	12.76	0.676	6.9	5.77	139	1.04	
1610	Bottle time	356023MW05R095		(3x40ml / HCl)			VOC				

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

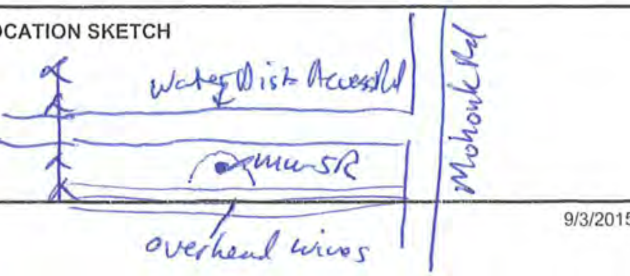
ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	☐
☐ TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES:

SIGNATURE:

LOCATION SKETCH

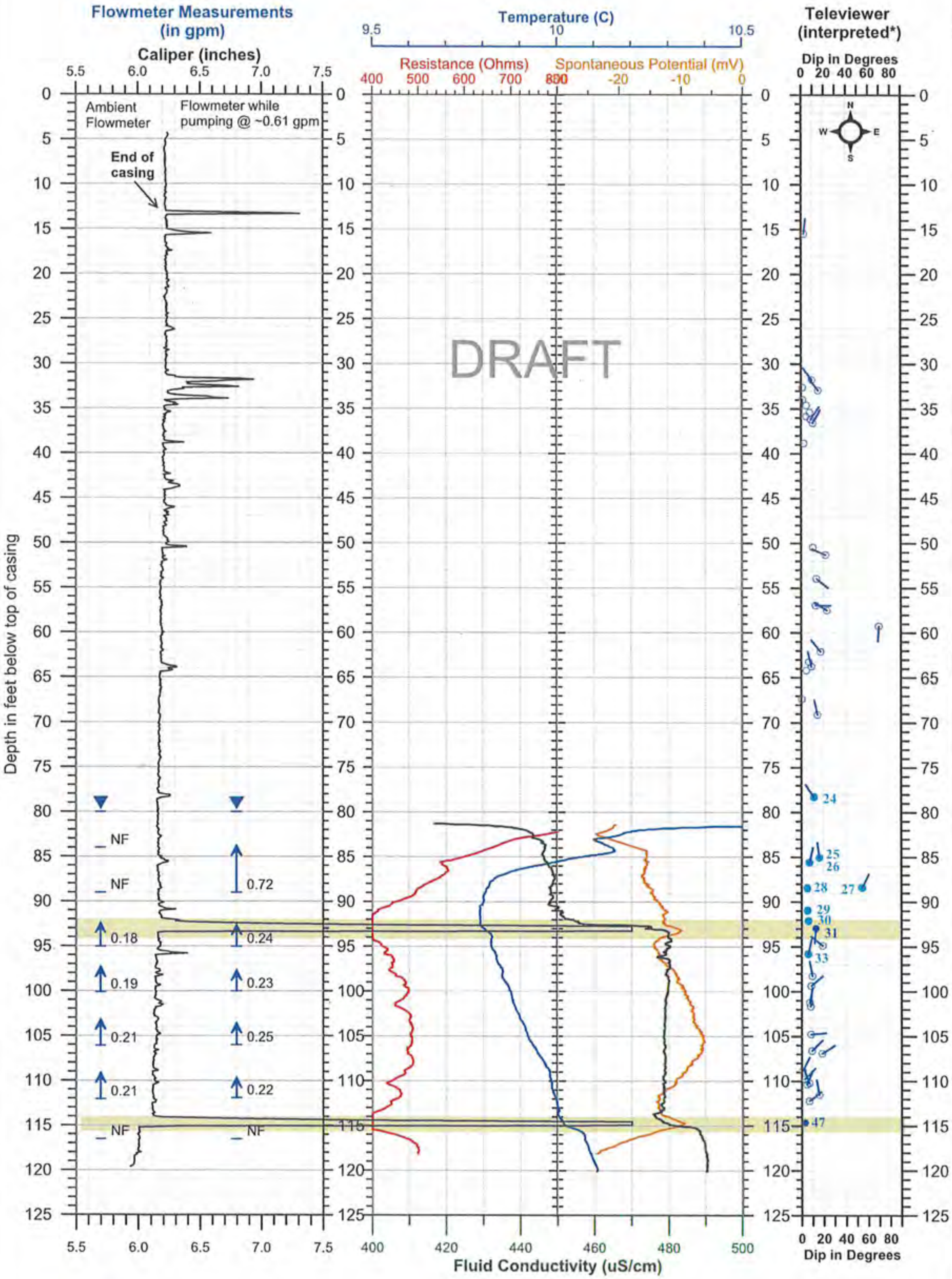


10/12/15

Northeast Geophysical Services

MW-5R
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/08/15



= Likely transmissive zone

= possible transmissive zone

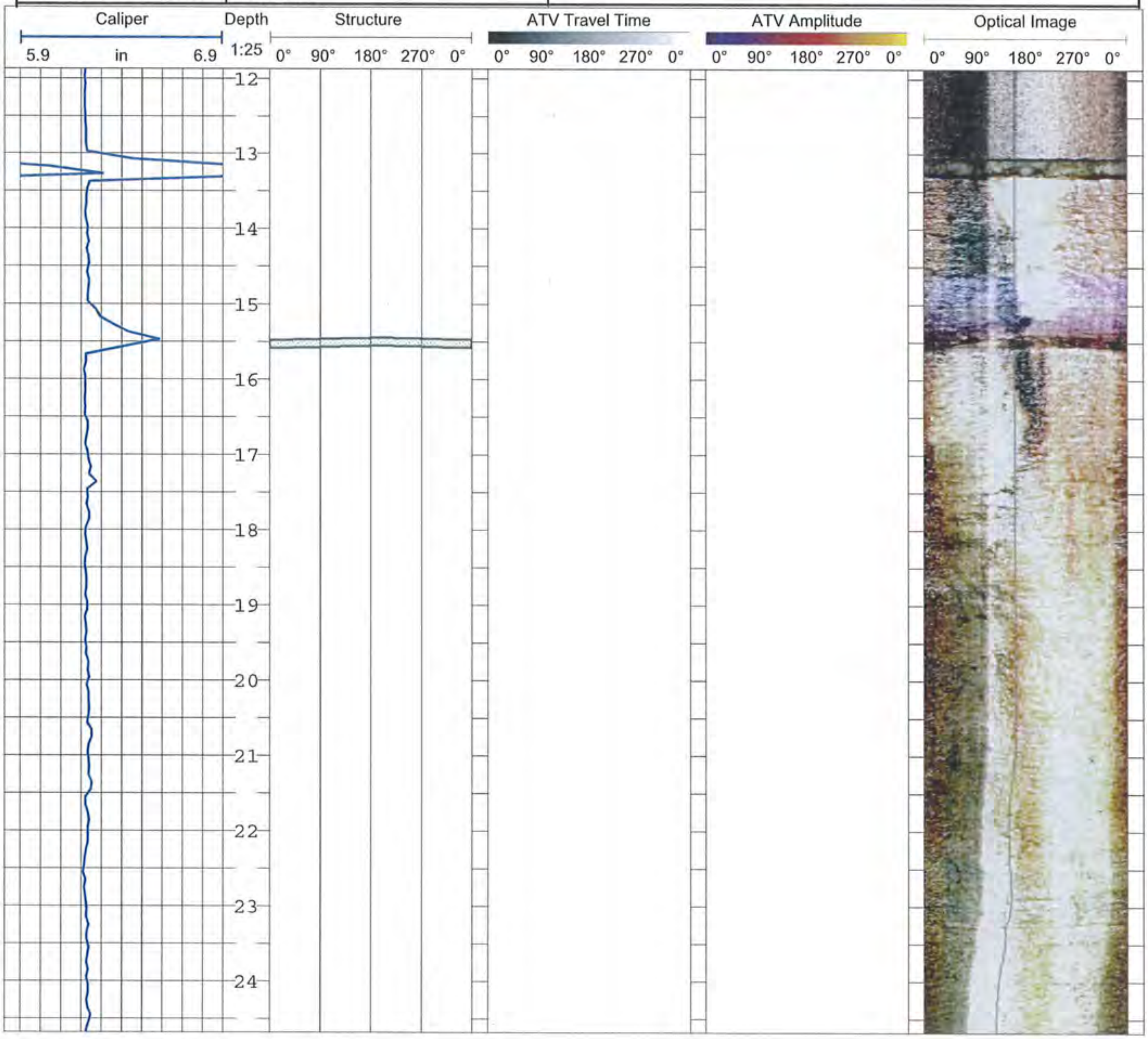
PLATE A-1
Borehole Geophysical Log
MW-5R
Mohonk Road Industrial Plant Site
High Falls, NY

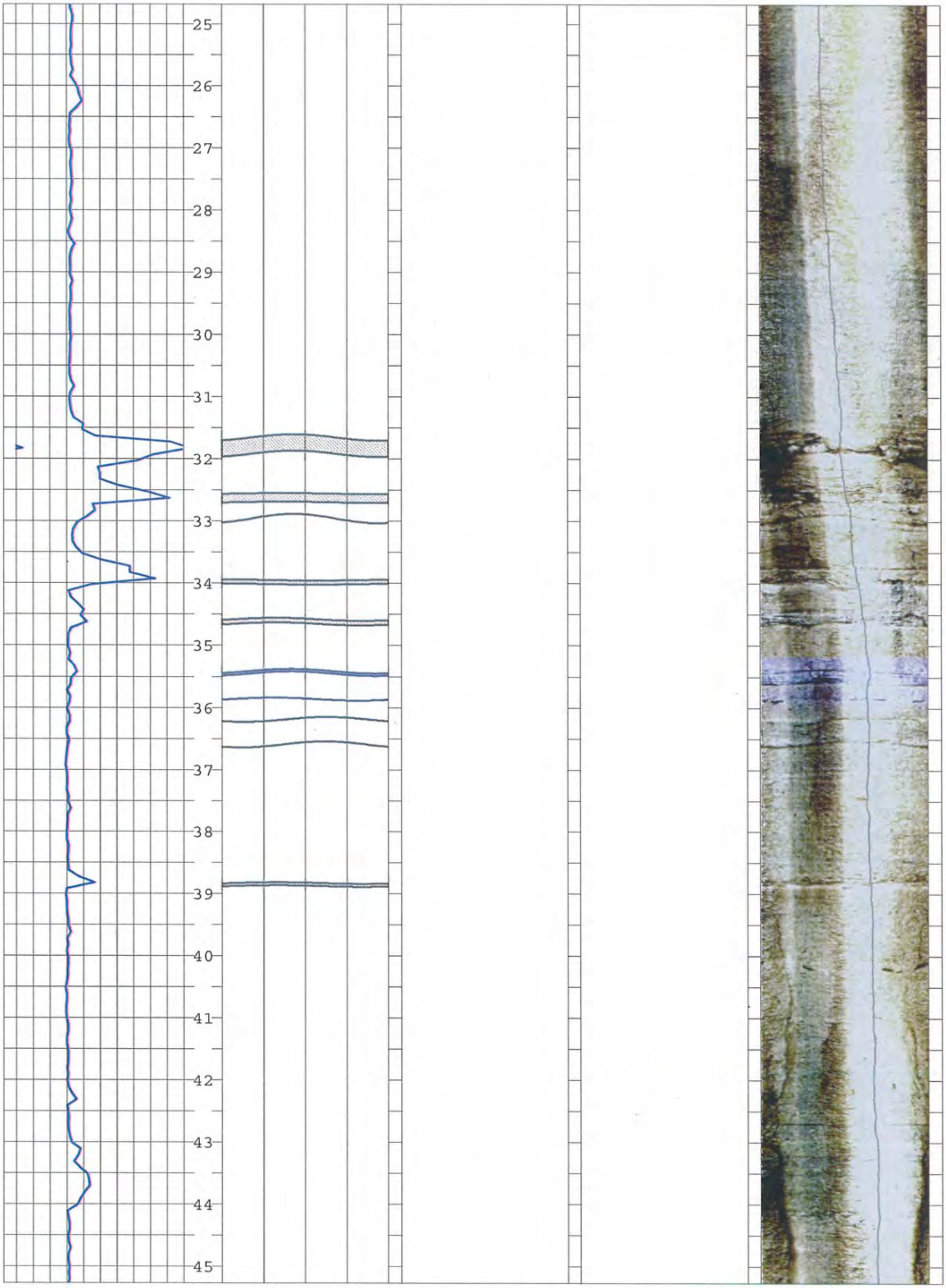
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

Date logged: 9/08/15

Northeast
Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log:	Plate A-4 Televiewer & Caliper Logs		
Well:	**MW-5R**		
Site:	Mohonk Industrial Road Plant		
Date:	9/08/2015	**Location:**	High Falls, NY
Casing Depth:	13 ft	**For:**	AMEC Foster Wheeler
Casing Type:	6 in	**Logged by:**	R. Rawcliffe
Boring Depth:	120.5 ft	**Orientation:**	magnetic
Meas. From:	top of casing	**Structure Plots:**	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	1.22 ft		
Water Level:	81.52		

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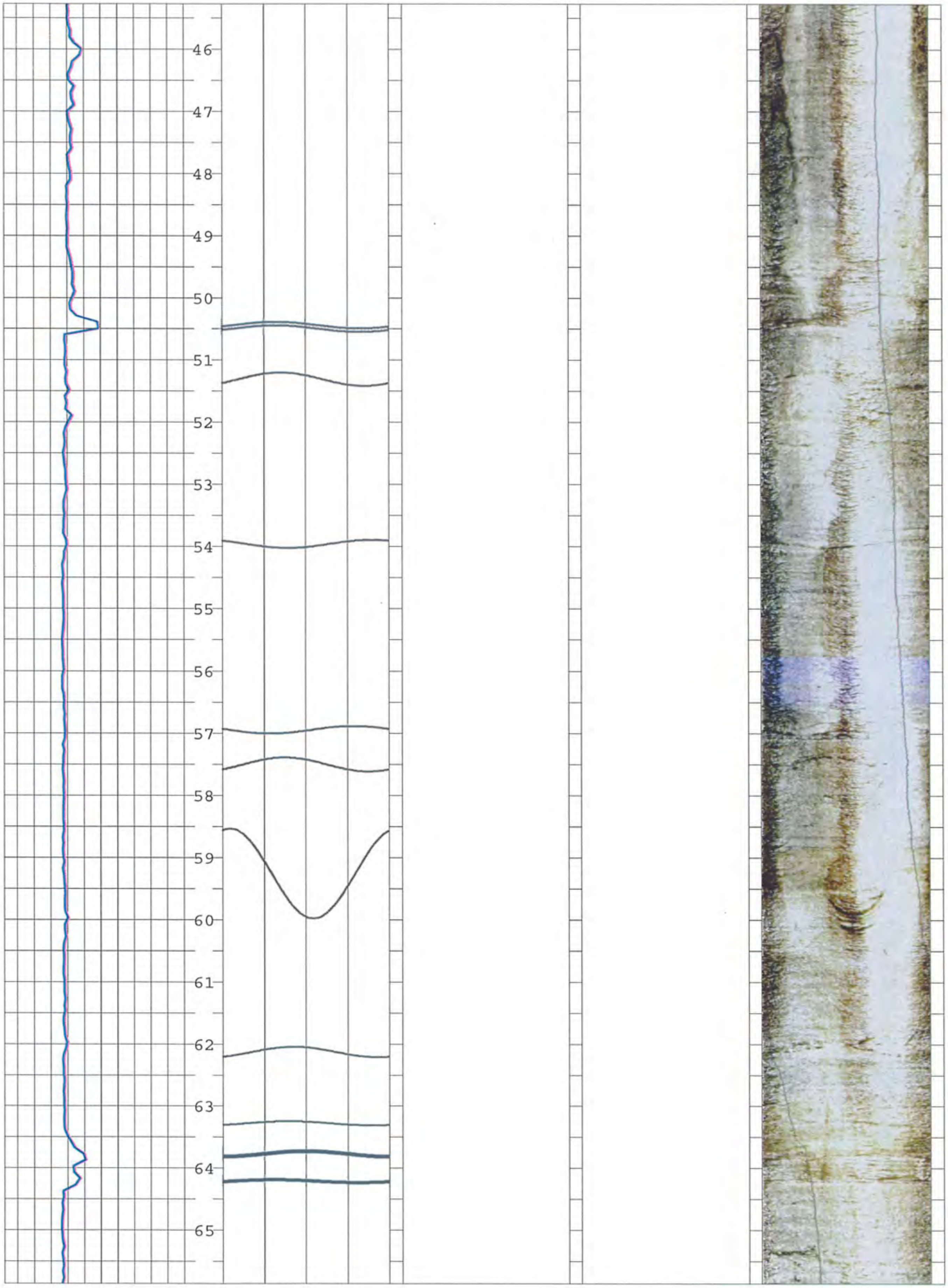
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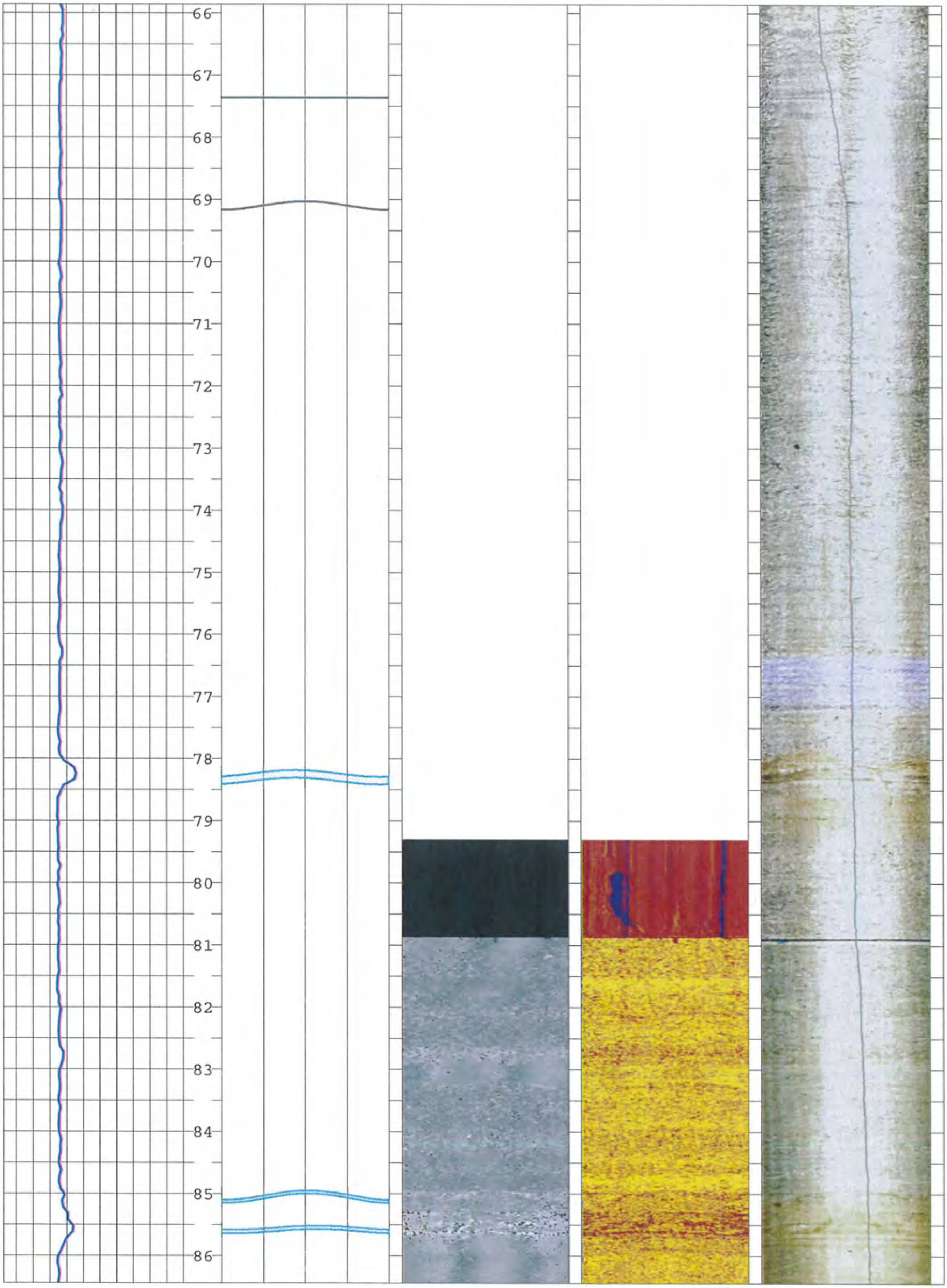
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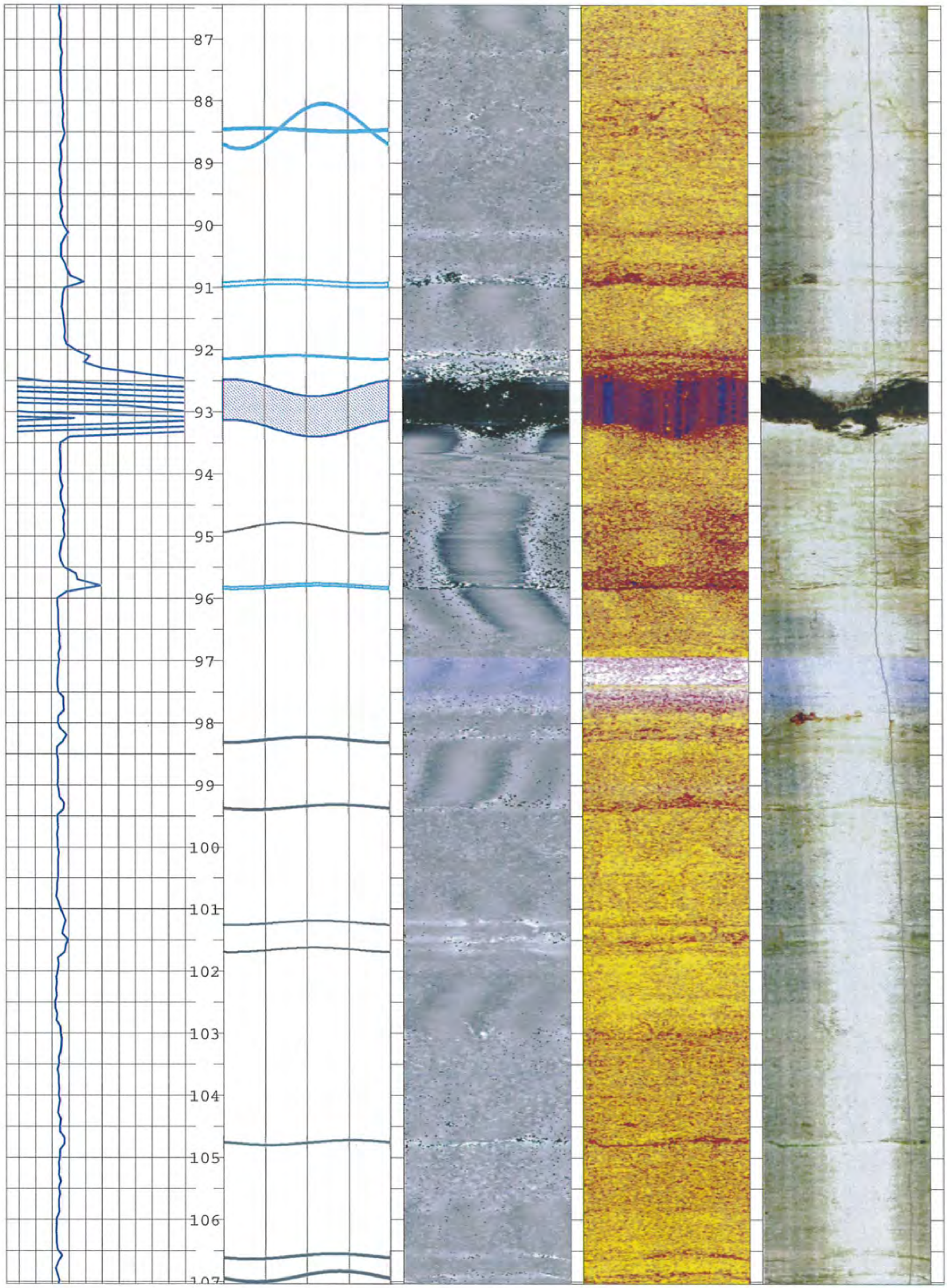
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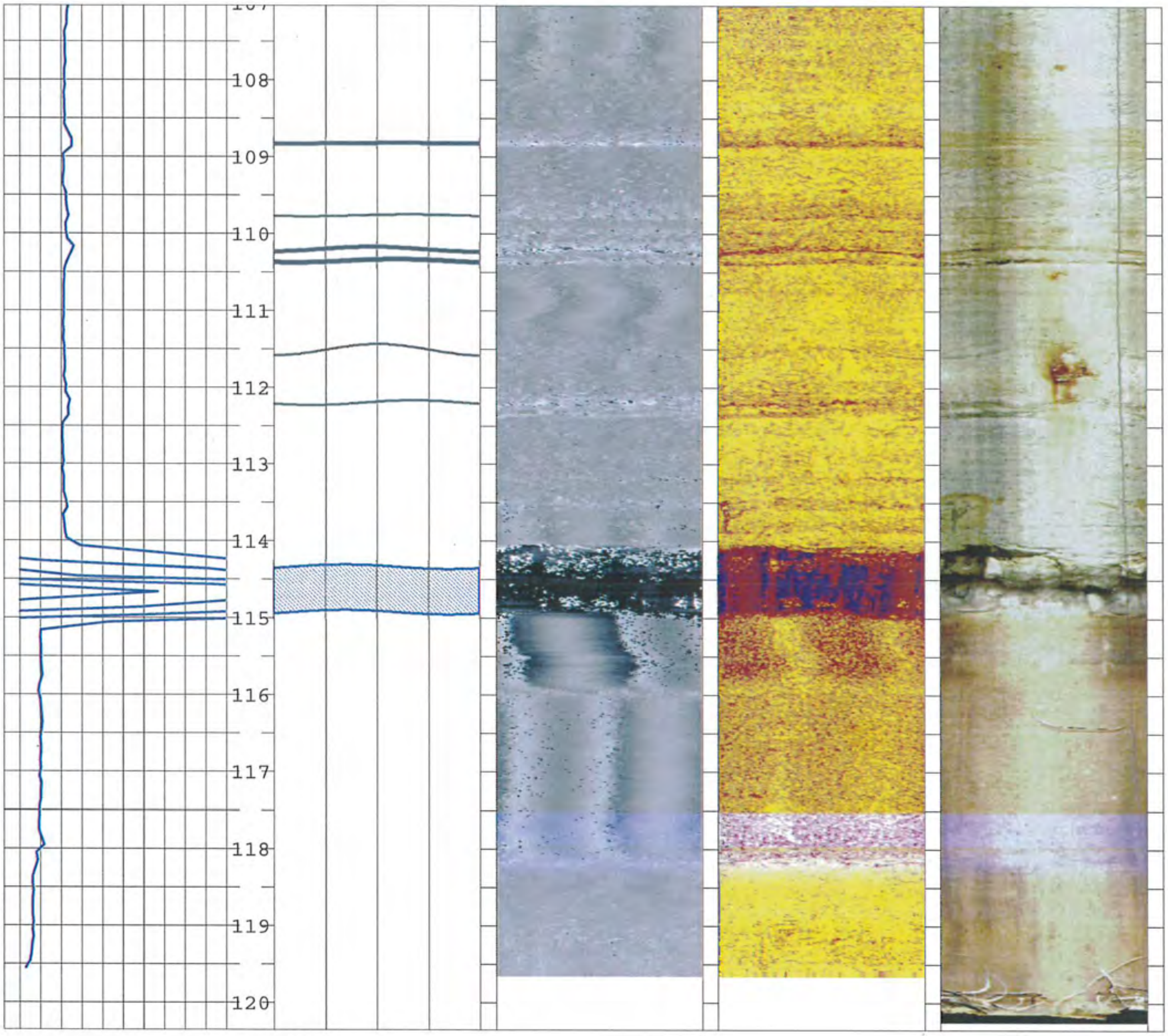
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Page 1 of 1

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID MW-7R

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	09/24/15
ACTIVITY	START 0800 END 1220	DRILLER	WAYNE CAMPBELL	GEOLOGIST	J. DESJARLAIS

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	164-174' TOC	TOP OF BEDROCK	≈ 27' TOC	TOP OF LOWER PACKER	174'
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	180.3' TOC	BOTTOM OF UPPER PACKER	164'
CASING STICKUP (above ground surface)	2.7'	INITIAL WATER LEVEL (W.L.)	61.21'	LENGTH OF PACKERS (sealed test zone)	
BOTTOM OF CASING	30' TOC	INITIAL W. L. IN ANNULUS	—	REFERENCE DATUM (for water levels)	TOR = TOC + 0.42

COMMENTS START PURGE W/ GRUNDFOS @ 1031 / SET BLADDER PUMP @ 11:13, W/ INTAKE @ 170'. START BLADDER 40 PSI 10/10 IN/OUT. OBTAIN SAMPLE @ 12:12 AFTER ~10 LITERS LOW-FLOW PURGE SAMPLE [356023MW07R170]. DEFLATE PACKER @ 12:19

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
0946	—	61.49	61.47	Inflate packers							
0955	160	61.48	61.19								
1000	160	61.53	61.54								
1012	160	61.54	61.54								
1031	160	61.63	62.54	220 HZ	Start Grundfos						BEGIN PURGE
1036	160	61.70	62.65	1 gal/min							5 gall
1041	160	61.74	62.73	1 gal/min							10 gall
1046	160	61.80	62.79	1 gal/min							15 gal
1051	160	61.80	62.78	1 g/min							20 gal
1057	160		61.78								
11:13	160		61.62	Remove Grundfos							
11:19	160	61.60	61.58	Start bladder pump							
1131	160	61.58	61.62	170 ml	13.63	0.606	7.12	8.78	241	94.7	
1136	160	61.58	61.62	180 ml	12.81	0.610	7.06	8.28	230	4.19	
1141	160	61.57	61.60	190 ml	12.53	0.597	7.0	5.41	214	1.76	
1146	160	61.57	61.60	200 mL	12.41	0.592	6.97	4.75	206	1.64	
1151	160	61.56	61.60	210 mL	12.32	0.590	6.98	4.50	190	1.59	
1156	160	61.56	61.60	210 ml	12.20	0.590	6.98	4.36	160	1.80	
1201	160	61.54	61.62	220 mL	12.21	0.590	6.99	4.28	147	1.91	
1206	160	←	—	220 mL	12.20	0.590	6.99	4.3	144	1.69	~10 liters
1219	0										

EQUIPMENT DOCUMENTATION

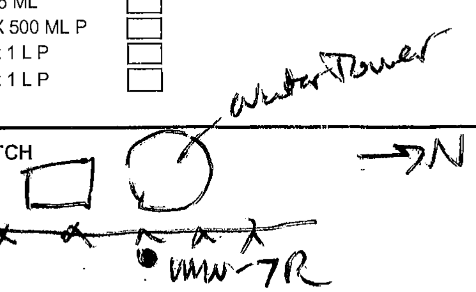
TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒ @12:12 9/24/15
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	☐
☐ TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES:

LOCATION SKETCH



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10/12/15

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID MW-7R

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/24/15
ACTIVITY	START 1220 END 1440	DRILLER	Wayne Campbell	GEOLOGIST	J Rudolph

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	137-147' TOC	TOP OF BEDROCK	≈ 27' TOC	TOP OF LOWER PACKER	147'
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	180.3' TOC	BOTTOM OF UPPER PACKER	137'
CASING STICKUP (above ground surface)	2.7	INITIAL WATER LEVEL (W.L.)	61.21	LENGTH OF PACKERS (sealed test zone)	10'
BOTTOM OF CASING	30' TOC	INITIAL W. L. IN ANNULUS	—	REFERENCE DATUM (for water levels)	TOR = TOC + 0.46

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
1232	155	61.71	61.71	Inflating packers							
1233		61.52	61.52								
1242		61.53	61.62								
1249		61.53	61.60								
1253		61.53	61.60								
1300		61.51	61.58	Installed [illegible]							
1302	155	61.55	62.48	Start purge							
1306		61.70	62.76								5 gal.
1309		61.78	62.87								10 gal
1313		61.83	62.92					PID on pump outlet = 0.3 ppm			15 gal
1316		61.87	62.97								20 gal
1319		61.86	63.98								25 gal
1339	155	61.58	61.65	Install Bladder pump + start purge							
1348		61.56	61.62	150	15.6	0.553	7.2	7.3	216	3.8	
1355		61.54	61.62	150	13.6	0.603	7.1	8.5	212	4.4	
1400		61.53	61.61	150	13.2	0.611	7.1	8.9	206	2.8	
1410		61.51	61.60	155	13.0	0.613	7.1	8.7	177	3.2	
1415		61.52	61.59	155	13.0	0.613	7.1	8.4	171	2.8	
1420		61.51	61.58	165	12.9	0.613	7.1	8.3	169	2.3	
1425		61.50	61.58	155	12.9	0.612	7.1	8.4	167	2.2	
1430		61.49	61.57	150	12.9	0.613	7.1	8.2	161	1.7	
1435	Bottle time 356023MW07R138										

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

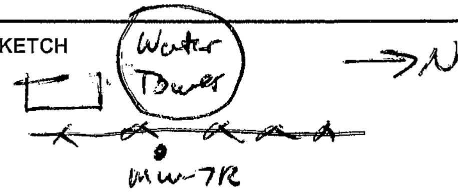
ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	☐
☐ TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES:

SIGNATURE: [signature] 10/12/15

LOCATION SKETCH



FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID MW-7R

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/24/15
ACTIVITY	START 1545 END 1745	DRILLER	Wayne Campbell	GEOLOGIST	ID/JR

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	92.5 - 102.5' TOC	TOP OF BEDROCK	≈27' TOC	TOP OF LOWER PACKER	102.5
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	180.3' TOC	BOTTOM OF UPPER PACKER	92.5
CASING STICKUP (above ground surface)	2.7'	INITIAL WATER LEVEL (W.L.)	61.21'	LENGTH OF PACKERS (sealed test zone)	10'
BOTTOM OF CASING	30' TOC	INITIAL W. L. IN ANNULUS	—	REFERENCE DATUM (for water levels)	TOR = TOC + 0.01

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
1555	125	60.97	61.01	Inflating packers							
1600	↓	60.83	60.79								
1605		60.81	60.80								
1610		60.78	60.78								
1612		60.78	60.78	Start purge with Grundfos							
1614	125	61.45	67.45								5 Gallons
1617		62.07	68.40								10 Gal
1620		62.46	68.83								15 Gal
1623		62.81	69.20								20 Gal
1626		63.03	69.39								
1636		62.04	61.95	Installed Bladder Pump							
1639		61.78	61.83								BEGIN PURGE
1654		61.30	61.36	100 ml	15.22	0.604	7.15	8.25	173	8.35	
1659		61.23	61.32	140 ml	13.81	0.612	7.08	8.88	143	8.68	
1704		61.19	61.24	150 ml	13.28	0.612	7.06	8.37	143	8.50	
1709		61.13	61.17	150 mL	13.00	0.613	7.08	7.90	142	8.88	
1714		61.08	61.14	150 mL	12.84	0.613	7.09	7.64	141	8.48	
1719		61.05	61.11	150 mL	12.61	0.612	7.09	7.60	141	8.22	
1724		61.02	61.08	150 mL	12.65	0.609	7.10	~~7.47~~ 7.41	144	7.87	
1730		61.00	61.07	150 mL	12.63	0.607	7.10	7.54	145	8.08	
1742			60.96								DEFLATE
1736	Bottle time 356023MW07R095										

EQUIPMENT DOCUMENTATION

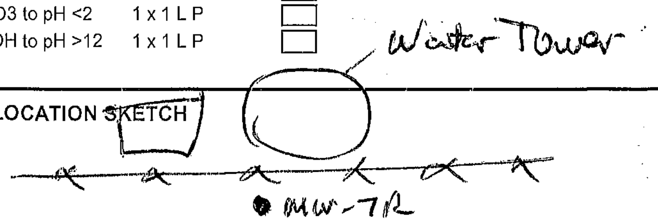
TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
☐	☐ HIGH DENSITY POLY	☒ STAINLESS STEEL	☒ TEFLON
☒ QED BLADDER	☒ OTHER LDPE	☐ OTHER	☐ OTHER

ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	☒ 1736
☐ AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	☐
☐ NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	☐
☐ TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	☐
☐ CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	☐

NOTES:

LOCATION SKETCH



SIGNATURE: Jerry Pauly

10/12/15

ede

FIELD DATA RECORD - BEDROCK PACKER TESTING AND LOW FLOW GROUNDWATER SAMPLING BOREHOLE ID MW-7R

PROJECT	Mohonk Road Industrial	CLIENT	NYSDEC	JOB NUMBER	3617157346
SITE ID	356023	CONTRACTOR	NGS	DATE	9/24/15
ACTIVITY	START 9/24/15 1745 END 9/25/15 0930	DRILLER	Wayne Campbell	GEOLOGIST	J Rawcliff

DEPTHS (All measurements to ~~ground surface~~ TOC in feet)

TARGET TEST INTERVAL	73-83' TOC	TOP OF BEDROCK	≈27' TOC	TOP OF LOWER PACKER	83' TOC
BOREHOLE DIAMETER	6"	BOTTOM OF BORING	180.3' TOC	BOTTOM OF UPPER PACKER	73' TOC
CASING STICKUP (above ground surface)	2.7'	INITIAL WATER LEVEL (W.L.)	61.21'	LENGTH OF PACKERS (sealed test zone)	10
BOTTOM OF CASING	30' TOC	INITIAL W. L. IN ANNULUS	—	REFERENCE DATUM (for water levels)	TOR = TOC + 0.43

COMMENTS

TIME	PACKER PRESSURE (PSI)	WATER LEVEL IN ANNULUS (ft TOR)	WATER LEVEL IN RISER (ft TOR)	PUMPING RATE (gals/min)	TEMP. (°C)	SPECIFIC COND. (mS/cm)	pH (units)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTU)	OTHER
1754	110	~~60.84~~	61.38	Inflating packers							
1800		61.33	61.32								
1805		61.29 61.28	61.32								
1812		61.27	61.31								
1817		61.27	61.25	Install Grundfos							
1818		61.27	61.28	Start purge							
1821		61.29	63.09								5 Gal
1824		61.37	63.59								10 Gal
1827		61.43	63.92								15 Gal
1831		61.49	64.14								20 Gal
1834		61.54	64.35								25 Gal
0759	110	60.77	60.92	9/25/15							
0808		60.77	60.91	Installed bladder pump and start purge							
0814		60.78	61.01	235	11.6	0.597	7.0	8.8	108	5.9	
0820		60.78	61.02	250	11.3	0.601	7.1	8.4	85	9.1	
0830		60.79	61.04	250	11.2	0.602	7.1	8.3	83	8.5	
0835		60.80	61.03	255	11.1	0.603	7.2	8.2	83	7.5	
0840		60.80	61.03	250	11.1	0.604	7.2	8.1	84	7.2	
0845		60.81	61.03	250	11.2	0.604	7.2	8.2	84	6.6	
0850		60.81	61.03	250	11.2	0.604	7.2	8.1	85	6.0	
0850	Bottle time	356023	MW07R080								

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	TYPE OF TUBING	TYPE OF PUMP MATERIAL	TYPE OF BLADDER MATERIAL
[ ]	[X] ~~HIGH DENSITY~~ POLY	[X] STAINLESS STEEL	[X] TEFLON
[X] QED BLADDER	[X] OTHER LDPE	[ ] OTHER	[ ] OTHER

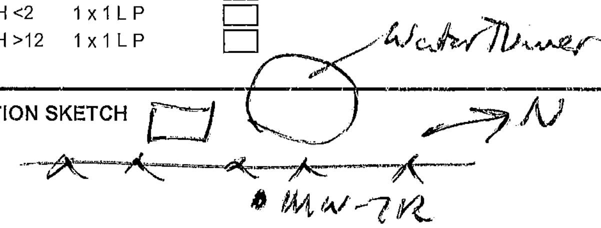
ANALYTICAL PARAMETERS

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[X] VOC	USEPA-8260	HCL / 4 DEG. C	3 X 40 ML	[X]
[ ] AMMONIA(nitrogen)	USEPA 350.1	H2SO4/4 DEG. C	125 ML	[ ]
[ ] NITRITE/NITRATE	USEPA-353.2	4 DEG. C	1 X 500 ML P	[ ]
[ ] TAL METALS	USEPA 6000/7000	HNO3 to pH <2	1 x 1 L P	[ ]
[ ] CYANIDE	USEPA 335.2	NaOH to pH >12	1 x 1 L P	[ ]

NOTES:

SIGNATURE: [signature] 10/12/15

LOCATION SKETCH

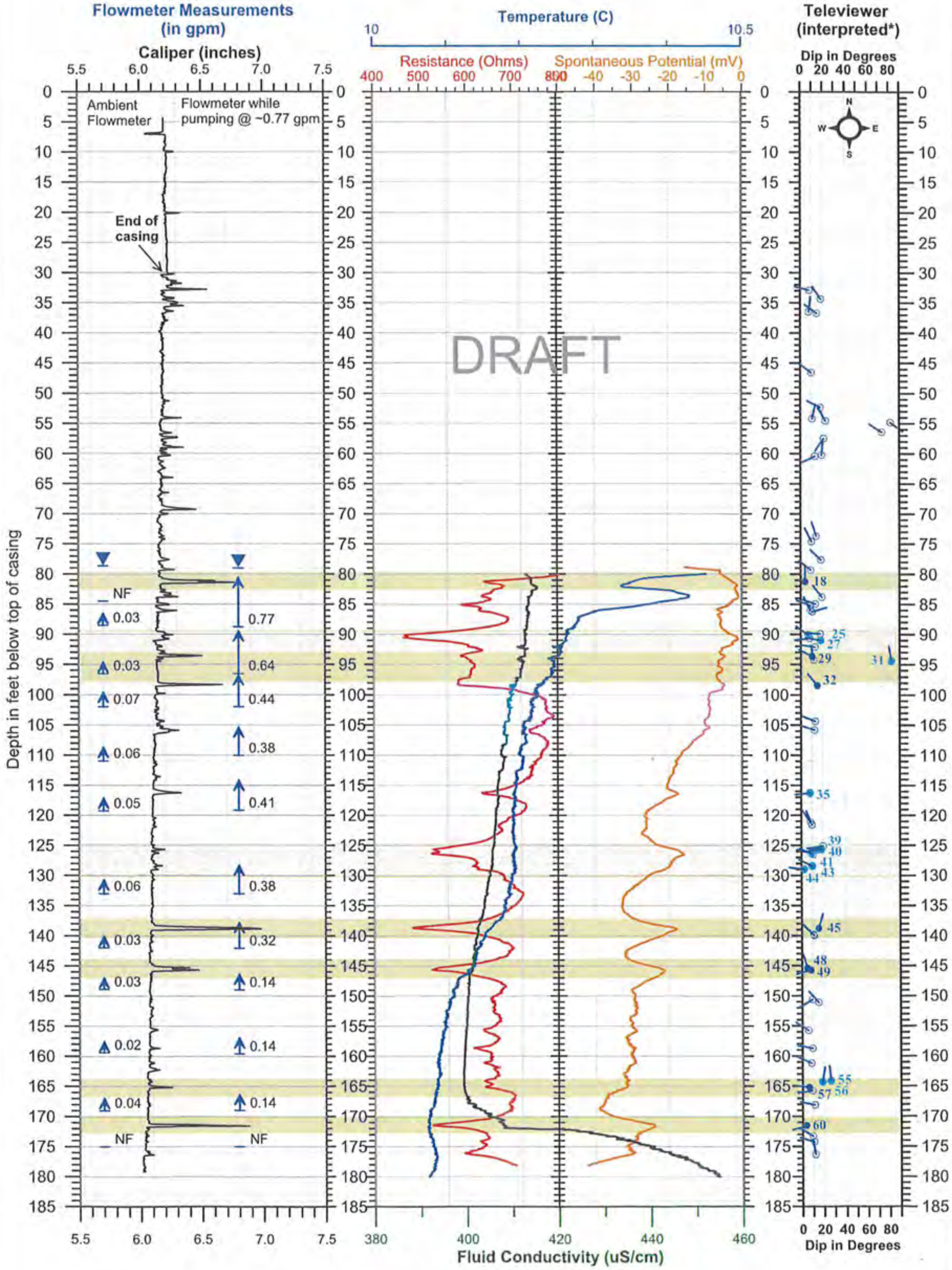


0848 61.21' TOC

Northeast Geophysical Services

MW-7R
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/10/15



= Likely transmissive zone

= possible transmissive zone

PLATE C-1
Borehole Geophysical Log
MW-7R
Mohonk Road Industrial Plant Site
High Falls, NY

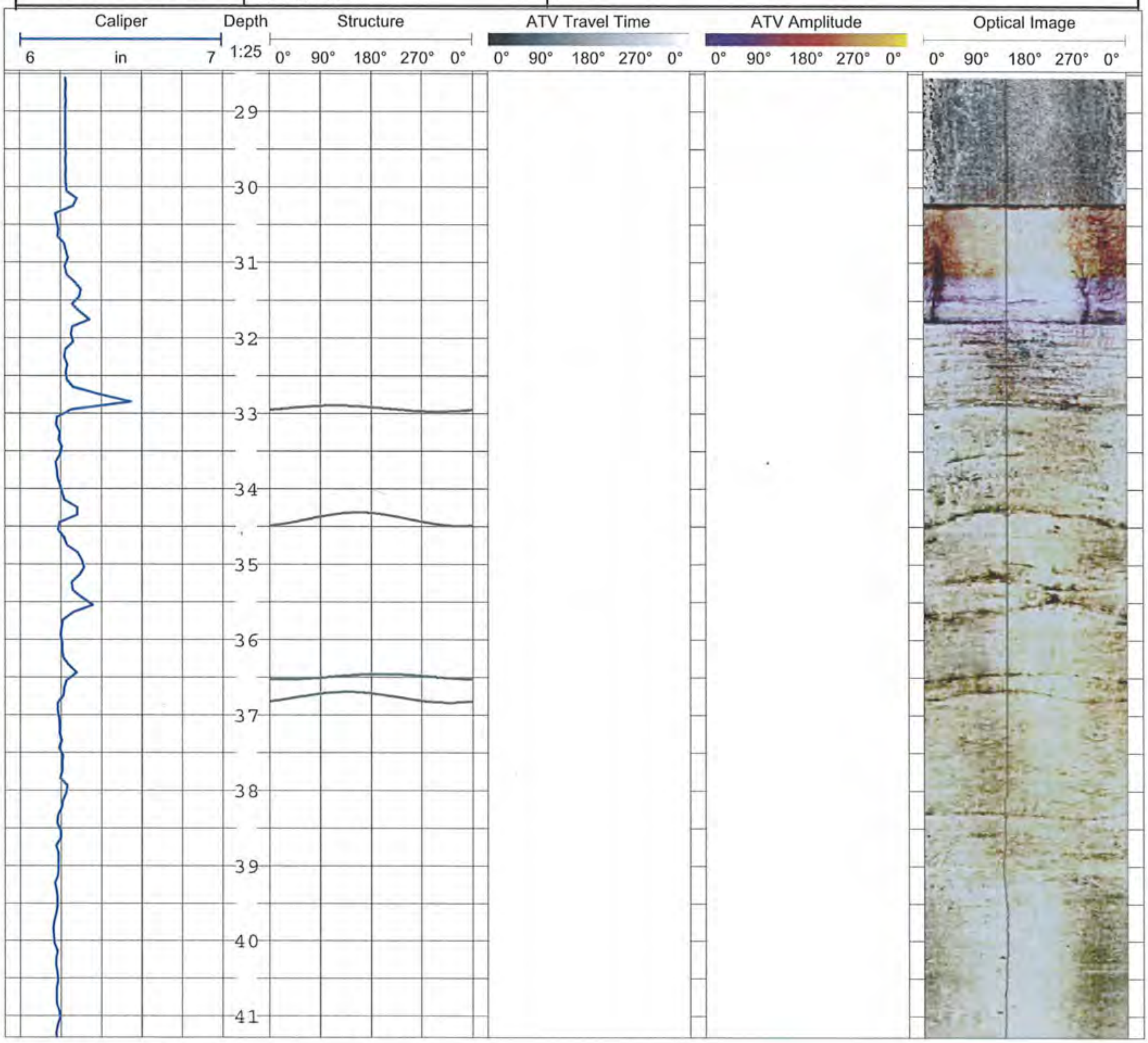
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

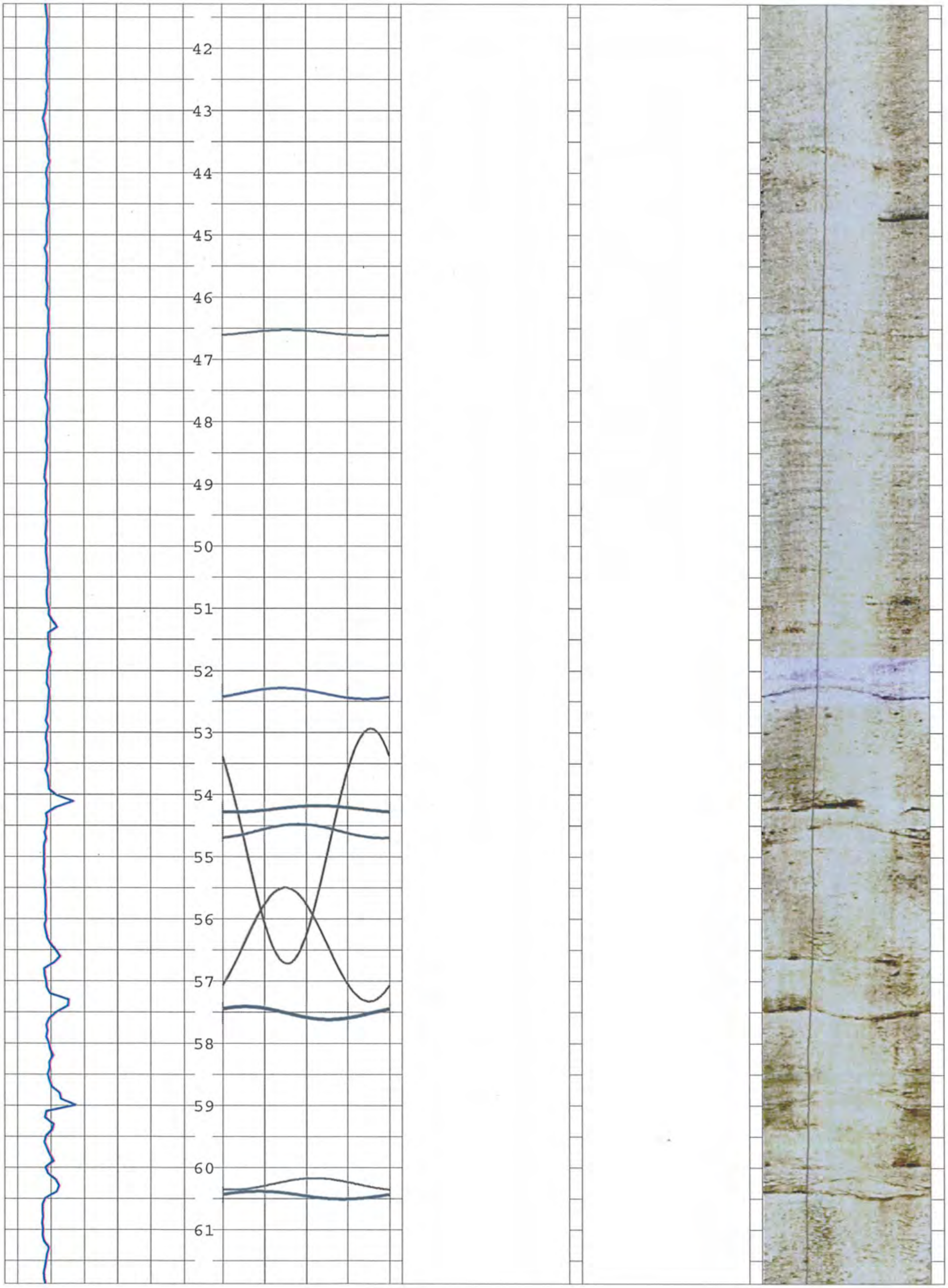
Date logged: 9/10/15

Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log:	Plate C-4 Televiewer & Caliper Logs
Well:	MW-7R
Site:	Mohonk Road Industrial Plant
Date:	9/10/2015
Location:	High Falls, NY
Casing Depth:	30 ft
For:	AMEC Foster Wheeler
Casing Type:	6 in
Logged by:	R. Rawcliffe
Boring Depth:	180.3 ft
Orientation:	magnetic
Meas. From:	top of casing
Stickup:	2.61 ft
Water Level:	78.8 ft

Structure Plots:
black = planar features (faults, foliation, bedding, joints, etc)
light blue = possibly transmissive fracture
dark blue = likely transmissive fracture

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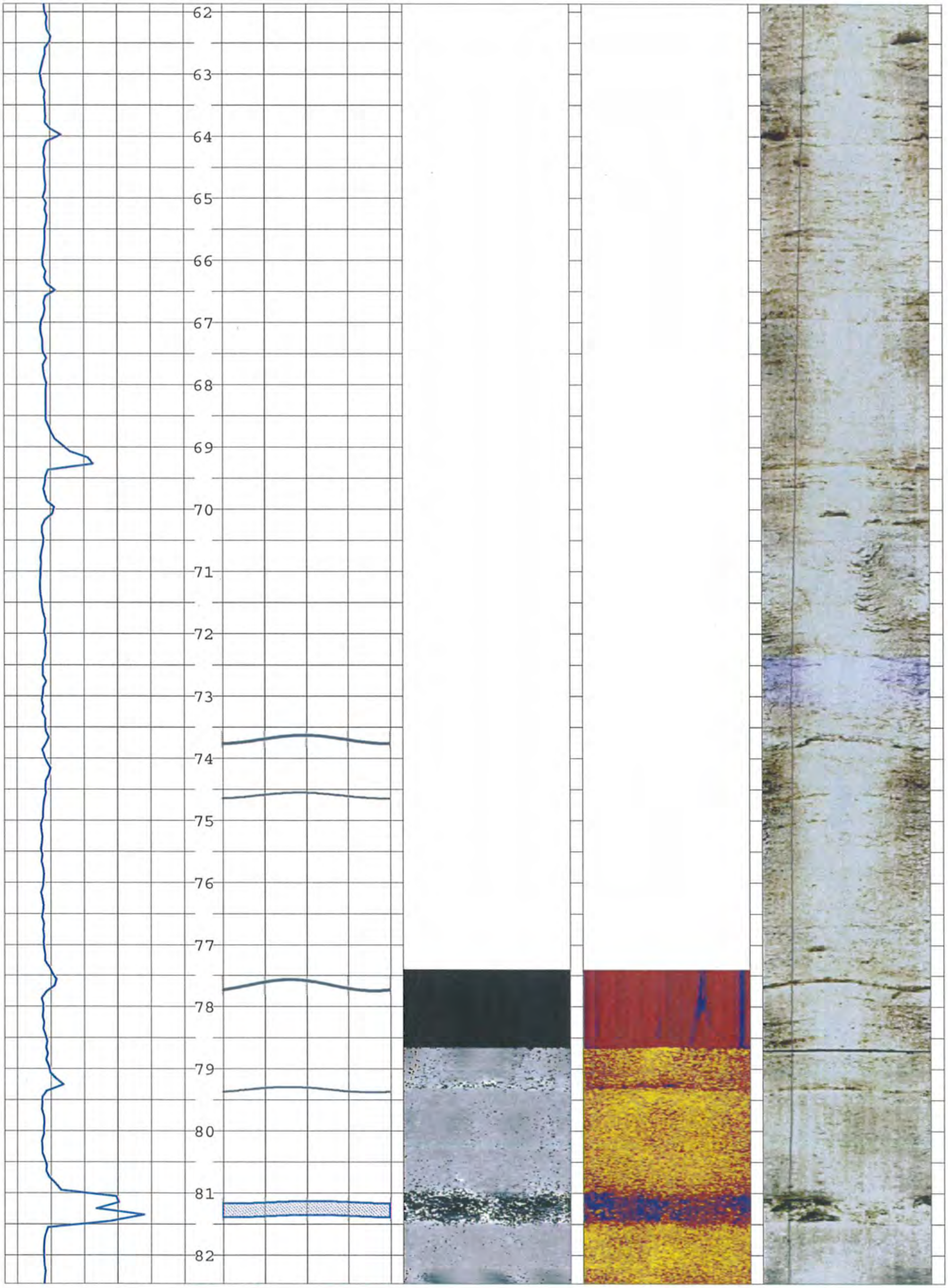
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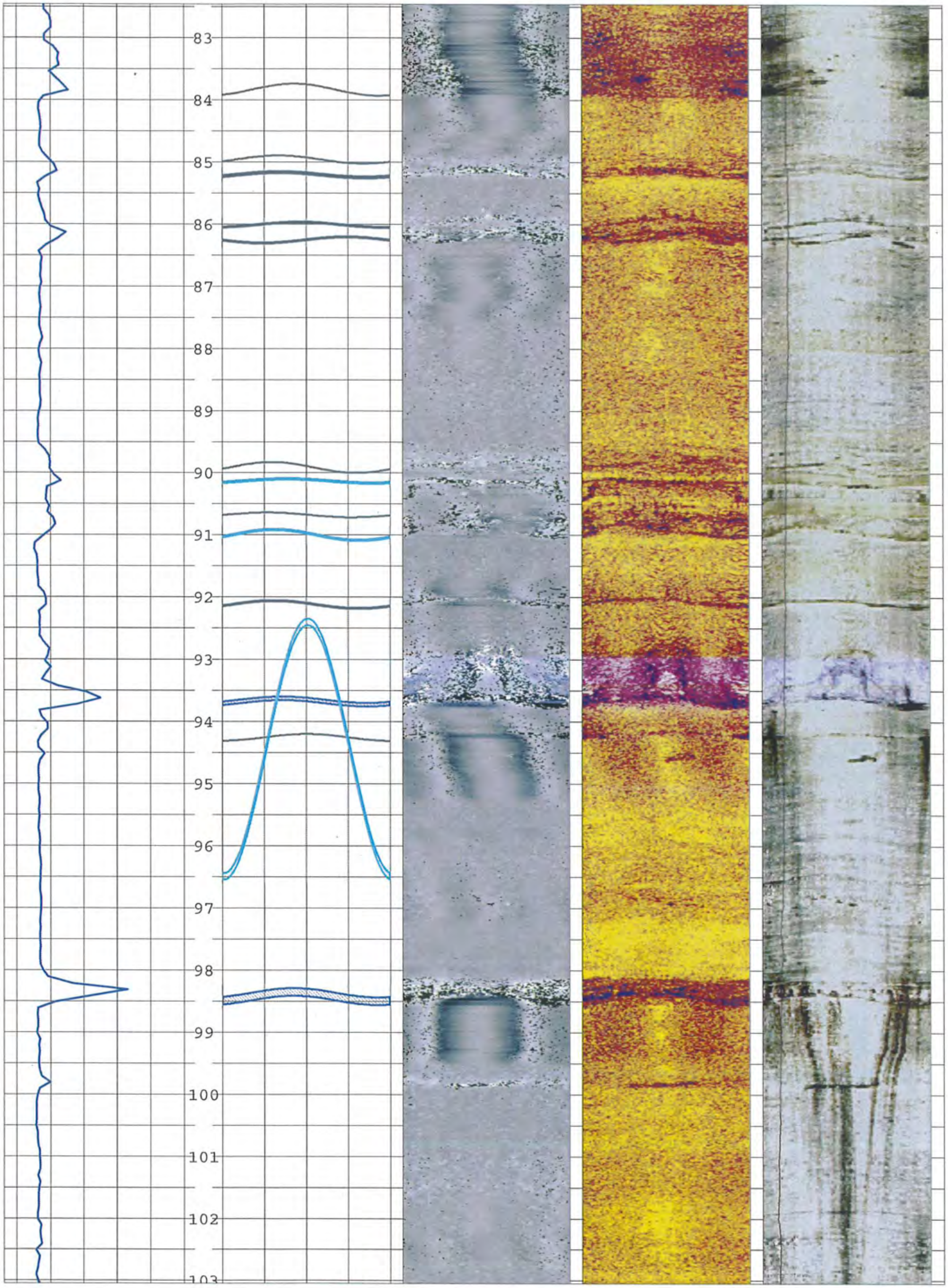

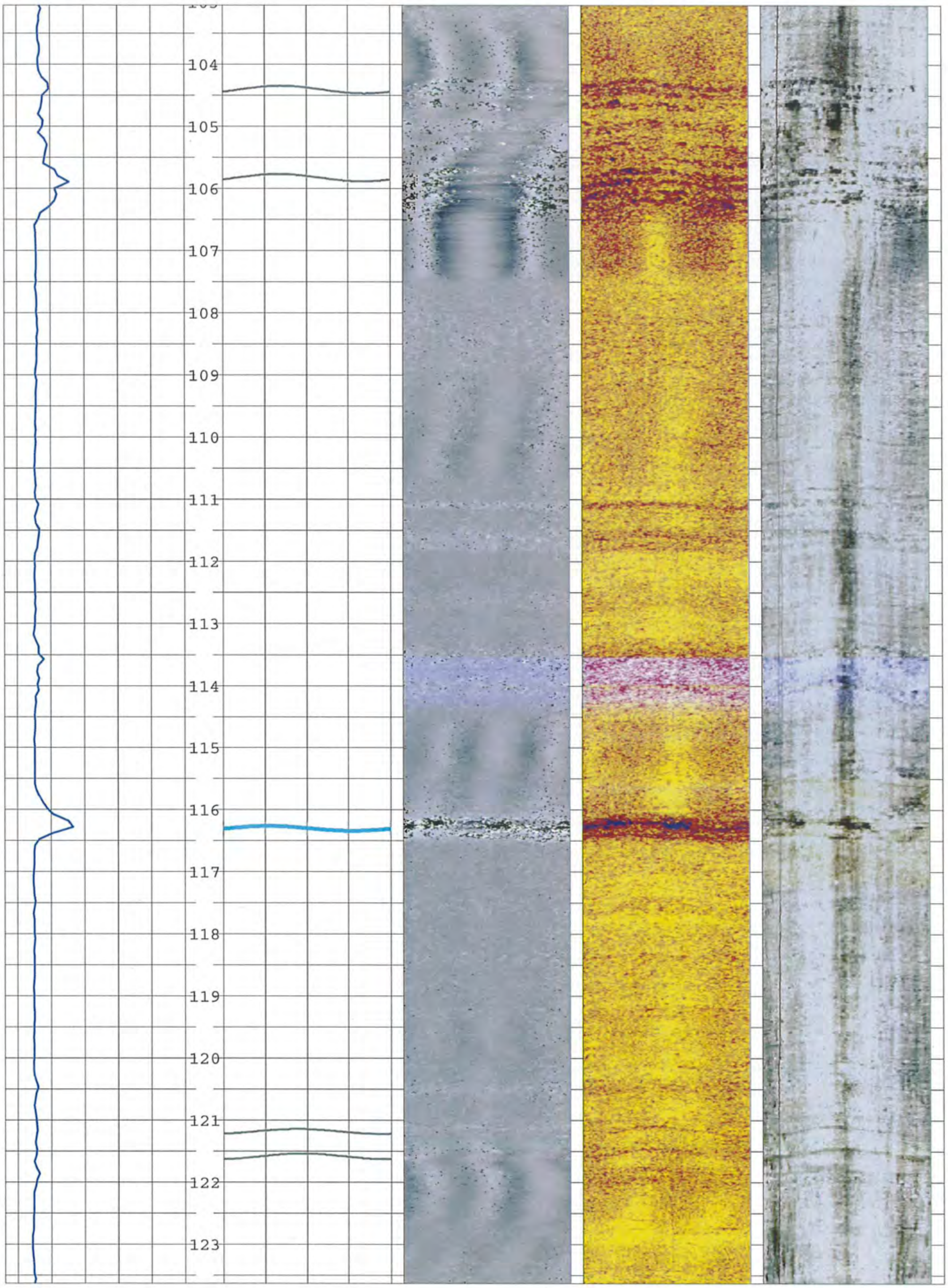
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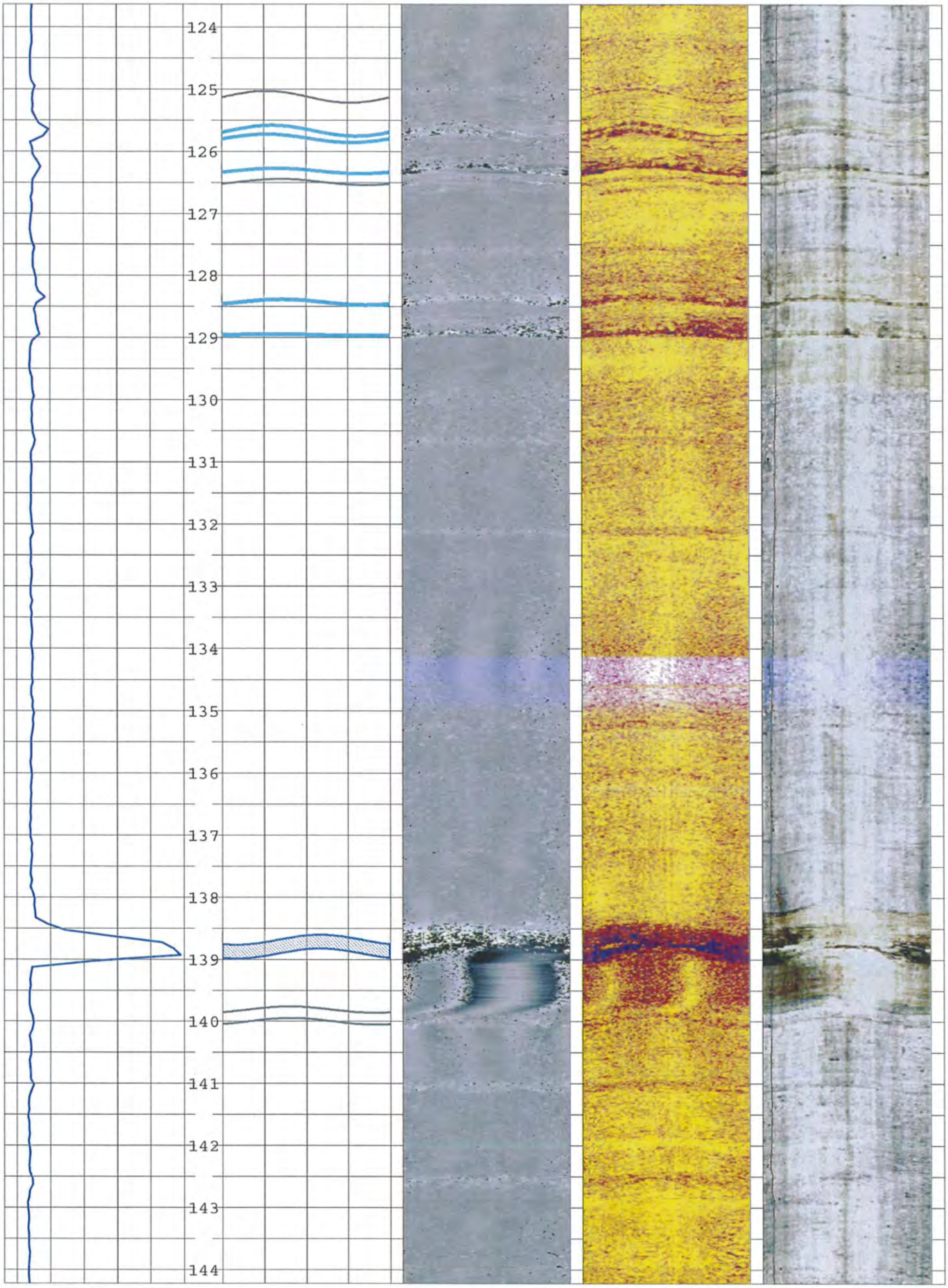

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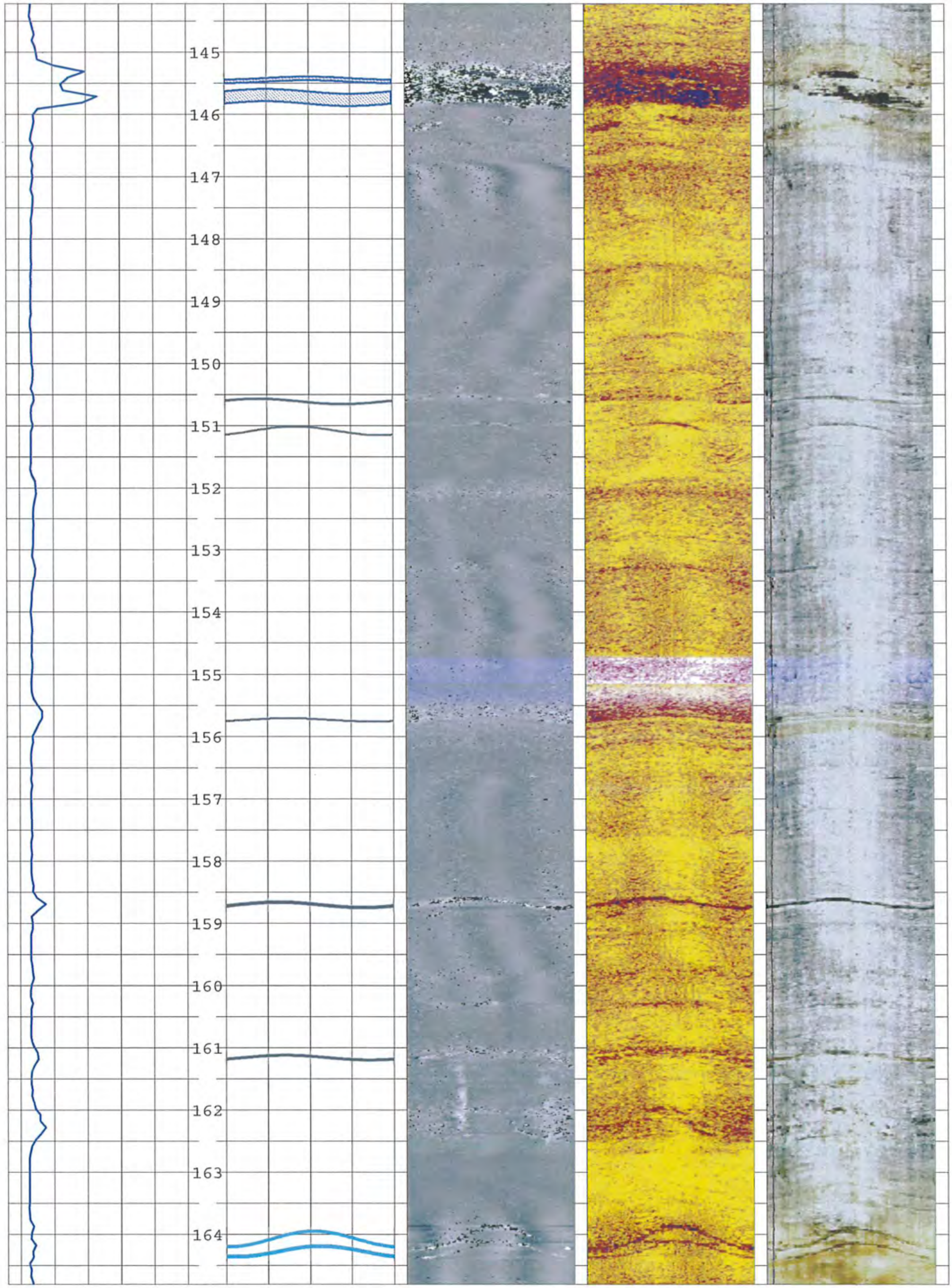

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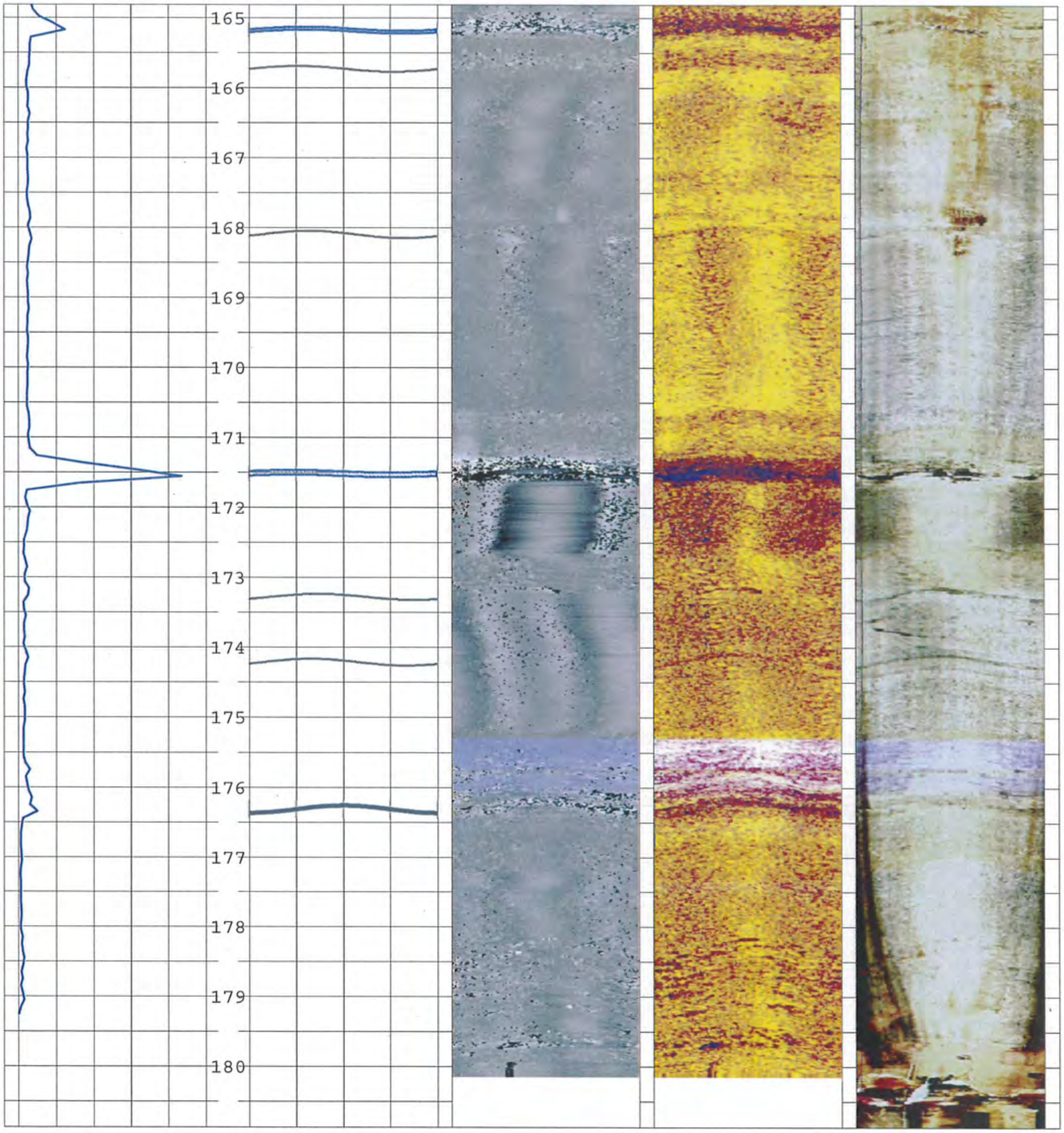

