HUNTER RESEARCH

ARCHAEOLOGICAL MONITORING AND TESTING ENVIRONMENTAL REMEDIATION AT THE FORMER CONRAIL AND SPECTRASERVE SITES

INTERMODAL FERRY TRANSPORTATION CENTER CITY OF SOUTH AMBOY MIDDLESEX COUNTY, NEW JERSEY

Prepared for:

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MANAGEMENT SUMMARY

A program of archaeological monitoring was undertaken in 2016 and 2017 in connection with the remediation of contaminated soils at the site of the proposed Intermodal Ferry Transportation Center (IFTC) in the City of South Amboy, Middlesex County, New Jersey. The IFTC is located on the site of the former ferry terminals and rail yard facilities of the Camden and Amboy Railroad (later the Pennsylvania Railroad) on the Raritan Bay shoreline. This location lies within the Camden and Amboy Railroad (Main Line) Historic District, which has been deemed eligible for inclusion in the New Jersey and National Registers of Historic Places on the basis of opinions offered by the New Jersey State Historic Preservation Officer. Archaeological monitoring was performed in partial fulfillment of the requirements of a 2009 Memorandum of Agreement (MOA) developed under Section 106 of the National Historic Preservation Act of 1966 (as amended) for the IFTC project. The monitoring work was carried out by Hunter Research, Inc., working as a subcontractor to Potomac-Hudson Environmental, Inc., remediation engineers for the City of South Amboy.

Seven of the total of 18 remedial areas (#s 1, 3, 6-8, 10 and 18) produced no evidence of significant archaeological resources, although in some of these locations excavations did not proceed deep enough to penetrate all cultural strata. In three other remedial areas (#s 2, 4 and 5), remains of minimal interest were documented, consisting of mundane mid-20th-century features, such as concrete slab and recently manufactured iron and steel rails (i.e., from the later Pennsylvania Railroad period). In six remedial areas (#s 9, 11-14 and 17), rather more substantive remains were encountered which could be linked confidently with structures shown on historic maps. Generally speaking, these remains were not especially revealing or significant in their own right and their routine physical expression merely reinforced data accessible in the documentary record.

Archaeological remains of much greater interest were documented in the two remaining Remedial Areas (#s 15 and 16). In Remedial Area 15, remnants of a late 19th/early 20th-century engine house were uncovered, overlying the substantial masonry foundations of a mid-19th-century, Camden and Amboy Railroad-era turntable and one of its approach tracks. On the basis of careful archaeological and archival analysis, this turntable is thought to have been in use from the mid-1850s until 1887, when the structure was superseded by a larger, 60-foot-diameter turntable installed a short distance to the northeast. Portions of both turntables remain in place today, including most of the critical pivot base for the earlier turntable, but site remediation activity necessitated the removal of large parts of both structures.

In Remedial Area 16, archaeological monitoring and formal archaeological excavation explored the long and complex sequence of rail lines in the railyard, focusing on the tracks that ran along the spit-like landform extending out to the historic ferry terminal site. Traces of the base of the original Camden and Amboy Railroad rail bed, laid down in 1832, were pinpointed during the course of this work and it was established that the spit-like landform was built up by an additional two feet or so of sand fill to obtain the necessary gradient for the original rail line of the early 1830s. Native American artifacts were also recovered from undisturbed sand lay-

ers beneath the rail bed, indicating that this landform was a favored aboriginal setting. Adjacent to the original rail bed remains, two lines of large stone blocks were identified as re-used stone sleepers from the original rail bed, evidently serving as underpinning for the rail bed for later 19th/early 20th-century trackage.

The results of the archaeological monitoring in Remedial Areas 15 and 16, and to a lesser extent in Remedial Areas 9, 11-3 and 17, offer up the prospect that other mid-19th-century remains of buildings and structures may survive along the base of the southeastern slope of the spit-like landform extending out to the original ferry terminal site, especially to the southwest of the engine house. The documenting of the base of the original Camden and Amboy Railroad rail bed in Remedial Area 16 enables the grade of the original rail line in this area to be projected at approximately 14 to 15 feet above sea level. These elevation data have implications for the potential survival of the various structures shown along the route between the terminal and the village of South Amboy on maps of 1836 and 1850, most of which appear to have been located on the northwest side of the rail line or on the ridge of the spit-like landform. Overall, the data derived from Remedial Area 16 suggest a far greater likelihood than previously thought for survival of early Camden and Amboy Railroad features at the IFTC site, including at the original Camden and Amboy Railroad wharf terminal site on the Raritan Bay shoreline.

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Several staff at the New Jersey Historic Preservation Office assisted in the review of the monitoring activity, notably Katherine Marcopul, Administrator and Deputy State Historic Preservation Officer, and Vincent Maresca, Senior Historic Preservation Specialist. Special acknowledgement is made here to Pierre Lacombe, recently retired from the U.S. Geological Survey, for his expert knowledge and extremely helpful insights on the method of construction of the original Camden and Amboy Railroad rail bed. Accurate interpretation of critical field evidence would not have been possible without Pierre's contributions.

Throughout the period of archaeological fieldwork, close coordination was necessary with the remediation contractor, Ambient Group, LLC and there were many occasions on which Ambient staff assisted in excavation work that was clearly more archaeological than remedial in nature. Of the many Ambient staff who assisted us we wish to acknowledge Sergio Cardoso, Julian Heal, Charles Iepson, Daron Kolb, William Coffee, Hector Serrano, Kevin Hartwell and John Morganheira.

With regard to Hunter Research staff involvement, the project was conducted under the overall direction of Hunter Research Principal Archaeologists, Richard Hunter and James Lee, but the main burden of the complicated work in the field was shouldered by Joshua Butchko, Principal Investigator. He received assistance at critical times from Evan Mydlowski, Surveyor/Cartographer and Assistant Archaeologist. Additional background research was required as specific finds were made, especially with regard to the turntables, and this was largely performed by Principal Historian, Patrick Harshbarger, and Principal Archaeologist, Richard Hunter,

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with help from Eryn Boyce, Historian. Report graphics were produced by Evan Mydlowski under the direction of Richard Hunter and Joshua Butchko. Report layout was completed by Patricia Madrigal, Publications Director. This report was written by Richard Hunter, Patrick Harshbarger and Joshua Butchko.

Richard W. Hunter, Ph.D., RPA
Principal/President

Chapter 1

INTRODUCTION

This technical report describes and interprets the results of a program of archaeological monitoring undertaken in 2016 and 2017 in connection with the remediation of contaminated soils at the site of the proposed Intermodal Ferry Transportation Center (IFTC) in the City of South Amboy, Middlesex County, New Jersey (Figure 1.1). The IFTC is located on the site of the former ferry terminals and rail yard facilities of the Camden and Amboy Railroad (later the Pennsylvania Railroad) on the Raritan Bay shoreline. The specific location where remediation work occurred is also referred to as the former Conrail and Spectraserve sites. The archaeological monitoring task was carried out by Hunter Research, Inc., working as a subcontractor to Potomac-Hudson Environmental, Inc., remediation engineers for the City of South Amboy.

Based on earlier historical and archaeological studies, summarized in a report produced by Hunter Research in 2015, there was an expectation that archaeological traces of the Pennsylvania Railroad and, less likely, the Camden and Amboy Railroad phases of the South Amboy ferry terminal might survive below ground within the bounds of the former Conrail and Spectraserve sites. Such archaeological resources would potentially be considered as contributing elements of the Camden and Amboy Railroad (Main Line) Historic District, which has been deemed eligible for inclusion in the New Jersey and National Registers of Historic Places on the basis of opinions offered by the New Jersey State Historic Preservation Officer (June 26, 1975; October 4, 1991; March 23, 2016). Archaeological monitoring at the Conrail and Spectraserve sites was consequently performed in partial fulfillment of the requirements of a Memorandum of Agreement (MOA) developed under Section 106 of the National Historic Preservation Act of 1966 (as amended) for the larger IFTC project. The MOA, signed by the Federal Highway Administration, the New Jersey Historic Preservation Office, the New Jersey Department of Transportation and the City of South Amboy, was executed in December 2009 (Appendix A).

The principal responsibility of the archaeological monitor was to ensure that the remediation activities complied with the terms of the MOA and adhered to an archaeological monitoring protocol approved by the New Jersey Historic Preservation Office (NJHPO). A monitoring protocol, prepared by Hunter Research (see below, Appendix B), was approved by the NJHPO in August 2016 and guided the initial phase of archaeological monitoring activity completed between December 8, 2016 and January 18, 2017. Two levels of archaeological monitoring were envisaged in the protocol: basic observational monitoring and more detailed documentary monitoring. These two complementary approaches to monitoring, which were employed during the initial phase of work, are described in greater detail in Chapter 2 of this report.

Somewhat unexpectedly, in mid-January 2017, remedial excavations encountered two significant early railroad features: the remains of a turntable and a stretch of rail bed, both thought to date from the 1831-71 period of the Camden and Amboy Railroad. These resources were judged to be of sufficient historical importance that they merited a more intensive examination and documentation than was provided for in the original archaeological monitoring protocol. A detailed work plan was subsequently developed for further study of these remains and approved by the NJHPO on February 13, 2017 (see below, Appendix

C). Cast as supplementary archaeological monitoring and testing, this work was conducted between April 5 and 25, 2017. The current report addresses the results of both the original archaeological monitoring conducted in December 2016 and January 2017 and the supplementary monitoring and testing conducted in April 2017. The report supplements the document prepared by Hunter Research in 2015 which summarized a range of cultural resources investigations completed at the IFTC project site between 2000 and 2012 (Hunter Research, Inc. 2015).

Figure 1.1. Site Plan Showing Proposed Remedial Areas. Source: New Jersey Geographic Information Network 2015.

Chapter 2

ARCHAEOLOGICAL MONITORING METHODOLOGY

Stipulation I of the Memorandum of Agreement executed in December 2009 spells out two conditions for archaeological monitoring (Appendix A). The first condition, titled "Preconstruction Notice," concerns the communication of information about the archaeological monitoring needs of the Intermodal Ferry Transportation Center (IFTC) project and requires the development of "an archaeological monitoring/data recovery procedure" by the City of South Amboy. This procedure, prepared by Hunter Research on behalf of the City of South Amboy in August 2016 and approved by the New Jersey Historic Preservation Office (NJHPO), is included as Appendix B of the current document. The second condition of Stipulation I of the MOA, titled "Monitoring," provides a basic framework for the archaeological monitoring activity and reads as follows:

> *B. Monitoring – A professionally qualified archaeological monitor shall be present on-site and shall inspect all excavations/earthmoving operations that may result in subsurface disturbance. Two types of monitoring may be anticipated, and provisions for both types shall be included in the procedure developed as Task A above.*
>
> *Observational monitoring – which entails visual examination of work in progress and the rapid documentation of features or artifacts through photography, survey, and written notes.*
>
> *Documentary monitoring – requires discontinuation of construction related work for a longer period of time to investigate and document [sufficiently to meet any requirements for archaeological mitigation] archaeological features which are significant or potentially significant.*

As directed by the MOA, Hunter Research implemented the two levels of archaeological monitoring – observational monitoring and documentary monitoring – which are described in greater detail below. This two-level approach ensured that the archaeological monitoring was carried out in the most efficient manner during construction activities, where the objective was to minimize or eliminate time and cost delays to the remediation activities, while ensuring that historically significant archaeological materials relating to the Camden and Amboy Railroad (Main Line) Historic District were adequately documented. Archaeological monitors maintained regular contact with project engineers, Potomac-Hudson Environmental, Inc., and with the contractor, Ambient Group, LLC; complied with contractors' procedures and schedules on worksites; performed the required archaeological monitoring so as to limit, as far as possible, disruption to the overall construction schedule; and provided adequate staffing to complete appropriate monitoring procedures within the time frames specified.

At certain critical points during the remediation and archaeological monitoring operations onsite meetings were held to review the progress of the work and make decisions concerning how to most effectively document the archaeological resources being discovered. These meetings were attended by various combinations of Hunter Research archaeologists, environmental specialists and engineers from Potomac-Hudson Environmental, the contractor's field staff and representatives from the City of South Amboy, the New Jersey Department of Transportation and the New

Jersey Historic Preservation Office. Key meetings involving all of the above participants were held on January 18, 2017 at the conclusion of the initial phase of observational monitoring and on April 19, 2017, midway through the documentary monitoring and archaeological testing in Remedial Areas 15 and 16.

Observational monitoring was conducted between December 8 and 30, 2016 and January 3 and 18, 2017. It also continued intermittently and concurrently with the documentary monitoring between April 5 and 25, 2017 as the contractor undertook final remedial measures and site clean-up operations. The observational monitoring task involved the rapid recordation of numerous minor archaeological discoveries made during the contractor remedial operations. The work was accomplished by a single qualified archaeologist (principally Joshua Butchko), who undertook visual observation of excavations, the inspection of back dirt piles, the taking of measurements and written notes, digital photography, and the annotation of site maps and plans. Short-term cessation of work (involving stoppages of not more than two hours) occurred occasionally in order to complete some recordation actions. A daily monitoring log was maintained during observational monitoring and, along with other field data, forms the basis for many of the observations and interpretations included in this report.

Based on an earlier episode of observational monitoring performed in 2012 for the Radford Ferry Road phase of the IFTC project, it was thought at the outset of the remedial work that documentary monitoring would be unnecessary over much of the site. However, this proved not to be the case and extended documentary monitoring was ultimately performed for Remedial Areas 15 and 16 between April 5 and 25, 2017 when substantive remains dating from the Camden and Amboy Railroad period of site usage in 1831-71 were recorded. Documentary monitoring in this instance involved archaeologically-directed backhoe excavation, dewatering, extensive manual excavation, limited retrieval of artifacts, surveying using a total station and GPS, in-field scale drawing of plan views and profiles, and digital photography.

Remediation work was initially guided by earlier environmental studies that had identified contaminated soils at specific locations within the project site (Figure 1.1). Some of these locations were restricted to pockets of contamination; others covered more expansive areas. As the remedial excavations progressed, it was sometimes necessary to adjust the boundaries of the contaminated areas based on field observation and in-field soil testing. In the case of Remedial Areas 15 and 16, the limits of excavation were also adjusted to allow for better archaeological exposure. Figure 2.1 delineates the areas originally defined for remediation and the limits of actual excavation. In many instances, there was a close correlation between features of archaeological interest and loci of soil contamination (i.e., historic activities, such as locomotive and car maintenance taking place within the footprints of former buildings or structures, were often the source of the contamination, as was the case with the two turntables, the engine house and at least one car repair shop). Also indicated on Figure 2.1 is the location and direction of view of a series of eight photographs showing general site conditions before, during and after remediation (Photographs 2.1-2.8).

From the standpoint of identifying and documenting archaeological resources, the monitoring was carried out with constant and systematic reference to Figure 7.1 in the earlier report of cultural resources investigations (Hunter Research, Inc. 2015). This graphic, effectively a composite of historic site information compiled from a range of 19th- and 20th-century maps, helped archaeologists in pinpointing which of the many buildings and structures on the project site were likely being encountered during the monitoring operations. While a useful guide to building and structure identification, this graphic was by no means

Key

Remedial Areas (PHE Designation)

1. Remedial Area 1 (PHE S-9)
2. Remedial Area 2 (PHE S-5)
3. Remedial Area 3 (PHE S-17)
4. Remedial Area 4 (PHE TP-C5)
5. Remedial Area 5 (PHE Area 4)
6. Remedial Area 6 (PHE S-16)
7. Remedial Area 7 (AOC7-PHE 16)
8. Remedial Area 8 (AOC7-PHE 53)
9. Remedial Area 9 (PHE S-15)
10. Remedial Area 10 (AOC7-PHE 17)

11-13. Remedial Area 11-13 (AOC7-PHE 11 and 5)

14. Remedial Area 14 (AOC7-PHE 6)
15. Remedial Area 15 (PHE Area 2)
16. Remedial Area 16 (PHE Area 3)
17. Remedial Area 17 (PHE Area 1)
18. Remedial Area 18 (Shooting Range)

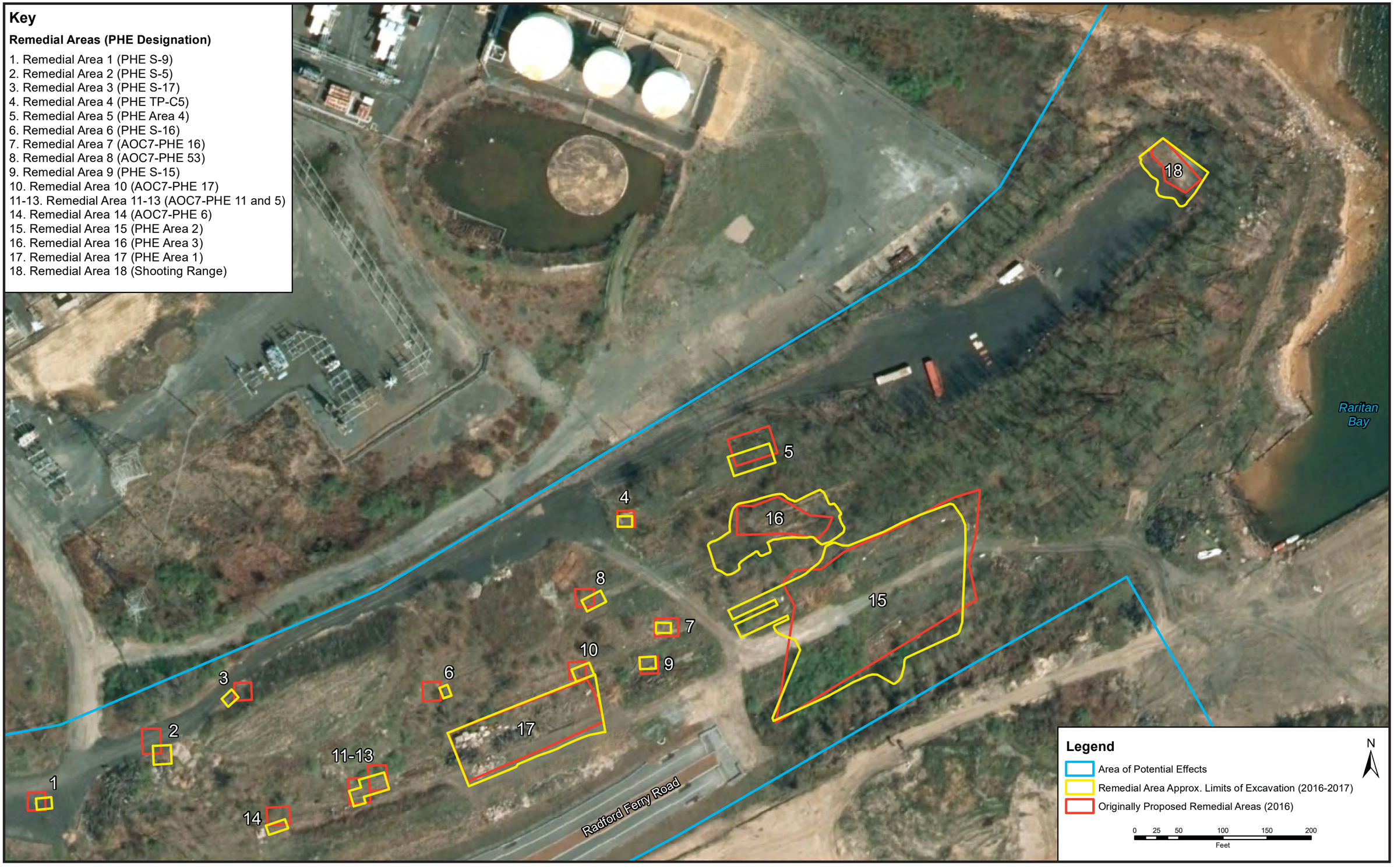


Figure 2.1. Site Plan Showing Proposed and Actual Remedial Areas. Source: New Jersey Geographic Information Network 2015.

Legend

- Area of Potential Effects
- Remedial Area Approx. Extent of Excavation (2016-2017)
- Excavation Locations (Hunter Research, 2001-02)
- Former Railroad Structures (For Key, See Hunter Research, Inc. 2015: Figure 7.1)

N

0 25 50 100 150 200
Feet

Key

Remedial Areas (PHE Designation)

1. Remedial Area 1 (PHE S-9)
2. Remedial Area 2 (PHE S-5)
3. Remedial Area 3 (PHE S-17)
4. Remedial Area 4 (PHE TP-C5)
5. Remedial Area 5 (PHE Area 4)
6. Remedial Area 6 (PHE S-16)
7. Remedial Area 7 (AOC7-PHE 16)
8. Remedial Area 8 (AOC7-PHE 53)
9. Remedial Area 9 (PHE S-15)
10. Remedial Area 10 (AOC7-PHE 17)

11-13. Remedial Area 11-13 (AOC7-PHE 11 and 5)

14. Remedial Area 14 (AOC7-PHE 6)
15. Remedial Area 15 (PHE Area 2)
16. Remedial Area 16 (PHE Area 3)
17. Remedial Area 17 (PHE Area 1)
18. Remedial Area 18 (Shooting Range)

Figure 2.2. Site Plan Showing Remedial Areas, Historic Features and Locations of Earlier Archaeological Excavations. See Hunter Research, Inc. 2015: Figure 7.1 for Key to Structures.

Photograph 2.1. View looking northeast across the southwest end of the project site prior to the start of remediation; Remedial Areas 11-13 (AOC7-PHE 11 and AOC7-PHE 5) are located behind the low wooded rise at left; Remedial Area 17 (PHE Area 1) is located at right (Photographer: Joshua Butchko, August 2016) [HRI Neg. #16008/D1:013].

Photograph 2.2. View looking northeast across the southwest end of the project site after the clearing of surface debris and vegetation; Remedial Areas 11-13 (AOC7-PHE 11 and AOC7-PHE 5) are located at left; Remedial Area 17 (PHE Area 1) is located at right (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:364].

Photograph 2.3. View looking west-northwest across the southwest end of the project site during remediation; Remedial Areas 11-13 (AOC7-PHE 11 and AOC7-PHE 5) are located at left; Remedial Area 17 (PHE Area 1) is located at right (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:007].

Photograph 2.4. View looking northeast across the center of the project site during remediation; Remedial Area 17 (PHE Area 1) is located at left; Remedial Area 15 (PHE Area 2) is located at right; Remedial Area 16 (PHE Area 3) is located on top of the spit-like landform just beyond the gravel road in the center of this view (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:006].

Photograph 2.5. View looking east across the southeast end of the project site during remediation; the western end of Remedial Area 15 (PHE Area 2), where the remains of several key railroad features were found, is in the center of this view (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:005].

Photograph 2.6. View looking east-northeast across the southwest end of the project site during remediation; the limits of Remedial Area 14 (AOC7 – PHE6) have been marked out in white spray paint prior to the start of remedial excavation (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:153].

Photograph 2.7. View looking east-southeast across the east end of the project site during remediation; excavation of Remedial Area 16 (PHE Area 3) is in progress in the center of this view (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:526].

Photograph 2.8. View looking northeast across the center of the project site during remediation; excavation of Remedial Area 15 (PHE Area 2) is in progress and the southeast corner of the engine house [Structure 58] is visible in the center of this view as indicated by the placement of the scale rods; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D8:061].

all-inclusive and there were important features of the site, most notably the earlier of the two turntables and traces of possible original Camden and Amboy Railroad rail bed, which were found that do not appear on Figure 7.1, nor on historic maps. Figure 2.2 reproduces a portion of the earlier Figure 7.1 on to which have been superimposed the remedial areas that were treated in 2016-17.

Two broad categories of artifacts were addressed during the archaeological monitoring. One category comprised large items of potential historical interest encountered during the initial site clearing operations and in remediation excavations. Most of these items were gathered from Remedial Areas 15-17. They included stone sleepers, fragments of wood pilings, concrete pier bases, lengths of iron rail and an assortment of metal (chiefly iron) objects, including a gear fragment, a chain, a rod and a clamp tool. Such materials were judged too large to remove from the site. They were instead stockpiled in the northeast corner of the site adjacent to a pair of containers and retained with the intention of making them available for possible future incorporation into "on-site interpretive materials or displays" as specified in Stipulation 4.A of the MOA (Photograph 2.9).

A second category of artifacts consisted of portable items recovered during the course of the monitoring work, most of which were found in April 2017 during manual archaeological excavation and documentation in Remedial Areas 15 and 16. These materials, including a number of Native American artifacts recovered from the excavation unit on the site of the former Camden and Amboy Railroad rail bed, are inventoried in Appendix D of this report. As per Stipulation 5 of the MOA, "artifacts recovered during fieldwork and not used for on-site interpretation are [to be] offered to the NJ State Museum, NJ Transportation Museum and other appropriate local or railroad focused facilities as identified in consultation with the SHPO."

Photograph 2.9. View of large items gathered from Remedial Areas 15-17 and stockpiled for possible future incorporation into on-site interpretive displays; these materials include stone sleepers, concrete pier bases, lengths of iron rail and a gear cogwheel (Photographer: Joshua Butchko, April 2017) [HRI Neg. #16008/D8:427].

Chapter 3

ENGINE HOUSE AND TURNTABLES (REMEDIAL AREA 15)

A. OVERVIEW

Remedial Area 15 (PHE Area 2) comprised a roughly rhomboidal-shaped zone of contamination measuring approximately 250 feet southwest-northeast by 150 feet northwest-southeast (Figure 3.1). This area was located toward the base of the slope that ran along the southeast side of the natural sandy spit-like landform extending out to where the ferry terminal was formerly situated. The principal sources of contamination within this area appear to have been a pair of oil houses [Structures 88 and 89] and the eastern end of an engine house/locomotive house [Structure 58]

This chapter addresses features of particular archaeological interest identified in the western and southern portion of the remedial area, namely the remains of the engine house [Structure 58], whose origins lie in the immediate pre-Civil War era, and the circular pits and footings of two turntables, one again apparently dating from the Camden and Amboy Railroad period just prior to the Civil War and the other [Structure 71], apparently its successor, being in existence from the late 1880s until shortly after World War I. Other archaeological remains of lesser interest in the eastern and northern portion of Remedial Area 15 are discussed in Chapter 5 below.

Back in mid-June 2001, exploratory backhoe trenching by Hunter Research toward the western end of Remedial Area 15 uncovered part of the foundation for the northwest wall of the engine house near the northern corner of the building (Trench 1). The foundation consisted of three courses of mortared brick masonry and lay beneath a concrete slab floor. In early April 2002, further limited archaeological testing, again using a backhoe, was performed approximately within the center of Remedial Area 15. This work encountered the northeast foundation of the engine house and a concrete pad outside and to the northeast of the building (Trench 17). These excavations exposed, but did not penetrate the concrete pad, although a small trench, 2.5 by 7 feet, was dug to a depth of 5 feet adjacent to and outside the engine house's foundation where the pad was absent. This trench documented a soil profile comprising 2 feet of trap rock, sand and gravel fill over 9 inches of coal and coal ash over a layer of culturally sterile sandy clay. The northeast foundation of the engine house was characterized as a concrete-faced, brick wall overlying a mortared gravel footing, extending to a depth of three feet below the ground surface. The masonry included Sayre & Fisher bricks, probably of late 19th- or early 20th-century date. The width of the wall was not established because the brick masonry was partially covered by the concrete floor of the engine house interior (perhaps an indication of a doorway). In neither Trench 1 nor Trench 17 did excavations attempt to explore the interior of the engine house or cultural deposits beneath the building (U.S. Department of Transportation, Federal Highway Administration and City of South Amboy 2003:4-50 and 4-51).

No further archaeological activity was undertaken in this area until early December 2016 when the remediation contractor installed silt fencing and excavated three 3 by 10-foot test trenches to confirm contamination conditions and locate utilities prior to starting larger-scale remedial work. These trenches, like the earlier archaeological tests, were placed between the engine house [Structure 58] and the oil and waste house [Structure 88] and were monitored by an archaeologist. All three trenches were dug to a depth

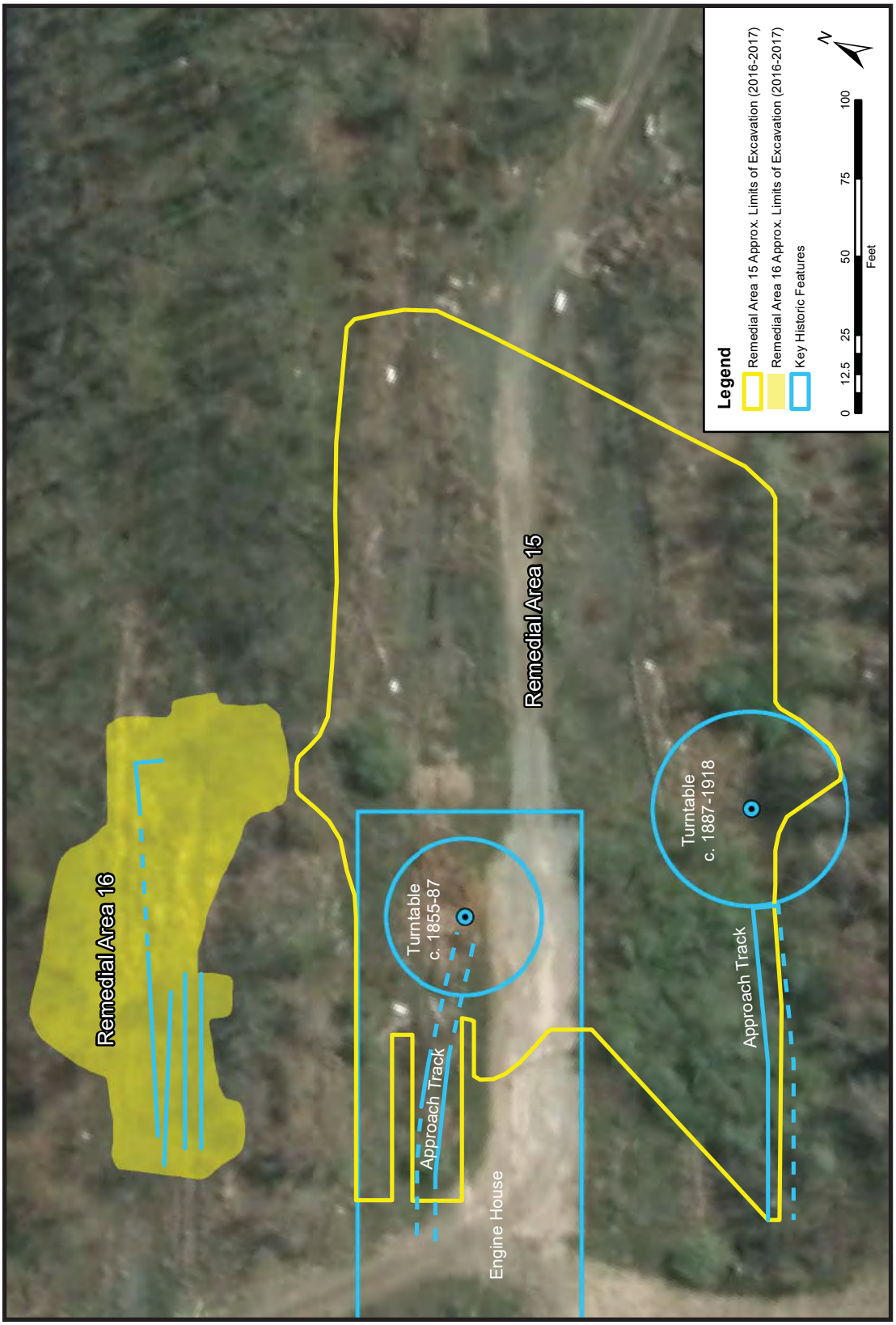


Figure 3.1. Remedial Area 15, Site Plan.

of 3.5 to 4 feet and found 1.5 to 2 feet of historic fill overlying a thick deposit of possibly redeposited natural sand. No structural remains were observed.

The initial phase of remediation excavations within Remedial Area 15 were performed in late December 2016 and early January 2017 and were subjected to observational archaeological monitoring. This work rapidly exposed the footprint of the northeastern end of the engine house and remains of the late 19th/early 20th-century turntable located just beyond and outside the building's eastern corner. The interior of the engine house contained a substantial concrete floor as well as a series of linear concrete channels running longitudinally within the building. These latter features were interpreted as ash pits for emptying and collecting coal fuel waste from locomotives. The turntable outside the engine house, a portion of which extended beyond the southeastern edge of the remediation area, had been disturbed by a concrete drain that bisected its circular pit. A substantial part of this late 19th/early 20th-century turntable, which is well documented on historic maps and in Interstate Commerce Commission records (see below), was removed as part of the remedial operations.

In the course of remediating the contaminated soils within the engine house, it was necessary to remove large areas of the concrete floor and ash pits. It was during this operation, conducted in mid-January, that remains of an earlier turntable were found beneath the engine house floor. Although compromised by the construction of the concrete floor and ash pits, just over half of the base of the turntable pit, including the all-important central pivot area, survived intact. Once the extent and potential significance of these remains were recognized, remediation excavation was halted to allow for more intensive archaeological documentation. An on-site meeting was held on January 18, 2017, attended by senior staff from Hunter Research, Potomac-Hudson Environmental and Ambient Group and representatives from the City of South Amboy, the New Jersey Historic Preservation Office and the New Jersey Department of Transportation. It was agreed that a program of documentary monitoring should be devised and implemented before remedial work could be concluded in this part of Remedial Area 15.

Following development and approval of a scope-of-work for the documentary monitoring, this task was implemented in April 2017 concurrent with additional observational monitoring as the remediation excavations progressed further to the southwest within the engine house. During this second phase of archaeological monitoring, more of the turntable was exposed and recorded both under the concrete floor and beneath and between the ash pits. In addition, a section of the foundations supporting an approach track leading into the turntable was found a short distance to the west. Some portions of the turntable were removed during the early stages of the remediation process, but substantial parts of the turntable pit, including the footings for the pivot, along with all of the observed remains of the approach track foundations, were left intact and reburied beneath the remedial gravel. A second on-site meeting, held on April 19, 2017 and attended by the same parties as the earlier meeting, reviewed the progress of the documentary monitoring and confirmed the plans to preserve as much of the turntable and approach track remains in place as possible.

B. HISTORICAL DETAIL

A comprehensive historic context for the South Amboy ferry terminal is provided in Chapter 5 of the earlier report on cultural resources investigations at the Intermodal Ferry Transportation Center (IFTC) site (Hunter Research, Inc. 2015). This section of the current chapter focuses more narrowly on the western portion of Remedial Area 15 and on the history of the key railroad features located there. While some critical records (published and manuscript sources; maps

and photographs) are available for the ferry terminal and depot, much important historical information may have been lost as a result of the Consolidated Rail Corporation's discarding and dispersal of original archival materials in the 1980s. Consequently, the task of reconstructing the overall evolution of the South Amboy ferry terminal and related facilities, and the history of specific buildings and infrastructure elements, is especially challenging and somewhat speculative. It is only in the early 20th century that the buildings and structures then standing in Remedial Area 15 become fully intelligible.

Two detailed maps have been identified showing the South Amboy ferry terminal and depot in the earliest years of the Camden and Amboy Railroad (Figures 3.2 and 3.3). Both dating from 1836 and prepared by the Perth Amboy surveyor and merchant, Francis W. Brinley, these maps reveal that the ferry terminal and depot comprised two distinct clusters of buildings roughly a third of a mile apart. Down on the bayshore was an L-shaped complex of buildings at the wharf; inland, at the intersection of the railroad with the Bordentown and Amboy Turnpike, were various shops, dwellings and the "Rail road house" (the tavern). Remedial Area 15 is situated roughly midway between the wharf and the tavern, close to a single, long, rectangular building which is thought to be one of two brick engine houses identified in a report prepared in 1840 listing the buildings of the Camden and Amboy Railroad (see below).

It is surmised that both the railroad tracks and the engine house would have occupied the crest of the sandy ridge or spit-like landform that extended out to the wharf. On one of the Brinley maps (Figure 3.2), the engine house lies between two sets of tracks, with the main line passing southeast of the building, and a cut-off passing along its northwest side. The other Brinley map (Figure 3.3), more of a sketch plan, shows only the main line passing southeast of the engine house, while the building is depicted as having two distinct sections of unequal size. The engine house shown on the 1836 maps is thought to be an entirely different building from the engine house examined during archaeological monitoring of Remedial Area 15 (see below).

An essential source for the early history of the South Amboy ferry terminal and depot is the annual reports of the Joint Board of Directors to the Stockholders of the Delaware and Raritan Canal and Camden and Amboy Railroad (and their successor, the United New Jersey Railroad and Canal Company), which were published yearly from 1840 until 1871 when these entities were absorbed into the Pennsylvania Railroad system. Several of these reports, most notably those of 1840 and 1850, provide valuable detail on the railroad's buildings, infrastructure and equipment. For South Amboy, the 1840 report identifies a brick car house, a frame car house, a frame transportation house, a frame house, a frame office, a wood shed and a wood water tank, all apparently at the wharf, and two brick engine houses, two frame carpenter shops, a frame blacksmith shop, a frame oil room, two wood sheds, two water tanks (one brick and one wood), two ice houses, a tavern and outbuildings, superintendent's house, store house and 18 dwelling houses, all in the depot and village. The order in which these buildings are listed aligns with the two clusters of activity evident on the maps of 1836, with the first of the two brick engine houses, described as 70 by 26.5 feet with two tracks and a metal roof, most likely corresponding to the structure shown midway between the depot and wharf close to Remedial Area 15 (Figures 3.2 and 3.3) (Joint Board of Directors of the Delaware and Raritan Canal Company and Camden and Amboy Railroad and Transportation Companies 1840; Hunter Research, Inc. 2015:5-36).

The report of the Joint Board of Directors, published a decade later, coupled with two manuscript "statements" produced in support of the report prepared by the railroad's engineer, William Cook, and assistant

Figure 3.2. Brinley, Francis W. Detail of *Map of the City of Perth Amboy, N.J.* 1836. Scale: 1 inch = 880 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

Figure 3.3. Brinley, Francis W. Sketch Map of the South Amboy Terminal of the Camden and Amboy Railroad. 1836. Not to scale. Approximate location of Remedial Areas 15 and 16 circled.

superintendent, Robert J. Van Rensselaer, offer an even more detailed picture of the South Amboy facilities. One of the statements specifies "the permanent improvements that have been made to the road" since 1840, describes its present condition and gives "a complete list of the real estate now belonging to the Company, observing, by the way, that some items of property which were enumerated in 1840, will not appear in the list now given, in consequence of having been destroyed, disposed of, or replaced by subsequent erection." The second statement lists the "number, kind and condition of the cars, locomotive engines, and appurtenances, of the tools and machines in the shops of the Company, together with an estimate of value on the first day of January 1850" (Cook 1850; Joint Board of Directors of the Delaware and Raritan Canal Company and Camden and Amboy Railroad and Transportation Companies 1850; Van Rensseelaer 1850; Hunter Research, Inc. 2015:5-37).

Cook's statement of 1850 divides the South Amboy real estate into two groups of assets, one dealing with the "Depot at Wharf" and the other the "Upper Depot." Eight structures are listed at the wharf: a frame car house, a brick car house with a continuation, two frame transportation houses, a frame transportation office, a frame car repair building, a passengers' office and a frame shed. The frame car house is notable for containing a 36-foot-diameter "turnaround," but the dimensions and location of this structure clearly do not correspond to the archaeological remains of the two turntables found in Remedial Area 15. The list of buildings and structures at the Upper Depot is far more extensive and includes the tavern house and outbuildings, a brick engine house, a brick blacksmith shop, three frame carpenter shops, 14 dwellings, 14 "shanty houses," a frame store, a market house/office, a slaughterhouse, a frame schoolhouse, two ice houses, a frame stable and a brick water tank. For the most part, using descriptions and dimensions, it is possible to match up buildings in the 1850 statement with those in the report of 1840. Several buildings had been expanded over the course of the decade and clearly the Upper Depot had grown into a true company village. Significantly, one of the two brick engine houses listed in 1840 (the one described as 70 by 26.5 feet in plan) is absent from the 1850 statement. It is suggested that this building, thought to have been located midway between the wharf and Upper Depot, may have gone out of use or been pulled down in the interim (Cook 1850; Joint Board of Directors of the Delaware and Raritan Canal Company and Camden and Amboy Railroad and Transportation Companies 1850; Hunter Research, Inc. 2015:5-37).

However, this hypothesis may not be correct since the Otley and Keily map of Middlesex County in 1850 (Figure 3.4) appears to show a building similar in outline to the structure on the Brinley sketch map of 1836 (Figure 3.3) in roughly the same location as that suggested for the 70-by-26.5-foot brick engine house. Perhaps this engine house was demolished around 1850 or Otley and Keily were gathering information for their map a few years earlier than its actual date of publication. In any event, the Otley and Keily map is instructive in showing how all of the buildings in the Upper Depot between the core of the village and wharf – probably the carpenter shops, the blacksmith shop and the other engine house – were located on the northwest side of the railroad tracks. The tracks also divided into three lines just east of Remedial Area 15, crossing the road and heading for the wharf. Remedial Area 15 would appear to be devoid of buildings at this time.

