APPENDIX 1: CULTURAL AND HISTORIC RESOURCES

1-A: Correspondence with NJHPO

- **1 – Section 106 Consulting Parties Initiation Letters**
- **2 – NJHPO Concurrence of Adverse Effects Letter: April 3, 2017**
- **3 – Draft Programmatic Agreement Transmittal Letter to NJHPO: April 5, 2019**

1-B: Programmatic Agreement

1-C: Cultural and Historic Resources

1-D: Phase 1A Archaeological Documentary Study

Appendix 1 – A

CORRESPONDENCE WITH NJHPO

Appendix 1 – A – 1

SECTION 106 CONSULTING PARTIES INITIATION LETTERS

U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE.
Washington, D.C. 20590

NOV 5 2015

Mr. Daniel Saunders
Deputy State Historic Preservation Officer
Mail Code 501-04B
New Jersey Department of Environmental Protection
Historic Preservation Office, PO Box 420
501 East State Street, 4th Floor
Trenton, NJ 08625-0420

Re: Sawtooth Bridges Replacement Project, Hudson County, NJ
Section 106 Initiation

Dear Mr. Saunders:

The National Railroad Passenger Corporation (Amtrak) is proposing the replacement of Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96. These bridges, collectively known as the "Sawtooth Bridges," are located in the Town of Kearny, Hudson County, New Jersey along a critical segment of the Northeast Corridor between Newark, New Jersey and New York, New York (see Attachment A, Figure 1). The Federal Railroad Administration (FRA) is serving as the lead federal agency for the preparation of a Categorical Exclusion in accordance with the National Environmental Policy Act (NEPA). Amtrak is the owner and operator of the Sawtooth Bridges.

The Sawtooth Bridges are located along the New Jersey and National Register (S/NR)-eligible Pennsylvania Railroad New York to Philadelphia Historic District (Northeast Corridor, Pennsylvania to New York, see Attachment A, Figure 2). FRA is writing to initiate consultation for the aforementioned undertaking in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended); Section 4(f) of the United States Department of Transportation (USDOT) Act; and NEPA. Per Subpart A, Section 800.2(a)(3) and 800.2(c)(4) of 36 CFR, FRA is authorizing Amtrak (the project sponsor), as an applicant for federal approvals, to prepare information and analyses regarding Section 106 consultation for the referenced project.

In accordance with 36 C.F.R. §800.3, FRA is providing Attachment B, "Cultural Resources Methodology," to afford your office the opportunity to review 1) the proposed delineation of the Area of Potential Effect (APE), 2) the cultural resources impacts assessment criteria, and 3) an initial list of interested and consulting parties for this project. Further consultation with your office is anticipated regarding the identification and evaluation of effects to cultural resources.

If you have any questions or need further clarification about the proposed project, please contact Michelle Fishburne, FRA Environmental Protection Specialist, at (202) 493-0398 or

michelle.fishburne@dot.gov, or John Brun, Amtrak's Project Manager, at (215) 349-3070 or brunj@amtrak.com.

Please note that FRA has authorized Amtrak to consult with your agency on behalf of FRA for the purposes of this project. We request that you please copy Amtrak's Senior Historic Preservation Specialist on your response; a mailing address and email address are provided below.

We look forward to working with you on this important rail infrastructure project.

Sincerely,

for David Valenstein
Division Chief, Environment and Planning

cc: John Brun, Amtrak Project Manager
Johnette Davies, Amtrak Senior Historic Preservation Specialist (2955 Market Street, Mailbox 55, Philadelphia, PA 19104; johnette.davies@amtrak.com)
Michelle Fishburne, FRA Environmental Protection Specialist
Leslie Mesnick, AKRF, Vice President

Attachment A

Figures

7/31/2015

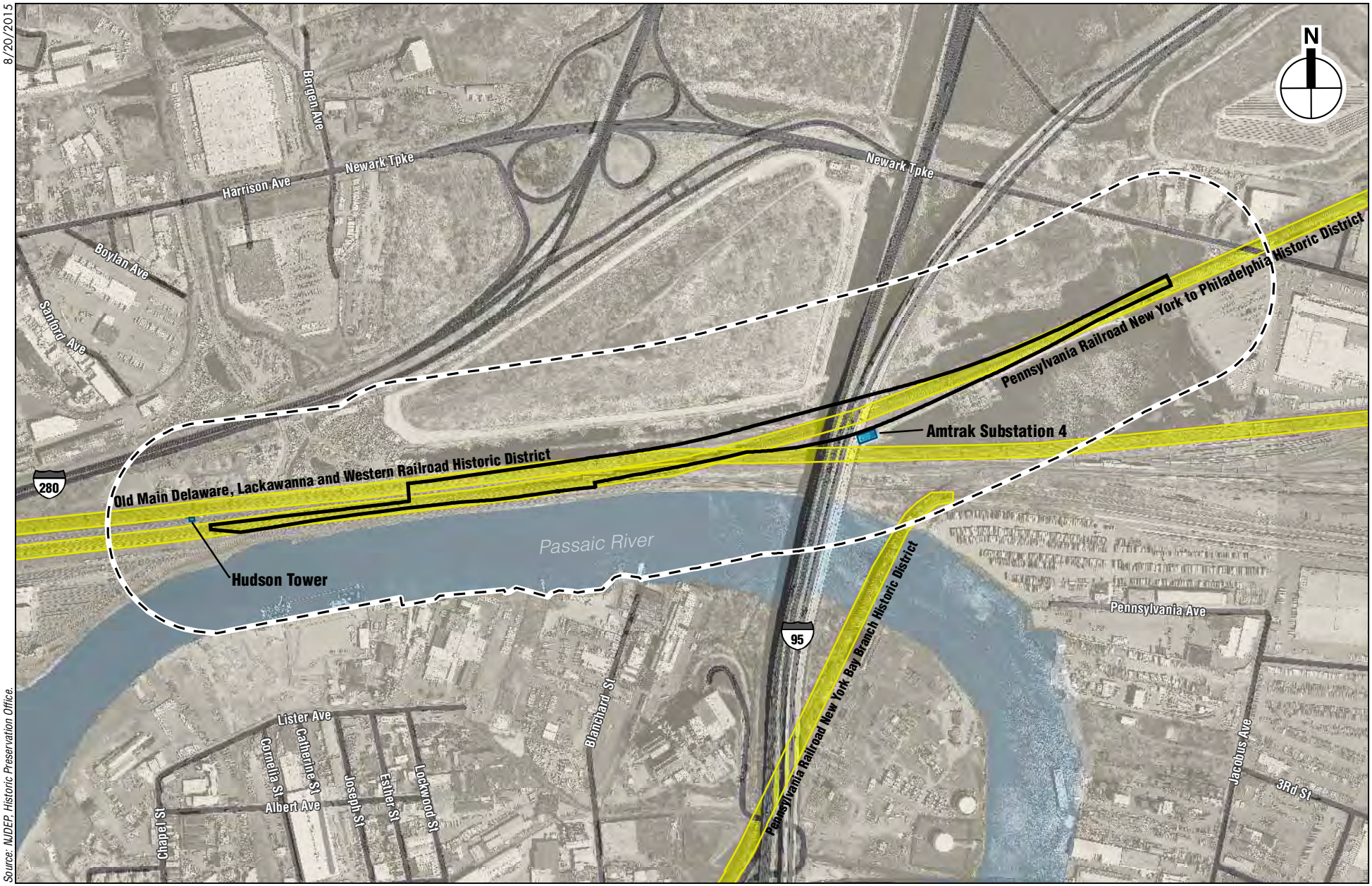
Project Site *Municipal Boundary*

Study Area

0 1,000 FEET

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Project Site
Figure 1



Project Site/Archaeological APE

Study Area

Historic Properties

Historic Districts

0 1,000 FEET

Architectural APE and
Known Architectural Resources

Figure 2

SAWTOOTH BRIDGES REPLACEMENT PROJECT

A. PROJECT DESCRIPTION

The National Railroad Passenger Corporation (Amtrak) is proposing the replacement of Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96. These bridges, collectively known as the "Sawtooth Bridges," are located in the Town of Kearny, Hudson County, New Jersey along a critical segment of the Northeast Corridor (NEC) between Newark, New Jersey and New York, New York (see Attachment A, Figure 1). The Federal Railroad Administration (FRA) is serving as the lead federal agency for this environmental review, being conducted in accordance with the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. The Sawtooth Bridges are located along the New Jersey and National Register (S/NR)-eligible Pennsylvania Railroad New York to Philadelphia Historic District (NEC, Pennsylvania to New York).

The Sawtooth Bridges Replacement Project (the "Proposed Project") will include construction of new bridges along the NEC, decommissioning and removal of the existing Sawtooth Bridges, necessary modifications to adjacent interlockings and crossovers, and other related improvements. The Proposed Project will be constructed within existing rail right-of-way. Property acquisition from Conrail will be required, along with a number of utility and other easements.

B. PROPOSED ARCHAEOLOGICAL AND ARCHITECTURAL RESOURCES ANALYSIS METHODOLOGIES

PROPOSED AREA OF POTENTIAL EFFECT (APE)

A required step in the Section 106 process is determining the Area of Potential Effect (APE), which is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if such properties exist" (36 CFR § 800.16[d]). The APE is influenced by the scale and nature of an undertaking. The project will have one APE. However, to facilitate the analysis of effects, the APE will be subdivided to indicate the area in which the Proposed Project could cause potential direct effects and the area in which the Proposed Project could cause indirect effects. The area in which potential direct effects could occur may also be known as the "project site" or the archaeological resources APE. The area in which potential indirect effects could occur may also be known as the architectural resources APE. The proposed APE is described below. As engineering for the Proposed Project progresses, if changes to the APE boundaries are required, the proposed changes will be submitted to NJHPO for review and concurrence.

APE FOR ARCHAEOLOGICAL RESOURCES

The area of potential effect for archaeological resources includes all areas that could experience ground disturbance under the Proposed Project. The archaeological APE is shown in Attachment A, Figure 2.

Potential in-ground disturbances may result from the construction of a new bridge. Modifications and/or additions to existing railroad tracks, embankments, and other railroad infrastructure could occur throughout the archaeological APE. Staging areas or temporary access roads could also be required during the construction phase.

APE FOR ARCHITECTURAL RESOURCES

In general, potential effects to architectural resources can include both direct physical effects (e.g., demolition, alteration, or damage from construction on nearby sites) and indirect contextual effects, such as the isolation of a property from its surrounding environment, or the introduction of visual, audible, or atmospheric elements that are out of character with a property or that alter its setting. The APE for architectural resources (shown in Attachment A, Figure 2) is, therefore, larger to account for any potential impacts that may occur where proposed construction activities could physically alter architectural resources or be close enough to them to potentially cause physical damage or visual or contextual impacts.

The APE for architectural resources for this project is defined as the area surrounding the project site within visual range of the project site. It also accounts for potential construction-related impacts. The APE for architectural resources extends 750 feet from the project site. These boundaries have been delineated to account for potential visual impacts of proposed construction activity along the Northeast Corridor.

Architectural resources may be impacted by elements of the Proposed Project alternatives including, removal of the existing Sawtooth Bridges; and modifications and/or additions to existing railroad tracks, embankments, and other railroad infrastructure throughout the project site.

IDENTIFICATION OF HISTORIC PROPERTIES

ARCHAEOLOGICAL RESOURCES

Archaeological studies will be undertaken to determine whether significant (S/NR-eligible) archaeological resources are present within the archaeological APE. First, the archaeological APE will be assessed for areas that may be sensitive for archaeological resources through the preparation of a Phase I Archaeological Documentary Study ("Phase I"). The Phase I will be prepared in accordance with New Jersey Historic Preservation Office Guidelines for Phase I Archaeological Investigations. It will involve a combination of comprehensive documentary research and field investigation of the project corridor. Background research efforts will include the development of a prehistoric and historic context, a discussion of the evolution of land use patterns based on historic cartographic sources and soil surveys, and an inventory of all previously recorded archaeological sites within the vicinity of the APE such as archaeological sites on file at the NJSM. Documentary research will be conducted to identify areas where prehistoric or historic-period activities may have occurred and resulted in archaeological resources. For each area where prehistoric or historic-period activities may have left archaeological remains, construction activities and other ground disturbances that occurred later on the site will be evaluated in order to identify locations where any archaeological resources, if originally present, may have survived. If background research identified areas of potential archaeological sensitivity, archaeologists will conduct field investigations (such as the excavation of shovel test pits and/or test units) to determine the presence or absence of potentially significant archaeological resources in the APE. If it is determined that additional survey is needed, the project team will coordinate with the NJHPO to determine the appropriate next steps in order to comply with Section 106. If warranted, a Phase II survey may be

undertaken to determine the boundaries and evaluate the significance of any archaeological deposits identified.

ARCHITECTURAL RESOURCES

Once the APE is determined, an inventory of officially recognized architectural resources within the APEs will be compiled based on the files of the NJHPO and the New Jersey State Museum (NJSM). This inventory will include properties or districts listed on the National Register of Historic Places (NR) and/or the New Jersey State Register (SR), or determined eligible for such listing; and National Historic Landmarks (NHLs).

Any potential architectural resources (i.e., properties that may be eligible for listing on the S/NR) within the architectural APE will also be identified based on field surveys by an architectural historian conducted in accordance with 36 CFR § 800.4 of the National Historic Preservation Act of 1966 (as amended). Research will be conducted on any potential architectural resources to identify pertinent historical information, such as date of construction and alterations, builder, architect, and relevant historic context(s). If appropriate, an architectural historian will prepare and submit a Historic Resources Inventory Form documenting any potential resources and submit such forms to NJHPO for review.

PROPOSED IMPACTS ASSESSMENT CRITERIA

Once the archaeological and architectural resources in the APEs are confirmed, the effects of the project on those resources will be assessed through application of the criteria of adverse effect as set forth in 36 CFR 800.5. The effects analysis will be based on the proposed construction and the anticipated effects it may have on archaeological and architectural resources. In order to assess the potential effects of project construction on archaeological resources, areas of archaeological sensitivity will be compared to the vertical and horizontal extent of the proposed disturbance to determine the potential for impacts. The assessment of the potential effects of project construction on architectural resources will include direct effects (such as construction-period activities that could physically alter or damage architectural resources) and indirect effects (such as visual or contextual changes that would diminish the historic integrity of architectural resources). A determination of adverse effect would be made if the analysis concludes that the Proposed Project would alter the characteristics of cultural resources that qualify them for inclusion in the NR.

C. SECTION 106 CONSULTING PARTIES

In accordance with 36 CFR 800.2, the lead federal agency, the Advisory Council on Historic Preservation (ACHP), other consulting parties, and the public are identified as participants in the Section 106 process. Consulting parties may include: the project sponsor, the New Jersey State Historic Preservation Officer (NJHPO); the Tribal Historic Preservation Officer (THPO); federally recognized Indian tribes that attach religious and cultural significance to historic properties that may be affected by an undertaking; and representatives of local governments. Consulting parties may also include other individuals and organizations with a demonstrated interest in the proposed federal undertaking.

As a part of the Section 106 consultation requirements for the Sawtooth Bridges Replacement Project, FRA will invite the ACHP to participate in the Section 106 consultation. The ACHP may elect not to participate and instead rely on the NJHPO to provide comments and concurrence. Other potential consulting parties that will be invited to participate in this project include:

- Absentee-Shawnee Tribe of Oklahoma
- Advisory Council on Historic Preservation
- Anthracite Railroads Historical Society, Inc.
- Cherokee Nation of New Jersey
- Consolidated Rail Corporation
- The Delaware Nation
- Delaware Tribe Historic Preservation Office
- Eastern Delaware Nation
- Eastern Lenape Nation of Pennsylvania Office and Cultural Center
- Hudson County
- Hudson County Division of Cultural Affairs & Tourism
- Hudson County Division of Planning
- Meadowlands Museum
- Nanticoke Association
- Nanticoke Lenni-Lenape Indians of New Jersey
- New Jersey Meadowlands Commission/MRC
- New Jersey Turnpike Authority
- New York Chapter, Railway and Locomotive Historical Society
- New Jersey Dept. of Environmental Protection: Historic Preservation
- North Jersey Chapter, National Railway Historical Society, Inc.
- The Oneida Indian Nation
- Passaic River Coalition
- Pennsylvania Railroad Technical and Historical Society
- Powhatan Renape Nation Rankokus Indian Reservation
- Rail-Marine Information Group
- Ramapough Lunaape Community Center
- Roebling Chapter - Society for Industrial Archeology
- Shawnee Tribe of Oklahoma
- Society of Industrial Archaeology
- Stockbridge-Munsee Band of Mohican Indians
- Thomas Flagg
- Town of Harrison Mayor's Office
- Town of Kearny Mayor's Office
- Tri-State Chapter, National Railway Historical Society
- United Railroad Historical Society of New Jersey

Periodically throughout the Section 106 process, FRA and Amtrak will provide the public with information about the undertaking and its effects on historic properties. The public will be given

opportunities to provide input on the potential effects of the project, as well as any resolution of adverse effects on historic resources that may result from the project. It is assumed that, in accordance with 36 CFR § 800.2(d)(3), the procedures utilized for public involvement under NEPA will also satisfy the requirements of the Section 106 process.

SAWTOOTH BRIDGES REPLACEMENT PROJECT
POTENTIAL CONSULTING PARTIES AND INDIAN TRIBES

Proposed Consulting and Interested Parties

Reid Nelson Director of Federal Agency Programs
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001 -2637

John K. Enright
Consolidated Rail Corporation
1717 Arch Street, Suite 1310
Philadelphia, PA 19103

Thomas A. DeGise
Hudson County Executive
Justice Brennan Court House
583 Newark Ave.
Jersey City, NJ 07306

Jamie Fox, Chairman
New Jersey Turnpike Authority
P.O. Box 5042
Woodbridge, NJ 07095

William (Bill) LaRosa, Director of Cultural Affairs & Tourism
Hudson County Division of Cultural Affairs & Tourism, Brennan Courthouse
583 Newark Avenue
Newark, NJ 07306

Massiel M. Ferrara, PP, AICP**,** Division Chief
Hudson County Division of Planning
Meadowview Complex, Bldg. 1, Floor 2
595 County Avenue
Secaucus, NJ 07094

Michael Ferguson , Chairman
New Jersey Meadowlands Commission
1 Dekorte Park Plaza
P.O. Box 640
Lyndhurst, NJ 07071

James A. Fife, Mayor
Town of Harrison Mayor's Office
318 Harrison Avenue
Harrison, NJ 07029

Alberto G. Santos, Mayor
Town of Kearny Mayor's Office
402 Kearny Avenue
Kearny, NJ 07032

Daniel Saunders, Deputy SHPO
Mail Code 501-04B
NJ Dept. of Environmental Protection
Historic Preservation
PO Box 420
501 East State Street
4th Floor
Trenton, NJ 08625-0420

Anthracite Railroads Historical Society, Inc.
P.O. Box 519
Lansdale, PA 19446

John E. Barth, President
North Jersey Chapter, National Railway Historical Society, Inc.
54 Poplar St
Closter, NJ 07624-1036

John Teichmoeller, Coordinator
Rail-Marine Information Group
12107 Mt. Albert Rd
Ellicott City, MD 21042

Michael Del Vecchio, President
Tri-State Chapter, National Railway Historical Society
P.O. Box 1217
Morristown, NJ 07962-1217

Kate Kelleher, Administrative Assistant
Passaic River Coalition
330 Speedwell Avenue
Morristown, NJ 07960

Gilda Healy, Interim Director
Meadowlands Museum
91 Crane Avenue,
Rutherford, NJ 07070

Ed Swain, Public Relations Manager
Pennsylvania Railroad Technical and Historical Society
6469 Winter Hazel Drive
Middletown, OH 45044-8351

Joe Macasek, President
Roebling Chapter
Society for Industrial Archeology
19 Budd Street
Morristown, NJ 07960

Larry Gross, President
United Railroad Historical Society of New Jersey
PO Box 711
Clark, NJ 07066

Society of Industrial Archaeology
National Headquarters
c/o Department of Social Sciences
Michigan Tech
1400 Townsend Dr
Houghton, MI 49931-1295

Thomas Flagg
SUNY College of Optometry
33 West 42nd St
New York, NY 10036

Tommy Meehan, Membership/Chapter Chairman
New York Chapter, Railway and Locomotive Historical Society
42 Portland Pl FL 2, Yonkers NY 10703-2206

Non-Federally Recognized Tribe List

Tony Powell
Ramapough Mountain Indians
Ramapough Lunaape Community Center
189 Stag Hill Road
Mahwah, NJ 07430

C.W. Longbow, Principal Chief
Cherokee Nation of New Jersey
182 Ellery Ave.
Newark NJ, 07106

Corrine Remington, Secretary
Eastern Delaware Nation
Boro Line Road
Dushore, Pa 18614

Eastern Lenape Nation of Pennsylvania Office and Cultural Center
P.O. Box 43
Saylorsburg, PA 18353

William H. Daisey, Chief
Nanticoke Association
27073 John J. Williams Highway
Millsboro, DE 19966

Mark Gould, Tribal Chairperson
Nanticoke Lenni-Lenape Indians of New Jersey
18 East Commerce Street
Bridgeton, NJ 08302

Powhatan Renape Nation Rankokus Indian Reservation
P.O. Box 2353
Riverton NJ 08077

Federally Recognized Tribe List

Nekole Alligood Cultural Preservation Director
The Delaware Nation
Cultural Preservation Office
PO Box 825
31064 State Highway 281
Anadarko, Oklahoma 73005

Jodi Hayes, Tribal Administrator
Shawnee Tribe of Oklahoma
P.O. Box 189
29 S Hwy 69A
Miami, Oklahoma, 74354
shawneetribe@shawnee-tribe.com 918.542.2441

Joseph Blanchard, THPO
Absentee-Shawnee Tribe of Oklahoma
2025 South Gordon Cooper Drive
Shawnee, Oklahoma 74801
Phone: 405-275-4030 ext. 303
Joseph.blanchard@astribe.com

Sherry White
Tribal Historic Preservation Officer
Stockbridge-Munsee Community Band of Mohican Indians
N8476 Moh He Con Nuck Road
Bowler, Wisconsin 54416
Phone: 715-793-3970 | Fax: 715-793-4836
Email: sherry.white@mohican-nsn-gov

Mr. Jesse Bergevin
Tribal Historic Preservation Officer
The Oneida Indian Nation
1256 Union Street
P.O.Box 662
Oneida, New York 13421-0662
Phone: (315) 829-8463
Fax: (315 829-8473
jbergevin@oneida-nation.org

Dr. Brice Obermeyer
Delaware Tribe Historic Preservation Office
Roosevelt Hall, Rm 212
1200 Commercial St.
Emporia, Kansas 66801
Telephone 918-335-7026
bobermey@emporia.edu

NATIONAL RAILROAD PASSENGER CORPORATION
30th Street Station, Philadelphia, PA 19104

AMTRAK

January 26, 2016

Mr. Daniel Saunders
Deputy State Historic Preservation Officer
Mail Code 501-04B
New Jersey Department of Environmental Protection
Historic Preservation Office, PO Box 420
501 East State Street, 4th Floor
Trenton, NJ 08625-0420

Re: Sawtooth Bridges Replacement Project, Hudson County, NJ
Section 106 Initiation: Additional Information

Dear Mr. Saunders:

Thank you for confirming your receipt of the Section 106 initiation letter for the Sawtooth Bridges project. As described in that letter, National Railroad Passenger Corporation (Amtrak) is proposing the replacement of Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96 in the Town of Kearny, Hudson County, New Jersey along a critical segment of the Northeast Corridor (NEC) between Newark, New Jersey and New York, New York (the Proposed Project). The Federal Railroad Administration (FRA) is serving as the lead federal agency for the preparation of an environmental review in accordance with the National Environmental Policy Act (NEPA), Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended), and other legislation. Amtrak is the owner and operator of the Sawtooth Bridges. As noted in FRA's original letter, Amtrak is authorized to continue Section 106 consultation on the behalf of FRA.

The previous letter initiated the Section 106 consultation process and provided a "Cultural Resources Methodology," which included 1) the proposed delineation of the Area of Potential Effect (APE), 2) the cultural resources impacts assessment criteria, and 3) an initial list of interested and consulting parties for this project. Following a telephone conversation between me and Patricia Chrisman of your office, this letter provides additional detail regarding specific aspects of the cultural resources methodology, including the location and appearance of the Sawtooth Bridges and the proposed methods of coordinating with consulting and interested parties.

SAWTOOTH BRIDGES LOCATION AND DESCRIPTION

As noted previously, Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96, collectively known as the "Sawtooth Bridges," are located along an approximately 1.1-mile long segment of Amtrak's NEC, north of the Passaic River between Amtrak MP 8.3 (Hudson Interlocking) and MP 7.2 (Swift Interlocking) in the Town of Kearny, Hudson County. The Sawtooth Bridges are within the New Jersey and National Register (S/NR)-eligible Pennsylvania Railroad New York to Philadelphia Historic District (NEC, Pennsylvania to New York) and for the purposes of the environmental review are being considered elements that contribute to the historic character of the Historic District. The bridges' name "Sawtooth" is derived from their sawtooth-like appearance in plan, which is the result of the decking that supports the bridges as they cross over other rail lines. Included with this letter is a map illustrating the specific locations of the Sawtooth Bridges (Figure 1). Also included are photographs showing detailed views of the Sawtooth Bridges (Figures 2-5).

As part of the Proposed Project, four new multiple span bridges would be constructed along the NEC, including a single-track viaduct to carry Morris & Essex Line Track 5; a two-track viaduct to carry NEC Tracks 3 and 4; and two two-track viaducts to carry NEC Tracks 1 and 2. The proposed new multiple span bridges would not differ substantially from the existing Sawtooth Bridges in terms of height or alignment. Based on conceptual engineering, it is expected that two replacement multiple span bridges for NEC Tracks 1 and 2 will be located on the existing bridge alignment, the new multiple span bridge for NEC Tracks 3 and 4 will be just to the north of the existing bridge alignment, and the new multiple span bridge for Track 5 will be located on a new northern alignment (still within the railroad right-of-way). It is anticipated that the elevation of the proposed structures would change from the existing elevation by a maximum of six feet. Graphics depicting the proposed location of the new bridges are being prepared as part of the NEPA documentation. It should be noted that another existing railroad bridge, NJ Transit's Br. 0.35 Harrison Connection (also known as the "Red Bridge") is located immediately south of the Sawtooth Bridges, limiting the visibility of the existing and proposed structures from the south.

CONSULTING AND INTERESTED PARTIES

FRA's previous correspondence presented proposed consulting and interested parties to be invited to participate in the Section 106 process. In general, in accordance with 36 CFR 800.2, in addition to the lead federal agency and the Advisory Council on Historic Preservation (ACHP), other consulting parties may include (1) the State Historic Preservation Officer (NJHPO); (2) federally recognized Indian Tribes or Native Hawaiian organizations (as applicable); (3) representatives of local governments with jurisdiction over the area that may be affected by the undertaking; (4) other involved agencies, such as those providing assistance, permits, licenses, and other approvals. Finally, (5) other consulting parties, also known as interested parties, are individuals or organizations with a demonstrated interest in the undertaking "due to the nature of their economic or legal relation to the undertaking or affected properties, or their concern with the undertaking's effect on historic properties."

The list of proposed consulting parties and interested parties provided below is repeated from FRA's previous correspondence and the list of potential participants is unchanged; however, it has now been divided into potential consulting parties (including the first four categories listed above) and potential interested parties (the fifth category listed above):

POTENTIAL CONSULTING PARTIES

Federally Recognized Indian Tribes

- Absentee-Shawnee Tribe of Oklahoma
- Cherokee Nation of New Jersey
- The Delaware Nation
- Delaware Tribe of Indians
- The Oneida Indian Nation
- Eastern Shawnee Tribe of Oklahoma
- Stockbridge-Munsee Band of Mohican Indians

State Recognized Indian Tribes

- Nanticoke Indian Association
- Powhatan Renape Nation Rankokus Indian Reservation
- Ramapough Lunaape Community Center
- Nanticoke Lenni-Lenape Indians of New Jersey

Other Tribal Organizations

- Eastern Delaware Nation
- Eastern Lenape Nation of Pennsylvania Office and Cultural Center

Local Governments and Other Involved Agencies

- Hudson County
- Hudson County Division of Cultural Affairs & Tourism
- Hudson County Division of Planning
- New Jersey Turnpike Authority
- New Jersey Dept. of Environmental Protection: Historic Preservation
- Town of Harrison Mayor's Office
- Town of Kearny Mayor's Office

Potential Interested Parties

- Anthracite Railroads Historical Society, Inc.
- Consolidated Rail Corporation
- Meadowlands Museum
- New Jersey Meadowlands Commission/MRC
- New York Chapter, Railway and Locomotive Historical Society
- North Jersey Chapter, National Railway Historical Society, Inc.
- Passaic River Coalition
- Pennsylvania Railroad Technical and Historical Society
- Rail-Marine Information Group
- Roebling Chapter - Society for Industrial Archaeology
- Society of Industrial Archaeology
- Thomas Flagg
- Tri-State Chapter, National Railway Historical Society
- United Railroad Historical Society of New Jersey

Outreach to potential consulting and interested parties will initially be made through a letter inviting the parties to participate in the Section 106 process for the project. A separate letter will be sent to federally recognized tribes from the FRA. The letters will provide the potential consulting and interested parties with information regarding the proposed Project and will provide appropriate Project team contact information. Those parties that respond positively to the invitation to participate will be provided with important project information as the Section 106 process progresses, including information regarding the identification of historic properties in the APE; the potential effects of the proposed project on historic properties; and, if adverse effects would occur, proposed measures to resolve any such effects. Indian tribes will be provided with this information even if they did not respond positively to the initial outreach. Consulting and interested parties, including tribes, will be given an opportunity to participate in the identification of historic properties, effects, and measures to avoid, minimize, or mitigate adverse effects, as appropriate. One or more meetings may be held if requested by any of the consulting or interested parties. A separate meeting for federally recognized Indian tribes will be offered if any of the tribes express an interest in attending a meeting.

If you have any questions or need further clarification about the proposed project, please contact me at (215) 349-1354 or johnette.davies@amtrak.com or John Brun, Amtrak's Project Manager, at (215) 349-3070 or brunj@amtrak.com. We look forward to working with you on this important rail transportation project.

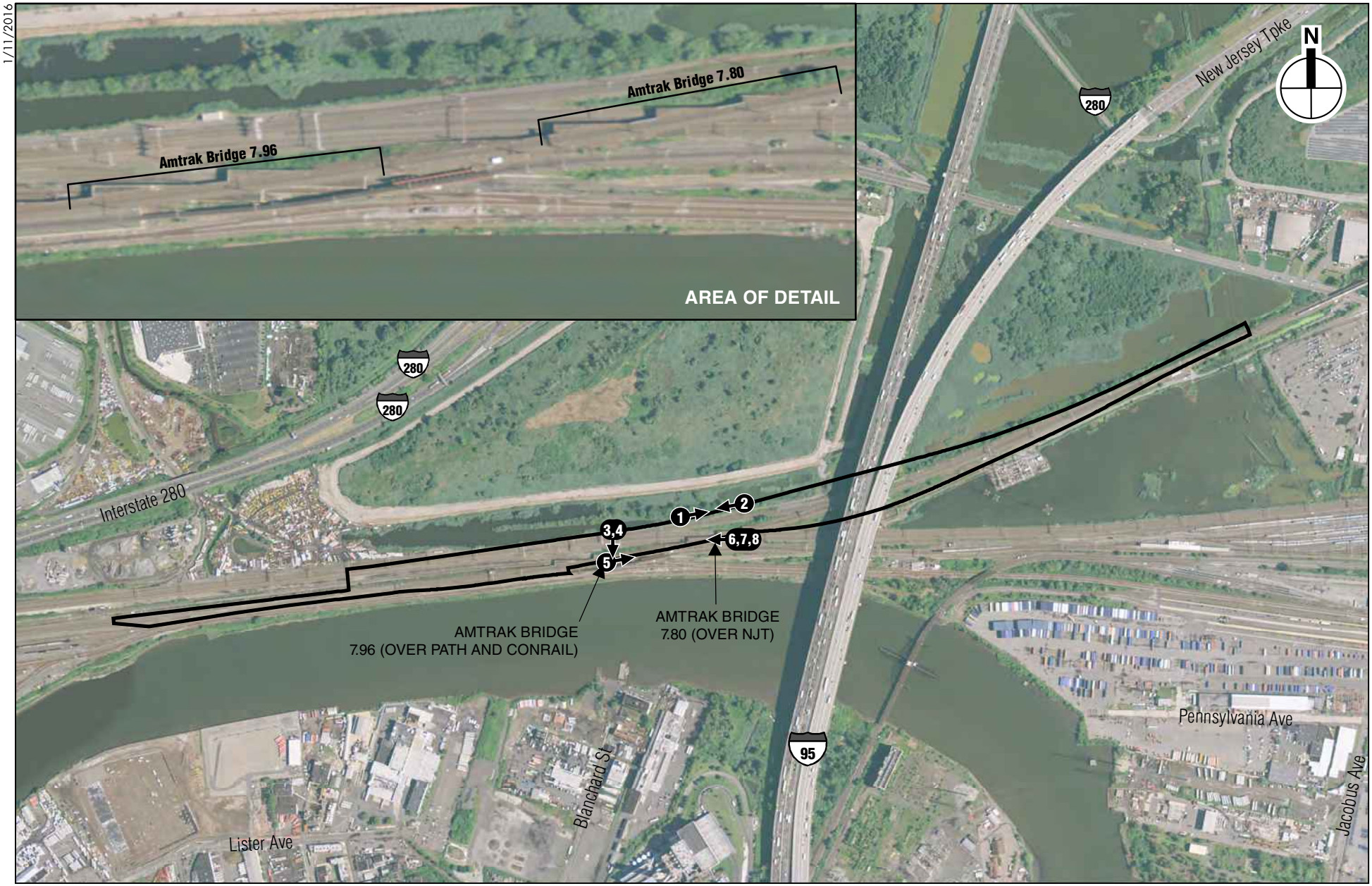
Sincerely,

Johnette Davies
Senior Historic Preservation Specialist
Amtrak

cc: John Brun, Amtrak
Michelle Fishburne, FRA
Leslie Mesnick, Calladium Group

Enclosures: Figures 1-5

1/11/2016



Project Site

Photograph View Direction and Reference Number

0 1,000 FEET

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Project Site
Figure 1

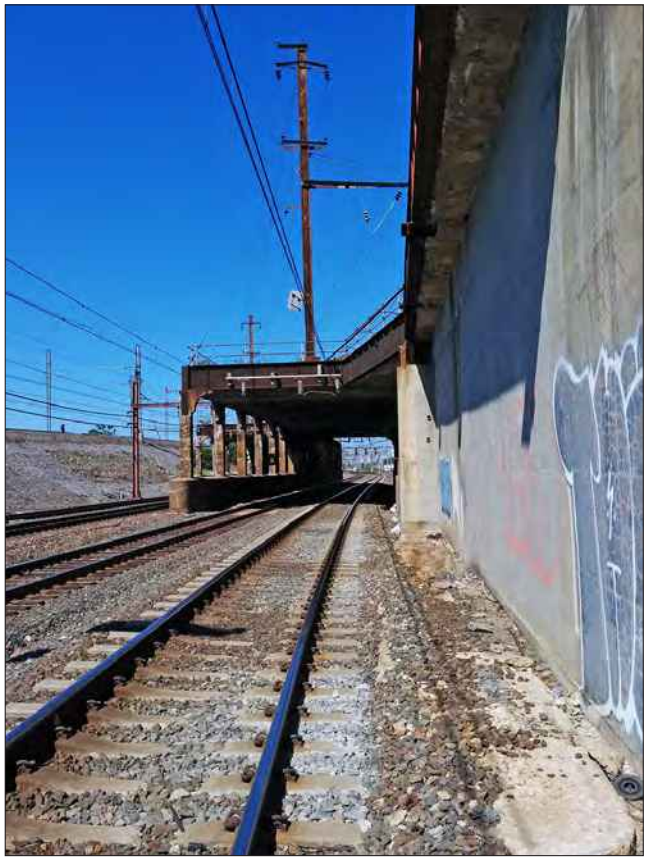
View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.80) facing east **1**

View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.80) facing west **2**

View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.96) facing southwest **3**

View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.96) facing south **4**

View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.96) to the left and the NJ Transit Br. 0.35 Harrison Connection to the right, facing northeast **5**



View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.80) facing southwest **6**

View from underneath one of the Sawtooth Bridges (Amtrak Bridge No. 7.80) facing west **7**

View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.80) facing west **8**

HPO Project No. 16-0476-2
HPO-D2016-071

State of New Jersey
MAIL CODE 501-04B
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NATURAL & HISTORIC RESOURCES
HISTORIC PRESERVATION OFFICE
P.O. Box 420
Trenton, NJ 08625-0420
TEL. (609) 984-0176 FAX (609) 984-0578

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt Governor

BOB MARTIN
Commissioner

April 11, 2016

David Valenstein
Division Chief, Environmental and Planning
Federal Railroad Administration
1200 New Jersey Ave., SE
Washington, D.C. 20590

Dear Mr. Valenstein:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR 800: Protection of Historic Properties, as published in the Federal Register on December 12, 2000 (65 FR 77698-77739) and amended on July 6, 2004 (FR 40544-40555), I am providing **Initial Consultation Comments** for the following proposed project:

Kearny Town, Hudson County
Sawtooth Bridges Replacement Project
National Railroad Passenger Corporation (AMTRAK)
Federal Railroad Administration (FRA)

The proposed project consists of the replacement of Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96 - known collectively as the "Sawtooth Bridges". The existing bridges will be decommissioned and removed and new bridges will be constructed.

800.3 Initiation of the Section 106 Process

I concur that the Federal Rail Administration (FRA), the National Railroad Passenger Corporation (Amtrak), and the New Jersey Historic Preservation Office (HPO) are the appropriate parties for the initiation of consultation. Public involvement activities may identify additional consultation parties and resource organizations. As described in the submitted materials, FRA and Amtrak will provide the public with information regarding the project. The public will be given the opportunity to provide input.

800.4 Identification of Historic Properties

I agree with the Area of Potential Effects (APE) for architectural history and archaeology as delineated on the submitted maps The proposed APE appears to include all the properties that would by physically and visually impacted by the proposed project.

I agree that the list consulting parties, identified in your January 26, 2016 consultation letter, are organizations with a potential interest in and knowledge of historic properties within the APE and should be considered information resources for the pending cultural resources evaluation. However, please be aware that the Cherokee Nation of New Jersey is not a federally recognized Indian tribe and should be listed under other tribal organizations.

Archaeology

Regarding the identification of archaeological resources, please clarify whether the HPO will have the opportunity to review the results of a Phase I survey, whether or not Amtrak feel that there are historic resources present.

Additional Comments

Please note that materials sent to the Delaware Tribe should not be sent to Dr. Obermeyer; rather, they should be addressed to:

Delaware Tribe Historic Preservation Representative
Ms. Susan Bacho
Ms. Blair Fink
P.O. Box 64
Pocono Lake, PA 18347
temple@delawaretribe.org

The HPO looks forward to continued consultation on the above project and any more detailed data as the project as it is developed to understand any necessary modifications to adjacent interlockings, crossovers, or other related improvements. If you have any questions regarding historic architecture, please contact Patty Chrisman of my staff at (609) 984-0850 or at Patty.Chrisman@dep.nj.gov. For questions regarding archaeology, please contact Vincent Maresca at (609) 633-2395 or at Vincent.Maresca@dep.nj.gov. Please refer to project number 16-0476 in any future emails, telephone calls or written correspondence in order to expedite our review and response.

Sincerely,

Daniel D. Saunders
Deputy State Historic Preservation Officer

c. Michelle Fishburne, FRA
John Brun, Amtrak
Johnette Davies, Amtrak

DDS/VM

Appendix 1 – A – 2

NJHPO CONCURRENCE OF ADVERSE EFFECTS LETTER: APRIL 3, 2017

State of New Jersey
MAIL CODE 501-04B
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NATURAL & HISTORIC RESOURCES
HISTORIC PRESERVATION OFFICE
P.O. Box 420
Trenton, NJ 08625-0420
TEL. (609) 984-0176 FAX (609) 984-0578

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

April 3, 2017

Marlys Osterhues
Chief, Environmental & Corridor Planning Division
Office of Railroad Policy and Development
Federal Railroad Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Dear Marlys Osterhues:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR 800: Protection of Historic Properties, as published in the Federal Register on December 12, 2000 (65 FR 777698-77739) and as amended on July 6, 2004 (69 FR 40544-40555), I am providing Continuing Consultation Comments for the following proposed project:

Kearny Town, Hudson County
Sawtooth Bridges Replacement Project (Amtrak Bridges 7.80 and 7.96)
National Railroad Passenger Corporation (AMTRAK)
Federal Railroad Administration (FRA)
Section 106

Summary: The HPO finds that the demolition of Amtrak Bridges 7.80 and 7.96, also known as the Sawtooth Bridges, will have **an adverse effect** to the National Register eligible Pennsylvania Railroad New York to Philadelphia Historic District.

Thank you for providing the Historic Preservation Office (HPO) with the opportunity for review and comment on the above referenced undertaking. This letter is in response to a cover letter, "Attachment C- Cultural and Historic Resources", which is the cultural resources section from the Draft Categorical Exclusion worksheet carried out in conjunction with the National Environmental Policy Act (NEPA), and the following Phase IA archaeological report received at our office on March 3, 2017:

Meade, Elizabeth D., and Molly R. McDonald
August 2016 *Phase IA Archaeological Documentary Study: Sawtooth Bridges Replacement Project, Kearny, Hudson, New Jersey.* Prepared for National Railroad Passenger Corporation (Amtrak), Philadelphia, PA. Prepared by AKRF, Inc., New York, NewYork.

800.4 Identification of Historic Properties

Architecture

The above referenced report entitled "Attachment C- Cultural and Historic Resources" identifies five previously identified historic properties within the Area of Potential Effects (APE) which are listed on the National Register of Historic Places or have been determined eligible for listing on the National Register of Historic Places, as follows:

- Pennsylvania Railroad New York to Philadelphia Historic District (SHPO Opinion October 2, 2002, updated January 14, 2015)
- Old Main Delaware, Lackawanna and Western Railroad Historic District (SHPO Opinion September 24, 1996)
- Substation 4 (Amtrak Substation 41) (SHPO Opinion September 12, 1994)
- Hudson Tower (February 6, 1997)
- Pennsylvania Railroad New York Bay Branch Historic District (April 22, 2005)

The HPO concurs with this list of historic properties located within the APE.

The HPO also concurs with the consultant that the Amtrak Bridges 7.80 and 7.96, also known as the Sawtooth Bridges, are contributing resources to the Pennsylvania Railroad New York to Philadelphia Historic District. The Amtrak Bridges 7.80 and 7.96, also known as the Sawtooth Bridges, were originally constructed in 1907 as part of the early electrification of the Pennsylvania Railroad between the Manhattan Transfer, through the Hudson Tunnel and ultimately arriving directly at the newly constructed Penn Station in Manhattan. Both bridges were constructed within the period of significance of the Pennsylvania Railroad New York to Philadelphia Historic District (which begins in 1835 and continues indefinitely until 50 years from the current date), share the significance of, and are located within the boundary of the Pennsylvania Railroad New York to Philadelphia Historic District. Therefore, both Amtrak Bridge 7.80 and 7.96 are considered contributing resources to the Pennsylvania Railroad New York to Philadelphia Historic District.

The HPO would additionally like to request the reevaluation of the end date of the Period of Significance for the Pennsylvania Railroad New York to Philadelphia Historic District. The HPO would like to come to a mutually agreed upon end date with FRA in order to incorporate the clarification of the SHPO Opinion of Eligibility for the National Register of Historic Places in future correspondence regarding this historic district. The HPO thanks the federal agencies for this consideration.

Archaeology

The above referenced report states that the project area is filled tidal wetlands with the potential for deeply buried Pre-Contact period archaeological resources below the marsh at depths greater than 10 to 30 feet below present grade. The report recommends once detailed construction methods are developed, any ground disturbance to any deeply buried sand layers should be evaluated for the need for archaeological monitoring during construction. *The HPO concurs with this assessment. Please be aware, the HPO would not recommend monitoring for any pile-driven construction methods.*

800.5 Assessment of Adverse Effects

The undertaking, as proposed, would demolish and replace Amtrak Bridges 7.80 and 7.96, also known as the Sawtooth Bridges, which are contributing resources to the Pennsylvania Railroad New York to Philadelphia Historic District. Therefore, the HPO concurs with the consultant's finding in the Cultural and Historic Resources Report, that this project, as proposed, is not in conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties,* and therefore will have **an adverse effect** to the Pennsylvania Railroad New York to Philadelphia Historic District. The HPO also concurs with the consultant's finding that the undertaking, as proposed, will not have an adverse effect, either directly or indirectly, on the other historic properties located within the APE, namely the Old Main Delaware, Lackawanna and Western Railroad Historic District, Substation 4 (Amtrak Substation 41), Hudson Tower, nor the Pennsylvania Railroad New York Bay Branch Historic District, which have been determined eligible for listing on the National Register of Historic Places. However, the HPO does concur with the consultant's recommendation that a Construction Protection Plan be developed in consultation with the HPO, in order to avoid the potential for accidental damage to both the Substation 4 (Amtrak Substation 41) and the Hudson Tower, due to the close proximity to the proposed demolition and construction activity of these National Register eligible historic resources.

In consequence, additional consultation between the Federal Railroad Administration, HPO, and any consulting parties will be necessary for developing ways to avoid, minimize and/or mitigate project effects on the Pennsylvania Railroad New York to Philadelphia Historic District. Pursuant to 36 CFR 800.6 (Resolution of Adverse Effects) the agency shall notify the Advisory Council for Historic Preservation (ACHP) of the adverse effects finding and provide the Council documentation as specified in 36 CFR 800.11. The agency shall also involve consulting parties and the public to develop and evaluate alternatives to avoid, minimize and mitigate adverse effects to historic properties, as stipulated in 36 CFR 800.6.

Additional Comments

Thank you again for providing the opportunity to review and comment on the potential for the above-referenced undertaking to affect historic properties. Please reference the HPO project number 16-0476 in any future calls, emails, submission or written correspondence to help expedite your review and response. If you have any questions, please feel free to contact Jenna

Solomon of my staff at (609) 984-0850 or jenna.solomon@dep.nj.gov with questions regarding historic architecture, historic districts or historic landscapes or Vincent Maresca of my staff at (609) 633-2395 or vincent.maresca@dep.nj.gov with questions regarding archaeology or archaeological survey.

Sincerely,

Katherine J. Marcopul
Deputy State Historic
Preservation Officer

CC: Advisory Council for Historic Preservation
Laura Shick, FRA
Johnette Davies, Amtrak
Brandon Bratcher, FRA
John Brun, Amtrak
Molly McDonald, AKRF
Leslie Mesnick, The Calladium Group
Consulting Parties

KJM/MMB/JS/VM/tn

Appendix 1 – A – 3

DRAFT PROGRAMMATIC AGREEMENT TRANSMITTAL LETTER TO NJHPO: APRIL 5, 2019

U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

April 5, 2019

Ms. Katherine J. Marcopul
Deputy State Historic Preservation Officer
Mail Code 501-04B
New Jersey Department of Environmental Protection
Historic Preservation Office, PO Box 420
501 East State Street, 4th Floor
Trenton, NJ 08625-0420

Re: Sawtooth Bridges Replacement Project, Hudson County, NJ
HPO Project No. 16-0476
Programmatic Agreement

Dear Ms. Marcopul:

As you know, the National Railroad Passenger Corporation (Amtrak) is proposing to replace Amtrak Bridges No. 7.80 and No. 7.96, collectively referred to as the "Sawtooth Bridges", which are critical links and existing bottlenecks on Amtrak's Northeast Corridor (NEC). The Federal Railroad Administration (FRA) is serving as the lead federal agency for the preparation of an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, Section 106 of the National Historic Preservation Act of 1966, as amended (Section 106), and other legislation for the proposed Sawtooth Bridges Replacement Project (Proposed Project). The purpose of this letter is to continue consultation under Section 106.

Under the implementing regulations for Section 106 (36 CFR 800), FRA has determined that a Programmatic Agreement (PA), rather than a Memorandum of Agreement, is the most appropriate method to document procedures to continue the identification and evaluation of archaeological resources as well as to resolve the known adverse effects of the Proposed Project. Therefore, pursuant to 36 CFR 800.14(b), this letter transmits the enclosed draft PA for your review and comment. The PA reflects mitigation stipulations proposed by FRA and your office from prior correspondence.

Concurrent with your office's review, by copying them on this letter, FRA also invites the Section 106 consulting parties to review and comment on the draft PA. Please note that the public will also have an opportunity to review and comment on the Programmatic Agreement after SHPO and consulting party review when the Environmental Assessment is released for public review and comment.

FRA requests that your office provide comments on the draft PA within 30 days of receipt of this letter. Should you have any questions, please do not hesitate to contact Mr. Brandon Bratcher, Environmental Protection Specialist, at (202) 493-0844 or brandon.bratcher@dot.gov or Johnette Davies, Amtrak's Lead Historic Preservation Specialist, at 215-349-1354 or Johnette.davies@amtrak.com. Please copy Ms. Davies on your response.

Sincerely,

Katherine Zeringue
Federal Preservation Officer
Environmental & Corridor Planning Division
Office of Railroad Policy and Development

Enc: Draft Programmatic Agreement

cc: Johnette Davies, Amtrak Lead Historic Preservation Specialist
John Brun, Amtrak Project Manager
Molly McDonald, AKRF
Leslie Mesnick, Calladium Group
James Bruno, Esq., Town of Kearny
Chester Brooks, Chief, Delaware Tribe
Kim Penrod, Delaware Nation
Tonya Tipton, Shawnee Tribe of Oklahoma

Appendix 1 – B

PROGRAMMATIC AGREEMENT

PROGRAMMATIC AGREEMENT

AMONG

THE FEDERAL RAILROAD ADMINISTRATION,

THE NATIONAL RAILROAD PASSENGER CORPORATION,

AND

THE NEW JERSEY HISTORIC PRESERVATION OFFICER

REGARDING THE

SAWTOOTH BRIDGES REPLACEMENT PROJECT

TOWN OF KEARNY, HUDSON COUNTY, NEW JERSEY

WHEREAS, the National Railroad Passenger Corporation ("Amtrak") is proposing the replacement of Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96 (collectively known as the "Sawtooth Bridges"), located in the Town of Kearny, Hudson County, New Jersey (the "Project"); and

WHEREAS, the Federal Railroad Administration (FRA) has provided financial assistance to Amtrak for design and environmental analyses for the Project in compliance with the National Environmental Policy Act (42 U.S.C. § 4321 *et seq*.) (NEPA), and may provide future financial assistance to Amtrak for implementation of the Project; and

WHEREAS, FRA has determined that, should FRA provide financial assistance for implementation of the Project, it would become an "Undertaking" pursuant to Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C.§ 306108) (NHPA), as amended, and its implementing regulations at 36 CFR § 800 (hereinafter collectively referred to as Section 106), and FRA would be responsible for compliance with Section 106; and

WHEREAS, should FRA provide financial assistance for implementation of the Project, FRA intends to use this Programmatic Agreement (PA) to satisfy its Section 106 responsibilities; and

WHEREAS, FRA is the lead Federal agency for the Project under NEPA and is preparing an Environmental Assessment pursuant to NEPA and FRA's Procedures for Considering Environmental Impacts (64 FR 28545, May 26, 1999) and has coordinated Section 106 compliance with the NEPA process; and

WHEREAS, Amtrak, owner and operator of the Northeast Corridor (NEC) and the existing Sawtooth Bridges, has acted as the Project designer responsible for carrying out the design in support of the NEPA process; and

WHEREAS, FRA, and Amtrak on behalf of FRA, have consulted with the New Jersey Historic Preservation Office (NJHPO) and defined the Project's area of potential effects ("APEs") (**Attachment 1**), and NJHPO concurred with the APEs in a letter dated April 11, 2016; and

WHEREAS, in a letter dated September 23, 2016, Amtrak, on behalf of FRA, invited potentially interested Federally-recognized Indian Tribes (Tribes) to participate in consultation for the purposes of Section 106, and FRA followed up with a letter dated March 1, 2017 to these same Tribes, attaching the APE, identification of historic properties in the APE – including the Phase 1A archaeology report, and

the determination of adverse effect, to the following invited Federally-recognized Indian Tribes: the Delaware Nation, the Shawnee Tribe of Oklahoma, the Absentee-Shawnee Tribe of Oklahoma, the Stockbridge-Munsee Community, the Oneida Indian Nation, and the Delaware Tribe; and the Delaware Tribe, the Delaware Nation, and the Shawnee Tribe of Oklahoma responded that no known cultural resources would be affected by the Project but asked to remain apprised of the Project as it moves forward; the Stockbridge-Munsee Community declined to participate; and the other Tribes did not respond; and

WHEREAS, in a letter dated September 23, 2016, Amtrak, on behalf of FRA, invited 26 organizations, institutions, governmental agencies, elected officials, other Indian Tribes, and individuals to participate as Consulting Parties for the purposes of Section 106 (see **Attachment 2**), and Amtrak followed up with a letter to the same parties dated March 1, 2017 attaching the APE, identification of historic properties in the APE, and the determination of adverse effect, and the Town of Kearny accepted the invitation; Thomas Flagg, a known industrial archaeologist, declined to participate; Conrail did not formally accept the invitation, but requested ongoing consultation with respect to engineering design; and the remaining entities did not respond; and

WHEREAS, FRA and Amtrak consulted with the parties that accepted the invitation to consult (the Consulting Parties); and

WHEREAS, the Sawtooth Bridges are contributing elements within the Pennsylvania Railroad New York to Philadelphia Historic District (Northeast Corridor), which was determined eligible for the National Register of Historic Places (NR) by the Federal Highway Administration in consultation with NJHPO on March 3, 2003; and

WHEREAS, FRA and Amtrak, in consultation with NJHPO, identified five (5) additional NR-listed or eligible historic properties in the Project's APE, and NJHPO concurred with this identification on April 3, 2017; and

WHEREAS, through consultation, FRA determined that the Project, if constructed, will have an adverse effect on one historic property, the Pennsylvania Railroad New York to Philadelphia Historic District and that no other historic properties would be adversely affected, and NJHPO concurred with this finding on April 3, 2017; and

WHEREAS, NJHPO requested that the reevaluation of the period of significance of the Pennsylvania Railroad New York to Philadelphia Historic District be included as a mitigation measure in this PA; however, the reevaluation of the period of significance of the Pennsylvania Railroad New York to Philadelphia Historic District was subsequently undertaken by NJ Transit and NJHPO concurred with the reevaluation on June 4, 2019; and

WHEREAS, a *Phase IA Documentary Study: Sawtooth Bridges Replacement Project* (AKRF: August 2016) prepared for the Project and submitted to NJHPO and Federally-recognized Indian Tribes on March 1, 2017, identified areas of potential archaeological sensitivity at depths between 10 and 30 feet below the ground surface in areas that have not previously been disturbed as a result of the installation of utilities, the construction of the existing bridges, or other development ("archaeologically sensitive area") and NJHPO concurred with this characterization in a letter dated April 3, 2017; and

WHEREAS, through the consultation referenced above, FRA has concluded that the Project is located in an area with low potential for pre-contact archeological resources from 0- to 10-feet below ground surface and no potential for post-contact archeological resources but that Project designs cannot be

sufficiently advanced at this time, and the identification and effects on potential deeply buried pre-contact archeological resources cannot be fully determined at this very early stage of Project planning and design and prior completion of FRA's NEPA process; and

WHEREAS, if the Project advances to final design and construction with financial assistance from FRA, FRA has elected to complete, in consultation with NJHPO, the final identification, evaluation, and effects assessment on archeological resources in phases, pursuant to 36 CFR § 800.4(b)(2) and 800.5(a)(3), and in accordance with the ongoing consultation process specified in this PA pursuant to 36 CFR § 800.14(b); and

WHEREAS, FRA has invited Amtrak, as the owner and operator of the NEC and the entity that would design and construct the Project, to participate in this PA as an invited Signatory with responsibilities under this PA, and Amtrak has accepted; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1), on June 8, 2017 Amtrak on behalf of FRA, notified the Advisory Council on Historic Preservation (ACHP) of FRA's adverse effect determination with specified documentation via the ACHP's e106 system, and the ACHP responded to FRA in a letter dated June 21, 2017 that it has chosen not to participate in the consultation pursuant to 36 C.F.R. § 800.6(a)(1)(iii); and

NOW, THEREFORE, FRA, Amtrak, and NJHPO (each a Signatory and together the Signatories) agree that the Project, if it becomes an Undertaking, will be implemented in accordance with the following stipulations in order to avoid, minimize and mitigate adverse effects on historic properties, and that these stipulations will govern the Undertaking and all of its parts until this PA expires or is terminated.

STIPULATIONS

I. APPLICABILITY

This PA would apply to FRA's Undertaking and would only bind FRA and Amtrak if FRA provides financial assistance for the construction of the Project.

II. PROFESSIONAL QUALIFICATION STANDARDS

A. Amtrak will ensure that all historic preservation and documentation work regarding architectural properties carried out pursuant to this PA will be done by, or under the direct supervision of, a qualified professional(s) in the disciplines of architectural history who meet[s] the relevant standards outlined in the *Secretary of the Interior's Professional Qualifications Standards for Architectural Historians* (48 FR 44738-9).

B. Amtrak will ensure that all archaeological work carried out pursuant to this PA will be done by or under the direct supervision of a qualified professional(s) in the discipline of archaeology who meet[s] the relevant standards outlined in the *Secretary of the Interior's Professional Qualifications Standards for Archaeologists* (48 FR 44738-9).

III. TREATMENT MEASURES FOR ARCHITECTURAL HISTORIC PROPERTIES

A. National Park Service (NPS) Historic American Engineering Record (HAER) Level II Equivalent Documentation

1. Amtrak will produce documentation of the Sawtooth Bridges that meets the standards of the National Park Service (NPS) Level II Historic American Engineering Record (HAER) documentation. HAER documentation narratives will describe in detail the

physical characteristics of the structures (including their engineering, design, and setting), and their history, focusing on their construction as part of the Pennsylvania Railroad in the early twentieth century. Specific attention will be afforded to interpretation of how contemporary engineering and materials science constraints and cost considerations affected the final design and construction of the structures. Primary and secondary resources will be used in the research effort, including historic engineering literature, United States Army Corps of Engineers Reports, Amtrak's files, newspapers and periodicals, library collections, historical societies, and other repositories in New York and New Jersey. Narratives will be supported by historic plans, photographs, and other documents, where available.

2. The HAER recordation will also include photographic documentation of the Sawtooth Bridges. Close-up and contextual views will be provided in accordance with the standards of the National Park Service (NPS) HAER Level II documentation. The documentation will consist of photographs with large-format negatives, photo key map and photo list. Photographs will include images of the original engineering plans for the Sawtooth bridges.

3. Digital photography files will also be provided, formatted in accordance with the current NPS Heritage Documentation Programs (HDP) photography guidelines. Amtrak will consult with NJHPO and NPS Heritage Documentation Programs on the final scope, content, format, and disposition of the documentation.

4. Following completion of the HAER documentation, Amtrak will distribute one (1) PDF electronic copy of the documentation to FRA, (1) hard copy and one (1) PDF electronic copy of the documentation to NJHPO, and (1) hard copy and one (1) PDF electronic copy of the documentation to NPS and up to (10) hard copies will be offered to local and regional repositories such as libraries, historical societies, and other collections, to be determined in consultation with NJHPO, as well as to FRA and NJ HPO

5. Amtrak will explore whether additional entities such as railroad or industrial history organizations that would be willing to post the PDF recordation documents to their publicly accessible websites. Amtrak will consult with NJ HPO to identify up to five (5) of these potential organizations and associated websites. If an organization does not wish to accept or post the file, Amtrak is not required to identify a substitute organization.

B. Construction Protection Plan

1. As Project planning progresses and construction limits are finalized, Amtrak will prepare and implement a Construction Protection Plan (CPP) to avoid construction-related damage to historic properties within close proximity (approximately 100 feet) of Project construction activities, likely including the Hudson Tower and/or Substation 4 (both NR-eligible). The CPP will describe the Project construction procedures in the vicinity of historic properties and measures that Amtrak will take to avoid inadvertent construction impacts to historic properties.

2. Amtrak will submit the CPP to NJHPO for review and comment prior to implementation in accordance with Stipulation V.

3. Amtrak will provide FRA with copies of all correspondence related to the CPP and a copy of the final plan.

C. Design Review

1. Amtrak will ensure that the preliminary and final plans and specifications for the proposed new bridges adhere to the *Secretary of the Interior's Standards and Treatments for Historic Properties* and are compatible with the historical character of the Pennsylvania Railroad Historic District.

2. Amtrak will consult with FRA and NJHPO to identify engineering constraints and opportunities for incorporating historically compatible design into the preliminary and final plans. Amtrak will consult with FRA and NJHPO in the development of bridge plans at the preliminary (30 percent) and pre-final (approximately 75 percent), and final (100 percent) design stages.

IV. TREATMENT MEASURES FOR ARCHAEOLOGICAL RESOURCES

A. If FRA determines that Tribal involvement is warranted, then FRA is responsible for all government-to-government consultation with Federally recognized Tribes.

B. When Amtrak advances the Project design and additional information is known regarding the specific location of ground disturbing activities and potential sub-surface impacts of the Project, Amtrak will ensure those design plans are reviewed by a qualified archaeologist, selected by Amtrak. The archaeologist will determine if the Project could potentially impact archaeologically sensitive areas at depths where disturbance of archaeological materials may be feasible and determine locations, if any, where monitoring will be required. In the event that Amtrak's proposed construction methodology will not allow monitoring at depths greater than 10 feet (e.g., in those locations where piles will be driven), then no archaeological monitoring will be required.

C. In the event that soil borings are advanced within the Project site for engineering purposes, such soil borings will be reviewed by a qualified archaeologist selected by Amtrak to determine if potentially sensitive alluvial deposits, such as those observed in adjacent areas, are present within the Project site. Amtrak will prepare a borings report and associated curation and recommendations for further work, if applicable, in accordance with New Jersey State Standards and submit the report to FRA. The report and recommendations will be reviewed by FRA and, upon FRA approval, submitted to NJHPO and Tribes, as appropriate, upon completion of boring activities.

D. If Amtrak's archaeologist, in consultation with FRA and NJHPO, determines that archaeological monitoring is warranted based on the results of analyses conducted under Stipulations IV.A. or B. above, Amtrak will develop an archaeological monitoring plan in consultation with FRA and NJHPO. Any monitoring plan developed in consultation with FRA and NJHPO will include provisions for consulting with Indian Tribes, as appropriate, in the event of a discovery.

E. If archaeological monitoring is completed, Amtrak will prepare a monitoring report and curation in accordance with New Jersey State Standards and submit the report to FRA. The monitoring report will be reviewed by FRA and, upon FRA approval, submitted to NJHPO and Tribes, as appropriate, at the completion of monitoring activities.

F. If potentially significant archaeological resources are encountered during monitoring, Amtrak and FRA will consult with NJHPO and any other consulting parties that wish to participate pursuant to 36 CFR 800.4(b) to complete identification efforts and develop ways to avoid, minimize, and/or mitigate any project effects pursuant to 36 CFR 800.6 as defined in the archaeological monitoring work plan in IV.D.

V. DOCUMENT REVIEW

Unless otherwise stated in the stipulations, the Signatories will provide comments on the documents they review as set forth below:

A. The Signatories will have up to thirty (30) calendar days from the date of receipt to review and provide written comments to Amtrak on documents stipulated in this PA.

B. Tribes, when appropriate, will have up to thirty (30) calendar days from the date of receipt to review and provide written comments to FRA on documents stipulated in this PA.

C. Amtrak and FRA will ensure any written comments received within the timeframe are considered and addressed, as appropriate.

D. If the Signatories or Tribes, do not submit written comments to Amtrak or FRA, as applicable, within thirty (30) calendar days of receipt of any document, it is understood the non-responding Signatories or Tribes have no comments on the submittal.

E. If the Signatories object to or recommend extensive revisions to submissions stipulated in the PA, Amtrak will work with FRA expeditiously to respond to the recommendations and resolve disputes.

F. If FRA and Amtrak cannot resolve the disputes, and if further consultation with the Signatories is deemed unproductive by any Signatory, the Signatories will adhere to the dispute resolution procedures described in Stipulation XI.

G. The Signatories acknowledge that the timeframes set forth in this PA will be the maximum allowed under normal circumstances. In exigent circumstances (e.g., concerns over construction suspensions or delays), all Signatories agree to expedite their respective document review and dispute resolution obligations within seven (7) calendar days.

VI. PROJECT MODIFICATION AND CHANGES

In the event of any modifications or changes to the Project scope, the following measures will be implemented through consultation among the Signatories:

A. Amtrak, in coordination with FRA, will assess and revise the Project APE as needed to incorporate any additional areas that have the potential to affect historic properties pursuant to 36 CFR § 800.4(a); upon FRA approval, Amtrak will provide a revised APE to NJHPO for review and comment.

