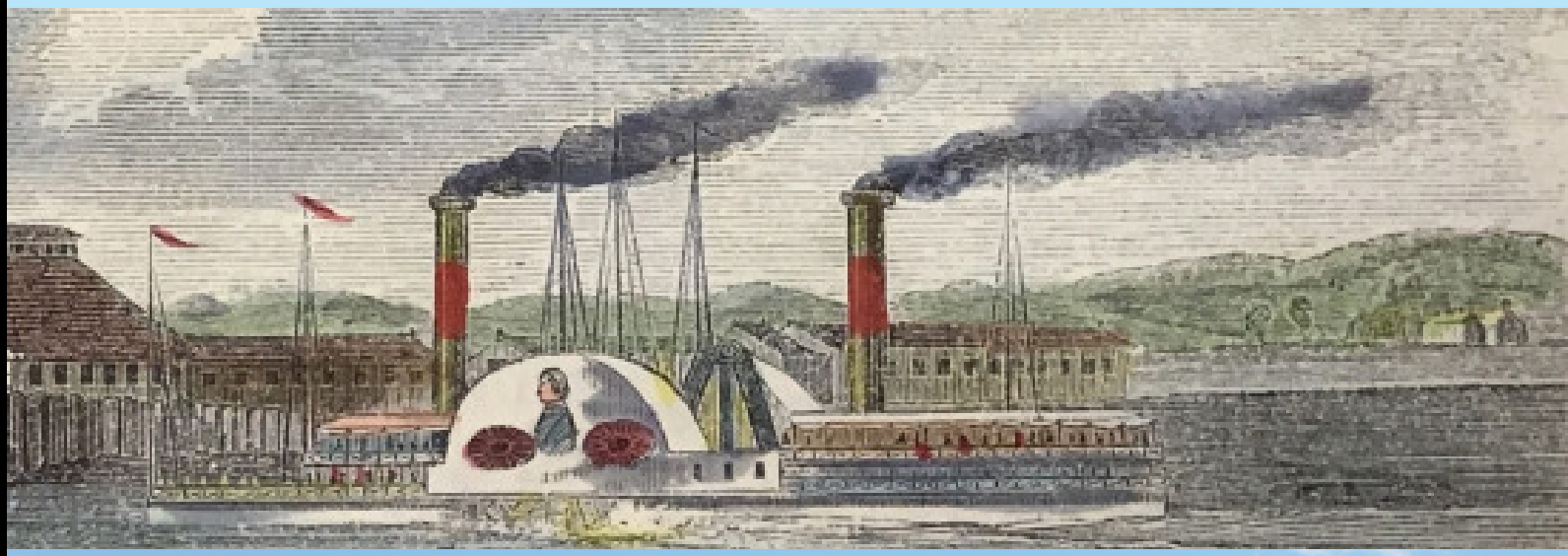
ARCHAEOLOGICAL DOCUMENTATION
CAMDEN AND AMBOY RAILROAD/PENNSYLVANIA RAILROAD WHARVES
WESTMORELAND PIER AND LEHIGH PIER
(INTERMODAL FERRY TRANSPORTATION CENTER SITE)
CITY OF SOUTH AMBOY, MIDDLESEX COUNTY, NEW JERSEY

Prepared for:
French & Parrello Associates, P.A.
City of South Amboy

Prepared by:
Patrick Harshbarger, M.A., Principal Historian
Richard W. Hunter, Ph.D., RPA, Principal
Joshua Butchko, M.A., RPA, Principal Investigator



HUNTER RESEARCH, INC.
DECEMBER 2020

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MANAGEMENT SUMMARY

This technical report presents, compiles and analyzes a variety of archaeological and historical data related to the former wharves and piers at the Intermodal Ferry Transportation Center (ITFC) site on the south shore of Raritan Bay in the City of South Amboy, Middlesex County, New Jersey. These waterfront features are located within and contributing to the New Jersey and National Register-eligible Camden and Amboy Railroad Main Line Historic District. The wharves and piers, which are in a ruinous state, are a remnant of the former Camden and Amboy Railroad/Pennsylvania Railroad rail-marine terminal. This terminal was established in 1831 and ranks as one of the first tidewater railroad terminals in the United States. Over the course of nearly 150 years of operation, the terminal evolved to meet many needs, particularly the transfer of coal from rail to water for distribution throughout the Port of New York. Specifically, this documentation is intended to fulfill Stipulation III of the 2009 Memorandum of Agreement (MOA) reached between the Federal Highway Administration, the New Jersey Historic Preservation Office, the New Jersey Department of Transportation and the City of South Amboy to mitigate adverse effects related to the construction of the new ITFC.

Methodologies used to collect and verify field data included pedestrian survey, survey from small watercraft, unmanned aerial vehicle (UAV or drone) technology, GPS, measured and interpretive drawings, and geo-referenced digital photography. Visible features onshore, within the tidal zone and partially submerged were documented, including the remains of timber piles, timber bulkheads, stone and timber pier footings, log crib boxes, stone railroad abutments and embankments, a timber corduroy ramp, wood hurdles and artifacts, most notably stone sleepers and sills re-used or discarded from the original Camden and Amboy Railroad rail bed. The upstanding structural remains of the Westmoreland and Lehigh Piers were documented in Historic American Engineering Record (HAER) format. The HAER data is presented in two appendices consisting of digital photographs, drawings and historic narratives specifically focused on the physical remnants and historical significance of the two massive coal piers built in 1872.

The report concludes with the observation that the documented waterfront features represent the substantial underpinnings of a vast terminal infrastructure of buildings, wharves and rail lines, most of which existed at elevations ten to 15 feet above the present-day water level. With this infrastructure largely stripped away, what remains are foundational elements, mostly composed of wood and only partially visible. Many of these foundation elements likely extend to depths of between ten and 20 feet below the beach and bay floor. A zone of deeply buried archaeological sensitivity remains unexplored, especially in the area of the early Camden and Amboy Railroad/Pennsylvania Railroad wharves of the 1830s to the 1870s, which will not be disturbed as a result of the ITFC project as presently planned.

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ACKNOWLEDGMENTS

This program of archaeological documentation was carried out by Hunter Research, Inc. under contract to French & Parrello Associates, P.A. (FPA) for the City of South Amboy under the administrative oversight of the New Jersey Department of Transportation (NJDOT). We extend particular appreciation to Steven A. Tardy, PE, Chief Executive Officer of FPA, for his oversight of our work and for sharing details of the project design for the IFTC site. We offer our thanks to Glenn R. Skarzynski, MPA, Business Administrator, and Camille Tooker, Confidential Aide to the Mayor of the City of South Amboy and Lauralee Rappleye, Acting Manager/ Project Manager/Archeologist (NJDOT Bureau of Environmental Program Resources) for their assistance in keeping this complex project on track.

Several staff at the New Jersey Historic Preservation Office assisted in the conceptualization of the documentation, notably Katherine Marcopul, Administrator and Deputy State Historic Preservation Officer, and Vincent Maresca, Senior Historic Preservation Specialist. Special acknowledgement is offered here to Pierre Lacombe, recently retired from the U.S. Geological Survey, for his expert knowledge and helpful insights on the identification and use of stone sleepers and sills in the construction of the original Camden and Amboy Railroad rail infrastructure.

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, and Principal Historian, Patrick Harshbarger, but the main burden of the field documentation was shouldered by Joshua Butchko, Principal Investigator, Evan Mydlowski, Surveyor/Drone Operator, and Alexis Alemy and Michael Brown, Field Archaeologists. Patrick Harshbarger, Principal Historian, oversaw the completion of the Historic American Engineering Record (HAER) documentation for the Westmoreland and Lehigh piers. Report graphics were largely produced by Evan Mydlowski with assistance from Michael Brown. Report layout was completed by Patricia Madrigal. This report was written by Richard Hunter, Patrick Harshbarger and Joshua Butchko.

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

Chapter 1

INTRODUCTION

The archaeological and historical documentation presented in this report is provided in support of design and permitting for the proposed Intermodal Ferry Transportation Center (ITFC) on the south shore of Raritan Bay in the City of South Amboy, Middlesex County, New Jersey (Figures 1.1 and 1.2). This documentation, prepared as part of project compliance with Section 106 of the National Historic Preservation Act, specifically addresses Stipulation III of the 2009 Memorandum of Agreement (MOA) reached between the Federal Highway Administration, the New Jersey State Historic Preservation Office, the New Jersey Department of Transportation and the City of South Amboy (Appendix A), which reads as follows:

> **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.

This documentation, as per Stipulation IV of the MOA, will also assist the project design team, led by French & Parrello Associates, P.A., with development of the proposed South Amboy IFTC Site by addressing areas of the piers and wharves that may be impacted by project activities, eliminating or minimizing the need for future archaeological monitoring in those areas. Another outcome of the documentation program is to supply data that may be useful in the development of a site design that incorporates historic elements. For example, an inventory of Camden & Amboy Railroad stone sleepers, originally used to carry railroad tracks and later salvaged for use in walls and footings of the piers, will be useful in consideration of their use as a landscape element or in interpretive displays at the new passenger ferry terminal.

The archaeological documentation has been carefully tailored to meet an evolving project design. Current plans envisage ferry slips positioned between the historic Westmoreland and Lehigh piers, a ferry terminal building and staging plaza situated northwest of the Westmoreland Pier (where the former Pennsylvania Railroad railyards were located) and parking areas to the southwest accessed by Radford Ferry Road (Figures 1.3a-b). Archaeological recordation work was spelled out in a technical proposal dated March 29, 2019 (Appendix B) and focused on two main tasks: 1). the documentation of piles and piling structures on all offshore areas extending from the Lehigh Pier as far north as and including the former Camden and Amboy piers; and 2). the preparation of Historic American Engineering Record (HAER) state-level equivalent documentation of the remains of the Westmoreland and Lehigh piers, two of the more

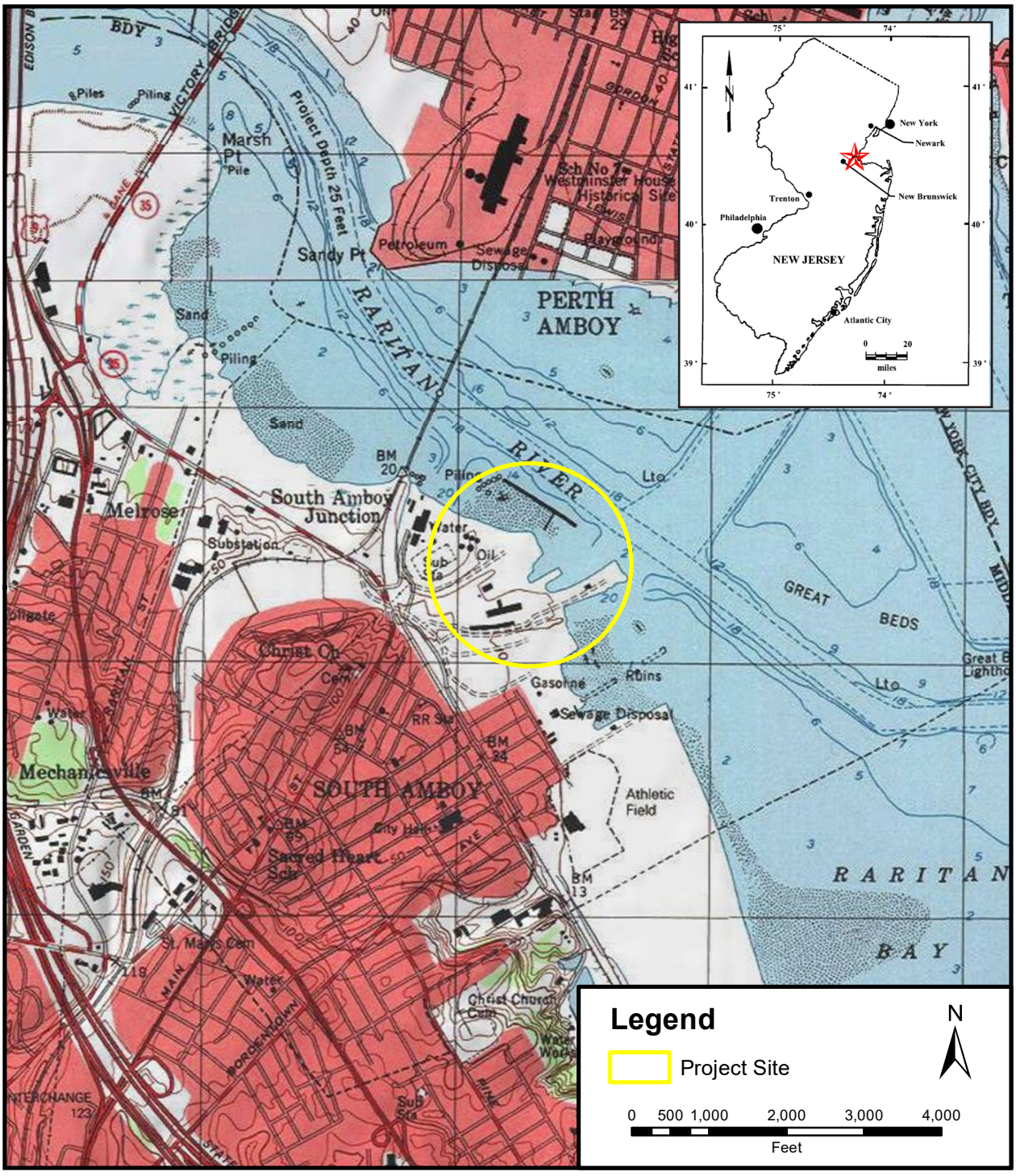


Figure 1.1. Location of the South Amboy Intermodal Ferry Transportation Center Project Site (circled). Source: USGS 7.5' Topographic Series, South Amboy Quadrangle (1954).

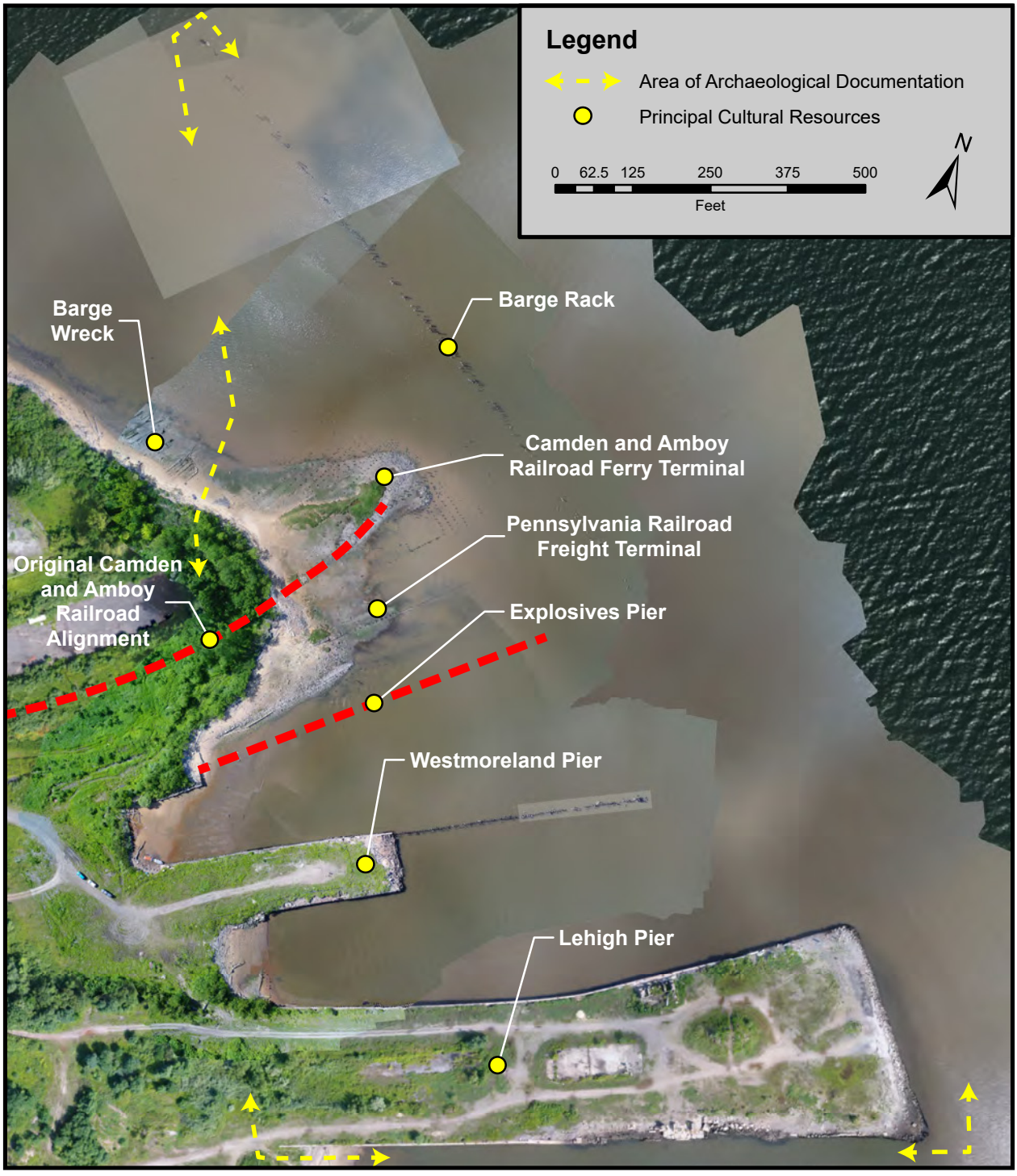
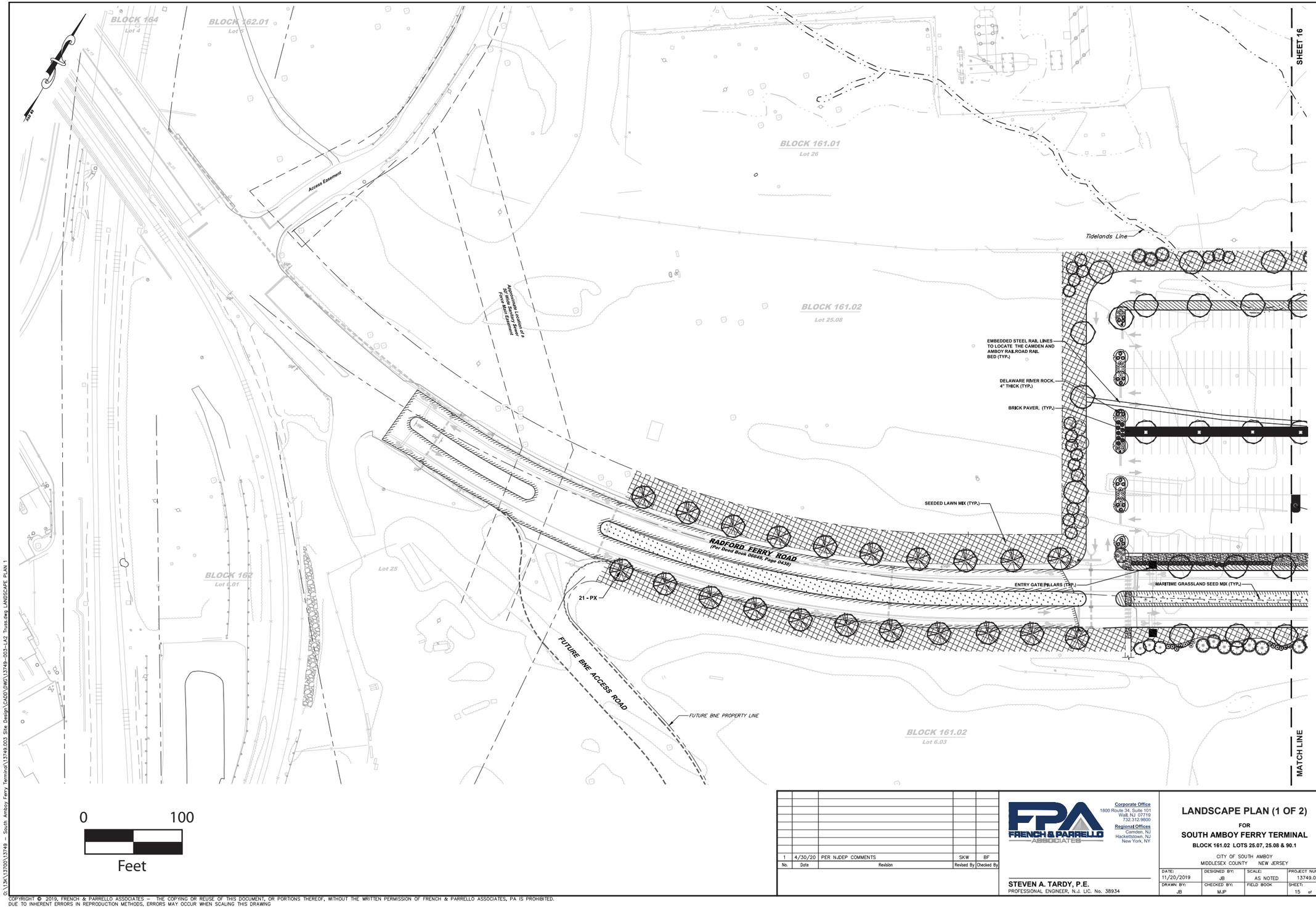


Figure 1.2. Aerial Photomosaic Plan View of the South Amboy Intermodal Ferry Transportation Center Project Site Showing the Principal Cultural Resources Being Subjected to Archaeological Documentation.

intact former coal piers, which are proposed to remain in place and be modified for ferry service (Appendices C and D).

This report should be viewed as a supplement to two other recent documents prepared by Hunter Research in connection with the South Amboy IFTC project: a report completed in 2015 that provided a background history of the Camden and Amboy Railroad/ Pennsylvania Railroad passenger and freight terminal operations at South Amboy and summarized a range of cultural resources investigations completed at the IFTC project site between 2000 and 2012 (Hunter Research, Inc. 2015); and a second report that addressed the results of archaeological monitoring of soil remediation conducted at the site in 2016-17 (Hunter Research, Inc. 2018)



No.	Date	Revision	Revised By	Checked By
1	4/30/20	PER NJDEP COMMENTS	SKW	BF

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PROFESSIONAL ENGINEER, N.J. LIC. No. 38934

LANDSCAPE PLAN (1 OF 2)

FOR

SOUTH AMBOY FERRY TERMINAL

BLOCK 161.02 LOTS 25.07, 25.08 & 90.1

CITY OF SOUTH AMBOY
MIDDLESEX COUNTY NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
11/20/2019	JB	AS NOTED	13749.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	SHEET:
JB	MJP		15 of 29

O:\13K\13700\13749 – South Amboy Ferry Terminal\13749.003 Site Design\CADD\DWG\13749-003-LA2 Truss.dwg LANDSCAPE PLAN 1

Figure 1.3a. Landscape Plan for the Proposed South Amboy Ferry Terminal (West Section). Source: French & Parrello Associates, P.A. (November 20, 2019).

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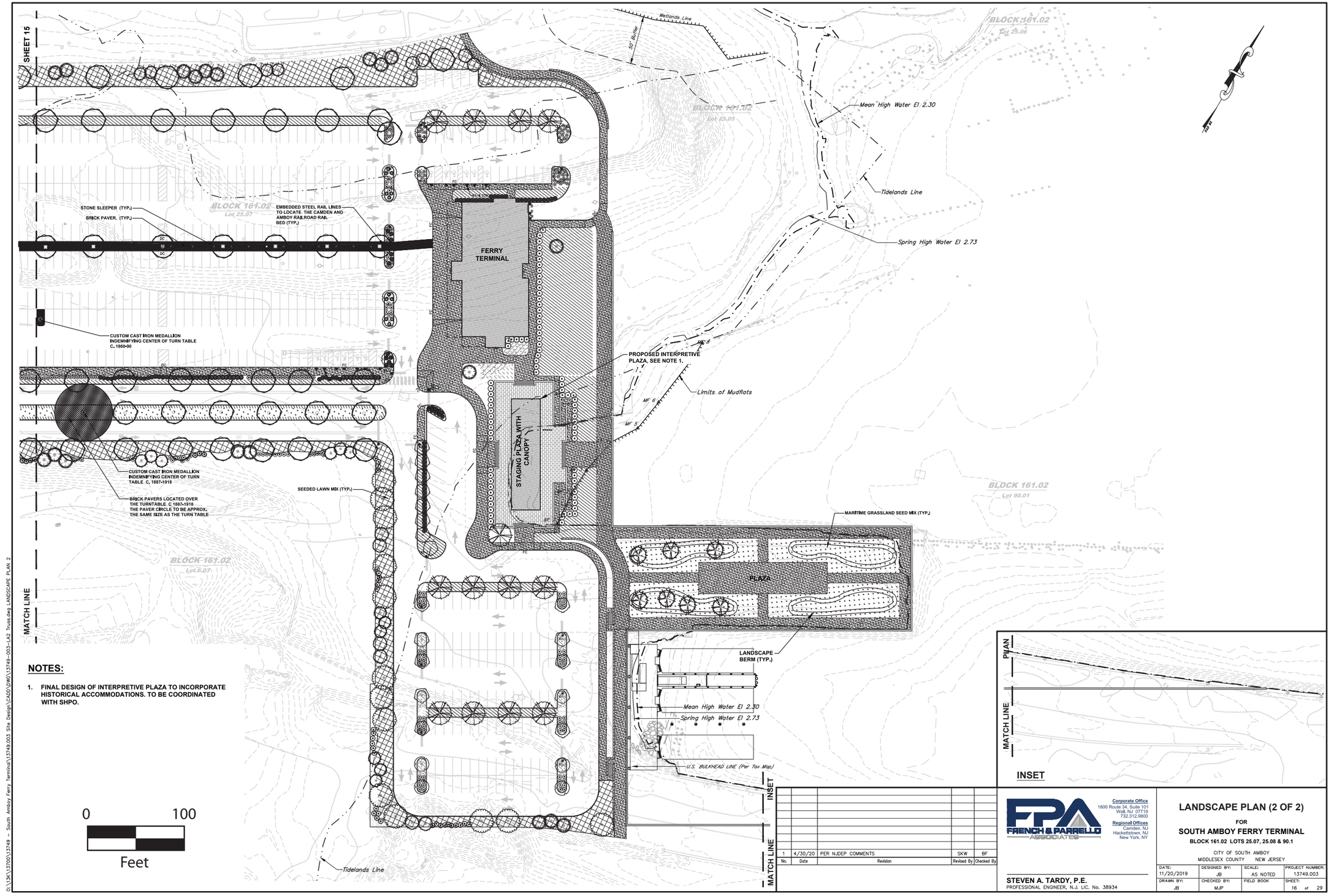

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LANDSCAPE PLAN (2 OF 2)

FOR

SOUTH AMBOY FERRY TERMINAL

BLOCK 161.02 LOTS 25.07, 25.08 & 90.1

CITY OF SOUTH AMBOY
MIDDLESEX COUNTY NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
11/20/2019	JB	AS NOTED	13749.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	SHEET:
JB	MJP		16 of 29

Figure 1.3b. Landscape Plan for the Proposed South Amboy Ferry Terminal (East Section). Source: French & Parrello Associates, P.A. (November 20, 2019).