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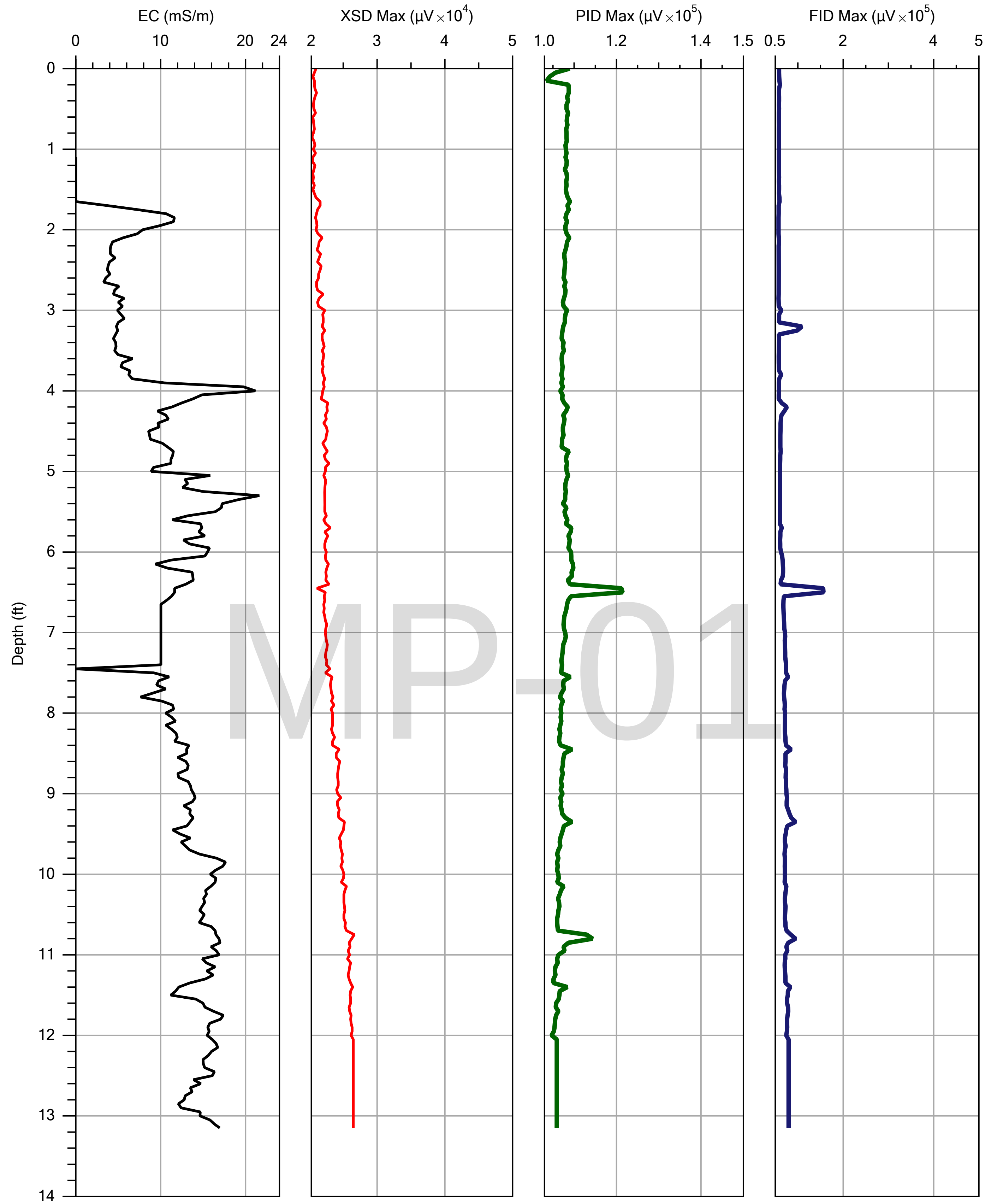
APPENDIX D

MEMBRANE INTERFACE PROBE LOGS



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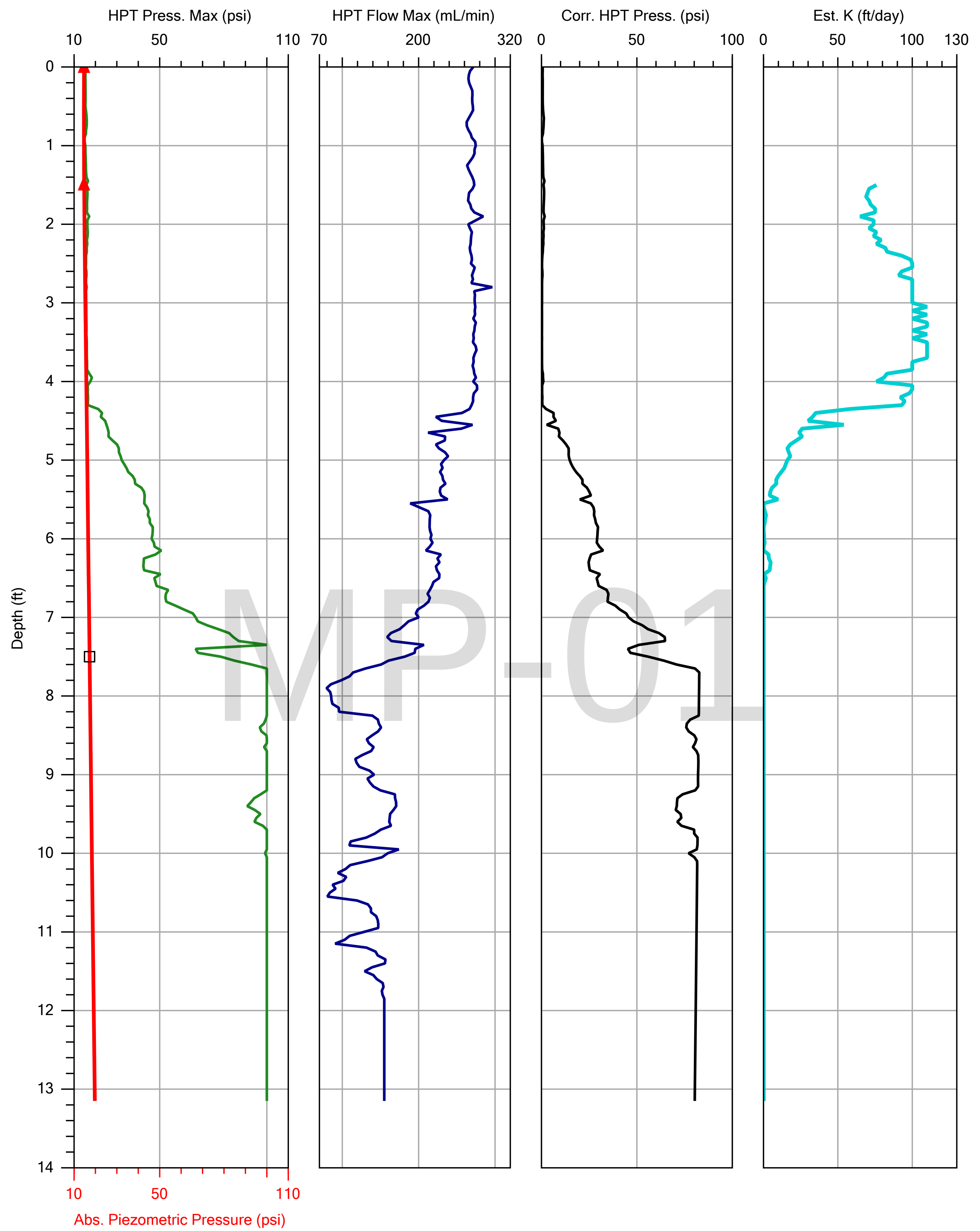

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Company: ZEBRA	Operator: Zack	Date: 9/30/2015
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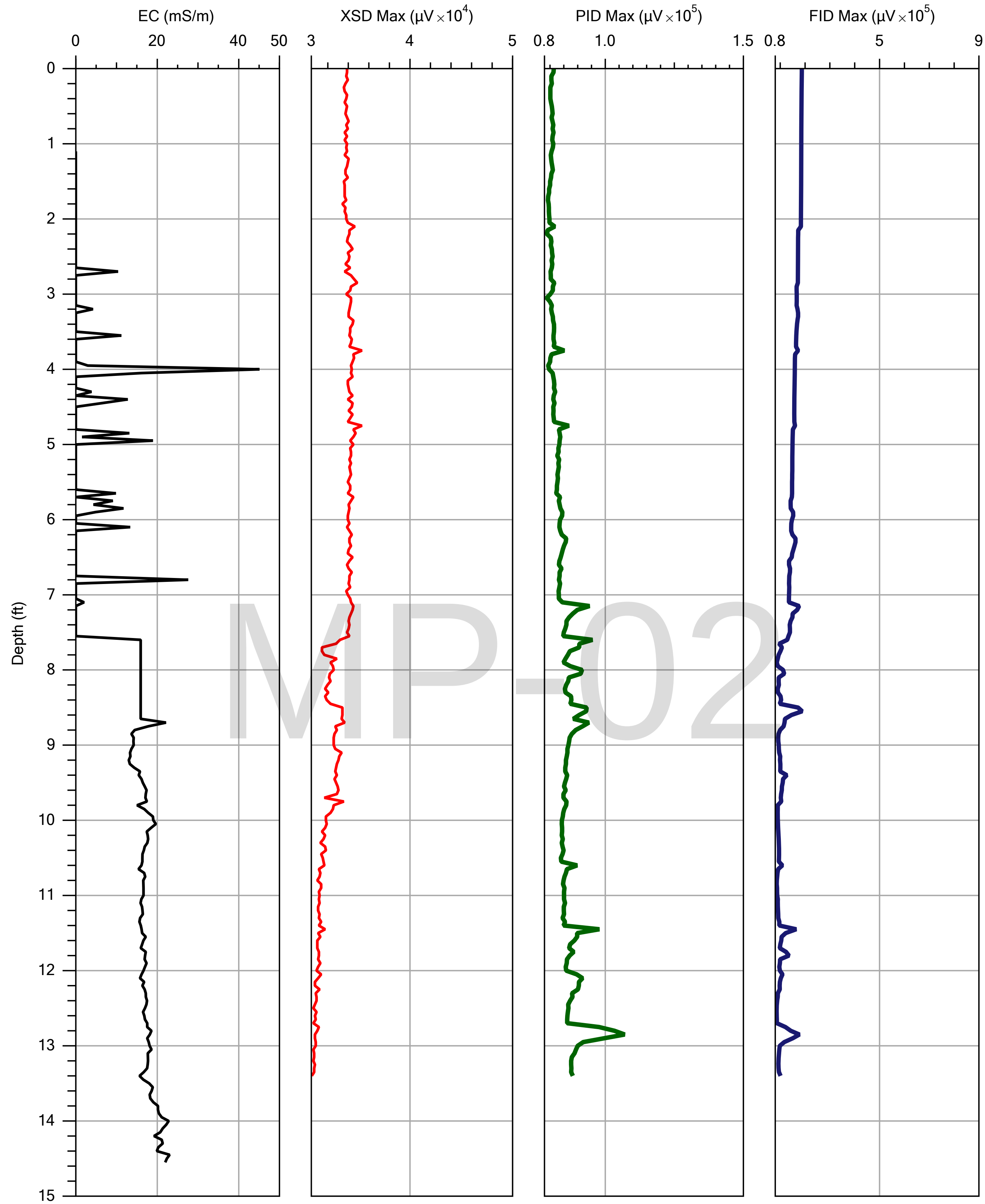
ZEBRA Technical Services - Subsurface Sampling, Injections and Data Collection for Environmental Professionals Since 1992.



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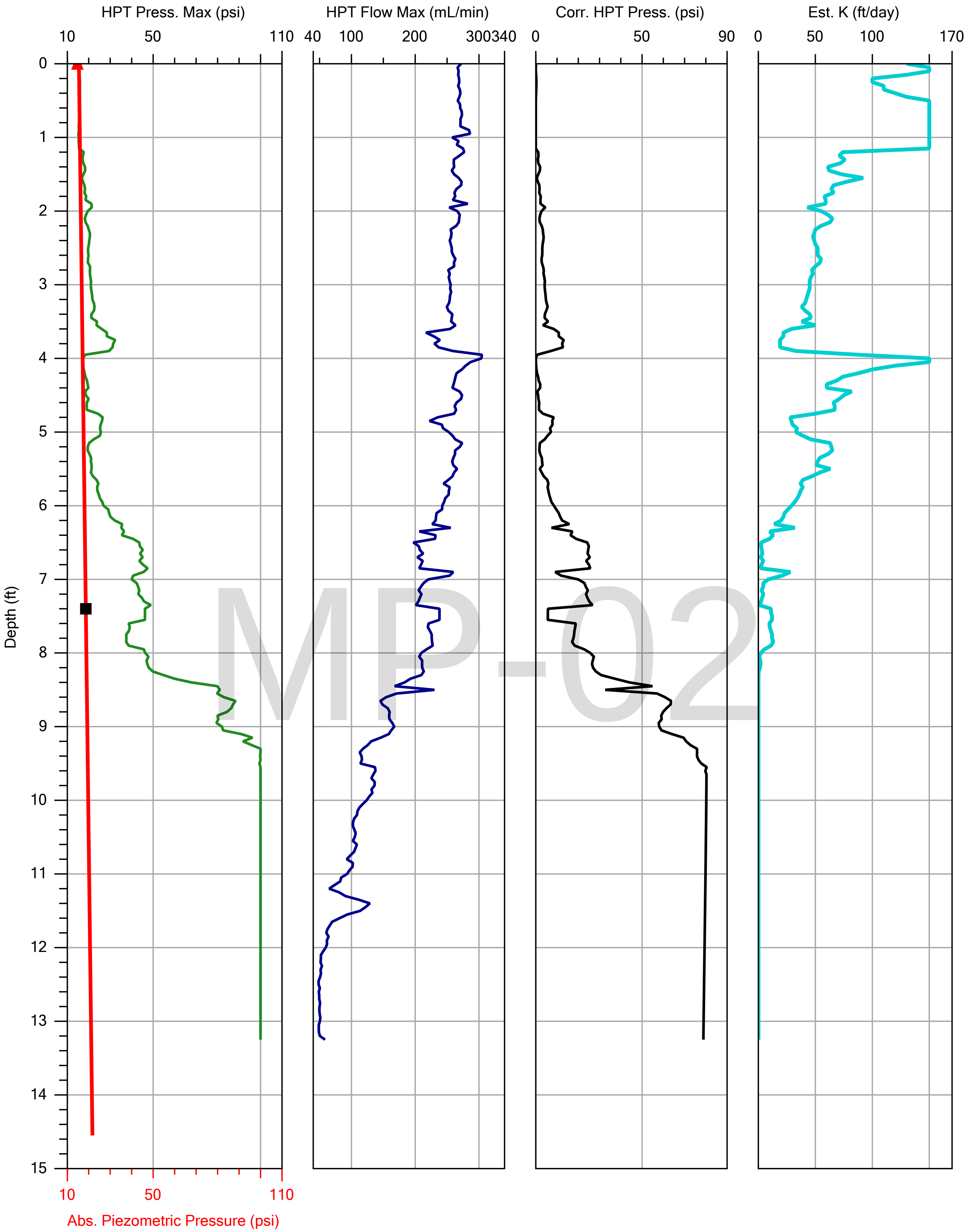

ZEBRA

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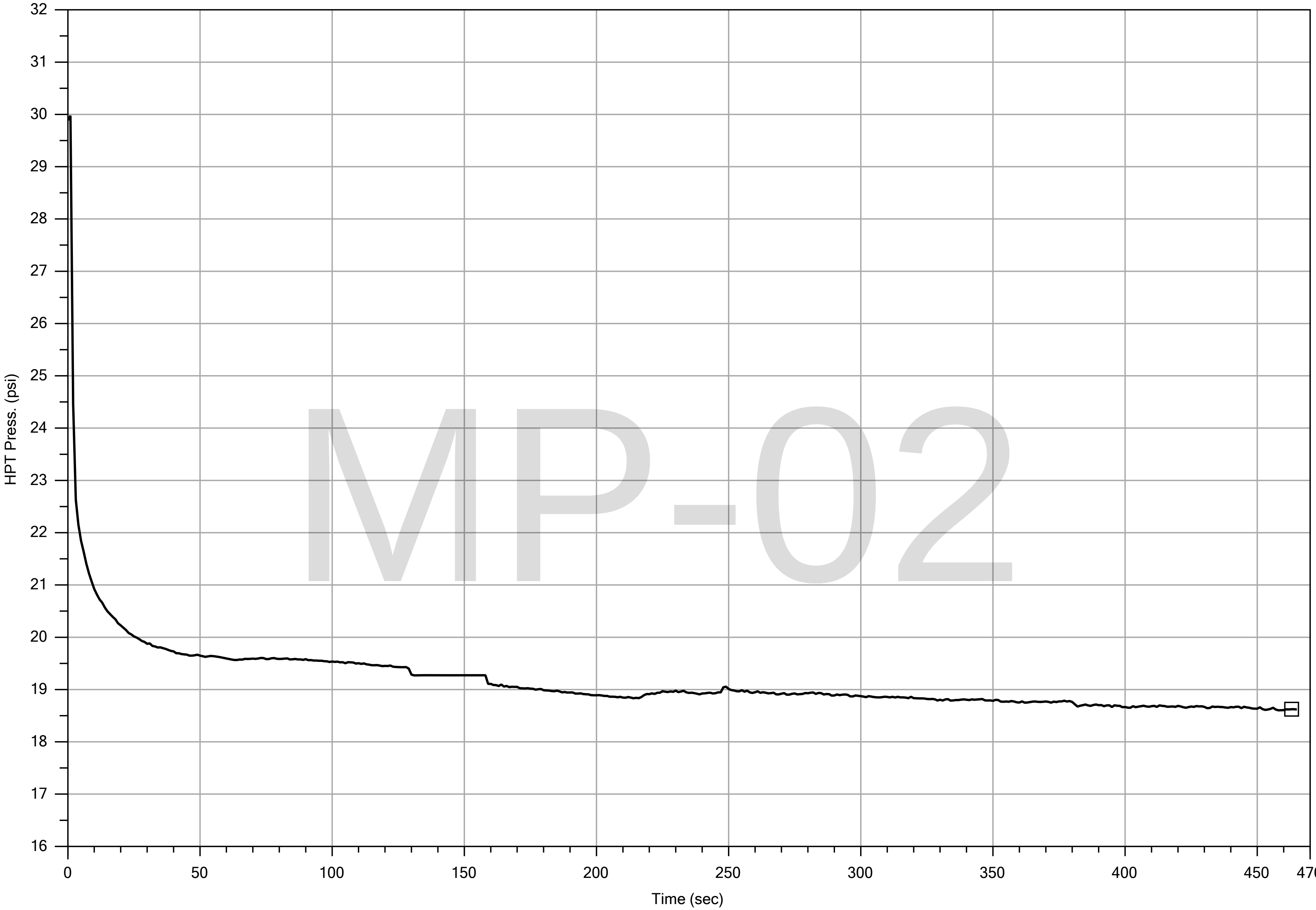

HPT DISSIPATION (SINGLE CASE)

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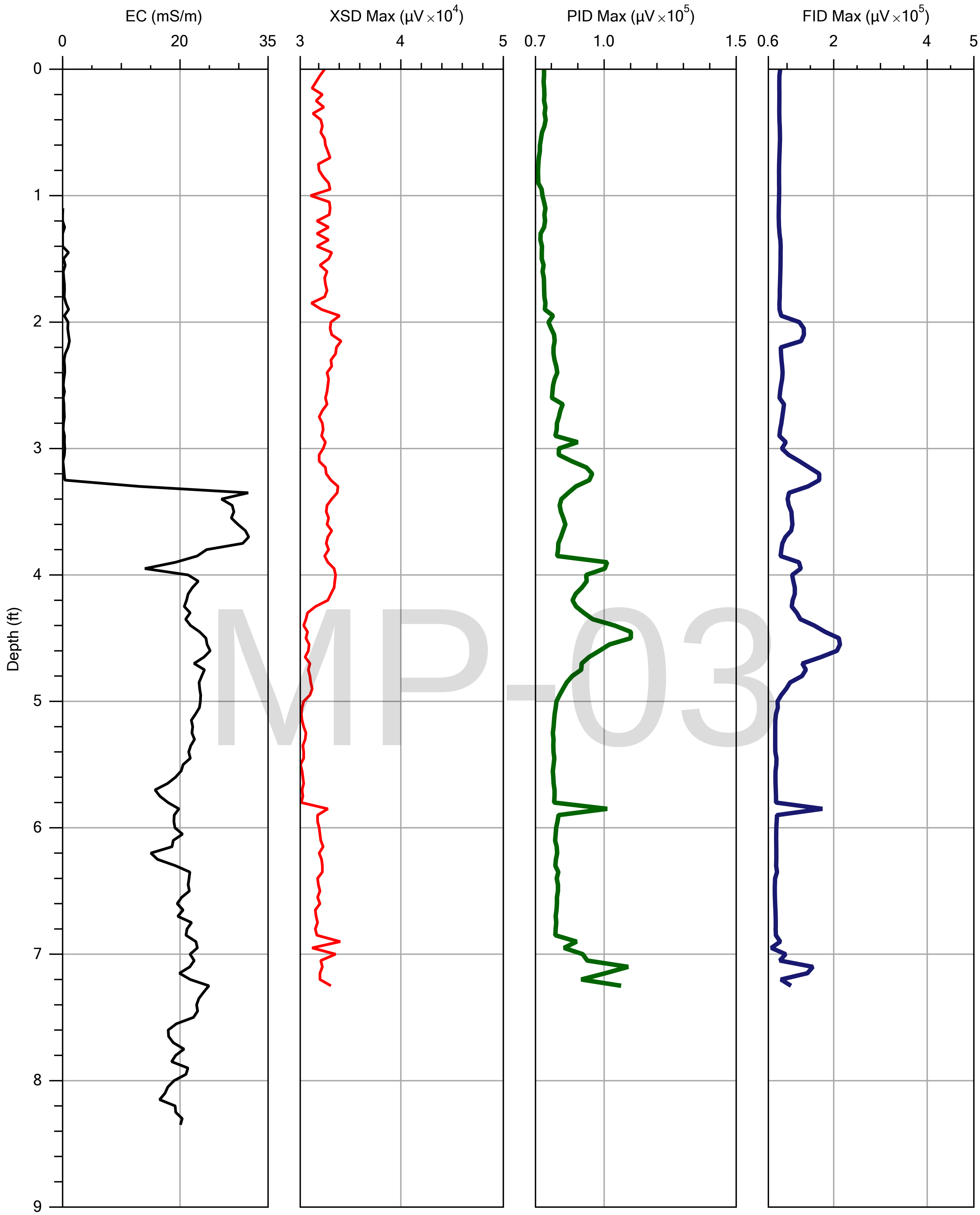

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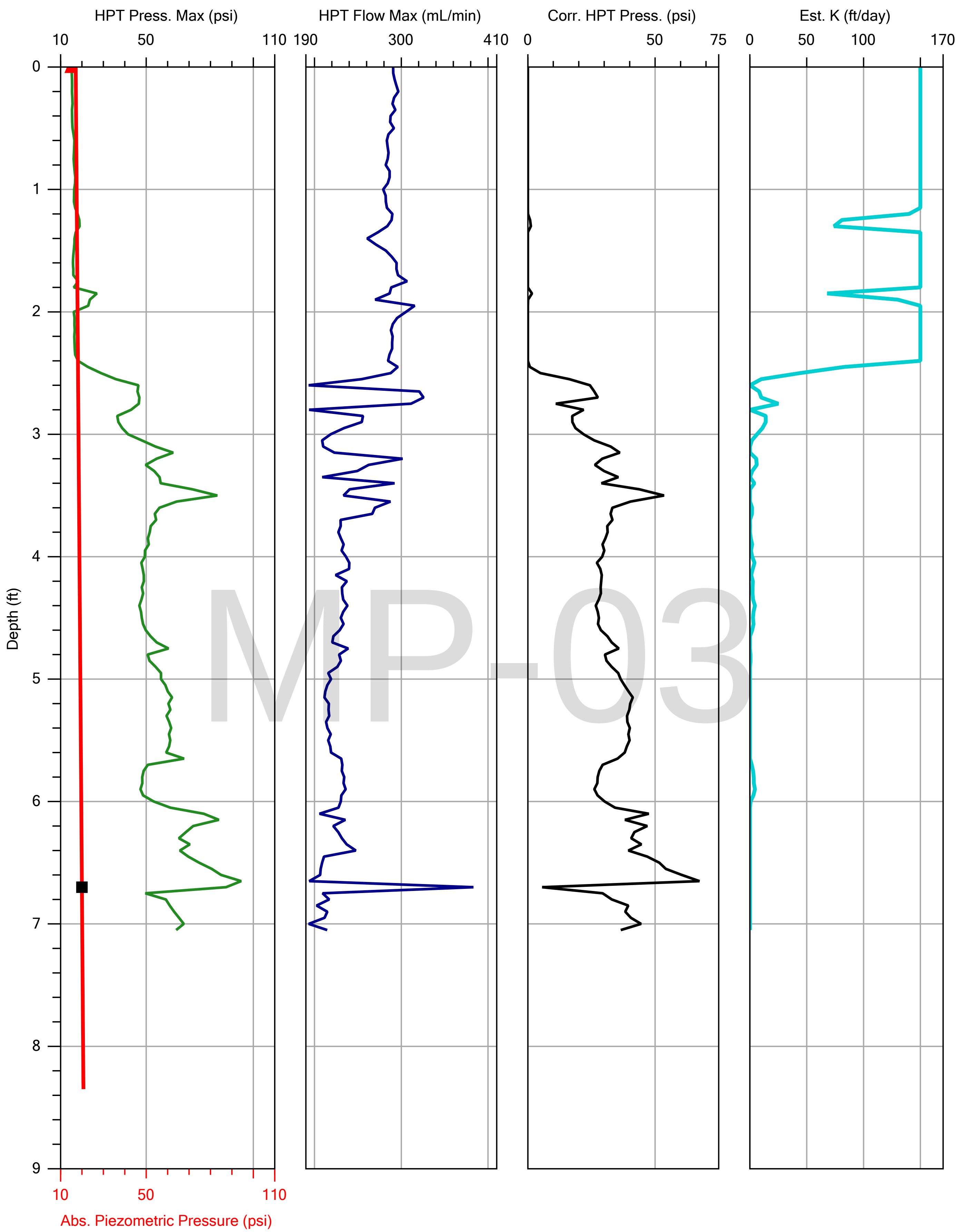

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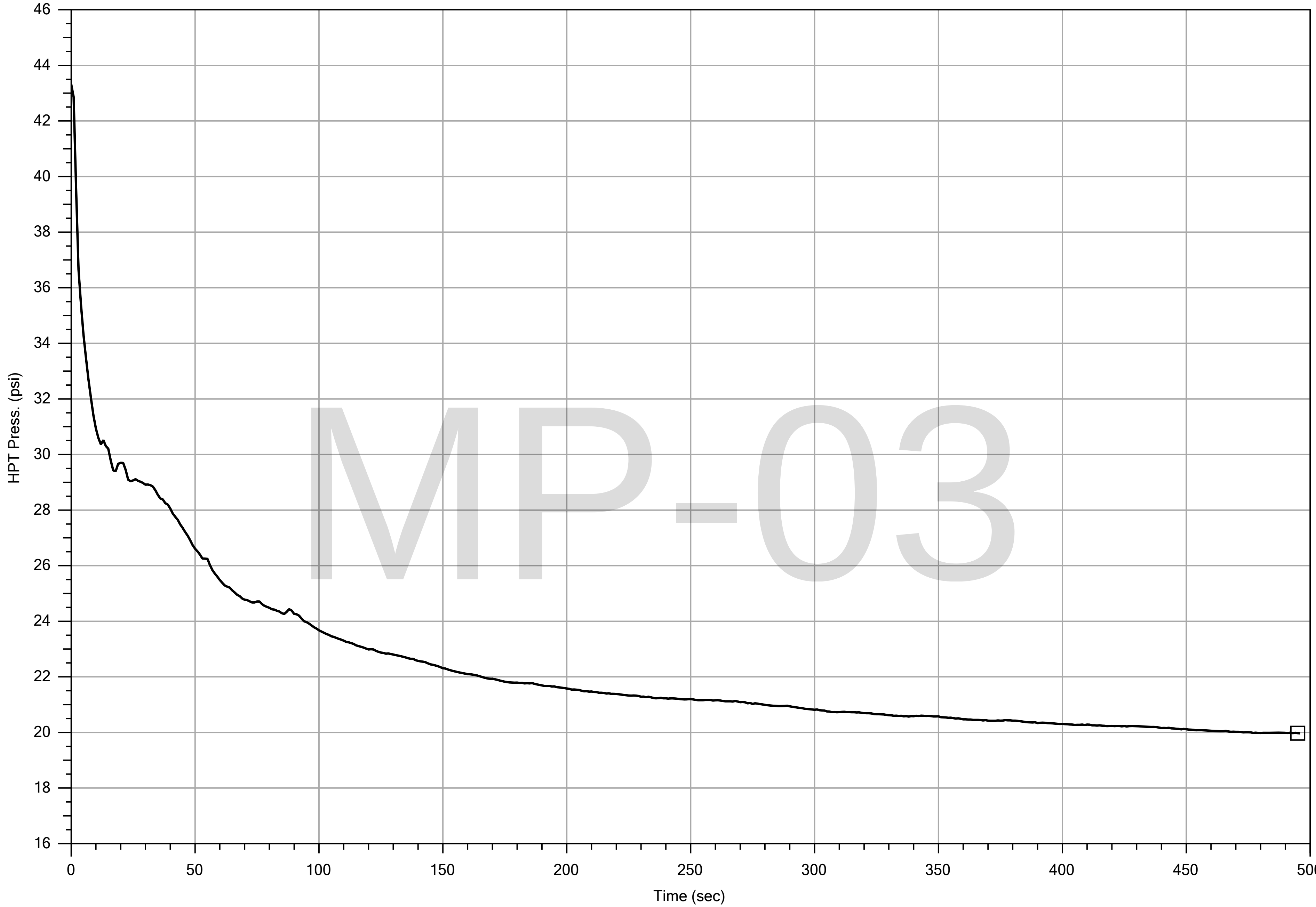

ZEBRA

HPT DISSIPATION (SINGLE CASE)

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Company: ZEBRA	Operator: Zack	Location:	Sensor: HPT Press.
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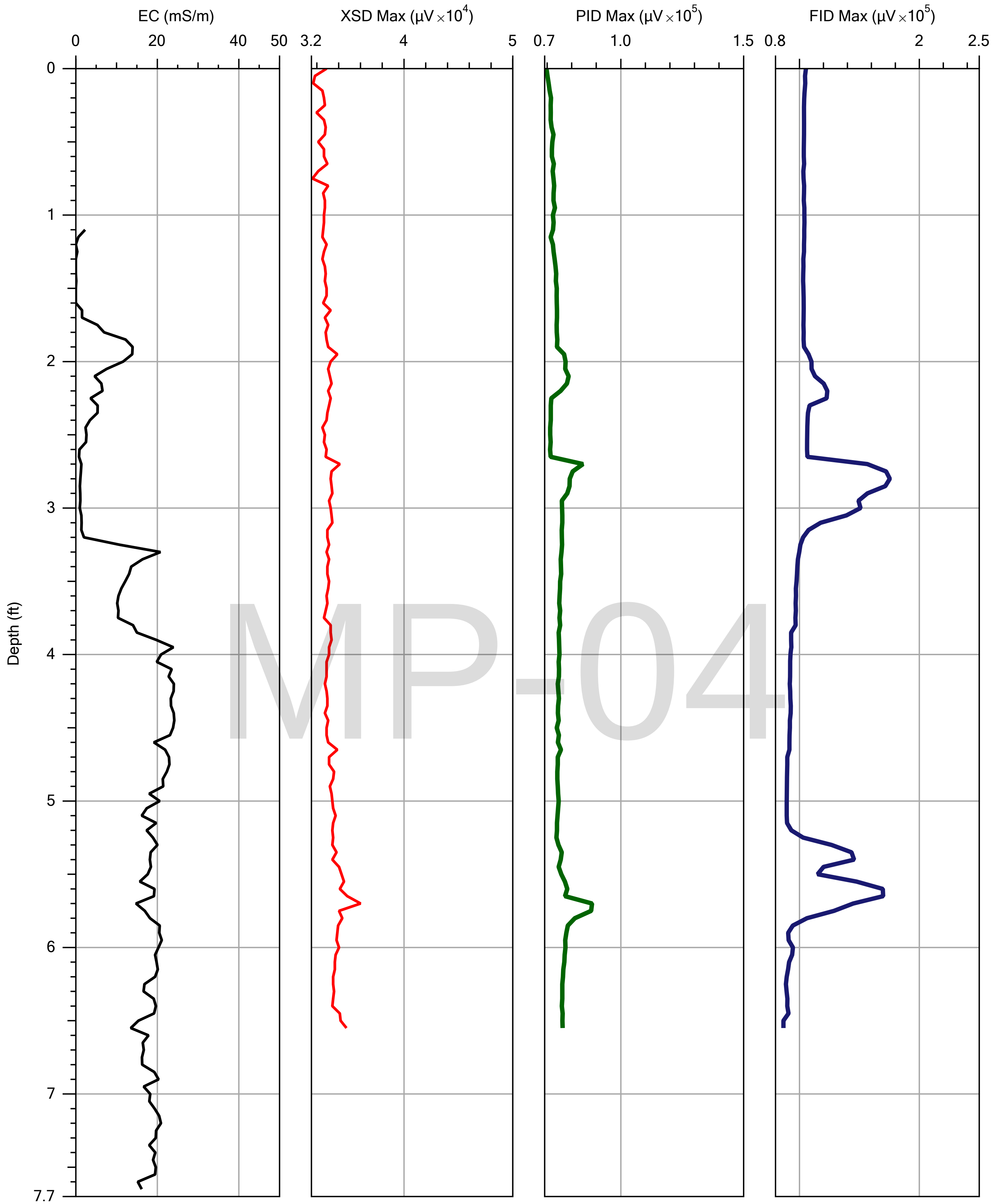

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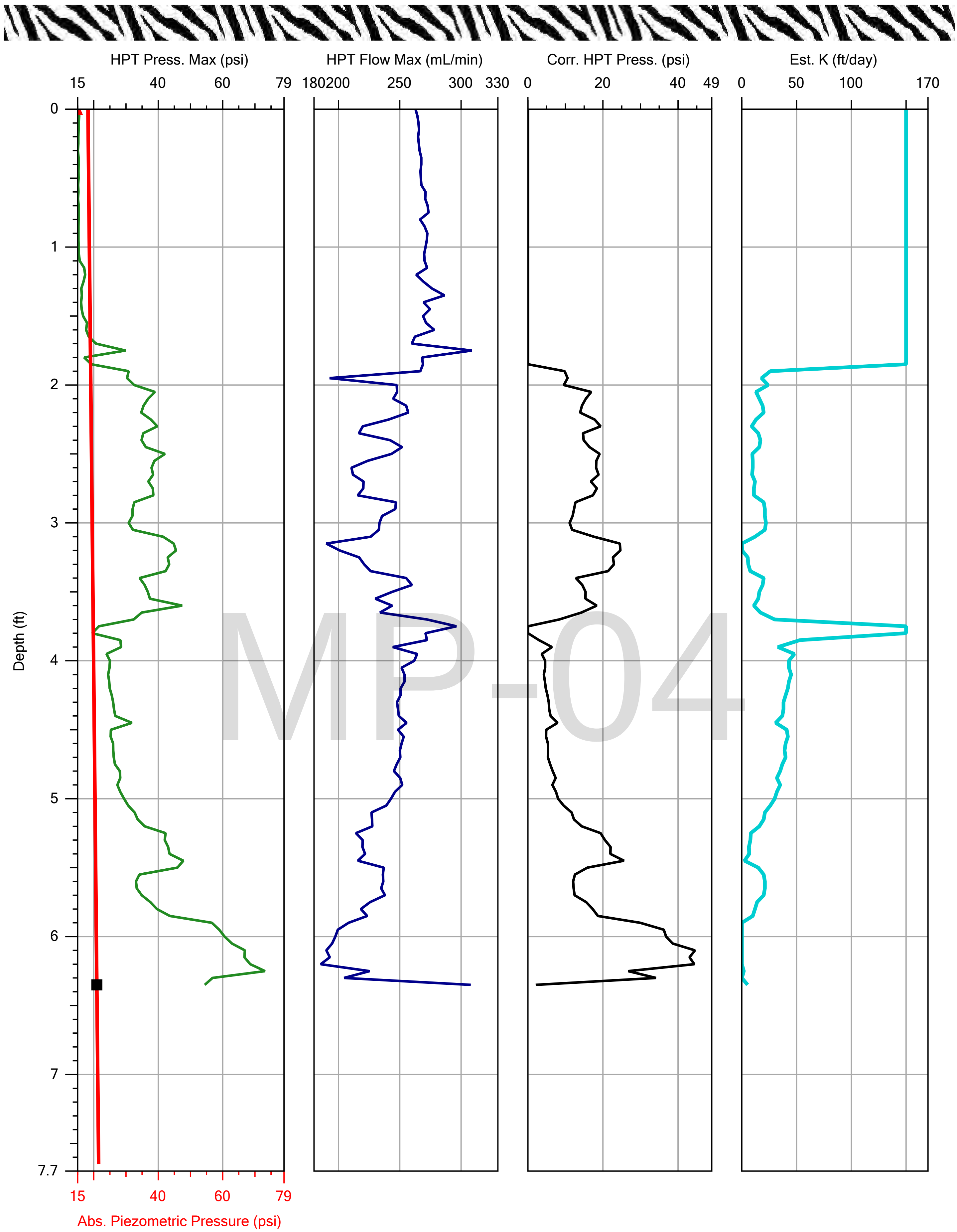
Project ID: 203-15-7097	Client: AMEC	Location:



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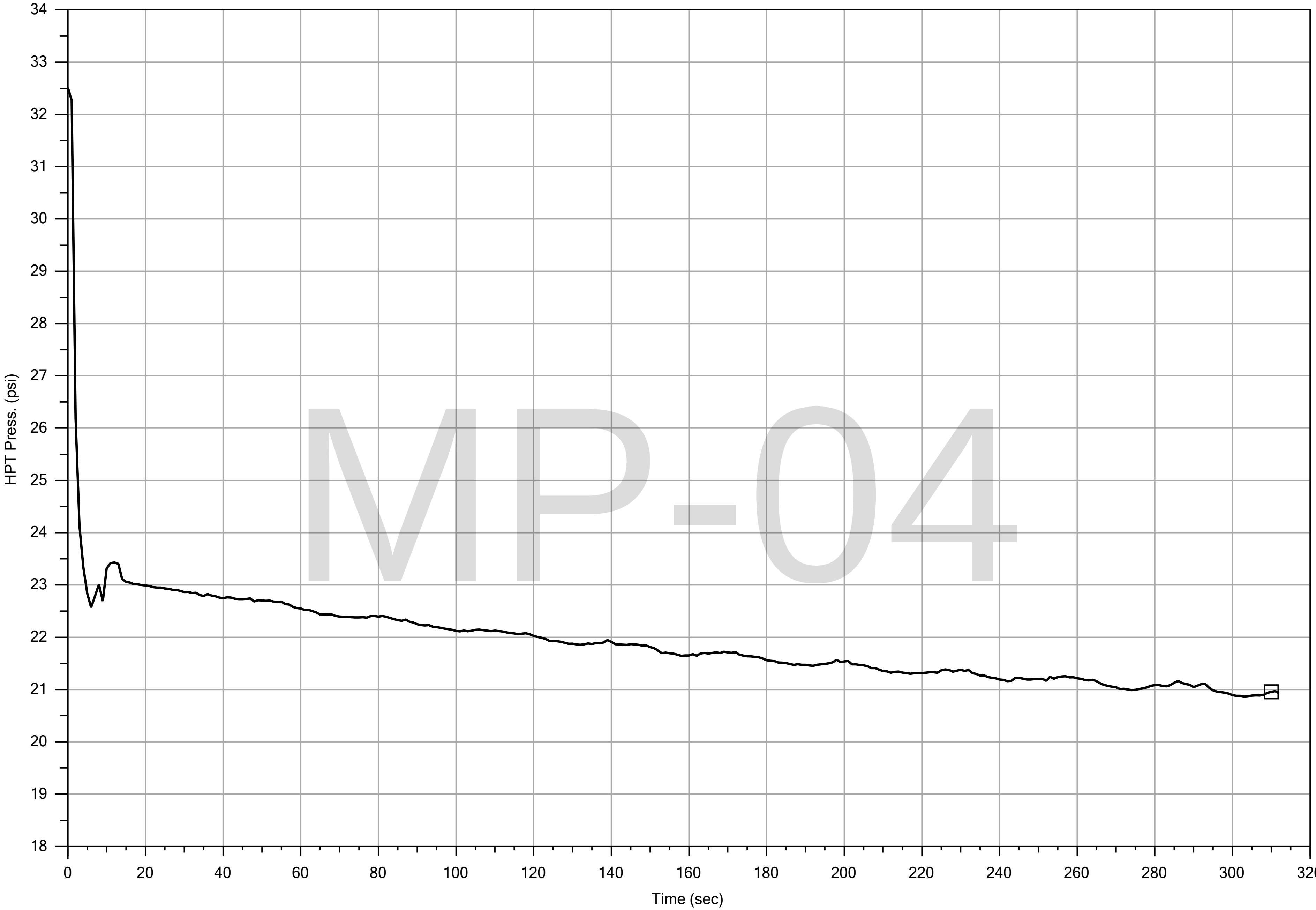

HPT DISSIPATION (SINGLE CASE)

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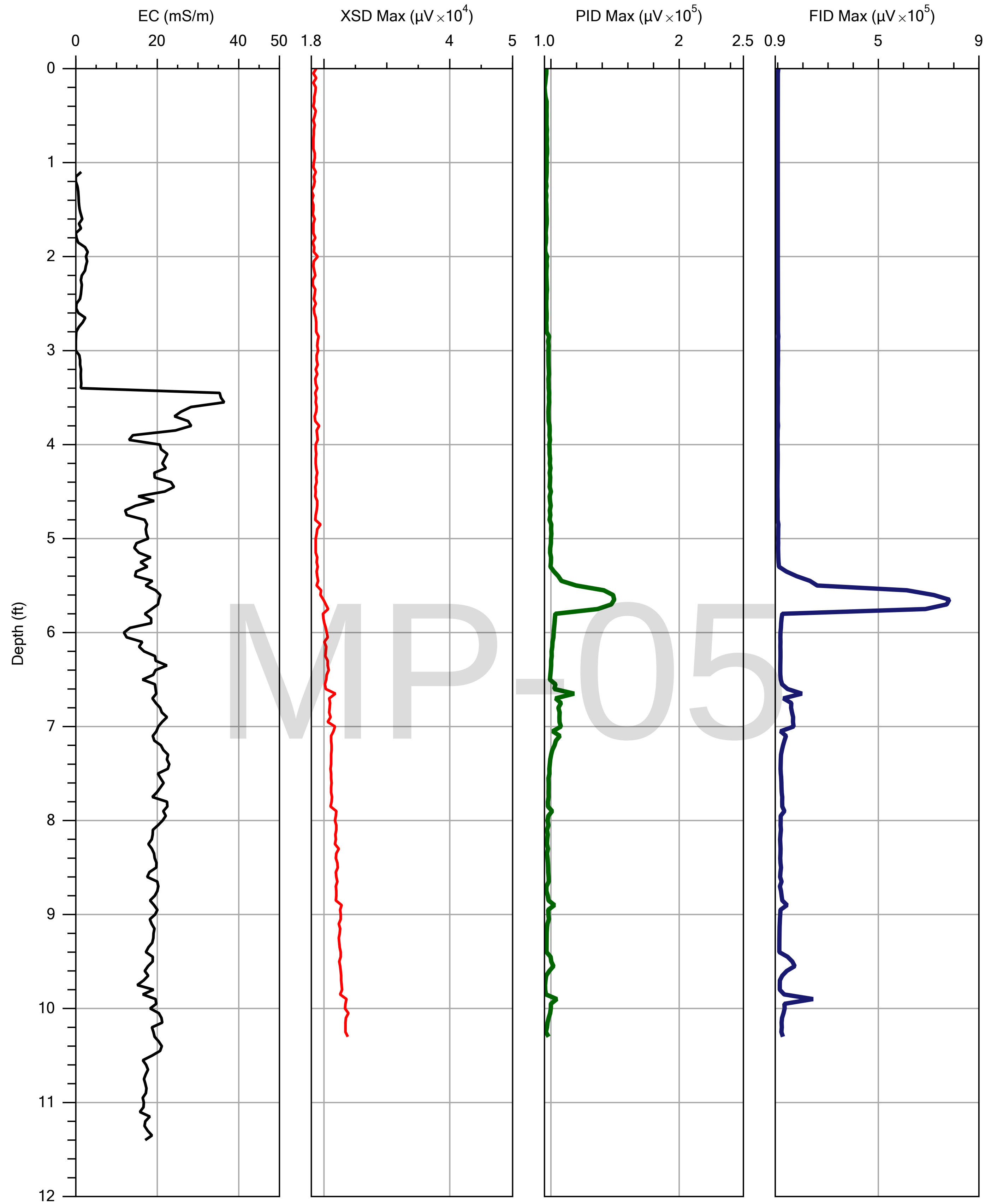

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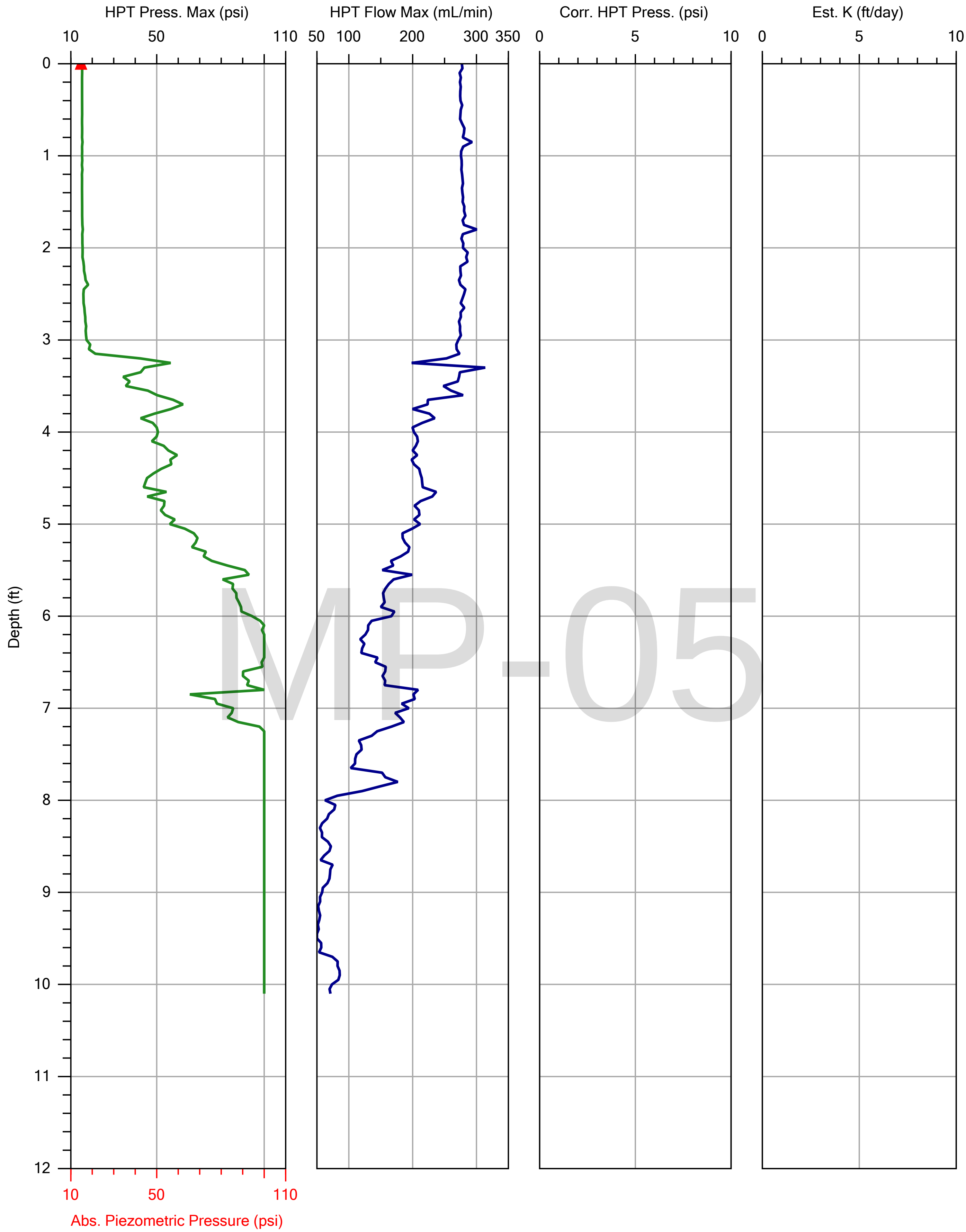

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Company: ZEBRA	Operator: Zack	Date: 9/30/2015
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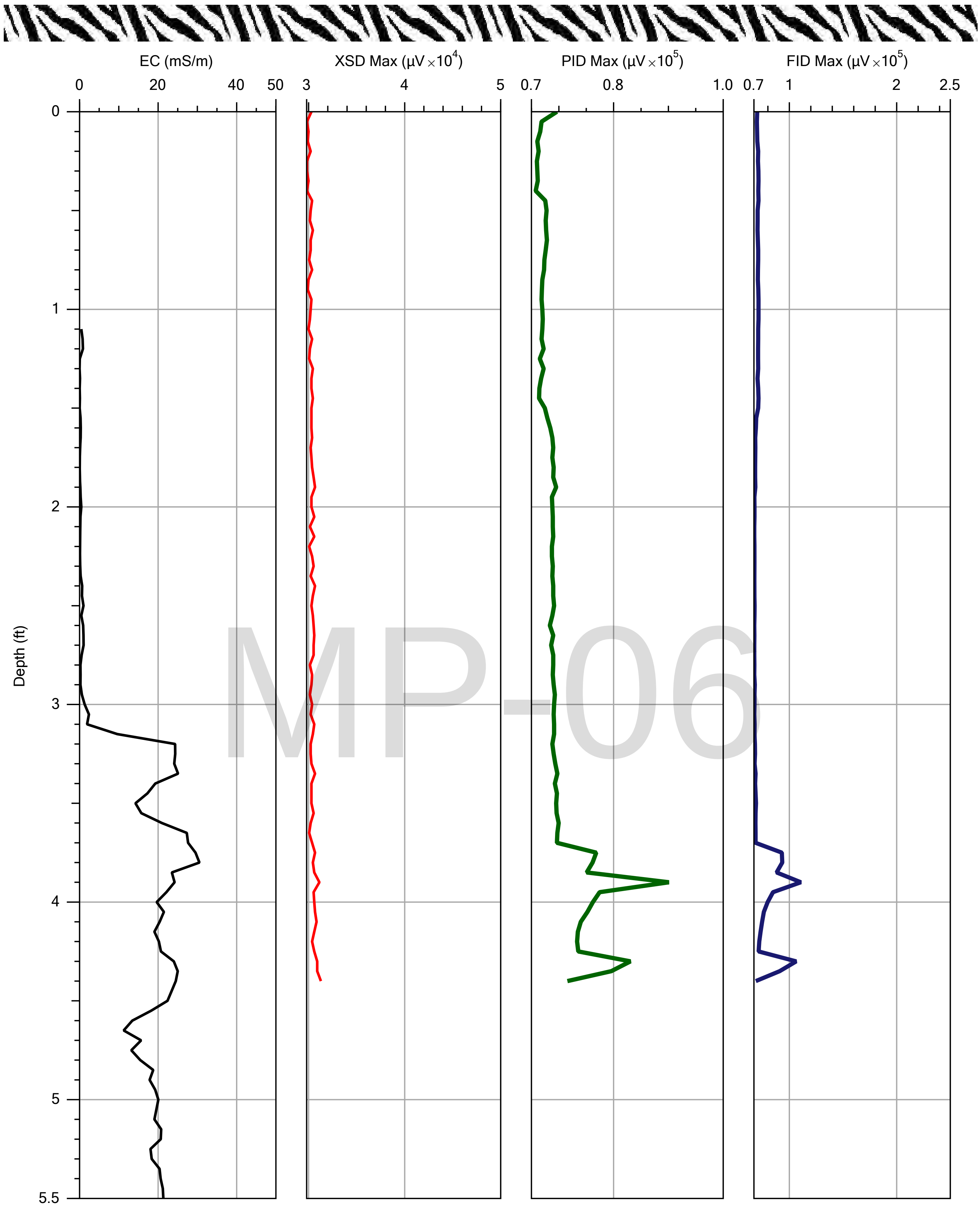

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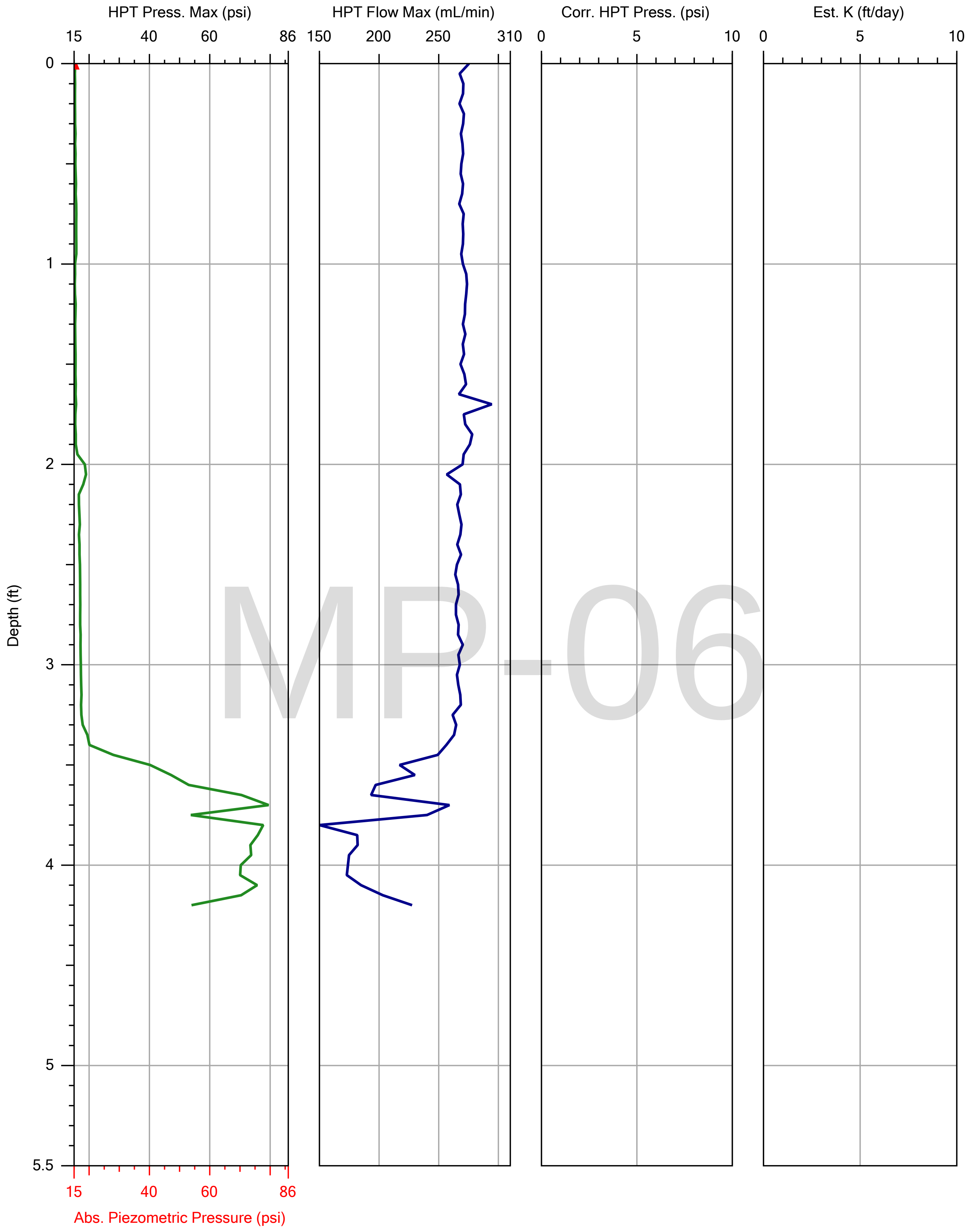

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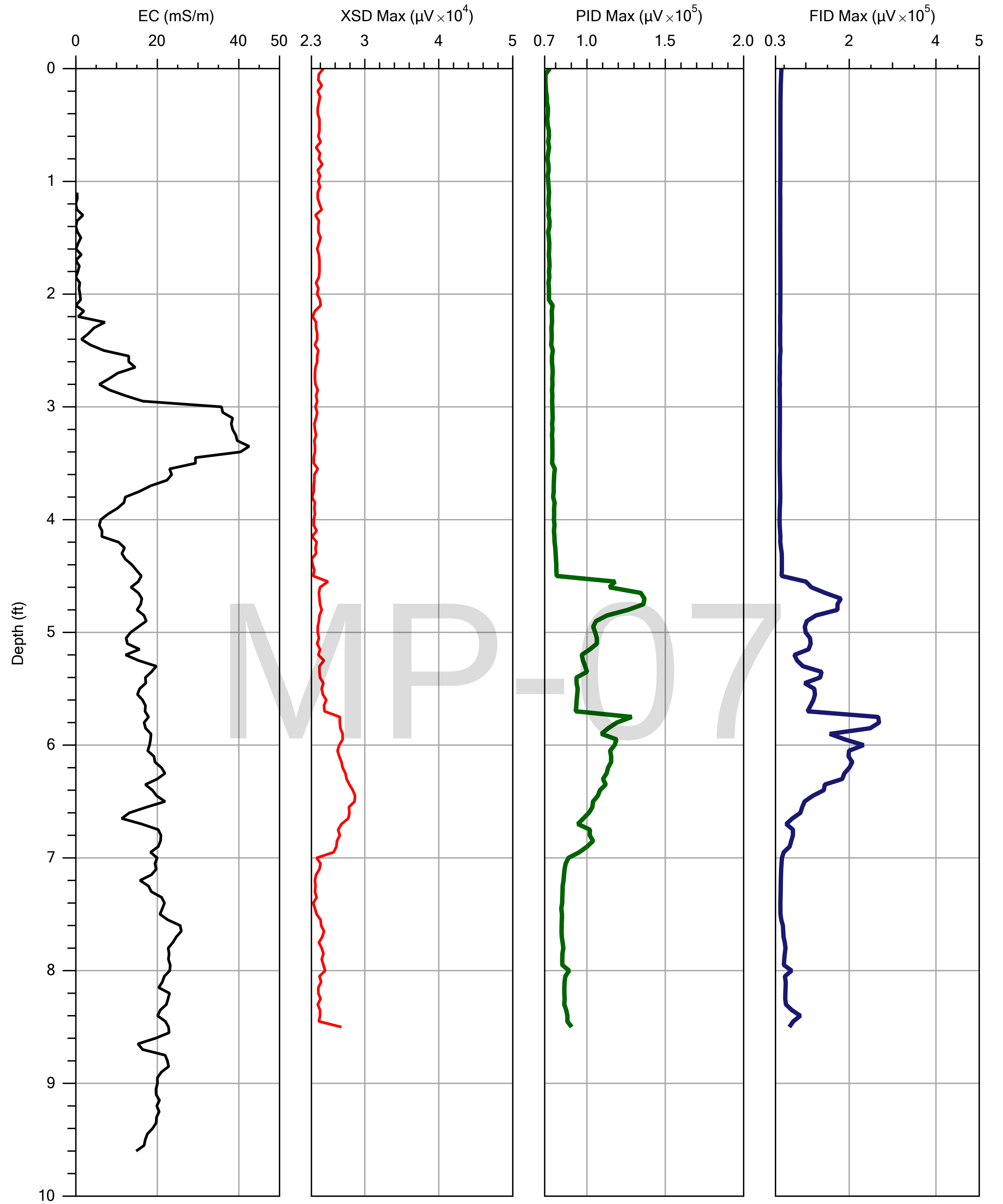

ZEBRA

Company: ZEBRA	Operator: Zack	Date: 9/30/2015
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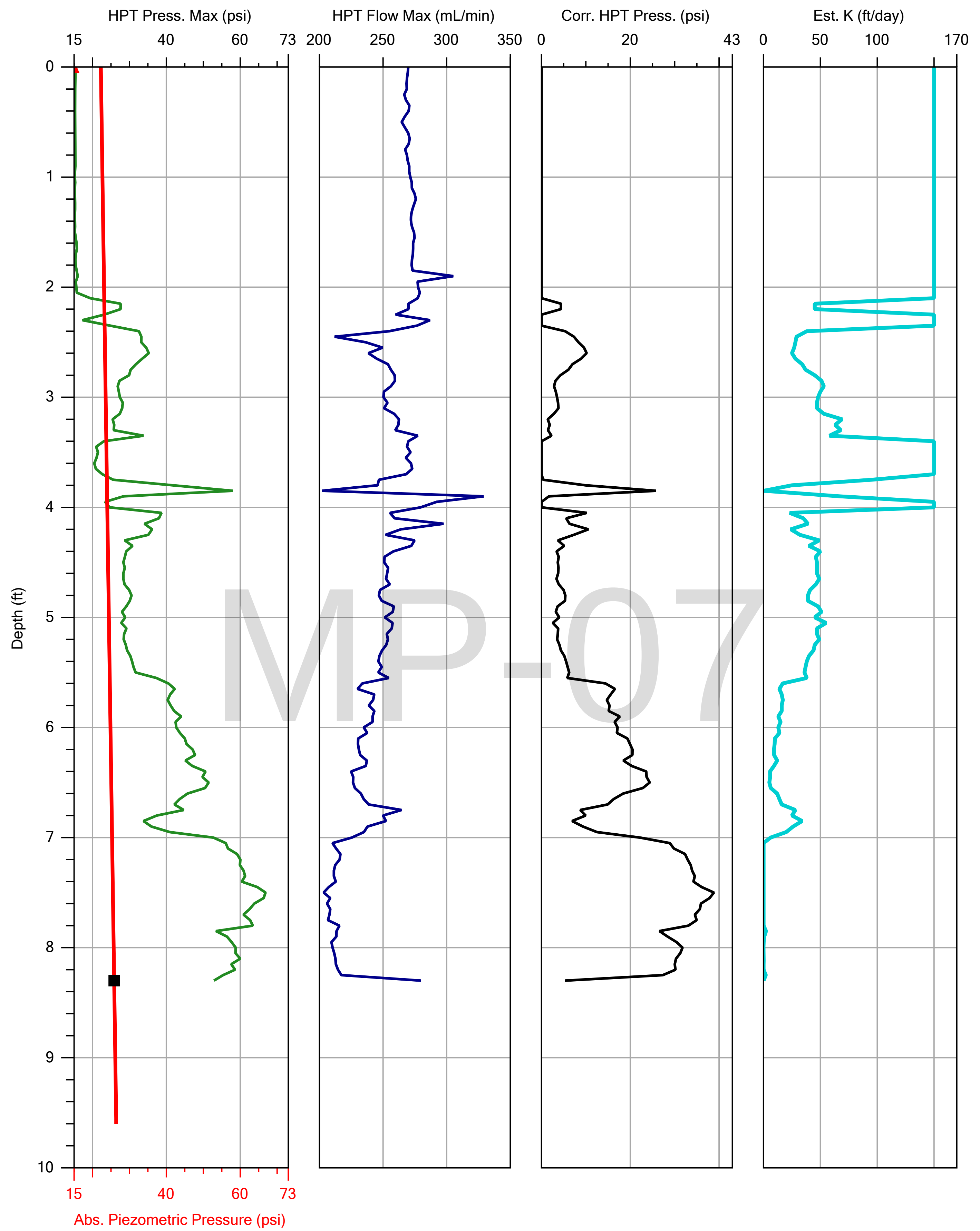

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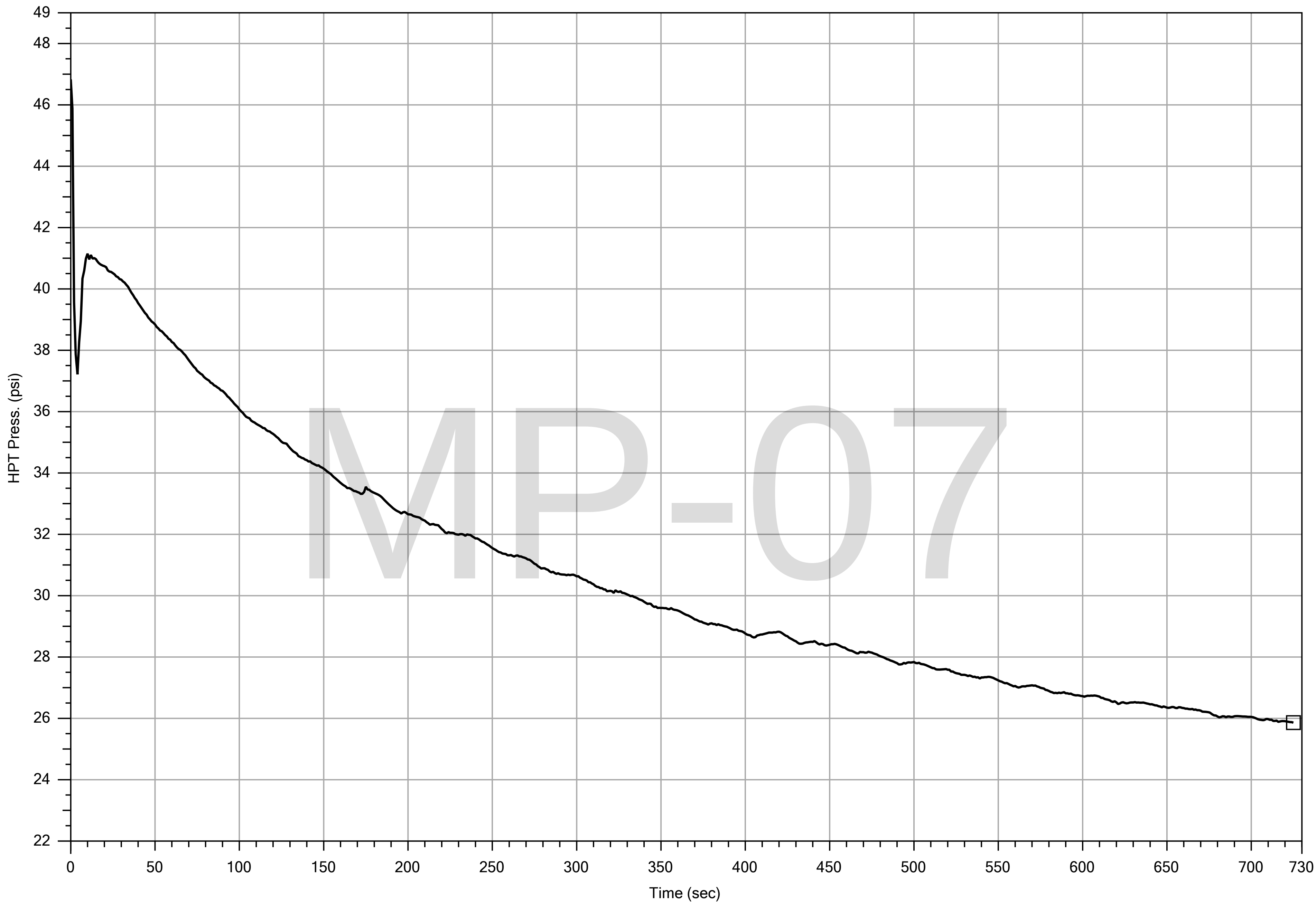

ZEBRA

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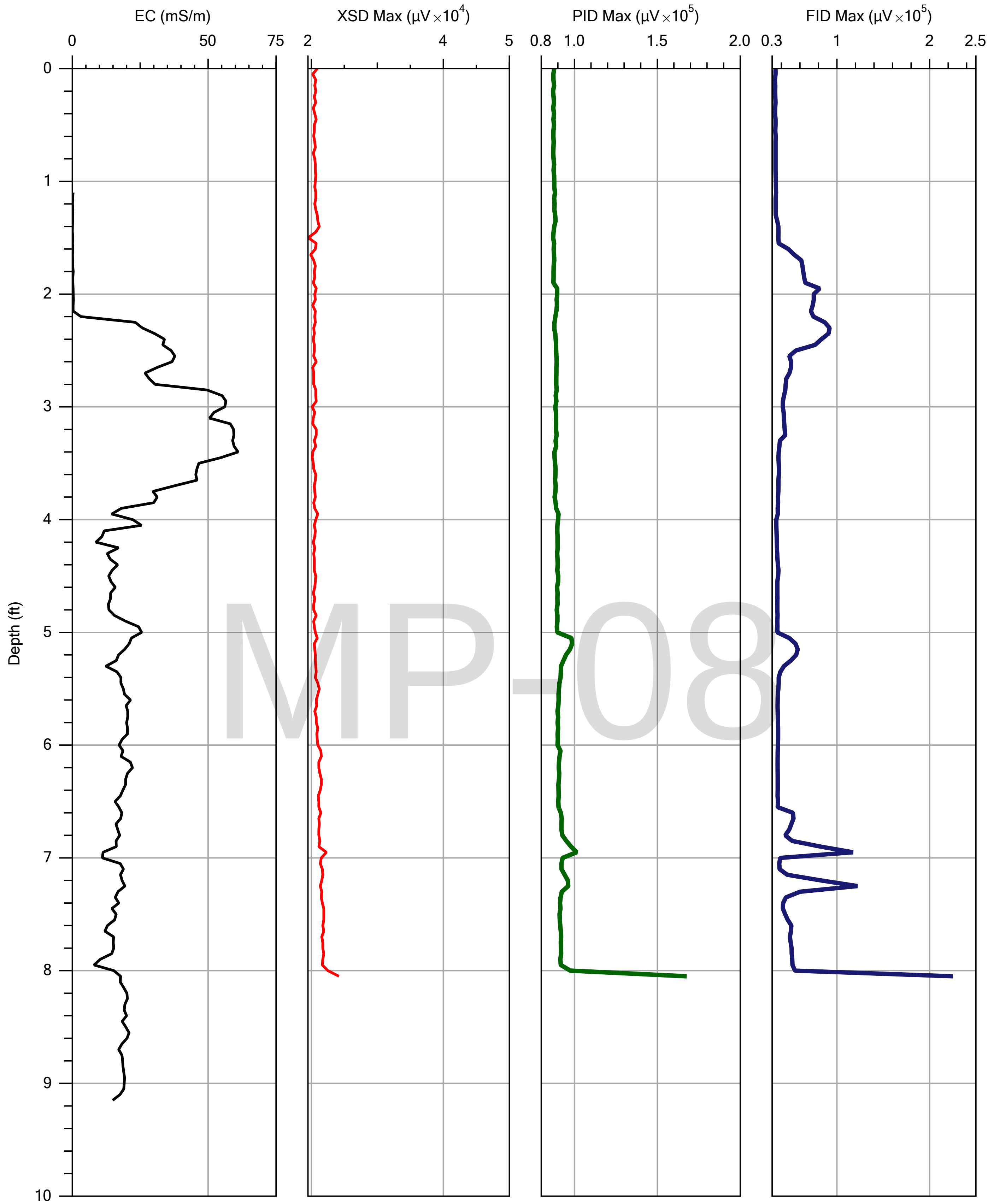