Unfortunately, no detailed reports for the South Amboy ferry terminal and depot have been identified subsequent to 1850 until the early 20th century. The historic map coverage is also wanting for this period since the Sanborn fire insurance coverage for South Amboy did not extend into the Pennsylvania Railroad facilities until 1918. Two maps are of some assistance, however, in showing how the depot facilities were evolving in the second half of the 19th century. A

Figure 3.4. Otley, J.W. and J. Keily. Detail of *Map of Middlesex County, New Jersey.* 1850. Scale 1 inch = 860 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

detailed inset of South Amboy in the Walling *Map of Middlesex County, New Jersey* in 1861 depicts a series of four new buildings – a car shop, a machine shop, a blacksmith shop and an engine house – on the southeast side of the railroad tracks between the village and the wharf (Figure 3.5). The location of the furthest northeast of these, the engine house, coincides roughly with Remedial Area 15. All or part of this structure may be the same engine house as the one encountered during archaeological monitoring (see below). There is no indication on the map that the building contained a turntable, as evidenced by the archaeology, but it is notable that the rail spur leading into the building does not exit at the opposite end, implying that a turntable could perhaps have been a feature of the engine house interior.

The map of South Amboy included in the Everts and Stewart *Combination Atlas Map of Middlesex County, New Jersey*, published in 1876, apparently shows the same engine house building, perhaps enlarged to the northeast (Figure 3.6). Interestingly, four tracks enter the building at its southwestern end, while two exit from the outer bays at its opposite northeastern end. The "bump-out" at the northeastern end of the building begs the question: could this have enclosed a turntable? A new car house and oil house are shown northeast of the engine house, while to the southwest an enormous car and machine shop replaced the line of three buildings shown on the Walling map of 1861. There are a number of other new buildings shown to the south of the car and machine shop, along with a large out-of-doors turntable on the southern edge of the depot facility. The appearance of two new wharves and several new buildings and structures, the arrangement of the various workshops and the general proliferation of railroad trackage on the Everts and Stewart map all hint at the substantial growth of the depot in the 1860s and 1870s. This map also depicts the course of the New York and Long Branch Railroad, opened in 1875, which added a whole other new dimension to South Amboy's railroad landscape.

While other topographic and coast survey maps around the turn of the 20th century continue to show the South Amboy ferry terminal and depot (e.g., Figure 3.7), it is not until the second decade of the 20th century that depot buildings and structures in the vicinity of Remedial Area 15 begin to come into sharper focus. Fire insurance maps prepared by the Sanborn Map Company in 1918, supplemented with information from Pennsylvania Railroad Company and Interstate Commerce Commission (ICC) records reveal important details about the engine house and other buildings and structures in this part of the depot which were pertinent to the archaeological discoveries.

The engine house, referred to as a locomotive house, is depicted on the Sanborn insurance map of 1918 as a long rectangular brick building topped by a four-foot high clerestory running along its central axis. It had exterior brick pilasters and two rows of wood posts spaced 17 feet apart in the building interior. Three sets of rail tracks entered the southwest end of the building and one set exited the opposite end in the southeasternmost bay (Figure 3.8). The ICC records for the United New Jersey Railroad Company, compiled in 1916, offer considerable further detail on the building, noting for example that the 12-inch brick exterior walls were set on a stone foundation and providing a floor plan showing a row of four 67.3-foot-long, 4-foot-wide brick-built ash pits at the northeastern end of the engine house. Why there were four ash pits in 1916 and only three sets of tracks shown on the Sanborn maps in 1918 is unclear (although it may be pertinent that the earlier Everts and Stewart map of 1876 showed four, not three, sets of tracks entering the building). Inside the engine house, according to the early 20th-century ICC records, there were a set of 7-inch-diameter plate bending rolls (made by J. Molyneaux in 1887), a 1.5 cubic yard clam shell bucket (perhaps for emptying the ash pits), a superheater unit test set, a gauge tester, a grindstone and a yoke. Overall, the engine house at this time seems to have

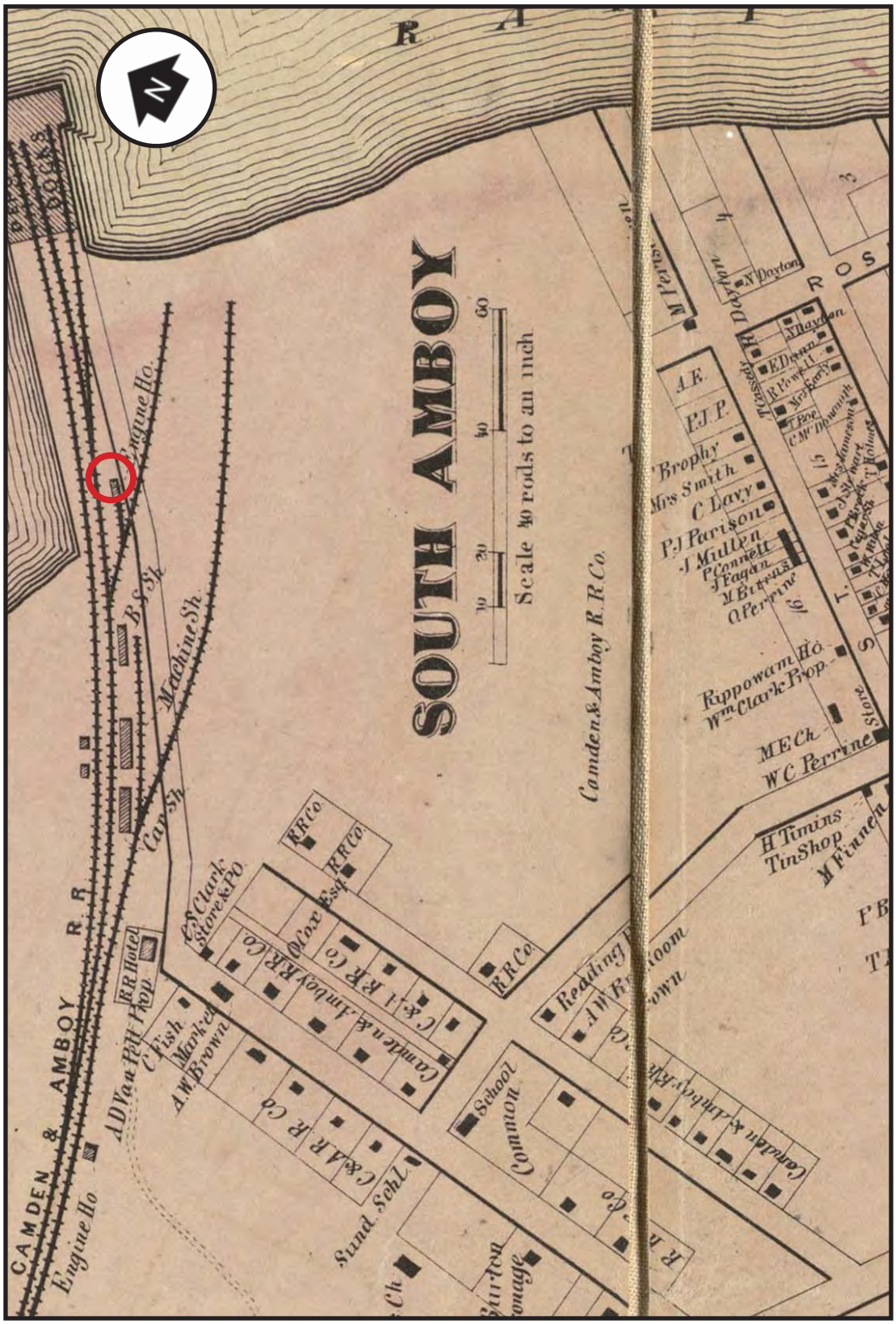


Figure 3.5. Walling, H.F. Detail of *Map of Middlesex County, New Jersey.* 1861. Scale 1 inch = 280 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

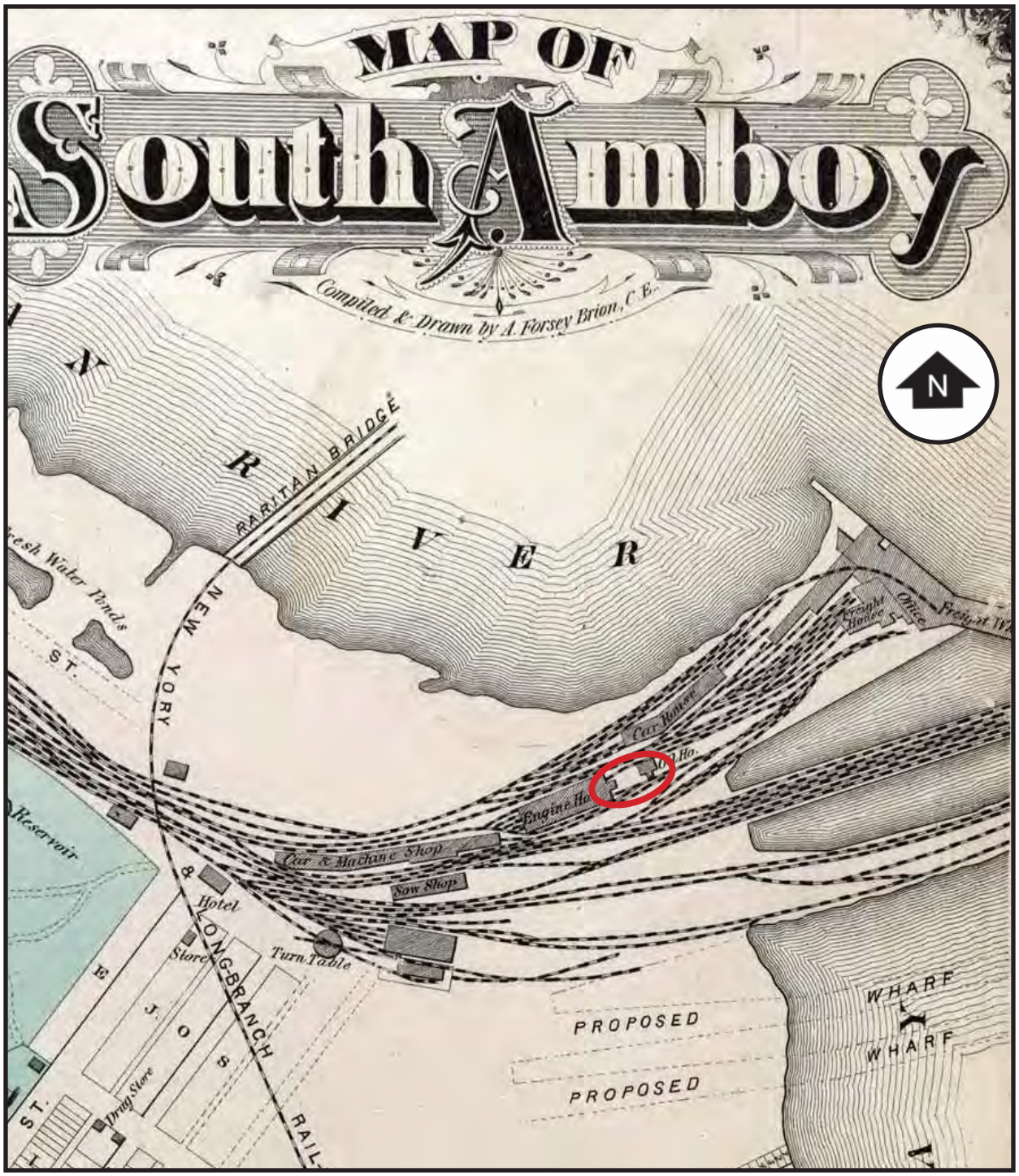


Figure 3.6. Everts and Stewart. Detail of Map of South Amboy. Combination Atlas Map of Middlesex County, New Jersey. 1876. Scale 1 inch = 395 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

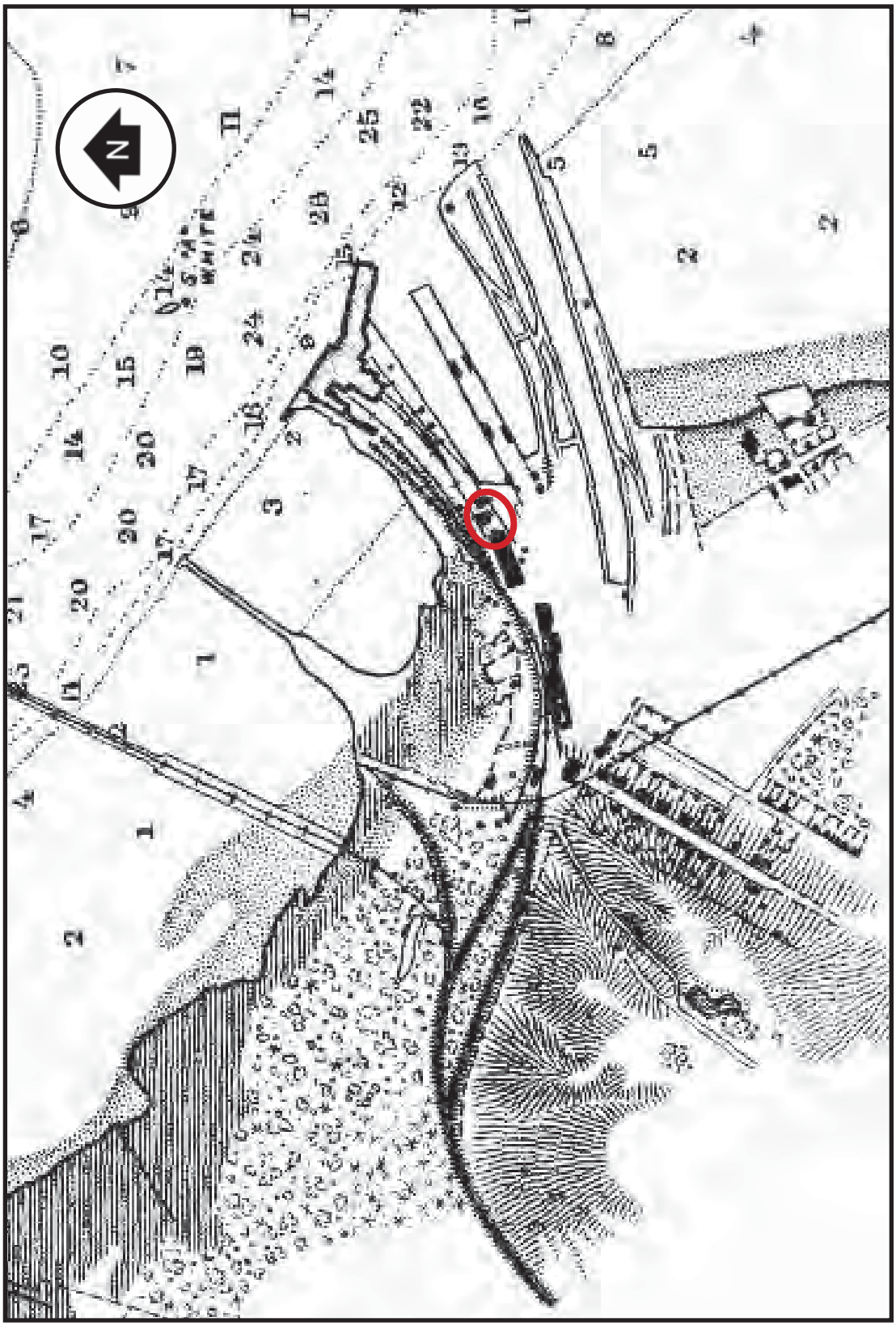


Figure 3.7. U.S. Coast and Geodetic Survey. Detail of *Raritan River from Raritan Bay to New Brunswick, New Jersey.* 1907. Scale 1 inch = 640 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

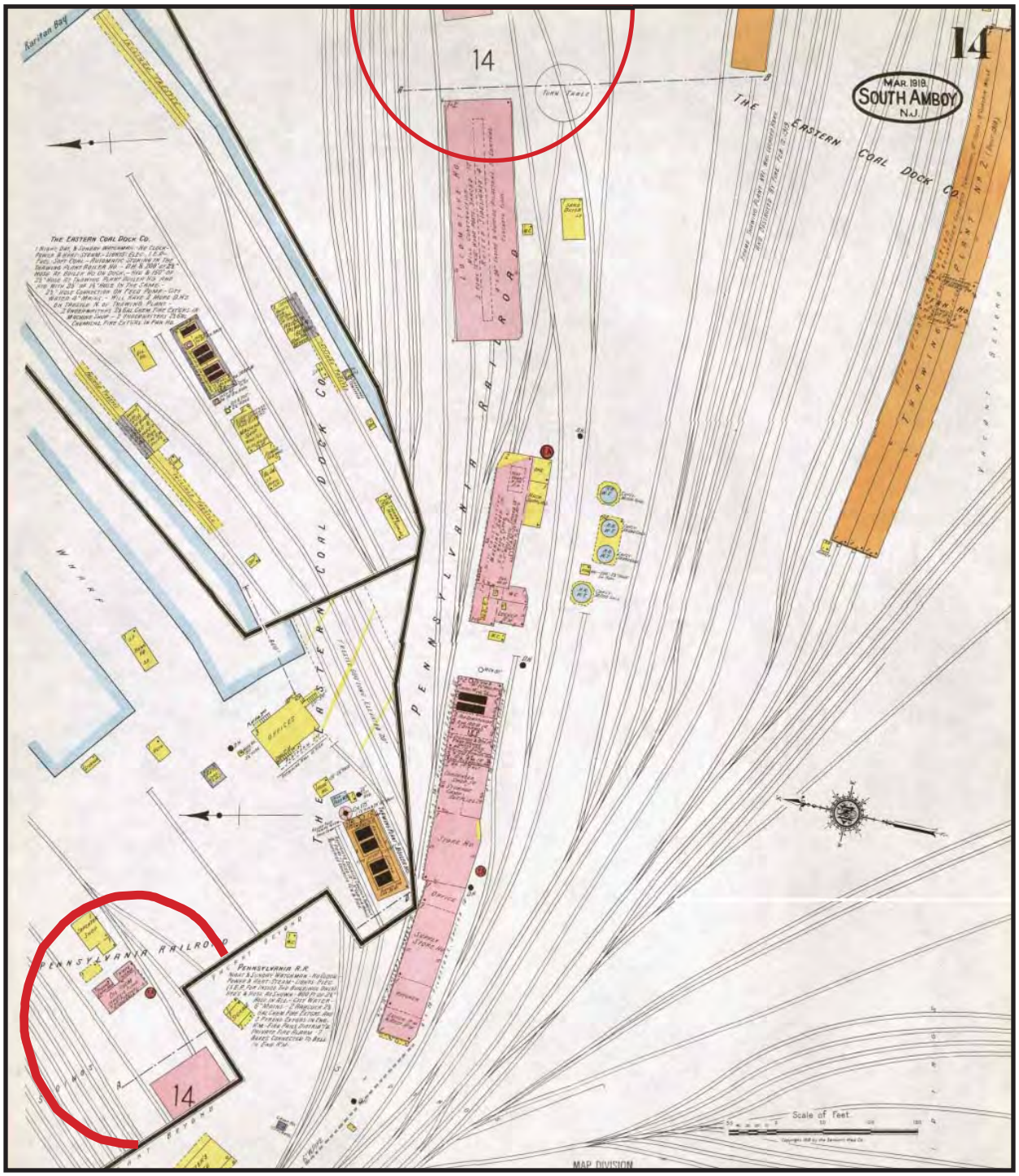


Figure 3.8. Sanborn Map Company. Sheet 14. *Insurance Maps of South Amboy, Middlesex County, New Jersey.* 1918. Scale 1 inch = 170 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

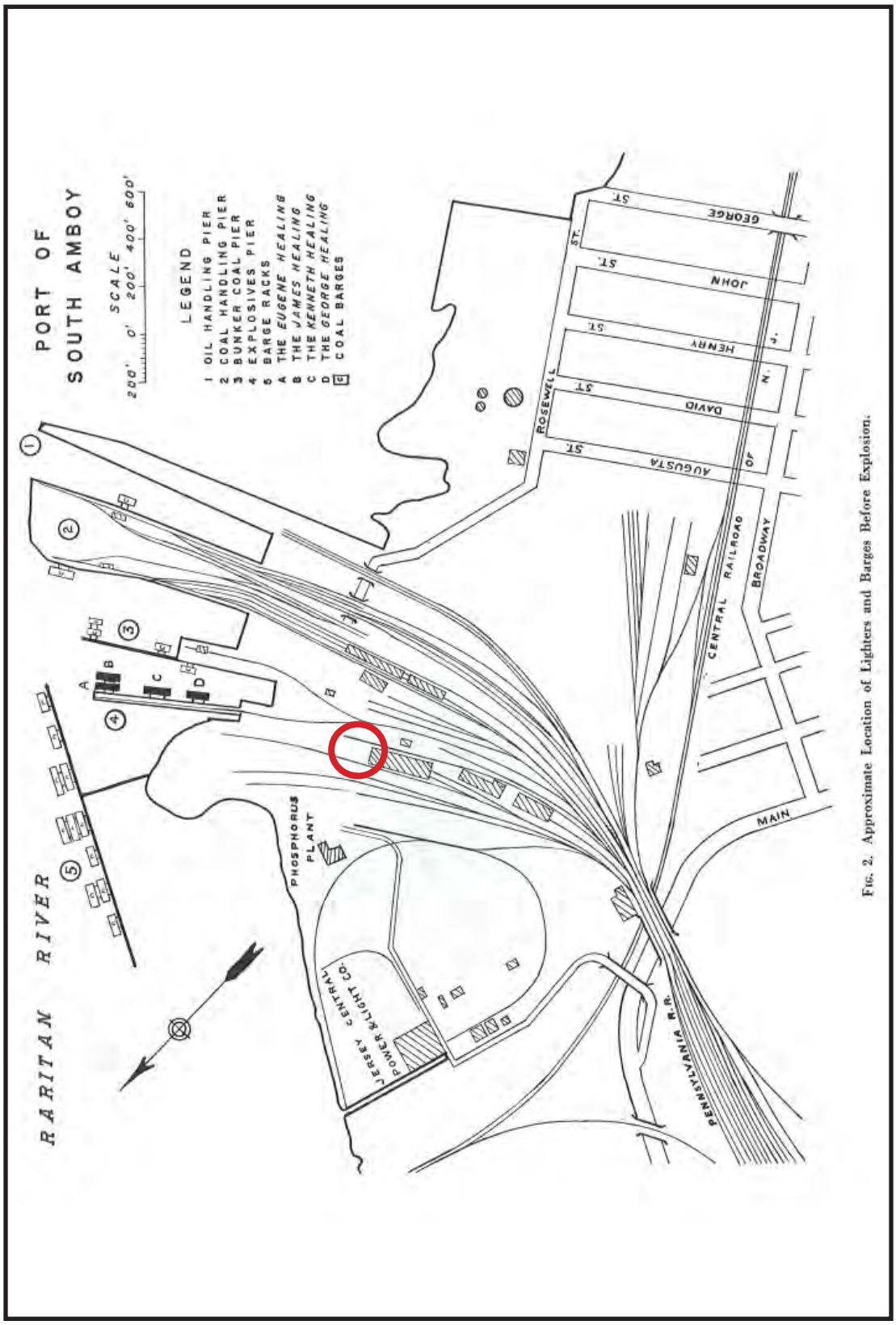


FIG. 2. Approximate Location of Lighters and Barges Before Explosion.

Figure 3.9. National Board of Fire Underwriters and the Fire Insurance Rating Organization of New Jersey. Plan of the Port of South Amboy Showing the Location of Lighters and Barges before the Explosion of May 19, 1950. 1951. Scale as shown. Approximate location of Remedial Areas 15 and 16 circled.

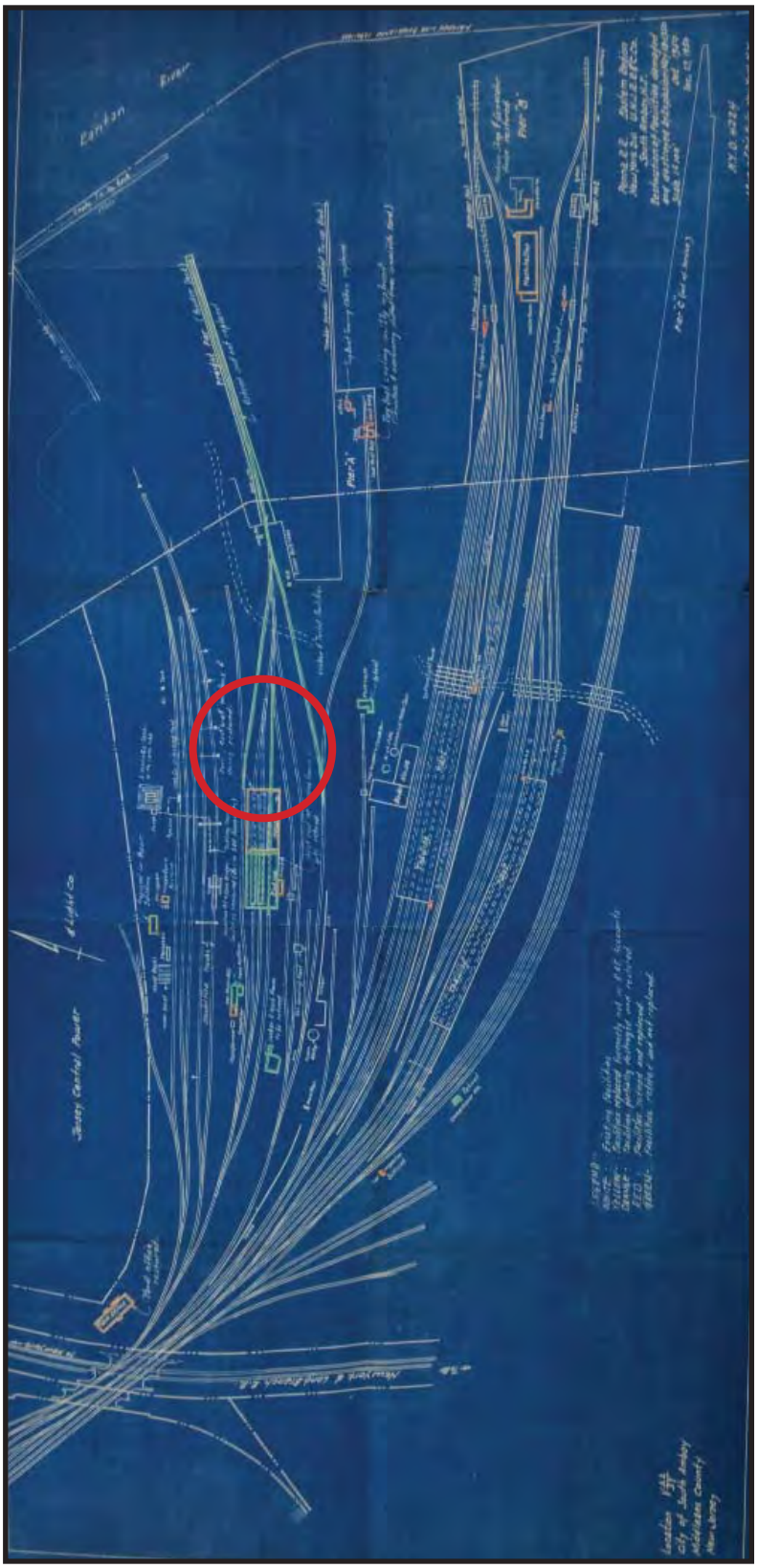
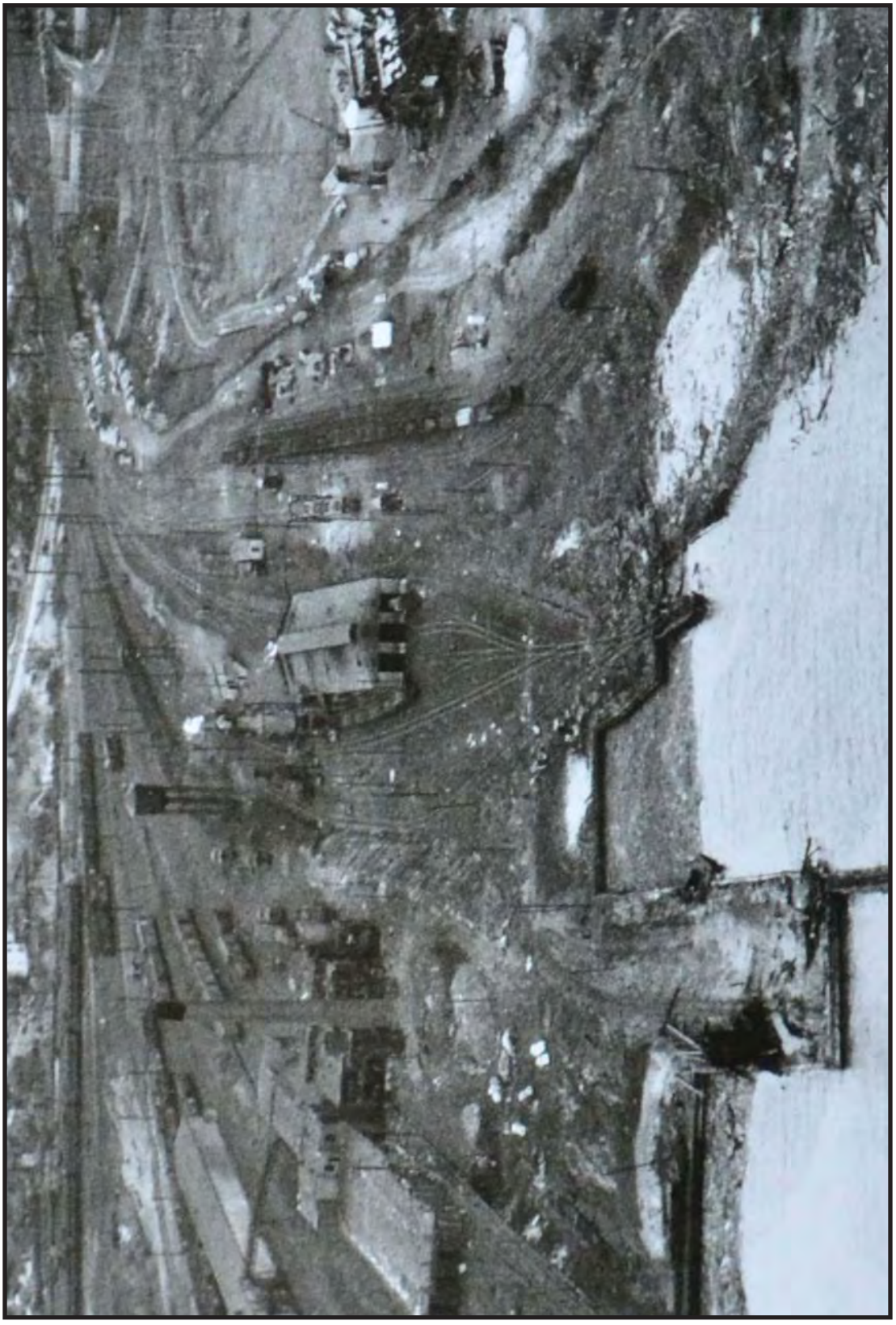


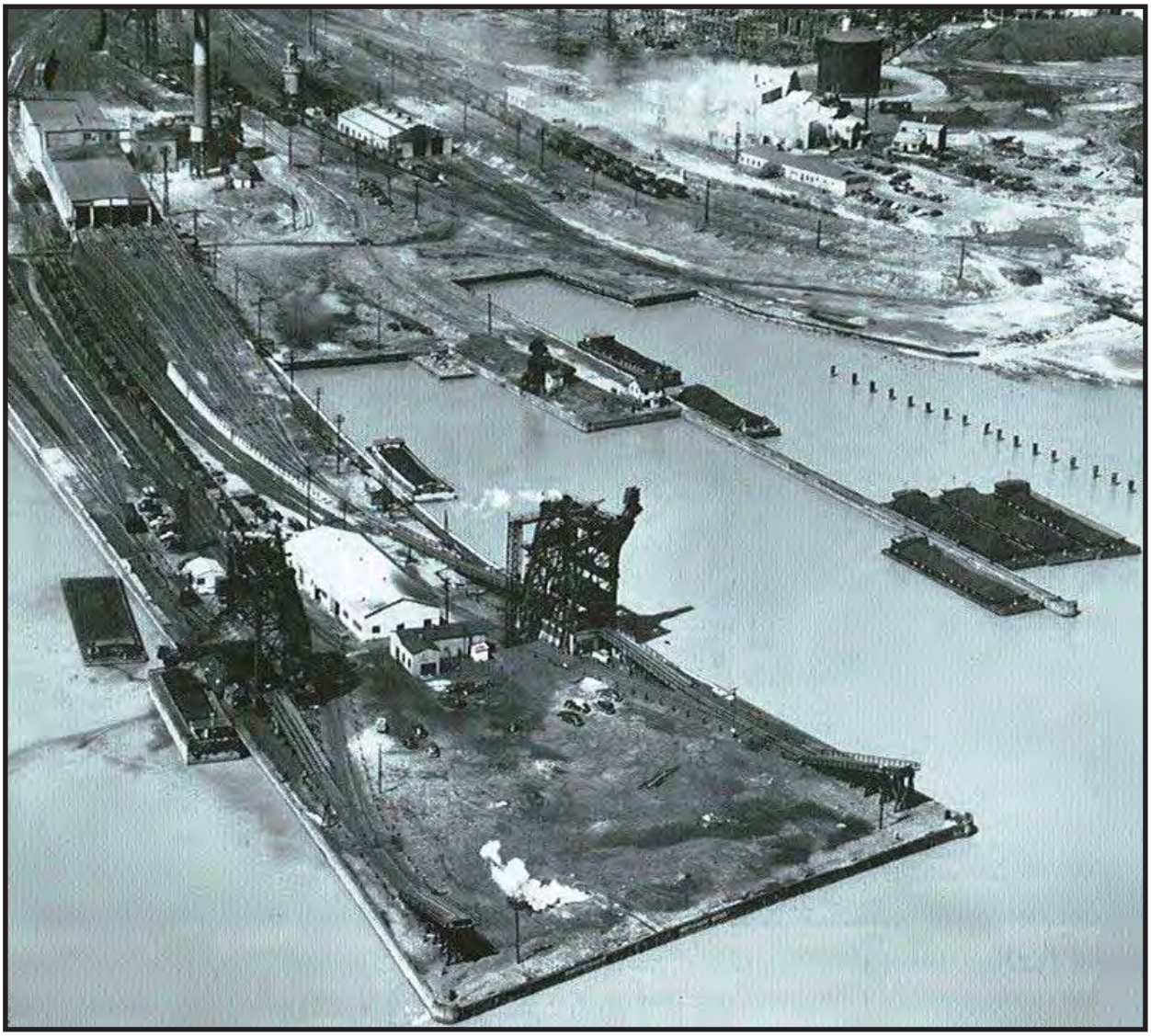
Figure 3.10. Pennsylvania Railroad Company. *Restoration of Facilities Damaged and Destroyed by Explosion May 19, 1950.* 1950. Scale: 1 inch = 400 feet (approximately). Approximate location of Remedial Areas 15 and 16 circled.

Photograph 3.1. Aerial view of the South Amboy terminal looking west, *circa* 1950 (detail); this photograph was taken shortly before the explosion of May 19, 1950; the engine house is at upper center of view (Source: Hagley Museum and Library, Pennsylvania Railroad Photographs Collection E.18366).

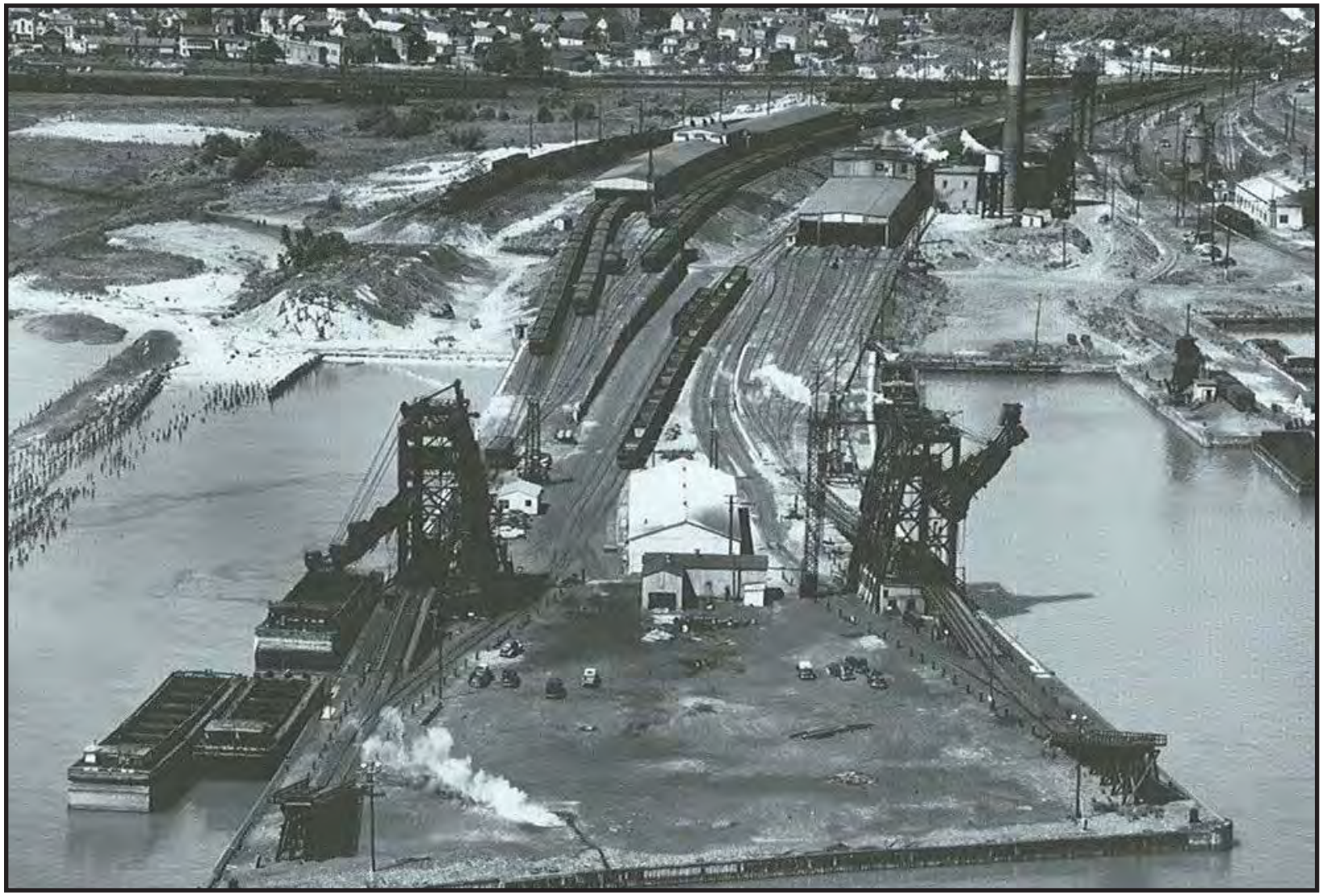


Photograph 3.2. Aerial view of the South Amboy terminal looking southwest, *circa* 1950 (detail); this photograph was taken shortly after the explosion of May 19, 1950; the engine house is in center of view (Source: Hagley Museum and Library, Pennsylvania Railroad Photographs Collection E.18367).

Photograph 3.3. Aerial view of the South Amboy terminal looking southeast, *circa* 1950 (detail); this photograph was taken shortly after the explosion of May 19, 1950; the engine house is at right center of view (Source: Hagley Museum and Library, Pennsylvania Railroad Photographs Collection E.18367).



Photograph 3.4. Aerial view of the coal handling pier at the South Amboy terminal looking west, *circa* 1953; the engine house is at upper center left of view; note the southwestern end of the building has been removed (Source: Francy 1998:38).



Photograph 3.5. Aerial view of the coal handling pier at the South Amboy terminal looking west, *circa* 1953; the engine house is at upper right of view; note the southwestern end of the building has been removed (Source: Francy 1998:38).

seen fairly limited use, possibly far less than in earlier years when major locomotive upkeep may have been taking place in the building (Interstate Commerce Commission 1916).

Northeast of the engine house in 1918 were an oil room, constructed in brick, and a frame carpenter shop, while a few feet beyond the building's eastern corner was a turntable (Figure 3.8). The ICC records of 1916 itemize the latter structure as a 60-foot-diameter steel turntable set within a mortared brownstone perimeter wall. A Pennsylvania Railroad Company field book from 1910 offers further information, referring to it as a "60-foot plate girder turntable" built by the Philadelphia Bridge Works in January 1887. A sketch cross-section gives basic dimensions and shows the turntable pit as having a brick floor and an offset on the interior of the perimeter wall on top of which the table's balance wheels would have run. The Philadelphia Bridge Works, based in Pottstown, Pennsylvania, was operated by the firm of Cofrode & Salor from 1877 to 1896 and specialized in the manufacture of railroad bridges and turntables (Philadelphia Bridge Works 1897; Pennsylvania Railroad Company 1910; Interstate Commerce Commission 1916; Darnell 1984:61).