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Chapter 2

METHODOLOGY

A. OVERVIEW

Archaeological documentation was undertaken over the course of several days in roughly four-hour blocks of time to take maximum advantage of low tide conditions. Piles and wharf remains along the shoreline and within pedestrian reach of the shore were examined and documented on foot, in waders, while a shallow boat (canoe or kayak) was used to gain access to the offshore pile locations. GPS technology (Trimble GeoExplorer 7X with sub-foot accuracy) was used to survey the locations of key piles, e.g., those at the ends of lines of piles of similar type, and other features of particular interest both on and off shore.

Survey data were supplemented with georeferenced photomosaic aerial imagery gathered from an unmanned aerial vehicle (UAV or drone) and from geo-rectified aerial photographs to produce comprehensive mapping of the entire South Amboy IFTC site. The high-quality, high-resolution aerial photographic coverage of 1979 was of particular value as it showed many piles and other structural features that were visible just below the water surface. General views of lines of wharf and bulkhead remains were recorded with high resolution digital photography, while selected digital photographs were also taken of representative piles and individual piles of particular interest (e.g., those with hardware). No artifacts were retained during the course of the documentation. No sampling of timber piles or of the timber structural members of wharves and bulkheads was undertaken for species identification.

In combination with the documentation of piles, Hunter Research staff examined and surveyed the shoreline in considerable detail, using land-based and drone photography to record walls, building foundations, masonry concentrations, timber cribwork, iron hardware and various types of stone, brick and timber linear features. Particular attention was given to reused stone sleepers, with the position and orientation of these distinctive blocks of stone being surveyed and spot elevations being taken selectively where they formed clear linear arrangements of shoreline protective masonry.

B. PROJECT SITE LIMITS

Archaeological documentation was limited to the shoreline and immediate offshore portions of the Camden and Amboy Railroad/Pennsylvania Railroad wharves and the Westmoreland and Lehigh piers. All descriptions of the site proceed from north to south, beginning with offshore and then onshore features within the area of the wharves, and then proceeding south to the Westmoreland Pier and finally to the Lehigh Pier (Figure 2.1).

The furthest northeastern limit of the historic terminal area lies out in the Raritan Bay and is defined by a line of timber piles which represent the remains of an early 20th-century barge rack. These extend for approximately 1,100 feet roughly parallel to and 500 to 600 feet from the shoreline. Moving onshore, the northwestern limit of the archaeological documentation of the historic terminal area is marked by a pile of stone ballast lying on the beach just beyond the furthest visible extent of the network of vertical wooden piles. Beyond this point, but explicitly excluded from the documentation exercise, is a partially buried wreck, assumed by size and shape to be a barge, lying at the interface of the beach and the tidal zone. The onshore portion and adjacent tidal zone of the historic Camden and Amboy Railroad/Pennsylvania Railroad terminal area includes a complex and heavily deteriorated arrangement of timber piles and other stone and

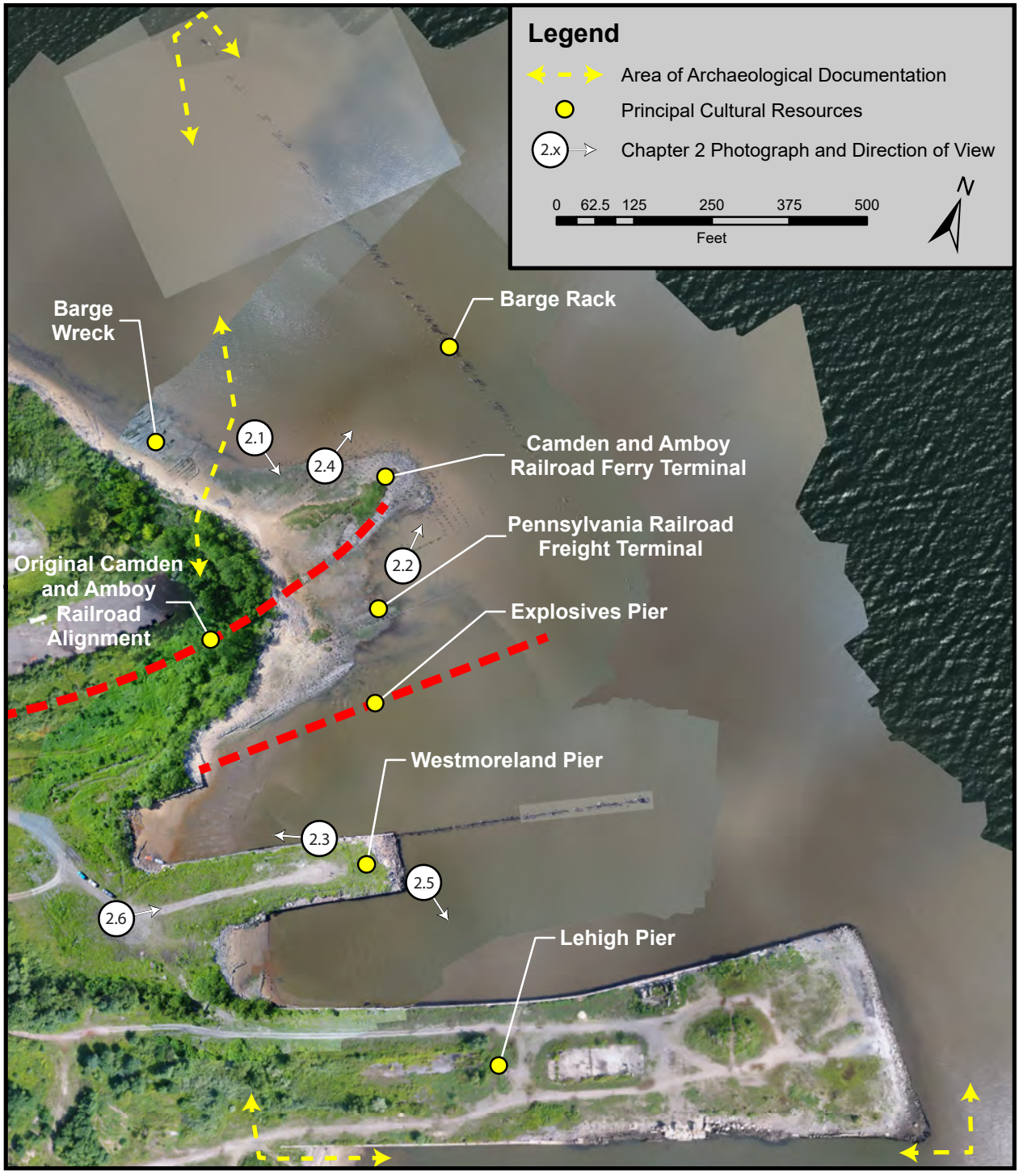

Figure 2.1. Aerial Photomosaic Plan View of the South Amboy Intermodal Ferry Transportation Center Project Site Showing the Principal Cultural Resources Being Subjected to Archaeological Documentation and Chapter 2 Photographs with Directions of View.

timber features, which are generally considered to be the remains of the cribbing and foundations that supported the 19th- and 20th-century wharves and other terminal facilities. Multiple phases of construction are evident in these remains. Along the southeastern edge of this area, extending out into the bay was the explosives pier, of which virtually no trace survives today owing to the explosion of May 19, 1950.

Roughly 200 feet south of the explosives pier is the Westmoreland Pier, which originally supported a series of coal bunkers and trestles for transferring coal from railroad cars to barges and lighters. This survives as a roughly 400-foot-long, 100-foot-wide, ruinous stone rubble and timber jetty extending northeast into the bay. The remains of this pier extend out another 400 feet northeastward from the northern corner of the jetty as a line of timber piles. Roughly 150 feet southeast of the Westmoreland Pier is the Lehigh Pier, a considerably larger stone and timber structure, also a former coal handling pier, which projects out northeastward from the shoreline for approximately 1,000 feet. At its landward end the pier is roughly 225 feet wide, but it increases in size to a width of almost 350 feet at its opposite northeastern end. Further to the southeast, barely visible today and excluded from the documentation exercise since it will not be affected by the IFTC project, is the stub of the mid-20th-century oil handling pier. Between each of the piers, the shoreline is marked by narrow cove-like inlets defined by ruinous timber bulkheading against which sand, mud and debris have accumulated.

C. DOCUMENTATION PROCEDURE

Archaeological documentation was conducted on an intermittent basis between early June and late August of 2019, and again in June 2020 under a variety of summer to early fall weather conditions. A total of 11 visits were made to the project site, carefully timed to take advantage of low tides, minimal wind and no precipitation. The archaeological team adopted a multi-pronged approach to the documentation task involving a combination of surface inspection, land-based and marine survey, measured drawings, and unmanned aerial vehicle (UAV) photographic survey.

The shoreline portion of the IFTC site was accessed via a series of dirt and gravel roads which weave through the heavily modified and filled landscape. Vehicles and equipment were, for the most part, stationed just inland from the southwestern end of the Westmoreland Pier from where other locations within the project site could be most easily reached. Large sections of the site were covered by thick underbrush, saplings and incipient woodland, especially just inland of the shoreline where the Camden and Amboy Railroad/Pennsylvania wharves were located. These areas were excluded from survey and documentation, since they did not contain timber piles or show surface evidence of foundations; however, limited manual clearing of brush was occasionally necessary to gain suitable access to the shoreline and to establish clear sight lines for total station survey work.

Surface Inspection and Land-based Survey: surface inspection and pedestrian survey of the shoreline involved a three-person team undertaking multiple sweeps of the project site, moving from southeast to northwest and back again. Features of note were flagged with fluorescent tape and, where necessary, brush was cleared to facilitate their documentation. This task was initially completed as low tide approached, allowing one team member, outfitted in chest-high waders and personal flotation device, to gauge the water depth and soil stability in the tidal zone. Temporary flags were posted in the water delimiting a safe boundary within which team members could continue to work on foot. Beyond this boundary, survey and documentation were conducted by boat. Generally, the waters surrounding the Westmoreland and Lehigh piers were deep and muddy at low tide, meaning all access was by boat; however,

many of the offshore features associated with the Camden and Amboy Railroad/Pennsylvania Railroad wharves proved to be in shallow, stable water at low tide which allowed for extended pedestrian access.

Survey and mapping were undertaken as part of the land-based survey using a Topcon/GTS-229 total station (Photograph 2.1). Seven datums were placed strategically across the site, taking various obstructions into account. These included a critical datum situated in the core of the site, through which data from this current survey could be tied in to earlier archaeological work conducted by Hunter Research archaeologists in 2016-2017 (Hunter Research, Inc. 2018). A digital GPS, Trimble/Geo 7X with a Tornado antenna was also used in support of this survey, in large part to pinpoint features located during this earlier work. Two-way radios were used to communicate information between the surveyor operating the total station and the prism rod-bearer at the survey target. The survey team devised a project-specific list of common terms for data entry and developed a simple routine for physically marking objects or features as they were surveyed. The latter comprised a combination of flagging tape and temporary spray paint to mark the daily progress from day to day (Photograph 2.2).

Digital photography and the creation of representative plan views and profiles formed an important aspect of the land-based survey. General views of lines of pilings and wharves were photographed, along with close-up views of selected individual pilings, cribbing, masonry features and other construction details. Special attention was given to the visible remains of the Westmoreland and Lehigh piers and their immediate surroundings as these were the subject of formal Historic American Engineering Record (HAER) documentation. As part of the HAER documentation, numerous elevation views were photographed at low tide (Photograph 2.3) for use in digital mosaic elevations and to supplement the drafting of representative cross-sections (see below, Chapter 3).

An assortment of cultural material was observed scattered across the surface of the beach, none of which was retained during the documentation process. This included modern trash and debris washed onshore by the tide interspersed with eroded historic structural debris, hardware and other artifacts that most likely derived from the ferry terminal site. Typical historic artifacts consisted of structural debris (e.g., bricks, concrete, asphalt and utility pipes) with many of the bricks bearing makers' marks of local brickmaking companies, most notably, the Sayre & Fisher Brick Company, which was in production from 1850 until 1970, and the Lenox Brick Company, which operated in nearby Cliffwood in the early years of the 20th century. Other makers' marks reflect the production of more distant brick manufacturing centers, such as those along the Hudson River in the Haverstraw area of Rockland County, New York (e.g., the Excelsior Brick Company) and in the Kingston area of Ulster County, New York. Stone sleepers and other structural debris likely relating to the Camden and Amboy Railroad era of the ferry terminal site are discussed further in Chapter 3. A range of metal hardware, chiefly rail spikes, anchor chain links, cleats and braces, was also observed along with smaller quantities of historic glass and ceramic debris. Most of the ceramic debris consisted of electrical insulator fragments, likely associated with the railroad system, a category of material that was amply sampled in earlier studies.

Marine Survey: in order to document pilings, the pier perimeters and other shoreline features, it was necessary to make use of watercraft and carefully time the recording work to take advantage of the fluctuating water level. A two-person canoe and a one-person kayak were both used to document features in areas beyond the safe limit of pedestrian access, with many of the same techniques and equipment being employed as in the land-based survey.

To complete the total station survey, the more easily maneuverable one-person kayak was deployed to collect data along the two lines of pilings associated with the barge racks, within the historic ferry terminal area and around the perimeter of the Westmoreland and Lehigh piers (Photograph 2.4). The kayak operator was required to multitask operation of the vessel, prism rod, anchor tether, temporary paint, digital camera and two-way radio, the latter being used to communicate details of the pilings back to the total station operator. The camera was used to gather representative photographs of pilings, crossbeams and associated hardware. This portion of the survey work was conducted in multiple episodes at varying tide levels in order to effectively document the variable height of the lines of pilings. Among the many safety concerns were the often windy conditions, strong currents and close proximity of shipping lanes in the Raritan Bay. Completion of the HAER documentation of the Westmoreland and Lehigh piers also involved use of the two-person canoe (Photograph 2.5). In this instance, one person navigated the vessel, while the other operated the camera and tripod, taking digital photographs of the northwest, northeast and southeast elevations of both piers.

Unmanned Aerial Vehicle (UAV) Photographic Survey: aerial photographic survey was carried out using a DJI Phantom 4 Pro drone. Overall aerial photographic coverage was derived for the entire IFTC Site and was followed by taking extensive, more detailed aerial photographs of the shoreline. The scheduling of this work involved obtaining appropriate airspace permissions and ensuring that weather conditions were safe, i.e., dry and with winds below 15 miles per hour (Photograph 2.6). The drone was flown at a number of different altitudes following predetermined flight patterns to ensure that imagery was captured for the full extent of the shoreline undergoing documentation. Adequate overlap of photographs was also necessary to allow individual images to be stitched together during processing. The aerial photographs were processed using Agisoft Metashape software which enabled the creation of georectified orthomosaic imagery. A digital elevation model (DEM) was also derived from the drone-acquired imagery, displaying elevation changes across the shoreline and project site. Selected orthomosaic aerial photographs and DEMs are included as illustrations throughout this report.

A large volume of data was gathered during the course of this documentation exercise. More than 2,400 data points were collected via total station survey and georectified and georeferenced for future use. A total of 5,229 digital photographs were taken: 3,343 drone-acquired aerial photographs and 1,886 images acquired at ground level. The latter category mostly consists of elevation views of the sides of the Westmoreland and Lehigh piers and close-up views of other features along the shoreline. Several cross-section drawings were completed in the field to supplement the photographic record.

D. INTERPRETATION PROCEDURE

With the large volume of field survey and aerial photographic data compiled and available for study, a methodical process was embarked upon involving the comparison of this information with the sequence of historic maps and historic aerial photographs. Of the scores of maps that are in existence for the South Amboy area from the 1760s onwards (and aerial photographs from *circa* 1930), only a handful are of particular utility. Upon careful review, four maps from 1836, 1876, 1907 and 1950, along with the aerial photographic coverage from 1979, were selected for this comparative analysis with the data compiled in the field.

Through a combination of “rubber sheeting” and georeferencing each of the maps was superimposed over the georectified orthomosaic base map stitched

Figure 2.2. Brinley Sketch Map of 1836 Superimposed over Aerial Photomosaic Plan View of 2019.

Figure 2.3. Everts and Stewart Map of 1876 Superimposed over Aerial Photomosaic Plan View of 2019.

Figure 2.4. U.S. Coast and Geodetic Survey Map of 1907 Superimposed over Aerial Photomosaic Plan View of 2019.

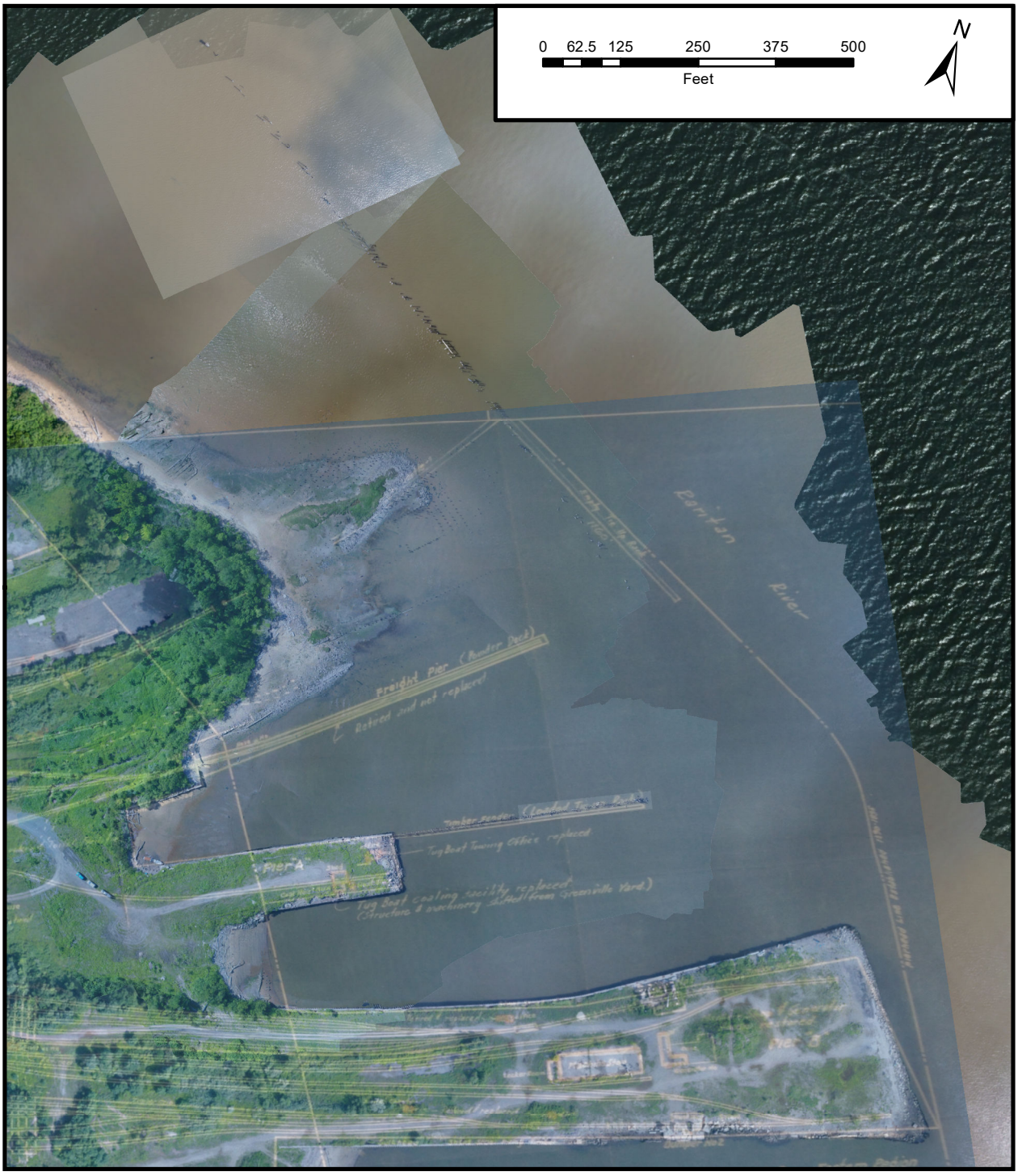

Figure 2.5. Pennsylvania Railroad Map of 1950 Superimposed over Aerial Photomosaic Plan View of 2019.

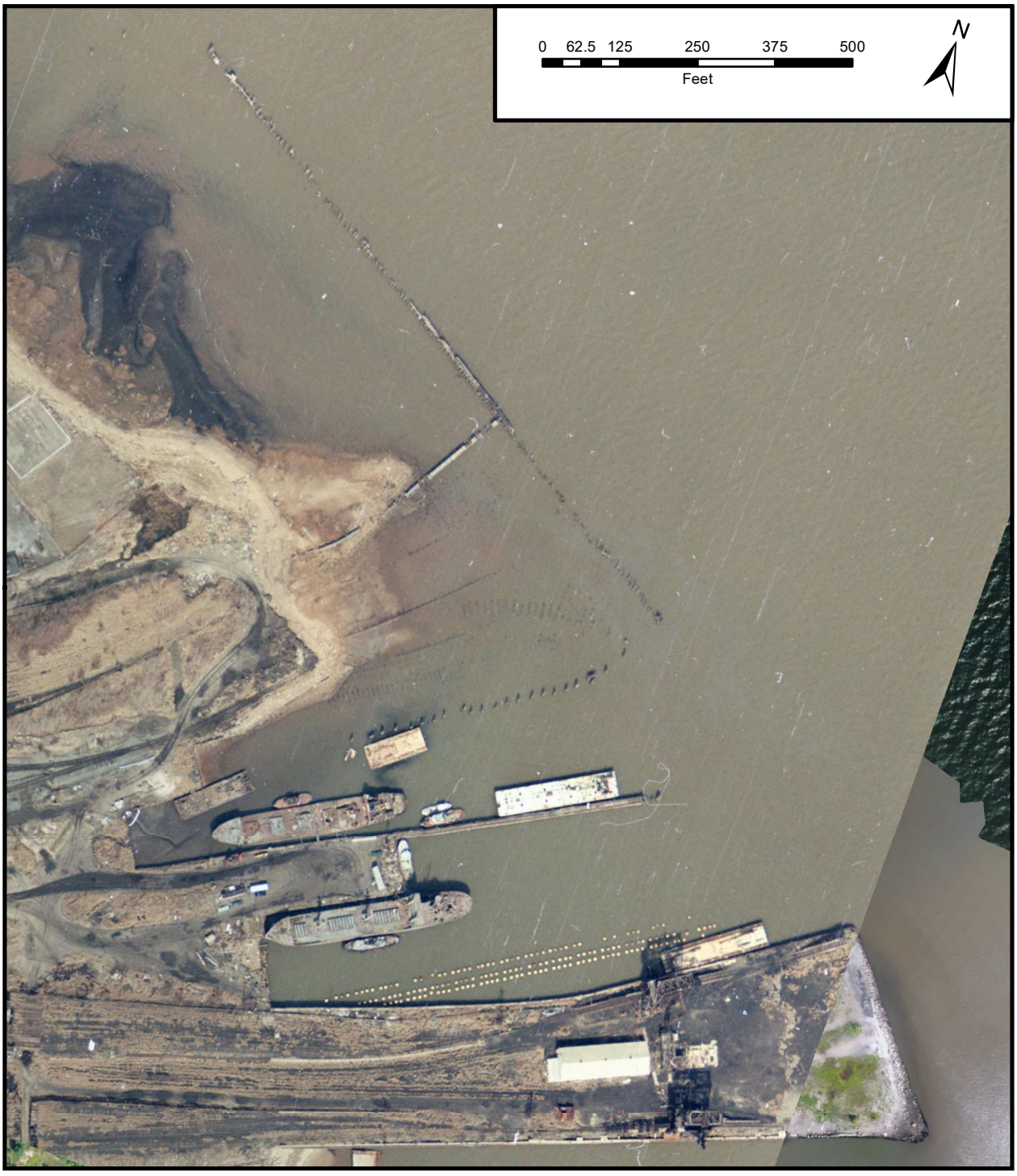

Figure 2.6. National Environmental Title Research, Aerial Photograph, 1979.

together from the UAV aerial photography acquired in 2019, while the 1979 aerial photographic coverage, gathered at low tide under calm conditions and showing numerous offshore features, was likewise georectified and scanned for site elements that could supplement the 2019 field survey and aerial data. This process of comparative analysis provides the underpinning for the detailed description and interpretation of the shoreline presented below in Chapter 3.

The Brinley sketch map of 1836 was chosen since it gives the earliest detailed and accurate representation of the original wharf and its distinctive L-shaped plan at the dawn of the Camden and Amboy Railroad era. Superimposed over the orthomosaic base map, it shows excellent correlation between the wharf and the spit-like natural landform, with the sites of the elevated terminal buildings lying mostly offshore just beyond the tidal zone, but inshore of the barge rack (Figure 2.2). The Everts and Stewart map of 1876, early on in the Pennsylvania Railroad era, shows the southeastward expansion of the original ferry terminal into a freight terminal, again elevated and with most of the facility lying offshore (Figure 2.3). The U.S. Coast and Geodetic Survey map of 1907 shows the freight terminal at a later stage of development during the Pennsylvania Railroad era prior to the construction of the explosives pier during World War I (Figure 2.4). The Pennsylvania Railroad map of 1950, a reconstructed map showing the freight terminal elements as they existed immediately prior to the explosion of May 19, 1950, is included primarily for its depiction of the explosives pier, which continued in use with the barge rack long after the rest of the original freight and ferry terminal area had been demolished (Figure 2.5). The aerial photographic coverage of 1979 was selected for analysis in part because of its clear correlation with the 2019 orthomosaic base map, despite the passage of four decades, but no less important because of the visibility of additional, barely submerged structural remains in the offshore area between the low tide limit and the barge rack (Figure 2.6).

Chapter 3

SUMMARY OF RESULTS

A. CAMDEN AND AMBOY RAILROAD/ PENNSYLVANIA RAILROAD WHARVES

Archaeological documentation of the Camden and Amboy Railroad/Pennsylvania Railroad wharves was conducted intermittently over the course of several days in June, July and August of 2019 (Figure 3.1). The documentation activity involved a combination of pedestrian, marine and aerial survey. Typical tasks included visual inspection, limited brush clearing, note-taking, the taking of measurements with hand tapes, the creation of in-field scale drawings and sketches, total station survey, and land-based and aerial digital photography.

A number of features and areas of interest were identified during the documentation process. In many cases, these defied definitive description and interpretation, and they clearly reflect several episodes of construction and modification. The remains mostly comprise stone and timber features that are believed to relate to wharves, piers, bulkheads and ferry and railroad infrastructure. They are expressed in the form, most especially, of timber piles and piling structures, timber cribbing and corduroy matting, stone foundations and retaining walls, and rock fill or ballast, all surrounded and often covered with tidal muds, beach sand and pebbles. Sporadic evidence of iron hardware (e.g., spikes, bolts, washers, nuts, straps) was also observed, sometimes embedded in piles and timber construction, but also scattered loose across the ground surface. The occurrence of re-used stone railroad sleepers, stone sills and other rough-dressed masonry blocks was of particular interest owing to their probably having originated as part of the Camden and Amboy Railroad's first-generation rail infrastructure of the 1830s.