B. Amtrak, in coordination with FRA, will carry out additional investigations, as needed, to identify architectural and archaeological properties that may be affected pursuant to 36 CFR § 800.4(b).

C. Amtrak, in coordination with FRA, will evaluate and assess the Project's effect on historic properties pursuant to 36 CFR § 800.4(c)-(d) and 800.5.

D. If a change in Project scope results in additional adverse effects to historic properties, Amtrak will consult with the other Signatories to explore measures to avoid, minimize, or mitigate effects on these properties and amend the PA in accordance with Stipulation XII and consider whether the identification of and coordination with any additional consulting parties is appropriate.

VII. UNANTICIPATED DISCOVERIES

Amtrak, in coordination with FRA, will develop an Unanticipated Discoveries Plan (UDP) to be included in construction and bidding documents and used by the Project contractor in the event

of unanticipated discoveries or if known historic properties are affected in an unanticipated manner. The UDP will incorporate procedures for interacting with the media, a chain of contact, stop-work requirements, and other appropriate provisions. Amtrak, in coordination with FRA, will submit the draft UDP to the Signatories, participating Federally-recognized Indian Tribes and participating Consulting Parties for review and comment in accordance with Stipulation V. The UDP will include the following components:

A. In the event any previously unidentified historic architectural or archeological resource is discovered, Amtrak will require the contractor to halt all work in and secure the area of the discovery. For any discovered archeological resources, Amtrak will also halt work in surrounding areas where additional subsurface remains can reasonably be expected to be present. This includes establishing a perimeter with a radius of at least 50 feet around a discovery where there will be no excavation, operation of heavy machinery, or stockpiling. Work in all other Project areas may continue.

B. Amtrak, in coordination with FRA, will notify the Signatories within twenty-four (24) hours of the discovery. As appropriate, FRA will also identify and invite Federally-recognized Indian Tribes and Consulting Parties to consult regarding unanticipated discoveries.

C. Amtrak, in consultation with FRA, NJHPO, and other Consulting Parties, if appropriate, will investigate the discovery site and evaluate the resource(s) according to the professional standards and guidelines contained in Stipulation II. Amtrak will prepare and submit to FRA for review and comment: a written document containing a proposed determination of NR eligibility of the resource, an assessment of Project effects on historic properties, if appropriate, and any recommended treatment measures. Upon FRA's approval, Amtrak will submit the determination of NR eligibility, effects assessment, and/or recommended treatment measures document, if appropriate, to NJHPO, Signatories, and Consulting Parties, as appropriate, for review and comment. If the potential resource is associated with Native American prehistory or history, FRA will provide the documentation to the Tribes within five (5) business days for their review with a request for comment. The Signatories and other Consulting Parties if applicable, will respond with any comments within five (5) business days of receipt.

D. In the event there is an unanticipated effect to a known historic architectural resource or archaeologically sensitive area, Amtrak will notify FRA, Signatories, and participating Tribes and Consulting Parties, as appropriate, within forty-eight (48) hours of the event by providing written documentation describing the event and the potential effect to the historic property. Amtrak will propose treatment measures to FRA for review. Upon FRA's approval, and in coordination with FRA, the Amtrak will submit the recommended treatment measures document to NJHPO, Signatories, and participating Tribes and Consulting Parties as appropriate, for review and comment. The NJHPO, Signatories, and participating Tribes and Consulting Parties will respond with any comments within five (5) business days of receipt.

E. If it is necessary to develop treatment measures in accordance with Stipulation VII.C. and VII.D., above, Amtrak, in coordination with FRA and NJHPO, implement the treatment measures approved by FRA.

F. Amtrak will ensure ground disturbing activities within the affected area do not proceed until FRA, in consultation with the Signatories and participating Tribes and Consulting

Parties, as appropriate, determines that either 1) the located resource is not NR-eligible or 2) the agreed upon treatment measures for historic properties have been implemented.

VIII. TREATMENT OF HUMAN REMAINS

A. If human remains are encountered during archaeological investigations or construction, Amtrak will immediately halt subsurface disturbance in that portion of the Project area and immediately secure and protect the human remains and any associated funerary objects in place in such a way that minimizes further exposure or damage to the remains from the elements, looting, and/or vandalism. A perimeter with a radius of at least 50 feet around human remains will also be established where there will be no excavation, operation of heavy machinery, or stockpiling.

B. Amtrak will immediately notify the local police department to determine if the discovery is subject to a criminal investigation by law enforcement and notify the Signatories within twenty-four (24) hours of the initial discovery.

C. If a criminal investigation is not appropriate, the Amtrak will apply and implement all relevant laws, procedures, policies, and guidelines concerning the treatment and repatriation of burial sites, human remains, and funerary objects.

D. In the event the human remains encountered could be of Native American origin, whether prehistoric or historic, FRA will immediately notify NJHPO, Federally-recognized Indian Tribes, and Consulting Parties to determine the treatment plan for the Native American human remains and any associated funerary objects.

E. If the remains are not of Native American origin, Amtrak will, as appropriate, develop a research design/treatment plan for the appropriate treatment of the remains and any associated artifacts, consistent with procedures and guidelines contained in Stipulation IV and in accordance with Stipulation V.

F. Amtrak will not proceed with work in the affected area until FRA, in consultation with NJHPO and Tribes, as appropriate, determines that the development and implementation of an appropriate research design/treatment plan or other recommended mitigation measures are completed. However, work in all other Project areas may continue.

IX. MONITORING AND REPORTING

Once yearly, beginning one (1) year from the date of execution of this PA until it expires or is terminated, Amtrak will provide all Signatories to this PA a summary report detailing work undertaken pursuant to its terms. Such report will include any scheduling changes proposed, any problems encountered, and any disputes and objections received in FRA and Amtrak's efforts to carry out the terms of this PA. Clear evidence of advancing the completion of PA stipulations, shared with Signatories, will be considered sufficient reporting in lieu of a summary report.

X. ADOPTABILITY

In the event that another Federal agency, not initially party to this PA receives an application for financial assistance, permits, licenses, or approvals for the Project, that agency may fulfill its Section 106 responsibilities and adopt this PA by (1) stating in writing it concurs with the terms of this PA, (2) providing the Signatories an electronic copy of its written concurrence, (3) executing a signature page to this PA, and filing the signature with the ACHP, and (4) implementing the terms of this PA, as applicable.

XI. DISPUTE RESOLUTION

Should any Signatory to this PA object at any time to any actions proposed or the manner in which the terms of this PA are implemented by providing written notice of such objection to FRA, FRA will consult with such Signatory to resolve the objection. If FRA determines that the objection cannot be resolved within thirty (30) calendar days FRA will:

A. Forward all documentation relevant to the dispute, including FRA's proposed resolution, to the ACHP (with a copy to the Signatories) and request that the ACHP provide FRA with its advice on the resolution of the objection within forty-five (45) calendar days of receiving the documentation.

B. If the ACHP does not provide its advice regarding the dispute within the forty-five (45) calendar day time period, FRA may make a decision on the dispute and proceed accordingly. FRA will document its decision in a written response to the objection that takes into account any timely comments regarding the dispute from the ACHP and the Signatories and provide the ACHP and Signatories with a copy of such written response.

C. The Signatories remain responsible for carrying out all other actions subject to the terms of this PA that are not the subject of the dispute.

XII. AMENDMENTS

This PA may be amended when such an amendment is agreed to in writing by all Signatories. The amendment will be effective on the date that the amendment is signed by all Signatories. FRA will file the amendment with ACHP.

XIII. TERMINATION

If any Signatory to this PA determines that its terms will not or cannot be carried out, that Signatory will immediately consult with the other Signatories to attempt to develop an amendment per Stipulation XII. If within thirty (30) calendar days an amendment cannot be reached, any Signatory may terminate the PA upon written notification to the other Signatories.

Once the PA is terminated, and prior to work initiating or continuing on the Undertaking, FRA must either (a) execute a new PA pursuant to 36 CFR § 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. FRA will notify the Signatories as to the course of action it will pursue.

XIV. DURATION

This PA will expire when all its stipulations have been completed or in fifteen (15) years from the effective date, whichever comes first, unless the Signatories agree in writing to an extension in accordance with Stipulation XII. Amendments.

XV. EXECUTION AND EFFECTIVE DATE

This PA will go into effect on the date that the final Signatory signs the document. Execution of this PA by the Signatories and its subsequent filing with the ACHP by FRA demonstrates that FRA has taken into account the effect of the Project on historic properties and afforded the ACHP an opportunity to comment.

APPROVAL AND SIGNATURE PAGE FOR
PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL RAILROAD ADMINISTRATION,
THE NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK),
AND
THE NEW JERSEY HISTORIC PRESERVATION OFFICER
REGARDING THE
SAWTOOTH BRIDGES REPLACEMENT PROJECT
IN HUDSON COUNTY, NEW JERSEY

FEDERAL RAILROAD ADMINISTRATION

By:_____ Date:_____

Marlys Osterhues
Division Chief, Environmental and Corridor Planning
Office of Railroad Policy and Development

APPROVAL AND SIGNATURE PAGE FOR
PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL RAILROAD ADMINISTRATION,
THE NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK),
AND
THE NEW JERSEY HISTORIC PRESERVATION OFFICER
REGARDING THE
SAWTOOTH BRIDGES REPLACEMENT PROJECT
IN HUDSON COUNTY, NEW JERSEY

NEW JERSEY HISTORIC PRESERVATION OFFICER

By:_____ Date:_____

Katherine Marcopul
Deputy State Historic Preservation Officer

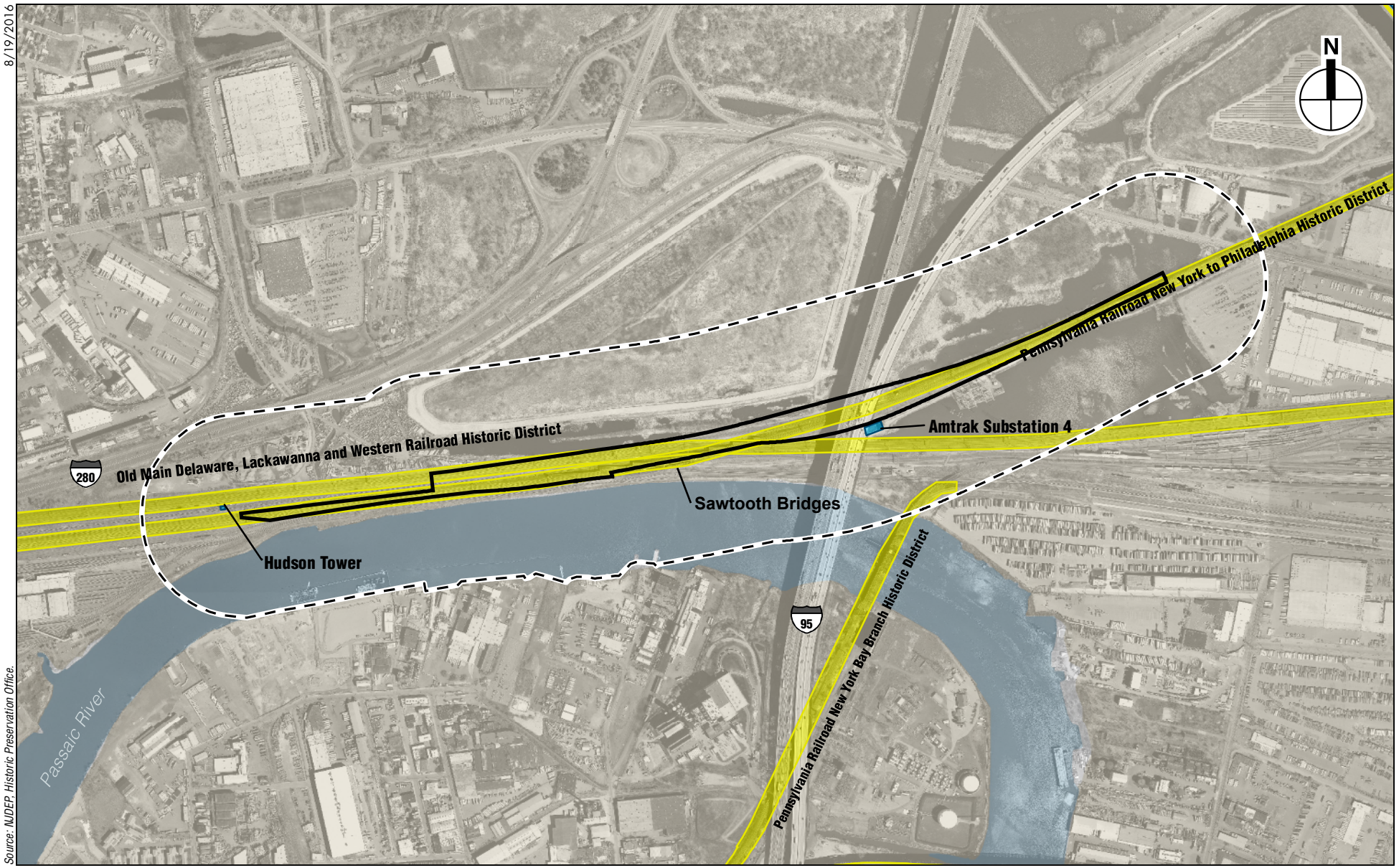
APPROVAL AND SIGNATURE PAGE FOR
PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL RAILROAD ADMINISTRATION,
THE NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK),
AND
THE NEW JERSEY HISTORIC PRESERVATION OFFICER
REGARDING THE
SAWTOOTH BRIDGES REPLACEMENT PROJECT
IN HUDSON COUNTY, NEW JERSEY

AMTRAK

By:_____ Date:_____

Gerhard Williams
VP Chief Engineer

ATTACHMENT 1 – AREA OF POTENTIAL EFFECTS



SAWTOOTH BRIDGES REPLACEMENT PROJECT

Cultural Resources

Figure 3-5

ATTACHMENT 2 – LIST OF INVITED SECTION 106 CONSULTING PARTIES

INVITED CONSULTING PARTIES

Federally-Recognized Indian Tribes

- Absentee-Shawnee Tribe of Oklahoma
- The Delaware Nation
- Delaware Tribe of Indians
- The Oneida Indian Nation
- Eastern Shawnee Tribe of Oklahoma
- Stockbridge-Munsee Band of Mohican Indians

State-Recognized Indian Tribes

- Nanticoke Indian Association
- Powhatan Renape Nation
- Ramapough Lenape Indian Nation
- Nanticoke Lenni-Lenape Indians of New Jersey

Other Tribal Organizations

- Eastern Delaware Nation
- Eastern Lenape Nation of Pennsylvania Office and Cultural Center
- Cherokee Nation of New Jersey

Local Governments and Other Involved Agencies

- Hudson County Executive
- Hudson County Division of Cultural Affairs & Tourism
- Hudson County Division of Planning
- New Jersey Turnpike Authority
- New Jersey Dept. of Environmental Protection: Historic Preservation
- Town of Harrison Mayor's Office
- Town of Kearny Mayor's Office

Potential Interested Parties

- Anthracite Railroads Historical Society, Inc.
- Consolidated Rail Corporation
- Meadowlands Museum
- New Jersey Meadowlands Commission
- Railway and Locomotive Historical Society, New York Chapter
- National Railway Historical Society, Inc., North Jersey Chapter

- Passaic River Coalition
- Pennsylvania Railroad Technical and Historical Society
- Rail-Marine Information Group
- Society for Industrial Archaeology, Roebling Chapter
- Society of Industrial Archaeology, National Headquarters
- Thomas Flagg, Industrial Archaeologist
- National Railway Historical Society, New York Chapter
- National Railway Historical Society, Tri-State Chapter
- United Railroad Historical Society of New Jersey

Appendix 1 – C
CULTURAL AND HISTORIC RESOURCES

This appendix considers the potential of the Proposed Project to affect historic resources in the Proposed Project's area of potential effect (APE) for architectural and archaeological resources (see Figure 3-5).

A. METHODOLOGY

In consultation with the New Jersey State Historic Preservation Office (NJHPO), APEs for architectural and archaeological resources have been delineated to take into account any direct, indirect, secondary, and cumulative impacts on these resource types. The APEs for architectural and archaeological resources and the methodologies used to assess potential impacts within the APEs are described below and shown on **Figure 3-5**.

ARCHITECTURAL RESOURCES

In general, potential effects to architectural resources can include both direct physical effects (e.g., demolition, alteration, or damage from construction on nearby sites) and indirect contextual effects, such as the isolation of a property from its surrounding environment, or the introduction of visual, audible, or atmospheric elements that are out of character with a property or that alter its setting. The APE for architectural resources (shown in **Figure 3-5**) must therefore be large enough to account for locations where proposed construction activities could physically alter architectural resources or be close enough to them to potentially cause physical damage or visual or contextual impacts.

The APE for architectural resources for this project is defined as the area surrounding the project site within visual range and to account for potential construction-related impacts. The APE for architectural resources extends approximately 750 feet from the Proposed Project site. These boundaries have been delineated to account for potential visual impacts of proposed construction activity along the NEC. The proposed structures would not differ substantially from the existing Sawtooth Bridges in terms of height or alignment. The elevation of the proposed structures would change from the existing elevation by a maximum of five feet. Further, another existing railroad bridge, NJ Transit's Bridge 0.35 (also known as the "Red Bridge") is located immediately south of the Sawtooth Bridges, limiting the visibility of the existing and proposed structures from the south.

Once the architectural APE was determined, an inventory of officially recognized historic resources within the architectural APE was compiled based on the files of the NJHPO and the New Jersey State Museum (NJSM). This inventory includes properties or districts listed on the National Register of Historic Places (NRHP) and/or the New Jersey State Register (SR), or determined eligible for such listing; National Historic Landmarks (NHL); and archaeological sites on file at the NJSM. Field surveys were also conducted to identify any potential architectural resources (i.e., properties that may be eligible for listing on the NRHP) within the architectural APE.

Once the historic resources in the architectural APE were identified, the effects of the Proposed Project on those resources were assessed. In addition to assessing direct and indirect effects (described above), Section 106 of the NHPA requires consideration of reasonably foreseeable effects that may occur later in time, be further removed in distance, or be cumulative.

ARCHAEOLOGICAL RESOURCES

The APE for archaeological resources includes the area where subsurface disturbance would occur as part of the Proposed Project—the Sawtooth Bridge Replacement Project site itself. To assess the archaeological sensitivity of the archaeological APE, a Phase 1A Archaeological Documentary Study (Phase 1A) of the project site was prepared by AKRF, Inc. in August 2016. As part of the Phase 1A, extensive documentary research was conducted to identify the development and occupation histories of the archaeological APE during both the prehistoric (Native American) and historic periods. The Phase 1A had four goals: 1) to determine the likelihood that the project locations were inhabited during the prehistoric or historic periods; 2) to determine the likelihood that archaeological resources could have survived intact on the project site after development and landscape alteration associated with the construction of the existing railroad facilities; 3) to make a determination of the project site's archaeological sensitivity; and 4) to make recommendations for additional archaeological investigations where necessary. The Phase 1A was submitted to NJHPO for review and comment and its conclusions are summarized in this appendix. The Phase 1A is included in Appendix 1-D.

B. BACKGROUND HISTORY

The development and occupation histories of the archaeological APE and surrounding vicinity are described in detail in the Phase 1A and are summarized below to provide context for the known and potential historic resources discussed later in this appendix.

ENVIRONMENTAL SETTING

The archaeological APE is located in the Hackensack Meadowlands District, the tidal and freshwater wetlands surrounding the Hackensack and Passaic Rivers in northeastern New Jersey. The modern landscape of the archaeological APE is radically different than what was seen a century ago, as landfilling has transformed the former marshlands into dry, developable land. However, until the existing rail lines were constructed, the archaeological APE was inundated marshland. An extended glacial period left the Northeast blanketed in thick ice sheets for thousands of years. The retreat of the glaciers caused sea levels to rise and New Jersey's shoreline may have been as much as 85 feet lower and 80 miles away from its present location when the first Native Americans arrived in the region (NJHPO 1997). The increase in temperatures and rise of sea levels led to the gradual formation of the Meadowlands over many thousands of years.

Soil borings completed in the vicinity of the archaeological APE suggest that the ground surface prior to inundation/marsh formation was at variable depths across the project site and surrounding vicinity (soil borings were reviewed as part of the Phase 1A, see Appendix 1-D). The presence of peat or organic silts in many of the borings likely represents what was the bottom of the marsh prior to landfilling. Alluvial soils were identified between approximately 10 and 30 feet below the ground surface (the exact depths varied greatly among the borings) and are likely similar to alluvial sands identified as archaeologically sensitive at other nearby archaeological sites where deeply buried archaeological resources were identified at similar

depths (Langan 2012). Recommendations for additional archaeological analyses of these soils, if present, are outlined below in **Section D, "Probable Impacts of the Proposed Project**," **Section E: "Mitigation Measures**," and in the Phase 1A study included as Appendix 1-D.

THE PREHISTORIC PERIOD

Human populations did not inhabit the northeastern United States (including the area that is modern New Jersey) until the glaciers began to retreat more than 14,000 years ago and were settled in the area by approximately 11,500 years before present (BP). Archaeologists have divided the time between the arrival of the first humans in northeastern North America and the arrival of Europeans more than 11,000 years later into the following contextual periods: Paleo-Indian/Early Archaic (11,500-8,000 before present [BP]), Middle Archaic (8,000-6,000 BP), Late Archaic (6,000-3,000 BP), Early/Middle Woodland (3,000 BP–1,200), Late Woodland (1,200 BP to AD 1500) and European Intrusion/Contact Period (AD1500-AD 1700).[1] These divisions are based on certain changes in environmental conditions, technological advancements, and cultural adaptations, which are observable in the archaeological record. A full summary of the prehistoric occupation of the general area during these time periods is provided in the Phase 1A.

PREVIOUSLY IDENTIFIED ARCHAEOLOGICAL SITES IN THE VICINITY

As the archaeological APE and the surrounding area were inundated for many thousands of years, little evidence of Native American activity in the area has been identified. A deeply buried prehistoric archaeological site (New Jersey State Museum [NJSM] Site 28-HD-44) was identified approximately 2,000 feet east of the project site on the western shore of the Hackensack River and south of the existing Amtrak tracks (Langan 2012). Archaeological resources at that site were identified within alluvial soils located between 9 and 17 feet beneath the ground surface. The majority of the finds were from the eastern portion of the site, in close proximity to the Hackensack River (ibid).

DEVELOPMENT AND OCCUPATION OF THE ARCHAEOLOGICAL APE DURING THE HISTORIC PERIOD

Despite the undeveloped nature of the low-lying marshes, Kearny's location between the burgeoning cities of Newark and Jersey City increasingly made the township a convenient location for both industrial and commercial use as well as for residential communities. The Hackensack and Passaic rivers provided transportation opportunities to local residents and businesses, as did the multiple turnpikes, plank roads, and railroads that traversed the area. As a result of its location between the major cities of New York and Philadelphia and between New England and the southern states, transportation has been a major component of New Jersey's history since the colonial period. New Jersey also supplied products and material to nearby cities—including grain, lumber, meat, and other regional exports—and New Jersey's Atlantic coast, its many navigable rivers, and its low-lying land corridors made it possible for myriad transportation networks to develop, most of which were oriented in a northeast-southwest direction connecting New York City and Philadelphia.

[1] The date ranges for these prehistoric periods is based on the timeline presented in the "New Jersey Statewide Historic Contexts" section of the *New Jersey Historic Preservation Plan* issued by NJHPO in 1997.

As the 19th century continued, railroads came to dominate transportation and New Jersey was at the forefront of railroad construction in the United States. In 1832, the New Jersey Railroad and Transportation Company (NJRR) was incorporated to construct a direct rail line across the archaeological APE between Trenton, New Jersey and New York City via a terminal and ferry located in Jersey City (Van Winkle 1924). The New Jersey Railroad later became part of the Pennsylvania Railroad. The Morris & Essex Railroad was chartered in 1835 to connect the New Jersey cities of Morristown and Newark. In 1836, the NJRR agreed to carry Morris & Essex traffic between Newark and Jersey City. In 1868, the Delaware, Lackawanna, and Western Railroad leased the Morris & Essex Railroad, including all of its branches (Lane 1939).

Following the development of the first railroads through the area in the 1860s and 1870s, Kearny was transformed from undeveloped meadow to a center of industry. During the last quarter of the 19th century, the Kearny Meadowlands experienced rapid industrial development due in part to new transportation routes and advances in land-making technology. The Pennsylvania Railroad became one of the most powerful rail lines in the northeastern United States at the turn of the 20th century. During that time, the rail line expanded its facilities, culminating with the construction of tunnels beneath the Hudson River—eliminating the need for ferries for the first time—and Pennsylvania Station in Manhattan in 1910 (Jonnes 2007). A new "double" track was constructed across the Meadowlands to the northeast towards Weehawken, where the tunnels connected to New York's Pennsylvania Station (Couper 1912). The new tracks crossed the meadows and wound around Snake Hill on an elevated embankment and across numerous bridges, including the Sawtooth Bridges, which were completed in 1907 (ibid).

The Pennsylvania Railroad transformed train travel in the early 20th century, and by the mid-20th century, New Jersey's transportation was again transformed by the advent of highways and motor vehicle traffic. The New Jersey Turnpike was constructed through the center of the archaeological APE in the mid-20th century, as the popularity of railroads began to decline.

C. EXISTING CONDITIONS

ARCHAEOLOGICAL RESOURCES

As described previously, the archaeological sensitivity of the archaeological APE was analyzed in a Phase 1A Archaeological Documentary Study of the archaeological APE that was prepared by AKRF, Inc. in August 2016. The conclusions and recommendations of the Phase 1A are summarized below. The Phase 1A is included in Appendix 1-D. In its letter dated April 3, 2017, the NJHPO concurred with the archaeological assessment.

PREHISTORIC ARCHAEOLOGICAL SENSITIVITY

The prehistoric sensitivity of project sites in the northeastern United States is generally evaluated by a site's proximity to level slopes, water courses, well-drained soils, and previously-identified prehistoric archaeological sites. While the archaeological APE was inundated, it would not have been an ideal site for camping or hunting and gathering, or seasonal occupation during the time that it was inundated. However, prior to the rise of sea levels several thousands of years ago, the site would have been dry land that may have been inhabitable by the earliest groups of humans that occupied the region during the prehistoric period.

The Phase 1A concluded that if undisturbed prehistoric ground surfaces are present at great depths beneath the project site, they would be considered to be archaeologically sensitive.

Potential archaeological resources at the Sawtooth Bridges replacement project site would be expected to be located at deposits at depths of approximately 10 to 30 feet or more below the ground surface, given the depths of alluvial soils and peat deposits as seen in soil borings from nearby areas. Given the extent to which railroad-related disturbance likely disturbed those depths, the Phase 1A concluded that the archaeological APE has low potential to yield intact prehistoric archaeological deposits overall. However, as stated in the Phase 1A, if the soils in this area are intact, they could potentially yield archaeological resources associated with the prehistoric occupation of the project site.

HISTORIC PERIOD ARCHAEOLOGICAL SENSITIVITY

As mentioned previously, the Phase 1A determined that the project site was occupied by inundated marshland until the early 19th century when the first railroad tracks were constructed through the area. No evidence exists to suggest that the project site was occupied during the historic period (including the 17th through the 20th centuries). A single map-documented structure not associated with railroad uses was located near the project site in the early 19th century. Historic maps indicate that this structure was located within unfilled marsh and it appears that this structure may have been used for agricultural purposes. Extensive development and redevelopment has occurred within the project site as a result of the construction and re-construction of various railroad-related structures, including bridges, berms, catenary poles, utilities, and other infrastructure. The Phase 1A concluded that the archaeological APE has no sensitivity for archaeological resources dating to the historic period.

ARCHITECTURAL RESOURCES

There are five previously identified architectural resources in the Sawtooth Bridges architectural APE, all of which have been determined eligible for the NRHP (see Table C-1 and Figure 3-5). Based on a survey of the architectural APE performed by a qualified architectural historian, no potential architectural resources (resources that have not been previously surveyed but which meet the NRHP Criteria) were identified within the architectural APE.

Pennsylvania Railroad New York to Philadelphia Historic District (Northeast Corridor, Pennsylvania to New York, within the architectural APE). The extension of the Pennsylvania Railroad, built over the first decade of the twentieth century, consisted of eight miles of electrified rail line between Midtown Manhattan and Newark, New Jersey. The same project also included the construction of New York Penn Station and a system of railroad tubes beneath the Hudson River between New York and New Jersey (completed in 1910). The Pennsylvania Railroad system also included several bridges that carry the railroad over water, marsh, and other railroads. The Sawtooth Bridges (Amtrak Bridges 7.80 and 7.96) were constructed as part of the Pennsylvania Railroad system in 1907. The Sawtooth Bridges were not specifically identified as contributing resources to Pennsylvania Railroad New York to Philadelphia Historic District in documentation describing that district on file with NJHPO. Furthermore, the historic integrity of the Sawtooth Bridges has been compromised due to several substantial repairs to the bridges during the late 20th century. However, the bridges are within the boundaries of the Historic District, were constructed during the period of significance identified for the Historic District, and relate to historical themes identified as relevant to the significance of the Historic District. As stated in NJHPO's letter dated April 3, 2017, both Amtrak Bridge 7.80 and 7.96 are considered contributing resources to the Pennsylvania Railroad New York to Philadelphia Historic District. The Pennsylvania Railroad New York to Philadelphia Historic District was determined eligible for the NRHP in 2002.

Old Main Delaware Lackawanna & Western Railroad (Morris & Essex Rail Line right-of-way from Hudson, Hoboken City, to Warren, Washington Township, and along Warren Railroad to the Delaware River; within architectural APE in Kearny). The Delaware Lackawanna & Western (DL&W) Railroad was chartered in 1815, to transport anthracite coal from Pennsylvania's Lackawanna Valley to Hoboken where it could be distributed to eastern markets. The DL&W Line later offered passenger service, allowing inhabitants of New Jersey towns and countryside to access the ferries to New York City located in Hoboken. The DL&W set standards for passenger service and safety at the turn of the century, and was the first line to use telephones rather than telegraphs for train dispatching. Suburban stations had a distinctive standardized design featuring hipped roofs and porches. The NJHPO determined the railroad eligible for the NRHP on September 24, 1996.

Table C-1
Architectural Resources within APE

Ref No	Resource Name	Location	Municipality in the APE	NRHP-Listed	NRHP-Eligible
1	Pennsylvania Railroad New York to Philadelphia Historic District	Northeast Corridor, Pennsylvania to New York	Kearny & Harrison		X
2	Old Main DL&W Railroad Historic District	Morris & Essex Railroad ROW from Hudson, Hoboken City, to Warren, Washington Twp., and along Warren Railroad to the Delaware River	Kearny		X
3	Substation 4	Northeast Corridor (former Pennsylvania Railroad) at New Jersey Turnpike, Milepost 7.2	Kearny		X
4	Hudson Tower	Between Northeast Corridor and Morris & Essex at eastern boundary of Harrison	Kearny		X
5	Pennsylvania Railroad Bay Branch Historic District	Traverses NJ Turnpike and Passaic River in APE	Newark and Kearny		X

Notes: See Figure 3-5 for reference.

Substation 4 (Northeast Corridor at New Jersey Turnpike, Kearny). The building at Substation 4 is a two-and-a-half-story red brick structure with large round-arched windows and doorways. The New Jersey Turnpike is located almost directly above the substation building. The building has a large stone plaque set into the façade, inscribed with the words "Sub-Station 4, Pennsylvania Railroad." According to the inventory form completed for this structure, the building contains a single room on the basement and second-story levels. The first floor contains a workspace and "separate battery and wash rooms for employees."

The Meadows Division of the Pennsylvania Railroad (now the Northeast Corridor) was completed and put into service in 1910. Substation 4 was built as part of the original DC electrical transmission system and supplied electric traction power to this section of the railroad. This portion of the railroad was converted to an AC system in the early 1930s. At the time of the

NRHP eligibility assessment for the substation (1994), the structure's function had already been replaced by the fenced-in compound designated as Substation 41. NJHPO determined the Substation 4 building eligible for the NRHP on September 12, 1994.

Hudson Tower (Northeast Corridor at Milepost 7.2, Kearny). The Hudson Tower was identified as NRHP-eligible by NJHPO in 1997 as part of an evaluation of multiple interlocking towers along the Northeast Corridor. The NJHPO's evaluation of the property (on file at NJHPO's offices) noted that interlocking towers represent a "significant and increasingly endangered property type," which are "commonly under-acknowledged in the development and expansion of railroads." The Hudson Tower specifically was determined eligible under Criterion C "as an intact example of an early twentieth century railroad signal tower representing the application of the 'automatic safety principle' to railroad operations to increase reliability and safety." It was also cited as the last remaining element of the former Manhattan Transfer Station, which was the point where steam locomotives were replaced with electric locomotives for passage through the tunnel to New York's Penn Station. This complex is significant for its association with the electrification of the railroads and was part of a cultural gateway to New York City. Therefore, the Hudson Tower was also determined eligible under Criterion A for its association with this complex and cultural history.

Pennsylvania Railroad New York Bay Branch Historic District (Newark and Kearny). Built in sections between 1889 and 1904 as part of the PRR's massive and comprehensive program to reach the Port of New York, the PRR New York Bay Branch Historic District (NJHPO Opinion: 4/22/2005) was determined eligible for the NRHP under Criterion A in the area of transportation for its contribution to the state's industrial, commercial, and urban expansion. The railroad became the critical link in both local and regional rail systems, enabling the PRR to secure a dominant place in the nation's busiest port and establishing itself as the country's largest railroad during the twentieth century. The PRR New York Bay Branch Historic District is also eligible under Criterion C for its significant engineering and collection of contributing bridges, culverts, yards, and surviving overhead electrified catenary system. The railroad's period of significance extends from 1889, when two predecessor railroads of the PRR New York Bay Branch Historic District received their corporate charters, to 1945, when the railroad completed the last transfer bridge at the contributing Greenville Yard Piers. The boundaries of the eligible historic district include the historic right-of-way.

D. NO ACTION ALTERNATIVE

ARCHAEOLOGICAL RESOURCES

Absent the Proposed Project, it is assumed that the potentially archaeologically sensitive depths within the archaeological APE would remain undisturbed. Therefore, the No Action Alternative would not result in impacts on archaeological resources.

ARCHITECTURAL RESOURCES

Under the No Action Alternative, the condition of the Sawtooth Bridges would continue to deteriorate. Extensive repairs to the Sawtooth Bridges would be necessary to maintain them as safe operable structures. These repairs would likely diminish their historic integrity, possibly resulting in an adverse effect to the Sawtooth Bridges, even if they were retained rather than

demolished. Moreover, the No Action Alternative would not satisfy the Proposed Project's purpose and need.

E. PROBABLE IMPACTS OF THE PROPOSED PROJECT

ARCHAEOLOGICAL RESOURCES

As described above, an adverse archaeological effect is defined as any disturbance or damage to a significant archaeological resource. Such an effect could occur if construction were to disturb the soil at the same depth where that resource was present. As described previously, the Phase 1A determined that the archaeological APE has low sensitivity for prehistoric resources at depths ranging between 10 to 30 feet and no sensitivity for historic period resources.

As described in the Phase 1A, if undisturbed prehistoric ground surfaces exist at great depths, they may contain archaeological resources that would provide new information about the earliest occupation of the Meadowlands area before the rise of sea levels. However, because the archaeological APE is located at the confluence of several very active rail corridors, no soil borings can be advanced within the boundaries of the project site at this time. Therefore, the extent to which the alluvial soils present beneath the project site have survived the deep disturbance associated with the construction of the railroads, bridges, and their associated utilities is unknown. In those locations where deep disturbance has already occurred, such as the locations of the Sawtooth Bridges themselves, it is expected that there is little chance that archaeologically sensitive depths would remain intact. However, other areas that have not been subjected to deep disturbance, such as the portions of the rail corridor that have been built up and do not contain utilities, could contain undisturbed alluvial soils that could contain archaeological resources. As recommended in the Phase 1A, when the project design is advanced and additional information is known regarding the specific sub-surface impacts of the Proposed Project, those plans will be reviewed by a qualified archaeologist. It is expected that during the engineering phase, the project team will be able to complete a geophysical investigation of the archaeological APE that would involve a series of geotechnical borings. Upon the completion of that investigation, the archaeologists' review of soil boring logs will determine if the Proposed Project could potentially impact archaeologically sensitive depths and to determine those locations where monitoring will be required, should any exist.

If the alluvial soils are determined to be absent within the archaeological APE, no additional archaeological analysis would be required. In the event that soil borings indicate that the potentially sensitive alluvial soil layers are present, or if the results are ambiguous, the Phase 1A recommended archaeological monitoring for those areas where the construction of the Proposed Project would result in disturbance to depths ranging between 10 and 30 feet below the ground surface in previously undisturbed areas. No monitoring was recommended in those locations where deep disturbance has already occurred, such as within the footprints of the existing bridges and in locations where piles have been driven to support the existing tracks.

Finally, in the event that the proposed construction methodology would not allow an archaeologist to monitor the site at depths ranging between 10 and 30 feet below the ground surface (e.g., in those locations where piles will be driven), then no archaeological monitoring is recommended. Prior to any archaeological monitoring, an archaeological monitoring program will be developed in consultation with NJHPO to further investigate the archaeological sensitivity of those areas.

To avoid impacts on archaeological resources, Amtrak will perform additional archaeological investigation as appropriate as described above and as outlined in a Memorandum of Agreement (MOA) between FRA, NJHPO, and Amtrak.

ARCHITECTURAL RESOURCES

As described below, the Proposed Project will not affect the following architectural resources: the Old Main Delaware, Lackawanna, & Western Historic District (NRHP-eligible); Substation 4 (NRHP-eligible); Hudson Tower (NRHP-eligible); or the Pennsylvania Railroad New York Bay Branch Historic District (NRHP-eligible). None of these resources would be directly affected by project construction. Furthermore, while the context of these resources would be somewhat altered by the removal of the existing Sawtooth Bridges and the construction of new bridges carrying the Northeast Corridor, the overall context of these resources is not expected to be substantially changed. The Proposed Project would replace existing railroad-related structures with new railroad-related structures, and therefore, the use, atmosphere, and overall conditions of the resources' context would remain largely the same.

The Proposed Project would have a direct effect on the Pennsylvania Railroad New York to Philadelphia Historic District (NRHP-eligible), since it would result in the removal of the Sawtooth Bridges, which are considered a contributing element within that Historic District. As set forth in the draft MOA, ongoing consultation will be undertaken among FRA, NJHPO, and Amtrak as project engineering proceeds to minimize or mitigate the adverse effects to the Pennsylvania Railroad New York to Philadelphia Historic District.

While the Pennsylvania Railroad New York to Philadelphia Historic District retains historic integrity overall, it should be noted that the historic district in the architectural APE has undergone extensive alterations. In the 1990s, the Kearny Connection was created by linking the New Jersey Transit Morristown Line (Morris & Essex Railroad) with the NEC (Hanley 1991). Other improvements were made in the late-20th and early-21st century as part of the use and maintenance of the active rail corridor, including track work, the construction of instrument houses and other modifications to allow for high speed rail service at the Kearny Connection and the surrounding area (Railway Age 1995). The Portal Signal Tower was demolished in the mid-1990s, further altering the fabric of the historic district. In addition to these alterations, numerous 'state of good repair' projects have replaced or repaired rail, ties, ballast, catenary system components, and other physical features of the Northeast Corridor in the architectural APE. Furthermore, substantial changes were made to the Sawtooth Bridges in 1996 and in 2004, including repairs of cracked girders and encasing columns in concrete. In light of the extensive recent alterations to the fabric and appearance of the Pennsylvania Railroad New York to Philadelphia Historic District in the architectural APE, the anticipated effects of the Proposed Project would be adverse insofar as they would add to the cumulative alterations of the resource's original fabric and appearance that have occurred in the architectural APE in recent decades.

No physical changes are proposed to Substation 4 (NRHP-eligible) or the Hudson Tower; however, project-related construction could occur in close proximity to Substation 4, and therefore could result in accidental damage to the resource. Ongoing consultation will be undertaken among FRA, NJHPO, and Amtrak as project designs progress. As part of this consultation, protection measures, in the form of a Construction Protection Plan, will be developed in consultation with NJHPO, as set forth in the project's draft MOA. The

Construction Protection Plan will set forth the specific measures to be used, and specifications that will be applied, to protect these architectural resources during the construction period.

CUMULATIVE IMPACTS

A number of federally funded projects along the Pennsylvania Railroad New York to Philadelphia Historic District are underway and/or in the planning or engineering stages. Some of these projects will add to the extensive alterations of the Historic District since the time that it was determined NRHP-eligible in on October 2, 2002. The Portal Bridge Capacity Enhancement Project and other projects along the Northeast Corridor in the area would remove or alter features that contribute to the historic character of the Pennsylvania Railroad New York to Philadelphia Historic District. In combination with the impacts of these other projects, the proposed project would further diminish the integrity of the Historic District. However, notwithstanding these incremental changes to the Historic District, the property would remain NRHP-eligible. No cumulative impacts on this or other historic properties in the APE have been identified.

F. MITIGATION MEASURES

As mandated by Section 106 of the NHPA of 1966, FRA and Amtrak have participated in an ongoing consultation process with the NJHPO with respect to potential effects on archaeological and architectural resources. As part of this ongoing process, measures have been explored to avoid, minimize, or mitigate adverse effects to archaeological and architectural resources. Development of these measures is set forth in a draft MOA, to be executed by FRA, NJHPO, and Amtrak as part of this NEPA documentation. The draft MOA (see Appendix 1-B) includes the following provisions:

- Amtrak will produce documentation of the Sawtooth Bridges that is consistent with the standards of the NPS Level II Historic American Engineering Record (HAER) documentation.
- Amtrak will prepare and implement a Construction Protection Plan (CPP) to avoid construction-related damage to historic properties within close proximity to Proposed Project activities.
- Amtrak will ensure that the preliminary and final plans and specifications for the proposed new bridges adhere to the *Secretary of the Interior's Standards and Treatments for Historic Properties* and are compatible with the historical character of the Pennsylvania Railroad Historic District.
- Amtrak will consult with FRA and NJHPO in the development of bridge plans at the preliminary (30 percent) and pre-final (approximately 75 percent) design stages.
- Amtrak will reevaluate the period of significance for the Pennsylvania Railroad New York to Philadelphia Historic District.
- If Amtrak's archaeologist, in consultation with FRA and NJHPO, determines that archaeological monitoring is warranted, Amtrak will develop an archaeological monitoring plan in consultation with FRA and NJHPO. Any monitoring plan developed in consultation with NJHPO will include provisions for consulting with Indian Tribes, as appropriate, in the event of a discovery.

- If potentially significant archaeological resources are encountered during monitoring, Amtrak and FRA will consult with NJHPO pursuant to 36 CFR 800.4(b) to complete identification efforts.

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Appendix 1 – D

PHASE 1A ARCHAEOLOGICAL DOCUMENTARY STUDY

Phase 1A Archaeological Documentary Study:

Sawtooth Bridges Replacement Project

Kearny, Hudson County, New Jersey

Prepared for:

National Railroad Passenger Corporation (Amtrak)
30th Street Station
2955 Market Street, 5th Floor South
Philadelphia, PA 19104

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016

August 2016

Executive Summary

INTRODUCTION AND PROJECT DESCRIPTION

The National Railroad Passenger Corporation (Amtrak) is proposing the Sawtooth Bridges Replacement Project in the Town of Kearny and the Town of Harrison in Hudson County, New Jersey (see **Figure 1**). The project would involve the replacement of Amtrak Bridges No. 7.80 and No. 7.96, which are collectively referred to as the "Sawtooth Bridges." Amtrak Bridge No. 7.80 carries Amtrak's Northeast Corridor (NEC) over four New Jersey Transit Corporation (NJ TRANSIT) rail tracks that serve the Morris & Essex Line. Amtrak Bridge No. 7.96 carries the NEC over one Port Authority Trans-Hudson Corporation (PATH) Newark–World Trade Center (WTC) rail track and one Conrail Center Street Branch rail track. The Sawtooth Bridges are located along a critical segment of the NEC between Newark, New Jersey and New York, New York. The project site includes an approximately 1.1-mile long segment of the NEC in Harrison and Kearny, New Jersey, located roughly between mile post (MP) 8.3 on the west end (Hudson Interlocking) and MP 7.2 (Swift Interlocking) on the east end.

This document has been prepared in accordance with the National Environmental Policy Act (NEPA); the New Jersey Register of Historic Places Act (NJSA); Section 4(f) of the United States Department of Transportation (DOT) Act; and Section 106 of the National Historic Preservation Act of 1966 (as amended) and associated implementing regulations in 36 C.F.R. 800. Per Subpart A, Section 800.2(a)(3) and 800.2(c)(4) of 36 C.F.R. 800, FRA is authorizing the project sponsors, as an applicant for federal approvals, to prepare information, analyses, and recommendations regarding Section 106 consultation for the referenced project. Copies of this report will be on file at Amtrak, FRA, and NJHPO.

CONCLUSIONS

As part of the background research for this Phase 1A Archaeological Documentary Study, various primary and secondary resources were analyzed, including historic maps and atlases, historic photographs and lithographs, newspaper articles, and local histories.

PREHISTORIC ARCHAEOLOGICAL SENSITIVITY ASSESSMENT

The prehistoric sensitivity of project sites in the northeastern United States is generally evaluated by a site's proximity to level slopes, water courses, well-drained soils, and previously-identified prehistoric archaeological sites. The project site was historically inundated tidal marsh that was filled as the site was converted for rail use. The project site would therefore not have been an ideal site for camping or hunting and gathering, or seasonal occupation during the time that it was inundated. However, prior to the rise of sea levels several thousands of years ago, the site would have been dry land that may have been inhabitable by the earliest groups of humans that occupied the region during the prehistoric period. Soil borings suggest that the boundary between alluvial soils and glacial till, possibly representing the pre-marsh ground surface within the project site, is situated between 10 and 30 feet below the current ground surface. It is therefore possible that a precontact ground surface could have been located at that depth at one time. However, such a ground surface may have been extensively disturbed as a result of disturbances associated with driving piles and constructing deep foundations to support the rail structures within the landfill.

If undisturbed prehistoric ground surfaces are present at great depths beneath the project site, they would be considered to be archaeologically sensitive. Given the extent to which railroad-related disturbance likely disturbed those depths, the project site is determined to have low potential to yield intact prehistoric archaeological deposits at depths of approximately 10 to 30 feet or more below the ground surface. If the soils in this area were intact, they could potentially yield archaeological resources associated with the prehistoric occupation of the project site.

HISTORIC PERIOD ARCHAEOLOGICAL SENSITIVITY ASSESSMENT

The project site was occupied by inundated marshland until the early 19th century when the first railroad tracks were constructed through the area. No evidence exists to suggest that the project site was occupied during the historic period with the exception of a possibly nursery/seed production facility. Extensive development and redevelopment has occurred within the project site as a result of the construction and re-construction of various railroad-related structures, including bridges, berms, catenary poles, utilities, and other infrastructure. The project site is therefore determined to have no sensitivity for archaeological resources dating to the historic period.

RECOMMENDATIONS

The project site has been determined to have low sensitivity for prehistoric resources at depths greater than 10 to 30 feet and no sensitivity for historic period resources. If undisturbed prehistoric ground surfaces exist at great depths, they may contain archaeological resources that would provide new information about the earliest occupation of the Meadowlands area before the rise of sea levels. However, because no soil borings can be advanced within the boundaries of the project site, the extent to which the alluvial soils present beneath the project site have survived the deep disturbance associated with the construction of the railroads, bridges, and their associated utilities is unknown. In those locations where deep disturbance has already occurred, such as the locations of the Sawtooth Bridges themselves, it is expected that there is little chance that archaeologically sensitive depths would remain intact. However, other areas that have not been subjected to deep disturbance, such as the portions of the rail corridor that have been built up and do not contain utilities, could contain undisturbed alluvial soils that could contain archaeological resources.

Archaeological monitoring is recommended for those areas where the construction of the proposed project would result in disturbance to depths greater than 10 feet below the ground surface in previously undisturbed areas. No monitoring is recommended in those locations where deep disturbance has already occurred, such as within the footprints of the existing bridges and in locations where piles have been driven to support the existing tracks. When the project design is advanced and additional information is known regarding the specific sub-surface impacts of the Proposed Project, those plans will be reviewed by a qualified archaeologist. The archaeologist will determine if the Proposed Project could potentially impact archaeologically sensitive depths and to determine those locations where monitoring will be required, should any exist. In the event that soil borings can be advanced within the project site, they should also be reviewed by an archaeologist to determine if potentially sensitive alluvial deposits such as those observed in adjacent areas are present within the project site to further clarify those locations that would require archaeological monitoring during construction. Finally, in the event that the proposed construction methodology would not allow an archaeologist to monitor the site at depths greater than 10 feet (e.g., in those locations where piles will be driven), then no archaeological monitoring is recommended. Prior to any archaeological monitoring, an archaeological monitoring program will be developed in consultation with NJHPO to further investigate the archaeological sensitivity of those areas.

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Chapter 1: Introduction and Methodology

A. INTRODUCTION

The National Railroad Passenger Corporation (Amtrak) is proposing the Sawtooth Bridges Replacement Project in the Town of Kearny and the Town of Harrison in Hudson County, New Jersey (see **Figure 1**). The project would involve the replacement of Amtrak Bridges No. 7.80 and No. 7.96 which are collectively referred to as the "Sawtooth Bridges." Amtrak Bridge No. 7.80 carries Amtrak's Northeast Corridor (NEC) over four New Jersey Transit Corporation (NJ TRANSIT) rail tracks that serve the Morris & Essex Line. Amtrak Bridge No. 7.96 carries the NEC over one Port Authority Trans-Hudson Corporation (PATH) Newark–World Trade Center (WTC) rail track and one Conrail Center Street Branch rail track. The Sawtooth Bridges are located along a critical segment of the NEC between Newark, New Jersey and New York, New York. The project site includes an approximately 1.1-mile long segment of the NEC in Harrison and Kearny, New Jersey, located roughly between mile post (MP) 8.3 on the west end (Hudson Interlocking) and MP 7.2 (Swift Interlocking) on the east end. The project is just north of a bend in the Passaic River.

The Sawtooth Bridges were constructed in 1907 and are nearing the end of their functional life. Efforts were made to rehabilitate the bridges in the 1980s, however, recent inspections have indicated that the Sawtooth Bridges continue to deteriorate and exhibit fatigue. Amtrak conducted an inspection and condition survey in 2013, which found the Sawtooth Bridges to be in poor to very poor condition with some components that might be characterized as serious and in need of replacement (Portal Partners 2013a). The increasing age of the Sawtooth Bridges, their structural condition, and their two speed-restricted tracks limit the efficiency and reliability of rail operations along the bridges and in this segment of the NEC. In addition, demand for rail service along the NEC is at record levels. The NEC cannot continue to readily accommodate this rising demand without difficulties due to infrastructure that is highly constrained and in need of repair. The replacement of the Sawtooth Bridges is critical to Amtrak and other users of the NEC as well as to adjacent railroads.

This document has been prepared in accordance with the National Environmental Policy Act (NEPA); the New Jersey Register of Historic Places Act (NJSA); Section 4(f) of the United States Department of Transportation (DOT) Act; and Section 106 of the National Historic Preservation Act of 1966 (as amended) and associated implementing regulations in 36 C.F.R. 800. Per Subpart A, Section 800.2(a)(3) and 800.2(c)(4) of 36 C.F.R., FRA is authorizing the project sponsors, as an applicant for federal approvals, to prepare information, analyses, and recommendations regarding Section 106 consultation for the referenced project. The principle investigator for this Phase 1A Archeological Documentary Study was Elizabeth D. Meade, MA, RPA (see **Appendix A**). Portions of the report were researched and written by Molly McDonald, MA, RPA and additional research assistance was provided by JoLayne S. Morneau, MS.

B. PROPOSED PROJECT DESCRIPTION

The project site is located in the Hackensack Meadowlands District in northeastern New Jersey. The area of potential effect (APE) for archaeological resources includes all areas that could experience ground

disturbance under the Proposed Project alternatives (see **Figures 1 and 2**). The project site analyzed in this Phase 1A Archaeological Documentary Study therefore includes those portions of the NEC that will be subjected to subsurface impacts as part of the Proposed Project (described below).

The Proposed Project will include the decommissioning and removal of the Sawtooth Bridges; an increase in the number of tracks from two to four; and the construction of three new bridges along the NEC to enhance its efficiency, speed, and reliability. The three new bridges will include: 1) a single-track viaduct to carry Morris & Essex Line Track 5; 2) a two-track viaduct to carry NEC Tracks 3 and 4 (and to temporarily carry NEC Tracks 2 and 3 during the construction period); and 3) a two-track viaduct to carry NEC Tracks 1 and 2. Other adjustments to various NEC railroad elements will be necessary, including the relocation of interlockings and crossovers; the realignment of Conrail's Center Street Branch; and the installation of new catenary supports and catenary poles.

Amtrak, NJ TRANSIT, Conrail, and PATH each own various parcels in the project area. The Sawtooth Bridges Replacement Project would be constructed entirely within existing railroad right-of-way. No residential or business displacements would occur. The project will require property acquisition among railroads, as well as easements across various property types, as follows:

- The relocated NJ TRANSIT Track 5 will partially be on property owned by Conrail. This property will likely be purchased from Conrail for NJ TRANSIT;
- Proposed Tracks 3 and 4 (temporary Tracks 3 and 2) will require aerial or bridge easements from NJ TRANSIT, PATH, and Conrail;
- Track alignments will pass under the New Jersey Turnpike, which has easements over the NEC;
- Two gas valving facilities owned by Williams-Transco and PSE&G will need to be relocated;
- Third-party fiber optic lines will need to be temporarily relocated, requiring a temporary construction easement from the Town of Kearny; and
- Right-of-entry permits with adjacent railroads and temporary access permits with the New Jersey Turnpike Authority will be required to access the site for construction.

There are four foundation types that were evaluated for the proposed Sawtooth Bridge replacement structures new north and south viaducts and retaining walls, including: spread footings, driven pipe piles, drilled shafts and micropiles. Spread footings may be suitable for support of some types of retaining walls. For the viaduct structure, deep foundations are a more suitable option. Micropiles are a well-suited alternative because subsurface disturbance to those facilities are minimized in comparison to drilled shafts and driven steel pipe piles.

C. HISTORIC DISTRICTS WITHIN THE PROJECT SITE

The project site is partially located within two historic districts that are eligible for listing on the State and National Registers (S/NR) of Historic Places (see **Figure 2**). The first is the Pennsylvania Railroad New York to Philadelphia Historic District, which covers the tracks of Amtrak's Northeast Corridor between Pennsylvania and New York. The 8-mile electrified rail extension of the Pennsylvania Railroad was built during the first decade of the 20th century between Midtown Manhattan and Newark, New Jersey. The development project also included the construction of New York Pennsylvania Station (PSNY) and a system of railroad tubes beneath the Hudson River between New York and New Jersey, completed in 1910, which was an engineering marvel that changed the nature of railroad operations in New York City and the surrounding region. The Pennsylvania Railroad system also included several bridges, including the Sawtooth Bridges, which carry the railroad over water, marsh, and other railroads. The Pennsylvania Railroad New York to Philadelphia District, now known as the Northeast Corridor, was determined to be S/NR-eligible by NJHPO in 2002.

The second historic district, which covers a smaller portion of the project site, is the Old Main Delaware Lackawanna & Western Rail Road (DL&WRR) Historic District on the Morris & Essex Rail Line right-of-way now operated by NJ TRANSIT. The DL&WRR was chartered in 1815 and was initially constructed to transport anthracite coal from Pennsylvania's Lackawanna Valley to Hoboken where it could be distributed to eastern markets. The portion of the DL&WRR that runs between Newark and New York City was constructed in the early 1860s and became incorporated into the DL&WRR in 1868. The DL&WRR Line later offered passenger service, allowing inhabitants of New Jersey towns and countryside to access the ferries to New York City located in Hoboken. The DL&WRR set standards for passenger service and safety at the turn of the 20th century, and was the first line to use telephones rather than telegraphs for train dispatching. Suburban stations had a distinctive standardized design featuring hipped roofs and porches. The NJHPO determined that the DL&WRR Historic District is S/NR-eligible on September 24, 1996.

D. RESEARCH GOALS AND METHODOLOGY

The following Phase 1A Archaeological Documentary Study of the Sawtooth Bridges Replacement project site has been designed to follow the guidelines and standards for archaeological investigations issued by NJHPO. The study documents the development history of the proposed project site as well as its potential to yield archaeological resources, including both prehistoric and historic cultural resources. In addition, this report documents the current conditions of the project site and previous cultural resource investigations that have taken place in the vicinity.

This Phase 1A Archaeological Documentary Study has four major goals: (1) to determine the likelihood that the project site was occupied during the prehistoric (i.e., Native American) and/or historic periods; (2) to determine the effect of subsequent development and landscape alteration on any potential archaeological resources that may have been located at the project site; (3) to make a determination of the project site's potential archaeological sensitivity; and (4) to make recommendations for further archaeological analysis, if necessary. The steps taken to fulfill these goals are explained in greater detail below.

The first goal of this documentary study is to determine the likelihood that the project locations were inhabited during the prehistoric or historic periods and identify any activities that may have taken place on the project site that would have resulted in the deposition of archaeological resources. In order to determine the likelihood of the project site's occupation during the prehistoric and historic periods, documentary research was completed to establish a chronology of the project site's development, landscape alteration, and to identify any individuals who may have owned the land or worked and/or resided there, and to determine if buildings were present on the project locations in the past.

Data was gathered from various published and unpublished primary and secondary resources, such as historic maps, topographical analyses (both modern and historic), historic photographs, newspaper articles, local histories, and previously conducted archaeological surveys. These published and unpublished resources were consulted at various repositories. Online textual archives, such as Google Books and the Internet Archive Open Access Texts, were also accessed. Information concerning known and potential archaeological resources in the project site was obtained through a review of previously conducted cultural resource investigations performed in the project site vicinity, listings of previously identified archaeological sites on file at the New Jersey Historic Preservation Office (NJHPO) and the New Jersey State Museum (NJSM). Finally, a site walkover was conducted to observe current site conditions, including any visible evidence of past disturbance.

The second goal of this Phase 1A study is to determine the likelihood that archaeological resources could have survived intact on the project site after development and landscape alteration (i.e., erosion, grading,

filling, etc.). Potential disturbance associated with paving and utility installation was also considered. Historic maps documenting structures on the project location were analyzed and historic and current topographical maps were compared to determine the extent to which the project locations have been disturbed. After identifying the likelihood that archaeological resources were deposited on the project site and the likelihood that they could remain intact given subsequent development and landscape alteration, a sensitivity determination was made for the project locations for both prehistoric and historic period resources.

The third goal of this study was to make a determination of the project site's archaeological sensitivity. The "Guidelines for Phase 1 Archaeological Investigations" issued by NJHPO[1] indicate that four categories of sensitivity should be considered: No sensitivity; low sensitivity; medium/moderate sensitivity; and high sensitivity. For the purposes of this study, those terms are defined as follows:

- No Sensitivity: Those locations that have been sufficiently disturbed to the extent that archaeological resources could not survive intact.
- Low: Areas of low sensitivity are those where the original topography would suggest that Native American sites would not be present (i.e., locations at great distances from fresh and salt water resources), locations where no historic activity occurred before the installation of municipal water and sewer networks, or those locations determined to be sufficiently disturbed so that archaeological resources are not likely to remain intact.
- Medium/Moderate: Areas with topographical features that would suggest Native American occupation, documented historic period activity, and with some disturbance, but not sufficient disturbance to eliminate the possibility that archaeological resources are intact on the project site.
- High: Areas with topographical features that would suggest Native American occupation, documented historic period activity, and minimal or no documented disturbance.

As mentioned above, the fourth goal of this study was to make recommendations for additional archaeological investigations where necessary. Phase 1B testing is generally warranted for areas determined to have moderate sensitivity or higher. Archaeological testing is designed to determine the presence or absence of archaeological resources that could be impacted by a proposed project. Should they exist at the project locations, such archaeological resources could provide new insight into the prehistoric occupation of the Passaic River waterfront, the transition from Native American to European settlement, or the historic period occupation of the project site.

[1] Accessible at: http://www.nj.gov/dep/hpo/1identify/arkeoguide1.htm.

Chapter 2: Background Research

A. INTRODUCTION

This chapter provides a summary of background research that was completed to identify and define the environmental context and physical setting of the project site (including geology, topography, soils, and hydrology); the characteristics of the Paleoenvironment (the physical setting prior to the time of European settlement); the site's current conditions and vegetation; and a brief description of previous archaeological investigations that have taken place in the vicinity. Additional, more extensive background research was completed to identify the occupation and development histories of the project site during the prehistoric and historic periods. That information is summarized in greater detail in **Chapter 3: Prehistoric Period** and **Chapter 4: The Historic Period**.

B. ENVIRONMENTAL AND PHYSICAL SETTINGS

GEOLOGY AND BEDROCK

The project site is located within the Newark Basin portion of New Jersey's Piedmont Physiographic Province (New Jersey Department of Environmental Protection [NJDEP] 1999). This area is characterized by the Meadowlands of the Hackensack River Valley. The project site is located in a lowland area characterized by recent "beach and estuarine deposits" dating to the Holocene, beginning around 12,000 years ago, concurrent with the arrival of the first humans in the region (ibid). Also called the "Newark Basin," bedrock in the area "consists mainly of gently inclined strata of Upper Triassic red sandstones and shales, but includes interbedded green and black shales and some conglomerates" (Schuberth 1968: 14).

The Meadowlands area is surrounded by bedrock dating to the Triassic and Jurassic periods and was formed between approximately 230 to 190 million years ago (Schuberth 1968). To the north and west of the APE, bedrock is characterized by siltstone, shale, sandstone, and conglomerate sedimentary rock and to the east, the bedrock is composed of diabase (ibid). To the northeast of the site, on the eastern side of the Hackensack River, is Snake Hill, a diabase rock outcrop that is part of the Bergen Ridge. Snake Hill and a second, smaller hill known as Little Snake Hill located to the southeast, represent "two small intrusive plugs…[that] probably represent small offshoot stringers of diabasic magma that departed from the major Palisades igneous mass as it moved into the Newark Strata" (ibid: 153). The diabase intrusions stand significantly higher than the surrounding lowlands largely as a result of diabase's resistance to erosion, as compared to the sandstone of the areas to the west (ibid).

HYDROLOGY

The project site is situated on the northern shore of the Passaic River, approximately 1.5 miles north of its confluence with the Hackensack River and Newark Bay. As described above, the site is located within the Meadowlands, which were named for the thick tracts of tidally-inundated salt marsh that covered the area surrounding the confluence of the Passaic and Hackensack Rivers. The existing Cedar Creek Marsh is located to the north and south of the eastern portion of the project site. The creek that drains the marshes

into the Passaic River runs beneath the railroad tracks through a culvert in this location (Portal Partners 2013b). Additional wetlands are mapped in the vicinity of the project site to the west of the New Jersey Turnpike (ibid).

Historic maps—including the 1844-1845 Hassler coastal survey (see **Figure 3**), the 1844 and 1847 Smith maps, the 1849 Sidney map, and the 1873 Hopkins map—depict the low-lying area before landfilling dramatically changed the landscape in the vicinity. While significant portions of the marsh were filled as part of transportation projects (including rail and highway corridors), portions of the Meadowlands remain inundated, including areas to the north and south of the central and eastern portions of the project site (see **Figure 1**). Maps published in the late 19th and early 20th century (e.g., the 1891 Bien and Vermule atlas and the 1891 and 1900 USGS maps) reflect the filling of the area immediately surrounding the project site on the northern side of the Passaic River, although mid-20th century USGS maps again depict portions of that area as tidal marsh.

Maps depict two substantial creeks that drained the marshland, "Frank's Creek," near the western end of the project site, and an unnamed creek near the eastern end that is now part of the Cedar Creek Marshes. Frank's Creek was a substantial stream that extended several miles north of the Passaic River. Portions of the creek are still extant and in the vicinity of the project site, the creek runs through a culvert beneath the railroad tracks. Railroad uses in the surrounding area caused significant changes to the stream, and by the early 20th century it was:

> *…crossed near the mouth by a great railway grade, bearing the four regular tracks of the Pennsylvania Railroad, the two regular tracks of the Delaware, Lackawanna & Western Railroad, and a number of siding tracks. The creek penetrates this grade through a concrete culvert which has an upstream opening twelve feet wide and six feet high. In this opening are fitted two large tide gates, by means of which the water passes out at low tide…IN addition to the interference which the various grades crossing it set up…the creek is called upon to drain a very much larger area than formerly, and to make matters still worse it is expected to carry the raw sewage of Kearny from that town to the Passaic River. The natural and normal result followed—the channel of Frank Creek became filled with sediment and the sewage spread over sections of the marsh along the banks* (New Jersey State Agricultural Experiment Station 1914: 412-413).