Subsequent Sanborn fire insurance maps for South Amboy, produced in 1930 and 1948, continue to show the engine/locomotive house in much the same fashion as the 1918 Sanborn map with three sets of tracks entering the building, but on each of these maps all three sets of tracks are also shown as exiting the building at its opposite northeastern end. The turntable outside the engine house, based on these same maps, had gone out of use sometime between 1918 and 1930 and its site was evidently filled and graded following removal of the turntable equipment (Sanborn Map Company 1930, 1948; Pennsylvania Railroad Company 1950).

The engine house remained in use throughout the inter-war period, but, as with most of the depot facilities, it sustained damage from the massive explosion of May 19, 1950 which resulted in the deaths of 26 dock handlers and five barge captains. Maps and photographs document the ferry terminal site shortly before and after the explosion, showing the enormous devastation along the waterfront (Figures 3.9 and 3.10; Photographs 3.1-3.3). The engine house managed to withstand the blast, but suffered some structural and exterior damage such that the southwestern half of the building was soon removed entirely. The northeastern half of the building was restored and resumed limited use (Photographs 3.4 and 3.5). The South Amboy terminal facilities spiraled into decline in the second half of the 20th century, being subject to the merger of the Pennsylvania Railroad with the New York Central Railroad in 1957-68 and to the bankruptcy of its successor entity, Penn Central, in 1970. Conrail took over Penn Central in 1976, but three years later abandoned the South Amboy operations, selling the terminal site to the Modern Transportation Company (later known as Spectraserve). The engine house remained standing and continued in marginal use throughout these ownership changes, eventually being used by Spectraserve for storage purposes. The building was abandoned in the late 1980s and pulled down in the late 1990s (National Environmental Title Research [NETR] 1995).

C. ARCHAEOLOGICAL FIELD INVESTIGATIONS

Excavation along the southeastern edge of Remedial Area 15 encountered the remains of the late 19th/early 20th-century turntable and an approach track, both depicted on the Sanborn map of 1918 (Figures 3.8 and 3.11; Photographs 3.6-3.12). A segment of the turntable's mortared stone perimeter wall and a brick-lined, ash-filled pit were initially exposed during the course of silt fence installation, helping to pinpoint the

location of this feature early on during the remediation work (Photograph 3.6). It is unclear whether the brick-lined pit was related to the operation of the turntable (perhaps serving as a sump) or, perhaps more likely, was an unrelated later feature. It contained one square timber piling and may also have been connected to the cast-iron standpipe and pipe with a valve, located a short distance to the east. These pipes and a terracotta pipe all cut through the turntable's perimeter wall and were clearly later features.

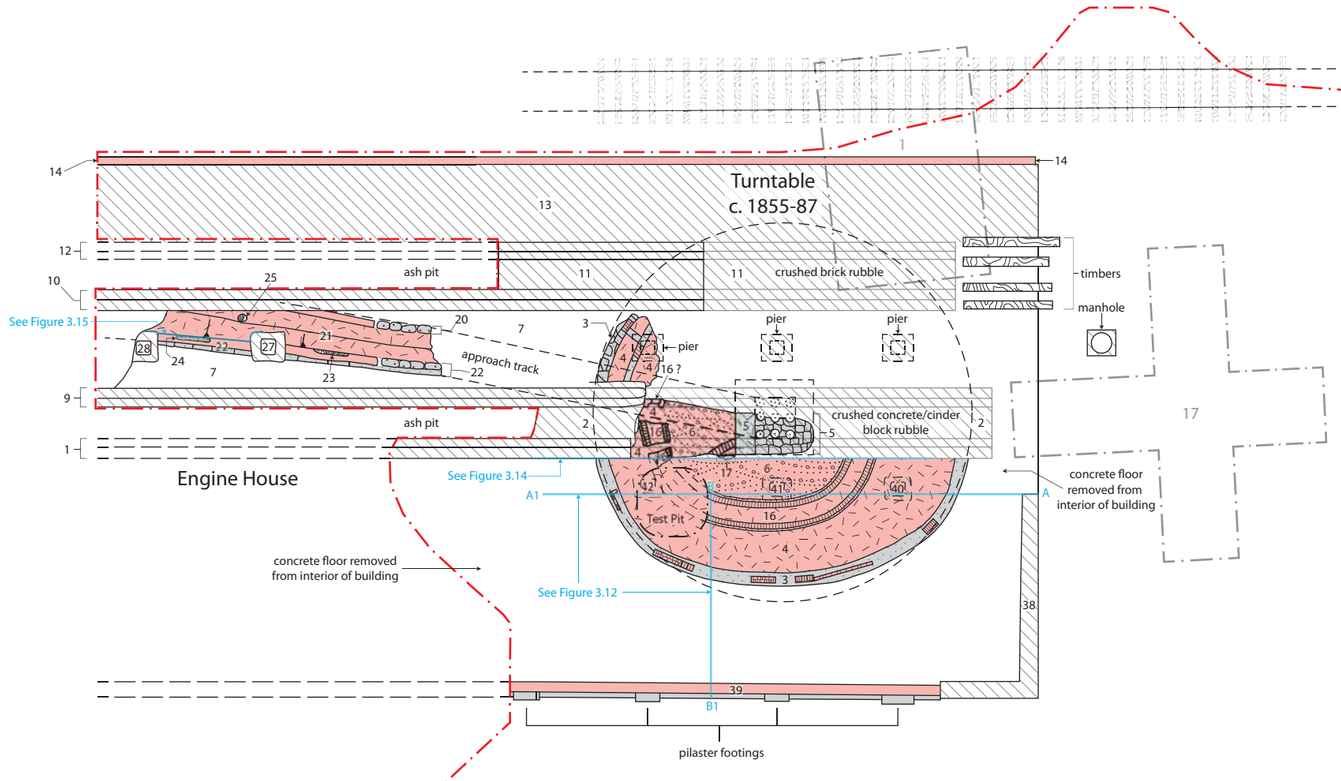
When larger-scale remedial excavation commenced and extended to depths of up to five feet below grade, work proceeded from southwest to northeast and the first remains to be examined were the mortared brick foundations for one of two approach tracks that led in to the turntable (Photographs 3.7-3.9). A roughly 100-foot length of these foundations was exposed and found to consist of two parallel brick walls, two feet wide and roughly three feet high, enclosing a four-foot-wide, brick-floored, channel-like space, which was filled with coal ash and an upper layer of sand, gravel and rubble. A very slight curve was evident in the line of these foundations, which closely matched the alignment of the southernmost approach track shown on the Sanborn map of 1918. No traces of the other more northerly approach track were observed. The approach track foundations are presumed to have supported standard gauge track which is 4 feet 8.5 inches wide. The tunnel-like space between the sidewalls would have been used by workers inspecting the underside of a locomotive and tender, and would also have served to collect ash, fuel waste and lubricant.

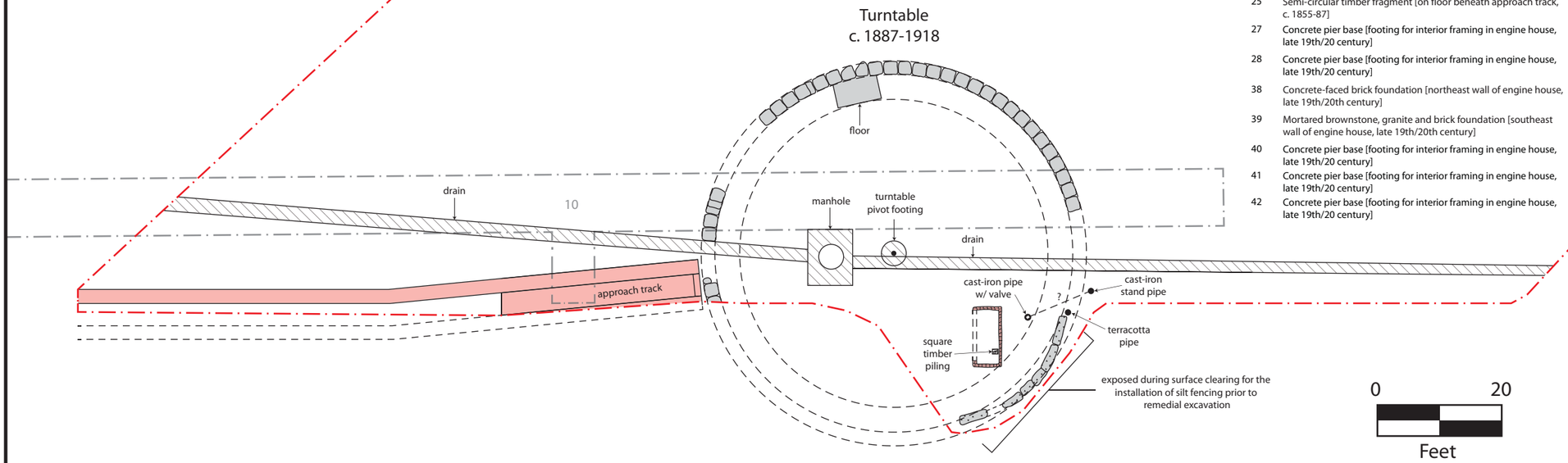
The northeastern end of the approach track's brick foundations abutted the stone masonry of the turntable's perimeter wall. This intersection was somewhat disturbed by the installation of a later concrete drain that bisected the turntable (Figure 3.11; Photographs 3.8 and 3.9). The drain passed over the center point of the turntable and was serviced by a manhole, the construction of both features resulting in the removal of much of the interior of the turntable pit. The concrete pivot base for the turntable, which was largely obscured by the drain, was approximately four feet in diameter and encased at least two (probably four) iron rods which presumably would have held the center bearing mechanism of the turntable securely in place (Photograph 3.10). Since it is fashioned in concrete, it is possible that this is not the original pivot base.

The turntable's mortared stone perimeter wall was largely intact except where it had been pierced by the concrete drain (Photographs 3.11 and 3.12). Roughly two feet in thickness and composed of blocks of gneiss, marble, brownstone and shale, it was observed at various stages prior to its removal and documented as forming a circle 62 feet in exterior diameter (i.e., enclosing an interior space 58 feet in diameter). The wall survived to a height of up to four feet in places and toward its base on the interior there was a substantial mortared stone offset, four feet in width. This offset, which evidently encircled the entire structure, would have supported the balance wheels beneath the turntable perimeter. No evidence was observed for the brick paved floor that the Pennsylvania Railroad Company field notebooks show in a cross-section sketched in 1910 (see below, Figure 3.16).

In the course of the remediation work, most of the turntable foundations to the northwest of the concrete drain were removed, but the pivot base, the brick-lined pit, much of the perimeter wall to the southeast of the drain, and the approach track foundations all still remain intact. Upon inspection, following their excavation and removal, many of the stone blocks forming the perimeter wall were found to be sleepers re-used from another rail bed, probably from the early Camden and Amboy Railroad phase (1831-71). These stones displayed the characteristic dimensions, spike holes and plate marks of sleepers observed elsewhere along the Camden and Amboy rail corridor. This topic is discussed in greater detail in Chapter 4 below. The

Remedial Area 15, Site Plan, Turntables and Northeast End of Engine House





Context List

Context	*Description [Interpretation] (Munsell)*
1	Concrete wall [southeast sidewall of ash pit in engine house center bay, c. 1920s]
2	Concrete floor [ash pit in engine house center bay, c. 1920s]
3	Mortared brownstone foundation and brick wall [turntable pit perimeter wall, c. 1855-87]
4	Mortar-coated brick floor [turntable pit floor, c. 1855-87]
5	Mortared brownstone foundation enclosing stone rubble w/ wood pilings and iron spikes [turntable pivot footings, c. 1855-87]
6	Crushed brick and stone rubble [turntable pit subfloor, c. 1855-87]
7	Wet sand [construction bedding deposit for turntable, c. 1855-87] (10YR 6/8)
9	Concrete wall [northwest sidewall of ash pit in engine house center bay, c. 1920s]
10	Concrete wall [southeast sidewall of ash pit in engine house northwest bay, c. 1920s]
11	Concrete floor [ash pit in engine house northwest bay, c. 1920s]
12	Concrete wall [northwest sidewall of ash pit in engine house northwest bay, c. 1920s]
14	Mortared brick foundation [northwest wall of engine house, late 19th/20th century]
16	Mortared stone footing capped w/ brick [track for balance wheels in turntable pit floor, c. 1855-87]
17	Mortared stone footing capped w/ brick [turntable pit floor, c. 1855-87]
20	Mortared brownstone and brick foundation [northwest sidewall supporting approach track, c. 1855-87]
21	Mortar-coated brick floor [floor beneath approach track, c. 1855-87]
22	Mortared brownstone and brick foundation [southeast sidewall supporting approach track, c. 1855-87]
23	Timber beam w/ metal bracket, 4.5 x 0.8 x 0.2 feet [incorporated into southeast sidewall supporting approach track, c. 1855-87]
24	Timber beam w/ metal bracket, 4.0 x 0.8 x 0.2 feet [incorporated into southeast sidewall supporting approach track, c. 1855-87]
25	Semi-circular timber fragment [on floor beneath approach track, c. 1855-87]
27	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
28	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
38	Concrete-faced brick foundation [northeast wall of engine house, late 19th/20th century]
39	Mortared brownstone, granite and brick foundation [southeast wall of engine house, late 19th/20th century]
40	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
41	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
42	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]

0 20
Feet

Brick
Brownstone
Concrete
Gravel
Mortar
Stone
Timber
Excavation Locations (Hunter Research, 2001-02)
Limit of Excavation of Remediation Area (2016-2017)
Profile Drawing Indicator

Figure 3.11. Remedial Area 15, Site Plan, Turntables and Northeast End of Engine House.

Photograph 3.6. View looking south-southeast showing the southern portion of Remedial Area 15 (PHE Area 2); the curving stone wall extending from lower left to upper right is the base of the perimeter wall of the late 19th/early 20th-century turntable [Structure 71]; the rectangular brick-lined pit in the foreground contained at least one square timber piling and may have been associated with the operation of the turntable or an entirely unrelated feature; scales in feet (Photographer: James Lee, December 2016) [HRI Neg. #16008/D4:001].

Photograph 3.7. View looking southeast showing the southwest corner of Remedial Area 15 (PHE Area 2); the linear feature along the edge of the excavation is the brick foundation supporting the northern side of the approach track leading into the late 19th/early 20th-century turntable (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:026].

Photograph 3.8. View looking southwest in the southern portion of Remedial Area 15 (PHE Area 2); the mortared brick foundation supporting the approach track and a concrete drain pipe intersect with the stone perimeter wall of the late 19th/early 20th-century turntable [Structure 71]; the concrete pipe post-dates the turntable perimeter wall; the northern brick sidewall supporting the approach track abuts the masonry of the turntable pit; scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:047].

Photograph 3.9. View looking southwest in the southern portion of Remedial Area 15 (PHE Area 2); the concrete drain pipe cuts through the center of the late 19th/early 20th-century turntable pit [Structure 71]; the scale rods are placed on the pivot footing at the center of the turntable; the stone perimeter wall of the turntable pit is visible at left edge and the northern brick sidewall of the approach track can be seen beyond the turntable in front of the pile of gravel remedial fill; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:117].

Photograph 3.10. Detailed view looking south showing the concrete pivot footing at the center of the late 19th/early 20th-century turntable [Structure 71] directly beneath the concrete drain; scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:120].

Photograph 3.11. View looking east showing a portion of the stone perimeter wall of the early late 19th/20th-century turntable [Structure 71] in Remedial Area 15 (PHE Area 2); note how this structure is set down into a construction bed of redeposited natural sands; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:216].

Photograph 3.12. Detailed view looking northeast showing the mortared stone masonry of the perimeter wall and floor of the late 19th/early 20th-century turntable [Structure 71] in Remedial Area 15 (PHE Area 2); scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:215].

Photograph 3.13. View looking southwest across the northwestern corner of Remedial Area 15 (PHE Area 2) at an early stage of excavation; the linear features are the tops of the concrete ash pits [1, 9, 10, 12] inside the engine house [Structure 58] (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:158].

sleeper stones recovered from the turntable perimeter wall were stockpiled and are being saved for future construction usage at the ferry terminal site.

All of the masonry remains of the late 19th/early 20th-century turntable and approach track were set in a bright orange, culturally sterile sand that extended to a depth of at least five feet. Initially, it was thought that this was an undisturbed natural sand subsoil, but taking into account the pre-19th-century topography and the spit-like landform to the north, this material is now considered more likely to be a construction bedding plane laid down on top of the tidal marshland that formerly covered this area. The sand is presumed to have been mined nearby from the spit-like landform and then redeposited and spread out to provide a suitable surface on which to build the railroad infrastructure.

As excavations proceeded northwest across the western end of Remedial Area 15 the masonry foundations, concrete floor and the tops of the concrete ash pits of the engine house were quickly exposed (Figures 3.1, 3.11 and 3.12; Photographs 3.13 and 3.14). The northeasternmost 70 feet of this building were initially uncovered in late December 2016 and early January 2017, but the excavation area was expanded further to the southwest by an additional 50 feet in April 2017 so that more of the engine house interior was eventually revealed. The foundations for the exterior walls of the building [contexts 38 and 39] were mostly constructed in brownstone and brick on a base of granite blocks set into an orange sand construction deposit [7], but the footings for the eastern corner and much of the northeastern wall had been reinforced and in some places replaced with concrete. The foundations were between 18 inches and two feet in width and survived to depths of up to 3.5 and 4 feet. Along the exterior of the southeast wall were a series of stone pilaster bases spaced at 17 feet on center, which corresponded to the building's framing dimensions given in the ICC records and on the Sanborn map of 1918. Inside the building were the remnants of two parallel rows of concrete pier bases, again displaying the 17-foot spacing, which would have supported the interior framing and clerestory (Figures 3.8, 3.11 and 3.12; Photographs 3.15-3.17).

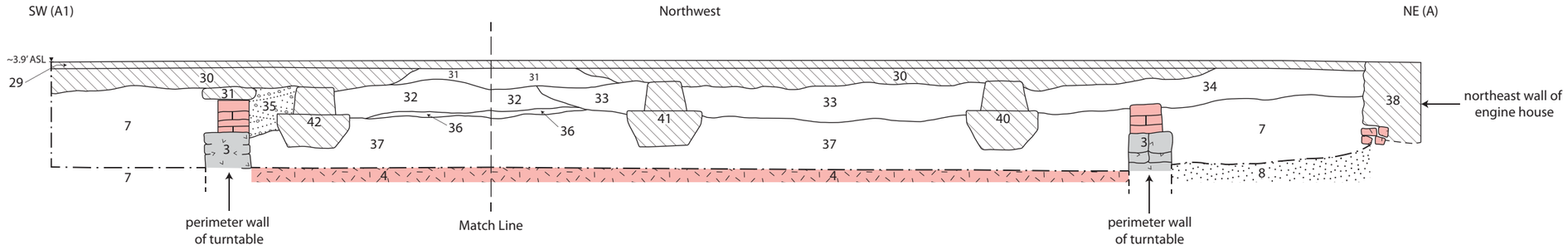
Inside the engine house and set into its concrete floor [29] were two long concrete channels running the length of the building, one in the central bay [2], the other in the northwestern bay [11] (Figures 3.11; Photographs 3.18 and 3.19). These served as ash pits beneath rail tracks positioned on the offsets within the concrete channel, the tracks passing through the building from southwest to northeast. The sidewalls of these pits, set on a concrete base 11 feet wide by 2.5 feet thick, were 2.5 feet wide at the bottom and 15 inches wide at the top (i.e., above the offsets). The interior space of the ash pits measured four feet across and three feet deep (two feet below the offset). No evidence was observed for a third ash pit in the southeastern bay of the building, which appears to correlate with the Pennsylvania Railroad Company map of 1950 (see above, Figure 3.10). The concrete ash pits and concrete floor of the engine house post-date 1916, as ICC records for that year document a row of four brick ash pits within the building which were presumably replaced at some later time. There was also evidence for an earlier episode of concrete flooring [30] within the building (Figure 3.12), which further suggests that other major interior modifications occurred during the building's history.

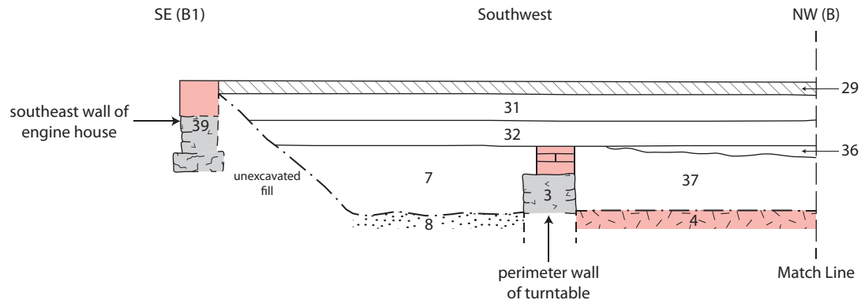
Removal of the concrete flooring inside the engine house to get at the contaminated soils beneath resulted in the discovery of a circular wall [3] of mortared brick set on top of a mortared brownstone footing immediately to the southeast of the ash pit in the building's central bay (Figures 3.11 and 3.12; Photographs 3.20-3.23). Further excavation, partly by machine and partly by hand, exposed a mortared brick, rubble and gravel floor [4, 6, 16] within the circumference of the circular wall. By this time recognizable as a turntable, concentric bands of brickwork were evident

Photograph 3.14. View looking northwest across the northwestern corner of Remedial Area 15 (PHE Area 2) at an early stage of excavation; in the foreground is the eastern corner [38, 39] of the engine house [Structure 58], the interior of which is beyond (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:161].

Photograph 3.15. View looking northeast showing the exterior of the stone, brick and concrete southeast foundation [39] of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); note the stone pilaster bases spaced at regular 17-foot intervals along the face of the wall; scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D7:309].

Remedial Area 15, Cross-Sections, Mid-19th-Century Turntable and Northeast End of Engine House





Context List

Context	*Description [Interpretation] (Munsell)*
3	Mortared brownstone foundation and brick wall [turntable pit perimeter wall, c. 1855-87]
4	Mortar-coated brick floor [turntable pit floor, c. 1855-87]
7	Wet sand [construction bedding deposit for turntable, c. 1855-87] (10YR 6/8)
8	Wet loamy sand [tidal marsh deposit, subsoil] (5B 5/1)
29	Concrete floor [floor of engine house [late 19th/20th century]
30	Concrete floor [?earlier floor or subfloor of engine house, late 19th/20th century]
31	Compact, mottled sand and gravel [leveling deposit for engine house, late 19th century] (10YR 2/1, 10YR 6/6)
32	Dense coal slag and coal ash [turntable destruction deposit/leveling deposit for engine house, late 19th century]
33	Coal slag and crushed charcoal [turntable destruction deposit/leveling deposit for engine house, late 19th century]
34	Coal slag and coal ash with sand [turntable destruction deposit/leveling deposit for engine house, late 19th century]
35	Loose gravel [fill, late 19th century]
36	Mottled loam sand w/ gravel [turntable destruction deposit/leveling deposit for engine house, late 19th century] (10YR 2/1, 10YR 6/8)
37	Dense, oily coal slag and coal ash w/ sand [turntable final waste deposit, *circa* 1887]
38	Concrete-faced brick foundation [northeast wall of engine house, late 19th/20th century]
39	Mortared brownstone, granite and brick foundation [southeast wall of engine house, late 19th/20th century]
40	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
41	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
42	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]

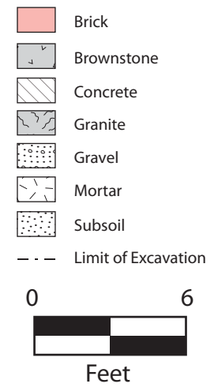


Figure 3.12. Remedial Area 15, Cross-Sections, Mid-19th-Century Turntable and Northeast End of Engine House.

Photograph 3.16. View looking west showing the exterior of the stone, brick and concrete southeast foundation [39] of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); note the stone footings for brick pilasters spaced at regular 17-foot intervals along the face of the wall; scales in feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D7:330].

Photograph 3.17. View looking east showing the interior face of the stone, brick and concrete foundation of the eastern corner [38, 39] of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:142].

Photograph 3.18. View looking southwest showing the removal of the concrete floor [29] and ash pit [1, 2, 9] inside the northeastern end of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:185].

Photograph 3.19. View looking west-southwest showing the concrete ash pits inside the northeastern end of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); the ash pit in the northwestern bay [10-12] is at left, the one in the central bay [1, 2, 9] is at right; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D6:207].

Photograph 3.20. View looking northeast showing the mortared brick and stone masonry of the perimeter wall [3] of the mid-19th-century turntable beneath the concrete floor [29] of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:175].

Photograph 3.21. View looking west showing the southern portion of the mid-19th-century turntable pit [3, 4, 6, 16] beneath the concrete floor [29] of the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:195].

Photograph 3.22. View looking southwest showing the perimeter wall [3] and the circular bands in the mortared brick floor [4, 16] of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:191].

Photograph 3.23. View looking east-northeast showing the southern portion of the foundations [3, 4, 6, 16] of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); the concrete walls [1, 9] at center left are part of the ash pit in the central bay of the engine house overlying the turntable; scales in feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:290].

in the floor surface bordered by areas of plain mortar and rubble (Photographs 3.21 and 3.22). The exterior diameter of the turntable foundation's perimeter wall was projected as being 50 feet and the interior as 47 feet.

Remedial excavations demonstrated that the turntable remains were effectively serving as a sump for much of the oil contamination in the ground and for this reason most of the southern half of the feature was removed following its documentation by the archaeological monitor. During the course of these removals, several nine-inch-diameter, pointed-end wood pilings were recovered, indicating that the turntable pit was erected on a timber substructure driven into the underlying sands to provide stability (Photograph 3.24). At this juncture in the remediation process it was realized that, in fact, important aspects of the archaeological resource were being insufficiently documented and that the imminent removal of more of the concrete ash pits and concrete floor from on top of the turntable foundations could result in irretrievable loss of valuable historical information (Photograph 3.25). In particular, the all-important central pivot area of the turntable was at risk of obliteration from the removal of the concrete ash pit in the center bay of the engine house. Following an on-site meeting in mid-January 2017, the remediation work was put on hold while a suitable program for documentary monitoring was developed and an effort was made to try and preserve in place at least some representative portions of the turntable. The principal goal of the documentary monitoring, for the most part successfully achieved, was to record a "slice" of the turntable pie as effectively as possible in both plan view and cross-section.

When remediation and archaeological monitoring resumed in April 2017, the initial emphasis was placed on exposing and examining the central pivot area (Figures 3.11 and 3.13). This involved the carefully supervised removal of the overlying concrete ash pit and dewatering, yet even this proved quite damaging to the turntable since parts of the floor and perimeter wall were inseparable from the concrete (Photographs 3.26-3.28). Eventually, a satisfactory exposure of the central pivot area was accomplished and the remnants of a mortared stone footing for the pivot could be seen positioned within the circular perimeter wall and floor of the turntable (Photographs 3.29 and 3.30). The footings [5] consisted of a rough-dressed stone foundation, ten feet square, enclosing an inner zone of packed, mortared rubble, six feet square, within which were set six surviving (nine originally projected) rotted timber pilings, each with a 1.5 to 1.75-foot-long, one-inch-square, wrought-iron spike driven into the top (Figures 3.12 and 3.13; Photograph 3.31). It is thought that these nine spikes secured a square wooden plate within the six-foot-square inner zone of the footings on top of which the center bearing mechanism would have been set. The pivot footings survived to a height of three feet in the southern corner and were set into the underlying construction deposit of orange brown wet sand [7] into which the pilings were presumably driven. The wet sand overlay a marsh deposit of wet grey loamy sand [8], which is interpreted as the original pre-construction tidal marshland.

Encircling the footings for the pivot, a relatively complete and intact slice of the turntable floor was freshly exposed, showing again the circular bands of brickwork [16] roughly midway between the pivot and the perimeter wall, but also a second band of carefully laid brick masonry immediately inside and adjacent to the perimeter wall [3] (Photographs 3.32-3.34). In both cases, the rings of brickwork are thought to have supported balance wheels mounted on the underside of the turntable. Patches of the mortar floor also survived on top of a matrix of crushed brick and stone rubble and gravel, but much of this surface had been stripped away when removing the concrete ash pit.

Photograph 3.24. View looking east-southeast showing the remains of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2) following removal of its mortared brick floor and the southeasternmost wall [1] of the concrete ash pit in the center bay; a sample of one of the timber pilings from beneath the turntable floor sits on the concrete foundation at left (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:356].

Photograph 3.25. View looking northeast showing the remains of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2) midway through remediation; the southern portion of the turntable has been removed and replaced by gravel remedial fill; the central pivot area of the turntable still lies unexamined beneath the concrete ash pit wall [1]; scale in feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D9:018].

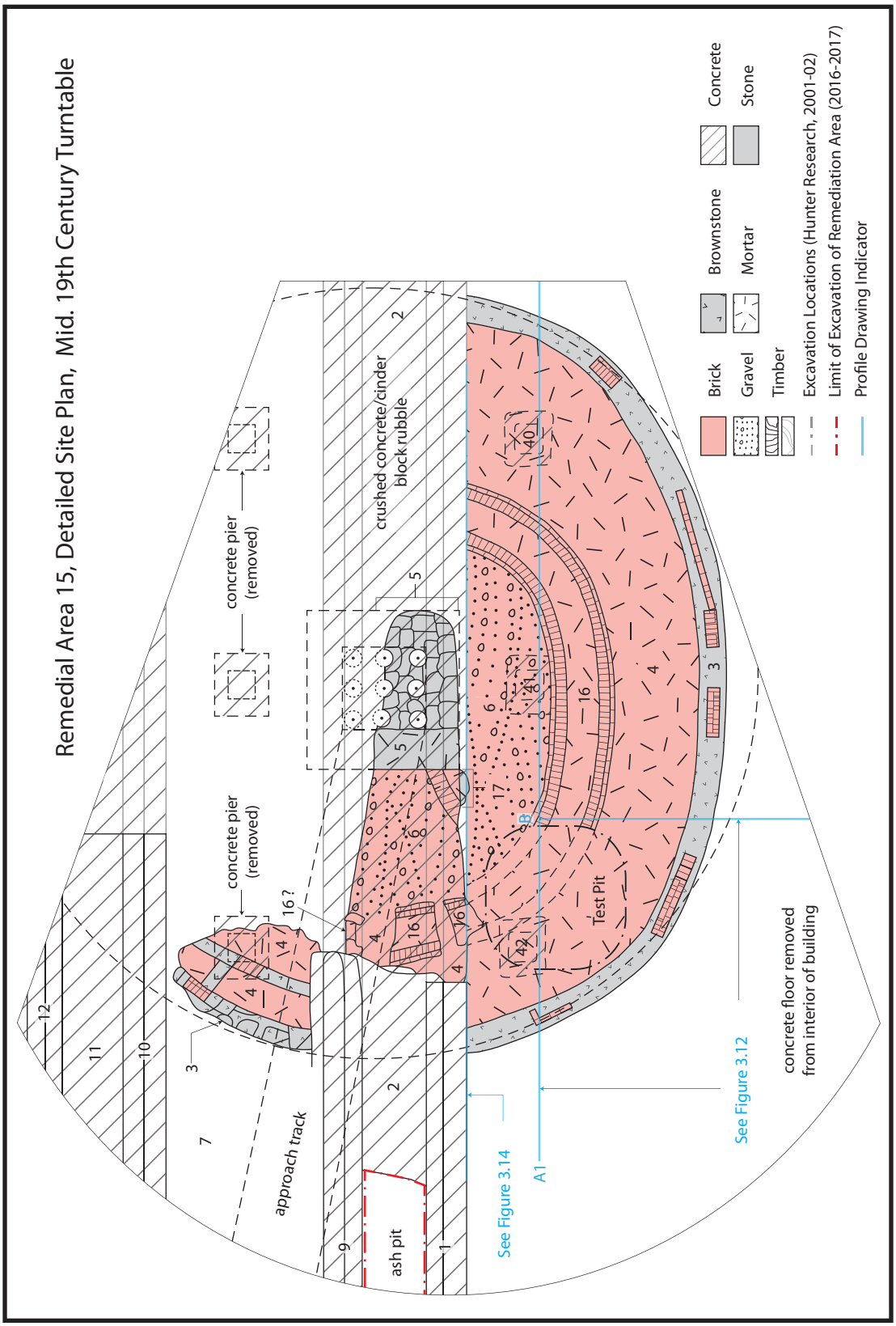


Figure 3.13. Remedial Area 15, Detailed Site Plan, Mid-19th-Century Turntable.

Photograph 3.26. View looking west-northwest showing removal of the concrete ash pit [9] from on top of the central pivot area of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2) (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:027].

Photograph 3.27. View looking west showing removal of the concrete ash pit [1, 2, 9] from on top of the central pivot area of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2); the remains of the pivot base footings [5] lay submerged in the center of the view; the concrete slab beyond [2], when removed, was encrusted with remnants of the turntable's brick and mortar floor [4, 6, 16] (see following image, Photograph 3.28) (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:037].

Photograph 3.28. View looking west showing remnants of the mid-19th-century turntable's brick floor [4, 6, 16] attached to the underside of the ash pit's concrete floor [2] (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:124].

Photograph 3.29. View looking west-northwest showing the central pivot area of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2) following removal of the ash pit's concrete floor and dewatering; the remnants of the pivot footings [5], consisting of large mortared stone blocks and timber pilings, is in the foreground; the partially removed brick floor of the turntable [4, 6, 16] lies beyond in front of the concrete ash pit [1, 2, 9] seen here in cross-section; the brick and stone perimeter wall of the turntable [3] is visible to the right of the ash pit; scales in feet (Photographer: Patrick Harshbarger, April 2017) [HRI Neg. #17023/D3:003].

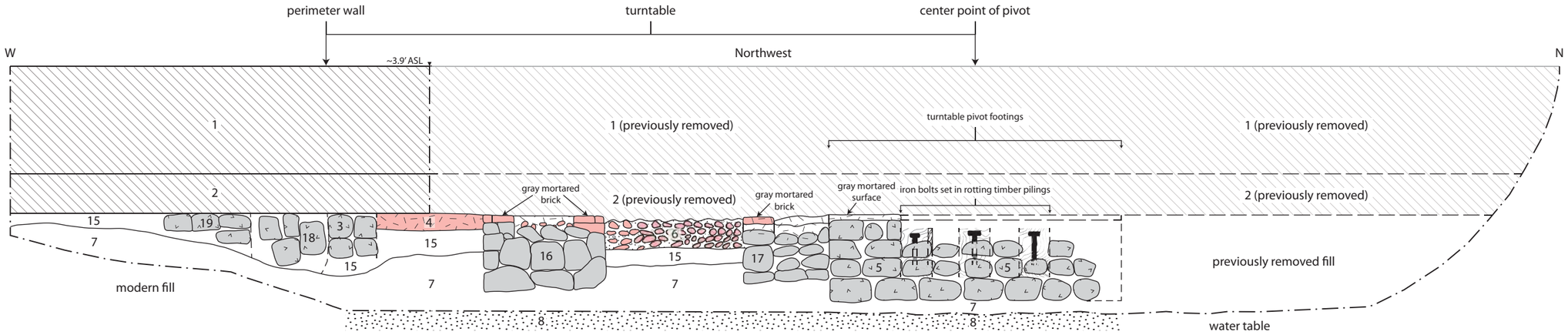
Photograph 3.30. View looking northwest showing the central pivot area of the mid-19th-century turntable beneath the engine house [Structure 58] in Remedial Area 15 (PHE Area 2) following removal of the ash pit's concrete floor, dewatering and clean-up; remnants of the pivot footings [5], consisting of large mortared stone blocks and timber pilings, is in the foreground; the partially removed brick floor of the turntable [4, 6, 16] lies beyond in front of the concrete ash pit [1, 2, 9] seen here in cross-section; the brick and stone perimeter wall of the turntable [3] is visible to the right of the ash pit; scales in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:367].

Photograph 3.31. Detailed view of the stone rubble core of the turntable's pivot footings [5] with its regularly spaced timber pilings in the center; scales in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:312].

Photograph 3.32. Detailed view looking north showing the mortared brick floor [16] and rubble sub-base [6] in the inner portion of the turntable pit following removal of the ash pit's concrete floor, dewatering and clean-up; the brickwork [16] at left would have supported balance wheels beneath the middle portion of the turntable; the remnants of the pivot base footings [5] are at right; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:220].

Photograph 3.33. Detailed view looking east showing the mortared brick floor [16] and rubble sub-base [6] in the inner portion of the turntable pit following removal of the ash pit's concrete floor, dewatering and clean-up; the brickwork [16] in the foreground would have supported balance wheels beneath the middle portion of the turntable; the remnants of the pivot footings [5] are beyond; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:226].

Remedial Area 15, Radial Cross-Section of Mid-19th-Century Turntable



Context List

Context	*Description [Interpretation] (Munsell)*
1	Concrete wall [southeast sidewall of ash pit in engine house center bay, c. 1920s]
2	Concrete floor [ash pit in engine house center bay, c. 1920s]
3	Mortared brownstone foundation and brick wall [turntable pit perimeter wall, c. 1855-87]
4	Mortar-coated brick floor [turntable pit floor, c. 1855-87]
5	Mortared brownstone foundation enclosing stone rubble w/ wood pilings and iron spikes [turntable pivot footings, c.1855-87]
6	Crushed brick and stone rubble [turntable pit subfloor, c. 1855-87]
7	Wet sand [construction bedding deposit for turntable, c. 1855-87] (10YR 6/8)
8	Wet loamy sand [tidal marsh deposit, subsoil] (5B 5/1)
15	Wet mottled sandy clay [construction bedding deposit for turntable, c. 1855-87] (10YR 6/1, 10YR 4/2)
16	Mortared stone footing capped w/ brick [track for balance wheels in turntable pit floor, c. 1855-87]
17	Mortared stone footing capped w/ brick [turntable pit floor, c. 1855-87]
18	Displaced mortared brick and brownstone wall [disturbed turntable pit perimeter wall, late 19th century]
19	Dry-laid brownstone wall [additional support for exterior of turntable pit perimeter wall, c. 1855-87]

Brick
Brownstone
Concrete
Gravel
Iron
Mortar
Stone
Subsoil
Timber
Limit of Excavation

0 4
Feet

Figure 3.14. Remedial Area 15, Radial Cross-Section of Mid-19th-Century Turntable.

Photograph 3.34. Detailed view looking down at the outer portion of the mortared brick turntable floor [4] and perimeter wall [3] following removal of the ash pit's concrete floor, dewatering and clean-up; note the brickwork [4] in the floor that would have supported the turntable's outermost balance wheels; scale in tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:177].

Photograph 3.35. Detailed view of part of a cross-section through the turntable base looking north-northwest; this view shows the brick and stone foundation for the turntable perimeter wall [3] set into the underlying sandy clay and sand construction deposit [7, 15] and sealed beneath the concrete floor of the ash pit [2]; scale in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:371].

Photograph 3.36. Detailed view of part of a cross-section through the turntable pit looking north-northwest; this view is an easterly continuation of that shown in Photograph 3.35 and shows the brick and stone foundation for the band of brickwork [16] in the turntable floor (for supporting balance wheels), with crushed stone and brick rubble fill [6] to the right; scale in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:370].

Photograph 3.37. Detailed view of part of a cross-section through the turntable pit looking north-northwest; this view is an easterly continuation of that shown in Photograph 3.36 and shows the brick and stone foundation for the band of brickwork [16] in the turntable floor (for supporting balance wheels) at left, with crushed stone and brick rubble fill [6] to the right, and the stone foundation of the pivot footings [5] below the scale rod at far right; scale in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:369].

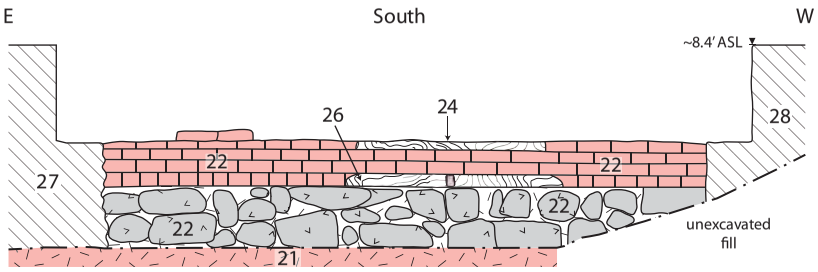
Photograph 3.38. Detailed view of part of a cross-section through the turntable pit looking north-northwest; this view is an easterly continuation of that shown in Photograph 3.37 and shows the southwest stone foundation and stone rubble core of the pivot footings [5]; note the sand construction deposit [7] below the footings, and the wet loamy sand marshland deposit [8] at the bottom of the soil profile; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:368].

Photograph 3.39. View looking east-southeast showing early stages of excavation within and beneath the ash pit [1, 2, 9] in the western extension of Remedial Area 15 (PHE Area 2); the exterior face of the stone foundations for the brick perimeter wall [3] of the mid-19th-century turntable is visible between the concrete walls of the ash pit at the end of the excavation (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:409].