This narrative proceeds roughly northwest to southeast along the shoreline, beginning with the barge rack and catwalk, which are the furthest offshore visible features, then moving onshore to a section of timber bulkhead with rock fill at the northwestern end of the site, progressing southeastwards through the original Camden and Amboy Railroad ferry terminal site and later Pennsylvania Railroad freight terminal area, the site of the explosives pier (a structure that was destroyed by an explosion in 1950 and of which virtually no trace survives today) and ending with the bulkhead that defines the northwestern side of the docking area to the northwest of the Westmoreland Pier. Following this portion of the narrative, the distribution and patterning of the timber piles is discussed briefly and generally with reference to the survey data gathered in the field. While limited, specific interpretation of the piles and of various individual features is provided throughout this narrative, a broader synthesis of the site as a whole is deferred until the following chapter.

1. Barge Rack and Catwalk

A series of timber piles associated with a substantial barge rack and a catwalk connecting the rack to the shore were inspected and mostly documented with the help of a canoe and kayak (Figure 3.2; Photographs 3.1-3.6). These piles are both taller and more intact than the piles and piling structures closer in to shore. Most of them, especially those forming part of the rack, are still visible at high tide and many are occupied by nesting and scavenging coastal birds, including seagulls, cormorants and herons. The barge rack and catwalk were built *circa* 1920 based on analysis of Interstate Commerce Commission (ICC) valuation

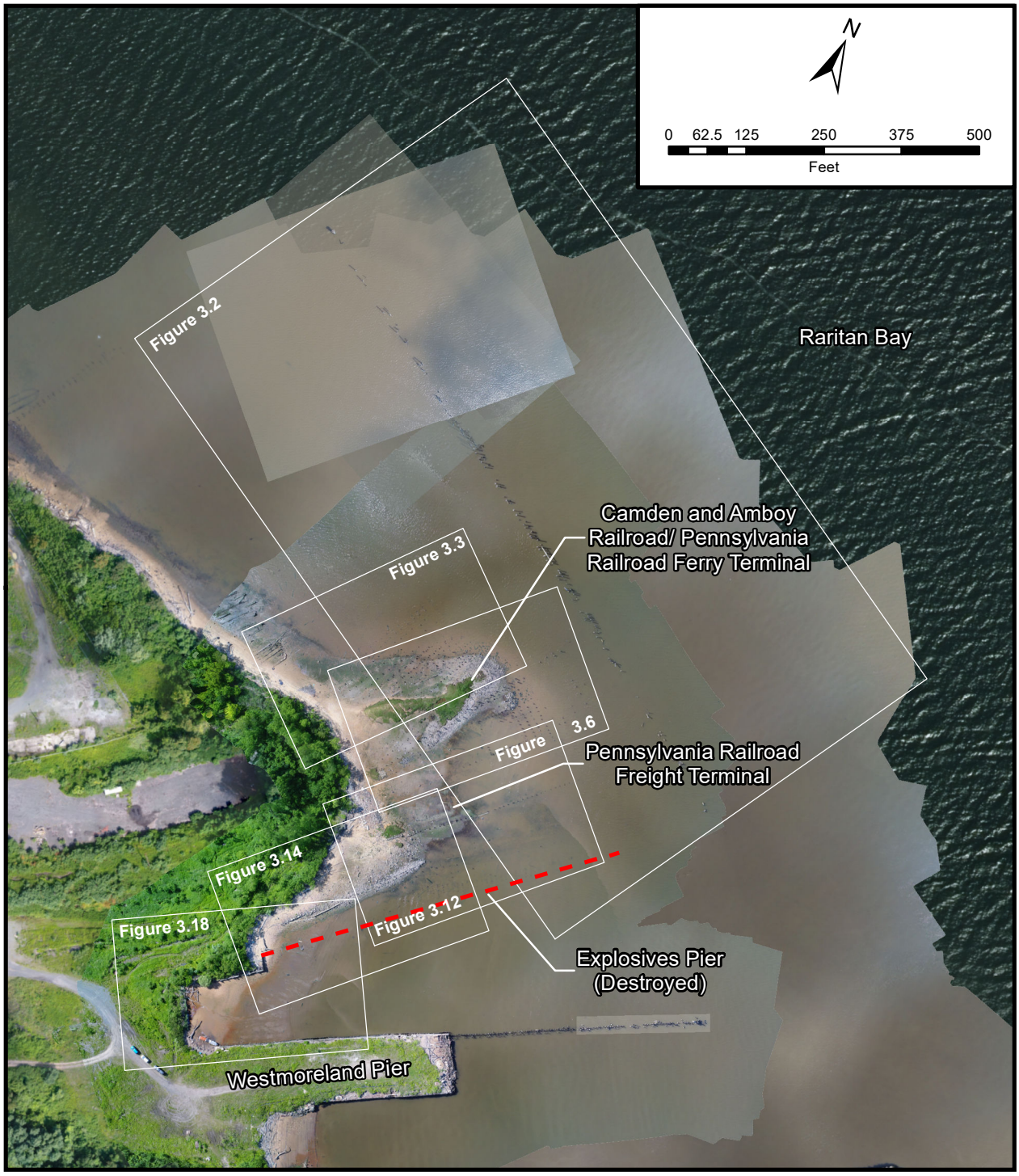

Figure 3.1. Aerial Photomosaic Plan View of the Camden and Amboy Railroad/Pennsylvania Railroad Wharves: Index Map.

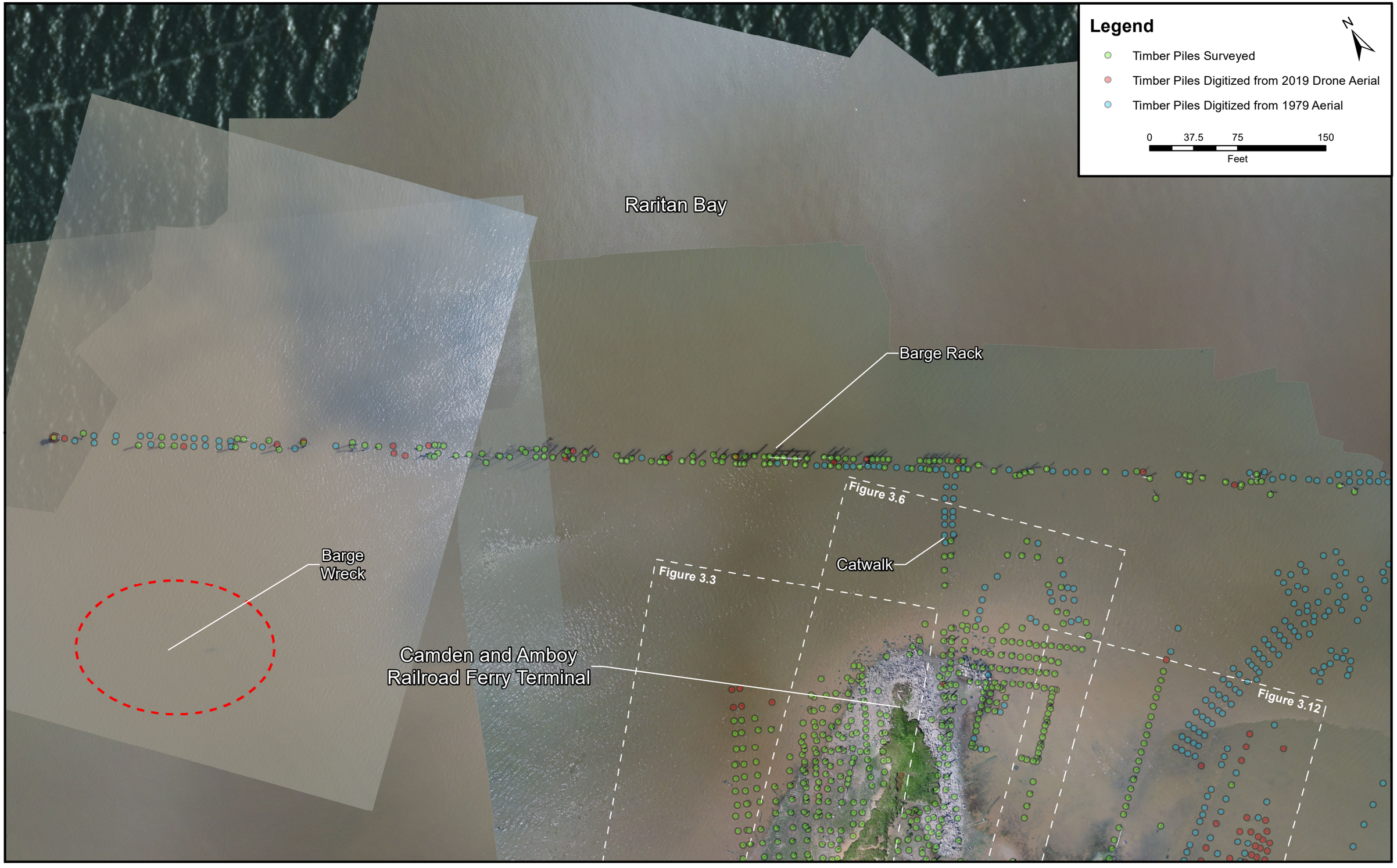

Figure 3.2. Aerial Photomosaic Plan View of the Camden and Amboy Railroad/Pennsylvania Railroad Wharves: Barge Rack and Catwalk.

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Photograph 3.1. View looking north showing the northwestern end of the barge rack, built circa 1920 (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:076].

Photograph 3.2. View looking southeast along and between the two rows of piles that form the barge rack. Note the remnant transverse timbers hanging from some of the piles, the iron bolts with washers and nuts, and cormorants on the look-out for fish (Photographer: Joshua Butchko, August 2019) [HRI Neg.# 19013/D7:066].

Photograph 3.3. View looking west-northwest showing examples of the barge rack piles with iron hardware (spikes, bolts, nuts, washers and bands) (Photographer: Joshua Butchko, August 2019) [HRI Neg.# 19013/D7:060].

Photograph 3.4. Close-up view of a typical cluster pile, comprised of multiple logs bound together with wire rope and iron staples, at the northwestern end of the barge rack (Photographer: Joshua Butchko, August 2019) [HRI Neg.# 19013/D7:040].

Photograph 3.5. View looking northwest showing a typical barge rack pile with iron hardware (bolts, nuts and washers) (Photographer: Joshua Butchko, August 2019) [HRI Neg.# 19013/D7:053].

Photograph 3.6. View looking southwest along the line of the catwalk connecting the barge rack to the shore. Note that many of the walkway piles are taller than those supporting the adjoining deck to the left. Some of these piles may also be remnants of the New Brunswick Pier, built in 1891 and continuing in place until circa 1920 when the barge rack and catwalk were constructed (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:075].

records of 1916, historic photographs and historic maps. They replaced a 741-foot-long, 15.5-foot-wide timber structure referred to as the New Brunswick Pier, built in 1891, which terminated out in the bay in a 54-by-41-foot platform on piles. The catwalk roughly followed the alignment of the pier and may have re-used some of its piles.

The barge rack remains are situated entirely in water and only accessible by boat. They were surveyed in two phases, at high and low tide, because of the variable height of the piles. The rack remains extend from northwest to southeast for a total distance of approximately 930 feet, consisting of a total of roughly 150 to 160 visible piles arranged in two rows roughly six feet apart. All of the piles are circular in cross-section, generally 1.2 feet in diameter and spaced six to eight feet apart along each of the rows. Many are leaning at an angle and partially displaced, although some also appear to have been intentionally placed between the two rows to give additional support to the overall structure. The two ends of the rack are marked by cluster piles, five or six piles bound together with wire rope and iron staples.

Additional supporting timbers and other hardware were also observed along the barge rack. Many of the piles at various different heights have long iron spikes driven into them or bolts passing through them with nuts and washers attached. Some piles have a ferrous metal band wrapped around what appears to be the finished top. Most of the horizontal framework of the barge rack is absent; however, at least three examples of flat (2 x 10-inch) cross-timbers were noted partly in place in the higher surviving portion of the rack.

At low tide, the remains of the catwalk are situated partly on shore and partly in the water. These remains extend northeast-southwest for approximately 275 feet, connecting the barge rack to the shore. The surviving remnants of the catwalk comprise at least 35 piles arranged in two rows spaced seven feet apart. The piles are circular in cross section, generally around 1.1 feet in diameter, and spaced roughly 12 feet apart along each of the rows. Most of them (roughly 30) survive as intact pairs on shore, while the remainder are less regularly arranged in the water along the same alignment heading northeast out into the bay, perpendicular to the rack.

In the offshore areas between the barge rack and the shoreline – at low tide and when the water is at its calmest and clearest – the barely visible, fully submerged outlines of additional piles and what may be barge wrecks can just be made out. These features were not documented in the "field" and are most visible in mid-20th-century aerial photographs, most notably those taken in 1979.

2. Shoreline Northwest of Original Camden and Amboy Railroad Ferry Terminal

Timber Bulkhead and Rock Fill: A substantial concentration of stone, comprised of irregular, small to medium-sized schist and bluestone fragments, was observed projecting out northeastward from the edge of the bay shore close to the high tide line (Figures 3.3 and 3.4; Photograph 3.7). When maximally exposed at low tide, this feature measures roughly 25 to 30 feet from northeast to southwest along its northwestern side, but it appears to continue on further to the southwest beneath the edge of the bay shore. A series of at least five one-foot-diameter timber piles fronting timber plank sheeting define its northwestern edge, terminating in a cluster of three piles at its northeastern end which appear to represent a corner. Heading southeast from this corner, the northeastern side of the feature, which measures roughly 18 feet in length, is less well defined and displays no timber piles or sheeting, although these may be more deeply buried and obscured by tumbled rock fill. There is no clear southeastern end to the northeast side of the feature, but the remains may extend further to the southeast

Photograph 3.7. View looking northeast showing the bulkhead and rock fill at the northwestern end of the project site. Note the vertical timber piles in front of the timber plank sheeting retaining the rock fill and defining the exterior face of the bulkhead. The piles beyond relate to Piling Structure A, considered to be part of a mid-19th-century expansion of the Camden and Amboy Railroad, while the original early 1830s Camden and Amboy Railroad wharf straddled the grassy promontory in the distance (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:017].

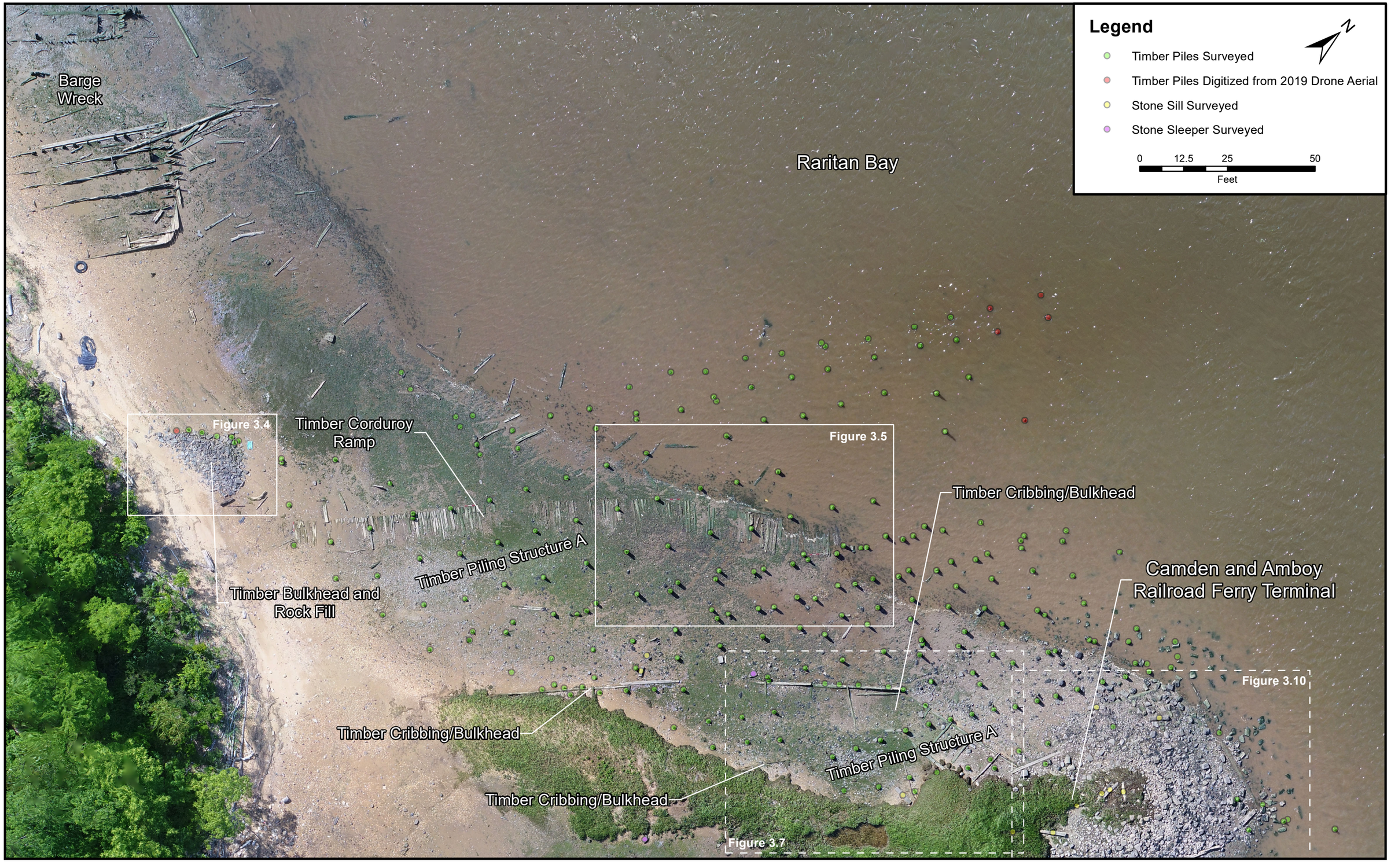

Figure 3.3. Aerial Photomosaic Plan View of the Shoreline Northwest of the Camden and Amboy Railroad/Pennsylvania Railroad Wharves.

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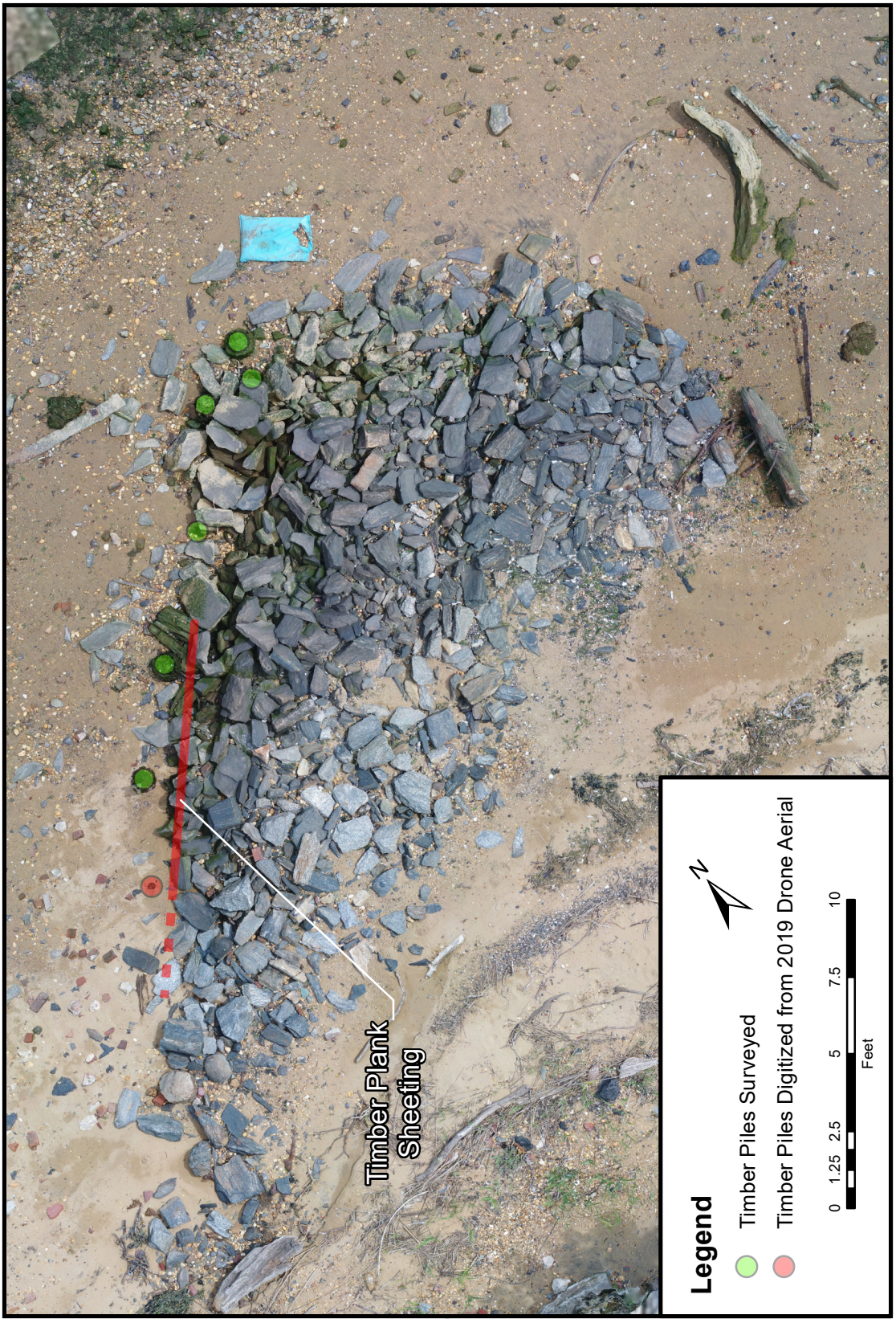

Figure 3.4. Detailed Aerial Photomosaic Plan View of Bulkhead and Rock Fill.

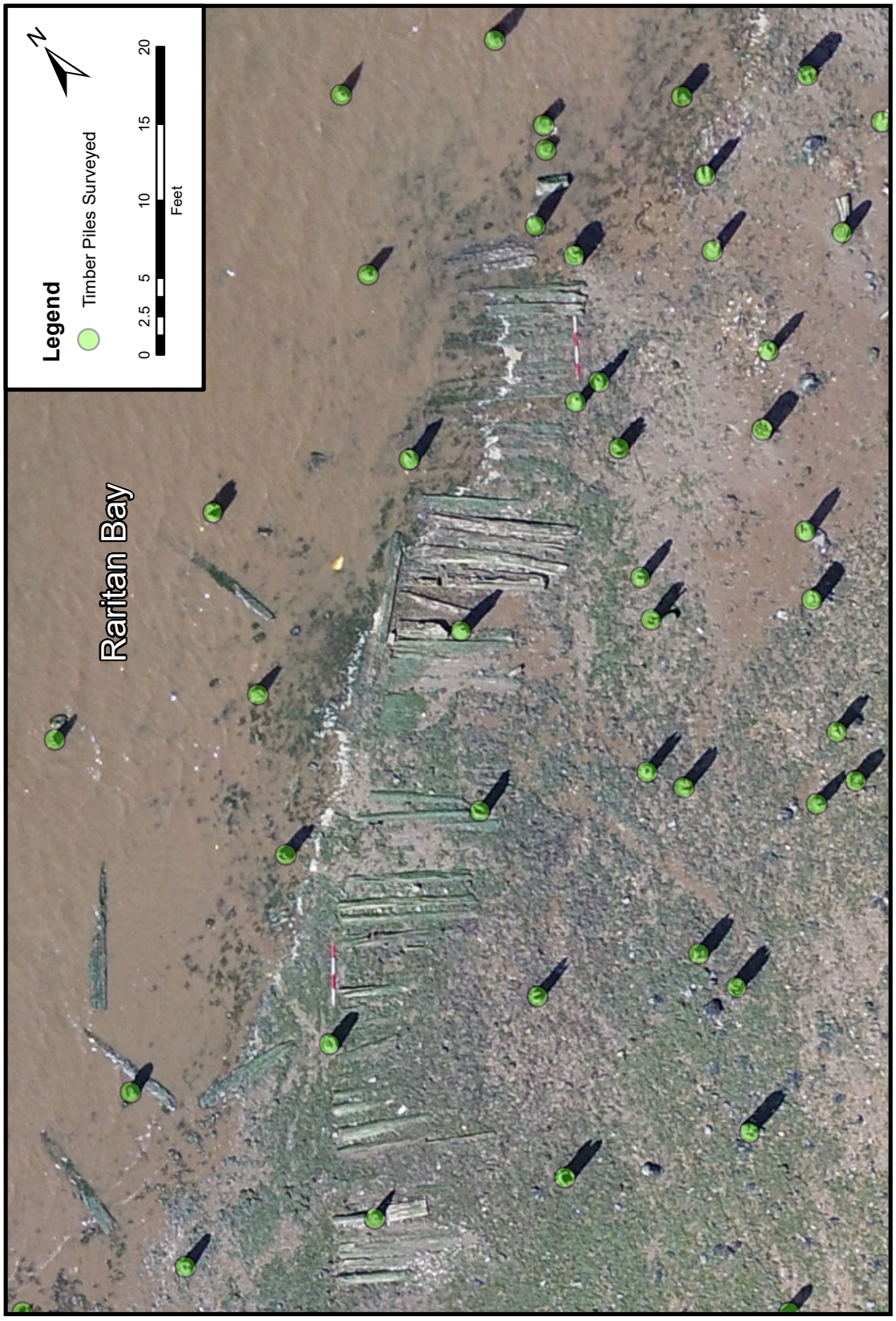

Figure 3.5. Detailed Aerial Photomosaic Plan View of Corduroy Ramp.

Photograph 3.8. View looking northeast along and down the alignment of the timber corduroy ramp thought to have been used to assist in launching and hauling vessels in and out of the bay. Note that timber piles from Piling Structure A have been driven through, and therefore post-date, the ramp. This ramp may date from the Camden and Amboy Railroad era or even from the 18th or early 19th centuries prior to the coming of the railroad (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:093].

Photograph 3.9. View looking southeast showing the northwestern edge of the timber corduroy ramp. The ramp is composed of a single layer of horizontally laid, sawn and rough-hewn timbers, each roughly ten feet long, laid side by side on the bay floor (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:023].

and southwest beneath the sandy surface of the bay shore. The surface elevation of the rock fill ranges between 0.94 and 1.8 feet below sea level.

Overall, this feature is thought most likely to represent the remains of a section of timber bulkhead behind which lay rock fill or ballast. The structure has no clear relation to either the length of timber corduroy ramp located just a few feet to the east or to the expansive grid of piles (Timber Piling Structure A) that spreads northeastward out into the bay. However, it is thought most likely that the bulkhead served as an anchor for the latter at its furthest northwest corner and is therefore considered part of an expansion of the Camden and Amboy Railroad terminal by the Pennsylvania Railroad that occurred in the early 1870s (see below).