The Hackensack and Passaic Rivers originally contained a sufficient quantity of fresh water that they were used as cattle watering locations (Marshall 2004). The saline content of the rivers increased during the 19th and 20th centuries as a result of engineering projects (e.g., the construction of dams and mill ponds) that altered the rivers' course (ibid). Fresh water was further depleted after the Hackensack Water Company began pumping water from the area to neighboring cities (ibid). In the early 20th century, larger-scale dams were constructed in the Hackensack River watershed as the local population expanded and required increased water supply (ibid). The increase in salinity resulted in a change in the plant life in the area over the last two centuries; fresh-water plants, such as common reed (*Phragmities australis*), have been replaced by salt-water plants, such as cordgrass (*Spartina alterniflora*) (ibid). By the late 20th century, the Meadowlands had earned a negative reputation, as an unhealthy and largely unproductive wasteland, unusable for agriculture or development.

TOPOGRAPHY

The modern landscape of the project site is radically different than what was seen a century ago, as landfilling has transformed the former marshlands into dry, developable land. West of the New Jersey Turnpike, the tracks of Amtrak's Northeast Corridor, along the southern side of the project site, run along an artificial, elevated berm and the Sawtooth Bridges. The berm slopes down towards the adjacent grade

near the western end of the project site. To the north of these elevated tracks and passing beneath the Sawtooth Bridges, the existing tracks of the NJ TRANSIT Morris & Essex Line are located on a built-up, gravelly area that is several feet above the ground surface of the adjacent wetlands to the north. Based on comparisons with historic maps, it would appear that the project site is constructed on landfill placed in the Meadowlands in the 19th and 20th centuries as part of the construction of the existing rail line.

SOILS

The United States Department of Agriculture (USDA) National Resources Conservation Service's Web Soil Survey indicates that the project site, along with the entire Amtrak rail corridor in the project vicinity, is characterized by a single soil complex known as "Urban Land, wet substratum" ("URWETB") (see **Figure 4**). This soil type is summarized below in **Table 1**. Immediately to the north of the rail corridor, except in those locations that are underwater, soils are mapped as "Westbrook Mucky Peat," ("WectA") and "Secaucus artifactual fine sandy loam" ("SecA"). As shown in **Table 1**, the three soil types vary in terms of slope, drainage, and landform. However, the rail corridor itself does appear to be urban fill surrounded by areas of open water or deposits typical of marshland.

Table 1
Project Area Soils

Series Name	Soil Horizon Depth (in inches)	Texture	Slope (%)	Drainage	Landform
URWETB	**M1**: 0 to 6	"Material"	0 to 8	Depth to water table = 20 inches	Summit
	M 2: 6 to 20	"Material"			
	2^Cu: 20 to 79	Coarse sandy loam			
SecA	**^Au**: 0 to 6	Gravelly-artifactual fine sandy loam	0 to 3	Moderately well drained	Backslope
	^Cu1: 6 to 17	Very artifactual fine sandy loam			
	^Cu2: 17 to 35	Extremely cobbly-artifactual fine sandy loam			
	^Cu3: 35 to 65	Extremely cobbly-artifactual fine sandy loam			
WectA	**Oe**: 0 to 19	Mucky peat	0 to 2	Very poorly drained	Tidal marsh
	Cg: 19 to 59	Silt loam			
Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture: Web Soil Survey. Available online at: http://websoilsurvey.nrcs.usda.gov/. Accessed July, 2015.					

SUMMARY OF SOIL BORINGS FROM THE VICINITY OF THE PROJECT SITE

For the purposes of this analysis, several sets of soil boring data from the immediate vicinity of the project site were analyzed. All of the boring logs that were analyzed were included as appendices in Portal Partners' 2013 Alternatives Analysis for the Sawtooth Bridges Project (Portal Partners 2013b). Soil boring logs described in this section are included as **Appendix B**.[1]

The most recent information was associated with soil borings completed between 2008 and 2012 as part of the Portal Bridge Capacity Enhancement (PBCE) Project (described in greater detail in **Section F: "Previous Cultural Resources Investigations in the Vicinity"**). These borings were completed across a portion of the project site east of the New Jersey Turnpike. The borings appear to have been located adjacent to the railroad tracks within or in the immediate vicinity of the existing marshland on both the

[1] The soil boring logs included in Appendix B originally appeared as Appendix K in Portal Partners 2013b.

north and south sides of the existing rail lines. The borings were advanced to great depths and encountered bedrock or weathered/decomposing bedrock at depths between 60 and 100 feet below the ground surface, with the depth of bedrock increasing to the east. The upper levels of each of the borings (between the ground surface and a depth of 40 feet) present a typical profile of fill or organic material at the ground surface; then a deposit of alluvium; then a very thick layer of glacial till. The threshold between the alluvial deposits and the underlying glacial till—possibly representing the ground surface before the rise of sea levels—was identified at varying depths, but was typically observed between 20 and 30 feet below the ground surface.

Additional borings were completed in 1972, 1977, and 1979 as part of various improvement projects associated with the Bellville Turnpike; the Erie Lackawanna Railroad; and the reconstruction of the Newark-Jersey City Turnpike, respectively. One boring was advanced in 1979 east of the Newark-Jersey City Turnpike and south of the railroad tracks—to the northeast of the project site—that identified a layer of organic silt between 7.5 and 9 feet beneath the ground surface. The 1977 boring program was located along the southern side of the rail line west of the New Jersey Turnpike. Three of those borings identified a thin (approximately 1 to 2 feet in thickness) layer or of peat and/or silt at varying depths of 8 to 17 feet below the ground surface. Finally, one of the borings advanced in 1972 identified a peat layer at approximately 7 to 8 feet beneath the ground surface within the location of what was then a proposed new track west of the New Jersey Turnpike and north of the Pennsylvania Railroad tracks.

The combined results of these borings suggest that the pre-inundation ground surface was at variable depths across the project site and surrounding vicinity. The presence of peat or organic silts likely represents what was the bottom of the marsh prior to landfilling. The alluvial soils identified between approximately 10 and 30 feet below the ground surface (the exact depths varied greatly among the borings) are likely similar to alluvial sands identified as archaeologically sensitive at other nearby sites (see below).

C. REGIONAL PALEOENVIRONMENT

Due to the extended glacial period that left the Northeast blanketed in thick ice sheets for thousands of years, the area was not inhabited by humans until approximately 12,500 years ago. The retreat of the glaciers caused sea levels to rise and New Jersey's shoreline may have been as much as 85 feet lower and 80 miles away from its present location when the first Native Americans arrived in the region (NJHPO 1997). With the increase in temperatures and sea levels and the formation of new waterways fed by glacial runoff, a variety of flora and fauna spread throughout the region. At this time, large open conifer forests expanded across the northeast, interspersed with open meadows and marshland (NJHPO 1997; Cantwell and Wall 2001). A wide variety of animal life could also be found, including large mammals such as mammoth, mastodon, caribou, musk ox, moose, as well as smaller mammals such as fox, beaver, hare, and many kinds of marine animals (NJHPO 1997; Cantwell and Wall 2001).

Climate changes continued to reshape the environment of the northeast as time progressed. As the climate grew increasingly warmer, jack pine, fir, spruce, and birch trees were replaced with hardwood forests of red and white pine, oak, and beech (Ritchie 1980). Furthermore, a decrease in glacial runoff resulted in the creation of small bodies of water such as lakes as well as, later on, low-lying marshes and swampy areas (NJHPO 1997). By 10,000 years ago, there was "considerable environmental diversity, with a mosaic of wetlands, oak stands, and a variety of other plant resources…[making it]…an attractive and hospitable quarter for both human and animal populations" (Cantwell and Wall 2001: 53). Warmer temperatures forced the herds of large mammals to travel north before eventually dying out. The new surroundings attracted other animals such as rabbit, turkey, waterfowl, bear, turtles, and white-tailed deer (ibid). The expanded water courses became home to a variety of marine life, and as temperatures warmed, fish became increasingly important to the local environment (ibid).

D. ENVIRONMENTAL CHANGES DURING THE HISTORIC PERIOD

The project site is situated within the area historically known as New Jersey's "Meadowlands," an area of tidal and freshwater wetlands surrounding the Hackensack and Passaic Rivers. In 1896, the total area covered by the Meadowlands was approximately 43 square miles and the wetlands covered the area from Hackensack in the north to Elizabeth in the south (Marshall 2004). The project site was situated within a region specifically known as the "Hackensack Meadows," while the southern portion of the Meadowlands on the west side of Newark Bay was historically known as the "Newark Meadows" (ibid). Extensive landfilling, extraction of natural resources, pollution, environmental factors (e.g., rising sea levels), and urban development has transformed the landscape of the Meadowlands, which now cover approximately 13 square miles (ibid).

EXPLOITATION OF RESOURCES IN THE HISTORIC PERIOD

From the prehistoric period through the late 19th century, local inhabitants used the Meadowlands as a source of shellfish, fish, foul, and other game, as well as for the various maritime resources that the wetlands provided. Newark Bay was famous for oysters, and by the late 19th century had become one of the top producers of seed oysters for surrounding areas, including New York City, as the Newark Bay oysters were found to have better survival rates after transportation (Ingersoll 1881). Though the seed oysters were sent as far as California, by the turn of the century Newark Bay and its surrounding waterways, including the Passaic River, were so polluted that shellfish harvested from the area was no longer fit for human consumption (Kurlansky 2006).

In addition to oysters, between the 1660s and the 1920s, settlers cultivated and harvested salt hay in the area. Salt hay, used for livestock feed and bedding and as a packing material, was the basis of an important industry (Teal 1969: 40). Early settlers divided the wetlands into "long, narrow lots, which were allocated to the male heads of households" who "were required to excavate small ditches (six feet wide and two feet deep) to identify property boundaries" (Marshall 2004: 7). During the last quarter of the 19th century, the harvesting of fish and game from the Meadowlands was curtailed due to pollution and diminishing water flow (ibid). Salt hay production ceased in the early 20th century as salt hay's role in the local economy was reduced (ibid).

Early settlers in the area in the historic period over-exploited the Atlantic white cedar forests that once occupied large tracts of the Meadowlands, including the Hackensack riverfront in Kearny. The wood of the trees, which reached up to 60 feet tall, was extremely rot-resistant, and was ideal for boatbuilding, road construction, and shingle manufacture (Sloane 1965). Cedar from the Meadowlands area was almost exclusively used to create the roofing shingles that were used across the nation in the 18th century (ibid). Not only were live trees extensively harvested, but preserved, fallen trees and stumps were "mined" from depths of approximately 12 feet below the water level of the wetland areas (ibid: 15). By the late 18th century, the cedar forests in the Meadowlands had been all but decimated by the heavy lumbering, and while minor resurgences of growth occurred in later years, Atlantic white cedars no longer grow in the area (ibid). However, the stumps of the former forests are visible at low tide in certain portions of the Meadowlands (Sullivan 1998: 41).

LANDSCAPE TRANSFORMATION IN THE 19TH AND 20TH CENTURIES

In the 19th and 20th centuries, approximately 30 square miles of the Meadowlands were transformed to dry upland as a direct result of human engineering, including both land reclamation—accomplished either through construction of dikes and drains—and land making—involving the deposition of fill material on wetlands (Marshall 2004). Nineteenth century projects were mainly limited to land reclamation: drained wetlands were located below the high tide line, and were intended for development as farm land rather

than residential or industrial use (ibid). The earliest known land reclamation efforts in the Meadowlands were carried out by the Swartwout family from the 1820s to the 1840s (ibid). Later, in the 1860s, engineer Spencer B. Driggs and developer Samuel Pike employed cutting edge methods, involving water pumps, tidal gates, and iron-plated dikes, to reclaim land in the same area (ibid). The iron dikes installed as part of these projects are still intact in some locations, and are visible along the Hackensack River (Sullivan 1998: 51). In the late 19th century, several similar land reclamation projects were spearheaded by Newark businessmen, politicians, and developers (Marshall 2004).

In the 20th century, as population increased and suburbanization resulted in a need for developable land, a more costly method of land making became popular, using fill to elevate made land above the water level, thus allowing its use for industrial, commercial, or residential purposes. Fill materials were often dredged from nearby navigational channels; were excavated as part of development projects in the vicinity; or were simply refuse collected from towns and cities in the area (Marshall 2004). Among the major land-makers and developers in the Meadowlands was the New Jersey Terminal Dock and Land Improvement Company, which used New York City garbage and excavation debris from the construction of Hudson River tunnels to fill over five square miles of wetland between the Hackensack and Passaic rivers (ibid). However, industrial waste and sewage were also deposited within the wetlands and illegal dumping activities—some possibly undocumented—also occurred. A nearly 94-acre landfill (now inactive) owned by the Town of Kearny and the New Jersey Department of Transportation is situated immediately to the north of the project site (Portal Partners 2013b). The landfill was not properly closed when it ceased operations in 1982, and it has, therefore, contributed to the contamination of the surrounding wetlands (ibid).

In 1968, the Hackensack Meadowlands Development Act was enacted by the New Jersey Legislature, intended to prevent illegal dumping (Marshall 2004). A year later, the Hackensack Meadowlands Development Commission was founded (ibid). The initial purpose of the group was to oversee planning and development, and to regulate garbage disposal. By the 1970s, conservation of the Meadowlands had become a more popular cause, and the Hackensack Meadowlands Development Commission (which changed its name to the New Jersey Meadowlands Commission in 2001) focused its efforts on remediation and protection of the remaining wetlands (ibid).

E. CURRENT PROJECT SITE CONDITIONS

The project site is an active rail corridor that is operated as part of the main line of Amtrak's Northeast Corridor. The ground surface of the APE has been significantly modified over the past century due to development associated with transportation, commerce, and industry. The site contains little to no vegetation with the exception of wetland grasses. The project site is entirely composed of landfill and is surrounded by salt marsh and upland areas that are both developed and undeveloped. The rail corridor is developed with numerous railroad lines at various elevations. The tracks are lined with catenary poles, and overhead wires and exiting utilities run along and in the immediate vicinity of the project site. Within the project site, electric, gas, and telecommunications lines run in the vicinity of the existing railroad tracks (Portal Partners 2013b).

The site includes the existing Sawtooth Bridges, two under-grade bridges that carry two sets of tracks. The bridges, which are in deteriorating condition, were constructed in 1907 as part of the expansion of the Pennsylvania Railroad through the Meadowlands. The railroad tracks are at grade in the eastern portion of the project site and run past wetlands and open water east of the viaducts that carry the New Jersey Turnpike over the Passaic River. The bridges have extensive subsurface foundations. As described above, west of the turnpike, the former DL&WRR railroad tracks (now part of NJ TRANSIT's Morris & Essex Line) continue on built-up areas several feet above sea level within the northern portion of the project site while the NEC tracks to the south (formerly part of the Pennsylvania Railroad) are carried at a higher

elevation across the Sawtooth Bridges and an artificial berm. To the south of the berm, outside of the project site, are tracks used by PATH trains.

An existing historic substation—Pennsylvania Railroad Substation No. 4—is located adjacent to the project site to the south of the railroad tracks beneath the viaduct that carries the New Jersey Turnpike. This structure was constructed in 1910, when the Pennsylvania Railroad expanded its operations through the Meadowlands, and is eligible for listing on the State and National Registers of Historic Places (Portal Partners 2013b). Other small maintenance/storage sheds are present along the railroad tracks within the project site and the immediate vicinity. In addition, an Amtrak representative described an allegedly 19th-century brick tunnel that runs north-south beneath the existing rail line, connecting a tide gate at the Passaic River and a concrete culvert north of the project site. This tunnel appears to be part of the drainage infrastructure built to allow Frank's Creek to flow beneath the railroad tracks out to the Passaic River.

F. PREVIOUS CULTURAL RESOURCES INVESTIGATIONS IN THE VICINITY

Two large environmental review projects have been completed in the last decade that included assessments of the archaeological sensitivity of a portion of the Sawtooth Bridges replacement project site or its immediate vicinity. These investigations are summarized below.

PORTAL BRIDGE

Amtrak and NJ TRANSIT have proposed the PBCE project to enhance the capacity and improve the operation of the Portal Bridge, a passenger rail bridge over the Hackensack River to the east of the Sawtooth Bridge project site. The existing Portal Bridge is a two-track moveable swing-span bridge between the Town of Kearny and the Town of Secaucus in Hudson County, New Jersey and is a critical infrastructure element for Amtrak and NJ TRANSIT. The existing Portal Bridge, however, poses reliability concerns, capacity constraints, and operational inflexibility. The PCBE Project would meet current and future demand, and would enable NJ TRANSIT to provide new services in the future.

The Federal Railroad Administration (FRA) and NJ TRANSIT prepared a Final Environmental Impact Statement (FEIS) and Section 4(f) Evaluation for the project in October 2008 to analyze the potential environmental impacts from the proposed project. FRA was the lead federal agency for the FEIS, which was prepared in accordance with NEPA. The Federal Transit Administration (FTA), U.S. Environmental Protection Agency (USEPA), and the USCG were cooperating agencies for the environmental review.

The FEIS included a detailed analysis of cultural resources, including archaeological resources, and was prepared in accordance with NEPA, the New Jersey Register of Historic Places Act, Section 4(f) of the United States Department of Transportation Act, and Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended) and associated implementing regulations in 36 C.F.R. 800. The archaeological APE for the PBCE project site included a portion of the eastern end of the Sawtooth Bridges Replacement project site.

The archaeological resources analysis determined that the PBCE project site—including that portion that overlaps with the Sawtooth Bridges replacement project site—has low archaeological sensitivity overall. However, the analysis identified what is known as the Historic Cemeteries of Hudson County, a potter's field, located within and adjacent to the PBCE on the eastern side of the Hackensack River. Pursuant to Section 106, a Memorandum of Agreement (MOA) among FRA, NJHPO, Amtrak, and NJ TRANSIT was prepared to address the next steps in the event that the project was determined to affect the area that was considered to be sensitive for human remains.

Pursuant to the MOA, as the project design was advanced, NJ TRANSIT and Amtrak conducted a Phase 1B Archaeological Survey in June 2009. Archaeological field testing consisting of six backhoe trenches to determine the presence or absence of human burials or evidence of shaft features associated with the historic cemetery. No evidence of burial shafts or human remains was observed during the testing and it was determined that the PBCE project would not impact areas that were sensitive for human remains. The results of the Phase IB archaeological survey were compiled into a report, which was submitted to NJHPO on August 11, 2009. NJHPO issued a letter of concurrence with the findings on September 29, 2009. This satisfied the project sponsors' commitments regarding archaeological resources per the Section 106 process and no further measures were taken. A draft "Unanticipated Discoveries Plan for Archaeological Resources" was submitted to NJHPO and approved on January 23, 2013.

ACCESS TO THE REGION'S CORE (ARC)

In 2008, NJ TRANSIT, in partnership with the Port Authority of New York and New Jersey (PANYNJ), entered preliminary engineering for the Access to the Region's Core (ARC) project, although this project was canceled before it was constructed. The project as proposed would have included a new passenger rail terminal adjacent to New York's Pennsylvania Station and a new two-track tunnel underneath the Hudson River that would have connected with the existing NEC. Ancillary elements of ARC would have included the construction of a new Kearny Yard west of the Hackensack River, east of the Sawtooth Bridge project site. FTA served as lead agency for the environmental review that was conducted prior to the cancellation of the project. As part of the environmental review, a Draft Environmental Impact Statement (DEIS) for the ARC project was issued in February 2007 and a Supplemental Draft Environmental Impact Statement (SDEIS) was published in March 2008.

The DEIS included a detailed analysis of cultural resources, including archaeological resources, and was prepared in accordance with NEPA, the New Jersey Register of Historic Places Act, the New York State Historic Preservation Act of 1980, Section 4(f) of the United States Department of Transportation Act, and Section 106 of the NHPA. As part of the archaeological resources assessment, a Phase 1A Archaeological Documentary Study of the ARC project site was prepared by Transit Link Consultants (TLC) in 2005. A portion of the ARC project site overlapped with the PBCE project site. Several areas of archaeological sensitivity were identified throughout the ARC project site in both the New York and New Jersey portions of the APE. The area of sensitivity closest to the Sawtooth Bridges replacement project site that was identified at that time was several miles away in the location of the Hudson County potter's field, across the Hackensack River. As described above, Phase 1B archaeological testing in this area concluded that human remains were not present.

STANDARD CHLORINE CHEMICAL SITE: ARCHAEOLOGICAL MONITORING

In 2012, Langan Engineering and Environmental Services ("Langan") issued a report summarizing the results of an archaeological monitoring investigation at the Standard Chlorine Chemical Site, on the western bank of the Hackensack River approximately 2,000 feet northeast of the Sawtooth Bridges replacement project site. A Phase 1A Archaeological Documentary Study of the site had identified a sand layer beneath the depth of marsh deposits at depths ranging between 9 and 17 feet below the ground surface (Langan 2012). A total of fourteen samples were taken at a 500-foot interval along the path of a proposed slurry wall that was being constructed on the site. Archaeological resources comprising 200 lithic artifacts (including flakes, debitage, and a possible core) were recovered and identified as an archaeological site (filed with NJHPO as Site 28-HD-44). This site is described in greater detail in **Chapter 3: Prehistoric Period**.

A. PREHISTORIC CONTEXT

Archaeologists have divided the time between the arrival of the first humans in northeastern North America and the arrival of Europeans more than 11,000 years later into the following contextual periods: Paleo-Indian/Early Archaic (11,500-8,000 before present [BP]), Middle Archaic (8,000-6,000 BP), Late Archaic (6,000-3,000 BP), Early/Middle Woodland (3,000 BP–1,200), Late Woodland (1,200 BP to AD 1500) and European Intrusion/Contact Period (AD1500-AD 1700).[1] These divisions are based on certain changes in environmental conditions, technological advancements, and cultural adaptations, which are observable in the archaeological record. Some prehistoric archaeological sites identified in New Jersey have spanned several time periods while others are shown to have been occupied for short durations only (NJHPO 1997).

PALEO-INDIAN PERIOD (11,500 TO APPROXIMATELY 10,000 YEARS BP)

Human populations did not inhabit the northeastern United States (including the area that is modern New Jersey) until the glaciers began to retreat more than 14,000 years ago, and possibly arrived as early as 12,500 years before present (Lenik 1999). The first Native American populations of the region are referred to by archaeologists as Paleo-Indians. The Paleo-Indians most likely exploited a wide variety of resources provided by their environment. It has been suggested that they did not only actively hunt the large mammals that roamed about the region (mammoths, mastodons, etc.), but they also hunted and trapped smaller animals and supplemented their diet with fish and gathered plants from the conifer-dominated cold weather species that grew in the area (Cantwell and Wall 2001; NJHPO 1997). The limited growth range of plant and animal species also limited the occupation range of the Paleo-Indians (NJHPO 1997).

Archaeological evidence suggests that the Paleo-Indians were likely highly mobile hunters and gatherers who utilized a distinct style of lithic technology, typified by fluted points often made of high-quality chert. They appear to have lived in small groups of fewer than 50 individuals and did not maintain permanent campsites (Dincauze 2000). Stone quarries were a common feature of Paleo-Indian sites (NJHPO 1997).

Most of the Paleo-Indian sites were located near what were then water sources before the rise of sea levels. As a result of the close proximity of Paleo-Indian sites to the coastline, few of them have been preserved in New Jersey and neighboring coastal states, as many sites are now assumed to be submerged (Transit Link Consultants [TLC] 2005). Of the few Paleo-Indian sites that have been found in the region, many have been found on Staten Island, to the south of the project site.

[1] The date ranges for these prehistoric periods is based on the timeline presented in the "New Jersey Statewide Historic Contexts" section of the *New Jersey Historic Preservation Plan* issued by NJHPO in 1997.

ARCHAIC PERIOD (APPROXIMATELY 10,000 TO 3,000 YEARS BP)

The aforementioned environmental transformations that resulted in the submergence of Paleo-Indian landscapes also included the continued post-glacial warming trend, the extension of hardwood forests from the south, and a decrease in glacial runoff which resulted in the creation of lakes and other small bodies of water (Cantwell and Wall 2001). There was a subsequent migration of new animal and plant species into the area, while the herds of large mammals traveled north, eventually dying out. The new surroundings attracted smaller animals, such as rabbit, turkey, waterfowl, and white-tailed deer (ibid). Plants and vegetation more suited to warm weather, such as oak, hickory, beech, and chestnut trees, also flourished at this time (NJHPO 1997). This subsequently resulted in an increase in the human population and new advancements in subsistence strategies and lithic tool technology. More importantly, the geographic range of Archaic peoples expanded to follow resources, leading to the formation of a greater number of archaeological sites (ibid).

In general, archaeologists have shown that Archaic Native American sites are most often located near water sources. The abundance of food resources which arose during this period allowed the Archaic Native Americans to occupy individual sites on a permanent or semi-permanent basis, unlike their nomadic Paleo-Indian predecessors. However, Archaic sites in New York City indicate that the Native Americans there continued to hunt and forage on a part-time basis. This was most likely due to the incredibly diverse environmental niches that could be found across the region throughout the Archaic period and it is possible that the Native Americans residing across the river in New Jersey exhibited similar behavioral patterns (Cantwell and Wall 2001, Grumet 1995).

Perhaps the most important technological development at this time was the advent of fishing technology, which occurred during the Middle Archaic in response to an increasing dependence on the area's marine resources. The new technology included stone hooks and net sinkers. In addition, the influx of nut- and seed-bearing foliage resulted in the development of stone mortars and pestles as well as stone axes, used to process plant material (Cantwell and Wall 2001; NJHPO 1997).

In order to successfully hunt the smaller game animals that had established themselves in the region, narrower spear points and knives were manufactured, along with weighted spear throwers. Domestic technology was advanced as well, with the development of a wider variety of hide scrapers and, later in the period, the origin of bowls made from steatite or soapstone. Tools continued to be crafted in part from foreign lithic materials, indicating that there was consistent trade among Archaic Native American groups from various regions in North America throughout the Archaic (Cantwell and Wall 2001).

Although the rise of sea levels was in decline by this time, given the recent rapid development of the area, few Early and Middle Archaic sites have been identified in northeastern New Jersey and the New York Metropolitan Area (Boesch 1994; TLC 2005). Again, many sites from this time period have been identified on the high ground of Staten Island. An Early Archaic site, the Black Creek Site—which is listed on the National Register of Historic Places—was identified in the 1990s in the Vernon Valley in Sussex County, northwestern New Jersey (Vernon Historical Society n.d.). The site is located on a 40-acre peninsular landform within a post-glacial lake bed. Many thousands of artifacts ranging from the Early Archaic to the Contact and early historic periods were recovered including stone tools, projectile points, and pottery sherds (ibid). However, many Late Archaic sites have been found in the region, as by that time, sea levels were closer to their current locations (NJHPO 1997). Late Archaic habitation sites are often found in areas of low elevation near water courses, and temporary hunting sites are often located near sandy areas (Boesch 1994). Archaeological investigations at Late Archaic sites suggest that "increased social stratification and complexity" characterized the people of that age (NJHPO 1997: 16).

WOODLAND PERIOD (3,000 BP-AD 1500)

The Woodland period represents a cultural revolution of sorts for the Northeast. During this time, Native Americans began to alter their way of life, focusing on a settled, agricultural lifestyle rather than one of nomadic hunting and gathering. Social rituals begin to become visible in the archaeological record at this time. There have been many elaborate human and canine burial sites identified from this period. It was at this time that pottery began to be produced, which resulted in dramatic alterations to the ways of life of native populations as food storage allowed for more permanent occupation sites (NJHPO 1997).

In general, there was a greater emphasis placed on composite tools during the Woodland period. While stone scrapers, knives, and hammerstones were still in use, there was an increased use of bone, shell, and wood in tool making. Furthermore, the development of bows and arrows revolutionized hunting practices. Fishing continued to be important to the local economy and wooden boats and bone hooks were often utilized (Historical Perspectives, Inc. 2005). Many tools from this period were made from imported materials, indicating that the trade networks established earlier were still being maintained with groups from neighboring areas, including Staten Island, Long Island, the Susquehanna Valley, and what is now upstate New York (Cantwell and Wall 2001; NJHPO 1997).

Pottery was introduced into Native American society early in the Woodland period, and by the time of European contact in the 1500s, well-crafted and elaborately decorated pottery was being manufactured. The subdivision of the Woodland period into Early, Middle, and Late sections is largely dependent on the style of pottery which was produced at that time. Woodland pottery had simple beginnings; the first examples were coil pots with pointed bases, which were made with grit temper. These were replaced during the Middle Woodland period by shell-tempered vessels bearing a variety of stamped and imprinted decorations (Louis Berger Group [LBG] 2004).

Woodland-era sites across North America indicate that there was an overall shift toward full-time agriculture and permanently settled villages. There was, however, some farming of maize, beans, squash, and tobacco. The development of pottery, increasingly complex burial sites, and the presence of domesticated dogs are all consistent with sedentary societies, which have a close association with a particular territory or piece of land.

Two possible Woodland-period sites were identified within several miles of the archaeological APE. These were identified by Dr. William L. Pyle in 1936, and have been recorded in the New Jersey State Museum site files as site numbers 26-HD-7 and 26-HD-8 respectively. The sites were located in Jersey City. Site 26-HD-7 was described as being at the foot of the lake and north of the knoll in Lincoln Park, Jersey City. It was identified as a village or camp site located near a former spring. Pyle collected over 50 artifacts from the site, including projectile points, axes, pipes, and knives, with a date range estimated at 300 to 3,000 years BP. Site 26-HD-8 was located at the foot of Williams, Boyd, Virginia, and Ege Avenues, south of Lincoln Park, in Jersey City, near the Hackensack River. Little information was recorded regarding this site.

EUROPEAN INTRUSION/CONTACT PERIOD (AD 1500-1700)

The Woodland period ended with the arrival of the first Europeans in the early 1500s. Because of the short duration of the Contact Period, it can be difficult to differentiate between sites dating to the later portion of the Woodland and the Contact Period (NJHPO 1997). At that time, a division of the Delaware Indians known as the Lenni Lenape resided in northern New Jersey (ibid). A group of Munsee known as the Hackensack Indians also resided in the vicinity of the project site (Grumet 1981). The Hackensack have been described as “a numerous as well as a war-like group” whose territory extended as far inland as the Passaic River (Bolton 1975: 58). The group was friendly with their neighbors, who included the Raritan to the southeast and the Tappan to the north. It is possible that they shared their lands as far south

as Staten Island with the latter group (ibid). Giovanni de Verrazano was the first European to view New York in 1524. However, expeditions by Lord de la Warre in 1608 and Henry Hudson in 1609 marked the true beginning of European occupation in the area (NJHPO 1997).

Shortly after Hudson's men explored Staten Island and northern New Jersey, a skirmish ensued with the local Indians, resulting in the death of one of Hudson's crewmen (Lenik 1999). Because of this early incident, the Native Americans in the region were initially extremely wary of Europeans. The first attempt at a permanent settlement in the area was known as "Pavonia," located on the neck of land east of Newark Bay, in the vicinity of the modern towns of Jersey City and Bayonne; southeast of the project site. The land was granted in 1629 by the Dutch West India Company (WIC) to Michael Pauw (Paauw) (Stokes 1967). After five years of hostile encounters with the local Native Americans, Pauw sold the land back to the WIC for 26,000 guilders (ibid). Although several Dutch farmers lived in the area in the 1630s and 1640s, as seen on the Manatus Map of 1639**,** a successful permanent settlement was not established until 1660, when Bergen Village, near today's Jersey City, was founded (Lenik 1999).

At the start of the Contact Period, Native Americans maintained the village sites they had established near water sources. As their trade with European settlers intensified, they became increasingly sedentary and the way of life once maintained by the Native Americans was thoroughly and rapidly altered. European guns, cloth, kettles, glass beads, and alcohol soon became incorporated into the Native American economy. While at first the Natives traded furs and pelts in exchange for European goods, maize (corn) quickly became an important commodity. Most Lenape groups grew corn at the sites of their permanent habitation sites as well as at seasonal campsites, and soon Europeans began to rely on Native American agriculture (Becker 1999). Soon, maize began to "stabilize" the Native American economy and was a major factor in the increased sedentary behavior of local Indian tribes (ibid: 45).

Once the European settlers became more self-sufficient, maize was no longer an important commodity and the newly formed Native American economy suffered (Lenik 1999). In addition, the Native Americans suffered from the side-effects of European colonization: disease, alcoholism, and warfare. Fierce wars soon broke out between the Dutch and the Indians. This was most intense during the early 1640s when Dutch Director-General William Kieft ordered many ferocious and unprovoked attacks on the Native population. One of the more vicious attacks at this time occurred in 1643, when after a Dutch man was murdered by a Native American at the Pavonia settlement, the Dutch slaughtered a village of Native American refugees, including many Hackensack, in the middle of the night (Grumet 1981). While Kieft's war with the Indians continued in other parts of New Amsterdam, the Hackensack signed peace treaties in both 1643 and 1645 (ibid). The warfare was somewhat abated when Kieft was replaced by Peter Stuyvesant, who brought some stability to the area (Burrows and Wallace 1999). However, the Native Americans were no match for the growing numbers of armed European settlers. With their populations quickly decreasing and the European demand for land increasing, the natives began to sell off their land in greater quantities.

As land in the New York City region was sold to the Europeans, many displaced Native Americans joined the Hackensack in northern New Jersey. By 1700, the Hackensack and Tappan tribes had each been forced to retreat to the "upper reaches of the Hackensack and Passaic Rivers" until they had "virtually merged" (Grumet 1981: 13). They occupied the highland areas of northern New Jersey until the mid-18th century, at which time they were gradually forced further and further west (Grumet 1981: 13). The area now occupied by the 'West Hudson' towns of Kearny and Harrison, was called *Meghgecticock* by the Hackensack Indians and was named "New Barbadoes Neck" after Chief Tantaqua deeded much of the area to Captain William Sanford of Barbados in 1668 (Krasner 2000). Snake Hill, to the east of the Hackensack River, was reportedly held sacred by the Hackensack Indians that inhabited the area in the Colonial period (Van Winkle 1924).

Multiple Contact-period archaeological sites have been identified in the region. Alanson Skinner and Max Schrabisch, in their 1913 report of archaeological sites in New Jersey, recorded 11 Native American fish weirs (traps) in the Passaic River (Lutins and DeCondo 1999). Of these 11 weirs, the Fair Lawn/Paterson Fish Weir is still extant. Lutins and DeCondo, who investigated the structure in 1999, described it as a V-shaped stone wall constructed of boulders and river cobbles, spanning the entire width of the Passaic River (roughly 260 feet) north of the Fair Lawn Avenue Bridge near the city of Paterson (ibid). Contact Period sites associated with Native American villages can include the remnants of dwellings; trash middens; storage pits; hearths; and/or burials (NJHPO 1997).

B. PREVIOUSLY IDENTIFIED NATIVE AMERICAN ARCHAEOLOGICAL SITES

As described in NJHPO's 1997 State Historic Preservation Plan, prehistoric archaeological sites in New Jersey can include "large and small settlements, cemetery and other burial sites, trails, stone quarries, fish weirs, shell middens, and a wide variety of special purpose locations where specific foods and non-food resources were collected and/or processed" (NJHPO 1997: 15). Site file searches at NJHPO and NJSM indicate that one prehistoric archaeological site has been identified within one mile of of the project site (see **Table 2**).

Table 2
Previously Identified Prehistoric Archaeological Sites

NJSM Site Number	Approximate Distance from Project Site	Time Period	Site Type and Information
28-HD-44	0.38 miles (2,000 feet)	*Prehistoric*	Deeply buried lithic tools and debitage collected through monitoring/sampling.

Source: NJSM site files; Langan 2012.

As described in the previous chapter, NJSM site 28-HD-44 was identified approximately 2,000 feet east of the project site on the western shore of the Hackensack River and south of the existing Amtrak tracks (Langan 2012). A Phase 1A of the site had determined that the site had low sensitivity for sites dating to the Woodland—when the area would have been inundated marsh—and low to moderate sensitivity at greater depths for earlier periods of occupation (ibid). A geomorphological assessment of the site concluded that the site "was a depositional setting (a combined floodplain of the Passaic and Hackensack Rivers) during a period in the Early to Middle Holocene, when much of the Hackensack River valley was subject to erosion or was a non-depositional setting" (ibid: 6). The general stratigraphy of the site included 6 to 10 feet of fill; 2 to 7 feet of marsh deposits; 3 to 8 feet of alluvial soils; and finally, glacial lake bed sediments. As described **in Chapter 2: Background Research**, soil borings indicate that a similar soil profile is present within the Sawtooth Bridges replacement project site.

The alluvial soils, located between 9 and 17 feet beneath the ground surface, were considered to be the most likely to contain archaeological resources. The "broad sandy element" was thought to be "somewhat anomalous in the Meadowlands setting…[suggesting] that as this part of the Hackensack River valley was affected by Late Holocene sea level rise and marsh formation, the area between the Passaic and Hackensack River channels formed a topographic high where inundation would have been delayed" (Langan 2012: 44). Historic maps (e.g., the 1844-1845 Hassler map, see **Figure 3**) do indeed suggest that a central portion of the landform existed between the two rivers.

As described previously, the archaeological site now known as 28-HD-44 was identified in 2011 during archaeological monitoring completed by Langan Engineering and Environmental Services during the construction of a slurry wall. In total, eight of the 21 samples collected during the investigation included

evidence of prehistoric occupation, including 146 pieces of debitage and a possible depleted core (Audin and Stiteler 2011). The majority of the finds were from the eastern portion of the site, in close proximity to the Hackensack River (ibid). Additional monitoring was recommended in this area, particularly for those areas where excavation would extend to a depth greater than 15 feet below the marsh mat surface near the Hackensack River (ibid).

A. INTRODUCTION

The historic period in New Jersey began in the 16th and 17th centuries when the first European explorers arrived in the region and European settlements began. The 1997 State Historic Preservation Plan (NJHPO 1997: 18) divides New Jersey's historic period into six general historical contexts: Initial colonial settlement (between 1630 and 1775); Early industrialization, urbanization, and agricultural development (1775 to 1860); Suburban development (1860 to 1775); Immigration and agricultural, industrial, commercial, and urban expansion (1850 to 1920); Metropolitan New Jersey (1910 to 1945); and Modern New Jersey (1945 to the present). The following chapter provides general historic contexts for the Meadlowlands region of New Jersey; the Town of Kearny; and the general industrial and transportation history of the area. The chapter also includes a summary of the development of the project site during the historic period with other background information as necessary to clarify the project site's place within broader historical contextual themes that have been established for New Jersey.

B. HISTORICAL CONTEXT FOR THE PROJECT SITE

Among the earliest European explorers to land in New Jersey was Lord de la Warre, who arrived in 1608 and for whom the Delaware River was named (NJHPO 1997). Dutch settlers soon followed, establishing communities first in Hudson and Bergen Counties, closer to the heart of the main settlement of New Netherland, then located on Manhattan (ibid). As the project site was composed of marshland, little development occurred in the area during America's colonial occupation.

THE EARLY HISTORY OF HARRISON AND KEARNY

In 1719, copper was discovered in the vicinity of what is now Kearny, New Jersey in 1719, which prompted settlement and construction of new roads (Whitehead 1901; Van Winkle 1924). Initial settlement occurred on a "riser" of land located to the north and west of the project site and along the high ground on the western side of the Passaic River (Van Winkle 1924: 364). A mine operated by Arent Schuyler (1662-1730), a merchant of Dutch extraction, became one of the first successful industries in the area and was in operation into the late 19th century (Whitehead 1901; Van Winkle 1924). The copper mine is one of the only locations specifically named on a 1777 coastal survey of New Jersey produced by William Faden. The beginnings of industry and settlement in the area resulted in a need for roads. The Newark Plank Road, which ran east-west across the lower Kearny Meadowlands north of the project site, was built in 1765 (Whitehead 1901). The road appears on early historic maps (such as the 1844 Smith map and the 1844-1845 Hassler Coastal Survey) to the north of the project site. Whereas at first ferries were located at either end of the road to carry travelers over the adjacent rivers, bridges were soon constructed to allow the road to continue across the water to the mainland (Van Winkle 1924).

As mentioned in **Chapter 3: Prehistoric Period**, the portion of the Meadowlands in which the project site is situated was named "New Barbadoes Neck" in honor of Captain William Sanford of Barbados, who purchased the land from the local Native Americans in 1668 (Whitehead 1901). An 1812 coastal survey by William Watson identifies the project site by this name and also indicates that by that time, the

point of land near the confluence of the Hackensack and Passaic Rivers was known as "Sanford's Point." In 1825, "New Barbados Neck" was officially renamed "Lodi" in commemoration of Napoleon's victory in that northern Italian town in 1796 and a town in New Jersey northwest of the project site still bears this name (Scott 1922). An 1845 map of New Jersey produced by John T. Hammond identifies the project site by this name, although in 1840, the name was changed again, to Harrison, in honor of President William Henry Harrison (ibid). In 1867, the town of Kearny separated from the town of Harrison; it was named after General Philip Kearny, a commander in the Mexican and Civil wars (Krasner 2000; Van Winkle 1924). Kearny, who was killed at Chantilly during the Civil War, had established an elaborate estate in the area, which he called Belle Grove, between 1853 and 1856 (Krasner 2000).

Throughout the 18th and much of the 19th centuries, Kearny remained largely undeveloped, with the exception of the roads and railroads that traversed it. During the late 19th and early 20th centuries, "the meadows, a marsh land, were deemed worthless and…members of the Council suggested abandoning the entire tract as a common nuisance which cost the township more money to police and guard than it was worth" (Van Winkle 1924: 369). Until that time, "the entire meadow tract was as nature made it, the only exception being the two or three boat houses which had sprung up adjacent to the railroad bridges crossing the Hackensack river" (ibid: 370).

In addition, a wealth of anecdotal accounts in newspapers and local histories suggests that the Meadowlands in Kearny were the site of river pirate camps from the colonial period through the early 19th century. River pirates harassed the ships and docks of New York City and New Jersey, stealing boats and ships' cargos and engaging in smuggling operations (Van Winkle 1924). The river pirates' best known camps included the Fourth Ward of Manhattan, the Meadowlands near Bayonne, and the cedar swamps adjacent to Snake Hill in Kearny (ibid). One of the larger camps was allegedly northeast of the project site, "secreted in the tract of the Kearny meadows somewhere opposite Snake Hill which they reached by means of a tidal creek or stream" (ibid: 369). This inlet was likely to the northeast of the project site along the Hackensack River.

THE CONSTRUCTION OF RAILROADS AND RISE OF INDUSTRY IN THE 19TH CENTURY

Despite the undeveloped nature of the low-lying marshes, Kearny's location between the burgeoning cities of Newark and Jersey City increasingly made the township a convenient location for both industrial and commercial use as well as for residential communities. The Hackensack and Passaic rivers provided transportation opportunities to local residents and businesses, as did the multiple turnpikes, plank roads, and railroads that traversed the area. The industrial transformation of the Kearny Meadows began in earnest in the early 20th century (Van Winkle 1924). As a result of its location between the major cities of New York and Philadelphia and between New England and the southern states, transportation has been a major component of New Jersey's history since the colonial period. New Jersey also supplied products and material to nearby cities—including grain, lumber, meat, and other regional exports—and New Jersey's Atlantic coast. The state's many navigable rivers, and its low-lying land corridors made it possible for myriad transportation networks to develop, most of which were oriented in a northeast-southwest direction connecting New York City and Philadelphia.

One of the earliest public roads in New Jersey, authorized by the State Legislature in 1765, ran from Newark across the Meadowlands (north of the project site) to Paulus Hook (now a section of Jersey City) where travelers could get to Manhattan by ferry (Whitehead 1901). In 1790, the Legislature appointed five commissioners to oversee the construction and maintenance of toll bridges across the Hackensack and Passaic rivers. Shareholders or 'proprietors' quickly formed a joint-stock company, and claimed a monopoly on building bridges near the mouths of the two rivers. The roadway was a success, multiple stage coach lines were established, and Newark's population grew swiftly, due to the ease of travel to New York City (Lane 1939: 125). Additional turnpikes were constructed across New Jersey in the early

19th century and the roads were generally established by municipalities in order to serve local or regional transportation and trade needs. Most turnpikes in New Jersey successfully provided returns to investors, particularly where monopolies existed; however, the success of the turnpikes waned with the competition of canals. The Morris Canal, which connected the upper Delaware with Newark and Jersey City to the south of the project site, was constructed in 1831. Canals quickly superseded roadways as routes for the transport of goods, particularly anthracite coal from Pennsylvania (Lane 1939: 162).

As the 19th century continued, railroads came to dominate transportation and New Jersey was at the forefront of railroad construction in the United States. In 1832, the New Jersey Railroad and Transportation Company (NJRR) was incorporated to construct a direct rail line between Trenton, New Jersey and New York City via a terminal and ferry located in Jersey City (Van Winkle 1924). The NJRR was the third rail company to be established in the state and the construction of the line across the marshland was one of the more complicated aspects of its construction (Treese 2006). At that time, railroad lines constructed within the meadows between the Passaic and Hackensack Rivers were constructed on "embankments [built] by driving piles surprisingly deep into the muck before reaching bedrock and then hauling in tons of fill" (ibid: 110).

In a letter to stockholders written in 1841, the NJRR noted that cost overruns during the construction of the rail line were in part due to the "embankments across the meadows which settled at several placed for a considerable distance to the depth of from seventy to eighty feet" (NJRR 1841). A feature published in *Scientific American* in 1868 depicts the extensive manpower that was required to construct the dikes and dams that allowed for land to be reclaimed within the meadows and to allow for the railroad lines to be constructed and to allow for the land to be "productive of good rather than evil" (*Scientific American* 1868: 65).

The NJRR's success was enhanced when it leased the ferry operations that connected it to major cities in 1841 and subsequently purchased the ferries twelve years later (Treese 2006). The NJRR was primarily a passenger line, and earned a reputation for comfort and convenience (Lane 1939: 363). The Morris & Essex Railroad was chartered in 1835 to connect the New Jersey cities of Morristown and Newark. In 1836, the NJRR agreed to carry Morris & Essex traffic between Newark and Jersey City. In 1868, the Delaware, Lackawanna, and Western Railroad leased the Morris & Essex Railroad, including all of its branches. With the establishment of the rail lines, stage coach companies between New York and Philadelphia ceased to operate (Lane 1939: 381). The New Jersey Railroad Company and the conglomerate Camden and Amboy Railroad were consolidated as the United Canal and Railroad Companies of New Jersey in 1867. In 1871, the Pennsylvania Railroad leased the consolidated company, and thus acquired a continuous route from New York to Philadelphia (Treese 2006).

Following the development of the first railroads through the area in the 1860s and 1870s, Kearny was transformed from undeveloped meadow to a center of industry. Numerous large-scale manufacturing facilities were established in the area. Several of the largest Kearny mills had British proprietors, who recruited workers from England and Scotland. In contrast, workers for the industries of Arlington were primarily Swedes and Belgians, and the majority of those in the town of Harrison (west of Kearny) were Irish (Van Winkle 1924: 371).

During the last quarter of the 19th century, the Kearny Meadowlands experienced rapid industrial development due in part to new transportation routes and advances in land-making technology. Multiple textile and floor-covering mills were established in Kearny during the 1880s and 1890s, and the town's population exploded during this period, largely with immigrants from England and Scotland. The population continued to increase in the early 20th century, rising from 18,659 to 26,724 between 1910 and 1920 (Van Winkle 1924: 361). Kearny's downtown area was located east of Midland Avenue, to the west of the project site.

EXPANSION AND MODERNIZATION OF THE RAILROAD IN THE 20TH CENTURY

The Pennsylvania Railroad became one of the most powerful rail lines in the northeastern United States at the turn of the 20th century. During that time, the rail line expanded its facilities, culminating with the construction of tunnels beneath the Hudson River—eliminating the need for ferries for the first time—and Pennsylvania Station in Manhattan in 1910 (Jonnes 2007). The construction of the Hudson River tunnels eliminated the need for the ferry crossing at Jersey City and as a result, a new, "double" track was constructed across the Meadowlands to the northeast towards Weehawken, where the tunnels connected to New York's Pennsylvania Station (Couper 1912). The double tracks crossed the meadows and wound around Snake Hill on an elevated embankment and across numerous bridges, including the Sawtooth Bridges (ibid). The centerpiece of the "Meadows Division" of the rail line was the Manhattan Transfer, a new interchange yard located in the meadows to the west of the project site (American Society of Civil Engineers 1910). Substation Number 4 was also constructed at this time as part of the expansion of the Pennsylvania Railroad.

While the engineers who designed the bridge had anticipated problems as a result of settling, as had occurred with the original construction of the NJRR, the expanded Pennsylvania Railroad tracks experienced fewer problems associated with the meadows (Couper 1912). Some of the fill material was generated by cellar excavation and some was from the tunnel excavations and was brought up the Hackensack and Passaic Rivers by scow (ibid). The landscape was at that time described as follows:

> *The Meadows section of the railroad is a 5-mile continuous stretch of semi-tidal meadow swampland…The ground surface is covered with a heavy growth of reeds and the top stratum is a peaty bog from 8 to 15 feet deep, underlaid* [sic] *with varying strata of clay, fine sand, and mixed sand and clay for very considerable depths* (American Society of Civil Engineers 1910: 351-352).

The unpredictable and highly variable subsurface conditions made it difficult to determine how deep foundations needed to be (American Society of Civil Engineers 1910). During the construction of a telegraph line along the southern side of the tracks, concrete pole foundations extended anywhere between 30 and 80 feet beneath the ground surface (ibid). The Meadows branch of the Pennsylvania Railroad is now part of Amtrak's Northeast Corridor and runs through the project site in Kearny.

The Pennsylvania Railroad transformed train travel in the early 20th century, and by the mid-20th century, New Jersey's transportation was again transformed by the advent of highways and motor vehicle traffic. In the 1930s, discussions began in support of constructing a major highway from Boston to Washington. Momentum dissipated with the advent of the Great Depression; however, then-New Jersey Governor Alfred E. Driscoll reintroduced the idea in the mid-1940s. In 1948, the State Legislature enacted the New Jersey Turnpike Authority Act, which created the New Jersey Turnpike Authority to oversee the planning, construction, and maintenance of the highway (Plant 2007). The planning and construction of the roadway were put on an accelerated timeline and when it was completed in 1952, it was "considered the cutting edge of highway construction" (ibid: 112).

C. THE DEVELOPMENT HISTORY OF THE PROJECT SITE

As described above, the project site and surrounding area remained undeveloped wetlands until the early 19th century. One of the earliest maps of the area is Hassler's ca. 1844-1845 coastal survey (see **Figure 3**). The only development shown in the vicinity of the project site on that map are the tracks of the NJRR, which as described above, was incorporated in 1832. The tracks crossed east-west through the Meadowlands in a nearly straight line. As such, the tracks only entered the western portion of the project site. The map depicts two small structures to the south of the tracks, in the approximate location of existing Substation Number 4. While the railroad tracks are depicted on the map as being surrounded by

marsh, a large area between the Hackensack and Passaic Rivers on either side of the tracks is depicted as filled and divided into large lots or fields. The tracks and surrounding marshland are also depicted on Smith's 1844 and 1847 map of the region, both of which suggest the presence of a structure to the south of the tracks similar to Hassler's 1844-1845 map.

AGRICULTURAL CULTIVATION WITHIN THE MEADOWS

Sidney's 1849 map depicting the area reflects the growth that had occurred in the area by the mid-19th century. That map indicates that the project site continued to be inundated wetland, however it also reflects the construction of homes and business along the Newark Plank Road to the north. A second road is depicted on that map extending south from the plank road to the railroad tracks. Two structures are depicted in the vicinity of the project site along that road. The first structure was situated immediately north of the railroad tracks on the eastern side of the road and the map does not identify its use or owner. The second structure was located on the east side of the road less than a quarter of a mile north of the tracks and its owner is identified as "[Gustine] & Lathrop."

No individual with the last name "Lathorp" was recorded as a resident of Hudson County in the 1850 Federal Census, although Samuel J. Gustin, a 34-year-old nurseryman, was recorded as a resident of the North Ward of Newark in Essex County that year. Samuel J. Gustin ran an establishment known as the "Newark Nursery" or "Nurseries," a fruit and tree farm that may have been located on or near the project site, as described below (Barry 1854; New Jersey State Legislature 1857). In 1857, Gustin was appointed "Nurseryman and Superintendent of Planting" for what was then the newly founded Central Park in Manhattan (*New York* Times 1857).

Walling's 1860 map of the area only depicts one structure in the vicinity of the project site (see **Figure 5**). That structure was the former Lathorp building which by 1860 had become the property of "G. Thorburn." No other developments are shown in the vicinity of the project site on the 1860 map with the exception of the tracks of the "New Jersey RR." The railroad tracks and the structure owned by Thorburn are both shown as located within and completely surrounded by marshland. Again, it therefore does not appear likely that this was a residential dwelling and was likely still in use for agricultural purposes as it had been when Samuel J. Gustin was identified as an owner. By 1860, census records indicate that Gustin had moved to Pennsylvania, although historic directories for Newark published in 1861 and 1862 continue to list him as a nurseryman operating a business along the "*Causeway*." However, he appears to have remained invested in the Newark Nursery through that time.

The individual identified as the owner on the Walling map may be Grant Thorburn, a horticulturalist and seed producer, who moved from New York to New Jersey in the early 19th century (Thorburn 1853). Thorburn is thought to have issued the first seed catalog in the nation in 1822 and been the first to mass-produce seeds (Robertson 2011). In 1829, Grant Thorburn wrote of the "abundance" of liverwort "on the banks of the Hackensack Rivers in New Jersey…the only herb that ever God Almighty made which has no *medical properties*" (ibid: 221). Thorburn also wrote of how he came to own property in the area in the first decades of the 19th century and how it led him to bankruptcy, and eventually jail:

> *A few years previous, a gardener from England, by the name of Thornly, purchased about seven acres of land near Newark Bridge, which he improved as a kitchen-garden, and for raising a few seed; but failing of success, and getting in debt, he absconded. He owed me a hundred dollars at the time; so, when he got to Philadelphia he executed a deed, whereby he constituted me owner of the soil, the first intimation of which was my receiving said deed per mail. As there was a considerable crop of seeds on the ground at the time, I resolved to gather the seeds as part payment; and as there was a mortgage for two hundred dollars on the premises, to let the land go to whomsoever had the best claim.*

> *The seeds were gathered, and the crop hardly paid the men's wages; but still I was persuaded to pay the mortgage and keep the place, as my well-intending friends all said it would do wonders under the management of an active man. It did wonders with a witness; for, after striving and toiling by sunlight and moonlight, in wet weather and dry weather, I found, at the end of five years, I had spent the whole earnings of my life and was several thousands worse than nothing* (Thorburn 1853: 69-70).

Thorburn later found success as a seed merchant in New York City and resided in Queens and Connecticut after 1854, and therefore, was not living in New Jersey at the time that the 1860 Walling map was produced (Wilson and Fiske 1889). The only resident of New Jersey identified in the 1860 census with a similar name was Grant's son, George C. Thorburn. Thorburn was a resident of Newark and also a well-known horticulturalist and botanist (Thorburn 1843; Thomas 1877). George C. Thorburn died in 1860, the year the map was published, after falling into an open church vault (*New York Observer and Chronicle* 1860). Around the time of his death, he was preparing to take control of the management of George Washington's estate at Mount Vernon (ibid). A historic directory published in 1863 indicates that Thorburn's widow, Virginia, resided at 9 State Street in Newark, in close proximity to the Passaic River.

Regardless of which Thorburn may have owned the property, it was likely used for agricultural purposes only. In 1854, a man named J.M. Thorburn advertised that the Newark Nursery included "125 acres in the highest state of cultivation" (Thorburn 1854. 327). An 1860 advertisement in *The Working Farmer* was posted by Samuel C. Pitman, who had recently purchased the Newark Nurseries, which advertised "fruit and ornamental trees of every variety" in East Newark along the line of the New Jersey Railroad. The advertisement specified that orders could be placed at Thorburn's store on John Street in Manhattan. A second advertisement placed in *The Horticulturalist and Journal of Rural Art and Rural Taste* in 1860 announced that "the Newark Nursery…disposed of some 200 acres of their grounds to a Company, for a permanent 'fair ground'" and were therefore "obliged to remove the Trees from those grounds" (*The Horticulturalist…* 1860: p. 10). The advertisement indicated that orders should be placed with "Gustin & Pitman, Nurseryman, Newark, or to Messers. J.M. Thorburn & Co., 15 John Street, New York" (ibid). It therefore appears that both Gustin and Thorburn retained a stake in the nursery through at least 1860, when it appears to have been sold.

Neither Sidney's 1849 map nor Walling's 1860 map identifies the use of the structure associated with Gustin and Thorburn. Given its marshy surroundings, the property was most likely associated with the farm/nursery uses and was not used as a residence. The exact location of the nursery is not identified on historic maps. It is unclear if the marsh could have supported the nursery while inundated, and it is possible the large upland area shown on maps to the east of the project site may have been the actual location of the tree farm. It is also possible that given the landfilling that altered the landscape to allow the construction of the rail line to the south caused the area to the north to be less inundated and therefore usable farmland. If the nursery was located within the marsh area, it would be expected that drains and ditches were excavated in the area to drain the farmland and allow for the planting of trees and other vegetation.

RAILROAD EXPANSION

An 1866 coastal chart is the first to depict the tracks of the DL&WRR Railroad to the north of the New Jersey Railroad tracks. The Morris and Essex Railroad had been chartered in 1835 and was later absorbed into the DL&WRR (Hoyt 1918). The Morris and Essex line had been linked to the NJRR on the eastern shore of the Passaic River—but west of the project site—in 1855 (Couper 1912). Circa 1862-1863, the Morris and Essex line was expanded to include a new line linking the towns of Newark and Hoboken through the Meadowlands, and allowing the line to connect to New York City along an uninterrupted path

(Hoyt 1918; Couper 1912). In 1868, the line was leased by the DL&WRR (Couper 1912). In the vicinity of the project site, the Morris and Essex tracks ran parallel to and north of the tracks of the NJRR.

A coastal survey of the area created by F.H. Gerdes between 1871 and 1874 depicts the project site in greater detail, though it shows neither the road that led south from the Newark Plank Road nor the former building owned by Thorburn. The map is also among the first to reflect the construction of the Morris & Essex Rail line within the project site north of the NJRR tracks. With the exception of the railroad tracks, the project site is depicted as entirely undeveloped marshland. To the south of the railroad tracks, in the vicinity of structures seen on maps from the 1840s, was a small building situated on what may have been a small wharf built at the edge of the Passaic River. A small road led from this building to the northwest, possibly in the vicinity of the road seen on the 1849 and 1860 maps, but it is shown as terminating a short distance north of the rail line. Finally, the map depicts Frank's Creek running beneath both the Morris & Essex and New Jersey Railroad tracks, but the map is not clear as to whether the creek was running through a culvert or if the tracks passed over the creek via small bridges. Finally, the name "Thorburg" is shown on the map to the southeast of the project site, near the mouth of a creek on the northern shore of the Passaic River, possibly referencing the Thorburn property identified on previous maps.

Coastal charts published by the United States Coast and Geodetic Survey in 1889, 1906, 1912, and 1914 and USGS maps issued in 1891, 1898 (see **Figure 6**), 1900, and 1905 do not depict any buildings in or in the immediate vicinity of the project site, although some of these maps do reflect the expansion of the Pennsylvania Railroad. The 1891 Bien and Vermule topographical atlas, which does not depict building footprints, identifies the area immediately surrounding the project site to the north of the railroad tracks as fresh marsh. The marshland to the south of the railroad near the western half of the project site, adjacent to the Passaic River, and the areas to the north of the Newark Turnpike are depicted on the 1891 map as tidal marshland. It therefore appears that the project site remained relatively undisturbed at the turn of the 20th century while dramatic landscape modifications and industrial development were transforming the Meadowlands all around the site.

One of the first accurate real estate atlases of the area was published by G. Hopkins in 1909. Once again, no structures are depicted in the vicinity of the project site with the exception of the rail corridors of the "Pennsylvania Tunnel and Terminal Rail Road Company," including the Meadows Division that was under construction at the time, and the DL&WRR Railroad. The land to the north of the rail corridors and east of Frank's Creek is identified on the map as belonging to the "Newark Meadows Improvement Company." No structures or developments other than the railroad and Pennsylvania Railroad Substation No. 4 are depicted in the vicinity of the project site on that map.

THE RISE OF INDUSTRY

Coastal charts and aerial photos dating to the 1920s and 1930s reflect the increasing industrialization of the area as well as the continued landfilling and landscape transformation that took place at that time.[1] A 1925 Nautical Chart depicts dramatically reduced wetlands, with only those immediately adjacent to the railroad tracks remaining, and it also reflects dredging that occurred to deepen and regulate the Passaic River. An updated atlas published by Hopkins in 1934 reflects expansions to the railroad tracks through

[1] Coastal charts dating to the 18th, 19th, and 20th centuries were accessed through the digital Historical Map and Chart collection of the National Oceanic and Atmospheric Association (NOAA). Aerial photographs dating to 1931, 1946, 1954, 1966, 1970, 1976, 1984, 1991, 1995, 2006, and 2010 and USGS maps published in 1891, 1900, 1905, 1925, 1947, 1955m 1967, 1981, and 1995 were provided by EDR (2015a and 2015b). Other historic USGS maps, including, 1898, were examined through: http://ngmdb.usgs.gov/maps/.

and in the vicinity of the project site. However, no other development is depicted and the still-vacant area to the north of the tracks was identified as the property of the "Newark Factory Sites Company, Inc."

Subsequent maps reflect the construction of industrial complexes to the north, as well as the construction of the New Jersey Turnpike. The development of the New Jersey Turnpike spurred the development of large industrial and commercial facilities in the area. However, no maps indicate that substantial development took place within the project site during the historic period (including the 17th through the 20th centuries) with the exception of development associated with railroad usage.

In the 1990s, the Kearny Connection was created by linking the New Jersey Transit Morristown Line (Morris & Essex Railroad) with the NEC (Hanley 1991). Other improvements were made in the late-20th and early-21st century as part of the use and maintenance of the active rail corridor, including track work, the construction of instrument houses and other modifications to allow for high speed rail service at the Kearny Connection and the surrounding area (*Railway Age* 1995).

Chapter 5: Conclusions, Interpretations, and Recommendations

A. SENSITIVITY ASSESSMENT

As part of the background research for this Phase 1A Archaeological Documentary Study, various primary and secondary resources were analyzed, including historic maps and atlases, historic photographs and lithographs, newspaper articles, and local histories. The information provided by these sources was analyzed to reach the following conclusions.

DISTURBANCE ASSESSMENT

The project site is entirely located within an area of filled marshland within the former Hackensack Meadowlands. Shallow disturbance to the project site may have been generated by dredging, channeling, and salt hay farming that occurred during the early portion of the historic period. But significant, widespread disturbance would have occurred beginning in the 19th century, when the rail lines were first constructed. That landscape modification involved filling and pile driving throughout the project site. Additional deep disturbance would have occurred during the expansion of the rail lines in the late 19th and early 20th centuries. Additional tracks, bridges, electrical systems, telegraph poles, and other railway-related structures were constructed at that time, which would also have required filling and deep support foundations. The depths to which the disturbance extended may have been more than 30 to 80 feet in certain locations.

PREHISTORIC SENSITIVITY ASSESSMENT

The prehistoric sensitivity of project sites in the northeastern United States is generally evaluated by a site's proximity to level slopes, water courses, well-drained soils, and previously-identified prehistoric archaeological sites. The project site was historically part of the Meadowlands and was inundated tidal marsh prior to the landfilling efforts that allowed for the marsh to be converted for rail use. The project site would therefore not have been an ideal site for camping or hunting and gathering, or seasonal occupation during the time that it was inundated.

However, prior to the rise of sea levels several thousands of years ago, the site would have been dry land that may have been inhabitable by the earliest groups of humans that occupied the region during the prehistoric period. Soil borings suggest that the boundary between alluvial soils and glacial till, possibly representing the pre-marsh ground surface within the project site, is situated between 20 and 30 feet below the current ground surface. It is therefore possible that a precontact ground surface could have been located at that depth at one time. However, such a ground surface may have been extensively disturbed as a result of disturbances associated with driving piles and constructing deep foundations to support the rail structures within the landfill.

If undisturbed prehistoric ground surfaces are present at great depths beneath the project site, they would be considered to be archaeologically sensitive. As described in Chapter 3: Prehistoric Period, a deeply-buried Native American site was identified in 2011 to the northeast of the project site, within another landfilled portion of the Meadowlands. As part of an archaeological investigation on that site, which was determined to have been on an anomalous rise of land within the meadows, alluvial soils situated between

9 and 17 feet below the ground surface were found to contain prehistoric archaeological resources (Audin and Stiteler 2011). Additional archaeological resources were thought to be present in that location at depths of 15 feet or more.