Photograph 3.40. Detailed view looking northeast showing the exterior face of the brick and stone perimeter wall [3] of the mid-19th-century turntable in the western extension of Remedial Area 15 (PHE Area 2); scales in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:257].

Photograph 3.41. View looking west showing the remaining portions of the mid-19th-century turntable being covered with geotextile fabric and reburied beneath gravel remedial fill (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:527].

Remedial Area 15, Sidewall Interior Elevation of Approach Track to Mid-19th-Century Turntable



Context List

Context	*Description [Interpretation]*
21	Mortar-coated brick floor [floor beneath approach track, c. 1855-87]
22	Mortared brownstone and brick foundation [southeast sidewall supporting approach track, c. 1855-87]
24	Timber beam w/ metal bracket, 4.0 x 0.8 x 0.2 feet [incorporated into southeast sidewall supporting approach track, c. 1855-87]
26	Timber beam w/ metal bracket, 4.5 x 0.8 x 0.2 feet [incorporated into southeast sidewall supporting approach track, c. 1855-87]
27	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]
28	Concrete pier base [footing for interior framing in engine house, late 19th/20 century]

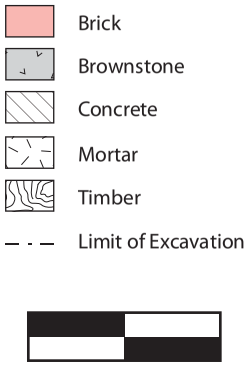


Figure 3.15. Remedial Area 15, Interior Elevation of Sidewall, Approach Track to Mid-19th-Century Turntable.

Photograph 3.42. View looking west showing the western extension of Remedial Area 15 (PHE Area 2); the two parallel mortared stone and brick foundations [20, 22] supported the approach track leading into the mid-19th-century turntable (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:593].

Photograph 3.43. View looking east showing the western extension of Remedial Area 15 (PHE Area 2); the mortared stone and brick foundation [22] with the scale rod laid horizontally on top supported the southern side of the approach track leading into the mid-19th-century turntable; the corresponding northern foundation [20] for the approach track is just visible at the top of the view; these foundations have been disturbed by the concrete piers and foundations of the engine house [Structure 58] and its ash pits; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:663].

Photograph 3.44. Detailed view looking south showing the mortared stone and brick foundation [22] that supported the southern side of the approach track leading into the mid-19th-century turntable; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:672].

Photograph 3.45. View looking west southwest showing the western extension of Remedial Area 15 (PHE Area 2); the mortared brick and stone foundations [20, 22] supporting the approach track leading into the mid-19th-century turntable are shown at their point of maximum exposure immediately prior to backfilling with gravel remedial fill; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:674].

Photograph 3.46. View looking west showing the western extension of Remedial Area 15 (PHE Area 2) being prepared for backfilling; the mortared brick and stone foundations supporting the approach track leading into the mid-19th-century turntable were covered with geotextile fabric (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:702].

Photograph 3.47. View looking east showing the western extension of Remedial Area 15 (PHE Area 2) undergoing backfilling with gravel remedial fill; orange plastic snow fencing was placed within the fill to alert future excavators of sensitive archaeological remains below (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:707].

A critical cross-section across the radius of the turntable is documented in Figure 3.14 and a matching series of images (Photographs 3.35-3.38). These show the compositional make-up of the turntable's foundations with more substantial stone rubble footings being evident not only for the pivot base but also for the perimeter wall and the brickwork supporting the balance wheels.

Following the recording of the radial cross-section of the turntable, remedial work proceeded southwesterly within the space between the two concrete ash pits. This activity resulted in a fuller exposure of the exterior face of the turntable's perimeter wall (Photographs 3.39 and 3.40). As observed elsewhere, this wall [3] comprised a two-foot-high mortared stone foundation topped by courses of brick masonry. As remedial excavations progressed southwest and further away from the turntable, the remnants of the structure were covered in geotextile fabric and buried beneath remedial gravel. Orange plastic fencing was placed within the gravel to alert future excavators to the presence of buried remains deeper down beneath the gravel deposit (Photograph 3.41).

The final phase of excavation in Remedial Area 15 within the space between the two concrete ash pits revealed the remains of the foundations for one of possibly three approach tracks that led into the mid-19th-century turntable buried beneath the northeastern end of the engine house (Figures 3.11, 3.13 and 3.15; Photographs 3.42-3.45). Built in a similar masonry style to the turntable, these foundations [20, 22] consisted of a channel-like structure that ran parallel to the long axis of the engine house, curving slightly at its northeastern end to make a beeline for the center of the turntable. The sidewalls were spaced just over five feet apart on center (sufficient to carry standard gauge track) and were constructed of mortared brick on a mortared brownstone foundation with a mortared brick floor extending in between. Horizontal timbers with iron hardware were both placed on top of and incorporated into the sidewalls in at least two locations. The timbers on top of the side walls may have served as part of the bed for the rail tracks, while those embedded in the body of the wall were perhaps related to some form of cross-bracing to keep the sidewalls and tracks in place.

The approach track remains were somewhat compromised by the construction of the concrete ash pits [2, 11] on either side and by the concrete pier bases [27, 28] between the ash pits. Unfortunately, the area where the approach track would have intersected with the turntable had been entirely removed by the 20th-century engine house modifications. No trace was observed of the other two approach tracks postulated from the documentary record, but remains of these may yet survive in unexcavated parts of the engine house interior. Following their documentation, the approach track remains were covered in geotextile fabric, buried in remedial gravel fill and marked with orange plastic fencing (Photographs 3.46 and 3.47).

D. ANALYSIS

Remedial Area 15 lies close to the edge of the tidal marshland on the southeastern downslope side of the sandy spit of land that extended out to the original South Amboy ferry terminal site. This setting (the specific location of the remedial area), based on analysis of historic maps and early reports to the Joint Board of Directors to the Stockholders of the Delaware and Raritan Canal and Camden and Amboy Railroad, appears to have been first developed as part of the evolving and expanding railroad depot at some point after 1850. The Walling map of 1861 (Figure 3.5) is the first map to show buildings and railroad tracks in this part of the depot site, implying that railroad infrastructure began to spread into this area in the 1850s. From this point on, there was a dizzying sequence of railroad-related construction and reconstruction at the South Amboy terminal that

continued into the early 20th century, reflecting a shift in emphasis from passenger to freight traffic and growth in the number of wharves along the shoreline. Soil profiles and archaeological data suggest that in opening up this part of the depot for development, substantial beds of sand were periodically placed over the marshland fringe to facilitate construction. The sand is thought most likely to have been mined from the adjacent spit of land, thus radically modifying the original topography.

An engine house is first identified on the Walling map in the vicinity of Remedial Area 15, but it is not certain that the northeastern end of the building revealed by the remedial excavations is part of that structure. The building is of considerable width (73 feet) and displays an architectural style (single-story, brick with pilasters, large gable-end door openings and a clerestory) that persisted from the mid-19th-century through into the early 20th century. While the excavated building may or may not correspond to the engine house shown on the Everts and Stewart map of 1876, it is only through the Pennsylvania Railroad Company and ICC records of 1910-1916 and the Sanborn fire insurance map of 1918 that the archaeological data gathered in 2001-02 and 2016-17 can be unequivocally matched up with the historical record. Indeed, as discussed further below, one strong possibility is that the original engine house at this site may have been situated to the southwest and was then later expanded northeastward in the later 19th century to create the footprint seen on early 20th-century maps.

The engine house was primarily a facility where rail locomotives were repaired and maintained. Throughout its period of use, tracks entered the southwestern end of the building – apparently four sets of tracks in the earlier years, reduced to three by 1918. Based on the historic maps, the number of tracks exiting the opposite northeastern end of the building seems to have varied – none in 1861, two in 1876, one in 1918 and three in 1950 – but cartographic inaccuracy may be at play here, since locomotives could have either passed directly through the building or been turned on a turntable so that they could exit the way they came in. A critical task conducted in the engine house was the removal of ash from the locomotive boilers. A row of four long ash pits, constructed in brick, was documented in the northeastern end of the engine house in the ICC records of 1916, but these were soon after replaced by two larger and longer concrete ash pits servicing two of the three early/mid-20th-century tracks passing through the building. These later pits, still largely intact, were found during the archaeological monitoring. Their construction, along with the installation of a concrete floor throughout the building, removed all trace of the earlier brick ash pits.

Much of the uncertainty about the date of construction of the northeastern end of the engine house stems from the discovery of the turntable foundations beneath its concrete floor and ash pits. Indeed, the relationship of the engine house to this turntable, which was centrally positioned within its interior, is a crucial question in the interpretation of the archaeological record. Many early turntables appear to have been located out in the open outside of an engine house, but it is clear from the 1850 report to the Joint Board of Directors that the Camden and Amboy Railroad made use of a 36-foot-diameter “turn-around” or turntable inside the car house on the wharf at South Amboy. This latter turntable is likely an original feature of the railroad and most, if not all, of the 30 Camden and Amboy locomotives inventoried in 1850 will have made use of this piece of equipment. Among the locomotives still operational in 1850 was the *John Bull*, identifiable through its being described as “imported in 1831, in good serviceable condition” (Cook 1850; Van Rensselaer 1850; White 1981).

So, was the turntable found beneath the engine house originally and contemporaneously constructed inside the building or was it installed outside beyond the exit

doors of what was initially a shorter structure located just to the southwest? At first impression, largely because it was so exactly centrally placed within the building along the axis of the middle set of tracks, it was thought that the turntable was probably built coincident with the engine house. However, its presence and operation would surely have interfered with the interior structural framing of the 73-foot-wide building. On balance, it seems more likely that the turntable was built outside the northeastern end of what was originally a shorter building and then later, after it fell out of use, the engine house was extended northeastward over the top of its filled-in foundation. This latter action may well have occurred in 1887 or thereabouts when the new, larger turntable was installed a short distance to the southeast. Possibly relevant to this interpretation is the 1916 record of a set of plate bending rolls, made by J. Molyneaux in 1887, being in the engine house. The same date of manufacture for both the new turntable and the plate bending rolls perhaps reflects an episode of site modification and upgrade in this part of the depot which resulted in the older turntable being replaced. Finally, the point is worth making that, irrespective of whether the older turntable was installed and operated inside or outside the engine house, the railroad tracks would likely have followed same alignment in their approach to the turn-around structure.

Turntables were an essential component of all railyards and their sophistication and size (seen principally in their diameter) increased over time as larger, heavier and more powerful locomotives were put into service (Figure 3.16; Photographs 3.48 and 3.49). The turntable foundations unearthed beneath the engine house floor indicate that the turntable itself would have been 50 feet in diameter, which is of a size commonly constructed in the period *circa* 1850-80. The brick masonry of the floor suggest that the table made use of balance wheels both under its perimeter and also beneath its mid-section. Its central pivot was supported by a noticeably substantial stone foundation set on wood pilings driven into the underlying sand and marshland (Figure 3.17) (Wm. Sellers & Co. 1885; Yeaton 1914; Bianculli 2003:180-186).

The basic characteristics of the turntable also conform well in general terms with a description of such structures included in a handbook of railroad construction compiled in 1857:

> Turntables consist of simply a circular framework of wood or iron, placed at the centre upon a solid iron pintle which bears the whole weight, and guided at the circumference by a series of fifteen, eighteen, or twenty wheels fourteen of fifteen inches in diameter. The wheels are placed in an independent spider frame, and run upon a curved rail placed on the bottom masonry, and the table runs upon the top of the wheels, so that the motion of the circumference of the table is double that of the wheels.
>
> The frame consists, first, of a pair of timbers ten or twelve inches wide and fifteen or sixteen inches deep, upon which the rails are placed, strongly trussed so as to throw the load upon the centre. At right angles to these are placed, at a distance of eight or ten feet, timbers 5 x 10, also trussed, which serve to connect the load more completely with the wheels. The whole is stiffened by diagonal bracing, and is strongly floored. The table is turned by a pinion upon itself, working into a rack fastened to the foundation or to the side masonry. The trusses, as also the centre bearing, should be capable of adjustment vertically (Vose 1857:406).

The details of the turntable foundations also suggest another close parallel in J.C. Robie's "balanced" and adjustable turntable, a type introduced in 1854 (Figure 3.18). This somewhat elaborate system was primarily supported by a rugged shaft and used a central metal tower-like frame with adjustable tension rods extend-

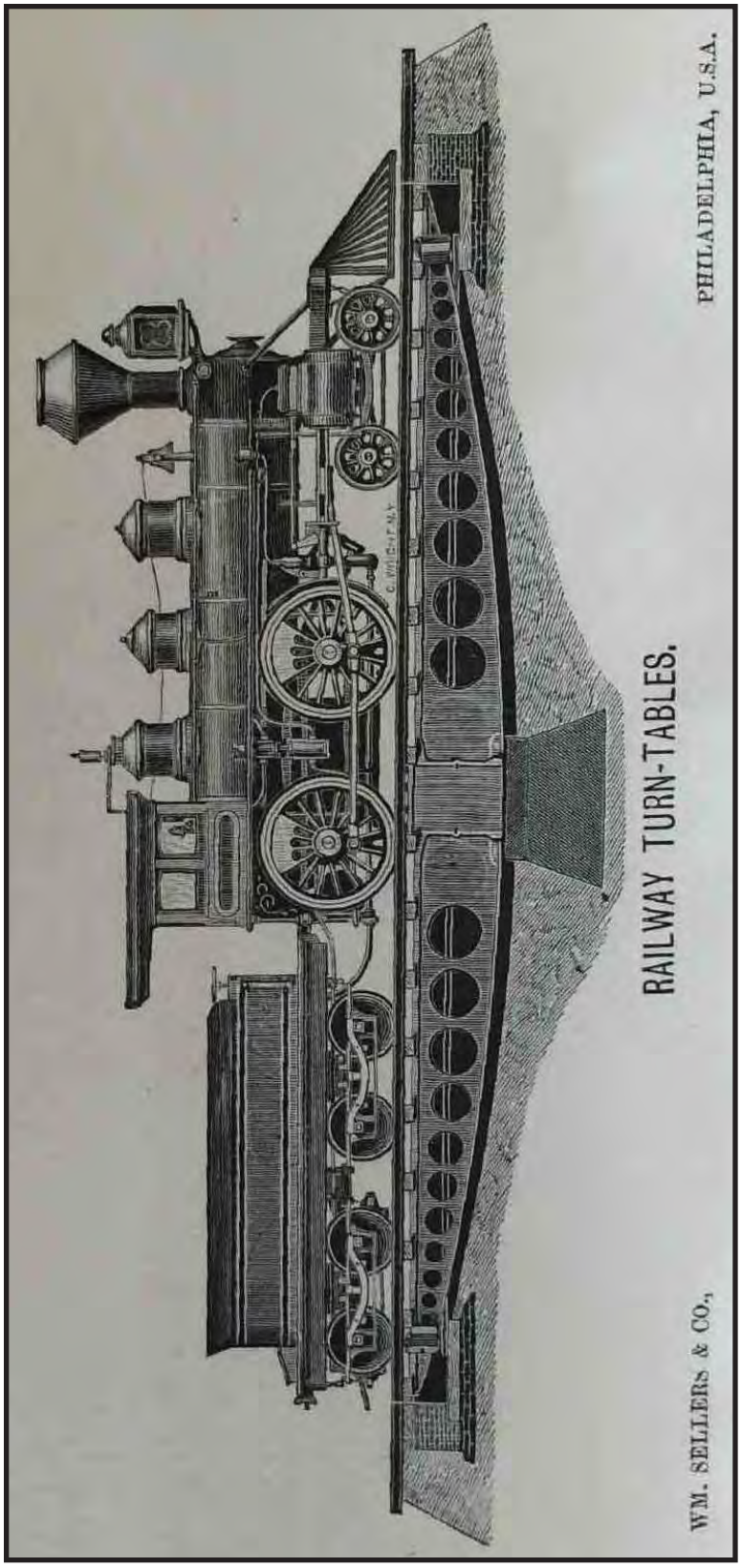
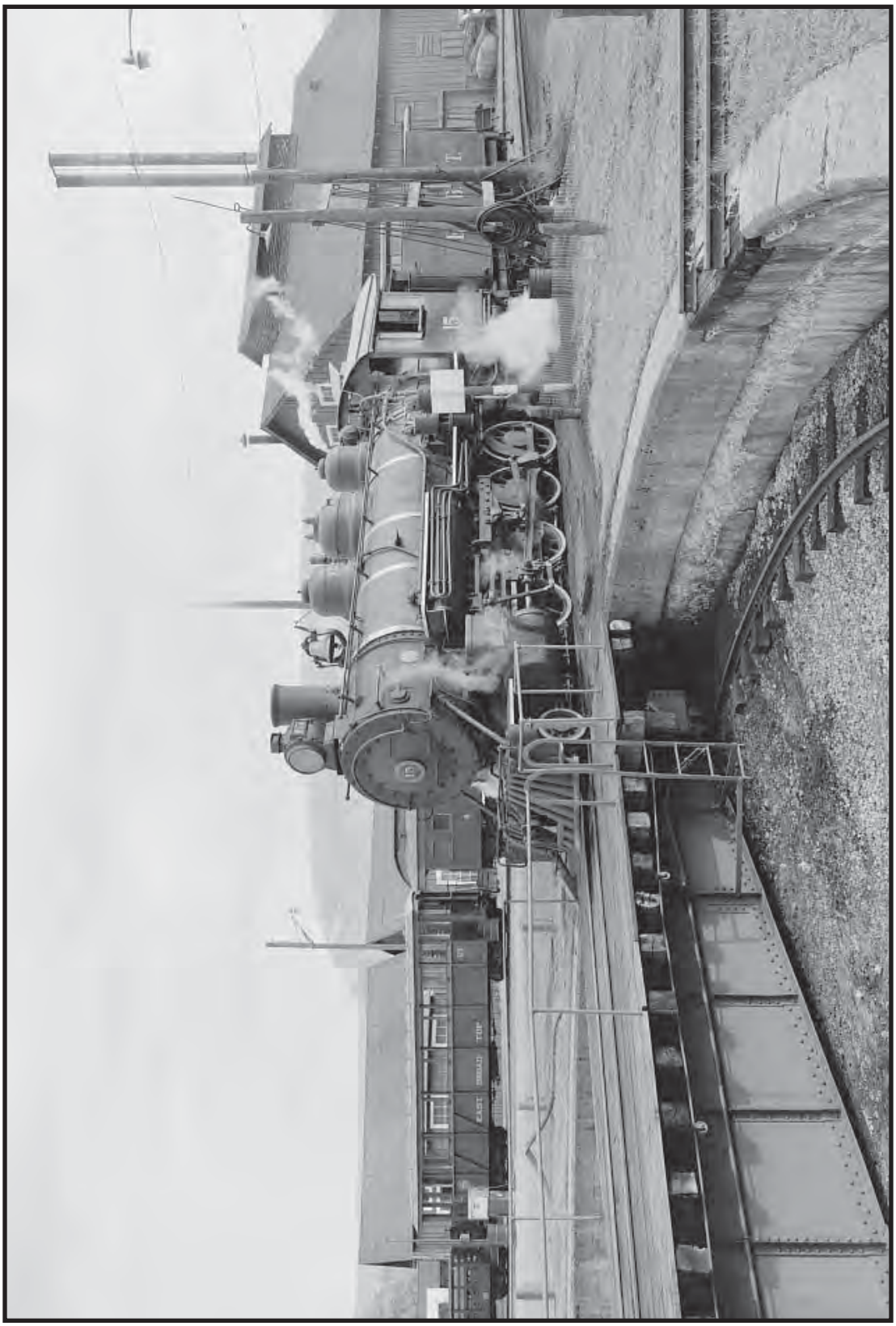
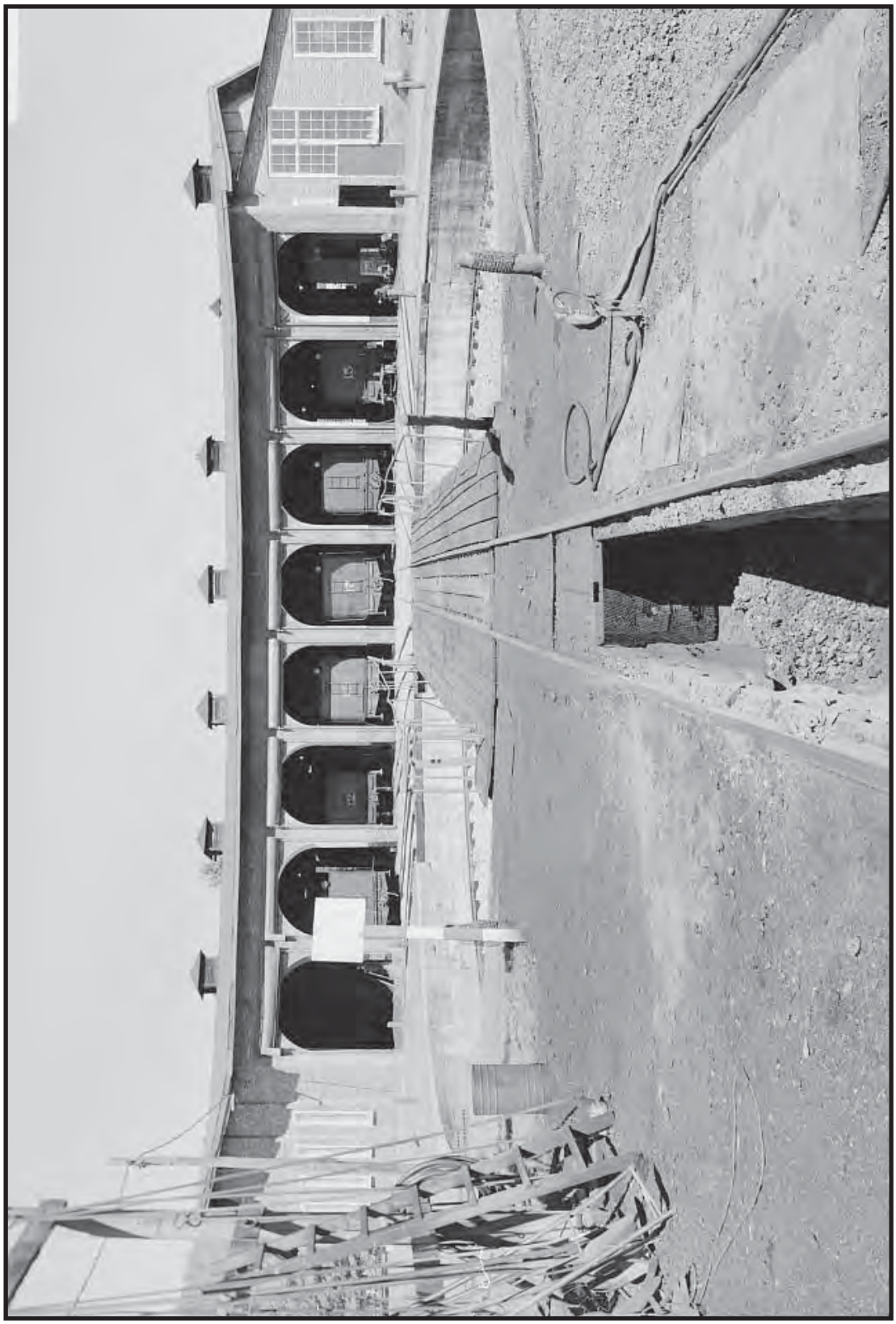


Figure 3.16. Wm. Sellers & Co. Representative View of a Late 19th-Century Steam Locomotive on a Turntable. 1885. This cross-section more likely resembles the later of the two turntables (built in 1887) documented through archaeological monitoring.



Photograph 3.48. Typical view of a steam locomotive approaching a turntable at the East Broad Top Railroad & Coal Company Roundhouse, Rockhill Furnace, Huntingdon County, Pennsylvania (Source: Boucher 1986) [HAER PA, 31-ROCFN, 1B--12]).



Photograph 3.49. Typical view of a turntable with ash pit beneath an approach track at the East Broad Top Railroad & Coal Company Roundhouse, Rockhill Furnace, Huntingdon County, Pennsylvania (Source: Boucher 1986) [HAER PA, 31-ROCFN, 1B--8]).

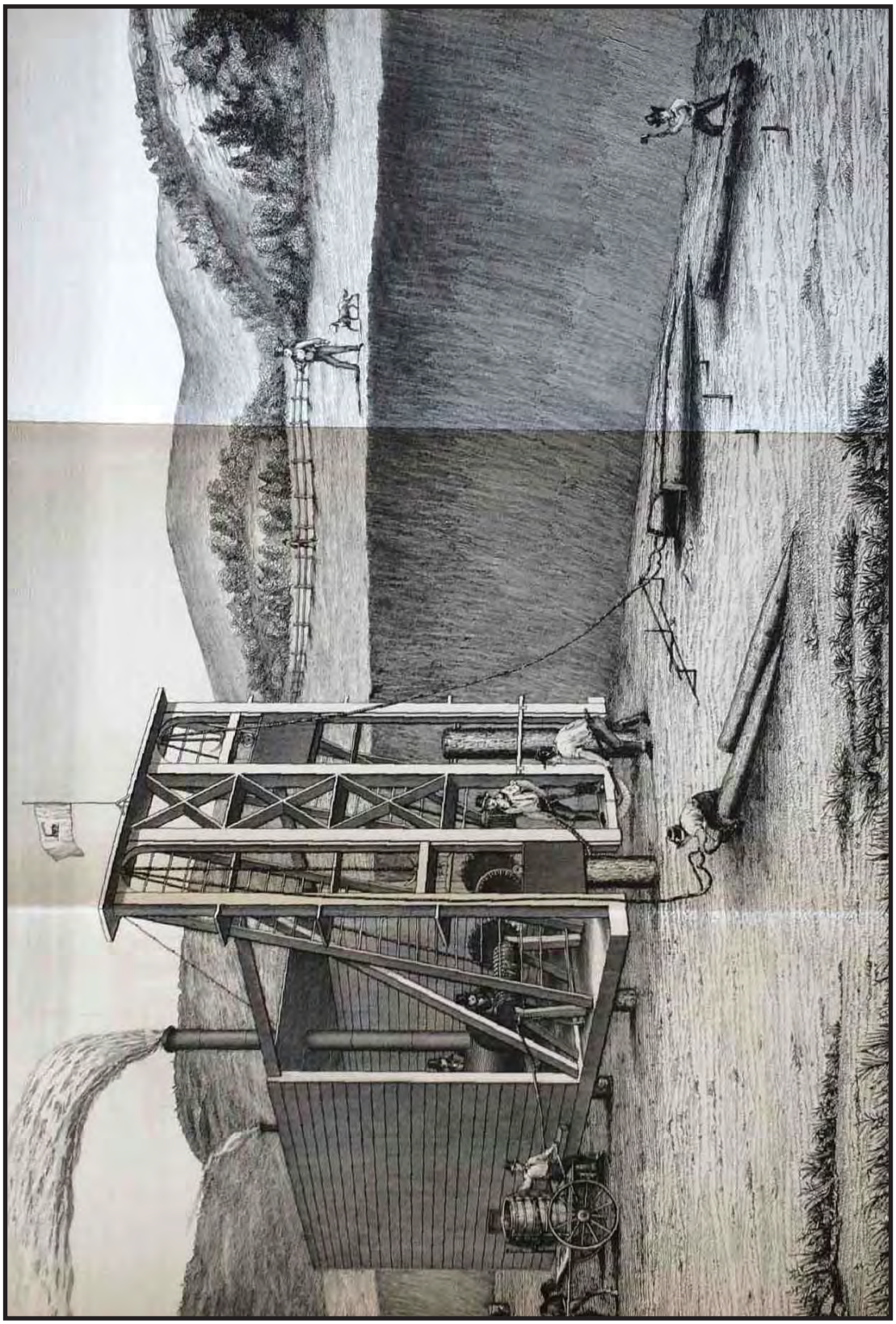


Figure 3.17. Weale, John. A Steam-Powered Pile Driving Machine. 1843. Equipment of this type was likely used in setting foundations for structures like turntables which required especially sound footings.

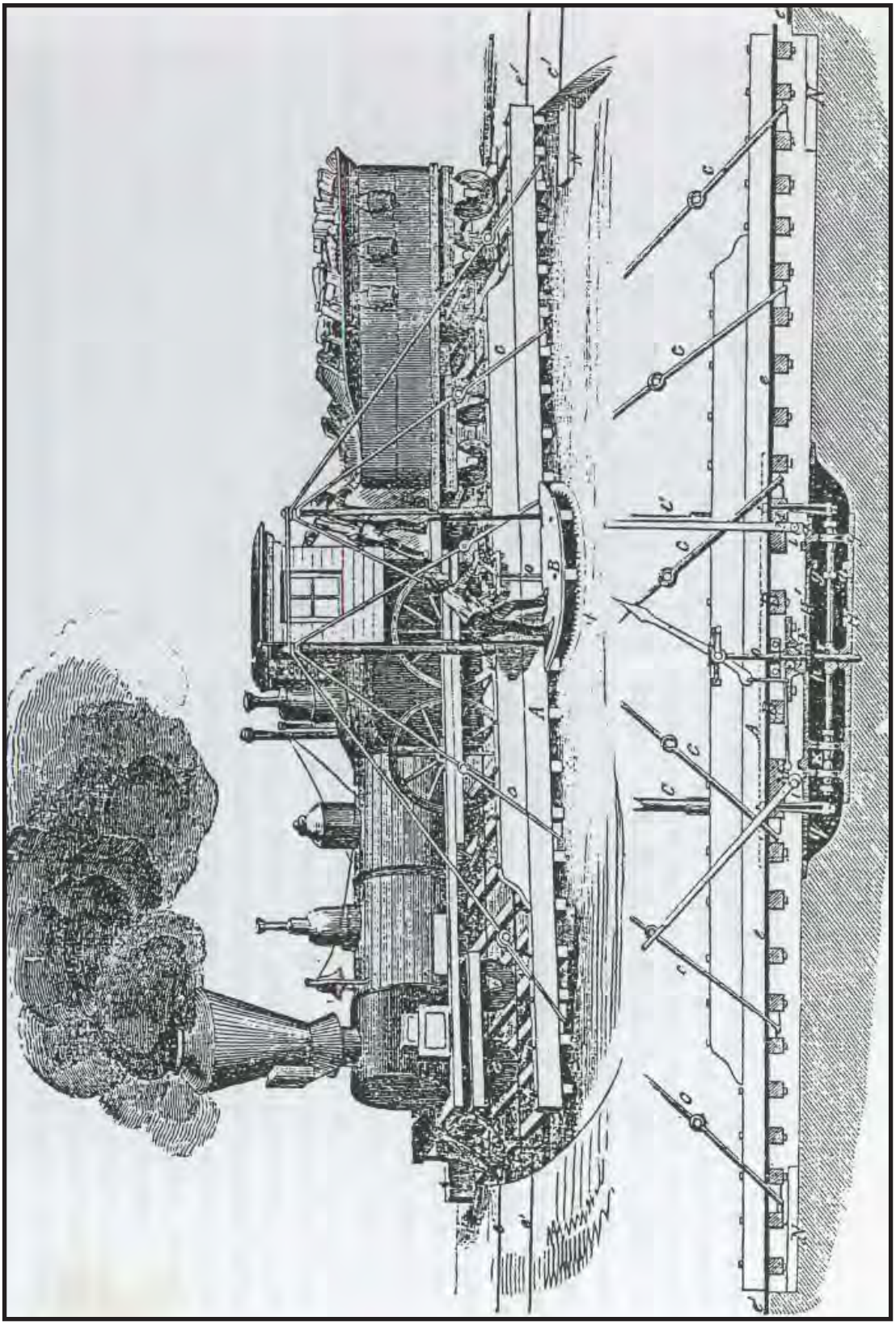


Figure 3.18. Robie's Balance Turn-Table. Side View and Cross-Section. 1854.

ing out to the mid-section and ends of the "bridge" on either side of the track. With the bulk of the weight thus carried over the central pivot, balance wheels would have served primarily as guides rolling over the brick floor in the pit beneath. The platform of Robie's turntable was constructed of longitudinal timbers secured by bolts and plate and it seems possible that South Amboy's 50-foot turntable was similarly built. The carriage underneath for turning the platform, illustrated in Figure 3.19, consists of bottom and top plates (H H^1), a center pin (J), two metal rings (I I^1) and the rollers (K K). Robie notes that the bottom and top plates could "carry an engine and tender of from 40 to 45 feet in length" and needed only to be about 8 feet in diameter. These dimensions are broadly consistent with the turntable, and in particular with the footings for the pivot area, revealed during the archaeological monitoring (Robies' Balance Turn-Table 1854; Bianculli 2003:181-182).

Locomotive size, or more specifically the combined length of the locomotive and tender, is another useful clue to the date of the turntable, in essence providing a *terminus post quem* or date before which a turntable of a particular diameter would have been in use (Figure 3.20). As implied above, locomotives and tenders on the Camden and Amboy prior to around 1850 would have measured less than 36 feet or thereabouts. This rolling stock combination could certainly have been turned on the 50-foot table found beneath the engine house floor. As noted above, the Robie turntable of the mid-1850s, which matches reasonably well with the South Amboy 50-foot specimen, was designed for a locomotive plus tender length of around 45 feet. The Pennsylvania Railroad Company developed its D12 and D13 classes of Eight-Wheeler, both around 45 feet in length (locomotive plus tender), in 1889 and 1892, so these also could have made use of South Amboy's 50-foot turntable. The locomotive and tender of the D16 class of Eight-Wheeler, however, introduced in 1895, measured at least 60 feet, rendering the 50-foot turntable obsolete by this date, if not sooner (Westcott 1960:102, 106).

In summary, based on historic maps, Camden and Amboy records and comparative turntable designs, the 50-foot turntable at South Amboy was most likely installed no earlier than the mid-1850s. If this structure had been present in 1850, its existence would almost certainly have been referenced in the report to the Joint Board of Directors produced in that year. The turntable likely continued in operation into the late 1880s, probably being dismantled around 1887 when it was superseded by the new, larger turntable installed outside the engine house.

This second, larger 60-foot-diameter steel turntable is more easily pegged in terms of its date and overall character. As noted above, it was manufactured by the Philadelphia Bridge Works in January 1887 and would appear to have been put in place that same year. It went out of use at some point between 1918 and 1930 and the site had been filled and graded by this latter date. Sixty-foot-diameter turntables were rapidly becoming obsolete in the early 1920s following the Pennsylvania Railroad's introduction of the Ten-Wheeler Class G5 locomotive, which was well in excess of 60 feet in length. Details of the turntable are documented in a field notebook of the Pennsylvania Railroad Company compiled in 1910 and more exhaustively in ICC records of 1916. The structure may well have been steam-powered and perhaps resembled the turntables designed and installed by the Pennsylvania Railroad for their Altoona shops (Figure 3.21) (Bianculli 2003:184-185). Archaeologically speaking, remains of the stone perimeter wall and central pivot footings survived (somewhat compromised by later utilities construction). Minimal evidence was observed of the turntable pit's brick floor, although some parts survived around the inside edge of the perimeter wall.

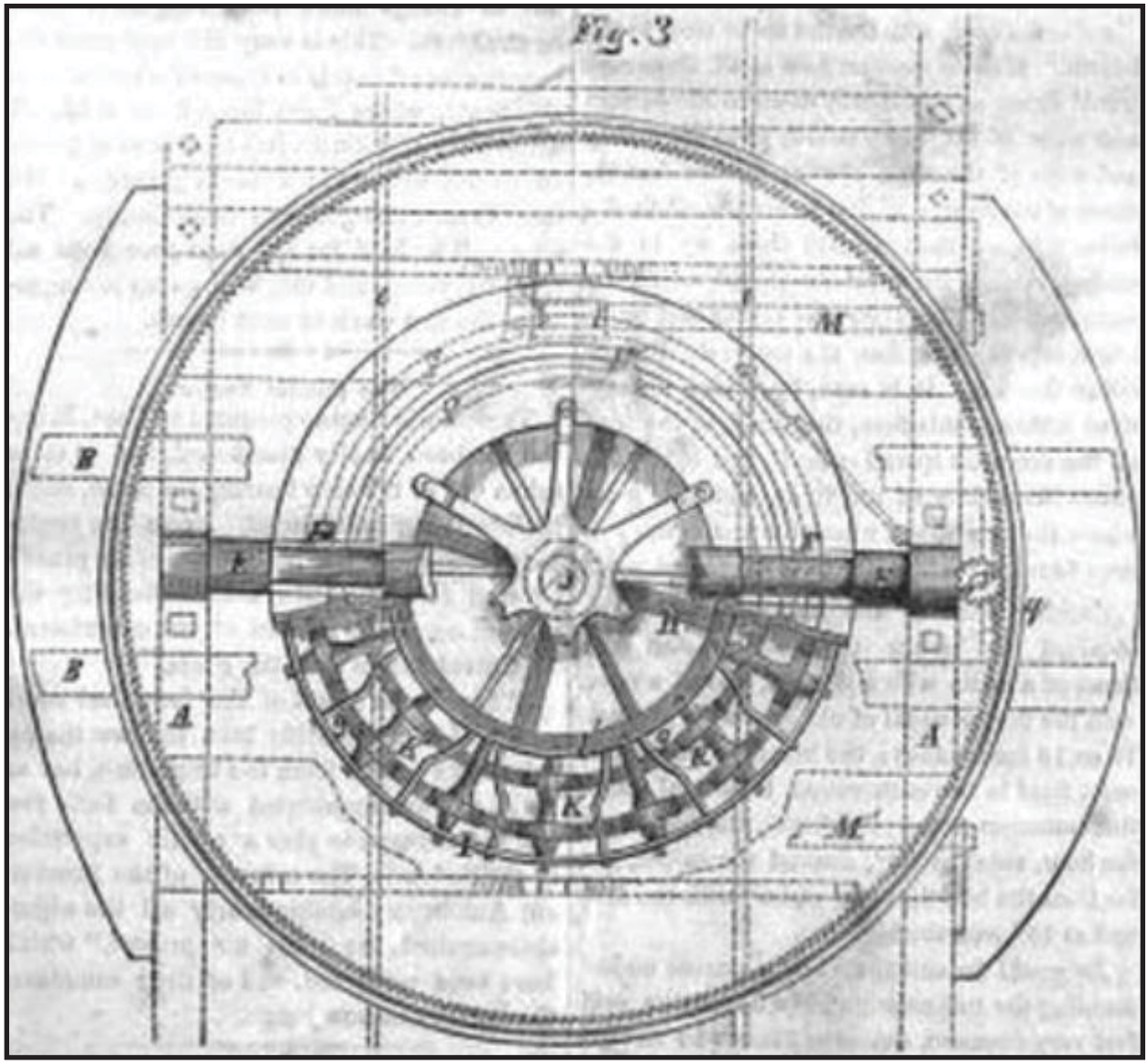


Figure 3.19. Robie's Balance Turn-Table. Plan View of Central Pivot Area. 1854. Note the width of the rail beneath the circular carriage atop the pivot is standard gauge (4 feet 8.5 inches).