Timber Corduroy Ramp: To the northwest of the original Camden and Amboy Railroad wharf is a distinctive linear timber feature which extends northeastward out into the bay from the shoreline for at least 165 feet (Figures 3.3 and 3.5; Photographs 3.8 and 3.9). Only a small portion at the southwest end is exposed on the beach at high tide, but at low tide a much greater length is visible. Comprised of a series of sawn and rough-hewn timbers, each roughly ten feet long and between six and nine inches square in cross section, lying horizontally side-by-side, the feature has the appearance of a mat-like trackway. There do not appear to be any upright timbers or piles holding the matting in place, nor any connecting iron hardware; rather it has been laid down directly on to the sandy and muddy surface of the beach.

The elevation of this feature varies from one to three feet below sea level and it slopes downward to the northeast, following the gradient of the beach. Its northeastern end curves slightly to the east or else has been dislodged from its original position. The timbers at this downslope end appear more eroded and fragmentary than those further to the southwest. The southwestern end peters out on the sandy beach approximately 40 feet northeast of the tree line. It is unclear if it continues further to the southwest below the beach sand.

The timber matting is pierced by several of the piles of the timber piling structure noted above. This pegs the date of the matting to the mid-19th century or earlier. As the feature survives at an elevation at or just below sea level, it is thought most likely to be related to the launching and hauling of vessels in and out of the bay rather than part of the wharf structure (note the elevation of the rail lines would have been roughly 14 to 15 feet above sea level). On this basis, the feature is tentatively interpreted as a corduroy ramp that was in use either in the Camden and Amboy Railroad era, or in the pre-railroad era. It may be relevant that a ferry crossing was in existence between South Amboy and Perth Amboy from at least the 1680s onwards, likely terminating in this general vicinity.

3. Original Camden and Amboy Railroad Ferry Terminal

Underlying Landform: The original Camden and Amboy Railroad ferry terminal was positioned on a wharf that projected northeastward out into Raritan Bay from the tip of a spit-like natural landform. The eroded remnants of this landform survive today as a low, grassy promontory covered with timber and stone structural remains and debris, embedded in mud and sand. The promontory measures roughly 150 feet across at its base along the shoreline and at low tide extends some 275 to 300 feet into the bay, tapering to a rounded point (Figure 3.6; Photograph 3.10).

Timber Piling Structure A: An expansive array of eroded timber piles, arranged in a rough grid pattern, extends over most of the original Camden and Amboy Railroad ferry terminal area and continues northwestward on to the adjoining bay shore (Figures 3.3

and 3.6; Photograph 3.11). The piles, predominantly around one foot in diameter, relate to a piling structure that covers an area measuring approximately 175 feet east-west by at least 275 feet north-south. The long axis of the grid is oriented roughly north-south, perpendicular to the underlying natural landform. Some 200 piles are visible at low tide, while there are likely additional examples buried beneath sediment and submerged offshore to the north. The surface elevations of the visible piles range between 0.5 and 2.2 feet below sea level.

Although the spacing between the piles is not entirely uniform, there are between 15 and 20 rows on the piling structure's east-west axis and 25 to 30 rows on its north-south axis. The individual piles positioned on the grid are typically spaced between 10 and 12 feet apart. Several piles do not fall exactly within the grid pattern and may be considered outliers, while others appear to be coupled with examples contained within the grid. These may be the result of repairs or were installed to provide additional localized support; in most cases, these are unlikely to represent remnants of different, earlier or later structures since their overall characteristics match those of piles within the grid. However, two parallel lines of somewhat larger piles, around 1.2 feet in diameter and projecting higher than the piles in the grid, extend for a distance of almost 200 feet in the tidal zone from southwest to northeast along the south side of the underlying landform, continuing on into the bay. These are part of the support structure for the catwalk leading out to the barge rack and are presumed to date from *circa* 1920 (although they could also be part of the New Brunswick Pier and date from *circa* 1891-1920).

The grid of piles forming the piling structure evidently supported a substantial timber deck on top of which buildings could be erected and rail tracks laid down. This structure is interpreted as part of the Pennsylvania Railroad expansion of the former Camden and Amboy Railroad terminal in the early 1870s. The structure broadly matches the basic outline of the terminal shown on the Everts & Stewart map of 1876 (see above, Figure 2.3). The deck had been abandoned by around 1890, being replaced around this time by the New Brunswick Pier, and then *circa* 1920 by the barge rack and catwalk. As noted above, a number of the piles pierce the corduroy ramp that runs southwest-northeast through the western section of the piling structure, indicating that the deck was constructed later than the ramp. Several of the piles also penetrate the bulkheads described below, further supporting a later date for the deck. The southwestern corner of the piling structure lies adjacent to the rock-filled bulkhead previously described (see above). Although there is no obvious direct relationship between the two features, it is thought likely that the piling structure and deck were anchored to the shoreline by this latter bulkhead.

Timber Cribbing/Bulkheads: The promontory landform is encased by several segments of timber cribbing, which, although indistinct in places, appears to serve as a series of bulkheads wrapping around its northeastern tip and extending along both its northwestern and southeastern sides (Figures 3.6-3.10). Overall, the bulkheads define a 250-foot-long area that is roughly 120 feet wide at its onshore southwestern end and 45 feet wide at the northeastern tip. The bulkheads are mostly comprised of linear timber cribbing with a box-like structure formed with horizontally laid sawn and rough-hewn logs, held in place along their outer edge by vertical timber piles (and, in some instances, by plank sheeting) and by stone and pebble ballast within the box interior. Aside from occasional rough lap joints, there is no *in-situ* evidence for more complex carpentry (e.g., mortise and tenon) or securing hardware (e.g., iron bolts or spikes).

The southwest end of the outermost bulkhead along the northwest side of the promontory is visible on the edge of the grass approximately 70 feet northeast of the onshore tree line. It runs roughly parallel to and

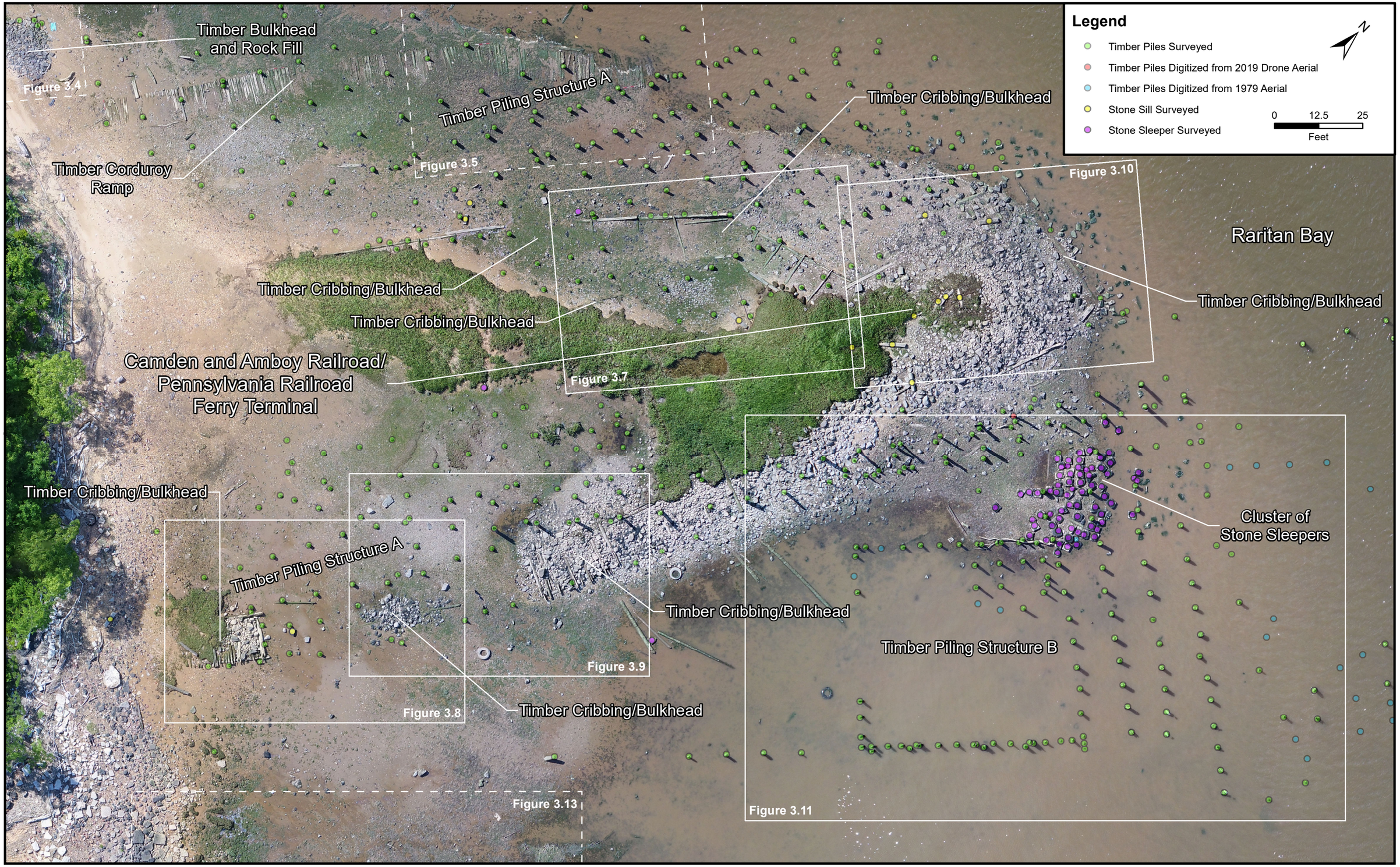

Figure 3.6. Aerial Photomosaic Plan View of the Original Camden and Amboy Railroad Ferry Terminal Area.

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Photograph 3.10. View looking north-northeast showing the eroded promontory on which the wharf supporting the original Camden and Amboy Railroad ferry terminal was constructed. The timber corduroy ramp thought to have been used to assist in launching and hauling vessels in and out of the bay is in the left foreground, and may date from the Camden and Amboy Railroad era or earlier. The vertical timber piles are part of Piling Structure A and date from the mid-19th century (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:098].

Photograph 3.11. View looking west along the Raritan Bay shoreline showing the pattern of timber piles forming Timber Piling Structure A which supported a major part of the deck for the Camden and Amboy Railroad/Pennsylvania Railroad terminal from the mid-19th century through circa 1890 (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:082].

45 feet southeast of the corduroy ramp (see above) for approximately 120 feet, before turning 45 degrees southeast and continuing for an additional 40 feet, then angling north again and connecting with the bulkhead structure that gives shape to the northeastern tip of the promontory (Figure 3.7; Photograph 3.12). This stretch of bulkhead consists of a series of boxes, defined by two outer lines of rough-dressed timbers, roughly 12 feet apart, laid horizontally end-to-end. The space in between is divided by smaller transverse timbers into smaller boxes around eight to ten feet in width, which are filled with mud, sand and stone debris. The outer longitudinal timbers are somewhat larger, measuring around eight to ten inches in cross section, while the transverse members are more typically log-like and roughly six inches in diameter. Surface elevations along this section of bulkhead range between 0.5 feet above and one foot below sea level.

Roughly 25 feet to the southeast of the outer edge of this bulkhead, projecting out from the grassy, muddy northwestern edge of the promontory, is a short segment of a different, possibly earlier bulkhead (Figure 3.7; Photograph 3.13). Extending northeast to southwest for roughly 18 feet and with one visible transverse timber, this appears to be a remnant of a bulkhead that defined a narrower (hence presumed earlier) version of the promontory landform. It is notable that the outer edge of this structure is retained by a series of vertically set planks driven into the mud. It is unclear, however, whether the structure is cellular and encased by two parallel lines of timbers with connecting transverse members, as in the bulkhead further to the northwest, or whether the transverse members are "dead men" anchored into the mud of the promontory.

The southwest end of the bulkhead along the southeastern side of the promontory is visible in a patch of grass approximately 40 feet northeast of the onshore tree line. This section of bulkhead pursues a slightly curving alignment and follows the southeastern edge of the promontory landform for approximately 225 feet, again connecting at its northeastern end with the bulkhead structure near the tip of the promontory (Figures 3.6, 3.8 and 3.9; Photograph 3.14). The southwestern end of this section of bulkhead is discontinuous and parts have either been eroded away or were never present (with a trestle superstructure perhaps being carried on piers or piles). The segment at the far southwestern end measures roughly 25 feet in length and 12 to 13 feet in width. It has defining horizontal timbers retained by vertical piles along its northwestern and southeastern edges with multiple, smaller, closely-spaced, log-like transverse members placed in between, partially capped with stone ballast (Photograph 3.15).

Heading northeast along the bulkhead line, a roughly 75-foot gap is broken only by a concentration of stone blocks, which may represent the fill remainder of an eroded log crib box now buried in the mud (Photograph 3.14). Continuing northeast to the tip of the promontory is the best preserved section of the southeast bulkhead, again 12 to 13 feet wide and defined by longitudinal timbers, eight to ten inches in cross section, with smaller transverse members around six inches in diameter (Photograph 3.16). The spacing of the transverse members is variable, but mostly around four feet, while large quantities of stone ballast are spread in amongst the timber framing. Surface elevations along the southeastern bulkhead range from approximately 1.7 feet above sea level at the southwest end to roughly 0.5 feet above sea level at the opposite northeastern end.

There are some differences between the outermost northwest and southeast bulkheads. The former displays a more angular alignment in plan, seen in at least two sharp changes in direction, while the latter follows a more curving route (probably reflecting the course of a rail line above). The southeast bulkhead is discontinuous at its southwestern end, while the northwest bulkhead appears continuous. There is

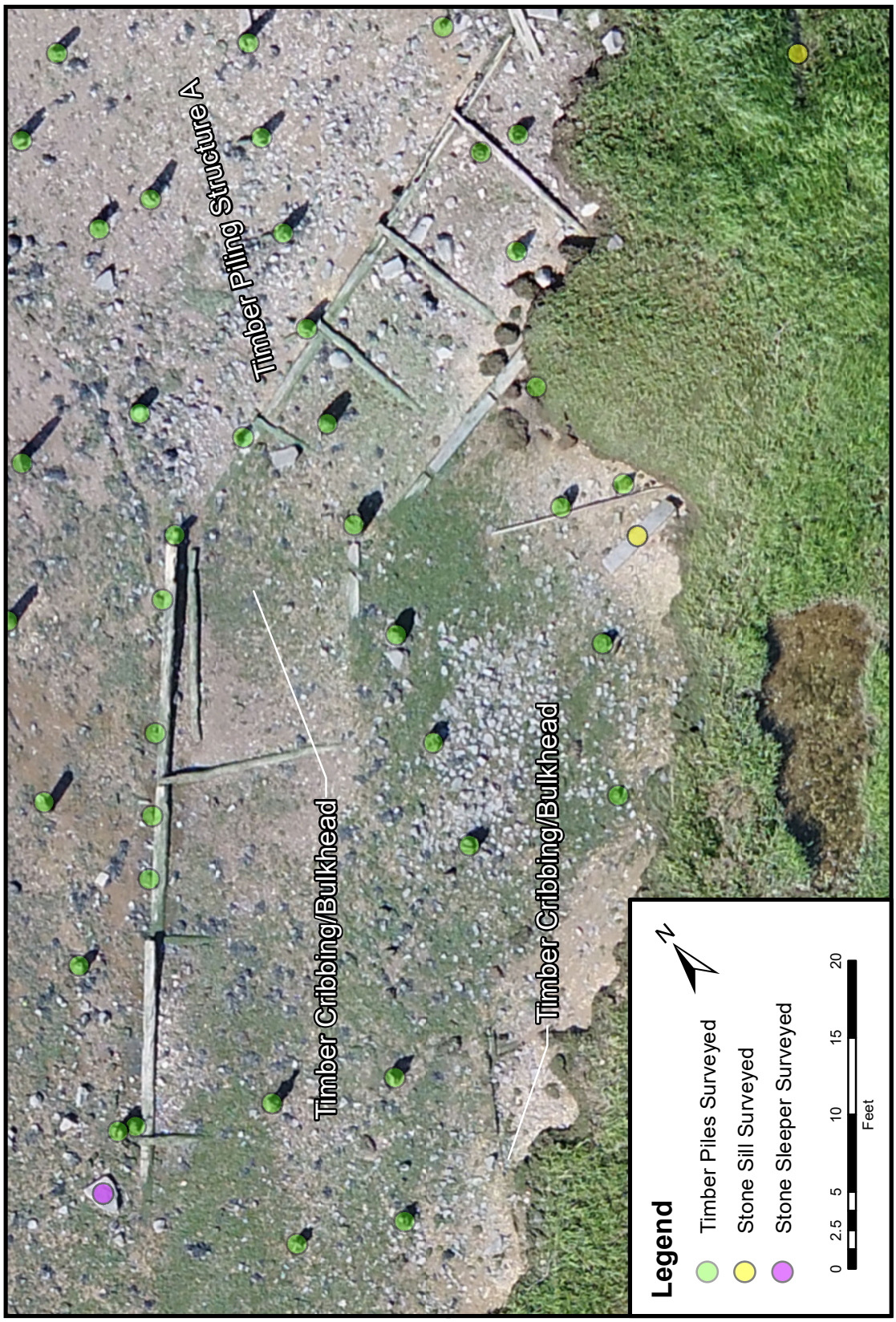

Figure 3.7. Detailed Aerial Photomosaic Plan View of Northwest Bulkheads.

Photograph 3.12. View looking northeast along a section of timber bulkhead remains retaining the northwest side of the promontory. The large vertical timber piles, which pierce the bulkhead, are part of Piling Structure A. This bulkhead is interpreted as dating from the Camden and Amboy Railroad era, possibly from the early 1830s (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:027].

Photograph 3.13. View looking south along a section of timber bulkhead remains retaining the northwest side of the promontory. Note the timber sheeting at right along the outer edge of the bulkhead. These remains are separate from and define a narrower promontory than the remains shown in Photograph 3.12; on this basis they are thought to be older and may pre-date the Camden and Amboy Railroad era (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:025].

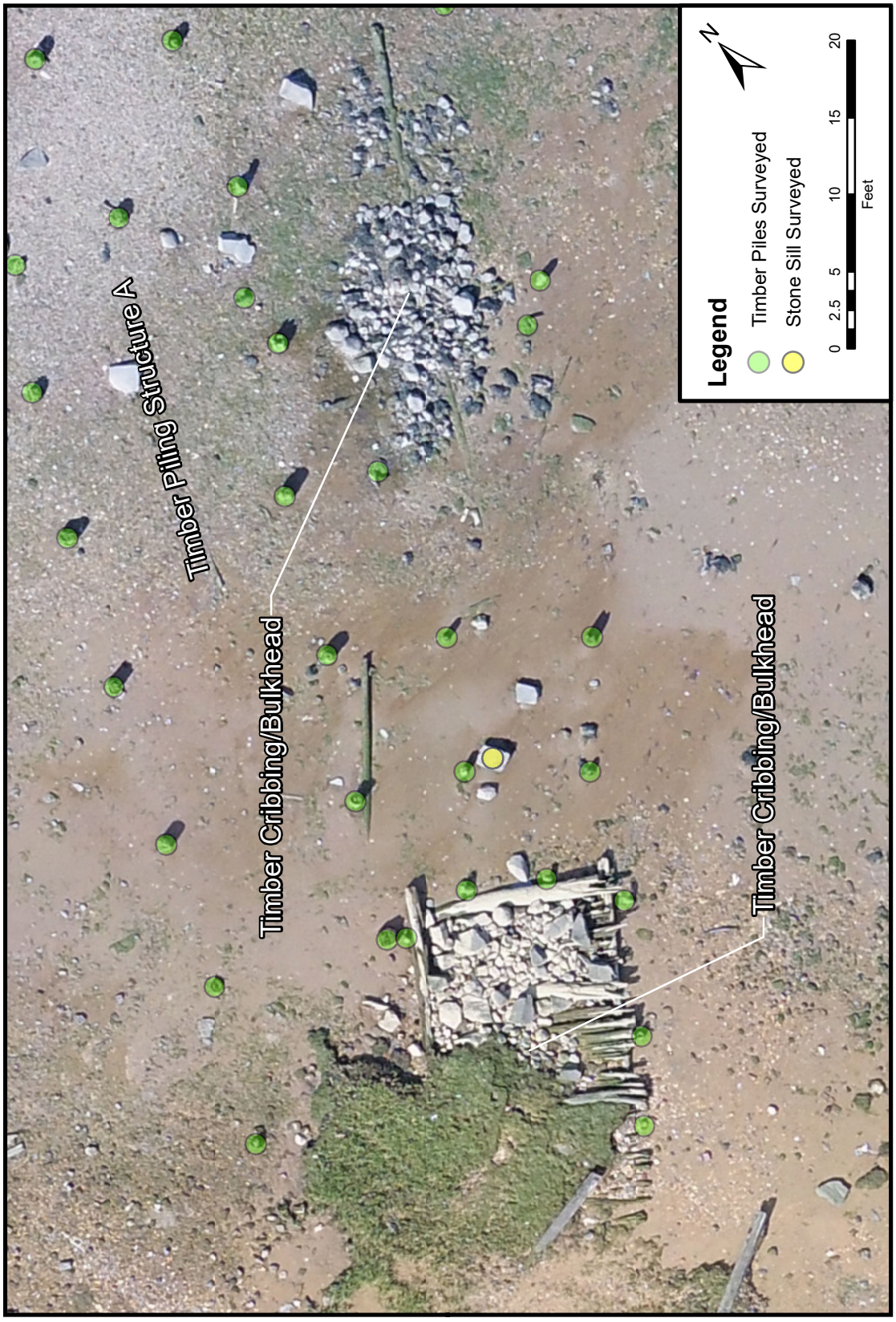

Figure 3.8. Detailed Aerial Photomosaic Plan View of Southwest End of Southeast Bulkhead.

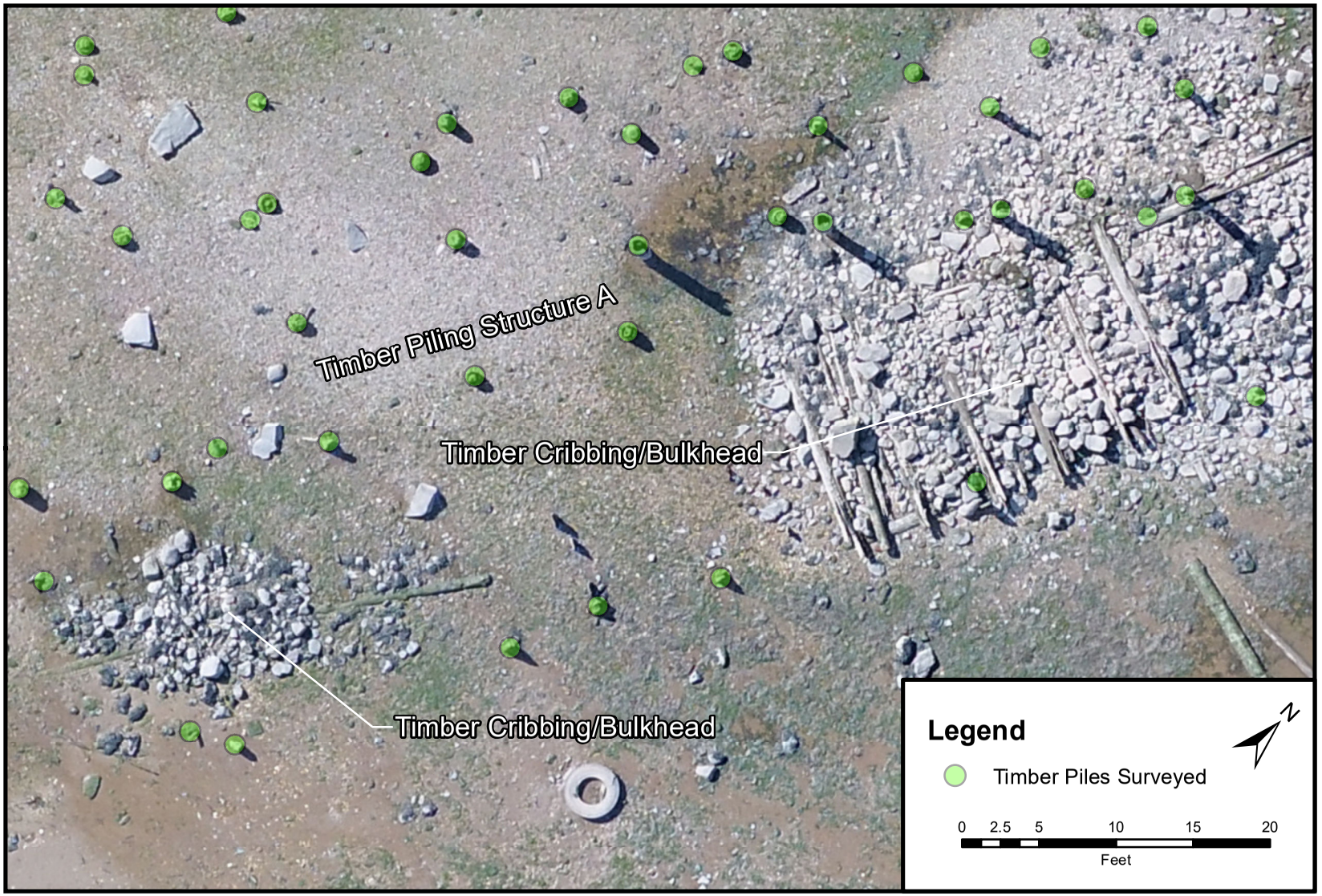

Figure 3.9. Detailed Aerial Photomosaic Plan View of Central Section of Southeast Bulkhead.

Photograph 3.14. View looking northeast showing the southwestern end of the bulkhead that defines the southeastern edge of the promontory. The vertical piles in the middle distance are part of Piling Structure A. The pile of stone just beyond the bulkhead remains in the foreground may represent the remains of a single crib box or pier base for a trestle. This bulkhead is interpreted as dating from the Camden and Amboy Railroad era, possibly from the early 1830s (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:057].

Photograph 3.15. View looking southwest showing the southwestern end of the bulkhead that defines the southeastern edge of the promontory. Note the vertical piles which suggest that this is a stub end of a section of bulkhead likely supporting one end of a trestle on which rail tracks were likely laid. These remains are interpreted as dating from the Camden and Amboy Railroad era, possibly from the early 1830s (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:050].

Photograph 3.16. View looking northeast showing the northeastern section of the bulkhead that defines the southeastern edge of the promontory. The double line of taller piles supported the catwalk connecting out to the barge rack, built circa 1920 (and may also have been part of the New Brunswick Pier, constructed in 1891). The short eroded vertical piles in the foreground suggest that this is a stub end of the bulkhead likely supporting one end of a trestle on which rail tracks were likely laid. These remains are interpreted as dating from the Camden and Amboy Railroad era, possibly from the early 1830s (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:045].

somewhat better preservation of the southeast bulkhead which survives to a slightly higher elevation and contains considerably more stone ballast and stone debris. Unfortunately, the latter material, a mixture of river cobbles and larger stone blocks, serves to obscure much of the underlying timber structure.