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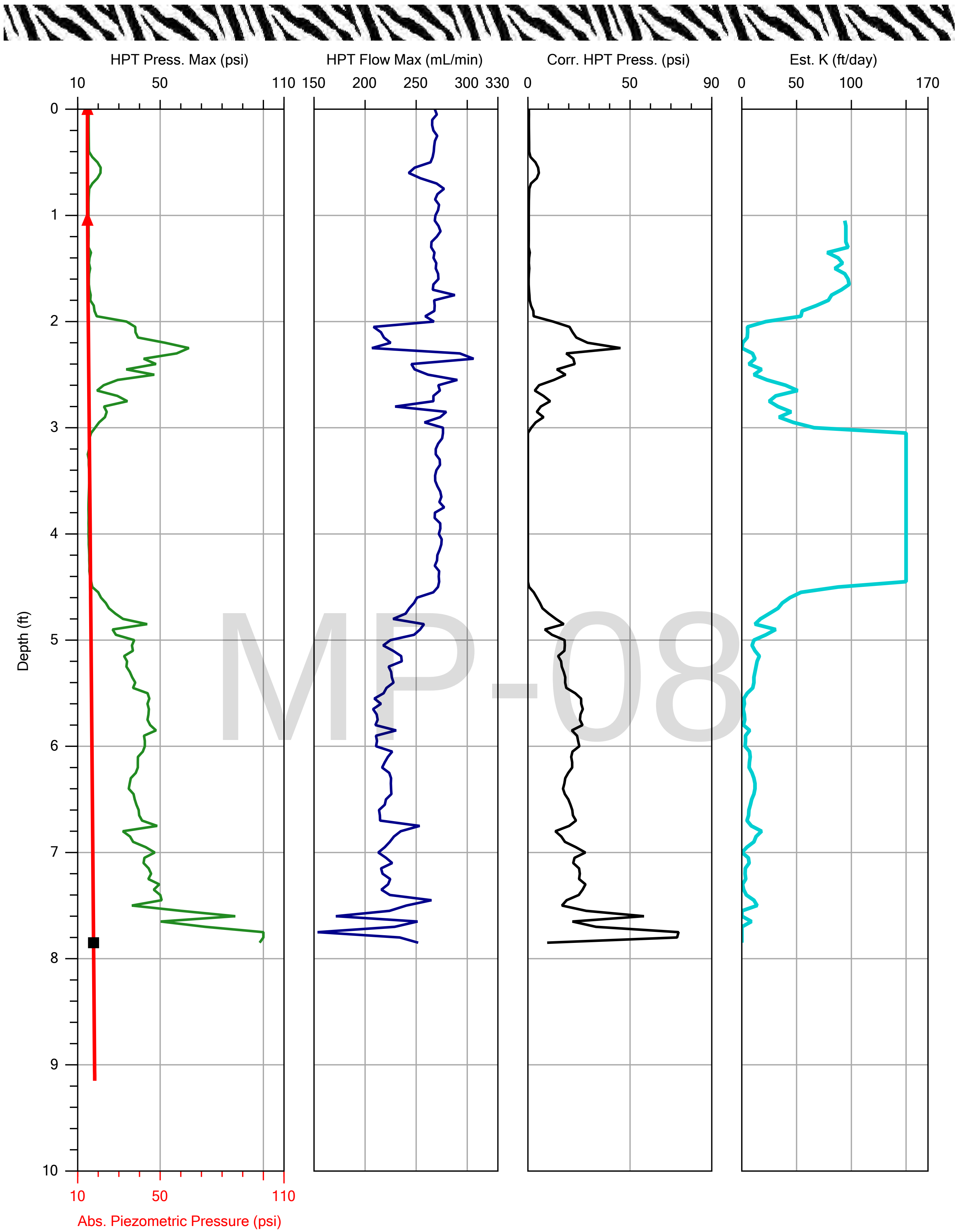

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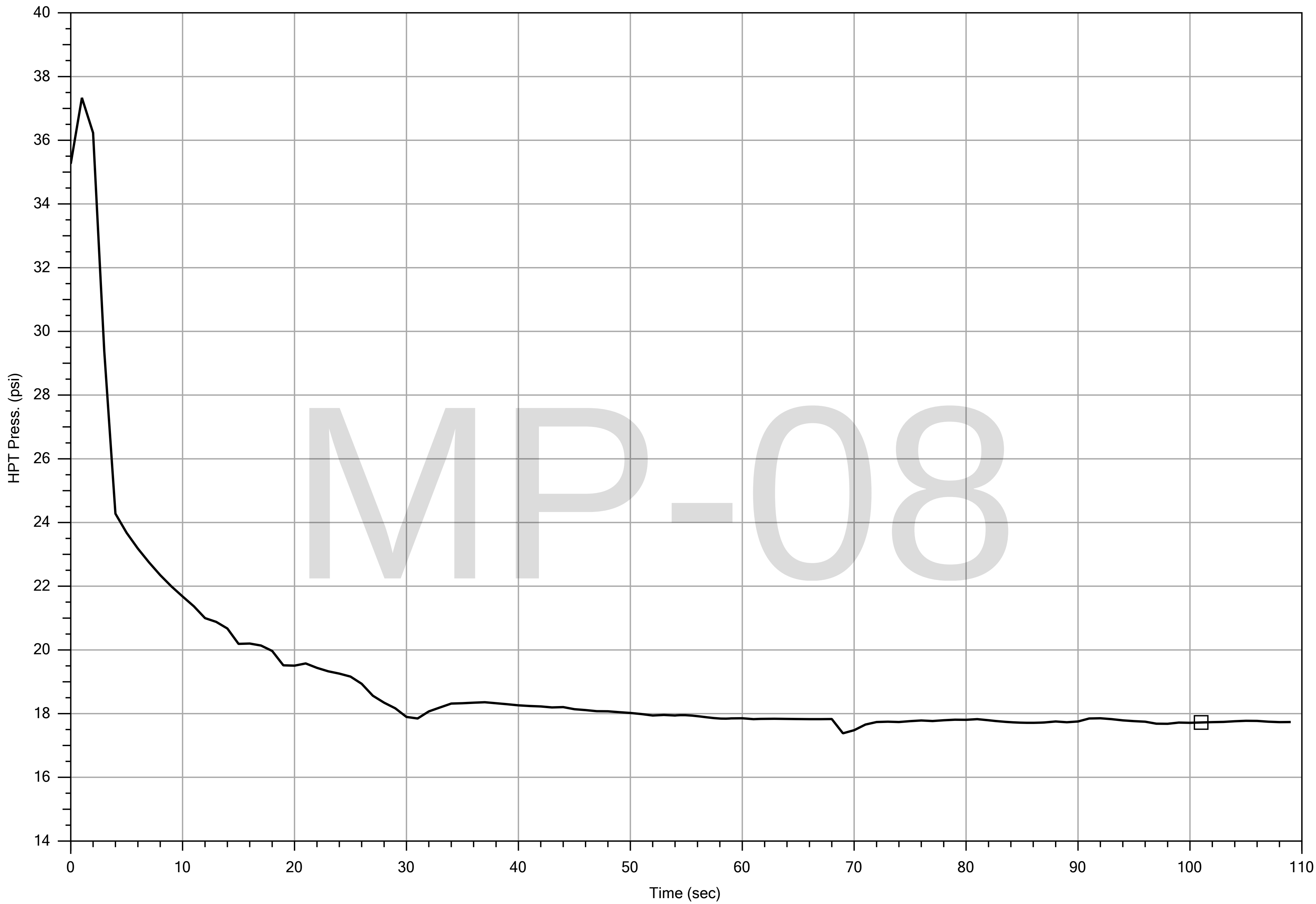

HPT DISSIPATION (SINGLE CASE)

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Company: ZEBRA	Operator: Zack	Location:	Sensor: HPT Press.
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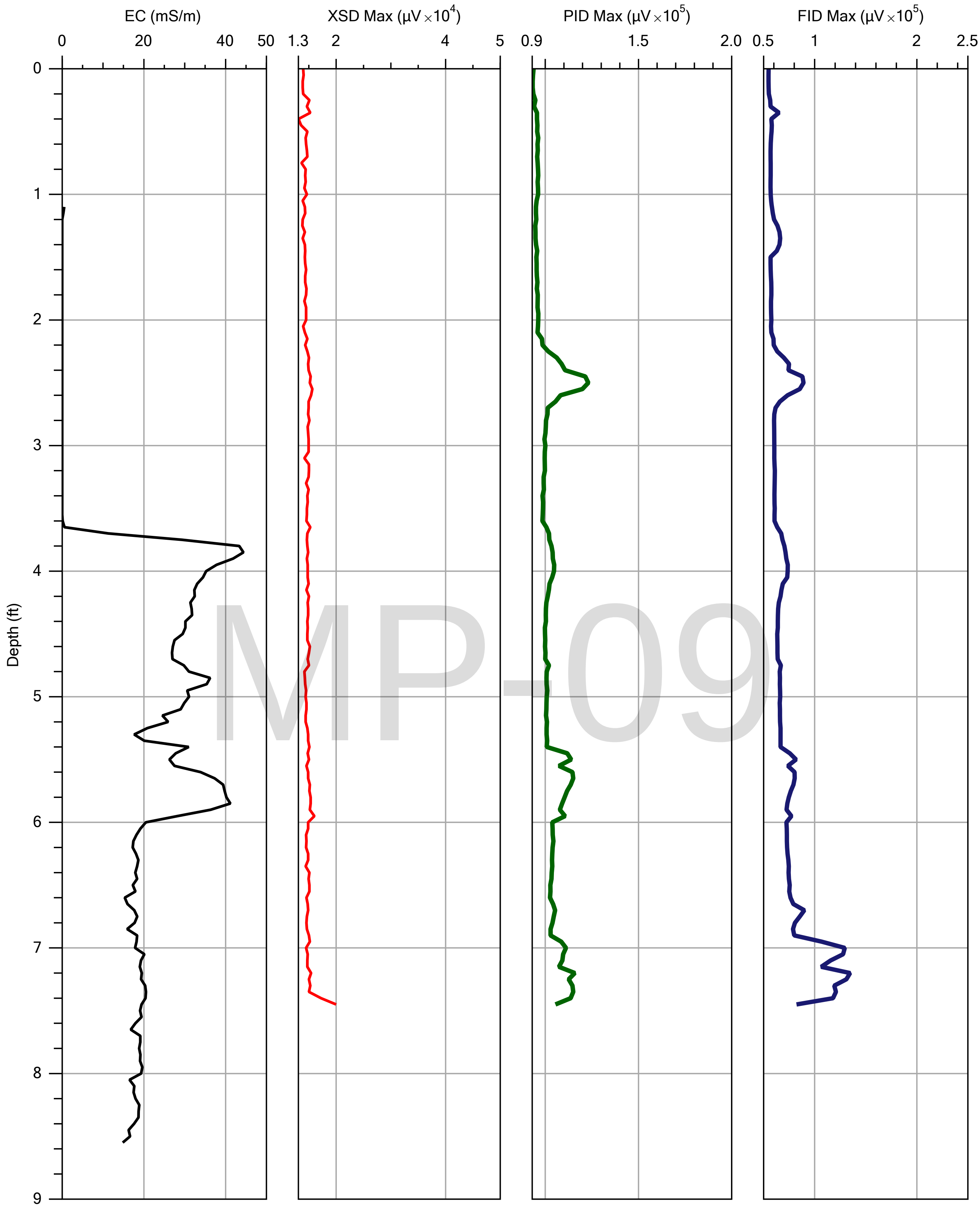

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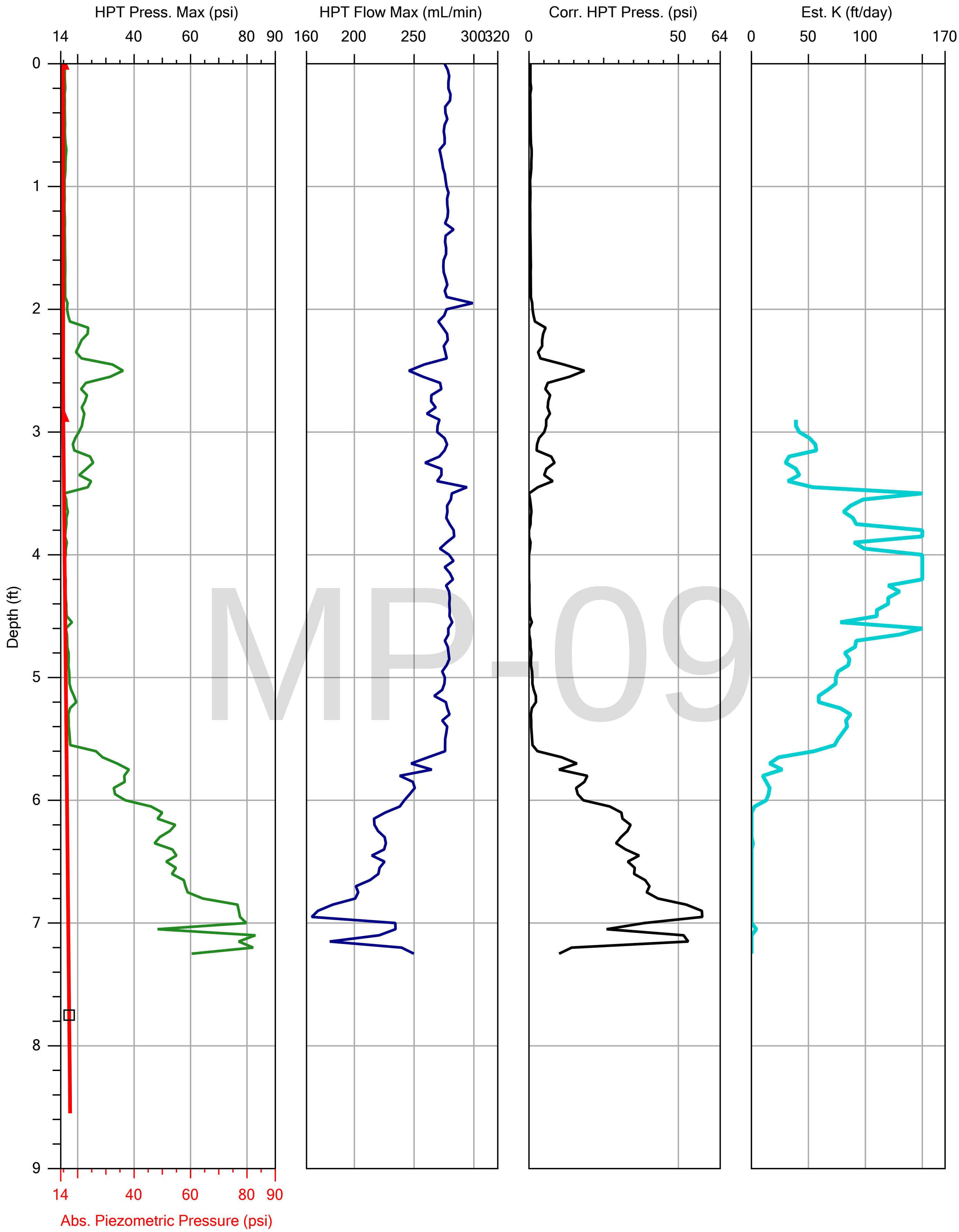

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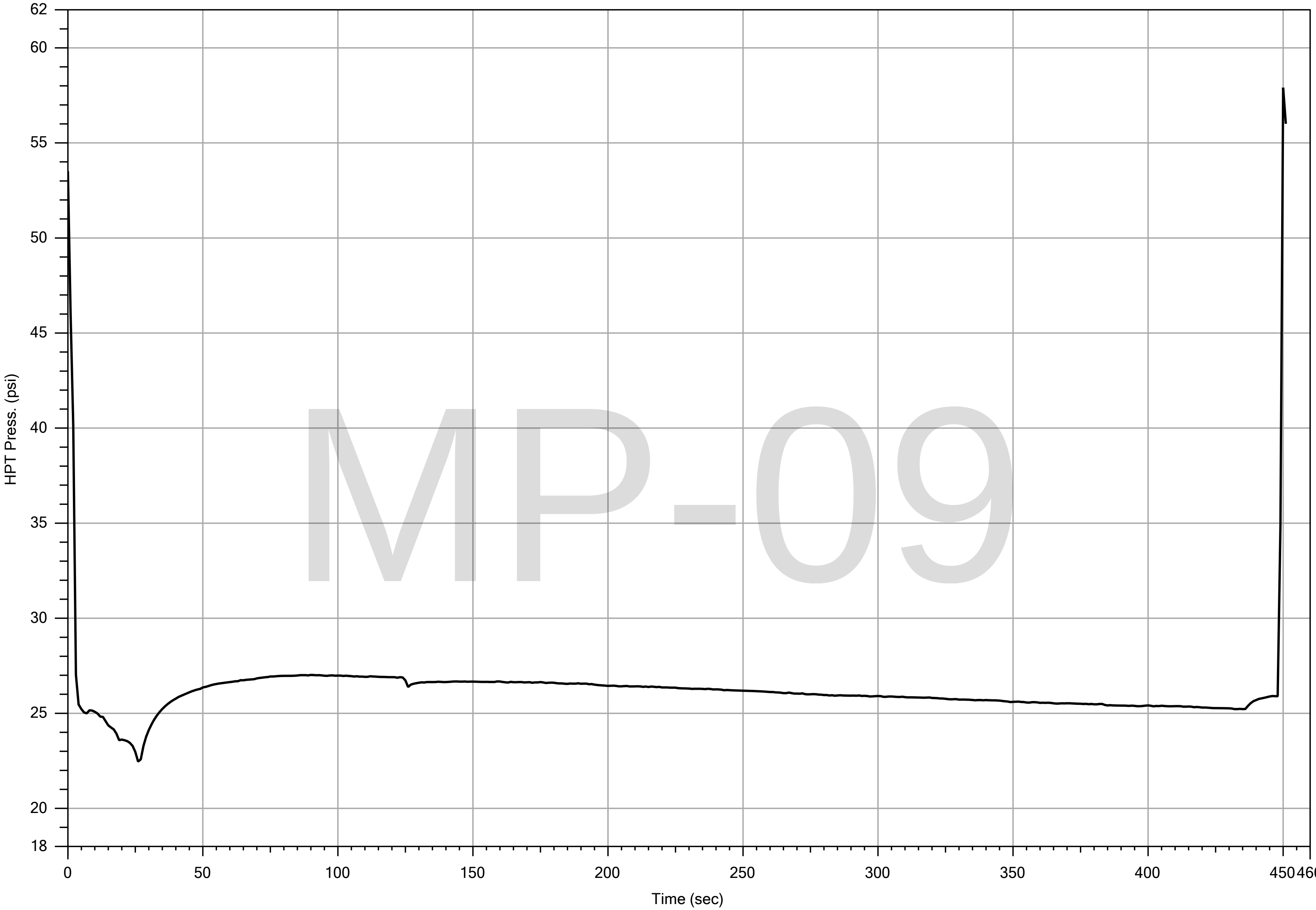
Company: ZEBRA	Operator: Zack	Date: 10/1/2015
Project ID: 203-15-7097	Client: AMEC	Location:

ZEBRA Technical Services - Subsurface Sampling, Injections and Data Collection for Environmental Professionals Since 1992.



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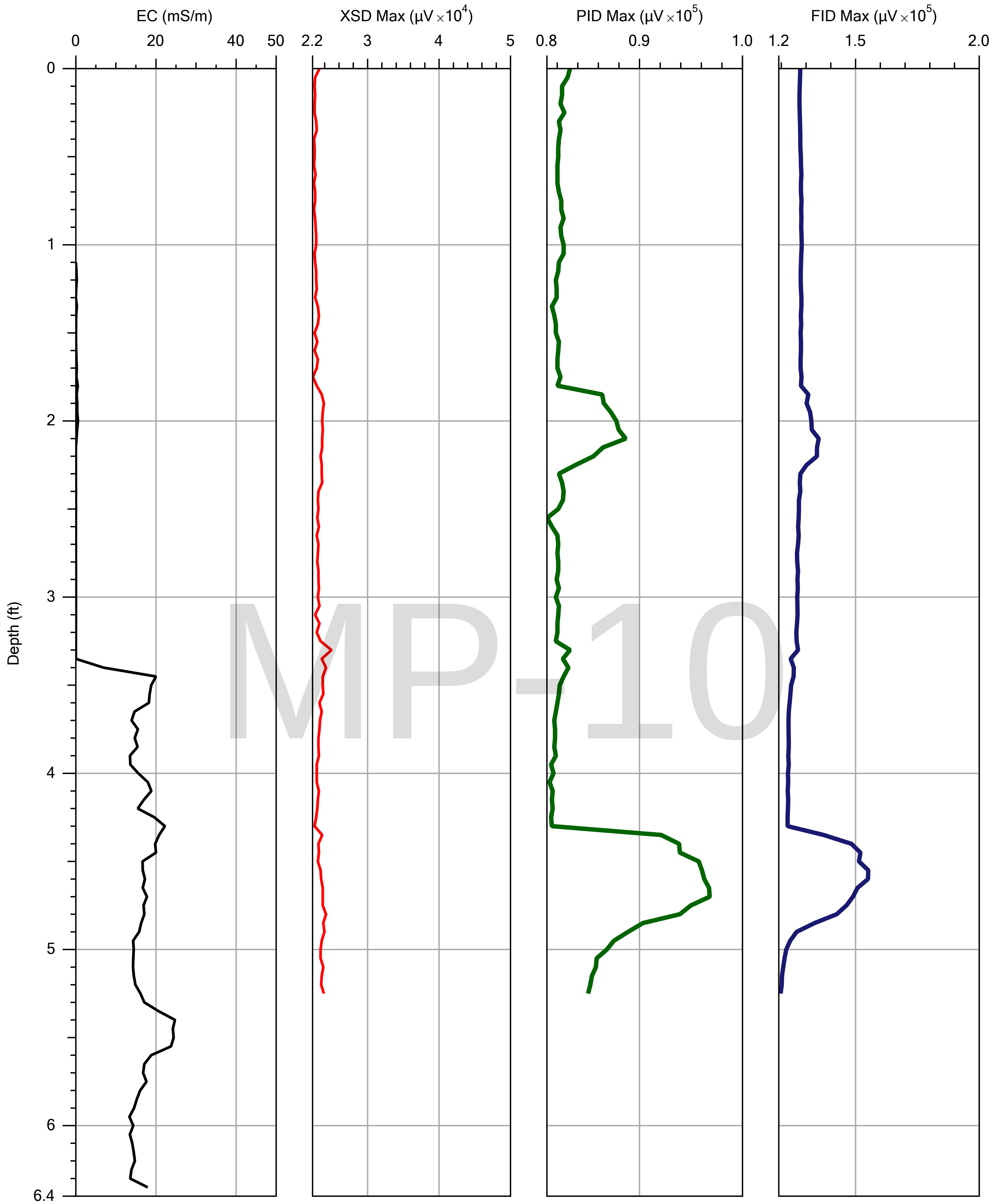

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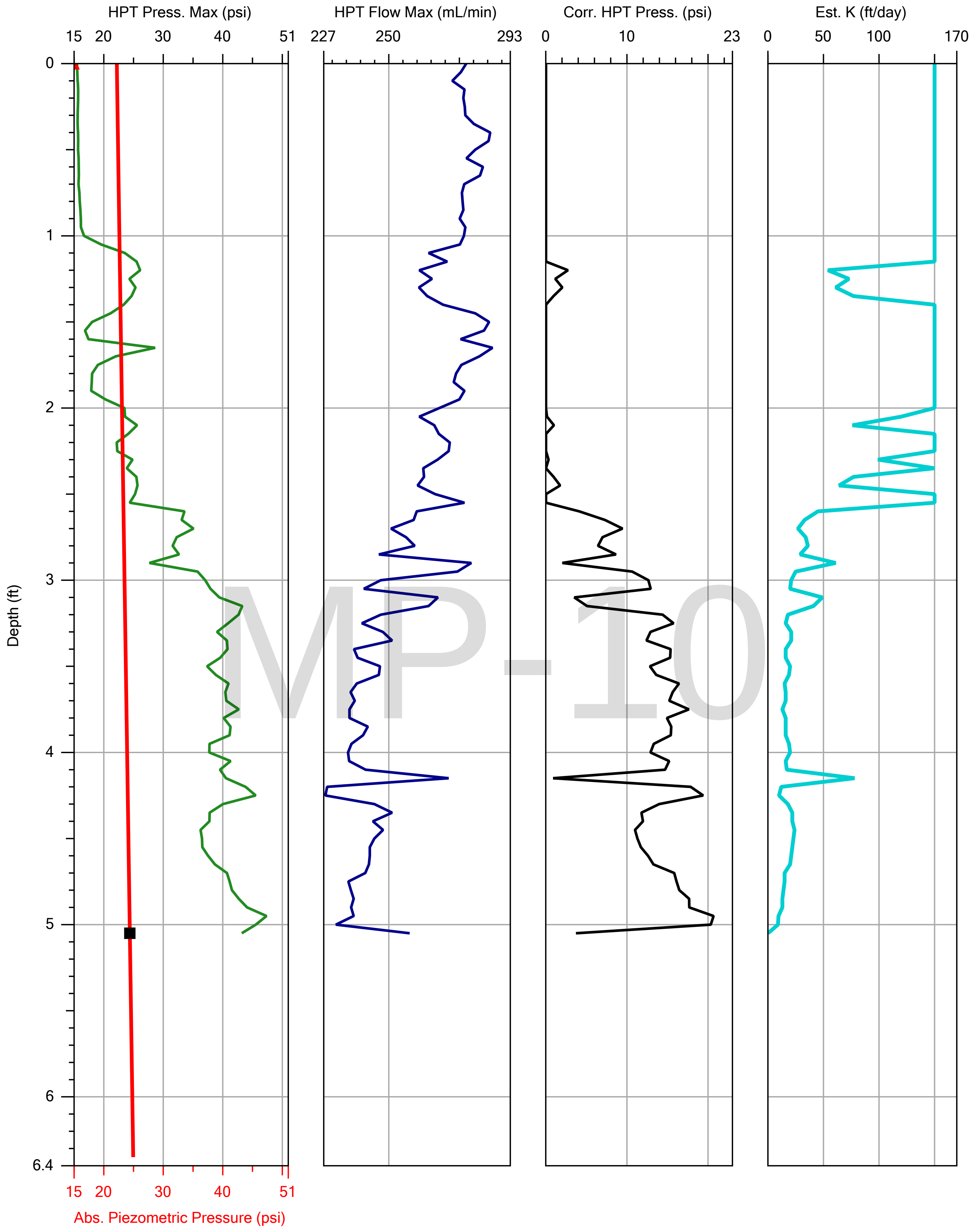

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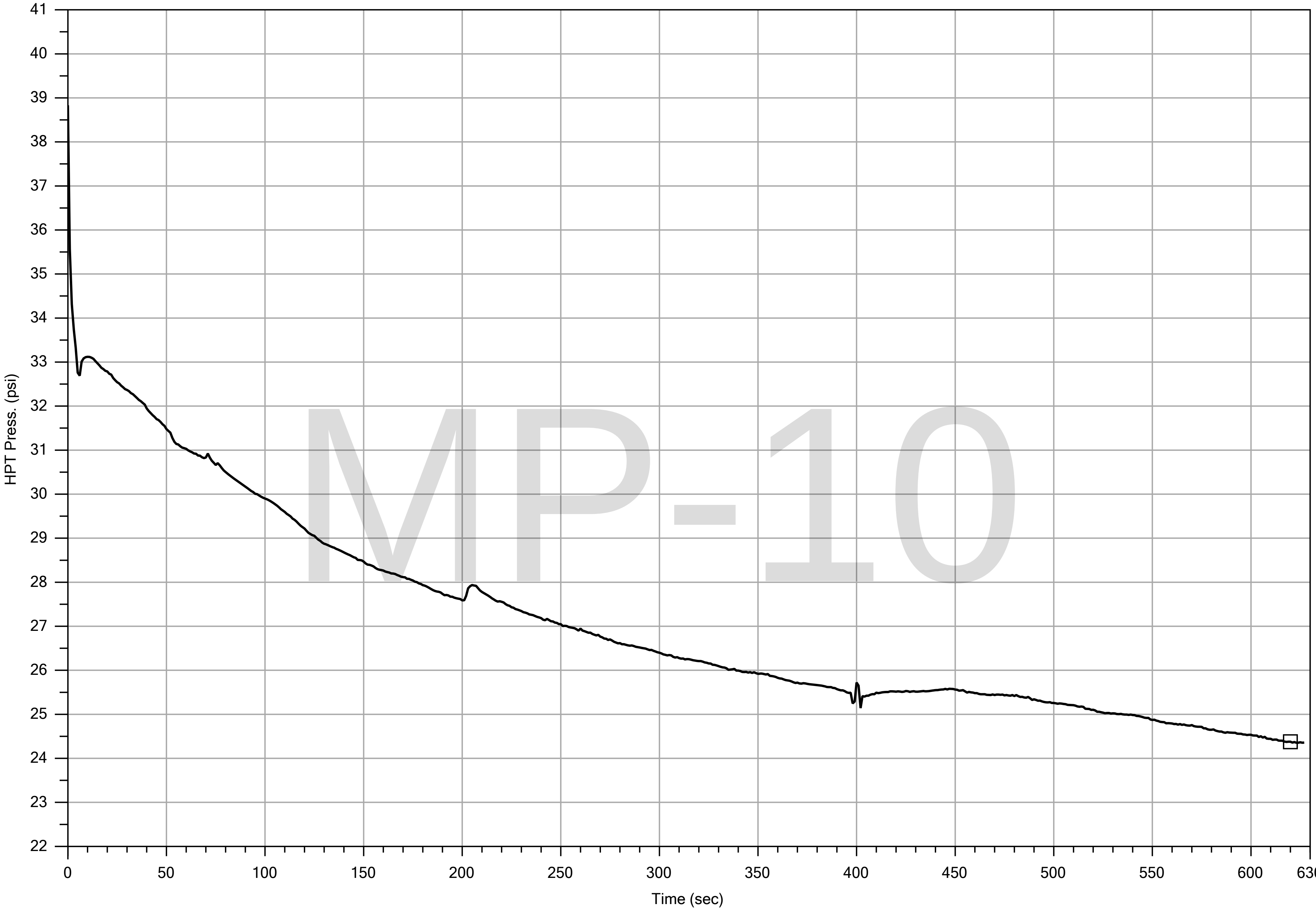

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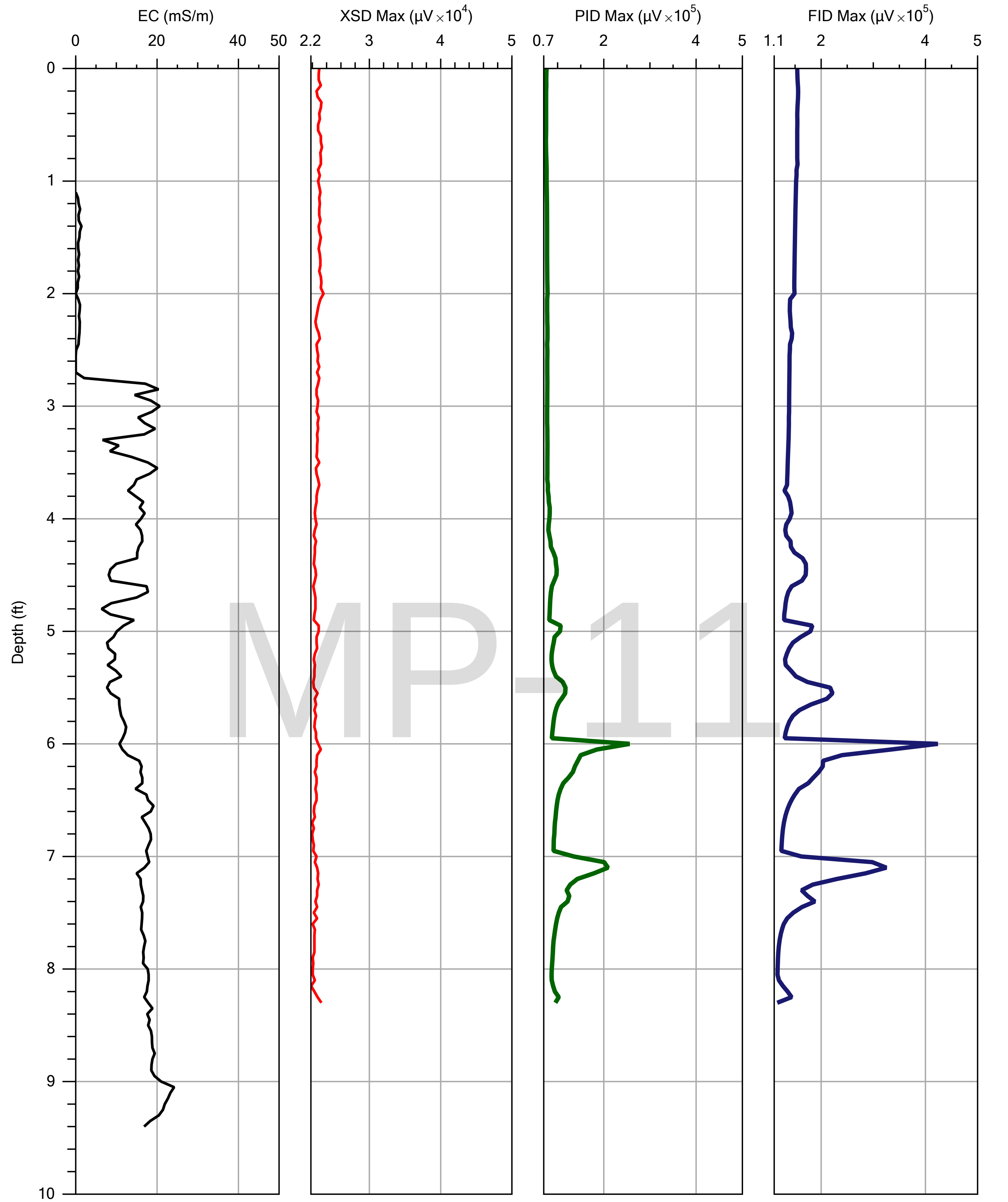

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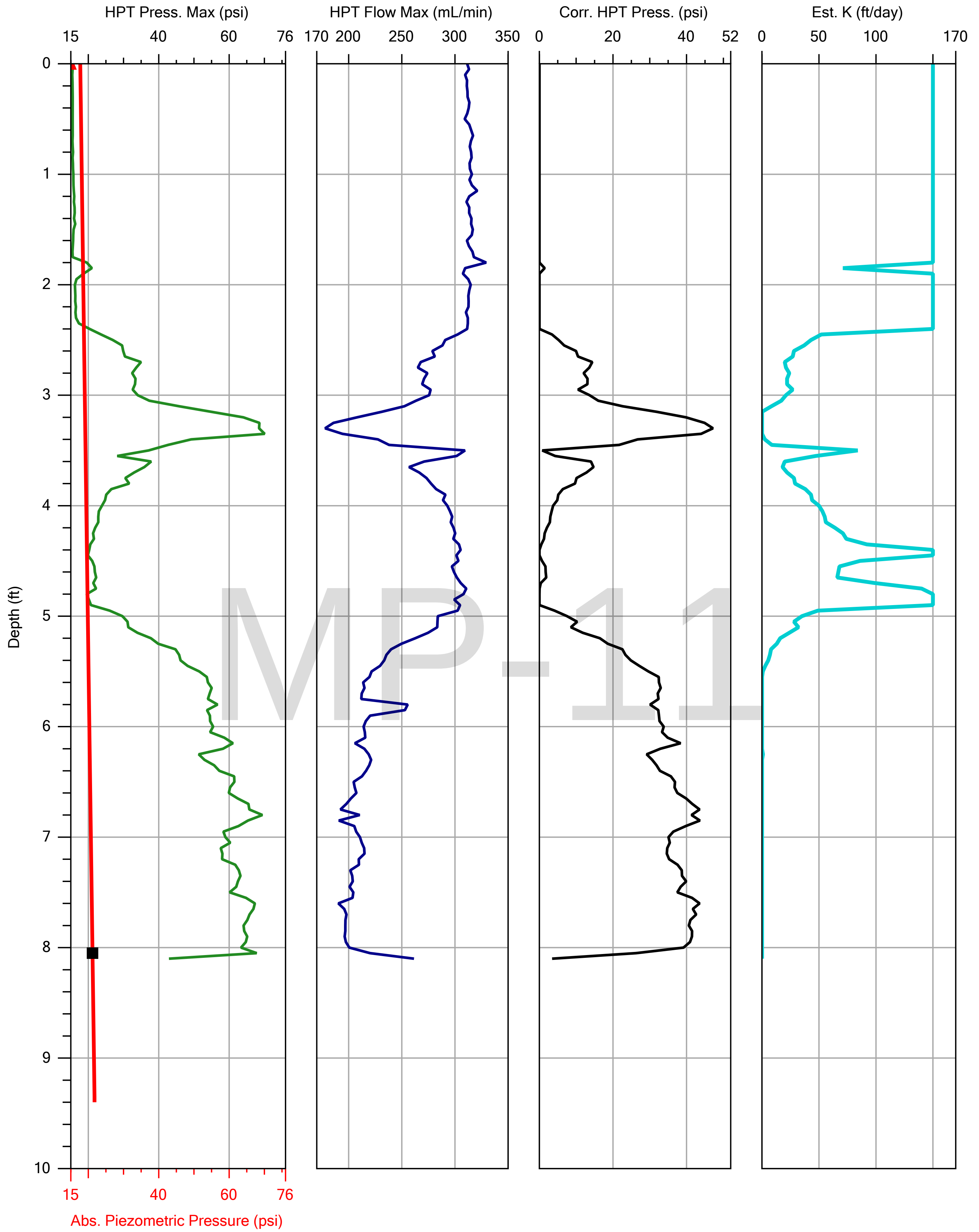

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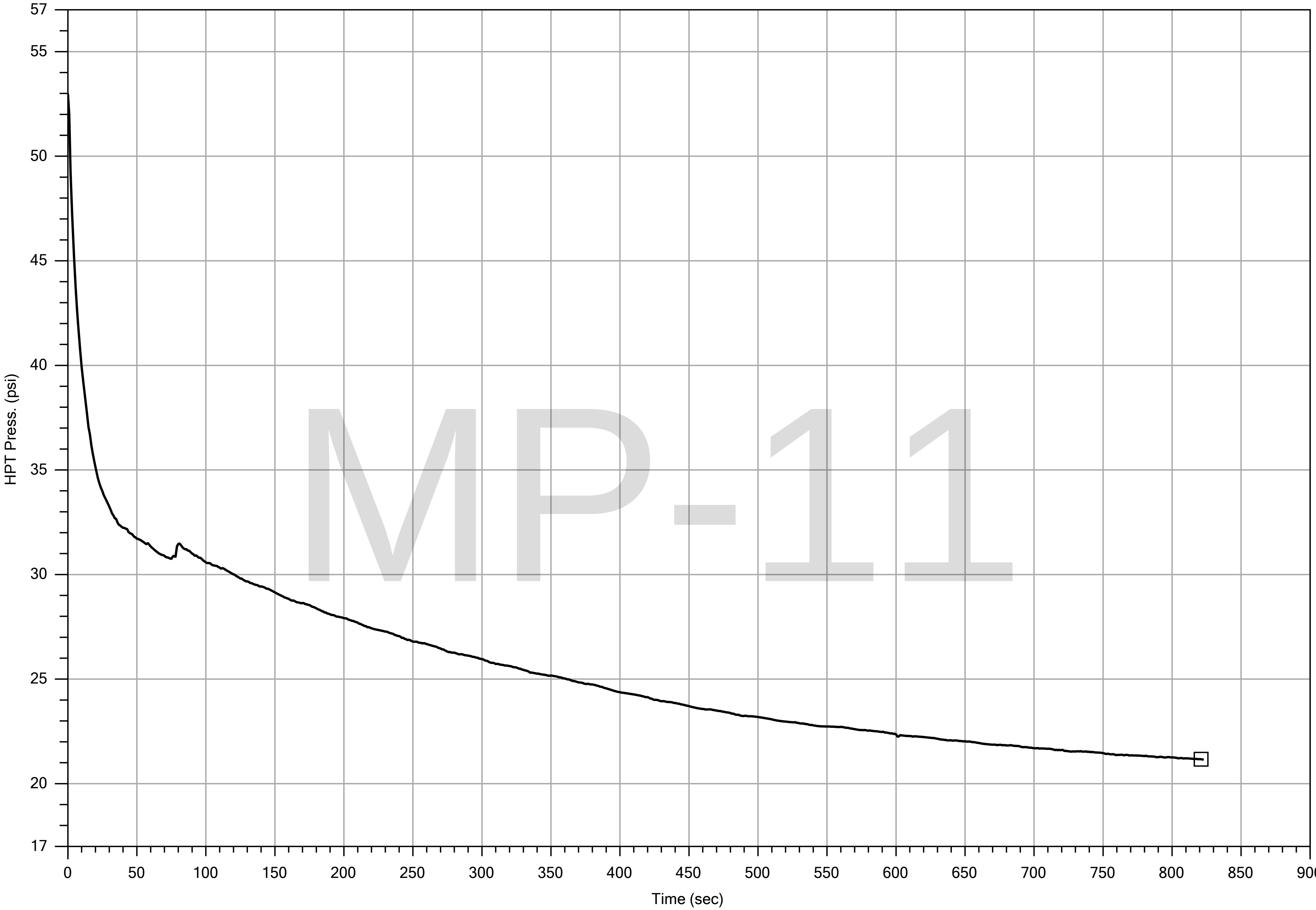

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HPT DISSIPATION (SINGLE CASE)

Company: ZEBRA	Operator: Zack	File: MP-11.TIM	Date: 10/1/2015
Project ID: 203-15-7097	Client: AMEC	Location:	Sensor: HPT Press.
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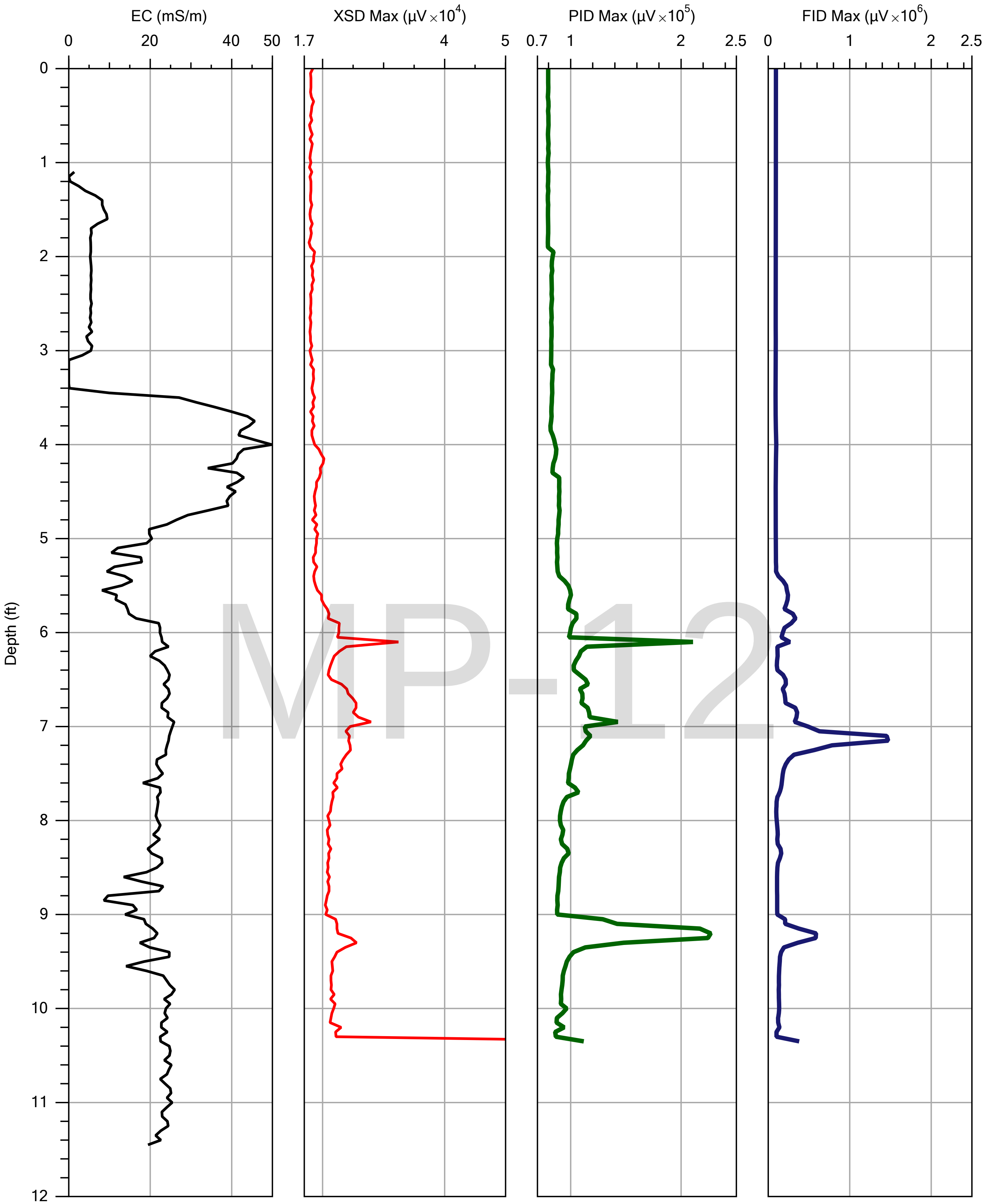

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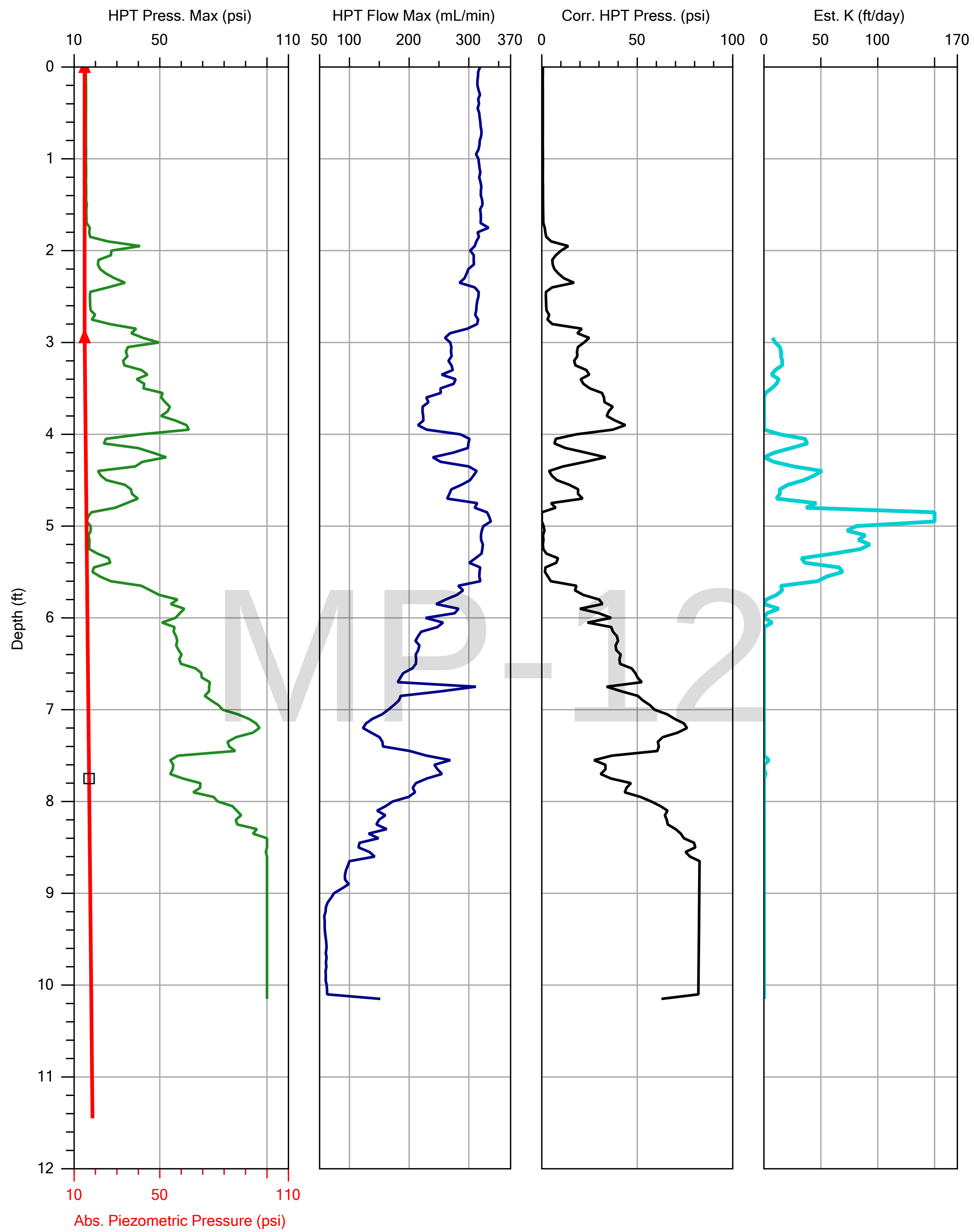
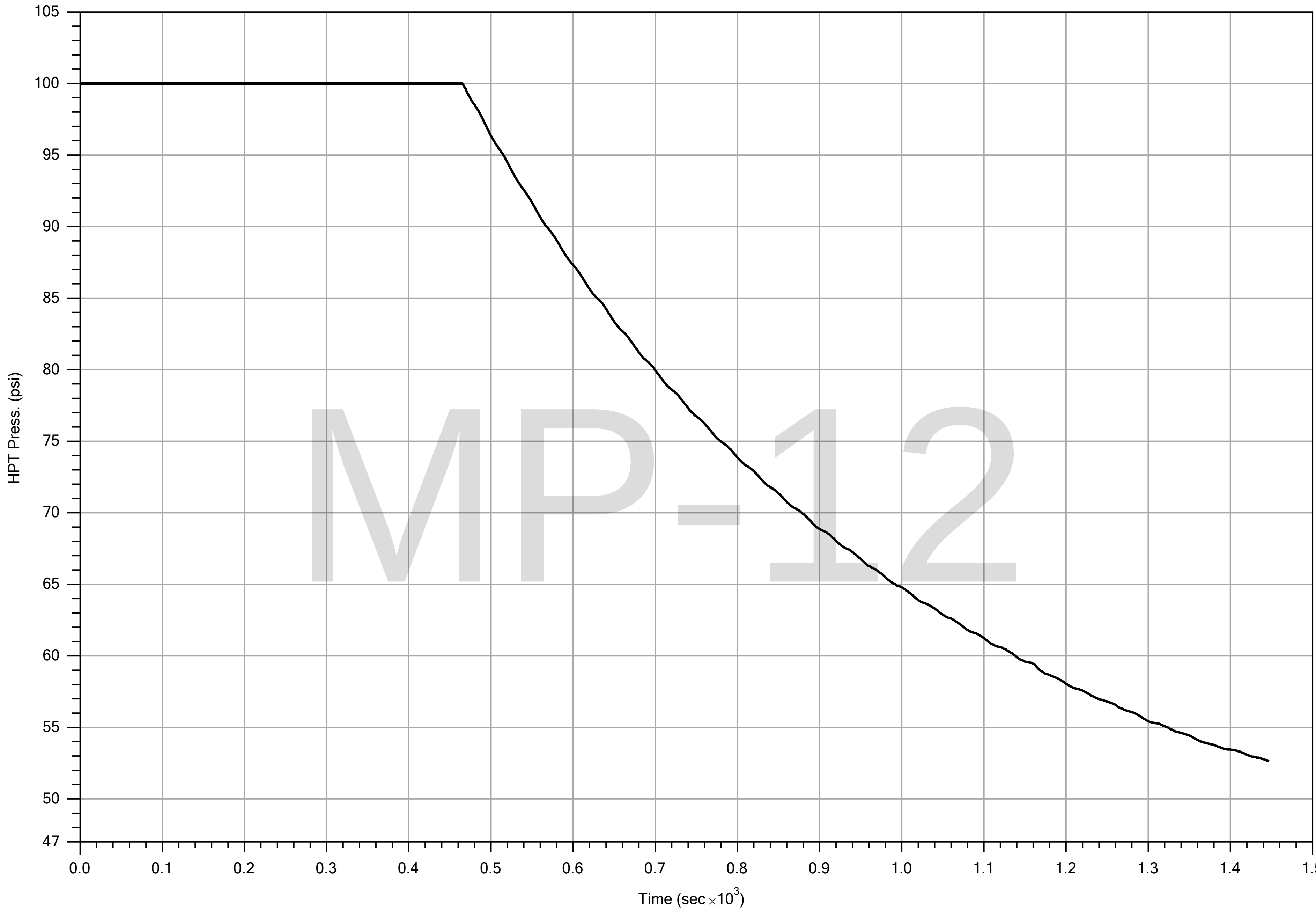
		Location:

ZEBRA Technical Services - Subsurface Sampling, Injections and Data Collection for Environmental Professionals Since 1992.



		File: MP-12.MHP
Company: ZEBRA	Operator: Zack	Date: 10/1/2015
Project ID: 203-15-7097	Client: AMEC	Location:

ZEBRA Technical Services - Subsurface Sampling, Injections and Data Collection for Environmental Professionals Since 1992.



HPT DISSIPATION (SINGLE CASE)

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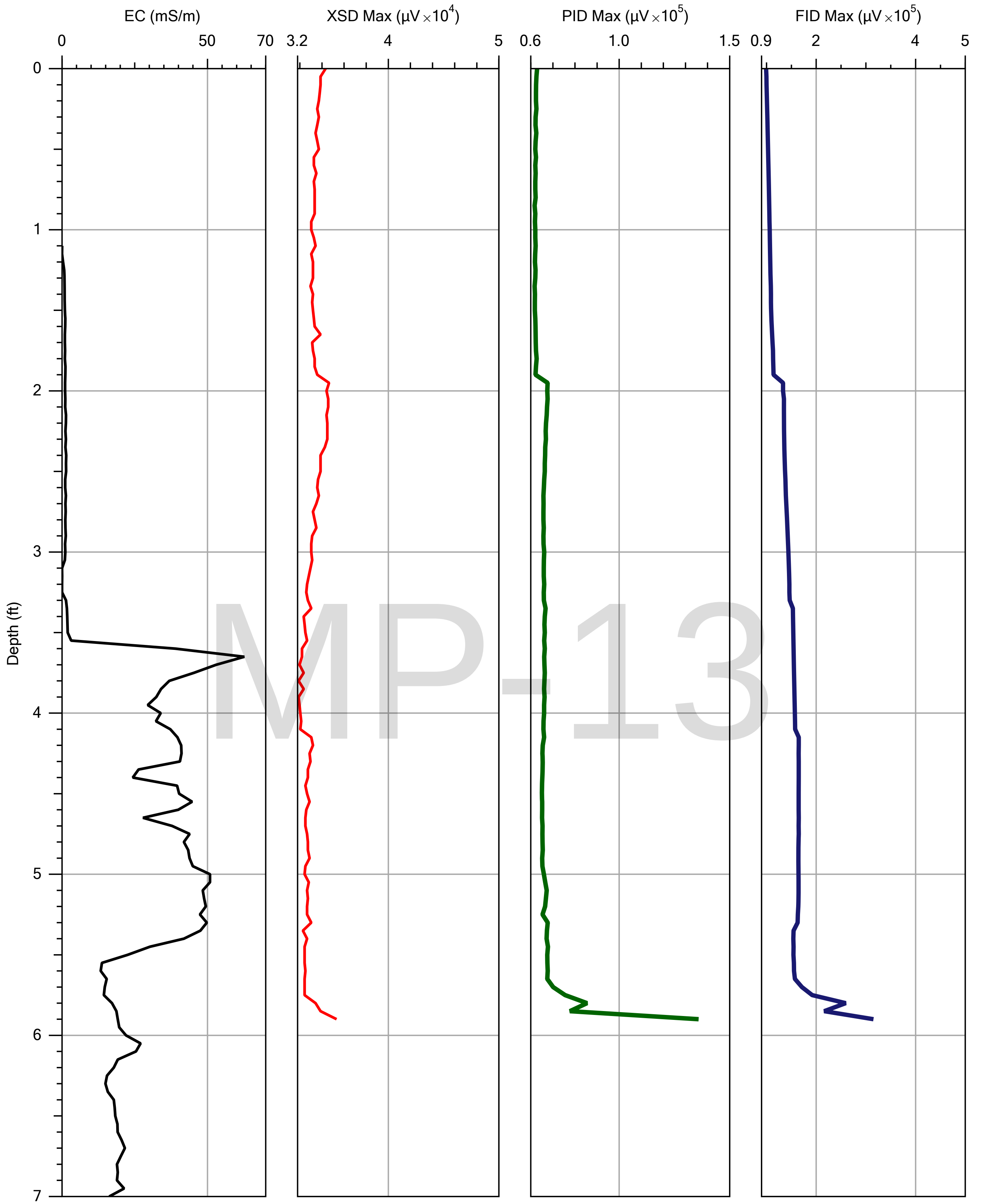

ZEBRA

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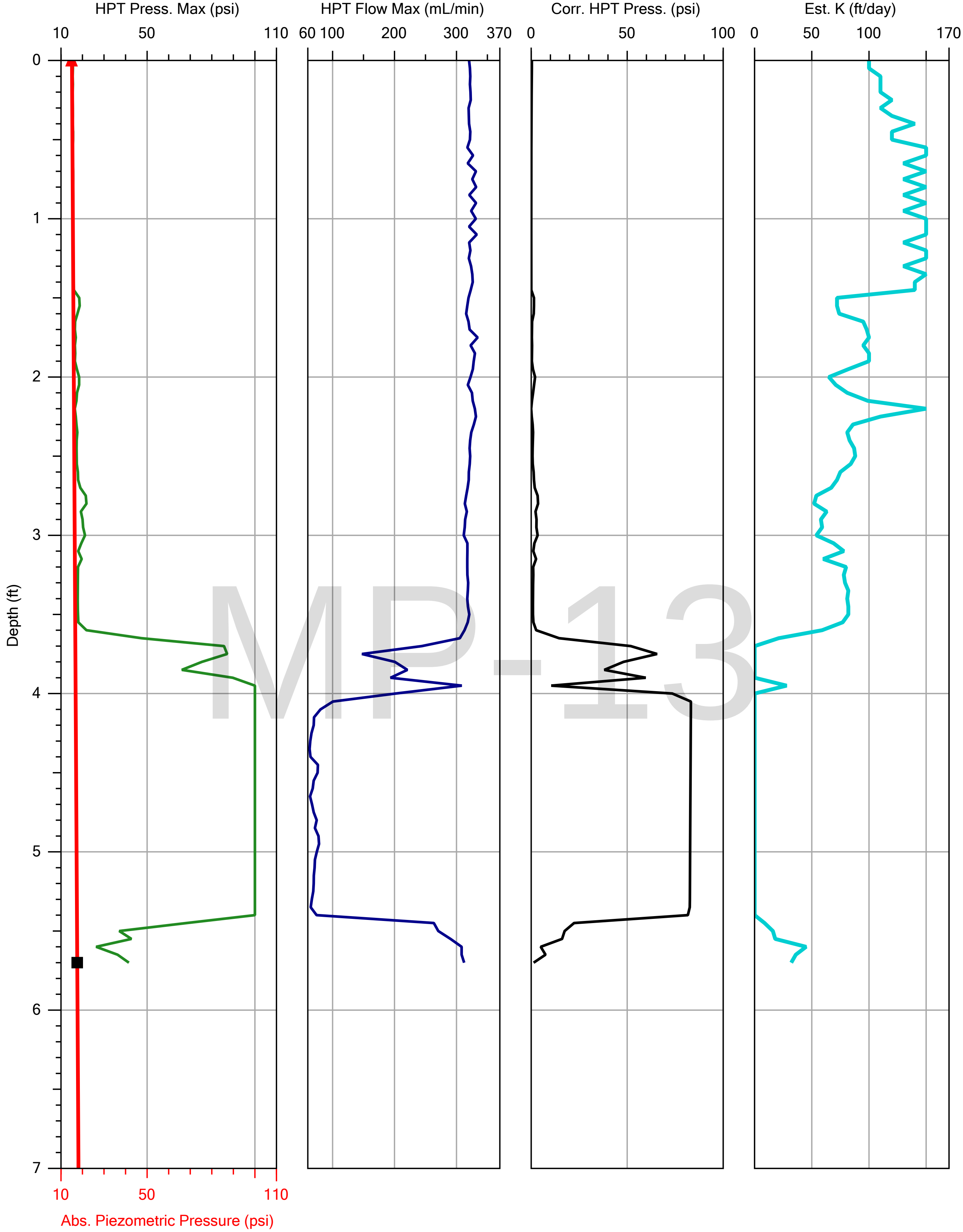

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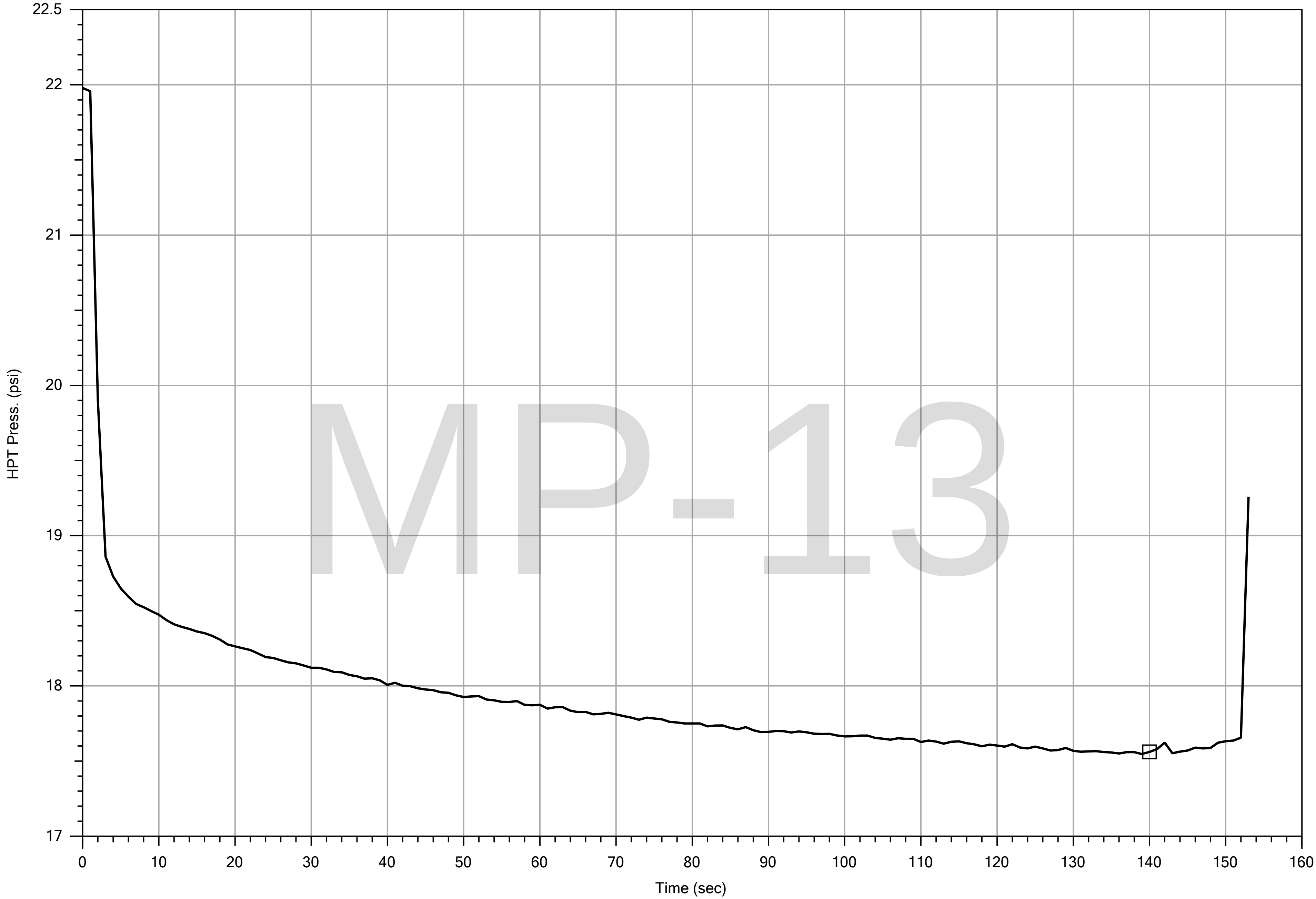
Project ID: 203-15-7097	Client: AMEC	Location:



HPT DISSIPATION (SINGLE CASE)

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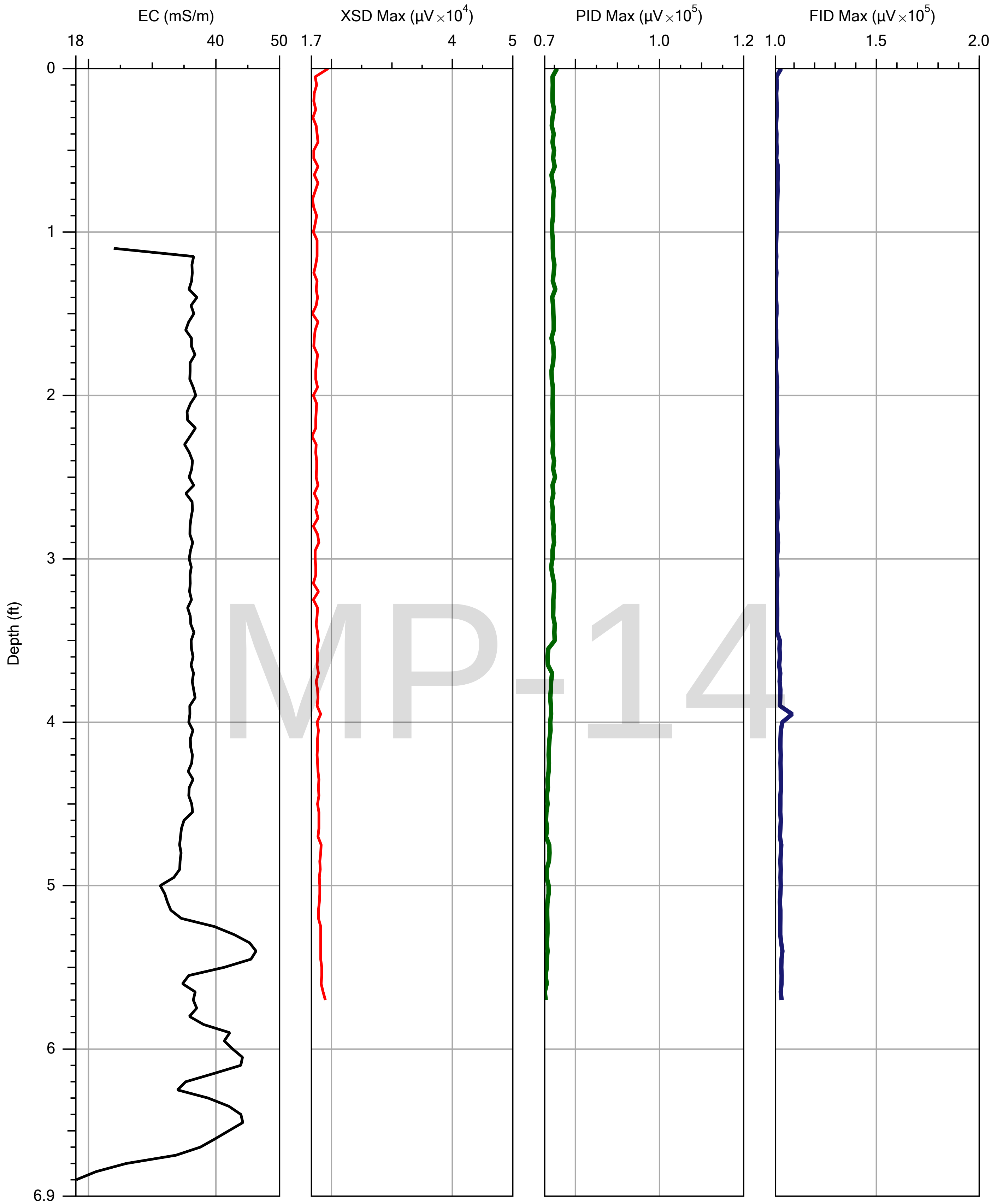

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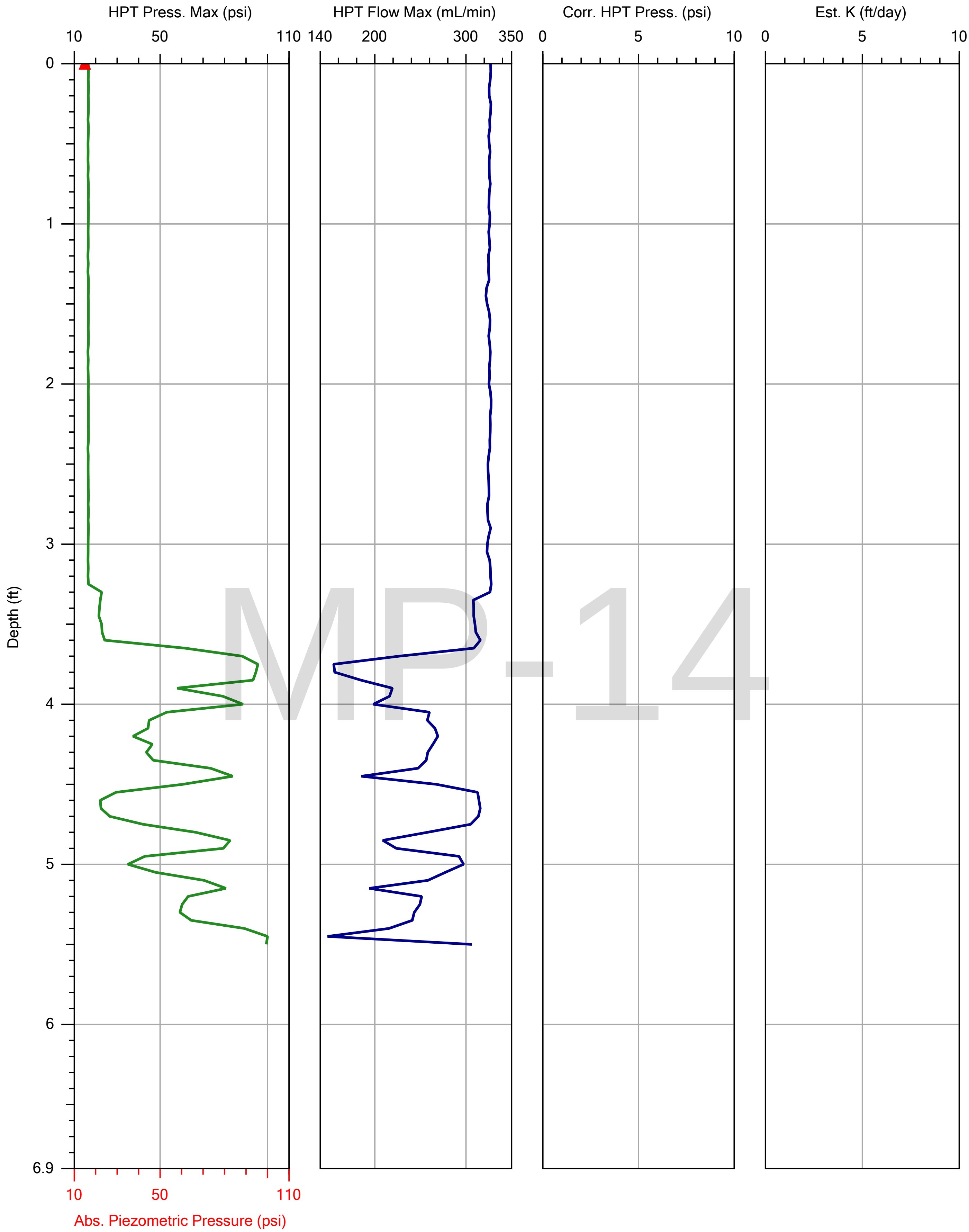

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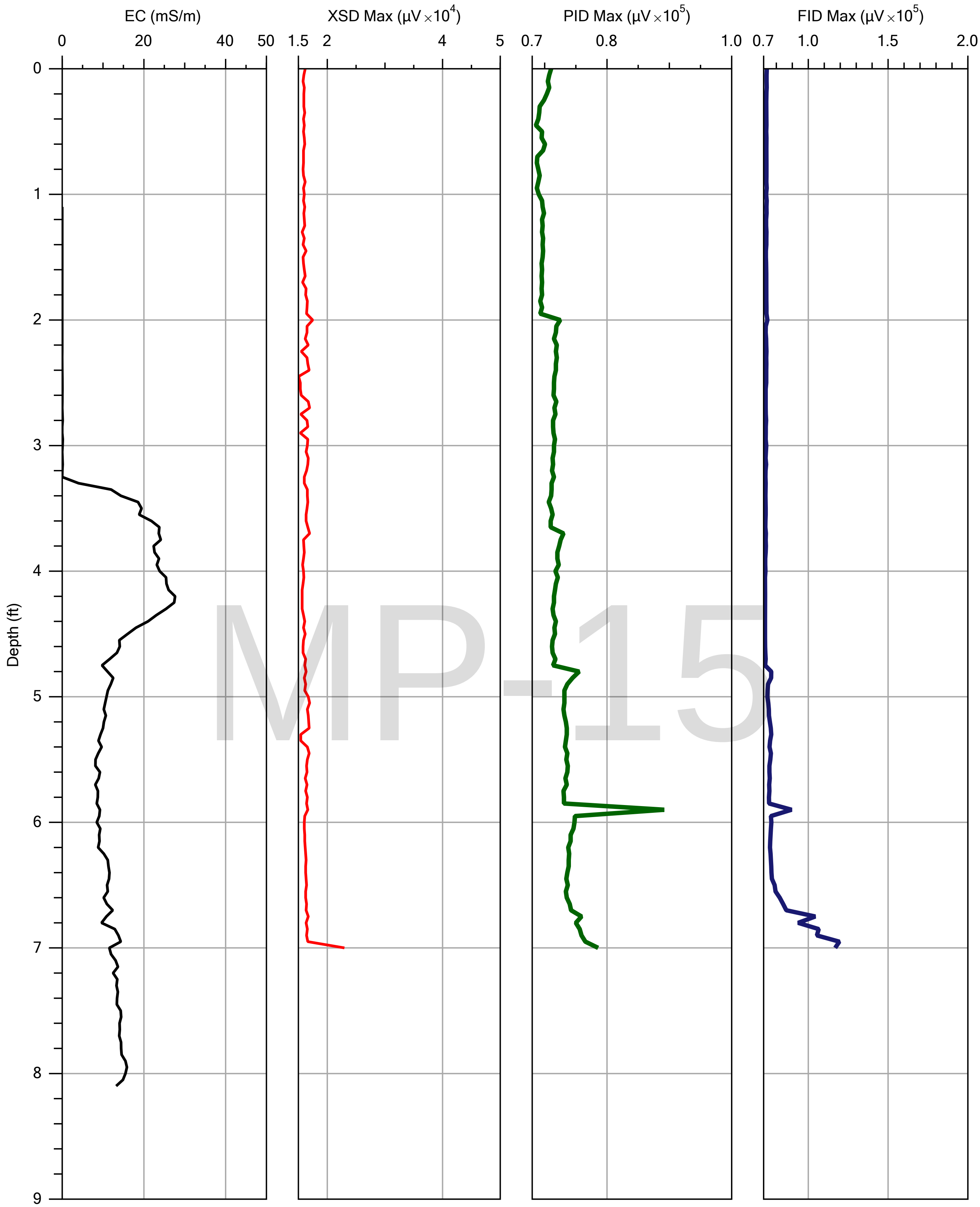

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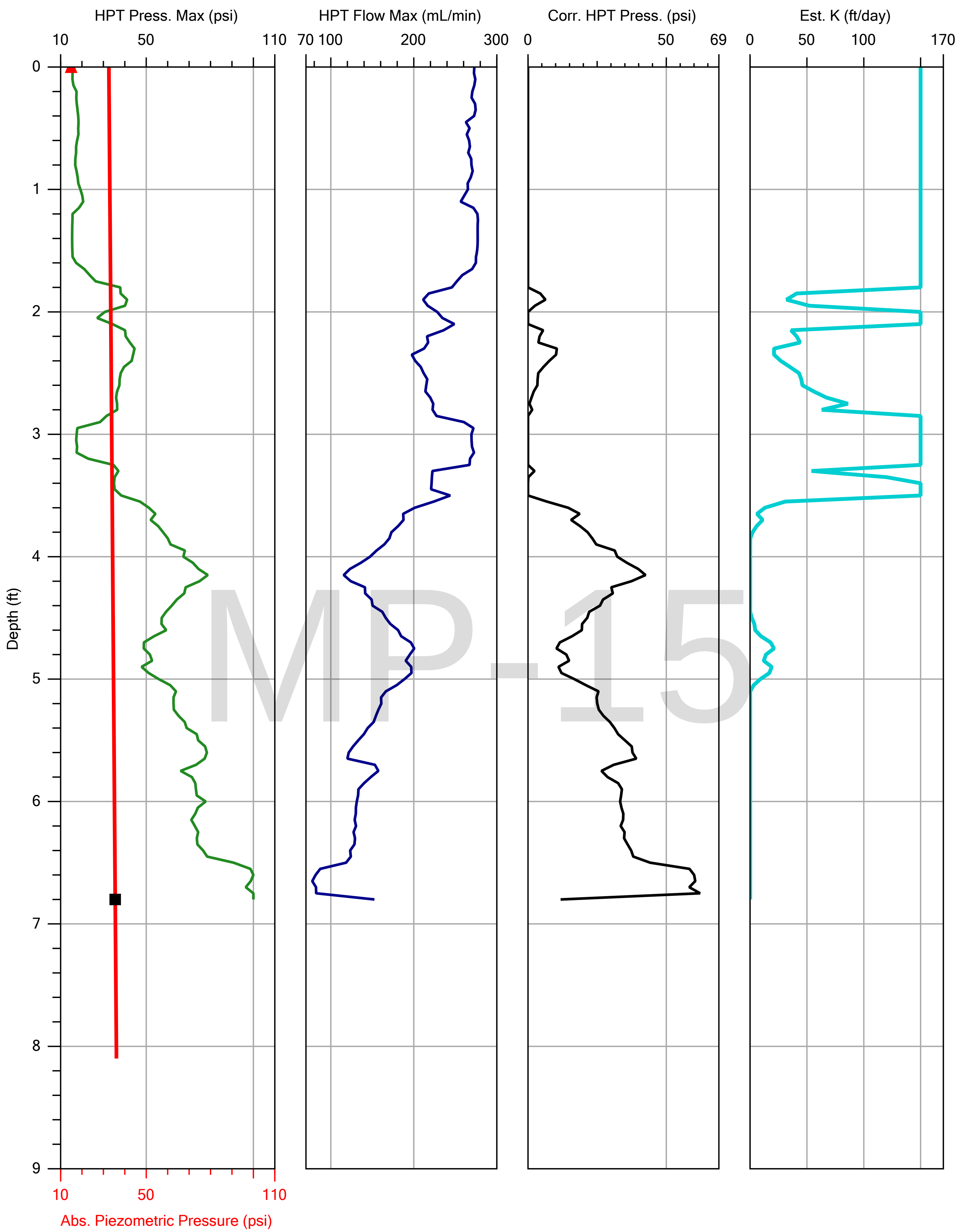

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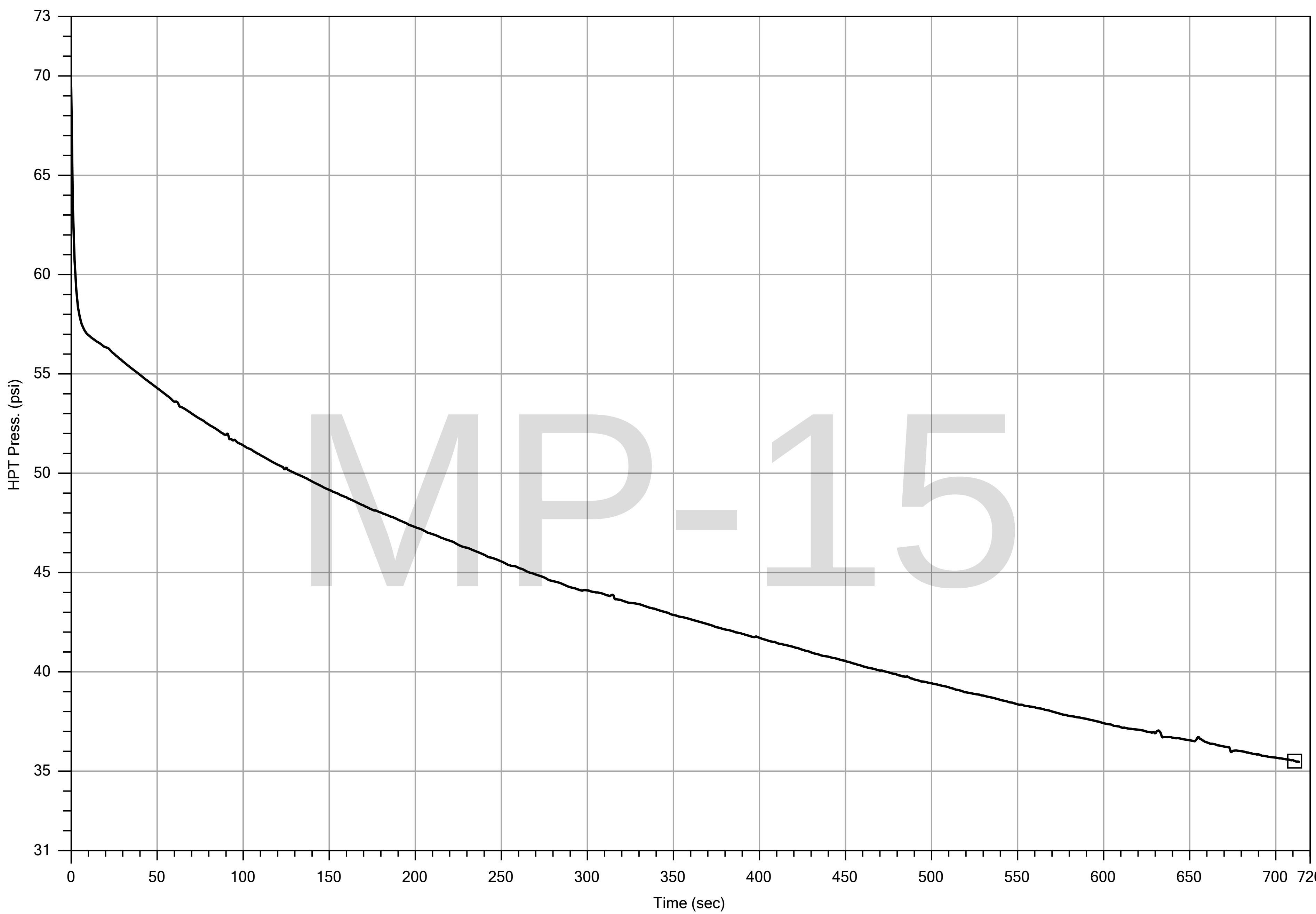


ZEBRA

HPT DISSIPATION (SINGLE CASE)

		File: MP-15.TIM	Date: 10/1/2015
Company: ZEBRA	Operator: Zack	Location:	Sensor: HPT Press.
Project ID: 203-15-7097	Client: AMEC	Depth: 6.82 ft	Test: 1

APPENDIX E

BOREHOLE GEOPHYSICAL REPORT

BOREHOLE GEOPHYSICAL LOGGING
OF SIX BEDROCK BOREHOLES
AT THE
MOHONK ROAD INDUSTRIAL SITE
HIGH FALLS, NEW YORK

Northeast Geophysical Services
4 Union Street, Suite 3
Bangor, Maine 04401
2016

BOREHOLE GEOPHYSICAL LOGGING
OF SIX BEDROCK BOREHOLES
AT THE
MOHONK ROAD INDUSTRIAL SITE
HIGH FALLS, NEW YORK

Introduction

At the request of AMEC Foster Wheeler, six bedrock boreholes totaling about 668 lineal feet located at the Mohonk Road Industrial Site in High Falls, New York were geophysically logged by Northeast Geophysical Services (NGS). The boreholes are designated as ERT-1, MW-5R, MW-7R, SVE-19, SVE-20 and SVE-21. The boreholes were logged between September 8th and September 22nd, 2015.