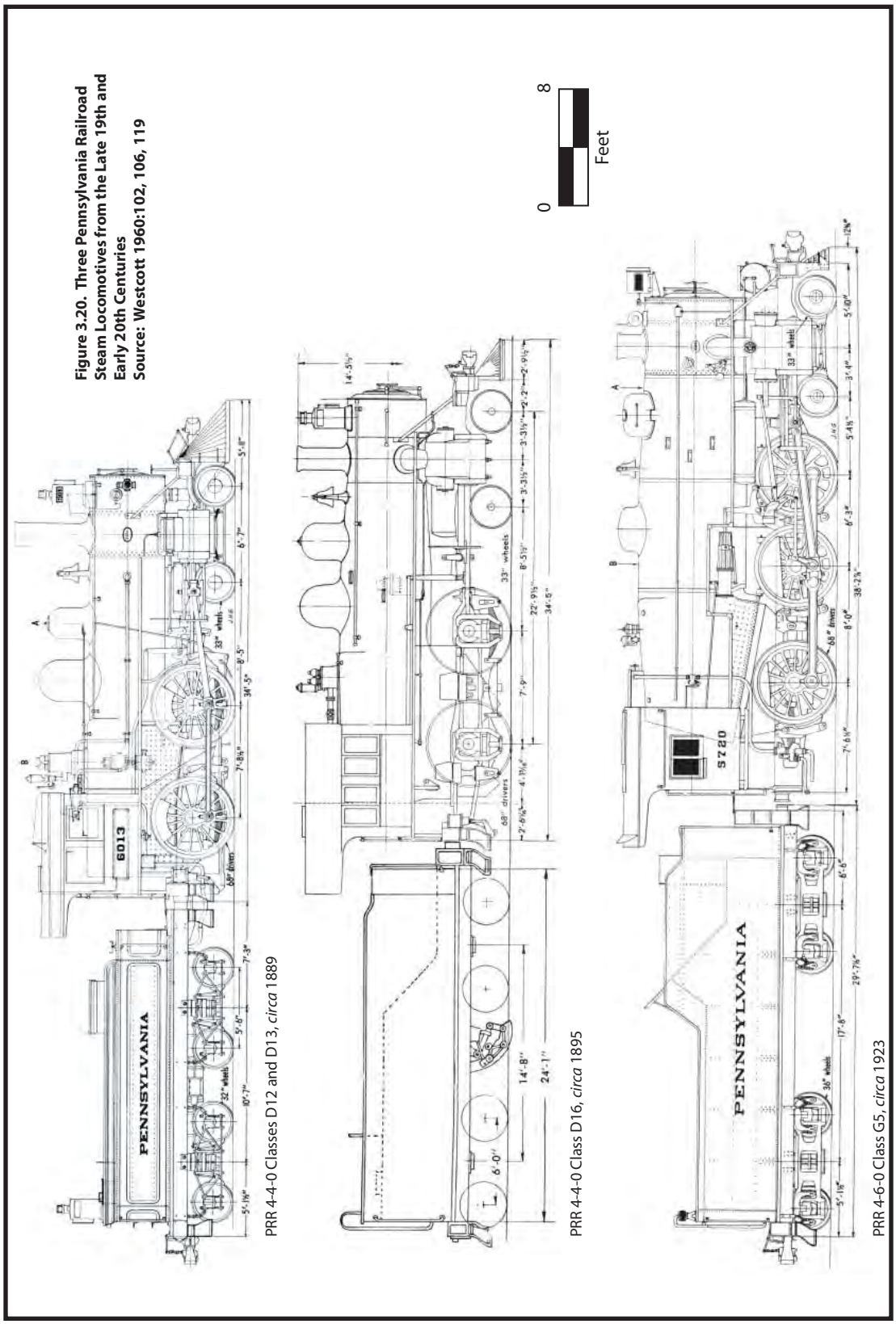


Figure 3.20. Three Pennsylvania Railroad Steam Locomotives from the Late 19th and Early 20th Centuries. Top: PRR 4-4-0 Classes D12 and D13, *circa* 1889. Middle: PRR 4-4-0 Class D16, *circa* 1895. Bottom: PRR 4-6-0 Class G5, *circa* 1923. Source: Westcott 1960:102, 106, 119.

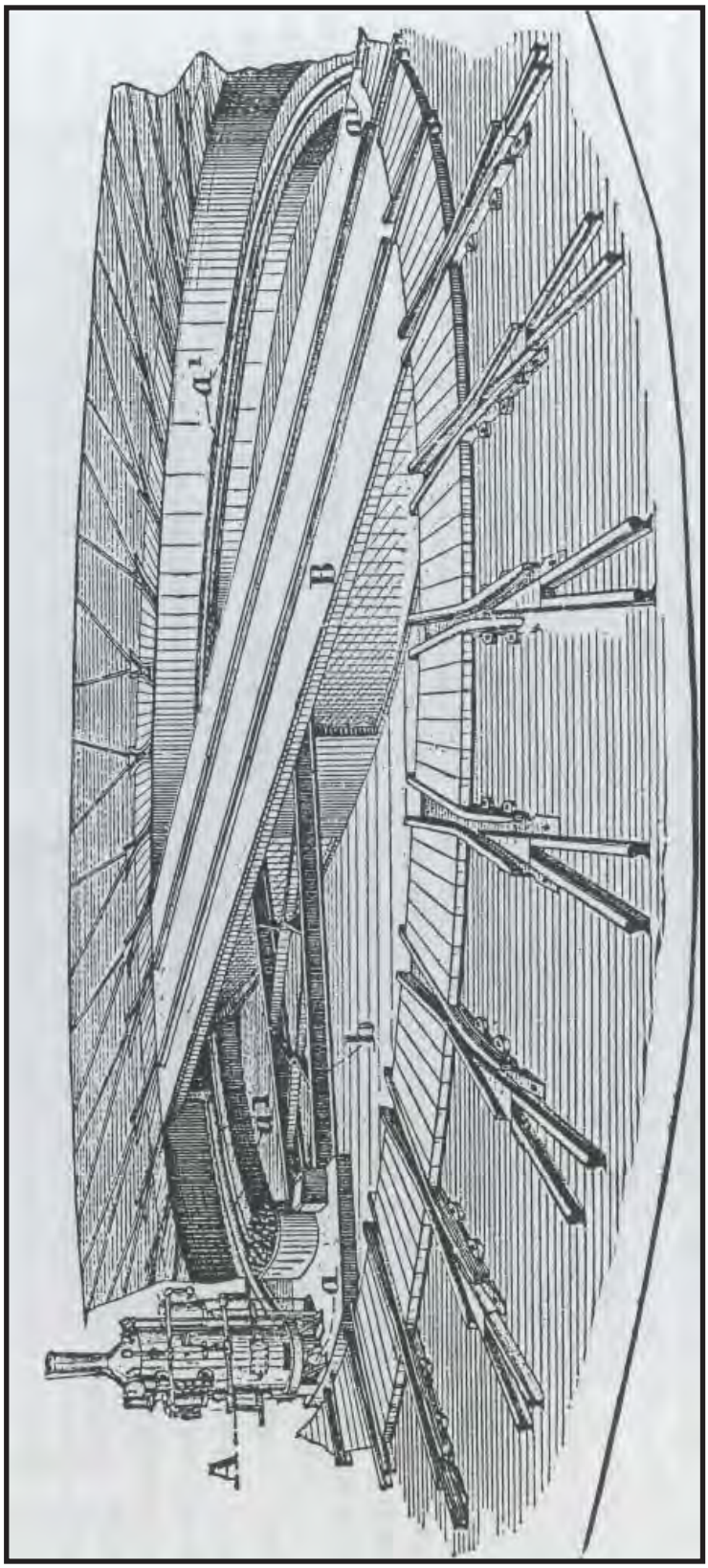


Figure 3.21. Steam-Powered Turntable Installed by the Pennsylvania Railroad at Their Altoona Shops. Source: Bianculli 2003:185.

Chapter 4

CAMDEN AND AMBOY RAILROAD RAIL BED (REMEDIAL AREA 16)

A. OVERVIEW

Remedial Area 16 (PHE Area 3) comprised an irregularly shaped zone of contamination measuring in its maximum extent roughly 150 feet northeast-southwest by 70 feet northwest-southeast (Figure 4.1). Its southeast corner closely abutted the northwestern edge of Remedial Area 15. Remedial Area 16 lay on the crest of the spit-like landform extending out to the Raritan Bay shoreline and was situated roughly 750 feet southwest of the former ferry terminal site. It straddled a series of railroad tracks, including the course of what is believed to be the original Camden and Amboy Railroad route to the terminal. Historic map analysis indicated that there were no buildings located within the remedial area, although an inspection pit/sand bridge facility [Structure 57] and a pump house [Structure 69], both dating from the mid-20th century, were positioned nearby to the southwest and northwest respectively. The engine house [Structure 58] in Remedial Area 15 was also located about 35 feet away to the south. The monitoring expectation was that the principal archaeological resources of interest would be the remains of railroad tracks and bed and related infrastructure.

No exploratory archaeological excavations were conducted in 2001-02 within the limits of Remedial Area 16, but some backhoe-assisted testing was conducted nearby. In June 2001, Test Trench 3 was excavated less than 25 feet southwest of the southwestern edge of Remedial Area 16. This excavation documented a series of sands to a depth of 5.4 feet below the surface, but found no structural remains or recognizable traces of rail bed. The uppermost three layers, which extended to a depth of 2.5 feet, were identified as mottled fill deposits. Roughly 50 feet southwest of Test Trench 3 another excavation, Test Trench 11, was placed in the area of the inspection pit/sand bridge facility [Structure 57]. The results were described as follows:

> Two parallel sections of concrete curbing oriented east-west each one foot wide located six feet apart, were exposed beneath fill. A one-foot wide concrete and wood railroad tie shelf was located 0.50 feet below the top of each concrete curb. The alternating one-foot-wide wood and concrete sections appear to have supported iron rails. A demolition deposit consisting of concrete, metal, and silty sand filled the four-foot-wide space between the concrete curb and rail support. This deposit extended down below the concrete curb and rail at least three feet, possibly providing access to the underside of rail cars (U.S. Department of Transportation, Federal Highway Administration and City of South Amboy 2003:4-51).

In April 2002 a series of four more backhoe trenches, Test Trenches 13-16, were excavated between 50 and 250 feet north and northeast of Remedial Area 16 in search of a car house [Structure 101] that was depicted on the Everts and Stewart map of 1876 (see above, Figure 2.2 and 3.6). These trenches encountered fill deposits and layers of coal dust over a natural sand subsoil, but found no evidence of structural remains (U.S. Department of Transportation, Federal Highway Administration and City of South Amboy 2003:4-51 and 4-52).

Excavation in Remedial Area 16 took place in early/mid-January 2017 and soon encountered two lines of carefully placed stone blocks, oriented generally west southwest to east northeast, but not exactly parallel

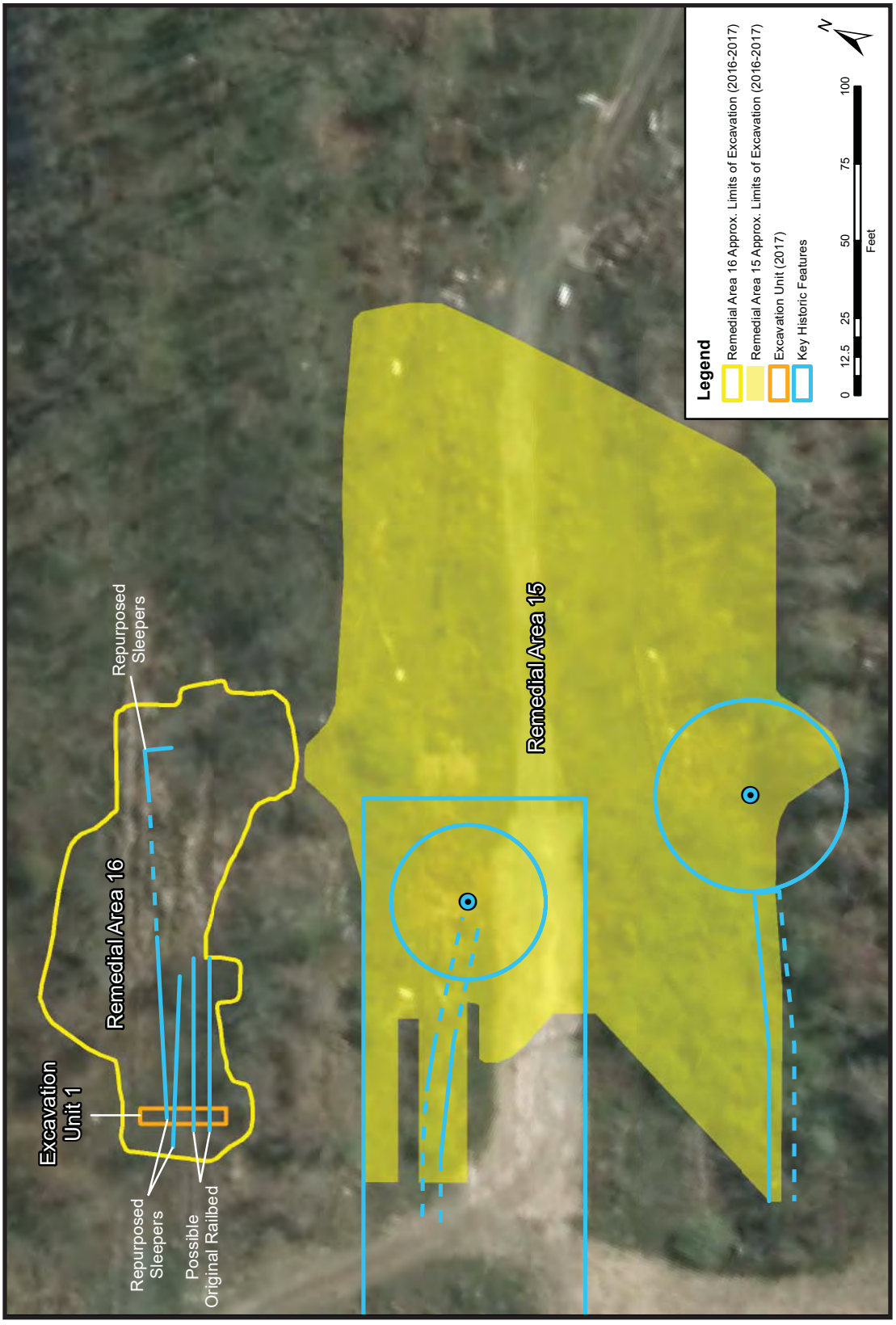


Figure 4.1. Remedial Area 16, Site Plan.

to one another. The stone blocks were immediately recognized as possible early sleepers from the Camden and Amboy Railroad rail bed, although it was uncertain whether they were in their original position, or had been re-used in some later modification of the tracks. These finds, occurring at roughly the same time as the discovery of the nearby turntable remains beneath the engine house in Remedial Area 15, were the subject of further discussion at the on-site meeting held on January 18, 2017 and it was agreed that the rail bed traces in Remedial Area 16 should also be included in the documentary monitoring program that was ultimately implemented in April 2017. As a result, particular attention was subsequently given to documenting the stone sleepers, many of which displayed clear evidence of having once had rails fastened to them. In addition, as a supplement to the monitoring work, an archaeological test trench was dug across the line of the rail bed remains to allow for recovery of a cross-section of these critical linear features. Ultimately, all of the stone sleepers proved to have been re-used in later trackage manifestations in the South Amboy railyard (likely from the Pennsylvania Railroad era), but the expanded archaeological excavation conducted in April 2017 did also find traces of what are considered to be *in-situ* remains of the original Camden and Amboy Railroad rail bed running alongside and to the southeast of the lines of re-used stone sleepers.

B. HISTORICAL DETAIL

As noted above in Chapter 3, a comprehensive historic context for the South Amboy ferry terminal is provided in Chapter 5 of the earlier report on cultural resources investigations at the Intermodal Ferry Transportation Center (IFTC) site (Hunter Research, Inc. 2015). This section of the current chapter focuses specifically on the construction history of the Camden and Amboy Railroad/Pennsylvania Railroad with particular reference to the rail bed and trackage in the South Amboy railyard and Remedial Area 16. Rail lines appear to have existed within the limits of Remedial Area 16 throughout the railyard's period of use from the early 1830s through into the mid-1970s (see above, Chapter 3 and Figures 3.2-3.10).

The first segment of the Camden and Amboy Railroad line was constructed from South Amboy to Stewart's Point (at Fieldsboro between Bordentown and White Hill) in 1830-32, with grading commencing in December of 1830, and the line itself beginning to be laid in late April/early May of 1832. Regular passenger service between Stewart's Point and South Amboy commenced on December 17, 1832. Ferry connections were provided at both ends of the line by the steamboats *Robert Morris* (on the Delaware River to Philadelphia) and the *Water-Witch* (across Raritan Bay, along the Arthur Kill and across New York Bay to Manhattan) (Directors of the Camden and Amboy Rail Road and Transportation Company 1833:3-4, 14-15).

The South Amboy to Stewart's Point segment of the Camden and Amboy Railroad, covering a distance of 35 miles, was laid as a single track "with a sufficient number of turn-outs at suitable distances, to avoid all difficulty from the meeting of cars on the line." Great care was taken in the construction process. The rails, imported from England, were laid down "in the most permanent manner, and every precaution taken to ensure the security and durability of the line. The foundation is of broken stone, laid in trenches entirely below the frost, and well packed by rolling them with massive rollers, so as to guard against any derangement of the line, either from settling or the action of the frost" (Directors of the Camden and Amboy Rail Road and Transportation Company 1833:3-4).

The winter of 1831-32 was especially severe and resulted in modifications in the construction of the rail bed, as noted in the annual report of 1833:

> It has been thought prudent, not only to lay the broken stone foundation deeper, but that it should have much more base than originally contemplated. Instead of six hundred, sixteen hundred tons of this material have been used on each mile; so that the whole road now rests upon a solid stone foundation, laid below the sensible action of the frost, and with a base of three feet under each rail, or six feet to each track. A similar change has been made in the size of the stone blocks, which have been increased from a surface equal to two feet, to four and five feet ….. The large blocks are not only more expensive in quarrying and handling, (three of these weighing a ton,) but many of the quarries were unable to furnish them at all, of the size required (Directors of the Camden and Amboy Rail Road and Transportation Company 1833:7-8).

Ensuring an adequate supply of stone for the sleepers appears always to have been something of a challenge. The harsh winter held up the shipping of stone on the ice-bound Delaware River and Raritan Bay for almost five months. One of the main suppliers was the quarries at Sing Sing Prison on the Hudson, but a cholera outbreak there interrupted production for much of the summer of 1832 (Directors of the Camden and Amboy Rail Road and Transportation Company 1833:5).

Nevertheless, construction of the railroad from South Amboy to Stewart's Point was successfully completed before the end of the year and the route was operational throughout 1833. A knowledgeable traveler reported in the July-December issue of *Mechanics Magazine* that the line was "constructed after the English plan, with Mr. R. Stevens' improved iron rails; and that part of the track which has been recently laid has a better surface than any railroad I have ever seen, either in this country or in England." The same source stated that the passenger cars were still horse-drawn at this time, with roughly 180 horses performing this task, but also noting that three of four locomotives were in use conveying materials for construction and "as many more nearly in readiness" (Mechanics' Magazine 1833:157).

A more precise description of the original Camden and Amboy railroad rail bed is provided in the Joint Board of Directors' report of 1840. The bed was 15 feet wide at grade and bordered by a three-foot-deep ditch on both sides along most of its length. Quite possibly the ditch was not necessary for the section of track within Remedial Area 16 as the spit-like landform would have fell away naturally on either side. The majority of the rail bed for South Amboy to Stewart's Point portion of the line, covering more than 26 miles, was constructed as follows:

> …. stone blocks, two feet square, 10 to 13 inches thick, were placed 3.2 feet apart, from centre to centre – embedded with small stone on the trenches; then settled with a heavy wooden driver, worked by horse power; two holes were drilled into each stone block, (except at the junction blocks, which have four holes), one inch in diameter, and five inches deep. Upon the stone blocks, locust chairs, 14 inches long, 6 to 8 inches in width, and from 1 to 2 inches thick, are placed, and attached to the stone blocks, by trenails driven into the holes of the stone blocks. The chairs were then dressed, to receive the edge rail, of the I form (invented by R.L. Stevens, Esq.) 3½ inches high, 2 1/8 inches on the upper running surface, and three and a half inches in width on its base, weighing 42 lbs. to the yard, is laid and fastened by spikes six inches long, with hooked heads, the ends of the bars resting upon wrought iron plates, or cast iron chairs, and are connected together by an iron tongue five inches long, two inches wide, and five eighths of an inch thick, with two rivets passing through the ends of the bars and tongues oblong hole, to

> allow for expunctral contraction (Joint Board of Directors of the Delaware and Raritan Canal Company and Camden and Amboy Railroad and Transportation Companies 1840:22-23).

Most of the rest of the rail bed, covering a distance of just over seven miles, was constructed a little differently, being laid with "cross sleepers, placed 2 feet 8 inches apart from centre to centre, of oak and chestnut, 8 feet long, 6 inches thick, and not less than 6 inches in width – embedded with small broken stone, upon the stone trenches, and consolidated with heavy hand pounders." The cross sleepers were then dressed to receive the edge rail to which they were then fastened in the manner described above (Joint Board of Directors of the Delaware and Raritan Canal Company and Camden and Amboy Railroad and Transportation Companies 1840:23). It is not known for sure which of the two methods of laying the rail bed was originally used at the South Amboy end of the line, but the presence of so many stone sleepers in the area of the ferry terminal suggests strongly that it was the first and more widespread technique that was employed. Theoretically, if sufficient remains survived *in situ*, the two methods should be distinguishable archaeologically.

Over time, as rail traffic expanded and rolling stock increased in size and weight, the maintenance and replacement of rail iron and the rail bed became of increasing concern, as is evident from the annual reports that the board of directors prepared for the stockholders. However, it is difficult to pinpoint when and where repair and replacement actions were taking place. Overall, it would appear that the condition of the iron rail was more of an issue than the underlying rail bed. It was noted on January 1, 1842, for example, that "the road between Bordentown and South Amboy, (laid with stone blocks) [is] in better order than [it ever] has been, and require[s] no repairs." A year later, "[t]he road between Bordentown and Amboy, being nearly all of the most permanent character – laid with stone blocks, locust and T-rail – has required only adjusting the rail or upper surface, and is now in better condition than last year. The remaining part of the road, laid with cross sleepers, has had many new ones placed under the rails." The 1848 annual report stated that it was necessary to relay a large portion of the Bordentown to South Amboy line with "new and heavy rails." By 1856, the annual report noted that, for the entire route, "there are now 6.58 miles remaining of the original rails; which it will be desirable to replace with the heavier rail during the present year" (Joint Board of Directors of the Delaware and Raritan Canal Company and Camden and Amboy Railroad and Transportation Companies 1842 & 1843:9, 14; 1848:4; 1856:21).

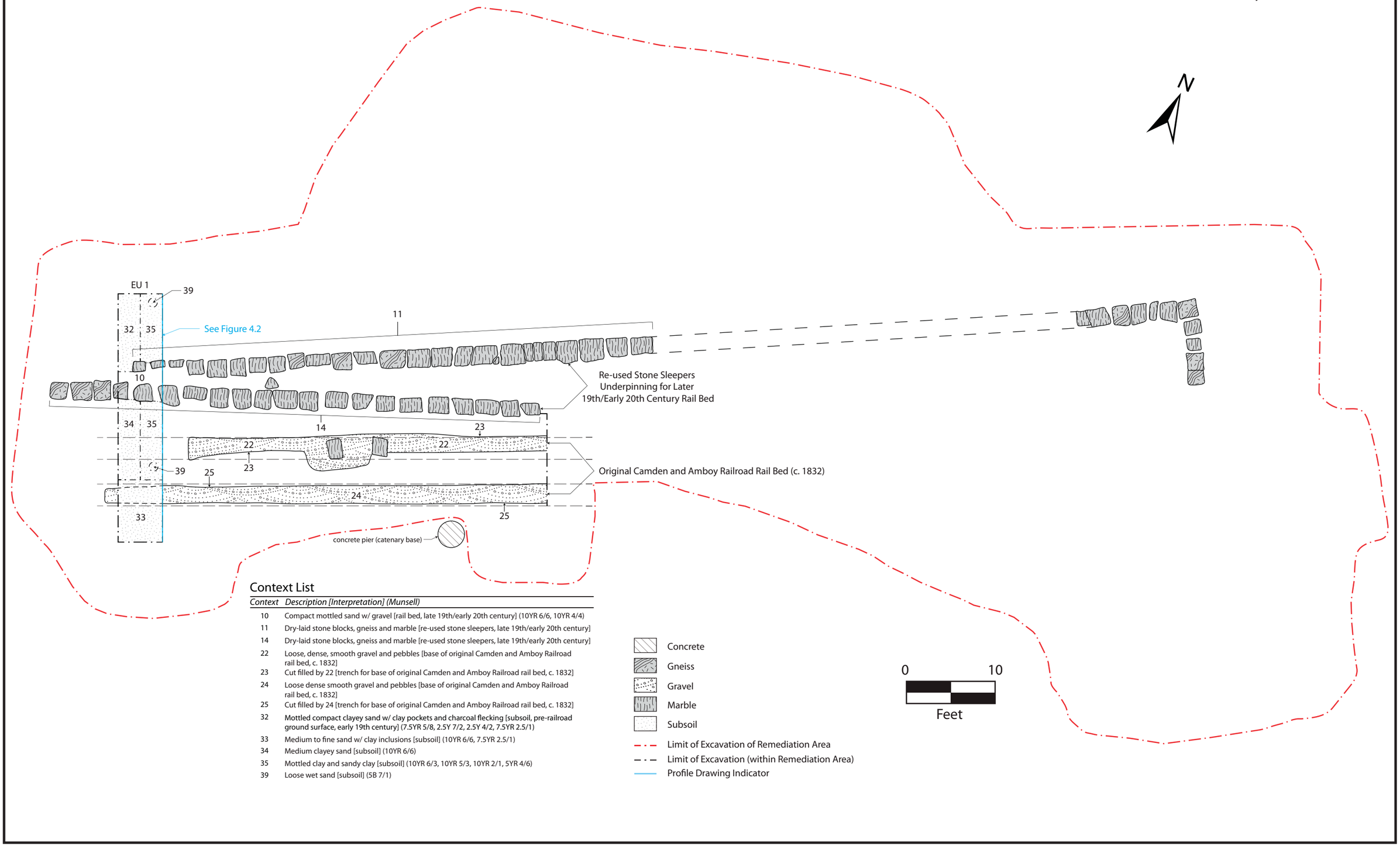
It seems very unlikely, with the ongoing expansion and reconfiguration of the South Amboy railyard from the 1830s until deep into the 20th century, that any segments of the original rail bed would have continued in use without undergoing modification, while it is probable also that portions of the bed will have been abandoned and newly built over, with building materials being re-used elsewhere. As the sequence of historic maps (see above, Figures 3.2-3.10) clearly shows, while the overall rail route through the railyard to the ferry terminal remains constant, there is a massive proliferation in the number of rail tracks, especially in the Pennsylvania Railroad era, which undoubtedly will have taken its toll on the earliest versions of Camden and Amboy Railroad infrastructure.

C. ARCHAEOLOGICAL FIELD INVESTIGATIONS

Excavation within Remedial Area 16 in early January 2017 encountered two lines of large stone blocks running roughly northeast-southwest (Figure 4.2; Photographs 4.1-4.4). The lines were almost, but not quite, parallel, converging on a point toward the southwestern end of the excavation area. The stones were

Photograph 4.1. View looking northeast showing Remedial Area 16 (PHE Area 3) with excavation in progress and the first line of stone sleepers in the process of being exposed (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D7:559].

Remedial Area 16, Site Plan, Camden and Amboy Railroad Rail Beds



Context List

Context	*Description [Interpretation] (Munsell)*
10	Compact mottled sand w/ gravel [rail bed, late 19th/early 20th century] (10YR 6/6, 10YR 4/4)
11	Dry-laid stone blocks, gneiss and marble [re-used stone sleepers, late 19th/early 20th century]
14	Dry-laid stone blocks, gneiss and marble [re-used stone sleepers, late 19th/early 20th century]
22	Loose, dense, smooth gravel and pebbles [base of original Camden and Amboy Railroad rail bed, c. 1832]
23	Cut filled by 22 [trench for base of original Camden and Amboy Railroad rail bed, c. 1832]
24	Loose dense smooth gravel and pebbles [base of original Camden and Amboy Railroad rail bed, c. 1832]
25	Cut filled by 24 [trench for base of original Camden and Amboy Railroad rail bed, c. 1832]
32	Mottled compact clayey sand w/ clay pockets and charcoal flecking [subsoil, pre-railroad ground surface, early 19th century] (7.5YR 5/8, 2.5Y 7/2, 2.5Y 4/2, 7.5YR 2.5/1)
33	Medium to fine sand w/ clay inclusions [subsoil] (10YR 6/6, 7.5YR 2.5/1)
34	Medium clayey sand [subsoil] (10YR 6/6)
35	Mottled clay and sandy clay [subsoil] (10YR 6/3, 10YR 5/3, 10YR 2/1, 5YR 4/6)
39	Loose wet sand [subsoil] (5B 7/1)

Figure 4.2. Remedial Area 16, Site Plan, Rail Beds.

Photograph 4.2. View looking southwest showing Remedial Area 16 (PHE Area 3) with excavation in progress and the first line of stone sleepers in the process of being exposed; scales in feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D7:554].

Photograph 4.3. View looking southwest showing the first line of stone sleepers set into thick layer of sand fill at the southwestern end of Remedial Area 16 (PHE Area 3); scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:070].

Photograph 4.4. View looking east showing the second line of stone sleepers exposed in what was then the southeastern edge of Remedial Area 16 (PHE Area 3); scales in feet and tenths of feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D8:262].

placed close to one another and are best described as irregularly shaped, rough-dressed, square or rectangular blocks, roughly two feet square and between 12 and 15 inches thick. Several of them displayed traces of quarrying and had drill holes, features which are described and discussed in greater detail below. The lines of stone blocks were initially interpreted as possible rail bed features, although their alignment and whether or not they were in their original depositional context were the subject of some debate. Following an on-site meeting held on January 18, 2017, attended by senior staff from Hunter Research, Potomac-Hudson Environmental and Ambient Group and representatives from the City of South Amboy, the New Jersey Historic Preservation Office and the New Jersey Department of Transportation, it was decided to explore the lines of stone blocks further and also document these remains in cross-section through manual archaeological excavation of a trench placed perpendicular across their alignment.

Supplementary excavations were carried out in April 2017. The overall area of study and remediation was first extended to the southwest and northeast to allow the linear character of the possible rail bed remains to be more fully exposed and examined in greater detail. This expansion of the excavation area revealed traces of what are thought to be an earlier segment of rail bed associated with the Camden and Amboy Railroad period of use and also found more stone blocks, evidently arranged as a corner foundation, some 50 feet to the northeast of the originally discovered lines of stone blocks. Both are discussed further below. The archaeological trench intended to record the cross-section across the possible rail bed was placed at the junction of the two lines of stone sleepers (Photographs 4.5 and 4.6).

The supplementary archaeological work allowed for a more thorough examination of the stone sleepers, which was accomplished with the assistance of geologist and Camden and Amboy Railroad expert, Pierre Lacombe of the U.S. Geological Survey. In the southwestern part of Remedial Area 16, approximately 50 of these stone sleepers, all dry-laid, were observed in place (a few others had also been dislodged during the earlier remediation work). Several of them displayed the typical characteristics of original Camden and Amboy Railroad stone sleepers, conforming to Lacombe's two-hole and four-hole model (and to the contemporary descriptions referenced in Section 4B of this chapter) (Photographs 4.7 and 4.8). On most of the stones with drill holes, the rectangular outline of the setting for the chair or plate, usually made of locust, was also visible. Some stones showed evidence of quarrying and the use of wedges and the pin and feather technique. Most of the stones were fashioned in gneiss or marble and probably extracted from quarries in the Hudson valley or northern New Jersey.

However, the stone sleepers with the drill holes form no pattern when viewed as a group and their surfaces with drill holes randomly face in multiple directions, indicating that they are not in their original positions. Furthermore, these sleeper stones were placed cheek-by-jowl, whereas in all other locations where *in-situ* remains of the Camden and Amboy railroad rail bed have been observed, e.g., in Hightstown Borough and Monroe Township, the stones are arranged along two parallel lines in what Lacombe recognizes as "1-4 or 1-5 arrays" where four-hole stone sleepers are placed 16 feet apart along each line with four or five two-hole stone sleepers evenly spaced in between (Patten *et al.* 2015; Pierre Lacombe, email communication, April 13, 2017). Clearly, the stone sleepers discovered in Remedial Area 16, while originally forming part of the original Camden and Amboy railroad rail bed somewhere nearby, were later re-used in a reconfiguration and upgrading of tracks in the railyard.

The true purpose of the two lines of re-used stone sleepers is not entirely understood. They are thought most likely to represent a substructure or reinforcing linear foundation for a rail track, now entirely

Photograph 4.5. View looking west showing the junction of the two lines of stone sleepers near the southwestern end of Remedial Area 16 (PHE Area 3) where Excavation Unit 1 was soon dug; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:088].

Photograph 4.6. View looking east showing the junction of the two lines of stone sleepers near the southwestern end of Remedial Area 16 (PHE Area 3); work has just begun on Excavation Unit 1 in the foreground; the corner foundation is visible in the distance continuing the line of stones to the left; scales in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:493].

Photograph 4.7. Close-up view of typical two-hole stone sleeper showing one-inch diameter holes drilled to receive fastening trenails and spikes; traces of the rectangular outline for the setting for the locust chair or plate are just visible surrounding the drill holes; scale in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:447].

Photograph 4.8. Close-up view of typical four-hole stone sleeper, or junction block, showing one-inch diameter holes drilled to receive fastening trenails and spikes; one spike still in place; traces of the rectangular outline for the setting for the locust chair or plate are just visible surrounding the drill holes; scale in feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:450].

removed, that may have been at an elevation several inches, perhaps even a foot or more, higher than that of the top surface of the stones. The V-shaped relationship between the two lines of stones may signify the location of a switch or frog and a need for additional foundational support, although the angle is somewhat acute. The relationship of the more northerly line of stones to the corner foundation discovered near the northeastern edge of Remedial Area 16 is uncertain, but if these features did support a track, it may have been only a short siding (see below).

In the course of expanding the area of archaeological excavation within Remedial Area 16 further to the southwest, two distinct linear strips of gravel and waterworn pebbles were found to the southeast of the lines of stone blocks (Figure 4.2; Photographs 4.9 and 4.10). Set deliberately into the surrounding sands, these gravel/pebble strips are not naturally formed and appear to be fill of linear manmade trenches. Although parallel to one another, the two strips did not run parallel to either of the two nearby lines of stone blocks. Each gravel/pebble strip measured roughly 20 to 24 inches in width and six inches in thickness, and they were spaced approximately five feet apart on center. Based on contemporary written descriptions of the Camden and Amboy Railroad rail bed and observations of surviving sections of rail bed along the Camden and Amboy route, these strips are interpreted as the bottom portions of the trenches containing the ballast on which the stone sleepers were originally placed. Further discussion of these rail bed remains is offered below in Section 4D of this chapter.

Two stone sleepers were documented roughly five feet apart along the gravel/pebble strip furthest to the northwest (Figure 4.2; Photographs 4.9 and 4.10). Because of their horizontal spacing, their depth in relation to the gravel and pebbles, and their slightly off-center displacement, these stone sleepers are not thought to be in their original position. In fact, they most likely represent remnants of footings for the rail that would have run parallel to the rail supported by the neighboring line of stone blocks lying roughly five feet to the northwest (i.e., standard gauge track). Alternatively, these two stone sleepers could merely have been discarded, unused, around the time that all the other nearby stone sleepers were set in place.

Approximately 50 feet northeast of the northeastern end of the more northerly line of stone blocks, and continuing the alignment of the blocks, a substantial corner foundation was exposed, comprising two courses of stacked re-used stone sleepers (Figures 4,2; Photographs 4.11 and 4.12). Roughly 13 feet of the northwest arm of the corner and some nine feet of the northeast arm survived. One two-hole and one four-hole stone sleeper were noted in the top course of this dry-laid masonry. The corner foundation was set down into deposits of sand fill. The purpose of this foundation is unclear. It uncertain, for example, if it supported a building, or enclosed some feature of the railyard, or if it represents footings for a “deadman” at the end of a siding. The currently available historic maps of this area show no structures other than railroad tracks.

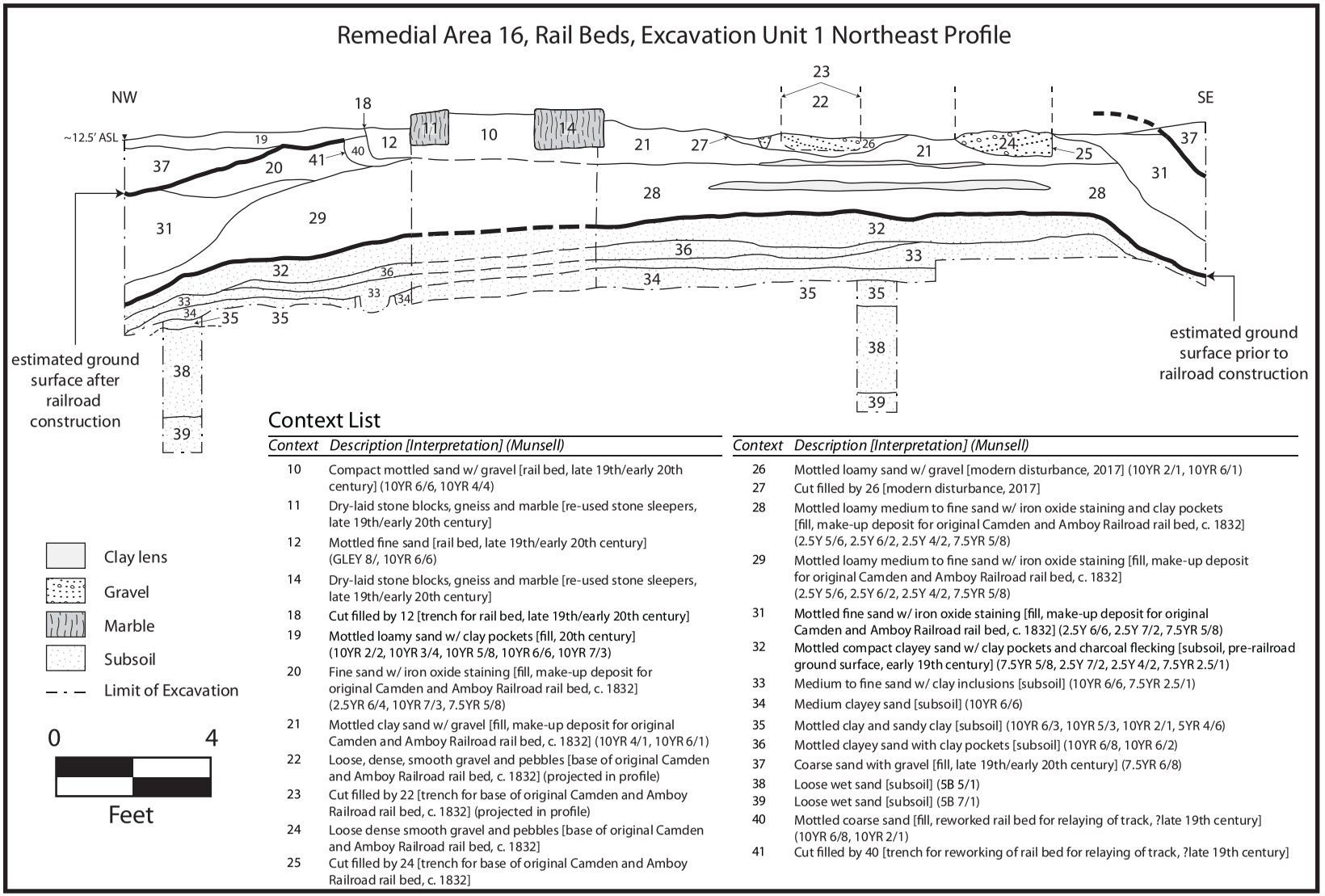
Excavation Unit 1, measuring 28 feet northwest-southeast by five feet northeast-southwest, was dug partly by machine and partly by hand to a maximum depth of five feet below the level of the stone sleepers and gravel/pebble rail bed (Figures 4.2 and 4.3; Photographs 4.13-4.15). This trench proved instructive as it enabled a cross-sectional view both of the rail beds and of the fill deposits and the natural spit-like landform on which the rail lines were constructed. The ground surface prior to the commencement of railroad construction is judged to be represented approximately by the top of Context 32, a mottled, compact, clayey sand with clay pockets and charcoal flecking in its upper portion. Context 32 and the soil layers beneath contained only prehistoric artifacts and their stratigraphy showed soils sloping down to the

Photograph 4.9. View looking east along the northern line of packed gravel in Remedial Area 16 (PHE Area 3); this linear gravel feature, set into the natural sands, is interpreted as a segment of the original Camden and Amboy Railroad rail bed dating from the 1830s; the stone sleeper in the foreground is not considered part of the original rail bed; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:494].

Photograph 4.10. View looking west across the western end of Remedial Area 16 (Area 3) showing the two parallel lines of packed gravel and lines of stone sleepers; the two lines of gravel, spaced approximately five feet on center, are interpreted as part of the original Camden and Amboy Railroad rail bed dating from the 1830s and would have supported standard gauge track; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:552].

Photograph 4.11. View looking west showing the corner foundation at the northeastern end of Remedial Area 16 (PHE Area 3); the gravel remedial fill is in the center of the view with the rail bed remnants beyond; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:686].

Photograph 4.12. Detailed view looking west showing the corner foundation at the northeastern end of Remedial Area 16 (PHE Area 3); this masonry may have been a substructure for a "deadman" at the end of a short siding; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:418].