The bulkhead at the northeastern tip of the promontory is also heavily obscured by stone debris and it is difficult, without excavation, to establish the outlines of structural remains in this area with any confidence. The northwest and southeast bulkheads clearly converge on a point about 250 feet northeast of the onshore tree line, where there is a hint of a rectangular shape in plan, measuring roughly 60 feet north-south by 40 feet east-west, formed in part by a pair of substantial, horizontally-laid timbers up to 12 by 10 inches in cross section (Figure 3.10; Photograph 3.17).

No timber cribbing is visible within the footprint of the rectangular outline owing to the substantial amount of stone debris which covers the area. The stone debris is mostly medium-sized river cobbles and large blocks of stone, probably stone ballast and demolition rubble, but there are also several very large cut stone oblong blocks of a rock type (gneiss or marble) similar to that used by the Camden and Amboy Railroad for stone sleepers in their rail beds (Photograph 3.18). These blocks vary between four and eight feet in length and between nine and 12 inches in cross section. Many appear to be plain stone blocks that were perhaps used for building retaining walls for embankments and abutments, but some have drill holes and iron spikes and have been roughly dressed along one long edge to provide a linear setting for what is believed to be an iron strap rail. These latter stone "sills" are considered to be evidence of rail bed construction from the early years of the Camden and Amboy Railroad era in the 1830s and 1840s. Surface elevations on the top of the stone debris are at approximately 1.6 feet above sea level, while the same material extends to depths of approximately 2.5 feet below sea level.

The central part of the promontory landform between the outermost northwest and southeast bulkheads is mostly covered by grass on top of mud, but, as noted above, along the exposed edges there are sporadic indications of horizontal timbers, vertical timber piles and timber plank sheeting, suggesting that other evidence of bulkheads and structural remains is present below ground. Stone debris is also scattered around, most likely derived from fill within and behind bulkheads. The outermost northwest and southeast bulkheads were most likely built early on during the Camden and Amboy Railroad era and were designed to stabilize the promontory landform while supporting a wharf-like superstructure carrying the rail approaches to the terminal buildings that occupied the end of the pier jutting out into the bay (see above, Figure 2.2). The point where these bulkheads converge on the rectangular outline at the tip of the promontory may coincide with the junction of the wharves on the promontory with the landward end of the pier containing the terminal buildings. While construction of these bulkheads is provisionally attributed to the Camden and Amboy Railroad period in the 1830s and 1840s, some of the more vestigial evidence of bulkheads on the promontory may be of an earlier date, perhaps associated with the ferries that operated from this location during the 18th and early 19th centuries. In contrast, many of the piles toward the southwestern and northwestern ends of the promontory, near the head of the beach, form part of Timber Piling Structure A and likely date from the early 1870s when the Pennsylvania Railroad took over and increased the volume of freight traffic at the terminal.

Timber Piling Structure B: Immediately offshore and northeast of the tip of the promontory landform is a large group of timber piles, termed here Timber Piling Structure B, that covers an area approximately

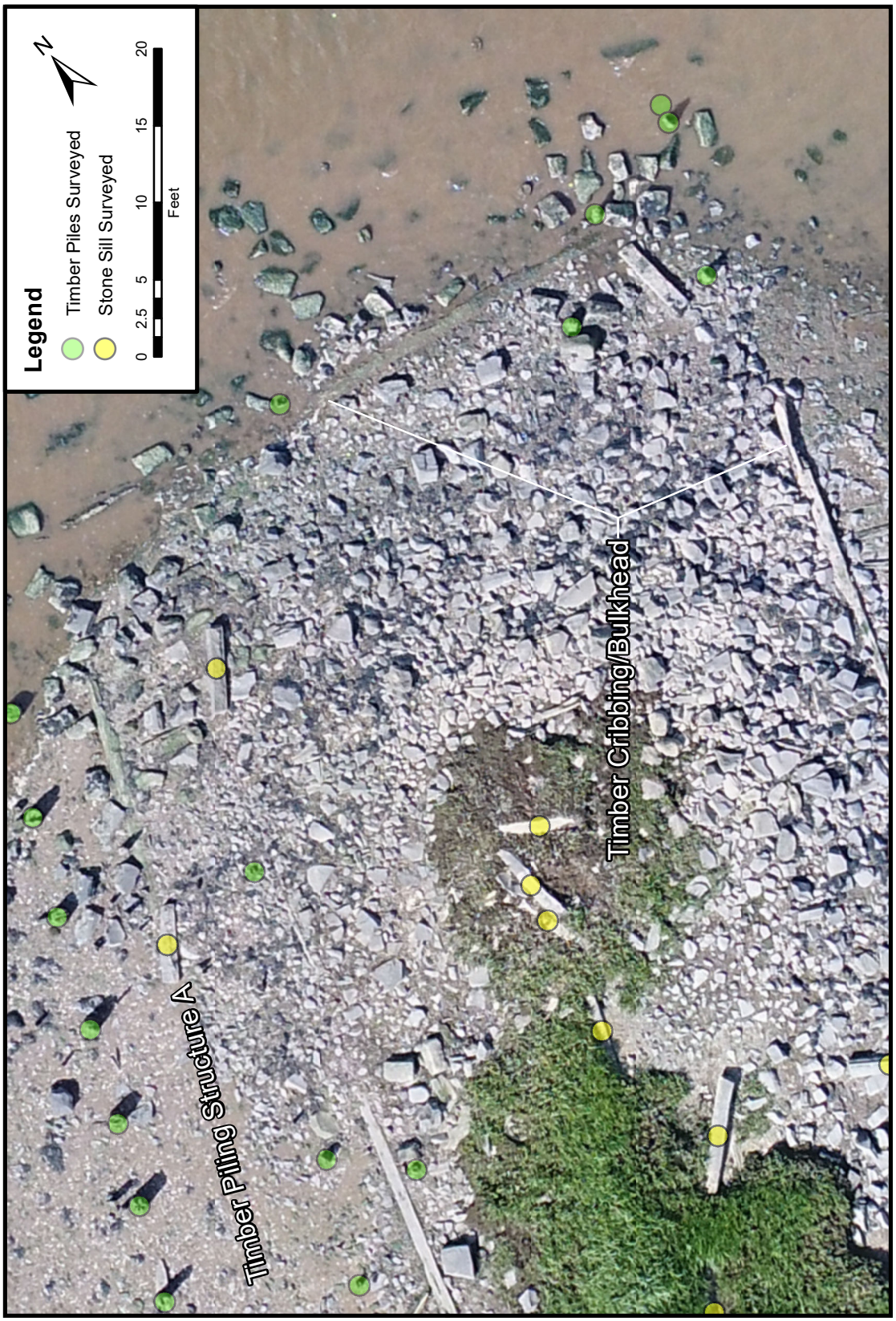

Figure 3.10. Detailed Aerial Photomosaic Plan View of Bulkheads at Northeast End of Promontory.

Photograph 3.17. View looking northwest showing the eastern end of the promontory. The long horizontal beam marks the southeastern side of a bulkhead apparently encasing the tip of the promontory, upon which is piled rock fill. These remains are interpreted as dating from the Camden and Amboy Railroad era, possibly from the early 1830s. The barge rack is in the middle distance (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:035].

Photograph 3.18. View looking northwest showing one of the several stone sills scattered on the surface of the promontory. Note the flat, linear setting on the long edge under the seaweed which is thought to have held a strap rail. This masonry rail bed construction is considered to date from early in the Camden and Amboy Railroad era and stone fragments such as these were discarded on site in later upgrades of the terminal facility (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:034].

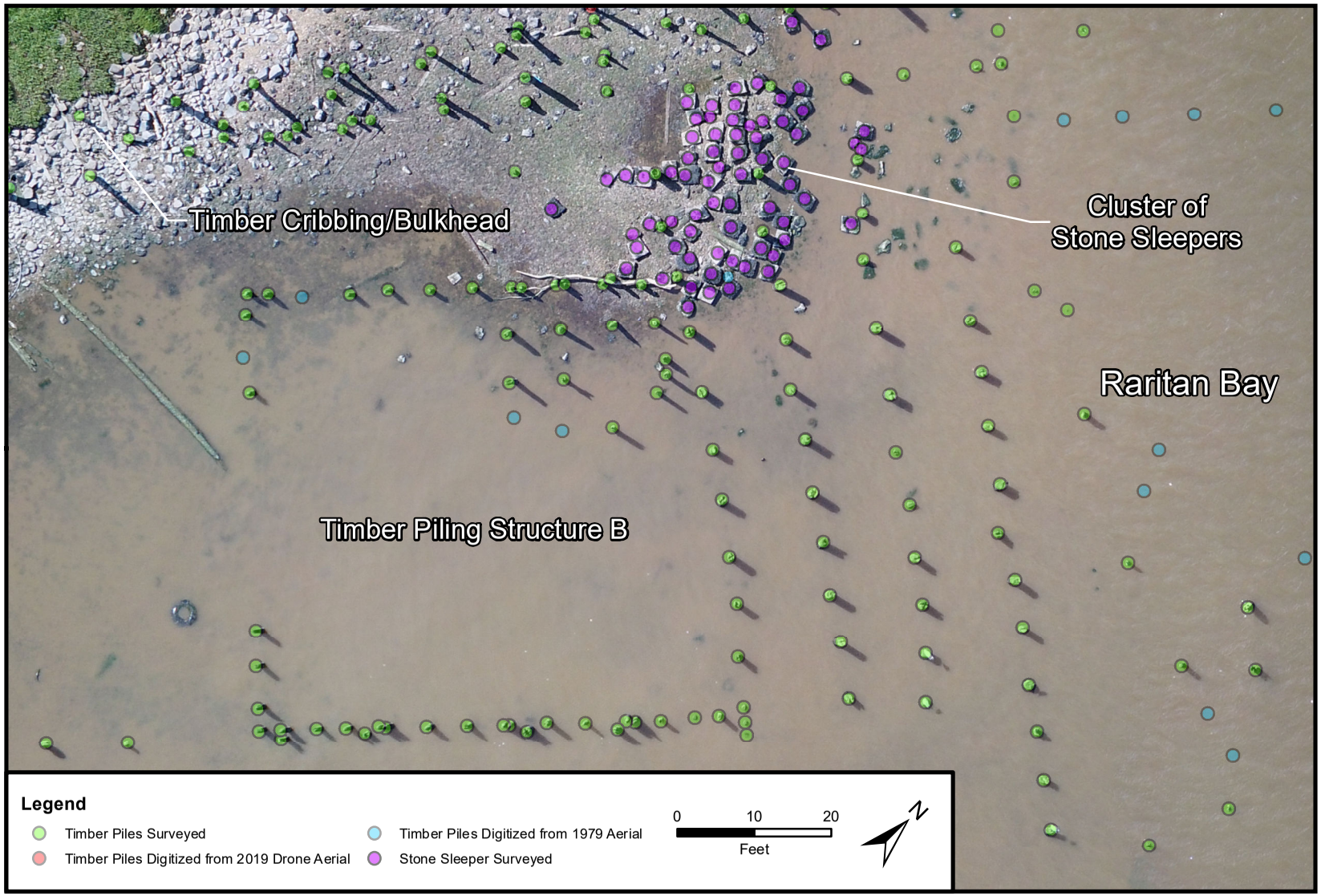

Figure 3.11. Detailed Aerial Photomosaic Plan View of Piling Structure B and Concentration of Stone Sleepers.

Photograph 3.19. View looking northwest towards Piling Structure B which lies just offshore and northeast of the promontory landform that supported the Camden and Amboy Railroad Ferry Terminal. These remains most likely date from the mid-19th century (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:062].

Photograph 3.20. View looking northeast showing the concentration of stone sleepers scattered in amongst the piles of Piling Structure B just offshore and northeast of the promontory landform that supported the Camden and Amboy Railroad Ferry Terminal. Stone fragments such as these are thought to have been discarded on site in the course of later upgrades of the terminal facility (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:080].

Photograph 3.21. View looking northeast showing typical two-hole and four-hole stone sleepers placed against one of the piles of Piling Structure B (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:039].

100 feet square (Figures 3.6 and 3.11; Photograph 3.19). Comprising approximately 125 circular piles, ranging between eight and 12 inches in diameter, this piling structure displays a grid-like pattern that is oriented slightly differently (tending more to the northeast) to the pattern that is evident in Timber Piling Structure A. The tops of the piles survive at elevations between 0.5 feet above and 1.5 feet below sea level.

In the northeast portion of the grid four rows of piles run northwest to southeast and are spaced roughly ten feet apart with the interval between the piles within each row being between six and eight feet. The southeasternmost edge of the grid has more closely spaced piles and its alignment continues with a wider spacing beyond the grid for roughly 50 feet to the southwest and 25 feet to the northeast. The arrangement of the piles is such that there is an area roughly 60 feet square in the southern end of the 100-foot-square grid where virtually no piles are present. The explanation for this is uncertain, but this "blank" area may have served as a docking location for small vessels servicing the ferry and freight terminal. Timber Piling Structure B is thought most likely to have supported decking and buildings forming part of the early 1870s expansion of the Camden and Amboy Railroad terminal by the Pennsylvania Railroad.

Concentration of Stone Sleepers: At the northern end of Timber Piling Structure B, adjacent to the tip of the promontory landform, is a spread of stone sleepers, which are scattered in amongst the piles (Figures 3.6 and 3.11; Photographs 3.20 and 3.21). Their identification as stone sleepers follows recognition of similar stone blocks encountered during archaeological work performed in connection with soil remediation at the IFTC site in 2016 and 2017 (Hunter Research, Inc. 2018:4-95). The blocks are irregularly shaped, rough-dressed, roughly two feet square and between 12 and 15 inches thick. They are mostly marble or gneiss, and many of them display drill holes in the distinctive two-hole or four-hole arrangement that characterized the fastening of iron rails to these rail bed components.

In all, some 55 stone sleepers are present spread over an area measuring approximately 30 by 40 feet. They are generally located between 1.5 and 2.5 feet below sea level, trending deeper from west to east and following the slope of the bay floor. In this instance, the stone sleepers are clearly not in their original location and have been disassembled from whatever rail bed they were once a part of. Although there is some suggestion that the blocks closest to the promontory might have been deliberately placed, it seems more likely that they were purposely discarded into the bay shore mud, perhaps as part of the upgrading of the early Camden and Amboy Railroad terminal in the early 1870s.

4. Camden and Amboy Railroad/ Pennsylvania Railroad Freight Terminal

Southeast of the promontory landform on which the original Camden and Amboy Railroad ferry terminal was situated, the shoreline dissolves into an expanse of beach from which a series of piling structures, timber remains, a ruinous stone and rubble railroad embankment and a stone retaining wall/bulkhead all project out into the bay (Figure 3.12; Photograph 3.22). Many of these features defy conclusive interpretation and are difficult to describe since they are often obscured by rubble, mud, sand or water. Many likely supported railroad tracks feeding into the freight house and wharf which were positioned just offshore between the tidal zone and barge rack (see above, Figure 2.3), while others may relate to earlier periods of shoreline activity during or before the Camden and Amboy Railroad era. Scattered throughout this area are large blocks of stone, refractory brick and bricks used in building construction, and pieces of iron hardware. Included among the stone blocks are

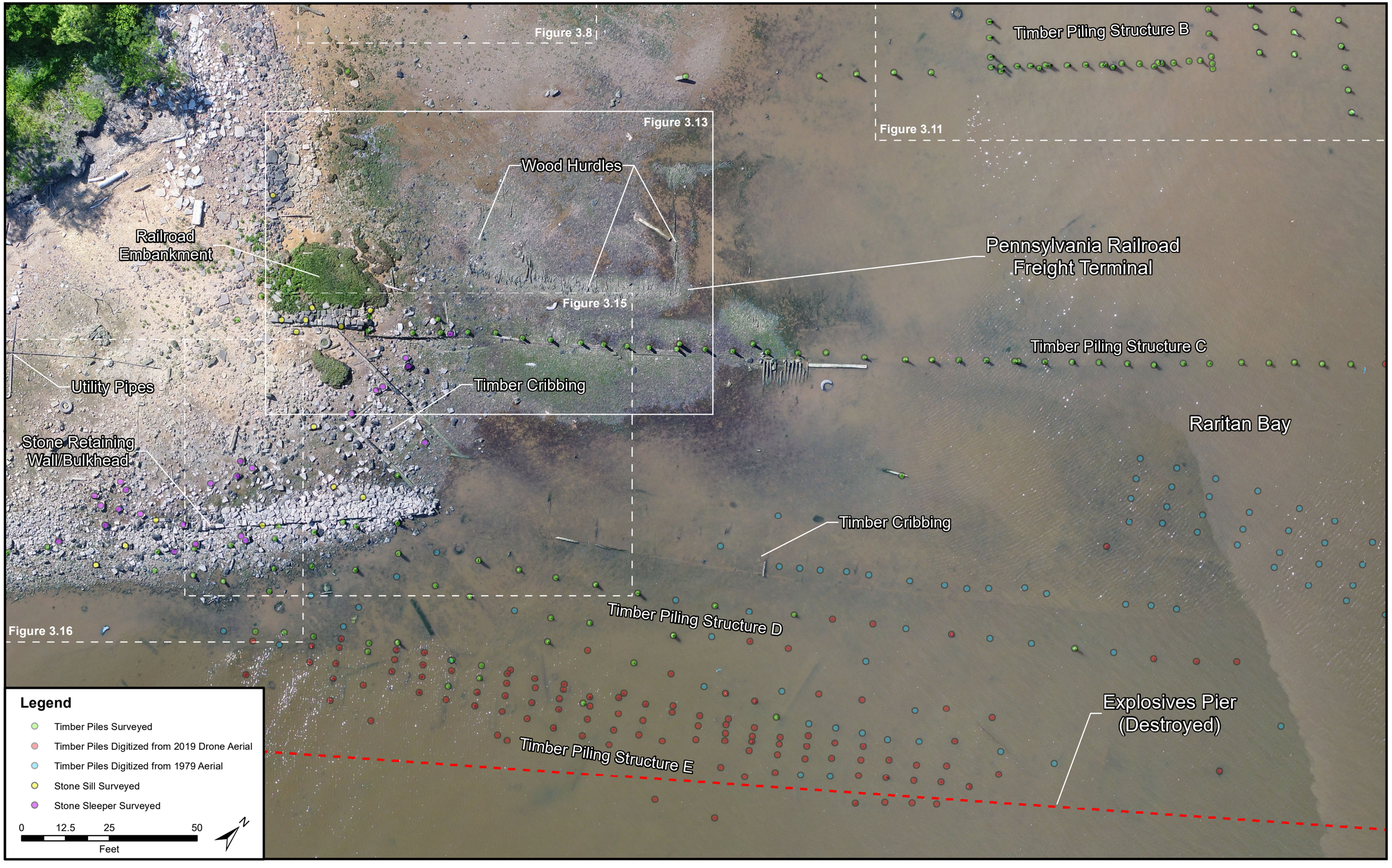

Figure 3.12. Aerial Photomosaic Plan View of the Camden and Amboy Railroad/Pennsylvania Railroad Freight Terminal Area.

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Photograph 3.22. View looking east across the shoreline southeast of the promontory landform showing Piling Structure C extending out into the bay. The Camden and Amboy Railroad/Pennsylvania Railroad freight terminal was located just offshore at left. The line of piles at far right extend out from the Westmoreland Pier, while the Lehigh Pier lies beyond (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:234].

Photograph 3.23. General view showing typical stone and brick debris on the beach inshore of the Camden and Amboy Railroad/Pennsylvania Railroad freight terminal. The large block in the center of the view is a stone sill with drill holes used for fastening strap rails, probably early Camden and Amboy Railroad masonry discarded in the course of later upgrades of the terminal facility (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:069].

consist of at least 100 piles, all circular in cross section, which form a linear arrangement extending into the bay from southwest to northeast for a distance of at least 330 feet. The piles appear to be arranged in roughly 40 evenly spaced rows, eight feet apart, each containing up to four piles. However, only 15 of the 40 rows retain all four piles. Each row is approximately 11 feet in length and individual piles are spaced between 3.3 and four feet apart along each row. As with Timber Piling Structure D, most of the piles are heavily deteriorated and no hardware is evident; most are around ten inches in diameter. Elevations taken on the tops of the piles range between two and five feet below sea level.

Aerial photographic coverage of 1979 again provides a clearer view of this piling structure than is currently evident under low tide conditions (cf. Figure 2.5). As with Timber Piling Structure D, these remains are interpreted as part of the underpinning for a trestle which would have supported a railroad track, probably the track furthest to the southeast of the various rail lines leading out to the Pennsylvania Railroad freight terminal. This track may not date from the early 1870s but rather from later in the 19th century as a result of the southeastward spread of the rail infrastructure of the freight terminal. This track alignment correlates reasonably well with the southeasternmost line on the U.S. Coast and Geodetic Survey map of 1907, but is not evident on the Everts and Stewart map of 1876 (cf. Figures 2.3 and 2.4).

Stone Retaining Wall/Timber Bulkhead: One of the most prominent features of the Camden and Amboy Railroad/Pennsylvania Railroad freight terminal area is a substantial, dry-laid stone retaining wall and bulkhead that extends from southwest to northeast for approximately 250 feet, effectively defining the freight terminal's southeastern limit (Figures 3.12 and 3.14-3.17; Photographs 3.27-3.29). The Interstate Commerce Commission records of 1916 refer to this as the "Old Stone Wall" and it is speculated, based on historic maps, that this structure may date from a mid-19th century expansion of the Camden and Amboy Railroad terminal, or from certainly no later than the early 1870s, when the Pennsylvania Railroad took over and expanded the facility's freight operations. Historic photographs show that this wall/bulkhead supported a freight pier in the late 19th century. During World War I it was extended out into the bay as a wooden pier on piles and was used primarily for the transshipment of smokeless powder (see below, Photographs 4.2 and 4.5). A fire in 1923 resulted in the abandonment of this pier and the construction of a new explosives pier running parallel and immediately to the southeast.

The southwestern end of the stone retaining wall/bulkhead, located approximately 60 feet northwest of the mid-1920s explosives pier, is partially eroded and obscured by sand but is presumed to connect with the substantial timber bulkhead that heads southeast and perpendicular into the bay between the freight terminal and the Westmoreland Pier. At its northeastern end, which has also been eroded, it would appear to have been tied in to the timber cribbing and piling structures that carried the rail lines out to the freight wharves. The wall is roughly four feet in width. Tidal erosion has taken its toll on the masonry, displacing many of the rocks, but a clear southeastern face is visible in several places. Elevations at the southwestern end of the wall are around two feet above sea level, while its northeastern end is still evident at around 1.1 feet below sea level.

Much of the retaining wall/bulkhead is comprised of roughly cut stone and the masonry includes a substantial number of re-used stone sleepers, especially toward the southwestern end. At least 15 to 20 stone sleepers exist *in situ* within the wall and another 20 to 25 lie displaced in the immediate vicinity. The stone sleepers are of standard size, roughly two feet square and between 12 and 15 inches in thickness, and they have been fashioned from gneiss, marble or red sand-

a number of sills and sleepers, some of them apparently discarded, others incorporated into the principal retaining wall/bulkhead that defines the southeastern edge of this area (Photograph 3.23).

Wood Hurdles: Furthest to the northwest in the Camden and Amboy Railroad/Pennsylvania Railroad freight terminal area is a barely visible and heavily eroded timber feature in the low tide zone that covers a roughly rectangular area measuring 60 feet southwest-northeast by 30 feet southeast-northwest (Figures 3.12 and 3.13; Photographs 3.24 and 3.25). This feature, which survives at elevations between 1.7 and 2.9 feet below sea level, consists of a mat of interwoven wood hurdles and branches laid down on the sandy bay floor. The mat may have originally been weighted down with rock ballast and lain flatter on the surface of the beach. It is arranged parallel to the shoreline and lies perpendicular to and alongside Timber Piling Structure C (see below), but appears to bear no structural relation to this or any other nearby features. Its purpose is uncertain, although it most likely fulfilled some sort of stabilizing function relating to the launching or removal of vessels from the bay. It may be a remnant of some pre-railroad-era shoreline activity.

Railroad Embankment and Timber Piling Structure C: Inshore and roughly 25 feet southwest of the wood hurdles described above is a grass-covered fragment of railroad embankment that connects to a line of timber piles, Timber Piling Structure C, extending northeast out into the bay (Figures 3.12 and 3.13; Photograph 3.26). Fully visible at low tide, the embankment fragment is roughly 30 feet in length, between seven and ten feet wide and has a surface elevation of around 0.5 feet above sea level. The southeast face of the embankment is held back by a dry-laid retaining wall composed of large, rough-dressed, rectangular stone blocks, possibly including some stone sills re-used from earlier rail beds. The core of the embankment is comprised of stone rubble, although its northwestern edge and southwestern end are heavily eroded and concealed by grass. A pair of vertical iron pipes, each around eight inches in diameter and of uncertain function, protrude from the beach about ten feet beyond the southwestern end. The northeastern end of the embankment, however, is abutted by large transverse timbers and vertical timber piles, which clearly indicate that this represents the northeastern terminus of the masonry portion of the structure.

Continuing the southwest-northeast alignment of the southeast face of the embankment, but offset roughly two feet to the southeast is a line of close to 40 vertical timber piles, termed here Timber Piling Structure C, that extends approximately 280 feet northeastward into the bay. The tops of these piles are visible at low tide; all are heavily deteriorated, circular in cross section and between eight and 13 feet in diameter. The majority of the piles form a single line with the spacing between individual logs ranging between six and 11 feet. Vertical timber plank sheeting extends northeast along the southeast side of the piles for a distance of at least 30 feet from the end of the embankment. Lying parallel to, southeast of and alongside the timber sheeting and piles, extending northeast for roughly 100 feet, is a line of horizontal square-cut timbers laid end to end. The furthest northeastern timber is the most intact, measuring roughly 16 feet in length and 12 inches square in cross section. Attached to its southwestern end is a series of 13 fragmentary wood slats, between 2.2 and 7.3 feet long and seven inches wide, lying perpendicular to the line of timbers. The function of these timber remains is uncertain; they may be remnants of a collapsed dock or walkway.

Together, the fragmentary railroad embankment and Timber Piling Structure C are interpreted as part of the support system for a railroad track leading out to the freight terminal area of the Camden and Amboy Railroad and the successor facility of the Pennsylvania Railroad. Based on historic map evidence, railroad

Figure 3.13. Detailed Aerial Photomosaic Plan View of Wood Hurdles, Railroad Embankment and Piling Structure C.

Photograph 3.24. View looking northeast showing the area of wood hurdles laid on the floor of the bay in the area of the railroad tracks leading to the Pennsylvania Railroad freight terminal. This feature may pre-date the Camden and Amboy Railroad era (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:062].

Photograph 3.25. Close-up view looking northeast showing the wood hurdles laid on the floor of the bay (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:059].

tracks were certainly in place in this location as by the early 1870s (see above, Figure 2.3) and, based on the evidence of historic maps (e.g., Otley and Keily 1850; Walling 1861) and could date from one or two decades earlier than this. It is presumed that the piles are all that remains from a timber trestle structure.