The Sawtooth Bridges replacement project site does not appear to have been located on a similar elevated area, and therefore, potential archaeological resources would be expected to be located at greater depths. Given the extent to which railroad-related activities likely disturbed those depths, the project site is determined to have low potential to yield intact prehistoric archaeological deposits at depths of approximately 10 to 30 feet or more below the ground surface. If the soils in this area were intact, they could potentially yield archaeological resources associated with the prehistoric occupation of the project site.

HISTORIC SENSITIVITY ASSESSMENT

As mentioned previously, the project site was occupied by inundated marshland until the early 19th century when the first railroad tracks were constructed through the area. No evidence exists to suggest that the project site was occupied during the historic period. A single map-documented structure not associated with railroad uses was located near the project site in the early 19th century. Historic maps indicate that this structure was located within the marsh and it appears that this structure may have been used for agricultural purposes. Extensive development and redevelopment has occurred within the project site as a result of the construction and re-construction of various railroad-related structures, including bridges, berms, catenary poles, utilities, and other infrastructure. The project site is therefore determined to have no sensitivity for archaeological resources dating to the historic period.

B. RECOMMENDATIONS

The project site has been determined to have low sensitivity for prehistoric resources at depths greater than 10 to 30 feet and no sensitivity for historic period resources. If undisturbed prehistoric ground surfaces exist at great depths, they may contain archaeological resources that would provide new information about the earliest occupation of the Meadowlands area before the rise of sea levels. However, because no soil borings can be advanced within the boundaries of the project site, the extent to which the alluvial soils present beneath the project site have survived the deep disturbance associated with the construction of the railroads, bridges, and their associated utilities is unknown. In those locations where deep disturbance has already occurred, such as the locations of the Sawtooth Bridges themselves, it is expected that there is little chance that archaeologically sensitive depths would remain intact. However, other areas that have not been subjected to deep disturbance, such as the portions of the rail corridor that have been built up and do not contain utilities, could contain undisturbed alluvial soils that could contain archaeological resources.

Archaeological monitoring is recommended for those areas where the construction of the proposed project would result in disturbance to depths greater than 10 feet below the ground surface in previously undisturbed areas. No monitoring is recommended in those locations where deep disturbance has already occurred, such as within the footprints of the existing bridges and in locations where piles have been driven to support the existing tracks. When the project design is advanced and additional information is known regarding the specific sub-surface impacts of the Proposed Project, those plans will be reviewed by a qualified archaeologist. The archaeologist will determine if the Proposed Project could potentially impact archaeologically sensitive depths and to determine those locations where monitoring will be required, should any exist. In the event that soil borings can be advanced within the project site, they should also be reviewed by an archaeologist to determine if potentially sensitive alluvial deposits such as those observed in adjacent areas are present within the project site to further clarify those locations that would require archaeological monitoring during construction. Finally, in the event that the proposed

construction methodology would not allow an archaeologist to monitor the site at depths greater than 10 feet (e.g., in those locations where piles will be driven), then no archaeological monitoring is recommended. Prior to any archaeological monitoring, an archaeological monitoring program will be developed in consultation with NJHPO to further investigate the archaeological sensitivity of those areas.

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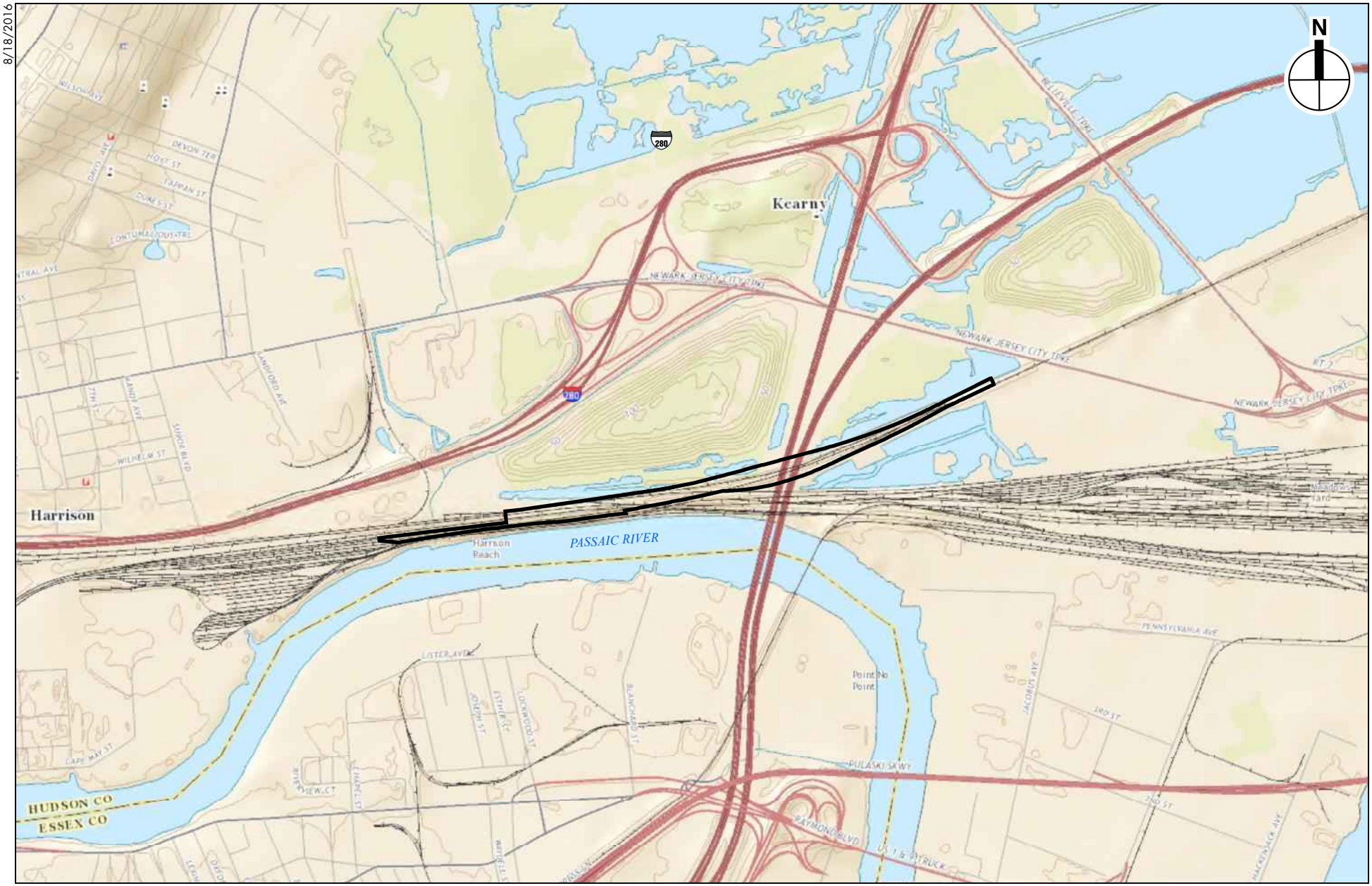
Figures

8/18/2016

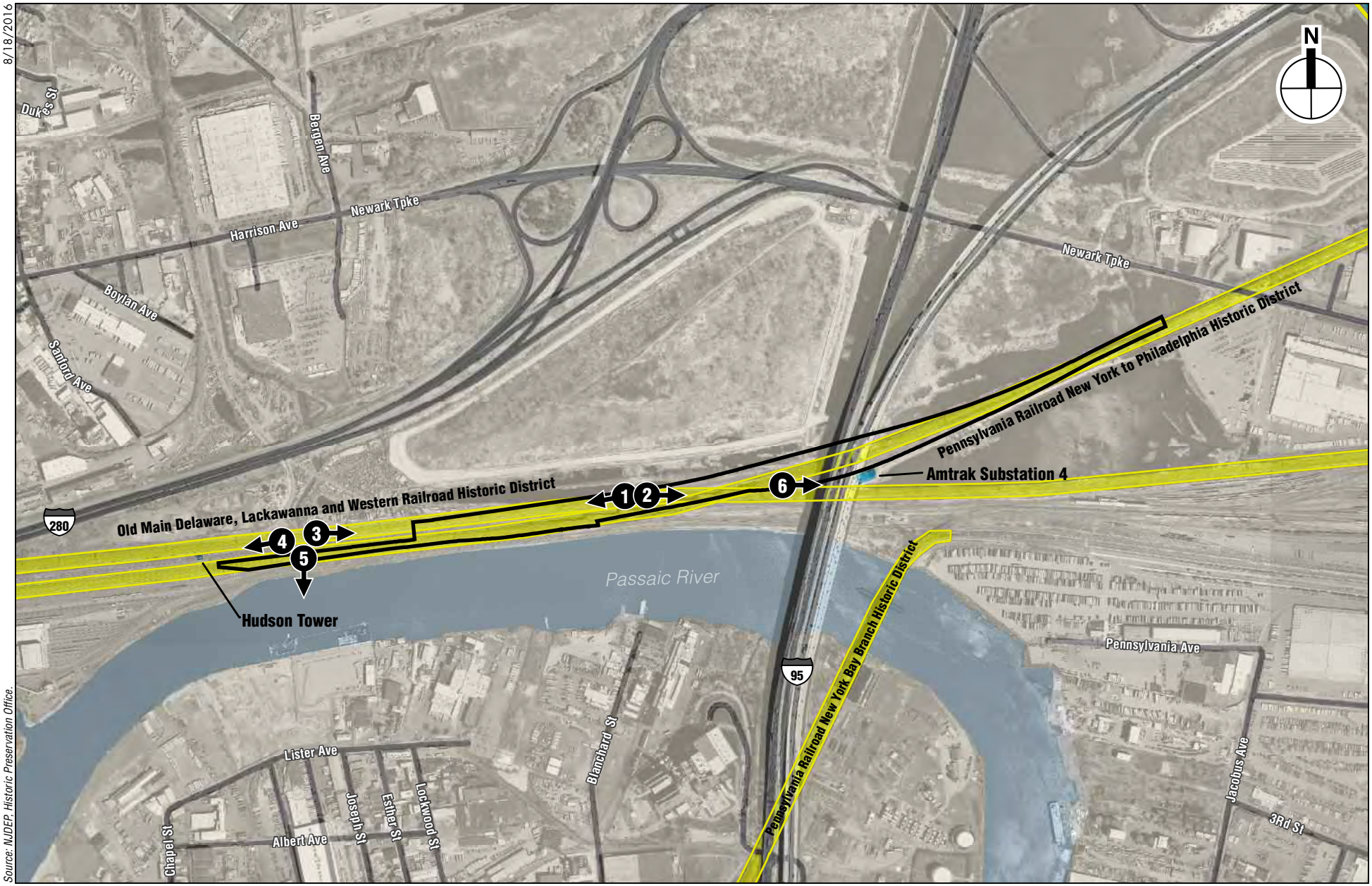


Project Site

USGS Quad Maps Showing the Project Location

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Figure 1



8/18/2016

Source: NJDEP, Historic Preservation Office.

Archaeological Area of Potential Effects

Historic Districts

Historic Properties

1 *Photograph Reference Number and Viewing Direction*

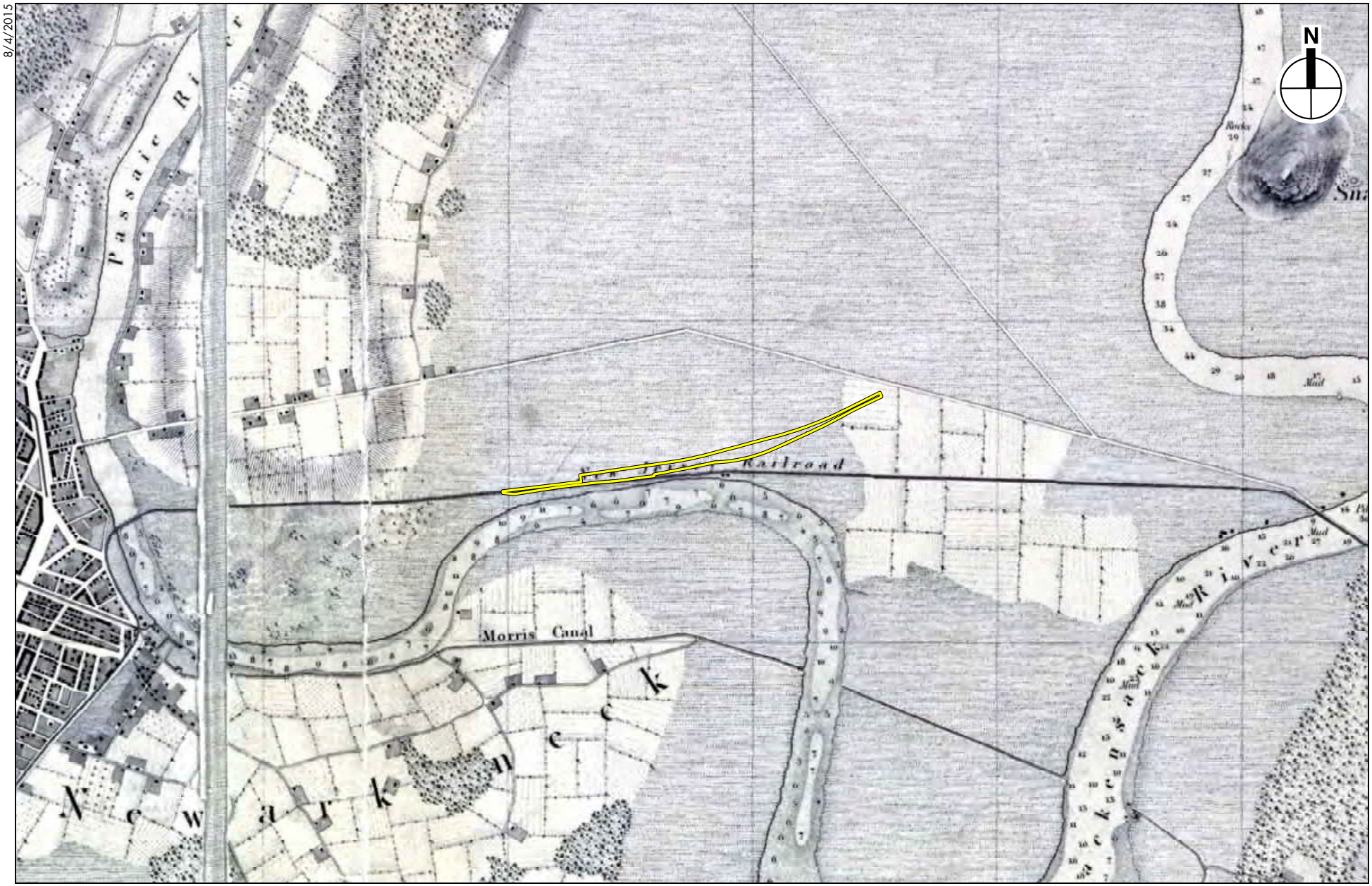
0 1,000 FEET

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Aerial Photograph Showing Known Historic Districts

Figure 2

8/4/2015



Project Site

Note: This map was georeferenced to align the modern and historic streetbeds. Due to inaccuracies in the original map and landscape modification that has altered topographical features, the location of the Project Site should be considered approximate.

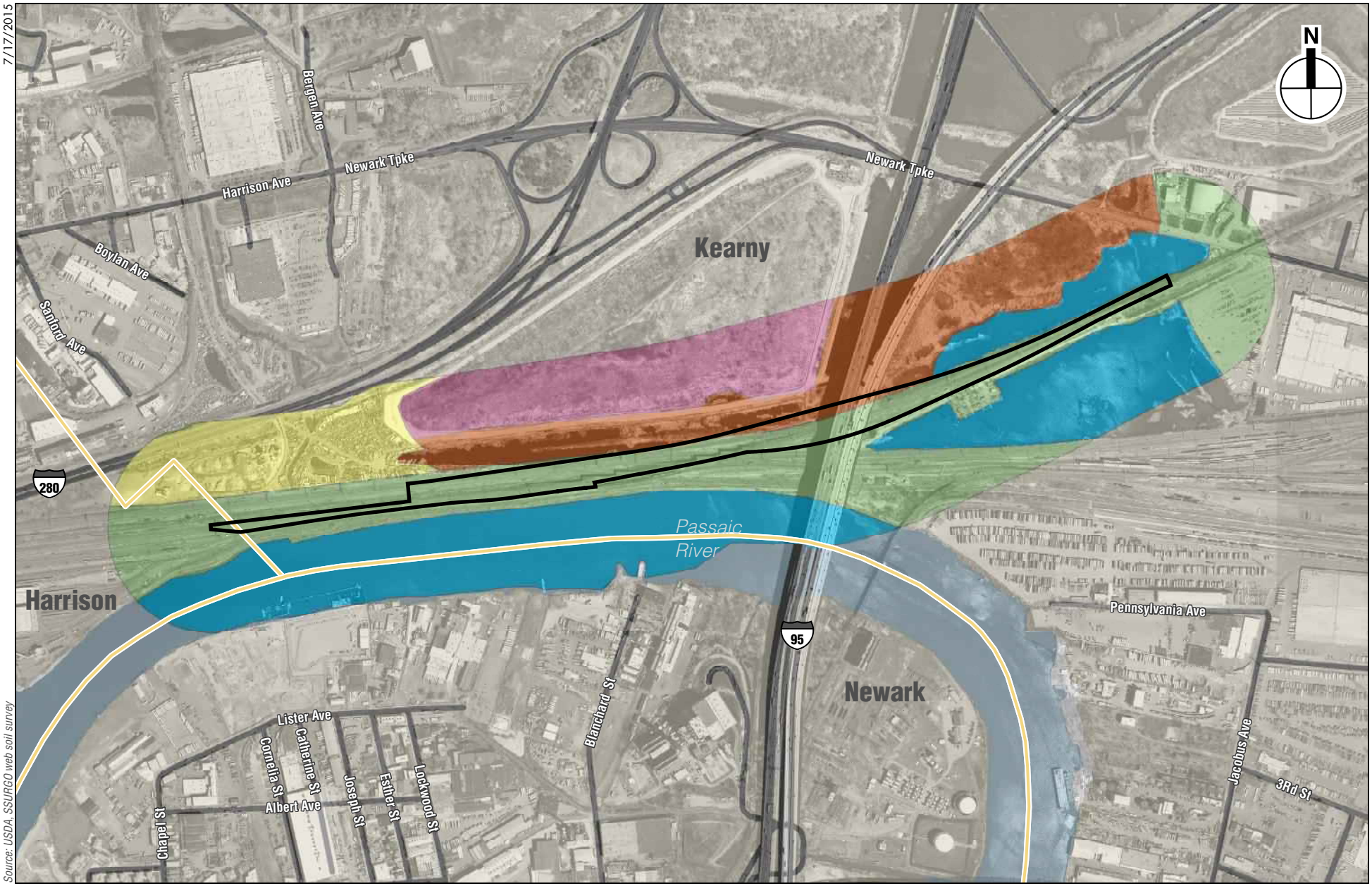
0 2,500 FEET

Ca. 1844-1845 Hassler Coastal Survey

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Figure 3

7/17/2015



Source: USDA, SSURGO web soil survey

Project Site

Municipal Boundary

SecA - Secaucus artifactual fine sandy loam - not prime farmland

URWETB - urban land - not prime farmland

UdrC - udorthents, refuse substratum - not prime farmland

WectA - westbrook mucky peat - not prime farmland

WATER - not prime farmland

0 1,000 FEET

USDA Soils Maps

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Figure 4

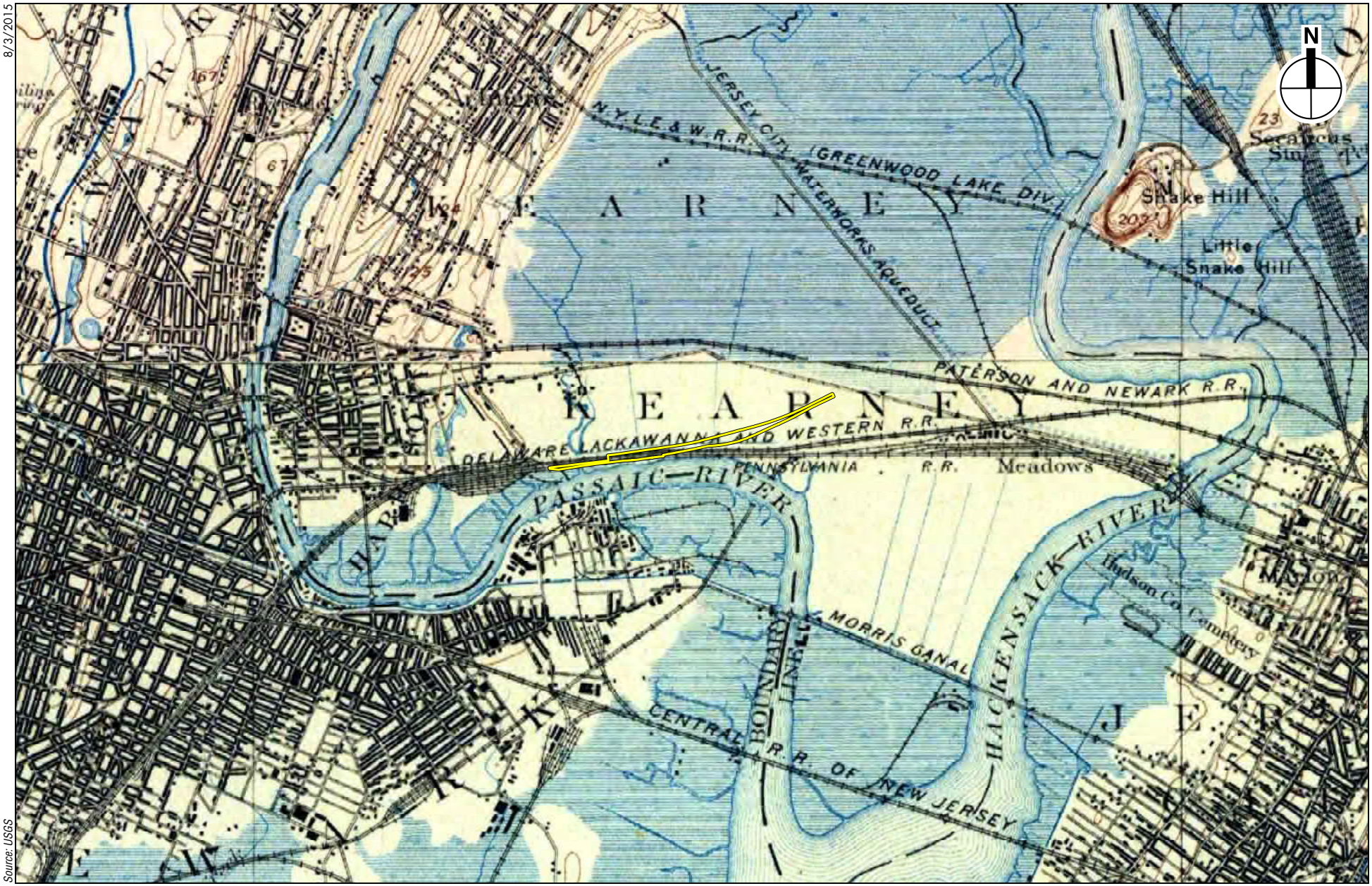
8/6/2015

1860 Walling Map

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Figure 5

8/3/2015



Source: USGS

Project Site

Note: This map was georeferenced to align the modern and historic streetbeds. Due to inaccuracies in the original map and landscape modification that has altered topographical features, the location of the Project Site should be considered approximate.

0 5,000 FEET

1898 USGS Map

SAWTOOTH BRIDGES REPLACEMENT PROJECT

Figure 6

Photographs

Photograph 1: View west from the northern side of the project site; one of the Sawtooth Bridges (Amtrak Bridge No. 7.96) is located at the left of the photo, leading to the elevated embankment that carries the NEC and south of the built-up area on which the NJ TRANSIT tracks are located.

Photograph 2: View east from the northern side of the project site towards one of the Sawtooth Bridges (Amtrak Bridge No. 7.80 at the center of the photograph.)

Photograph 3: View east from a point near the western end of the project site, showing the changes in grade along the NEC (at right) and the NJ TRANSIT lines (center).

Photograph 4: Looking west at the western end of the project site. The elevated embankment that carries the NEC line (at left) slopes down towards the ground surface in this location.

Photograph 5: View south of the change in grade between the NEC and the NJ TRANSIT tracks in the vicinity of a brick and concrete drainage culvert that carries Frank's Creek to the Passaic River.

Photograph 6: The northern side of the project site in the vicinity of the New Jersey Turnpike Viaduct, with Substation No. 4 visible in the background of the photograph.

Appendix A: Qualifications

ELIZABETH D. MEADE, RPA

TECHNICAL DIRECTOR/SENIOR ARCHAEOLOGIST

Elizabeth D. Meade, a Technical Director and senior archaeologist with AKRF, holds a Master's degree in Anthropology from Hunter College of the City University of New York and is experienced in the survey and documentation of archaeological resources. She has conducted numerous cultural resources investigations including Phase 1A Archaeological Documentary Studies and Phase 1B, Phase 2, and Phase 3 archaeological testing in both New York City and New York State for agency approval pursuant to the State Environmental Quality Review Act (SEQRA) and City Environmental Quality Review (CEQR). Ms. Meade has authored archaeological assessments for environmental impact statements, Phase 1A, Phase 1B, Phase 2, and Phase 3 archaeological field testing reports, disturbance memoranda, and archaeological monitoring and/or testing plans, and has experience in conducting archaeological fieldwork and laboratory analysis. Ms. Meade also serves as AKRF's Laboratory Director.

Before joining AKRF, Ms. Meade was employed by the New York City Landmarks Preservation Commission, where she conducted extensive research for the New York City Cemetery Survey. This research served as the basis for her Master's Thesis documenting the historic cemeteries of Queens and Staten Island. In addition, Ms. Meade has authored numerous journal articles and professional papers and recently co-authored a chapter in, *Tales of Gotham: Historic Archaeology and Ethnohistory in New York City*, which was edited by Diane Dallal and Meta Janowitz and published by Springer in 2013.

Education

M.A., Anthropology, CUNY Hunter College, New York, New York, 2006

B.A., Anthropology, New York University, New York, New York, 2004

Certifications/Licenses

Register of Professional Archaeologists (RPA)

Meets Secretary of Interior's Professional Qualification Standards for Cultural Resources Professionals (36 CFR Part 61, Appendix A)

Occupational Safety and Health Administration 10-Hour Certification in Construction Safety and Health Training

Amtrak Contractor Orientation Safety Training (2015)

Professional Memberships

New York State Archaeological Association (NYSAA), Metropolitan Chapter—Member, former Secretary

Professional Archaeologists of New York City (PANYC)—Member

Society for Historical Archaeology (SHA)—Member

Council for Northeast Historical Archaeology (CNEHA)—Member

Years of Experience

Year started in company: 2006

Year started in industry: 2004

RELEVANT EXPERIENCE

World Trade Center Vehicular Security Center, NY

AKRF is providing the Port Authority of New York and New Jersey (PANYNJ) and the Lower Manhattan Development Corporation (LMDC) with environmental consulting services in association with the WTC Vehicular Security Center. AKRF prepared an Environmental Assessment (EA) for the WTC Vehicular Security Center and conducted extensive archaeological investigations. Ms. Meade served as the Assistant Project Manager for the project. She and her colleagues provided archaeological monitoring services during construction and documented a number of archaeological resources, including an early wood water pipe and extensive timber wharf structures. The most notable discovery, which garnered international media attention, was the wooden hull of an 18th century merchant vessel. In a compressed time period, Ms. Meade and her colleagues efficiently uncovered and documented the significant archaeological find and carefully tagged, inventoried, and removed each timber for conservation. Concurrently, AKRF conducted appropriate consultation with agencies and consulting parties in accordance with Section 106 of the National Historic Preservation Act. AKRF is currently teaming with historic ship experts and other professionals to analyze the recovered vessel timbers and associated artifacts. Ms. Meade has authored and co-authored several papers and articles describing the find and has made numerous presentations about the ship at professional conferences and professional society meetings (see below).

LMDC East River Waterfront Access Project, New York, NY

AKRF was retained by the Lower Manhattan Development Corporation (LMDC) to prepare an Environmental Impact Statement (EIS) for the City's proposed development along the East River waterfront in Lower Manhattan. The plan would improve a two-mile-long public open space connecting Whitehall Ferry Terminal and Peter Minuit Plaza to East River Park with expanded open space and recreational facilities, cultural uses, and infrastructure improvements. The waterfront, many piers and the upland area under the elevated FDR Drive, including South Street, are included within the boundaries of the project. The esplanade as well as the piers would be renovated and redeveloped. Ms. Meade authored four Phase 1A documentary studies associated with proposed development projects located along the East River waterfront at Peck Slip, Rutgers Slip, Catherine Slip, and Montgomery Street. These Phase 1A reports documented the long history of the slips and their development as well as their potential to contain archaeological resources.

Water for the Future: Delaware Aqueduct Rondout-West Branch Tunnel Repair Program, Various Locations, New York

AKRF is currently leading the environmental impact assessment and permitting efforts for the New York City Department of Environmental Protection's Water for the Future: Delaware Aqueduct Rondout-West Branch Tunnel Repair Program, in association with the Joint Venture engineering team of Hatch Mott McDonald and Malcolm Pirnie. The preparation of the EIS for the first part of the program and the related federal, state and local permits and approvals are proceeding simultaneously to ensure that the program meets a 2013 date for groundbreaking. Ms. Meade serves as the Archaeological Resources Task Project Manager for the project and has completed several archaeological assessments of the project site—including Phase 1A and Phase 1B investigations—and has managed additional archaeological investigations of the project site by sub-consultants. In addition, Ms. Meade has coordinated extensively with the New York State Office of Parks, Recreation, and Historic Preservation to assess and document the archaeological sensitivity of the project site.

Hudson Square Rezoning, New York, NY

AKRF provided strategic planning services and prepared an Environmental Impact Statement (EIS) for the rezoning of an 18-block area in the Hudson Square neighborhood of Manhattan. AKRF's services included preparing potential development scenarios under various rezoning options to help the client, Trinity Real Estate, understand the environmental issues that could affect such areas as public schools, open space, historic resources,

transportation and parking, pedestrian circulation, air quality, and noise. Ms. Meade prepared a Phase 1A Archaeological Documentary Study of lots within the rezoning area.

New York University Core, New York, NY

By 2031, NYU proposes to construct nearly three million square feet of new academic uses at their academic core near Washington Square Park in Manhattan. AKRF is providing a range of environmental planning services such as planning and technical support, preparation of an EIS, and post-EIS support. Ms. Meade prepared a Phase 1A Archaeological Documentary of the project site, which included a sensitivity assessment of two superblocks and in-depth documentary research of selected lots within the project site.

West 44th Street and Eleventh Avenue Rezoning, New York, NY

AKRF prepared an Environmental Impact Statement (EIS)for the West 44th Street and Eleventh Avenue rezoning project. The proposed rezoning would permit the redevelopment of the project site with new residential buildings, a new school building, and new residential uses in an existing historic school building. Ms. Meade prepared a Phase 1A Archaeological Documentary Study of the project site, completed Phase 1B field testing within the areas identified as archaeologically sensitive in the Phase 1A, and co-authored the final Phase 1B report summarizing the findings of the archaeological investigation.

Sportime Randall's Island Tennis Center Annex, New York, NY

AKRF prepared an Environmental Assessment Statement (EAS) for the proposed Sportime Randall's Island Tennis Center Annex. Ms. Meade authored a Phase 1A Archaeological Documentary Study of the site, which is in close proximity to the city's former Potter's Field, and also prepared an Unanticipated Discoveries Plan to outline the steps that should be taken in the event that human remains are encountered during construction.

CornellNYC Tech, Roosevelt Island, NY

AKRF prepared an Environmental Impact Statement (EIS) for Cornell University's proposed new applied science and engineering campus on Roosevelt Island. This project, which is proposed in response to New York City's Applied Science NYC initiative, is expected to serve as a focal point for accelerating existing sectors of NYC's economy and driving the formation of new technology businesses through close ties to customers and core industry knowledge. The EIS was completed on an aggressive time schedule, which included a commitment to submit a complete preliminary draft EIS to the lead agency within 60 days of the public scoping meeting. Ms. Meade prepared a Phase 1A Archaeological Documentary Study of the project site.

Prospect Plaza Redevelopment Plan, Brooklyn, NY

The New York City Housing Authority (NYCHA) proposes to redevelop Prospect Plaza, a vacant high-rise public housing site in Brooklyn's Ocean Hill-Brownsville neighborhood. The project would create 450 new affordable residential units, a fresh foods grocery store, a community center, and open space. The proposed development would help to address the continuing need for quality affordable housing in New York City, and return this site to use as a community asset. Ms. Meade authored a Phase 1A Archaeological Documentary Study of the project site, completed Phase 1B field testing within the areas identified as archaeologically sensitive in the Phase 1A, and co-authored the final Phase 1B report summarizing the findings of the archaeological investigation.

Seward Park Mixed-Use Development Project, New York, NY

The Office of the Deputy Mayor for Economic Development, in coordination with the New York City Economic Development Corporation and the City of New York Department of Housing Preservation & Development, are sponsoring an approximately 1.7 million gross-square-foot mixed-use development project on 9 sites located on

the Lower East Side of Manhattan, which form the largest underdeveloped City-owned site south of 96th Street. AKRF led the preparation of the EIS for this mixed-use proposal and prepared the ULURP application for the various street mapping actions. Ms. Meade prepared a Phase 1A Archaeological Documentary Study of the project site, which involved in-depth research of numerous historic lots across a large area.

Mercy College, Irvington and Dobbs Ferry, New York

AKRF was retained by Mercy College to provide environmental services associated with proposed improvements to the school's main campus in Dobbs Ferry and Irvington, New York. Ms. Meade served as the archaeological resources task manager for the project and completed a Phase 1 Archeological Investigation of the campus, which included in-depth documentary research and archaeological testing.

Peach Lake Sewer District: North Salem and Southeast, NY

AKRF was retained by the Towns of North Salem and Southeast, New York (in Westchester and Putnam Counties, respectively) to complete an archaeological assessment of the site of a proposed sewer district along the shores of the Peach Lake. Ms. Meade prepared the Phase 1A Archaeological Documentary Study of the site and participated in Phase 1B, Phase 2, and Phase 3 archaeological investigations of the area, which resulted in the identification of a precontact archaeological site. Ms. Meade also assisted with the laboratory processing and analysis of the collected artifacts and contributed to the report that presented the findings.

Bronx Zoo Intermodal Transportation Facility

AKRF was retained by the Wildlife Conservation Society to prepare an Environmental Assessment (EA) for the construction of a proposed Intermodal Transportation Facility within the boundaries of the New York Zoological Park in the Bronx, New York. Ms. Meade prepared a Phase 1A Archaeological Documentary Study to document the history of the site and to determine its potential to yield significant archaeological resources dating to the precontact and historic periods. Ms. Meade also completed Phase 1B Archaeological testing at the Zoo and authored a Phase 1B report summarizing the results of the investigation.

New York City School Construction Authority, Various Locations, NY

Ms. Meade serves as the Archaeological Resources Task Manager for AKRF's on-call contract with the New York City School Construction Authority (SCA). Ms. Meade has authored numerous disturbance memoranda, Phase 1A Archaeological Documentary Studies, testing protocols, and Phase 1B and Phase 2 testing reports for various SCA projects throughout the five boroughs of New York City. Ms. Meade has also participated in laboratory processing and analysis for various SCA project sites. Ms. Meade recently served as one of the Principal Investigators for Phase 2 and Phase 3 Archaeological Investigations at the SCA's Crabtree Avenue site in the Sandy Ground area of Staten Island. The site is located within a National Register of Historic Places-listed Archaeological district in one of the oldest free African-American communities in the country. Other projects include Public School 51 (New York, NY), the Crown Heights Charter School (Brooklyn, NY), 110-02 Northern Boulevard (Queens, NY), 10 East 15th Street (New York, NY), and 400 Rider Avenue Charter High School in the Bronx (Bronx, NY).

City Tech New Academic Building, Brooklyn, NY

On behalf of the Dormitory Authority of the State of New York (DASNY), AKRF prepared the environmental assessment for the City Tech New Academic Building project which involves the construction of a nine-story academic building. Ms. Meade served as the Principal Investigator for archaeological resources for this project. Ms. Meade completed a Phase 1A Archaeological Documentary Study of the project site which analyzed both the occupation and development history of the site as well as its potential to contain human remains associated with a historic church that was formerly located on the property. Ms. Meade has also authored a Phase 1B Testing Protocol for the project site and continues to coordinate upcoming archaeological testing and monitoring with

DASNY, the New York City Landmarks Preservation Commission (LPC), the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP), and the remainder of the project team.

Spring Street Presbyterian Church, New York, NY

After the discovery of human remains at a construction site located in Manhattan, AKRF, Inc. was retained to provide cultural resources services and to prepare a plan for the recovery and analysis of the remains for the property, which was the site of an early-19th century church and burial vaults. Ms. Meade conducted site visits to assess the condition of the remains and conducted a Topic Intensive Documentary Study of the project site detailing the history of the church and its burial vaults. Ms. Meade completed additional documentary research based on the human remains and artifacts recovered from the site and has co-authored various articles based on that research (see below). Ms. Meade presented a paper based on her research of the Spring Street Church site at the Society for Historical Archaeology's 42nd Annual Conference on Historical and Underwater Archaeology, Toronto, Ontario, Canada and has authored or co-authored several published articles about the project.

SELECTED PAPERS, LECTURES, AND PUBLICATIONS

Meade, Elizabeth D.
2010 "'A Free Church for the People:' The History of the Spring Street Church and ifs Burial Vaults." In, *Northeast Historical Archaeology* 39(1): 8-18.

Meade, Elizabeth D. and Rebecca L. White
2013 "Public Life, Personal Grief: The Contrasting Existence of a 19th Century New York Family." In, *Tales of Gotham: Historic Archaeology and Ethnohistory in New York City*. Meta F. Janowitz and Diane Dallal, editors. Pp. 313-325. New York: Springer.

Meade, Elizabeth D., A. Michael Pappalardo, Molly McDonald, and Diane Dallal
2011 "The Documentation and Analysis of Vessel Remains at the World Trade Center Redevelopment Site in New York City." In, *ACUA Underwater Archaeology Proceedings 2011*. Filipe Castro and Lindsey Thomas, editors. Pp. 187-195. Advisory Council on Underwater Archaeology.

Meade, Elizabeth D. and Diane Dallal
January 2009 "A Free Church for the People: The History of the Spring Street Church and Its Role in the Abolitionist Movement." Society for Historical Archaeology's 42nd Annual Conference on Historical and Underwater Archaeology, Toronto, Ontario, Canada.

Meade, Elizabeth D. and Nichole Doub
March 2011 "Sunk Beneath the City Streets: The Excavation, Analysis, and Care of the World Trade Center Ship." Plenary Session at the Mid-Atlantic Archaeological Conference (MAAC) 2011 Annual Meeting, Ocean City, Maryland.

Pappalardo, A. Michael, Elizabeth D. Meade, Molly McDonald, and Diane Dallal
January 2011 "The Recordation and Analysis of Vessel Remains at the World Trade Center Site in Manhattan" Society for Historical Archaeology's 44th Annual Conference on Historical and Underwater Archaeology, Austin, Texas, Canada. Presented by Elizabeth D. Meade.

Wiencek, Robert, Elizabeth D. Meade, and Rebecca White.
January 2009 "Insatiate Archer, Would Not One Suffice?" Society for Historical Archaeology's 42nd Annual Conference on Historical and Underwater Archaeology, Toronto, Ontario, Canada.

MOLLY R. MCDONALD, RPA

TECHNICAL DIRECTOR

Molly McDonald, an architectural historian and archaeologist, is experienced in the survey and documentation of cultural resources and has produced numerous cultural resource surveys and National Register nominations in compliance with federal, state, and local regulations in New York State and throughout the northeast. She has completed impacts analyses in compliance with Section 106 of the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), Section 4(f) of the Department of Transportation Act, the New York State Historic Preservation Act, and other legislation, and has devised strategies for mitigating adverse effects. She has prepared Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) documentation. She routinely serves as Principal Investigator for all phases of archaeological investigation. She has extensive experience in writing archaeological documentary studies (Phase 1As) and testing plans, and in conducting archaeological fieldwork and laboratory analysis. Ms. McDonald routinely coordinates with the New York City Landmarks Preservation Commission and the State Historic Preservation Office in New York and other northeastern states. Before joining AKRF, Ms. McDonald was employed by the Historic House Trust, and subsequently served as Monuments Coordinator for the City of New York, Department of Parks. Ms. McDonald also worked as an architectural historian and archaeologist for Earth Tech/TAMS consultants prior to joining AKRF.

BACKGROUND

Education

M.A., Historic Preservation, Cornell University, Ithaca, NY, 2002
M.A., Buildings Archaeology, University of York, York, England, 2000
B.A., History, McGill University, Montreal, Canada, 1999

Licenses/Certifications

Register of Professional Archaeologists (RPA)
Meets Secretary of Interior's Professional Qualification Standards for Architectural Historians (36 CFR Part 61, Appendix A)
New Jersey State Historic Preservation Office Research Training

Professional Memberships

Member, National Trust for Historic Preservation
Member, Timber Framers Guild
Member, New York State Barn Coalition
Member, Vernacular Architecture Forum
Member, Society for Historical Archaeology
Member, Council for Northeast Historical Archaeology

Years of Experience

Year started in company: 2006
Year started in industry: 2000

RELEVANT EXPERIENCE

Amtrak/NJ Transit Portal Bridge Replacement Project EIS, Secaucus, NJ

Amtrak and NJ TRANSIT, in cooperation with the Federal Railroad Administration (FRA), plan to increase capacity on the Northeast Corridor rail line's Portal Bridge crossing over the Hackensack River. The proposed project is being reviewed under the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA). Ms. McDonald serves as Historic Resources Task Manager for the on-going project. The historic resources team identified and evaluated potential impacts on historic resources in the study area, including the State Register-listed Portal Bridge itself, and multiple other bridges, railroads, and structures. Ms. McDonald prepared archaeological documentary studies for the project site, which includes a National Register-eligible historic Potter's Field and assisted in field testing for remains associated with the cemetery. Currently, Ms. McDonald is coordinating with the New Jersey Historic Preservation Office and New Jersey Historic Districts Council to identify and implement mitigation measures, which will include Historic American Engineering Record (HAER) recordation, a salvage plan, and interpretive exhibits.

Port Authority of New York and New Jersey, Greenville Yards, Hudson County, NJ

Port Authority of New York and New Jersey (PANYNJ) and Federal Highway Administration (FHWA) propose emergency restoration, maintenance, and replacement of critical system elements to meet modern rail freight standards at the Greenville Yards, a vital link in the Cross Harbor rail barge system. Ms. McDonald serves as Cultural Resources Task Leader for the project, which is subject to the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act. The project site contains a massive rail car lift bridge and other infrastructure that has been determined State and National Register-eligible both individually and as part of the Greenville Yard Historic District.

PSEG Early Site Permit Application, Salem County, NJ

AKRF performed numerous cultural resources compliance tasks associated with PSEG's Early Site Permit Application for their Salem County site. Ms. McDonald served as cultural resources task manager for this work. As part of this project, Ms. McDonald conducted extensive architectural resources field surveys and conducted extensive coordination with both the New Jersey Historic Preservation Office (NJHPO) and Delaware Historic Preservation Office (DESHPO). Ms. McDonald prepared an assessment of the potential visual effects of the proposed project on architectural resources in the study area. She also completed Intensive Level Survey Forms for multiple historic properties in the study area, including early patterned brick houses. Ms. McDonald also oversaw the completion of Phase II terrestrial archaeological and submerged cultural resources surveys (Phase II Surveys) to determine whether significant (New Jersey State Register [SR] and/or National Register of Historic Places [NR]-eligible) archaeological and submerged resources are present in the project's archaeological area of potential effect (APE) in Salem County, New Jersey. The project obtained No Adverse Effects determinations from both NJHPO and DESHPO.

PSEG Site Selection, Multiple Locations, NJ

AKRF assisted PSEG with the analysis of alternative site locations for a potential new facility in multiple counties in New Jersey including Salem and Hunterdon Counties. Ms. McDonald served as the cultural resources task manager for this project. She conducted screening level archaeological analyses, including archaeological site file research at the New Jersey Historic Preservation Office (NJHPO) and New Jersey State Museum (NJSM). For architectural resources, Ms. McDonald conducted documentary studies and field surveys for four large study areas, each with a radius of ten miles. She identified hundreds of potential architectural resources in these study areas ranging from early patterned brick houses to stone barns. Ms. McDonald used this baseline data to generate a comparison of the alternative sites in terms of their potential to impact cultural resources.

Site Selection Study, Multiple Sites, New Jersey

Ms. McDonald serves as Cultural Resources Task Manager for a site selection study on behalf of a confidential client planning an industrial facility in New Jersey. As part of this project, Ms. McDonald has performed baseline research on cultural resources for sites in several counties in New Jersey. She has identified known architectural resources in the vicinity of these sites and has performed archaeological site file research at the New Jersey State Museum.

CZMA Consistency Determination, Outer Continental Shelf Meteorological Stations, Garden State Offshore Energy, Multiple Sites, New Jersey

The Coastal Zone Management Act (CZMA) requires that any federal actions affecting coastal resources should be consistent with the enforceable policies of a coastal state's federally approved Coastal Management Program. The proposed project involves the installation of two meteorological towers at locations approximately 20 miles off the coast of Southern New Jersey in the Atlantic Ocean. Ms. McDonald conducted baseline cultural resources data collection, visiting the New Jersey Historic Preservation Office to review files for multiple sites and synthesizing data on previous off-shore bathymetric surveys and archaeological investigations.

New Jersey Schools Construction Corporation, Historic Preservation and Mitigation Report, Union City Elementary School No. 2 – Gilmore School, Union City, Hudson County, New Jersey.

While at another firm, Ms. McDonald prepared cultural resources documentation in compliance with New Jersey Executive Order No. 215. Ms. McDonald identified a National Register-eligible historic district that would be impacted by construction of a playground. Ms. McDonald assisted project designers in devising context sensitive design for the playground that would complement the historic district, and coordinated with the New Jersey Historic Preservation Office.

New Jersey Department of Transportation, Drainage Improvement Project, US Route 30 (White Horse Pike), Winslow Township, New Jersey.

On behalf of the New Jersey Department of Transportation (NJDOT), Ms. McDonald collected cultural resources data within the area that will be impacted by the drainage improvement project. Ms. McDonald conducted an architectural resources survey to identify potential National Register-eligible resources and assessed potential impacts on cultural resources.

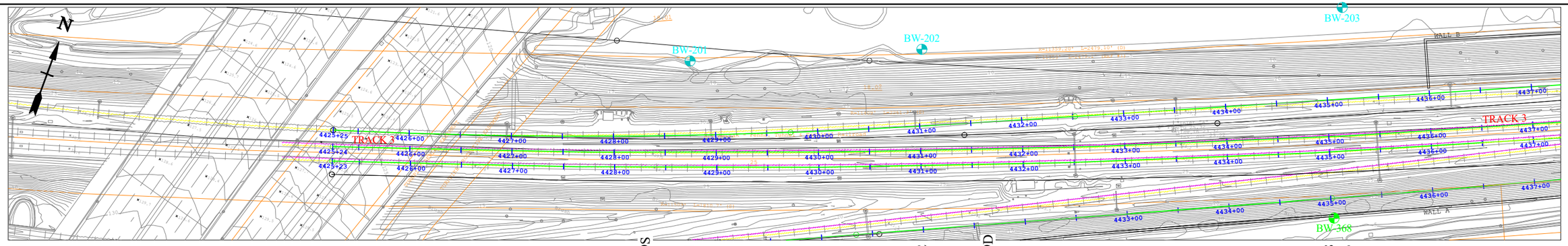
PAPERS AND PUBLICATIONS

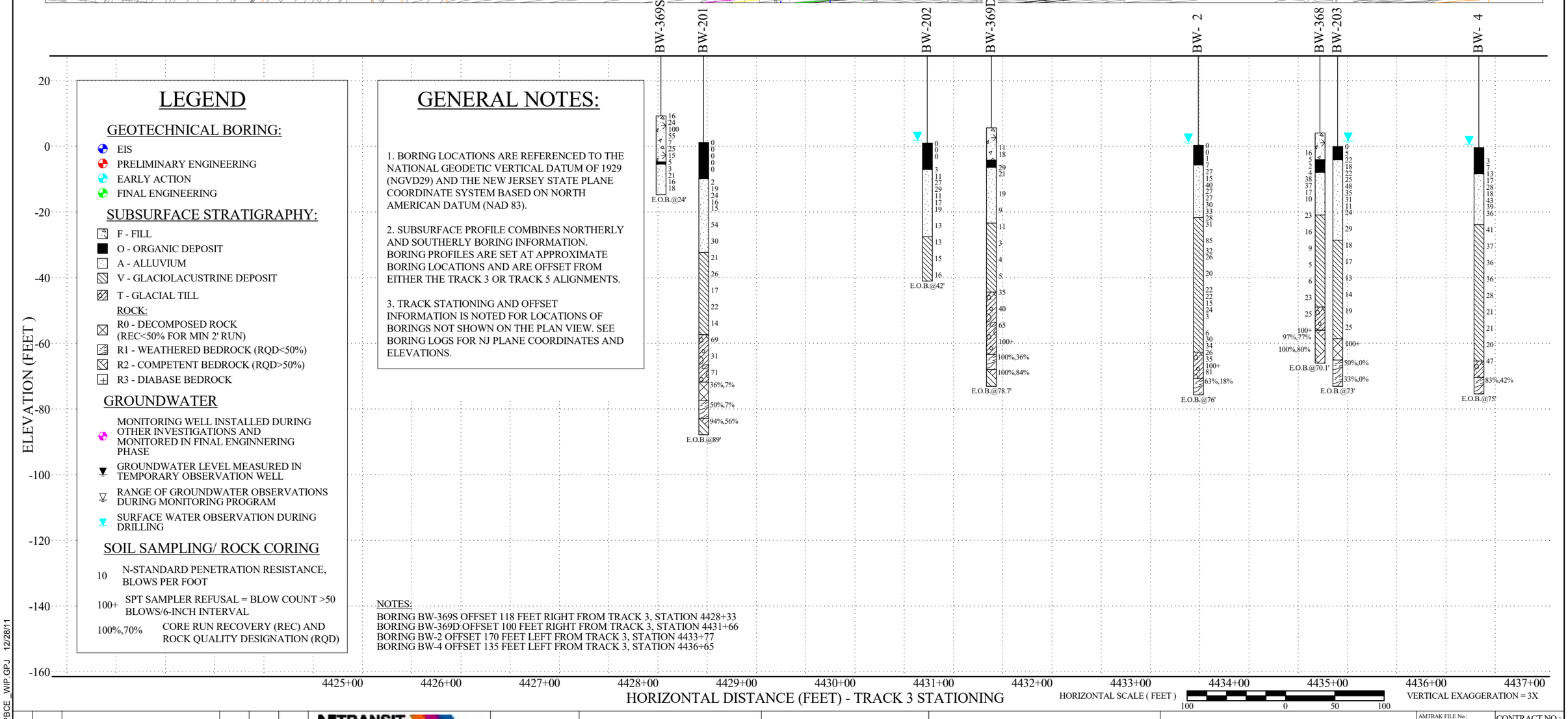
Archaeological Methodology Applied to Moved Houses on the South Fork of Long Island. Master of Arts Dissertation, York University (England), Department of Archaeology, 2000.

"The Archaeology and History of Moving Houses on the South Fork of Long Island," *Vernacular Architecture,* York City Printers: York, vol. 32. 2001.

The Abandoned Structures of the Other Islands of New York City: Past, Present, and Future. Masters of Arts Thesis, Historic Preservation Planning, Cornell University, 2002.

Appendix B: Soil Borings Completed as Part of Previous Projects in the Vicinity of the Archaeological APE





LEGEND

GEOTECHNICAL BORING:

- EIS
- PRELIMINARY ENGINEERING
- EARLY ACTION
- FINAL ENGINEERING

SUBSURFACE STRATIGRAPHY:

- F - FILL
- O - ORGANIC DEPOSIT
- A - ALLUVIUM
- V - GLACIOLACUSTRINE DEPOSIT
- T - GLACIAL TILL

ROCK:

- R0 - DECOMPOSED ROCK (REC<50% FOR MIN 2' RUN)
- R1 - WEATHERED BEDROCK (RQD<50%)
- R2 - COMPETENT BEDROCK (RQD>50%)
- R3 - DIABASE BEDROCK

GROUNDWATER

- MONITORING WELL INSTALLED DURING OTHER INVESTIGATIONS AND MONITORED IN FINAL ENGINNERING PHASE
- GROUNDWATER LEVEL MEASURED IN TEMPORARY OBSERVATION WELL
- RANGE OF GROUNDWATER OBSERVATIONS DURING MONITORING PROGRAM
- SURFACE WATER OBSERVATION DURING DRILLING

SOIL SAMPLING/ ROCK CORING

- 10 — N-STANDARD PENETRATION RESISTANCE, BLOWS PER FOOT
- 100+ — SPT SAMPLER REFUSAL = BLOW COUNT >50 BLOWS/6-INCH INTERVAL
- 100%,70% — CORE RUN RECOVERY (REC) AND ROCK QUALITY DESIGNATION (RQD)

GENERAL NOTES:

1. BORING LOCATIONS ARE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) AND THE NEW JERSEY STATE PLANE COORDINATE SYSTEM BASED ON NORTH AMERICAN DATUM (NAD 83).

2. SUBSURFACE PROFILE COMBINES NORTHERLY AND SOUTHERLY BORING INFORMATION. BORING PROFILES ARE SET AT APPROXIMATE BORING LOCATIONS AND ARE OFFSET FROM EITHER THE TRACK 3 OR TRACK 5 ALIGNMENTS.

3. TRACK STATIONING AND OFFSET INFORMATION IS NOTED FOR LOCATIONS OF BORINGS NOT SHOWN ON THE PLAN VIEW. SEE BORING LOGS FOR NJ PLANE COORDINATES AND ELEVATIONS.

NOTES:

BORING BW-369S OFFSET 118 FEET RIGHT FROM TRACK 3, STATION 4428+33
BORING BW-369D OFFSET 100 FEET RIGHT FROM TRACK 3, STATION 4431+66
BORING BW-2 OFFSET 170 FEET LEFT FROM TRACK 3, STATION 4433+77
BORING BW-4 OFFSET 135 FEET LEFT FROM TRACK 3, STATION 4436+65

HORIZONTAL SCALE (FEET) 100 0 50 100

VERTICAL EXAGGERATION = 3X

PORTAL_PROFILE PBCE_WIP.GPJ 12/28/11

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Geotechnical, Environmental & Civil Engineering
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Elmwood Park, NJ 07407
Tel:(201)791-0075
Fax:(201)791-4533

PORTAL BRIDGE CAPACITY ENHANCEMENT PROJECT

SUBSURFACE PROFILE
TRACK 3 - STA 4425+25 TO 4437+00

SHEET 1 OF 9

AMTRAK FILE No.:
AMTRAK FILE NO.:
AMTRAK Work Element No.:
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ISSUE:
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DATE:
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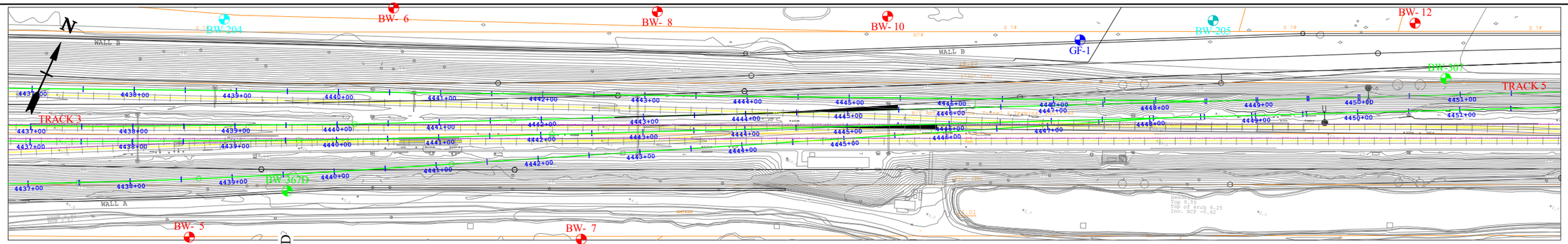
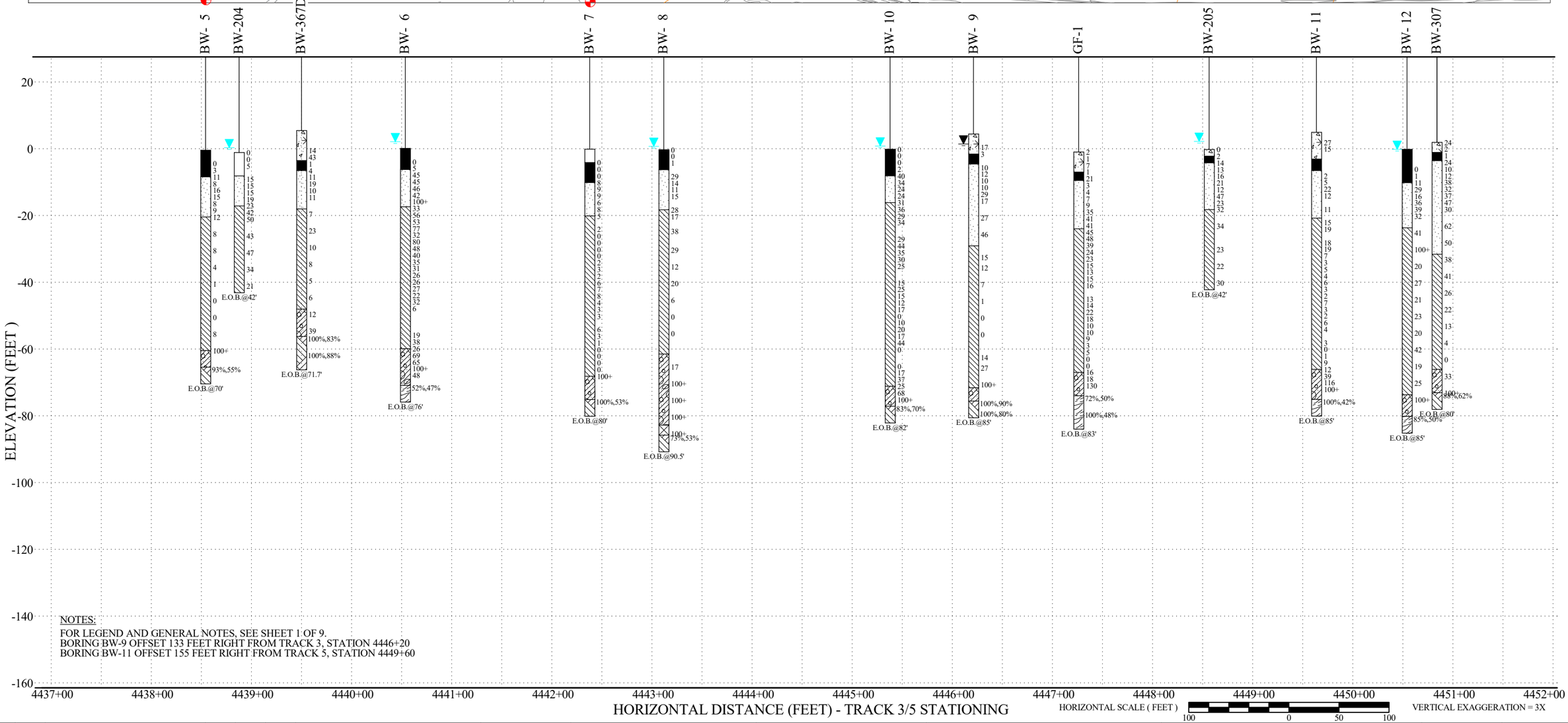
CONTRACT NO.: --

FIG. NO.: 6





NOTES:

FOR LEGEND AND GENERAL NOTES, SEE SHEET 1 OF 9.
BORING BW-9 OFFSET 133 FEET RIGHT FROM TRACK 3, STATION 4446+20
BORING BW-11 OFFSET 155 FEET RIGHT FROM TRACK 5, STATION 4449+60

PORTAL_PROFILE COPY PBCE _WIP_09_11 WEST.GPJ PORTAL BRIDGE DATATMPL_REV.GDT 9/28/11

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YU & Associates, Inc.
Geotechnical, Environmental & Civil Engineering
200 Riverfront Blvd
Elmwood Park, NJ 07407
Tel:(201)791-0075
Fax:(201)791-4533

PORTAL BRIDGE CAPACITY ENHANCEMENT PROJECT

SUBSURFACE PROFILE
TRACK 3/5 - STA 4437+00 TO 4452+00

SHEET 2 OF 9

AMTRAK FILE No.:
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ISSUE:
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DATE:
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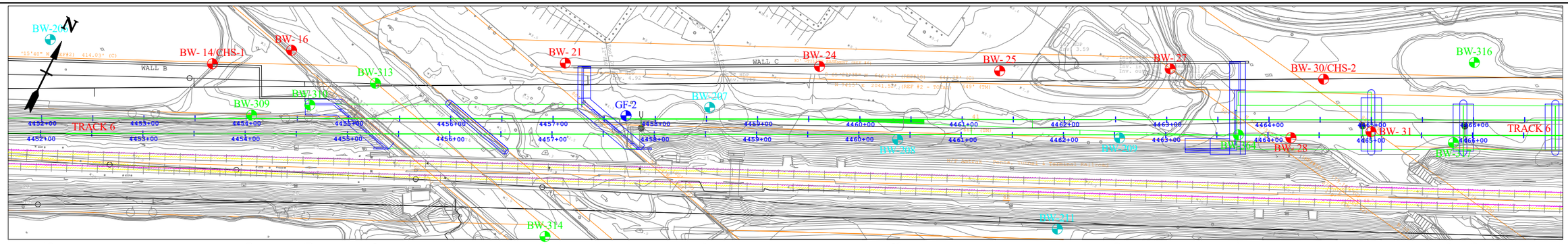
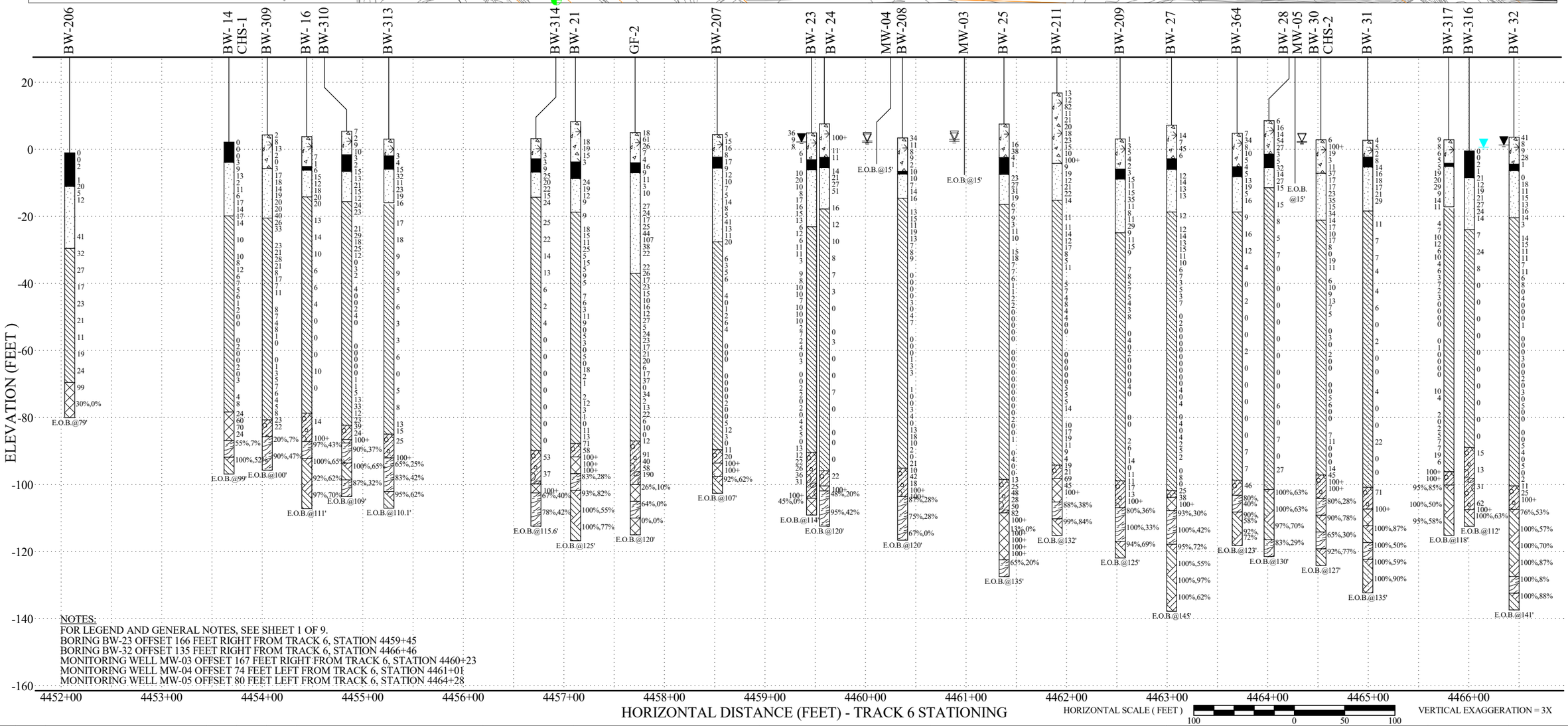
CONTRACT NO.: --

FIG. NO.: 6





NOTES:
FOR LEGEND AND GENERAL NOTES, SEE SHEET 1 OF 9.
BORING BW-23 OFFSET 166 FEET RIGHT FROM TRACK 6, STATION 4459+45
BORING BW-32 OFFSET 135 FEET RIGHT FROM TRACK 6, STATION 4466+46
MONITORING WELL MW-03 OFFSET 167 FEET RIGHT FROM TRACK 6, STATION 4460+23
MONITORING WELL MW-04 OFFSET 74 FEET LEFT FROM TRACK 6, STATION 4461+01
MONITORING WELL MW-05 OFFSET 80 FEET LEFT FROM TRACK 6, STATION 4464+28

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Portal Partners Gateway to Success

YU & Associates, Inc.
Geotechnical, Environmental & Civil Engineering
200 Riverfront Blvd
Elmwood Park, NJ 07407
Tel:(201)791-0075
Fax:(201)791-4533

PORTAL BRIDGE CAPACITY ENHANCEMENT PROJECT

SUBSURFACE PROFILE
TRACK 6 - STA 4452+00 TO 4466+50

SHEET 3 OF 9

AMTRAK FILE No.:
AMTRAK FILE NO.:
AMTRAK Work Element No.:
AMTRAK FILE NO.:
ISSUE:
AMTRAK FILE NO.:
DATE:
AMTRAK FILE NO.:

CONTRACT NO.: --
FIG. NO.: 6

PORTAL_PROFILE_COPY PBCE_WIP_09_11 WEST.GPJ 9/28/11

ENGINEERS FIELD BORING LOG

BORING NO. BW- 2
SHEET 1 OF 4
DATE: START 3/20/09
END 3/24/09
DATUM: NGVD29
ELEVATION: 0.3±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 696835.1± E. 597675.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER: DURING DRILLING: 0.0' TIME: 7:30 DATE: 3/23/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: 13:30 DATE: 3/24/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WR WR			-	OL	wet	Brown Organic SILT, frequent roots, (ORGANIC DEPOSIT).	Depth to mudline 1' PID = 0.0 ppm
2.0	S-2	WR WR WR WR			-	OL	wet		
4.0	S-3	WH WH 1 1	0.3'	15	-	OL	wet		PID = 0.0 ppm
6.0								6.0' El. -5.7'	
	S-4	2 3 4 5	1.0'	50	-	SM	wet	Dark brown medium to fine(+) SAND, some Silt, frequent roots, (ALLUVIUM).	PID = 0.0 ppm
8.0	S-5	6 12 15 17	1.5'	75	-	SM	wet	...little Silt.	PID = 0.0 ppm
10.0	S-6	3 4 11 8	0.7'	35	-	SM	wet		PID = 0.0 ppm
12.0	S-7	12 18 22 29	1.5'	75	-	SP-SM	wet	...coarse to fine, trace(+) Silt.	PID = 0.0 ppm
14.0	S-8	7 12 15 22	0.4'	20	-	SP	wet	...red-brown, some(+) medium to fine Gravel, trace(-) Silt.	PID = 0.0 ppm
16.0	S-9	11 12 15 50/4"	1.0'	55	-	SP-SM	wet	...gray-brown, coarse to fine, trace Silt, trace medium to fine Gravel.	PID = 0.0 ppm S-9: 7.6%<#200
17.8									
18.0	S-10	10 18 12 11	0.7'	35	-	SP	wet	Gray coarse to fine SAND, (ALLUVIUM).	PID = 0.0 ppm
20.0								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 2
SHEET 2 OF 4
DATE: START 3/20/09
END 3/24/09
DATUM: NGVD29
ELEVATION: 0.3±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 696835.1± E. 597675.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER: DURING DRILLING: 0.0' TIME: 7:30 DATE: 3/23/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: 13:30 DATE: 3/24/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
	S-11	10 15 18 31	0.8'	40	-	SP	wet	Gray brown coarse to fine SAND, (ALLUVIUM).	
22.0								22.0' _ El. -21.7'	
	S-12	11 15 13 11	1.5'	75	PP 1.60	CL	moist	Gray SILT & CLAY, (GLACIOLACUSTRINE DEPOSIT).	
24.0									
	S-13	10 13 18 20	1.2'	60	PP 1.00	CL	moist	Gray-brown varved Clayey SILT and Silty CLAY, alternating 3/4"± clayey silt, 3/4"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
26.0									
27.0									
	U-NR	P U S H	0.0'	0	-			No recovery.	Undisturbed sampling attempted with a piston sampler
29.0									
	S-14	25 45 40 42	0.9'	45	PP 3.50	ML	moist	Gray Clayey SILT, little(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 29'
31.0									
32.0									
	S-15	11 13 19 20	1.0'	50	PP 1.50	CL	moist	Gray CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
34.0									
	S-16	11 11 15 12	2.0'	100	PP 1.50	CL	moist	Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/2"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
36.0									
37.0									
	U-NR	P U S H	0.0'	0	-			No recovery.	Undisturbed sampling attempted with a piston sampler
39.0									
		8 11		100		CL	moist	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 2
SHEET 3 OF 4
DATE: START 3/20/09
END 3/24/09
DATUM: NGVD29
ELEVATION: 0.3±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 696835.1± E. 597675.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER:
DURING DRILLING: 0.0' TIME: 7:30 DATE: 3/23/09
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: -1.0' TIME: 13:30 DATE: 3/24/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
41.0	S-17	9 10	2.0'		-	CL	moist	*.....(continued from previous page).* Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/2"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
42.0									
44.0	U-1	P U S H	1.3'	65	PP 0.40	CL	moist		Undisturbed sample collected using a Shelby tube
46.0	S-18	8 10 12 13	2.0'	100	PP 1.50	CL	moist	Grayish brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
48.0	S-19	8 10 12 14	1.5'	75	PP N/A	CL	moist		
50.0	S-20	4 7 8 11	2.0'	100	PP N/A	CL	moist	...frequent silt seams.	
52.0	S-21	8 11 13 11	1.8'	90	PP 1.00	CL	moist	...occasional silt seams.	
54.0	S-22	WR WH 3 4	2.0'	100	PP 0.70	CL	moist	Brown Silty CLAY varved with Clayey Silt, alternating 1"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
55.0									
57.0	U-NR	P U S H	0.0'	0	-			No recovery.	Undisturbed sampling attempted with a piston sampler
59.0	S-23	9 3 3 3	2.0'	100	PP 0.90	CL	moist		
		3 17		50	PP	ML	moist	Brown Clayey SILT, trace(+) medium to fine Sand, (GLACIOLACUSTRINE DEPOSIT).	*.....(continued on next page)*

ENGINEERS FIELD BORING LOG

BORING NO. BW- 2
SHEET 4 OF 4
DATE: START 3/20/09
END 3/24/09
DATUM: NGVD29
ELEVATION: 0.3±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 696835.1± E. 597675.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER:
DURING DRILLING: 0.0' TIME: 7:30 DATE: 3/23/09
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: -1.0' TIME: 13:30 DATE: 3/24/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-24	13 13	1.0'		0.40	ML	moist	*.....(continued from previous page).*	
61.0									
	S-25	11 15 19 21	2.0'	100	PP 2.00	ML	moist	Brown Clayey SILT, trace(+) medium to fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
63.0								63.0' EI. -62.7'	
	S-26	25 13 13 13	0.4'	20	-	ML	moist	Brown SILT, some coarse to fine Sand, little(+) medium to fine Gravel, (GLACIAL TILL).	S-26: 61.2%<#200
65.0									
	S-27	5 15 20 23	0.8'	40	-	ML	moist		
67.0									
	S-28	27 50/4"	0.4'	48	-	ML	moist		
67.8									
69.0									
	S-29	25 37 44 50/4"	1.0'	55	-	ML	moist		
70.8									
71.0								71.0' Top of Rock at 71.0 feet. EI. -70.7'	
	C-1		3.2'	63 18				Brown SILTSTONE, moderately to slightly weathered, medium strong, very closely to closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
76.0								76.0' EI. -75.7'	
								Bottom of borehole at 76 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50 bags of bentonite, potable water.