Caliper, temperature, fluid conductivity, single-point resistance (SPR), spontaneous potential (SP), natural gamma and heat-pulse flowmeter measurements were collected from each of the boreholes. In addition, acoustic televiewer (ATV) and optical televiewer (OTV) images were generated for each borehole. The results of the geophysical logging were used to help select packer sample locations in boreholes ERT-1, MW-5R and MW-7R.

Summary of Results

The results of the geophysical logging of the six boreholes including the packer sample locations in boreholes ERT-1, MW-5R and MW-7R are attached to this report. Attachment A contains data from MW-5R, Attachment B contains data from ERT-1, Attachment C contains data from MW-7R and so forth. For each borehole the data are presented in a series of logs (Plates 1-4) that show the results of the geophysical measurements. Tables that provide the depth and calculated strike and dip of each identified feature and rose and polar plots of planar features for each borehole are also presented in the attachments.

The main objective of the geophysical logging was to identify transmissive fractures in the boreholes. The areas considered most likely to be transmissive are highlighted on Plate 1 in each attachment. There are probably other transmissive zones in the boreholes but these are the most likely areas based on the geophysics.

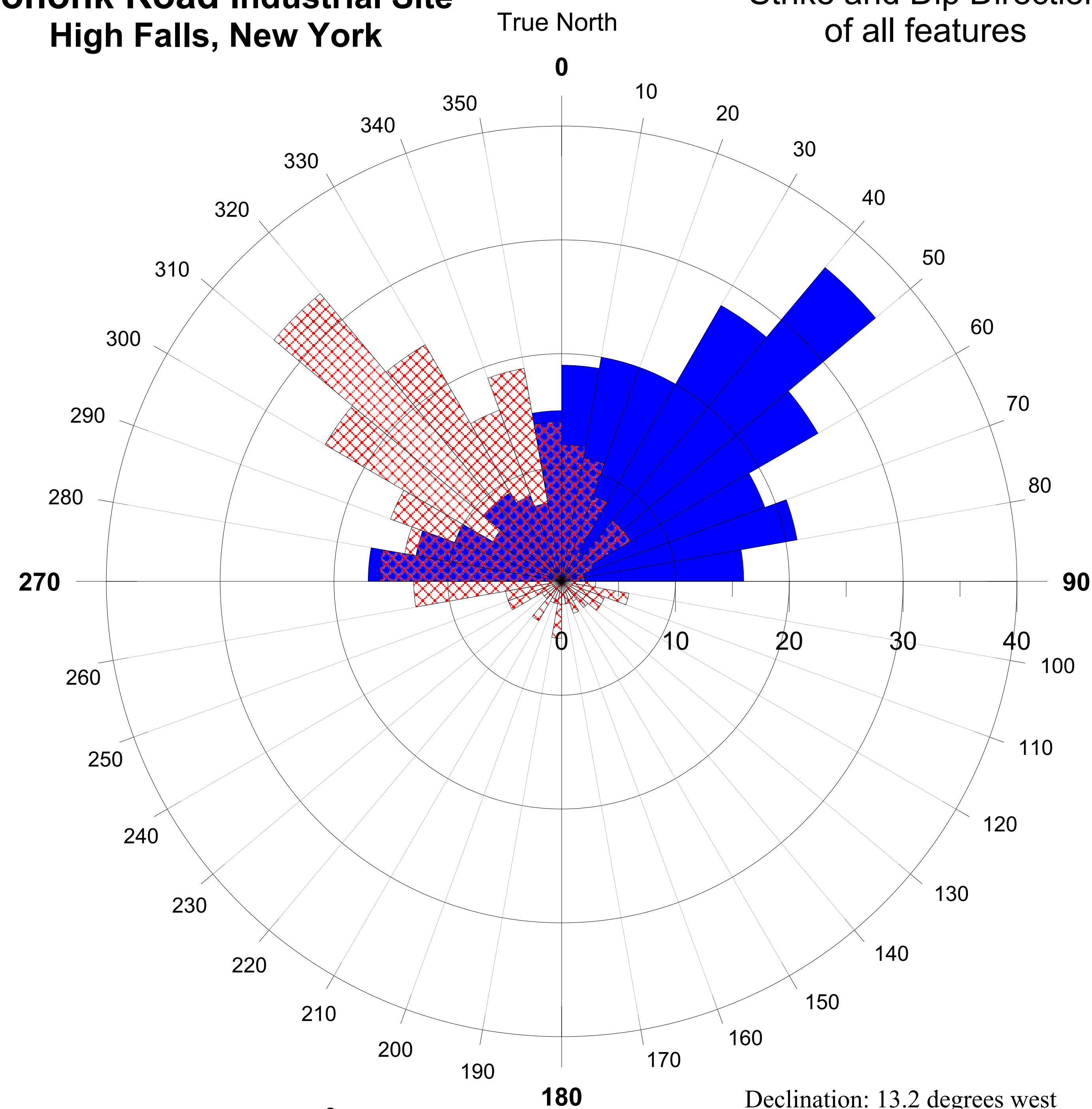
Figure 1 (page 2) is a rose plot of the strike and dip angle of all 300 interpreted features measured in the six boreholes logged by NGS. This plot shows that there is a wide range of orientations but a majority of the planar features generally strike 45° to the northeast and dip a median of 11° towards the northwest. This probably represents the bedding or foliation of the bedrock.

Figure 2 (page 3) is an upper hemisphere polar plot showing the dip amount and dip direction of the planar features in the boreholes interpreted to be likely or possibly transmissive. This graph shows that most of the transmissive fractures have a similar orientation to the bedding or foliation of the rock which strikes to the northeast and has a shallow dip to the northwest. However, there are some fractures that dip west, north and south also.

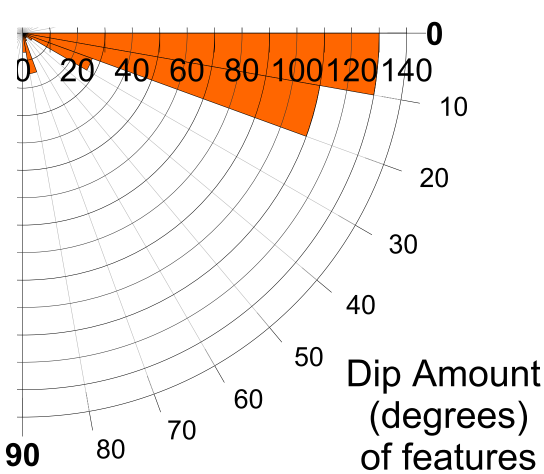
Northeast Geophysical Services

Mohonk Road Industrial Site
High Falls, New York

FIGURE 1
Strike and Dip Direction
of all features



Declination: 13.2 degrees west



Explanation

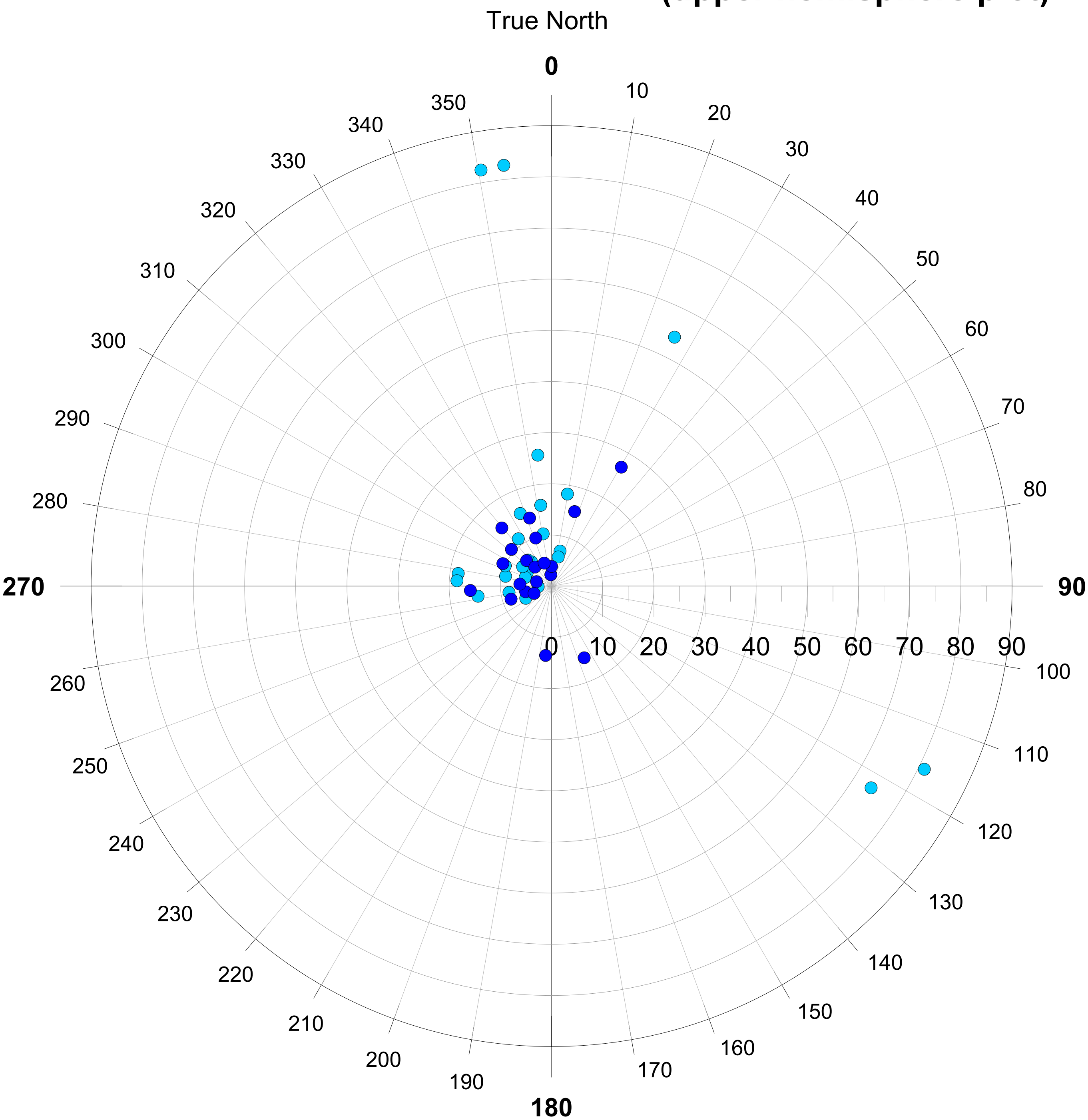
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 300 measurements
in six boreholes: MW-5, MW-7
ERT-1, SVE-19, SVE-20
and SVE-21

Northeast Geophysical Services

Mohonk Road Industrial Site
High Falls, New York

Figure 2
Dip Amount and Dip Azimuth of planar features considered likely or possibly transmissive (upper hemisphere plot)



Declination: 14.8 degrees west

Explanation -

- Possibly transmissive
- Likely transmissive

Based on 46 measurements
in six boreholes: MW-5, MW-7
ERT-1, SVE-19, SVE-20
and SVW-21

Geophysical Methods and Instrumentation

The boreholes were logged with a Mount Sopris Matrix digital logger. The boreholes were logged with a caliper tool, fluid temperature/fluid conductivity tool, a SPR/SP tool and the OTV and ATV tools. The final log on each borehole was the flowmeter measurements. Prior to entering the borehole each tool was decontaminated using soap (alconox) and deionized water rinse. Following is a brief description of each parameter that was measured and how that information is used to locate possible bedrock fractures.

Caliper measures the borehole diameter. Fractures are often revealed on the caliper log as abrupt widenings of the borehole.

Temperature (in degrees Centigrade [ºC]) is measured with the probe going down each hole. Generally, temperature rises smoothly with depth at a rate of about 1.0º C per 100 feet due to the local geothermal gradient. Areas where water may be entering or exiting the borehole are sometimes revealed on the temperature log as abrupt temperature changes or sometimes as temperature gradient changes. Other factors that can affect the temperature log besides transmissive fractures include variations in the thermal resistivity of the rock with depth along the borehole, surface climatic changes, thermal effects of drilling activity, and localized heat sources such as radionuclides in the rock or cement setting outside the casing.

Single-point-resistance (SPR) measures the electrical resistance (in ohms) between the probe and a surface electrode. Water-filled fractures will often appear as abrupt spikes of relatively low resistance on this log.

Spontaneous potential (SP) measures the natural electrical currents (in milli-volts) in the subsurface. Causes of SP can be due to electrochemical changes or oxidation-reduction potentials that may exist between different layers. Another cause for SP can be streaming potentials caused by fluid movement into or out of a bedrock fracture. Typically SP anomalies appear as spikes towards the left (lower voltage) on the log.

Fluid conductivity measures the conductivity (in micro Siemens) of the water in the borehole. Fluid conductivity can be useful in identifying transmissive fractures because water entering the borehole through fractures sometimes has a different conductivity than the water that is already in the borehole.

Natural gamma measures the gamma radiation in counts per second (cps) that is being emitted from the materials located next to the probe. Natural gamma is generally used as a way to distinguish between different lithologies or soil types. This is because different materials often have different percentages of radioactive elements (mainly potassium-40 and to a lesser extent uranium-238 and thorium-232). For example, shale, because of its higher clay content, is usually higher in radioactivity than sandstone or limestones. Bedrock fractures or fracture zones are sometimes distinguished by the gamma log because fractures often contain weathered clay minerals which can have higher amounts of potassium or uranium than the unfractured rock.

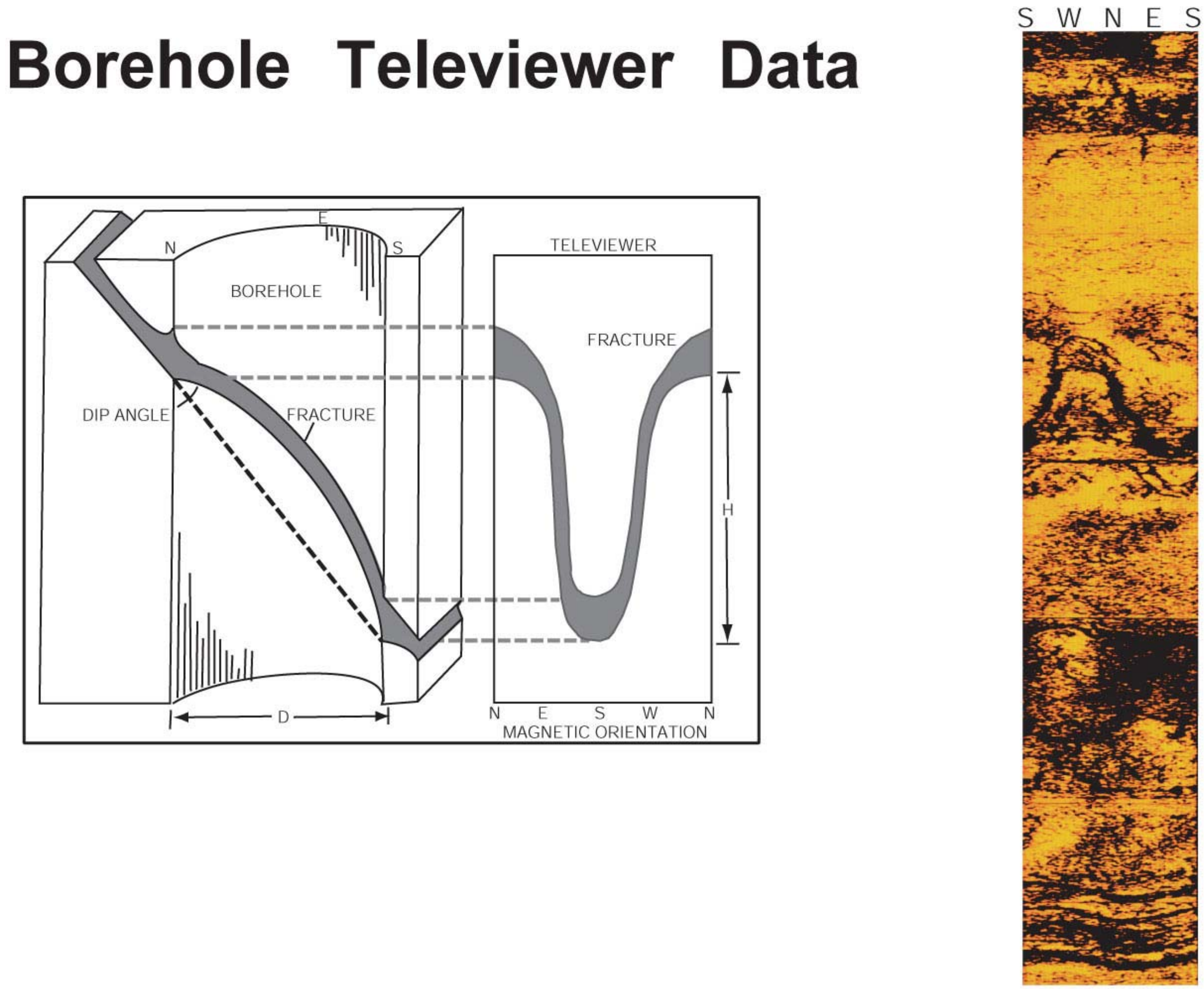
The optical televiewer (OTV) log provides a digital optical image of the borehole walls. The OTV can identify planar features such as fractures, bedding surfaces, and joints and the strike, dip direction and dip angle.

The acoustical televiewer (ATV) log provides an acoustical image of the borehole walls. The ATV works by scanning the borehole wall with an acoustic beam that is produced by a rapidly rotating piezoelectric source. Similar to the optical televiewer, planar features such as fractures, bedding surfaces and joints can be identified with the ATV tool and the strike, dip direction and dip angle of these features can often be determined.

The optical (OTV) and acoustical (ATV) televiewer logs are somewhat duplicative in that they both can provide similar information. However, there are advantages and disadvantages to both tools. The ATV requires the borehole to be water filled and will not provide information above the water level. The OTV can work in air or water but is not effective in cloudy, turbid water whereas the ATV will work fine in cloudy water.

The ATV can be better at discerning voids, cracks and fractures whereas the OTV can be better at discerning lithology. Also, sometimes water-bearing fractures are rust stained, which can be seen by the OTV.

The ATV (and OTV) data are presented as "unwrapped" images of the borehole wall that are oriented to magnetic north. The dip angle and dip direction of any planar feature that intersects the borehole can be measured from this image. The following figure illustrates this.



Each identified feature was digitized using WellCad software which then calculates the dip and dip direction of the features taking into account the borehole tilt and orientation.

The temperature, caliper, SPR, fluid conductivity, ATV and OTV logs were examined and possible bedrock fractures were identified. This information was used to select measurement locations for the flowmeter instrument. Generally, flowmeter measurements were taken in the zone above and below locations where potential fractures might exist in the boreholes.

Flowmeter Measurements

Flowmeter measurements of the vertical water flow were made in the boreholes using a Mount Sopris Heat Pulse Flowmeter. This instrument is capable of measuring flow direction in a borehole (up or down) and has a calibrated measurement range of 1.0 to 0.03 gallons per minute (gpm).

Vertical flow in a borehole is caused when two or more transmissive fractures in the borehole are at hydraulic disequilibrium with one another. When this occurs there is a hydraulic gradient developed and water will flow toward the fracture with the lower hydraulic head. When no vertical flow is measured it can mean that there are less than two transmissive fractures in the borehole or that all the fractures in the borehole are at equilibrium with each other.

Flowmeter measurements are made under ambient (unstressed) conditions and then repeated while stressing the borehole by pumping using a small pump situated near the top of the borehole. The effect of pumping is to cause inflow into the borehole from any transmissive fractures which can be identified by the flowmeter measurements.

Borehole Geophysical Results

Composite geophysical logs of the six boreholes are attached to this report (Attachments A through F). The geophysical data for each borehole are presented on a series of plots entitled Plates 1-4. The caliper log is plotted on Plates 1 and 4 for reference.

The first plot for each borehole, Plate 1, is a composite log plot containing the caliper log, heat pulse flowmeter, fluid conductivity, temperature, SPR, SP, gamma logs and a tadpole plot of the dip and dip direction of the interpreted planar features interpreted from the televiewer logs. The blue colored tadpoles represent likely (dark blue) transmissive fractures. The number adjacent to each blue tadpole reference tabulated data for the borehole that provide the strike, dip direction and dip amount of each identified planar feature in the borehole.

One or a combination of anomalous geophysical responses identified physical discontinuities that may represent possible transmissive fractures. These included abrupt widenings in the caliper log, changes in the fluid conductivity log, deflections or gradient changes in the temperature log and the heat pulse flowmeter measurements. The flowmeter log and the temperature and fluid conductivity logs were mainly used to identify transmissive fractures.

Plate 2 is a rose plot of the strike and dip angle of all the interpreted planar features in each borehole.

Plate 3 is an upper hemisphere polar plot of the dip direction and dip amount of planar features in each borehole.

Plate 4 is the televiewer image log plots, caliper log and interpreted structure for each borehole.

Table 1 provides the depth and calculated strike and dip of the planar features in each borehole that have been interpreted from the televiewer logs. These planar features may be fractures or may represent cleavage, joints or bedding planes. The results in Table 1 have been categorized and also have been color-coded on the logs to provide an interpretative range of the likelihood that the associated feature signifies a transmissive fracture as follows:

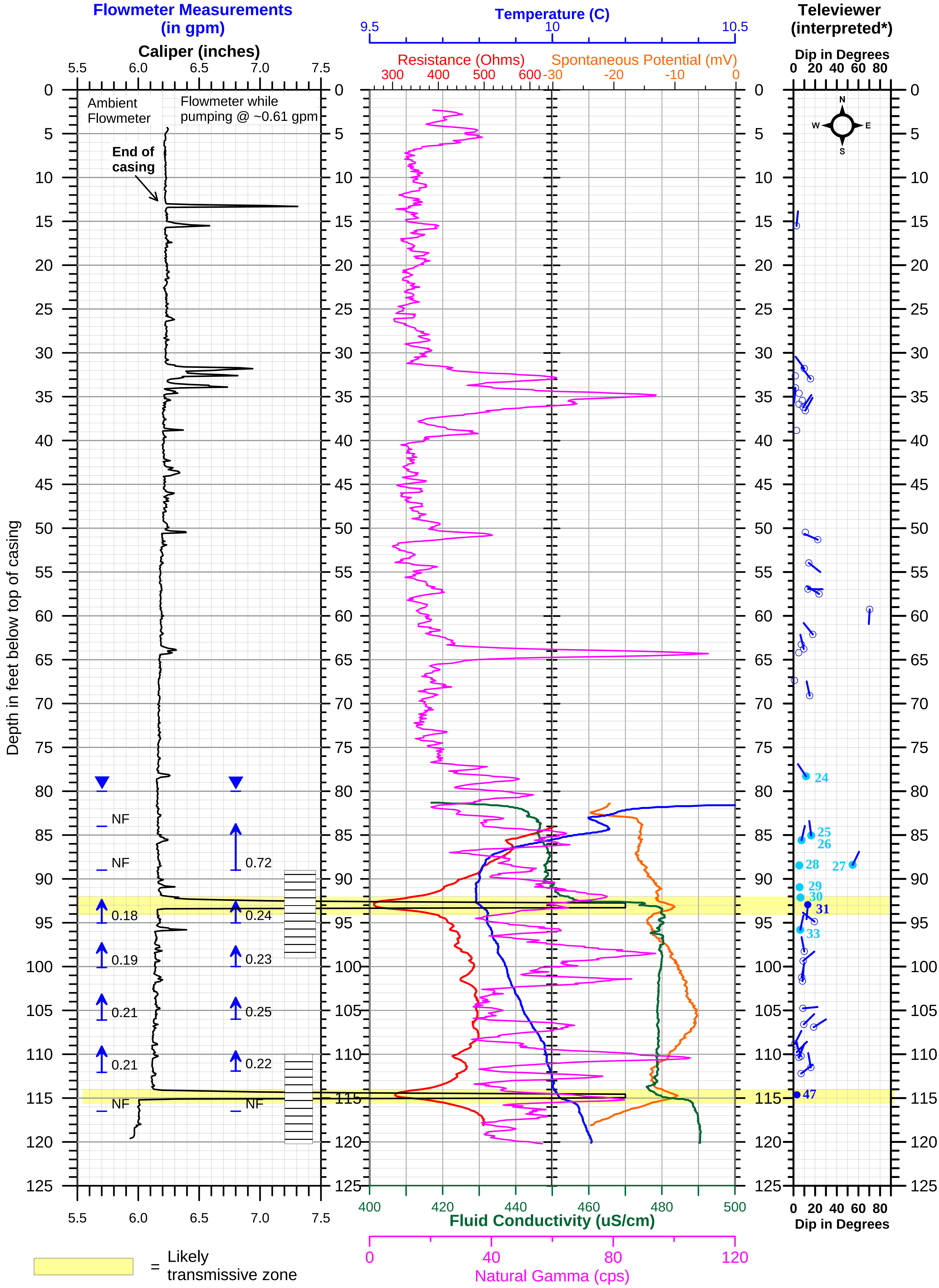
- Dark blue symbol (category 107) - multiple distinct borehole geophysical logging responses indicating borehole enlargement (caliper, SPR, acoustic signal), or evident change in the borehole fluid characteristic (temperature, fluid conductivity, discoloration on the optical log or quantified vertical flow) that provides the strongest data that the indicated bedrock feature represents a likely transmissive water-bearing fracture.
- Light blue symbol (category 108) - less amount of corroborating geophysical data to support that the indicated feature will transmit groundwater compared to the dark blue symbol. However, the televiewer logs show a fairly distinct acoustic signal or optical image that perhaps under a higher stress condition (e.g. pumping rate), vertical flow could be induced in the borehole. Less degree of confidence that the feature represents a transmissive feature.
- Black symbol (categories 100) - bedrock feature interpreted less likely to transmit water; more likely to represent planes of foliation, bedding planes or healed or filled fractures.

It is possible that there are other transmissive fractures in the boreholes but the ones indicated on the logs and tables are considered the most likely based on the geophysical measurements.

Northeast Geophysical Services

Date logged: 9/08/15

MW-5R
Mohonk Road Industrial Plant Site
High Falls, NY



Likely transmissive zone

possible transmissive zone

= packer sample zone

PLATE A-1
MW-5R
Mohonk Road Industrial Plant Site
High Falls, NY

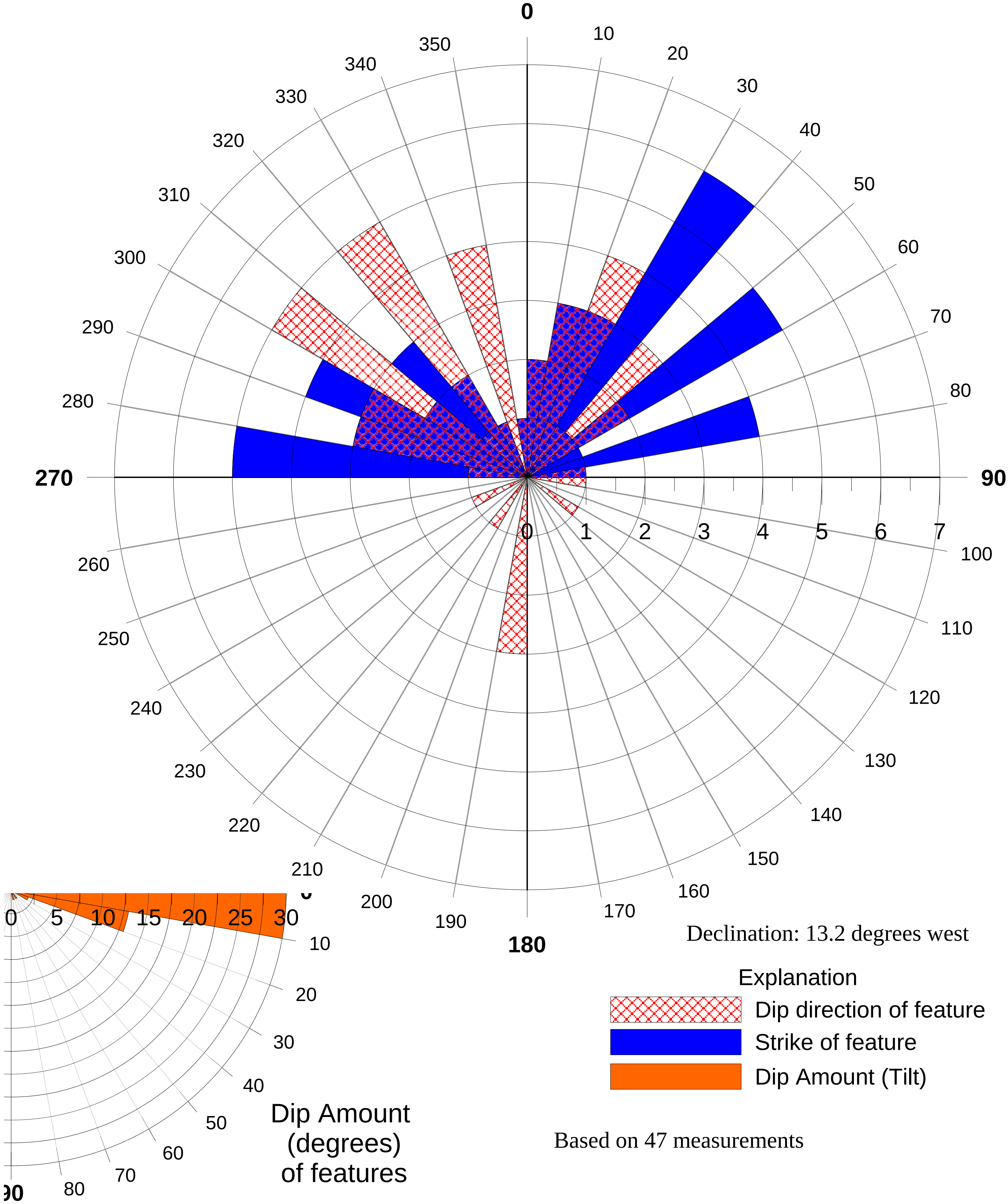
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

Date logged: 9/08/15

Northeast Geophysical Services

Borehole MW-5A
Mohonk Road Industrial Site
High Falls, NY

PLATE A-2
Strike and Dip Direction of all features



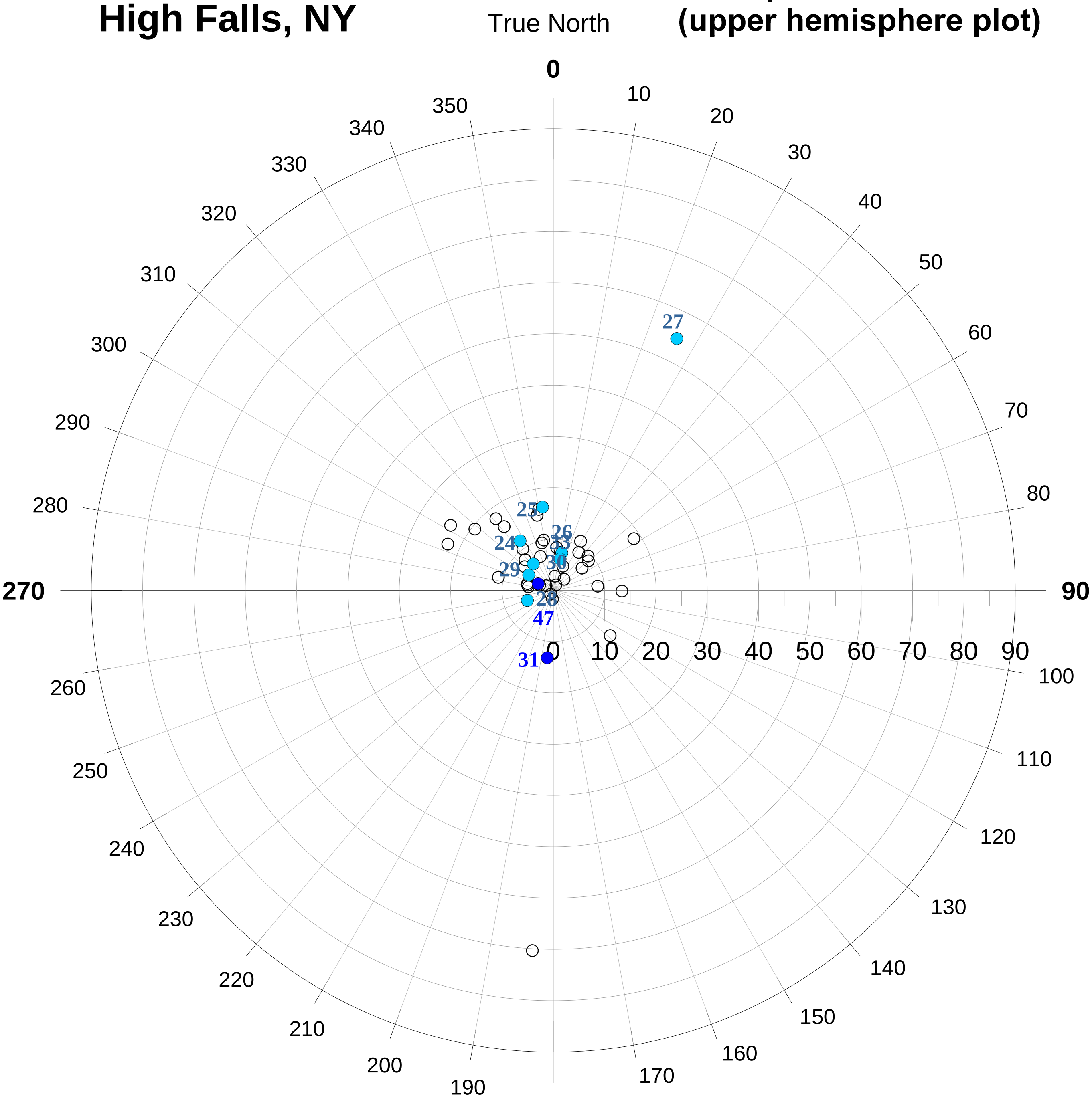
Declination: 13.2 degrees west

Based on 47 measurements

Northeast Geophysical Services

Borehole MW-5R
Mohonk Road Industrial Site
High Falls, NY

PLATE A-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation

- Possibly transmissive
- Likely transmissive
- possible joint, fracture, bedding or foliation

Declination: 13.2 degrees west

Based on 47 measurements

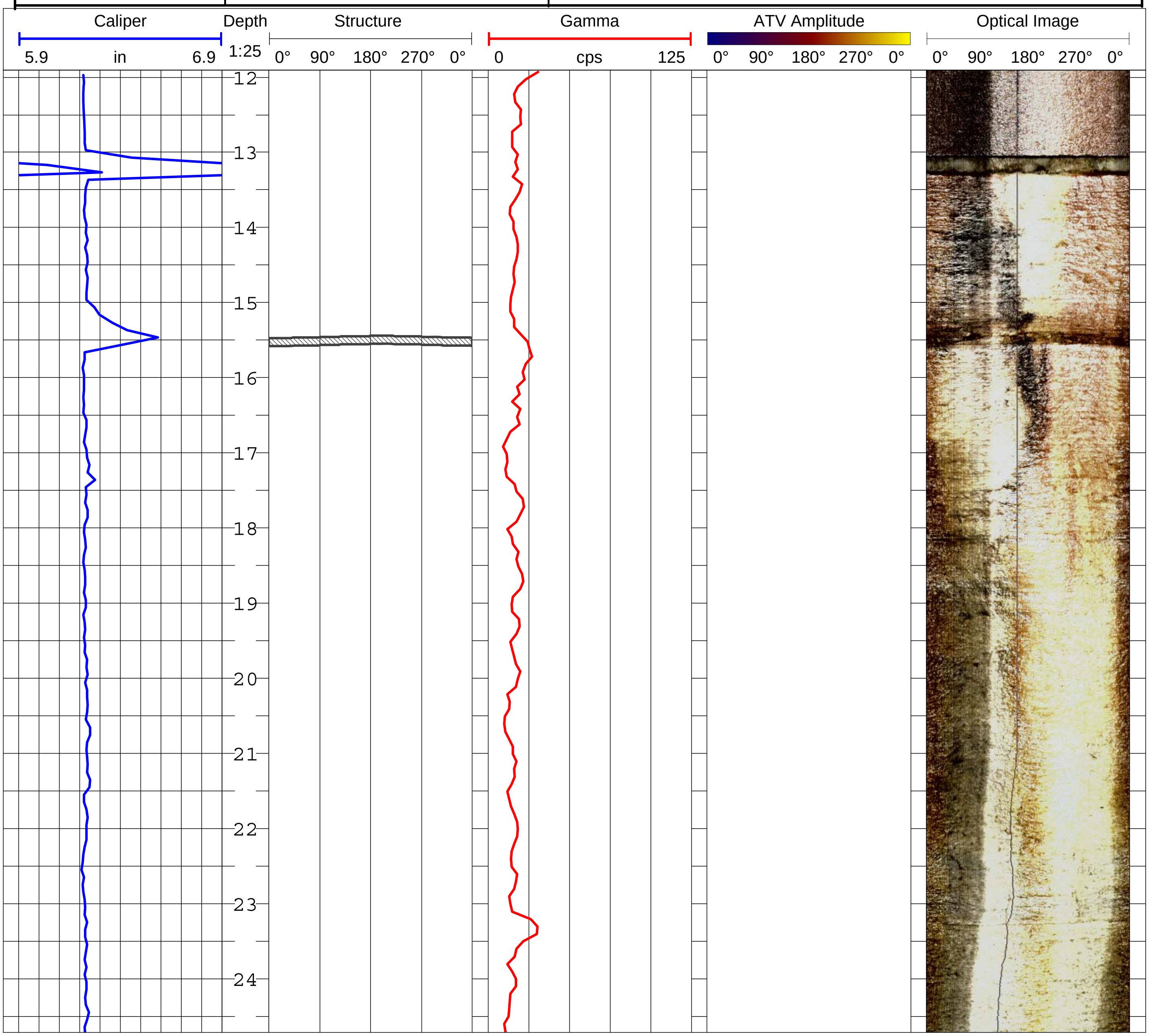
Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

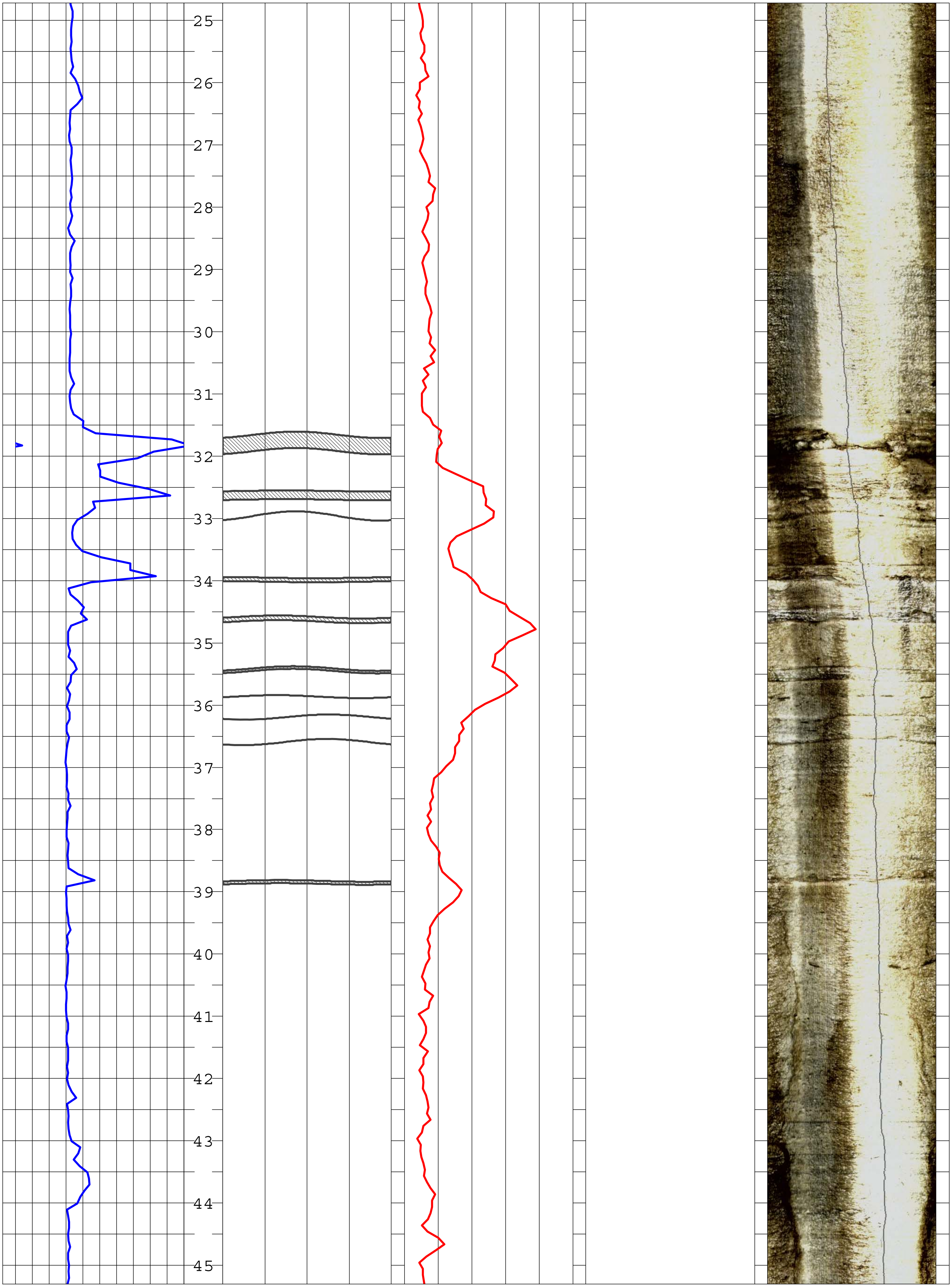
Log: Plate A-4 Televiewer, Gamma & Caliper

Well: MW-5R

Site: Mohonk Road Industrial Plant

Date:	9/08/2015	Location:	High Falls, NY
Casing Depth:	13 ft	For:	AMEC Foster Wheeler
Casing Type:	6 in	Logged by:	R. Rawcliffe
Boring Depth:	120.5 ft	Orientation:	magnetic
Meas. From:	top of casing	Structure Plots:	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	1.22 ft		
Water Level:	81.52		

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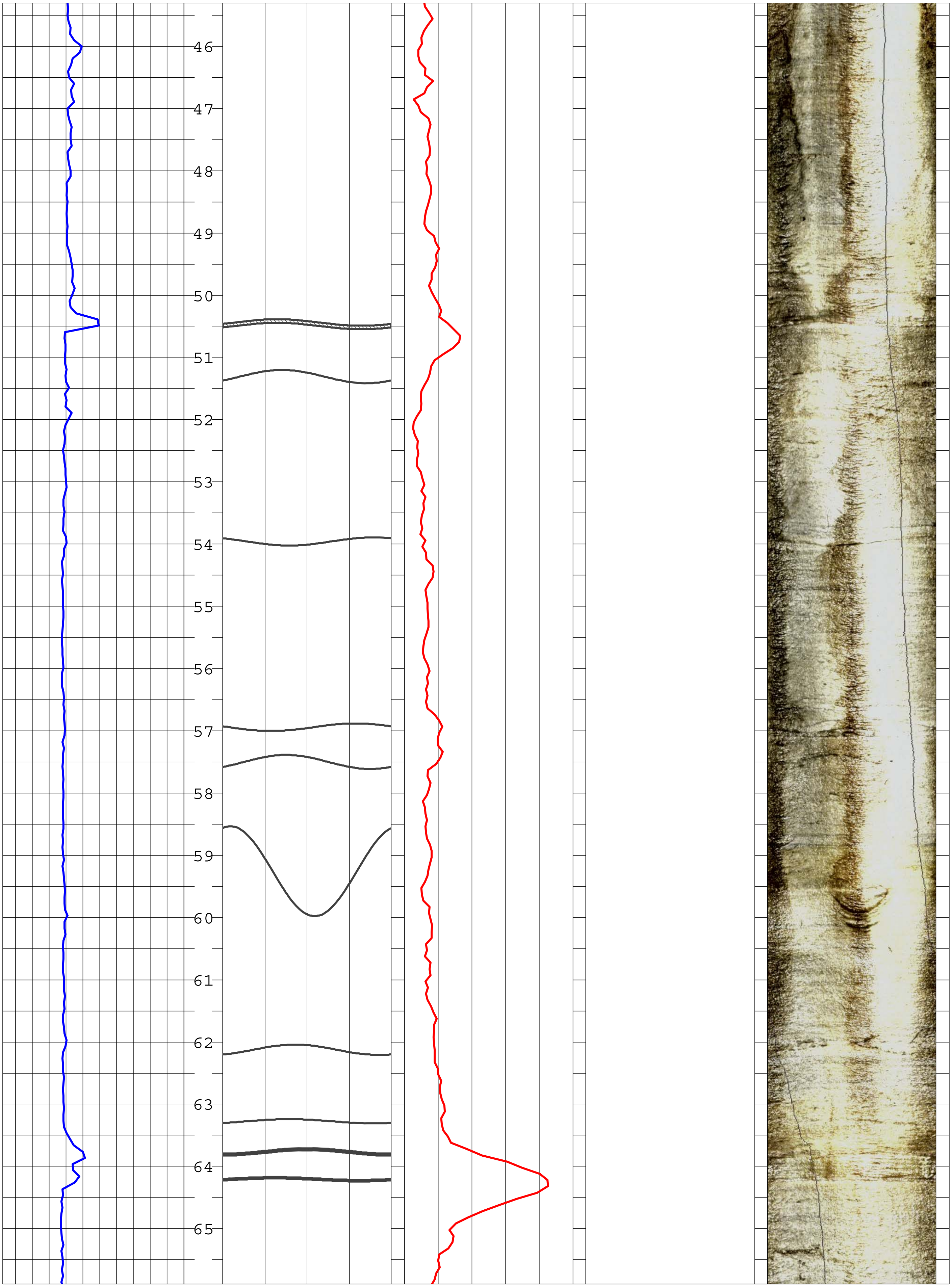
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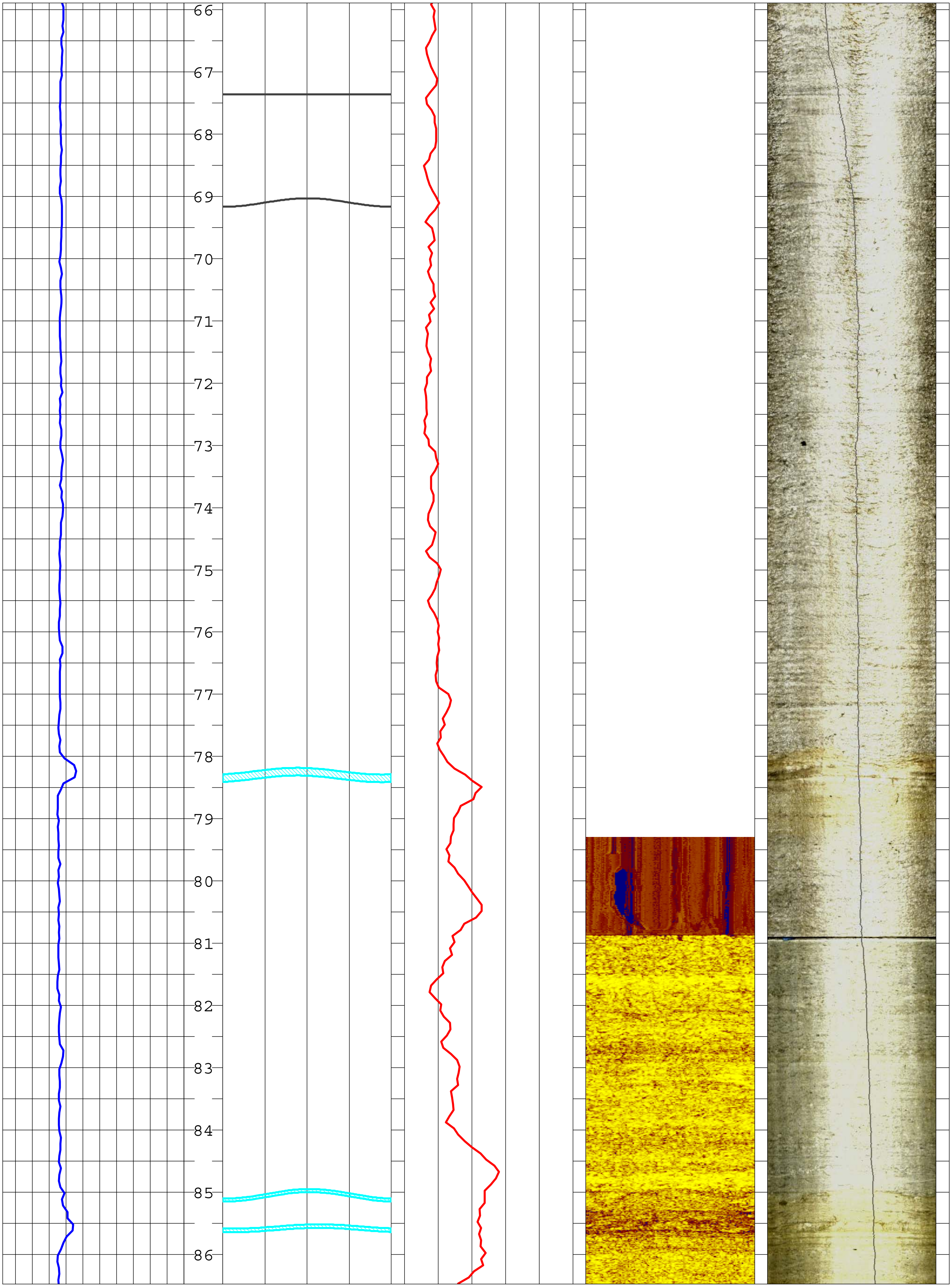
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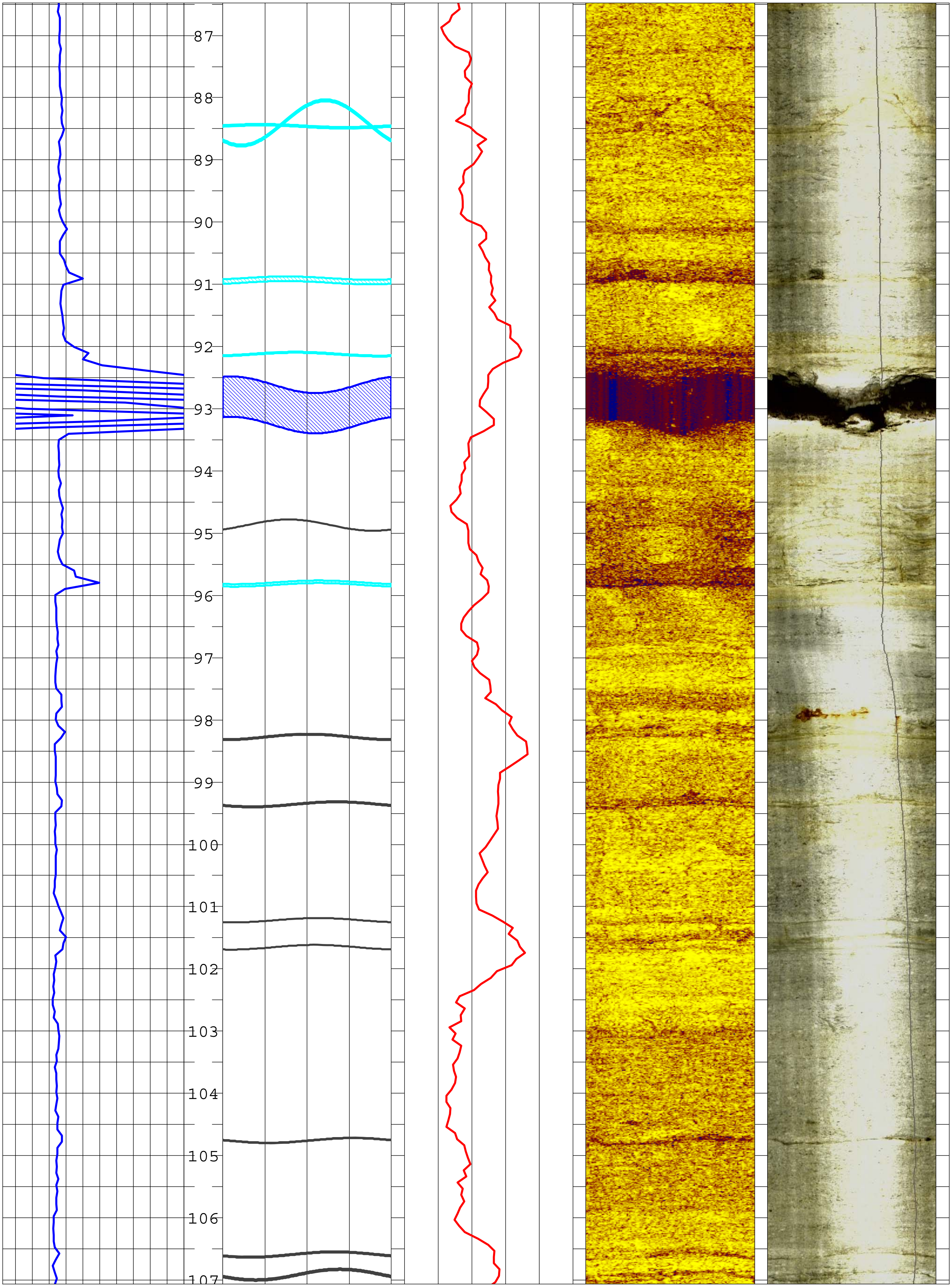
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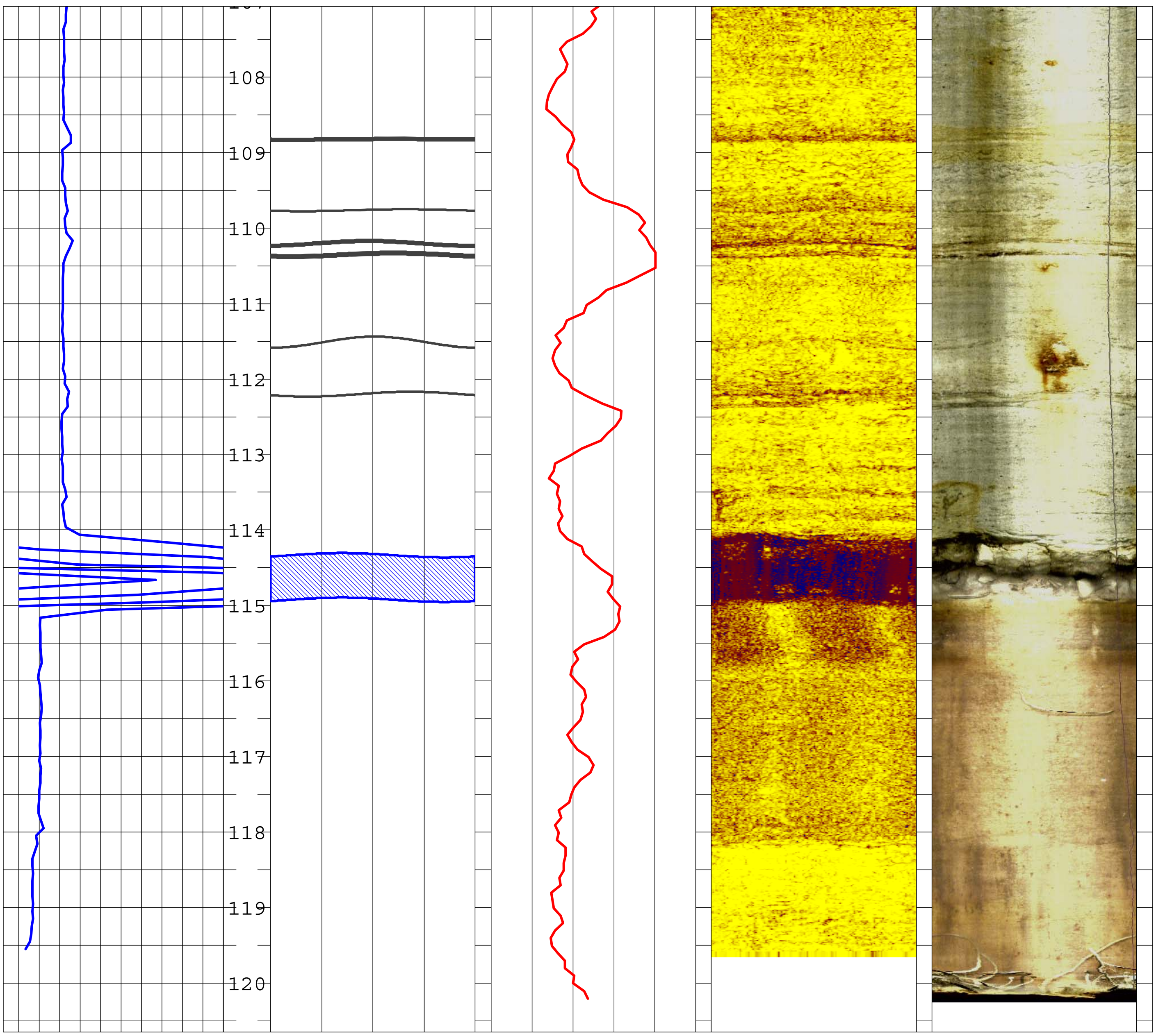
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TABLE A-1 Planar features interpreted from acoustical and optical televiewers
MW-5R - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
MW-5R	1	15.5	3	19	289	6	276	31	100
MW-5R	2	31.8	10	337	67	324	54	79	100
MW-5R	3	32.6	2	316	46	302	32	43	100
MW-5R	4	33.0	16	336	66	322	52	0	100
MW-5R	5	34.0	2	198	288	185	275	21	100
MW-5R	6	34.6	5	298	28	284	14	23	100
MW-5R	7	35.4	8	330	60	317	47	12	100
MW-5R	8	35.9	5	294	24	281	11	0	100
MW-5R	9	36.2	9	47	317	34	304	0	100
MW-5R	10	36.6	11	42	312	29	299	0	100
MW-5R	11	38.9	3	304	34	291	21	16	100
MW-5R	12	50.5	11	296	26	283	13	17	100
MW-5R	13	51.3	22	307	37	294	24	0	100
MW-5R	14	54.0	14	142	52	129	39	0	100
MW-5R	15	56.9	13	104	14	91	1	0	100
MW-5R	16	57.5	24	316	46	302	32	0	100
MW-5R	17	59.3	70	196	286	183	273	0	100
MW-5R	18	62.1	18	335	65	321	51	0	100
MW-5R	19	63.3	7	322	52	309	39	0	100
MW-5R	20	63.8	10	360	90	346	76	11	100
MW-5R	21	64.2	5	291	21	278	8	7	100
MW-5R	22	67.4	1	225	315	212	302	0	100
MW-5R	23	69.1	15	1	271	348	78	0	100
MW-5R	24	78.3	12	339	69	326	56	38	108
MW-5R	25	85.1	16	6	276	353	83	14	108
MW-5R	26	85.6	7	26	296	13	283	18	108
MW-5R	27	88.4	55	39	309	26	296	5	108
MW-5R	28	88.5	5	262	352	249	339	10	108
MW-5R	29	90.9	6	315	45	302	32	23	108
MW-5R	30	92.1	6	336	66	323	53	5	108
MW-5R	31	92.9	13	198	288	185	275	191	107

TABLE A-1 Planar features interpreted from acoustical and optical televiewers
MW-5R - Mohonk Road Industrial Site - High Falls, New York **September, 2015**

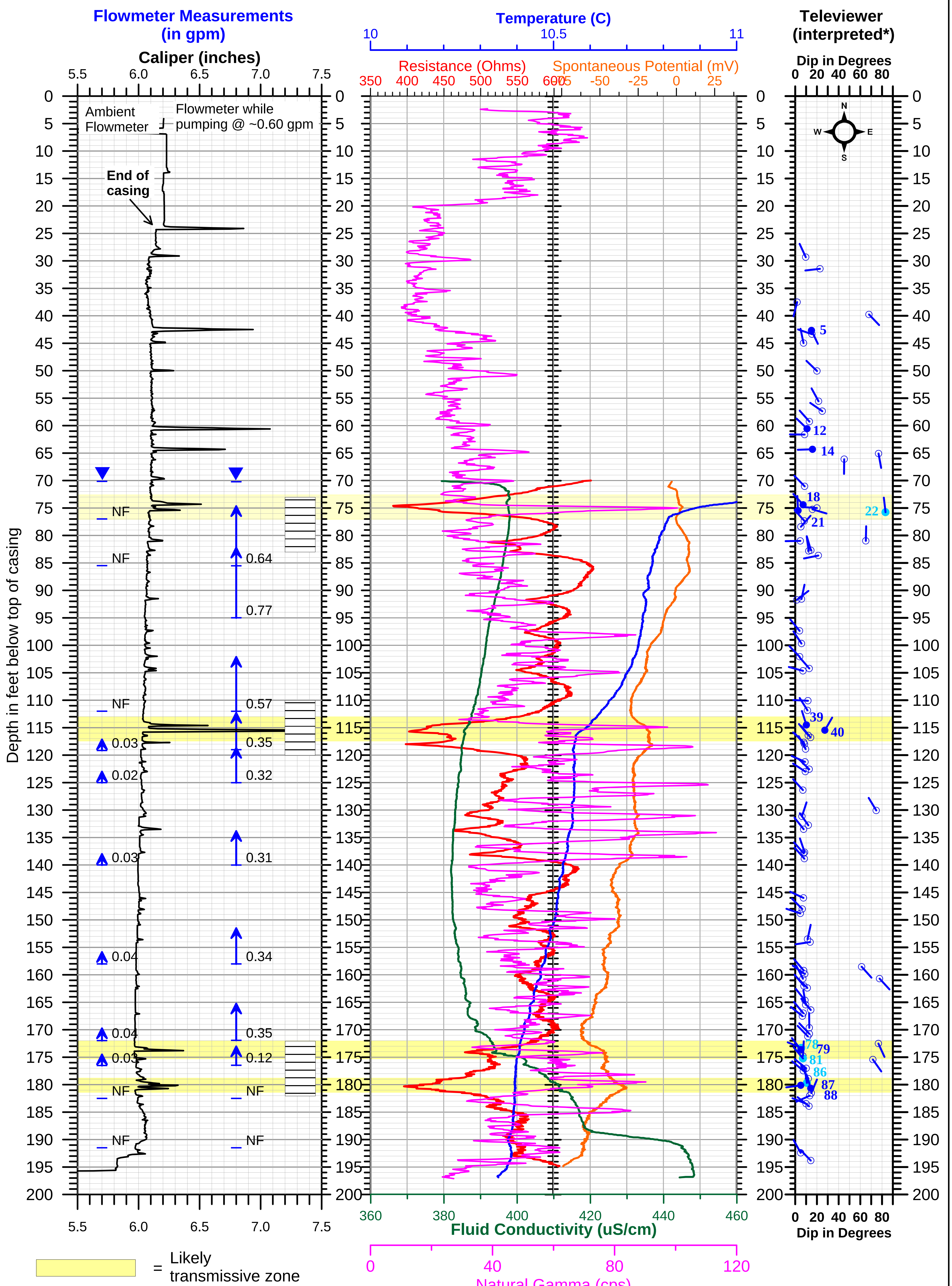
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
MW-5R	32	94.9	19	321	51	308	38	0	100
MW-5R	33	95.8	6	25	295	12	282	11	108
MW-5R	34	98.3	10	2	272	349	79	5	100
MW-5R	35	99.4	9	63	333	50	320	6	100
MW-5R	36	101.2	8	24	294	10	280	0	100
MW-5R	37	101.7	8	18	288	5	275	0	100
MW-5R	38	104.8	9	98	8	85	355	5	100
MW-5R	39	106.6	9	59	329	46	316	5	100
MW-5R	40	106.9	19	71	341	57	327	6	100
MW-5R	41	108.8	1	40	310	27	297	7	100
MW-5R	42	109.8	3	58	328	44	314	0	100
MW-5R	43	110.2	7	352	82	339	69	8	100
MW-5R	44	110.4	5	35	305	22	292	9	100
MW-5R	45	111.5	16	3	273	350	80	0	100
MW-5R	46	112.2	7	66	336	52	322	0	100
MW-5R	47	114.6	3	306	36	293	23	181	107