Timber Cribbing: Projecting out at an angle from the shoreline and extending east from the fragmentary railroad embankment described above to the northeastern end of the main stone retaining wall/bulkhead (see below) is a roughly 70-foot-long section of timber cribbing defined by two lines of horizontal timbers spaced 16 feet apart and linked by transverse members (Figures 3.12, 3.14 and 3.15; Photographs 3.26 and 3.27). The two outer lines are comprised of stacked cut timbers, each 12 feet long and approximately 12 to 13 inches square in cross section. The connecting transverse members consist of roughly shaped logs, seven or eight inches in diameter, and spaced 12 to 15 feet apart. The entire structure appears to have been held in place by vertical timber piles, some of which are still visible adjacent to the outer timbers. The southwestern end of this structure is exposed onshore at low tide, but it is otherwise submerged and difficult to discern below the water. Its top elevation is between one and 1.5 feet below sea level.

The alignment of the cribbing is faintly visible extending beyond the main retaining wall and continuing on into the bay, curving slightly to the northeast. Although difficult to see, its outline appears to extend as a line of piles for a distance of at least 200 to 225 feet, perhaps also merging with Timber Piling Structure D (see below). Aerial photograph coverage of 1979 provides a somewhat clearer sense of what may have formerly existed in this area compared with present-day conditions, since considerable erosion of the shoreline has taken place in the intervening 40 years (cf. Figure 2.6). The angled timber cribbing feature visible on the beach at low tide is probably the base of a supporting structure for a railroad switch linking lines that fed out to the freight terminal. On this basis it would most likely date from the mid-19th century and probably no later than the Pennsylvania Railroad era beginning in the early 1870s.

Timber Piling Structure D: Just offshore of the northeastern end of the main stone retaining wall/bulkhead (see below) is a concentration of vertical timber piles adjacent to and southeast of the timber cribbing feature described above (Figures 3.12 and 3.14). These piles are visible at low tide but are entirely within the water, i.e., inaccessible on foot. In all, at least 27 piles are present in a rough linear arrangement extending southwest-northeast for a distance of approximately 260 feet. The piles appear to be arranged in three roughly parallel lines comprising at least 15 incomplete and irregularly spaced rows, each containing up to three piles. Each row is approximately 19 feet in length with the rows spaced roughly eight feet apart. Individual piles are spaced between eight and 11 feet apart along each row. Most of the piles are heavily deteriorated and they vary between eight and 13 inches in diameter. No associated hardware is evident. Elevations taken on the tops of the piles are between 0.5 and 1.2 feet below sea level.

This piling structure is thought to be part of the underpinning for a trestle which would have supported a railroad track. As with other linear piling structures in this part of the freight terminal site, it is considered part of the infrastructure put in place by the Pennsylvania Railroad following its take-over of the Camden and Amboy Railroad terminal in the early 1870s.

Timber Piling Structure E: Running roughly parallel and adjacent to and some 25 feet southeast of Timber Piling Structure D, again just offshore of the northeastern end of the main stone retaining wall/bulkhead (see below), is another linear concentration of vertical timber piles (Figures 3.12 and 3.14). These remains are barely visible, even at low tide, but they

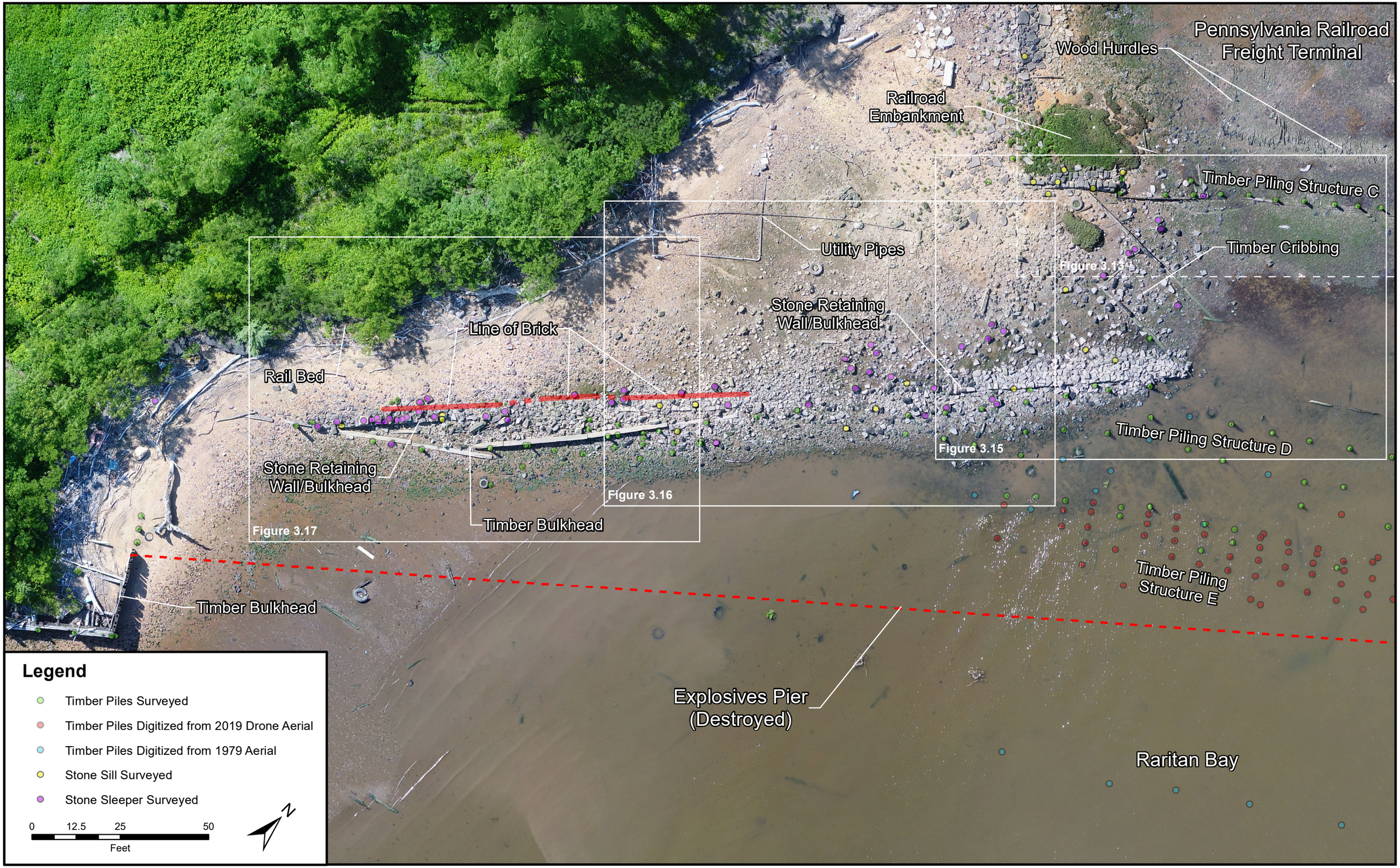

Figure 3.14. Aerial Photomosaic Plan View of the Southwest Portion of the Camden and Amboy Railroad/Pennsylvania Railroad Freight Terminal and the Explosives Pier.

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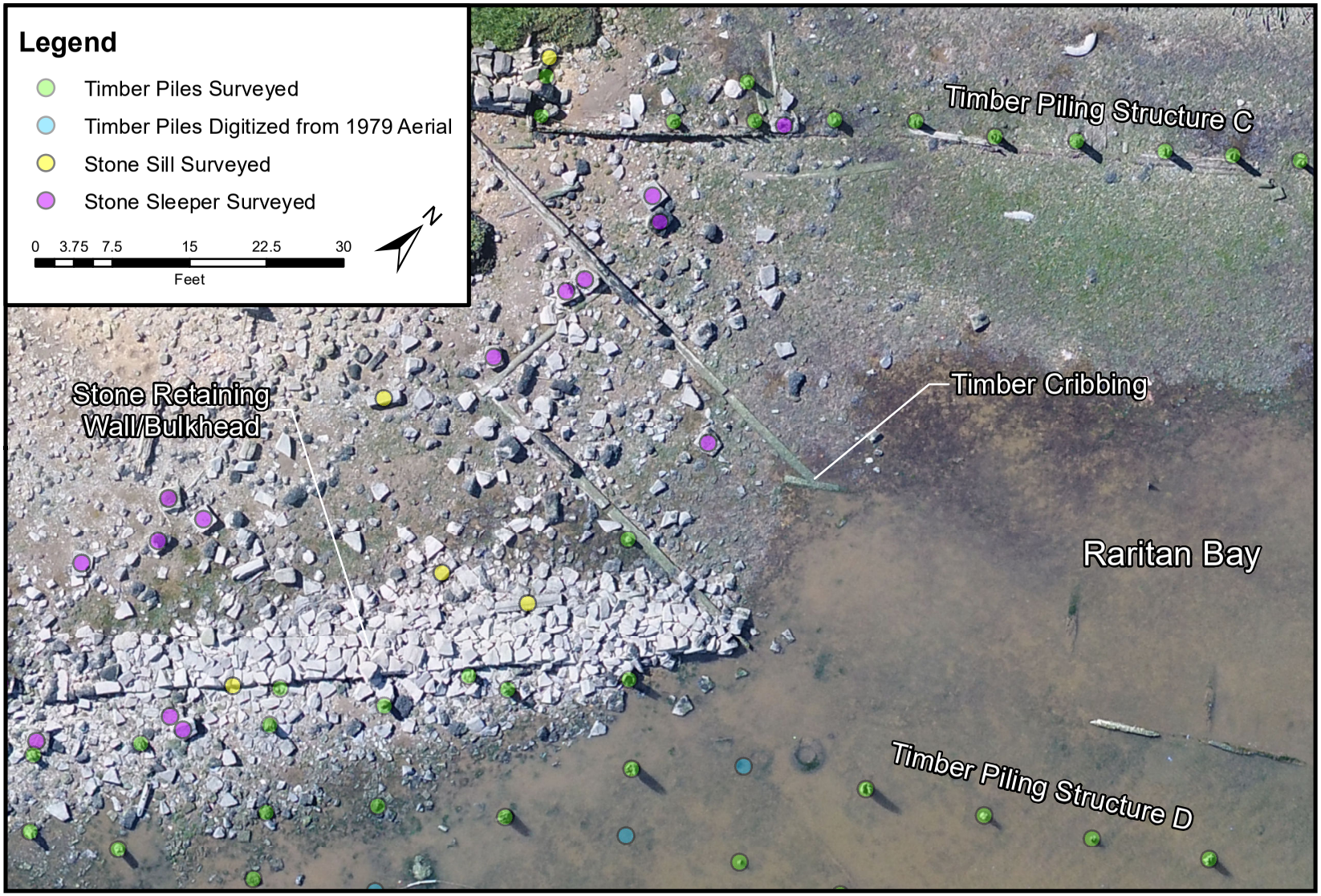

Figure 3.15. Detailed Aerial Photomosaic Plan View of Timber Cribbing and Northeast End of Stone Retaining Wall/Bulkhead.

Photograph 3.26. View looking west showing a section of railroad embankment with a stone retaining wall along its southeastern face. The embankment appears to have transitioned at this point to a timber trestle supported on piles and sheeting. These remains may date from the Pennsylvania Railroad era in the early 1870s or possibly from a mid-19th-century expansion of the freight terminal during the Camden and Amboy Railroad era (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:064].

Photograph 3.27. View looking northeast showing the northeastern end of the main stone retaining wall/bulkhead with a large stone sill in the center of the view. The horizontal timber beam and vertical pile at upper left are part of an angled section of timber cribbing that runs east-west between the retaining wall and the nearby railroad embankment. These features may date from the Pennsylvania Railroad era in the early 1870s or possibly from a mid-19th-century expansion of the freight terminal during the Camden and Amboy Railroad era. They would have supported the rail approaches to the freight terminal (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:072].

stone. Their top surfaces, where visible, exhibit traces showing how the iron rails were affixed using rectangular iron plates and spikes following Lacombe's two-hole and four-hole model (Hunter Research, Inc. 2018:4-4, 4-9). In addition to the displaced stone sleepers there are at least two re-used stone sills lying on top of the northeast end of the wall and fragments of other sills scattered along or close to the wall. Typically oblong in shape, measuring about 6.5 feet in length and 12 inches square, and with some displaying closely spaced drill scars (Photograph 3.27), it is not clear if these sills are in their original position within the retaining wall.

Southeast of, and running roughly parallel to the stone retaining wall there is evidence of a timber bulkhead in the form of vertical piles and horizontal timbers (Photograph 3.28), which indicates that the shoreline later extended out from the wall. The bulkhead comprises a single line of 1.3-foot-square horizontal timbers, each around 24 feet in length, and in places stacked up to three beams high. It passes obliquely across the southwestern end of the retaining wall, extending for approximately 75 feet to a point roughly ten feet southeast from the face of the wall, where it angles northward for almost another 75 feet eventually coming close to the wall face. This bowed outline of the bulkhead appears to have been deliberately constructed as it is stabilized along its southeast edge by a series of at least ten vertical piles, each about a foot in diameter and spaced between 12 to 15 feet apart. Drill holes, presumably for bolts and other framing hardware, appear intermittently along the top surface of the horizontal timbers. Elevations along the top of the bulkhead remains vary between a foot above and a foot below sea level.

Brick Remains and Cast-Iron Utility Lines: Northwest of the stone retaining wall/bulkhead, toward its southwestern end, on what is presumed to be filled land, are traces of brick construction along with *in-situ* remnants of cast-iron utility lines, considerable quantities of stone and brick rubble and numerous pieces of iron hardware (Figures 3.14, 3.16 and 3.17). There is a single row of laid bricks, beginning roughly 30 feet from the southwestern end of the retaining wall, that extends for up to 40 feet, running parallel to the wall less than a foot to the northwest, but it is unclear if this represents part of a building foundation or is a surface feature of some sort. There are large quantities of brick scattered throughout this area, including refractory flue blocks and many locally made plain red bricks stamped Sayre & Fisher, indicating that above-ground structures formerly stood in the vicinity (Photograph 3.29), but these were presumably destroyed by the explosion of May 19, 1950.

Further removed from the retaining wall/bulkhead, roughly 20 feet from the tree line, is a pair of cast iron utility pipes that emerge from the beach and extend northeast towards the water (Figures 3.14 and 3.16; Photograph 3.30). One of these lines, 0.4 feet in diameter and running parallel to and 40 feet northwest of the retaining wall, is most likely a steam line. It extends for 23 feet before turning at a right angle to the northwest and continuing for an additional 23 feet before disappearing beneath the beach surface. The second line, located 52 feet northwest of the retaining wall is 0.25 feet in diameter, most likely a water line, and extends northeastward for approximately 49 feet, crossing over the other larger-diameter steam line. How these lines related to particular buildings or rail lines is unclear, but they are presumed to be part of the Pennsylvania Railroad freight terminal infrastructure and most likely date to *circa* 1890-1910.

Rail Bed: Roughly 25 feet northwest of the retaining wall/bulkhead on the edge of the tree line is a section of intact, although heavily deteriorated, rail bed (Figures 3.14 and 3.17; Photograph 3.31). It comprises a 20-foot-long row of roughly a dozen evenly spaced, seven to eight-inch-square cut timber railroad ties. While the iron rails no longer remain, there are several still *in-situ* iron railroad spikes and at least two

Photograph 3.28. View looking north towards the retaining wall/bulkhead that defines the southeastern edge of the Pennsylvania Railroad freight terminal. The transverse timbers and vertical piles of the bulkhead lining the southeastern face of the stone retaining wall may be a later modification; the retaining wall is thought to date from the Pennsylvania Railroad era in the early 1870s or possibly from a mid-19th-century expansion of the freight terminal during the Camden and Amboy Railroad era (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:049].

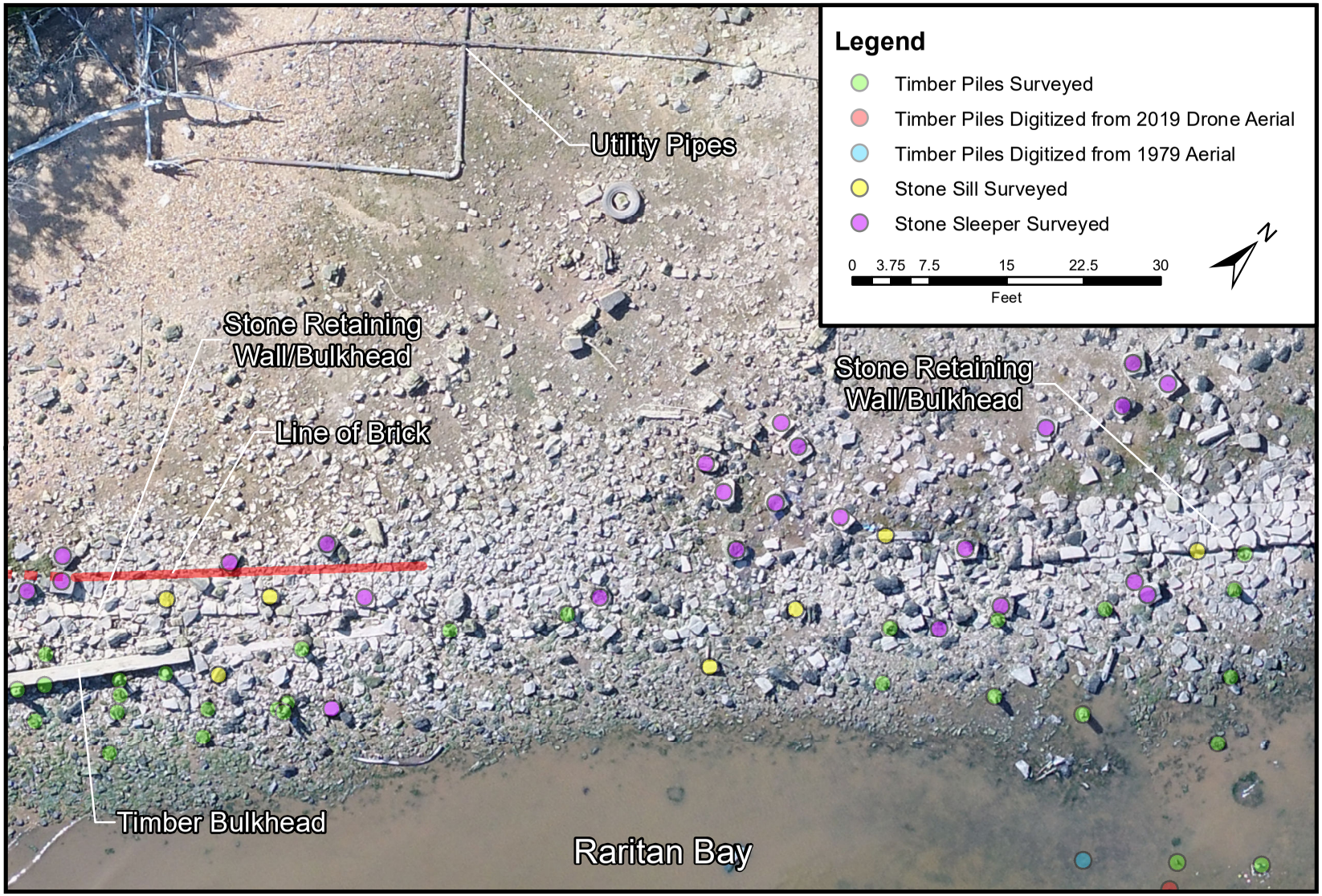

Figure 3.16. Detailed Aerial Photomosaic Plan View of Central Section of Stone Retaining Wall/Bulkhead.

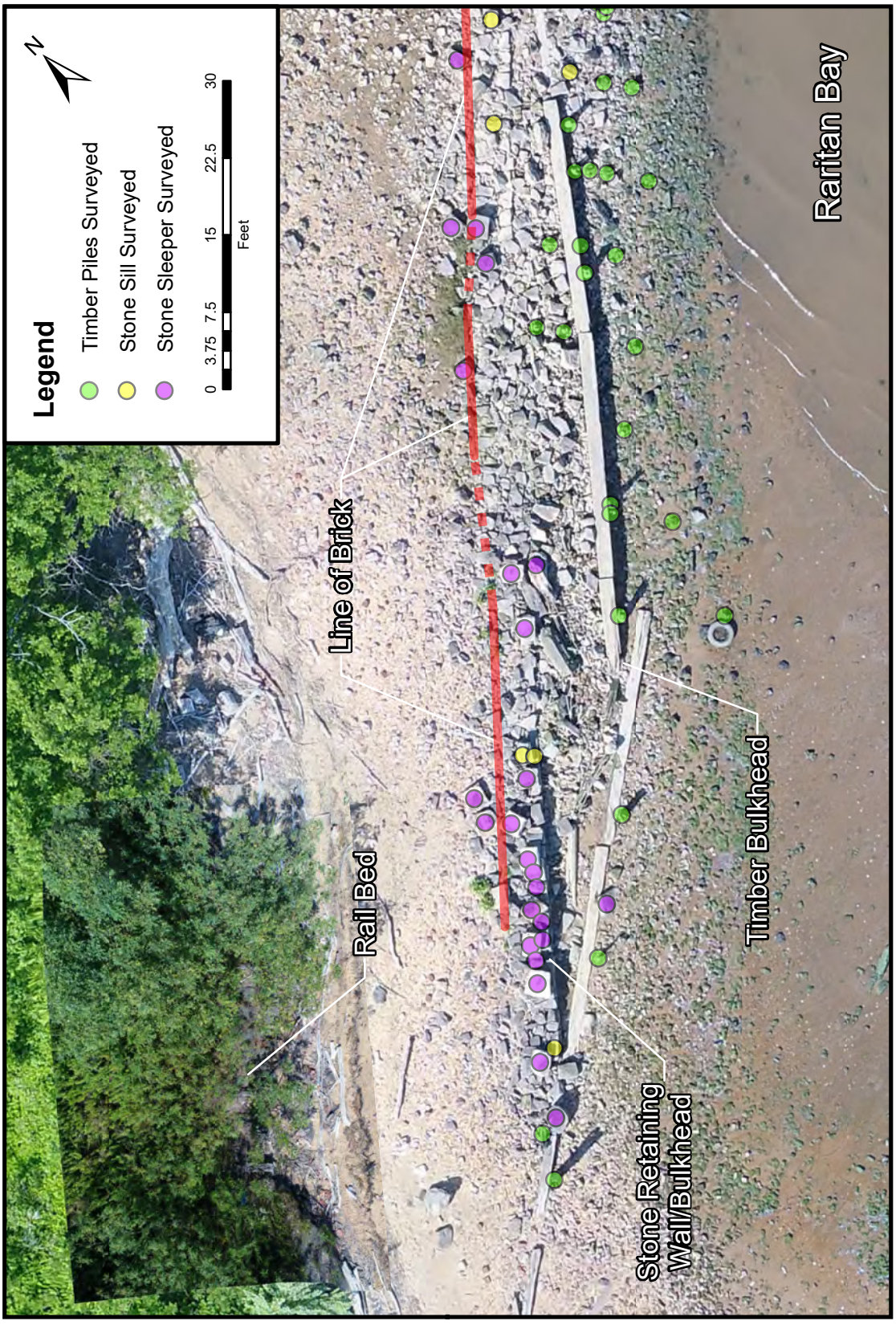

Figure 3.17. Detailed Aerial Photomosaic Plan View of Southwest End of Stone Retaining Wall/Bulkhead.

Photograph 3.29. View looking northeast along the retaining wall/bulkhead that defines the southeastern edge of the Camden and Amboy Railroad/Pennsylvania Railroad freight terminal. The transverse timbers and vertical piles of the bulkhead lining the southeastern face of the stone retaining wall may be a later modification; the retaining wall is thought to date from the Pennsylvania Railroad era in the early 1870s or possibly from a mid-19th-century expansion of the freight terminal during the Camden and Amboy Railroad era. The large square stone blocks are sleepers re-used from the Camden and Amboy Railroad rail beds (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:050].

Photograph 3.30. View looking east showing segments of abandoned cast-iron utility lines crossing the beach within the Camden and Amboy Railroad/Pennsylvania Railroad freight terminal. The larger diameter pipe is most likely a steam line; the smaller diameter pipe is probably a water line (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:013].

Photograph 3.31. View looking northeast showing a section of rail bed on the shoreline roughly 25 feet northwest of the retaining wall/bulkhead along the southeastern edge of the Camden and Amboy Railroad/Pennsylvania Railroad freight terminal (Photographer: Joshua Butchko, August 2019) [HRI Neg.# 19013/D7:091].

Figure 3.18. Aerial Photomosaic Plan View of the Inshore End of the Explosives Pier (Destroyed) and Bulkhead.

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tie plates, or base plates, which would have held the rails in place. This section of rail line runs southwest to northeast and parallel to the retaining wall/bulkhead. Its alignment correlates well with any one of several rail lines shown in this vicinity, all heading out to the Pennsylvania Railroad freight terminal, on the Everts and Stewart map of 1876 and the U.S. Coast and Geodetic Survey map of 1907 (see above, Figures 2.3 and 2.4).

5. Explosives Pier

The area of the explosives pier, built shortly after the earlier munitions pier burned in 1923, forms a distinct and separate element of the shoreline lying south of the Pennsylvania Railroad freight terminal. No obvious visible trace of the pier itself survives, even at low tide, and there are no telltale piles projecting from the water to indicate where it formerly stood. Its position can be reconstructed with some confidence, however, from aerial photographs and maps (e.g., Figures 2.5 and 2.6). It is assumed that the vast majority of this structure was obliterated by the explosion of May 19, 1950, although it is possible that evidence of the base of the piling structure that supported the pier may still survive in the form of truncated piles in the floor of the bay.

Timber Bulkhead: The principal remains in the area of the explosives pier consist of a substantial timber bulkhead that anchored the inshore end of the structure (Figure 3.18; Photographs 3.32-3.37). The bulkhead is composed of two connected segments: a 25-foot-long section oriented northwest-southeast lying some 60 feet south of the southwestern end of the stone retaining wall that marks the southeastern limit of the Pennsylvania Railroad freight terminal; and a 130-foot-long section running northeast-southwest whose northeast end connects to the southeastern end of the shorter segment described above. The southwest end of this longer segment is keyed into another section of northwest-southeast bulkhead that connects to the Westmoreland Pier. The longer segment effectively defines the northwestern side of the slip that separated the explosives pier from the Westmoreland Pier, while the explosives pier itself projected northeastward into the bay from the shorter segment. Elevations along the top of the bulkhead range between 3.8 and 5.1 feet above sea level.

The shorter northeast-facing bulkhead segment consists of a tightly fitted panel of nine-inch-square piles held together on its interior (southwest) face by at least one, 12-inch-diameter horizontal beam (Photograph 3.32). This latter beam is supported by at least three 12-inch-diameter "dead men," which extend horizontally into the earth to the southwest (Photograph 3.33). Three large vertical piles, 15 inches in diameter, and spaced four feet apart, continue the bulkhead line to the northwest indicating that it probably originally connected to the southwest end of the retaining wall.