Context List

Context	Description [Interpretation] (Munsell)
10	Compact mottled sand w/ gravel [rail bed, late 19th/early 20th century] (10YR 6/6, 10YR 4/4)
11	Dry-laid stone blocks, gneiss and marble [re-used stone sleepers, late 19th/early 20th century]
12	Mottled fine sand [rail bed, late 19th/early 20th century] (GLEY 8/, 10YR 6/6)
14	Dry-laid stone blocks, gneiss and marble [re-used stone sleepers, late 19th/early 20th century]
18	Cut filled by 12 [trench for rail bed, late 19th/early 20th century]
19	Mottled loamy sand w/ clay pockets [fill, 20th century] (10YR 2/2, 10YR 3/4, 10YR 5/8, 10YR 6/6, 10YR 7/3)
20	Fine sand w/ iron oxide staining [fill, make-up deposit for original Camden and Amboy Railroad rail bed, c. 1832] (2.5YR 6/4, 10YR 7/3, 7.5YR 5/8)
21	Mottled clay sand w/ gravel [fill, make-up deposit for original Camden and Amboy Railroad rail bed, c. 1832] (10YR 4/1, 10YR 6/1)
22	Loose, dense, smooth gravel and pebbles [base of original Camden and Amboy Railroad rail bed, c. 1832] (projected in profile)
23	Cut filled by 22 [trench for base of original Camden and Amboy Railroad rail bed, c. 1832] (projected in profile)
24	Loose dense smooth gravel and pebbles [base of original Camden and Amboy Railroad rail bed, c. 1832]
25	Cut filled by 24 [trench for base of original Camden and Amboy Railroad rail bed, c. 1832]

Context	Description [Interpretation] (Munsell)
26	Mottled loamy sand w/ gravel [modern disturbance, 2017] (10YR 2/1, 10YR 6/1)
27	Cut filled by 26 [modern disturbance, 2017]
28	Mottled loamy medium to fine sand w/ iron oxide staining and clay pockets [fill, make-up deposit for original Camden and Amboy Railroad rail bed, c. 1832] (2.5Y 5/6, 2.5Y 6/2, 2.5Y 4/2, 7.5YR 5/8)
29	Mottled loamy medium to fine sand w/ iron oxide staining [fill, make-up deposit for original Camden and Amboy Railroad rail bed, c. 1832] (2.5Y 5/6, 2.5Y 6/2, 2.5Y 4/2, 7.5YR 5/8)
31	Mottled fine sand w/ iron oxide staining [fill, make-up deposit for original Camden and Amboy Railroad rail bed, c. 1832] (2.5Y 6/6, 2.5Y 7/2, 7.5YR 5/8)
32	Mottled compact clayey sand w/ clay pockets and charcoal flecking [subsoil, pre-railroad ground surface, early 19th century] (7.5YR 5/8, 2.5Y 7/2, 2.5Y 4/2, 7.5YR 2.5/1)
33	Medium to fine sand w/ clay inclusions [subsoil] (10YR 6/6, 7.5YR 2.5/1)
34	Medium clayey sand [subsoil] (10YR 6/6)
35	Mottled clay and sandy clay [subsoil] (10YR 6/3, 10YR 5/3, 10YR 2/1, 5YR 4/6)
36	Mottled clayey sand with clay pockets [subsoil] (10YR 6/8, 10YR 6/2)
37	Coarse sand with gravel [fill, late 19th/early 20th century] (7.5YR 6/8)
38	Loose wet sand [subsoil] (5B 5/1)
39	Loose wet sand [subsoil] (5B 7/1)
40	Mottled coarse sand [fill, reworked rail bed for relaying of track, ?late 19th century] (10YR 6/8, 10YR 2/1)
41	Cut filled by 40 [trench for reworking of rail bed for relaying of track, ?late 19th century]

Figure 4.3. Remedial Area 16, Excavation Unit 1, Northeast Profile, Cross-Section of Rail Beds

Photograph 4.13. View looking southeast showing Excavation Unit 1 at the southwestern end of Remedial Area 16 (PHE Area 3); this unit was placed perpendicular to the lines of stone sleepers and gravel; the soil profile shows the slope of the underlying natural deposits that make up the spit-like landform on top of which the rail lines ran; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:790].

Photograph 4.14. View looking northeast showing Excavation Unit 1 at the southwestern end of Remedial Area 16 (PHE Area 3); this unit was placed perpendicular to the lines of stone sleepers and gravel; the soil profile shows the slope of the underlying natural deposits that make up the spit-like landform on top of which the rail lines ran; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:792].

Photograph 4.15. View looking southwest showing Excavation Unit 1 at the southwestern end of Remedial Area 16 (PHE Area 3); this unit was placed perpendicular to the lines of stone sleepers and gravel; the soil profile shows the slope of the underlying natural deposits that make up the spit-like landform on top of which the rail lines ran; scales in feet and tenths of feet (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:816].

Photograph 4.16. View looking east showing the stone sleepers, masonry and gravel features in Remedial Area 16 (PHE Area 3) being buried under protective geotextile fabric before backfilling (Photographer: Joshua Butchko, April 2017) [HRI Neg. #17023/D1:824].

northwest and southeast at either end of the trench, i.e., reflecting the sides of the spit-like landform extending out to the ferry terminal site.

The recovery of Native American artifacts from Contexts 32-34 and 38 is unsurprising as the slightly elevated spit-like landform would have served as an obvious route to the shoreline in the prehistoric period. The eight artifacts gathered from these intact prehistoric cultural deposits consist of three whole hammerstones (two quartzite and one quartz), a sandstone cobble-based tool (a smoothing stone), one utilized jasper flake and three shatter fragments (two jasper, including one thermally altered, and one quartz (Appendix D). Significantly, the recovery of two of these artifacts from Context 38 in the bucket auger tests in the base of the unit indicates that there is some potential for intact stratified prehistoric deposits along the crest of the spit-like landform. It was noted that the loose, wet, fine sands of Contexts 38 and 39 gave off an odor of fuel and exhibited visible contamination. Samples of the observed material were collected and analyzed by the remedial contractors and determined to be below actional cleanup levels. It is presumed that the source this material may have been the nearby engine house.

The soil profile observed in Excavation Unit 1 appears to indicate that the spit-like landform was overtopped with several thick layers of sand fill [Contexts 28, 29, 31, 20 and 21] into which the rail beds for the original Camden and Amboy Railroad [Contexts 22-25] and for the later railyard tracks [Contexts 10-12, 14, 18, 40, 41] were introduced. In this manner the cross-section of the original landform was considerably enlarged and the ground surface raised by about two feet. The deposition of the sand fill was no doubt necessary to establish the necessary grade for the tracks heading down to the ferry terminal site. The sand fill likely originated from nearby railroad-related construction sites and these soils contained a mix of Native American and historic artifacts, including: two sandstone hammerstones; a quartzite hammerstone/chopper; jasper, chalcedony, quartz and quartzite flakes and shatter fragments; sherds of redware, creamware and pearlware, and glass, brick, coal and nail fragments (Appendix D).

Following the completion of Excavation Unit 1, the trench was backfilled and the exposed lines of stone blocks and gravel/pebble rail bed remains were carefully covered with protective geotextile fabric before being themselves buried (Photograph 4.16). During the course of the remedial excavations, a number of stone sleepers were dislodged and removed. These blocks have been stockpiled on site for future use and possible incorporation into new construction.

D. ANALYSIS

Excavated archaeological remains found within Remedial Area 16 all indicate that this portion of the South Amboy railyard was only ever traversed by rail tracks. There are no definite traces of buildings or other railroad infrastructure, although the corner foundation composed of re-used stone sleepers defies clear explanation. The key to interpreting the archaeology of this location is the underlying sandy spit-like landform, whose southwest-northeast-oriented ridge supported the succession of rail lines leading out to the ferry terminal site on the shore of Raritan Bay. This ridge, which was documented in cross-section in Excavation Unit 1, appears to have been enhanced at the outset of railroad usage in the early 1830s with the Camden and Amboy Railroad engineers and construction workers depositing upward of two feet of sand fill to achieve the necessary grade for the tracks. The source of the fill was undoubtedly local and probably originated from nearby building sites and perhaps also from the basal side slopes of the spit-like landform.

Open-area, backhoe-assisted archaeological excavation in the southwest corner of the remedial area in April 2017 exposed roughly 50 feet of what is interpreted as the original Camden and Amboy Railroad rail bed, thought to have been laid down in 1832. Evident as two parallel strips of mixed gravel and pebbles, this matrix is viewed as the extreme base of the rail bed. Remains of the rail bed likely extended northeastward across the rest of Remedial Area 16, but were inadvertently removed during the remedial excavation work undertaken in early January 2017 (these would have been virtually impossible to recognize through observational monitoring). Traces of the rail bed may be expected to survive beyond the limits of Remedial Area 16 to the northeast and southwest. Projection of elevation data for the rail bed across the railyard site should allow a reasonable assessment to be made of its likely survival.

The trench excavated across the line of the railroad corridor (Excavation Unit 1) enabled a cross-section to be obtained of the original rail bed, showing that only its very lowest part survived to a depth of around six inches. The observed remains conform closely to the cross-section of the Camden and Amboy Railroad rail bed sketched by Franz Anton Ritter von Gerstner in 1842-43 (Figure 4.4) and also closely match the findings of a series of trenches excavated across the rail line south of Hightstown in 1985 (Hunter Research, Inc. 1986). Based on von Gerstner's sketch and contemporary descriptions of the rail bed (see above, Chapter 4B), the elevation of the top of the rail can be estimated as being at a height of roughly three feet above the base of the trench constructed for the rail bed, which in this section of the South Amboy railyard translates into an absolute elevation of approximately 14-15 feet above sea level.

Excavation Unit 1 also provided a cross-section of the two lines of stone blocks, showing these to be set at roughly the same depth as the base of the original rail bed, a short distance to the southeast. The blocks, mostly fashioned in gneiss or marble, almost all appear to be re-used stone sleepers from the original Camden and Amboy Railroad rail bed and are believed to form the underpinning for later 19th- or early 20th-century bed and track that have been removed. The sleepers are closely spaced and their original top surfaces with their telltale spike holes face in many different directions. Clearly, these sleepers are not in their original depositional context and do not conform the typical arrangement of such stones along original intact sections of the Camden and Amboy line (cf. Photograph 4.17) (e.g., Patten *et al.* 2015). The underpinning for this later rail bed may indicate the location of a frog and a short siding terminating some 120 feet away at a corner foundation composed of stacked, re-used stone sleepers. The elevation of the rails atop this later rail bed was likely similar to that of the original Camden and Amboy Railroad rail bed.

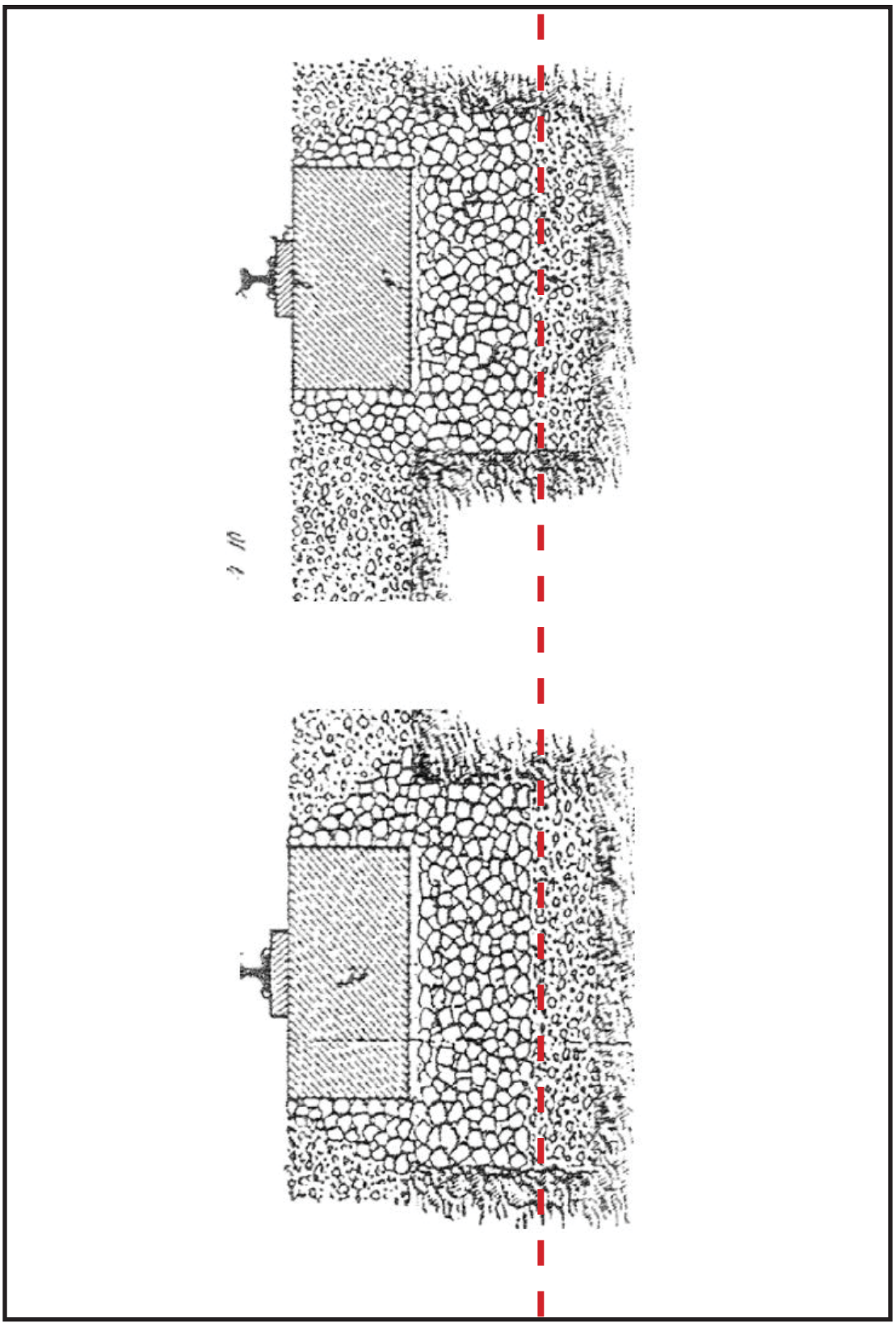
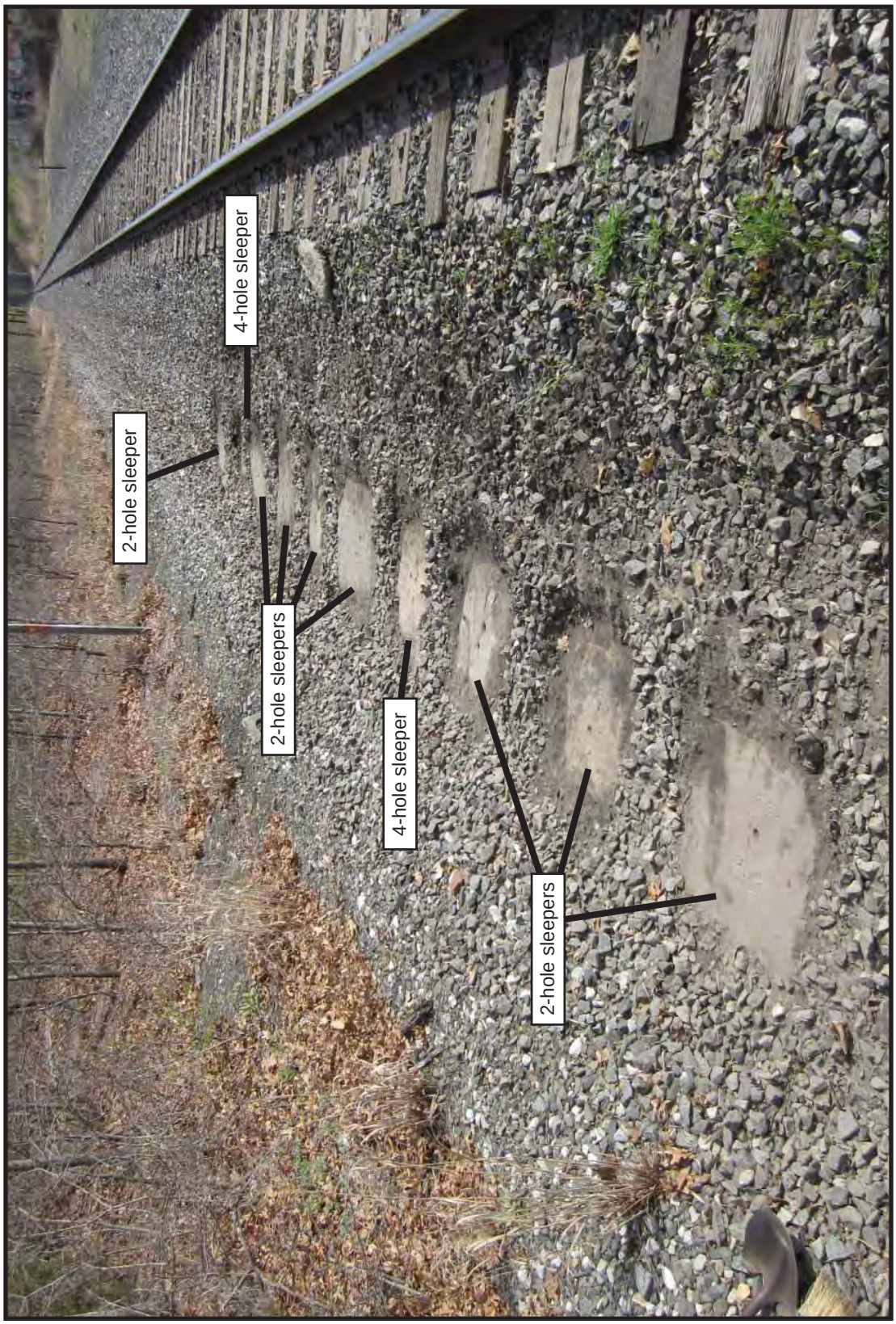


Figure 4.4. von Gerstner, Franz Anton Ritter. Cross-Section of the Camden and Amboy Railroad Rail Bed. 1842-43. Dashed line indicates approximate extent to which the rail bed survived within Remedial Area 16.



Photograph 4.17. View looking northeast along part of the original Camden and Amboy Railroad route southwest of the Cheesequake Road crossing, Borough of Sayreville, Middlesex County; a line of *in-situ* stone sleepers, part of the original rail bed, has been swept clean to show the typical configuration of the two-hole and four-hole blocks (Photographer: Richard Hunter, April 2017) [HRI Neg. #17023/D2:001].

Chapter 5

OTHER REMEDIATION ACTIVITY (REMEDIAL AREAS 1-15, 17 AND 18)

Archaeological monitoring in locations other than Remedial Areas 15 and 16 (discussed above in Chapters 3 and 4) was considerably less revealing and is discussed in summary fashion in the following paragraphs with reference to Figure 2.2. This monitoring work, all observational as opposed to documentary, was conducted in late December 2016 and early January 2017.

Remedial Area 1 [PHE Reference S-9] (Figure 2.2; Photograph 5.1), covering a roughly rectangular area measuring 220 square feet, was excavated to a maximum depth of 7.5 feet below the ground surface and involved the removal of a monitoring well. A gravel road surface overlay a compacted fill (road bed) which in turn overlay undisturbed natural sands at a depth of roughly two feet. No structural features or cultural deposits of interest were observed.

Remedial Area 2 [PHE Reference S-5] (Figure 2.2; Photograph 5.2), covering a roughly square area measuring 430 square feet, was excavated to a depth of 1.5 feet below the ground surface. A one-foot-thick layer of gravel and trap rock overlay roughly six inches of asphalt and gravel fill beneath which were two sets of diverging rail tracks indicating a nearby switch. The rails were set into a fill deposit, which was not full penetrated. No undisturbed natural sands were observed. Other than the rails, which probably date from the mid-20th century, no structural features or cultural deposits of interest were observed.

Remedial Area 3 [PHE Reference S-17] (Figure 2.2; Photograph 5.3), covering a roughly rectangular area measuring 180 square feet, was excavated to a depth of 1.5 feet below the ground surface. Three mottled loamy sand fill layers, the bottom one containing charcoal, were documented to a depth of 1.5 feet, below which were undisturbed natural sands. No structural features or cultural deposits of interest were observed.

Remedial Area 4 [PHE Reference TP-C5] (Figure 2.2; Photograph 5.4), covering a roughly rectangular area measuring 190 square feet, was excavated to a depth of 2.7 feet below the ground surface. A concrete slab was noted at a depth of approximately six inches in the northern profile of the excavation and a set of rail tracks was present on the surface just south of the southern edge of the remedial area. The trench itself contained a mixed sandy historic fill to the full depth of excavation. No undisturbed natural sands were observed.

Remedial Area 5 [PHE Reference Area 4] (Figure 2.2; Photograph 5.5), covering a roughly rectangular area measuring 1,125 square feet, was excavated to a depth of three feet below the ground surface at which undisturbed natural sands were encountered. The upper three feet of soils comprised a sequence of loamy sand fill deposits. A concrete slab was observed a few inches below the surface in the northwest profile of the excavation. This is thought to have been the floor of the mid-20th-century pump house [Structure 69] that formerly stood in this location.

Remedial Area 6 [PHE Reference S-16] (Figure 2.2; Photograph 5.6), covering a roughly rectangular area measuring 124 square feet, was positioned adjacent to a concrete pad and wood cribbing overlooking the site of the machine shop. Excavations proceeded through a fill deposit of disturbed and contaminated sands to a depth of 1.5 feet below the ground surface. No undis-

Photograph 5.1. View looking north showing Remedial Area 1 (PHE S-9) at the conclusion of excavation; no cultural features were observed; the soil profile shows a gravel surface over a thin layer of historic fill over undisturbed natural sands; scale in feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D7:380].

Photograph 5.2. View looking northeast showing Remedial Area 2 (PHE S-5) at the conclusion of excavation; note the two sets of rails, 4.5 feet apart, are near a switching point; remediation occurred entirely in historic fill to a depth of approximately two feet; scale in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:069].

Photograph 5.3. View looking southwest showing Remedial Area 3 (PHE S-17) at the conclusion of excavation; no cultural features were observed; the soil profile shows a thin layer of fill over undisturbed natural sands; remediation occurred to a depth of approximately two feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:080].

Photograph 5.4. View looking northwest showing Remedial Area 4 (PHE TP-C5) at the conclusion of excavation; a concrete slab floor close to the surface is visible in the north profile; remediation occurred entirely in historic fill to a depth of approximately four feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:116].

Photograph 5.5. View looking northeast showing Remedial Area 5 (PHE Area 5) at the conclusion of excavation; the concrete slab floor in the soil profile may be associated with a *circa* 1950 pump house; the soil profile shows the concrete slab over historic fill over undisturbed natural sands; remediation occurred to a depth of approximately three feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:128].

Photograph 5.6. View looking northwest showing Remedial Area 6 (PHE S-16) at the conclusion of excavation; no cultural features were observed; the soil profile shows a thin layer of historic fill and disturbed natural sands; remediation occurred to a depth of approximately two feet; scale in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:148].

turbed natural sands were observed. No structural features or cultural deposits of interest were observed within the excavation limits.

Remedial Area 7 [PHE Reference AOC7-PHE 16] (Figure 2.2; Photograph 5.7), covering a roughly rectangular area measuring 195 square feet, was excavated to a depth of 1.5 feet below the ground surface. A section of rail track at the ground surface was pulled aside to make for the excavation. A topsoil layer, roughly 1.2 feet thick, overlay a gravel fill layer that was not fully penetrated. No structural features or cultural deposits of interest were observed.

Remedial Area 8 [PHE Reference AOC7-PHE 53] (Figure 2.2; Photograph 5.8), covering a roughly rectangular area measuring 340 square feet, was excavated to a depth of 1.5 feet below the ground surface. A dense gravel layer, roughly 1.2 feet thick, overlay a fill deposit of mottled loamy sand with coal and coal ash. This latter deposit was not fully penetrated. No structural features or cultural deposits of interest were observed.

Remedial Area 9 [PHE Reference S-15] (Figure 2.2; Photographs 5.9 and 5.10), covering a roughly rectangular area measuring 240 square feet, was excavated to a depth of 1.5 feet below the ground surface. This excavation was positioned within the western corner of the former engine house [Structure 58] and exposed parts of this building's concrete floor and a section of rail from one of the tracks inside the building, as well as one brick and one concrete pier. The brick pier, which survived at a depth well below the concrete floor, may be an original structural support feature of the engine house. The concrete floor, approximately 0.65 feet thick, overlay a gravel fill with loamy sand, which in turn overlay a sand and gravel fill. No undisturbed natural sands were observed.

A fuller discussion of the engine house is given above in Chapter 3. It is hypothesized that the southwestern half of the building may have been the original engine house structure, dating from the third quarter of the 19th century, which was later extended to the northeast. The limited archaeological data recovered from this remedial area suggest that features of this Camden and Amboy Railroad-era structure may survive at depths of 1.5 feet or more may yet survive.

Remedial Area 10 [PHE Reference AOC7-PHE 17] (Figure 2.2; Photograph 5.11), covering a roughly rectangular area measuring 320 square feet, was excavated to a depth of 1.5 feet below the ground surface. This excavation was conducted on ground that sloped down from northwest to southeast. The northeast side of the trench showed sandy loam and sand fill layers that were considerably thicker on the uphill side of the excavation, where undisturbed natural sands were encountered at a depth of 3.5 feet. At the opposite downhill end of the excavation, undisturbed natural sands were found only 1.5 feet below the ground surface. No structural features or cultural deposits of interest were observed.

Remedial Areas 11, 12 and 13 [PHE Reference AOC7-PHE 11 & PHE 5] (Figures 2.2 and 5.1; Photographs 5.12 and 5.13) comprised three contiguous rectangular excavations covering a total of 860 square feet. These excavations were positioned within the footprint of a former early 20th-century boiler house/carpenter's shop [Structure 27], which occupied roughly the same site as a late 19th-century machine shop (see above, Figures 3.5-3.9).

Within this remedial area, a roughly 45-foot length of an east-west mortared brick foundation was uncovered which is interpreted as the north exterior wall of the boiler house/machine shop. No exterior corners of this building were observed, but the foundations of two interior cross walls were documented, defining interior work spaces. At the eastern end of the

Photograph 5.7. View looking east showing Remedial Area 7 (AOC7-PHE 16) at the conclusion of excavation; no cultural features were observed within the trench; the soil profile shows gravel fill and assorted lumber; the rail track at right has been pulled aside to allow for excavation; remediation occurred to a depth of approximately two feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:167].

Photograph 5.8. View looking northwest showing Remedial Area 8 (AOC7-PHE 53) at the conclusion of excavation; no cultural features were observed; remediation occurred entirely within historic fill to a depth of between two and three feet; scale in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:173].

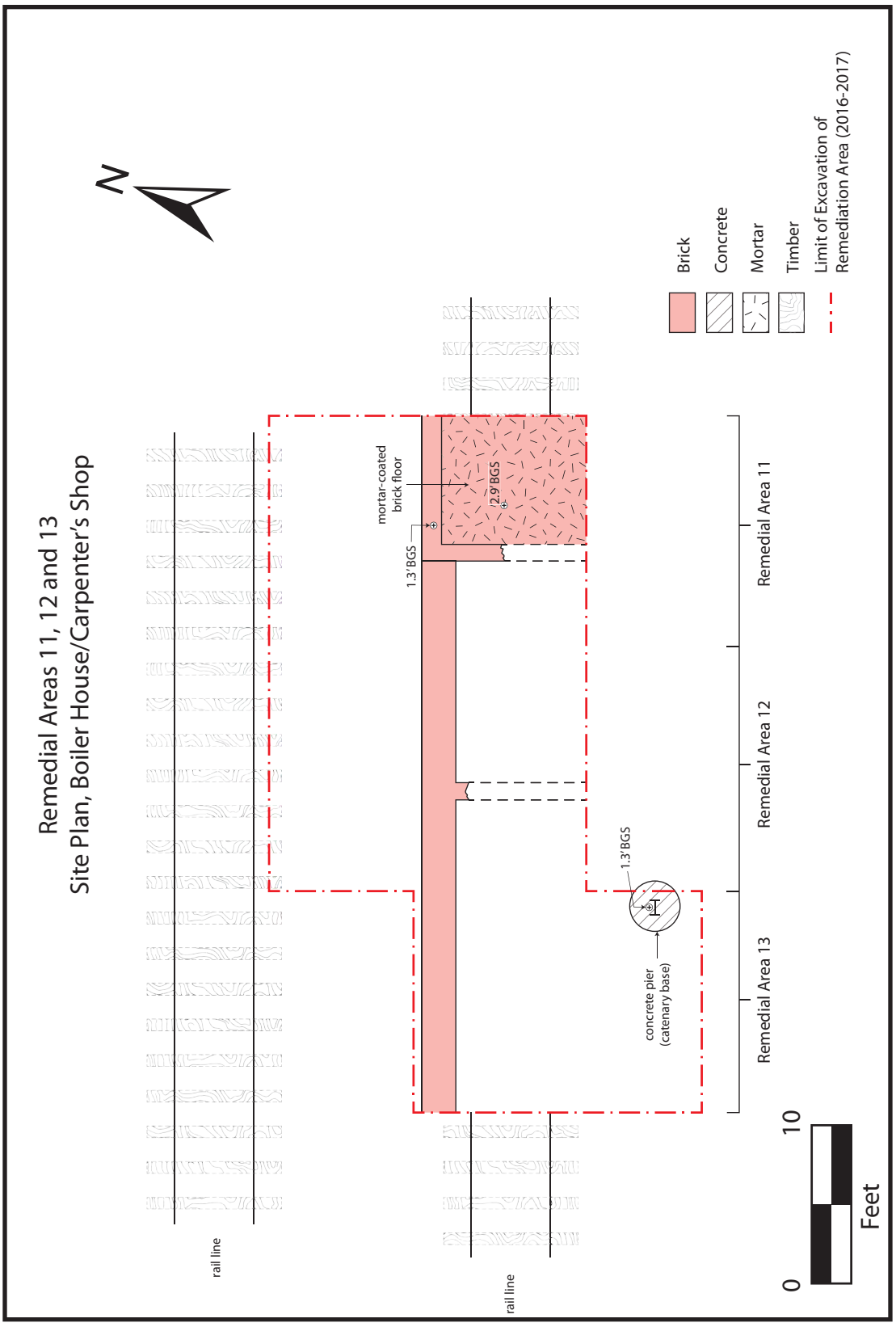


Figure 5.1. Remedial Areas 11, 12 and 13, Site Plan, Boiler House/Carpenter's Shop.

Photograph 5.9. View looking west showing Remedial Area 9 (PHE S-15) at the conclusion of excavation; the brick pier documented within the trench may relate to the structural framing of the mid-19th-century engine house [Structure 58]; the rail track and concrete slab floor would have been inside the engine house; remediation occurred entirely within historic fill to a depth of two feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:190].

Photograph 5.10. Detailed view looking north showing the brick pier within Remedial Area 9 (PHE S-15) that may relate to the structural framing of the mid-19th-century engine house [Structure 58]; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:186].

Photograph 5.11. View looking west showing Remedial Area 10 (AOC7-PHE 17) at the conclusion of excavation; no cultural features were observed; the soil profile shows historic fill over undisturbed natural sands; remediation occurred to a depth of two feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:199].

Photograph 5.12. View looking northwest showing Remedial Areas 11, 12 and 13 (AOC7-PHE 11 and AOC7-PHE 5) partially excavated; the long east-west brick wall with two stubs of north-south cross walls are part of the boiler house/carpenter's shop [Structure #27]; the section of the building in the right foreground has a mortar-coated brick floor; remediation occurred within historic fill and underlying undisturbed contaminated natural sands to a depth of up to ten feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:223].

Photograph 5.13. View looking northeast showing Remedial Areas 11, 12 and 13 (AOC7-PHE 11 and AOC7-PHE 5) at the conclusion of excavation; this view shows the undisturbed contaminated natural sands beneath the boiler house/carpenter's shop [Structure 27] which were remediated to a depth of up to ten feet; scale in feet (Photographer: Joshua Butchko, January 2017) [HRI Neg. #16008/D7:394].

Photograph 5.14. View looking north northeast showing Remedial Area 14 (AOC7-PHE 6) at the conclusion of excavation; the base of a mortared brick footing is visible in the bottom of the trench; this feature and overlying building rubble may relate to a late 19th-century machine shop or car shop, or less likely, to an early 20th-century boiler house/carpenter's shop [Structure 27] or store rooms [Structure 23]; remediation occurred within historic fill and underlying contaminated natural sands to a depth of up to one-and-a-half feet; scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:249].

building, a mortar-coated brick floor was exposed at a depth of 2.9 feet below the ground surface within a room at least ten feet square. Adjoining to the west was another room with an interior east-west dimension of 14 feet, while still further to the west an even larger adjoining room, at least 20 feet in its east-west dimension. The north-south dimension of all three of these rooms was not established, but was at least 18 feet (and possibly as much as 50 feet, based on historic maps) (see above, Figure 3.8). No floor surfaces were observed in the two more westerly rooms and these spaces contained fill deposits to a depth of approximately four to 4.5 feet below the ground surface beneath which were contaminated, undisturbed natural sands. The fill of the westernmost room was a mottled loamy sand with dense gravel and coal; the center room contained coal ash and coal dust.

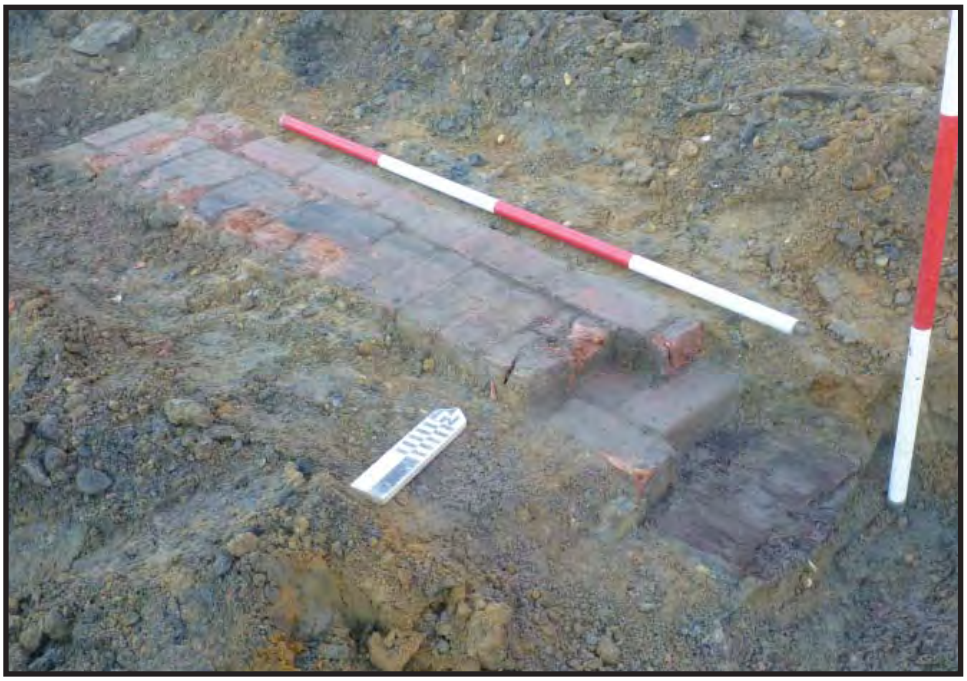
Archaeologically, no obvious distinction was observed between the boiler house/carpenter's shop and the earlier machine shop and it is speculated that the former structure may have re-used substantial parts of the latter. The remains documented in the field match up broadly with the details of a building referred to in 1916 as a "Carpenter Shop & Power Plant," when recorded by the Interstate Commerce Commission's Division of Valuation. A sketch plan was drawn at this time which shows a building 151 feet 4 inches long by 50 feet 8 inches wide divided into three sections (from east to west, a boiler room, power plant and lumber room) (Interstate Commerce Commission 1916). A similar but more detailed floor plan is depicted on the Sanborn fire insurance maps of 1918, which shows boilers, storage areas and, again, a carpenter's shop (see above, Figure 3.8). By the mid-20th century, this building had been demolished and rail tracks on a gravel rail bed had been routed across its footprint. A concrete pier for a catenary pole was also sunk within the fill of the westernmost room around this time. Outside the building, to the north, the soil sequence comprised two fill layers, a mottled loamy sand with gravel over a pungent sand loam with rubble and coal. Beneath this, at a depth of roughly 1.5 feet, undisturbed natural sands were encountered.

Remedial Area 14 [PHE Reference AOC7-PHE 6] (Figure 2.2; Photographs 5.14 and 5.15), covering a roughly rectangular area measuring 250 square feet, was excavated to a depth of 1.5 feet below the ground surface. This excavation was positioned toward the western end of the footprint of the former early 20th-century boiler house/carpenter's shop [Structure 27], which overlaps with the eastern end of the footprint of a series of store rooms [Structure 23] from the same period. Both of these buildings occupied the roughly the same site as a late 19th-century machine shop and car shop (see above, Figures 3.5-3.9). The remedial excavations were insufficiently deep or extensive to allow for a clear understanding of which of these buildings related to the archaeological remains found during the observational monitoring.

Excavation encountered but did not fully penetrate two layers of historic fill: a mottled loamy sand with gravel which overlay a mottled loamy sand densely filled with coal ash and brick rubble. In the northwest quadrant of the excavation, a mortared brick footing, roughly 3.5 feet square, was exposed at the base of the excavation at a depth of 1.5 feet below the ground surface. Exploration around the perimeter of this feature showed it to be set down into the natural sand subsoil. The footing is of uncertain function, but presumably supported equipment, or less likely, structural framing within one of the buildings in this location. Owing to its brick masonry construction, it is more likely to be associated with the machine shop or car shop rather than the later boiler house or store rooms.

Remedial Area 15 [PHE Reference Area 2] (Figures 2.2 and 3.1; Photographs 5.16-5.18) encountered numerous archaeological remains, the most significant of which were located in the western and southern portions of this extensive zone of contamination

Photograph 5.15. Detailed view looking north showing mortared brick footing within Remedial Area 14 (AOC7-PHE 6) set into natural sands; this feature may relate to a late 19th-century machine shop or car shop, or less likely, to an early 20th-century boiler house/carpenter's shop [Structure 27] or store rooms [Structure 23]; scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D5:253].



Photograph 5.16. View looking northwest showing a mortared brick footing in Remedial Area 15 (PHE Area 2) set on a wood sill in gravel fill and natural sands; this feature is thought to be part of the foundation of an oil/waste house of *circa* 1916 [Structure 88]; scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:259].

Photograph 5.17. View looking southeast showing the eastern end of Remedial Area 15 (PHE Area 2); the mortared brick and stone foundation in the foreground may be part of a carpenter's shop [Structure 90]; remediation in this area occurred within historic fill and underlying contaminated natural sands to a depth of up to six feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:347].

Photograph 5.18. View looking west-northwest showing a cast-iron oil tank prior to removal from the eastern end of Remedial Area 15 (PHE Area 2); scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:151].

(these are discussed above in Chapter 3). Additional archaeological remains were exposed in the northeastern portion of Remedial Area 15, apparently relating to a pair of oil houses [Structures 88 and 89] and a carpenter's shop [Structure 90]. Part of a truncated, mortared brick footing, roughly five feet long and one foot wide, was documented and is thought to be part of the foundation of the larger, combined oil and waste house [Structure 88] that was in existence around 1916. Set on a wood sill in fill deposits, this foundation fragment was left in place. A short distance to the northeast a section of mortared stone and brick wall is interpreted as part of the foundation of either another oil house [Structure 89] or a carpenter's shop [Structure 90], both of similar early 20th-century vintage. Just southeast of the site of the larger oil and waste house a massive, riveted, cast-iron oil tank was found and removed. Excavation in this northeastern part of Remedial Area 16 proceeded to depths of up to six feet in historic fill and underlying undisturbed contaminated natural sands.

Remedial Area 17 [PHE Reference Area 1] (Figures 2.2 and 5.2; Photographs 5.19-5.24) covered an area of almost 11,000 square feet and extended to depths of up to four feet. The remediation activity exposed remains of a large machine shop [Structure 43] that was in existence from at least the 1870s until the 1920s (see above, Figures 3.6-3.8) and which apparently succeeded an earlier blacksmith shop (see above, Figure 3.5). The northeastern part of the machine shop was exposed in the southwestern portion of the remedial area and was defined by a mortared brick and stone foundation and a concrete slab floor, which were encountered at a depth of roughly a foot below the ground surface. Set within the concrete floor were two parallel brick-built ash pits, approximately 69 feet long, oriented along the long east-west axis of the building. These remains match well with the sketch plan of the machine shop recorded by the Interstate Commerce Commission in 1916, which further reveals that the main block of the building measured roughly 72 feet east-west by 34 feet north-south. The machine shop also had a blacksmith shop at its western end and a stock room attached to its southeast corner (Interstate Commerce Commission 1916).

Outside and to the northeast of the machine shop, two additional brick ash pits were uncovered, continuing off to the southeast beyond the limits of the remedial area. These were likely used for servicing locomotives on rail tracks that entered the engine house nearby to the northeast. By the mid-20th century, the machine shop had been demolished and rail tracks had been laid over its former footprint. Excavations in Remedial Area 17 terminated in undisturbed natural sands at a depth of between three and four feet below the ground surface.

Remedial Area 18 [PHE Reference Shooting Range] (Figure 2.2; Photograph 5.25) covered an irregularly shaped area measuring approximately 3,200 square feet. Excavation removed contaminated fill and disturbed natural sand to a depth of between one and two feet below the ground surface. This location, which occupies the spit-like landform extending out the ferry terminal site, has been compromised through the construction of a shooting range. No structural features or cultural deposits of interest were observed.