Northeast Geophysical Services

ERT-1
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/09/15



= Likely transmissive zone

= possible transmissive zone

= packer sample zone

PLATE B-1
ERT-1
Mohonk Road Industrial Plant Site
High Falls, NY

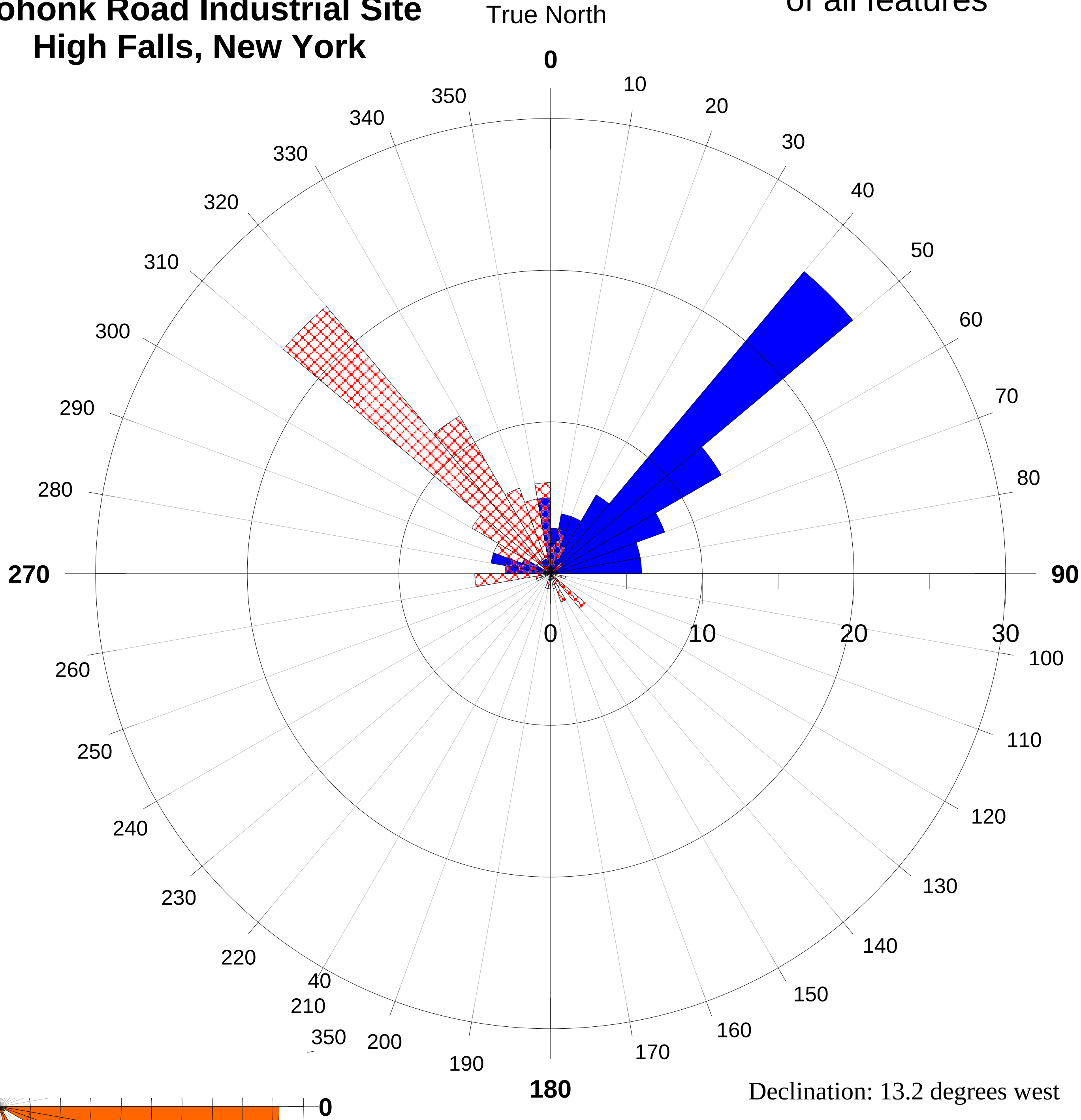
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

Date logged: 9/09/15

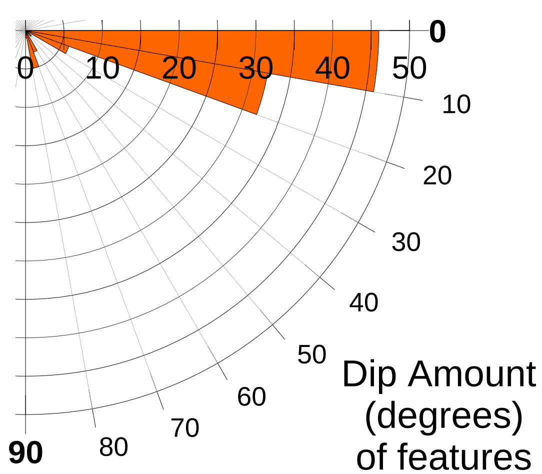
Northeast Geophysical Services

ERT-1 Well
Mohonk Road Industrial Site
High Falls, New York

PLATE B-2
Strike and Dip Direction
of all features



Declination: 13.2 degrees west



Dip Amount
(degrees)
of features

Explanation

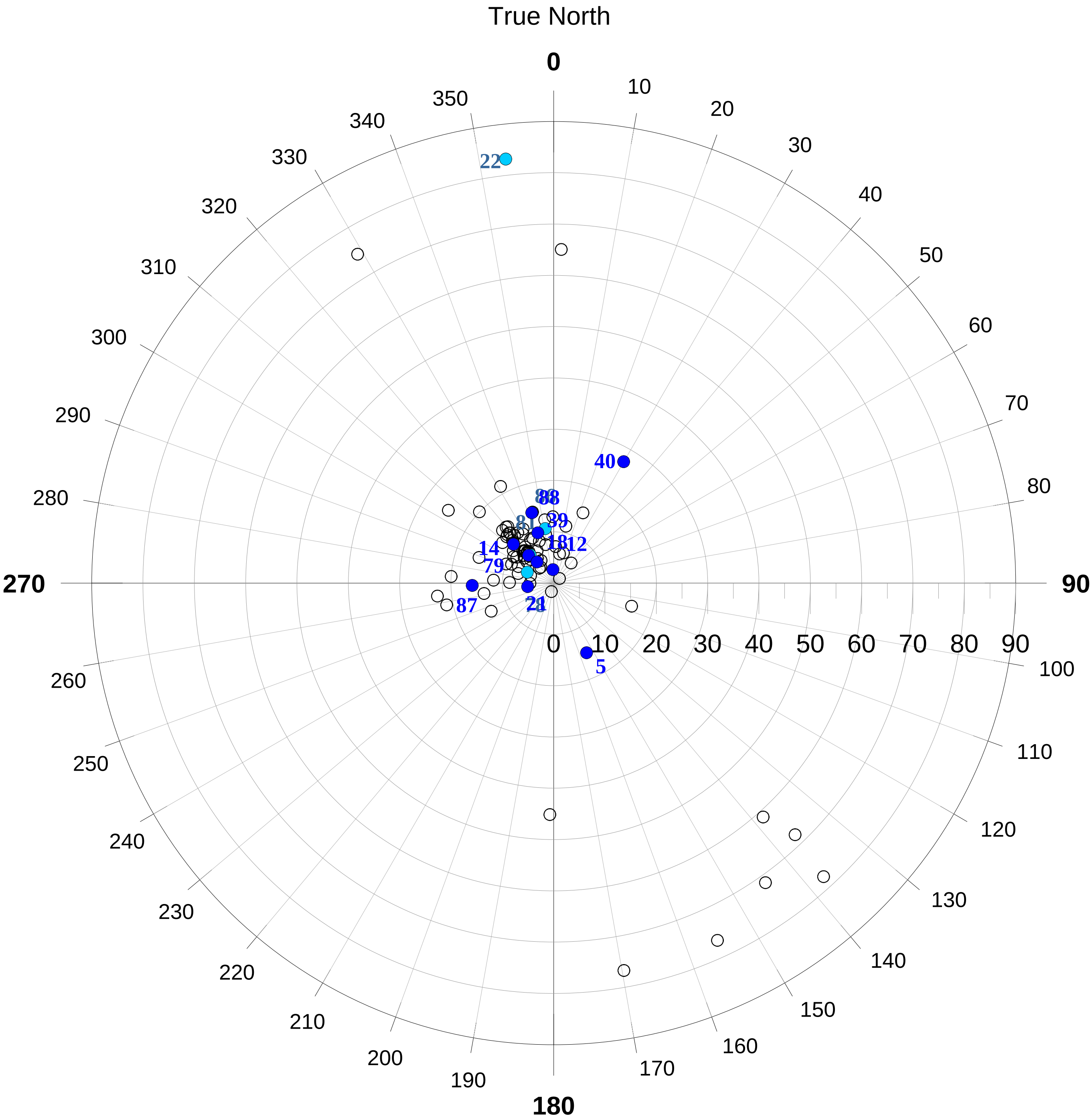
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 94 measurements

Northeast Geophysical Services

ERT-1 Well
Mohonk Road Industrial Site
High Falls, New York

PLATE B-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation -

- Possibly transmissive
- Likely transmissive
- planar features

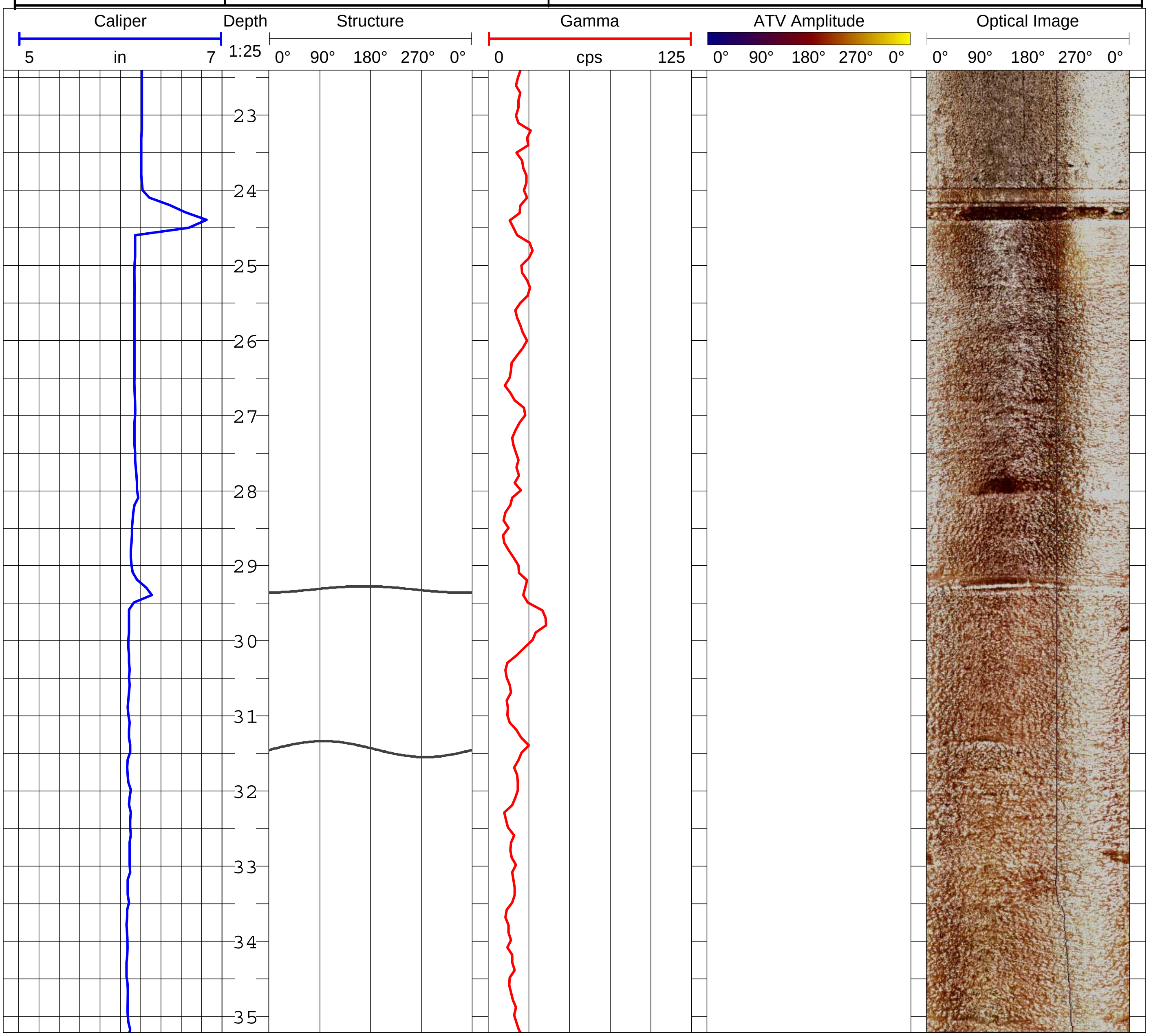
Declination: 13.2 degrees west

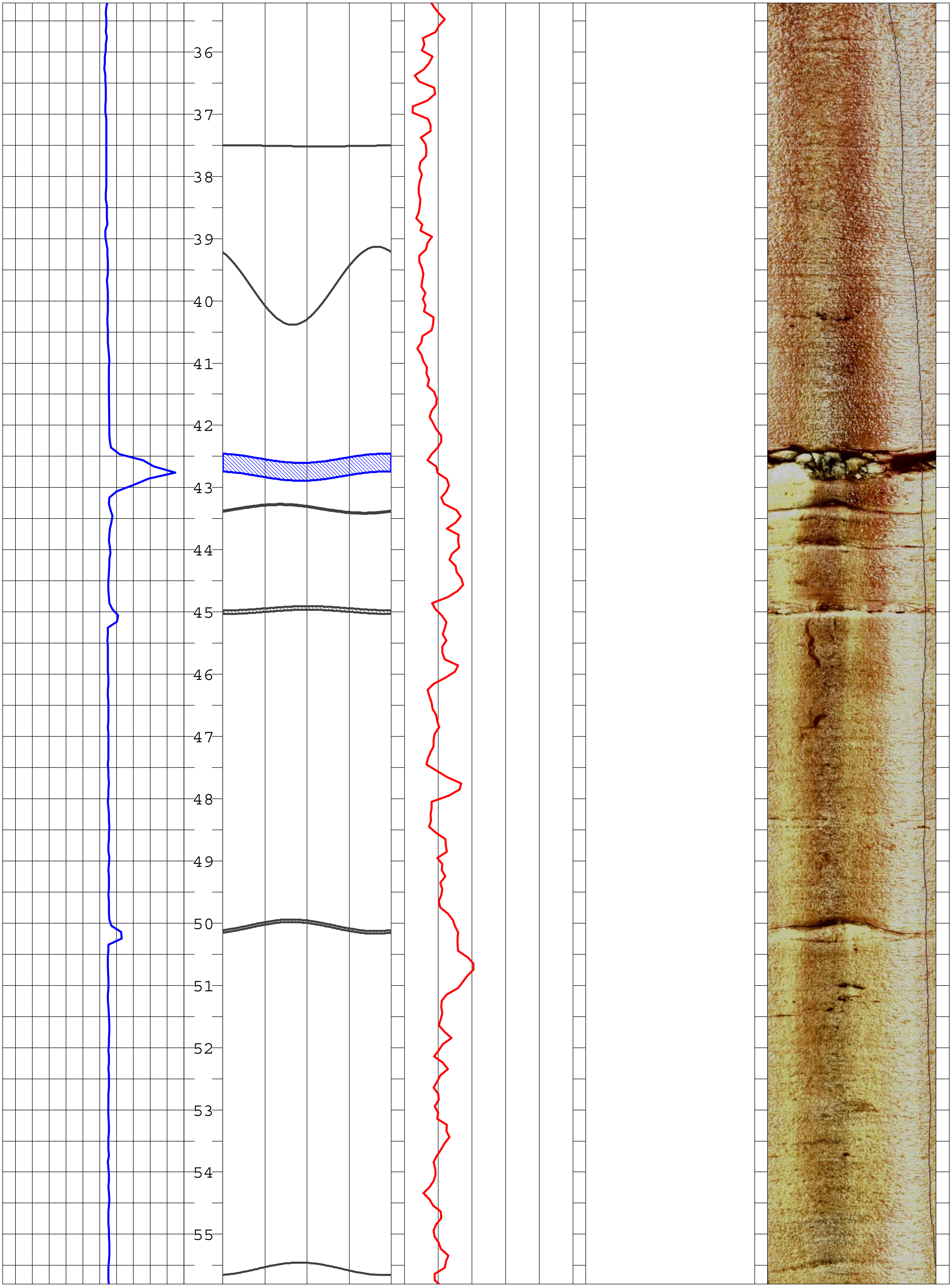
Based on 94 measurements

Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log: Plate B-4 Televiewer, Caliper & Gamma

Well:	ERT-1		
Site:	Mohonk Road Industrial Plant		
Date:	9/09/2015	Location:	High Falls, NY
Casing Depth:	24 ft	For:	AMEC Foster Wheeler
Casing Type:	6 in	Logged by:	R. Rawcliffe
Boring Depth:	197.2 ft	Orientation:	magnetic
Meas. From:	toc	Structure Plots:	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	2.52 ft		
Water Level:	70.48		

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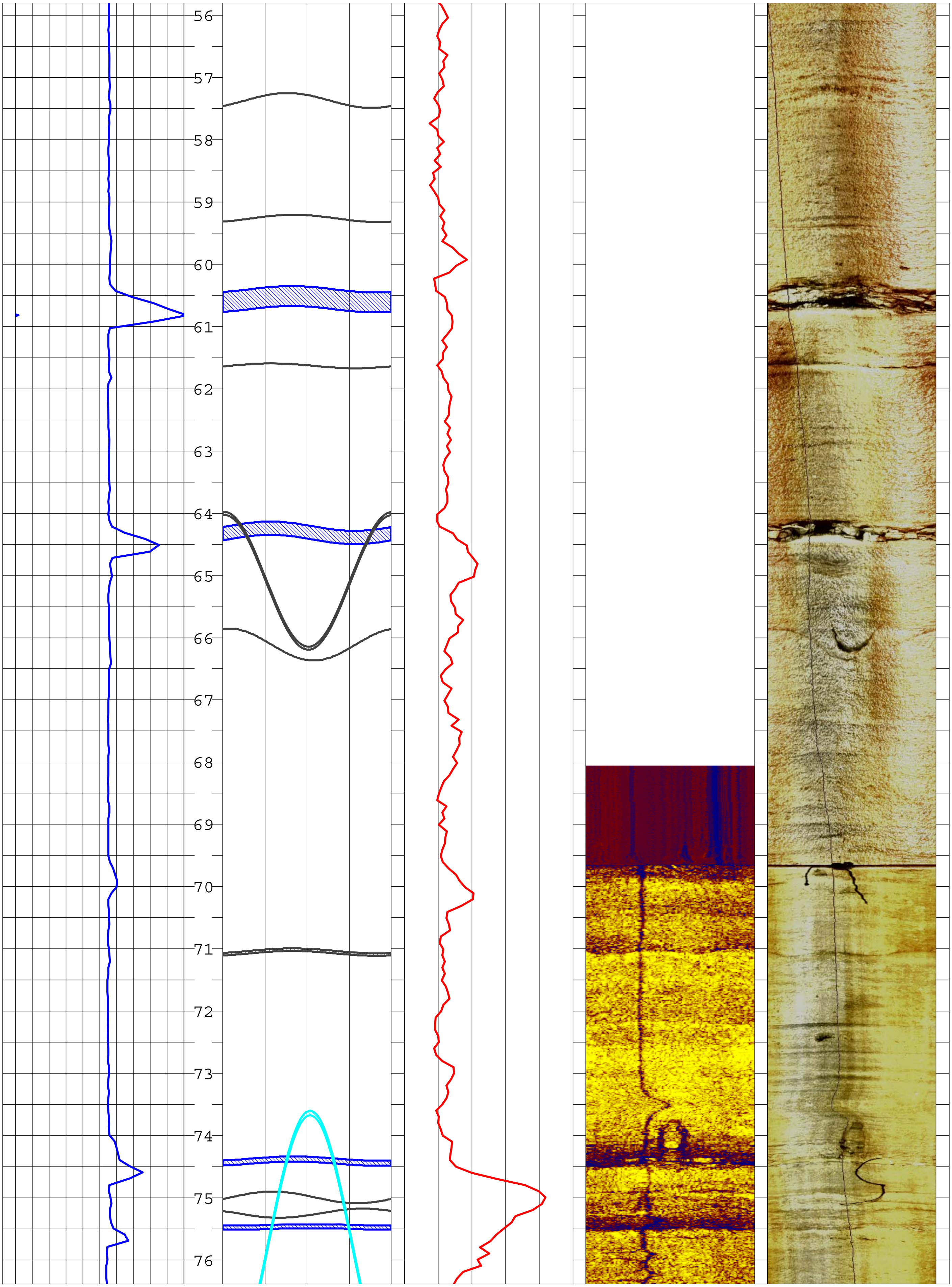
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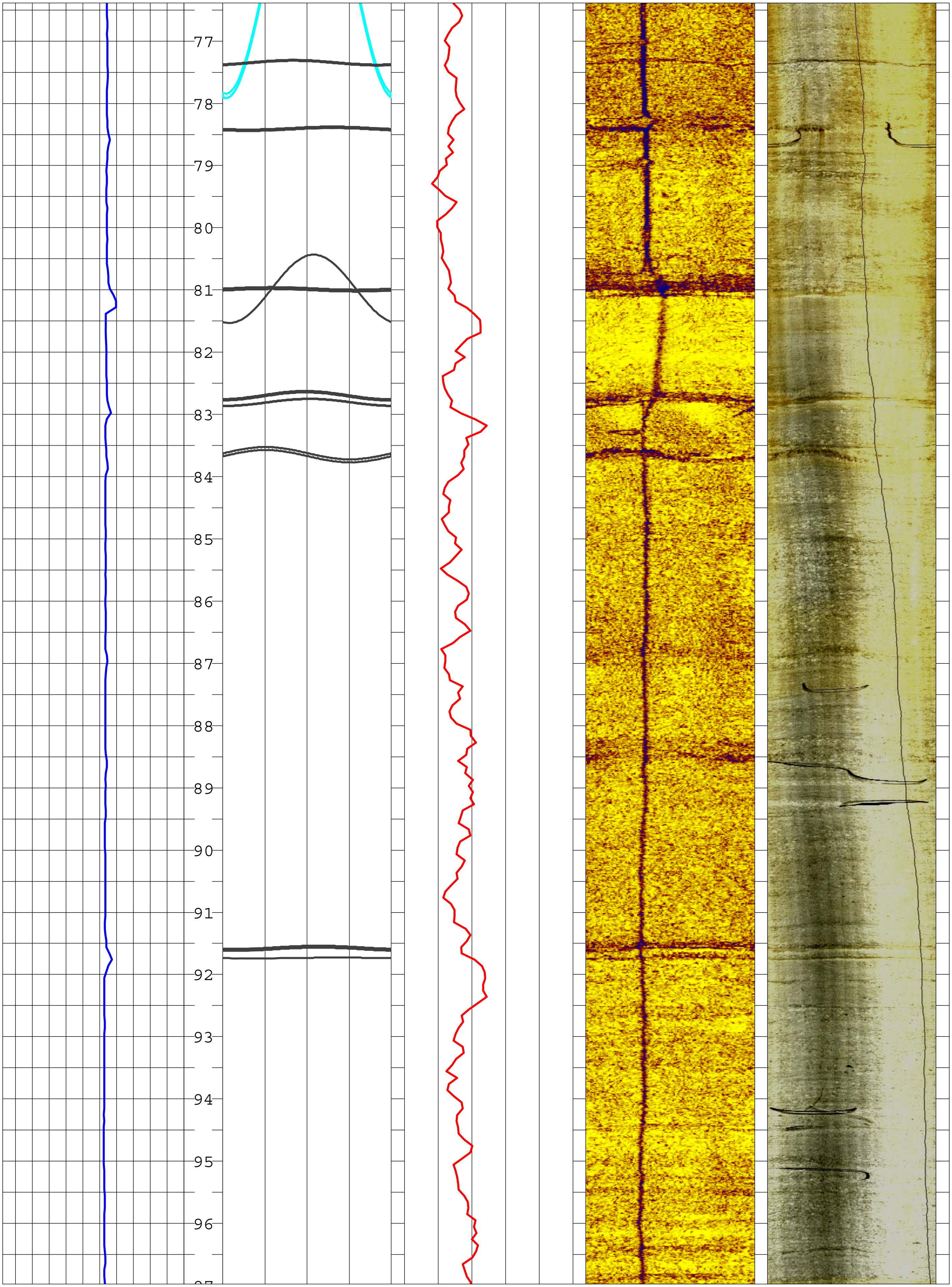
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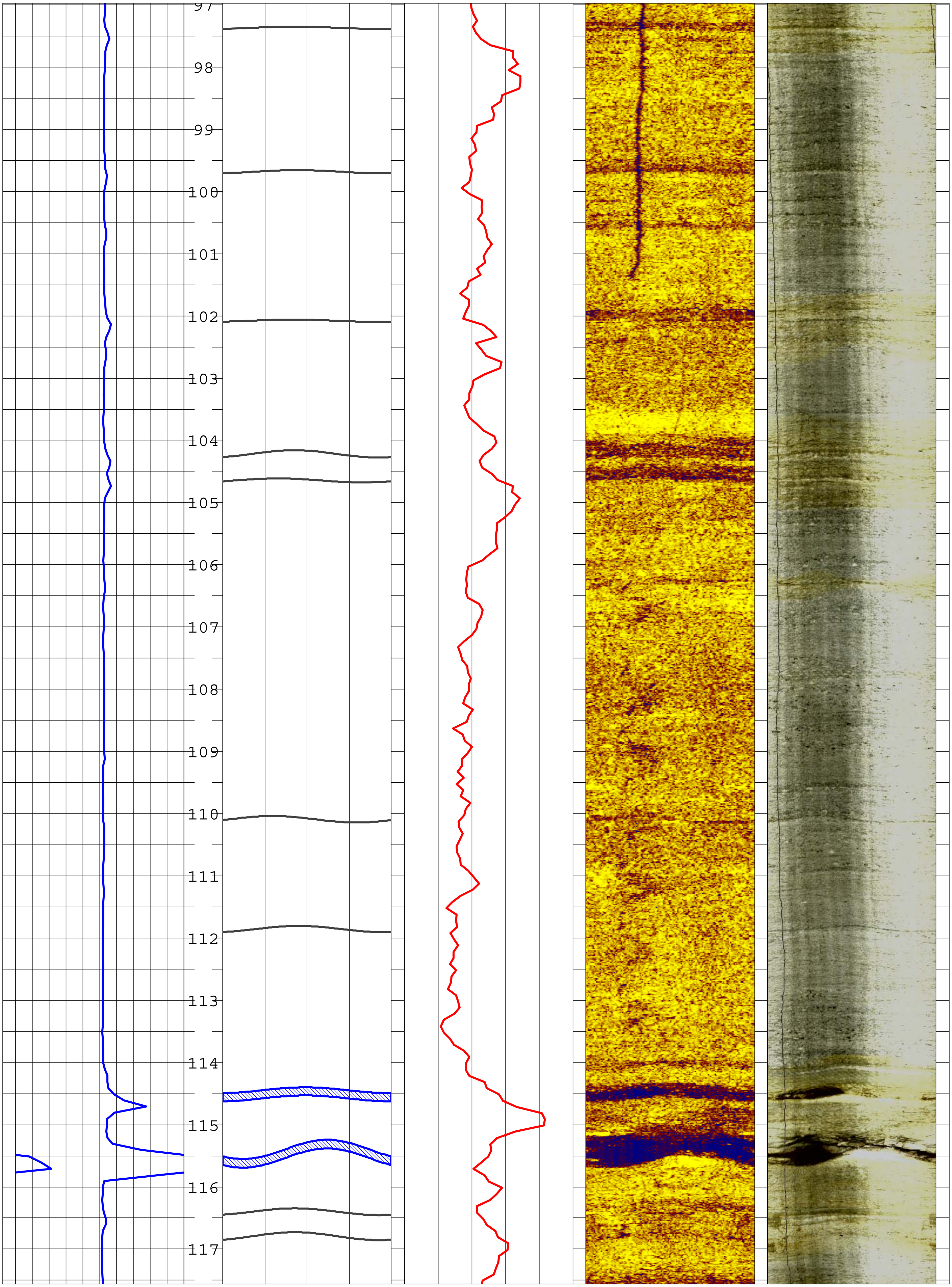
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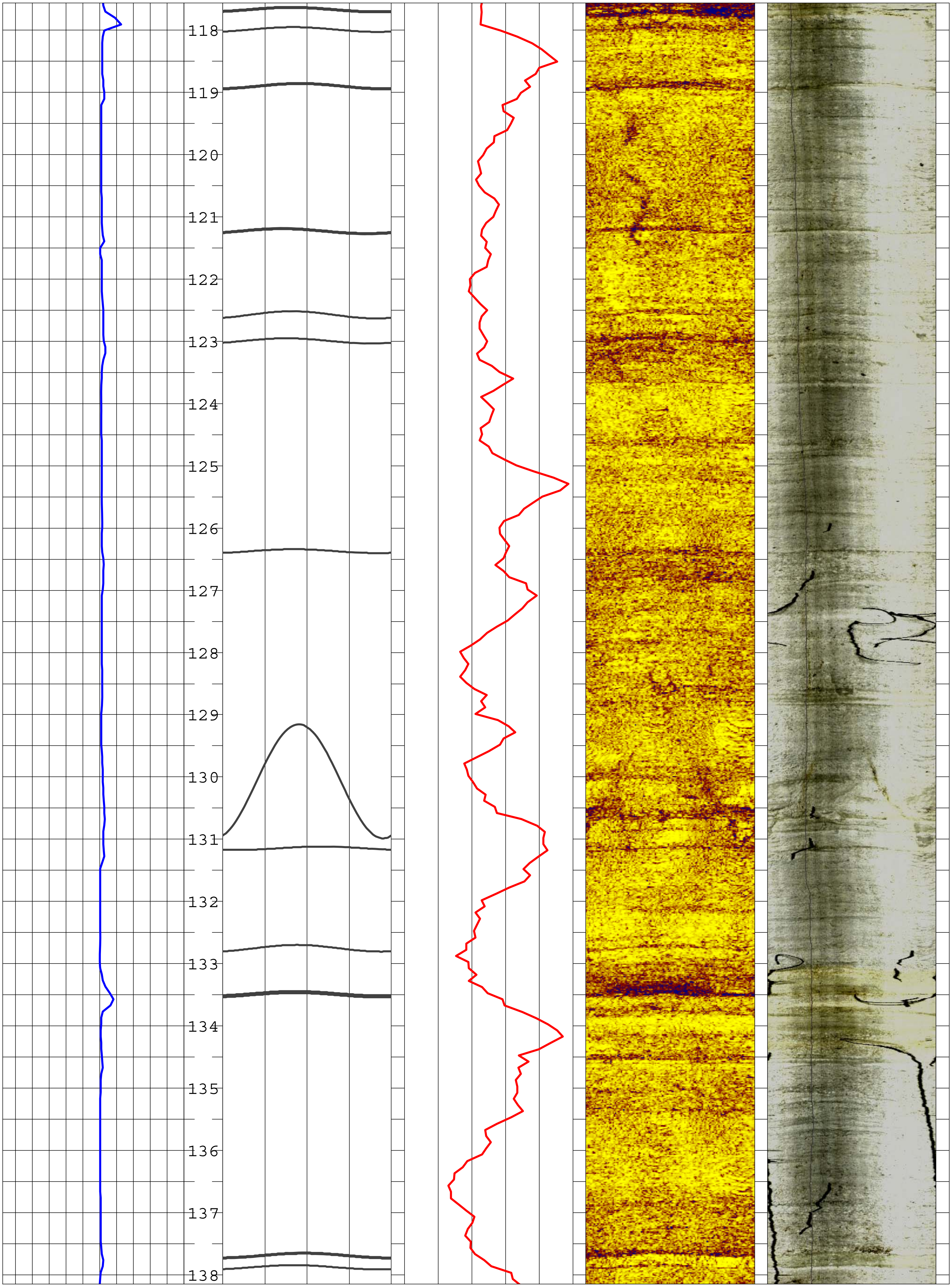
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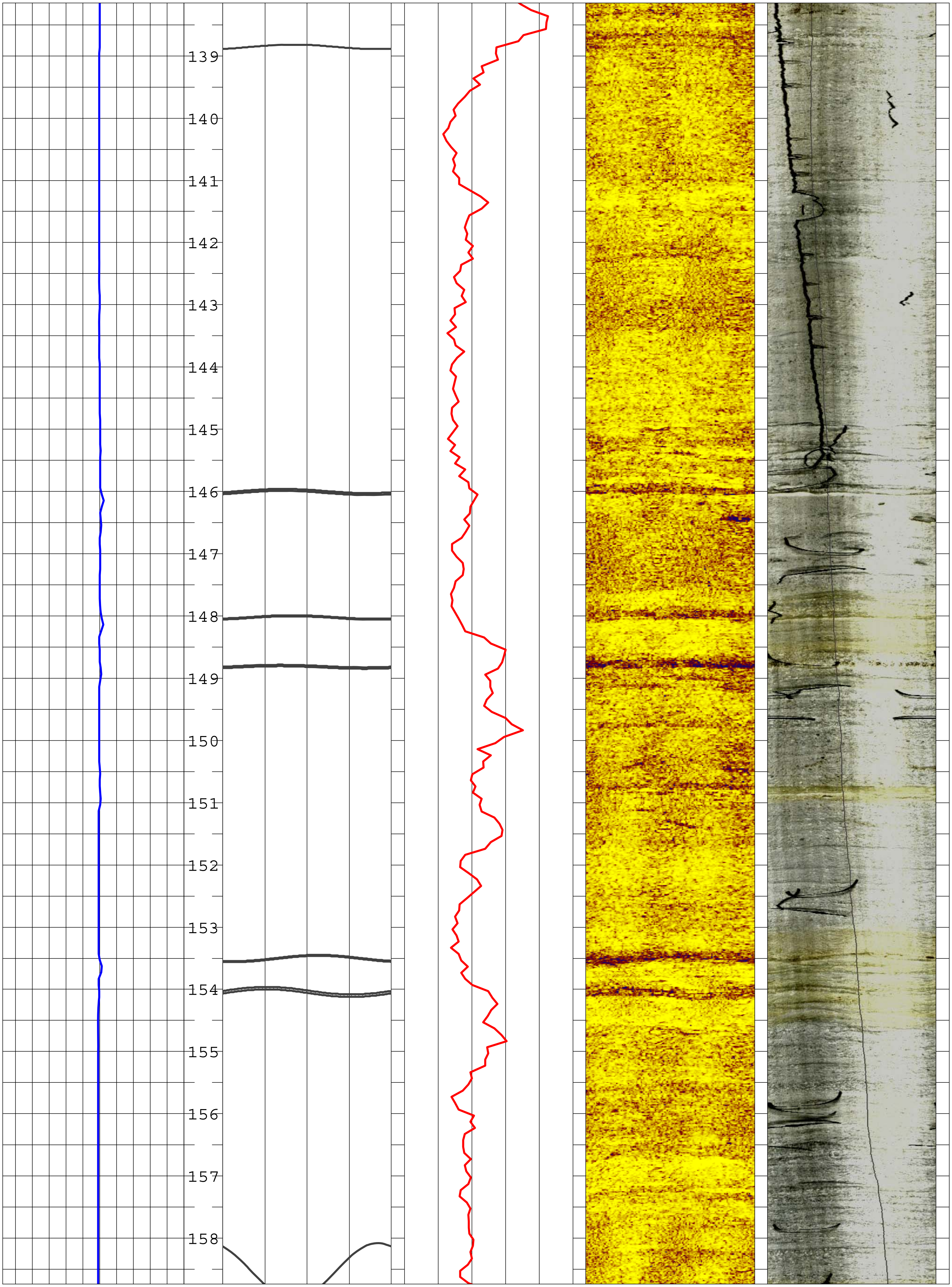
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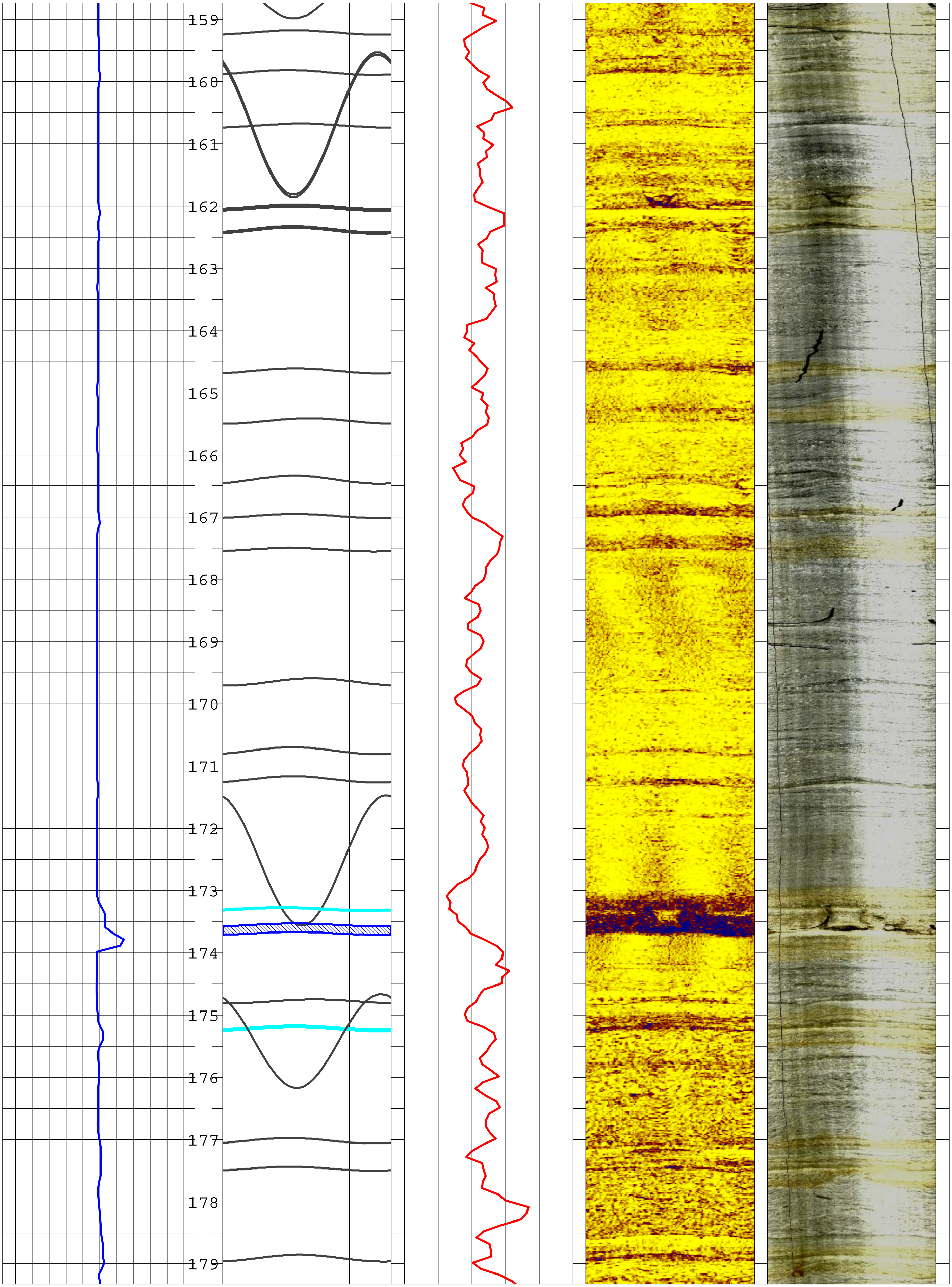
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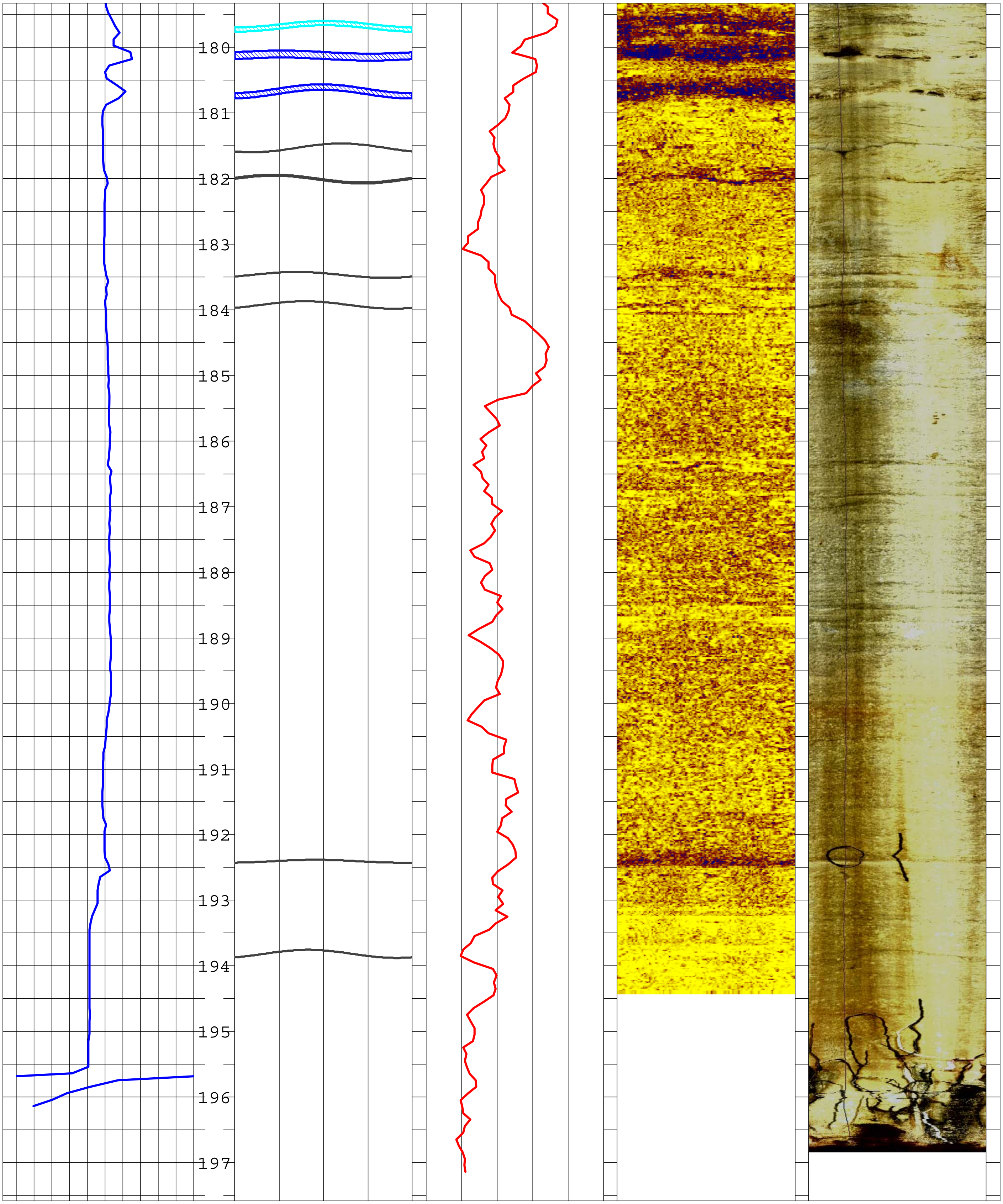
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TABLE B-1 Planar features interpreted from acoustical and optical televiewers

ERT-1 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**

Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
ERT-1	1	29.3	10	348	78	335	65	<1 mm	100
ERT-1	2	31.4	23	277	7	264	354	<1 mm	100
ERT-1	3	37.5	2	207	297	194	284	<1 mm	100
ERT-1	4	39.8	68	149	59	136	46	<1 mm	100
ERT-1	5	42.7	15	168	78	155	65	85	107
ERT-1	6	43.3	15	302	32	289	19	6	100
ERT-1	7	45.0	8	1	271	348	78	18	100
ERT-1	8	50.1	20	327	57	314	44	11	100
ERT-1	9	55.6	21	344	74	331	61	<1 mm	100
ERT-1	10	57.4	25	318	48	305	35	<1 mm	100
ERT-1	11	59.3	13	332	62	318	48	<1 mm	100
ERT-1	12	60.6	11	327	57	314	44	97	107
ERT-1	13	61.6	9	284	14	271	1	<1 mm	100
ERT-1	14	64.3	16	282	12	268	358	62	107
ERT-1	15	65.1	77	183	273	170	80	4	100
ERT-1	16	66.1	45	194	284	181	271	<1 mm	100
ERT-1	17	71.1	9	329	59	316	46	11	100
ERT-1	18	74.4	7	331	61	318	48	24	107
ERT-1	19	75.0	20	287	17	274	4	<1 mm	100
ERT-1	20	75.2	16	120	30	107	17	<1 mm	100
ERT-1	21	75.5	3	10	280	357	87	19	107
ERT-1	22	75.8	83	7	277	354	84	3	108
ERT-1	23	77.4	8	332	62	318	48	5	100
ERT-1	24	78.4	5	54	324	41	311	7	100
ERT-1	25	81.0	65	14	284	1	271	<1 mm	100
ERT-1	26	81.0	5	282	12	269	359	10	100
ERT-1	27	82.7	14	357	87	343	73	9	100
ERT-1	28	82.8	12	5	275	352	82	4	100
ERT-1	29	83.7	21	272	2	258	348	13	100
ERT-1	30	91.6	6	25	295	12	282	9	100
ERT-1	31	91.7	1	65	335	52	322	<1 mm	100
ERT-1	32	97.4	4	334	64	321	51	<1 mm	100
ERT-1	33	99.7	6	340	70	327	57	<1 mm	100
ERT-1	34	102.1	4	329	59	316	46	<1 mm	100

TABLE B-1 Planar features interpreted from acoustical and optical televiewers
ERT-1 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
ERT-1	35	104.2	13	332	62	319	49	<1 mm	100
ERT-1	36	104.7	7	298	28	285	15	<1 mm	100
ERT-1	37	110.1	12	286	16	273	3	<1 mm	100
ERT-1	38	111.9	11	341	71	328	58	<1 mm	100
ERT-1	39	114.5	10	356	86	342	72	39	107
ERT-1	40	115.5	27	43	313	30	300	37	107
ERT-1	41	116.4	12	334	64	321	51	<1 mm	100
ERT-1	42	116.8	14	334	64	321	51	<1 mm	100
ERT-1	43	117.7	8	326	56	313	43	5	100
ERT-1	44	118.0	9	331	61	317	47	<1 mm	100
ERT-1	45	118.9	10	345	75	332	62	4	100
ERT-1	46	121.2	9	307	37	294	24	6	100
ERT-1	47	122.6	13	328	58	315	45	<1 mm	100
ERT-1	48	123.0	9	316	46	303	33	<1 mm	100
ERT-1	49	126.4	7	331	61	318	48	<1 mm	100
ERT-1	50	130.1	75	342	72	329	59	<1 mm	100
ERT-1	51	131.1	6	31	301	18	288	<1 mm	100
ERT-1	52	132.8	12	338	68	325	55	<1 mm	100
ERT-1	53	133.5	8	335	65	322	52	10	100
ERT-1	54	137.7	9	354	84	341	71	4	100
ERT-1	55	137.9	8	332	62	319	49	<1 mm	100
ERT-1	56	138.9	8	332	62	319	49	<1 mm	100
ERT-1	57	146.0	8	308	38	295	25	10	100
ERT-1	58	148.0	6	329	59	315	45	5	100
ERT-1	59	148.8	5	301	31	288	18	7	100
ERT-1	60	153.5	11	25	295	12	282	6	100
ERT-1	61	154.0	14	275	5	261	351	11	100
ERT-1	62	158.5	61	151	61	138	48	<1 mm	100
ERT-1	63	159.2	8	333	63	320	50	<1 mm	100
ERT-1	64	159.9	9	318	48	305	35	<1 mm	100
ERT-1	65	160.7	78	151	61	137	47	2	100
ERT-1	66	160.7	7	346	76	333	63	<1 mm	100
ERT-1	67	162.0	8	333	63	320	50	10	100
ERT-1	68	162.4	11	328	58	315	45	7	100

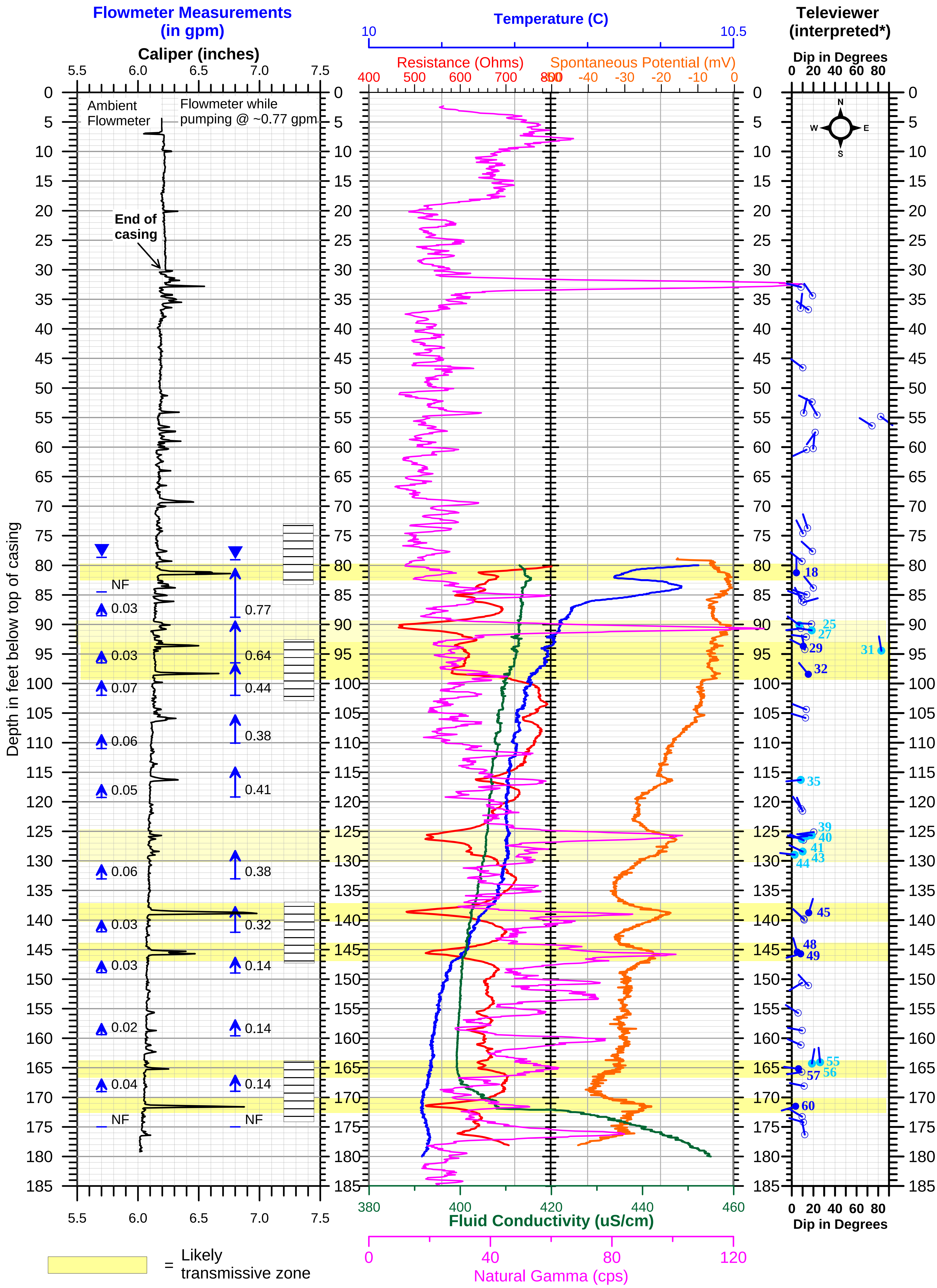
TABLE B-1 Planar features interpreted from acoustical and optical televiewers
ERT-1 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
ERT-1	69	164.7	9	335	65	321	51	<1 mm	100
ERT-1	70	165.5	10	4	274	351	81	<1 mm	100
ERT-1	71	166.4	14	333	63	320	50	<1 mm	100
ERT-1	72	167.0	7	333	63	320	50	<1 mm	100
ERT-1	73	167.5	7	322	52	309	39	<1 mm	100
ERT-1	74	169.7	13	13	283	359	89	<1 mm	100
ERT-1	75	170.8	13	329	59	316	46	<1 mm	100
ERT-1	76	171.2	12	329	59	316	46	<1 mm	100
ERT-1	77	172.5	77	169	79	155	65	<1 mm	100
ERT-1	78	173.3	6	306	36	292	22	5	108
ERT-1	79	173.6	5	335	65	322	52	42	107
ERT-1	80	174.8	7	16	286	3	273	<1 mm	100
ERT-1	81	175.2	7	333	63	320	50	9	108
ERT-1	82	175.4	72	158	68	145	55	<1 mm	100
ERT-1	83	177.0	10	322	52	309	39	<1 mm	100
ERT-1	84	177.5	7	323	53	310	40	<1 mm	100
ERT-1	85	178.9	12	344	74	331	61	<1 mm	100
ERT-1	86	179.7	11	4	274	351	81	19	108
ERT-1	87	180.1	5	275	5	262	352	32	107
ERT-1	88	180.7	14	356	86	343	73	25	107
ERT-1	89	181.5	15	36	306	23	293	<1 mm	100
ERT-1	90	182.0	13	259	349	246	336	4	100
ERT-1	91	183.5	10	305	35	292	22	<1 mm	100
ERT-1	92	183.9	13	322	52	308	38	<1 mm	100
ERT-1	93	192.4	5	344	74	331	61	<1 mm	100
ERT-1	94	193.8	14	329	59	316	46	<1 mm	100

Northeast Geophysical Services

MW-7R
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/10/15



= Likely transmissive zone

= possible transmissive zone

= packer sample zone

PLATE C-1
MW-7R
Mohonk Road Industrial Plant Site
High Falls, NY

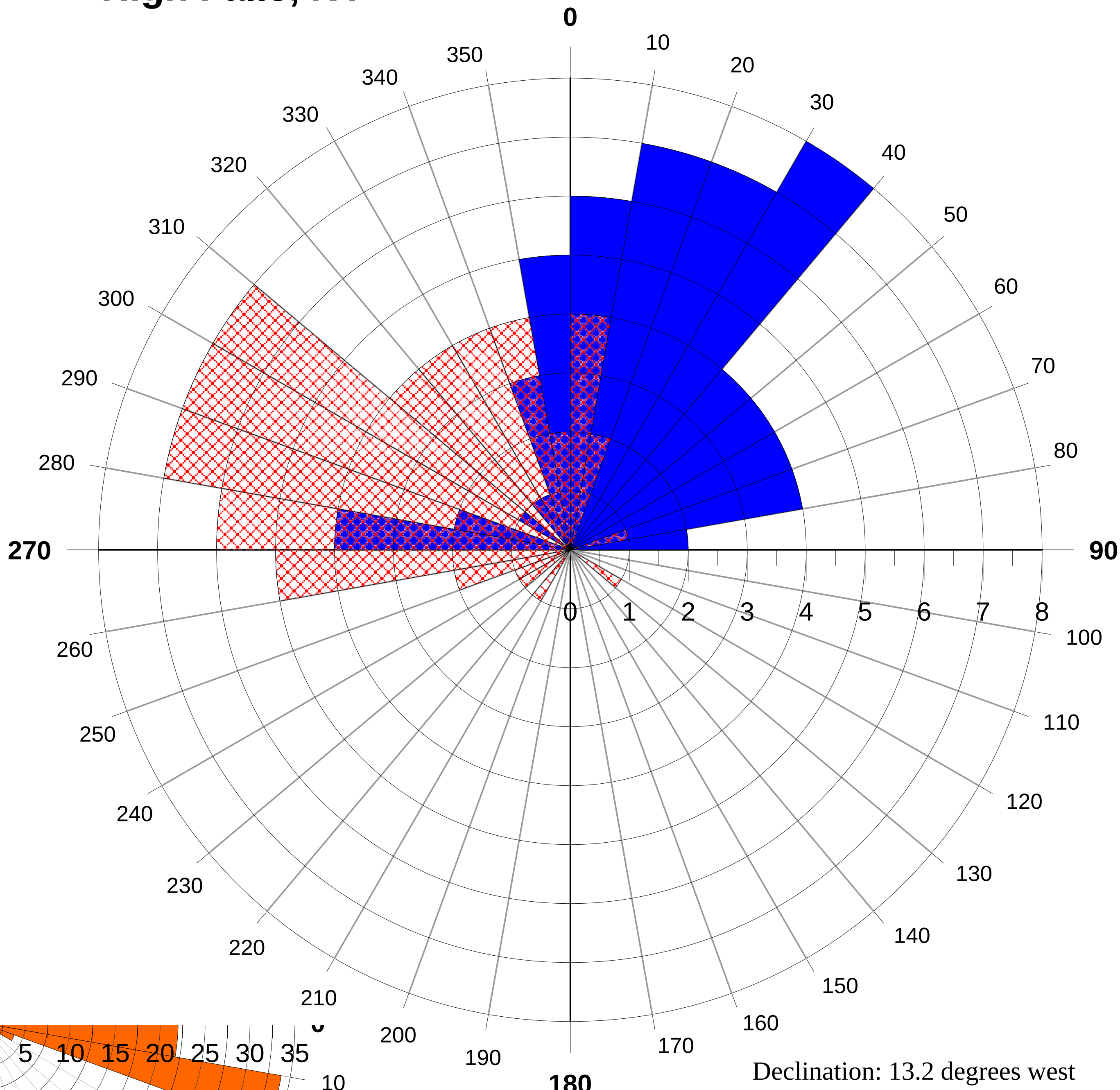
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

Date logged: 9/10/15

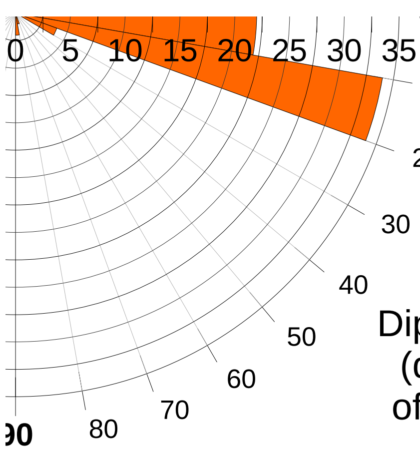
Northeast Geophysical Services

Borehole MW-7A
Mohonk Road Industrial Site
High Falls, NY

PLATE C-2
Strike and Dip Direction of all features



Declination: 13.2 degrees west



Dip Amount (degrees) of features

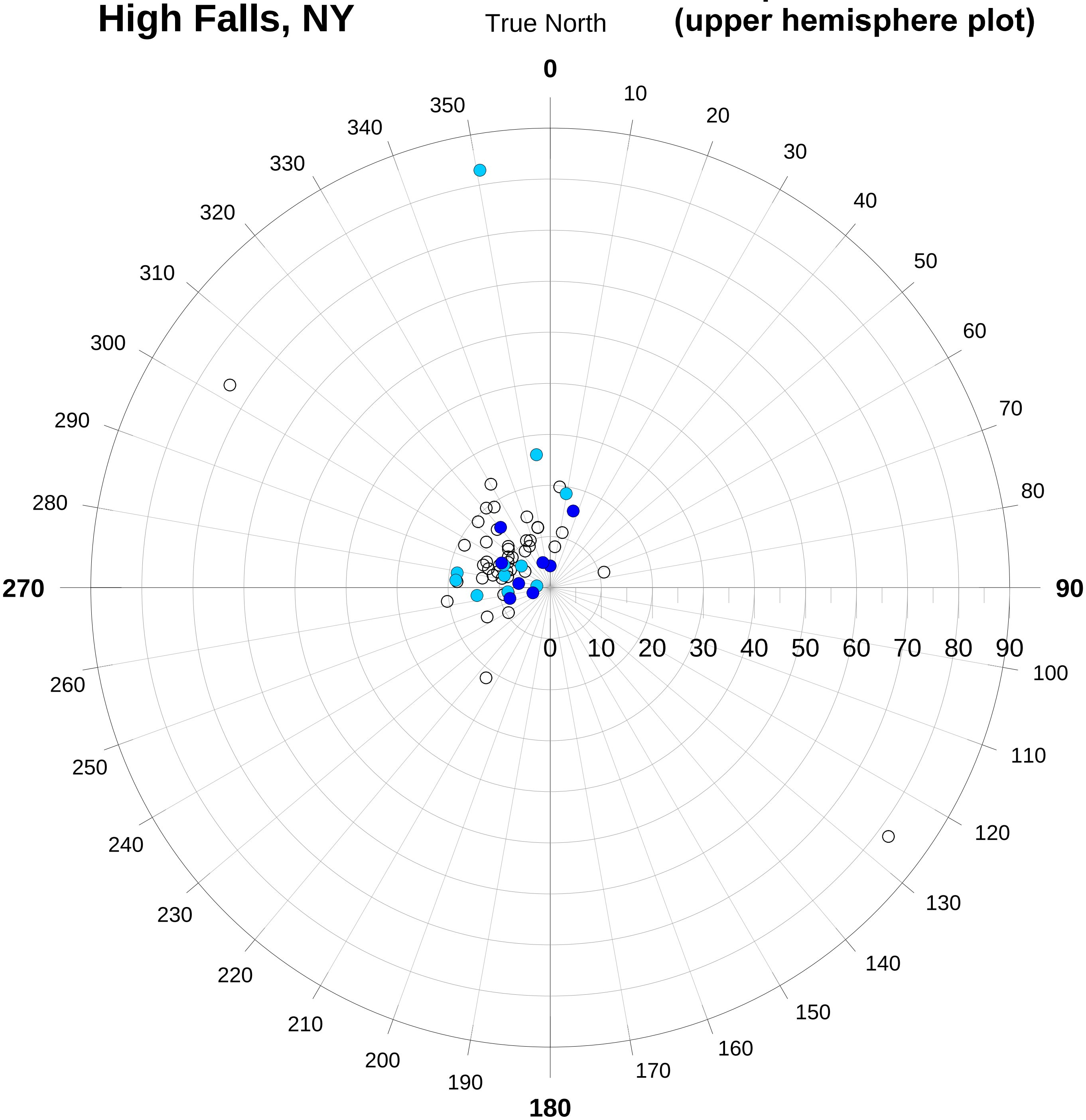
Explanation
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 63 measurements

Northeast Geophysical Services

Borehole MW-7R
Mohonk Road Industrial Site
High Falls, NY

PLATE C-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



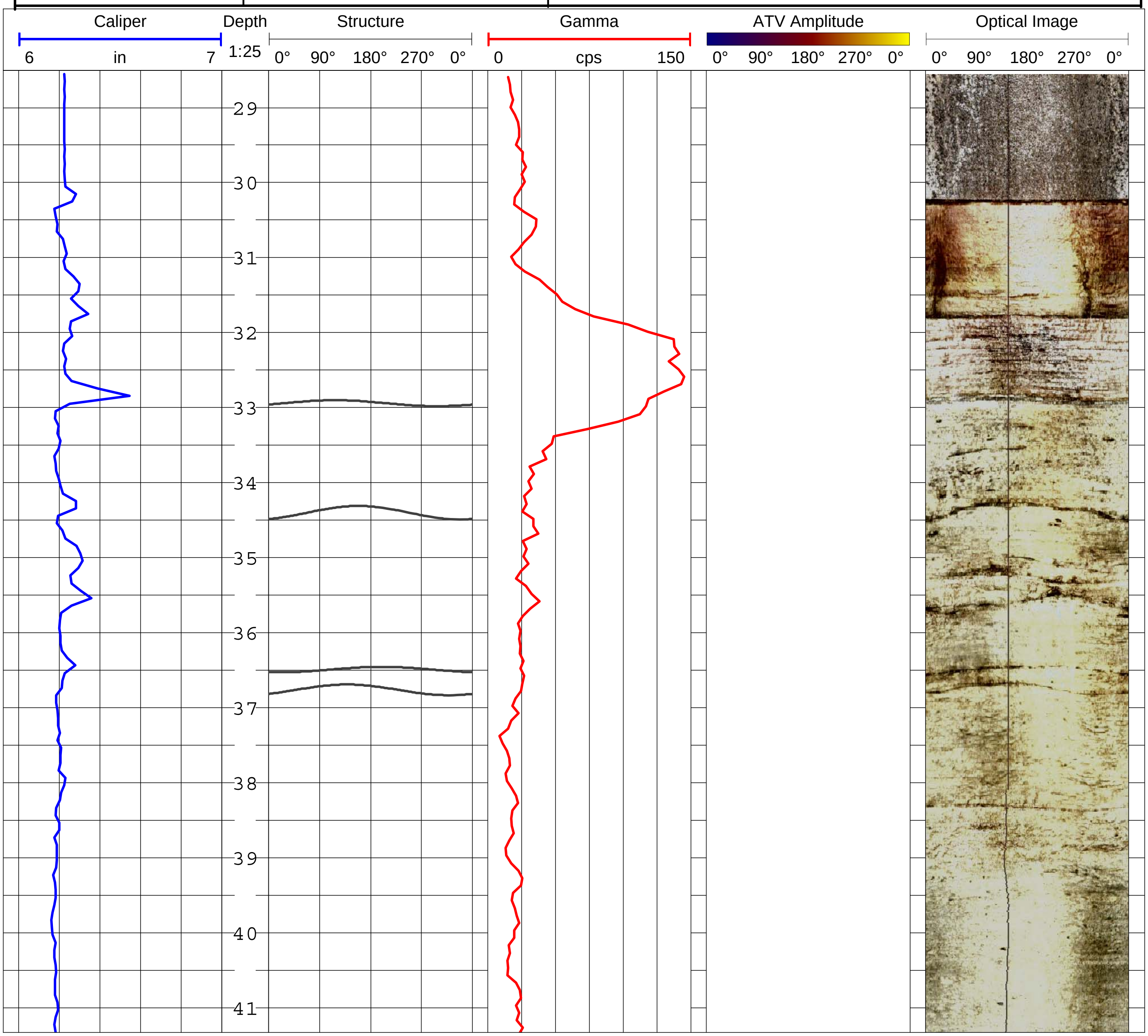
Explanation -

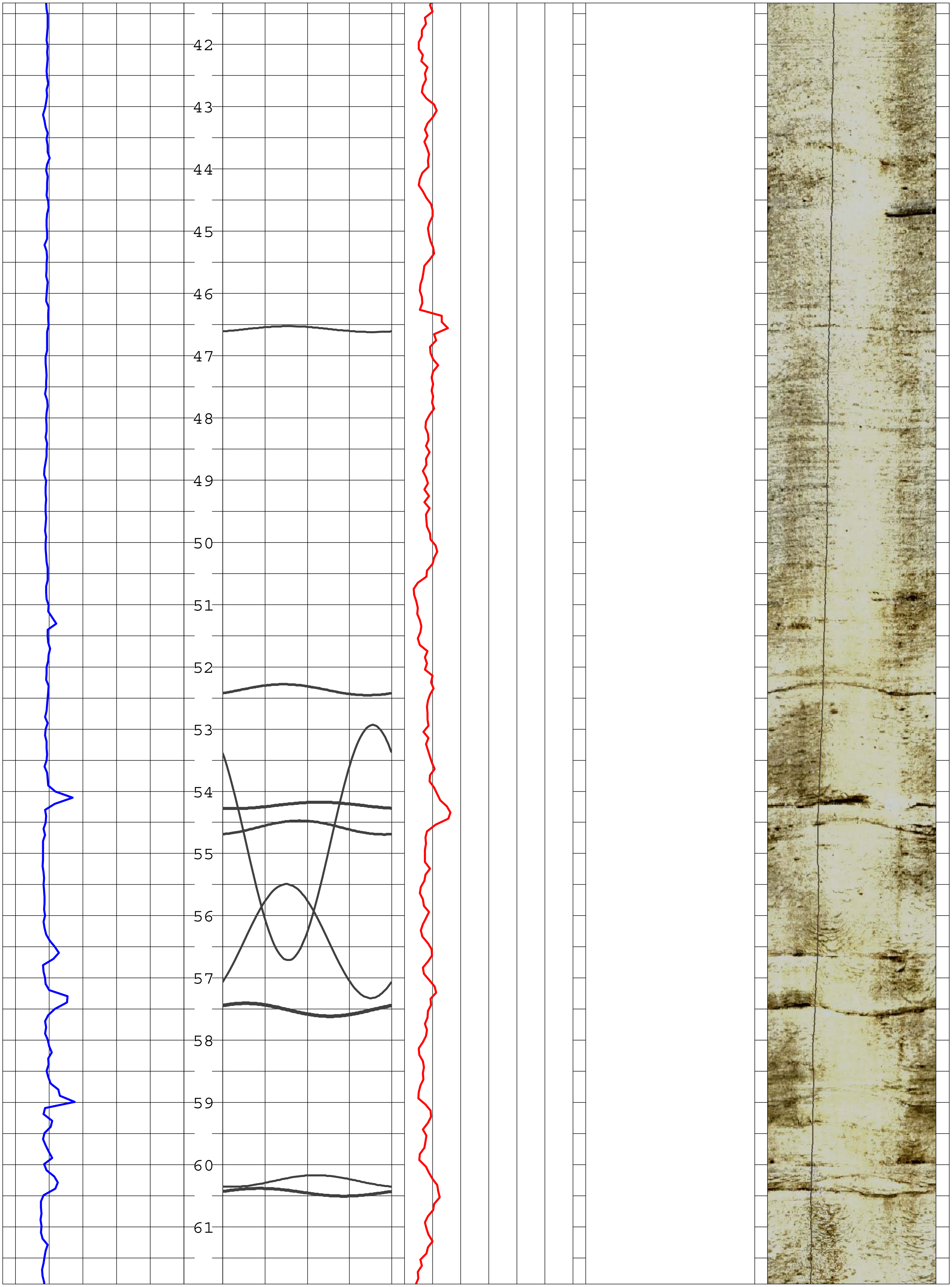
- Possibly transmissive
- Likely transmissive
- possible joint, fracture, bedding or foliation

Declination: 13.2 degrees west

Based on 36 measurements

Northeast Geophysical Services 4 Union Street Bangor, Maine 04401 Tel. 207-942-2700 email: ngsinc@negeophysical.com	**Log:** **Plate C-4 Televiewer, Gamma & Caliper** Well: **MW-7R** **Site:** **Mohonk Road Industrial Plant**
Date: 9/10/2015	**Location:** **High Falls, NY**
Casing Depth: 30 ft	**For:** AMEC Foster Wheeler
Casing Type: 6 in	**Logged by:** R. Rawcliffe
Boring Depth: 180.3 ft	**Orientation:** magnetic
Meas. From: top of casing	**Structure Plots:** black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup: 2.61 ft	
Water Level: 78.8 ft	