The longer bulkhead segment, whose primary function would have been to allow for the docking of vessels rather than anchor the pier structure, is held in place by 13 vertical timber piles (each roughly 14 inches in diameter) spaced ten feet apart (Photographs 3.34 and 3.35). Sawn transverse beams, nine inches square and ten feet long, are fitted between some of the piles, suggesting docking locations along the bulkhead line. The vertical piles retain a substantial timber bulkhead wall comprised of two rows of transverse beams, each roughly nine inches square and 12.5 feet long, which are held in place by a combination of vertical and horizontal iron bolts and bars (Photograph 3.36). The interior (northwest) side of the wall is supported by a series of 12-inch-diameter timbers ("dead men") which are keyed into squared holes along the inner line of transverse beams and slope down to the northwest into the earth (Photograph 3.37). The tide has washed out much of the space behind the bulkhead revealing a gravel fill.

Photograph 3.32. View looking southwest showing the close-set vertical timber piles along the north-east face of the short segment of bulkhead from which the explosives pier, built in the mid-1920s, projected out into Raritan Bay (toward the camera). This section of bulkhead may originally date from the early 1870s and be contemporary with the Westmoreland and Lehigh piers (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:218].

Photograph 3.33. Detailed view looking southeast along the interior of the short segment of bulkhead from which the explosives pier, built in the mid-1920s, projected out into Raritan Bay. This view shows the close-set, vertical timber pile, transverse timber and "dead man" construction of the bulkhead, which may originally date from the early 1870s and be contemporary with the Westmoreland and Lehigh piers. The Westmoreland Pier is across the water at the top of the view (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:213].

Photograph 3.34. View looking west showing the southeast face of the long segment of bulkhead extending southwest from the base of the explosives Pier. This section of bulkhead may originally date from the early 1870s and be contemporary with the Westmoreland and Lehigh piers. The short bulkhead segment is at right (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:041].

Photograph 3.35. View looking west showing the vertical timber pile and transverse beam construction of the long segment of bulkhead extending southwest from the base of the explosives pier. This section of bulkhead may originally date from the early 1870s and be contemporary with the Westmoreland and Lehigh piers. Note that some of the transverse timbers are flush with the front of the piles, probably indicating docking locations (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:075].

Photograph 3.36. Detailed view looking north showing the mode of construction of the long segment of bulkhead extending southwest from the base of the explosives pier. Note the piles are offset from the bulkhead wall and the bulkhead components are bolted and spiked together with iron hardware (Photographer: James Lee, September 2020) [HRI Neg.# 19013/D10:076].

Photograph 3.37. View looking northeast along the line of the long segment of bulkhead extending southwest from the base of the explosives pier. Note the mode of construction making use of vertical piles, transverse timbers and "dead man" bracing fastened with iron bolts and spikes. Scale in feet (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:192].

The Interstate Commerce Commission records of 1916, which predate the construction of the mid-1920s explosives pier, show that both the short and long bulkhead segments were in existence at that time and describe in some detail their manner of construction, which corresponds closely with the surviving timber remains and also resembles the mode of construction of the Westmoreland and Lehigh piers. It is thought that the fundamental structure of this bulkhead most likely dates from 1872, when the slip adjoining the north side of the Westmoreland Pier would have been defined, and was modified in the mid-1920s to allow for construction of the explosives pier.

6. Timber Piles

The documenting of the many timber piles or pilings associated with the Camden and Amboy Railroad/ Pennsylvania Railroad terminal at South Amboy was a particular focus of the field activities independent of the numerous other features – bulkheads, cribbing, walls, embankments, stone sleepers and sills, etc. – that have been described above. Indeed, Stipulation III of the Memorandum of Agreement emphasizes the documenting of pilings above all else (Appendix A).

A summary of the timber piles that were documented and surveyed by GPS in the field is provided in Table 3.1. In all, a total of 1,092 visible and accessible piles were surveyed over the course of 11 field visits spread over five different weeks between June 2019 and June 2020. Piles were categorized according to their cross-section (round, square, rectangular and indeterminate), with the vast majority – more than 90% – being logs of unknown length with a round cross-section that had been driven into the bay floor. It was not possible from visual inspection to establish the tree species of the piles, although the Interstate Commerce Commission records of 1916 indicate that hemlock and white oak were the types of wood most commonly used. In most cases, the piles were either waterlogged or had been coated in creosote to slow their deterioration, both of which hampered species identification. In addition, details of hardware on individual piles (nuts, bolts, plates, etc.) were also recorded.

The field data was supplemented with additional piles observed in aerial photographs captured by drone in 2019 and in the 1979 aerial photographic coverage. A total of 188 additional piles were recorded through drone photography, mostly consisting of piles that were inaccessible or went unobserved in the field survey. Another 288 piles were transferred from the 1979 aerial photography and these are mostly piles that were evident 40 years ago but are no longer visible today. The locations of these latter piles were digitized and combined with the field survey data in a geographic information system (GIS). All pile locations are shown in Figure 3.19. The file geodatabase from

TABLE 3.1. SUMMARY OF TIMBER PILES DOCUMENTED AT THE CAMDEN AND AMBOY RAILROAD/PENNSYLVANIA RAILROAD TERMINAL AT SOUTH AMBOY

Survey Week	All Piles	Round Piles	Square Piles	Rectangle Piles	Indeterminate Piles
Week 1	116	62	54	0	0
Week 2	336	333	0	3	0
Week 3	305	275	20	0	10
Week 4	239	231	0	0	8
Week 5	96	96	0	0	0
Survey Totals	**1092**	**997**	**74**	**3**	**18**

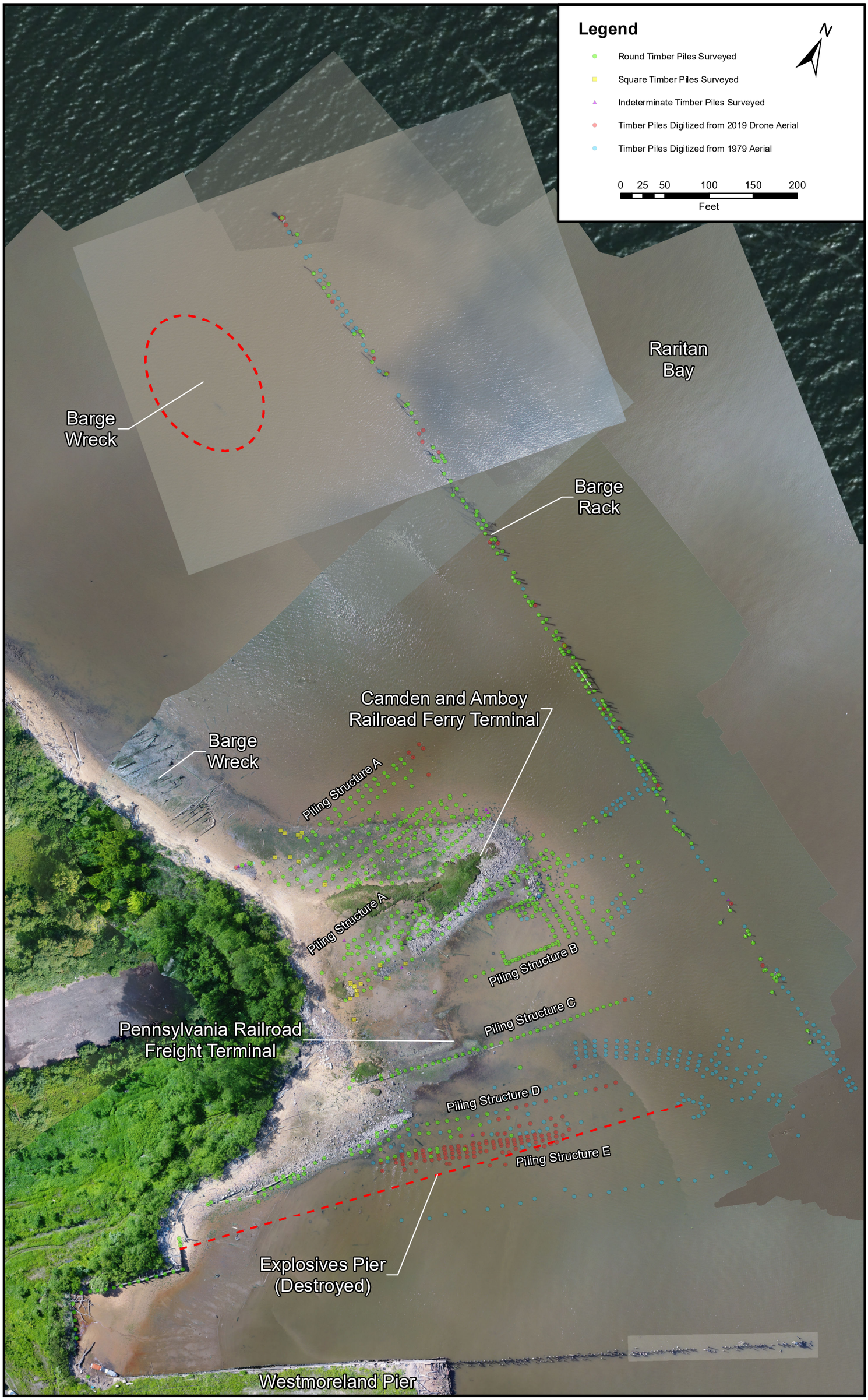

Figure 3.19. Aerial Photomosaic Plan View Showing All Surveyed and Digitized Piles.

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the GIS (made up of points, lines and polygon feature classes) is populated not only with pile data from the survey and aerial photography, but also includes other information, such as details of stone sleepers and sills. The survey and GIS data form a separate electronic submission accompanying this report.

The locational characteristics of the pile data as seen in Figure 3.1 display broad patterns that can be linked to basic features of the Camden and Amboy Railroad/ Pennsylvania Railroad terminal such as the barge rack and various piers and piling structures. The vast majority of the piles relate to the Pennsylvania Railroad era from the early 1870s onward, although grids of piles around the promontory where the original Camden and Amboy Railroad terminal was located may be associated with mid-19th-century expansions of the facility. While the pattern of piles provides a general sense of the overall extent of the terminal over the course of its approximate century and a half of active life, the pile data in and of themselves offer little opportunity for finer-grained chronological, functional or spatial analysis.

B. WESTMORELAND AND LEHIGH PIERS

Documentation of the Westmoreland Pier took place in June and August 2019, with follow-up for additional photographs and measurements of the Lehigh Pier in June 2020. The methodology employed was similar to that for documenting the piles and bulkheads in the area of the Camden and Amboy Railroad/ Pennsylvania Railroad Wharves, supplemented with Historic American Engineering Record (HAER) state-level equivalent documentation of the two piers proper, since these both remain as discrete, recognizable engineered structures (Figure 3.20). The HAER documentation consists of digital photographs of representative views, drawings based on field measurements and archival data, and a historic narrative based on primary sources. All images, drawings and text were produced in digital or hard-copy archival formats (i.e., TIF for images and acid-free paper and archival inks for printed materials). Please refer to Appendix C for the full Westmoreland Pier HAER Documentation Report and to Appendix D for the full Lehigh Pier HAER Documentation Report, both of which are summarized below.

The Westmoreland and Lehigh piers were built *circa* 1872 as a major expansion of the South Amboy terminal operations to the southeast of the earlier Camden and Amboy Railroad wharves. This expansion occurred shortly after acquisition of the Camden and Amboy Railroad by the Pennsylvania Railroad, which moved swiftly to expand the terminal as a major coal dock for supplying the New York City area market. Both piers remained operational as coal docks into the middle decades of the 20th century undergoing considerable changes in the method and process of handling and transferring coal from railroad cars to the watercraft that distributed the fuel to steamships and coal yards scattered about the Port of New York. The pier "superstructure" of coal-handling trestles, bunkers, chutes, dumpers and hoists is no longer present but the pier "substructure" that supported these operations remains intact.

The Westmoreland Pier is a rectangular plan, wood and earthen structure measuring approximately 420 feet long and 100 feet wide (Photograph 3.38). The pier was shortened from about 800 feet long *circa* 1911 during a conversion from a coal trestle pier to a coal bunker pier with steam hoist (Interstate Commerce Commission Valuation Records 1916). A line of timber piles, built as a tie up rack *circa* 1911, extends 412 feet eastward into the bay from the pier's northeast corner (Photograph 3.39). These piles historically supported a wood deck walkway, which is no longer present. The piles were surveyed and documented by GPS and are included in this report's electronic data submission.

Photograph 3.38. Westmoreland Pier: aerial view looking south with the Westmoreland Pier in center of the view. The southern edge of the Camden and Amboy Railroad/Pennsylvania Railroad Wharf area is in the foreground. The western end of the Lehigh Pier is in the background (Photographer: Evan Mydlowski, June 2019) [HRI Neg.# 19013/DR2:787].

Figure 3.20. Aerial Photomosaic Plan View of the Westmoreland and Lehigh Piers.

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Photograph 3.39. Westmoreland Pier: view looking southwest at the northeast corner with the line of piles extending out to the left. This line of piles supported a walkway and a tie-up rack (Photographer: Joshua Butchko, August 2019) [HRI Neg.# 19013/D4:42].

Photograph 3.40. Westmoreland Pier: view looking northwest at the southeast side of the pier showing timber sheet piles attached to horizontal timber runners to form the fender system (Photographer; Alexis Alemy, August 2019) [HRI Neg.# 19013/D3:316].

Photograph 3.41. Westmoreland Pier: view looking northeast at the east end of the pier (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:100].

Photograph 3.42. View looking southeast at remnant timber bulkhead at the southwestern end of the slip between the Westmoreland and Lehigh piers (Photographer: Joshua Butchko, June 2019) [HRI Neg.# 19013/D1:145].

Photograph 3.43. Lehigh Pier: aerial view of the Lehigh Pier, center top of view, and the eastern end of the Westmoreland Pier and its tie-up rack piles, center of view (Photographer: Evan Mydlowski, June 2019 [HRI Neg.# 19013/DR1:608].

Photograph 3.44. Lehigh Pier: view looking northeast at the southwestern end of the pier. The steel Z-sheet piles have fallen away at spots revealing concrete caps and the older timber piles and sheeting of the pier's original fender system (Photographer: Joshua Butchko, June 2020) [HRI Neg.# 19013/ D8:024].

Photograph 3.45. Lehigh Pier: view looking southwest along the southern edge of the pier. Erosion has revealed fill material (Photographer: Joshua Butchko, June 2020) [HRI Neg.# 19013/D8:046].

Photograph 3.46. Lehigh Pier: Dumper No. 1 foundations, view looking northeast (Photographer: Joshua Butchko, June 2020) [HRI Neg.# 19013/D8:036].

Photograph 3.47. Lehigh Pier: Dumper No. 2 foundations, view looking south (Photographer: Joshua Butchko, June 2020) [HRI Neg.# 19013/D8:007].

The Westmoreland Pier has a perimeter of deteriorated timber sheet pilings or whalers, meant to protect the pier from wave action and the crushing motion of docked watercraft bumping against it (Photograph 3.40). The timber sheet piles are driven into the bottom of the bay and secured by metal tie rods to horizontal 12-by-12 inch creosoted timber runners. The age of the timber sheeting is unknown but it comports with sheeting described as existing at the pier in 1916 and being continually renewed as it was damaged or worn out (Interstate Commerce Commission Valuation Records 1916).

The Westmoreland Pier has an elevation of approximately eight feet above sea level. Erosion of the earthen deck, particularly at the eastern end of the pier, has exposed rock masonry fill, mixed with building debris (Photograph 3.41). The interior construction, although not visible to inspection, is assumed to be the oldest and least altered of its structural elements. In 1916, the Interstate Commerce Commission reported that the interior was composed of a series of box-shaped timber crib boxes (resembling Lincoln log construction), measuring 100 feet long by 30 feet wide by 22 feet deep, extending into a trench that was dredged to 13 feet below the bay's low water line. An idealized cross section of the log crib construction is included in the HAER documentation.

The marine slip between the Westmoreland and Lehigh piers is between 150 feet to 180 feet wide as measured between the southeastern edge of the Westmoreland Pier and the northwestern edge of the Lehigh Pier. The southwestern landward end of the slip is a mudflat; however, there is a remnant bulkhead consisting of timber pilings, sheeting and tiebacks (Photograph 3.42). The bulkheads were surveyed and documented by GPS and are included in this report's electronic data submission.

The Lehigh Pier is a steel, wood and earthen structure measuring approximately 1,048 feet long from southwest to northeast as measured along its southeastern elevation (Photograph 3.43). The pier has an irregular five-sided plan, which flares in the direction of the pier's northeast corner. The pier's minimum width is approximately 223 feet at its landward end and its maximum width is 370 feet at the bay-facing eastern end.

Z-shaped steel sheet piles form the pier's southern and northern elevations (Photograph 3.44). These sheet piles are not original to the pier and were likely added in the 1950s or later. The steel sheet piles encase an earlier fender system of creosoted timber piles and timber sheeting, which is visible at the eastern end of the pier and partially visible in a few locations where the steel sheet piles have corroded and failed.

The Lehigh Pier has an earth-filled deck with an elevation of approximately 12 feet above sea level. The southern and eastern edges of the pier have areas where the sidewalls have failed revealing rock and earth fill (Photograph 3.45). Interstate Commerce Commission valuation records indicate that the Lehigh Pier's interior is composed of a series of box-shaped timber crib boxes identical to those composing the Westmoreland Pier. Based on the pier's overall dimensions, there would be some 70 of these boxes measuring 100 feet long by 30 feet wide by 22 feet deep, also sunk to a depth of 13 feet below the low water line. An idealized cross section of the log crib construction is included in the HAER documentation.

The Lehigh Pier supports the concrete foundations of two steel McMyler coal-car dumpers of 1910-1911, referred to as Dumper No. 1 and Dumper No. 2. The concrete foundation of Dumper No. 1 is on the north side of the pier and consists of concrete plinths and stub walls on a slab, with a rectangular plan of 30 feet by 60 feet (Photograph 3.46). The concrete foundation of Dumper No. 2 is on the south side of the pier with only three remaining stub walls on a concrete slab (Photograph 3.47).

Chapter 4

ANALYSIS AND INTERPRETATION

A. SITE EVOLUTION

The near-shore and shoreline features documented by this technical report fall within the footprints of a series of wharves, piers and tie-up barge racks that frame the evolution of the South Amboy terminal's waterfront from the 1830s to the end of operations in the 2010s (Figure 4.1). As a follow-up to prior investigations (Hunter Research, Inc. 2015, 2018), the current documentation has more closely correlated these waterfront features with specific phases of terminal development. The following summary of site evolution draws from and elaborates on the historic narrative and sources presented in Chapter 5, "Historic Context for the Camden and Amboy Railroad National Historic District (1831-1970)" in Hunter Research, Inc., *Cultural Resources Investigations, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey* (2015) with a specific focus on the marine-railroad interface at the waterfront. Readers are referred to Chapter 5 of the prior report for more information on the history of the railroad yard, which was located to the west of the piers and wharves.

The evolution of the waterfront at the South Amboy railroad terminal may be understood within a framework consisting of two principal areas of development, the original Camden and Amboy Railroad/ Pennsylvania Railroad wharves and the Westmoreland and Lehigh coal piers (Figure 4.1). The wharves, the older and northernmost of the areas, began as the original Camden and Amboy Railroad wharf of 1831 and continued to evolve and greatly expanded during the rest of the Camden and Amboy Railroad era in the 1840s to the 1860s, with further modification occurring during the Pennsylvania Railroad era from the 1870s to the 1920s, by which time it had largely fallen into disuse. The Westmoreland and Lehigh coal piers were built in 1872 with subsequent modifications in a period of active service that continued for almost a century until the demise of the Penn Central operations in the late 1960s to mid-1970s. Other features of interest are the Pennsylvania Railroad barge rack and catwalk of *circa* 1920 to 1970. Also identified, but somewhat less perfectly correlated with surviving piles and bulkheads in the area of the Camden and Amboy/Pennsylvania Railroad wharf are the New Brunswick freight pier of *circa* 1891 to 1920 and the Pennsylvania Railroad freight/explosives pier of *circa* 1916, which burned in 1923. This latter pier was replaced on a slightly different alignment by the Pennsylvania Railroad explosives pier of *circa* 1923, which itself was largely destroyed by a massive explosion in 1950, except for some remnants of the bulkheads at its landward end.

In 1831, the Camden and Amboy Railroad, New Jersey's first railroad offering regular passenger and express freight service, established its northeastern terminus at South Amboy, which was a convenient point of interchange with vessels bound to and from New York City and other points within the Port of New York. The near-immediate technological success and profitability of the company spurred the expansion of railroad transportation across the state, transforming New Jersey and the region in myriad ways. A key cog in the Camden and Amboy Railroad's original operations was its marriage with steamboat service to complete the connection between its terminal at South Amboy with New York City and with its southwestern terminal in Bordentown and eventually Camden and Philadelphia. The Camden and Amboy Railroad was nearly unique in the United States as

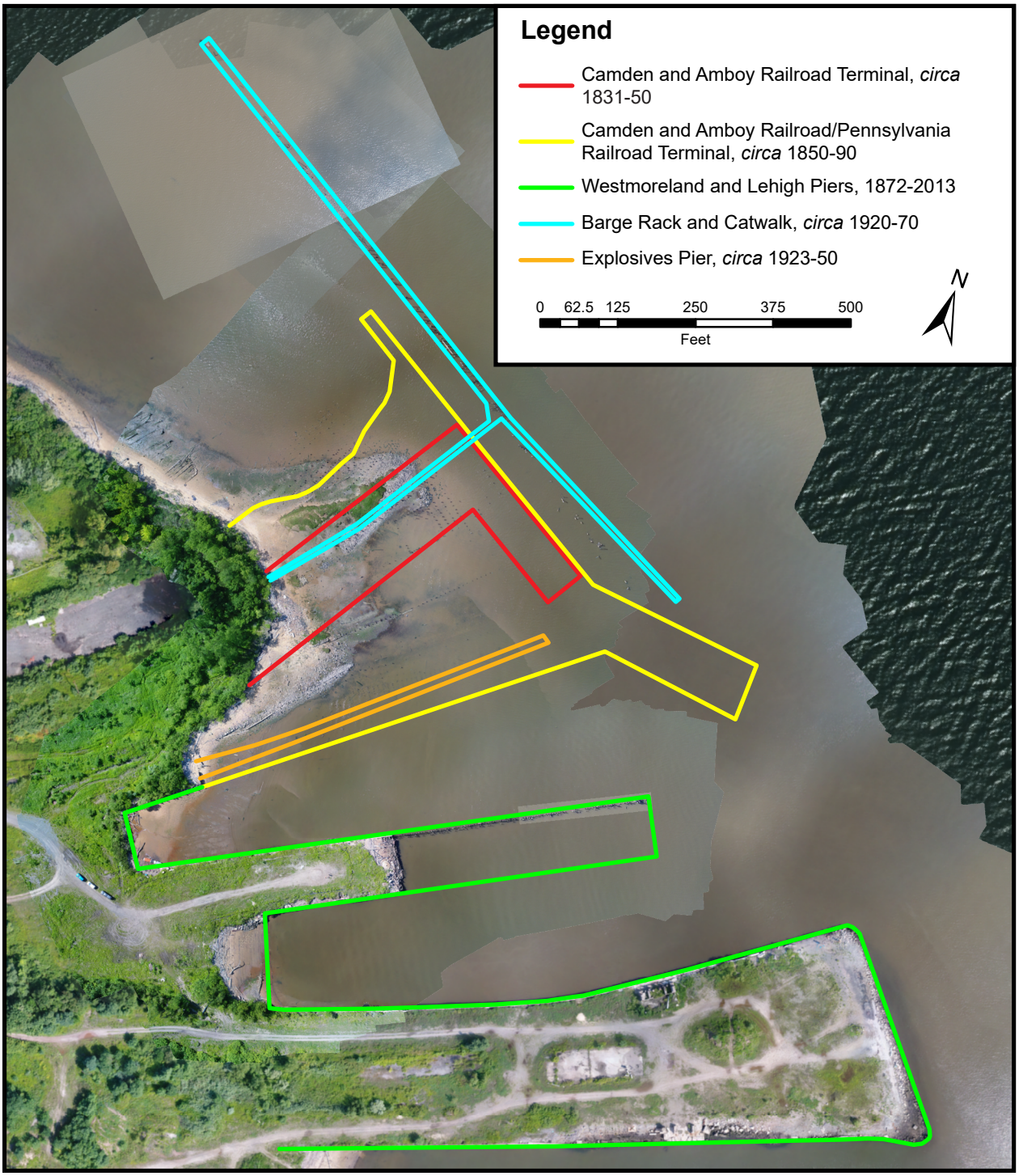


Figure 4.1. Periods of Development for the Camden and Amboy Railroad/Pennsylvania Railroad Terminal at South Amboy.

having two tidewater terminals and ferry transfers at either end of its line from the very start of operations. Company records document the impressive attempts to make this railroad-marine transfer as seamless as possible, including printing tickets so that passengers disembarking from ferries would know exactly which railroad car to board for a fast interchange.

The earliest area of waterfront development within the Camden and Amboy Railroad passenger and freight wharf area at South Amboy was an L-plan pier, extending into the bay along the axis of a sandy spit. Early records for this pier indicate it was a wharf of impressive size that supported substantial structures including a brick car house, a frame car house, a frame transportation house and a wood shed, each measuring more than 100 by 250 feet in length. In addition, the wharf supported an office, a water tank, a turntable and, of course, the railroad tracks and cars, which would have placed substantial weight on the wharfage. Evidence of cribs and bulkheads in the area of the original wharf suggests it was built with a substantial earth-retaining foundation capable of supporting the heavy loads.

More than 100,000 passengers and 10,000 tons of freight passed through South Amboy annually during the 1830s, but by the early 1840s the original terminal had been surpassed by a more direct railroad connection between Philadelphia and New York City. This new route passed through Newark, New Brunswick and Trenton, roughly corresponding to the present-day Amtrak Northeast Corridor, with ferry service across the Hudson River between Jersey City and Manhattan. As this new line took over the bulk of the passenger and fast freight service crossing the state, the terminal at South Amboy was relegated to local passenger service and handling slower freight and bulk materials. Nonetheless, there is clear evidence that the wharf at South Amboy continued to expand extending to the north and south of the original L-shaped wharf.

An engraving of *circa* 1854 illustrates a large and active marine terminal operation with two transfer bridges for moving goods between rail and ship, as well as many low buildings for storage and servicing of the railroad and ferry operations (Figure 4.2). On the ground today, within the documented area of the Camden and Amboy Railroad/Pennsylvania Railroad wharf is a series of bulkheads, log cribs and piling patterns that roughly correlate to the wharf's footprint and railroad track alignments, but the exact sequence of construction from the 1830s to the 1870s is difficult to ascertain. Railroad company records, and other sources, are largely devoid of much specific detailed information about the wharf and its expansion during this period, probably because these records were among the massive volume of material destroyed by Conrail after it took over the bankrupt Penn Central in 1976. By this time, the Camden and Amboy Railroad/Pennsylvania wharves had been out of service for more than 50 years and such data would have been considered of little value to then current railroad operations.