ENGINEERS FIELD BORING LOG

BORING NO. BW- 4
SHEET 1 OF 4
DATE: START 3/17/09
END 3/19/09
DATUM: NGVD29
ELEVATION: -0.4±
TOTAL DEPTH: 75'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 696916.5± E. 597950.8±
INSPECTORS NAME/COMPANY N. DelGrosso/ M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
									Depth to mudline 1'
									Drilled through soft soils to 4'
4.0									
	S-1	5 1 2 1	0.5'	25	-	OL	wet	Black Organic SILT, some Gravel, frequent plant matter, (ORGANIC DEPOSIT).	
6.0									
	S-2	14 5 2 1	0.7'	35	-	OL	wet	...no Gravel, frequent decomposed plant matter.	
8.0								8.0' El. -8.4'	
	S-3	7 6 7 8	0.7'	35	-	SP-SM	wet	Dark brown medium to fine(+) SAND, little(-) Silt, (ALLUVIUM).	
10.0									
	S-4	4 7 10 11	1.0'	50	-	SP-SM	wet		
12.0									
	S-5	10 12 16 19	1.8'	90	-	SP	wet	...gray-brown, coarse to fine, trace fine Gravel, trace Silt.	S-5: 4.2%<#200
14.0									
	S-6	3 7 11 15	1.0'	50	-	SP	wet		
16.0									
	S-7	24 26 17 20	1.4'	70	-	SP	wet		
18.0									
	S-8	8 12 27 50/2"	1.7'	100	-	SM	wet	...brown-gray, some fine Gravel, little Silt.	
19.7									
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 4
SHEET 2 OF 4
DATE: START 3/17/09
END 3/19/09
DATUM: NGVD29
ELEVATION: -0.4±
TOTAL DEPTH: 75'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 696916.5± E. 597950.8±
INSPECTORS NAME/COMPANY N. DelGrosso/ M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-9	10 13 23 24	1.8'	90	-	SP	wet	*.....(continued from previous page).* Gray coarse(+) to fine SAND, some(+) fine Gravel, (ALLUVIUM).	
25.0								23.5' El. -23.9'	
27.0	S-10	11 18 23 29	1.4'	70	-	ML	wet	Gray Clayey SILT, some fine Sand, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 25'
30.0									
32.0	S-11	14 17 20 25	1.4'	70	PP 2.10	CL-ML	moist	...trace fine Sand.	S-11: mc=23.6% LL=23, PI=5
35.0									
37.0	S-12	16 18 18 20	2.0'	100	PP 1.80	CL	moist	Gray CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 4
SHEET 3 OF 4
DATE: START 3/17/09
END 3/19/09
DATUM: NGVD29
ELEVATION: -0.4±
TOTAL DEPTH: 75'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 696916.5± E. 597950.8±
INSPECTORS NAME/COMPANY N. DelGrosso/ M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
42.0	S-13	17 17 19 22	2.0'	100	PP 1.50	CL	moist	Gray CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-14	11 15 13 11	2.0'	100	PP 1.00	CL	moist	Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/4"± silty clay, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
50.0									
52.0	S-15	10 10 11 8	2.0'	100	-	CL	moist	Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
55.0									
57.0	S-16	25 15 6 8	2.0'	100	-	CL	moist	Brown CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 4
SHEET 4 OF 4
DATE: START 3/17/09
END 3/19/09
DATUM: NGVD29
ELEVATION: -0.4±
TOTAL DEPTH: 75'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 696916.5± E. 597950.8±
INSPECTORS NAME/COMPANY N. DelGrosso/ M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
62.0	S-17	10 13 7 8	2.0'	100	-	CL	moist	*.....(continued from previous page).* Red-brown CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
63.0									
65.0	U-1	P U S H	2.0'	100	-	CL	moist		Undisturbed sample collected using a Shelby tube
								65.0' El. -65.4'	
66.8	S-18	10 22 25 50/3"	0.7'	40	-	ML	moist	Red-brown SILT, some coarse to fine Gravel, some(-) coarse to fine Sand, (GLACIAL TILL).	
70.0								70.0' Top of Rock at 70 feet. El. -70.4'	
75.0	C-1		4.2'	83 / 42				Brown SILTSTONE, moderately weathered, medium strong, very closely to moderately spaced fractures, (WEATHERED PASSAIC FORMATION). 75.0' El. -75.4'	
								Bottom of borehole at 75 feet. Notes: 1. Boring tremie grouted using 2x94-lb bags of portland cement, 10 lbs of bentonite, potable water.	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 5
SHEET 1 OF 4
DATE: START 3/6/09
END 3/9/09
DATUM: NGVD29
ELEVATION: -0.5±
TOTAL DEPTH: 70'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696772.5± E. 598224.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 0.0' TIME: 11:00 DATE: 3/6/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 3/9/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
									Drilled through soft soils and advanced 4" casing to 4'
4.0									
	S-1	WH WH WH WH	0.5'	25	-	OL	wet	Black Organic SILT, frequent roots, (ORGANIC DEPOSIT).	PID = 0.0 ppm
6.0									
	S-2	6 3 WH WH	0.4'	21	-	PT	wet	Dark brown PEAT, occasional plant matter, (ORGANIC DEPOSIT).	PID = 0.0 ppm
8.0								8.0' El. -8.5'	
	S-3	3 4 7 7	1.4'	70	-	SP-SM	moist	Brown medium to fine SAND, little(-) Silt, (ALLUVIUM).	PID = 0.0 ppm
10.0									
	S-4	3 4 4 12	1.3'	63	-	SP-SM	moist	...brownish gray, coarse to fine, trace(+) fine Gravel.	PID = 0.0 ppm
12.0									
	S-5	6 8 8 10	1.4'	70	-	SP-SM	moist		PID = 0.0 ppm
14.0									
	S-6	6 7 8 8	1.4'	70	-	SP-SM	wet		PID = 0.0 ppm
16.0									
	S-7	3 3 5 6	1.5'	75	-	SP	moist	Brown-gray medium to fine SAND, (ALLUVIUM).	PID = 0.0 ppm
18.0									
	S-8	4 3 6 6	1.7'	84	-	SP	moist		PID = 0.0 ppm
20.0								20.0' El. -20.5'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 5
SHEET 2 OF 4
DATE: START 3/6/09
END 3/9/09
DATUM: NGVD29
ELEVATION: -0.5±
TOTAL DEPTH: 70'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696772.5± E. 598224.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 0.0' TIME: 11:00 DATE: 3/6/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 3/9/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-9	3 6 6 11	1.8'	92	-	CL	moist	Light gray varved CLAY & SILT and Clayey SILT, alternating 1/5"± clay & silt, 1/5"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	PID = 0.0 ppm
25.0									
27.0	S-10	3 4 4 5	2.0'	100	PP 2.00	CL	wet	Light gray varved CLAY & SILT and Silty CLAY, alternating 1/8"± clay & silt, 1/8"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
28.0									
30.0	U-1	P U S H	1.0'	50	PP 2.00	CL	wet		Undisturbed sample collected using a Shelby tube U-1: mc=30% LL=30 and 48, PI=10 and 26 99%<#200 Advanced 4" casing to 30'
32.0	S-11	3 4 4 4	1.5'	75	PP 1.50	CL	wet	...brownish light gray, trace fine Sand.	
35.0									
37.0	S-12	WH 2 2 3	2.0'	100	PP 1.50	CL	wet		
40.0								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 5
SHEET 3 OF 4
DATE: START 3/6/09
END 3/9/09
DATUM: NGVD29
ELEVATION: -0.5±
TOTAL DEPTH: 70'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696772.5± E. 598224.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 0.0' TIME: 11:00 DATE: 3/6/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 3/9/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-13	WH WH 1 2	2.0'	100	PP 1.70	CL	wet	*.....(continued from previous page).* Brown varved Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
42.0									
45.0									
	S-14	WH WH WH WH	2.0'	100	PP 1.00	CL	wet		S-14: mc=37.6% LL=47, PI=28
47.0									
50.0									
	S-15	WH WH WH WH	0.8'	38	PP 0.50	CL	wet	Brown SILT & CLAY, (GLACIOLACUSTRINE DEPOSIT).	
52.0									
55.0									
	S-16	4 5 3 2	1.5'	75	PP 1.50	CL	wet	Brownish red Silty CLAY, little(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
57.0									
58.0									
	U-NR	P U S H			-			No recovery.	Undisturbed sampling attempted with a piston sampler
60.0								60.0' EI. -60.5'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 5
SHEET 4 OF 4
DATE: START 3/6/09
END 3/9/09
DATUM: NGVD29
ELEVATION: -0.5±
TOTAL DEPTH: 70'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696772.5± E. 598224.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 0.0' TIME: 11:00 DATE: 3/6/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 3/9/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
60.5	S-17	100/6"	0.5'	100	-	CL	wet	Brownish red Silty CLAY, some(-) fine Gravel, (GLACIAL TILL).	
65.0								65.0' Top of Rock at 65 feet. El. -65.5'	
	C-1		4.7'	93 / 55				Red-brown MUDSTONE, moderately to slightly weathered, medium strong, very closely to closely spaced fractures, (COMPETENT PASSAIC FORMATION).	
70.0								70.0' El. -70.5'	
								Bottom of borehole at 70 feet.	

Notes:
1. Boring tremie grouted using 1x50-lb bag of granular bentonite, potable water
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. BW- 6
SHEET 1 OF 4
DATE: START 3/9/09
END 3/12/09
DATUM: NGVD29
ELEVATION: 0.1±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697059.7± E. 598313.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 25.0'/70.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -2.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
									Depth to mudline 2'
									Drilled through soft soils to 4'
4.0									
	S-1	WH WH WH WH	0.5'	25	-	PT	wet	Black brown PEAT, occasional wood, (ORGANIC DEPOSIT).	PID = 0.0 ppm
6.0								6.3' El. -6.2'	
	S-2	2 2 3 7	1.3'	67	-	SM	wet	Light brown fine SAND, little Silt, (ALLUVIUM).	PID = 0.0 ppm
8.0									
	S-3	8 26 19 30	1.3'	67	-	SM	wet		PID = 0.0 ppm
10.0									
	S-4	22 17 28 24	2.0'	100	-	SM	wet	...some Silt.	PID = 0.0 ppm
12.0									
	S-5	24 20 26 27	2.0'	100	-	SM	wet		PID = 0.0 ppm
14.0									
	S-6	21 22 20 32	2.0'	100	-	SP	wet	Dark brown coarse to fine SAND, trace(-) Silt, trace fine Gravel, (ALLUVIUM).	S-6: 3.5%<#200
16.0									
16.9	S-7	42 100/5"	0.8'	91	-	SP	wet		Advanced 4" casing to 20' PID = 0.0 ppm
								17.5' El. -17.4'	
18.0									
	S-8	11 13 20 20	1.7'	84	PP 1.50	CL	wet	Light gray Silty CLAY varved with Clayey Silt, alternating 1"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	PID = 0.0 ppm
20.0								*.....(continued on next page)*.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 6**
SHEET **2** OF **4**
DATE: START **3/9/09**
END **3/12/09**
DATUM: **NGVD29**
ELEVATION: **0.1±**
TOTAL DEPTH: **76'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697059.7±** E. **598313.1±**
INSPECTORS NAME/COMPANY **N. DelGrosso/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Deigert/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"/3.0"** DEPTH: **25.0'/70.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-2.0'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-9	22 24 32 34	1.2'	59	PP 1.50	CL	wet	*.....(continued from previous page).* Light gray-brown varved Silty CLAY and Clayey SILT, alternating 1/4"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
24.0	S-10	13 25 28 35	1.8'	92	PP 1.00	ML	wet		
26.0	S-11	37 37 40 42	1.0'	50	PP >4.5	ML	wet	Light gray Clayey SILT, trace fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
28.0	S-12	WH WH 32 36	0.7'	34	PP >4.5	ML	wet		S-12: mc=18.9% LL=23, PI=3
30.0	S-13	37 50 30 30	1.0'	50	PP >4.5	ML	wet		
32.0	S-14	22 24 24 26	2.0'	100	PP 1.00	CL	wet	Light gray varved Silty CLAY and Clayey SILT, alternating 1/8"± silty clay, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
34.0	S-15	24 20 20 16	2.0'	100	PP 1.50	CL	wet		
36.0	S-16	11 17 18 15	2.0'	100	PP 1.50	CL	wet		
38.0	S-17	14 16 15 18	2.0'	100	PP 1.75	CL	wet		
40.0	S-18	9 11 15 17	2.0'	100	PP 1.00	CL	wet	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 6
SHEET 3 OF 4
DATE: START 3/9/09
END 3/12/09
DATUM: NGVD29
ELEVATION: 0.1±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697059.7± E. 598313.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 25.0'/70.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -2.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-19	11 14 12 10	2.0'	100	-	CL	wet	*.....(continued from previous page).* Brown varved Silty CLAY and Clayey SILT, alternating 1/8"± silty clay, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
44.0	S-20	10 12 15 17	2.0'	100	-	CL	wet		
46.0	S-21	9 10 12 15	2.0'	100	-	CL	wet		
48.0	S-22	10 19 13 16	2.0'	100	-	CL	wet		
50.0	S-23	WH WH 6 6	2.0'	100	-	CL	wet	...alternating 1/4"± silty clay, 1/4"± clayey silt, occasional fine sand seams.	
51.0									
53.0	U-NR	P U S H			-			No recovery.	Undisturbed sampling attempted with a piston sampler
56.0									
58.0	S-24	5 11 8 12	2.0'	100	PP 1.25	CL	wet	Red-brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 25'
60.0	S-25	5 16 22 26	1.3'	67	PP 1.50	CL	wet	...little(+) coarse to fine Sand.	
								60.0' El. -59.9'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 6
SHEET 4 OF 4
DATE: START 3/9/09
END 3/12/09
DATUM: NGVD29
ELEVATION: 0.1±
TOTAL DEPTH: 76'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697059.7± E. 598313.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 25.0'/70.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -2.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-26	9 10 16 15	0.5'	25	PP 1.50	CL	wet	Red-brown Silty CLAY, little coarse to fine Sand, trace coarse to fine Gravel, (GLACIAL TILL).	Advanced 3" casing to 76'
62.0									
	S-27	15 33 36 40	0.7'	34	-	CL	wet	...little coarse to fine Sand, trace fine Gravel.	
64.0									
	S-28	15 25 40 22	1.0'	50	-	CL	wet		
66.0									
	S-29	53 76 100/4"	1.0'	50	-	ML	wet	Red-brown Clayey SILT, little coarse to fine Sand, trace coarse to medium Gravel, (GLACIAL TILL).	
68.0									
	S-30	8 28 20 21	0.8'	40	-	SP	wet	Red-brown coarse to fine SAND, and coarse to fine Gravel, (GLACIAL TILL).	Hard drilling at 68' to 71'
70.0									
71.0								71.0' Top of Rock at 71.0 feet. El. -70.9'	Advanced 3" casing to 70'
	C-1		2.6'	52 / 47				Red-brown CLAYSTONE, moderately weathered, medium strong, very closely to closely spaced fractures, (WEATHERED PASSAIC FORMATION).	Rotary bit refusal at 71'
76.0								76.0' El. -75.9'	
								Bottom of borehole at 76 feet.	

Notes:
1. Boring tremie grouted using 3x50-lb bags of bentonite, potable water

ENGINEERS FIELD BORING LOG

BORING NO. BW- 7
SHEET 1 OF 5
DATE: START 3/10/09
END 3/11/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 80'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696930.1± E. 598574.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 15.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
									"O.G.Elevation" refers to top of temporary work platform. Depth to mudline is 4'
4.0								4.0' El. -4.2'	
	S-1	WR WR WR/4"	0.0'	0	-			No recovery.	PID = 0.0 ppm
5.3									
6.0									
	S-2	WH WH WH WH	0.2'	9	-	OH	wet	Black Organic SILT, (ORGANIC DEPOSIT).	
8.0									
	S-3	WH WH WH 2	0.4'	21	-	OH	wet	Black Organic CLAY, frequent plant matter, (ORGANIC DEPOSIT).	S-3: mc=94.8% LL=89, PI=49
10.0								10.0' El. -10.2'	
	S-4	3 3 5 5	0.8'	38	-	SM	wet	Bluish gray coarse to fine SAND, some(-) Silt, (ALLUVIUM).	
12.0									
	S-5	4 3 6 6	0.7'	34	-	SP-SM	wet	...light gray, little(-) Silt.	PID = 0.0 ppm
14.0									
	S-6	4 5 4 6	0.5'	25	-	SP	wet	Light brown medium to fine SAND, (ALLUVIUM).	PID = 0.0 ppm Advanced 4" casing to 15'
16.0									
	S-7	4 3 3 4	0.6'	29	-	SP-SM	wet	Brown coarse to fine SAND, little(-) Silt, (ALLUVIUM).	
18.0									
	S-8	3 4 4 6	0.0'	0	-			No recovery.	PID = 0.0 ppm
20.0								20.0' El. -20.2'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 7
SHEET 2 OF 5
DATE: START 3/10/09
END 3/11/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 80'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696930.1± E. 598574.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 15.0' WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-9	2 3 2 1	0.8'	42	PP 1.50	CL	wet	Grayish brown CLAY & SILT varved with Silt & Clay, little(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	PID = 0.0 ppm
24.0	U-1	P U S H	1.0'	50	PP 1.25 TV 0.15	CL	wet	Grayish brown SILT & CLAY varved with brown Clay & Silt, trace (-) Sand, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-1: mc=25% LL=27 and 33, PI=7 and 15 98%<#200
26.0	S-10	1 1 1 2	1.8'	90	PP 2.00	CL	wet	Brownish gray SILT & CLAY varved with brown Clay & Silt, alternating 1/8"± to 5/8"± silt & clay, 1/8"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
28.0	S-11	WH WH WH WH	0.7'	34	PP 0.05	CL	wet		
30.0	S-12	WH WH WH WH	1.6'	80	PP 0.05	CL	wet	Brownish gray SILT & CLAY, (GLACIOLACUSTRINE DEPOSIT).	
32.0	S-13	WH WH WH WH	1.5'	75	PP 0.05	CL-ML	wet		S-13: mc=22.4% LL=25%, PI=7% 99.2%<#200
34.0	S-14	WH WH WH WH	2.0'	100	PP 0.05	CL	wet		
36.0	S-15	WH 1 1 1	1.8'	90	PP 1.50	CL	wet		
38.0	S-16	1 2 1 1	1.5'	75	PP 1.50	CL	wet	Brownish gray varved Silty CLAY, 1/5"± varves, (GLACIOLACUSTRINE DEPOSIT).	
40.0	S-17	1 1 1 1	2.0'	100	PP 1.50	CL	wet		

.....(continued on next page).

ENGINEERS FIELD BORING LOG

BORING NO. BW- 7
SHEET 3 OF 5
DATE: START 3/10/09
END 3/11/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 80'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696930.1± E. 598574.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 15.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
42.0	S-18	2 3 3 4	2.0'	100	PP 1.50	CL	wet	Red-brown varved Silty CLAY, 1/2"± varves, (GLACIOLACUSTRINE DEPOSIT).	
44.0	S-19	3 4 3 3	2.0'	100	PP 1.25	CL	wet	Red-brown varved SILT & CLAY, 1/2"± varves, (GLACIOLACUSTRINE DEPOSIT).	
46.0	S-20	2 3 5 4	2.0'	100	PP 1.25	CL	wet	Red-brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
48.0	S-21	3 2 2 2	1.5'	75	PP 1.50	CL	wet		
50.0	S-22	2 2 1 1	2.0'	100	PP 0.75	CL	wet	Brown varved Silty CLAY and SILT & CLAY, alternating 1/2"± silty clay, 1/2"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
52.0	S-23	1 2 1 1	2.0'	100	PP 0.75	CL	wet		
54.0	U-2	P U S H	2.0'	100	PP 1.00 TV 0.15	CL	wet	Light brown SILT & CLAY varved with dark brown Clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-2: mc=37% LL=32 and 66, PI=10 and 41 100%<#200
56.0	S-24	2 3 3 2	2.0'	100	PP 0.75	CL	wet	Light brown SILT & CLAY varved with dark brown Clay, alternating 1/16"± to 1/2"± silt & clay, 1/8"± to 1/4"± clay, (GLACIOLACUSTRINE DEPOSIT).	
58.0	S-25	3 2 1 1	2.0'	100	PP 0.75	CL	wet	Red-brown SILT & CLAY, (GLACIOLACUSTRINE DEPOSIT).	
60.0	S-26	1 1 WH WH	2.0'	100	PP 0.50	CL	wet	Red-brown CLAY varved with Silt & Clay, alternating 1"± to 2"± clay, 1"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 7
SHEET 4 OF 5
DATE: START 3/10/09
END 3/11/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 80'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696930.1± E. 598574.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 15.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
	S-27	WH WH WH WH	2.0'	100	PP 0.50	CL	wet	Red-brown CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
62.0									
	S-28	WH WH WH WH	2.0'	100	PP 0.50	CL	wet		
64.0									
	S-29	WH WH WH WH	2.0'	100	PP 0.50	CL	wet		
66.0									
	S-30	WH WH WH WH	0.0'	0	-			No recovery.	
68.0								68.0' El. -68.2'	
68.5	S-31	100/6"	0.1'	20	-	GP	wet	Red-brown coarse to fine GRAVEL, (GLACIAL TILL).	
75.0								75.0' Top of Rock at 75.0 feet. El. -75.2'	Rotary bit refusal at 75'
	C-1		5.0'	100 / 53				Red-brown MUDSTONE, moderately weathered, medium strong, very closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
80.0								80.0' El. -80.2'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 7
SHEET 5 OF 5
DATE: START 3/10/09
END 3/11/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 80'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Salerno (off Amtrak ROW) N. 696930.1± E. 598574.3±
INSPECTORS NAME/COMPANY S. Calabretta/YU & Associates, Inc.
DRILLERS NAME/COMPANY L. Ramos/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 15.0' WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								Bottom of borehole at 80 feet. Notes: 1. Boring tremie grouted using 3x94-lb bags of portland cement, 3/4x50-lb bag of bentonite, potable water 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 8
SHEET 1 OF 5
DATE: START 2/19/09
END 3/4/09
DATUM: NGVD29
ELEVATION: -0.3±
TOTAL DEPTH: 90.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697163.6± E. 598549.4±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 23.0"/84.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WR WR	0.0'	0	-	OL	wet	Dark brown Organic SILT, (ORGANIC DEPOSIT).	Depth to mudline 1'
2.0	S-2	WR WR WR WR	0.0'	0	-	OL	wet	No recovery.	
4.0	S-3	0 1 0 1	1.1'	55	PP <0.25	PT	wet	Brown fibrous PEAT, (ORGANIC DEPOSIT).	PID = 0.0 ppm S-3: mc=402.0% Non-plastic
6.0								6.0' El. -6.3'	
8.0					-	SM	wet	Light brown fine SAND, little Silt, (ALLUVIUM).	Logged from drill cuttings from 6' to 8'
10.0	S-4	6 12 17 14	1.7'	85	-	SP-SM	wet	...green-brown coarse to fine, little(-) Silt.	PID = 0.0 ppm
12.0	S-5	4 7 7 12	1.1'	55	-	SM	wet	...yellow-brown medium to fine, some(-) Silt.	Advanced 4" casing to 10'
14.0	S-6	6 5 6 12	2.0'	100	-	SP-SM	wet	Gray-brown coarse to fine SAND, little(-) Silt, trace(-) fine Gravel, (ALLUVIUM).	PID = 0.0 ppm Advanced 4" casing to 13'
16.0	S-7	4 6 9 12	2.0'	100	-	SP-SM	wet	...trace Silt.	
18.0	S-8A S-8B	4 5 14 16	1.3'	65	- - PP 2.25	SP-SM ML	wet wet	Gray SILT, below 16.6', (ALLUVIUM).	Bentonite introduced at 16'
								18.0' El. -18.3'	
20.0	S-9	12 13 15 19	1.0'	50	PP 3.25	ML	wet	Gray and red-brown varved Clayey SILT, 1/8"± varves, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	PID = 0.0 ppm

ENGINEERS FIELD BORING LOG

BORING NO. BW- 8
SHEET 2 OF 5
DATE: START 2/19/09
END 3/4/09
DATUM: NGVD29
ELEVATION: -0.3±
TOTAL DEPTH: 90.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697163.6± E. 598549.4±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 23.0"/84.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-10	6 8 9 17	0.7'	35	PP 1.75	ML	wet	*.....(continued from previous page).* Gray varved SILT, (GLACIOLACUSTRINE DEPOSIT).	
23.0									
24.5	U-1	PUSH	1.1'	72	-	CL-ML	wet	Gray-brown Clayey SILT varved with Silt & Clay, alternating 3/8"± clayey silt, 1/4"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube, advanced 18" U-1: mc=26% LL=26 and 28, PI=4 and 6 99%<#200
26.5	S-11	11 17 21 28	1.5'	75	PP 1.50	CL-ML	wet		
30.0									
32.0	S-12	10 10 19 19	1.1'	55	PP 3.25	CL-ML	wet		
35.0									
37.0	S-13	3 5 7 9	1.2'	60	PP 0.75	CL	wet	Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/4"± silty clay, 1/10"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 8
SHEET 3 OF 5
DATE: START 2/19/09
END 3/4/09
DATUM: NGVD29
ELEVATION: -0.3±
TOTAL DEPTH: 90.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697163.6± E. 598549.4±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 23.0"/84.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-14	3 10 10 10	2.0'	100	PP 1.00	CL	wet	*.....(continued from previous page).* Red-brown Silty CLAY varved with Clayey Silt, alternating 1/4"± to 1/3"± silty clay, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 23'
45.0									
47.0	S-15	2 2 4 5	2.0'	100	PP 1.00	CL	wet		
50.0									
52.0	S-16	WH WH WH WH	2.0'	100	PP <0.25	CL	wet	...alternating 1/3"± silty clay, 1/4"± clayey silt.	
53.0									
55.0	U-2	P U S H	1.8'	92	PP <0.25 TV <0.05	CL	wet	Brown varved CLAY & SILT and Silty CLAY, alternating 1/8"± clay & silt, silty clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-2: mc=35% LL=34 and 61, PI=13 and 36 98%<#200
57.0	S-17	WR WR WH 5	2.0'	100	PP 0.75	CL	wet	Red-brown Silty CLAY varved with Clay & Silt, alternating 1/2"± to 1"± silty clay, 1/6"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 8
SHEET 4 OF 5
DATE: START 2/19/09
END 3/4/09
DATUM: NGVD29
ELEVATION: -0.3±
TOTAL DEPTH: 90.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697163.6± E. 598549.4±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 23.0"/84.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-18A	WR		100	-	SP-SM	wet	*.....(continued from previous page).*	Fluid loss at 60'
	S-18B	4 13 19	2.0'		- PP 1.25	ML	wet	Gray-brown coarse to medium SAND, little Silt, (GLACIOLACUSTRINE DEPOSIT). EI. -61.5'	
61.2'									
62.0								Red-brown Clayey SILT, some coarse to fine Sand, some(-) coarse to fine Gravel, (GLACIAL TILL).	
									Advanced 3" casing to 65'
65.0									
	S-19	5 6 11 14	2.0'	100	-	ML	wet	...some medium to fine Gravel.	S-19: mc=13.5% 44.6%<#200
67.0									
70.0									
70.1	S-20	100/1"	0.0'	0	-			No recovery. ...BOULDER at 70.1' to 71.5'.	Hard drilling at 70' to 80'
75.0									
75.3	S-21	100/3"	0.3'	100	-	GP	wet	Red-brown coarse to fine GRAVEL, some coarse to medium Sand, trace(-) Silt, (GLACIAL TILL).	
									Possible boulder at 79' to 80'
80.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 8
SHEET 5 OF 5
DATE: START 2/19/09
END 3/4/09
DATUM: NGVD29
ELEVATION: -0.3±
TOTAL DEPTH: 90.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 697163.6± E. 598549.4±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0"/3.0" DEPTH: 23.0"/84.0' WATER:
DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: -1.0' TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
80.3	S-22	65/3"	0.1'	33	-	GM	wet	*.....(continued from previous page).*	Advanced 3" casing to 65'
80.5	C-1		0.0'	0	-			Red-brown coarse to fine GRAVEL, (siltstone fragments), some coarse to medium Sand, trace(-) Silt, (GLACIAL TILL). No recovery.	
82.5								82.5' El. -82.8'	
85.0									Advanced 3" casing to 84'
85.3	S-23	50/4"	0.1'	33	-	ML	wet	85.5' Red-brown Clayey SILT, and medium to fine Gravel, (DECOMPOSED ROCK). El. -85.8'	Loss of circulaton at 85'
85.5	C-2		3.7'	73 / 53				Top of Rock at 85.5 feet. Red-brown CLAYSTONE, moderately to slightly weathered, medium strong to strong, very closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
90.5								90.5' El. -90.8'	

Bottom of borehole at 90.5 feet.

Notes:

1. Boring tremie grouted using 3x94-lb bags of portland cement, 1x50-lb bag of bentonite, potable water
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. BW- 9
SHEET 1 OF 5
DATE: START 3/4/09
END 3/6/09
DATUM: NGVD29
ELEVATION: 4.4±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Town of Kearny/USPS
N. 697085.9± E. 598925.1±
INSPECTORS NAME/COMPANY R. Clavel/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Zambardi/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED CME-55 Truck Mounted Rig with Safety Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 3.5' TIME: 8:23 DATE: 3/4/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 12.5' TIME: 11:50 DATE: 3/6/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0									
	G-1				-	SP-SM		Dark brown coarse to fine SAND, some coarse to fine Gravel, trace(+) Silt, occasional cobbles, brick fragments, (FILL).	Hand augered to 4' Used automatic hammer at 4' to 10' bgs
4.0									
	S-1	5 8 9 7	0.7'	34	-	GP-GM	wet	Dark brown coarse to fine GRAVEL, little(+) coarse to fine Sand, trace Silt, occasional ash, cinders, (FILL).	Bentonite introduced at 4'
6.0								6.0' El. -1.6'	
	S-2	3 2 1 1	0.3'	17	PP <0.25 TV <0.05	PT	wet	Black PEAT, trace(-) medium to fine Sand, (ORGANIC DEPOSIT).	Advanced 4" casing to 6'
8.0									
	U-1	P U S H	2.0'	100	-	PT	wet		Undisturbed sample collected using a Shelby tube U-1 (PT): mc=342% LL=174, PI=93 U-1(SM):39%<#200
					-	SM	wet	9.0' El. -4.6' Dark gray fine SAND, and(-) Silt, (ALLUVIUM).	
10.0									
	S-3	1 5 5 7	0.8'	38	-	SM	wet		
12.0									
	S-4	3 6 6 7	0.8'	42	-	SP-SM	wet	...little(-) Silt.	PID = 0.0 ppm
14.0									
	S-5	3 5 5 6	1.0'	50	-	SP	wet	Grayish brown medium to fine SAND, trace(-) Silt, (ALLUVIUM).	Advanced 4" casing to 15'
16.0									
	S-6	2 2 8 13	1.2'	59	-	SP	wet		PID = 0.0 ppm
18.0									
	S-7	8 14 15 17	1.0'	50	-	SP	wet		PID = 0.0 ppm
20.0								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 9**
SHEET **2** OF **5**
DATE: START **3/4/09**
END **3/6/09**
DATUM: **NGVD29**
ELEVATION: **4.4±**
TOTAL DEPTH: **85'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Town of Kearny/USPS** N. **697085.9±** E. **598925.1±**
INSPECTORS NAME/COMPANY **R. Clavel/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **J. Zambardi/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 Truck Mounted Rig with Safety Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **3.5'** TIME: **8:23** DATE: **3/4/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **12.5'** TIME: **11:50** DATE: **3/6/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
	S-8	3 9 8 9	1.5'	75	- - -	SP-SM ML	wet wet	Grayish brown medium to fine SAND, trace Silt, (ALLUVIUM). Gray SILT, (ALLUVIUM).	PID = 0.0 ppm
22.0									
									No pocket penetrometer test performed from S-8 to S-9 due to sample adhering to walls of split spoon
25.0									
	S-9	10 15 12 15	0.3'	17	-	ML	wet	Gray Clayey SILT, trace(-) fine Sand, (ALLUVIUM).	
27.0									
30.0									
	S-10	16 23 23 20	0.3'	17	-	CL	wet	Gray SILT & CLAY, (ALLUVIUM).	S-10: mc=26.2% LL=26, PI=8
32.0									
								33.5' _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ El. -29.1'	
35.0									
	U-2	P U S H	1.0'	50	PP 1.25 TV 0.50	CL	wet	Brown varved CLAY & SILT and Silty CLAY, alternating 1/2" to 1/4"± clay & silt, 1/2" to 1/4"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-2: mc=29% LL=31 and 40, PI=10 and 20 98%<#200
37.0									
	S-11	6 6 9 9	1.8'	92	PP 1.25	CL	wet	...alternating 1/8"± clay & silt, 1/8"± silty clay.	
39.0									
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 9
SHEET 3 OF 5
DATE: START 3/4/09
END 3/6/09
DATUM: NGVD29
ELEVATION: 4.4±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Town of Kearny/USPS N. 697085.9± E. 598925.1±
INSPECTORS NAME/COMPANY R. Clavel/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Zambardi/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 Truck Mounted Rig with Safety Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 3.5' TIME: 8:23 DATE: 3/4/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 12.5' TIME: 11:50 DATE: 3/6/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-12	4 6 6 8	1.8'	92	PP 1.50	CL	wet	*.....(continued from previous page).* Brown and gray varved Silty CLAY, 1/8"± varves, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-13	2 3 4 5	1.8'	92	PP 1.25	CL	wet	...3/16"± varves.	
50.0									
52.0	S-14	WH WH 1 3	1.8'	92	PP <0.25	CL	wet	...red-brown, 1/8"± varves.	
55.0									
57.0	S-15	WH WH WH 2	1.8'	92	PP <0.25	CL	wet		
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 9
SHEET 4 OF 5
DATE: START 3/4/09
END 3/6/09
DATUM: NGVD29
ELEVATION: 4.4±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Town of Kearny/USPS N. 697085.9± E. 598925.1±
INSPECTORS NAME/COMPANY R. Clavel/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Zambardi/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 Truck Mounted Rig with Safety Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 3.5' TIME: 8:23 DATE: 3/4/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 12.5' TIME: 11:50 DATE: 3/6/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
62.0	S-16	WH WH WH 3	1.8'	92	PP <0.25	CL	wet	*.....(continued from previous page).* Brown CLAY & SILT varved with Clay, alternating 3/8"± clay & silt, 1/4"± clay, (GLACIOLACUSTRINE DEPOSIT).	
65.0									
67.0	U-3	P U S H	0.8'	38	PP 1.00 TV 0.35	CL	wet	Red-brown CLAY & SILT varved with Clay, trace fine Sand, alternating 3/8"± clay & silt, 1/4"± clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-3: mc=45% LL=33 and 70, PI=11 and 40 98%<#200
69.0	S-17	3 4 10 8	1.8'	92	PP 1.00	CL	wet	Red-brown varved Silty CLAY and SILT & CLAY, alternating 5/8"± silt & clay, 5/8"± silty clay, occasional 6" silt layers, (GLACIOLACUSTRINE DEPOSIT).	
70.0									
72.0	S-18	7 13 14 8	1.8'	92	PP 1.65	CL	wet		
75.0									
76.3	S-19	5 10 70/3"	1.2'	96	- - -	CL-ML GP	wet wet	Red-brown Clayey SILT, (GLACIOLACUSTRINE DEPOSIT). 76.0' El. -71.6' Red-brown coarse GRAVEL, (GLACIAL TILL).	S-19: mc=21.0% LL=21, PI=5
80.0								80.0' El. -75.6'	Drill rig chattering from 77' to 80' Fluid loss at 77' to 80'

ENGINEERS FIELD BORING LOG

BORING NO. BW- 9
SHEET 5 OF 5
DATE: START 3/4/09
END 3/6/09
DATUM: NGVD29
ELEVATION: 4.4±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Town of Kearny/USPS N. 697085.9± E. 598925.1±
INSPECTORS NAME/COMPANY R. Clavel/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Zambardi/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 Truck Mounted Rig with Safety Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 3.5' TIME: 8:23 DATE: 3/4/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 12.5' TIME: 11:50 DATE: 3/6/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								Top of Rock at 80.0 feet.	Advanced 4" casing to 30'
	C-1		2.5'	100 / 90				Red-brown CLAYSTONE, moderately to slightly weathered, medium strong, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
82.5									
	C-2		2.5'	100 / 80					Core barrel clogged at 82.5'
85.0								85.0' El. -80.6'	
								Bottom of borehole at 85 feet.	Depth to water in temporary well: 3.0' bgs on 3-9-09 at 7:45 am

Notes:
1. Boring tremie grouted using 1x94-lb bag of portland cement, 1x50-lb bag of bentonite, potable water.
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.
3. Temporary well installed 2' east of boring BW-9 to 10'.

ENGINEERS FIELD BORING LOG

BORING NO. BW- 10
SHEET 1 OF 5
DATE: START 3/27/09
END 4/1/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 82'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697253.2± E. 598756.4±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 34.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WR WR	1.5'	75	-	OL	wet	Black Organic SILT, (ORGANIC DEPOSIT).	Depth to mudline 1'
2.0	S-2	WR WR WR WR	2.0'	100	-	OL	wet		
4.0	S-3	WR WR WR WR	2.0'	100	-	OL	wet		
6.0	S-4	WH WH 2 3	0.5'	25	-	SM	wet	Gray medium to fine(+) SAND, some Organic Silt, (ORGANIC DEPOSIT).	
8.0								8.0' El. -8.2'	
	S-5	9 16 24 21	1.0'	50	-	SP-SM	wet	Gray coarse to fine SAND, little(-) Silt, trace(-) fine Gravel, (ALLUVIUM).	S-5: mc=18.6% 10.3%<#200
10.0	S-6	7 16 18 21	2.0'	100	-	SP-SM	wet		
12.0	S-7	9 11 13 14	1.0'	50	-	SP-SM	wet		
14.0	S-8	9 13 11 9	1.5'	75	-	SP-SM	wet		
16.0								16.0' El. -16.2'	
	S-9	9 13 18 23	1.5'	75	PP 1.20	ML	wet	Gray varved SILT and Silty CLAY, alternating 1/16"± silt, 1/16"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
18.0	S-10	7 16 20 22	1.0'	50	PP 2.20	ML	moist		
20.0								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 10
SHEET 2 OF 5
DATE: START 3/27/09
END 4/1/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 82'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 697253.2± E. 598756.4±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 34.0' WATER:
DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: -1.0' TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-11A S-11B	7 13 16 21	1.9'	95	PP 2.00 -	ML	moist	*.....(continued from previous page).* Gray-brown SILT varved with Silty Clay, alternating 3/4"± silt, 1/4"± silty clay, with 6"± layer of gray medium to fine gravel, and silty clay at 20', (GLACIOLACUSTRINE DEPOSIT).	
24.0	S-12	12 16 18 19	2.0'	100	PP 1.50	ML	moist	...brown-gray, alternating 1/2"± silt, 1/4"± silty clay.	
25.0									
27.0	U-1	P U S H	1.5'	75	PP 1.70	ML	moist	Gray Clayey SILT, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube
29.0	S-13	12 14 15 21	1.0'	50	PP 2.60	CL	moist	Gray SILT & CLAY, (GLACIOLACUSTRINE DEPOSIT).	
31.0	S-14	13 18 26 29	1.0'	50	PP 3.50	CL	moist		
33.0	S-15	10 14 21 22	1.2'	60	PP 2.50	CL	moist	Gray Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
35.0	S-16	10 12 18 20	2.0'	100	PP NA	CL	moist	Gray Silty CLAY varved with Silt, alternating 1/4"± silty clay, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
37.0	S-17	8 12 13 12	2.0'	100	PP 1.50	CL	moist		
38.0									
40.0	U-2	P U S H	1.1'	55	PP 1.00	CL	moist	Gray Silty CLAY varved with Silt, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 10**
SHEET **3** OF **5**
DATE: START **3/27/09**
END **4/1/09**
DATUM: **NGVD29**
ELEVATION: **-0.2±**
TOTAL DEPTH: **82'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697253.2±** E. **598756.4±**
INSPECTORS NAME/COMPANY **M. Tekin/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Deigert/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.0'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
	S-18	7 7 8 10	2.0'	100	PP 1.00	CL	moist	Gray Silty CLAY varved with Silt, alternating 1/4"± silty clay, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
42.0									
	S-19	9 12 13 13	2.0'	100	PP 1.00	CL	moist		
44.0									
	S-20	5 7 8 9	2.0'	100	PP 0.60	CL	moist	...grayish brown.	
46.0									
	S-21	5 6 6 6	2.0'	100	PP 0.60	CL	moist	...alternating 1/4"± silty clay, 1/8"± silt.	
48.0									
	S-22	7 8 9 10	2.0'	100	PP 0.40	CL	moist		
50.0									
	S-23	WH WH WH WH	2.0'	100	PP 0.40	CL	moist	...alternating 1/2"± silty clay, 1/4"± silt.	
52.0									
	S-24	WH 3 7 7	2.0'	100	PP 1.00	CL	moist		
54.0									
	S-25	13 10 10 14	1.7'	85	PP 0.80	CL	moist	...grayish brown, alternating 1/2"± silty clay, 1/4"± silt, with 6"± layer of brown fine sand, some clayey silt.	
56.0									
	S-26	5 7 10 12	2.0'	100	PP 1.00	CL	moist	Brown CLAY & SILT, occasional silt seams, (GLACIOLACUSTRINE DEPOSIT).	
58.0									
	S-27	14 20 24 27	2.0'	100	PP 0.80	CL	moist	...with 4"± layer of red-brown fine sand, and silty clay.	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 10
SHEET 4 OF 5
DATE: START 3/27/09
END 4/1/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 82'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 697253.2± E. 598756.4±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 34.0' WATER: DURING DRILLING: TIME: DATE:
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: -1.0' TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
	S-28	WH WH WH WH	2.0'	100	PP 0.50	CL	moist	Grayish brown Silty CLAY varved with Silt, alternating 1/2"± silty clay, 1/4"± silt, (GLACIOLACUSTRINE DEPOSIT).	
62.0									
63.0									
	U-3	P U S H	1.8'	90	-	CL	moist	Gray-brown Silty CLAY varved with Silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler
65.0									
	S-29	WH WH WH WH	0.8'	40	-	ML	wet	Red-brown Clayey SILT, some fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
67.0									
	S-30	4 7 10 12	2.0'	100	-	ML	moist		
69.0									
	S-31	14 16 21 24	1.5'	75	PP 1.50	ML	moist		
71.0								71.0' EI. -71.2'	
	S-32	7 12 13 12	1.8'	90	-	ML	moist	Red-brown Clayey SILT, some(-) coarse to fine Sand, little(+) coarse to fine Gravel, (GLACIAL TILL).	
73.0									
	S-33	15 40 28 37	2.0'	100	-	ML	moist		
75.0									
	S-34	15 50/5"	0.5'	54	-	ML	wet	Red-brown Silt, some(+) coarse to fine Gravel, some(-) coarse to fine Sand, (GLACIAL TILL).	
75.9									
77.0								77.0' Top of Rock at 77 feet. EI. -77.2'	
	C-1		4.2'	83				Brown SILTSTONE, slightly weathered, medium strong, very closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 10**
SHEET **5** OF **5**
DATE: START **3/27/09**
END **4/1/09**
DATUM: **NGVD29**
ELEVATION: **-0.2±**
TOTAL DEPTH: **82'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697253.2±** E. **598756.4±**
INSPECTORS NAME/COMPANY **M. Tekin/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Deigert/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.0'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
82.0				70				*.....(continued from previous page).* Brown SILTSTONE, slightly weathered, medium strong, very closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION). 82.0' El. -82.2'	
								Bottom of borehole at 82 feet. Notes: 1. Boring tremie grouted using 3x94-lb bags of portland cement, potable water.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 11**
SHEET **1** OF **5**
DATE: START **12/29/08**
END **12/30/08**
DATUM: **NGVD29**
ELEVATION: **4.9±**
TOTAL DEPTH: **85'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **USPS** N. **697216.8±** E. **599242.0±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **D. Mendez/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-75 Truck Mounted Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **20.0'** WATER: DURING DRILLING: **2.5'** TIME: **9:30** DATE: **12/29/08**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:15** DATE: **12/30/08**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
3.0								Dark brown coarse to fine GRAVEL, some coarse to medium Sand, little Clayey Silt, (FILL).	Hand augered to 3' PID= 0.0 ppm
5.0	S-1	46 7 20 16	0.3'	15	-	GM	moist	...medium to fine, some(-) coarse to medium Sand, some Clayey Silt.	PID= 0.0 ppm
7.0	S-2	16 7 8 5	1.7'	85	-	SM	wet	Black coarse to fine SAND, some(-) medium to fine Gravel, little Silt, (FILL).	Advanced 4" casing to 5' PID= 0.3 ppm (VOCs)
9.0	S-3A S-3B	4 2 1 1	1.5'	75	- -	SM PT	wet wet		PID= 0.0 ppm
								8.0' EI. -3.1' Dark brown PEAT, (ORGANIC DEPOSIT).	PID= 0.0 ppm
11.0	U-1	P U S H	1.7'	85	- -	PT OL	wet wet	Gray-brown Organic SILT, and(+) medium to fine Sand, (ORGANIC DEPOSIT).	Undisturbed sample collected using a piston sampler U-1: mc=26% Non-plastic fines 52.2%<#200
13.0	S-4A S-4B	5 4 7 6	2.0'	100	- -	PT SM	wet wet	11.4' Dark brown PEAT, (ORGANIC DEPOSIT). EI. -6.5' Gray-brown fine SAND, some(-) Silt, occasional roots, (ALLUVIUM).	Advanced 4" casing to 10'
15.0	S-5	1 1 1 2	1.7'	85	-	ML	wet	Greenish brown Clayey SILT, some fine Sand, occasional fibers, (ALLUVIUM).	PID= 0.0 ppm
17.0	S-6	WH 1 4 5	2.0'	100	-	ML	wet	...little medium to fine Sand, trace fine Gravel, occasional roots.	PID= 0.0 ppm
19.0	S-7	5 10 12 14	2.0'	100	-	SM	wet	Gray-brown coarse(+) to fine SAND, little(+) Silt, trace fine Gravel, (ALLUVIUM).	Advanced 4" casing to 15' S-7: mc=16.2% 17.6%<#200
		4 5		75		SP-SM	wet	*.....(continued on next page).*	PID= 0.0 ppm

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 11**
SHEET **2** OF **5**
DATE: START **12/29/08**
END **12/30/08**
DATUM: **NGVD29**
ELEVATION: **4.9±**
TOTAL DEPTH: **85'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **USPS** N. **697216.8±** E. **599242.0±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **D. Mendez/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-75 Truck Mounted Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **20.0'** WATER: DURING DRILLING: **2.5'** TIME: **9:30** DATE: **12/29/08**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:15** DATE: **12/30/08**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
21.0	S-8	7 11	1.5'		-	SP-SM	wet	*.....(continued from previous page).* Gray-brown medium(+) to fine SAND, trace(+) Silt, (ALLUVIUM).	Advanced 4" casing to 20'
23.0	S-9A S-9B	5 7 8 9	2.0'	100	- PP 2.00 -	ML	wet	Gray-brown Clayey SILT, trace fine Sand, (ALLUVIUM).	PID= 0.0 ppm
25.0	S-10	5 5 6 11	2.0'	100	PP 2.13	ML	wet		
25.7'	S-11A S-11B	6 8 15 14	2.0'	100	- - PP 2.25	SP-SM ML	wet wet	Gray-brown coarse to medium SAND, trace Silt, (ALLUVIUM). EI. -20.8' Gray-brown Clayey SILT, trace fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
29.0	S-12	5 7 8 8	2.0'	100	PP 1.88	CL	wet	Gray-brown SILT & CLAY, trace(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	S-12: mc=26.8% LL=28, PI=9
31.0	S-13	5 9 10 13	2.0'	100	PP 2.00	CL	wet		
33.0	U-2	P U S H	1.5'	75	TV 0.65	CL	wet	Gray-brown SILT & CLAY varved with Clay & Silt, alternating 1/6"± silt & clay, 1/10"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-2: mc=27% LL=26 and 37, PI=6 and 16 97.8%<#200
35.0	S-14	5 8 10 10	2.0'	100	PP 2.25	CL	wet	Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/8"± to 3/8"± silty clay, 1/16"± to 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
37.0	S-15	11 9 10 12	2.0'	100	PP 2.25	CL	wet		
39.0	S-16	2 3 4 3	2.0'	100	PP 1.00	CL	wet		
		1 1		100	PP	CL	wet	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 11
SHEET 3 OF 5
DATE: START 12/29/08
END 12/30/08
DATUM: NGVD29
ELEVATION: 4.9±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697216.8± E. 599242.0±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 2.5' TIME: 9:30 DATE: 12/29/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 2.3' TIME: 7:15 DATE: 12/30/08
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
41.0	S-17	2 3	2.0'		1.00	CL	wet	*.....(continued from previous page).* Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/4"± to 5/8"± silty clay, 1/16"± to 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
43.0	S-18	2 2 3 4	2.0'	100	PP 0.63	CL	wet		
45.0	S-19	2 2 2 2	2.0'	100	PP 0.50	CL	wet	...alternating 1/2"± to 3/4"± silty clay, 1/16"± to 1/8"± clayey silt.	
47.0	S-20	WH 3 3 5	2.0'	100	PP 0.63	CL	wet		
49.0	S-21	WH WH 3 3	2.0'	100	PP 0.50	CL	wet		
51.0	S-22	WH 1 1 1	2.0'	100	PP 0.50	CL	wet		
53.0	S-23	3 3 4 3	2.0'	100	PP 0.63	CL	wet	...alternating 1/4"± to 5/8"± silty clay, 1/16"± to 3/8"± clayey silt.	
55.0	S-24	WH WH 3 3	2.0'	100	PP 0.50	CL	wet		
57.0	S-25	WH WH 2 4	2.0'	100	PP 0.50	CL	wet		
59.0	S-26	2 3 3 5	1.0'	50	PP 0.63	CL	wet		
		2 2		100	PP	CL	wet	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 11**
SHEET **4** OF **5**
DATE: START **12/29/08**
END **12/30/08**
DATUM: **NGVD29**
ELEVATION: **4.9±**
TOTAL DEPTH: **85'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **USPS** N. **697216.8±** E. **599242.0±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **D. Mendez/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-75 Truck Mounted Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **20.0'** WATER: DURING DRILLING: **2.5'** TIME: **9:30** DATE: **12/29/08**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:15** DATE: **12/30/08**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-27	2 3	2.0'		0.50	CL	wet	*.....(continued from previous page).* Gray-brown Silty CLAY varved with Silt & Clay, alternating 1/3"± silty clay, 1/16"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
61.0									
	U-3	P U S H	2.0'	100	TV 0.73	CH	wet		Undisturbed sample collected using a piston sampler U-3: mc=37% LL=26 and 55, PI=6 and 34 100%<#200
63.0									
	S-28	WH 1 2 2	2.0'	100	PP 0.50	CH	wet		
65.0									
	S-29	WH WH WH 3	2.0'	100	PP 0.38	CH	wet		
67.0									
	S-30	WH WH 1 3	2.0'	100	PP 0.25	CL	wet	Gray-brown Silty CLAY varved with Clayey Silt, alternating 1/8"± to 1/2"± silty clay, 1/16"± to 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
69.0									
	S-31	3 5 4 4	2.0'	100	PP 0.63	CL	wet		S-31: mc=12.4% LL=38, PI=20
71.0								71.0' EI. -66.1'	
	S-32	5 6 6 7	1.0'	50	-	GC	wet	Red-brown CLAY & SILT, some medium to fine Gravel, some(-) coarse to fine Sand, (GLACIAL TILL).	
73.0									
	S-33	6 12 27 24	1.5'	75	-	GC	wet		
75.0									
	S-34	33 69 47 100/2"	1.5'	88	-	CL	wet	Red-brown ...little(+) coarse to fine Gravel (claystone fragments).	
76.7									
77.0									
	S-35	100/5"	0.2'	22	-	CL	wet		
77.9									
80.0								80.0' Top of Rock at 80 feet. EI. -75.1'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 11
SHEET 5 OF 5
DATE: START 12/29/08
END 12/30/08
DATUM: NGVD29
ELEVATION: 4.9±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697216.8± E. 599242.0±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 2.5' TIME: 9:30 DATE: 12/29/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 2.3' TIME: 7:15 DATE: 12/30/08
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	C-1		5.0'	100 / 42				Red-brown CLAYSTONE, moderately to slightly weathered, medium strong, very closely to closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
85.0								85.0' El. -80.1'	
								Bottom of borehole at 85 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, bentonite, potable water.
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 12**
SHEET **1** OF **5**
DATE: START **4/7/09**
END **4/8/09**
DATUM: **NGVD29**
ELEVATION: **-0.2±**
TOTAL DEPTH: **85'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697461.6±** E. **599228.8±**
INSPECTORS NAME/COMPANY **M. Tekin/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Deigert/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: **3.0'** TIME: **7:30** DATE: **4/8/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:00** DATE: **4/8/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
									Depth to mudline 0'
									Drilled through soft soils and advanced 4" casing to 6'
6.0									
	S-1	WR WR WR WR	0.3'	15	-	OL	wet	Black Organic SILT, frequent plant roots, (ORGANIC DEPOSIT).	
8.0									
	S-2	WH WH 1 2	0.3'	15	-	OL	wet	...dark brown-gray, little fine Sand.	
10.0								10.0' _ El. -10.2'	
	S-3	3 5 6 9	1.5'	75	-	SM	wet	Gray fine SAND, some Silt, (ALLUVIUM).	
12.0									
	S-4	10 13 16 19	0.5'	25	-	SP-SM	wet	...little(-) Silt.	
14.0									
	S-5	4 7 9 9	2.0'	100	-	CL-ML	moist	Gray SILT & CLAY, little(+) fine Sand, (ALLUVIUM).	S-5: mc=21.9% LL=21, PI=6 70.8%<#200
16.0									
	S-6	14 18 18 21	1.0'	50	-	CL-ML	moist		
18.0									
	S-7	12 18 21 23	1.5'	75	-	SP-SM	wet	Gray medium to fine SAND, little(-) Silt, (ALLUVIUM).	
20.0								*.....(continued on next page)*.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 12**
SHEET **2** OF **5**
DATE: START **4/7/09**
END **4/8/09**
DATUM: **NGVD29**
ELEVATION: **-0.2±**
TOTAL DEPTH: **85'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697461.6±** E. **599228.8±**
INSPECTORS NAME/COMPANY **M. Tekin/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Deigert/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: **3.0'** TIME: **7:30** DATE: **4/8/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:00** DATE: **4/8/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-8	7 13 19 27	1.0'	50	-	SP-SM	wet	*.....(continued from previous page).* Gray medium to fine SAND, little(-) Silt, (ALLUVIUM).	
								23.5' El. -23.7'	
25.0									
27.0	S-9	10 18 23 27	1.4'	70	PP 1.80	CL	moist	Gray Silty CLAY varved with brown Silt, alternating 1/2"± silty clay, 1/8"± silt, (GLACIOLACUSTRINE DEPOSIT).	
30.0									Advanced 4" casing to 29'
31.3	S-10	25 35 50/4"	1.0'	75	PP 3.50	CL-ML	moist	Gray SILT & CLAY, (GLACIOLACUSTRINE DEPOSIT).	S-10: mc=20.1% LL=24, PI=6
35.0									
37.0	S-11	7 9 11 15	2.0'	100	PP 0.80	CL	moist	Gray Silty CLAY varved with brown Silt, alternating 1/2"± silty clay, 1/8"± silt, (GLACIOLACUSTRINE DEPOSIT).	
38.0									
40.0	U-1	P U S H	1.8'	90	TV 0.45	CL	moist	Gray Silty CLAY varved with brown Silt, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube

ENGINEERS FIELD BORING LOG

BORING NO. BW- 12
SHEET 3 OF 5
DATE: START 4/7/09
END 4/8/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697461.6± E. 599228.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER: DURING DRILLING: 3.0' TIME: 7:30 DATE: 4/8/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 4/8/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-12	11 13 14 18	2.0'	100	-	CL	moist	*.....(continued from previous page).* Gray Silty CLAY varved with brown Silt, alternating 1/2"± silty clay, 1/8"± silt, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-13	9 10 11 12	2.0'	100	-	CL	moist		
50.0									
52.0	S-14	8 10 13 14	2.0'	100	PP 1.20	CL	moist		
55.0									
57.0	S-15	5 8 12 20	2.0'	100	PP 1.30	CL	moist	Brown CLAY & SILT, with 1"± fine sand layer, (GLACIOLACUSTRINE DEPOSIT).	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 12
SHEET 4 OF 5
DATE: START 4/7/09
END 4/8/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697461.6± E. 599228.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER: DURING DRILLING: 3.0' TIME: 7:30 DATE: 4/8/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 4/8/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
62.0	S-16	6 17 25 27	1.0'	50	-	CL	moist	Brown CLAY & SILT, with 1.5"± fine sand layer, (GLACIOLACUSTRINE DEPOSIT).	
65.0									
67.0	S-17	12 11 8 12	2.0'	100	TV 0.08	CL	moist	Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
68.0									
70.0	U-NR	P U S H	0.0'	0	-		moist	No recovery.	Undisturbed sampling attempted with a piston sampler
72.0	S-18	8 10 15 15	2.0'	100	-	CL	moist	Brown varved Silty CLAY and Clayey SILT, alternating 1/4"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
								73.5' El. -73.7'	
75.0									
76.3	S-19	9 28 50/4"	0.5'	38	-	GM	wet	Brown coarse to fine GRAVEL, some(+) Clayey Silt, little coarse to fine Sand, (GLACIAL TILL).	
80.0								80.0' El. -80.2'	Rotary bit refusal at 79'

ENGINEERS FIELD BORING LOG

BORING NO. BW- 12
SHEET 5 OF 5
DATE: START 4/7/09
END 4/8/09
DATUM: NGVD29
ELEVATION: -0.2±
TOTAL DEPTH: 85'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Cedar Creek Marsh
N. 697461.6± E. 599228.8±
INSPECTORS NAME/COMPANY M. Tekin/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED Acker Skid Rig with Donut Hammer (on barrel float)
CASING SIZE: 4.0" DEPTH: 29.0' WATER:
DURING DRILLING: 3.0' TIME: 7:30 DATE: 4/8/09
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: 0.0' TIME: 13:00 DATE: 4/8/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
				85				Top of Rock at 80.0 feet.	
	C-1		4.3'					Brown MUDSTONE, moderately weathered, medium strong, extremely closely to closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
85.0				50				85.0' El. -85.2'	
								Bottom of borehole at 85 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, potable water.