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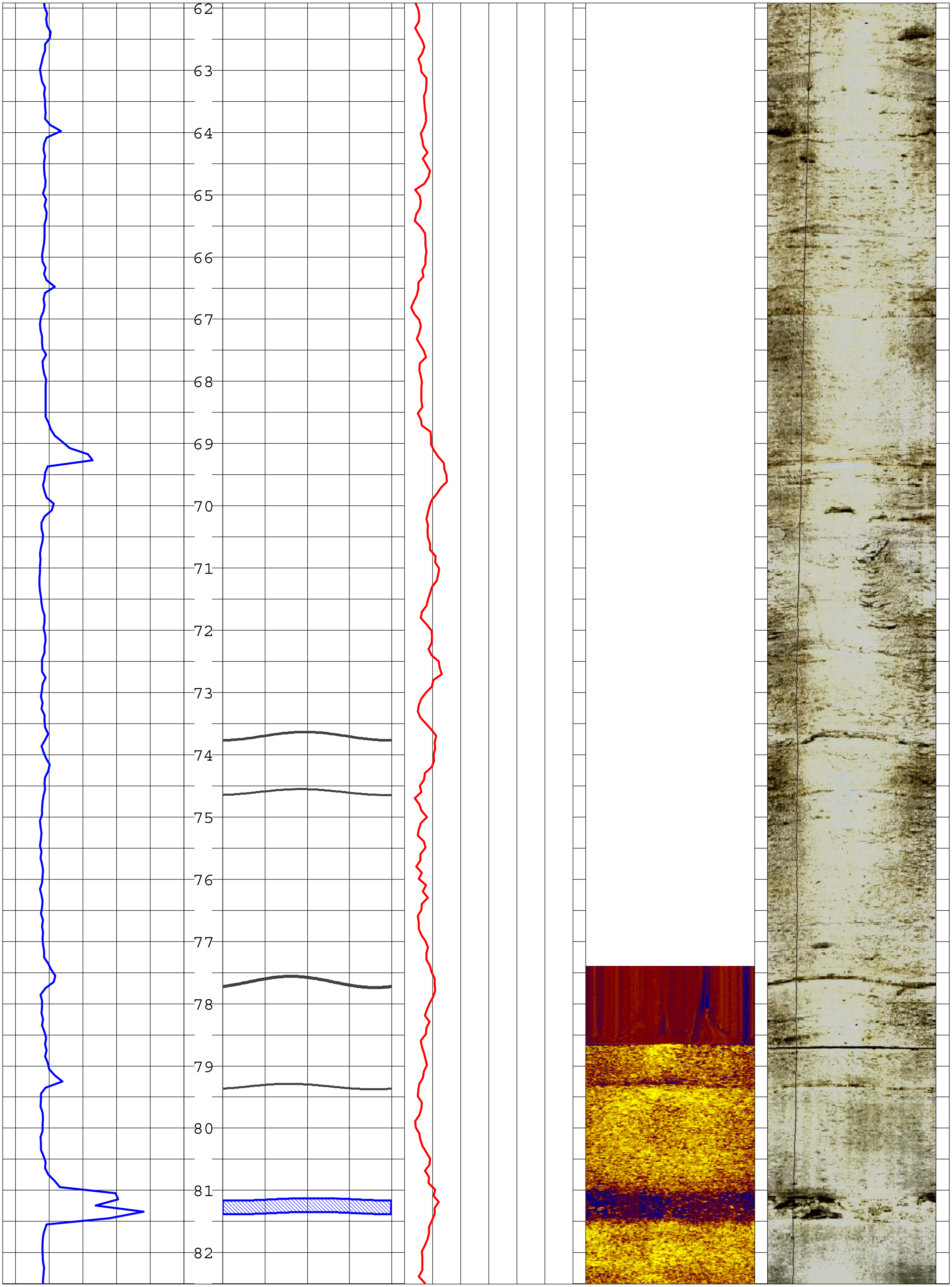
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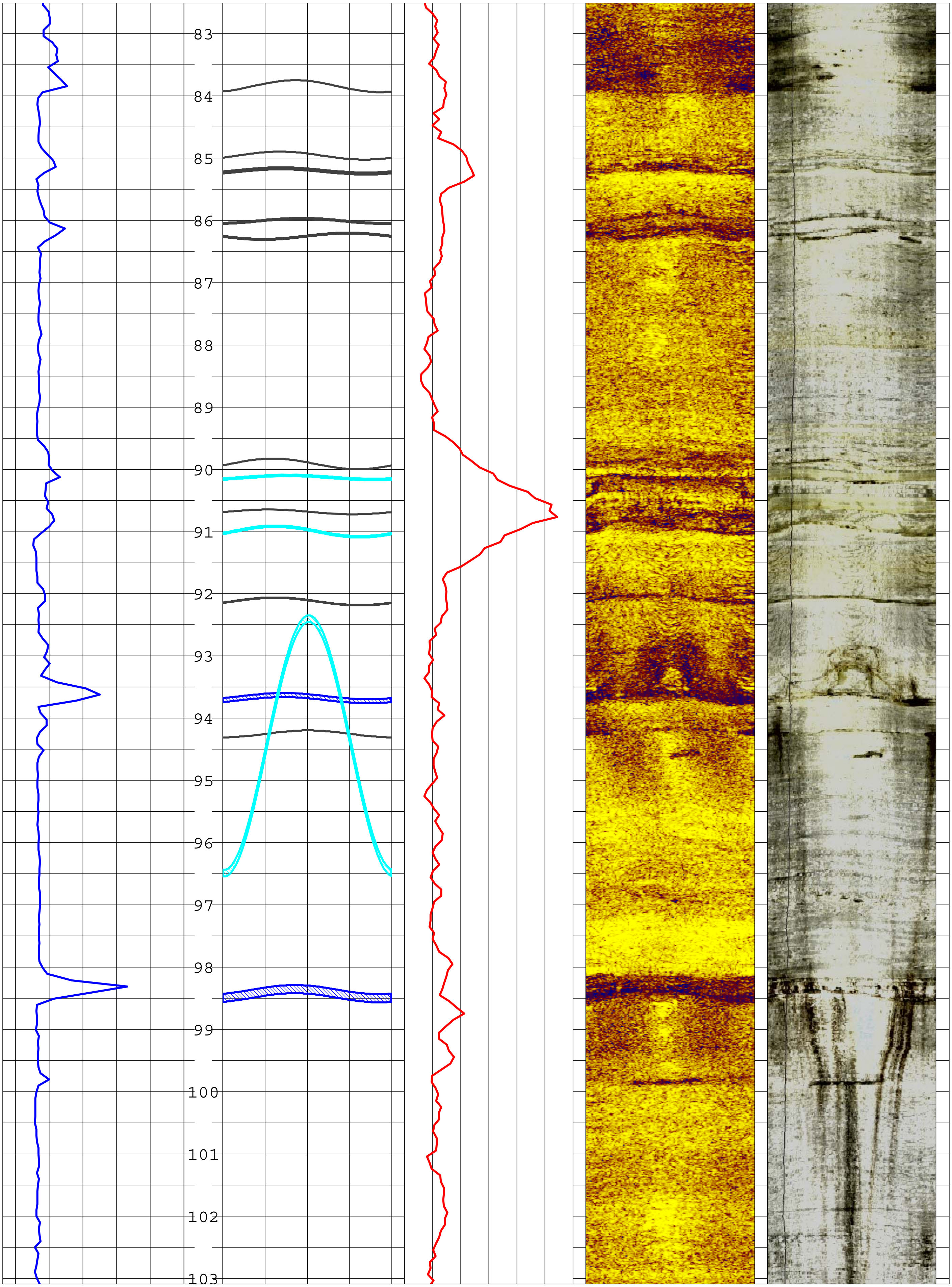
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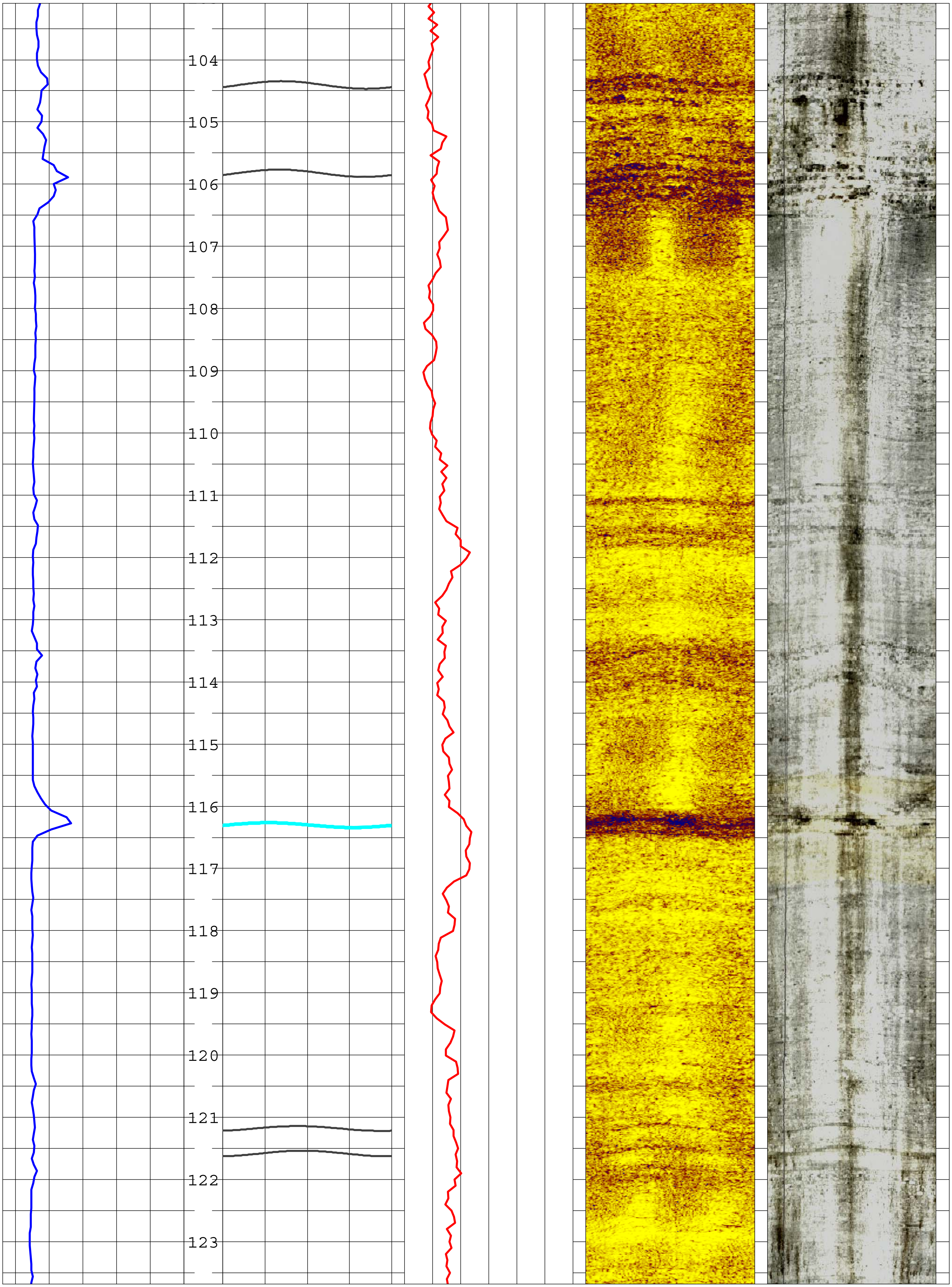
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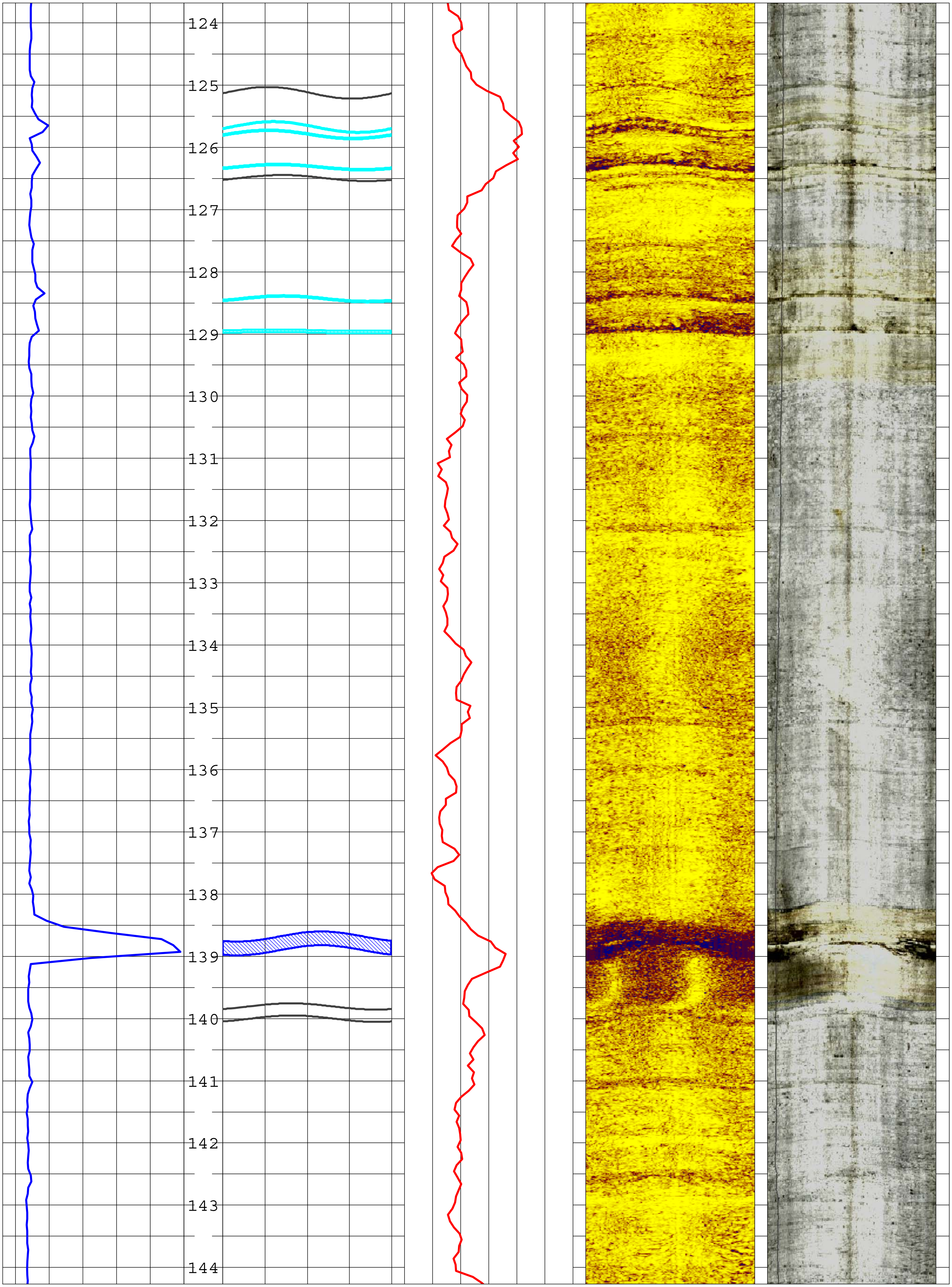
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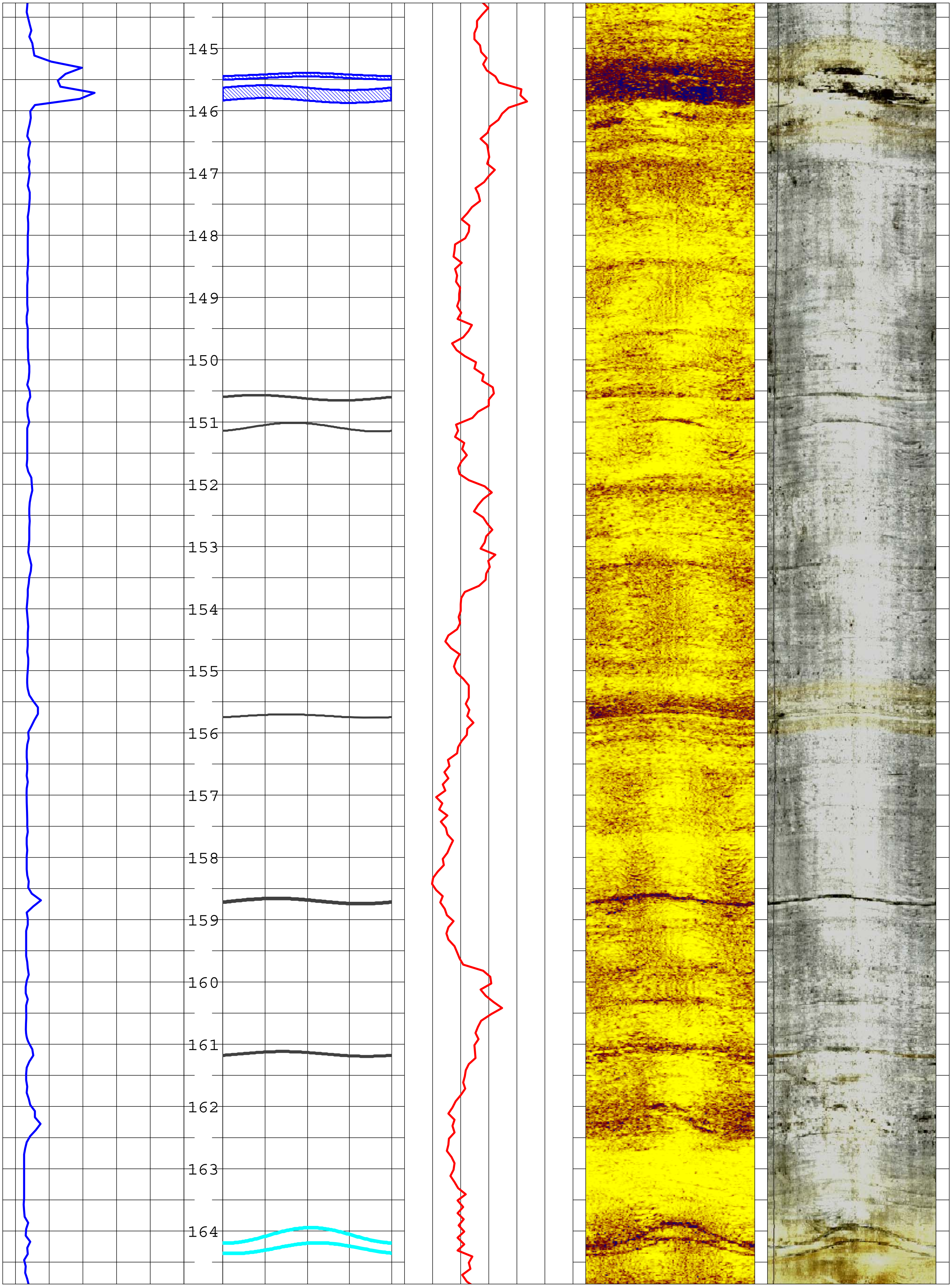
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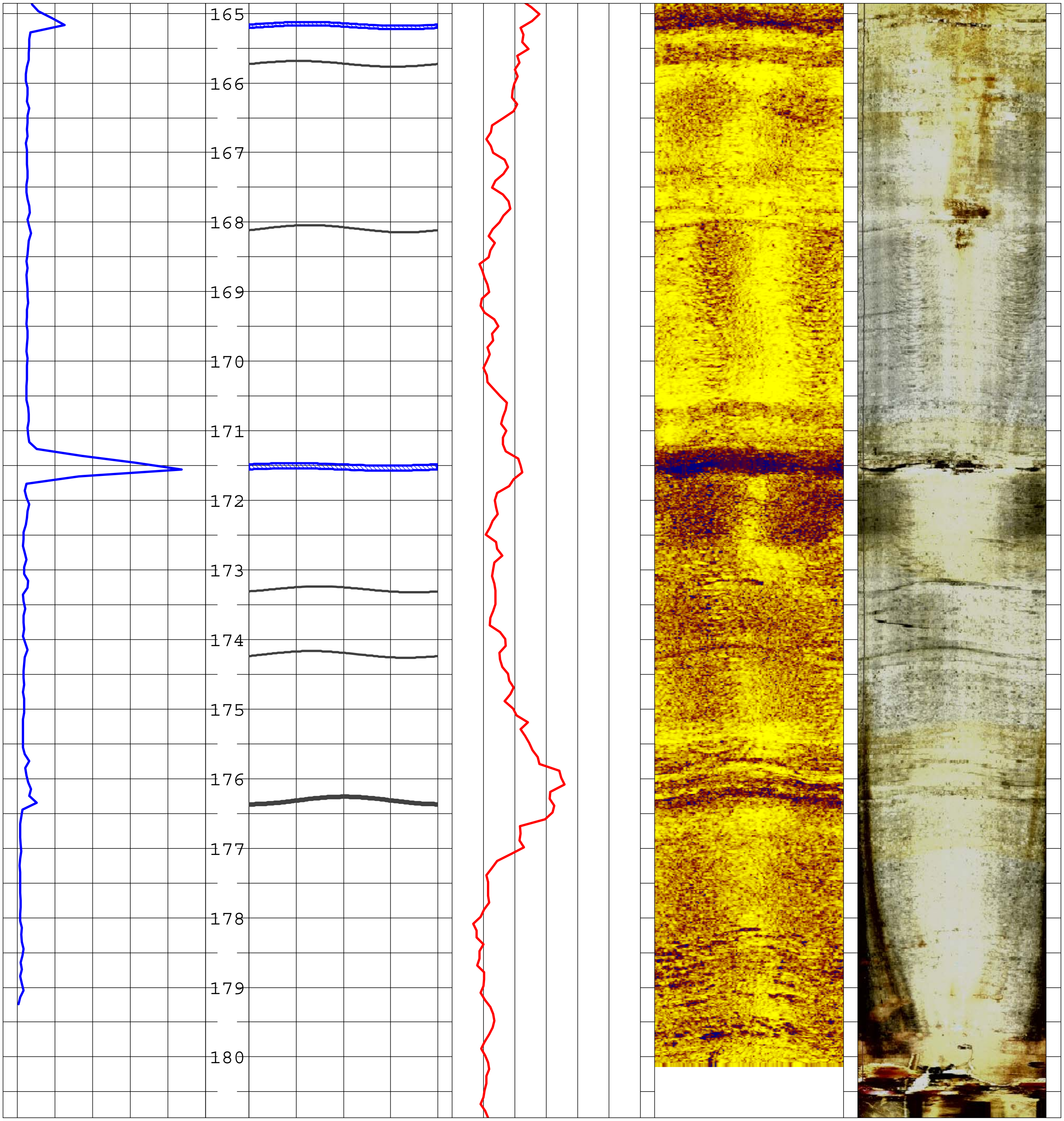
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TABLE C-1 Planar features interpreted from acoustical and optical televiewers
MW-7R - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
MW-7R	1	32.9	9	297	27	284	14	<1 mm	100
MW-7R	2	34.4	19	338	68	325	55	<1 mm	100
MW-7R	3	36.5	8	20	290	6	276	<1 mm	100
MW-7R	4	36.8	15	319	49	305	35	<1 mm	100
MW-7R	5	46.6	10	319	49	306	36	<1 mm	100
MW-7R	6	52.4	19	309	39	296	26	2	100
MW-7R	7	54.2	11	26	296	12	282	5	100
MW-7R	8	54.6	23	343	73	330	60	2	100
MW-7R	9	54.8	82	140	50	126	36	<1 mm	100
MW-7R	10	56.4	74	315	45	302	32	<1 mm	100
MW-7R	11	57.5	22	229	319	215	305	7	100
MW-7R	12	60.3	20	19	289	5	275	<1 mm	100
MW-7R	13	60.4	14	258	348	245	335	6	100
MW-7R	14	73.7	15	355	85	342	72	5	100
MW-7R	15	74.6	10	346	76	333	63	<1 mm	100
MW-7R	16	77.7	19	326	56	312	42	5	100
MW-7R	17	79.3	9	322	52	308	38	<1 mm	100
MW-7R	18	81.3	4	13	283	0	270	66	107
MW-7R	19	83.8	20	334	64	321	51	<1 mm	100
MW-7R	20	85.0	14	302	32	289	19	<1 mm	100
MW-7R	21	85.2	9	304	34	291	21	9	100
MW-7R	22	86.0	9	346	76	333	63	6	100
MW-7R	23	86.3	11	87	357	74	344	5	100
MW-7R	24	89.9	18	287	17	274	4	<1 mm	100
MW-7R	25	90.1	7	320	50	307	37	7	108
MW-7R	26	90.7	8	277	7	263	353	<1 mm	100
MW-7R	27	91.0	18	292	22	279	9	8	108
MW-7R	28	92.1	13	291	21	278	8	3	100
MW-7R	29	93.7	11	310	40	297	27	18	107
MW-7R	30	94.3	12	1	271	348	78	<1 mm	100
MW-7R	31	94.5	83	4	274	350	80	4	108
MW-7R	32	98.4	15	334	64	320	50	36	107
MW-7R	33	104.4	13	305	35	292	22	<1 mm	100
MW-7R	34	105.8	13	300	30	287	17	<1 mm	100

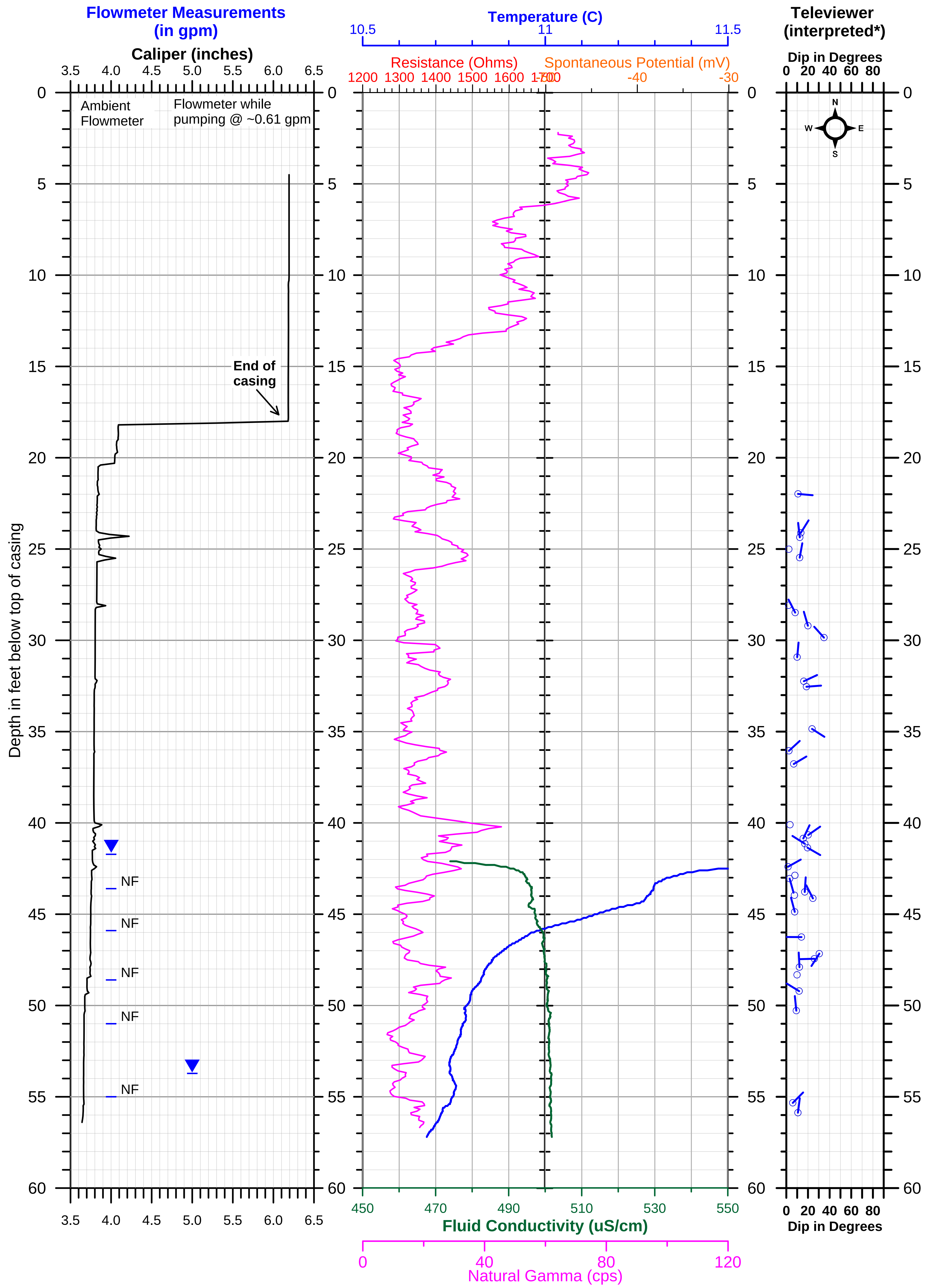
TABLE C-1 Planar features interpreted from acoustical and optical televiewers
MW-7R - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
MW-7R	35	116.3	8	277	7	264	354	9	108
MW-7R	36	121.2	9	339	69	325	55	<1 mm	100
MW-7R	37	121.6	10	350	80	337	67	<1 mm	100
MW-7R	38	125.1	20	276	6	262	352	<1 mm	100
MW-7R	39	125.7	19	288	18	274	4	6	108
MW-7R	40	125.8	14	277	7	264	354	6	108
MW-7R	41	126.3	9	298	28	285	15	9	108
MW-7R	42	126.5	11	307	37	294	24	<1 mm	100
MW-7R	43	128.4	10	309	39	296	26	9	108
MW-7R	44	129.0	3	290	20	277	7	11	108
MW-7R	45	138.8	16	30	300	17	287	64	107
MW-7R	46	139.8	11	326	56	312	42	<1 mm	100
MW-7R	47	140.0	12	328	58	315	45	<1 mm	100
MW-7R	48	145.4	5	357	87	344	74	17	107
MW-7R	49	145.7	8	268	358	255	345	61	107
MW-7R	50	150.6	10	252	342	239	329	4	100
MW-7R	51	151.1	15	331	61	318	48	<1 mm	100
MW-7R	52	155.7	6	316	46	303	33	<1 mm	100
MW-7R	53	158.7	10	294	24	281	11	6	100
MW-7R	54	161.2	8	307	37	294	24	5	100
MW-7R	55	164.1	26	7	277	354	84	7	108
MW-7R	56	164.3	19	23	293	10	280	8	108
MW-7R	57	165.2	6	291	21	277	7	14	107
MW-7R	58	165.7	9	274	4	261	351	<1 mm	100
MW-7R	59	168.1	11	295	25	282	12	<1 mm	100
MW-7R	60	171.5	4	266	356	253	343	22	107
MW-7R	61	173.3	10	314	44	301	31	<1 mm	100
MW-7R	62	174.2	11	300	30	287	17	<1 mm	100
MW-7R	63	176.3	12	2	272	348	78	10	100

Northeast Geophysical Services

SVE-19
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/11/15



= Likely transmissive zone

= possible transmissive zone

The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

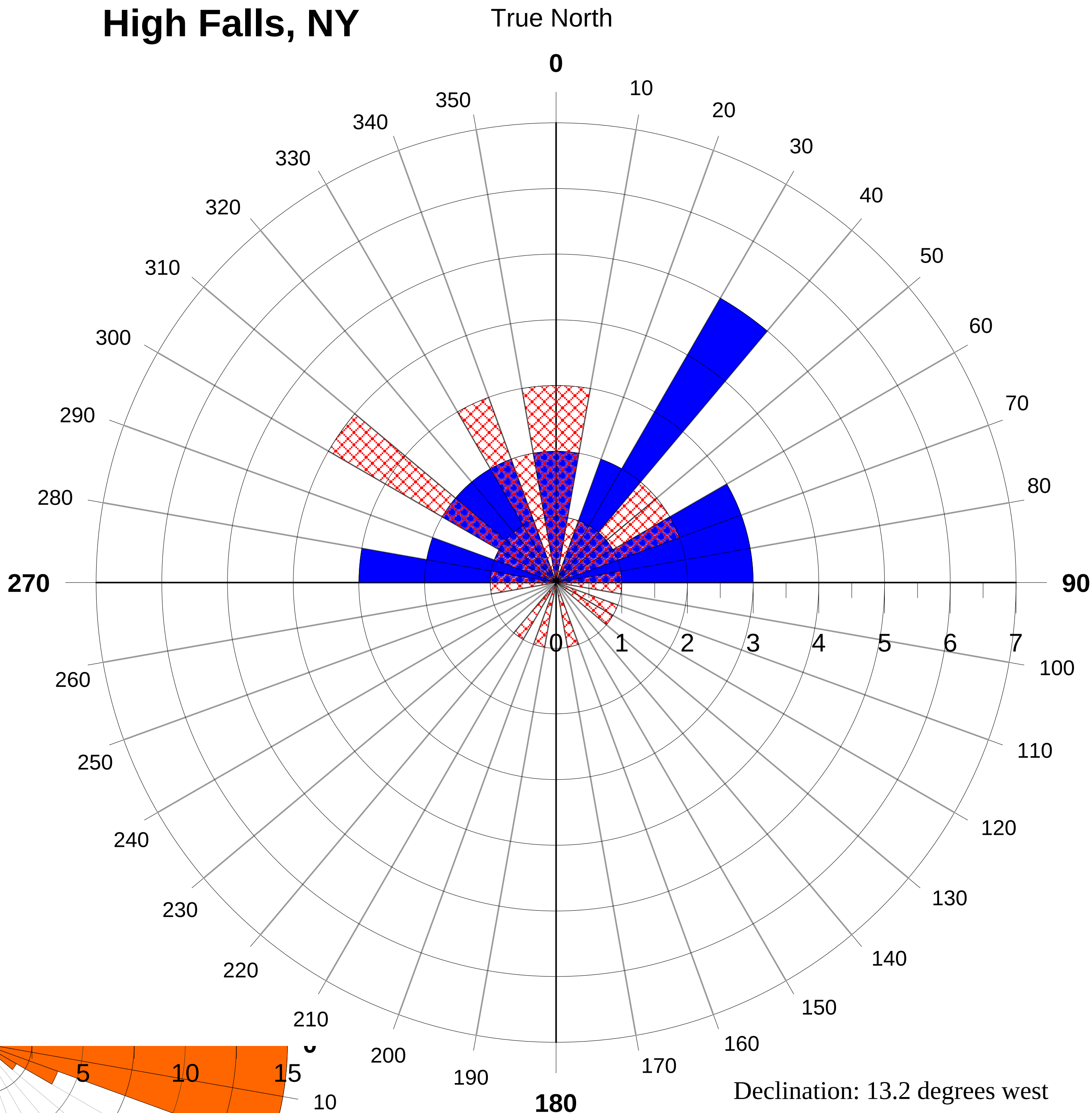
PLATE D-1
SVE-19
Mohonk Road Industrial Plant Site
High Falls, NY

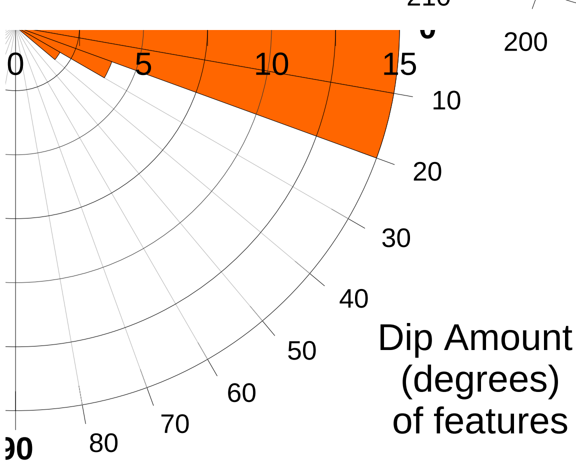
Date logged: 9/11/15

Northeast Geophysical Services

Borehole SVE-19
Mohonk Road Industrial Site
High Falls, NY

PLATE D-2
Strike and Dip Direction
of all features





Declination: 13.2 degrees west

Explanation

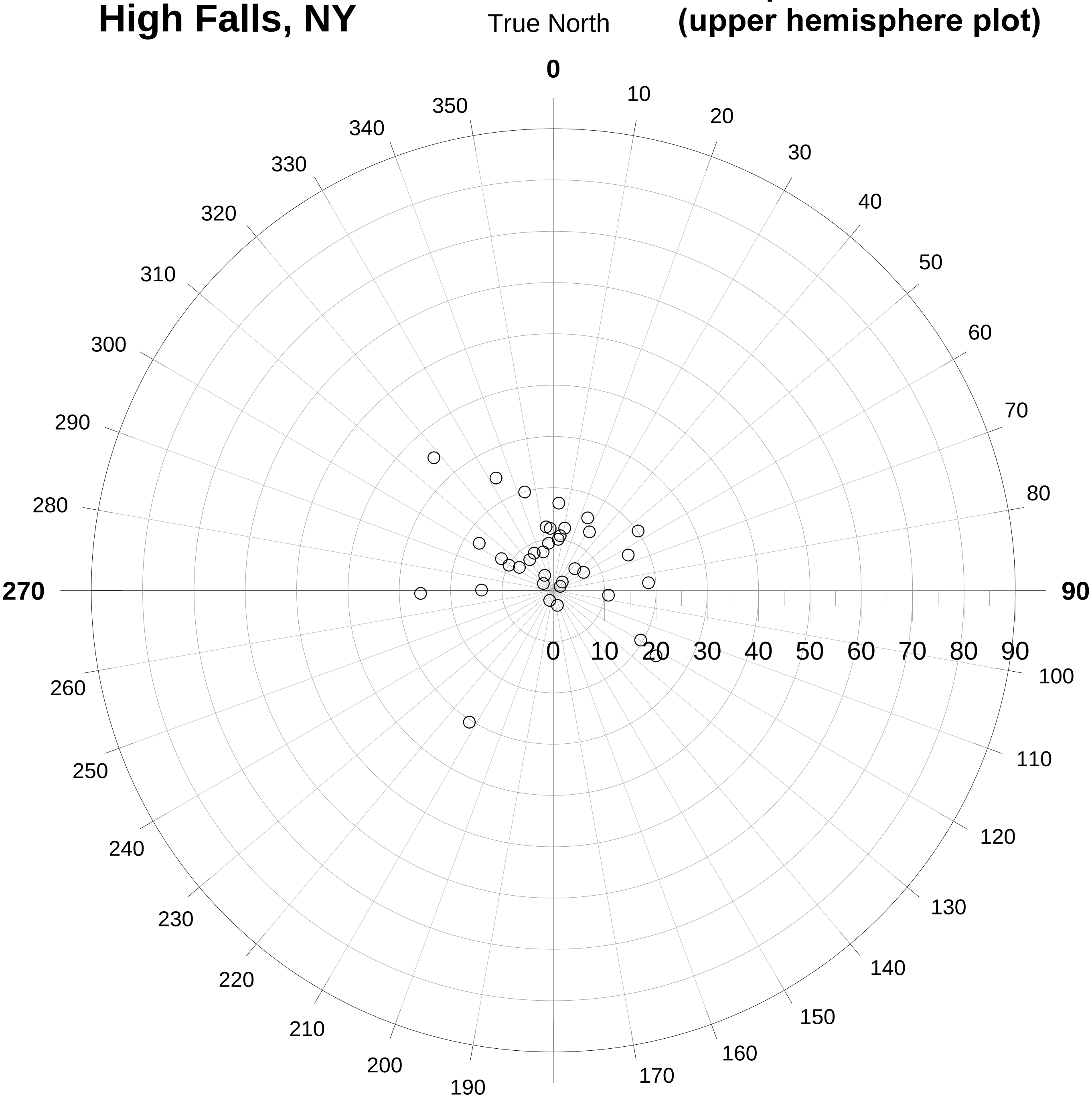
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 36 measurements

Northeast Geophysical Services

Borehole SVE-19
Mohonk Road Industrial Site
High Falls, NY

PLATE D-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation -

- Possibly transmissive
- Likely transmissive
- possible joint, fracture, bedding or foliation

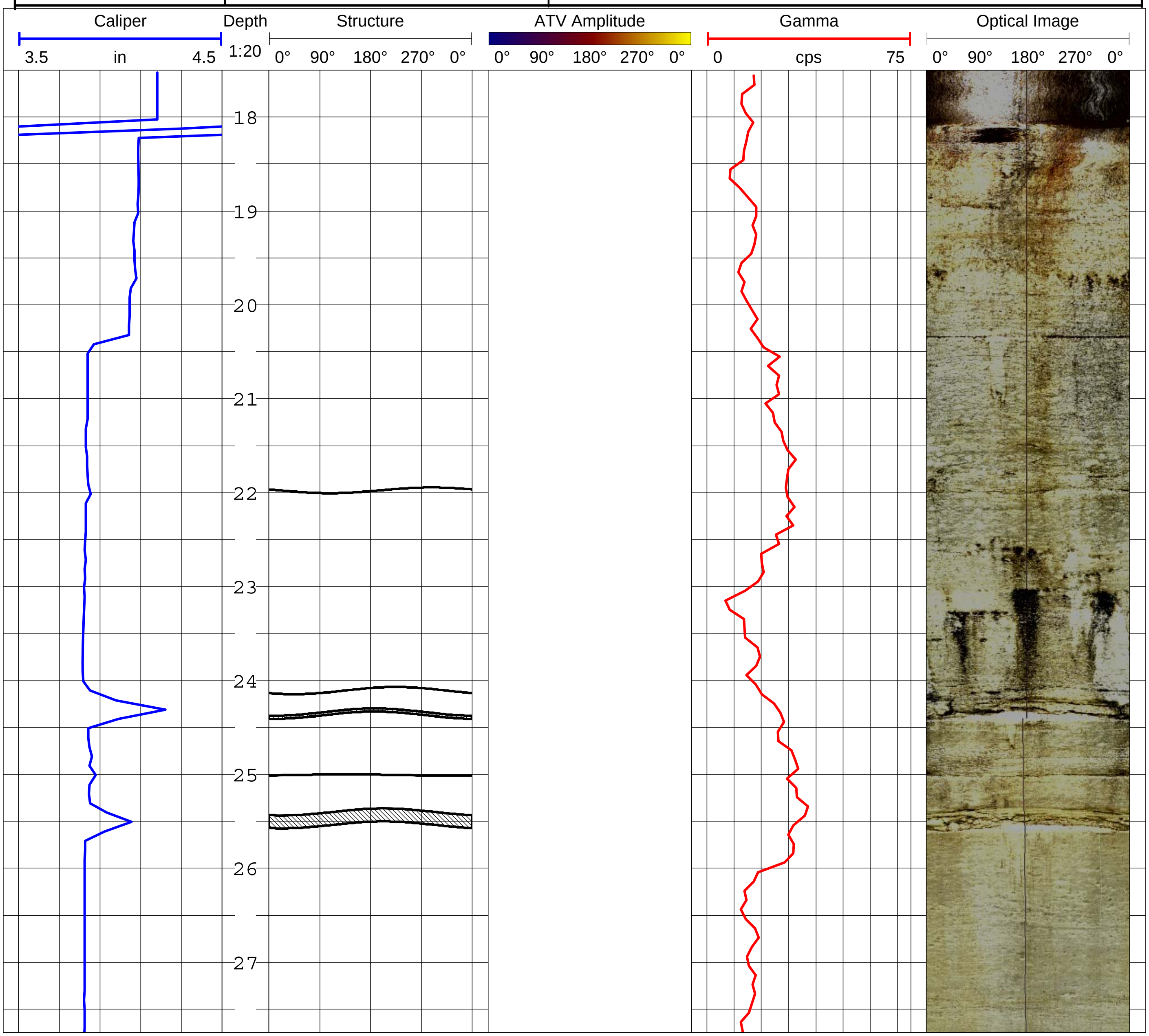
Declination: 13.2 degrees west

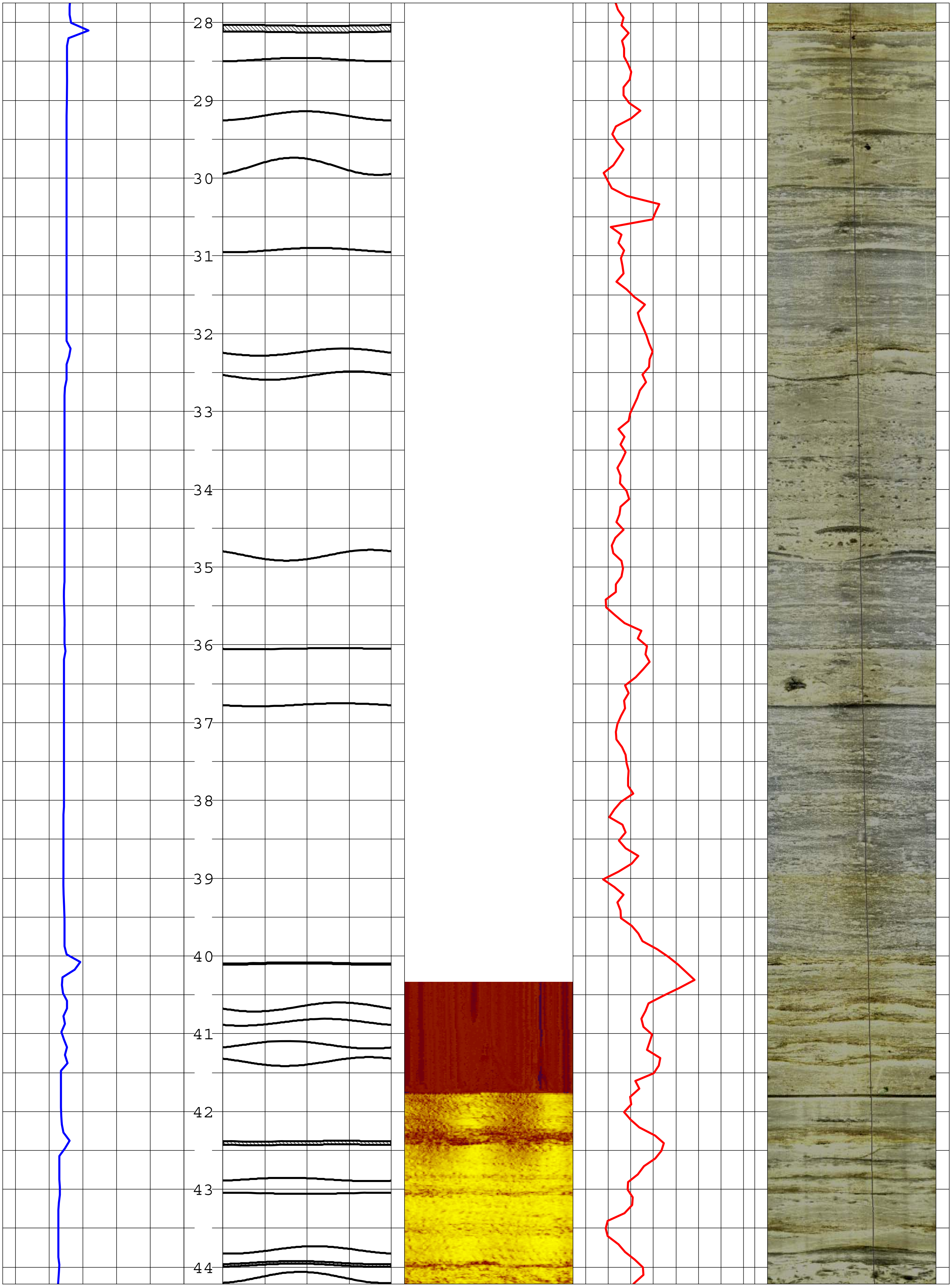
Based on 36 measurements

Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log:	**Plate D-4 Televiewer, Gamma & Caliper**
Well:	SVE-19
Site:	Mohonk Road Industrial Plant
Date:	9/11/2015
Location:	High Falls, NY
Casing Depth:	18 ft
For:	AMEC Foster Wheeler
Casing Type:	steel
Logged by:	R. Rawcliffe
Boring Depth:	57.44 ft
Orientation:	magnetic
Meas. From:	top of casing
Stickup:	1.80 ft
Water Level:	42.18

Structure Plots:
black = planar features (faults, foliation, bedding, joints, etc)
light blue = possibly transmissive fracture
dark blue = likely transmissive fracture

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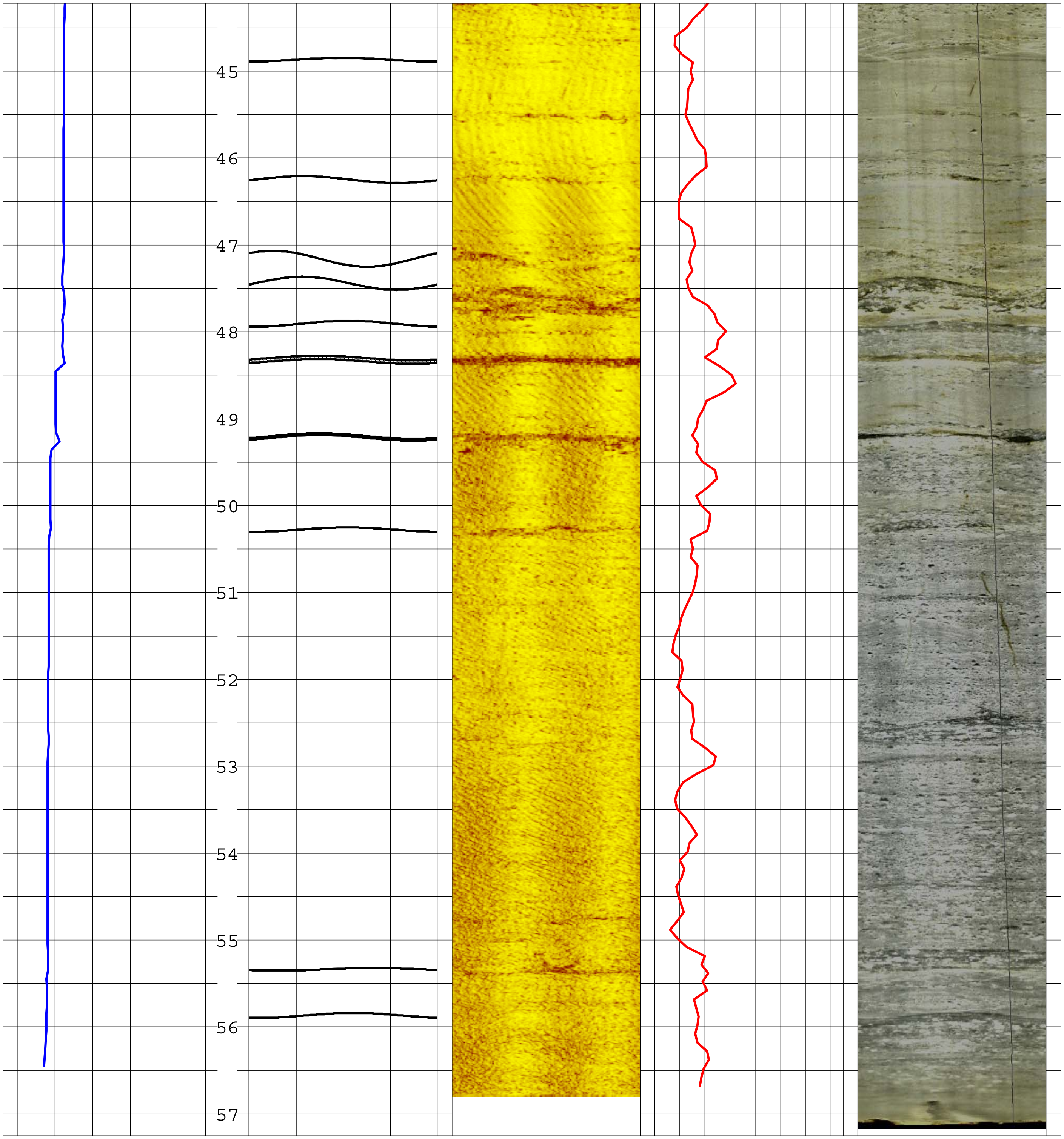
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TABLE D-1 Planar features interpreted from acoustical and optical televiewers
SVE-19 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
SVE-19	1	22.0	11	108	18	95	5	<1 mm	100
SVE-19	2	24.1	13	45	315	32	302	<1 mm	100
SVE-19	3	24.4	12	7	277	354	84	9	100
SVE-19	4	25.0	2	318	48	304	34	<1 mm	100
SVE-19	5	25.5	12	24	294	10	280	41	100
SVE-19	6	28.1	2	213	303	199	289	26	100
SVE-19	7	28.5	8	346	76	333	63	<1 mm	100
SVE-19	8	29.2	20	357	87	344	74	<1 mm	100
SVE-19	9	29.9	35	331	61	318	48	<1 mm	100
SVE-19	10	30.9	10	19	289	6	276	<1 mm	100
SVE-19	11	32.2	16	78	348	65	335	<1 mm	100
SVE-19	12	32.5	19	99	9	86	356	<1 mm	100
SVE-19	13	34.9	24	136	46	123	33	<1 mm	100
SVE-19	14	36.1	2	61	331	48	318	<1 mm	100
SVE-19	15	36.8	7	73	343	59	329	<1 mm	100
SVE-19	16	40.1	3	343	73	330	60	4	100
SVE-19	17	40.7	20	68	338	55	325	<1 mm	100
SVE-19	18	40.9	16	39	309	25	295	<1 mm	100
SVE-19	19	41.1	17	316	46	302	32	<1 mm	100
SVE-19	20	41.4	20	133	43	120	30	<1 mm	100
SVE-19	21	42.4	2	74	344	61	331	13	100
SVE-19	22	42.9	8	317	47	304	34	<1 mm	100
SVE-19	23	43.1	3	178	88	165	75	<1 mm	100
SVE-19	24	43.8	17	17	287	4	274	<1 mm	100
SVE-19	25	44.0	8	336	66	323	53	9	100
SVE-19	26	44.1	25	346	76	333	63	<1 mm	100
SVE-19	27	44.9	8	358	88	345	75	<1 mm	100
SVE-19	28	46.3	14	283	13	270	0	<1 mm	100
SVE-19	29	47.2	30	226	316	212	302	<1 mm	100
SVE-19	30	47.4	26	282	12	269	359	<1 mm	100
SVE-19	31	47.9	12	10	280	357	87	<1 mm	100

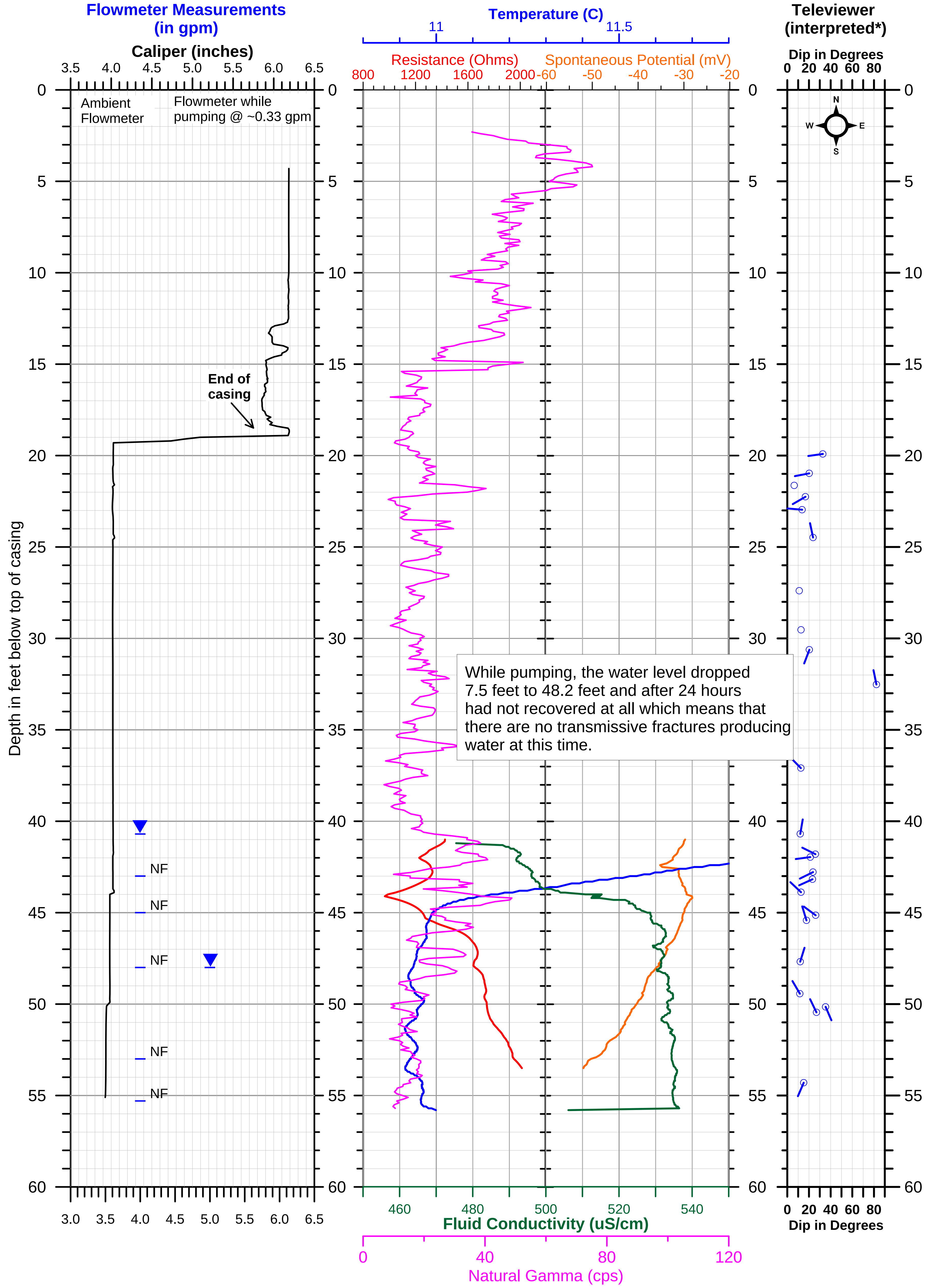
TABLE D-1 Planar features interpreted from acoustical and optical televiewers
SVE-19 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
SVE-19	32	48.3	10	313	43	299	29	11.5	100
SVE-19	33	49.2	12	315	45	301	31	6.5	100
SVE-19	34	50.3	9	7	277	354	84	<1 mm	100
SVE-19	35	55.3	6	58	328	45	315	<1 mm	100
SVE-19	36	55.9	11	20	290	7	277	<1 mm	100

Northeast Geophysical Services

SVE-20
Mohonk Road Industrial Plant Site
High Falls, NY

Date logged: 9/08/15



= Likely transmissive zone

= possible transmissive zone

PLATE E-1
SVE-20
Mohonk Road Industrial Plant Site
High Falls, NY

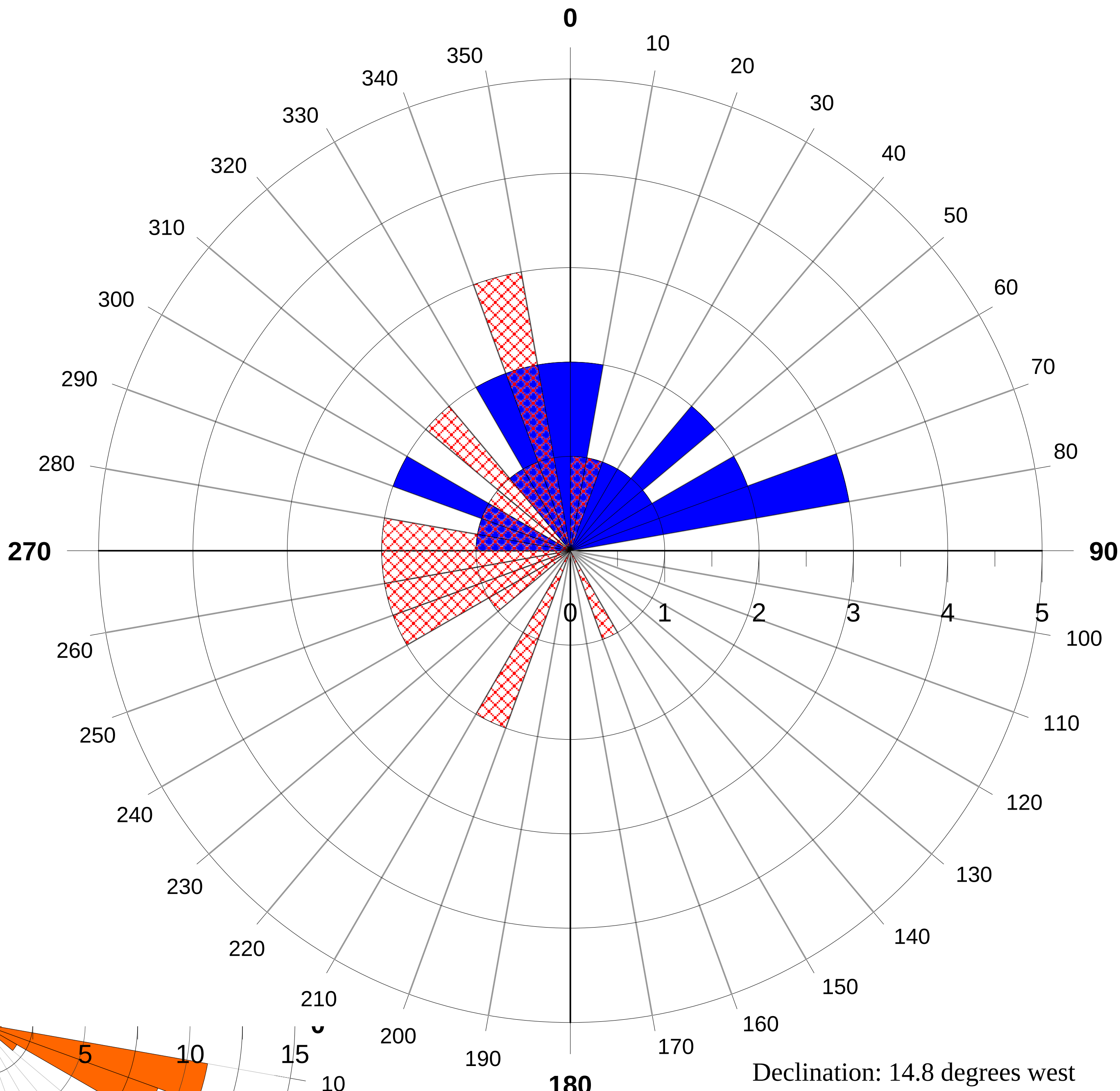
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.

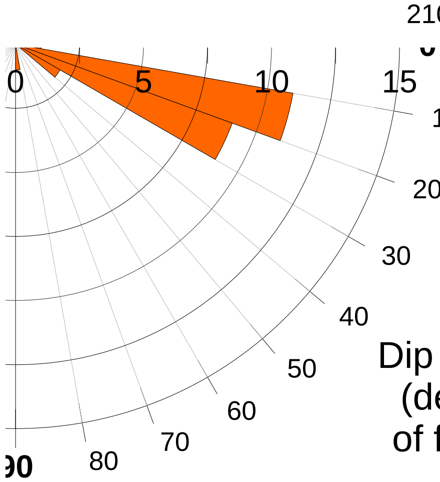
Date logged: 9/08/15

Northeast Geophysical Services

Borehole SVE-20
Mohonk Road Industrial Site
High Falls, NY

PLATE E-2
Strike and Dip Direction of all features





Dip Amount (degrees) of features

Declination: 14.8 degrees west

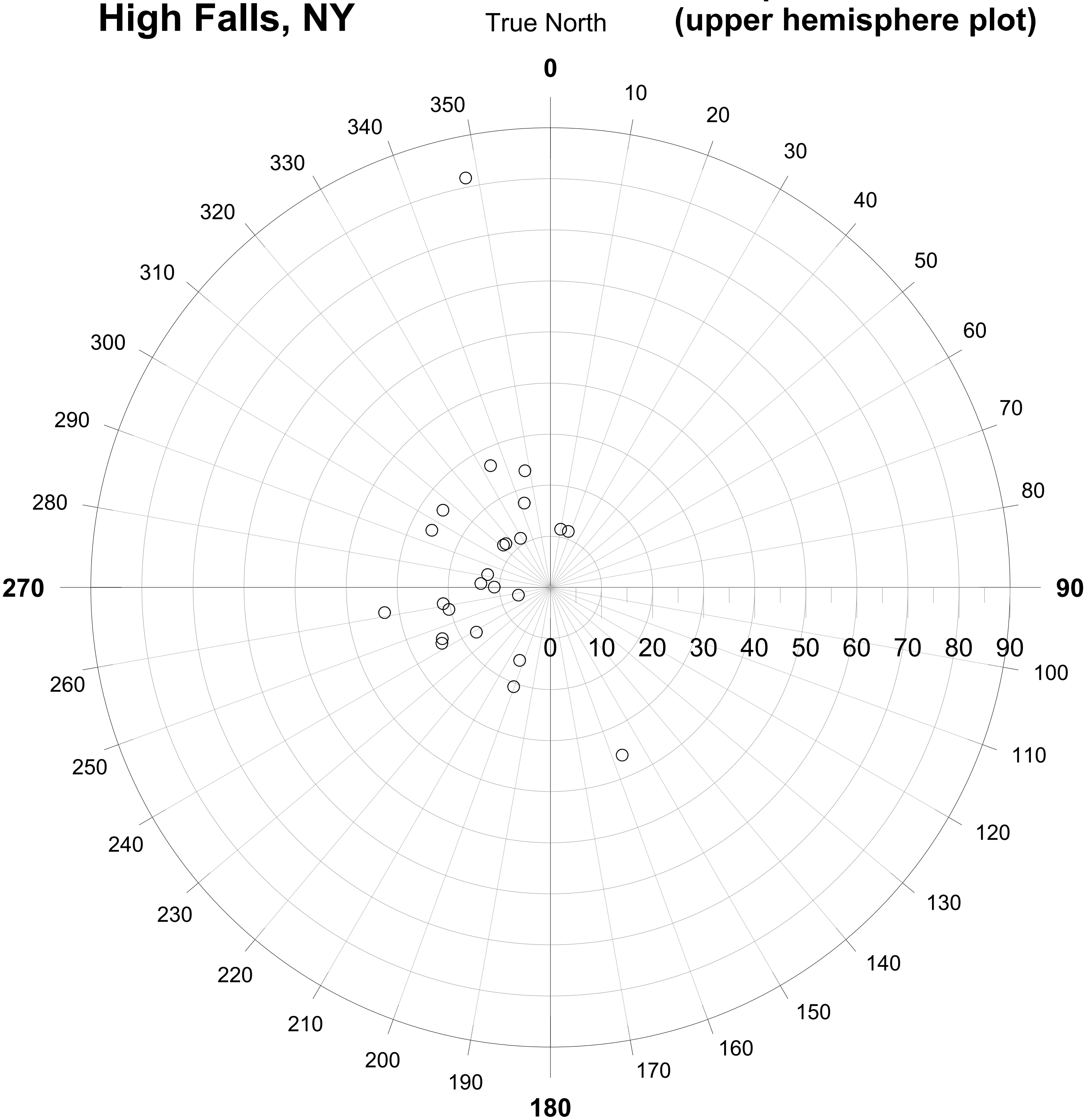
Explanation
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 24 measurements

Northeast Geophysical Services

Borehole SVE-20
Mohonk Road Industrial Site
High Falls, NY

PLATE E-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation -

- Possibly transmissive
- Likely transmissive
- possible joint, fracture, bedding or foliation

Declination: 13.2 degrees west

Based on 24 measurements

Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log: **Plate E-4 Televiewer, Gamma & Caliper**

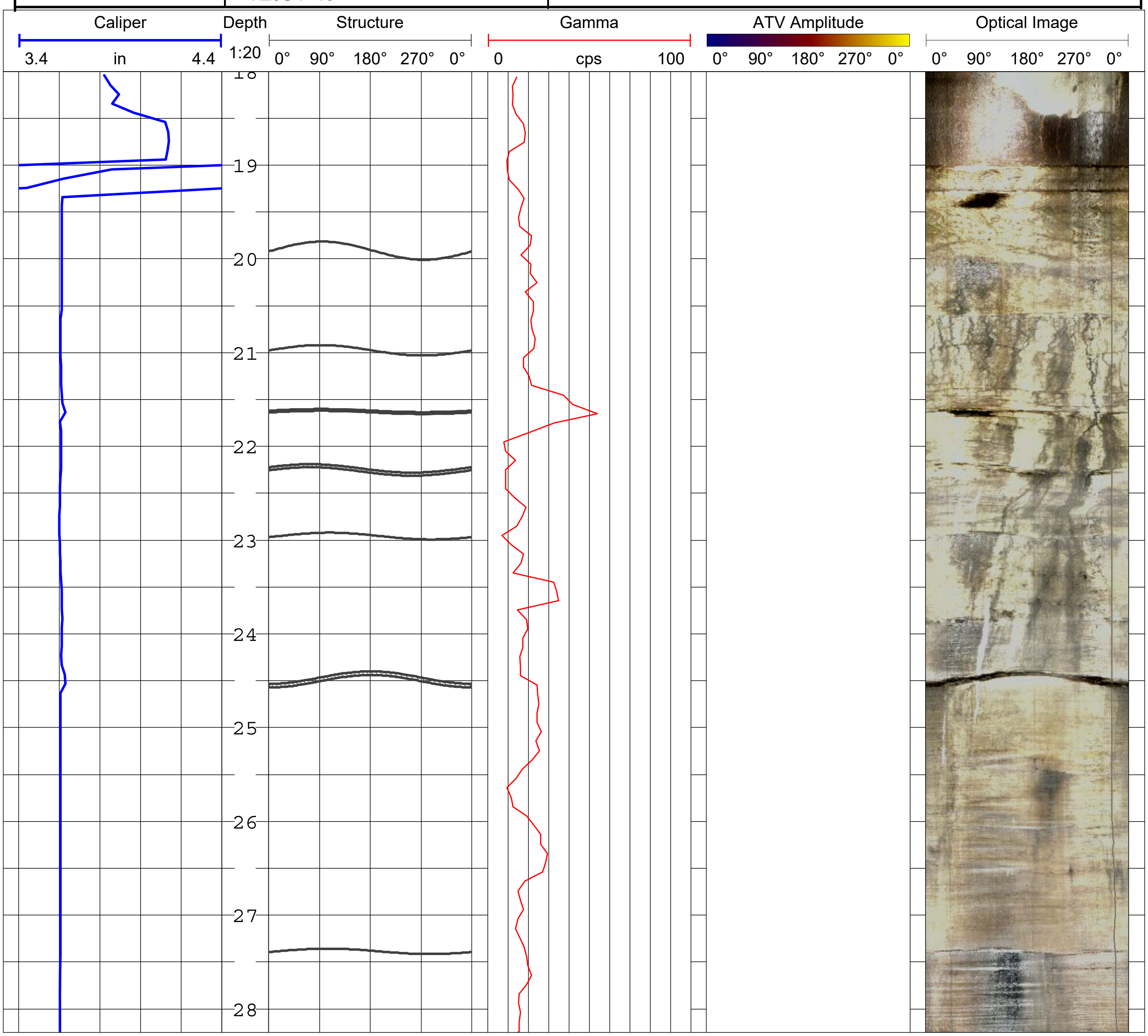
Well: SVE-20

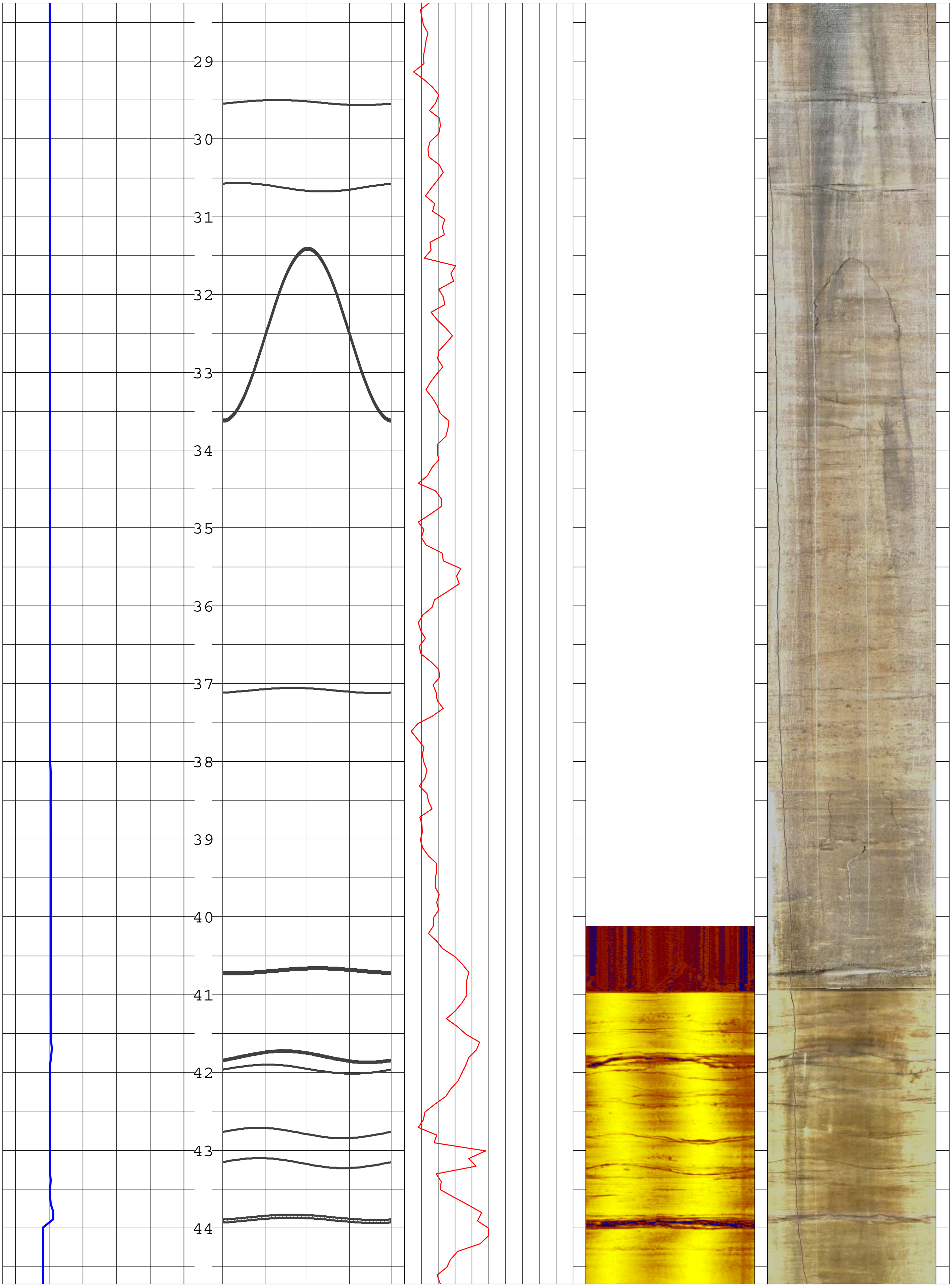
Site: Mohonk Road Industrial Plant

Date:	9/08/2015	Location:	High Falls, NY
Casing Depth:	19 ft	For:	AMEC Foster Wheeler
Casing Type:	steel	Logged by:	R. Rawcliffe
Boring Depth:	56.1 ft	Orientation:	magnetic
Meas. From:	top of casing	Structure Plots:	
Stickup:	1.22 ft		
Water Level:	41.37 ft		

Structure Plots:

black = planar features (faults, foliation, bedding, joints, etc)
light blue = possibly transmissive fracture
dark blue = likely transmissive fracture