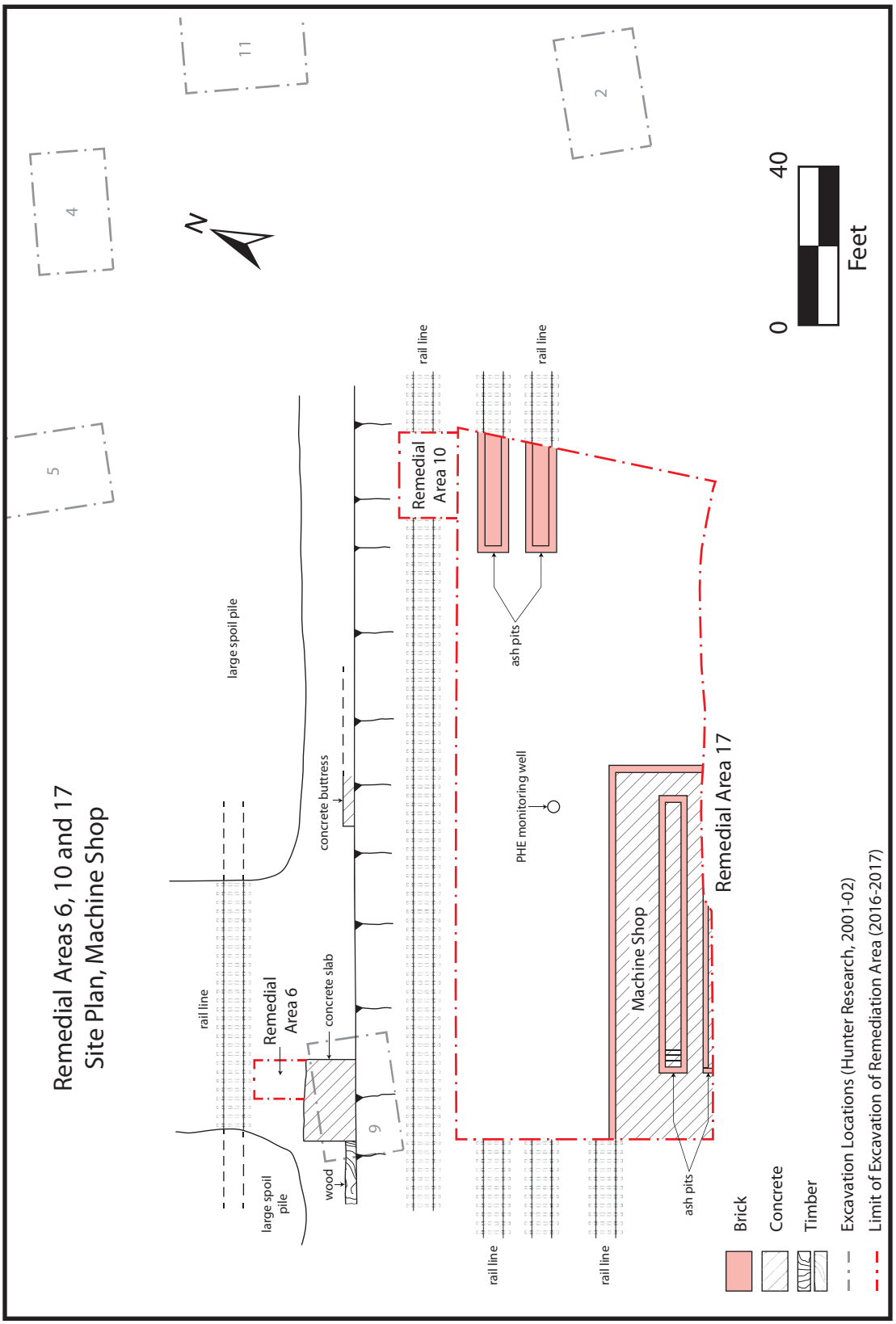
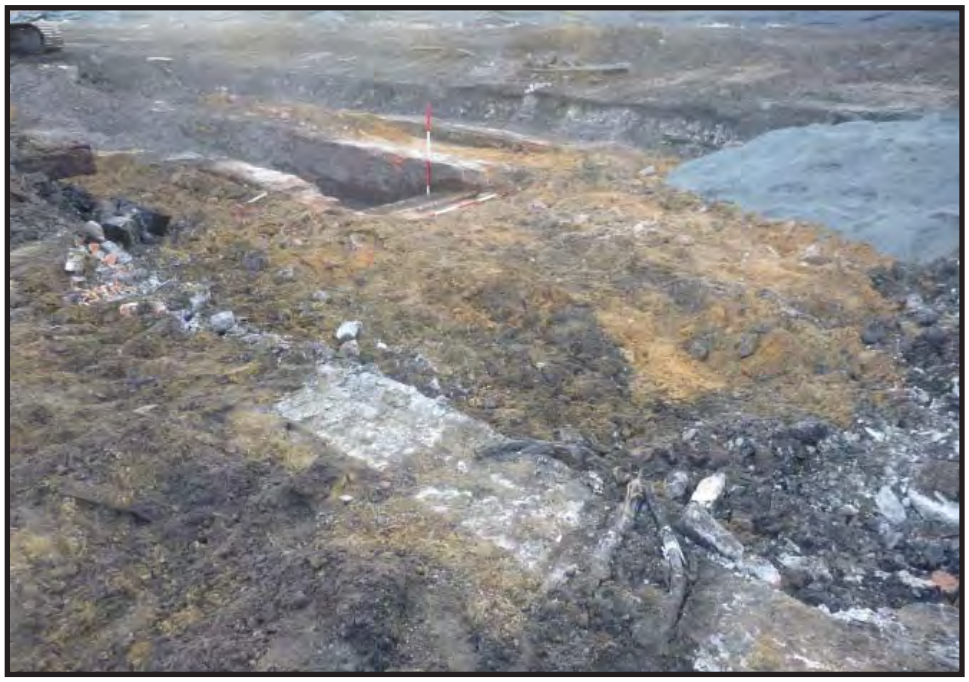


Figure 5.2. Remedial Area 17, Site Plan, Machine Shop.

Photograph 5.19. View looking southeast showing the western end of Remedial Area 17 (PHE Area 1); the masonry walls in the middle distance are part of the machine shop [Structure 43] (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:475].

Photograph 5.20. View looking west-northwest showing the western end of Remedial Area 17 (PHE Area 1); the concrete floor and brick and stone foundation of the machine shop [Structure 43] are visible in the foreground; remediation in this area occurred within historic fill and contaminated natural sands to a depth of three feet; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/ D7:413].



Photograph 5.21. View looking southeast showing the western end of Remedial Area 17 (PHE Area 1); the brick and stone foundation in the foreground is part of the machine shop [Structure 43]; one of the brick ash pits lies beyond within the machine shop interior; remediation in this area occurred within historic fill and contaminated natural sands to a depth of three feet (deeper within the ash pit); scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:454].

Photograph 5.22. View looking south showing one of the brick ash pits within the machine shop [Structure 43] in the western end of Remedial Area 17 (PHE Area 1); scales in feet and tenths of feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:459].

Photograph 5.23. View looking southeast showing the east end of the machine shop [Structure 43] in Remedial Area 17 (PHE Area 1); a brick ash pit is at right; scales in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D8:110].

Photograph 5.24. View looking northeast showing the brick ash pits outside and to the northeast of the machine shop [Structure 43] in the northeast end of Remedial Area 17 (PHE Area 1); scale in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:581].

Photograph 5.25. View looking northeast showing Remedial Area 18; remediation removed one to two feet of fill and contaminated natural sands from the spit-like landform, already compromised by construction of the shooting range; scale in feet (Photographer: Joshua Butchko, December 2016) [HRI Neg. #16008/D7:277].

Chapter 6

SUMMARY AND CONCLUSIONS

Archaeological monitoring conducted in December 2016 and January and April 2017 observed and documented remediation excavations in 18 locations across the Intermodal Ferry Transportation Center (IFTC) project site. The results of this work and the key archaeological findings are summarized in Table 6.1.

The size of the areas being remediated varied greatly from around 200 square feet to as much as 33,450 square feet in the case of Remedial Area 15. The extent and degree of contamination also varied considerably from area to area, but correlated closely with the locations of certain types of servicing facilities within the former South Amboy railyard, notably engine houses, turntables, machines shops and car repair shops, the locations of many of these structures being discernible on historic maps (see above, Figures 2.2 and 3.5-3.10). Most of these mapped structures, however, date from the third quarter of the 19th century or later, and do not necessarily include rolling stock maintenance facilities from the early Camden and Amboy Railroad era in the 1830s and 1840s, whose locations are less well known.

Seven of the remedial areas (#s 1, 3, 6-8, 10 and 18) produced no evidence of significant archaeological resources, although in some of these locations excavations did not proceed deep enough to penetrate all cultural strata. For the most part, in these seven locations, the cultural stratigraphy was characterized by uninformative, mixed fill deposits lying directly on top of undisturbed natural sands. In three other remedial areas (#s 2, 4 and 5), remains of minimal interest were documented, consisting of mundane mid-20th-century features, such as concrete slab and recently manufactured iron and steel rails (i.e., from the later Pennsylvania Railroad period), again in association with mixed fill and undisturbed sand subsoil.

In six remedial areas (#s 9, 11-14 and 17), rather more substantive remains were encountered which could be linked confidently with structures shown on historic maps. Generally speaking, these remains are not especially revealing or significant in their own right and their routine physical expression merely reinforces data accessible in the documentary record (as seen, for example, in the Interstate Commerce Commission [ICC] records of 1916 and the Sanborn fire insurance map of 1918). Thus, in Remedial Area 17, the brick foundations of a late 19th/early 20th-century machine shop with a pair of interior brick ash pits were conclusively identified. In Remedial Areas 11-13, the brick foundations and floor of an early 20th-century boiler house/carpenter's shop [Structure 27] were similarly easily recognized. Likewise, a brick footing in Remedial Area 14 is probably part of the same building or an adjoining store room [Structure 23]. However, it should be noted that some of the remains in Remedial Areas 11-14 may also relate to an earlier machine shop or car shop that is shown on earlier historic maps as being in roughly the same location.

In Remedial Area 9, located inside the western corner of the late 19th/20th-century engine house [Structure 58], remediation proceeded only to a depth of 1.5 feet below the ground surface. A mortared brick pier documented in this area may be part of the engine house structure, but it is also possible that it could relate to an earlier building. This judgment is based in part on the findings within Remedial Area 15, which

Table 6.1. Summary of Cultural Resources Observed and Documented During Archaeological Monitoring

Remedial Area	PHE Reference	Size (sq ft)	Maximum Depth of Excavation (ft)	Cultural Resource Findings
1	S-9	220	7.5	No cultural resources identified
2	S-5	430	1.5	Mid-20th-century iron rails near switchpoint
3	S-17	180	1.5	No cultural resources identified
4	TP-C5	190	2.7	Mid-20th-century concrete slab
5	Area 4	1125	3	Concrete slab, probable floor of c.1950 pump house [Structure 69]
6	S-16	125	1.5	No cultural resources identified
7	AOC7-PHE 16	195	1.5	No cultural resources identified
8	AOC7-PHE 53	340	1.5	No cultural resources identified
9	S-15	240	1.5	Brick pier, concrete pier and concrete slab, all within footprint of late 19th/early 20th-century engine house [Structure 58]
10	AOC7-PHE 17	320	1.5	No cultural resources identified
11, 12 & 13	AOC7-PHE 11 & PHE 5	860	10	Brick foundations and mortar-coated brick floor of early 20th-century boiler house/carpenter's shop [Structure 27]
14	AOC7-PHE 6	250	1.5	Mortared brick footing probably within footprint of early 20th-century boiler house/carpenter's shop [Structure 27] or store room [Structure 23]
15	Area 2	33450	6	Mid-19th century turntable and approach track beneath late 19th/20th-century engine house [Structure 58]; late 19th/early 20th-century turntable [Structure 71] and approach track; brick foundation of early 20th-century oil/waste house [Structure 88]; brick foundation of early 20th-century carpenter's shop [Structure 90]; mid-20th-century oil tank
16	Area 3	7570	17	Gravel/pebble base of original Camden and Amboy Railroad rail bed, c.1832; stone block underpinning, including re-used original Camden and Amboy stone sleepers, for late 19th/early 20th-century rail bed at switchpoint; corner foundation comprised of re-used original Camden and Amboy stone sleepers
17	Area 1	10930	4	Brick foundations of late 19th/early 20th-century machine shop [Structure 43] with interior brick ash pits; also brick ash pits outside
18	Shooting Range	3200	1.5	No cultural resources identified

included the opposite northeastern end of the engine house, where significant railroad-related remains were encountered beneath the building (see below).

Archaeological remains of much greater interest were documented in the two remaining Remedial Areas (#s 15 and 16). In Remedial Area 15, extensive remnants of the final, 20th-century manifestation of the engine house [Structure 58] were uncovered, including brick and stone foundations, concrete pier bases, a concrete slab floor and two long, concrete ash pits. The brick and stone foundations likely date from the late 19th century, but the interior of the building certainly underwent major episodes of alteration and upgrade over the course of its century-plus history. The concrete ash pits, for example, replaced earlier brick versions of the same sometime after 1916, as the ICC records clearly indicate the existence of brick-built, not concrete, ash pits in this year.

The principal and most significant discovery in Remedial Area 15 was the exposure of the substantial masonry foundations of a mid-19th-century, Camden and Amboy Railroad-era turntable and one of its approach tracks sealed beneath the floor and ash pits of the engine house. Constructed mostly in mortared brick, but including a massive stone central base for the turntable pivot, the 50-foot-diameter turntable structure was set on a foundation of wood pilings driven into the underlying sands and tidal marsh. On the basis of careful archaeological and archival analysis, this turntable is thought to date from no earlier than the mid-1850s until 1887, when the structure was apparently superseded by a larger, 60-foot-diameter turntable installed a short distance to the northeast. Both turntables are believed to have operated outdoors in the railyard and it is hypothesized that the original engine house was extended northeastward over the earlier turntable in the late 1880s when the latter went out of use. Masonry remains of the later 60-foot-diameter turntable and another approach track, which remained in operation into the 1920s, were also documented within Remedial Area 15, as were fragmentary brick foundations of an oil/waste house and carpenter's shop, both dating from the early 20th century. Portions of both turntables remain in place today, including most of the critical pivot base for the earlier turntable, but site remediation activity necessitated the removal of large parts of both structures.

In Remedial Area 16, archaeological monitoring and formal archaeological excavation specifically addressed remains relating to the long and complex sequence of rail lines in the railyard, focusing on the tracks that ran along the ridge of the spit-like landform extending out to the historic ferry terminal site. Traces of the base of the original Camden and Amboy Railroad rail bed, laid down in 1832, were pinpointed during the course of this work and it was established that the spit-like landform was built up by an additional two feet or so of sand fill to obtain the necessary gradient for the original rail line of the early 1830s. A moderate number of Native American artifacts were recovered from undisturbed depositional contexts in the sand layers beneath the rail bed (and also in the make-up deposits for the rail bed itself), indicating that this landform was a favored aboriginal setting. Adjacent to the original rail bed remains, lines of large stone blocks, chiefly of gneiss and marble, were found running generally, although not exactly, parallel to the earlier rail line. These blocks were identified as re-used stone sleepers from the original rail bed, most likely re-used as underpinning for the rail bed for later 19th or early 20th-century trackage. A corner foundation, also composed of re-used stone sleepers, defied certain interpretation, but may have supported a "deadman" at the end of a short siding.

The results of the archaeological monitoring in Remedial Areas 15 and 16, and to a lesser extent in Remedial Areas 9, 11-3 and 17, demand some re-evaluation of the archaeological potential of the IFTC site. The discovery of a mid-19th-century, 50-foot-diameter turntable beneath the late 19th-

century engine house offers up the prospect that other mid-19th-century remains of buildings and structures may survive along the base of the southeastern slope of the spit-like landform extending out to the original ferry terminal site, especially to the southwest of the engine house. Based on historic map analysis (see above, Figures 3.5 and 3.6), this area appears to have been developed as part of the railyard facility later on in the Camden and Amboy Railroad phase, in the third quarter of the 19th century, a period which is not well documented in the historical record. Archaeological investigations suggest that major land modification took place in this area during this period to allow a series of buildings to be set bench-like into the side of the spit-like landform. The stratigraphy is often difficult to read, but extensive redeposition of sands appears to have occurred and archaeological features may well survive at depths of three feet or more, depending on the extent to which the original natural landform has been modified.

The documenting of the base of the original Camden and Amboy Railroad rail bed in Remedial Area 16 enables the grade of the original rail line in this area to be projected at approximately 14 to 15 feet above sea level. This is a valuable nugget of information as this elevation can be extrapolated across the rest of the site and provide a benchmark for judging whether other segments of rail line, and perhaps still more important, the remains of other rail-side facilities may survive. These elevation data have particular implications for the potential survival of the various structures shown along the route between the terminal and the village of South Amboy on the maps of 1836 and 1850, most of which appear to have been located on the northwest side of the rail line or on the ridge of the spit-like landform (see above, Figures 3.2-3.4). The data derived from Remedial Area 16 suggests a far greater likelihood than previously thought for early Camden and Amboy Railroad features to have survived.

Finally, it should not be ruled out that substantive archaeological resources may yet survive deeply buried at the original Camden and Amboy Railroad wharf terminal site itself, which today is projected to lie beneath the shooting range, beneath the berm at the range's northeastern end and between the berm and the present shoreline. Again, the projection of the 14-to-15-foot-above-sea-level elevation and the scale of recent land disturbance are the two critical factors requiring consideration in the assessment of the archaeological potential of the historic terminal site, although it should be assumed that the terminal buildings, docks and other infrastructure were erected on deep and substantial masonry foundations and wood pilings.

Data derived from the archaeological monitoring, especially from Remedial Areas 15 and 16, are critically important for the future planning, design and construction of the ITFC. Within the framework established by the Memorandum of Agreement (MOA), the monitoring has documented Camden and Amboy Railroad-era features and recovered historic materials such as sleepers and T-rails that should be preserved. The MOA provides that these materials should be considered for incorporation into the ITFC's design as interpreted landscape features. There is a far greater quantity of this material than previously supposed. The recent episode of archaeological monitoring has clearly shown there is a reasonable likelihood that future ground disturbing activities will encounter *in-situ* archaeological features. This has considerable implications for project costs and schedules. As ITFC plans develop, it would be advisable for the parties to the MOA to review and discuss archaeological strategies and the most efficient and cost effective approaches to protecting and documenting archaeological resources.

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Appendix A

MEMORANDUM OF AGREEMENT, DECEMBER 2009

Final

AMENDED
MEMORANDUM OF AGREEMENT
BETWEEN THE FEDERAL HIGHWAY ADMINISTRATION AND THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER REGARDING THE INTERMODAL FERRY TRANSPORTATION CENTER CITY OF SOUTH AMBOY, MIDDLESEX COUNTY, NEW JERSEY

WHEREAS, the City of South Amboy proposes to construct a ferry facility [including access roadway, parking, terminal and in-water improvements] to accommodate up to three ferry vessels in South Amboy, Middlesex County using funds provided by the Federal Highway Administration (FHWA) via the New Jersey Department of Transportation (NJDOT); and

WHEREAS, the FHWA, the New Jersey State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation (Council), and the NJDOT executed a Programmatic Agreement in November of 1996 which stipulates how FHWA's Section 106 responsibilities for NJDOT-administered federal aid projects will be satisfied; and

WHEREAS, in accordance with that agreement, the NJDOT has consulted with the SHPO in order to determine the area of potential effect (APE), to identify significant National Register eligible and listed properties, and to assess the effects of the project on both eligible and listed properties within the APE pursuant to the requirements of 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act of 1966 as amended (16 U.S.C.470f); and

WHEREAS, background and field research have indicated that physical remains of the Camden and Amboy [ca. 1831 - 1871] and Pennsylvania [ca. 1871- 1965] Railroads persist within and beyond the APE, but the integrity of the physical remains in the APE is low; and

WHEREAS, the historic significance of the property within the APE relates primarily to it being the location of nationally significant events, the feeling or sense of place conveyed by the few physical remains, and the setting of the former rail yard and piers; and

WHEREAS, previous consultation on other projects resulted in an initial June 26, 1975 opinion (and several reiterations of that opinion in the context of federally funded

roadway and other projects) that the Camden and Amboy Railroad (Main Line) Historic District is eligible for listing in the National Register of Historic Places; and

WHEREAS, previous consultation has also indicated that the period of significance for the Camden & Amboy Railroad (Main Line) Historic District spans the tenures of both railroad companies, and that understanding the relationships between the various archeological remains and evaluating their significance is a complex process requiring extensive background research; and

WHEREAS, consultation for other projects affecting the Camden & Amboy Railroad (Main Line) Historic District has focused on identifying and protecting contributing resources and features of the historic district; introducing historically compatible new bridges, stations, and structures; and adequately mitigating the adverse effects resulting from new construction or removal of original features; and

WHEREAS, Hunter Research has compiled an inventory of visible railroad remains within the APE [*The Catenary Structures at the Intermodal Ferry Transportation Center, South Amboy, Middlesex County, New Jersey with a note on Camden and Amboy Railroad Stone Sleepers, Historic Context, Description and Recommendations;* Ian Burrow, December 2002] documenting the overall integrity of the Camden and Amboy Railroad yards at this location is low, as only catenary structures and displaced stone sleepers, and two coal thawing sheds and associated infrastructure remain intact within the APE of the project; and

WHEREAS, the FHWA has determined in consultation with the SHPO and others that the construction of this project as proposed will have an adverse effect on the Camden & Amboy Railroad (Main Line) Historic District due to the alteration and/or removal of the catenary structures and stone sleepers; and

WHEREAS, the NJDOT and FHWA have considered alternatives to avoid or minimize the adverse effects and have found that they are not feasible; and

WHEREAS, a Camden and Amboy corridor management study entitled *Camden and Amboy Railroad Historic Districts Study, Volume 1 and Volume 2* identified appropriate mitigation strategies and additional opportunities which were considered by the project sponsors in developing a mitigation program to offset the adverse effects of the proposed construction; and

WHEREAS, consultation for the Southern New Jersey Light Rail Transit System (SNJLRTS) has involved extensively researched consideration of appropriate standard design features for new construction within the Camden and Amboy Railroad (Main Line) Historic District; and

WHEREAS; it is desirable to utilize a single design vocabulary for all projects within the historic district; and

WHEREAS, two public meetings were held on February 8, 2001 and June 27, 2001 in the City of South Amboy to describe the project and the environmental studies which had been conducted to the public, and to allow the public to ask questions and provide comments on the work conducted to date; and

WHEREAS, questions and comments at that meeting related primarily to traffic engineering issues; and

WHEREAS, the FHWA, SHPO, NJDOT and City of South Amboy, have consulted to develop a plan to mitigate the adverse effects; and

WHEREAS, NJDOT on behalf of the FHWA invited the City of South Amboy to concur in the MOA and they have agreed; and

WHEREAS, the NJDOT has participated in the consultation, has been invited to concur in the MOA, and has agreed; and

WHEREAS, the Advisory Council was notified of the adverse effect and invited to participate in the consultation process via letter dated March 21, 2002 and has declined to participate in the consultation process; and

WHEREAS, for the purposes of construction the project was broken into four project phases: the Main Street Bridge, Radford Ferry Road Phase I, Radford Ferry Road Phase II and the Intermodal Facility; and

WHEREAS, the Main Street Bridge project was completed in Spring of 2007, and the construction of the Radford Ferry Road Phase I project [initiated in April of 2007] was completed in May 2009; and

WHEREAS, the design for the remaining phases of the project was subsequently revised as the result of the NJDEP Waterfront Development Permitting process –the location of the waterfront walkway was moved landward of the wetland transition area and the ferry dock and access locations were changed, thus both the dredging of material and the containment area for the dredged materials were eliminated from the project; and

WHEREAS, the effect of the revised design continues to be adverse; and

WHEREAS, this agreement supersedes the previous Memorandum of Agreement [executed on 7/25/03];

NOW, THEREFORE, the FHWA and the SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

STIPULATIONS

The FHWA will ensure that the following measures are carried out:

The City of South Amboy, using the services of a consultant and prior to the initiation of construction, shall implement the following stipulations.

I. Archeological Monitoring

A. Preconstruction Notice – The City of South Amboy shall ensure that all construction inspectors and contractors are informed about the need for identification, evaluation and protection of historic properties pursuant to Section 106 of the National Historic Preservation Act; and that they are informed of all stipulations in this MOA which may restrict or constrain construction activities. The City shall develop an archeological monitoring/data recovery procedure, which provides for notification and coordination with NJDOT, SHPO and FHWA should historic resources and/or features be uncovered during construction. The procedure shall provide for immediate cessation of construction activities in any areas where undocumented remains are uncovered, notification of qualified archeologists to collect initial information about the resources identified and convene a consultation meeting; and implementation of any data collection/mitigation procedures which might, through consultation, be determined appropriate. FHWA, NJDOT and SHPO staff shall be available for on-site consultation in no more than two days of notification of the need for consultation. The procedure shall be submitted to the SHPO, NJDOT and FHWA for review and comment prior to advertising the construction contract; the revised procedure shall be included in the construction bid package and shall be an item of discussion during the preconstruction conference. SHPO staff will be invited to participate in the preconstruction conference.

B. Monitoring – A professionally qualified archeological monitor shall be present on-site and shall inspect all excavations/earthmoving operations that may result in subsurface disturbance. Two types of monitoring may be anticipated, and

provisions for both types shall be included in the procedures developed as Task A above.

1. Observational monitoring - which entails visual examination of work in progress and the rapid documentation of features or artifacts through photography, survey, and written notes.
2. Documentary monitoring – requires discontinuation of construction related work for a longer period of time to investigate and document [sufficiently to meet any requirements for archeological mitigation] archeological features which are significant or potentially significant.

II. Photographic Documentation

Documentary photos of the overall rail site and specific perspectives that illustrate the surviving catenary system, remaining pier/wharf pilings, and former locomotive shop area in relation to the surviving coal thawing sheds will be taken for inclusion in the final report. Any railroad artifacts that will not be used in the gateway or as landscape features will be photographically documented in their original setting prior to removal.

III. Field Verification of Pier/Wharf Locations

The City of South Amboy will ensure that field verification of the locations of the various piers and wharves in the area of direct impact, as documented in historic maps, will be undertaken. The locations of key pilings will be recorded using global positioning system (GPS) technology, and ancillary pilings will be mapped using relational techniques. Archival photographs of the pilings will be taken to supplement the mapping effort. Visible hardware will be photographed only if it has the ability to assist in the dating or other interpretation of the pier/wharf features. No artifacts will be retained. The goal of this effort is to verify the locations and construction sequences of the various pier/wharf features that appear on historic maps. Such information will contribute to an understanding of how the rail facility developed and functioned.

IV. Design Considerations - Site Design

A Landscape Architect with a demonstrated interest in historic preservation will be added to the project design team to assist with the development of the site. The goal of this individual's involvement will be to ensure that, to the degree possible, all pertinent features, of the facility will be compatible with the historic architecture and engineering characteristics, features, and setting of the Camden and Amboy Railroad (Main Line) Historic District. The design shall be responsive to the standards, guidelines, and recommended approaches for new construction affecting historic properties as set forth in the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. Historic compatibility considerations shall include design, location, size, scale, materials, color, workmanship, and visual impacts. Design

features such as fencing, lighting, handrails, signage, etc. selected for the SNJLRTS shall be considered for use in the current project. Specific tasks to be accomplished with the involvement of the Landscape Architect include

A. Developing a site plan and on-site interpretive materials or displays that utilize and interpret in situ historic railroad artifacts and landscape features. The plan should minimize the visual impacts of the new construction on the remaining landscape features of the historic rail facility and propose interpretive elements that are consistent with similar materials being developed by NJ Transit and NJDOT for use within the Camden & Amboy Railroad (Main Line) Historic District When removal of artifacts is unavoidable, the materials will be offered for relocation as described in Section V.

B. Developing a "gateway" to the intermodal transportation facility that preserves in place two types of catenary structures--a Portal Bridge [C15a/b] and one or more Bracket Arm Bridge Structures [C20 or C21].

The overall site plan and design details for the gateway; and specifications [including plans as needed] for the removal of the railroad features will be submitted to the SHPO for review as soon as possible, but at least prior to advertisement of Phase III of the project, to determine if proposed designs are compatible with historic properties. Any design compatibility issues raised by the SHPO will be addressed and resolved through consultation among the City, SHPO, NJDOT, and FHWA prior to the advertisement of the job and/or prior to the initiation of any actions which may compromise the integrity of the railroad features.

V. Artifacts

The City shall ensure that all artifacts recovered during fieldwork and not used for on-site interpretation are offered to the NJ State Museum, NJ Transportation Museum and other appropriate local or railroad focused facilities as identified in consultation with the SHPO. Potential recipients will be provided with a notice of the availability of any artifacts [for 30 days]. The City will work with interested recipients to reasonably accommodate any requests for artifacts, and will distribute those artifacts which it is feasible to move. All artifacts may be disposed of after 60 days if no bona fide recipients have been identified

VI. Reporting

The City shall ensure that appropriate reporting of the research conducted for the project is completed. The following will be accomplished:

A. Additional Research – Historical research completed to date has been sufficient to satisfy the identification and assessment components of the Section 106 process. Additional research will be conducted as partial mitigation for the adverse effects to the Camden and Amboy Railroad (Main Line) Historic District. This research will address materials in the collections

of the Pennsylvania State Archives, Hagley Museum, New Jersey State Library/Archives, New Jersey Historical Society and other repositories that may be identified as the result of the review of *The Camden and Amboy Railroad and Transportation Company, A Bibliography [1947]*. Research will be undertaken in order to collect information from primary and secondary sources pertinent to the understanding of the development of the South Amboy rail facility in the years between 1831 and 1911. This research will place the facility within regional economic and transportation contexts. The region is roughly defined as the area between the Ports of New York and New Jersey to the north and Philadelphia to the south. No more than 20 person-days shall be expended on this effort.

B. Technical Report - The results of all historical and archeological research conducted for this project will be presented in an analytical and narrative report, which conforms to professional reporting standards as described in the New Jersey Register of Historic Places Act Rules [N.J.A.C. 7:4]. The narrative section of the report will place the facility in the overall context of the Camden and Amboy and Pennsylvania Railroad operations, and also present the specific history and development of the South Amboy facilities. The report shall specifically address the development and functioning of the rail-maritime connection, and the evolution of the physical configuration and operations of the South Amboy facility. Photographic documentation of the various site elements as compiled for interim survey/management reports and as described in Task II above will also be included in the technical report. Copies of the report will be provided to no more than five institutions, that will be identified in consultation with the SHPO. Institutions my request either a CD or hard copy.

C. Non-technical Report – A non-technical, descriptive summary of information about the history of the rail facility within the context of the Camden and Amboy and Pennsylvania rail systems compiled during the current investigations will be prepared in a format suitable for posting on a web site. The information will be initially posted on the City of South Amboy's Web site and maintained on the web site for a minimum of one year after its posting. If any other organization shows an interest in hosting the information on their web site, the City will supply a digital copy of the report for posting. The technical report prepared in response to Task VI.B may also be posted as a companion document to the non-technical report.

ADMINISTRATIVE CONDITIONS

I. Professional Qualifications

The City and NJDOT, on behalf of FHWA, will ensure that all work is carried out by/under the direct supervision of a person or persons meeting at a minimum the *Secretary of the Interior's Professional Qualifications Standards for Archaeology, History and/or Architectural History [48 FR 44738-44739]* as appropriate.

II. Dispute Resolutions

At any time during the implementation of the measures stipulated in this MOA, should an objection to any such measure or its manner of implementation be raised, FHWA will notify all signatories to the agreement, take the objection into account, and consult as needed to resolve the objection.

Disputes regarding the completion of the terms of this agreement as necessary shall be resolved by the signatories. If the signatories cannot agree regarding a dispute, the FHWA shall then initiate appropriate actions in accordance with the provisions of 36 CFR 800.6(b) and 800.7 as appropriate.

Modification, amendment, or termination of this agreement as necessary shall be accomplished by the signatories in the same manner as the original agreement.

III. Design Changes

If any changes to the Intermodal Ferry Transportation Center project design occur which have the potential to affect historic properties, the City of South Amboy shall notify the NJDOT. NJDOT, with the assistance of the FHWA, shall consult with the SHPO in accordance with the provisions of 36 CFR Part 800. For any such changes, the City shall submit a plan sheet or design sketch showing the proposed change; a written description of why the change is needed; and a description of alternatives considered to achieve the same goals. If formal consultation is initiated the SHPO shall provide written comments to the City, FHWA, NJDOT [Bureau of Environmental Services and Local Aid] within five working days of receipt of documents. Review comments shall evaluate the change for its potential to affect historic properties and its conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties.*

IV. Project Completion

A. **Project Completion** - All work required to complete the tasks enumerated in Stipulations I through IV will be completed within two years of the receipt of the NJDEP permit(s) for the construction of Phase III. Should an alternate schedule be required, that schedule will be established and provided to all consulting parties prior to the initiation of construction of Phase III. Work required as part of Stipulation VI will be accomplished according to a schedule developed during negotiations for the cultural resources work.

B. **Documentation of Satisfaction of Stipulations** - The City shall submit a short narrative report with appropriate illustrations to all consulting parties demonstrating satisfaction of any mitigation requirements which will not be included in the archeological reports within 90 days of completion of construction or according to an alternate schedule negotiated immediately after the pre-construction meeting.

V. Review of Implementation

This agreement shall become null and void if construction is not initiated within ten years from the date of execution unless the signatories agree in writing to an extension. If, after ten years without action the FHWA chooses to continue with the undertaking, it shall re-initiate its review in accordance with the provisions of 36 CFR Part 800.

Execution of this Memorandum of Agreement and implementation of its terms evidence that FHWA has afforded the Council an opportunity to comment on the Intermodal Ferry Transportation Center project and its effects on historic properties, and that the FHWA has taken in to account the effects of the project on historic properties.

FEDERAL HIGHWAY ADMINISTRATION

By: _____ Date: 12/22/2009

For Dennis L. Merida, P.E.
Division Administrator, NJ Division Office

NEW JERSEY STATE HISTORIC PRESERVATION OFFICE

By: _____ Date: 12/15/2009

Daniel D. Saunders
Deputy State Historic Preservation Officer

Concur:

NEW JERSEY STATE DEPARTMENT OF TRANSPORTATION

By: _____ Date: 12-14-09

Michael Russo.
Director, Local Aid and Economic Development

CITY OF SOUTH AMBOY

By: _____ Date: 12/10/09

John T. O'Leary
Mayor

Appendix B

ARCHAEOLOGICAL MONITORING PROTOCOL

INTERMODAL FERRY TRANSPORTATION CENTER
CITY OF SOUTH AMBOY
MIDDLESEX COUNTY, NEW JERSEY

ARCHAEOLOGICAL MONITORING PROTOCOL

Purpose

Archaeological monitoring of construction at the Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey (IFTC) is intended to fulfill the requirements of Section 106 of the National Historic Preservation Act of 1966 (as amended). There is a need to ensure that archaeological resources that may be eligible for the State and National Registers of Historic Places be identified and appropriately treated within the framework of the construction schedule.

This document sets out procedures to ensure that the archaeological monitoring is carried out in the most efficient manner during construction activities. The objective is to minimize or eliminate time and cost delays to the construction, while ensuring that significant archaeological materials relating to the history of this nationally significant property are correctly treated.

Definitions

"Observational Monitoring" means the rapid recordation of archaeological discoveries made during Contractor's operations. This is accomplished by archaeologists, using visual observation, photography and written notes, the inspection of back dirt piles, and the mapping of discoveries in plan and profile. **Short-term cessation of work** (as defined below) may be required in order to complete some recordation actions. Such cessations do not disrupt the Contractor's schedule and are not subject to claims from the Contractor.

"Documentary Monitoring" means the detailed archaeological investigation of discoveries while Contractor's operations are suspended at a particular location for an agreed period. These costs may be recoverable by the Contractor if such stoppages are specifically authorized. Authorization will be through specific procedures set out below.

"Short-term cessation of work": a period of not more than two hours during observational monitoring

"Contractor" means the company responsible for the construction activities covered under the Memorandum of Agreement

"Archaeological Monitors" Means archaeologists meeting the Secretary of the Interior's Standards set forth in 48 FR 44716 and contracted to perform this monitoring.

Contractor Responsibilities

The Contractor will:

1. Ensure that the Archaeological Monitors have access to the site at all reasonable times.
2. Work with the Agent to ensure that the Archaeological Monitors are aware of the project schedule and have two business notice of operations requiring monitoring.
3. Communicate the requirements and procedures for monitoring to any subcontractors.

Agent Responsibilities

The Agent will:

1. Work with the Contractor to ensure that the Archaeological Monitors are aware of the project schedule and have two business days' notice of operations requiring monitoring.

Archaeological Monitor Responsibilities

The Archaeological Monitors will:

1. Maintain regular contact with the Contractor.
2. Conform to Contractors' procedures and schedules on worksites.
3. Seek to perform the required archaeological monitoring so as to limit, as far as possible, disruption to the overall construction schedule.
4. Provide adequate staff to complete appropriate recording for short-term cessation of work and for Documentary Monitoring procedures.
5. Consult with appropriate NJDOT and NJ SHPO staff relative to Section 106 consultation issues (as defined herein)

POINTS OF CONTACT

Archaeological Monitors:
Hunter Research, Inc., 120 West State Street
Trenton NJ 08608
609-695-0122

James Lee, Vice President; xtn 106; Mobile 908-329-5331. jlee@hunterresearch.com
Alternate:
Joshua Butchko, Principal Investigator, xtn 116. Mobile 609-350-3286. jbutchko@hunterresearch.com

Contractor (Hereafter "Contractor"):
The Ambient Group, LLC
222 Thies Road
Sewell, NJ 08080
Ph. 856-582-1765
Fx. 856-582-2114

Julian Heal *Ph.* 856-582-1765 x 102 *Cell* 215-870-5092

Agent for Client (Hereafter "Agent"):
Potomac Hudson Environmental
207 Stevens Ave, South Amboy, NJ 08879
Ph: (732) 525-3100

David Draper, LSRP Ph. (732) 525-3100 Cell (908) 578-9306

NJDOT Bureau of Environmental Program Resources
Lauralee Rappleye, Environmental Specialist IV; Mobile 302-530-9672; Office 609-530-2990

NJ State Historic Preservation Office
(contact one of the following in this order)
Kate Marcopul; Office 609-984-5816
Alternates:
Vincent Maresca; Office 609-633-2395
Jesse West-Rosenthal; Office 609-984-6019

ACTIONS REQUIRING MONITORING

Construction activities that will require monitoring comprise:

- Excavation: trenching for utilities and drainage, and any other bulk removal of material by machinery or hand digging
- The removal of soils from existing grade

PROCEDURES:

1. Flow of Information

The Agent will facilitate a regular exchange of information on Contractor's work schedule and the requirements for archaeological monitoring. Arrangements will be made to ensure that Archaeological Monitors will be on site when excavation or soil removal is in progress (see above, Responsibilities).

2. General considerations

Safety:
Archaeological Monitors will report to the Contractor's representative responsible for site safety prior to monitoring operations.

Human Remains:
There is a minimal possibility that human remains, either as intact burials or disarticulated skeletal fragments from previously disturbed interments, will be located during Contractor's operations. If such remains are found the Contractor will immediately notify the Client and the Archaeological Monitor. The Archaeological Monitor will then proceed according to the attached protocols. In addition, the Archaeological Monitor shall immediately contact both the NJDOT-BEPR and NJSHPO points of contact, informing them of the find and any actions taken.

3. Observational Monitoring

Observational monitoring will entail one or more of the following:

Non-intrusive observations
Archaeological Monitors will observe Contractor's excavations, inspecting back dirt piles and exposed trench profiles, and taking notes and photographic records, and collecting artifact and soil samples.

Short-duration work stoppages
On the basis of observations, the Archaeological Monitor may request the Contractor for a short-term cessation of work at a particular location in order to record information in more detail, or to more thoroughly evaluate exposed material. **"Short-term cessation of work"** is defined as a **period of not more than two hours**. Stoppages in excess of two hours will fall under Documentary Monitoring, and require authorization as set out below.

4. Documentary Monitoring

Decision-making process
The decision on the necessity for Documentary Monitoring will be made by the Archaeological Monitor in consultation with NJDOT-BEPR and the NJ SHPO. If the Archaeological Monitor on site determines that there are significant archaeological resources at the work location, and that these cannot be adequately evaluated and recorded through Observational Monitoring (up to and including a two-hour cessation of work), he/she will inform the Contractor and the Agent immediately, and in any case within the two hour cessation period if implemented.

The Agent will convene, as soon as reasonably possible, a site meeting or conference

phone call between the Contractor, the Archaeological Monitor, NJDOT-BEPR and the NJ SHPO and other parties as considered necessary by the Agent, to discuss the need for documentary monitoring, recommend appropriate documentation procedures and identify the anticipated extent and duration of the work needed. This work will not proceed without the consensus of the NJDOT-BEPR and NJ SHPO. A summary record of each decision will be emailed to the Client and to Ms. Lauralee Rappleye at NJDOT, and Ms. Kate Marcopul and the NJ SHPO point of contact involved in the decision.