ENGINEERS FIELD BORING LOG

BORING NO. BW- 13
SHEET 1 OF 5
DATE: START 12/30/08
END 12/31/08
DATUM: NGVD29
ELEVATION: 5.2±
TOTAL DEPTH: 89.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697330.2± E. 599472.3±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Kurzynowski/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 8.0' WATER: DURING DRILLING: 2.5' TIME: 7:30 DATE: 12/30/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:50 DATE: 12/31/08
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								Dark brown and gray coarse to fine Gravel, some coarse to fine Sand, some Silt, (FILL).	Hand augered to 4' PID=0.0 ppm
									PID=0.0 ppm
4.0									
	S-1	5 2 8 20	0.5'	25	-	GM	wet	...red-brown and brown, and coarse to fine Sand, some Silt.	Advanced 4" casing to 8' PID=0.0 ppm
6.0									
	S-2	12 7 9 23	1.1'	55	-	ML	wet	Red-brown, dark brown, and dark gray Silt, and medium to fine Sand, little coarse to fine Gravel, (FILL).	PID=0.0 ppm Bentonite introduced at 6'
8.0								8.0' _ El. -2.8'	
	S-3	WH WH 1 WH	1.0'	50	-	PT	wet	Brown PEAT, (ORGANIC DEPOSIT).	PID=0.0 ppm Organic odor
10.0									PID=0.0 ppm
	U-1	P U S H	1.9'	95	- -	PT SM	wet wet	11.0' _ El. -5.8' Bluish gray coarse to fine SAND, some(-) Silt, (ALLUVIUM).	Undisturbed sample collected using a piston sampler
12.0									
	S-4	4 3 5 3	1.4'	70	-	SM	wet	Greenish gray medium to fine SAND, some(+) Silt, (ALLUVIUM).	PID=0.0 ppm
14.0									
	S-5	3 4 4 4	1.2'	60	PP 0.75	ML	wet	Dark greenish brown SILT, and(+) medium to fine Sand, (ALLUVIUM).	PID=0.0 ppm
16.0									
	S-6	7 9 8 10	1.6'	80	-	SM	wet	Brown coarse to fine SAND, and Silt, trace fine Gravel, frequent 1"± silt layers, (ALLUVIUM).	PID=0.0 ppm S-6: mc=17.6% 43.5%<#200
18.0									
	S-7	2 9 12 16	0.0'	0	-			No recovery.	
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 13
SHEET 2 OF 5
DATE: START 12/30/08
END 12/31/08
DATUM: NGVD29
ELEVATION: 5.2±
TOTAL DEPTH: 89.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697330.2± E. 599472.3±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Kurzynowski/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 8.0' WATER: DURING DRILLING: 2.5' TIME: 7:30 DATE: 12/30/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:50 DATE: 12/31/08
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-8	8 9 10 10	1.5'	75	-	SM	wet	*.....(continued from previous page).* Brownish gray coarse to fine SAND, little(+) Silt, (ALLUVIUM).	PID=0.0 ppm
25.0								23.5' El. -18.3'	
27.0	S-9	8 9 10 10	1.8'	90	PP 2.00	CL	wet	Brown and gray SILT & CLAY, trace(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	S-9: mc=29.1% LL=29, PI=9 98.7%<#200
30.0									
32.0	S-10	5 8 8 11	1.6'	80	PP 2.25	CL	wet	Brown and dark gray varved CLAY & SILT, 1/5"± varves, (GLACIOLACUSTRINE DEPOSIT).	
35.0									
37.0	S-11	4 4 6 7	0.0'	0	-			No recovery.	
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 13**
SHEET **3** OF **5**
DATE: START **12/30/08**
END **12/31/08**
DATUM: **NGVD29**
ELEVATION: **5.2±**
TOTAL DEPTH: **89.5'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **USPS** N. **697330.2±** E. **599472.3±**
INSPECTORS NAME/COMPANY **A. Fyodorova/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **J. Kurzynowski/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-75 Truck Mounted Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **8.0'** WATER: DURING DRILLING: **2.5'** TIME: **7:30** DATE: **12/30/08**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **7:50** DATE: **12/31/08**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	U-2	P U S H	1.8'	90	PP 1.25 TV 0.15	CL	wet	*.....(continued from previous page).* Dark gray varved Clayey SILT and Silty CLAY, alternating 1/8"± clayey silt, 1/8"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-2: mc=33% LL=34 and 46, PI=3 and 26 100%<#200
44.0	S-12	1 4 5 5	1.8'	90	PP 1.75	CL	wet	...1/5"± varves, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-13	WH 2 3 5	2.0'	100	PP 1.25	CL	wet	Dark grayish brown Silty CLAY varved with Clayey Silt, alternating 1/4"± to 1/2"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
50.0									
52.0	S-14	WH WH 1 1	2.0'	100	PP 0.75	CL	wet	Brown varved Silty CLAY and Clayey SILT, alternating 1/4"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
55.0									
57.0	S-15	WR WR WR WR	2.0'	100	PP 0.75	CL	wet	Brown Silty CLAY varved with Clayey Silt, alternating 1/2"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 13
SHEET 4 OF 5
DATE: START 12/30/08
END 12/31/08
DATUM: NGVD29
ELEVATION: 5.2±
TOTAL DEPTH: 89.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697330.2± E. 599472.3±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Kurzynowski/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 8.0' WATER: DURING DRILLING: 2.5' TIME: 7:30 DATE: 12/30/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:50 DATE: 12/31/08
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
62.0	S-16	WH WH WH WH	2.0'	100	PP <0.5	CL	wet	*.....(continued from previous page).* Red-brown Silty CLAY varved with Clayey Silt, alternating 1"± silty clay, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	S-16: mc=45% LL=40, PI=22
65.0									
67.0	S-17	WR WR WR WR	2.0'	100	PP <0.5	CL	wet	...alternating 1"± to 1.5"± silty clay, 3/4"± to 1"± clayey silt.	
70.0									
72.0	U-3	P U S H	1.9'	95	PP <0.5	CL	wet	Red-brown varved SILT & CLAY and Silty CLAY, alternating 1/4"± silt & clay, 1/4"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-3: mc=41% LL=28 and 56 PI=6 and 34
74.0	S-18	WH WH 2 1	2.0'	100	PP <0.5	CL	wet	Red-brown Silty CLAY varved with Clayey Silt, alternating 1"± to 2"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
75.0									
77.0	S-19	WR WR WR WR	2.0'	100	PP <0.5	CL	wet		
								78.5' El. -73.3'	
80.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 13
SHEET 5 OF 5
DATE: START 12/30/08
END 12/31/08
DATUM: NGVD29
ELEVATION: 5.2±
TOTAL DEPTH: 89.5'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697330.2± E. 599472.3±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY J. Kurzynowski/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 8.0' WATER: DURING DRILLING: 2.5' TIME: 7:30 DATE: 12/30/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:50 DATE: 12/31/08
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-20	8 5 5 9	2.0'	100	-	ML	wet	*.....(continued from previous page).* Red-brown Clayey SILT, some(-) medium to fine Gravel, trace medium to fine Sand, (GLACIAL TILL).	Depth to water 5.5' on 12/31/08 at 7:45 am
82.0									
								83.5' El. -78.3'	
85.0									
85.2	S-21	50/3"	0.2'	100	-	GM	wet	Red-brown coarse to fine GRAVEL, and Clayey Silt, (claystone and siltstone fragments), (DECOMPOSED ROCK).	
85.5				69				85.5' El. -80.3' Top of Rock at 85.5 feet.	
	C-1		2.8'					Red-brown and light gray CLAYSTONE, moderately weathered, medium strong, very closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
89.5				25				89.5' El. -84.3'	
								Bottom of borehole at 89.5 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement,1/2x50-lb bag of bentonite, potable water.
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14/CHS-1**
SHEET **1** OF **6**
DATE: START **4/16/09**
END **4/17/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **99'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697581.8±** E. **599514.5±**
INSPECTORS NAME/COMPANY **A. Hernandez/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **23.0'** WATER: DURING DRILLING: **4.0'** TIME: **9:00** DATE: **4/16/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:30** DATE: **4/17/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WH WH WH WH	0.0'	0	-			No recovery.	PID = 0.0 ppm Organic material observed at ground surface (marsh)
2.0	S-2	WR WR WH WH	0.1'	5	-	OL	moist	Dark brown Organic SILT, frequent plant matter, roots, wood, (ORGANIC DEPOSIT).	PID=0.0 ppm
4.0	S-3	WH WH WH WH	0.0'	0	-			No recovery.	Advanced 5" casing to 5' PID = 0.0 ppm
6.0	S-4	WH WH 3 3	1.2'	60	-	ML	moist	6.0' El. -3.9' Grayish brown SILT, and fine Sand, (ALLUVIUM).	PID=0.0 ppm<
8.0	S-5	2 4 5 5	1.6'	80	-	SM	wet	Brown fine SAND, some(-) Silt, occasional plant matter, (ALLUVIUM).	Advanced 5" casing to 8' PID = 0.0 ppm
10.0	S-6	5 5 8 6	2.0'	100	-	SM	wet	Brown coarse to fine SAND, little Silt, (ALLUVIUM).	PID = 0.0 ppm
12.0	S-7	WH WH 2 3	1.2'	60	-	SM	wet	...some(-) Silt.	PID = 0.0 ppm
14.0	S-8	5 5 6 6	2.0'	100	-	SM	wet	Brown fine SAND, some(-) Silt, (ALLUVIUM).	PID = 0.0 ppm
16.0	S-9	1 2 4 2	1.4'	70	-	ML	wet	Brown SILT, and fine Sand, (ALLUVIUM).	Advanced 5" casing to 13' PID = 0.0 ppm Advanced 5" casing to 18'
18.0	S-10	2 7 10 10	1.5'	75	-	ML	wet		PID = 0.0 ppm
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14/CHS-1**
SHEET **2** OF **6**
DATE: START **4/16/09**
END **4/17/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **99'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697581.8±** E. **599514.5±**
INSPECTORS NAME/COMPANY **A. Hernandez/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **23.0'** WATER: DURING DRILLING: **4.0'** TIME: **9:00** DATE: **4/16/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:30** DATE: **4/17/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-11	5 7 7 5	1.5'	75	PP 1.00	ML	wet	*.....(continued from previous page).* Brown Clayey SILT, some fine Sand, (ALLUVIUM). 22.0' El. -19.9'	PID = 0.0 ppm
24.0	S-12	5 7 10 8	1.6'	80	PP 1.25	CL	wet	Brown varved Clayey SILT, (GLACIOLACUSTRINE DEPOSIT).	PID = 0.0 ppm
26.0	S-13	4 6 8 8	1.7'	85	PP 3.50	CL	wet	Brown varved Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	Advanced 5" casing to 23'
27.0									
29.0	U-NR/ G-1	P U S H	0.3'	15	PP 3.00 TV 0.45	CL	wet		Undisturbed sampling attempted with a Shelby tube: insufficient recovery, sample collected in jar G-1
31.0	S-14	4 4 6 6	2.0'	100	PP 1.75	CL	wet		
32.0									
34.0	U-1	P U S H	1.0'	50	-	CL	wet	Brown Clayey SILT varved with Silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-1: mc=28%
36.0	S-15	3 4 6 5	2.0'	100	PP 1.25	CL	wet	...1/4"± varves.	
38.0	S-16	3 3 5 4	2.0'	100	PP 0.75	CL	wet		
40.0	S-17	4 6 6 5	2.0'	100	PP 1.25	CL	wet	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14/CHS-1**
SHEET **3** OF **6**
DATE: START **4/16/09**
END **4/17/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **99'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697581.8±** E. **599514.5±**
INSPECTORS NAME/COMPANY **A. Hernandez/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **23.0'** WATER: DURING DRILLING: **4.0'** TIME: **9:00** DATE: **4/16/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:30** DATE: **4/17/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
42.0	S-18	2 2 4 2	2.0'	100	PP 1.25	CL	wet	Brown varved Silty CLAY and SILT & CLAY, alternating 1/4"± to 1/3"± silty clay, silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
44.0	S-19	3 3 4 4	2.0'	100	PP 1.25	CL	wet		
46.0	S-20	2 2 3 2	2.0'	100	PP 1.25	CL	wet		
48.0	S-21	WH 2 4 3	2.0'	100	PP <0.1	CL	wet		
50.0	S-22	WH WH 1 2	2.0'	100	PP 0.50	CL	wet	Brown varved Silty CLAY and Clayey SILT, alternating 1/4"± to 1/2"± clayey silt, 1/4"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
52.0	S-23	WR WH 2 2	2.0'	100	PP <0.1	CL	wet		
54.0	S-24	WR WR WH WH	2.0'	100	PP 0.75	CL	wet	Brown Silty CLAY varved with Clay & Silt, alternating 3/4"± silty clay, 1/4"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
56.0	S-25	WR WR WH WH	2.0'	100	PP 0.25	CL	wet		
57.0									
59.0	U-2	P U S H	2.0'	100	PP 0.50 TV 0.40	CL	wet	Red-brown varved Silty CLAY and CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-2: mc=38% LL=32 and 42, PI=13 and23 100%<#200
		WR WR		100	PP	CL	wet	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14/CHS-1**
SHEET **4** OF **6**
DATE: START **4/16/09**
END **4/17/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **99'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697581.8±** E. **599514.5±**
INSPECTORS NAME/COMPANY **A. Hernandez/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **23.0'** WATER: DURING DRILLING: **4.0'** TIME: **9:00** DATE: **4/16/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:30** DATE: **4/17/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
61.0	S-26	WH WH	2.0'		<0.25	CL	wet	*.....(continued from previous page).* Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT). ...occasional fine sand seams.	
63.0	S-27	WR WH 2 5	2.0'	100	PP <0.1	CL	wet		
65.0	S-28	WR WR WR WR	1.3'	65	PP <0.1	CL	wet		
67.0	S-29	WR WR WH WH	2.0'	100	PP 0.50	CL	wet		
69.0	S-30	WH WH 2 2	2.0'	100	PP <0.1	CL	wet	Brown Silty CLAY varved with Silt & Clay, alternating 3/4"± silty clay, 1/4"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
71.0	S-31	WR WR WR WR	2.0'	100	PP <0.1	CL	wet	Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
73.0	S-32	WR WH 3 4	2.0'	100	PP 0.25	CL	moist	Brown Silty CLAY varved with Silt & Clay, alternating 3/4"± silty clay, 1/4"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
74.0									
76.0	U-3	P U S H			PP 0.25 TV 0.20	CL	moist		Undisturbed sample collected using a piston sampler U-3: mc=32% LL=26 and 39, PI=7 and 22
78.0	S-33	WR 1 3 6	2.0'	100	PP 1.50	CL	moist	Red-brown Silty CLAY, trace(-) fine Gravel, trace(-) coarse to fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
80.0	S-34	WH 2 6 5	1.8'	90	PP <0.1	CL	moist	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14/CHS-1**
SHEET **5** OF **6**
DATE: START **4/16/09**
END **4/17/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **99'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697581.8±** E. **599514.5±**
INSPECTORS NAME/COMPANY **A. Hernandez/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **23.0'** WATER: DURING DRILLING: **4.0'** TIME: **9:00** DATE: **4/16/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:30** DATE: **4/17/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								80.5'.....*(continued from previous page)*. El. -78.4'	Rig chattering at 80.5'
81.0									
	S-35	11 14 10 8	1.3'	65	-	GC	moist	Red-brown coarse to fine GRAVEL, some Silty Clay, trace medium to fine Sand, (DECOMPOSED ROCK).	
83.0									
	S-36	19 35 25 100/5"	1.1'	57	-	GC	moist	...red-brown and blue-gray.	
84.9									
85.0	S-37	8 22 48 27	1.0'	50	-	GC	moist		
87.0									
	S-38	10 9 15 30	1.2'	60	-	GC	moist		
89.0								89.0' Top of Rock at 89 feet. El. -86.9'	
	C-1		2.8'	55 / 7				Red-brown CLAYSTONE, moderately weathered, medium strong, very closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
94.0								94.0' El. -91.9'	
	C-2		5.0'	100 / 52				Red-brown CLAYSTONE, moderately weathered, medium strong, very closely to closely spaced fractures, (COMPETENT PASSAIC FORMATION).	
99.0								99.0' El. -96.9'	
								Bottom of borehole at 99 feet.	
								Notes:	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14/CHS-1**
SHEET **6** OF **6**
DATE: START **4/16/09**
END **4/17/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **99'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697581.8±** E. **599514.5±**
INSPECTORS NAME/COMPANY **A. Hernandez/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **23.0'** WATER: DURING DRILLING: **4.0'** TIME: **9:00** DATE: **4/16/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:30** DATE: **4/17/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								1. Boring completed as slope inclinometer under direct observation by MRCE. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample. 3. Slope inclinometer tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite, potable water on 6/1/10.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14A/CHS-1A**
SHEET **1** OF **6**
DATE: START **4/21/09**
END **4/23/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **102'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697586.3±** E. **599523.5±**
INSPECTORS NAME/COMPANY **A. Fyodorova/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 Truck Mounted Rig with Safety Hammer**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: **1.0'** TIME: **12:30** DATE: **4/21/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:00** DATE: **4/23/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	3 1 WH 2	0.0'	0	-		wet	No recovery.	Organic material observed in drill cuttings
2.0									
5.0									Advanced 4" casing to 4'
	S-2	1 WH 1 1	0.3'	15	-	OL	wet	Black Organic SILT, occasional wood, plant matter, (ORGANIC DEPOSIT).	Organic odor Advanced 4" casing to 9'
7.0									
								8.5' El. -6.4'	
10.0									
	S-3	16 14 11 10	1.1'	55	-	SM	wet	Gray fine SAND, and(+) Silt, occasional plant matter, (ALLUVIUM).	Advanced 4" casing to 14'
12.0									
15.0									
	S-4	7 5 10 7	1.0'	50	-	SM	wet	...dark gray, some(-) Silt.	Advanced 4" casing to 19'
17.0									
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14A/CHS-1A**
SHEET **2** OF **6**
DATE: START **4/21/09**
END **4/23/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **102'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697586.3±** E. **599523.5±**
INSPECTORS NAME/COMPANY **A. Fyodorova/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 Truck Mounted Rig with Safety Hammer**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: **1.0'** TIME: **12:30** DATE: **4/21/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:00** DATE: **4/23/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-5A S-5B	13 7 13 14	1.8'	90	- - PP 2.75	SM ML	wet moist	*.....(continued from previous page).* Gray coarse to fine SAND, little Silt, (ALLUVIUM). Gray SILT, below 21.1', (ALLUVIUM).	Advanced 4" casing to 24'
25.0								23.5' _ El. -21.4'	
27.0	S-6	12 23 25 31	2.0'	100	PP 3.25	CL	moist	Blue and reddish gray varved Silty CLAY and Clayey SILT, alternating 1/8"± silty clay, clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
30.0									
32.0	S-7	10 13 19 23	1.8'	90	PP 3.00	ML	moist	Gray Clayey SILT, (GLACIOLACUSTRINE DEPOSIT).	
35.0									Advanced 4" casing to 34'
37.0	S-8	11 14 18 16	2.0'	100	PP 1.75	CL	moist	Brownish gray varved Silty CLAY and Clayey SILT, alternating 1/8"± silty clay, clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 14A/CHS-1A
SHEET 3 OF 6
DATE: START 4/21/09
END 4/23/09
DATUM: NGVD29
ELEVATION: 2.1±
TOTAL DEPTH: 102'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697586.3± E. 599523.5±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY P. Lynch/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 Truck Mounted Rig with Safety Hammer
CASING SIZE: 4.0" DEPTH: 34.0' WATER: DURING DRILLING: 1.0' TIME: 12:30 DATE: 4/21/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 4/23/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-9	9 17 15 12	1.9'	95	PP 1.75	CL	moist	*.....(continued from previous page).* Brownish gray varved Silty CLAY and Clayey SILT, alternating 1/5"± to 1/4"± silty clay, clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
46.0									
48.0	U-NR/ G-1	P U S H	0.5'	25	PP 1.75 TV 0.50	CL	moist	Brown varved Silty CLAY, 1/4"± to 1/3"± varves, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sampling attempted with a piston sampler: insufficient recovery, sample collected in a jar G-1
50.0	U-1	P U S H	1.0'	50	-	CL	moist		Undisturbed sample collected using a piston sampler U-1: mc=35%
51.0									
53.0	U-2	P U S H	1.2'	58	PP 1.25 TV 0.20	CL	moist		Undisturbed sample collected using a piston sampler U-2: mc=37%
55.0	S-10	4 9 7 12			PP 1.25	CL	moist	Gray-brown varved SILT & CLAY, 1/8"± varves, (GLACIOLACUSTRINE DEPOSIT).	
56.0									
58.0	U-3	P U S H	2.0'	100	PP 1.25 TV 0.20	CL	moist	Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-3: mc=41%
								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14A/CHS-1A**
SHEET **4** OF **6**
DATE: START **4/21/09**
END **4/23/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **102'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697586.3±** E. **599523.5±**
INSPECTORS NAME/COMPANY **A. Fyodorova/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 Truck Mounted Rig with Safety Hammer**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: **1.0'** TIME: **12:30** DATE: **4/21/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:00** DATE: **4/23/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
61.0									
	U-4	P U S H	1.7'	83	PP 1.00 TV 0.40	CL	moist	Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-4: mc=39%
63.0									
70.0									
	U-5	P U S H	1.8'	88	PP 1.00 TV 0.40	CL	wet		Undisturbed sample collected using a piston sampler U-5: mc=39%
72.0									
80.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 14A/CHS-1A
SHEET 5 OF 6
DATE: START 4/21/09
END 4/23/09
DATUM: NGVD29
ELEVATION: 2.1±
TOTAL DEPTH: 102'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Cedar Creek Marsh N. 697586.3± E. 599523.5±
INSPECTORS NAME/COMPANY A. Fyodorova/YU & Associates, Inc.
DRILLERS NAME/COMPANY P. Lynch/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 Truck Mounted Rig with Safety Hammer
CASING SIZE: 4.0" DEPTH: 34.0' WATER: DURING DRILLING: 1.0' TIME: 12:30 DATE: 4/21/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 13:00 DATE: 4/23/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-11A	2 5 8	1.2'	60	PP 2.50	ML	wet	80.5' Grayish brown Clayey SILT, (GLACIOLACUSTRINE DEPOSIT). El. -78.4'	*.....(continued from previous page)*
82.0	S-11B	9				ML	moist	Red-brown Clayey SILT, some medium to fine Gravel, (GLACIAL TILL).	
									Hard drilling at 88' to 92': Possible Decomposed Rock
92.0								92.0' Top of Rock at 92.0 feet. El. -89.9'	
	C-1		5.0'	100 / 47				Red-brown MUDSTONE, highly to moderately weathered, weak, extremely closely to moderately spaced fractures, (WEATHERED PASSAIC FORMATION).	
97.0								97.0' El. -94.9'	
	C-2		5.0'	100				Red-brown MUDSTONE, highly to moderately weathered, weak, extremely closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION). *.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 14A/CHS-1A**
SHEET **6** OF **6**
DATE: START **4/21/09**
END **4/23/09**
DATUM: **NGVD29**
ELEVATION: **2.1±**
TOTAL DEPTH: **102'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek Marsh** N. **697586.3±** E. **599523.5±**
INSPECTORS NAME/COMPANY **A. Fyodorova/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **P. Lynch/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 Truck Mounted Rig with Safety Hammer**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: **1.0'** TIME: **12:30** DATE: **4/21/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **13:00** DATE: **4/23/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
102.0				58				Red-brown MUDSTONE, highly to moderately weathered, weak, with soil (sand) zone at 100.6' to 100.9', extremely closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION). 102.0' El. -99.9'	*.....(continued from previous page)*
								Bottom of borehole at 102 feet.	

Notes:
1. Boring completed as slope inclinometer under direct observation by MRCE.
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.
3. Slope inclinometer tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite, potable water on 6/1/10.

ENGINEERS FIELD BORING LOG

BORING NO. BW- 15
SHEET 1 OF 6
DATE: START 12/31/08
END 1/5/09
DATUM: NGVD29
ELEVATION: 4.6±
TOTAL DEPTH: 100'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION USPS
N. 697425.5± E. 599671.8±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 0.8' TIME: 7:30 DATE: 12/31/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:10 DATE: 1/5/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
2.0									Hand augered to 2' PID= 0.0 ppm
4.0	S-1	13 20 35 18	1.5'	75	-	SP-SM	moist	Black coarse to fine SAND, some medium to fine Gravel, trace Silt, occasional brick fragments, (FILL).	PID= 0.0 ppm
6.0	S-2	12 16 17 14	1.5'	75	-	SM	moist	...dark brown, some(-) Clayey Silt, occasional cinders.	PID= 0.0 ppm Advanced 4" casing to 5'
8.0	S-3	8 10 11 10	1.7'	85	-	SP-SM	wet	...black, coarse to medium, some fine Gravel, trace Silt.	PID= 0.0 ppm
10.0	S-4	7 6 5 5	1.7'	85	-	ML	wet	Gray SILT, some fine Sand, (FILL). 10.0' El. -5.4'	PID= 0.0 ppm
12.0	S-5	WH 1 WH 1	0.3'	15	-	PT	wet	Dark brown PEAT, (ORGANIC DEPOSIT). 12.0' El. -7.4'	PID= 0.0 ppm Advanced 4" casing to 10'
14.0	U-1	P U S H	1.7'	85	TV 0.70	SM	wet	Grayish brown medium to fine(+) SAND, and(-) Silt, (ALLUVIUM).	PID= 0.0 ppm Undisturbed sample collected using a Shelby tube U-1: mc=21.0% Non-plastic 37.6%<#200
16.0	S-6	3 4 5 5	1.5'	75	-	SM	wet		PID= 0.0 ppm
18.0	S-7	5 7 7 9	1.5'	75	-	SM	wet	...fine.	PID= 0.0 ppm Advanced 4" casing to 15'
20.0	S-8	3 5 6 7	1.0'	50	-	SM	wet	...fine, some(-) Silt. *.....(continued on next page).*	PID= 0.0 ppm

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 15**
SHEET **2** OF **6**
DATE: START **12/31/08**
END **1/5/09**
DATUM: **NGVD29**
ELEVATION: **4.6±**
TOTAL DEPTH: **100'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **USPS** N. **697425.5±** E. **599671.8±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **D. Mendez/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-75 Truck Mounted Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **20.0'** WATER: DURING DRILLING: **0.8'** TIME: **7:30** DATE: **12/31/08**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **7:10** DATE: **1/5/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	PID= 0.0 ppm
	S-9	3 4 5 5	1.0'	50	-	SM	wet	Grayish brown fine SAND, some(-) Silt, (ALLUVIUM).	Advanced 4" casing to 20'
22.0									
	S-10	3 4 4 4	1.7'	85	PP 1.00	ML	wet	Grayish brown SILT, trace fine Sand, (ALLUVIUM).	
24.0									
	S-11	5 4 4 4	2.0'	100	PP 1.25	ML	wet	Grayish brown Clayey SILT, trace(-) fine Sand, (ALLUVIUM).	S-11: mc=28.2% LL=22, PI=1 98.1%<#200
26.0								26.0' El. -21.4'	
	S-12	5 5 6 7	2.0'	100	PP 1.50	ML	wet	Grayish brown Clayey SILT, trace(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
28.0									
	S-13	3 4 5 7	2.0'	100	PP 1.50	ML	wet		
30.0									
	S-14	5 6 9 10	2.0'	100	PP 2.00	ML	wet		
32.0									
	S-15	5 7 8 11	1.0'	50	PP 2.25	CL	wet	Grayish brown Silty CLAY varved with Clayey Silt, trace(-) fine Sand, alternating 1/8"± to 3/8"± silty clay, 1/16"± to 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
34.0									
	U-2	P U S H	1.7'	85	TV 0.75	CL	wet		Undisturbed sample collected using a Shelby tube U-2: mc=21.0% LL=27, PI=9 99.8%<#200
36.0									
	S-16	5 5 6 6	2.0'	100	PP 1.50	CL	wet	Grayish brown Silty CLAY varved with Clayey Silt, trace(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
38.0									
	S-17	WH WH 2 5	2.0'	100	PP 0.50	CL	wet	...alternating 1/8"± to 3/8"± silty clay, 1/16"± to 1/8"± clayey silt.	
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 15
SHEET 3 OF 6
DATE: START 12/31/08
END 1/5/09
DATUM: NGVD29
ELEVATION: 4.6±
TOTAL DEPTH: 100'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697425.5± E. 599671.8±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 0.8' TIME: 7:30 DATE: 12/31/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:10 DATE: 1/5/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-18	2 3 4 4	2.0'	100	PP 0.75	CL	wet	*.....(continued from previous page).* Red-brown Silty CLAY varved with Clayey Silt, alternating 1/4"± to 1/2"± silty clay, 1/8"± to 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
44.0	S-19	2 3 3 3	2.0'	100	PP 0.75	CL	wet		
46.0	S-20	WH 2 2 3	2.0'	100	PP 0.50	CL	wet		
48.0	S-21	WH WH WH 2	2.0'	100	PP 0.38	CL	wet	...alternating 1/4"± to 1/2"± silty clay, 1/8"± to 1/4"± clayey silt.	
50.0	S-22	1 1 3 4	2.0'	100	PP 0.53	CL	wet		
52.0	S-23	WH 2 2 2	2.0'	100	PP 0.53	CL	wet		
54.0	S-24	WH WH WH 1	2.0'	100	PP <0.25	CL	wet	...alternating 3/8"± to 1"± silty clay, 1/8"± to 1/4"± clayey silt.	
56.0	S-25	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
58.0	S-26	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
60.0	S-27	WH WH WH WH	2.0'	100	PP <0.25	CL	wet	...alternating 1/5"± to 3/4"± silty clay, 1/8"± clayey silt. *.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 15
SHEET 4 OF 6
DATE: START 12/31/08
END 1/5/09
DATUM: NGVD29
ELEVATION: 4.6±
TOTAL DEPTH: 100'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697425.5± E. 599671.8±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 0.8' TIME: 7:30 DATE: 12/31/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:10 DATE: 1/5/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
62.0	S-28	WH 1 1 2	2.0'	100	PP <0.25	CL	wet	Red-brown Silty CLAY varved with Clayey Silt, alternating 1/5"± to 3/4"± silty clay, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
64.0	S-29	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
66.0	U-3	P U S H	1.8'	90	TV 0.45	CL	wet	Red-brown Silty CLAY varved with Silt & Clay, alternating 1/3"± silty clay, 3/16"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-3: mc=40.0% LL=31 and 65, PI=8 and 38 99.9%<#200
68.0	S-30	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
70.0	S-31	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
72.0	S-32	4 4 WH 1	0.8'	40	PP 0.38	CL	wet	Red-brown Silty CLAY varved with Clayey Silt, alternating 7/8"± to 1.5"± silty clay, 1/16"± to 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
74.0	S-33	WH WH WH WH	2.0'	100	PP <0.25	CL	wet	...alternating 1"± to 1.5"± silty clay, 1/8"± clayey silt.	
76.0	S-34	1 WH WH 1	2.0'	100	PP <0.25	CL	wet	Red-brown CLAY & SILT varved with Clayey Silt, alternating 1"± to 1.5"± clay & silt, 1/8"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	S-34: mc=33% LL=36, PI=19
78.0	S-35	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
80.0	S-36	WH 1 1 1	2.0'	100	PP 0.25	CL	wet	...alternating 1"± to 1.5"± silty clay, 1/4"± clayey silt.	
								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 15
SHEET 5 OF 6
DATE: START 12/31/08
END 1/5/09
DATUM: NGVD29
ELEVATION: 4.6±
TOTAL DEPTH: 100'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697425.5± E. 599671.8±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 0.8' TIME: 7:30 DATE: 12/31/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:10 DATE: 1/5/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
82.0	S-37	1 1 1 1	2.0'	100	PP 0.38	CL	wet	*.....(continued from previous page).* Red-brown Silty CLAY varved with Clayey Silt, alternating 1"± to 1.5"± silty clay, 1/4"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
84.0	S-38	WR WR WR WR	2.0'	100	PP <0.25	CL	wet		
86.0	S-39	1 WH WH WH	2.0'	100	PP <0.25	CL	wet		
88.0	S-40	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
90.0	S-41	5 12 14 15	1.5'	75	-	CL	wet	88.0' EI. -83.4' Red-brown CLAY & SILT, some fine Gravel, little(+) coarse to medium Sand, (GLACIAL TILL).	
92.0	S-42	10 31 22 33	1.4'	70	-	CL	wet		
93.8	S-43	4 15 100/4"	0.1'	6	-			93.0' EI. -88.4' Red-brown CLAYSTONE, completely weathered, extremely weak, (DECOMPOSED ROCK).	
95.0								95.0' Top of Rock at 95.0 feet. EI. -90.4'	
100.0	C-1		4.8'	96 / 58				Red-brown CLAYSTONE, moderately to slightly weathered, medium strong to strong, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION). 100.0' EI. -95.4'	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 15
SHEET 6 OF 6
DATE: START 12/31/08
END 1/5/09
DATUM: NGVD29
ELEVATION: 4.6±
TOTAL DEPTH: 100'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION USPS N. 697425.5± E. 599671.8±
INSPECTORS NAME/COMPANY J. Yu/YU & Associates, Inc.
DRILLERS NAME/COMPANY D. Mendez/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-75 Truck Mounted Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 20.0' WATER: DURING DRILLING: 0.8' TIME: 7:30 DATE: 12/31/08
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 7:10 DATE: 1/5/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								Bottom of borehole at 100 feet. Notes: 1. Boring tremie grouted using 2x95-lb bags of portland cement, 10 lbs of bentonite, potable water. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW- 16**
SHEET **1** OF **6**
DATE: START **4/14/09**
END **4/16/09**
DATUM: **NGVD29**
ELEVATION: **3.8±**
TOTAL DEPTH: **111'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Newark JC Tpk** N. **697627.8±** E. **599578.1±**
INSPECTORS NAME/COMPANY **N. DelGrosso/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Deigert/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-55 ATV with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **25.0'** WATER: DURING DRILLING: **3.0'** TIME: **10:00** DATE: **4/14/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **0.0'** TIME: **14:15** DATE: **4/16/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
2.0								2" ASPHALT CONCRETE, 8" CONCRETE over 10" ASPHALT CONCRETE, 4" SUBBASE.	Hand excavated to 6' for utility clearance
4.0	S-1				-	SP-SM	moist	Gray coarse to fine SAND, some coarse to fine Gravel, trace Silt, (FILL).	S-1, S-2 blow counts not recorded
6.0	S-2				-	SP-SM	moist		
8.0	S-3	2 3 4 3	0.5'	25	-	SP-SM	wet	...dark brown, little coarse to fine Gravel, occasional roots.	
10.0	S-4	WH WH 1 1	1.4'	71	- -	SM PT	wet wet	Brown fine SAND, little Silt, (FILL). 8.9' El. -5.1' Brown fibrous PEAT, (ORGANIC DEPOSIT). 10.0' El. -6.2'	
12.0	S-5	1 3 3 3	0.7'	35	-	ML	wet	Gray Clayey SILT, trace fine Sand, occasional roots, (ALLUVIUM).	Advanced 4" casing to 15'
14.0	S-6	8 8 7 10	1.4'	71	-	SM	wet	Gray fine SAND, and Silt, (ALLUVIUM).	S-6: mc=22.6% 44.3%<#200
16.0	S-7	4 6 6 6	1.4'	71	-	SM	wet	...brown.	
18.0	S-8	6 8 10 12	1.4'	71	-	SM	wet		
20.0	S-9	10 11 9 10	1.7'	84	-	ML	wet	18.0' El. -14.2' Brown Clayey SILT, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 16
SHEET 2 OF 6
DATE: START 4/14/09
END 4/16/09
DATUM: NGVD29
ELEVATION: 3.8±
TOTAL DEPTH: 111'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Newark JC Tpk N. 697627.8± E. 599578.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: 3.0' TIME: 10:00 DATE: 4/14/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 14:15 DATE: 4/16/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-10	10 10 10 12	1.7'	84	PP 1.25	ML	wet	*.....(continued from previous page).* Brown varved Clayey SILT, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 25'
25.0									
27.0	S-11	4 6 7 10	1.4'	71	PP 2.25	ML	moist	Brown Clayey SILT, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 30'
30.0									
32.0	S-12	6 7 7 12	1.8'	92	-	ML	moist	...gray.	
35.0									
37.0	S-13	4 5 5 7	1.8'	92	PP 1.50	CL	moist	Gray CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	S-13: mc=29.5% LL=30, PI=11
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 16
SHEET 3 OF 6
DATE: START 4/14/09
END 4/16/09
DATUM: NGVD29
ELEVATION: 3.8±
TOTAL DEPTH: 111'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Newark JC Tpk N. 697627.8± E. 599578.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: 3.0' TIME: 10:00 DATE: 4/14/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 14:15 DATE: 4/16/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-14	4 3 3 4	2.0'	100	PP 1.25	CH	moist	*.....(continued from previous page).* Gray-brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	
43.0									
45.0	U-1	P U S H	2.0'	100	PP 1.25 TV 0.18	CH	moist	Gray-brown varved Silty CLAY and CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-1: mc=34.6% LL=35 and 56 PI=15 and 32
47.0	S-15	2 3 3 2	2.0'	100	PP 1.25	CH	moist		
50.0									
52.0	S-16	WH 2 2 3	2.0'	100	PP 1.00	CH	moist		
55.0									
57.0	S-17	WR WH WH WH	2.0'	100	PP 0.50	CL	moist	Gray-brown CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 16
SHEET 4 OF 6
DATE: START 4/14/09
END 4/16/09
DATUM: NGVD29
ELEVATION: 3.8±
TOTAL DEPTH: 111'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Newark JC Tpk N. 697627.8± E. 599578.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: 3.0' TIME: 10:00 DATE: 4/14/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 14:15 DATE: 4/16/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
62.0	S-18	WH WH WH WH	2.0'	100	PP 0.50	CL	moist	*.....(continued from previous page).* Red-brown varved CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT).	
65.0									
67.0	S-19	WH WH WH WH	2.0'	100	PP <0.5	CL	moist		
68.0									
70.0	U-2	P U S H	2.0'	100	PP 1.00 TV 0.50	CL	moist	Red-brown varved CLAY & SILT and CLAY, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-2: mc=37.5% LL=33 and 60 PI=13 and 44
72.0	S-20	6 6 4 6	2.0'	100	PP 0.50	CL	moist		
75.0									Bentonite introduced at 72'
77.0	S-21	WR WH WH WH	2.0'	100	PP 0.50	CL	moist	Brown varved CLAY & SILT, 1/4"± varves, (GLACIOLACUSTRINE DEPOSIT).	
78.0									
80.0	U-NR/ S-22	3 3 4 10	2.0'	100	PP 0.50	ML	moist	Red-brown Clayey SILT, occasional fine sand seams, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sampling attempted with a piston sampler, material recovered with SPT split spoon: blow counts represent that of disturbed material

ENGINEERS FIELD BORING LOG

BORING NO. BW- 16
SHEET 5 OF 6
DATE: START 4/14/09
END 4/16/09
DATUM: NGVD29
ELEVATION: 3.8±
TOTAL DEPTH: 111'

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Newark JC Tpk N. 697627.8± E. 599578.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 25.0' WATER: DURING DRILLING: 3.0' TIME: 10:00 DATE: 4/14/09
CHECKED BY: D. Mazujian DATE: 2/20/12 END OF DRILLING: 0.0' TIME: 14:15 DATE: 4/16/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page). Red-brown Clayey SILT, occasional fine sand seams, (GLACIOLACUSTRINE DEPOSIT).	
								82.5' El. -78.7'	
85.0									
	S-23	6 8 6 11	0.5'	25	-	ML	moist	Red-brown Clayey SILT, some coarse to fine Sand, little medium to fine Gravel, (GLACIAL TILL).	
87.0									
90.0									
90.2	S-24	100/2"	0.0'	0	-			No recovery.	
91.0								91.0' Top of Rock at 91 feet. El. -87.2'	
	C-1		4.8'	97 43				Red-brown CLAYSTONE, moderately weathered, very weak to medium strong, closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
96.0								96.0' El. -92.2'	
	C-2		5.0'	100				Red-brown CLAYSTONE, slightly to moderately weathered, very weak to medium strong, very closely to closely spaced fractures, (COMPETENT PASSAIC FORMATION).	
								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. BW- 16
SHEET 6 OF 6
DATE: START 4/14/09
END 4/16/09
DATUM: NGVD29
ELEVATION: 3.8±
TOTAL DEPTH: 111'

PROJECT NAME Portal Bridge Capacity Enhancement Project
COUNTY Hudson
MUNICIPALITY Kearny
LOCATION Newark JC Tpk
N. 697627.8± E. 599578.1±
INSPECTORS NAME/COMPANY N. DelGrosso/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Deigert/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring
EQUIPMENT USED CME-55 ATV with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 25.0' WATER:
DURING DRILLING: 3.0' TIME: 10:00 DATE: 4/14/09
CHECKED BY: D. Mazujian DATE: 2/20/12
END OF DRILLING: 0.0' TIME: 14:15 DATE: 4/16/09
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
101.0				65				*.....(continued from previous page).*	
	C-3		4.6'	92 / 62				Red-brown CLAYSTONE, slightly to moderately weathered, weak to medium strong, very closely to closely spaced fractures, (COMPETENT PASSAIC FORMATION).	
106.0									
	C-4		4.8'	97 / 70				...slightly weathered, medium strong, closely to moderately spaced fractures.	
111.0								111.0' El. -107.2'	
								Bottom of borehole at 111 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite, and cold patched with asphalt.

ENGINEERS FIELD BORING LOG

BORING NO. **BW-201**
SHEET **1** OF **5**
DATE: START **11/23/09**
END **12/2/09**
DATUM: **NGVD29**
ELEVATION: **1.2±**
TOTAL DEPTH: **89'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696580.0±** E. **597242.4±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"/3.0"** DEPTH: **29.0'/70.0'** WATER: DURING DRILLING: **3.0'** TIME: **11:15** DATE: **11/23/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **1.0'** TIME: **8:00** DATE: **12/1/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WR WR	0.5'	25	-	OL	moist	Black Organic Clayey SILT, frequent fibers, (ORGANIC DEPOSIT).	PID = 0.0 ppm
2.0	S-2	WR WR WR WR	0.7'	35	-	OL	moist		PID = 0.0 ppm
4.0	S-3	WR WR WR WR	0.5'	25	-	OL	moist		PID = 0.0 ppm
6.0	S-4	WR WR WR WR	0.0'	0	-			No recovery.	
8.0	S-5	WR WR WR WR	0.5'	25	-	PT	wet	Dark brown PEAT, (ORGANIC DEPOSIT).	PID = 0.0 ppm Advanced 4" casing to 8'
10.0	U-1/ U-NR	P U S H	0.0'	0	-			No recovery. 11.0' El. -9.9'	PID = 0.0 ppm Undisturbed sampling attempted with a Shelby tube
12.0	S-6	2 1 1 1	0.5'	25	-	SM	wet	Brown fine SAND, little Silt, occasional roots, (ALLUVIUM).	PID = 0.0 ppm Advanced 4" casing to 13'
14.0	S-7	3 7 12 14	1.5'	75	-	SP-SM	wet	...coarse(+) to medium, little fine Gravel, trace Silt.	PID = 0.0 ppm
16.0	S-8	8 9 15 17	1.0'	50	-	SP-SM	wet		PID = 0.0 ppm
18.0	S-9	8 8 8 7	1.0'	50	-	SP-SM	wet		PID = 0.0 ppm Advanced 4" casing to 18'
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-201**
SHEET **2** OF **5**
DATE: START **11/23/09**
END **12/2/09**
DATUM: **NGVD29**
ELEVATION: **1.2±**
TOTAL DEPTH: **89'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696580.0±** E. **597242.4±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"/3.0"** DEPTH: **29.0'/70.0'** WATER: DURING DRILLING: **3.0'** TIME: **11:15** DATE: **11/23/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **1.0'** TIME: **8:00** DATE: **12/1/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-10	9 6 9 8	1.3'	65	-	SP-SM	wet	*.....(continued from previous page).* Brown coarse(+) to medium SAND, some fine Gravel, trace Silt, (ALLUVIUM).	PID = 0.0 ppm
25.0									
27.0	S-11	13 24 30 35	1.0'	50	-	SM	wet	...gray-brown fine, some Silt.	
30.0									Advanced 4" casing to 29'
32.0	S-12	17 15 15 16	1.3'	65	PP 1.50	ML	moist	Gray-brown Clayey SILT, trace fine Sand, (ALLUVIUM).	
								33.5' El. -32.4'	
35.0									
37.0	S-13	8 8 13 12	1.5'	75	PP 1.00	CL	moist	Gray-brown CLAY & SILT varved with Silt, trace(-) fine Sand, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
38.0									
40.0	U-2	P U S H	2.0'	100	TV 0.65	CL	moist	*.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-2: mc = 29%, LL = 35, PI = 15, 98.7% < #200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-201**
SHEET **3** OF **5**
DATE: START **11/23/09**
END **12/2/09**
DATUM: **NGVD29**
ELEVATION: **1.2±**
TOTAL DEPTH: **89'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696580.0±** E. **597242.4±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"/3.0"** DEPTH: **29.0'/70.0'** WATER: DURING DRILLING: **3.0'** TIME: **11:15** DATE: **11/23/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **1.0'** TIME: **8:00** DATE: **12/1/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
42.0	S-14	13 12 14 13	2.0'	100	PP 1.25	CL	moist	Gray-brown CLAY & SILT varved with Silt, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-15	5 6 11 10	1.5'	75	PP 1.00	CL	moist		
48.0									
50.0	U-3	P U S H	2.0'	100	-	CL	moist	Gray-brown CLAY & SILT varved with Silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube
52.0	S-16	8 10 12 15	2.0'	100	PP 0.75	CH	moist	Gray-brown CLAY & SILT varved with Silt, alternating 1/4"± to 3/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
55.0									
57.0	S-17	12 6 8 9	2.0'	100	PP 0.75	CL	moist	...alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt.	
								58.5' El. -57.4'	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-201**
SHEET **4** OF **5**
DATE: START **11/23/09**
END **12/2/09**
DATUM: **NGVD29**
ELEVATION: **1.2±**
TOTAL DEPTH: **89'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696580.0±** E. **597242.4±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"/3.0"** DEPTH: **29.0'/70.0'** WATER: DURING DRILLING: **3.0'** TIME: **11:15** DATE: **11/23/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **1.0'** TIME: **8:00** DATE: **12/1/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
	S-18	34 43 26 29	0.2'	10	-	SC	wet	Red-brown coarse to medium SAND, some Clay & Silt, trace fine Gravel, (GLACIAL TILL).	
62.0									
	C-NR		0.0'	0	-			No recovery.	Rotary bit refusal at 62' Core barrel jammed at 65'
65.0									
	S-19	12 15 16 20	0.2'	10	-	SC	wet	Red-brown coarse to medium SAND, some Clay & Silt, little fine Gravel, (GLACIAL TILL).	
67.0									
70.0									
	S-20	17 31 40 50/1"	0.2'	13	-	SC	wet		Advanced 3" casing to 70'
71.6									
73.0								73.0' Top of Rock at 73.0 feet. El. -71.9'	
	C-1		1.8'	36 7				Red-brown MUDSTONE, highly weathered, (DECOMPOSED ROCK).	Rotary bit refusal at 73'
78.0									
79.0								78.5' El. -77.4'	
				50				*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-201**
SHEET **5** OF **5**
DATE: START **11/23/09**
END **12/2/09**
DATUM: **NGVD29**
ELEVATION: **1.2±**
TOTAL DEPTH: **89'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696580.0±** E. **597242.4±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"/3.0"** DEPTH: **29.0'/70.0'** WATER: DURING DRILLING: **3.0'** TIME: **11:15** DATE: **11/23/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **1.0'** TIME: **8:00** DATE: **12/1/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	C-2		2.5'	7				*.....(continued from previous page).* Red-brown MUDSTONE, highly to moderately weathered, weak to medium strong, extremely closely to closely spaced fractures, (WEATHERED PASSAIC FORMATION).	
84.0								84.0' EI. -82.9'	
	C-3		4.7'	94 / 56				Red-brown MUDSTONE, moderately to slightly weathered, medium strong to strong, very closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
89.0								89.0' EI. -87.9'	
								Bottom of borehole at 89 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag bentonite, potable water.
2. Undisturbed sample moisture contents noted in the "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. **BW-202**
SHEET **1** OF **3**
DATE: START **11/20/09**
END **11/20/09**
DATUM: **NGVD29**
ELEVATION: **1.0±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696669.1±** E. **597451.3±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-0.8'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WR WR	0.5'	25	-	OL	wet	Black Organic CLAY & SILT, occasional fibers, (ORGANIC DEPOSIT).	PID = 0.0 ppm
2.0									Depth to mud line was about 0.8'
	S-2	WR WR WR WR	0.5'	25	-	OL	wet		PID = 0.0 ppm
4.0	S-3	WR WR WR WR	0.3'	15	-	PT	wet	Dark brown PEAT, (ORGANIC DEPOSIT).	PID = 0.0 ppm
6.0									Advanced 4" casing in very soft soil to 6'
	U-1	P U S H	1.0'	50	-	PT	wet		PID = 0.0 ppm Undisturbed sample collected using a Shelby tube
8.0								8.0' El. -7.0'	U-1: mc = 229.1%
	S-4	1 1 2 4	1.0'	50	-	SM	wet	Gray-brown fine SAND, some(+) Silt, (ALLUVIUM).	PID = 0.0 ppm
10.0	S-5	3 5 6 9	1.0'	50	-	SP-SM	wet	Gray-brown medium to fine SAND, trace Silt, (ALLUVIUM).	PID = 0.0 ppm
12.0	S-6	4 7 20 18	1.7'	85	-	SP-SM	wet	...coarse to fine Sand, little(+) fine Gravel.	PID = 0.0 ppm
14.0									Advanced 4" casing to 14'
	S-7	14 13 16 15	1.0'	50	-	SP-SM	wet		PID = 0.0 ppm
16.0	S-8	8 5 6 6	1.0'	50	-	SP-SM	wet	...coarse to fine.	PID = 0.0 ppm
18.0	S-9	4 8 9 10	0.5'	25	-	SP-SM	wet		PID = 0.0 ppm
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-202**
SHEET **2** OF **3**
DATE: START **11/20/09**
END **11/20/09**
DATUM: **NGVD29**
ELEVATION: **1.0±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696669.1±** E. **597451.3±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-0.8'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-10	7 9 10 11	1.0'	50	-	SP-SM	wet	*.....(continued from previous page).* Gray-brown coarse to fine SAND, little fine Gravel, trace Silt, (ALLUVIUM).	Advanced 4" casing to 20' PID = 0.0 ppm
25.0									
27.0	S-11	5 6 7 9	1.5'	75	-	SP-SM	wet	...medium to fine.	
30.0								28.5' _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ El. -27.5'	
32.0	S-12	10 5 8 8	1.5'	75	PP 1.00	CL	moist	Gray-brown CLAY & SILT varved with Silt, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 29'
35.0									
37.0	S-13	8 7 8 8	1.5'	75	PP 1.25	CL	moist		
38.0									
40.0	U-2	P U S H	1.5'	75	TV 0.40	CL	moist	Gray-brown CLAY & SILT varved with Silt, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-2: mc = 29.0%, LL = 36, PI = 18, 99.4% < #200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-202**
SHEET **3** OF **3**
DATE: START **11/20/09**
END **11/20/09**
DATUM: **NGVD29**
ELEVATION: **1.0±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696669.1±** E. **597451.3±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-0.8'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-14	6 8 8 7	1.4'	70	PP 1.00	CL	moist	*.....(continued from previous page).* Gray-brown CLAY & SILT varved with Silt, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT). 42.0' El. -41.0'	
								Bottom of borehole at 42 feet. Notes: 1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite and potable water. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-203**
SHEET **1** OF **4**
DATE: START **11/12/09**
END **11/19/09**
DATUM: **NGVD29**
ELEVATION: **-0.1±**
TOTAL DEPTH: **73'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696849.8±** E. **597823.4±**
INSPECTORS NAME/COMPANY **S. Calabretta / J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.7'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WH WH WH WH	0.3'	15	-	OL	wet	Black Organic SILT, (ORGANIC DEPOSIT).	Depth to mudline 1.5' PID = 0.0 ppm
2.0	S-2	12 3 2 1	0.5'	25	-	OL	wet	...occasional wood fragments.	PID = 0.0 ppm
4.0								4.0' El. -4.1'	
	S-3	7 10 12 10	0.8'	40	-	SP	wet	Brown fine SAND, trace fine Gravel, (ALLUVIUM).	PID = 0.0 ppm Advanced 4" casing to 4'
6.0	S-4	10 8 10 12	1.0'	50	-	SP	wet	...coarse to fine.	PID = 0.0 ppm
8.0	S-5	10 11 11 13	1.2'	60	-	SP	wet	...medium to fine.	PID = 0.0 ppm
10.0	S-6	6 10 15 17	1.5'	75	-	SP	wet	...coarse to fine.	PID = 0.0 ppm
12.0	S-7	22 22 26 22	1.7'	85	-	SP	wet		PID = 0.0 ppm
14.0	S-8	16 17 18 18	1.0'	50	-	SP-SM	wet	...medium to fine, trace Silt.	PID = 0.0 ppm Advanced 4" casing to 14'
16.0	S-9	18 17 14 15	1.3'	65	-	SP	wet	...coarse to fine.	PID = 0.0 ppm
18.0	S-10	10 7 4 10	1.5'	75	-	SP	wet		PID = 0.0 ppm
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-203**
SHEET **2** OF **4**
DATE: START **11/12/09**
END **11/19/09**
DATUM: **NGVD29**
ELEVATION: **-0.1±**
TOTAL DEPTH: **73'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696849.8±** E. **597823.4±**
INSPECTORS NAME/COMPANY **S. Calabretta / J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.7'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-11	9 9 15 17	1.7'	85	PP 1.00	ML	wet	*.....(continued from previous page).* Gray-brown Clayey SILT, trace(-) fine Sand, (ALLUVIUM).	PID = 0.0 ppm
25.0									Advanced 4" casing to 24'
27.0	S-12	15 17 12 17	1.5'	75	PP 1.00	ML	wet		
30.0								28.5' _____ El. -28.6'	
32.0	S-13	7 9 9 11	1.7'	85	PP 1.00	CL	moist	Gray-brown CLAY & SILT varved with Silt, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
33.0									
35.0	U-NR	P U S H	0.0'	0	-	CL	wet	No recovery.	Undisturbed sampling attempted with a Shelby tube Advanced 4" casing to 34'
37.0	S-14	6 8 9 11	2.0'	100	PP 0.75	CL	moist	Gray-brown CLAY & SILT varved with Silt, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
38.0									
40.0	U-1A	P U S H	1.7'	85	PP 0.55	CL	moist	Gray-brown CLAY & SILT varved with Silt, little(+) medium to fine Gravel, trace coarse to fine Sand, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-1A: mc = 35.3%, LL = 39, PI = 17, 78.3% < #200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-203**
SHEET **3** OF **4**
DATE: START **11/12/09**
END **11/19/09**
DATUM: **NGVD29**
ELEVATION: **-0.1±**
TOTAL DEPTH: **73'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696849.8±** E. **597823.4±**
INSPECTORS NAME/COMPANY **S. Calabretta / J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.7'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	
42.0	S-15	6 6 7 9	2.0'	100	PP 1.00	CL	moist	Gray-brown CLAY & SILT varved with Silt, alternating 1/8"± to 1/4"± clay & silt, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-16	8 6 8 9	2.0'	100	PP 1.25	CL	moist	...red-brown.	
50.0									
52.0	S-17	7 8 11 9	2.0'	100	PP 1.00	CL	moist	Red-brown Silty CLAY varved with Silt, alternating 1/4" to 3/4"± silty clay, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
53.0									
55.0	U-2	P U S H	1.7'	85	TV 0.40	CL	moist	Red-brown Silty CLAY varved with Silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube
57.0	S-18	6 11 14 14	2.0'	100	PP 1.25	CL	moist	...alternating 1/4" to 3/4"± silty clay, 1/16"± silt.	
								58.5' El. -58.6'	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-203**
SHEET **4** OF **4**
DATE: START **11/12/09**
END **11/19/09**
DATUM: **NGVD29**
ELEVATION: **-0.1±**
TOTAL DEPTH: **73'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696849.8±** E. **597823.4±**
INSPECTORS NAME/COMPANY **S. Calabretta / J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **34.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.7'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
60.1	S-19	50/1"	0.1'	100	-	GC	wet	*.....(continued from previous page).* Red-brown fine GRAVEL, some(-) coarse to medium Sand, some Clay & Silt, (DECOMPOSED ROCK).	
65.0								65.0' Top of Rock at 65.0 feet. El. -65.1'	
	C-1		2.5'	50 / 0				Red-brown MUDSTONE, highly weathered, weak, extremely closely to closely spaced fractures, (WEATHERED PASSAIC FORMATION).	Rotary bit refusal at 65'
70.0									
	C-2		1.0'	33 / 0					Core barrel jammed at 73 ft
73.0								73.0' El. -73.1'	
								Bottom of borehole at 73 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite and potable water.
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. **BW-204**
SHEET **1** OF **3**
DATE: START **11/10/09**
END **11/11/09**
DATUM: **NGVD29**
ELEVATION: **-1.2±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696980.7±** E. **598166.9±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.5'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WH WH WH WH	0.5'	25	-	OH	wet	Black Organic CLAY & SILT, occassional plant matter, (ORGANIC DEPOSIT).	PID = 0.0 ppm Depth to mud line was about 1.5'
2.0	S-2	WH WH WH WH	1.0'	50	-	OH	wet		PID = 0.0 ppm
4.0	S-3	WR 3 2 4	0.7'	35	-	PT	wet	Dark brown PEAT, (ORGANIC DEPOSIT).	PID = 0.0 ppm
6.0	U-NR	P U S H	0.0'	0	-			No recovery. 7.0' El. -8.2'	Undisturbed sample attempted using a Shelby tube
8.0	S-4	6 8 7 8	1.0'	50	-	SP-SM	wet	Light brown medium to fine SAND, trace Silt, (ALLUVIUM).	PID = 0.0 ppm Advanced 4" casing to 8'
10.0	S-5	7 9 6 8	1.5'	75	-	SP-SM	wet		PID = 0.0 ppm
12.0	S-6	7 9 6 7	0.7'	35	-	SP-SM	wet	...coarse to fine.	PID = 0.0 ppm Advanced 4" casing to 13'
14.0	S-7	13 10 9 11	1.5'	75	-	SP-SM	wet	...trace fine Gravel. 16.0' El. -17.2'	PID = 0.0 ppm Silt & Clay in spoon tip
16.0	S-8	6 12 11 18	1.3'	65	PP 1.50	ML	wet	Gray-brown SILT & CLAY varved with Clay & Silt, alternating 1/8" to 1/4"± silt & clay, 1/16"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	PID = 0.0 ppm
18.0	S-9	13 20 22 24	1.3'	67	PP 1.50	ML	wet		PID = 0.0 ppm Advanced 4" casing to 18'
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-204**
SHEET **2** OF **3**
DATE: START **11/10/09**
END **11/11/09**
DATUM: **NGVD29**
ELEVATION: **-1.2±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696980.7±** E. **598166.9±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.5'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-10	11 21 29 32	1.3'	65	PP 1.75	ML	wet	*.....(continued from previous page).* Gray-brown SILT & CLAY varved with Silty Clay, trace fine Sand, alternating 1/4"± silt & clay, 1/32"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	PID = 0.0 ppm Advanced 4" casing to 24'
25.0									
27.0	S-11	10 18 25 21	1.0'	50	PP 1.75	ML	wet		
30.0									
32.0	S-12	17 20 27 29	1.5'	75	PP 1.75	ML	wet		
35.0									
37.0	S-13	13 15 19 11	1.7'	85	PP 1.00	CL	moist	Brown Silty CLAY varved with Clay & Silt, trace(-) fine Sand, alternating 1/8" to 1/4"± silty clay, 1/16" to 1/8" ± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
38.0									Cleaned out to 38'
40.0	U-2	P U S H	1.7'	85	TV 0.55	CL	moist	Brown Silty CLAY varved with Clay & Silt, trace(-) fine Sand, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-2: mc = 24.0%, LL = 46, PI = 26, 99.5% < #200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-204**
SHEET **3** OF **3**
DATE: START **11/10/09**
END **11/11/09**
DATUM: **NGVD29**
ELEVATION: **-1.2±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **696980.7±** E. **598166.9±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-1.5'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-14	10 9 12 14	2.0'	100	PP 1.00	CL	moist	*.....(continued from previous page).* Brown varved Silty CLAY and CLAY & SILT, trace(-) fine Sand, alternating 1/8"± silty clay, 1/8"± clay & silt, (GLACIOLACUSTRINE DEPOSIT). 42.0' El. -43.2'	
								Bottom of borehole at 42 feet. <u>Notes:</u> 1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite, potable water. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-205**
SHEET **1** OF **3**
DATE: START **10/30/09**
END **11/3/09**
DATUM: **NGVD29**
ELEVATION: **-0.3±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697381.8±** E. **599048.0±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **25.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-2.5'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WR 8	0.3'	13	-	SM	wet	Dark gray medium to fine(+) SAND, some(+) Clayey Silt, frequent paper and wood fragments, (FILL).	Depth to mudline 2.5'
2.0								2.0' El. -2.3'	PID= 0.0 PPM
	S-2	3 1 1 1	0.1'	5	-	OL	wet	Dark gray Organic SILT & CLAY, some fine Sand, occasional roots, (ORGANIC DEPOSIT).	PID= 0.0 PPM
4.0								4.0' El. -4.3'	
	S-3	3 5 9 13	1.0'	50	-	SM	wet	Grayish brown medium to fine(+) SAND, little Silt, (ALLUVIUM).	PID= 0.0 PPM
6.0									
	S-4A	8 9	1.6'	80	-	SM	wet		Advanced 4" casing to 6'
	S-4B	4 6			PP 0.63	ML	wet	Grayish brown Clayey SILT, little fine Sand, below 7.5', (ALLUVIUM).	PID= 0.0 PPM
8.0									
	S-5	7 8 8 8	1.0'	50	-	SM	wet	Gray-brown fine SAND, little Silt, (ALLUVIUM).	PID= 0.0 PPM
10.0									
	S-6	9 11 10 13	1.5'	75	-	SM	wet		Advanced 4" casing to 10' PID= 0.0 PPM
12.0									
	S-7	7 8 4 4	1.0'	50	-	SP-SM	wet	...trace Silt.	PID= 0.0 PPM
14.0									
	S-8	25 22 25 23	1.3'	65	-	SM	wet	...medium(+) to fine.	Advanced 4" casing to 15'
16.0									
	S-9	14 11 12 20	1.5'	75	PP 1.63	ML	wet	Gray-brown Clayey SILT, trace(-) Sand, (ALLUVIUM).	PID= 0.0 PPM
18.0								18.0' El. -18.3'	
	S-10	8 16 16 17	1.3'	67	PP 1.75	ML	wet	Gray-brown Clayey SILT varved with Clay & Silt, alternating 1/8" to 1/4"± clayey silt, 1/8"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
20.0								*.....(continued on next page).*	PID= 0.0 PPM

ENGINEERS FIELD BORING LOG

BORING NO. **BW-205**
SHEET **2** OF **3**
DATE: START **10/30/09**
END **11/3/09**
DATUM: **NGVD29**
ELEVATION: **-0.3±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697381.8±** E. **599048.0±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **25.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-2.5'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								.....(continued from previous page).	Advanced 4" casing to 21'
21.0									
	U-1	P U S H	0.5'	25	-	CL	moist	Red-brown SILT & CLAY trace fine Sand, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a piston sampler U-1: mc = 21.2%, LL = 31, PI = 8, 91.7% < #200
23.0									
	S-11	8 15 19 17	1.3'	65	PP 1.00	CL	moist	Gray-brown SILT & CLAY varved with Silty Clay, trace fine Sand, alternating 1/8" to 1/4" ± silt & clay, 1/8"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
25.0									
26.0									
	U-NR	P U S H	0.0'	0	-			No recovery.	Undisturbed sampling attempted with a piston sampler
28.0									
30.0									
	S-12	11 11 12 13	1.7'	85	PP 1.00	CL	moist	Gray-brown CLAY & SILT varved with Clayey Silt, alternating 1/8" to 1/4" clay & silt, and 1/8" clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
32.0									
35.0									
	S-13	8 10 12 15	1.7'	85	PP 1.25	CL	moist		
37.0									
38.0									
	U-NR	P U S H	0.0'	0	-			No recovery.	Undisturbed sampling attempted with a piston sampler
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-205**
SHEET **3** OF **3**
DATE: START **10/30/09**
END **11/3/09**
DATUM: **NGVD29**
ELEVATION: **-0.3±**
TOTAL DEPTH: **42'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697381.8±** E. **599048.0±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **25.0'** WATER: DURING DRILLING: _____ TIME: _____ DATE: _____
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **-2.5'** TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
				50				*.....(continued from previous page).*	
	S-14	5 13 17 24	1.0'		PP 1.25	CL	moist	Gray-brown CLAY & SILT varved with Clayey Silt, alternating 1/8" to 1/4" clay & silt, 1/8" clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
42.0								42.0' El. -42.3'	
								Bottom of borehole at 42 feet.	