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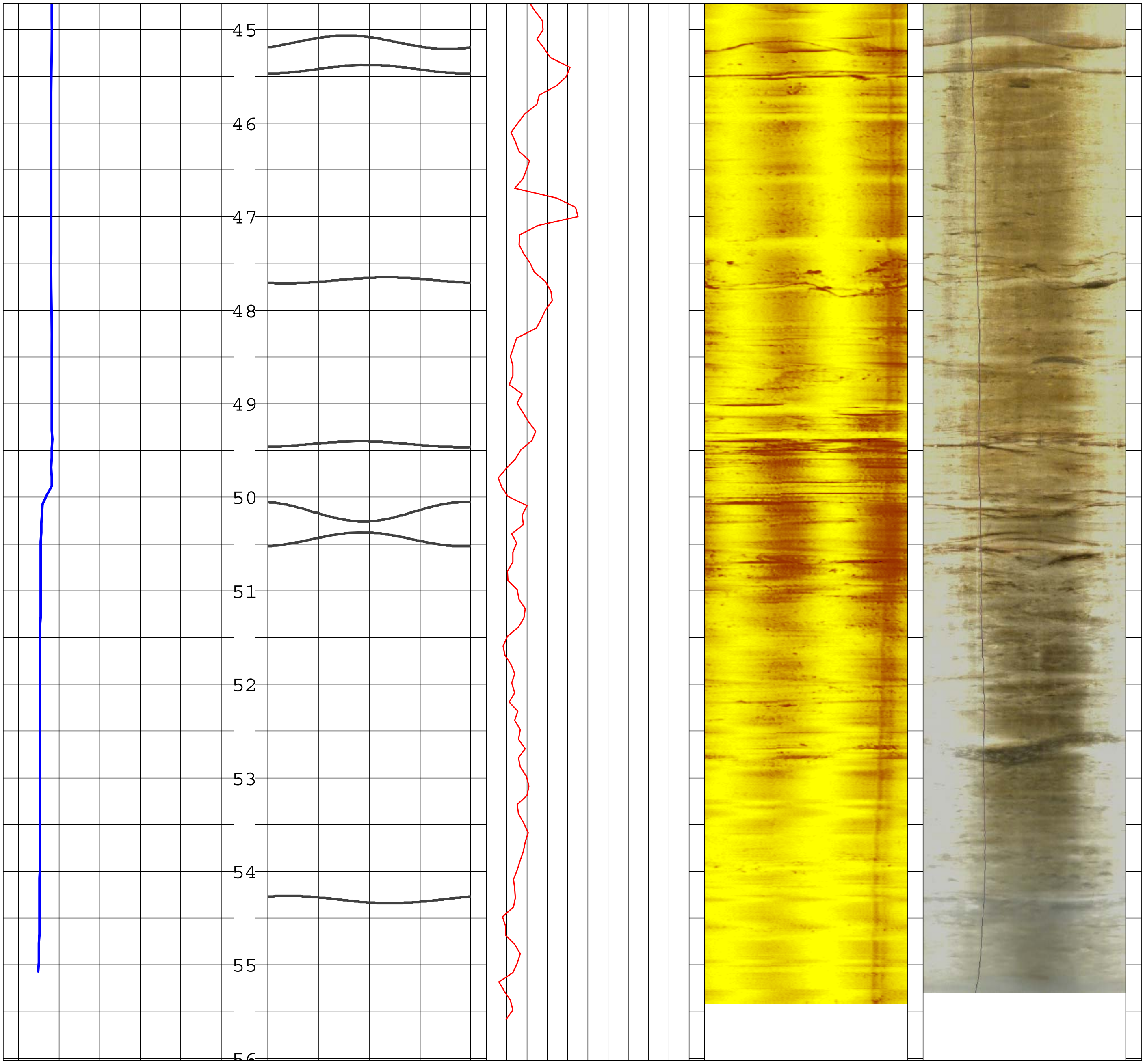
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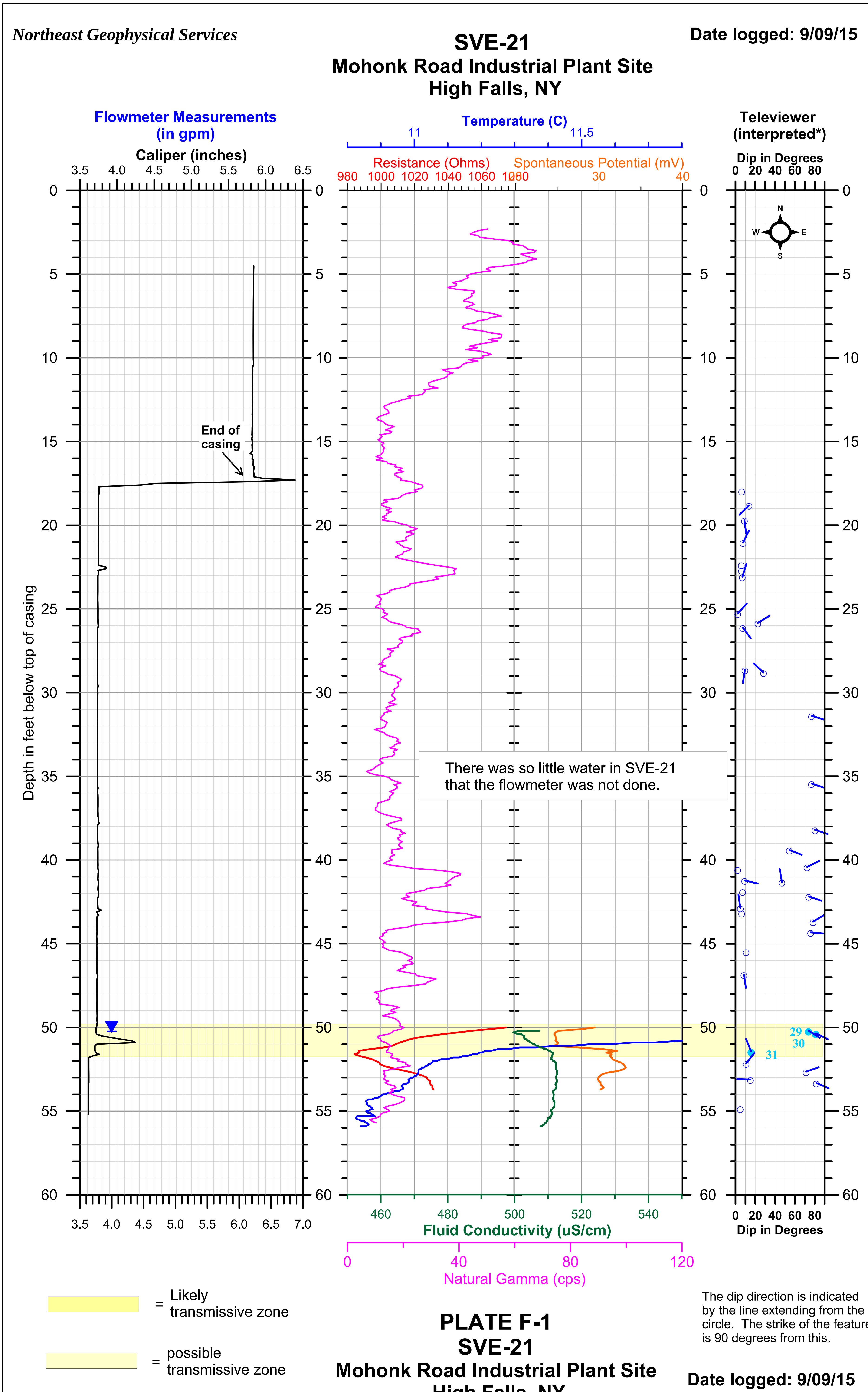
TABLE E-1 Planar features interpreted from acoustical and optical televiewers
SVE-20 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
SVE-20	1	19.9	33	275	5	262	352	<1 mm	100
SVE-20	2	21.0	20	272	2	259	349	<1 mm	100
SVE-20	3	21.6	6	273	3	260	350	6	100
SVE-20	4	22.3	17	253	343	240	330	10	100
SVE-20	5	23.0	14	288	18	275	5	<1 mm	100
SVE-20	6	24.5	24	1	271	348	78	12	100
SVE-20	7	27.4	11	286	16	272	2	<1 mm	100
SVE-20	8	29.5	13	296	26	283	13	<1 mm	100
SVE-20	9	30.6	20	214	304	201	291	<1 mm	100
SVE-20	10	32.5	82	2	272	348	78	1	100
SVE-20	11	37.1	13	329	59	316	46	<1 mm	100
SVE-20	12	40.7	12	23	293	10	280	8	100
SVE-20	13	41.8	26	310	40	297	27	5	100
SVE-20	14	42.0	21	276	6	262	352	<1 mm	100
SVE-20	15	42.8	24	257	347	244	334	<1 mm	100
SVE-20	16	43.2	23	259	349	246	336	<1 mm	100
SVE-20	17	43.9	13	327	57	313	43	13	100
SVE-20	18	45.1	26	320	50	306	36	<1 mm	100
SVE-20	19	45.4	18	356	86	343	73	<1 mm	100
SVE-20	20	47.7	12	30	300	17	287	<1 mm	100
SVE-20	21	49.4	12	343	73	330	60	<1 mm	100
SVE-20	22	50.2	35	170	80	157	67	<1 mm	100
SVE-20	23	50.5	27	347	77	334	64	<1 mm	100
SVE-20	24	54.3	15	217	307	203	293	<1 mm	100

Explanation:

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture



Northeast Geophysical Services
SVE-21
Mohonk Road Industrial Plant Site
High Falls, NY
Date logged: 9/09/15
Flowmeter Measurements
(in gpm)
Caliper (inches)
3.5 4.0 4.5 5.0 5.5 6.0 6.5
Temperature (C)
11 11.5
Resistance (Ohms)
980 1000 1020 1040 1060 1080
Spontaneous Potential (mV)
20 30 40
Televiewer
(interpreted*)
Dip in Degrees
0 20 40 60 80
N
W
E
S
End of casing
Depth in feet below top of casing
0 5 10 15 20 25 30 35 40 45 50 55 60
There was so little water in SVE-21 that the flowmeter was not done.
29
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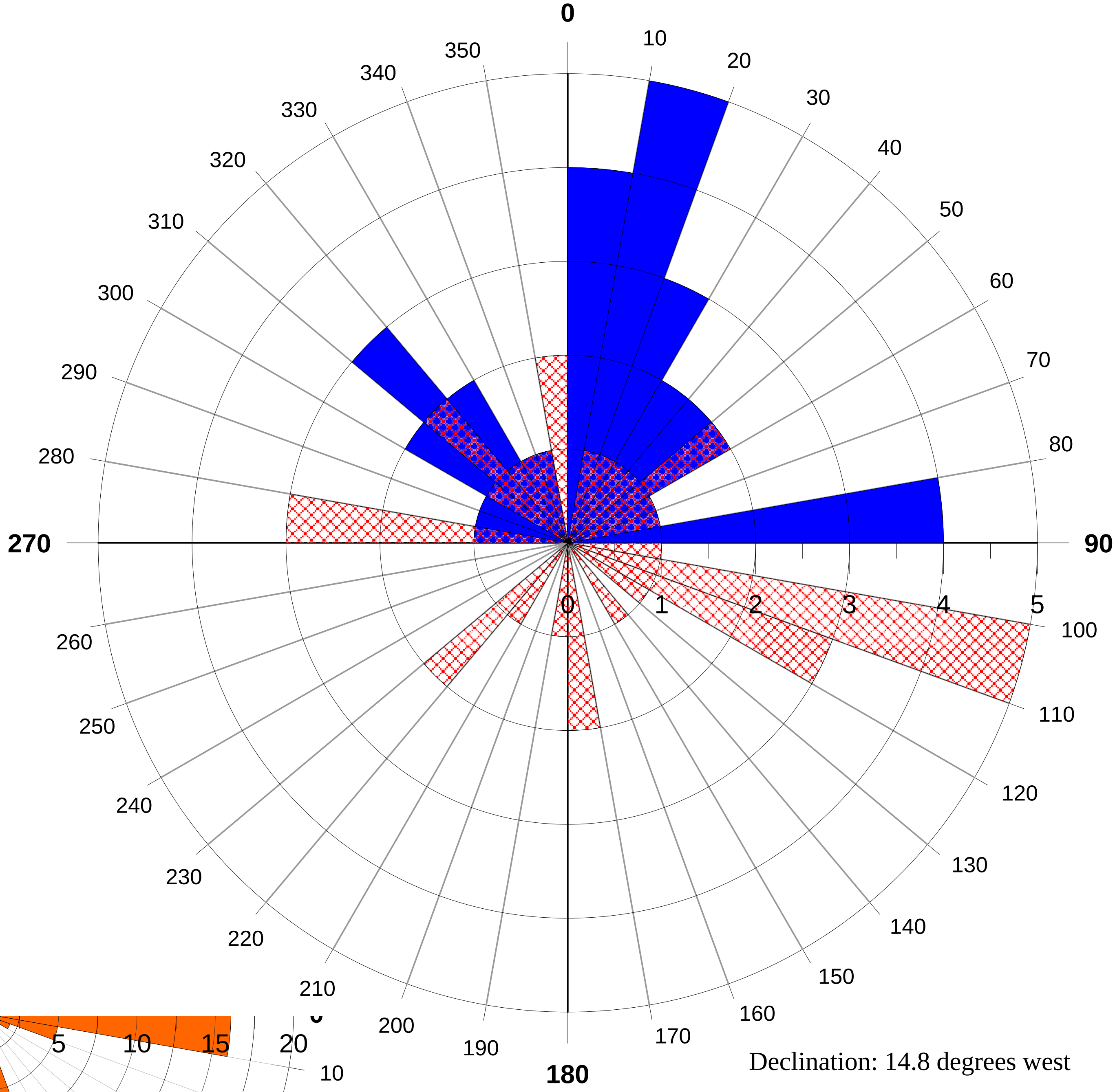
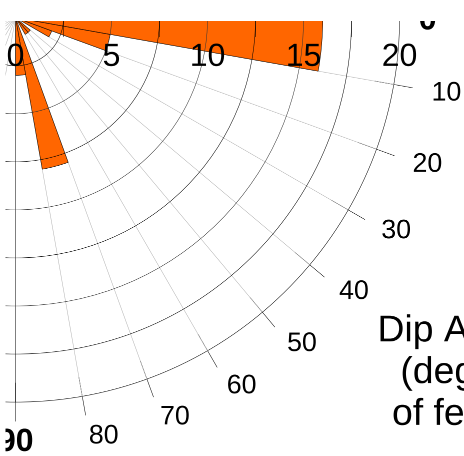
31
3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
460 480 500 520 540
Fluid Conductivity (uS/cm)
0 40 80 120
Natural Gamma (cps)
0 20 40 60 80
Dip in Degrees
= Likely transmissive zone
= possible transmissive zone
The dip direction is indicated by the line extending from the circle. The strike of the feature is 90 degrees from this.
PLATE F-1
SVE-21
Mohonk Road Industrial Plant Site
High Falls, NY
Date logged: 9/09/15

Northeast Geophysical Services

Borehole SVE-21
Mohonk Road Industrial Site
High Falls, NY

PLATE F-2
Strike and Dip Direction
of all features





Dip Amount
(degrees)
of features

Declination: 14.8 degrees west

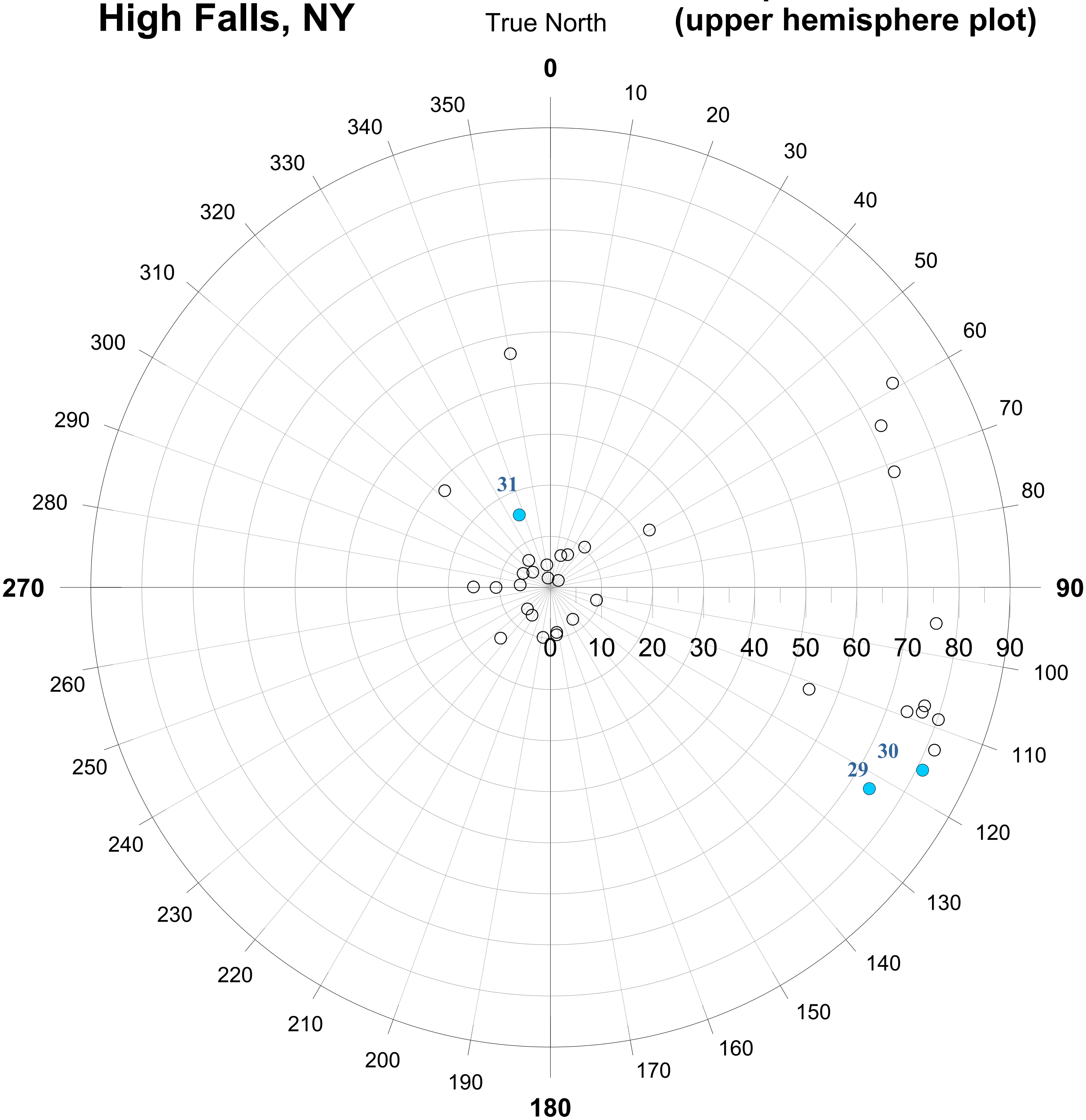
Explanation
Dip direction of feature
Strike of feature
Dip Amount (Tilt)

Based on 36 measurements

Northeast Geophysical Services

Borehole SVE-21
Mohonk Road Industrial Site
High Falls, NY

PLATE F-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



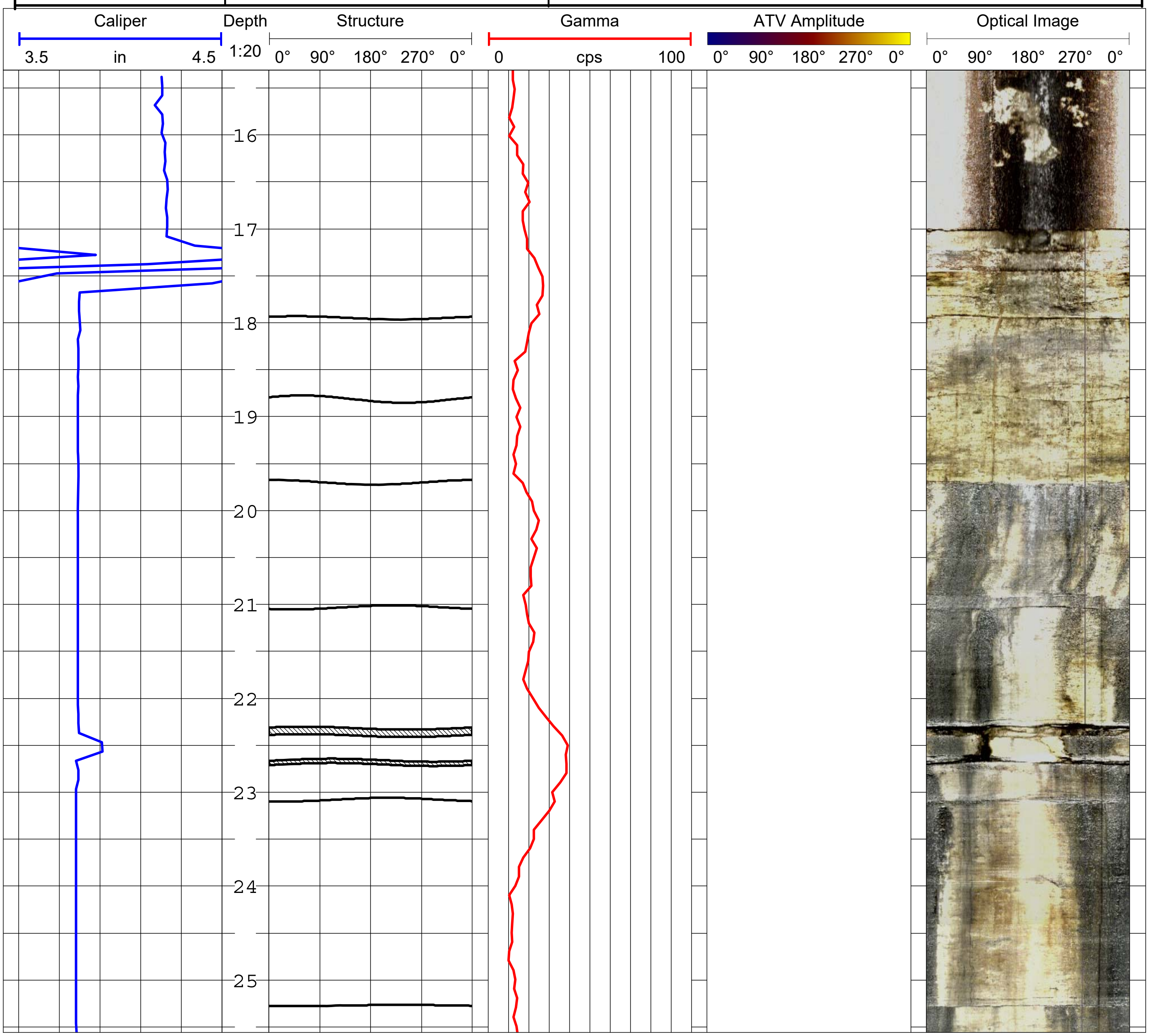
Explanation -

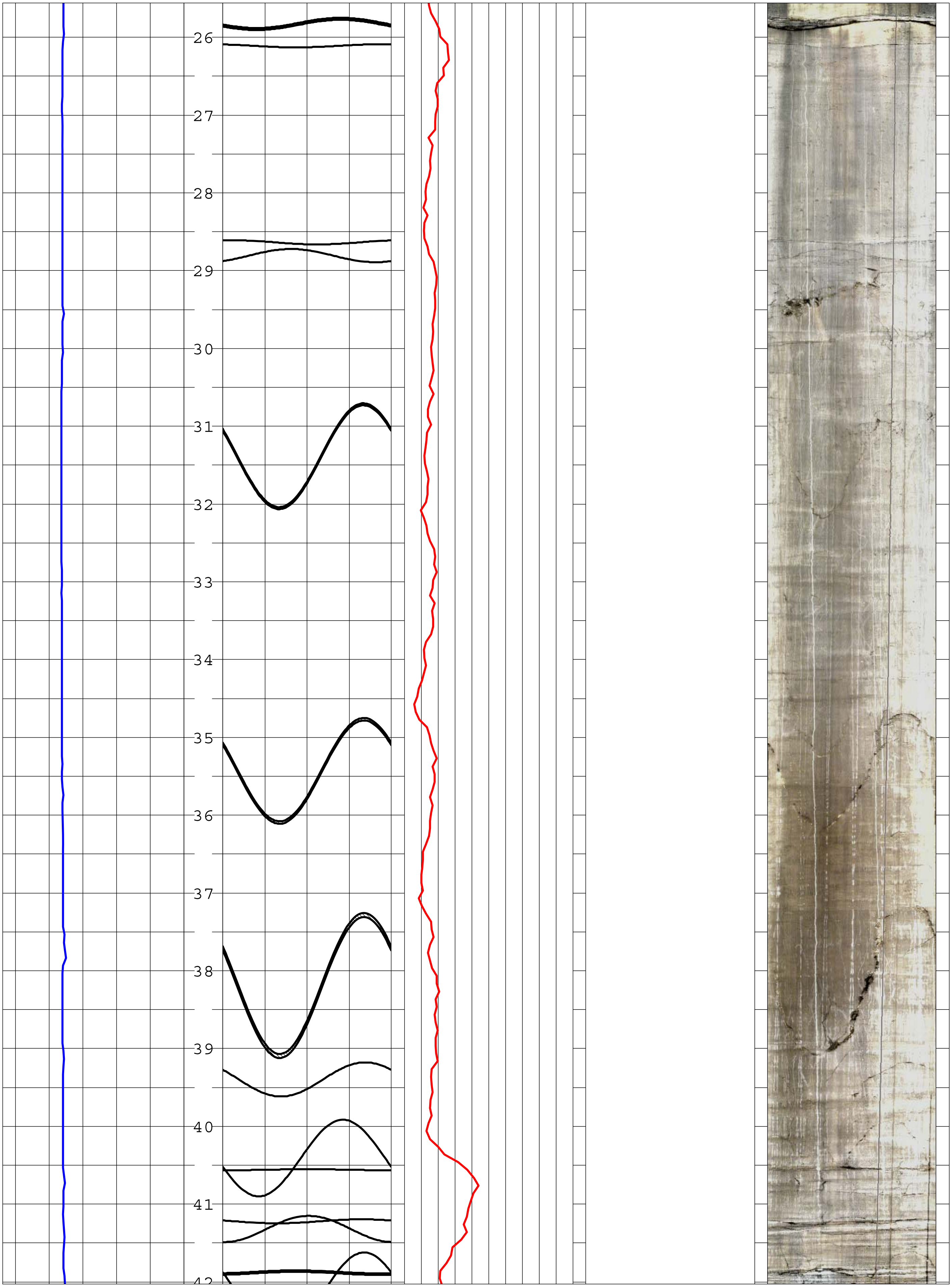
- Possibly transmissive
- Likely transmissive
- possible joint, fracture, bedding or foliation

Declination: 13.2 degrees west

Based on 36 measurements

Northeast Geophysical Services 4 Union Street Bangor, Maine 04401 Tel. 207-942-2700 email: ngsinc@negeophysical.com	**Log:** **Plate F-4 Televiewer, Gamma & Caliper** Well: SVE-21 **Site:** Mohonk Road Industrial Plant
Date: 9/09/2015	Location: High Falls, NY
Casing Depth: 17 ft	For: AMEC Foster Wheeler
Casing Type: steel	Logged by: R. Rawcliffe
Boring Depth: 56.2 ft	Orientation: magnetic
Meas. From: top of casing	Structure Plots: black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup: 1.33 ft	
Water Level: 50.23 ft	

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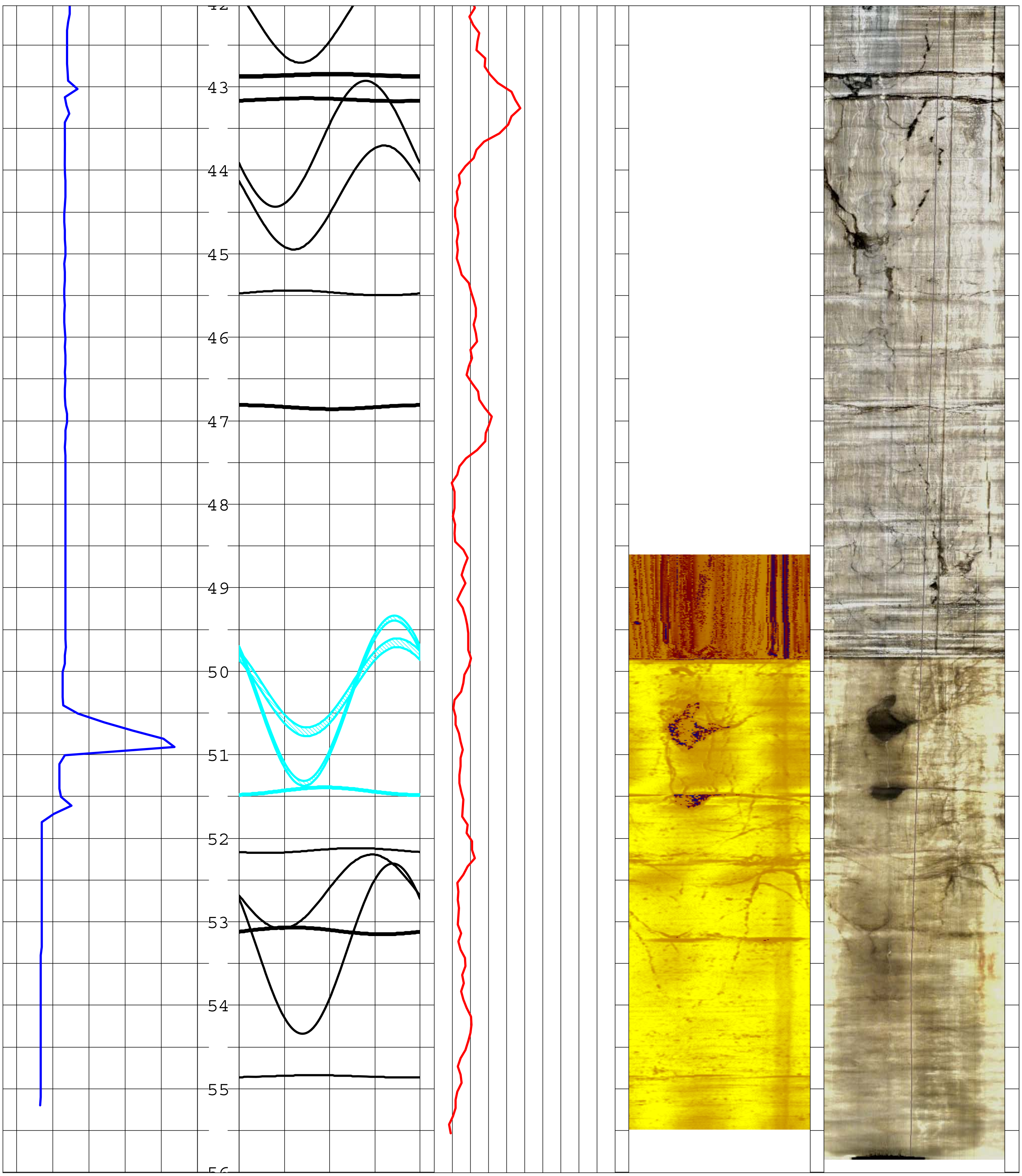
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TABLE F-1 Planar features interpreted from acoustical and optical televiewers
SVE-21 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
SVE-21	1	18.0	6	229	319	215	305	<1 mm	100
SVE-21	2	18.8	14	239	329	226	316	<1 mm	100
SVE-21	3	19.7	9	185	275	172	82	<1 mm	100
SVE-21	4	21.0	8	40	310	27	297	<1 mm	100
SVE-21	5	22.4	6	243	333	230	320	25	100
SVE-21	6	22.7	6	292	22	279	9	13	100
SVE-21	7	23.1	7	30	300	17	287	<1 mm	100
SVE-21	8	25.3	2	55	325	42	312	<1 mm	100
SVE-21	9	25.8	23	72	342	59	329	8	100
SVE-21	10	26.1	7	156	66	143	53	<1 mm	100
SVE-21	11	28.6	10	202	292	189	279	<1 mm	100
SVE-21	12	28.8	28	326	56	313	43	<1 mm	100
SVE-21	13	31.4	77	120	30	107	17	2	100
SVE-21	14	35.4	77	121	31	108	18	3	100
SVE-21	15	38.2	80	122	32	109	19	3	100
SVE-21	16	39.4	54	124	34	111	21	<1 mm	100
SVE-21	17	40.4	72	77	347	64	334	<1 mm	100
SVE-21	18	40.6	2	1	271	348	78	<1 mm	100
SVE-21	19	41.2	9	116	26	103	13	<1 mm	100
SVE-21	20	41.3	47	4	274	350	80	<1 mm	100
SVE-21	21	41.9	7	336	66	323	53	5	100
SVE-21	22	42.2	74	122	32	109	19	<1 mm	100
SVE-21	23	42.9	5	5	275	352	82	9	100
SVE-21	24	43.2	6	314	44	300	30	6	100
SVE-21	25	43.7	78	72	342	59	329	<1 mm	100
SVE-21	26	44.3	76	108	18	95	5	<1 mm	100
SVE-21	27	45.5	11	285	15	272	2	<1 mm	100
SVE-21	28	46.8	9	185	275	172	82	6	100
SVE-21	29	50.2	74	135	45	122	32	9	108
SVE-21	30	50.4	81	129	39	116	26	3	108
SVE-21	31	51.4	16	350	80	337	67	5	108

TABLE F-1 Planar features interpreted from acoustical and optical televiewers
SVE-21 - Mohonk Road Industrial Site - High Falls, New York **September, 2015**
Declination: 13.2 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
SVE-21	32	52.2	11	52	322	39	309	<1 mm	100
SVE-21	33	52.6	71	84	354	71	341	<1 mm	100
SVE-21	34	53.1	15	285	15	272	2	7	100
SVE-21	35	53.3	82	126	36	113	23	<1 mm	100
SVE-21	36	54.9	5	328	58	315	45	<1 mm	100

Explanation:

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture

APPENDIX F

SURVEY REPORT

TEST PIT LOCATIONS MOHAWK ROAD INDUSTRIAL SITE			
Test Pits	**Northing**	**Easting**	**Elevation at Ground**
TP 1(NW)	1087061.66	591919.34	321.58
TP 1(SE)	1087078.60	591915.30	319.82
TP 2(NE)	1087051.47	592007.75	324.80
TP 2(SW)	1087042.75	591988.83	324.72
TP 3(SW)	1087005.39	592025.50	325.86
TP 3(NE)	1087013.99	592040.19	325.89
TP 4(NE)	1087060.32	592013.30	323.99
TP 4(SW)	1087074.07	592028.28	323.58
TP 5(NE)	1087099.80	591982.29	321.17
TP 5(SW)	1087087.74	591968.15	322.29

*HORIZ. DATUM: NYSPCS EASTERN ZONE, NAD83
*VERT. DATUM: NAVD 88

MIPS (Direct-Push Points) MOHAWK ROAD INDUSTRIAL SITE			
Boring	**Northing**	**Easting**	**Elevation**
DP-01	1086909.83	592044.52	333.24
MP-02	1086907.83	592027.48	333.20
MP-03	1086912.22	592064.75	332.77
MP-04	1086939.56	592006.01	330.16
MP-05	1086936.22	592035.25	330.98
MP-06	1086940.85	592060.05	330.71
MP-07	1086961.00	592041.22	329.29
MP-08	1086967.43	592019.18	328.91
MP-09	1086970.62	592001.02	328.05
MP-10	1086981.23	592052.51	327.29
MP-11	1086971.34	592075.55	329.64
MP-12	1086991.63	592029.18	326.80
MP-13	1086994.60	592005.53	326.83
MP-14	1087021.75	592021.73	325.65
MP-15	1087023.02	592081.30	323.95

*HORIZ. DATUM: NYSPCS EASTERN ZONE, NAD83
*VERT. DATUM: NAVD 88

MONITORING WELLS MOHAWK ROAD INDUSTRIAL SITE				
Monitoring Wells	**Northing**	**Easting**	**Elevation Top Casing**	**Elevation Ground**
SVE-19	1087024.27	592029.19	326.78	325.41
SVE-20	1086983.81	592025.04	328.95	327.75
SVE-21	1086984.03	592046.86	328.57	327.23
SVE-22	1087006.65	592048.39	327.31	326.17
SVE-23	1087006.73	592014.25	327.33	326.07

*HORIZ. DATUM: NYSPCS EASTERN ZONE, NAD83
*VERT. DATUM: NAVD 88

I certify that I am a licensed land surveyor, New York State license number 050636, and that this table of coordinates was prepared from a field survey performed under my supervision and oversight.

Brian J. Zick

Brian J. Zick, LS License No. 050636

TEST PIT LOCATIONS MOHAWK ROAD INDUSTRIAL SITE			
Test Pits	**Northing**	**Easting**	**Elevation at Ground**
TP 1(NW)	42.98032007	77.43645776	321.58
TP 1(SE)	42.98036644	77.43647348	319.82
TP 2(NE)	42.98029457	77.43612700	324.80
TP 2(SW)	42.98027014	77.43619737	324.72
TP 3(SW)	42.98016866	77.43605895	325.86
TP 3(NE)	42.98019266	77.43600438	325.89
TP 4(NE)	42.98031903	77.43610660	323.99
TP 4(SW)	42.98035716	77.43605115	323.58
TP 5(NE)	42.98042648	77.43622396	321.17
TP 5(SW)	42.98039299	77.43627636	322.29

*HORIZ. DATUM: GEOGRAPHIC NAD83
*VERT. DATUM: NAVD 88

MIPS (Direct-Push Points) MOHAWK ROAD INDUSTRIAL SITE			
Boring	**Northing**	**Easting**	**Elevation**
DP-01	42.97990702	77.43598424	333.24
MP-02	42.97990105	77.43604782	333.20
MP-03	42.97991412	77.43590875	332.77
MP-04	42.97998751	77.43612928	330.16
MP-05	42.97997916	77.43601988	330.98
MP-06	42.97999255	77.43592737	330.71
MP-07	42.98004731	77.43599852	329.29
MP-08	42.98006432	77.43608109	328.91
MP-09	42.98007258	77.43614908	328.05
MP-10	42.98007663	77.43587061	327.29
MP-11	42.98010312	77.43595710	329.64
MP-12	42.98013100	77.43604464	326.80
MP-13	42.98013848	77.43613313	326.83
MP-14	42.98021856	77.43585109	325.65
MP-15	42.98021342	77.43607365	323.95

*HORIZ. DATUM: GEOGRAPHIC NAD83
*VERT. DATUM: NAVD 88

MONITORING WELLS MOHAWK ROAD INDUSTRIAL SITE				
Monitoring Wells	**Northing**	**Easting**	**Elevation Top Casing**	**Elevation Ground**
SVE-19	42.98022055	77.43604586	326.78	325.41
SVE-20	42.98010943	77.43605985	328.95	327.75
SVE-21	42.98011066	77.43597831	328.57	327.23
SVE-22	42.98017274	77.43597345	327.31	326.17
SVE-23	42.98017201	77.43610100	327.33	326.07

*HORIZ. DATUM: GEOGRAPHIC NAD83
*VERT. DATUM: NAVD 88

I certify that I am a licensed land surveyor, New York State license number 050636, and that this table of coordinates was prepared from a field survey performed under my supervision and oversight.

Brian J Zick

Brian J. Zick, LS License No. 050636

APPENDIX G

INVESTIGATION DERIVED WASTE

GENERATOR'S AUTHORIZATION LETTER

Generator Information:

Generator Name: MOHONK ROAD INDUSTRIAL PLANT
Mailing Address: 186 MOHONK ROAD, HAMLET OF HIGH FALLS
City, State, Zip: HIGH FALLS, ULSTER COUNTY, NY 12440
Telephone #: 845-687-7490 (Brenda Reiss) or 845-389-0615 (Carl Chipman)
Offeror Name: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC)
625 Broadway
Albany, New York

Site Location: 186 MOHONK ROAD, HIGH FALLS, NEW YORK

RE: Authorization to sign "On Behalf Of" MACTEC, Authorized agent for the NYSDEC

Offeror / Company Name

This letter affirms that Veolia Environmental Services Technical Solutions, LLC (Veolia) is authorized to sign "on behalf of" the offeror named above on all waste management documents required for the contracted waste services. This authorization includes, but is not limited to, manifests, bills of lading, material profile sheets and land disposal notifications. The words "On behalf of" are to be added in the appropriate area after the signature of the Veolia representative.

It is acknowledged that, when signing any documents under this authorization "on behalf of" the offeror named above, Veolia assumes none of the generator's/offerors responsibility or liability associated with such signature, and that the generator/offeror retains all responsibility or liability as the generator/offeror of the material.

By signing this Authorization Letter, I hereby certify that I am fully authorized by MACTEC, agent for the NYSDEC to sign this letter.
Offeror / Company Name

Signature: [signature] agent for NYSDEC
Printed Name: Josh Bowe
Title: Project Manager
Date: 11/18/2015

VEOLIA ENVIRONMENTAL SERVICES

SHIPPING DOCUMENT	1. Generator ID Number NYD986950012	2. Page 1 of 1	3. Emergency Response Phone (877) 818-0087	4. Shipping Document Tracking Number ZZ 00459805

5. Generator's Name and Mailing Address
NY DEPT OF ENV CONSERVATION
625 BROADWAY
ALBANY, NY 12233
Generator's Phone: 845 687-7490

Generator's Site Address (if different than mailing address)
MOHONK ROAD INDUSTRIAL PLANT
186 MOHONK ROAD/ HAMLET OF HIG
H FALLS
HIGH FALLS, NY 12440

6. Transporter 1 Company Name: VEOLIA ES TECHNICAL SOLUTIONS — U.S. EPA ID Number: NJD080631369

7. Transporter 2 Company Name: ~~FREEHOLD CARTAGE INC~~ US Environmental Inc — U.S. EPA ID Number: ~~NJD054126164~~ PAR000524041

8. Designated Facility Name and Site Address
VEOLIA ES TECHNICAL SOLUTIONS
4301 INFIRMARY ROAD
WEST CARROLLTON, OH 45449
Facility's Phone: 937 859-6101
U.S. EPA ID Number: OHD093945293

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	Type	11. Total Quantity	12. Unit Wt./Vol.	13. Codes
	1. NON RCRA AND DOT NON REGULATED SOLID	1	DM	400	P	NONE
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information: ER Service Contracted by VESTS

15. GENERATOR S/OFFEROR S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: John M. [illegible] Jr agent for NYDEC — Signature — Month/Day/Year: 12 08 15

16. International Shipments: ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: Date leaving U.S.:
Transporter signature (for exports only):

17. Transporter Acknowledgement of Receipt of Shipment
Transporter 1 Printed/Typed Name: ~~CHRIS LEWIS~~ Shawn [illegible] ~~AS AGENT FOR PA-APCC~~ — Signature — 12 08 15
Transporter 2 Printed/Typed Name: DAN Mitchell — Signature: D Mitchell — 1 7 16

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Shipping Document Tracking Number:
18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:
18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Report Management Method Codes (i.e., codes for treatment, disposal, and recycling systems)

1.	2.	3.	4.
H141			

20. Designated Facility Owner or Operator: Certification of receipt of shipment except as noted in Item 18a
Printed/Typed Name: Brittany Blankenship — Signature — Month/Day/Year: 1 11 16

DESIGNATED FACILITY'S COPY

GENERATOR / INT'L / TRANSPORTER / DESIGNATED FACILITY

APPENDIX H

ANALYTICAL RESULTS

CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

1.0 INTRODUCTION

Soil and groundwater samples were collected in September and October 2015 at the Mohonk Road Industrial Plant in High Falls, New York, and shipped to TestAmerica Buffalo Laboratory located in Buffalo, New York, for analysis. Samples were analyzed by one or more of the following methods:

- Volatile Organic Compounds (VOCs) by Method 8260C
- Percent Solids by Method D2216

Results were reported in the following sample delivery groups (SDGs):

- 480-87442-1
- 480-88042-1
- 480-88479-1

Sample event information included in this chemistry review is presented in the following Tables:

- Table 1 – Summary of Samples and Analytical Methods
- Table 2 – Summary of Analytical Results
- Table 3 – Summary of Qualification Actions.

Laboratory deliverables included:

- Category B deliverable as defined in the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocols (NYSDEC, 2005) and
- QA/QC summary package.

The Category A review included the following evaluations. Data review checklists are provided as Attachment A.

- Lab Report Narrative Review
- Data Package Completeness and COC records (Table 1 verification)
- Sample Preservation and Holding Times
- QC Blanks
- Field Duplicate Evaluation
- Matrix spike and Matrix Spike Duplicate (MS/MSD) Evaluation
- Reporting Limits
- Electronic Data Qualification and Verification

The following laboratory data qualifiers or data review qualifiers are used in the final data presentation:

U = target analyte is not detected at or above the reporting limit
J = concentration is estimated

* = LCS/LCSD % Recovery or RPD outside of lab limits
B = method blank qualifier

2.0 POTENTIAL DATA LIMITATIONS

Based on the Category A Review conducted the data meets the data quality objectives; however, the following potential limitations were identified:

- Matrix spikes were performed on a subset of samples as specified on the chain of custody documentation. The laboratory qualified a sub-set of results with percent recoveries and/or RPDs outside of lab limits. The majority of MS/MSD outliers were interpreted to have no impact on sample results and lab qualifiers of F1 and F2 were removed for these target analytes based on professional judgment. For the MS/MSD associated with sample 356023DP5D, percent recoveries for 1,1,1-trichloroethane (132), ethylbenzene (136, 142), and total xylenes (136, 145) were above the 70-130 project control limits, indicating potential high biases. Low percent recoveries were reported for dichlorodifluoromethane (45, 42), indicating a potential low bias. Positive detections of 1,1,1-trichloroethane, ethylbenzene, and total xylenes in sample 356023DP5D were qualified estimated (J) and may represent high biases. Dichlorodifluoromethane was not detected in 356023DP5D and the reporting limit was qualified estimated (UJ). Results were assigned reason code MS-H or MS-L in Table 3.

- Results for methylene chloride in a subset of samples were qualified non-detect (U) based on blank contamination.

Reference:

New York State Department of Environmental Conservation (NYSDEC), 2005. "Analytical Services Protocols"; July 2005.

Data Validator: Julie Ricardi

Julie Ricardi

Date: 10/28/2015

Reviewed by: Christian Ricardi, NRCC-EAC

Chris Ricardi

Date: 10/29/2015

TABLE 1 - SUMMARY OF SAMPLES AND ANALYTICAL METHODS
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

					Method Class	VOCs	Solids
					Analysis Method	SW8260C	D2216
					Fraction	N	N
SDG	Location	Sample ID	Sample Date	Media	Qc Code	Param_Count	Param_Count
480-87442-1	QC	356023TB01	9/16/2015	BW	TB	48	
480-87442-1	SS01	356023SS0101	9/15/2015	SOIL	FS	48	1
480-87442-1	SS02	356023SS0201	9/15/2015	SOIL	FS	48	1
480-87442-1	SS02	356023SS0205	9/15/2015	SOIL	FS	48	1
480-87442-1	SS03	356023SS0302	9/15/2015	SOIL	FS	48	1
480-87442-1	SS04	356023SS0402	9/15/2015	SOIL	FS	48	1
480-87442-1	TP01	356023TP0102	9/15/2015	SOIL	FS	48	1
480-87442-1	TP01	356023TP0107	9/15/2015	SOIL	FS	48	1
480-87442-1	TP02	356023TP0203	9/15/2015	SOIL	FS	48	1
480-87442-1	TP02	356023TP0207	9/15/2015	SOIL	FS	48	1
480-87442-1	TP03	356023TP0303	9/15/2015	SOIL	FS	48	1
480-87442-1	TP03	356023TP0307	9/15/2015	SOIL	FS	48	1
480-87442-1	TP04	356023TP0404	9/15/2015	SOIL	FS	48	1
480-87442-1	TP05	356023TP0503	9/15/2015	SOIL	FS	48	1
480-87442-1	TP05	356023TP0507	9/15/2015	SOIL	FS	48	1
480-88042-1	ERT01	356023ERT01075	9/23/2015	GW	FS	48	
480-88042-1	ERT01	356023ERT01115	9/23/2015	GW	FS	48	
480-88042-1	ERT01	356023ERT01175	9/23/2015	GW	FS	48	
480-88042-1	MW05R	356023MW05R095	9/22/2015	GW	FS	48	
480-88042-1	MW05R	356023MW05R115	9/22/2015	GW	FS	48	
480-88042-1	MW05R	356023MW05R115XD	9/22/2015	GW	FD	48	
480-88042-1	MW07R	356023MW07R080	9/25/2015	GW	FS	48	
480-88042-1	MW07R	356023MW07R095	9/24/2015	GW	FS	48	
480-88042-1	MW07R	356023MW07R138	9/24/2015	GW	FS	48	
480-88042-1	MW07R	356023MW07R170	9/24/2015	GW	FS	48	
480-88042-1	QC	356023EB01	9/24/2015	BW	EB	48	
480-88042-1	QC	356023TB01	9/22/2015	BW	TB	48	
480-88479-1	DP11	356023DP11007	10/2/2015	SOIL	FS	48	1
480-88479-1	DP11	356023DP11009	10/2/2015	SOIL	FS	48	1
480-88479-1	DP12	356023DP12007	10/2/2015	SOIL	FS	48	1
480-88479-1	DP12	356023DP12010	10/2/2015	SOIL	FS	48	1
480-88479-1	DP13	356023DP13006	10/2/2015	SOIL	FS	48	1
480-88479-1	DP3	356023DP3004	10/2/2015	SOIL	FS	48	1
480-88479-1	DP3	356023DP3008	10/2/2015	SOIL	FS	48	1
480-88479-1	DP4	356023DP4003	10/2/2015	SOIL	FS	48	1
480-88479-1	DP4	356023DP4006	10/2/2015	SOIL	FS	48	1
480-88479-1	DP5	356023DP5005	10/2/2015	SOIL	FS	48	1
480-88479-1	DP5	356023DP5011	10/2/2015	SOIL	FS	48	1
480-88479-1	DP5	356023DP5D	10/2/2015	SOIL	FS	48	1
480-88479-1	DP6	356023DP6004	10/2/2015	SOIL	FS	48	1
480-88479-1	DP7	356023DP7006	10/2/2015	SOIL	FS	48	1
480-88479-1	DP7	356023DP7009	10/2/2015	SOIL	FS	48	1

NOTES:
BW = blank water
GW = groundwater
FS = field sample
FD = field duplicate
TB = trip blank
EB = equipment blank
Parameter Count refers to number of target analytes reported

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1		480-87442-1	
			Location	QC		SS01		SS02		SS02	
			Sample Date	9/16/2015		9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023TB01		356023SS0101		356023SS0201		356023SS0205	
			Qc Code	TB		FS		FS		FS	
Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,1,2,2-Tetrachloroethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,1,2-Trichloroethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,1-Dichloroethane	N	ug/kg	50	U	53		48	U	43	U
VOCs	1,1-Dichloroethene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,2,4-Trichlorobenzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,2-Dibromo-3-chloropropane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,2-Dibromoethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,2-Dichlorobenzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,2-Dichloroethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,2-Dichloropropane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,3-Dichlorobenzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	1,4-Dichlorobenzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	2-Butanone	N	ug/kg	250	U	240	U	240	U	220	U
VOCs	2-Hexanone	N	ug/kg	250	U	240	U	240	U	220	U
VOCs	4-Methyl-2-pentanone	N	ug/kg	250	U	240	U	240	U	220	U
VOCs	Acetic acid, methyl ester	N	ug/kg	50	U	61		48	U	43	U
VOCs	Acetone	N	ug/kg	250	U	240	U	240	U	220	U
VOCs	Benzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Bromodichloromethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Bromoform	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Bromomethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Carbon disulfide	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Carbon tetrachloride	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Chlorobenzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Chloroethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Chloroform	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Chloromethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Cis-1,2-Dichloroethene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Cis-1,3-Dichloropropene	N	ug/kg	50	U	48	U	48	U	43	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1		480-87442-1	
			Location	QC		SS01		SS02		SS02	
			Sample Date	9/16/2015		9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023TB01		356023SS0101		356023SS0201		356023SS0205	
			Qc Code	TB		FS		FS		FS	
Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Dibromochloromethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Dichlorodifluoromethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Ethyl benzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Isopropylbenzene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Methyl cyclohexane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Methyl Tertbutyl Ether	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Methylene chloride	N	ug/kg	11	J B *	48	U	48	U	43	U
VOCs	Styrene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Tetrachloroethene	N	ug/kg	50	U	15	J	48	U	43	U
VOCs	Toluene	N	ug/kg	50	U	48		48	U	43	U
VOCs	trans-1,2-Dichloroethene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	trans-1,3-Dichloropropene	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Trichloroethene	N	ug/kg	50	U	14	J	420		410	
VOCs	Trichlorofluoromethane	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Vinyl chloride	N	ug/kg	50	U	48	U	48	U	43	U
VOCs	Xylenes, Total	N	ug/kg	100	U	96	U	95	U	87	U
Solids	Percent Solids	N	Percent			87		88		89	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration
* = LCS/LCSD % Recovery or RPD outside of lab limits
B = method blank qualifier

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1		480-87442-1	
			Location	SS03		SS04		TP01		TP01	
			Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023SS0302		356023SS0402		356023TP0102		356023TP0107	
			Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	N	ug/kg	43	U	51	U	27	J	64	U
VOCs	1,1,2,2-Tetrachloroethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,1,2-Trichloroethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,1-Dichloroethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,1-Dichloroethene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,2,4-Trichlorobenzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,2-Dibromo-3-chloropropane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,2-Dibromoethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,2-Dichlorobenzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,2-Dichloroethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,2-Dichloropropane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,3-Dichlorobenzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	1,4-Dichlorobenzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	2-Butanone	N	ug/kg	220	U	250	U	340	U	320	U
VOCs	2-Hexanone	N	ug/kg	220	U	250	U	340	U	320	U
VOCs	4-Methyl-2-pentanone	N	ug/kg	220	U	250	U	340	U	320	U
VOCs	Acetic acid, methyl ester	N	ug/kg	43	U	51	U	66	J	71	
VOCs	Acetone	N	ug/kg	220	U	250	U	340	U	320	U
VOCs	Benzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Bromodichloromethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Bromoform	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Bromomethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Carbon disulfide	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Carbon tetrachloride	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Chlorobenzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Chloroethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Chloroform	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Chloromethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Cis-1,2-Dichloroethene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Cis-1,3-Dichloropropene	N	ug/kg	43	U	51	U	68	U	64	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1		480-87442-1	
			Location	SS03		SS04		TP01		TP01	
			Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023SS0302		356023SS0402		356023TP0102		356023TP0107	
			Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Dibromochloromethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Dichlorodifluoromethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Ethyl benzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Isopropylbenzene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Methyl cyclohexane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Methyl Tertbutyl Ether	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Methylene chloride	N	ug/kg	43	U	51	U	68	U *	64	U
VOCs	Styrene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Tetrachloroethene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Toluene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	trans-1,2-Dichloroethene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	trans-1,3-Dichloropropene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Trichloroethene	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Trichlorofluoromethane	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Vinyl chloride	N	ug/kg	43	U	51	U	68	U	64	U
VOCs	Xylenes, Total	N	ug/kg	86	U	100	U	140	U	130	U
Solids	Percent Solids	N	Percent	97		88		86		89	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration
* = LCS/LCSD % Recovery or RPD outside of lab limits
B = method blank qualifier

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1		480-87442-1	
			Location	TP02		TP02		TP03		TP03	
			Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023TP0207		356023TP0203		356023TP0307		356023TP0303	
			Qc Code	FS		FS		FS		FS	
Class	Parameter	Fraction	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	N	ug/kg	110		99		2200		650	
VOCs	1,1,2,2-Tetrachloroethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,1,2-Trichloroethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,1-Dichloroethane	N	ug/kg	23	J	33	J	23	J	69	U
VOCs	1,1-Dichloroethene	N	ug/kg	55	J	29	J	480		86	
VOCs	1,2,4-Trichlorobenzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,2-Dibromo-3-chloropropane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,2-Dibromoethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,2-Dichlorobenzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,2-Dichloroethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,2-Dichloropropane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,3-Dichlorobenzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	1,4-Dichlorobenzene	N	ug/kg	56	U	38	J	51	U	69	U
VOCs	2-Butanone	N	ug/kg	280	U	290	U	260	U	350	U
VOCs	2-Hexanone	N	ug/kg	280	U	290	U	260	U	350	U
VOCs	4-Methyl-2-pentanone	N	ug/kg	280	U	290	U	260	U	350	U
VOCs	Acetic acid, methyl ester	N	ug/kg	56	U	61		24	J	75	
VOCs	Acetone	N	ug/kg	280	U	290	U	260	U	350	U
VOCs	Benzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Bromodichloromethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Bromoform	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Bromomethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Carbon disulfide	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Carbon tetrachloride	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Chlorobenzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Chloroethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Chloroform	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Chloromethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Cis-1,2-Dichloroethene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Cis-1,3-Dichloropropene	N	ug/kg	56	U	58	U	51	U	69	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1		480-87442-1	
			Location	TP02		TP02		TP03		TP03	
			Sample Date	9/15/2015		9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023TP0207		356023TP0203		356023TP0307		356023TP0303	
			Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Dibromochloromethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Dichlorodifluoromethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Ethyl benzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Isopropylbenzene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Methyl cyclohexane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Methyl Tertbutyl Ether	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Methylene chloride	N	ug/kg	56	U	58	U *	51	U *	69	U *
VOCs	Styrene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Tetrachloroethene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Toluene	N	ug/kg	56	U	18	J	77		30	J
VOCs	trans-1,2-Dichloroethene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	trans-1,3-Dichloropropene	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Trichloroethene	N	ug/kg	26	J	21	J	1500		520	
VOCs	Trichlorofluoromethane	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Vinyl chloride	N	ug/kg	56	U	58	U	51	U	69	U
VOCs	Xylenes, Total	N	ug/kg	110	U	120	U	37	J	140	U
Solids	Percent Solids	N	Percent	90		81		90		82	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration
* = LCS/LCSD % Recovery or RPD outside of lab limits
B = method blank qualifier

Prepared by: BJS 10/28/2015
Checked by: JAR 10/28/2015

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1	
			Location	TP04		TP05		TP05	
			Sample Date	9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023TP0404		356023TP0507		356023TP0503	
			Qc Code	FS		FS		FS	
Class	Parameter	Fraction	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	N	ug/kg	20	J	63	U	90	U
VOCs	1,1,2,2-Tetrachloroethane	N	ug/kg	61	U	63	U	90	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	N	ug/kg	61	U	63	U	90	U
VOCs	1,1,2-Trichloroethane	N	ug/kg	61	U	63	U	90	U
VOCs	1,1-Dichloroethane	N	ug/kg	61	U	63	U	90	U
VOCs	1,1-Dichloroethene	N	ug/kg	61	U	63	U	90	U
VOCs	1,2,4-Trichlorobenzene	N	ug/kg	61	U	63	U	90	U
VOCs	1,2-Dibromo-3-chloropropane	N	ug/kg	61	U	63	U	90	U
VOCs	1,2-Dibromoethane	N	ug/kg	61	U	63	U	90	U
VOCs	1,2-Dichlorobenzene	N	ug/kg	61	U	63	U	90	U
VOCs	1,2-Dichloroethane	N	ug/kg	61	U	63	U	90	U
VOCs	1,2-Dichloropropane	N	ug/kg	61	U	63	U	90	U
VOCs	1,3-Dichlorobenzene	N	ug/kg	61	U	63	U	90	U
VOCs	1,4-Dichlorobenzene	N	ug/kg	61	U	63	U	90	U
VOCs	2-Butanone	N	ug/kg	310	U	310	U	450	U
VOCs	2-Hexanone	N	ug/kg	310	U	310	U	450	U
VOCs	4-Methyl-2-pentanone	N	ug/kg	310	U	310	U	450	U
VOCs	Acetic acid, methyl ester	N	ug/kg	61	U	33	J	90	
VOCs	Acetone	N	ug/kg	310	U	310	U	450	U
VOCs	Benzene	N	ug/kg	61	U	63	U	90	U
VOCs	Bromodichloromethane	N	ug/kg	61	U	63	U	90	U
VOCs	Bromoform	N	ug/kg	61	U	63	U	90	U
VOCs	Bromomethane	N	ug/kg	61	U	63	U	90	U
VOCs	Carbon disulfide	N	ug/kg	61	U	63	U	90	U
VOCs	Carbon tetrachloride	N	ug/kg	61	U	63	U	90	U
VOCs	Chlorobenzene	N	ug/kg	61	U	63	U	90	U
VOCs	Chloroethane	N	ug/kg	61	U	63	U	90	U
VOCs	Chloroform	N	ug/kg	61	U	63	U	90	U
VOCs	Chloromethane	N	ug/kg	61	U	63	U	90	U
VOCs	Cis-1,2-Dichloroethene	N	ug/kg	61	U	63	U	90	U
VOCs	Cis-1,3-Dichloropropene	N	ug/kg	61	U	63	U	90	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-87442-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

			SDG	480-87442-1		480-87442-1		480-87442-1	
			Location	TP04		TP05		TP05	
			Sample Date	9/15/2015		9/15/2015		9/15/2015	
			Sample ID	356023TP0404		356023TP0507		356023TP0503	
			Qc Code	FS		FS		FS	
Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	N	ug/kg	61	U	63	U	90	U
VOCs	Dibromochloromethane	N	ug/kg	61	U	63	U	90	U
VOCs	Dichlorodifluoromethane	N	ug/kg	61	U	63	U	90	U
VOCs	Ethyl benzene	N	ug/kg	61	U	63	U	90	U
VOCs	Isopropylbenzene	N	ug/kg	61	U	63	U	90	U
VOCs	Methyl cyclohexane	N	ug/kg	61	U	63	U	90	U
VOCs	Methyl Tertbutyl Ether	N	ug/kg	61	U	63	U	90	U
VOCs	Methylene chloride	N	ug/kg	61	U *	63	U *	90	U
VOCs	Styrene	N	ug/kg	61	U	63	U	90	U
VOCs	Tetrachloroethene	N	ug/kg	61	U	63	U	90	U
VOCs	Toluene	N	ug/kg	61	U	63	U	90	U
VOCs	trans-1,2-Dichloroethene	N	ug/kg	61	U	63	U	90	U
VOCs	trans-1,3-Dichloropropene	N	ug/kg	61	U	63	U	90	U
VOCs	Trichloroethene	N	ug/kg	22	J	63	U	90	U
VOCs	Trichlorofluoromethane	N	ug/kg	61	U	63	U	90	U
VOCs	Vinyl chloride	N	ug/kg	61	U	63	U	90	U
VOCs	Xylenes, Total	N	ug/kg	120	U	130	U	180	U
Solids	Percent Solids	N	Percent	90		89		74	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration
* = LCS/LCSD % Recovery or RPD outside of lab limits
B = method blank qualifier

Prepared by: BJS 10/28/2015
Checked by: JAR 10/28/2015

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88042-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88042-1		480-88042-1		480-88042-1		480-88042-1	
		Location	ERT01		ERT01		ERT01		MW05R	
		Sample Date	9/23/2015		9/23/2015		9/23/2015		9/22/2015	
		Sample ID	356023ERT01175		356023ERT01115		356023ERT01075		356023MW05R115	
		Qc Code	FS		FS		FS		FS	
Class	Parameter	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/l	64		81		170		36	
VOCs	1,1,2,2-Tetrachloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1,2-Trichloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1-Dichloroethane	ug/l	10		16		41		2.9	
VOCs	1,1-Dichloroethene	ug/l	16		20		32		8.3	
VOCs	1,2,4-Trichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dibromo-3-chloropropane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dibromoethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichloroethane	ug/l	1	U	1	U	0.52	J	1	U
VOCs	1,2-Dichloropropane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,3-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,4-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	2-Butanone	ug/l	10	U	10	U	10	U	10	U
VOCs	2-Hexanone	ug/l	5	U	5	U	5	U	5	U
VOCs	4-Methyl-2-pentanone	ug/l	5	U	5	U	5	U	5	U
VOCs	Acetic acid, methyl ester	ug/l	2.5	U	2.5	U	2.5	U	2.5	U
VOCs	Acetone	ug/l	10	U	10	U	10	U	10	U
VOCs	Benzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromodichloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromoform	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromomethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Carbon disulfide	ug/l	1	U	1	U	1	U	1	U
VOCs	Carbon tetrachloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Chlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloroform	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Cis-1,2-Dichloroethene	ug/l	1	U	1	U	0.83	J	1	U
VOCs	Cis-1,3-Dichloropropene	ug/l	1	U	1	U	1	U	1	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88042-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88042-1		480-88042-1		480-88042-1		480-88042-1	
		Location	ERT01		ERT01		ERT01		MW05R	
		Sample Date	9/23/2015		9/23/2015		9/23/2015		9/22/2015	
		Sample ID	356023ERT01175		356023ERT01115		356023ERT01075		356023MW05R115	
		Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	ug/l	1	U	1	U	1	U	1	U
VOCs	Dibromochloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Dichlorodifluoromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Ethyl benzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Isopropylbenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Methyl cyclohexane	ug/l	1	U	1	U	1	U	1	U
VOCs	Methyl Tertbutyl Ether	ug/l	1	U	1	U	1	U	1	U
VOCs	Methylene chloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Styrene	ug/l	1	U	1	U	1	U	1	U
VOCs	Tetrachloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	Toluene	ug/l	1	U	1	U	1	U	1	U
VOCs	trans-1,2-Dichloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	trans-1,3-Dichloropropene	ug/l	1	U	1	U	1	U	1	U
VOCs	Trichloroethene	ug/l	4.2		6.7		12		3.7	
VOCs	Trichlorofluoromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Vinyl chloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Xylenes, Total	ug/l	2	U	2	U	2	U	2	U

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88042-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88042-1		480-88042-1		480-88042-1		480-88042-1	
		Location	MW05R		MW05R		MW07R		MW07R	
		Sample Date	9/22/2015		9/22/2015		9/24/2015		9/24/2015	
		Sample ID	356023MW05R115XD		356023MW05R095		356023MW07R170		356023MW07R138	
		Qc Code	FD		FS		FS		FS	
Class	Parameter	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/l	37		94		16		45	
VOCs	1,1,2,2-Tetrachloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1,2-Trichloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1-Dichloroethane	ug/l	2.9		7.8		6.1		16	
VOCs	1,1-Dichloroethene	ug/l	8.6		20		2.8		6.5	
VOCs	1,2,4-Trichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dibromo-3-chloropropane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dibromoethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichloropropane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,3-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,4-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	2-Butanone	ug/l	10	U	10	U	10	U	10	U
VOCs	2-Hexanone	ug/l	5	U	5	U	5	U	5	U
VOCs	4-Methyl-2-pentanone	ug/l	5	U	5	U	5	U	5	U
VOCs	Acetic acid, methyl ester	ug/l	2.5	U	2.5	U	2.5	U	2.5	U
VOCs	Acetone	ug/l	10	U	10	U	10	U	10	U
VOCs	Benzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromodichloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromoform	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromomethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Carbon disulfide	ug/l	1	U	1	U	1	U	1	U
VOCs	Carbon tetrachloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Chlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloroform	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Cis-1,2-Dichloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	Cis-1,3-Dichloropropene	ug/l	1	U	1	U	1	U	1	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88042-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88042-1		480-88042-1		480-88042-1		480-88042-1	
		Location	MW05R		MW05R		MW07R		MW07R	
		Sample Date	9/22/2015		9/22/2015		9/24/2015		9/24/2015	
		Sample ID	356023MW05R115XD		356023MW05R095		356023MW07R170		356023MW07R138	
		Qc Code	FD		FS		FS		FS	
Class	Parameter	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	ug/l	1	U	1	U	1	U	1	U
VOCs	Dibromochloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Dichlorodifluoromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Ethyl benzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Isopropylbenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Methyl cyclohexane	ug/l	1	U	1	U	1	U	1	U
VOCs	Methyl Tertbutyl Ether	ug/l	1	U	1	U	1	U	1	U
VOCs	Methylene chloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Styrene	ug/l	1	U	1	U	1	U	1	U
VOCs	Tetrachloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	Toluene	ug/l	1	U	1	U	1	U	1	U
VOCs	trans-1,2-Dichloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	trans-1,3-Dichloropropene	ug/l	1	U	1	U	1	U	1	U
VOCs	Trichloroethene	ug/l	3.6		6.3		0.47	J	1.5	
VOCs	Trichlorofluoromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Vinyl chloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Xylenes, Total	ug/l	2	U	2	U	2	U	2	U

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88042-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88042-1		480-88042-1		480-88042-1		480-88042-1	
		Location	MW07R		MW07R		QC		QC	
		Sample Date	9/24/2015		9/25/2015		9/22/2015		9/24/2015	
		Sample ID	356023MW07R095		356023MW07R080		356023TB01		356023EB01	
		Qc Code	FS		FS		TB		EB	
Class	Parameter	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/l	130		35		1	U	1	U
VOCs	1,1,2,2-Tetrachloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1,2-Trichloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,1-Dichloroethane	ug/l	47		9.4		1	U	1	U
VOCs	1,1-Dichloroethene	ug/l	16		5.3		1	U	1	U
VOCs	1,2,4-Trichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dibromo-3-chloropropane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dibromoethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,2-Dichloropropane	ug/l	1	U	1	U	1	U	1	U
VOCs	1,3-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	1,4-Dichlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	2-Butanone	ug/l	10	U	10	U	10	U	10	U
VOCs	2-Hexanone	ug/l	5	U	5	U	5	U	5	U
VOCs	4-Methyl-2-pentanone	ug/l	5	U	5	U	5	U	5	U
VOCs	Acetic acid, methyl ester	ug/l	2.5	U	2.5	U	2.5	U	2.5	U
VOCs	Acetone	ug/l	10	U	10	U	10	U	18	
VOCs	Benzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromodichloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromoform	ug/l	1	U	1	U	1	U	1	U
VOCs	Bromomethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Carbon disulfide	ug/l	1	U	1	U	1	U	1	U
VOCs	Carbon tetrachloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Chlorobenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloroethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloroform	ug/l	1	U	1	U	1	U	1	U
VOCs	Chloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Cis-1,2-Dichloroethene	ug/l	1.8		1	U	1	U	1	U
VOCs	Cis-1,3-Dichloropropene	ug/l	1	U	1	U	1	U	1	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88042-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88042-1		480-88042-1		480-88042-1		480-88042-1	
		Location	MW07R		MW07R		QC		QC	
		Sample Date	9/24/2015		9/25/2015		9/22/2015		9/24/2015	
		Sample ID	356023MW07R095		356023MW07R080		356023TB01		356023EB01	
		Qc Code	FS		FS		TB		EB	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cyclohexane	ug/l	1	U	1	U	1	U	1	U
VOCs	Dibromochloromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Dichlorodifluoromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Ethyl benzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Isopropylbenzene	ug/l	1	U	1	U	1	U	1	U
VOCs	Methyl cyclohexane	ug/l	1	U	1	U	1	U	1	U
VOCs	Methyl Tertbutyl Ether	ug/l	1	U	1	U	1	U	1	U
VOCs	Methylene chloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Styrene	ug/l	1	U	1	U	1	U	1	U
VOCs	Tetrachloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	Toluene	ug/l	1	U	1	U	1	U	1	U
VOCs	trans-1,2-Dichloroethene	ug/l	1	U	1	U	1	U	1	U
VOCs	trans-1,3-Dichloropropene	ug/l	1	U	1	U	1	U	1	U
VOCs	Trichloroethene	ug/l	2.2		1.9		1	U	1	U
VOCs	Trichlorofluoromethane	ug/l	1	U	1	U	1	U	1	U
VOCs	Vinyl chloride	ug/l	1	U	1	U	1	U	1	U
VOCs	Xylenes, Total	ug/l	2	U	2	U	2	U	2	U