Procedures

For the duration of the Documentary Monitoring the defined portion of the site will be under the control of the Archaeological Monitors, who will be free to operate, within the terms of the agreement, at that location. The Archaeological Monitor will conform to the Health and Safety plan provisions that apply at the project site, and will consult with the Contractor's Site Safety and Health Officer before starting work.

The Archaeological Monitor will inform the Contractor and Agent as soon as Documentary Monitoring is complete.

5. Procedures for Unanticipated Discovery by the Contractor

When excavating operations encounter prehistoric or structural remains, or artifacts of historical or archaeological nature and the Archaeological Monitor is not present, operations will be temporarily discontinued at that location for a period of not more than 24 hours. The Client will be contacted immediately, and will subsequently contact the Archeological Monitor. In consultation with the NJDOT-BEPR and SHPO points of contact, the Archeological Monitor will determine if Observational or Documentary Monitoring will be required. If monitoring will be required, it will proceed as described above.

Guidelines for assessing whether "historically or archaeologically significant" items have been encountered:

The following items may be encountered and should be regarded as potentially significant:

- foundations or structures of brick, metal, stone or wood
- concentrations of artifacts (ceramics, glass, building material, bone). Particular attention should be paid to bone or teeth fragments or concentrations in case they represent human remains.
- concentrations of charcoal or building materials
- strikingly unusual colors or textures of soil (occupation sites or industrial activity).

Procedures for discovery of potential historic and prehistoric period human burials for projects requiring State and/or federal review by the Historic Preservation Office

If potential human burials or human skeletal remains are encountered, all ground disturbing activities in the vicinity shall cease immediately. The potential burials shall be left in place unless imminently threatened by human or natural displacement. Reversible actions such as careful obscuring and/or securing the burial(s) through backfilling of soils or other means shall be undertaken. The Historic Preservation Office shall be contacted immediately. Legal authorities and, as appropriate, the County Medical Examiner should be contacted to determine jurisdiction and legal measures that may be required. For the protection of the potential burials, information regarding the discovery shall not be disclosed to others except for individuals who have a need to know (e.g., site managers). If informative types of identification as to affiliation, condition, etc. prior to securing the potential burial(s) can be achieved without further displacement or excavation, this should be accomplished.

Excavation and other activities in the vicinity may resume after approval is provided by relevant parties potentially including, but not limited to, the Historic Preservation Office, the State Medical Examiner's office, and site managers. For most archaeological site types, if avoidance is not possible, archaeological data recovery can be accomplished prior to project implementation. However, for Native American and certain other human burials, exhumation may not be an acceptable alternative. The process of notification and consultation with lineal descendents; individuals and groups of similar cultural descendency; and interested public and professional communities may be involved in consultation to determine appropriate disposition of human burials (who is responsible for doing this?). Regardless of disposition of the remains, dignity and respect should accompany all treatment.

Investigation of historic or prehistoric period archaeological remains including skeletal remains and other burials shall be accomplished by a professional archaeologist meeting the National Park Services Professional Qualifications Standards for Archaeology.

Exhumation and analysis of historic or prehistoric period skeletal remains shall be accomplished by a professional skeletal analyst having: 1) a graduate degree in a field involving the study of the human skeleton such as skeletal biology, forensic osteology or other relevant aspects of physical anthropology or medicine; 2) a minimum of one year's experience in conducting laboratory reconstruction and analysis of skeletal remains, including the differentiation of the physical characteristics denoting cultural or biological affinity; and 3) demonstrated ability to design and execute a skeletal analysis including the written results and interpretations of such analysis. This is an excellent requirement. Perhaps SHPO could maintain a consultants' list and post it on the website?

In instances where human remains may be encountered during implementation of a development or other project and after any archaeological survey has been accomplished,

depending on the project circumstances, an archaeologist should either be on site or be immediately available in the event a potential human burial be encountered. In either instance, project documents must make note of this potential and provide information including: 1) full contact information for the archaeologist; 2) specification of the number of days prior to project implementation that the archaeologist will be notified that the project is about to proceed; 3) a chain of command including identification of the individual(s) with the authority to require work cessations in areas where potential human burials are encountered; 4) the likely number and duration of work cessations; and 5) if known, the location(s) on the project site illustrated and identified on site plans where human burials may be encountered.

The project permittee or other agent ultimately responsible for the project and therefore for the unearthing of the human burials or human skeletal remains shall be responsible for all costs associated with their investigation, exhumation, analysis and reinterment or other disposition.

Revised 10/10/12, 10/11/12, 8/15/2016, 9/29/16

Appendix C

WORK PLAN, SUPPLEMENTARY ARCHAEOLOGICAL MONITORING AND TESTING

CONSTRUCTION ENGINEERING AND RELATED SERVICES ASSOCIATED WITH REMEDIATION WORK WITHIN THE FORMER CONRAIL AND SPECTRASERVE SITES

WORK PLAN
SUPPLEMENTARY ARCHAEOLOGICAL MONITORING AND TESTING

Hunter Research, Inc., January 23, 2017 (revised February 7, 2017)

Task 1 – Documentary Monitoring, Camden and Amboy Railroad Turntable (Remediation Area 15 [PHE Area 2]):

A. Health and Safety Plan: The turntable remains are encased within contaminated soils. The contaminants in this location are petroleum hydrocarbons, including possible product, and typical historic fill exhibiting elevated metals and PAH compounds. Upon the advice of Potomac-Hudson, because field staff will be working for prolonged periods in close proximity to contaminated soils, Hunter Research will develop a site-specific health and safety plan that will govern field excavation procedures. We anticipate that modified Level D protective measures will be necessary for this work.

B. Archaeological Fieldwork: In accordance with the August 15, 2016 monitoring protocol authorized by NJHPO and the Hunter Research technical proposal of December 28, 2015, Hunter Research will undertake documentary monitoring in conjunction with the exposure and removal of the remaining estimated 50 by 10-foot section of the Camden and Amboy Railroad turntable discovered in January 2017. This task will involve a Hunter Research crew of three archaeologists working under the supervision of a Principal Investigator for one week in the field with additional mechanical excavation and dewatering assistance from the remediation contractor, Ambient Group, LLC.

The contractor will remove, under archaeological supervision, the concrete foundation and fill overlying the turntable remains to the point where intact remains survive and can be exposed through manual excavation. Hunter Research archaeologists will then complete the uncovering process by hand and document the turntable remains through scaled plan and profile drawings, survey compilation of elevation data relative to sea level, and digital photography. The contractor will assist with removal of rubble and excavated soils, as directed, and provide dewatering equipment as needed. Through a combination of manual and mechanical excavation archaeologists will then remove and continue documentation of the turntable remains. This task will include removal of all masonry and timber pilings to the point where remediation can continue.

Artifacts and samples of brick, stone masonry, mortar and timber pilings will be retained as appropriate. Easily portable items will be transported to the Hunter Research laboratory in Trenton for further examination and analysis. Large items will be

temporarily stockpiled on site and Hunter Research will coordinate with Potomac-Hudson and the City of South Amboy concerning their place of final storage and curation. This proposal makes no provision for artifact conservation.

C. Analysis and Report: Hunter Research will analyze artifacts and data gathered in the field. Carefully targeted research will be undertaken into early 19th-century railroad turntables to enable this discovery to be placed into its appropriate historical context. Reporting of this documentary monitoring episode and related research will be incorporated into the main report that will be produced for the overall archaeological monitoring program. It is anticipated that the turntable will form a major part of this report document, receiving its own chapter[s] within this document. Reporting of the documentary monitoring will also include preparation of final plans, profiles and other detailed drawings and photographs of the turntable, along with reproductions of relevant engineering drawings and photographs of other comparable turntables.

Task 2 – Archaeological Testing, Camden and Amboy Railroad Rail Bed (Adjacent to Remediation Area 16 [PHE Area 3])

A. Archaeological Fieldwork: Hunter Research will excavate a 10 x 10-foot trench across the projected alignment of the Camden and Amboy Railroad rail bed in a location approximately 25 to 50 feet west of Remediation Area 3. This task will involve a Hunter Research crew of two archaeologists working under the supervision of a Principal Investigator for three days in the field with additional mechanical excavation from the remediation contractor, Ambient Group, LLC. Limited contractor assistance may be required for the removal of overburden, but the bulk of this excavation will be conducted by hand with the goal of exposing and documenting a detailed cross-section of the rail bed. As a precautionary measure, modified Level D protection will be adopted by Hunter Research field staff.

Particular attention will be given to examining the stone materials of which the rail bed is composed, the bedding materials in which the sub-base of stone blocks is laid, and the underlying sandy soils (and establishing whether these are naturally formed or laid down as fill). There is also a possibility that Native American artifacts could be found in the underlying soils. Manual auger testing will be performed within the base of the trench to gain a clearer understanding of the underlying landform on which the rail bed is laid. Auger tests will be taken to a depth of approximately six to eight feet, which should be sufficient to determine if the landform is natural or manmade in origin. The trench will be documented in plan view and profile and by digital photography. Elevation data will be gathered using a total station and the location of the trench and rail bed will be recorded using a differential GPS with sub-meter accuracy. Artifacts will be recovered and recorded according to their stratigraphic provenience. Samples of construction materials, including stone blocks, will be retained. We do not anticipate removing stone blocks or sleepers (if these should survive) during the course of this work. The trench will be backfilled upon completion.

B. Analysis and Report: Artifacts and field data recovered from the trench excavation will be processed and analyzed. A brief report (estimated 12 to 15 pages of text plus illustrations and data appendices) will be prepared which will describe and interpret the results of the trench excavation. The report will include analysis of the field results within the broader context of other Camden and Amboy Railroad rail bed construction, including documented section of the line in the Hightstown area. Hunter Research will consult with Pierre Lacombe (USGS geologist) concerning the rail bed construction materials and construction methods. This document will be prepared in accordance with NJHPO reporting guidelines.

A draft document in PDF format will be provided to Potomac-Hudson, the City of South Amboy, NJDOT and NJHPO for review purposes. Following receipt of review comments, five printed copies and one PDF copy of a revised, final report will be produced and submitted to the City of South Amboy for distribution to NJDOT and NJHPO. If so directed by NJHPO and NJDOT, Hunter Research will incorporate this reporting task and document into the full monitoring report that is to be prepared for this project.

Task 3 – Project Coordination and Public Outreach

Hunter Research anticipates ongoing and regular consultation and coordination with the remediation contractor (Ambient Group), the project environmental consultant (Potomac-Hudson), the City of South Amboy, NJDOT and NJHPO. This activity will be conducted through in-person on-site meetings, email progress reporting and telephone communication. At the request of NJHPO, it is proposed that Hunter Research will prepare a 2 to 4-page, illustrated public information hand-out suitable for posting on the City of South Amboy and NJDOT websites that will summarize in non-technical fashion the results of the archaeological monitoring activities. This document will take the form of a supplement to the *Cultural Resources Digest* non-technical summary produced in October 2015.

Appendix D

ARTIFACT INVENTORY

ARTIFACT INVENTORY

All Site, Surface Collection **Catalog # 1**

Historic

1	Composite, Concrete, Brick, structural whole, gray, hollow, three holes perforated [1" diameter each], L 8in, W 3.75in, T 2.25in, 2.38g	Row #	9
5	Fired Clay - Ceramic, Porcelain, Industrial, insulator fragment, brown exterior glaze, D 1', "cap and pin" style high voltage suspension insulator	Row #	17
1	Fired Clay - Ceramic, Refined Earthenware, Ironstone, ointment jar lid fragment, transfer printed, black, late 19th century "Areca Nut Toothpaste" jar lid, possibly associated with Hector MacLeans, Alberta Canada; partial black lettering on top	Row #	6
1	Fired Clay - Ceramic, Stoneware, Gray-Bodied, beverage bottle shoulder and body fragment, salt glaze exterior, Albany slip interior	Row #	5
1	Fired Clay - Non-ceramic, Earthenware, Brick, structural whole, black and brown, burned and encrusted, L 7.5in, W 3.25in, T 2.1in, 1.93g	Row #	14
1	Fired Clay - Non-ceramic, Earthenware, Brick, structural whole, red http://brickcollecting.com/collection2.htm, weathered, L 7.75in, W 3.25in, T 2.25in, 1.72g, stamped "WASHBURN", mark of Washburn Brothers brickyards of Glasco, New York [post-1880s]	Row #	8
1	Fired Clay - Non-ceramic, Earthenware, Brick, structural whole, red, L 8.25in, W 3.5in, T 2.25in, 1.98g	Row #	7
1	Flora, Wood, utility block whole, pressure treated, machine cut timber, L 1ft, W 0.5ft, T 0.65ft, cut block with grooved top, 0.1 diameter hole thru center, impressed mark reads "MWT 02 SYP1 CCA-C.60 NORWALK 0-40"	Row #	4
1	Metal, Ferrous metal, bolt whole, threaded, severely corroded and encrusted, L 7in, 0.75" rod diameter, 1.75" cap diameter	Row #	12
1	Metal, Ferrous metal, bolt 80-90% complete, severely corroded and encrusted, L 9in, 0.75" rod diameter, 3" cap diameter, 3.25" washer diameter	Row #	11
1	Metal, Ferrous metal, coil fragment, corroded and encrusted, L 0.55ft, D 0.45', 0.1' thick spring coil	Row #	2
1	Metal, Ferrous metal, indeterminate type fragment, severely corroded and encrusted, U-shaped profile, hollow element bent into a "J"	Row #	13
1	Metal, Ferrous metal, mortise lock 80-90% complete, severely corroded and encrusted, L 5in, W 3in, T 1.5in	Row #	10
1	Metal, Ferrous metal, railroad spike whole, L 6.5in	Row #	15
1	Metal, Ferrous metal, railroad track fragment, corroded and encrusted, L 5.5ft, original 1830s segment of track, I-shaped, top 0.2 wide and 0.02 thick, bottom 0.13 wide and 0.05 thick	Row #	1
1	Metal, Ferrous metal, spool whole, corroded and encrusted, L 1ft, D 0.5', hollow central bar is 0.2' diameter	Row #	3
1	Metal, Ferrous metal, weight/ballast whole, ball shaped, corroded and encrusted, .71g, D 2.25"	Row #	16

Total Artifacts in Suface Collection: 21

Total Artifacts in All Site Surface Collection : 21

Remedial Area 15 (PHE Area 2), mid-19th century turntable, Material Sample **Catalog # 4**

Historic

1	Composite, Brick and Mortar, contaminated object, floor sample fragment, 4.02g, gray mortar mixed with thick red brick rubble chunks; base/bedding of turntable floor	Row #	1
1	Composite, Brick and Mortar, contaminated object, wall sample fragment, W 3.75in, T 2.45in, 1.7g, red, handmade brick; whitish yellow mortar	Row #	1
1	Composite, Stone and Mortar, contaminated object, wall sample fragment, 1.73g, rough cut brownstone, gray mortar with gravel inclusions	Row #	1
1	Fired Clay - Non-ceramic, Earthenware, Brick, contaminated object, structural sample fragment, red, L 8in, W 4in, T 2.25in, 1.9g	Row #	1
1	Stone, Brownstone, contaminated object, structural sample fragment, reddish brown, 1.4g	Row #	2
1	Stone, Marble, contaminated object, foundation sample fragment, white, 410g, cornerstone located at southeast corner of engine house	Row #	1
1	Stone, Quartzite, contaminated object, sleeper stone sample fragment, white and gray, 484g	Row #	1

Total Artifacts in Suface Collection: 7

ARTIFACT INVENTORY

Remedial Area 15 (PHE Area 2), mid-19th century turntable, Material Sample Context 3 **Catalog # 17**

Historic

1 Composite, Mortar, contaminated object, surface coating sample fragment, gray, T 1in, 330g Row # 1

1 Fired Clay - Non-ceramic, Earthenware, Brick, contaminated object, structural sample fragment, L 8.25in, W 4in, T 2.25in, 2.1g, red brick with gray mortar attached Row # 1

Total Artifacts in Context 3: 2

Remedial Area 15 (PHE Area 2), mid-19th century turntable, Material Sample Context 4 **Catalog # 18**

Historic

1 Composite, Mortar, contaminated object, indeterminate type sample fragment, gray, 440g Row # 1

1 Composite, Mortar, contaminated object, surface coating sample fragment, black, T 0.5in, 100g Row # 1

Total Artifacts in Context 4: 2

Remedial Area 15 (PHE Area 2), mid-19th century turntable, Material Sample Context 5 **Catalog # 10**

Historic

1 Composite, Ferrous metal and wood, contaminated object, bolt sample fragment, decayed timber fragment attached, square cut, corroded and encrusted, L 1.75ft, 2.1g Row # 1

1 Composite, Ferrous metal and wood, contaminated object, bolt sample fragment, decayed timber fragment attached, corroded and encrusted, L 1.5ft, 2.7g Row # 1

2 Metal, Ferrous metal, contaminated object, bolt sample fragment, corroded and encrusted, L 1.4ft, 2.2g, D 0.75" Row # 1

Total Artifacts in Context 5: 4

Remedial Area 15 (PHE Area 2), mid-19th century turntable, Material Sample Context 6 **Catalog # 11**

Historic

1 Composite, Brick and Stone, contaminated object, rubble sample fragment, red and gray, 4.1g Row # 1

Total Artifacts in Context 6: 1

Remedial Area 15 (PHE Area 2), mid-19th century turntable, Material Sample Context 17 **Catalog # 13**

Historic

1 Composite, Mortar, contaminated object, surface coating sample fragment, gray, T 1in, 844g Row # 1

Total Artifacts in Context 17: 1

Remedial Area 15 (PHE Area 2), approach to mid-19th century turntable, Material Sample Context 21 **Catalog # 15**

Historic

1 Composite, Mortar, contaminated object, surface coating sample fragment, gray, T 0.5in, 112g Row # 1

Total Artifacts in Context 21: 1

Remedial Area 15 (PHE Area 2), approach to mid-19th century turntable, Material Sample Context 22 **Catalog # 14**

Historic

1 Composite, Brick and Mortar, contaminated object, wall sample fragment, L 7in, W 4in, T 2.25in, 2g, red brick, whitish gray mortar Row # 1

Total Artifacts in Context 22: 1

Remedial Area 15 (PHE Area 2), approach to mid-19th century turntable, Material Sample Context 23 **Catalog # 16**

Historic

1 Flora, Wood, contaminated object, indeterminate cut timber sample fragment, 530g Row # 1

Total Artifacts in Context 23: 1

ARTIFACT INVENTORY

Total Artifacts in Remedial Area 15 (PHE Area 2) Material Sample : 20

Remedial Area 16 (PHE Area 3), Context 15 & 16, Trench **Catalog # 20**

Historic

4	Fauna, Shell - remains, oyster fragment	Row #	3
1	Fired Clay - Ceramic, Refined Earthenware, Pearlware, hollow ware fragment, undecorated, 1780 - 1890	Row #	1
1	Glass, Curved, hollow ware fragment, clear/uncolored	Row #	2
1	Metal, Ferrous metal, spike whole, severely encrusted, L 5.5in	Row #	5
1	Metal, Ferrous metal, spike whole, severely encrusted, L 7in	Row #	4

Total Artifacts in Suface Collection: 8

Total Artifacts in Remedial Area 16 (PHE Area 3) Trench : 8

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 12 **Catalog # 21**

Historic

1	Fuel, Coal, waste fragment	Row #	1
2	Fuel, Coal Slag, waste fragment	Row #	2
4	Metal, Ferrous metal, indeterminate type fragment, corroded	Row #	3

Total Artifacts in Context 12: 7

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 19 **Catalog # 22**

Historic

1	Fired Clay - Ceramic, Earthenware, Redware, hollow ware fragment, undecorated	Row #	2
1	Fired Clay - Ceramic, Refined Earthenware, Ironstone, hollow ware fragment, undecorated, 1840 - 1950	Row #	1
2	Fuel, Coal, waste fragment	Row #	10
4	Glass, Curved, bottle fragment, aqua	Row #	7
1	Glass, Curved, bottle fragment, light aqua	Row #	6
3	Glass, Flat, indeterminate type fragment, clear/uncolored	Row #	3
1	Glass, Flat, indeterminate type fragment, clouded white	Row #	4
2	Glass, Flat, safety light fragment, red	Row #	5
1	Metal, Ferrous metal, indeterminate type fragment, corroded and encrusted	Row #	9
7	Metal, Ferrous metal, nail fragment, corroded and encrusted	Row #	8

Total Artifacts in Context 19: 23

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 20 **Catalog # 23**

Prehistoric

1	Stone, Chalcedony, shatter fragment, cortex present, whitish gray	Row #	7
3	Stone, Jasper, flake fragment, tan	Row #	5
3	Stone, Jasper, shatter fragment, cortex present, whitish tan	Row #	6
1	Stone, Jasper, utilized flake whole, cortex present, brown, 32g	Row #	2
1	Stone, Quartzite, utilized flake whole, cortex present, reddish brown, 40g	Row #	3
1	Stone, Sandstone, hammerstone whole, purplish brown, 220g	Row #	4

Historic

5	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red	Row #	1

Total Artifacts in Context 20: 15

ARTIFACT INVENTORY

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 21		**Catalog #**	**24**
Prehistoric			
1	Stone, Jasper, flake whole, cortex present, brown, 1g	Row #	5
1	Stone, Jasper, flake fragment, brown	Row #	6
1	Stone, Jasper, tested pebble fragment, cortex present, brown, 10g	Row #	4
Historic			
1	Fired Clay - Ceramic, Refined Earthenware, Pearlware, plate rim fragment, impressed, Shell Edge, blue	Row #	1
1	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red	Row #	2
1	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red and black, burned and glazed	Row #	3
Total Artifacts in Context 21: 6			
Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 24		**Catalog #**	**25**
Historic			
4	Fauna, Shell - remains, oyster fragment	Row #	2
7	Fuel, Coal, waste fragment	Row #	1
Total Artifacts in Context 24: 11			
Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 28		**Catalog #**	**26**
Prehistoric			
1	Stone, Sandstone, hammerstone whole, 596g, smooth edges, slight pecking on one face	Row #	2
Historic			
3	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red	Row #	1
Total Artifacts in Context 28: 4			
Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 29		**Catalog #**	**27**
Prehistoric			
1	Stone, Jasper, flake fragment, brown	Row #	7
1	Stone, Jasper, shatter fragment, cortex present, brown	Row #	8
1	Stone, Quartzite, cobble-based tool whole, purplish brown, 1.352g, worn edges, slight pecking; possible hammerstone/chopper combo	Row #	10
1	Stone, Quartzite, shatter fragment, cortex present, whitish orange	Row #	9
Historic			
1	Fired Clay - Ceramic, Earthenware, Redware, hollow ware fragment, manganese glazed	Row #	2
1	Fired Clay - Ceramic, Refined Earthenware, Creamware, hollow ware fragment, undecorated, 1762 - 1820	Row #	1
7	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red	Row #	3
1	Fuel, Coal, waste fragment	Row #	6
2	Glass, Curved, indeterminate type fragment, olive green	Row #	4
1	Metal, Ferrous metal, nail fragment, corroded and encrusted	Row #	5
Total Artifacts in Context 29: 17			
Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 31		**Catalog #**	**28**
Prehistoric			
1	Stone, Jasper, utilized flake whole, cortex present, brown, 18g	Row #	5
Historic			
1	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red	Row #	2
5	Fired Clay - Non-ceramic, Earthenware, Brick, structural fragment, red	Row #	1
1	Fuel, Coal, waste fragment	Row #	4
1	Metal, Ferrous metal, nail fragment, corroded and encrusted	Row #	3

ARTIFACT INVENTORY

Total Artifacts in Context 31: 9

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 32 **Catalog # 29**

Prehistoric

1 Stone, Jasper, utilized flake fragment, cortex present, brown, 4g Row # 1

1 Stone, Quartzite, hammerstone whole, whitish tan, 64g, slight pecking on one end Row # 2

Total Artifacts in Context 32: 2

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 33 **Catalog # 30**

Prehistoric

1 Stone, Jasper, shatter fragment, cortex present, gray, thermally altered Row # 1

1 Stone, Quartz, hammerstone whole, white, 285g Row # 3

1 Stone, Quartzite, hammerstone whole, whitish tan, 146g Row # 2

Total Artifacts in Context 33: 3

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 34 **Catalog # 31**

Prehistoric

1 Stone, Jasper, shatter fragment, cortex present, brown Row # 1

Total Artifacts in Context 34: 1

Remedial Area 16 (PHE Area 3), Excavation Unit 1, Context 38 **Catalog # 32**

Prehistoric

1 Stone, Quartz, shatter fragment, cortex present, white Row # 1

1 Stone, Sandstone, cobble-based tool whole, reddish brown, 368g, smoothing stone Row # 2

Total Artifacts in Context 38: 2

Total Artifacts in Remedial Area 16 (PHE Area 3) Excavation Unit 1 : 100

Total Number of Artifacts: 149

*** Item Discarded in Laboratory**

Appendix E

NON-TECHNICAL SUMMARY

Cultural Resources Digest

Discovering New Jersey's Transportation Past

A Publication of the New Jersey Department of Transportation

Governor Phil Murphy | **May 2018** | Acting Commissioner Diane Gutierrez-Scaccetti

> location:

city of south amboy

middlesex county

> resource types:

railroad terminal

> action:

archaeological monitoring

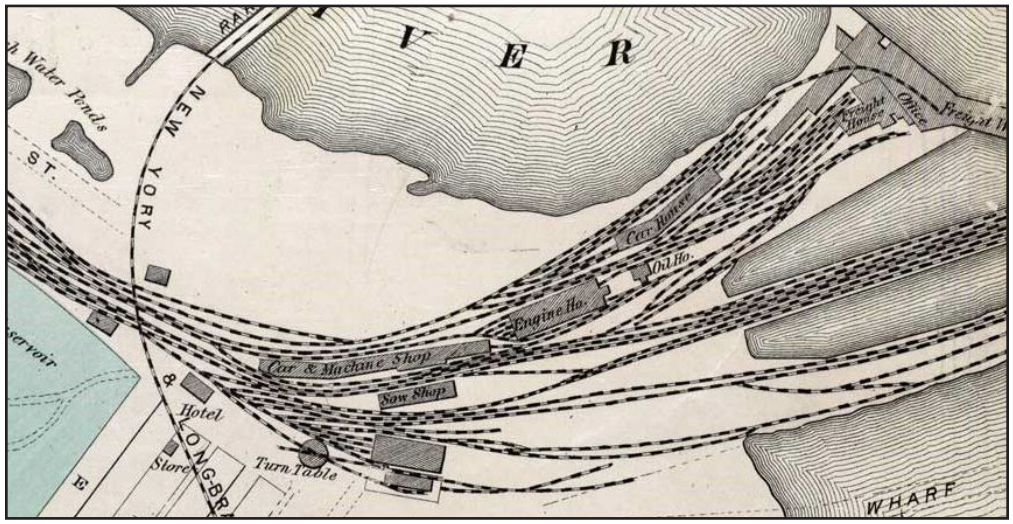
City of South Amboy
Middlesex County

The *Cultural Resources Digest*, published by the New Jersey Department of Transportation, summarizes information from professional studies in archaeology, history and historic architecture conducted during the development of transportation projects. Visit us at *http://www.state.nj.us/transportation/works/environment/overview.htm.*

The Intermodal Ferry Transportation Center

New Jersey's First Tidewater Railroad Terminal

Archaeological Monitoring Supplement



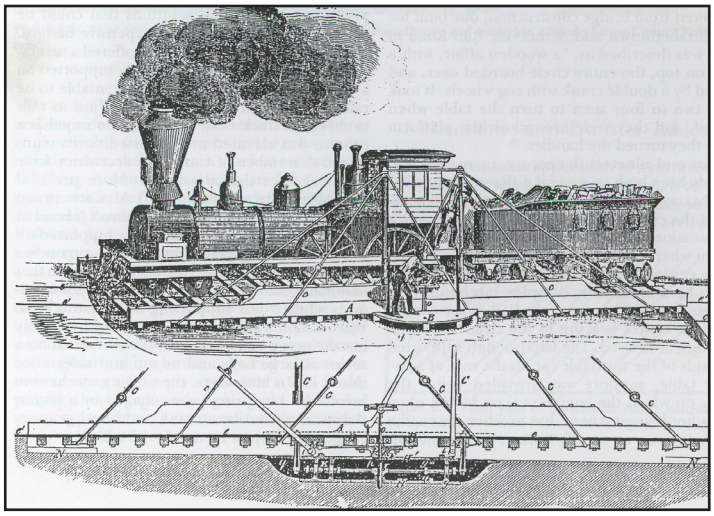
This detail from an 1876 map shows the many buildings and rail tracks located at the South Amboy ferry terminal and rail depot. [Source: Everts and Stewart, Combination Atlas Map of Middlesex County. 1876].

In late 2016 and early 2017 archaeological monitoring was undertaken in connection with remediation of contaminated soils at the site of the proposed Intermodal Ferry Transportation center (IFTC) on the south shore of Raritan Bay in South Amboy, Middlesex County. The IFTC, a combined bus, rail, ferry and pedestrian facility, is to be built on the site of the former ferry terminals and railyard of the Camden and Amboy Railroad (later the Pennsylvania Railroad). Today, the site is vacant and stripped of all its buildings and infrastructure.

Archaeological monitoring was performed in partial fulfillment of the requirements of a Memorandum of Agreement (MOA) developed under Section 106 of the National Historic Preservation Act of 1966 (as amended) for the overall IFTC project. Given the long history of the site and the large number of buildings and railroad structures known to have been there, it was perhaps not surprising that the soil remediation work and related monitoring encountered multiple below-ground remains of features associated with the earlier railroad use of the site. These included: two turntables, one from the mid-19th century, the other from the late 19th century, each with an associated approach track; and the gravel base of a portion of the original 1830s Camden and Amboy Railroad rail bed, along with several original stone sleepers re-used to support later rail tracks.

The Turntables

The principal discovery during the archaeological monitoring was the substantial masonry foundations of a mid-19th-century, Camden and Amboy railroad-era turntable and one of its approach tracks sealed beneath the floor and ash pits of a later 19th-century engine house. Constructed mostly in mortared brick, but including a massive stone central base for the turntable pivot, the 50-foot-diameter superstructure was set on a foundation of wood pilings driven into the underlying sands and tidal marsh. On the basis of archaeological and archival analysis, this turntable is thought to have been in use from no earlier than the mid-1850s until 1887, when it was superseded by a larger, 60-foot-diameter turntable installed a short distance to the northeast. Both turntables are believed to have operated outdoors in the railyard.



Robie's Balance Turn-table. Side view and cross-section, 1854 [Source: Scientific American, September 16, 1854].

Turntables were an essential component of all railyards and their sophistication and size increased over time as larger, heavier and more powerful locomotives were put into service. The turntable foundations unearthed beneath the engine house were 50 feet in diameter, a size commonly constructed in the period circa 1850-80. The brick masonry of the floor suggests that the table made use of balance wheels both under its perimeter and also beneath its mid-section.

Masonry remains of the later 60-foot-diameter turntable and another approach track, which remained in operation into the 1920s, were also documented. This second, larger, steel turntable was manufactured by the Philadelphia Bridge Works in January 1887 and was apparently put in place that same year. It went out of use at some point between 1918 and 1930, and the site had been filled and graded by the latter date. Sixty-foot-diameter turntables were rapidly becoming obsolete in the early 1920s following the Pennsylvania Railroad's introduction of the Ten-Wheeler Class G5 locomotive, which was well in excess of 60 feet in length. The structure may well have been steam-powered and probably resembled the turntables designed and installed by the Pennsylvania Railroad in their Altoona shops.

Left: *The southern portion of the mid-19th-century turntable pit beneath the concrete floor of the engine house.* ***Right:*** *The mortared brick and stone foundation supporting the approach track leading into the mid-19th-century turntable. [Source: Hunter Research, Inc.].*

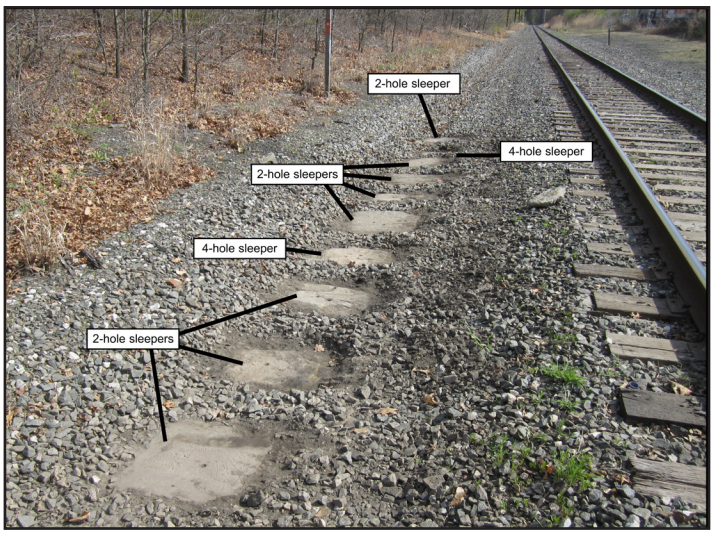
Left: *Two lines of stone sleepers re-used from their original Camden and Amboy Railroad railbed of the early 1830s.* ***Right:*** *Close-up views of typical two-hole and four-hole stone sleepers with rectangular imprint of chair or plate. [Source: Hunter Research, Inc.]*

Portions of both turntables remain in place today, including most of the critical pivot base for the earlier turntable, but soil remediation activity necessitated the removal of large parts of both structures.

The Camden and Amboy Rail Bed

Archaeological monitoring also addressed remains relating to the long and complex sequence of rail lines in the railyard, focusing on the tracks that ran along the ridge of the spit-like landform extending out to the historic ferry terminal site. These excavations revealed traces of an original segment of rail bed associated with the Camden and Amboy Railroad, laid down in 1832. Also found were close to 50 stone sleepers from the original rail bed, which had been re-used as supports for later trackage in the railyard.

The segment of original rail bed consisted of two parallel lines of compacted gravel, just under five feet apart, set in a sand fill. These represented the very base of the rail bed on top of which would have been laid two parallel rows of stone sleepers, spaced roughly three feet apart, to which was affixed standard-gauge, wrought-iron rail track. The two diverging lines of stone blocks found during the monitoring displayed all the typical characteristics of original Camden and Amboy Railroad sleepers, bearing on one surface either two or four, one-inch-diameter drilled holes and the imprint of a chair or plate used to fasten the iron rail. However, the stone sleepers were closely spaced and their surfaces with drill holes were randomly placed in multiple directions. It was concluded that they were not in their original position and had been re-used in some later reconfiguration and upgrading of tracks in the railyard, possibly supporting a switch or frog.



View along part of the original Camden and Amboy Railroad route showing a line of in-situ stone sleepers. Part of the original rail bed has been swept clean to show the typical configuration of the two-hole and four-hole blocks. [Source: Hunter Research, Inc.]

Project:	Archaeological Monitoring at the South Amboy Rail Terminal
Location:	City of South Amboy, Middlesex County
Date:	2016-2017
Consultant:	Hunter Research, Inc., 120 West State Street, Trenton, NJ 08608

For More Information…

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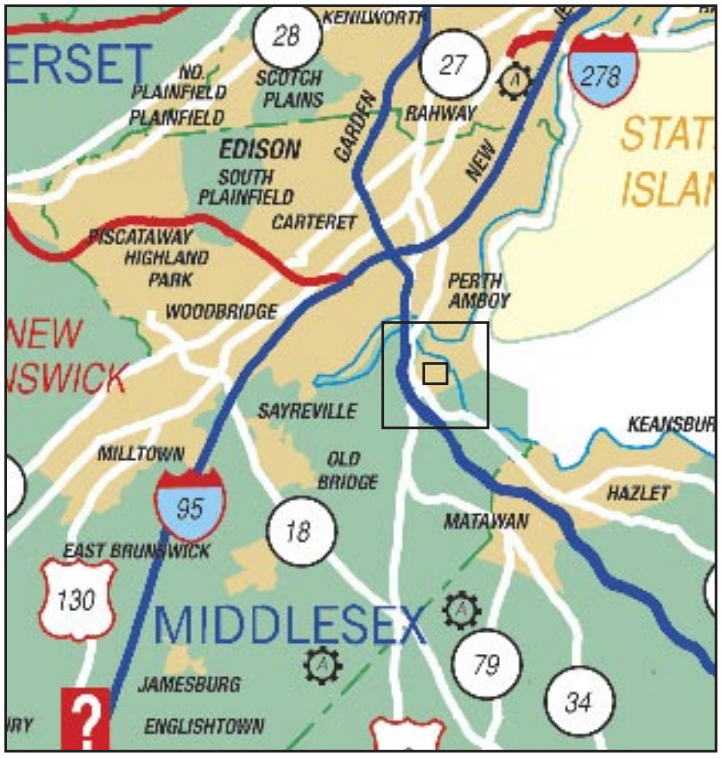
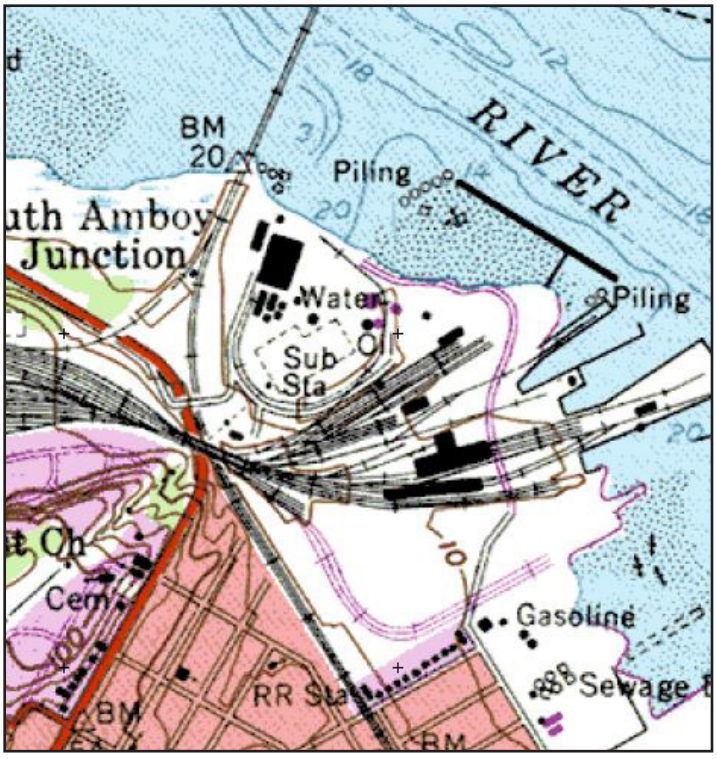
Additional information on transportation projects and historic preservation is available from the New Jersey Department of Transportation (http://www.state.nj.us/transportation/works/environment/overview.htm), the Federal Highway Administration (http://www.fhwa.dot.gov/environment/archaeology/index.htm), the New Jersey Historic Preservation Office (http://www.state.nj.us/dep/hpo/2protection/njrrevew.htm), and the Advisory Council on Historic Preservation (http://www.achp.gov/work106.html).



Project vicinity map



Area of detail

Appendix F

NEW JERSEY HISTORIC PRESERVATION OFFICE BIBLIOGRAPHIC ABSTRACT

APPENDIX F

New Jersey Historic Preservation Office
Bibliographic Abstract

HUNTER RESEARCH, INC.

Location:	Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, NJ
Drainage Basin:	Raritan River
U.S.G.S. Quadrangle:	South Amboy
Project:	Archaeological Monitoring and Testing, Environmental Remediation at the Former Conrail and Spectraserve Sites, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey
Level of Survey:	Monitoring
Cultural Resources:	Camden & Amboy Railroad railbed and turntables

Appendix G

PROJECT ADMINISTRATIVE DATA

APPENDIX G

Project Administrative Data

HUNTER RESEARCH, INC.
PROJECT SUMMARY

Project Name:	Archaeological Monitoring and Testing, Environmental Remediation at the Former Conrail and Spectraserve Sites, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey
Level of Survey:	Monitoring
HRI Project Reference:	16008/17023
Date of Report:	June 2018
Client:	City of South Amboy
Prime:	Potomac-Hudson Environmental, Inc.
Review Agency:	NJHPO
Agency Reference:	N/A
Artifacts/Records Deposited:	Hunter Research

PROJECT CHRONOLOGY

Date of Contract Award:	2/25/2016
Notice to Proceed:	2/25/2016
Background Research:	August 2016 - February 2018
Fieldwork:	December 2016 - April 2017
Analysis:	January - December 2017
Report Written:	September 2017 - June 2018

PROJECT PERSONNEL

Principal Investigator(s):	Richard W. Hunter, Joshua Butchko, James Lee
Background Researcher(s):	Richard W. Hunter, Patrick Harshbarger, Eryn Boyce
Field Supervisor(s):	Joshua Butchko
Field Assistant(s):	Evan Mydlowski
Analyst(s):	Joshua Butchko
Draftperson(s):	Evan Mydlowski
Report Author(s):	Richard W. Hunter, Patrick Harshbarger, Joshua Butchko