Notes:
1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite, potable water.
2. Water level was approximately 2.5' above top of soil
3. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. **BW-206**
SHEET **1** OF **5**
DATE: START **11/3/09**
END **11/9/09**
DATUM: **NGVD29**
ELEVATION: **-1.1±**
TOTAL DEPTH: **79'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697533.1±** E. **599361.8±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: **2.4'** TIME: **11:30** DATE: **11/3/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:45** DATE: **11/9/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WR WR WH WR	1.0'	50	-	OH	wet	Dark brown Organic CLAY & SILT, occasional fibers, (ORGANIC DEPOSIT).	PID = 0.0 ppm
2.0	S-2	WH WH WH 1	0.5'	25	-	OH	wet		PID = 0.0 ppm
4.0	S-3	1 1 1 1	1.0'	50	-	PT	wet	Dark brown PEAT, (ORGANIC DEPOSIT).	PID = 0.0 ppm Advanced 4" casing to 5' bgs
6.0	U-1	P U S H	1.5'	75	-	OL PT	wet wet	Dark brown Organic CLAY, and coarse to fine Gravel, (ORGANIC DEPOSIT). Dark brown PEAT, (ORGANIC DEPOSIT).	PID = 0.0 ppm Undisturbed sample collected using a Shelby tube U-1: mc = 373.4%, LL = 371, PI = 122, 54.0% < #200
8.0	S-4	WH WH 1 2	0.7'	35	PP <0.25	OL	wet	Greenish gray Organic SILT & CLAY, (ORGANIC DEPOSIT).	PID = 0.0 ppm
10.0								10.0' _ El. -11.1'	
12.0	S-5	5 9 11 7	1.0'	50	-	SM	wet	Gray-brown fine SAND, some(-) Silt, (ALLUVIUM).	PID = 0.0 ppm Advanced 4" casing to 11' bgs
14.0	S-6	5 2 3 4	1.3'	65	PP 0.75	CL	moist	Gray-brown SILT & CLAY, little fine Sand, (ALLUVIUM).	PID = 0.0 ppm
16.0	S-7	3 6 6 6	1.5'	75	PP 0.75	CL	moist	Gray-brown CLAY & SILT, trace(-) fine Sand, (ALLUVIUM).	PID = 0.0 ppm
17.0									
19.0	U-2	P U S H	2.0'	100	TV 0.45	CL-ML	moist	Gray-brown SILT & CLAY, trace(+) medium to fine Sand, (ALLUVIUM).	Undisturbed sample collected using a Shelby tube U-2: mc = 31.1%, LL = 27, PI = 5, 90.3% < #200 Advanced 4" casing to 19' bgs
	S-8A	14 26		85	PP 0.50	CL	moist	.....(continued on next page).	PID = 0.0 ppm

ENGINEERS FIELD BORING LOG

BORING NO. **BW-206**
SHEET **2** OF **5**
DATE: START **11/3/09**
END **11/9/09**
DATUM: **NGVD29**
ELEVATION: **-1.1±**
TOTAL DEPTH: **79'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697533.1±** E. **599361.8±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: **2.4'** TIME: **11:30** DATE: **11/3/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:45** DATE: **11/9/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-8B	21 15	1.7'		- PP 1.75	ML	moist	*.....(continued from previous page).* Gray-brown Clayey SILT, some fine Sand, below 19.5', (ALLUVIUM).	PID = 0.0 ppm
21.0									
25.0									Advanced 4" casing to 24' bgs
	S-9	9 20 21 25	2.0'	100	PP 1.75	CL	moist	Gray-brown CLAY & SILT, trace(-) fine Sand, (ALLUVIUM).	
27.0									
								28.5' El. -29.6'	
30.0									
	S-10	10 12 20 18	1.5'	75	PP 1.75	CL	moist	Gray-brown Silty CLAY varved with Silt, trace(-) medium to fine Sand, alternating 1/8" to 1/4"± silty clay, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
32.0									
35.0									
	S-11	10 10 17 14	1.5'	75	PP 1.50	CL	moist		
37.0									
38.0									
	U-3	P U S H	1.7'	85	TV 0.75	CL	moist	Gray-brown Silty CLAY varved with Silt, trace(-) medium to fine Sand, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-3: mc = 34.4%, LL = 42, PI = 20, 99.1% < #200
40.0									

ENGINEERS FIELD BORING LOG

BORING NO. **BW-206**
SHEET **3** OF **5**
DATE: START **11/3/09**
END **11/9/09**
DATUM: **NGVD29**
ELEVATION: **-1.1±**
TOTAL DEPTH: **79'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697533.1±** E. **599361.8±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: **2.4'** TIME: **11:30** DATE: **11/3/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:45** DATE: **11/9/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-12	5 9 8 10	1.5'	75	PP 1.00	CL	moist	*.....(continued from previous page).* Gray-brown Silty CLAY varved with Silt, trace(-) medium to fine Sand, alternating 1/8" to 1/4"± silty clay, 1/16"± silt, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-13	8 11 12 13	2.0'	100	PP 1.00	CL	moist	...red-brown, alternating 1/4" to 3/4"± silty clay, 1/16"± silt.	
50.0									
52.0	S-14	8 9 12 12	2.0'	100	PP 0.75	CL	moist		
55.0									
57.0	S-15	4 5 6 9	2.0'	100	PP 0.50	CL	moist	Red-brown Silty CLAY varved with Clayey Silt, alternating 1/4" to 1"± silty clay, 1/16"± clayey silt, (GLACIOLACUSTRINE DEPOSIT).	
58.0									
60.0	U-4	P U S H	2.0'	100	-	CL	moist	Red-brown Silty CLAY varved with Clayey Silt, and(-) coarse to medium Sand, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-4: mc = 32.7%, LL = 45, PI = 23, 63.4% < #200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-206**
SHEET **4** OF **5**
DATE: START **11/3/09**
END **11/9/09**
DATUM: **NGVD29**
ELEVATION: **-1.1±**
TOTAL DEPTH: **79'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697533.1±** E. **599361.8±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: **2.4'** TIME: **11:30** DATE: **11/3/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:45** DATE: **11/9/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
62.0	S-16	7 9 10 12	1.7'	85	PP 0.50	CL	moist	*.....(continued from previous page).* Red-brown Silty CLAY varved with Clayey Silt, and(-) coarse to medium Sand, (GLACIOLACUSTRINE DEPOSIT).	
65.0									
67.0	S-17	11 10 14 19	1.3'	65	PP 0.75	CL	moist		
70.0								68.5' El. -69.6'	
72.0	S-18	38 59 40 52	1.0'	50	-	GC	wet	Red-brown medium to fine GRAVEL, little coarse Sand, some Clay & Silt, (DECOMPOSED ROCK).	
74.0									Hard drilling from 72' to 74'
79.0	C-1		1.5'	30 / 0				Red-brown MUDSTONE, highly weathered, (DECOMPOSED ROCK).	Rotary bit refusal at 74'
								79.0' El. -80.1' Bottom of borehole at 79 feet.	
								Notes:	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-206**
SHEET **5** OF **5**
DATE: START **11/3/09**
END **11/9/09**
DATUM: **NGVD29**
ELEVATION: **-1.1±**
TOTAL DEPTH: **79'**

PROJECT NAME **Portal Bridge Capacity Enhancement Project** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Cedar Creek** N. **697533.1±** E. **599361.8±**
INSPECTORS NAME/COMPANY **J. Yu/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Blejwas/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Skid Rig with Donut Hammer (on barrel float)**
CASING SIZE: **4.0"** DEPTH: **24.0'** WATER: DURING DRILLING: **2.4'** TIME: **11:30** DATE: **11/3/09**
CHECKED BY: **D. Mazujian** DATE: **2/20/12** END OF DRILLING: **2.3'** TIME: **7:45** DATE: **11/9/09**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								1. Boring tremie grouted using 2x94-lb bags of portland cement, 1/2x50-lb bag of bentonite, potable water. 2. Water level was approximately 2'5" above top of soil upon completion. 3. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-317**
SHEET **1** OF **7**
DATE: START **10/24/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.8±**
TOTAL DEPTH: **118'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698047.8±** E. **600637.3±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **35.0'** WATER: DURING DRILLING: **0.5'** TIME: **10:00** DATE: **10/24/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **15:30** DATE: **10/31/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	2 4 5 6	0.5'	25	-	GP	wet	Black medium to fine GRAVEL, and brick fragments, trace fine Sand, trace Silt, frequent roots, (FILL).	
2.0	S-2	2 4 4 4	0.5'	25	-	GP	wet	Black medium to fine GRAVEL, some cinders, little medium to fine Sand, trace Silt, (FILL).	
4.0	S-3	1 3 3 3	0.3'	15	-	ML	wet	Black Clayey SILT, and medium to fine Gravel, (FILL).	S-3: mc=109.7% 55.0%<#200
6.0	S-4A	2 3	0.4'	20	-	ML	wet		
	S-4B	2 3				PT	wet		
7.0'								El. -4.2'	
								Dark brown PEAT, (ORGANIC DEPOSIT).	
8.0								El. -5.2'	
	S-5	2 3 2 6	0.7'	35	-	SM	wet	Gray fine SAND, little Clayey Silt, (ALLUVIUM).	S-5: mc=19.6% 46.0%<#200
10.0	S-6	8 10 9 14	1.7'	85	-	SP	wet	Gray fine SAND, trace Silt, (ALLUVIUM).	
12.0	S-7	5 10 10 12	2.0'	100	-	SM	wet	Greenish gray fine SAND, little Clayey Silt, (ALLUVIUM).	
14.0	S-8	10 15 14 13	2.0'	100	-	SP	wet	Gray fine SAND, trace Silt, (ALLUVIUM).	
16.0	S-9	4 5 4 5	2.0'	100	-	SM	wet	...and Silt.	
18.0	S-10	3 6 8 10	1.0'	50	-	ML	wet	Brown Clayey SILT, little fine Sand, (ALLUVIUM).	
20.0								20.0' *.....(continued on next page).* EI. -17.2'	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-317**
SHEET **2** OF **7**
DATE: START **10/24/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.8±**
TOTAL DEPTH: **118'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698047.8±** E. **600637.3±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **35.0'** WATER: DURING DRILLING: **0.5'** TIME: **10:00** DATE: **10/24/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **15:30** DATE: **10/31/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-11	2 5 6 8	2.0'	100	PP 2.00	CL	moist	*.....(continued from previous page).* Gray SILT & CLAY varved with brown Clay & Silt, alternating 1/8"± silt & clay, 1/16"± clay & silt, trace fine Sand, (GLACIOLACUSTRINE DEPOSIT).	S-11: mc=28.3% LL=31, PI=8 100%<#200
23.0									Easier drilling from 22'
25.0	U-1	P U S H	2.0'	100	PP 1.50 TV 1.00	CL	wet	Gray SILT & CLAY varved with brown Clay & Silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-1: mc=29.5% LL=32, PI=9
27.0	S-12	2 2 2 2	1.8'	90	PP 1.50	CL	wet	Gray SILT & CLAY varved with brown Clay & Silt, alternating 1/8"± silt & clay, 1/16"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
29.0	S-13	4 4 3 2	1.7'	85	PP 1.25	CL	wet		
31.0	S-14	4 4 6 4	2.0'	100	PP 1.00	CL	wet		
33.0	S-15	3 6 6 6	2.0'	100	PP 1.50	CL	wet		
35.0	S-16	2 3 3 4	2.0'	100	PP 1.00	CL	wet		
37.0	S-17	3 5 5 5	2.0'	100	PP 1.25	CL	moist	Gray CLAY & SILT varved with brown Silt & Clay, alternating 1/4"± clay & silt, 1/16"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
39.0	S-18	1 2 2 2	2.0'	100	PP 0.50	CL	moist		
		3 2		100	PP	CL	moist	*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-317**
SHEET **3** OF **7**
DATE: START **10/24/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.8±**
TOTAL DEPTH: **118'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698047.8±** E. **600637.3±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **35.0'** WATER: DURING DRILLING: **0.5'** TIME: **10:00** DATE: **10/24/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **15:30** DATE: **10/31/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
41.0	S-19	4 3	2.0'		0.50	CL	moist	*.....(continued from previous page).* Gray CLAY & SILT varved with brown Silt & Clay, alternating 1/4"± clay & silt, 1/16"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
43.0	S-20	1 2 1 2	2.0'	100	PP 0.75	CL	wet	...alternating 1/4"± clay & silt, 1/8"± silt & clay.	
45.0	S-21	4 3 4 5	2.0'	100	PP 0.75	CL	wet		
47.0	S-22	WH WH 2 2	2.0'	100	PP 0.25	CL	wet		
49.0	S-23	1 2 1 2	2.0'	100	PP 0.25	CL	wet		
51.0	S-24	WR WH WH 2	2.0'	100	PP <0.25	CL	wet		
53.0	S-25	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
55.0	S-26	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		S-26: mc=29.6% LL=35, PI=15 100%<#200
57.0	S-27	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
58.0									
60.0	U-2	P U S H	2.0'	100	PP <0.25 TV 0.10	CL	wet	Brown CLAY & SILT, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-2: mc=41.8% LL=36, PI=16 100%<#200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-317**
SHEET **4** OF **7**
DATE: START **10/24/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.8±**
TOTAL DEPTH: **118'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698047.8±** E. **600637.3±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **35.0'** WATER: DURING DRILLING: **0.5'** TIME: **10:00** DATE: **10/24/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **15:30** DATE: **10/31/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
62.0	S-28	WR WH WH WH	2.0'	100	PP <0.25	CL	wet	*.....(continued from previous page).* Brown CLAY & SILT varved with gray-brown Silty Clay, alternating 1/4"± clay & silt, 1/16"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
64.0	S-29	WH WH 1 2	2.0'	100	PP 0.50	CL	wet		
66.0	S-30	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
68.0	S-31	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
70.0	S-32	WR WH WH WH	2.0'	100	PP <0.25	CL	wet		
72.0	S-33	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
73.0									
75.0	U-3	P U S H	0.0'	0	-			No recovery.	Undisturbed sampling attempted with a Shelby tube
77.0	S-34	4 5 5 6	2.0'	100	PP 0.50	CL	wet	Brown CLAY & SILT varved with red-brown Silty Clay, alternating 1/4"± clay & silt, 1/16"± silty clay, trace fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
79.0	S-35	1 2 2 3	2.0'	100	PP 0.25	CL	wet		
80.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-317**
SHEET **5** OF **7**
DATE: START **10/24/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.8±**
TOTAL DEPTH: **118'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698047.8±** E. **600637.3±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **35.0'** WATER: DURING DRILLING: **0.5'** TIME: **10:00** DATE: **10/24/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **15:30** DATE: **10/31/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
82.0	U-3A	P U S H	2.0'	100	PP 0.50 TV 0.10	CL	wet	*.....(continued from previous page).* Brown Silty CLAY, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-3A: mc=40.8% LL=44, PI=23 100%<#200
84.0	S-36	1 1 1 2	2.0'	100	PP <0.25	CL	wet	Brown Silty CLAY varved with red-brown Clay & Silt, alternating 1/16"± silty clay, 1/32"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
86.0	S-37	WR WR WH 1	2.0'	100	PP <0.25	CL	wet		
88.0	S-38	1 1 1 1	2.0'	100	PP <0.25	CL	wet		
90.0	S-39	2 2 3 2	2.0'	100	PP <0.25	CL	wet		
92.0	S-40	2 3 4 4	2.0'	100	PP <0.25	CL	wet		
94.0	S-41	3 4 3 3	2.0'	100	PP <0.25	CL	wet		
96.0	S-42	9 10 9 12	0.7'	35	-	SM	wet	Red-brown fine SAND, some Silt, (GLACIOLACUSTRINE DEPOSIT).	
98.0	S-43	WR 2 4 3	2.0'	100	PP <0.25	CL	wet	Red-brown CLAY & SILT, little fine Sand, (GLACIOLACUSTRINE DEPOSIT).	Dropped 10' rods with spoon in hole. Upon retrieval of sample and rods, hole advanced to 99' due to sample retrieval.
99.0								99.0' El. -96.2'	
	S-44	7 13	0.8'	64	-	GC	wet	Red-brown medium to fine Gravel, and Silty Clay, little coarse to fine Sand, (GLACIAL TILL).	Hard drilling from 99'

ENGINEERS FIELD BORING LOG

BORING NO. **BW-317**
SHEET **6** OF **7**
DATE: START **10/24/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.8±**
TOTAL DEPTH: **118'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698047.8±** E. **600637.3±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **35.0'** WATER: DURING DRILLING: **0.5'** TIME: **10:00** DATE: **10/24/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **15:30** DATE: **10/31/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
100.2		50/2"							
101.0									Rock fragment at tip of spoon
	S-45	9 10 100/5"	0.8'	59	-	GC	wet	Red-brown coarse to fine Gravel, and Silty Clay, little coarse to fine Sand, (GLACIAL TILL).	
102.4									
103.0								103.0' Top of Rock at 103.0 feet. El. -100.2'	Rollerbit advanced to 103.0'
	C-1		4.8'	95 / 85				Red-brown SILTSTONE/MUDSTONE, slightly weathered, medium strong, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
108.0									
	C-2		5.0'	100 / 50				Red-brown MUDSTONE, slightly weathered, weak to medium strong, calcareous, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
113.0									
	C-3		4.8'	95 / 58				Red-brown MUDSTONE, slightly weathered, medium strong, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
118.0								118.0' El. -115.2'	
								Bottom of borehole at 118 feet.	

Notes:
1. Borehole tremie grouted using 2x94-lb bags portland cement, 1/2x50-lb bag of bentonite, and 50

ENGINEERS FIELD BORING LOG

BORING NO. BW-317
SHEET 7 OF 7
DATE: START 10/24/11
END 11/1/11
DATUM: NGVD29
ELEVATION: 2.8±
TOTAL DEPTH: 118'

PROJECT NAME Portal Bridge Final Engineering COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak N. 698047.8± E. 600637.3±
INSPECTORS NAME/COMPANY R. Jeremic/YU & Associates, Inc.
DRILLERS NAME/COMPANY C. Cruz/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED Acker Soil XLS Track Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 35.0' WATER: DURING DRILLING: 0.5' TIME: 10:00 DATE: 10/24/11
CHECKED BY: D. Mazujian DATE: 2/22/12 END OF DRILLING: 0.0' TIME: 15:30 DATE: 10/31/11
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								gallons of potable water. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-319**
SHEET **1** OF **3**
DATE: START **11/1/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.3±**
TOTAL DEPTH: **38.5'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698092.6±** E. **600725.2±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: **0.0'** TIME: **7:00** DATE: **11/1/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **16:00** DATE: **11/1/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	WH WH WH WH	0.3'	15	-		wet	Dark gray roots and plant fragments, (FILL).	
2.0	S-2	1 1 1 1	0.3'	15	-	GP	wet	Dark gray medium to fine GRAVEL, little coarse to fine Sand, trace Silt, frequent concrete and cinder fragments, (FILL).	
4.0								4.0' El. -1.7'	
	S-3	3 3 1 1	0.6'	30	-	PT	wet	Brown fibrous PEAT, (ORGANIC DEPOSIT).	
6.0	S-4	1 2 3 2	0.0'	0	-			No recovery.	Peat in cuttings to 8.0'
8.0								8.0' El. -5.7'	Casing bounced at 8' bgs
	S-5	3 6 7 8	0.2'	10	-	GP	wet	Dark gray and black medium to fine GRAVEL, (ALLUVIUM).	Casing spinning with rods
10.0	S-6	10 10 8 11	0.7'	35	-	SM	wet	Greenish gray fine SAND, and Silt, occasional wood fragments, (ALLUVIUM).	S-6: mc=20.4% 35%<#200
12.0	S-7	2 4 8 7	1.2'	60	-	SM	wet	Gray fine SAND, little Silt, trace wood fragments, (ALLUVIUM).	
14.0	S-8	4 9 11 13	1.5'	75	-	SP-SM	wet	...trace Silt.	
16.0	S-9	3 5 7 9	2.0'	100	-	ML	wet	Light brown Clayey SILT, some fine Sand, (ALLUVIUM).	
18.0	S-10	3 3 4 6	0.8'	40	-	ML	wet		
20.0								20.0' *.....(continued on next page).* El. -17.7'	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-319**
SHEET **2** OF **3**
DATE: START **11/1/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.3±**
TOTAL DEPTH: **38.5'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698092.6±** E. **600725.2±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: **0.0'** TIME: **7:00** DATE: **11/1/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **16:00** DATE: **11/1/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-11	1 2 2 2	1.2'	60	-	CL	wet	*.....(continued from previous page).* Gray SILT & CLAY varved with brown Clay & Silt, (GLACIOLACUSTRINE DEPOSIT).	S-11: mc=29.2% LL=30, PI=9 99%<#200
24.0	S-12	3 3 4 5	1.8'	90	-	CL	wet	...little fine Sand.	
25.0									
27.0	U-1	P U S H	2.0'	100	PP 0.75 TV 0.25	CL	wet	Gray SILT & CLAY varved with brown Clay & Silt, little fine Sand, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-1: mc=29.5% LL=29, PI=6
29.0	S-13	2 2 3 4	1.7'	85	PP 1.50	CL	wet	Gray SILT & CLAY varved with brown Clay & Silt, alternating 1/8"± silt & clay, 1/16"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	Advanced 4" casing to 29.0'
31.0	S-14	4 4 7 8	2.0'	100	PP 1.75	CL	wet		
33.0	S-15	2 3 5 4	0.0'	0	-			No recovery.	2 attempts
35.0	S-16	3 2 3 3	2.0'	100	PP 0.50	CL	wet	Gray-brown SILT & CLAY varved with gray Clay & Silt, alternating 1/8"± silt & clay, 1/16"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
37.0	S-17	WH WH WH WH	2.0'	100	PP <0.25	CL	wet		
38.5	S-18	WH WH WH	1.5'	100	PP <0.25	CL	wet		Spoon bouncing at 38.5' under hammer weight
								38.5' El. -36.2'	
								Bottom of borehole at 38.5 feet.	

Notes:
1. Borehole tremie grouted using 1/2x94-lb bag of

ENGINEERS FIELD BORING LOG

BORING NO. **BW-319**
SHEET **3** OF **3**
DATE: START **11/1/11**
END **11/1/11**
DATUM: **NGVD29**
ELEVATION: **2.3±**
TOTAL DEPTH: **38.5'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **698092.6±** E. **600725.2±**
INSPECTORS NAME/COMPANY **R. Jeremic/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary** EQUIPMENT USED **Acker Soil XLS Track Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **29.0'** WATER: DURING DRILLING: **0.0'** TIME: **7:00** DATE: **11/1/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **0.0'** TIME: **16:00** DATE: **11/1/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								portland cement, 1/2x50-lb bag of bentonite, potable water. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-368**
SHEET **1** OF **4**
DATE: START **11/21/11**
END **11/22/11**
DATUM: **NGVD29**
ELEVATION: **4.1±**
TOTAL DEPTH: **70.1'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696653.5±** E. **597887.1±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker LS Track with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **3.0'** TIME: **9:00** DATE: **11/21/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **3.0'** TIME: **15:00** DATE: **11/22/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	G-1				-	SP-SM		Gray-brown coarse to fine SAND, some coarse to fine Gravel, little(-) Silt, (FILL).	Hand augered to 6.0'
6.0	S-1	10 8 8 9	0.3'	15	-	GM	wet	Brown coarse to fine GRAVEL, little coarse to fine Sand, little Clayey Silt, (FILL).	
8.0	S-2	7 4 1 3	0.0'	0	-			No recovery, black organic Silt & Clay at tip of spoon.	
9.0' El. -4.9'									
10.0	S-3	1 1 1 2	1.0'	50	-	PT	wet	Black PEAT, (ORGANIC DEPOSIT).	S-3: mc=339.7% LL=482, PI=166 11.2%<#200 86.4% organic content
12.0' El. -7.9'									
12.0	S-4	3 2 2 2	1.3'	65	-	SM	wet	Gray coarse(-) to fine SAND, little(+) Clayey Silt, (ALLUVIUM).	
14.0	S-5	15 21 17 16	1.5'	75	-	SP-SM	wet	Gray coarse to fine SAND, trace Silt, (ALLUVIUM).	
16.0	S-6	14 17 20 13	1.5'	75	-	SP-SM	wet		S-6: mc=15.3% 88.3%<#200
18.0	S-7	12 10 7 8	1.2'	60	-	SP-SM	wet		
20.0								.....(continued on next page).	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-368**
SHEET **2** OF **4**
DATE: START **11/21/11**
END **11/22/11**
DATUM: **NGVD29**
ELEVATION: **4.1±**
TOTAL DEPTH: **70.1'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696653.5±** E. **597887.1±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker LS Track with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **3.0'** TIME: **9:00** DATE: **11/21/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **3.0'** TIME: **15:00** DATE: **11/22/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-8	2 4 6 6	0.6'	30	-	SP-SM	wet	*.....(continued from previous page).* Gray coarse to fine SAND, trace Silt, (ALLUVIUM).	
25.0								25.0' El. -20.9'	
27.0	S-9	14 11 12 10	1.7'	85	-	ML	wet	Gray SILT & CLAY varved with Clayey Silt, little fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
30.0									
32.0	S-10	10 8 8 5	2.0'	100	PP 2.50	CL	wet	Gray CLAY & SILT varved with brown Silt & Clay, alternating 1/2"± clay & silt, 1/4"± silt & clay, (GLACIOLACUSTRINE DEPOSIT).	
35.0									
37.0	S-11	3 4 5 7	2.0'	100	PP 2.00	CL	wet		
38.0									
40.0	U-1	P U S H	2.0'	100	PP 2.00 TV 1.00	CL	wet	Gray CLAY & SILT varved with brown Silt & Clay, (GLACIOLACUSTRINE DEPOSIT). *.....(continued on next page).*	Undisturbed sample collected using a Shelby tube U-1: mc=30.4% LL=37, PI=14 99.5%<#200

ENGINEERS FIELD BORING LOG

BORING NO. **BW-368**
SHEET **3** OF **4**
DATE: START **11/21/11**
END **11/22/11**
DATUM: **NGVD29**
ELEVATION: **4.1±**
TOTAL DEPTH: **70.1'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696653.5±** E. **597887.1±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker LS Track with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **3.0'** TIME: **9:00** DATE: **11/21/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **3.0'** TIME: **15:00** DATE: **11/22/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-12	1 2 3 5	2.0'	100	PP 1.50	CL	wet	*.....(continued from previous page).* Brown Silty CLAY varved with gray Clay & Silt, alternating 1/2"± silty clay, 1/4"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
45.0									
47.0	S-13	1 3 3 2	2.0'	100	PP 1.00	CL	wet		
48.0									
50.0	U-2	P U S H	2.0'	100	PP 1.00 TV 0.50	CL	wet	Brown Silty CLAY varved with gray Clay & Silt, (GLACIOLACUSTRINE DEPOSIT).	Undisturbed sample collected using a Shelby tube U-2: mc=28.0% LL=46, PI=23 99.9%<#200
52.0	S-14	8 9 14 10	1.7'	85	PP 2.00	CL	wet	Red-brown SILT & CLAY varved with gray Clay & Silt, alternating 1/2"± silt & clay, 1/4"± clay & silt, (GLACIOLACUSTRINE DEPOSIT).	
53.0' El. -48.9'									Strong rig chattering from 53'
55.0									
57.0	S-15	13 14 11 10	1.3'	65	-	GM	wet	Red-brown coarse to fine GRAVEL, little coarse to fine Sand, little Silty Clay, (GLACIAL TILL).	S-15: mc=8.8% 7.0%<#200
60.0									Strong rig chattering to 60'
60.0'								*.....(continued on next page).* El. -55.9'	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-368**
SHEET **4** OF **4**
DATE: START **11/21/11**
END **11/22/11**
DATUM: **NGVD29**
ELEVATION: **4.1±**
TOTAL DEPTH: **70.1'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696653.5±** E. **597887.1±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **Acker LS Track with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **3.0'** TIME: **9:00** DATE: **11/21/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **3.0'** TIME: **15:00** DATE: **11/22/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
60.1	S-16	100/1"	0.1'	100 / 97	-	WR	wet	60.1' Rock fragments at tip of spoon. El. -56.0' Top of Rock at 60.1 feet. Red-brown SILTSTONE, slightly weathered, medium strong, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	*.....(continued from previous page)*
	C-1		4.8'	/ 77					
65.1				100 /					
	C-2		5.0'	/ 80					
70.1								70.1' El. -66.0' Bottom of borehole at 70.1 feet.	

Notes:
1. Borehole tremie grouted using 2x94-lb bags portland cement, 1/2x50-lb bag of bentonite, and 50 gallons of potable water.
2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.

ENGINEERS FIELD BORING LOG

BORING NO. **BW-369D**
SHEET **1** OF **5**
DATE: START **12/6/11**
END **12/9/11**
DATUM: **NGVD29**
ELEVATION: **5.6±**
TOTAL DEPTH: **78.7'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696507.1±** E. **597582.8±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Carire/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-750 Rubber Tire Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **4.0'** TIME: **8:30** DATE: **12/6/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **2.0'** TIME: **9:30** DATE: **12/9/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0								Brown coarse to fine SAND, some coarse to fine Gravel, little Silt, with frequent brick and concrete fragments, (FILL).	Hand augered to 6.0'
	G-1				-				
6.0									
	S-1	6 6 5 3	0.4'	20	-	SM	wet	Black and brown coarse to fine SAND, some(-) coarse to fine Gravel, little Silt, with frequent brick and concrete fragments, (FILL).	
8.0									
	S-2	12 11 7 33	0.6'	30	-	SM ML-OL	wet wet	...little coarse to fine Gravel, little Silt, frequent brick and concrete fragments.	
10.0								9.8' El. -4.2'	Spoon dropped in bottom 2" of S-2
	U-1	P U S H	1.5'	75	-	OH-PT	wet	Black Organic CLAY & SILT, occasional roots and fibers, (ORGANIC DEPOSIT). Brown PEAT, (ORGANIC DEPOSIT).	U-1: mc=522.6% LL=496, PI=233 94.8%<#200 86.4% organic content
12.0								12.0' El. -6.4'	
	S-3	3 14 15 28	1.7'	85	-	SM	wet	Brown coarse to fine SAND, little Organic Silt, (ALLUVIUM).	
14.0									
	S-4	4 9 12 14	1.3'	65	-	SP	wet	Brown-gray coarse to fine SAND, and medium to fine Gravel, trace Silt, (ALLUVIUM).	
16.0									
20.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-369D**
SHEET **2** OF **5**
DATE: START **12/6/11**
END **12/9/11**
DATUM: **NGVD29**
ELEVATION: **5.6±**
TOTAL DEPTH: **78.7'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696507.1±** E. **597582.8±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Carire/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-750 Rubber Tire Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **4.0'** TIME: **8:30** DATE: **12/6/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **2.0'** TIME: **9:30** DATE: **12/9/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
22.0	S-5	6 10 9 8	0.6'	30	-	SP	wet	*.....(continued from previous page).* Gray coarse to fine SAND, little medium to fine Gravel, trace Silt, (ALLUVIUM).	
25.0									
27.0	S-6	3 4 5 5	0.5'	25	-	SP	wet	Brown coarse to fine SAND, some medium to fine Gravel, trace Silt, (ALLUVIUM).	
30.0								29.0' _ El. -23.4'	
32.0	S-7	4 5 6 7	2.0'	100	PP 1.50	CL		Gray varved CLAY & SILT and Silty CLAY, alternating 1/8"± to 1/16"± clay & silt, 1/8"± to 1/16"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
33.0									
35.0	U-2	P U S H	2.0'	100	PP 1.50 TV 0.75	CL		Gray CLAY & SILT varved with Silty Clay, (GLACIOLACUSTRINE DEPOSIT).	U-2: mc=32.0% LL=35, PI=14 100%<#200
37.0	S-8	3 2 1 2	2.0'	100	PP 1.00	CL		Gray CLAY & SILT varved with brown Silty Clay, alternating 3/8"± to 1/8"± clay & silt, 1/8"± to 1/16"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
40.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-369D**
SHEET **3** OF **5**
DATE: START **12/6/11**
END **12/9/11**
DATUM: **NGVD29**
ELEVATION: **5.6±**
TOTAL DEPTH: **78.7'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696507.1±** E. **597582.8±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Carire/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-750 Rubber Tire Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **4.0'** TIME: **8:30** DATE: **12/6/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **2.0'** TIME: **9:30** DATE: **12/9/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
42.0	S-9	3 2 2 3	2.0'	100	PP 0.50	CL		*.....(continued from previous page).* Gray CLAY & SILT varved with brown Silty Clay, alternating 5/8"± to 1/8"± clay & silt, 3/8"± to 1/8"± silty clay, (GLACIOLACUSTRINE DEPOSIT).	
43.0									
45.0	U-3	P U S H	2.0'	100	PP 1.00 TV 0.75			Brown Silty CLAY varved with gray Clay & Silt, (GLACIOLACUSTRINE DEPOSIT).	U-3: mc=39.7% LL=47, PI=25 99.9%<#200
47.0	S-10	1 2 3 4	2.0'	100	PP 1.00	CL		Gray & brown varved CLAY & SILT, alternating 3/4"± to 1/8"± gray clay & silt, 3/8"± to 1/8"± brown clay & silt, with fine Sand, (GLACIOLACUSTRINE DEPOSIT).	
50.0								50.0' El. -44.4'	
52.0	S-11	6 12 23 45	2.0'	100	-	CL	wet	Reddish brown CLAY & SILT, some(-) coarse to fine Gravel, little(-) coarse to fine Sand, (GLACIAL TILL).	
55.0									Rig chattering from 53.0'
57.0	S-12	14 17 23 19	1.5'	75	-	GM	wet	Reddish brown coarse to fine GRAVEL, some coarse to fine Sand, little Clayey Silt, (GLACIAL TILL).	
60.0								*.....(continued on next page).*	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-369D**
SHEET **4** OF **5**
DATE: START **12/6/11**
END **12/9/11**
DATUM: **NGVD29**
ELEVATION: **5.6±**
TOTAL DEPTH: **78.7'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696507.1±** E. **597582.8±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **M. Carire/JBD**
DRILLING METHODS **Mud Rotary, NX/NQ Coring** EQUIPMENT USED **CME-750 Rubber Tire Rig with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **30.0'** WATER: DURING DRILLING: **4.0'** TIME: **8:30** DATE: **12/6/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **2.0'** TIME: **9:30** DATE: **12/9/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-13	38 28 37 49	1.7'	85	-	GM	wet	*.....(continued from previous page).* Reddish brown coarse to fine GRAVEL, little coarse to fine Sand, little(+) Clay & Silt, (GLACIAL TILL).	
62.0									
65.0									
65.2	S-14	100/2"	0.0'	0	-			No recovery.	
69.0								69.0' Top of Rock at 69.0 feet. El. -63.4'	
	C-1		4.6'	100 / 36				Reddish brown SILTSTONE interbedded SANDSTONE from 72.3' to 72.9', slightly weathered, medium strong, very closely to moderately spaced fractures, (WEATHERED PASSAIC FORMATION).	Intermittent loss of drilling fluid
73.6								73.6' El. -68.0'	
	C-2		5.1'	100 / 84				Reddish brown SILTSTONE, slightly weathered, medium strong, closely to moderately spaced fractures, (COMPETENT PASSAIC FORMATION).	
78.7								78.7' El. -73.1'	
								Bottom of borehole at 78.7 feet.	

Notes:
1. Borehole tremie grouted using 2x94-lb bags

ENGINEERS FIELD BORING LOG

BORING NO. BW-369D
SHEET 5 OF 5
DATE: START 12/6/11
END 12/9/11
DATUM: NGVD29
ELEVATION: 5.6±
TOTAL DEPTH: 78.7'

PROJECT NAME Portal Bridge Final Engineering COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak N. 696507.1± E. 597582.8±
INSPECTORS NAME/COMPANY J. Thampi/YU & Associates, Inc.
DRILLERS NAME/COMPANY M. Carire/JBD
DRILLING METHODS Mud Rotary, NX/NQ Coring EQUIPMENT USED CME-750 Rubber Tire Rig with Automatic Hammer
CASING SIZE: 4.0" DEPTH: 30.0' WATER: DURING DRILLING: 4.0' TIME: 8:30 DATE: 12/6/11
CHECKED BY: D. Mazujian DATE: 2/22/12 END OF DRILLING: 2.0' TIME: 9:30 DATE: 12/9/11
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
								portland cement, 1/2x50-lb bag of bentonite, and 30 gallons of potable water. 2. Undisturbed sample moisture contents noted in "Remarks" reflect an average of all moisture contents determined for the sample.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-369S**
SHEET **1** OF **2**
DATE: START **12/5/11**
END **12/5/11**
DATUM: **NGVD29**
ELEVATION: **9.3±**
TOTAL DEPTH: **24'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696371.3±** E. **597275.5±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary** EQUIPMENT USED **Acker XLS Track with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **20.0'** WATER: DURING DRILLING: **10.0'** TIME: **11:00** DATE: **12/5/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **10.0'** TIME: **14:30** DATE: **12/5/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
0.0	S-1	3 6 10 14	1.0'	50	-	SM	moist	Brown coarse to fine SAND, some coarse to fine Gravel, little Silt, frequent black pockets of stained soil and brick fragments, (FILL).	Fifth attempt to advance this borehole
2.0	S-2	8 8 16 16	1.2'	60	-	SM	moist	...and coarse to fine Gravel.	
4.0	S-3	47 49 51 49	1.3'	65	-	SM	moist		S-3 - no stained soil observed below 4'
6.0	S-4	12 18 37 25	1.3'	65	-	SM	moist	...some medium to fine Gravel.	
8.0	S-5	5 4 3 5	0.5'	25	-	SM	moist	Dark gray and brown coarse to fine SAND, some medium to fine Gravel, little Silt, frequent brick fragments, (FILL).	
10.0	S-6	6 8 17 23	0.8'	40	-	SM	wet		
12.0	S-7	5 9 6 1	0.5'	25	-	GM	wet	Dark gray and black medium to fine Gravel, and coarse to fine Sand, little Silt, (FILL).	
14.0								14.0' EI. -4.8'	
	S-8A	3		50	-	PT	wet	Brown PEAT, semi-decomposed fibers, (ORGANIC	
14.7'								DEPOSIT). EI. -5.5'	
	S-8B	3 2 2	1.0'		-	SM	wet	Gray fine SAND, little(+) Clayey Silt, (ALLUVIUM).	
16.0	S-9	WH WH 3 4	0.9'	45	-	SM	wet	Gray medium to fine SAND, little(+) Clayey Silt, (ALLUVIUM).	
18.0	S-10	8 10 11 11	1.1'	55	-	SM	wet	Gray-brown coarse to fine SAND, little Silt, little(-) medium to fine Gravel, (ALLUVIUM).	
20.0								*.....(continued on next page)*.	

ENGINEERS FIELD BORING LOG

BORING NO. **BW-369S**
SHEET **2** OF **2**
DATE: START **12/5/11**
END **12/5/11**
DATUM: **NGVD29**
ELEVATION: **9.3±**
TOTAL DEPTH: **24'**

PROJECT NAME **Portal Bridge Final Engineering** COUNTY **Hudson**
MUNICIPALITY **Kearny** LOCATION **Amtrak** N. **696371.3±** E. **597275.5±**
INSPECTORS NAME/COMPANY **J. Thampi/YU & Associates, Inc.**
DRILLERS NAME/COMPANY **C. Cruz/JBD**
DRILLING METHODS **Mud Rotary** EQUIPMENT USED **Acker XLS Track with Automatic Hammer**
CASING SIZE: **4.0"** DEPTH: **20.0'** WATER: DURING DRILLING: **10.0'** TIME: **11:00** DATE: **12/5/11**
CHECKED BY: **D. Mazujian** DATE: **2/22/12** END OF DRILLING: **10.0'** TIME: **14:30** DATE: **12/5/11**
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT ON SAMPLER	RECOVERY (FT)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS	SAMPLE MOISTURE	DESCRIPTION	REMARKS
	S-11	7 8 8 7	0.5'	25	-	SM		*.....(continued from previous page).* Gray-brown medium to fine SAND, trace Silt, (ALLUVIUM).	
22.0	S-12	8 8 10 11	0.4'	20	-	SM		Gray-brown coarse to fine SAND, trace Silt, (ALLUVIUM).	
24.0								24.0' El. -14.8'	
								Bottom of borehole at 24 feet. Notes: 1. Borehole tremie grouted using 1x94-lb bag portland cement, 15-lbs of bentonite, and 30 gallons of potable water. 2. Fifth attempt made to advance boring.	

Gannett Fleming

ENGINEERS FIELD BORING LOG

BORING NO. GF-1
SHEET 1 OF 5
DATE: START 11/3/08
END 11/10/08
O.G. ELEV. 1.0

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak Property N. 697310.41 E. 598937.41
STATION _____ OFFSET FROM CENTERLINE _____
INSPECTOR J. Krupansky DRILLERS NAME/COMPANY C. Deigert/JBD Drilling Inc.
EQUIPMENT USED Barrel Float - Barge Mounted Acker Skid Rig with Donut Hammer, 2 1/4 turns on cathead
DRILLING METHODS Mud Rotary, Continuous SS Sampling, NX Conventional Rock Coring
CASING: SIZE: 4" DEPTH: 18.0' WATER: DURING DRILLING: -1.0' TIME: 10:00 DATE: 11/3/08
CHECKED BY: M. McCullough DATE: 11/12/08 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
0.0	S-1	WR WR 2 5	0.1'	5	-	ml	w	Black, SILT & CLAY, and coarse to fine Sand, little medium to fine Gravel, (Fill)	S-1 - S-3: contains organic matter, glass, brick frags, and debris
2.0	S-2	2 1 WH 1	0.3'	15	-	ml	w		
4.0	S-3	1 3 4 2	0.2'	10	-	ml	w		
6.0	S-4	WH 1 WH 1	1.2'	60	-	pt	w	6.0' El. -5.0' Brown, PEAT, (Meadow Mat)	
8.0	S-5	9 10 11 11	1.5'	75	-	sp	w	8.5' El. -7.5' Brown, coarse to fine SAND, trace Silt, (Alluvial)	
10.0	S-6	3 1 2 2	1.5'	75	-	sm	w	10.0' El. -9.0' Gray and brown, medium to fine SAND, and Silt, (Alluvial)	
12.0	S-7	1 2 2 3	1.5'	75	-	sm	w		
14.0	S-8	5 4 3 6	1.6'	80	-	sm	w		
16.0	S-9	5 5 4 6	2.0'	100	-	sm	w		
18.0	S-10	11 17 18 27	1.5'	75	-	sm	w	18.0' El. -17.0' Gray and brown, coarse to fine SAND, little Silt, (Alluvial)	
20.0									

Gannett Fleming

ENGINEERS FIELD BORING LOG

BORING NO. GF-1
SHEET 2 OF 5
DATE: START 11/3/08
END 11/10/08
O.G. ELEV. 1.0

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak Property N. 697310.41 E. 598937.41
STATION _____ OFFSET FROM CENTERLINE _____
INSPECTOR J. Krupansky DRILLERS NAME/COMPANY C. Deigert/JBD Drilling Inc.
EQUIPMENT USED Barrel Float - Barge Mounted Acker Skid Rig with Donut Hammer, 2 1/4 turns on cathead
DRILLING METHODS Mud Rotary, Continuous SS Sampling, NX Conventional Rock Coring
CASING: SIZE: 4" DEPTH: 18.0' WATER: DURING DRILLING: -1.0' TIME: 10:00 DATE: 11/3/08
CHECKED BY: M. McCullough DATE: 11/12/08 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
22.0	S-11	14 18 23 25	1.5'	75	-	sm	w	Gray and brown, coarse to fine SAND, little Silt, (Alluvial) .....*(continued from previous page)*	
24.0	S-12	14 24 17 24	1.5'	75	-	ml	w	23.0' El. -22.0' Gray and brown, CLAYEY SILT, varved with some fine Sand layers, (Glaciolacustrine)	23.0 - 66.0: contains closely spaced thin sandy varves
26.0	S-13	15 22 23 16	1.0'	50	PP 1.25	ml	w		
28.0	S-14	14 21 27 35	1.0'	50	PP 2.50	ml	w		
30.0	S-15	15 18 21 29	1.0'	50	PP 2.50	ml	w		
32.0	S-16	11 12 12 14	1.5'	75	PP 1.50	ml	w		
34.0	S-17	9 11 12 13	1.5'	75	PP 1.00	ml	w		
36.0	S-18	6 7 8 9	2.0'	100	PP 1.25	ml	w		
38.0	S-19	7 6 7 7	2.0'	100	PP 1.00	ml	w		
40.0	S-20	5 7 8 10	2.0'	100	PP 0.75	ml	w		

Gannett Fleming

ENGINEERS FIELD BORING LOG

BORING NO. GF-1
SHEET 3 OF 5
DATE: START 11/3/08
END 11/10/08
O.G. ELEV. 1.0

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak Property N. 697310.41 E. 598937.41
STATION _____ OFFSET FROM CENTERLINE _____
INSPECTOR J. Krupansky DRILLERS NAME/COMPANY C. Deigert/JBD Drilling Inc.
EQUIPMENT USED Barrel Float - Barge Mounted Acker Skid Rig with Donut Hammer, 2 1/4 turns on cathead
DRILLING METHODS Mud Rotary, Continuous SS Sampling, NX Conventional Rock Coring
CASING: SIZE: 4" DEPTH: 18.0' WATER: DURING DRILLING: -1.0' TIME: 10:00 DATE: 11/3/08
CHECKED BY: M. McCullough DATE: 11/12/08 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
42.0	S-21	6 7 9 9	2.0'	100	PP 0.50	ml	w	Gray and brown, CLAYEY SILT, varved with some fine Sand layers, (Glaciolacustrine) *.....(continued from previous page)*	
44.0	ST-1		2.0'	100	-	ml	w		
46.0	S-22	5 6 7 10	2.0'	100	PP 0.50	ml	w		
48.0	S-23	5 6 8 11	2.0'	100	PP 0.50	ml	w		
50.0	S-24	7 9 13 16	2.0'	100	PP 1.00	ml	w		
52.0	S-25	6 9 9 14	1.5'	75	PP 0.75	ml	w	52.0' El. -51.0'	
54.0	S-26	3 5 5 8	2.0'	100	PP 1.00	cl	w	Brown, CLAYEY SILT, varved with some fine Sand layers, (Glaciolacustrine)	
56.0	S-27	4 4 6 7	2.0'	100	PP 0.75	cl	w		
58.0	S-28	4 5 4 4	2.0'	100	PP 0.50	cl	w		
60.0	S-29	3 2 1 4	2.0'	100	PP 0.50	cl	w		

Gannett Fleming

ENGINEERS FIELD BORING LOG

BORING NO. GF-1
SHEET 4 OF 5
DATE: START 11/3/08
END 11/10/08
O.G. ELEV. 1.0

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak Property N. 697310.41 E. 598937.41
STATION _____ OFFSET FROM CENTERLINE _____
INSPECTOR J. Krupansky DRILLERS NAME/COMPANY C. Deigert/JBD Drilling Inc.
EQUIPMENT USED Barrel Float - Barge Mounted Acker Skid Rig with Donut Hammer, 2 1/4 turns on cathead
DRILLING METHODS Mud Rotary, Continuous SS Sampling, NX Conventional Rock Coring
CASING: SIZE: 4" DEPTH: 18.0' WATER: DURING DRILLING: -1.0' TIME: 10:00 DATE: 11/3/08
CHECKED BY: M. McCullough DATE: 11/12/08 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
62.0	S-30	3 3 2 5	2.0'	100	PP 0.50	cl	w	Brown, CLAYEY SILT, varved with some fine Sand layers, (Glaciolacustrine) .....*(continued from previous page)*	
64.0	S-31	1 WH WH 2	2.0'	100	-	cl	w		
66.0	S-32	1 WH WH WH	2.0'	100	-	cl	w		
								66.0' El. -65.0'	
68.0	S-33	6 8 8 7	1.5'	75	-	sm	w	Reddish brown, coarse to fine SAND, and Silt, little coarse to fine Gravel, (Glacial Till)	
70.0	S-34	9 10 8 12	0.2'	10	-	sm	w		
72.0	S-35	24 60 70 89	0.0'	0	-				
72.1	S-36	100/0	0.0'	0	-				
73.0								73.0' Top of Rock @ 73.0 ft El. -72.0'	
	R-1		3.6'	72 / 50				MUDSTONE, reddish brown, hard, moderately weathered, closely spaced joints, contains inter-bedded sandstone	Roller Bit Refusal at 73.0 ft
78.0				100					

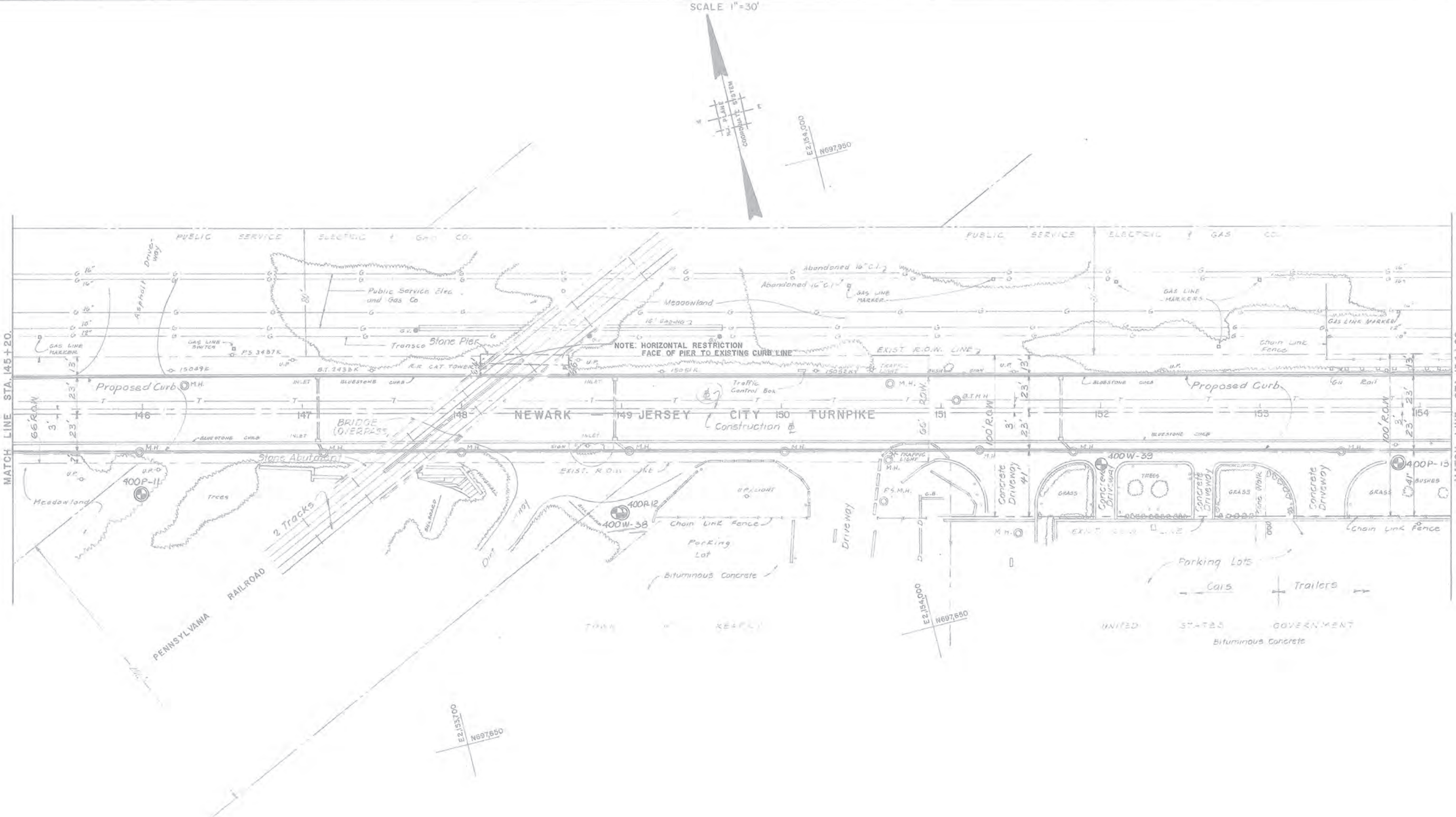
Gannett Fleming

ENGINEERS FIELD BORING LOG

BORING NO. GF-1
SHEET 5 OF 5
DATE: START 11/3/08
END 11/10/08
O.G. ELEV. 1.0

PROJECT NAME Portal Bridge Capacity Enhancement Project COUNTY Hudson
MUNICIPALITY Kearny LOCATION Amtrak Property N. 697310.41 E. 598937.41
STATION _____ OFFSET FROM CENTERLINE _____
INSPECTOR J. Krupansky DRILLERS NAME/COMPANY C. Deigert/JBD Drilling Inc.
EQUIPMENT USED Barrel Float - Barge Mounted Acker Skid Rig with Donut Hammer, 2 1/4 turns on cathead
DRILLING METHODS Mud Rotary, Continuous SS Sampling, NX Conventional Rock Coring
CASING: SIZE: 4" DEPTH: 18.0' WATER: DURING DRILLING: -1.0' TIME: 10:00 DATE: 11/3/08
CHECKED BY: M. McCullough DATE: 11/12/08 END OF DRILLING: _____ TIME: _____ DATE: _____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (Ft.)	RECOVERY(%) / RQD (%)	POCKET PENT/ TORVANE (TSF)	USCS / AASHTO	H_2O CONTENT	DESCRIPTION	REMARKS
	R-2		5.0'	48				MUDSTONE, reddish brown, hard, moderately weathered, closely spaced joints, contains inter-bedded sandstone .....*(continued from previous page)*	
83.0								83.0' El. -82.0'	
								Bottom of borehole at 83.0 feet.	



SCALE 1"=30'
N.J. PLANE COORDINATE SYSTEM
E2,154,000
N697,950
PUBLIC SERVICE ELECTRIC & GAS CO.
Abandoned 16" C.I.
Meadowland
Public Service Elec. and Gas Co.
Transco
Stone Pier
NOTE: HORIZONTAL RESTRICTION FACE OF PIER TO EXISTING CURB LINE
EXIST. R.O.W. LINE
GAS LINE MARKERS
Chain Link Fence
MATCH LINE STA. 145+20.
MATCH LINE STA. 154+20.
Proposed Curb
BRIDGE OVERPASS
NEWARK - JERSEY CITY TURNPIKE
Construction ℄
Traffic Control Box
66' R.O.W.
100' R.O.W.
Stone Abutment
Meadowland
400P-11
400R-12
400W-38
400W-39
400P-13
2 Tracks
PENNSYLVANIA RAILROAD
Chain Link Fence
Parking Lot
Bituminous Concrete
Driveway
Concrete Driveway
GRASS
TREES
Parking Lots
Cars
Trailers
TOWN OF KEARNY
UNITED STATES GOVERNMENT
Bituminous Concrete
E2,154,000
N697,650
E2,153,700
N697,650

Revised Boring Locations August 20, 1980

Revised August 2, 1979

NEW JERSEY DEPARTMENT OF TRANSPORTATION

IMPROVEMENT OF NEWARK - JERSEY CITY TURNPIKE
(N.J. SECONDARY ROUTE 508)
FROM SCHUYLER AVENUE TO N.J.S.H. ROUTE 7

TOWN OF KEARNY HUDSON COUNTY, N.J.

CONSTRUCTION PLAN

CALVIN H. GIBSON ASSOCIATES, P.C.
86 WASHINGTON STREET
EAST ORANGE, NEW JERSEY

DATE: JAN 19, 1979
SCALE AS SHOWN
PROJ. NO: M-7659 (104)

SHEET NO. 1 / 17

CALVIN H. GIBSON ASSOCIATES, P.A.
EAST ORANGE, NEW JERSEY

Form SO-9 8/72

New Jersey Department of Transportation

RETRACTABLE PLUG SAMPLER LOG

1 " Sampler 25# Slip Hammer, Drop = 12"

Rt. _____ Local Name: Roadway Boring

Section: Newark-Jersey City Turnpike

Sta. 115+80 Off. 45' Rt. Ref. Survey BL

Date: 9/17/79 Engr. Gervasio G.W.T. Dry

Boring No. 400P - 12

Field No. _____

Sheet 1 of 1

Laboratory Results: Wet Wt. #/Ft. 3	Laboratory Results: Moist %	Laboratory Results: Ign. Loss	Blows per foot		Sample Disp'n.	Sample Identification and Profile Change Elev. 2.1'	
			103	1	--- A	Brown MF Gravel, and CF SAND, little(-)Silt, tr.(+) Fibers, pieces of Wood, Slight Organic Odor. (Fill)	1.0'
						BOTTOM OF HOLE	
						NOTE: Fill runs back to Post Office fence. Made 4 attempts trying to get down.	