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1		480-88479-1	
		Location	DP11		DP11		DP12		DP12	
		Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP11007		356023DP11009		356023DP12007		356023DP12010	
		Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/kg	50	U	160		11000		190	
VOCs	1,1,2,2-Tetrachloroethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,1,2-Trichloroethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,1-Dichloroethane	ug/kg	50	U	54	U	110		54	U
VOCs	1,1-Dichloroethene	ug/kg	50	U	28	J	2100		22	J
VOCs	1,2,4-Trichlorobenzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,2-Dibromo-3-chloropropane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,2-Dibromoethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,2-Dichlorobenzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,2-Dichloroethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,2-Dichloropropane	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,3-Dichlorobenzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	1,4-Dichlorobenzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	2-Butanone	ug/kg	250	U	270	U	230	U	270	U
VOCs	2-Hexanone	ug/kg	250	U	270	U	230	U	270	U
VOCs	4-Methyl-2-pentanone	ug/kg	250	U	270	U	230	U	270	U
VOCs	Acetic acid, methyl ester	ug/kg	50	U	54	U	45	U	140	
VOCs	Acetone	ug/kg	250	U	270	U	230	U	270	U
VOCs	Benzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Bromodichloromethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Bromoform	ug/kg	50	U	54	U	45	U	54	U
VOCs	Bromomethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Carbon disulfide	ug/kg	50	U	54	U	45	U	54	U
VOCs	Carbon tetrachloride	ug/kg	50	U	54	U	45	U	54	U
VOCs	Chlorobenzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Chloroethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Chloroform	ug/kg	50	U	54	U	45	U	54	U
VOCs	Chloromethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Cis-1,2-Dichloroethene	ug/kg	50	U	54	U	45	U	54	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1		480-88479-1	
		Location	DP11		DP11		DP12		DP12	
		Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP11007		356023DP11009		356023DP12007		356023DP12010	
		Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cis-1,3-Dichloropropene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Cyclohexane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Dibromochloromethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Dichlorodifluoromethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Ethyl benzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Isopropylbenzene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Methyl cyclohexane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Methyl Tertbutyl Ether	ug/kg	50	U	54	U	45	U	54	U
VOCs	Methylene chloride	ug/kg	50	U	54	U	45	U	54	U
VOCs	Styrene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Tetrachloroethene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Toluene	ug/kg	50	U	54	U	45	U	54	U
VOCs	trans-1,2-Dichloroethene	ug/kg	50	U	54	U	45	U	54	U
VOCs	trans-1,3-Dichloropropene	ug/kg	50	U	54	U	45	U	54	U
VOCs	Trichloroethene	ug/kg	50	U	85		1900		170	
VOCs	Trichlorofluoromethane	ug/kg	50	U	54	U	45	U	54	U
VOCs	Vinyl chloride	ug/kg	50	U	54	U	45	U	54	U
VOCs	Xylenes, Total	ug/kg	99	U	62	J	90	U	110	U
Solids	Percent Solids	Percent	86		91		92		82	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1		480-88479-1	
		Location	DP13		DP3		DP3		DP4	
		Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP13006		356023DP3004		356023DP3008		356023DP4003	
		Qc Code	FS		FS		FS		FS	
Class	Parameter	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/kg	120		36	J	100		32	J
VOCs	1,1,2,2-Tetrachloroethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,1,2-Trichloroethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,1-Dichloroethane	ug/kg	130		48	U	48	U	48	U
VOCs	1,1-Dichloroethene	ug/kg	39	J	48	U	29	J	48	U
VOCs	1,2,4-Trichlorobenzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,2-Dibromo-3-chloropropane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,2-Dibromoethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,2-Dichlorobenzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,2-Dichloroethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,2-Dichloropropane	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,3-Dichlorobenzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	1,4-Dichlorobenzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	2-Butanone	ug/kg	230	U	240	U	240	U	240	U
VOCs	2-Hexanone	ug/kg	230	U	240	U	240	U	240	U
VOCs	4-Methyl-2-pentanone	ug/kg	230	U	240	U	240	U	240	U
VOCs	Acetic acid, methyl ester	ug/kg	46	U	48	U	48	U	48	U
VOCs	Acetone	ug/kg	230	U	240	U	240	U	240	U
VOCs	Benzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Bromodichloromethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Bromoform	ug/kg	46	U	48	U	48	U	48	U
VOCs	Bromomethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Carbon disulfide	ug/kg	46	U	48	U	48	U	48	U
VOCs	Carbon tetrachloride	ug/kg	46	U	48	U	48	U	48	U
VOCs	Chlorobenzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Chloroethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Chloroform	ug/kg	46	U	48	U	48	U	48	U
VOCs	Chloromethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Cis-1,2-Dichloroethene	ug/kg	46	U	48	U	48	U	48	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1		480-88479-1	
		Location	DP13		DP3		DP3		DP4	
		Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP13006		356023DP3004		356023DP3008		356023DP4003	
		Qc Code	FS		FS		FS		FS	
Class	Parameter	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cis-1,3-Dichloropropene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Cyclohexane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Dibromochloromethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Dichlorodifluoromethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Ethyl benzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Isopropylbenzene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Methyl cyclohexane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Methyl Tertbutyl Ether	ug/kg	46	U	48	U	48	U	48	U
VOCs	Methylene chloride	ug/kg	46	U	48	U	48	U	48	U
VOCs	Styrene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Tetrachloroethene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Toluene	ug/kg	46	U	48	U	48	U	48	U
VOCs	trans-1,2-Dichloroethene	ug/kg	46	U	48	U	48	U	48	U
VOCs	trans-1,3-Dichloropropene	ug/kg	46	U	48	U	48	U	48	U
VOCs	Trichloroethene	ug/kg	18	J	48	U	48	U	48	U
VOCs	Trichlorofluoromethane	ug/kg	46	U	48	U	48	U	48	U
VOCs	Vinyl chloride	ug/kg	46	U	48	U	48	U	48	U
VOCs	Xylenes, Total	ug/kg	92	U	96	U	97	U	96	U
Solids	Percent Solids	Percent	89		85		86		86	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1		480-88479-1	
		Location	DP4		DP5		DP5		DP5	
		Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP4006		356023DP5005		356023DP5011		356023DP5D	
		Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/kg	97		46	J	130		200	J
VOCs	1,1,2,2-Tetrachloroethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,1,2-Trichloroethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,1-Dichloroethane	ug/kg	17	J	49	U	18	J	47	U
VOCs	1,1-Dichloroethene	ug/kg	23	J	49	U	42	U	47	U
VOCs	1,2,4-Trichlorobenzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,2-Dibromo-3-chloropropane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,2-Dibromoethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,2-Dichlorobenzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,2-Dichloroethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,2-Dichloropropane	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,3-Dichlorobenzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	1,4-Dichlorobenzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	2-Butanone	ug/kg	250	U	250	U	210	U	230	U
VOCs	2-Hexanone	ug/kg	250	U	250	U	210	U	230	U
VOCs	4-Methyl-2-pentanone	ug/kg	250	U	250	U	210	U	230	U
VOCs	Acetic acid, methyl ester	ug/kg	50	U	49	U	42	U	47	U
VOCs	Acetone	ug/kg	250	U	250	U	210	U	230	U
VOCs	Benzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Bromodichloromethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Bromoform	ug/kg	50	U	49	U	42	U	47	U
VOCs	Bromomethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Carbon disulfide	ug/kg	50	U	49	U	42	U	47	U
VOCs	Carbon tetrachloride	ug/kg	50	U	49	U	42	U	47	U
VOCs	Chlorobenzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Chloroethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Chloroform	ug/kg	50	U	49	U	42	U	47	U
VOCs	Chloromethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Cis-1,2-Dichloroethene	ug/kg	50	U	49	U	42	U	47	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1		480-88479-1	
		Location	DP4		DP5		DP5		DP5	
		Sample Date	10/2/2015		10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP4006		356023DP5005		356023DP5011		356023DP5D	
		Qc Code	FS		FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cis-1,3-Dichloropropene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Cyclohexane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Dibromochloromethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Dichlorodifluoromethane	ug/kg	50	U	49	U	42	U	47	UJ
VOCs	Ethyl benzene	ug/kg	50	U	49	U	42	U	23	J
VOCs	Isopropylbenzene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Methyl cyclohexane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Methyl Tertbutyl Ether	ug/kg	50	U	49	U	42	U	47	U
VOCs	Methylene chloride	ug/kg	50	U	49	U	42	U	47	U
VOCs	Styrene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Tetrachloroethene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Toluene	ug/kg	50	U	49	U	42	U	47	U
VOCs	trans-1,2-Dichloroethene	ug/kg	50	U	49	U	42	U	47	U
VOCs	trans-1,3-Dichloropropene	ug/kg	50	U	49	U	42	U	47	U
VOCs	Trichloroethene	ug/kg	28	J	120		370		560	
VOCs	Trichlorofluoromethane	ug/kg	50	U	49	U	42	U	47	U
VOCs	Vinyl chloride	ug/kg	50	U	49	U	42	U	47	U
VOCs	Xylenes, Total	ug/kg	62	J	99	U	83	J	220	J
Solids	Percent Solids	Percent	86		88		90		91	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1	
		Location	DP6		DP7		DP7	
		Sample Date	10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP6004		356023DP7006		356023DP7009	
		Qc Code	FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1-Trichloroethane	ug/kg	130		82		230	
VOCs	1,1,2,2-Tetrachloroethane	ug/kg	50	U	47	U	44	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	50	U	47	U	44	U
VOCs	1,1,2-Trichloroethane	ug/kg	50	U	47	U	44	U
VOCs	1,1-Dichloroethane	ug/kg	50	U	47	U	44	U
VOCs	1,1-Dichloroethene	ug/kg	50	U	47	U	26	J
VOCs	1,2,4-Trichlorobenzene	ug/kg	50	U	47	U	44	U
VOCs	1,2-Dibromo-3-chloropropane	ug/kg	50	U	47	U	44	U
VOCs	1,2-Dibromoethane	ug/kg	50	U	47	U	44	U
VOCs	1,2-Dichlorobenzene	ug/kg	50	U	47	U	44	U
VOCs	1,2-Dichloroethane	ug/kg	50	U	47	U	44	U
VOCs	1,2-Dichloropropane	ug/kg	50	U	47	U	44	U
VOCs	1,3-Dichlorobenzene	ug/kg	50	U	47	U	44	U
VOCs	1,4-Dichlorobenzene	ug/kg	50	U	47	U	44	U
VOCs	2-Butanone	ug/kg	250	U	230	U	220	U
VOCs	2-Hexanone	ug/kg	250	U	230	U	220	U
VOCs	4-Methyl-2-pentanone	ug/kg	250	U	230	U	220	U
VOCs	Acetic acid, methyl ester	ug/kg	37	J	47	U	44	U
VOCs	Acetone	ug/kg	250	U	230	U	220	U
VOCs	Benzene	ug/kg	50	U	47	U	44	U
VOCs	Bromodichloromethane	ug/kg	50	U	47	U	44	U
VOCs	Bromoform	ug/kg	50	U	47	U	44	U
VOCs	Bromomethane	ug/kg	50	U	47	U	44	U
VOCs	Carbon disulfide	ug/kg	50	U	47	U	44	U
VOCs	Carbon tetrachloride	ug/kg	50	U	47	U	44	U
VOCs	Chlorobenzene	ug/kg	50	U	47	U	44	U
VOCs	Chloroethane	ug/kg	50	U	47	U	44	U
VOCs	Chloroform	ug/kg	50	U	47	U	44	U
VOCs	Chloromethane	ug/kg	50	U	47	U	44	U
VOCs	Cis-1,2-Dichloroethene	ug/kg	50	U	47	U	44	U

TABLE 2 - SUMMARY OF ANALYTICAL RESULTS - SDG 480-88479-1
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

		Lab Sample Delivery Group	480-88479-1		480-88479-1		480-88479-1	
		Location	DP6		DP7		DP7	
		Sample Date	10/2/2015		10/2/2015		10/2/2015	
		Sample ID	356023DP6004		356023DP7006		356023DP7009	
		Qc Code	FS		FS		FS	
Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Cis-1,3-Dichloropropene	ug/kg	50	U	47	U	44	U
VOCs	Cyclohexane	ug/kg	50	U	47	U	44	U
VOCs	Dibromochloromethane	ug/kg	50	U	47	U	44	U
VOCs	Dichlorodifluoromethane	ug/kg	50	U	47	U	44	U
VOCs	Ethyl benzene	ug/kg	50	U	47	U	44	U
VOCs	Isopropylbenzene	ug/kg	50	U	47	U	44	U
VOCs	Methyl cyclohexane	ug/kg	50	U	47	U	44	U
VOCs	Methyl Tertbutyl Ether	ug/kg	50	U	47	U	44	U
VOCs	Methylene chloride	ug/kg	50	U	47	U	44	U
VOCs	Styrene	ug/kg	50	U	47	U	44	U
VOCs	Tetrachloroethene	ug/kg	50	U	47	U	44	U
VOCs	Toluene	ug/kg	87		47	U	44	U
VOCs	trans-1,2-Dichloroethene	ug/kg	50	U	47	U	44	U
VOCs	trans-1,3-Dichloropropene	ug/kg	50	U	47	U	44	U
VOCs	Trichloroethene	ug/kg	50	U	390		860	
VOCs	Trichlorofluoromethane	ug/kg	50	U	47	U	44	U
VOCs	Vinyl chloride	ug/kg	50	U	47	U	44	U
VOCs	Xylenes, Total	ug/kg	99	U	93	U	110	
Solids	Percent Solids	Percent	87		88		91	

NOTES:
ugkg = microgram per kilogram
ug/l = microgram per liter
U = not detected
J = estimated concentration

TABLE 3 - SUMMARY OF QUALIFICATION ACTIONS
CATEGORY A REVIEW
SEPTEMBER-OCTOBER 2015 SAMPLING PROGRAM
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

SDG	Analysis Method	Lab Sample Id	Field Sample ID	Parameter Name	Lab Result	Lab Qualifier	Validated Result	Validation Qualifier	Val Reason Code	Units	Lab Id
480-87442-1	SW8260C	480-87442-1	356023SS0302	Methylene chloride	40	J B *	43	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-14	356023TP0503	Methylene chloride	36	J B *	90	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-2	356023SS0201	Methylene chloride	36	J B *	48	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-3	356023SS0205	Methylene chloride	22	J B *	43	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-4	356023SS0402	Methylene chloride	13	J B *	51	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-5	356023SS0101	Methylene chloride	17	J B *	48	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-7	356023TP0107	Methylene chloride	14	J B *	64	U	BL1, BL2	ug/kg	TALBFLO
480-87442-1	SW8260C	480-87442-9	356023TP0207	Methylene chloride	44	J B *	56	U	BL1, BL2	ug/kg	TALBFLO
480-88479-1	SW8260C	480-88479-7	356023DP5D	1,1,1-Trichloroethane	200	F1	200	J	MS-H	ug/kg	TALBFLO
480-88479-1	SW8260C	480-88479-7	356023DP5D	Dichlorodifluoromethane	47	U F1	47	UJ	MS-L	ug/kg	TALBFLO
480-88479-1	SW8260C	480-88479-7	356023DP5D	Ethyl benzene	23	J F1	23	J	MS-H	ug/kg	TALBFLO
480-88479-1	SW8260C	480-88479-7	356023DP5D	Xylenes, Total	220	F1	220	J	MS-H	ug/kg	TALBFLO

NOTES:
BL1 = method blank qualifier
BL2 = field or trip blank qualifier
MS-L = MS/MSD percent recovery less than control limit
MS-H = MS/MSD percent recovery greater than control limit

Prepared by: BJS 10/28/2015
Checked by: JAR 10/28/2015

ATTACHMENT A

VOCs

PROJECT CATEGORY A REVIEW RECORD
Project: NYSDEC Mohonk Road
Method : SW-846 8260B
Laboratory and SDG(s): TAL **SDG#** 480-87442-1
Date: 10/21/15
Reviewer: Julie Ricardi
Review Level ☒ CATEGORY A

1. ☑ **Case Narrative Review and COC/Data Package Completeness** COMMENTS
   Were problems noted?
   See attached narrative & comments below as noted.
   Were all the samples on the COC analyzed for the requested analyses? YES NO (circle one)

   Are Field Sample IDs and Locations assigned correctly? YES NO (circle one)

2. ☑ **Holding time and Sample Collection**
   All samples were analyzed within the 14 day holding time. YES NO (circle one)

3. ☑ **QC Blanks**
   Are method blanks free of contamination? YES NO (circle one)
   See attached
   Are Trip blanks free of contamination? YES NO (circle one)
   See attached
   Are Rinse blanks free of contamination? YES NO NA (circle one)

4. ☑ **Matrix Spike** - Region II limits (water and soil 70-130%, water RPD 20, soil RPD 35)
   Were MS/MSDs submitted/analyzed? YES NO

   Were all results were within the Region II limits? YES NO NA (circle one)

5. ☑ **Field Duplicates** - Region II Limits (water RPD 50, soil RPD 100)
   Were Field Duplicates submitted/analyzed? YES NO

   Were all results were within Region II Limits? YES NO NA (circle one)

6. ☑ **Reporting Limits:** Were samples analyzed at a dilution? YES NO (circle one)

7. ☑ **Electronic Data Review and Edits**
   Does the EDD match the Form I's? YES NO (circle one)

   No errors were found in the electronic data provided by the laboratory.

8. ☑ **Table Review** **Table 1** (sample Listing), **Table 2** (results summary), **Table 3** (Reason Codes), **Table 4** (TICs). Did lab report TICs? YES NO (circle one)

Sample Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: NYSDEC:Mohonk Site

TestAmerica Job ID: 480-87442-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
480-87442-1	356023SS0302	Solid	09/15/15 11:40	09/17/15 10:30
480-87442-2	356023SS0201	Solid	09/15/15 14:39	09/17/15 10:30
480-87442-3	356023SS0205	Solid	09/15/15 15:00	09/17/15 10:30
480-87442-4	356023SS0402	Solid	09/15/15 16:25	09/17/15 10:30
480-87442-5	356023SS0101	Solid	09/15/15 17:35	09/17/15 10:30
480-87442-6	356023TP0102	Solid	09/15/15 10:30	09/17/15 10:30
480-87442-7	356023TP0107	Solid	09/15/15 10:35	09/17/15 10:30
480-87442-8	356023TP0203	Solid	09/15/15 12:30	09/17/15 10:30
480-87442-9	356023TP0207	Solid	09/15/15 12:25	09/17/15 10:30
480-87442-10	356023TP0303	Solid	09/15/15 14:35	09/17/15 10:30
480-87442-11	356023TP0307	Solid	09/15/15 14:30	09/17/15 10:30
480-87442-12	356023TP0404	Solid	09/15/15 15:45	09/17/15 10:30
480-87442-13	356023TP0507	Solid	09/15/15 16:50	09/17/15 10:30
480-87442-14	356023TP0503	Solid	09/15/15 16:55	09/17/15 10:30
480-87442-15	356023TB01	Solid	09/16/15 12:00	09/17/15 10:30

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Mohonk

Case Narrative

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: NYSDEC:Mohonk Site

TestAmerica Job ID: 480-87442-1

Job ID: 480-87442-1

Laboratory: TestAmerica Buffalo

Narrative

Job Narrative
480-87442-1

Comments
No additional comments.

Receipt
The samples were received on 9/17/2015 10:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.1° C.

GC/MS VOA
Method(s) 8260C: The laboratory control sample (LCS) for batch preparation batch 480-265162 and analytical batch 480-265174 recovered outside control limits for the following analyte: Methylene Chloride. This analyte was biased high in the LCS and was not detected above the reporting limit in the associated samples; therefore, the data have been reported. no impact; not a contaminant of concern (COC)

Method(s) 8260C: The method blank for preparation batch 480-265162 and analytical batch 480-265174 contained Methylene Chloride above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed. U

Method(s) 8260C: The continuing calibration verification (CCV) analyzed in batch 480-265250 was outside the method criteria for the following analyte: Methylene Chloride. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated. The following samples are affected: 356023SS0302 (480-87442-1) not contaminant of concern

Method(s) 8260C: The continuing calibration verification (CCV) associated with batch 480-265250 recovered above the upper control limit for Methylene Chloride. The samples associated with this CCV were not detected above the reporting limit for the affected analyte; therefore, the data have been reported. The following sample is impacted: 356023TP0503 (480-87442-14). not COC

*: lab quals for LCS out; left on results

Method(s) 8260C: The continuing calibration verification (CCV) associated with batch 480-265250 recovered above the upper control limit for 1,1,2-Trichloro-1,2,2-trifluoroethane, 2-Hexanone, and Chloromethane. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The following samples are impacted: 356023SS0302 (480-87442-1) and 356023TP0503 (480-87442-14). not COCs

Method(s) 8260C: The method blank for preparation batch 480-265162 and analytical batch 480-265250 contained Methylene Chloride above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and re-analysis of samples was not performed. U

Method(s) 8260C: The laboratory control sample (LCS) preparation batch 480-265162 and analytical batch 480-265250 recovered outside control limits for the following analyte: Methylene Chloride. This analyte was biased high in the LCS and was not detected above the reporting limit in the associated sample; therefore, the data have been reported. The following sample is impacted: 356023TP0503 (480-87442-14). no impact; not COC

Method(s) 8260C: The %RPD of the laboratory control sample (LCS) and laboratory control standard duplicate (LCSD) for preparation batch preparation batch 480-265162 and analytical batch 480-265250 recovered outside control limits for several analytes. %recs OK; no impact

Method(s) 8260C: The laboratory control sample (LCS) for preparation batch 480-265162 and analytical batch 480-265616 recovered outside control limits for the following analyte: Methylene Chloride. This analyte was biased high in the LCS and was not detected above the reporting limit in the associated sample; therefore, the data have been reported. The following sample is impacted: 356023SS0302 (480-87442-1). no impact; not COC

Method(s) 8260C: The %RPD of the laboratory control sample (LCS) and laboratory control standard duplicate (LCSD) for preparation batch preparation batch 480-265162 and analytical batch 480-265616 recovered outside control limits for several analytes. The following sample is impacted: 356023SS0302 (480-87442-1). %recs OK; no impact " * left on data

Method(s) 8260C: The method blank for preparation batch 480-265162 and analytical batch 480-265616 contained Methylene Chloride

U

JN 10/22/15

Job ID: 480-87442-1 (Continued)

Laboratory: TestAmerica Buffalo (Continued)

above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction of samples was not performed. The following sample is impacted: 356023SS0302 (480-87442-1).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Blank

Method: 8260C - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 480-265162/3-A
Matrix: Solid
Analysis Batch: 265174

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 265162

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		98	27	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,1,2,2-Tetrachloroethane	ND		98	16	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		98	49	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,1,2-Trichloroethane	ND		98	21	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,1-Dichloroethane	ND		98	30	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,1-Dichloroethene	ND		98	34	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,2,4-Trichlorobenzene	ND		98	37	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,2-Dibromo-3-Chloropropane	ND		98	49	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,2-Dibromoethane	ND		98	17	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,2-Dichlorobenzene	ND		98	25	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,2-Dichloroethane	ND		98	40	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,2-Dichloropropane	ND		98	16	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,3-Dichlorobenzene	ND		98	26	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
1,4-Dichlorobenzene	ND		98	14	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
2-Butanone (MEK)	ND		490	290	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
2-Hexanone	ND		490	200	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
4-Methyl-2-pentanone (MIBK)	ND		490	31	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Acetone	ND		490	400	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Benzene	ND		98	19	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Bromodichloromethane	ND		98	20	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Bromoform	ND		98	49	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Bromomethane	ND		98	22	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Carbon disulfide	ND		98	45	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Carbon tetrachloride	ND		98	25	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Chlorobenzene	ND		98	13	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Chloroethane	ND		98	20	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Chloroform	ND		98	68	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Chloromethane	ND		98	23	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
cis-1,2-Dichloroethene	ND		98	27	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
cis-1,3-Dichloropropene	ND		98	24	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Cyclohexane	ND		98	22	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Dibromochloromethane	ND		98	48	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Dichlorodifluoromethane	ND		98	43	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Ethylbenzene	ND		98	29	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Isopropylbenzene	ND		98	15	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Methyl acetate	ND		98	47	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Methyl tert-butyl ether	ND		98	37	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Methylcyclohexane	ND		98	46	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Methylene Chloride	50.6	J	98	19	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Styrene	ND		98	24	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Tetrachloroethene	ND		98	13	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Toluene	ND		98	26	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
trans-1,2-Dichloroethene	ND		98	23	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
trans-1,3-Dichloropropene	ND		98	9.7	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Trichloroethene	ND		98	27	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Trichlorofluoromethane	ND		98	46	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Vinyl chloride	ND		98	33	ug/Kg		09/23/15 16:09	09/23/15 22:33	1
Xylenes, Total	ND		200	55	ug/Kg		09/23/15 16:09	09/23/15 22:33	1

U all MeCl2 detections BL1

10x Action level = 506 ug/Kg

JM
10/22/15

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: NYSDEC:Mohonk Site

TestAmerica Job ID: 480-87442-1

Client Sample ID: 356023TB01

Lab Sample ID: 480-87442-15

Date Collected: 09/16/15 12:00
Date Received: 09/17/15 10:30

Trip Blank

Matrix: Solid

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		50	14	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,1,2,2-Tetrachloroethane	ND		50	8.1	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		50	25	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,1,2-Trichloroethane	ND		50	11	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,1-Dichloroethane	ND		50	15	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,1-Dichloroethene	ND		50	17	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,2,4-Trichlorobenzene	ND		50	19	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,2-Dibromo-3-Chloropropane	ND		50	25	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,2-Dibromoethane	ND		50	8.8	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,2-Dichlorobenzene	ND		50	13	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,2-Dichloroethane	ND		50	20	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,2-Dichloropropane	ND		50	8.1	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,3-Dichlorobenzene	ND		50	13	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
1,4-Dichlorobenzene	ND		50	7.0	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
2-Butanone (MEK)	ND		250	150	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
2-Hexanone	ND		250	100	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
4-Methyl-2-pentanone (MIBK)	ND		250	16	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Acetone	ND		250	210	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Benzene	ND		50	9.5	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Bromodichloromethane	ND		50	10	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Bromoform	ND		50	25	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Bromomethane	ND		50	11	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Carbon disulfide	ND		50	23	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Carbon tetrachloride	ND		50	13	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Chlorobenzene	ND		50	6.6	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Chloroethane	ND		50	10	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Chloroform	ND		50	34	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Chloromethane	ND		50	12	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
cis-1,2-Dichloroethene	ND		50	14	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
cis-1,3-Dichloropropene	ND		50	12	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Cyclohexane	ND		50	11	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Dibromochloromethane	ND		50	24	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Dichlorodifluoromethane	ND		50	22	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Ethylbenzene	ND		50	15	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Isopropylbenzene	ND		50	7.5	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Methyl acetate	ND		50	24	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Methyl tert-butyl ether	ND	10x Action	50	19	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Methylcyclohexane	ND	Level =	50	23	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Methylene Chloride (U) all $MeCl_2$	11	J B * 110.45	50	9.9	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Styrene	ND	ks	50	12	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Tetrachloroethene detections	ND		50	6.7	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Toluene BL2	ND		50	13	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
trans-1,2-Dichloroethene	ND		50	12	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
trans-1,3-Dichloropropene	ND	jn	50	4.9	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Trichloroethene	ND	10/22/15	50	14	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Trichlorofluoromethane	ND		50	23	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Vinyl chloride	ND		50	17	ug/Kg		09/17/15 10:30	09/24/15 04:39	1
Xylenes, Total	ND		100	28	ug/Kg		09/17/15 10:30	09/24/15 04:39	1

No quals
jr
10/22/15

VOCs

PROJECT CATEGORY A REVIEW RECORD
Project: NYSDEC Mohonk Road
Method : SW-846 8260B
Laboratory and SDG(s): TAL **SDG#** 480-88042-1
Date: 10/22/15
Reviewer: Julie Ricardi
Review Level ☒ CATEGORY A

1. ☑ **Case Narrative Review and COC/Data Package Completeness** COMMENTS
   Were problems noted?
   No problems noted in narrative
   Were all the samples on the COC analyzed for the requested analyses? YES NO (circle one)

   Are Field Sample IDs and Locations assigned correctly YES NO (circle one)

2. ☑ **Holding time and Sample Collection**
   All samples were analyzed within the 14 day holding time. YES NO (circle one)

3. ☑ **QC Blanks**
   Are method blanks free of contamination? YES NO (circle one)

   Are Trip blanks free of contamination? YES NO (circle one)

   Are Rinse blanks free of contamination? YES NO NA (circle one)
   See attached results; acetone detected in EB01 but not present in samples; no action.

4. ☑ **Matrix Spike** - Region II limits (water and soil 70-130%, water RPD 20, soil RPD 35)
   Were MS/MSDs submitted/analyzed? YES NO
   356023MW05R115 MS/MSD
   Were all results were within the Region II limits? YES NO NA (circle one)
   See attached summary; TCFM accepted w/o qualification based on prof. judgment since %rec OK & result ND in MW05R115/MW05R115XD (MS RPD out)

5. ☑ **Field Duplicates** - Region II Limits (water RPD 50, soil RPD 100)
   Were Field Duplicates submitted/analyzed? YES NO
   356023MW05R115 / 356023 MW05R115 XD
   Were all results were within Region II Limits? YES NO NA (circle one)

6. ☑ **Reporting Limits:** Were samples analyzed at a dilution? YES NO (circle one)
   2x dilutions performed for high (E) concentrations of 1,1,1-TCA in 356023ERT01075 and 356023MW07R095; all other results from undiluted runs.

7. ☑ **Electronic Data Review and Edits**
   Does the EDD match the Form I's? YES NO (circle one)

   No errors were found in the electronic data provided by the laboratory.

8. ☑ **Table Review** **Table 1** (sample Listing), **Table 2** (results summary), **Table** 3 (Reason Codes), **Table 4** (TICs). Did lab report TICs? YES NO (circle one)

Sample Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: NYSDEC:Mohonk Site

TestAmerica Job ID: 480-88042-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
480-88042-1	356023MW05R115	Water	09/22/15 12:05	09/29/15 10:00
480-88042-2	356023MW05R115XD	Water	09/22/15 12:05	09/29/15 10:00
480-88042-3	356023MW05R095	Water	09/22/15 16:10	09/29/15 10:00
480-88042-4	356023ERT01175	Water	09/23/15 11:05	09/29/15 10:00
480-88042-5	356023ERT01115	Water	09/23/15 13:45	09/29/15 10:00
480-88042-6	356023ERT01075	Water	09/23/15 16:25	09/29/15 10:00
480-88042-7	356023EB01	Water	09/24/15 08:00	09/29/15 10:00
480-88042-8	356023TB01	Water	09/22/15 12:00	09/29/15 10:00
480-88042-9	356023MW07R170	Water	09/24/15 12:12	09/29/15 10:00
480-88042-10	356023MW07R138	Water	09/24/15 14:35	09/29/15 10:00
480-88042-11	356023MW07R095	Water	09/24/15 17:36	09/29/15 10:00
480-88042-12	356023MW07R080	Water	09/25/15 08:55	09/29/15 10:00

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Job ID: 480-88042-1

Laboratory: TestAmerica Buffalo

Narrative

Job Narrative
480-88042-1

Receipt
The samples were received on 9/29/2015 10:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.5° C.

GC/MS VOA
Method(s) 8260C: The following samples were diluted to bring the concentration of target analytes within the calibration range: 356023ERT01075 (480-88042-6) and 356023MW07R095 (480-88042-11). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Ricardi, Julie A

From:	Fischer, Brian <Brian.Fischer@testamericainc.com>
Sent:	Thursday, October 22, 2015 1:48 PM
To:	Ricardi, Julie A
Subject:	RE: NYSDEC Mohonk SDGs 480-88042-1 and 480-88479-1 Narrative Question

Response from the lab is below:
All batches associated with these 2 jobs were checked. There were no QC failures hence the reason you have no NCMs stating QC failures. We do not comment on MS/SD failures unless it is a QUAPP specific requirement. The system puts the F1/F2 flags in which state the failure.
Let me know if you need anything else.
Thanks

BRIAN FISCHER
Manager of Project Management

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

10 Hazelwood Drive
Amherst, NY 14228
Tel 716.504.9835
www.testamericainc.com

From: Ricardi, Julie A [mailto:julie.ricardi@amecfw.com]
Sent: Thursday, October 22, 2015 9:49 AM
To: Fischer, Brian
Subject: NYSDEC Mohonk SDGs 480-88042-1 and 480-88479-1 Narrative Question

Hi Brian,

I'm reviewing the Mohonk VOC data and noticed that for the first SDG (480-87442-1) continuing calibrations and batch QC that were outside control limits were noted in the narrative. For SDGs 480-88042-1 and 480-88479-1 I'm seeing lab qualifiers on the reports, but I don't see any corresponding comments in the narratives, and these 2 narratives are considerably shorter than the one for SDG 480-87442-1.

So I just wanted to see if someone could take a look at 480-88042-1 and 480-88479-1 and make sure these two narratives are complete? They don't appear to address MS/MSDs that are flagged as being out, and there is little to no continuing calibration comments (which may mean nothing was out, but just wanted to confirm that).

Thanks very much,
Julie

Julie Ricardi

Senior 1 Scientist
Amec Foster Wheeler Environment & Infrastructure
511 Congress Street
Portland, Maine 04112-7050
207-828-3608 T W Th
207-926-3721 M F
E julie.ricardi@amecfw.com
amecfw.com

amec
foster
wheeler

Client Sample ID: 356023EB01
Date Collected: 09/24/15 08:00
Date Received: 09/29/15 10:00

Equipment Blank

Lab Sample ID: 480-88042-7
Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.0	0.82	ug/L			10/02/15 18:43	1
1,1,2,2-Tetrachloroethane	ND		1.0	0.21	ug/L			10/02/15 18:43	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.0	0.31	ug/L			10/02/15 18:43	1
1,1,2-Trichloroethane	ND		1.0	0.23	ug/L			10/02/15 18:43	1
1,1-Dichloroethane	ND		1.0	0.38	ug/L			10/02/15 18:43	1
1,1-Dichloroethene	ND		1.0	0.29	ug/L			10/02/15 18:43	1
1,2,4-Trichlorobenzene	ND		1.0	0.41	ug/L			10/02/15 18:43	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.39	ug/L			10/02/15 18:43	1
1,2-Dibromoethane	ND		1.0	0.73	ug/L			10/02/15 18:43	1
1,2-Dichlorobenzene	ND		1.0	0.79	ug/L			10/02/15 18:43	1
1,2-Dichloroethane	ND		1.0	0.21	ug/L			10/02/15 18:43	1
1,2-Dichloropropane	ND		1.0	0.72	ug/L			10/02/15 18:43	1
1,3-Dichlorobenzene	ND		1.0	0.78	ug/L			10/02/15 18:43	1
1,4-Dichlorobenzene	ND		1.0	0.84	ug/L			10/02/15 18:43	1
2-Butanone (MEK)	ND		10	1.3	ug/L			10/02/15 18:43	1
2-Hexanone	ND		5.0	1.2	ug/L			10/02/15 18:43	1
4-Methyl-2-pentanone (MIBK)	ND		5.0	2.1	ug/L			10/02/15 18:43	1
Acetone	18	No sample	10	3.0	ug/L			10/02/15 18:43	1
Benzene	ND		1.0	0.41	ug/L			10/02/15 18:43	1
Bromodichloromethane	ND	detections	1.0	0.39	ug/L			10/02/15 18:43	1
Bromoform	ND	∴ no action	1.0	0.26	ug/L			10/02/15 18:43	1
Bromomethane	ND		1.0	0.69	ug/L			10/02/15 18:43	1
Carbon disulfide	ND	needed,	1.0	0.19	ug/L			10/02/15 18:43	1
Carbon tetrachloride	ND	no impact	1.0	0.27	ug/L			10/02/15 18:43	1
Chlorobenzene	ND		1.0	0.75	ug/L			10/02/15 18:43	1
Chloroethane	ND		1.0	0.32	ug/L			10/02/15 18:43	1
Chloroform	ND	JR	1.0	0.34	ug/L			10/02/15 18:43	1
Chloromethane	ND	10/22/15	1.0	0.35	ug/L			10/02/15 18:43	1
cis-1,2-Dichloroethene	ND		1.0	0.81	ug/L			10/02/15 18:43	1
cis-1,3-Dichloropropene	ND		1.0	0.36	ug/L			10/02/15 18:43	1
Cyclohexane	ND		1.0	0.18	ug/L			10/02/15 18:43	1
Dibromochloromethane	ND		1.0	0.32	ug/L			10/02/15 18:43	1
Dichlorodifluoromethane	ND		1.0	0.68	ug/L			10/02/15 18:43	1
Ethylbenzene	ND		1.0	0.74	ug/L			10/02/15 18:43	1
Isopropylbenzene	ND		1.0	0.79	ug/L			10/02/15 18:43	1
Methyl acetate	ND		2.5	1.3	ug/L			10/02/15 18:43	1
Methyl tert-butyl ether	ND		1.0	0.16	ug/L			10/02/15 18:43	1
Methylcyclohexane	ND		1.0	0.16	ug/L			10/02/15 18:43	1
Methylene Chloride	ND		1.0	0.44	ug/L			10/02/15 18:43	1
Styrene	ND		1.0	0.73	ug/L			10/02/15 18:43	1
Tetrachloroethene	ND		1.0	0.36	ug/L			10/02/15 18:43	1
Toluene	ND		1.0	0.51	ug/L			10/02/15 18:43	1
trans-1,2-Dichloroethene	ND		1.0	0.90	ug/L			10/02/15 18:43	1
trans-1,3-Dichloropropene	ND		1.0	0.37	ug/L			10/02/15 18:43	1
Trichloroethene	ND		1.0	0.46	ug/L			10/02/15 18:43	1
Trichlorofluoromethane	ND		1.0	0.88	ug/L			10/02/15 18:43	1
Vinyl chloride	ND		1.0	0.90	ug/L			10/02/15 18:43	1
Xylenes, Total	ND		2.0	0.66	ug/L			10/02/15 18:43	1

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
TestAmerica Job ID: 480-88042-1
Project/Site: NYSDEC:Mohonk Site

Method: 8260C - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 480-88042-1 MS
Client Sample ID: 356023MW05R115
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 266634

70-130

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	36		25.0	63.5		ug/L		111	73 - 126
1,1,2,2-Tetrachloroethane	ND		25.0	28.6		ug/L		114	70 - 126
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		25.0	25.5		ug/L		102	52 - 148
1,1,2-Trichloroethane	ND		25.0	27.6		ug/L		110	76 - 122
1,1-Dichloroethane	2.9		25.0	29.7		ug/L		107	71 - 129
1,1-Dichloroethene	8.3		25.0	34.0		ug/L		103	58 - 121
1,2,4-Trichlorobenzene	ND		25.0	23.4		ug/L		94	70 - 122
1,2-Dibromo-3-Chloropropane J+	ND	F1	25.0	33.7	F1	ug/L		135	56 - 134
1,2-Dibromoethane	ND		25.0	26.8		ug/L		107	77 - 120
1,2-Dichlorobenzene OK	ND		25.0	26.3		ug/L		105	80 - 124
1,2-Dichloroethane	ND		25.0	29.5		ug/L		118	75 - 127
1,2-Dichloropropane	ND		25.0	27.1		ug/L		108	76 - 120
1,3-Dichlorobenzene	ND		25.0	25.7		ug/L		103	77 - 120
1,4-Dichlorobenzene	ND		25.0	25.8		ug/L		103	75 - 120
2-Butanone (MEK)	ND		125	158		ug/L		127	57 - 140
2-Hexanone J+	ND	F1	125	170	F1	ug/L		136	65 - 127
4-Methyl-2-pentanone (MIBK) J+	ND	F1	125	169	F1	ug/L		135	71 - 125
Acetone	ND		125	159		ug/L		127	56 - 142
Benzene OK	ND		25.0	25.3		ug/L		101	71 - 124
Bromodichloromethane	ND		25.0	28.7		ug/L		115	80 - 122
Bromoform	ND		25.0	30.6		ug/L		122	52 - 132
Bromomethane	ND		25.0	24.5		ug/L		98	55 - 144
Carbon disulfide	ND		25.0	23.4		ug/L		94	59 - 134
Carbon tetrachloride	ND		25.0	27.6		ug/L		110	72 - 134
Chlorobenzene	ND		25.0	25.3		ug/L		101	72 - 120
Chloroethane	ND		25.0	25.4		ug/L		101	69 - 136
Chloroform	ND		25.0	26.5		ug/L		106	73 - 127
Chloromethane	ND	F1 F2	25.0	27.7		ug/L		✓ 111	68 - 124
cis-1,2-Dichloroethene	ND		25.0	24.6		ug/L		98	74 - 124
cis-1,3-Dichloropropene	ND		25.0	25.6		ug/L		102	74 - 124
Cyclohexane	ND		25.0	26.6		ug/L		107	59 - 135
Dibromochloromethane	ND		25.0	29.4		ug/L		117	75 - 125
Dichlorodifluoromethane	ND		25.0	23.8		ug/L		95	59 - 135
Ethylbenzene	ND		25.0	25.8		ug/L		103	77 - 123
Isopropylbenzene	ND		25.0	25.8		ug/L		103	77 - 122
Methyl acetate	ND		125	150		ug/L		120	74 - 133
Methyl tert-butyl ether	ND		25.0	28.0		ug/L		112	64 - 127
Methylcyclohexane	ND		25.0	24.7		ug/L		99	61 - 138
Methylene Chloride	ND		25.0	24.7		ug/L		99	57 - 132
Styrene	ND		25.0	25.1		ug/L		101	70 - 130
Tetrachloroethene	ND		25.0	23.9		ug/L		95	74 - 122
Toluene	ND		25.0	25.1		ug/L		100	80 - 122
trans-1,2-Dichloroethene	ND		25.0	25.2		ug/L		101	73 - 127
trans-1,3-Dichloropropene	ND		25.0	26.9		ug/L		108	72 - 123
Trichloroethene	3.7		25.0	28.1		ug/L		98	74 - 123
Trichlorofluoromethane	ND	F2	25.0	23.7		ug/L		✓ 95	62 - 152
Vinyl chloride	ND	F1 F2	25.0	29.2		ug/L		✓ 117	65 - 133

remove lab quals; no impact

JR 10/22/15

Method: 8260C - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 480-88042-1 MS **Client Sample ID: 356023MW05R115**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 266634

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Xylenes, Total	ND		50.0	49.2		ug/L		98	76 - 122

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*111*		*66 - 137*
4-Bromofluorobenzene (Surr)	*102*		*73 - 120*
Dibromofluoromethane (Surr)	*105*		*60 - 140*
Toluene-d8 (Surr)	*105*		*71 - 126*

70-130 | 20

Lab Sample ID: 480-88042-1 MSD **Client Sample ID: 356023MW05R115**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 266634

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1-Trichloroethane	36		25.0	65.3		ug/L		118	73 - 126	3	15
1,1,2,2-Tetrachloroethane	ND		25.0	27.5		ug/L		110	70 - 126	4	15
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		25.0	26.5		ug/L		106	52 - 148	4	20
1,1,2-Trichloroethane	ND		25.0	26.8		ug/L		107	76 - 122	3	15
1,1-Dichloroethane	2.9		25.0	30.5		ug/L		111	71 - 129	3	20
1,1-Dichloroethene	8.3		25.0	34.7		ug/L		106	58 - 121	2	16
1,2,4-Trichlorobenzene	ND		25.0	24.9		ug/L		100	70 - 122	6	20
1,2-Dibromo-3-Chloropropane	ND	F1	25.0	32.6		ug/L		130	56 - 134	3	15
1,2-Dibromoethane	ND		25.0	26.0		ug/L		104	77 - 120	3	15
1,2-Dichlorobenzene	ND		25.0	26.5		ug/L		106	80 - 124	1	20
1,2-Dichloroethane	ND		25.0	28.6		ug/L		114	75 - 127	3	20
1,2-Dichloropropane	ND		25.0	26.8		ug/L		107	76 - 120	1	20
1,3-Dichlorobenzene	ND		25.0	26.2		ug/L		105	77 - 120	2	20
1,4-Dichlorobenzene	ND		25.0	26.8		ug/L		107	75 - 120	4	20
2-Butanone (MEK)	ND		125	147		ug/L		117	57 - 140	8	20
2-Hexanone	ND	F1	125	161	F1	ug/L		128	65 - 127	6	15
4-Methyl-2-pentanone (MIBK)	ND	F1	125	157	F1	ug/L		126	71 - 125	7	35
Acetone	ND		125	150		ug/L		120	56 - 142	6	15
Benzene	ND		25.0	25.8		ug/L		103	71 - 124	2	13
Bromodichloromethane	ND		25.0	28.2		ug/L		113	80 - 122	2	15
Bromoform	ND		25.0	30.1		ug/L		121	52 - 132	2	15
Bromomethane	ND		25.0	28.4		ug/L		114	55 - 144	15	15
Carbon disulfide	ND		25.0	26.6		ug/L		106	59 - 134	13	15
Carbon tetrachloride	ND		25.0	29.1		ug/L		116	72 - 134	5	15
Chlorobenzene	ND		25.0	25.6		ug/L		102	72 - 120	1	25
Chloroethane	ND		25.0	29.6		ug/L		118	69 - 136	15	15
Chloroform	ND		25.0	26.7		ug/L		107	73 - 127	1	20
Chloromethane	ND	F1 F2	25.0	32.4	F1 F2	ug/L		130	68 - 124	16	15
cis-1,2-Dichloroethene	ND		25.0	25.2		ug/L		101	74 - 124	3	15
cis-1,3-Dichloropropene	ND		25.0	25.6		ug/L		102	74 - 124	0	15
Cyclohexane	ND		25.0	27.9		ug/L		112	59 - 135	5	20
Dibromochloromethane	ND		25.0	28.7		ug/L		115	75 - 125	2	15
Dichlorodifluoromethane	ND		25.0	28.4		ug/L		114	59 - 135	18	20
Ethylbenzene	ND		25.0	26.7		ug/L		107	77 - 123	4	15

remove lab qual
no impact
gr 10/22/15

gr 10/22/15

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: NYSDEC:Mohonk Site

TestAmerica Job ID: 480-88042-1

Method: 8260C - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 480-88042-1 MSD
Matrix: Water
Analysis Batch: 266634

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Client Sample ID: 356023MW05R115
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Isopropylbenzene	ND		25.0	27.3		ug/L		109	77 - 122	6	20
Methyl acetate	ND		125	140		ug/L		112	74 - 133	7	20
Methyl tert-butyl ether	ND		25.0	27.0		ug/L		108	64 - 127	4	37
Methylcyclohexane	ND		25.0	26.1		ug/L		104	61 - 138	6	20
Methylene Chloride	ND		25.0	24.5		ug/L		98	57 - 132	1	15
Styrene	ND		25.0	25.7		ug/L		103	70 - 130	2	20
Tetrachloroethene	ND		25.0	25.1		ug/L		100	74 - 122	5	20
Toluene	ND		25.0	26.3		ug/L		105	80 - 122	4	15
trans-1,2-Dichloroethene	ND		25.0	25.8		ug/L		103	73 - 127	3	20
trans-1,3-Dichloropropene MS-RPD*	ND		25.0	26.6		ug/L		106	72 - 123	1	15
Trichloroethene	3.7		25.0	29.0		ug/L		101	74 - 123	3 *	16
Trichlorofluoromethane ~~J (UJ)~~	ND	F2	25.0	29.8	F2	ug/L		119	62 - 152	23	20
Vinyl chloride J+	ND	F1 F2	25.0	34.6	F1 F2	ug/L		138	65 - 133	17	15
Xylenes, Total	ND		50.0	50.9		ug/L		102	76 - 122	3	16

* Accept ND results for TCFM w/o qualification based on professional judgment, no qual.

Surrogate	MSD %Recovery	MSD Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	*107*		*66 - 137*
4-Bromofluorobenzene (Surr)	*99*		*73 - 120*
Dibromofluoromethane (Surr)	*102*		*60 - 140*
Toluene-d8 (Surr)	*103*		*71 - 126*

JR
10/22/15

Lab Sample ID: MB 480-266843/8
Matrix: Water
Analysis Batch: 266843

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.0	0.82	ug/L			10/04/15 21:07	1
1,1,2,2-Tetrachloroethane	ND		1.0	0.21	ug/L			10/04/15 21:07	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.0	0.31	ug/L			10/04/15 21:07	1
1,1,2-Trichloroethane	ND		1.0	0.23	ug/L			10/04/15 21:07	1
1,1-Dichloroethane	ND		1.0	0.38	ug/L			10/04/15 21:07	1
1,1-Dichloroethene	ND		1.0	0.29	ug/L			10/04/15 21:07	1
1,2,4-Trichlorobenzene	ND		1.0	0.41	ug/L			10/04/15 21:07	1
1,2-Dibromo-3-Chloropropane	ND		1.0	0.39	ug/L			10/04/15 21:07	1
1,2-Dibromoethane	ND		1.0	0.73	ug/L			10/04/15 21:07	1
1,2-Dichlorobenzene	ND		1.0	0.79	ug/L			10/04/15 21:07	1
1,2-Dichloroethane	ND		1.0	0.21	ug/L			10/04/15 21:07	1
1,2-Dichloropropane	ND		1.0	0.72	ug/L			10/04/15 21:07	1
1,3-Dichlorobenzene	ND		1.0	0.78	ug/L			10/04/15 21:07	1
1,4-Dichlorobenzene	ND		1.0	0.84	ug/L			10/04/15 21:07	1
2-Butanone (MEK)	ND		10	1.3	ug/L			10/04/15 21:07	1
2-Hexanone	ND		5.0	1.2	ug/L			10/04/15 21:07	1
4-Methyl-2-pentanone (MIBK)	ND		5.0	2.1	ug/L			10/04/15 21:07	1
Acetone	ND		10	3.0	ug/L			10/04/15 21:07	1
Benzene	ND		1.0	0.41	ug/L			10/04/15 21:07	1
Bromodichloromethane	ND		1.0	0.39	ug/L			10/04/15 21:07	1
Bromoform	ND		1.0	0.26	ug/L			10/04/15 21:07	1
Bromomethane	ND		1.0	0.69	ug/L			10/04/15 21:07	1

TestAmerica Buffalo

VOCs

PROJECT CATEGORY A REVIEW RECORD
Project: NYSDEC Mohonk Road
Method : SW-846 8260B
Laboratory and SDG(s): TAL **SDG#** 480-88479-1
Date: 10/22/15
Reviewer: Julie Ricardi
Review Level [X] CATEGORY A

1. ☑ **Case Narrative Review and COC/Data Package Completeness** COMMENTS
   Were problems noted?
   See attached narrative & comments below as noted.
   Were all the samples on the COC analyzed for the requested analyses? YES NO (circle one)

   Are Field Sample IDs and Locations assigned correctly? YES NO (circle one)

2. ☑ **Holding time and Sample Collection**
   All samples were analyzed within the 14 day holding time. YES NO (circle one)

3. ☑ **QC Blanks**
   Are method blanks free of contamination? YES NO (circle one)

   Are Trip blanks free of contamination? YES NO (circle one) N/A
   No trip blanks reported w/ this dataset
   Are Rinse blanks free of contamination? YES NO NA (circle one)

4. ☑ **Matrix Spike** - Region II limits (water and soil 70-130%, water RPD 20, soil RPD 35)
   Were MS/MSDs submitted/analyzed? YES NO
   356023 DP5 MS/MSD
   Were all results were within the Region II limits? YES NO NA (circle one)
   See attached summary for qualifiers

5. ☑ **Field Duplicates** - Region II Limits (water RPD 50, soil RPD 100)
   Were Field Duplicates submitted/analyzed? YES NO

   Were all results were within Region II Limits? YES NO NA (circle one)

6. ☑ **Reporting Limits:** Were samples analyzed at a dilution? YES NO (circle one)
   10x dilution performed for high (E) concentration of 1,1,1-TCA in 356023 DP12007; all other results were reported from undiluted runs.

7. ☑ **Electronic Data Review and Edits**
   Does the EDD match the Form I's? YES NO (circle one)
   See comment below.
   No errors were found in the electronic data provided by the laboratory, with exception of Percent Moisture reported in place of Percent Solids. Percent solids were calculated & compared to Form 1 results, and these values were used for final reporting.

8. ☑ **Table Review** Table 1 (sample Listing), **Table 2** (results summary), **Table 3** (Reason Codes), **Table 4** (TICs). Did lab report TICs? YES NO (circle one)

Sample Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: NYSDEC:Mohonk Site

TestAmerica Job ID: 480-88479-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
480-88479-1	356023DP3004	Solid	10/02/15 08:30	10/06/15 09:00
480-88479-2	356023DP3008	Solid	10/02/15 08:38	10/06/15 09:00
480-88479-3	356023DP4003	Solid	10/02/15 08:50	10/06/15 09:00
480-88479-4	356023DP4006	Solid	10/02/15 08:52	10/06/15 09:00
480-88479-5	356023DP5005	Solid	10/02/15 09:05	10/06/15 09:00
480-88479-6	356023DP5011	Solid	10/02/15 09:07	10/06/15 09:00
480-88479-7	356023DP5D	Solid	10/02/15 09:10	10/06/15 09:00
480-88479-8	356023DP12007	Solid	10/02/15 10:16	10/06/15 09:00
480-88479-9	356023DP12010	Solid	10/02/15 10:19	10/06/15 09:00
480-88479-10	356023DP11007	Solid	10/02/15 10:45	10/06/15 09:00
480-88479-11	356023DP11009	Solid	10/02/15 10:50	10/06/15 09:00
480-88479-12	356023DP13006	Solid	10/02/15 11:00	10/06/15 09:00
480-88479-13	356023DP6004	Solid	10/02/15 09:25	10/06/15 09:00
480-88479-14	356023DP7006	Solid	10/02/15 10:03	10/06/15 09:00
480-88479-15	356023DP7009	Solid	10/02/15 10:06	10/06/15 09:00

Case Narrative

Job ID: 480-88479-1

Laboratory: TestAmerica Buffalo

Narrative

Job Narrative
480-88479-1

Receipt
The samples were received on 10/6/2015 9:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.0° C.

GC/MS VOA
Method(s) 8260C: The following sample was diluted to bring the concentration of target analytes within the calibration range: 356023DP12007 (480-88479-8). Elevated reporting limits (RLs) are provided.

OK Method(s) 8260C: The continuing calibration verification (CCV) analyzed in batch 480-268123 was outside the method criteria for the following analytes: Chloromethane and Vinyl chloride. A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analytes is considered estimated. The following sample is impacted: 356023DP12007 (480-88479-8).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Or 10/12/15

8

Method: 8260C - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCS 480-267952/1-A
Matrix: Solid
Analysis Batch: 268008

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 267952

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
trans-1,3-Dichloropropene	2450	2570		ug/Kg		105	73 - 118
Trichloroethene	2450	2220		ug/Kg		91	75 - 131
Trichlorofluoromethane	2450	1990		ug/Kg		81	29 - 158
Vinyl chloride	2450	2250		ug/Kg		92	59 - 124
Xylenes, Total	4900	4780		ug/Kg		98	78 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*94*		*53 - 146*
4-Bromofluorobenzene (Surr)	*99*		*49 - 148*
Dibromofluoromethane (Surr)	*94*		*60 - 140*
Toluene-d8 (Surr)	*103*		*50 - 149*

70 - 130

Lab Sample ID: 480-88479-7 MS
Matrix: Solid
Analysis Batch: 268008

Client Sample ID: 356023DP5D
Prep Type: Total/NA
Prep Batch: 267952

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	200	F1	1000	1400	F1	ug/Kg	☼	120	64 - 116
1,1,2,2-Tetrachloroethane	ND	F1	1000	1300	F1	ug/Kg	☼	130	75 - 120
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	F1	1000	1100	F1	ug/Kg	☼	110	40 - 120
1,1,2-Trichloroethane J+ OK	ND	F1	1000	1390	F1	ug/Kg	☼	139	70 - 130
1,1-Dichloroethane	ND	F1	1000	1240	F1	ug/Kg	☼	124	82 - 138
1,1-Dichloroethene	ND	F1	1000	1150	F1	ug/Kg	☼	114	50 - 147
1,2,4-Trichlorobenzene J+	ND	F1	1000	1490	F1	ug/Kg	☼	149	40 - 160
1,2-Dibromo-3-Chloropropane	ND	F1	1000	1210	F1	ug/Kg	☼	120	60 - 110
1,2-Dibromoethane J+	ND	F1	1000	1390	F1	ug/Kg	☼	139	81 - 119
1,2-Dichlorobenzene J+	ND	F1	1000	1330	F1	ug/Kg	☼	132	80 - 132
1,2-Dichloroethane	ND	F1	1000	1180	F1	ug/Kg	☼	118	78 - 129
1,2-Dichloropropane J+	ND	F1	1000	1390	F1	ug/Kg	☼	138	76 - 125
1,3-Dichlorobenzene J+	ND	F1	1000	1330	F1	ug/Kg	☼	132	63 - 134
1,4-Dichlorobenzene J+	ND	F1	1000	1310	F1	ug/Kg	☼	131	60 - 134
2-Butanone (MEK)	ND	F1	5010	6030	F1	ug/Kg	☼	120	54 - 149
2-Hexanone J+	ND	F1	5010	6880	F1	ug/Kg	☼	137	70 - 127
4-Methyl-2-pentanone (MIBK) J+	ND	F1	5010	6980	F1	ug/Kg	☼	139	74 - 120
Acetone	ND	F1	5010	4680	F1	ug/Kg	☼	93	47 - 141
Benzene	ND	F1	1000	1300	F1	ug/Kg	☼	130	77 - 125
Bromodichloromethane All OK;	ND	F1	1000	1250	F1	ug/Kg	☼	125	71 - 121
Bromoform	ND	F1	1000	1080	F1	ug/Kg	☼	108	48 - 125
Bromomethane high biases	ND	F1	1000	901	F1	ug/Kg	☼	90	39 - 149
Carbon disulfide	ND	F1	1000	965	F1	ug/Kg	☼	96	40 - 136
Carbon tetrachloride w/ results	ND	F1	1000	1210	F1	ug/Kg	☼	121	54 - 135
Chlorobenzene J+ ND	ND	F1	1000	1330	F1	ug/Kg	☼	132	76 - 126
Chloroethane	ND	F1	1000	988	F1	ug/Kg	☼	99	23 - 164
Chloroform	ND	F1	1000	1240	F1	ug/Kg	☼	123	78 - 118
Chloromethane	ND	F1	1000	845	F1	ug/Kg	☼	84	61 - 124
cis-1,2-Dichloroethene	ND	F1	1000	1280	F1	ug/Kg	☼	128	79 - 124
cis-1,3-Dichloropropene J+	ND	F1	1000	1380	F1	ug/Kg	☼	138	75 - 121

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc TestAmerica Job ID: 480-88479-1
Project/Site: NYSDEC:Mohonk Site

8

Method: 8260C - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 480-88479-7 MS **Client Sample ID: 356023DP5D**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 268008 **Prep Batch: 267952**

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Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cyclohexane	ND	F1	1000	1200	F1	ug/Kg	☼	120	49 - 129
Dibromochloromethane	ND	F1	1000	1210	F1	ug/Kg	☼	121	64 - 118
Dichlorodifluoromethane J UJ MS-L	ND	F1	1000	455	F1	ug/Kg	☼	45	10 - 150
Ethylbenzene J+ MS-H	23	J F1	1000	1390	F1	ug/Kg	☼	136	78 - 124
Isopropylbenzene J+ ok	ND	F1	1000	1430	F1	ug/Kg	☼	143	76 - 119
Methyl acetate	ND	F1	5010	6270	F1	ug/Kg	☼	125	71 - 123
Methyl tert-butyl ether J+ ok	ND	F1	1000	1320	F1	ug/Kg	☼	131	67 - 137
Methylcyclohexane	ND	F1	1000	1310	F1	ug/Kg	☼	130	50 - 130
Methylene Chloride	ND	F1	1000	1250	F1	ug/Kg	☼	125	75 - 118
Styrene J+ ok	ND	F1	1000	1420	F1	ug/Kg	☼	142	84 - 119
Tetrachloroethene J+	ND	F1	1000	1350	F1	ug/Kg	☼	135	73 - 133
Toluene J+	ND	F1	1000	1490	F1	ug/Kg	☼	149	75 - 124
trans-1,2-Dichloroethene	ND	F1	1000	1200	F1	ug/Kg	☼	120	74 - 129
trans-1,3-Dichloropropene J+ ok	ND	F1	1000	1400	F1	ug/Kg	☼	140	73 - 118
Trichloroethene	560	F1	1000	1660	F1	ug/Kg	☼	110	75 - 131
Trichlorofluoromethane	ND	F1	1000	936	F1	ug/Kg	☼	93	29 - 158
Vinyl chloride	ND	F1	1000	879	F1	ug/Kg	☼	88	59 - 124
Xylenes, Total J+ MS-H	220	F1	2000	2940	F1	ug/Kg	☼	136	78 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*92*		*53 - 146*
4-Bromofluorobenzene (Surr)	*99*		*49 - 148*
Dibromofluoromethane (Surr)	*95*		*60 - 140*
Toluene-d8 (Surr)	*100*		*50 - 149*

Lab Sample ID: 480-88479-7 MSD **Client Sample ID: 356023DP5D**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 268008 **Prep Batch: 267952**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1-Trichloroethane J+ MS H	200	F1	943	1440	F1	ug/Kg	☼	132	64 - 116	3	20
1,1,2,2-Tetrachloroethane J+ ok	ND	F1	943	1280	F1	ug/Kg	☼	136	75 - 120	2	20
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	F1	943	1020		ug/Kg	☼	109	40 - 120	7	20
1,1,2-Trichloroethane J+ ok	ND	F1	943	1340	F1	ug/Kg	☼	142	70 - 130	4	20
1,1-Dichloroethane J+	ND	F1	943	1230		ug/Kg	☼	131	82 - 138	1	20
1,1-Dichloroethene	ND	F1	943	1110		ug/Kg	☼	118	50 - 147	3	20
1,2,4-Trichlorobenzene J+	ND	F1	943	1560	F1	ug/Kg	☼	165	40 - 160	4	20
1,2-Dibromo-3-Chloropropane J+	ND	F1	943	1240	F1	ug/Kg	☼	131	60 - 110	3	20
1,2-Dibromoethane J+	ND	F1	943	1330	F1	ug/Kg	☼	141	81 - 119	5	20
1,2-Dichlorobenzene J+ All	ND	F1	943	1350	F1	ug/Kg	☼	144	80 - 132	2	20
1,2-Dichloroethane ND	ND	F1	943	1140		ug/Kg	☼	121	78 - 129	3	20
1,2-Dichloropropane J+	ND	F1	943	1380	F1	ug/Kg	☼	146	76 - 125	1	20
1,3-Dichlorobenzene J+	ND	F1	943	1320	F1	ug/Kg	☼	140	63 - 134	0	20
1,4-Dichlorobenzene J+	ND	F1	943	1320	F1	ug/Kg	☼	140	60 - 134	0	20
2-Butanone (MEK)	ND	F1	4710	6120		ug/Kg	☼	130	54 - 149	2	20
2-Hexanone J+	ND	F1	4710	6850	F1	ug/Kg	☼	145	70 - 127	0	20
4-Methyl-2-pentanone (MIBK) J+	ND	F1	4710	6870	F1	ug/Kg	☼	146	74 - 120	2	20

Method: 8260C - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: 480-88479-7 MSD — **Client Sample ID: 356023DP5D**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 268008 — **Prep Batch: 267952**

70-130 / 35

Analyte		Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Acetone		ND	F1	4710	5000		ug/Kg	☼	106	47 - 141	7	20
Benzene	OK	ND	F1	943	1250	F1	ug/Kg	☼	133	77 - 125	4	20
Bromodichloromethane		ND	F1	943	1220	F1	ug/Kg	☼	129	71 - 121	3	20
Bromoform		ND	F1	943	1100		ug/Kg	☼	117	48 - 125	2	20
Bromomethane		ND	F1	943	833		ug/Kg	☼	88	39 - 149	8	20
Carbon disulfide		ND	F1	943	932		ug/Kg	☼	99	40 - 136	3	20
Carbon tetrachloride		ND	F1	943	1200		ug/Kg	☼	127	54 - 135	1	20
Chlorobenzene	OK	ND	F1	943	1280	F1	ug/Kg	☼	136	76 - 126	3	20
Chloroethane		ND	F1	943	882		ug/Kg	☼	94	23 - 164	11	20
Chloroform		ND	F1	943	1210	F1	ug/Kg	☼	128	78 - 118	2	20
Chloromethane		ND	F1	943	768		ug/Kg	☼	81	61 - 124	10	20
cis-1,2-Dichloroethene		ND	F1	943	1230	F1	ug/Kg	☼	130	79 - 124	4	20
cis-1,3-Dichloropropene	OK	ND	F1	943	1370	F1	ug/Kg	☼	145	75 - 121	1	20
Cyclohexane		ND	F1	943	1170		ug/Kg	☼	124	49 - 129	3	20
Dibromochloromethane	OK	ND	F1	943	1230	F1	ug/Kg	☼	131	64 - 118	2	20
Dichlorodifluoromethane	J (UJ) MS-L	ND	F1	943	391		ug/Kg	☼	42	10 - 150	15	20
Ethylbenzene	(J+) MS-H	23	J F1	943	1360	F1	ug/Kg	☼	142	78 - 124	2	20
Isopropylbenzene	OK	ND	F1	943	1470	F1	ug/Kg	☼	156	76 - 119	2	20
Methyl acetate		ND	F1	4710	6160	F1	ug/Kg	☼	131	71 - 123	2	20
Methyl tert-butyl ether		ND	F1	943	1270		ug/Kg	☼	135	67 - 137	4	20
Methylcyclohexane		ND	F1	943	1280	F1	ug/Kg	☼	136	50 - 130	2	20
Methylene Chloride		ND	F1	943	1210	F1	ug/Kg	☼	129	75 - 118	3	20
Styrene	OK	ND	F1	943	1390	F1	ug/Kg	☼	148	84 - 119	2	20
Tetrachloroethene		ND	F1	943	1330	F1	ug/Kg	☼	141	73 - 133	2	20
Toluene		ND	F1	943	1440	F1	ug/Kg	☼	152	75 - 124	4	20
trans-1,2-Dichloroethene		ND	F1	943	1180		ug/Kg	☼	125	74 - 129	2	20
trans-1,3-Dichloropropene	OK	ND	F1	943	1430	F1	ug/Kg	☼	152	73 - 118	2	20
Trichloroethene		560	F1	943	1790		ug/Kg	☼	130	75 - 131	7	20
Trichlorofluoromethane		ND	F1	943	844		ug/Kg	☼	89	29 - 158	10	20
Vinyl chloride		ND	F1	943	819		ug/Kg	☼	87	59 - 124	7	20
Xylenes, Total	(J+) MS-H	220	F1	1890	2950	F1	ug/Kg	☼	145	78 - 125	0	20

Surrogate	MSD %Recovery	MSD Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	*92*		*53 - 146*
4-Bromofluorobenzene (Surr)	*101*		*49 - 148*
Dibromofluoromethane (Surr)	*93*		*60 - 140*
Toluene-d8 (Surr)	*99*		*50 - 149*

APPENDIX I

CONCEPTUAL CROSS SECTIONS

Prepared/Date: JPH 06/24/16
Checked/Date: DF 06/24/16

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

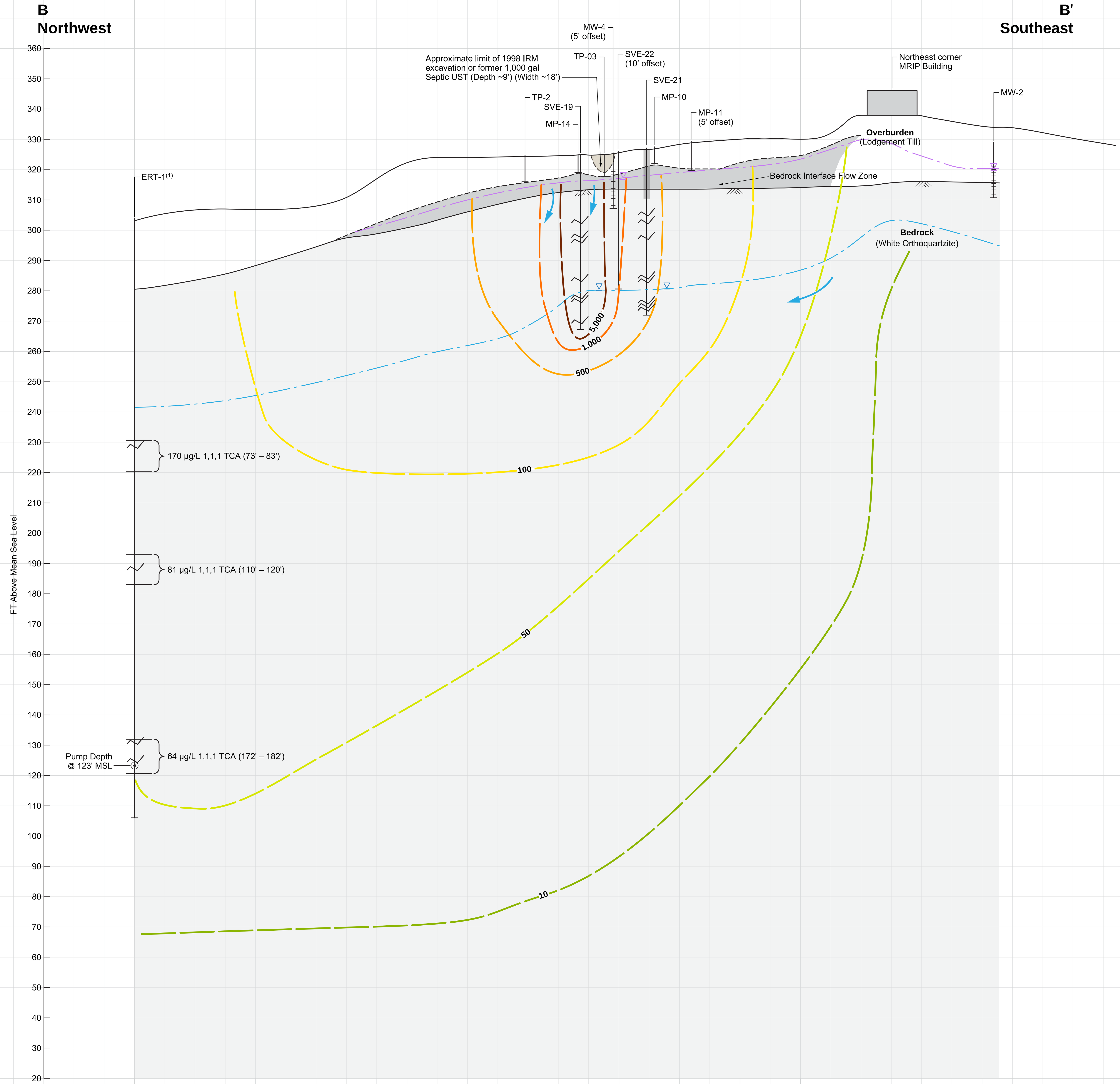
MACTEC

Conceptual Cross-Section A-A'

Project 3617157346

Appendix I

PORT2016004a.ai



Approximate
Vertical Scale, 1" = 20'
0 20 40

Approximate
Horizontal Scale, 1" = 40'
0 40 80

Legend

- (2100 µg/L) Groundwater 1,1,1-TCA concentration from TetraTech, November 2015 LTM
- 1,1,1-TCA 5,000 µg/L
- 1,1,1-TCA 1,000 µg/L
- 1,1,1-TCA 500 µg/L
- 1,1,1-TCA 100 µg/L
- 1,1,1-TCA 50 µg/L
- 1,1,1-TCA 10 µg/L
- Bedrock Interface Flow Zone
- Estimated Ground Surface
- Estimated Bedrock Interface Zone Surface
- Interpreted Groundwater Flow
- Groundwater Elevation Measurement
- Overburden Interpreted Groundwater Surface
- Bedrock Interpreted Groundwater Surface
- Bedrock Fractures
- Estimated Competent Bedrock Surface

Notes

(1) 1,1,1-TCA data presented in ERT-1 is from MACTEC Data Gap Packer Sampling, September 2015

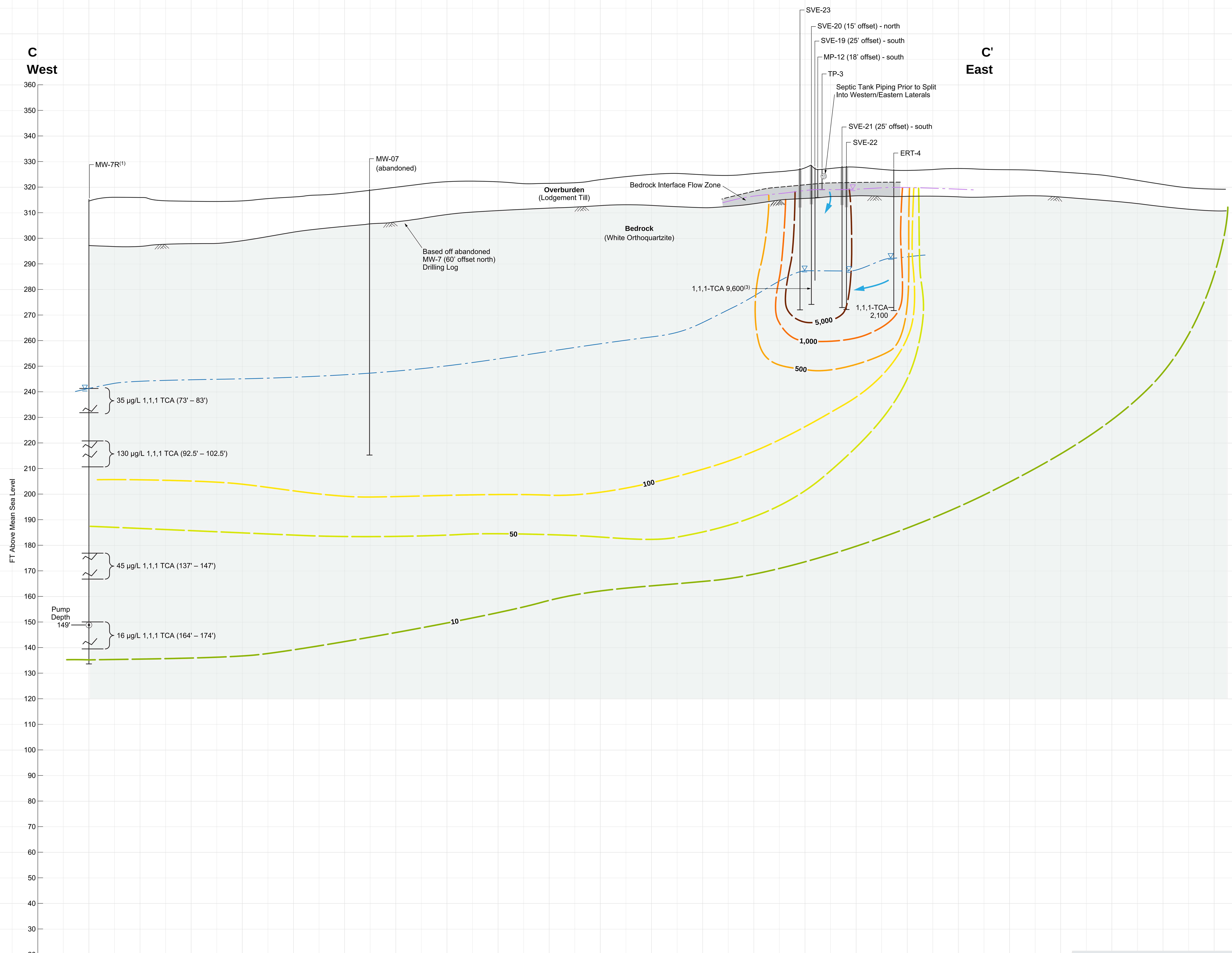
(2) 1,1,1-TCA contour lines reflect TetraTech, November 2015 LTM data

Cross-Section is representative of our current Site understanding, and is conceptual in nature.

Prepared/Date: JPH 06/24/16
Checked/Date: DF 06/24/16

NYSDEC Mohonk Road Industrial Plant Marbletown, New York	MACTEC	Conceptual Cross-Section B-B' Project 3617157346 Appendix I

PORT2016004b.ai



Approximate Vertical Scale, 1" = 20'
0 20 40

Approximate Horizontal Scale, 1" = 40'
0 40 80

Legend

- (2100 µg/L) Groundwater 1,1,1-TCA concentration from TetraTech, November 2015 LTM
- 1,1,1-TCA 5,000 µg/L
- 1,1,1-TCA 1,000 µg/L
- 1,1,1-TCA 500 µg/L
- 1,1,1-TCA 100 µg/L
- 1,1,1-TCA 50 µg/L
- 1,1,1-TCA 10 µg/L
- Bedrock Interface Flow Zone
- Estimated Ground Surface
- Estimated Bedrock Interface Zone Surface
- Interpreted Groundwater Flow
- Groundwater Elevation Measurement
- Overburden Interpreted Groundwater Surface
- Bedrock Interpreted Groundwater Surface
- Bedrock Fractures
- Estimated Competent Bedrock Surface

Notes

(1) 1,1,1-TCA data presented in MW-7R is from MACTEC Data Gap Packer Sampling, September 2015

(2) 1,1,1-TCA contour lines reflect TetraTech, November 2015 LTM data

(3) 1,1,1-TCA concentration is SVE-20 (9,600 µg/L) is result from PDB sampler deployed at 40-44 ft. on 11/19/15

Cross-Section is representative of our current Site understanding, and is conceptual in nature.

Prepared/Date: JPH 06/24/16
Checked/Date: DF 06/24/16

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Conceptual Cross-Section C-C'

Project 3617157346

Appendix I

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