DEPTH IN FEET

0'
5'
10'
15'
20'

CAPITAL LETTERS = Jar Samples Retained

X = Sample Discarded – – – = No Recovery

ROMAN NUMERALS = Tube Samples Retained

= Limits of Sampling (Column 5)

Form SO-2 2/79

NEW JERSEY DEPARTMENT OF TRANSPORTATION

ROUTE: LOCAL NAME: Roadway Boring TEST HOLE NO. 400W - 38

SECTION: Newark-Jersey City Turnpike

STATION: 115+80 OFFSET: 45' Rt. REFERENCE LINE: Survey BL GROUND LINE ELEVATION: +2.1'

BORINGS MADE BY: Bowers DATE STARTED: 1/2/80

INSPECTOR: Lounsberry DATE COMPLETED: 1/3/80

Elevation G.W.T.		
0 Hr.	+2.1'	Date: 1/4/80
24 Hr.	SAME	Date: 1/5/80
______ ft. P.P. Installed		Date:

CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon 0/6	6/12	12/18	REC.	Sample ID and Profile Change	
5	S-1	0.0'	1.5'	3	9	10	16"	FILL-Black CF SAND, trace (+) Silt, little(-)	
3								F Gravel. (Cinders)	
3	S-2	1.5'	3.0'	7	8	3	3"	FILL-Black CF SAND, little F Gravel. (Cinders)	
2									
2	S-3	3.0'	4.5'	4	3	2	8"	SAME	
5	S-4	4.5'	6.0'	2	2	1	3"	SAME	
12								FILL-Dark Brown CF SAND, little Silt, trace F	
4	S-5	6.0'	7.5'	2	1	1	4"	Gravel.	7.5'
6								Dark Brown Fibrous Organic SILT.	9.0'
8	S-6	7.5'	9.0'	3	2	4	5"		
15									
36	S-7	9.0'	10.5"	5	6	5	18"	Dark Grey F SAND, trace (+) Silt.	
36									
38									
32									
20	S-9	15.0'	16.5"	6	9	10	17"	Brown F SAND, little (+) Silt.	
21									
34									
37									
45									
	S-9	20.0'	21.5'	8	14	21	18"	SAME	
									21.5'
								BOTTOM OF HOLE	

Nominal I.D. of Drive Pipe	2½" XXXX
Nominal I.D. of Split Barrel Sampler	1½"
Weight of hammer on Drive Pipe	300 lbs.
Weight of hammer on Split Barrel Sampler	140 lbs.
Drop of hammer on Drive Pipe	24"
Drop of hammer on Split Barrel Sampler	30"

Core Dia. ______

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The Information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation

Bureau of Geotechnical Engineering

Approximate Change in Strata ______

Inferred Change in Strata - - - - - -

Form SO-2 7/74

NEW JERSEY DEPARTMENT OF TRANSPORTATION

ROUTE: LOCAL NAME: **Run-in Track Station** TEST HOLE NO. **432W - 3**

SECTION: **Erie-Lackawanna Electrification**

STATION: OFFSET: REFERENCE LINE: GROUND LINE ELEVATION: **+3.5'**

BORINGS MADE BY: **Servillo** DATE STARTED: **5/18/77**

INSPECTOR: **Henry** DATE COMPLETED: **5/19/77**

Elevation G.W.T.		Date
0 Hr.	+0.5'	5/19/77
24 Hr.	SAME	5/20/77
ft. P.P. Installed		Date:

Depth	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon 0/6	6/12	12/18	REC.	Sample ID and Profile Change	Strata
	4	S-1	0.0'	1.5'	1	1	4	5"	Black CF Sand, and (+) Silt, little (-) MF	
	4								Gravel (Ashes, Rotted Wood).	
	3	S-2	1.5'	3.0'	6	6	8	3"	Black CF SAND, some (-) Silt, some (-) CF	
	5								Gravel (Cinders).	
5	6	S-3	3.0'	4.5'	8	10	13	6"	Red Brn.CF Sand,some(-)Silt,some(+)CF Gravel.	
	7	S-4	4.5'	6.0'	9	11	14	6"	SAME	
	6									
	5	S-5	6.0'	7.5'	2	2	3	5"	SAME	8.0'
	4	S-6	7.5'	9.0'	2	1	1	4"	Black Organic Silt.	
10	2									
	2	S-7	9.0'	10.5'	1	1	2	5"	SAME (Liquid consistency) trace (+) Fibers.	
	3	S-8	10.5'	12.0'	1	1	1	3"	Black Organic SILT and PEAT (very high moisture cont.).	
	5									12.9'
	21	S-9	12.0'	13.5'	1	1	5	18"	Yellow Gry.CF SAND,some(+)Silt,trace(-)Fibers.	
15	22	S-10	13.5'	15.0'	16	16	20	11"	Grey Brown CF SAND, Silt.	
	30									
	32									
	32									
	33									
20	34									
		S-11	20.0'	21.5'	11	18	19	15"	Grey SILT and, F Sand.	21.5'
									BOTTOM OF HOLE	
25										
30										
35										
40										

Nominal I.D. of Drive Pipe	2½"	4"
Nominal I.D. of Split Barrel Sampler	1½"	
Weight of hammer on Drive Pipe	300 lbs.	
Weight of hammer on Split Barrel Sampler	140 lbs.	
Drop of hammer on Drive Pipe	24"	
Drop of hammer on Split Barrel Sampler	30"	

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The Information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation
Soils Bureau

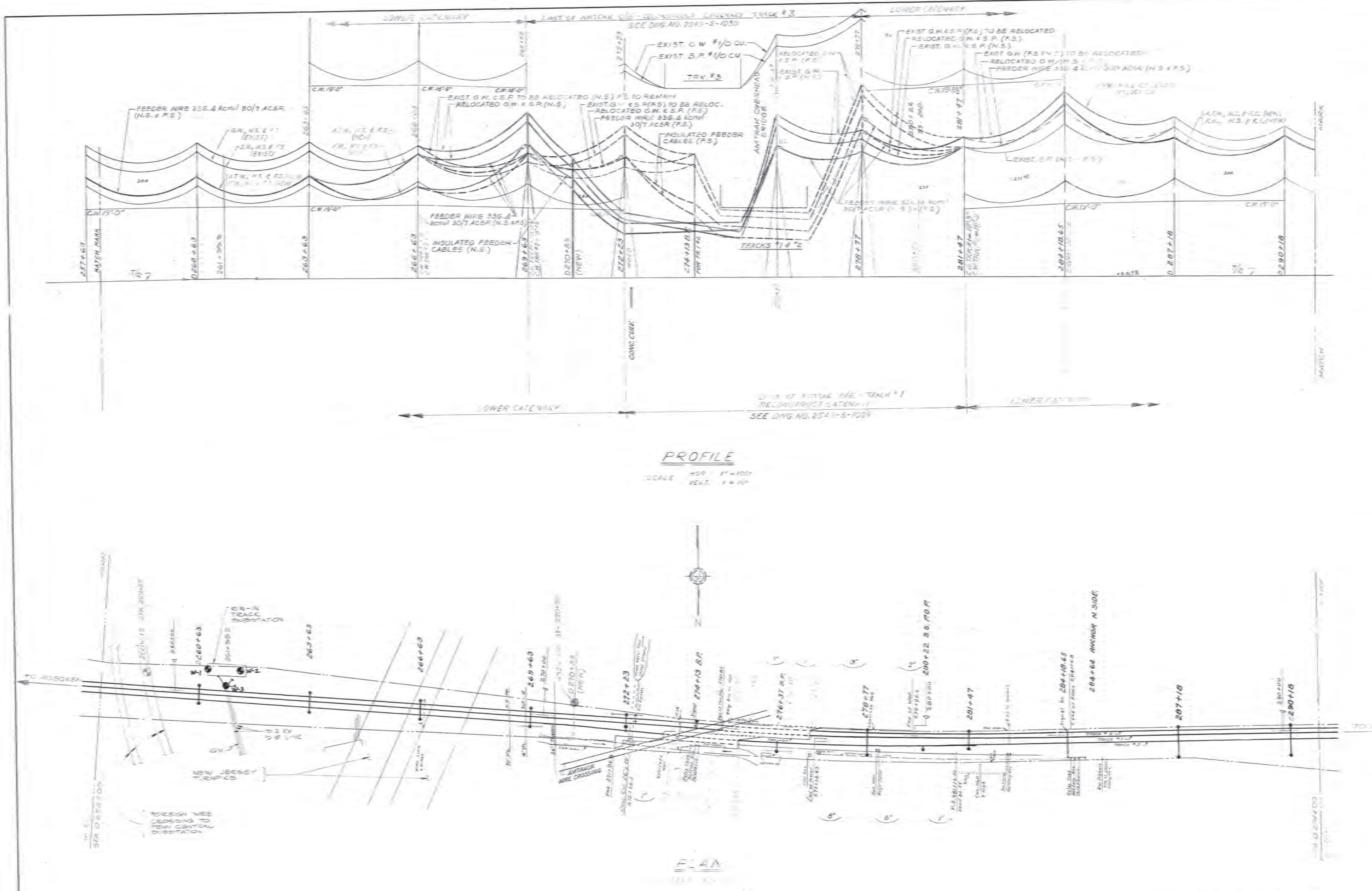
Core Dia. ____

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

Approximate Change in Strata ____

Inferred Change in Strata - - - - -

STATE	UMTA AID PROJECT NO.			SHEET NO.	TOTAL SHEETS
N.J.	[illegible]				



ESTIMATED QUANTITIES

ITEM	UNIT	CONTRACT QUANTITY	AS-BUILT QUANTITY
MODIFICATIONS TO EXISTING STRUCTURE AT STA. D250+63	LUMP SUM	LUMP SUM	
" " " " D263+63	"	"	
" " " " D266+63	"	"	
" " " " D269+63	"	"	
" " " " D272+23	"	"	
" " " " [illegible]	"	"	
" " " " D261+353	"	"	
MODIFICATIONS TO EXISTING STRUCTURE AT STA. D276+37	"	"	
" " " " D278+77	"	"	
" " " " D280+86	"	"	
" " " " D281+47	"	"	
" " " " D284+18.65	"	"	
" " " " D287+18	"	"	
" " " " D290+18	LUMP SUM	LUMP SUM	
[illegible]	[illegible]	[illegible]	
[illegible] TRACKS #1 & 3	LUMP SUM	LUMP SUM	
FEEDER WIRE 336.4 kcmil 30/7 ACSR	LIN. FT.	10,344	
FEEDER INSULATED CABLE 1-M 750 kcmil ALU.	LIN. FT.	2,680	
EXISTING GROUND WIRE RELOCATION	LIN. FT.	[illegible]	
EXISTING SIGNAL POWER RELOCATION	LIN. FT.	6,128	
NEW STRUCTURE AT STA. D 270+63	LUMP SUM	LUMP SUM	
OVERHEAD BRIDGE CATENARY ATTACHMENT-GROUNDING & BONDING-AMTRAK OVERHEAD BRIDGE-STA.D275+30	LUMP SUM	LUMP SUM	
* FOUNDATION EXCAVATION	CU. YD.	186	
* REINFORCEMENT STEEL IN STRUCTURES	LBS.	4720	
* CLASS "B" CONCRETE IN STRUCTURES	CU. YD.	19	
* TEMPORARY SHEETING	SQ. FT.	1160	
* STEEL SHEET PILING	SQ. FT.	480	
* STEEL H-PILES HP12×53	LIN. FT.	370	
* SPLICES FOR H-PILE	UNIT	6	

* REFERENCE DWGS. 2549-S-198 TO S-211.

NOTE:
FOR GENERAL NOTES, LEGEND AND ABBREVIATIONS SEE DWG. NO. 2549-S-55

ISSUE NO.	DATE	DWN.	CH'K'D.	APPROVALS	ISSUED FOR
					PHASE III

GIBBS & HILL DRAWING No. 2549-S-27

NEW JERSEY DEPARTMENT OF TRANSPORTATION
BUREAU OF STRUCTURAL DESIGN

ERIE LACKAWANNA ELECTRIFICATION
CONVERSION, EXTENSION AND REHABILITATION
WEST END TO SUMMIT

COUNTY HUDSON, ESSEX & UNION

ELECTRIFICATION PLAN AND PROFILE

STA. 258+00 TO STA. 291+00

Gibbs & Hill, Inc.
ENGINEERS, DESIGNERS, CONSTRUCTORS
NEW YORK
JOB NO. 2549

DATE
SCALE: AS NOTED
CONTRACT
SHEET No. 8 OF 8
23

REVISION	BY	CH'K'D.	DATE

CONTROL SECTION	JOB NO.
DES. BY	CHK. BY
DWN. BY	
EST. BY	CHK. BY
SPECS. BY	

IN CHARGE OF

Form SO-2 7/74

NEW JERSEY DEPARTMENT OF TRANSPORTATION

ROUTE: LOCAL NAME: Run-in Track Station TEST HOLE NO. 432W - 1

SECTION: Erie-Lackawanna Electrification

STATION: OFFSET: REFERENCE LINE: GROUND LINE ELEVATION: +10.3'

BORINGS MADE BY: Servillo DATE STARTED: 5/4/77

INSPECTOR: Henry DATE COMPLETED: 5/12/77

Elevation G.W.T.		
0 Hr.	+0.7'	Date: 5/12/77
24 Hr.	SAME	Date: 5/13/77
______ ft. P.P. Installed		Date:

Depth	CASING BLOWS	SAMPLE NO.	DEPTH (from)	DEPTH (to)	Blows on Spoon 0–6	6–12	12–18	REC.	Sample ID and Profile Change	
	23	S-1	0.0'	1.5'	2	3	5	4"	Black CF Sand and (-) Silt, some (-) MF Gravel	
	25								(Cinder and Ashes).	
	37									
	25									
5	20									
	30	S-2	5.0'	6.5'	3	4	5	6"	SAME	
	70									
	170									
	100									
10	74									
	52	S-3	10.0'	11.5'	17	10	10	7"	Red Brown CF SAND, and (-) Silt, little (-)	
	58								MF Gravel.	
	64									
	72									
15	77									
	13	S-4	15.0'	16.0'	17	6	--	0"	(Semi liquid consistancy)	
	17	U-1	16.0'	18.0'	PRESS8/6"			23"	Red Brown & Black CF SAND, some (-) Silt,	
	49								trace MF Gravel, trace Reeds and Roots.	17.5'
	116	U-2	18.0'	19.8'	P R E S S			10"	Brown PEAT	18.3'
20	50								Grey CF SAND, little (+) Silt.	
	60	S-5	20.0'	21.5'	10	7	6	3"	Grey Brown CF SAND, little Silt, little CF	
	70								Gravel (Wash Residue?)	
	72									
	90									
25	92									
	42	S-6	25.0'	26.5'	36	44	37	18"	Red Brown CF SAND, trace Silt.	
	105									
	122									
	110									
30	123									30.0'
	101	S-7	30.0'	31.5'	25	27	26	18"	Grey SILT little, F Sand.	
	158									
	132									
	140								(65%) (35%)	
35	145	U-3	35.0'	36.5'	P R E S S			0"	Grey SILT varved with Grey Brown CLAY.	
	132	S- 8	35.0'	36.5'	7	7	7	16"		
	152									
	158									
	129									
40	120									

Nominal I.D. of Drive Pipe	XXX 4"
Nominal I.D. of Split Barrel Sampler	1½"
Weight of hammer on Drive Pipe	300 lbs.
Weight of hammer on Split Barrel Sampler	140 lbs.
Drop of hammer on Drive Pipe	24"
Drop of hammer on Split Barrel Sampler	30"

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The Information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation
Soils Bureau

Core Dia. ______

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

Approximate Change in Strata ______

Inferred Change in Strata - - - - - -

Form SO-2 7/74 NEW JERSEY DEPARTMENT OF TRANSPORTATION

ROUTE: LOCAL NAME: **Run-in Track Station** TEST HOLE NO. **432W - 1**

SECTION: **Erie-Lackawanna Electrification**

STATION: OFFSET: REFERENCE LINE: GROUND LINE ELEVATION: **+10.3'**

BORINGS MADE BY: **Servillo** DATE STARTED: **5/4/77**

INSPECTOR: **Henry** DATE COMPLETED: **5/12/77**

	Elevation G.W.T.	
0 Hr.	+0.7'	Date: 5/12/77
24 Hr.	SAME	Date: 5/13/77
______ ft. P.P. Installed		Date:

Depth	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon 0/6	6/12	12/18	REC.	Sample ID and Profile Change	
	112	U-4	40.0'	42.0'	P R	E S	S	24"		
	223	S-9	42.0'	43.5'	6	6	9	18"	Brown Varved Silty CLAY.	
	210									
	175									
45	154									
	150	U-5	45.0'	46.0'	P R	E S	S	12"		
	147	S-10	46.0'	47.5'	7	10	13	18"	Red Brown varved SILT with thin Red Brown	
	132								Clay and Red Brown MF varves.	
50	153									
XX	183									
	130	U-6	50.0'	50.7'	P R	E S	S	0"		
	142	S-11	50.5'	52.0'	10	12	18	10"	- - - - - - - - - -	51.5'
	150								Red Brown SILT and CF Sand, little (+) MF	
	165								Gravel.	
55	425									
XX	545	S-12	55.0'	55.9'	142	150/4"	--	7"	Red Brown CF Sand, little Silt, and (-) CF	
	500								Gravel (highly decomposed Shale).	
	750									58.0'
60										
XX		C-1	58.0'	63.0'	C O	R E		55"	Red Brown F SANDSTONE.	
						Rec.		92%		
						RQD		0%		
										63.0'
65										
XX									BOTTOM OF HOLE	
30										
35										
40										

Nominal I.D. of Drive Pipe	XXX 4"
Nominal I.D. of Split Barrel Sampler	1½"
Weight of hammer on Drive Pipe	300 lbs.
Weight of hammer on Split Barrel Sampler	140 lbs.
Drop of hammer on Drive Pipe	24"
Drop of hammer on Split Barrel Sampler	30"

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The Information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation
Soils Bureau

Core Dia. ______

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

Approximate Change in Strata ______

Inferred Change in Strata - - - - - - -

Form SO-2 7/74 — NEW JERSEY DEPARTMENT OF TRANSPORTATION —

ROUTE: LOCAL NAME: **Run-in Track Station** TEST HOLE NO. **432W - 2**

SECTION: **Erie-Lackawanna Electrification**

STATION: OFFSET: REFERENCE LINE: GROUND LINE ELEVATION: **+9.5'**

BORINGS MADE BY: **Servillo** DATE STARTED: **4/28/77**

INSPECTOR: **Henry** DATE COMPLETED: **5/16/77**

Elevation G.W.T.

- 0 Hr. **+1.5' Filled in Dry** Date: **5/16/77**
- 24 Hr. **Flooded with wash water from 2A** ~~XXXXXXXXXXX~~ Date: **5/17/77**
- Date:

Depth	Casing Blows	Sample No.	Depth		Blows on Spoon 0/6	6/12	12/18	Rec.	Sample ID and Profile Change	
	3	S-1	0.0'	1.5'	3	5	6	6"	Black CF Sand, and Silt, trace F Gravel -	
	13								roots (Cinders and Ashes).	
	12									
	17									
5	15									
	32	S-2	5.0'	6.5'	7	11	11	8"	Reddish Brown and Black CF Sand, and (-) Silt,	
	55								little MF Gravel. (Cinders)	
	60									
	40									
10	32									
	18	S-3	10.0'	11.5'	13	13	13	11"	Red Brown CF SAND, some (+) Silt, little MF	
	20								Gravel.	
	25									
	29									
15	31									15.0'
	8	S-4	15.0'	16.5'	11	9	9	18"	Dark Brown & Black PEAT some, CF Sand, little	
	7								Organic SILT.	
	8									18.0'
	12									
20	21									
	22	S-5	20.0'	21.5'	13	15	14	8"	Grey & Red Brown CF SAND, little Silt, little	
	24								MF Gravel.	
	35									
	42									
25	50									
	21	S-6	25.0'	26.5'	16	23	25	6"	Reddish Grey CF SAND, little (-) Silt.	
	32									
	45									
	47									
30	53									
	46	S-7	30.0'	31.5'	26	37	50	16"	Grey F SAND, and (+) Silt.	
	66									
	56									
	52									
35	47									35.0'
	41	S-8	35.0'	36.5'	6	10	14	18"	Grey Clayey SILT (90%) varved with Red Brown	
	40								F Sand (10%).	
	37									
	35									
40	35									

Nominal I.D. of Drive Pipe	2½" ~~XX~~
Nominal I.D. of Split Barrel Sampler	1½"
Weight of hammer on Drive Pipe	300 lbs.
Weight of hammer on Split Barrel Sampler	140 lbs.
Drop of hammer on Drive Pipe	24"
Drop of hammer on Split Barrel Sampler	30"

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation
Soils Bureau

Core Dia. ________

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

Approximate Change in Strata ________

Inferred Change in Strata - - - - - - - -

Form SO-2 7/74 NEW JERSEY DEPARTMENT OF TRANSPORTATION

ROUTE: LOCAL NAME: **Run-in Track Station** TEST HOLE NO. **432W - 2**

SECTION: **Erie-Lackawanna Electrification**

STATION: OFFSET: REFERENCE LINE: GROUND LINE ELEVATION: **+9.5'**

BORINGS MADE BY: **Servillo** DATE STARTED: **4/28/77**

INSPECTOR: **Henry** DATE COMPLETED: **5/16/77**

	Elevation G.W.T.	
0 Hr.	+1.5' Filled in Dry	Date: 5/16/77
24 Hr.	Flooded with wash water from 2A XXXXXXXXXXX	Date: 5/17/77
		Date:

	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon 0-6	6-12	12-18	REC.	Sample ID and Profile Change	
	37	S-9	40.0'	41.5'	6	8	9	18"	Grey Brown varved CLAY.	
	41									
	38									
	37									
45	34									
	47	S-10	45.0'	46.5'	4	13	18	18"	Red Brown Varved CLAY.	
	50									
	47									
50	48									
XX	32									
	47	S-11	50.0'	51.5'	7	9	10	14"	Red Brown CLAY (85%) varved with Red Brown Silt (15%).	
	40									
	35									
55	38									
XX	42									
	50	S-12	55.0'	56.5'	15	15	16	13"	Red Brown varved Silty CLAY trace, CF Sand, trace (-) MF Gravel.	
	65									
	159									
60	650									59.0'
XX										
		C-1	59.0'	60.0'	C O R E			7"	Red Brown VF Sandstone and Shale.	60.2'
						Rec.		58%		
						RQD		0%		
65		C-2	60.0'	60.2'	C O R E			0"	BOTTOM OF HOLE	
XX						Rec.		0%		
						RQD		0%		
30										
35										
40										

Nominal I.D. of Drive Pipe	2½" XX
Nominal I.D. of Split Barrel Sampler	1½"
Weight of hammer on Drive Pipe	300 lbs.
Weight of hammer on Split Barrel Sampler	140 lbs.
Drop of hammer on Drive Pipe	24"
Drop of hammer on Split Barrel Sampler	30"

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation
Soils Bureau

Core Dia. ____________

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

Approximate Change in Strata ____________

Inferred Change in Strata - - - - - - - - - -

Form SO-2 7/74

NEW JERSEY DEPARTMENT OF TRANSPORTATION

ROUTE: LOCAL NAME: **Run-in Track Station** TEST HOLE NO. **432W - 3**

SECTION: **Erie-Lackawanna Electrification**

STATION: OFFSET: REFERENCE LINE: GROUND LINE ELEVATION: **+3.5'**

BORINGS MADE BY: **Servillo** DATE STARTED: **5/18/77**

INSPECTOR: **Henry** DATE COMPLETED: **5/19/77**

Elevation G.W.T.		Date
0 Hr.	+0.5'	5/19/77
24 Hr.	SAME	5/20/77
______ ft. P.P. Installed		Date:

Depth	Casing Blows	Sample No.	Depth From	Depth To	Blows on Spoon 0/6	6/12	12/18	Rec.	Sample ID and Profile Change	Strata
	4	S-1	0.0'	1.5'	1	1	4	5"	Black CF Sand, and (+) Silt, little (-) MF	
	4								Gravel (Ashes, Rotted Wood).	
	3	S-2	1.5'	3.0'	6	6	8	3"	Black CF SAND, some (-) Silt, some (-) CF	
	5								Gravel (Cinders).	
5	6	S-3	3.0'	4.5'	8	10	13	6"	Red Brn.CF Sand,some(-)Silt,some(+)CF Gravel.	
	7	S-4	4.5'	6.0'	9	11	14	6"	SAME	
	6									
	5	S-5	6.0'	7.5'	2	2	3	5"	SAME	8.0'
	4	S-6	7.5'	9.0'	2	1	1	4"	Black Organic Silt.	
10	2									
	2	S-7	9.0'	10.5'	1	1	2	5"	SAME (Liquid consistency) trace (+) Fibers.	
	3	S-8	10.5'	12.0'	1	1	1	3"	Black Organic SILT and PEAT (very high moisture cont.).	
	5									12.9'
	21	S-9	12.0'	13.5'	1	1	5	18"	Yellow Gry.CF SAND,some(+)Silt,trace(-)Fibers.	
15	22	S-10	13.5'	15.0'	16	16	20	11"	Grey Brown CF SAND, Silt.	
	30									
	32									
	32									
	33									
20	34									
		S-11	20.0'	21.5'	11	18	19	15"	Grey SILT and, F Sand.	
										21.5'
									BOTTOM OF HOLE	
25										
30										
35										
40										

Nominal I.D. of Drive Pipe	2½" 4"
Nominal I.D. of Split Barrel Sampler	1½"
Weight of hammer on Drive Pipe	300 lbs.
Weight of hammer on Split Barrel Sampler	140 lbs.
Drop of hammer on Drive Pipe	24"
Drop of hammer on Split Barrel Sampler	30"

Core Dia. ______

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The Contractor shall make his own subsurface investigations in order to satisfy himself of the actual subsurface conditions. The Information contained on this log is not warranted to show the actual subsurface conditions. The Contractor agrees that he will make no claims against the State if he finds that the actual conditions do not conform to those indicated by this log.

New Jersey Department of Transportation
Soils Bureau

Approximate Change in Strata ______

Inferred Change in Strata - - - - - -

NO. OF SHEETS

ELEVATION IN FEET

320 310 300 290 280 270 260 250 240 230 220 210 200 190 180

56 55 54 53 52 51 50

NOTES

1. A combination of two or more Soils Types is indicated by combining the respective symbols with the predominant soil type being shown in a heavier weight of line.
2. Borings prefixed by "A" were made with Auger Equipment. Borings prefixed by "S" were made by P.A. Force using a one-inch Sampling Spoon described in Note No. 3. All other Borings were samples as described in Note No. 4 unless otherwise indicated.
3. B/FT.- Indicates the number of Blows required to drive a one-inch I.D. open ended Sampling Spoon, one foot driven by a ____ lb. hammer with a free fall of ____ inches. Spoon is a retractable plug sampler part No. 1511 described in Acker Drill Co., Inc. Catalog No. 12.
4. B/FT.- Indicates the number of Blows required to drive a 1-3/8-inch I.D. open ended Sampling Spoon, one foot driven by a 140 lb. hammer with a free fall of 30 inches. Spoon is similar and equal to Split Barrel Sampler No. A-13376, as described in Sprague and Henwood, Inc. Catalog No. 300-1.
5. W%- Indicates Water Content of samples obtained.
6. W.L.- INDICATES LEVEL OF FREE WATER SURFACE IN SOIL AT THE TIME BORING WAS MADE AND WAS DETERMINED BY OBSERVATION IN AUGERED HOLE, OR MEASURED IN BORING HOLE, OR AN ADJ. WELLPT.
7. F.H.- Indicates that the sample was Pressed in by hand.
8. U- Indicates undisturbed sample. See Boring Report for size and method of sampling.
9. T- Indicates Trap used in obtaining sample.
10. * * - Indicates Open End Rod used.
11. 88%- Indicates percentage recovered from each Run of Core Drillings.
12. For complete description of Soil and Rock Samples of Individual Borings see the forms entitled Classification of Borings, Boring Report, Drilling Report and Undisturbed Samples.
13. # - INDICATES 300 LB. HAMMER USED
14. V - INDICATES VANE SHEAR TEST

VERTICAL CONTROL

N

S

LEGEND

WATER
SAND
GRAVEL
CINDERS ASHES & REFUSE
SILT
WOOD
ROCK FRAGMENTS
CLAY
ORGANIC SILT
PEAT
DECOMPOSED ROCK
BOULDERS
ROCK

AREA SHOWN ON THIS DWG.

STA. N 574+44 — 56
STA. N 563+10 — 55
PROPOSED WESTBOUND CONNECTION
STA. N 550+62 — 54
STA. N 541+56 — 53
STA. N 537+12 — 52
STA. N 530+00 — 51
STA. N 523+62 — 50
STA. N 517+00 — 49
STA. N 514+06

PROPOSED RAIL TRACK
EXISTING PENNSYLVANIA RAILROAD
PROPOSED EASTBOUND CONNECTION
NEWARK
ERIE R.R.
BELLEVILLE TURNPIKE
PASSAIC RIVER
NEW JERSEY TURNPIKE
NEW JERSEY TURNPIKE
ERIE-LACK. TRACKS TO HOBOKEN
TURNPIKE

1" = 200'

LEGEND

TYPE I LAND BORING
TYPE II LAND BORING

REV. NO.	DESCRIPTION OF CHANGE	MADE BY	APPROVED	DATE

THE PORT OF NEW YORK AUTHORITY

PUBLIC TRANSPORTATION STUDY

BELLVILLE TURNPIKE TO PASSAIC RIVER AREA

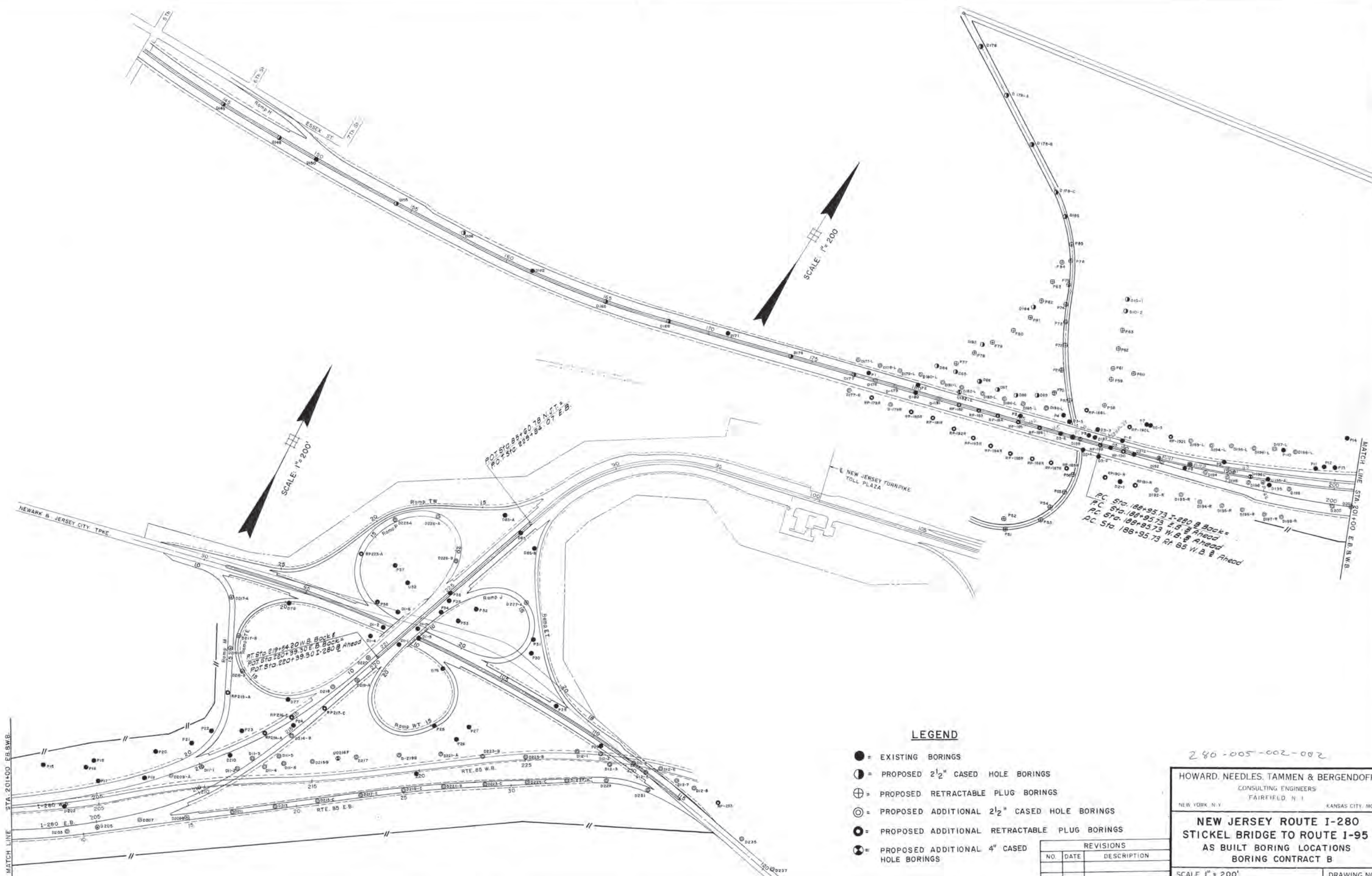
GEOLOGIC PROFILES

SCALE AS SHOWN

CONTRACT NO. DRAWING NO. PTS-SL007

DESIGN BY | DATE
DRAWN BY LJB | DATE 8/72
DES. & DWG. CHKD. BY | DATE
IN CHARGE | DATE

CHIEF ENGINEER
ENGINEER OF DESIGN
DATE AUG 30,1972



LEGEND

- ● = EXISTING BORINGS
- ◑ = PROPOSED 2½" CASED HOLE BORINGS
- ⊕ = PROPOSED RETRACTABLE PLUG BORINGS
- ◎ = PROPOSED ADDITIONAL 2½" CASED HOLE BORINGS
- ◉ = PROPOSED ADDITIONAL RETRACTABLE PLUG BORINGS
- ⊗ = PROPOSED ADDITIONAL 4" CASED HOLE BORINGS

REVISIONS		
NO.	DATE	DESCRIPTION

280-005-002-002

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
FAIRFIELD, N.J.
NEW YORK, N.Y. KANSAS CITY, MO

NEW JERSEY ROUTE I-280
STICKEL BRIDGE TO ROUTE I-95
AS BUILT BORING LOCATIONS
BORING CONTRACT B

SCALE 1" = 200'
DATE 10/31/73
DRAWING NO. 2 of 2

HOWARD, NEEDLES, TAMMEN & BERGENDOFF CONSULTING ENGINEERS FAIRFIELD, N.J.

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

CONSULTING ENGINEERS

Boring No. P51

Sheet No. 1 of 2

BORINGS FOR

I-280, New Jersey

(PROJECT)

Giles Drilling Corporation

(CONTRACTOR)

CONTRACT NO. B PURPOSE Roadway STRUCTURE NO. _____

LOCATION Harrison, New Jersey RDWY. Boylan STA. 36+73 OFF. 45 LT

RIG NO. 6 TYPE Porter Sampler	DRILLER R.Crockett	HELPER(S) C. Kuzma				
DATE 12-7-70						
TIME STARTED 10:45						
TIME FINISHED 11:05						
WEATHER Cloudy						
DEPTH REACHED 12.0						

GROUND ELEVATION +2.0 M.L.W. ELEVATION _____

ZERO OF BORING LOG _____ ELEVATION GROUND WATER _____

PAY QUANTITIES

LINEAL FEET OF BORING					SAMPLES			LIN. FT. OF ROCK CORE		
2-½"	3"	4"	Porter Sampler		ORDINARY DRY	UNDIST. DRY		1-⅜"	1-⅝"	
ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM
			12.0							

	UNIT WEIGHT	SIZE	WEIGHT OF HAMMER	AV. FALL
CASING				
ORDINARY DRY SAMPLES		O.D. 1" I.D.	25# Slip	12"
UNDISTURBED SAMPLES		TYPE	LENGTH	O.D. I.D.

GROUND WATER READINGS

DATE								
TIME								
DEPTH								

GENERAL REMARKS _____

INSPECTOR Charles Suk RESIDENT ENGINEER _____

FORM N21-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS

Boring No. P-51
Sheet No. 2 of 2

BORINGS FOR

New Jersey I-280

CONTRACT NO. B PURPOSE Roadway

ELEV.	BLOWS ON CASING	BLOWS ON SPOON = recovery FOR 6" PENETRAT'N.		SAMPLE NO.	SAMPLE DEPTH	LOG	P=Push MATERIAL & REMARKS
+2.0						0.0	
	P	0	6"	1	0-3		Blk.Br.c-f SAND, little Silt,trace c-f Gravel, trace Root
1		0					Fibers - Field observation
		0					(Fill)
2		0					
		0					
3		6					- Same -
		0		2	3-6		(Fill)
4		0					
		0					
5	-3.0	0				5.0	
	-3.5	6				5.5	Grey Br.SILT & CLAY,little Br.Peat,trace f Sand(organic odor)
6		6					Grey CLAY & SILT,tr. f Sand,tr.Root fibers(organic odor)
		0		3	6-9		(Sample Retained)
7		0					
		0					
8		0					
		5					- Same -
9		6					- Same -
		0		4	9-12		
10	P	0					
		0					
11	-9.0	68 5				11.0	-Same-
	-9.5	6				11.5	Grey CLAY & SILT, little c-f+ Sand (organic odor)
12	-10.0	89 6				12.0	Br. c-f+ SAND, trace f Gravel, trace Silt

Bottom of hole

FORM N 20-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS

Boring No. P52
Sheet No. 1 of 2

BORINGS FOR

I-280, New Jersey
(PROJECT)

Giles Drilling Corporation
(CONTRACTOR)

CONTRACT NO. B PURPOSE Roadway STRUCTURE NO. —

LOCATION Harrison, New Jersey RDWY. Boylan STA. 36+50 OFF. ℄

RIG NO. 6 TYPE Porter Sampler	DRILLER R. Crockett	HELPER(S) C. Kuzma				
DATE 12-7-70						
TIME STARTED 11:20						
TIME FINISHED 1:30						
WEATHER Cloudy						
DEPTH REACHED 10.0						

GROUND ELEVATION +1.6 M.L.W. ELEVATION —
ZERO OF BORING LOG — ELEVATION GROUND WATER —

PAY QUANTITIES

LINEAL FEET OF BORING					SAMPLES			LIN. FT. OF ROCK CORE		
2-½"	3"	4"	Porter Sampler		ORDINARY DRY	UNDIST. DRY		1-⅜"	1-⅝"	
ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM
			9.0							

	UNIT WEIGHT	SIZE	WEIGHT OF HAMMER	AV. FALL
CASING	—	—	—	—
ORDINARY DRY SAMPLES		O.D. 1" I.D. —	25# SLIP	12"
UNDISTURBED SAMPLES		TYPE —	LENGTH — O.D. —	I.D. —

GROUND WATER READINGS

DATE	—	—	—	—	—	—	—	—
TIME	—	—	—	—	—	—	—	—
DEPTH	—	—	—	—	—	—	—	—

GENERAL REMARKS —

INSPECTOR Charles Suk RESIDENT ENGINEER —

FORM N21-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS

Boring No. P52
Sheet No. 2 of 2

BORINGS FOR

I 280, New Jersey

CONTRACT NO. B PURPOSE Roadway

On initial attempt hit obstruction st 4.5'. Moved hole 2 ft.
P=Push

ELEV.	BLOWS ON CASING	BLOWS ON SPOON recovery FOR 6" PENETRAT'N.		SAMPLE NO.	SAMPLE DEPTH	LOG	MATERIAL & REMARKS
+1.6							
	P	0	6	1	0-3		Blk.Br.c-f SAND,little c-f Gravel,trace root fibers,trace silt
	P	0					-Fill - Field observation
-0.1	P	1				1.5	- Same - -Fill-
	P	6					Blk.Br.SILT & CLAY,little c-f Sand,trace f Gravel,trace Peat
		6					- Same -
	11	6					- Same -
		0		2	3-6		
	13	0					
		0					
	13	0					
		3					- Same -
	17	6					- Same -
		0		4	6-9		
-5.4	16	0				7.0	- Sample Retained -
		4					Blk.CLAY & SILT,little f Sand (organic odor)
	40	6					- Same -
		6	↓				Top 3" SAME, Bottom 3" Br. c-f+ SAND, trace Silt
-7.4	74	6	6			9.0	- Same -
							Bottom of hole

FORM N 20-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

CONSULTING ENGINEERS

Boring No. P53

Sheet No. 1 of 2

BORINGS FOR

I-280, New Jersey

(PROJECT)

Giles Drilling Corporation

(CONTRACTOR)

CONTRACT NO. B PURPOSE Roadway STRUCTURE NO. _____

LOCATION Harrison, New Jersey RDWY Boylan STA. 35+50 OFF 20 LT

RIG NO. 6	TYPE Porter Sampler	DRILLER R.Crockett	HELPER(S) C. Kuzma				
DATE 12-7-70							
TIME STARTED 1:30							
TIME FINISHED 1:45							
WEATHER Cloudy							
DEPTH REACHED 9.0							

GROUND ELEVATION +3.0 M.L.W. ELEVATION _____

ZERO OF BORING LOG _____ ELEVATION GROUND WATER _____

PAY QUANTITIES

LINEAL FEET OF BORING					SAMPLES			LIN. FT. OF ROCK CORE		
2-½"	3"	4"	Porter Sampler		ORDINARY DRY	UNDIST. DRY		1-⅜"	1-⅝"	
ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM
			9.0							

	UNIT WEIGHT	SIZE	WEIGHT OF HAMMER	AV. FALL
CASING				
ORDINARY DRY SAMPLES	O.D. 1" I.D.		25# SLIP	12"
UNDISTURBED SAMPLES	TYPE		LENGTH O.D.	I.D.

GROUND WATER READINGS

DATE								
TIME								
DEPTH								

GENERAL REMARKS _____

INSPECTOR Charles Suk RESIDENT ENGINEER _____

FORM N21-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS

Boring No. P53
Sheet No. 2 of 2

BORINGS FOR

I 280, New Jersey

CONTRACT NO. B PURPOSE Roadway

ELEV. +3.0	BLOWS ON CASING	BLOWS ON recovery FOR 6" PENETRAT'N.		SAMPLE NO.	SAMPLE DEPTH	LOG	MATERIAL & REMARKS P=Push
	P	0	6	1	0-3		Blk organic SILT, little c-f Sand, trace Root fibers
1	P	0					Field Observation
	P	0					- Fill -
2	P	0					
+0.4		4				2.6	- Same - Fill
3	17	6					Top 4" same -; Bottom 2" Br. c-f+ SAND, trace Silt
		0		2	3-6		
4	15	0					
		0					
5	19	0					
		0					
6	23	2				6.0	- Same -
		0		3	6-9		
7	10	0					
		0					
8	26	0					
-5.5		0	▼			8.5	
9 -6.0	61	6	6			9.0	Top 4"Grey SILTY CLAY,trace root fibers,trace f Sand(Sample Retained)
							Bottom 2" Br. c-f+ SAND, trace Silt
							Bottom of hole

FORM N 20-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

CONSULTING ENGINEERS

Boring No. P54

Sheet No. 1 of 2

BORINGS FOR

I-280, New Jersey

(PROJECT)

Giles Drilling Corporation

(CONTRACTOR)

CONTRACT NO. B PURPOSE Roadway STRUCTURE NO. _____

LOCATION Harrison, New Jersey RDWY. Boylan STA. 34+50 OFF. 20 LT

RIG NO. 6 TYPE Porter Sampler	DRILLER R. Crockett	HELPER(S) C. Kuzma				
DATE	12-7-70					
TIME STARTED	1:45					
TIME FINISHED	2:35					
WEATHER	Cloudy					
DEPTH REACHED	11.0					

GROUND ELEVATION +2.5 M.L.W. ELEVATION _____

ZERO OF BORING LOG _____ ELEVATION GROUND WATER _____

PAY QUANTITIES

LINEAL FEET OF BORING					SAMPLES			LIN. FT. OF ROCK CORE		
2-½"	3"	4"	Porter Sampler		ORDINARY DRY	UNDIST. DRY		1-⅜"	1-⅝"	
ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM
			11.0							

	UNIT WEIGHT	SIZE	WEIGHT OF HAMMER	AV. FALL
CASING				
ORDINARY DRY SAMPLES	O.D. 1" I.D.		25# SLIP	12"
UNDISTURBED SAMPLES	TYPE		LENGTH	O.D. I.D.

GROUND WATER READINGS

DATE								
TIME								
DEPTH								

GENERAL REMARKS _____

INSPECTOR Charles Suk RESIDENT ENGINEER _____

FORM N.21-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS

Boring No. P54
Sheet No. 2 of 2

BORINGS FOR

I 280, New Jersey

CONTRACT NO. B PURPOSE Roadway

ELEV. +2.5	BLOWS ON CASING	BLOWS=SPOON recovery FOR 6" PENETRAT'N.		SAMPLE NO.	SAMPLE DEPTH	LOG	MATERIAL & REMARKS P=Push
	P	0	6	1	0-3		Blk Grey CLAY & SILT, and Br. Peat, trace c-f Sand
1		0					(Field observation)
		0					(Fill from ditch excavation)
2		0					- Same -
		6					- Same -
3		6					- Same -
		0		2	3-6		
4		0					Wet at 3.0'
		0					
5		0					
-3.0		6				5.5	- Same -
6		6					Blk.Grey CLAY & SILT, trace Br. Peat, trace f Sand
		0		3	6-9		-Sample Retained-
7	11	0					
		0					
8	50	4					Blk.Grey CLAY & SILT, little Br. Peat, trace f Sand
		6					- Same -
9	-6.4 53	6				8.9	Top 4"Same,Bottom 2" Br.Grey c-f SAND,little Silt,tr.f Gravel
		6		4	9-11		- Same -
0	30	6					- Same -
		6					- Same -
11	-8.5 94	6				11.0	- Same -
							Bottom of hole

FORM N 20-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

CONSULTING ENGINEERS

Boring No. P55

Sheet No. 1 of 2

BORINGS FOR

New Jersey I-280

(PROJECT)

Giles Drilling Corporation

(CONTRACTOR)

CONTRACT NO. B PURPOSE Roadway STRUCTURE NO. _____

LOCATION Harrison, New Jersey RDWY. Boylan STA. 33+50 OFF. 20 LT

RIG NO. 6	TYPE Porter Sampler	DRILLER R. Crockett	HELPER(S) C. Kuzma			
DATE 12-7-70						
TIME STARTED 2:40						
TIME FINISHED 3:00						
WEATHER Cloudy						
DEPTH REACHED 9.0						

GROUND ELEVATION +0.8 M.L.W. ELEVATION _____

ZERO OF BORING LOG _____ ELEVATION GROUND WATER _____

PAY QUANTITIES

LINEAL FEET OF BORING					SAMPLES			LIN. FT. OF ROCK CORE		
2-½"	3"	4"	Porter Sampler		ORDINARY DRY	UNDIST. DRY		1-⅜"	1-⅝"	
ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM
			9.0							

	UNIT WEIGHT	SIZE	WEIGHT OF HAMMER	AV. FALL
CASING				
ORDINARY DRY SAMPLES	O.D. 1" I.D. _____		25# SLIP	12"
UNDISTURBED SAMPLES	TYPE _____		LENGTH _____ O.D. _____ I.D. _____	

GROUND WATER READINGS

DATE								
TIME								
DEPTH								

GENERAL REMARKS _____

INSPECTOR Charles Suk RESIDENT ENGINEER _____

FORM N21-A

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS

Boring No. P55
Sheet No. 2 of 2

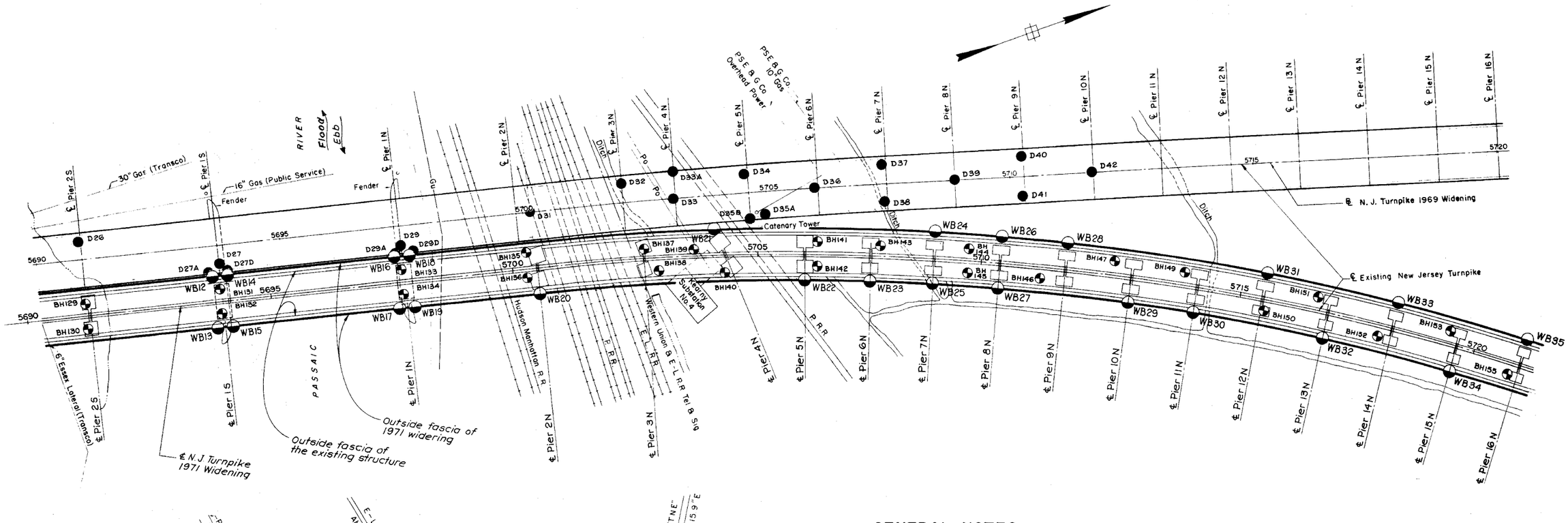
BORINGS FOR

New Jersey I-280

CONTRACT NO. B PURPOSE Roadway

	ELEV. +0.8	BLOWS ON CASING	BLOWS ON SAMPLER FOR 6" PENETRATION recovery		SAMPLE NO.	SAMPLE DEPTH	LOG	MATERIAL & REMARKS P=Push
		P	0	6	1	0-3		Blk. organic SILT, and Br.Peat, trace f Sand
1			0					(Field observation)
	-0.7		0				1.5	
2			0					
			4					Grey Blk. CLAY & SILT, little Br. Peat, trace f Sand
3			6					- Same -
			0		2	3-6		
4		↓	0					
		P	0					
5		9	0					-Sample Retained-
			4				5.6	Grey Blk CLAY & SILT,trace f Sand,trace Root fibers
6	-4.8	35	6					Top 2"Same,Bottom 4"Grey c-f+ SAND,little Silt,trace
			0		3	6-9		Root fibers
7		49	4					- Same -
			6					Grey c-f SAND, little Silt
8		54	6					- Same -
			6	↓				- Same -
9	-8.2	76	6	6			9.0	- Same -
								Bottom of hole

FORM N 20-A



GENERAL NOTES

1. ◔ Denotes locations of 2½" Cased Hole Borings 1951.
2. ● Denotes locations of 2½" Cased Hole Borings 1969.
3. ◒ Denotes locations of 2½" Cased Hole Borings 1971.
4. The first Elevation noted is the existing ground surface, the last is the bottom of the boring and the remainder denote strata changes.
5. ▼ Denotes ground water elevation.
6. Blows on casing are the blows per foot for a 300 pound hammer falling 24 inches, unles otherwise noted.
7. Blows on spoon are the blows per 6 inches for a 1⅜" Sampler using a 140 pound hammer falling 30 inches, unless otherwise noted.
8. Numbers in the log column denote depth of strata changes below existing ground.
9. Sample descriptions are based on visual identi-fications by the boring inspectors.
10. Abbreviations and quantitative terms:

C	- coarse	trace	- 1 to 10 %
m	- medium	little	- 10 to 20 %
f	- fine	some	- 20 to 35 %
		and	- 35 to 60 %

11. Stations and offsets refer to ℄ Existing Bridge.

0 ½ 1 2 3 4

ORIGINAL SIZE IN INCHES

NO.	DATE	REVISION
1	10-3-74	AS-BUILT

NEW JERSEY TURNPIKE AUTHORITY

NEW JERSEY TURNPIKE 1971 WIDENING

SECTION NO. 6 — MILE 107 TO ROUTE 280

PASSAIC RIVER BRIDGE
RIVER SPAN & NORTH APPROACH
BORING LOGS WB-12 THRU WB-43

CLAUSS AND NOLAN
NEWARK NEW JERSEY

SCALE: 1"=100'-0"
CONTRACT NO. W-781
SHEET NO. 122 OF 136

W-781 SHT 122

WB20

STA. 5700 + 43.89 50' Rt.

ELEV.	BLOWS ON CASING	BLOWS ON SPOON 0"/6"	6"/12"	12"/18"	SAMPLE NO.	DEPTH	LOG	MATERIAL & REMARKS
7.0								
+5.0		3	3	3	1	2.0-3.5	2.0	Red brown c-f Sand, Gravel and Rock fragm.
+2.0		3	2	1	2	5.0-6.5	5.0	Black Cinders and c-f Gravel
-1.0							8.0	Gray brown c-f Sand, trace of Silt
		1	1	1	3	10-11.5		Black Coal, Cinders and Muck
-6.0							13.0	
-8.5		2	7	10	4	15-16.5	15.5	Peat
		3	4	8	5	20-21.5		Gray brown c-f Sand, trace of Silt and m-f Gravel
-18.0							25.0	
		11	11	8	6	25-26.5		Gray f silty Sand
-23.0							30.0	
		3	6	6	7	30-31.5		Gray varved clayey Silt
		3	4	5	8	35-36.5		
-33.0							40.0	
		2	3	3	9	40-41.5		Brown varved clayey Silt with layers of f silty Sand
		4	7	8	10	45-46.5		
-42.0							49.0	
		5	6	9	11	50-51.5		Red brown silty Clay, trace of m-f Gravel and Rock fragments
		6	7	9	12	55-56.5		
-52.0							59.0	
-53.5		175			13	60-60.5	60.5	Decomposed red Shale
		Drill time 8 10 12 12 14 mins./ft.						Drilled 82% Recovery of red seamy Shale 29 pieces and fragments No casing blows, drilled casing in.
-58.5							65.5	Bottom of Hole

WB21

STA. 5703+81.00 50' Lt.

ELEV.	BLOWS ON CASING	BLOWS ON SPOON 0"/6"	6"/12"	12"/18"	SAMPLE NO.	DEPTH	LOG	MATERIAL & REMARKS
8.6								
		42	17	26	1	2.0-3.5		Gray brown c-f Sand, Gravel, Cinders, Ash and Boulders
		2	3	3	2	5.0-6.5		
-1.4							10.0	
		1	1	1	3	10-11.5		Peat
-5.4							14.0	
		3	9	7	4	15-16.5		Brown c-f Sand, trace of Silt
		3	4	6	5	20-21.5		
		15	15	11	6	25-26.5		
-19.4							28.0	
								Gray f silty Sand
-22.4		5	8	8	7	30-31.5	31.0	
								Gray varved clayey Silt
		3	4	6	8	35-36.5		
-31.4							40.0	
		3	3	5	9	40-41.5		Gray brown clayey Silt
-36.4							45.0	
		2	4	4	10	45-46.5		Brown varved clayey Silt
		2	2	3	11	50-51.5		
-46.4							55.0	
		2	5	8	12	55-56.5		Red brown clayey Silt with layers of silty f Sand
		5	10	10	13	60-61.5		
-54.4							63.0	
		3	5	8	14	65-66.5		Red brown silty Clay, trace of m-f Gravel Rock fragments and boulders
		5	8	11	15	70-71.5		
		6	9	21	16	75-76.5		
-71.4							80.0	

BLOWS ON CASING	BLOWS ON SPOON 0"/6"	6"/12"	12"/18"	SAMPLE NO.	DEPTH	LOG	MATERIAL & REMARKS
	Drill time 5 5 8 10 12 mins./ft.						Drilled 40% Recovery of red seamy Shale 8 pieces and fragments
-76.4						85.0	
	Drill time 10 11 9 10 10 mins./ft.						Drilled 93% Recovery of red seamy Shale 19 pieces and fragments No casing blows drilled casing in.
-81.4						90.0	
							Bottom of Hole

NOTE:

For Boring Locations See Sheet 122.

NO.	DATE	REVISION
1	10-3-74	AS-BUILT

NEW JERSEY TURNPIKE AUTHORITY

NEW JERSEY TURNPIKE 1971 WIDENING

SECTION NO. 6 — MILE 107 TO ROUTE 280

PASSAIC RIVER BRIDGE SUBSTRUCTURE NORTH APPROACH BORING LOGS WB 20 AND WB 21

CLAUSS AND NOLAN

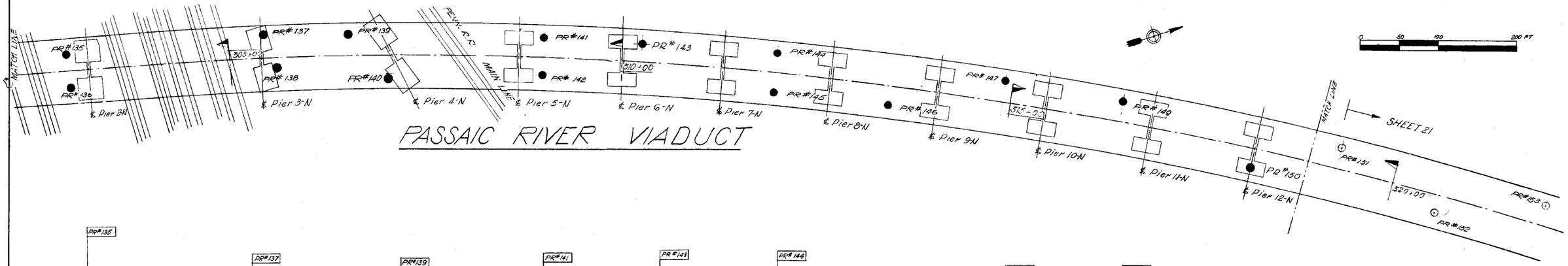
NEWARK NEW JERSEY

SCALE: 1"=6'-0"

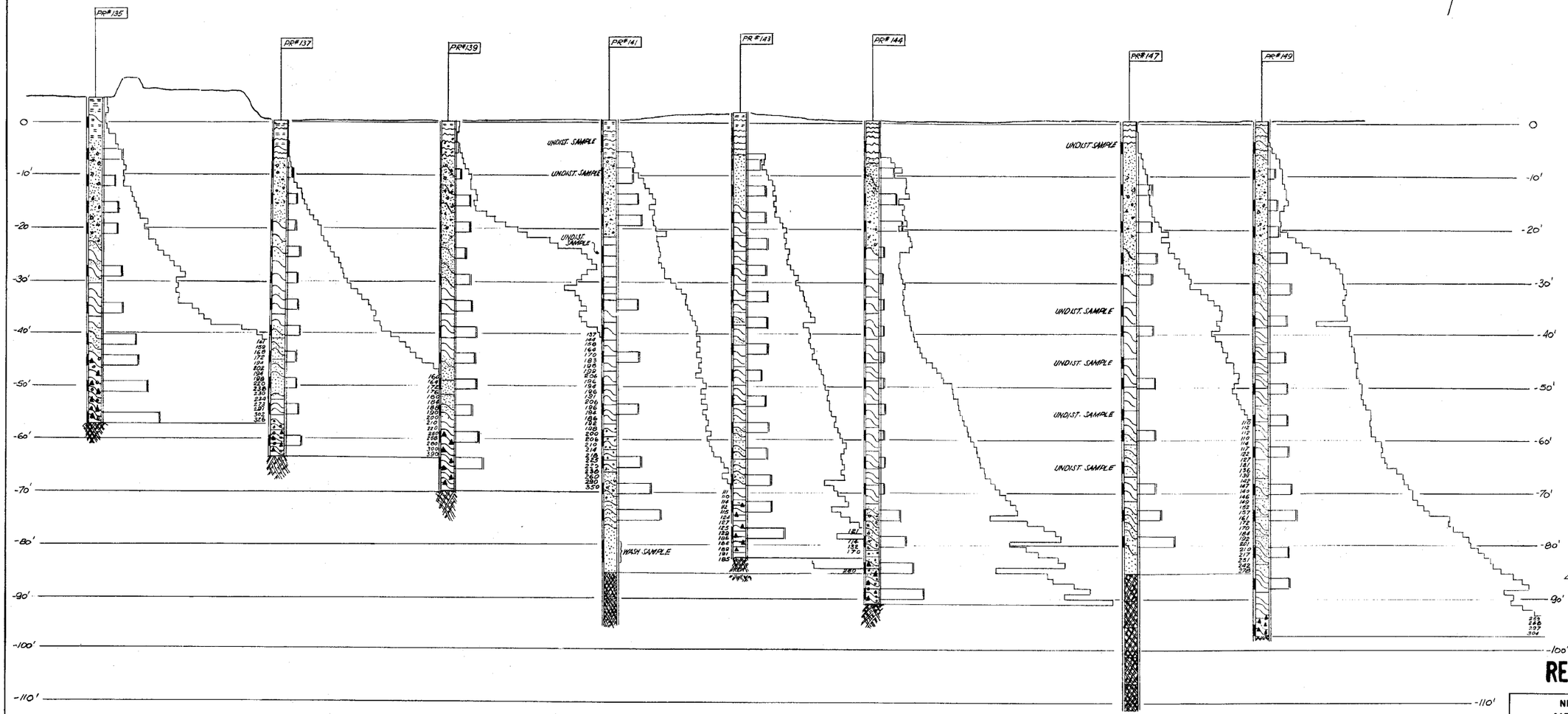
CONTRACT NO. W - 781.

SHEET NO. 126 OF 136

W-781



PASSAIC RIVER VIADUCT



NOTE:
FOR BORINGS PR# 136, 138, 140, 142, 145, 146, 150 SEE SHEET # 21

LEGEND

- FILL (CINDER)
- PEAT
- CLAY
- STIFF CLAY
- SILT
- STIFF SILT
- SAND
- GRAVEL
- ROCK (FRAGS.)
- BEDROCK
- PR# 42 — TEST HOLE NO.
- WATER LEVEL
- UNIT WET WEIGHT IN LBS. PER CUBIC FT.
- 118 (20) — MOISTURE CONTENT % DRY WEIGHT
- AREA IN WHICH SOIL SAMPLES ARE RECOVERED
- DOUBLE LINE INDICATES CASED BORINGS
- BLOW COUNT GRAPH 50 BLOWS PER INCH
- DOUBLE LINE INDICATES BLOWS ON SPOON

Note:
Borings made by the Giles Drilling Co. from Dec. 1949 to Jan. 1950.

REFERENCE DRAWING

Note:
See specifications for availability for inspection of samples, rock cores and driller's reports.

SEE CONTRACT NO. 148 "AS-BUILT" DRAWING FOR NOTES.

	BY	DATE
MADE		
TRACED		
CHECKED		
IN CHARGE OF		

NO.	REVISION	BY	DATE

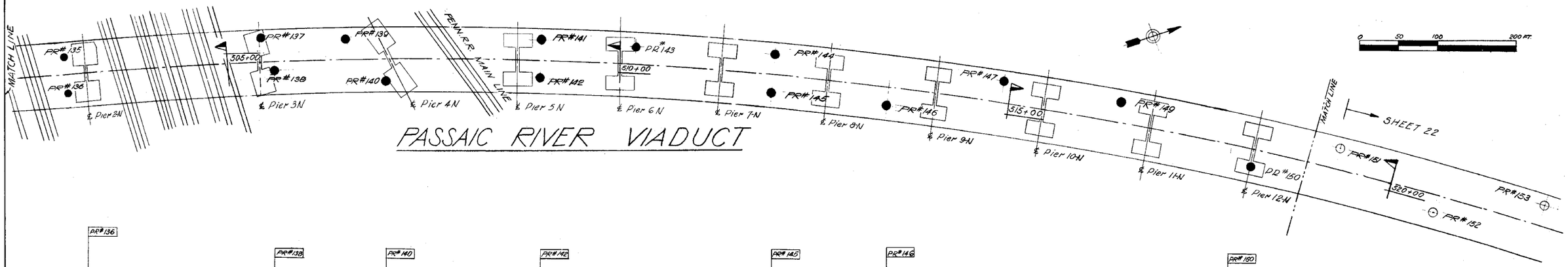
NEW JERSEY TURNPIKE AUTHORITY
NEW JERSEY TURNPIKE
SECTION NO. 6

PASSAIC RIVER BRIDGE
NORTH APPROACH PIERS AND ABUTMENT
BORINGS

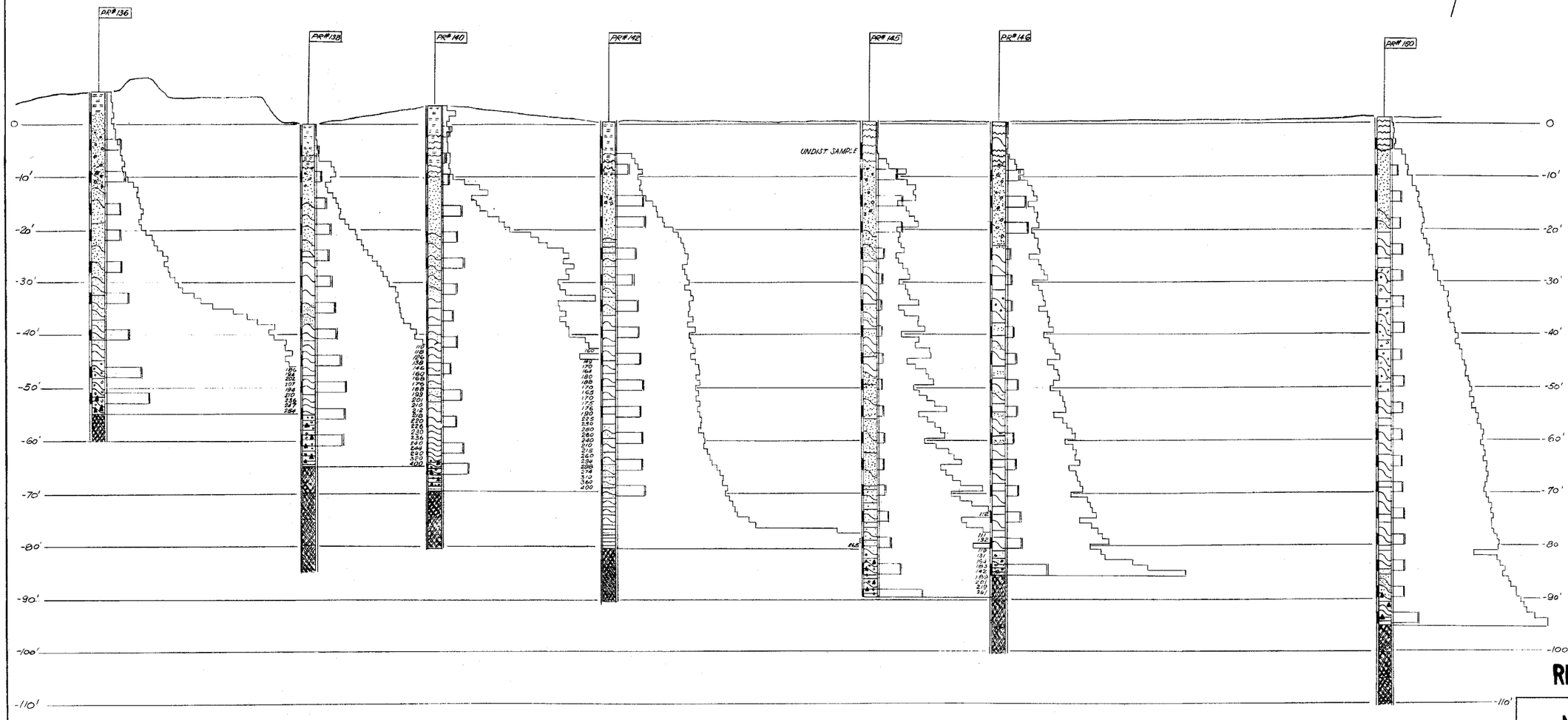
AMMANN & WHITNEY
CONSULTING ENGINEERS
76 NINTH AVENUE NEW YORK

SCALE: AS NOTED
CONTRACT NO. 148
SHEET NO. 20 OF 23

CONTRACT NO. W-781 SHEET NO. 106 OF 136



PASSAIC RIVER VIADUCT



NOTE:
FOR BORINGS PR# 135, 137, 139, 141, 143, 144, 147 AND 149 SEE SHEET # 20

LEGEND

- FILL (CINDER)
- PEAT
- CLAY
- STIFF CLAY
- SILT
- STIFF SILT
- SAND
- GRAVEL
- ROCK (FRAGS.)
- BEDROCK
- PR#42 TEST HOLE NO.
- WATER LEVEL
- UNIT WET WEIGHT IN LBS. PER CUBIC FT.
- 118 (20) MOISTURE CONTENT % DRY WEIGHT
- AREA IN WHICH SOIL SAMPLES ARE RECOVERED
- DOUBLE LINE INDICATES CASED BORINGS
- BLOW COUNT GRAPH 50 BLOWS PER INCH
- DOUBLE LINE INDICATES BLOWS ON SPOON

Note:
Borings made by the Giles Drilling Co. from Dec. 1949 to Jan. 1950.

REFERENCE DRAWING

Note:
See specifications for availability for inspection of samples, rock cores and driller's reports.

SEE CONTRACT NO. 14B "AS-BUILT" DRAWING FOR NOTES.

	BY	DATE
MADE		
TRACED		
CHECKED		
IN CHARGE OF		

NO.	REVISION	BY	DATE

NEW JERSEY TURNPIKE AUTHORITY
NEW JERSEY TURNPIKE
SECTION NO. 6

PASSAIC RIVER BRIDGE
NORTH APPROACH PIERS AND ABUTMENT
BORINGS

AMMANN & WHITNEY
CONSULTING ENGINEERS
76 NINTH AVENUE NEW YORK

SCALE: AS NOTED
CONTRACT NO. 14B
SHEET NO 21 OF 23