Considerably more archival data support an interpretation of the site evolution from the early 1870s to the present day. These include postcard views, photographs, historic maps, aerial photographs and, of exceptional value, Interstate Commerce Commission (ICC) valuation records of 1916, without which some details of the site's evolution, like the cellular log crib construction of the Westmoreland and Lehigh piers, would be particularly obscure. Views of the coal piers in operation from *circa* 1872 to 1910 are particularly impressive as they illustrate the tall and massive timber trestles that covered the piers and carried coal cars out over bunkers and chutes that directed coal into waiting barges and lighters (Photographs 4.1-4.4). The weight of this coal-handling superstructure speaks directly to the substantiality of the pier underpinnings that have survived largely intact to the present day.

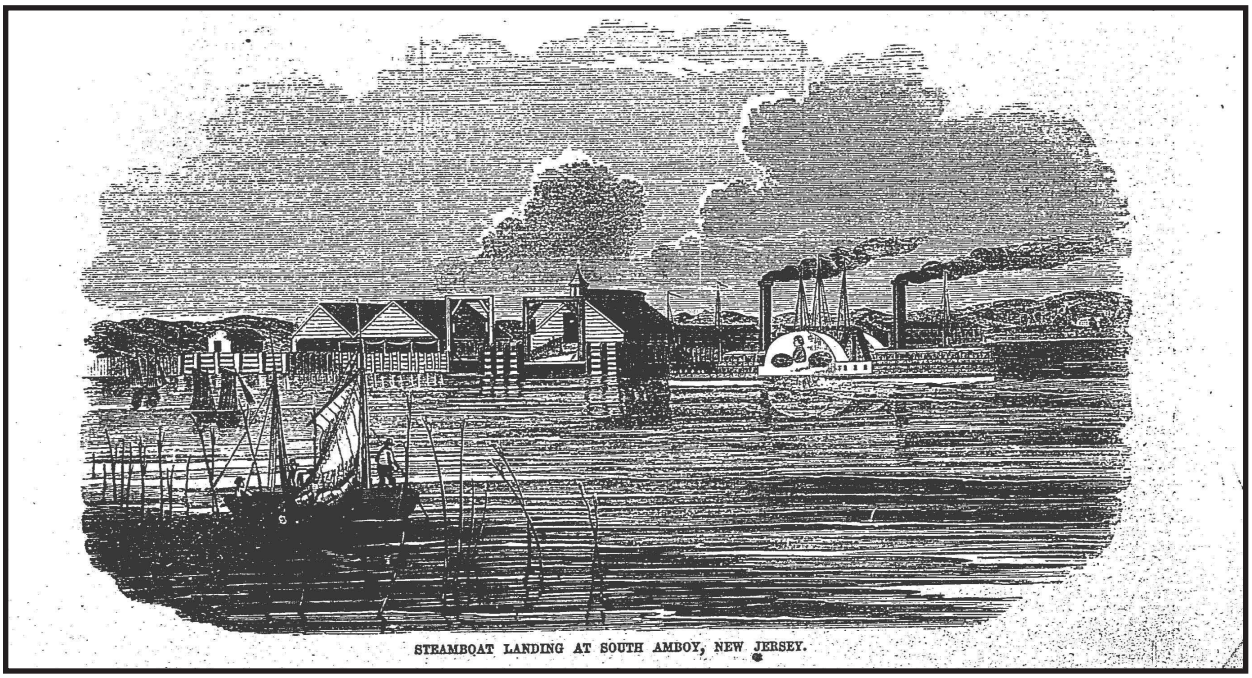
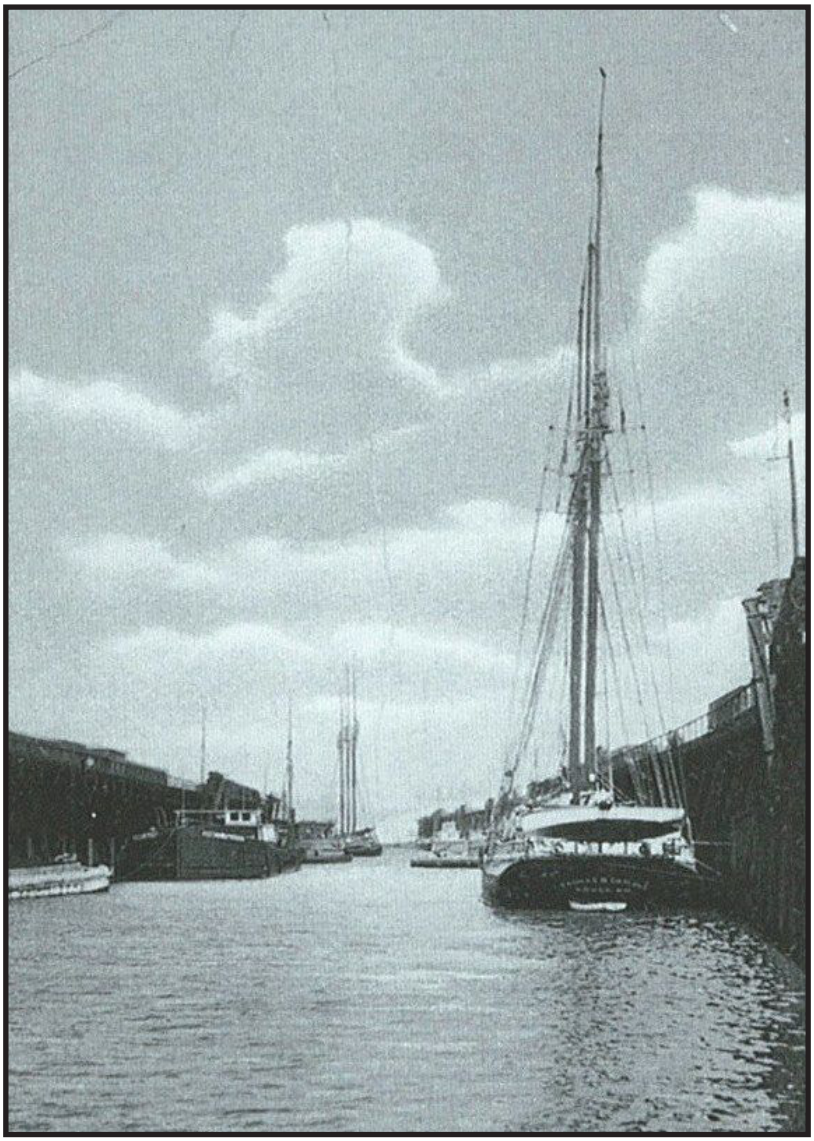
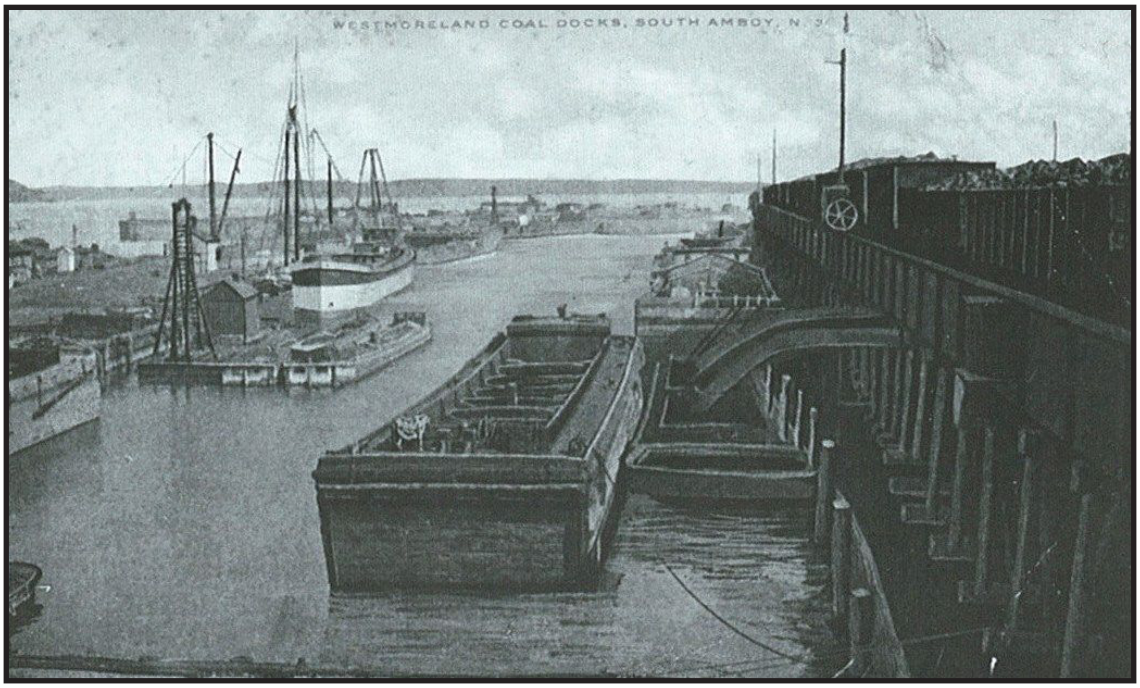


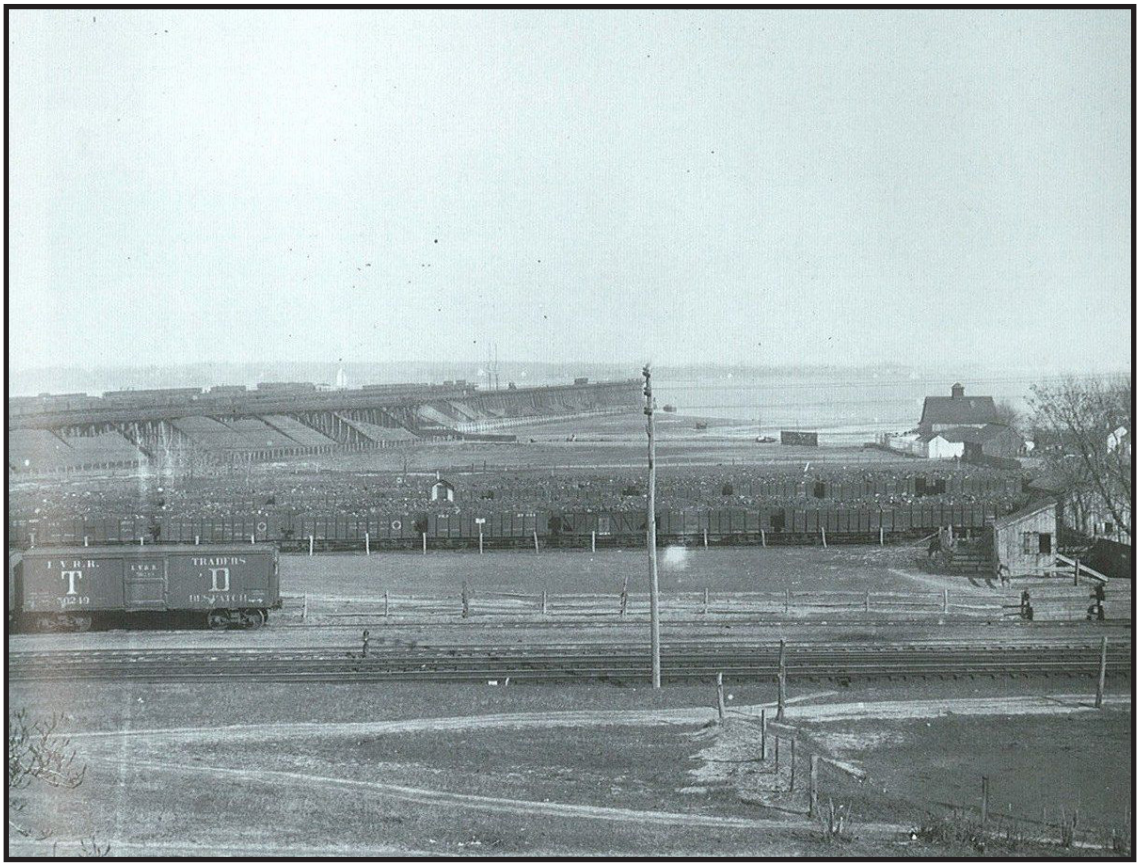
Figure 4.2. Steamboat Landing at South Amboy, New Jersey. 1854. The gable-roof buildings are the Camden and Amboy Railroad ferry terminal on the T-wharf. The two timber-frame structures are transfer bridges that were used to transfer railcars and cargo on and off vessels. The bridges had hinged leaves that adjusted with the tide. Source: Gleason's Pictorial Drawing-Room Companion. April 1, 1854.



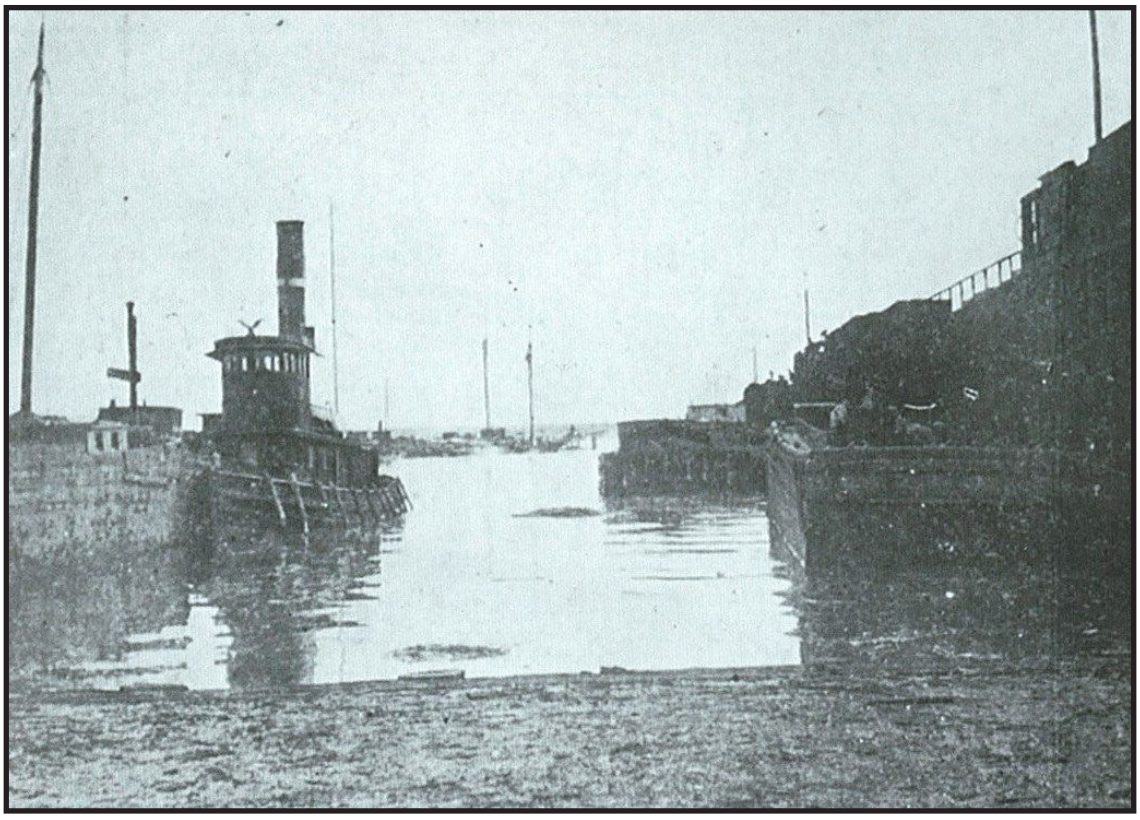
Photograph 4.1. View looking northeast between the Westmoreland Pier (left) and the Lehigh Pier (right). *Circa* 1880. Source: Francy 1998.



Photograph 4.2. View looking northeast between the Westmoreland Pier (right) and the Pennsylvania Railroad freight pier (left). *Circa* 1890. Source: Francy 1998.



Photograph 4.3. Panoramic view looking northeast from South Amboy with the Lehigh Pier in the distance. This photograph can be dated to the period when the Dodge conveyor system was in use (*circa* 1891-1909) due to the large coal piles under the trestle leading out to the pier. Circa 1891-1909. Source: Francy 1998.



Photograph 4.4. View looking northeast between the Westmoreland Pier (right) and the Pennsylvania Railroad freight pier (left). *Circa* 1900. Source: Francy 1998.

The year 1872 marked a significant turning point in the site's development. It was not only in this year that the Pennsylvania Railroad gained control of the Camden and Amboy Railroad through lease of its parent company, the United New Jersey Railroad and Canal Company, but it was also the year when the Pennsylvania Railroad brought its considerable financial resources to bear on the construction of the two coal docks to the southeast of the original Camden and Amboy Railroad wharves. The Pennsylvania Railroad transformed the old Camden and Amboy Railroad terminal into a major East Coast coal port, handling bituminous coal at the Westmoreland Pier and anthracite coal at the Lehigh Pier. The company consciously positioned itself to compete with the Central Railroad of New Jersey and the Delaware, Lackawanna and Western Railroad, which had until that date been the dominant coal railroads with access to New York City via their respective connections between the anthracite coal fields of northeastern Pennsylvania and the Hoboken-Jersey City waterfront.

The Pennsylvania Railroad's investment in the coal docks paid off admirably. In subsequent years, major investments in state-of-the-art, high-volume, coal-handling technologies were pursued. These included the purchase and installation of patented Dodge coal conveyor systems at the Westmoreland and Lehigh piers in 1891 and two patented McMyler dumpers at the Lehigh Pier in 1910. Unfortunately, only the concrete foundations of the McMyler dumpers survive. The Pennsylvania Railroad's coal agent stated confidently in 1915 that the coal piers were earning six million dollars per year, making coal transferred from railroad to marine at South Amboy "beyond doubt the most profitable freight tonnage handled by our system." This was an astounding observation given the breadth and profitability of a company that was considered by most measures the world's largest business organization. It also makes clear just how critical South Amboy was to the Pennsylvania Railroad's financial health. The Westmoreland and Lehigh piers today remain structurally intact despite the removal of all of the coal handling equipment, buildings and trackage that the piers historically supported. The original cellular log crib pier construction of 1872, sunk to a depth of about 13 feet below the low water line, appears for all intents and purposes to remain intact, although not open to visual inspection. An important caveat to the piers' completeness is that the Westmoreland Pier was shortened by about 400 feet *circa* 1911.

The year *circa* 1910-11 was another important date in the terminal's development. It was then that the Lehigh Pier was converted to McMyler dumper operations. The dumpers, which literally picked up and flipped over entire 40-ton coal cars to empty their contents into barges, eliminated the need for the high trestles, which were removed from the piers. The two dumpers, known as Dumper No. 1 and Dumper No. 2, were respectively situated to the north and south sides of the pier at about its midpoint. The advantage of the McMyler dumper system was its speed and scale of operation and the quick return of empty cars into service. This innovation also initiated a series of changes in neighboring piers and wharves.

The Westmoreland Pier, as previously mentioned, was shortened and supplied with a coal hoist specifically for loading bunker coal into the tugs that maneuvered the barges. It also serviced steamships and lighters, some of which would deliver coal to larger ocean-going craft waiting for refueling in New York's harbor. A line of piles served as a tie-up extending some 400 feet off the northeast corner of the Westmoreland Pier. Around 1920, a new barge rack, consisting of piles and a narrow walkway was placed just outside the northeastern line of the by then out-of-use Camden and Amboy Railroad/Pennsylvania Railroad wharves. This rack served as a tie-up for the empty barges waiting to be shifted to the Lehigh Pier and for full barges waiting to be formed up and tugged to coal yards scattered around the port. A pedestrian catwalk connected the barge rack to the land, forming a large

T-shape plan. The barge rack and catwalk are among most clearly identifiable of the features remaining in this area.

The construction of the two massive coal piers in 1872 marked the beginning of the decline of the old Camden and Amboy Railroad/Pennsylvania Railroad wharves. Probably equally influential in the decline of these wharves was the opening of the New York and Long Branch Railroad in 1875, connecting South Amboy with Perth Amboy and points north via a new Raritan River bridge. Prior to this the closest railroad crossing of the Raritan River was at New Brunswick. Views of the 1880s to the 1900s provide some evidence that tugs, pile driving barges and small freighters were the main types of craft making use of the wharf during the last decades of the 19th century (Photographs 4.1, 4.2 and 4.4). ICC records suggest that much of the original wharf superstructure of the 1830s to the 1870s to the north side of the wharf had been removed by the early 1890s. A much smaller and narrower pier, reported as only 15.5 feet wide, perhaps close to the alignment of the original Camden and Amboy Railroad line, was built *circa* 1891. Known during its brief period of existence as the New Brunswick Pier, ICC records noted its use by wagons, presumably horse-drawn vehicles, loading freight on and off of lighters. The pier did not have railroad tracks and likely served the dwindling number of wagons still transferring local agricultural produce and livestock to New York City. The New Brunswick Pier was replaced by the barge rack and catwalk no later than *circa* 1920.

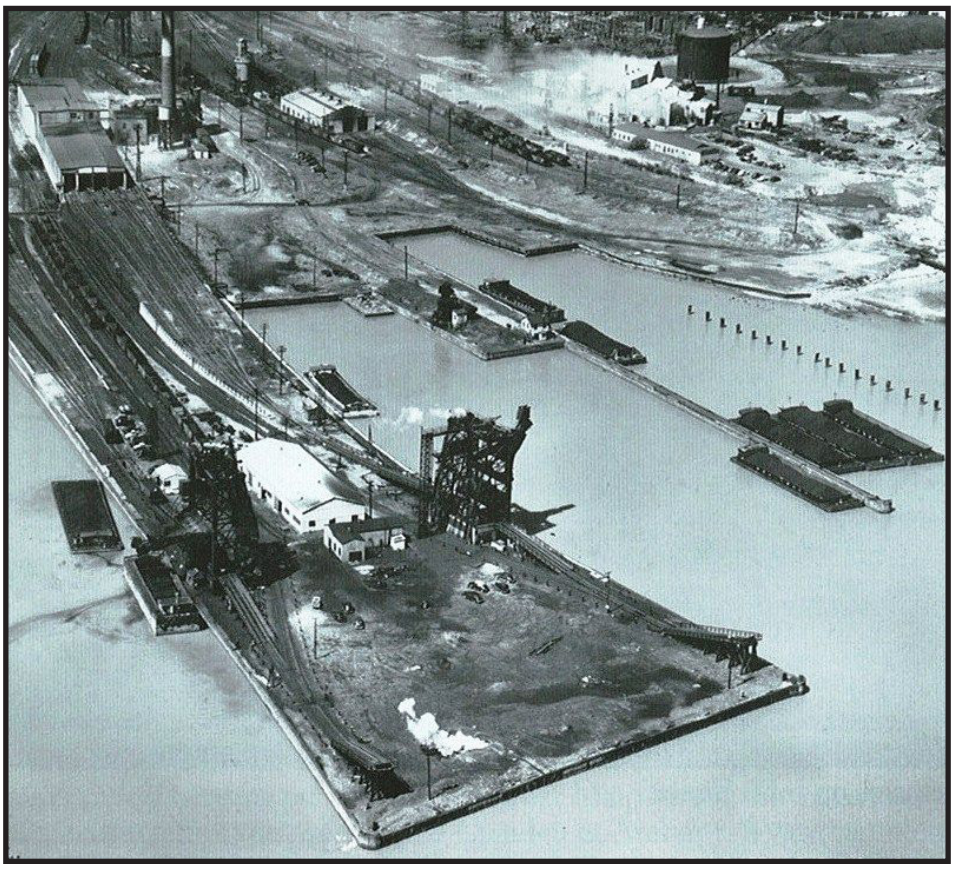
Around 1916, the south side of the old Camden and Amboy Railroad/Pennsylvania Railroad wharves was replaced with a new a pier, usually referred to as a freight or explosives pier. This pier maintained the southeastern edge of the earlier wharf and even appears at its landward end to have incorporated an "old stone wall," whose composition included stone sleepers salvaged from the original Camden and Amboy Railroad rail infrastructure; however, it was clearly described in ICC records as a new pier supported on timber pile bents with a wood deck carrying two tracks. This pier was being used to transfer munitions when it burned in 1923 (Photograph 4.5). It was replaced shortly thereafter by a new explosives pier that was built on an alignment close by to the southeast, oriented at a slight angle to the earlier pier.

The completion of the explosives pier of *circa* 1923-25 marked the last major change to the overall plan and layout of the project site, although the terminal area would remain operational as a railroad-owned and operated facility into the 1970s. The last half century of operations was marked by little new investment, likely because of the decreasing profitability of transporting coal. The movement of munitions through South Amboy grew in importance during and after World War I. The tragedy of Black Tom, the powder pier that blew up near downtown Jersey City in 1916, likely a result of sabotage, struck panic throughout the population of the metropolitan area. The event emphasized a need to move the transfer of explosives away from terminals in the highly populated areas of Jersey City and Hoboken. South Amboy fit the bill and it seems likely that the new freight/explosives pier of 1916 was built in direct response to Black Tom. Whatever the case, munitions regularly moved through South Amboy from around the time of America's entry into World War I in 1917 all the way through World War II and into the early years of the Cold War. The second explosives pier built following the fire of 1923 served its purpose until 1950 when it too met a fate similar to – yet even more drastic than that which afflicted – its predecessor. On May 19, a trainload of anti-tank mines and other explosives blew up on the pier, creating a crater that completely obliterated its pilings, damaged neighboring bulkheads and leveled numerous buildings and structures, including tipping over and irreparably damaging one of the coal-car dumpers on the Lehigh Pier. Photographs and data gathered to document the explosion, in part to sub-

Photograph 4.5. The Pennsylvania Railroad freight pier, which was used as an explosives pier during and after World War I, following a fire in 1923. View is looking northeast with the barge rack in the background. Source: Dunn 1923.

Photograph 4.6. Aerial view of the South Amboy Pennsylvania Railroad terminal, looking west, before the explosion of May 19, 1950. Source: Pennsylvania Railroad Photographs.

Photograph 4.7. Aerial view of the South Amboy Pennsylvania Railroad terminal, looking west, showing damage from the explosion of May 19, 1950. Source: Pennsylvania Railroad Photographs.



Photograph 4.8. Aerial view of the South Amboy Pennsylvania Railroad terminal, looking west, with the Lehigh Pier in the foreground and the Westmoreland Pier. Circa 1953. Source: Francy 1998.

stantiate insurance claims and assess fault, are among the most useful sources for understanding not only the impact of the explosion but the layout of the coal-handling operations on the neighboring Westmoreland and Lehigh piers in the mid-20th century. These include an excellent series of before and after aerial photographs (Photographs 4.6-4.8).

Following the explosion of 1950, the Pennsylvania Railroad did not rebuild the explosives pier, instead installing a line of piles that served to fend off any vessels that might drift into the shallow area of the former Camden and Amboy Railroad/Pennsylvania Railroad wharves and the destroyed pier. The subsequent declining profitability of the coal operations on the Westmoreland and Lehigh piers is surmised from evidence that the Westmoreland's coal hoist and one of the damaged McMyler dumpers were replaced by similar decommissioned machines relocated from the railroad's Greenville terminal in Jersey City. Rail-to-marine transfers at South Amboy had largely ceased by the 1970s, although Amboy Aggregates, a local supplier of sand to the construction industry, used the piers from 1984 to 2013 to dock barges and support its dredging operations until going out of business in the latter year.

B. SITE ENGINEERING CONSIDERATIONS AND CONSTRUCTION TECHNOLOGY

The age of railroads is usually thought of as an age of iron, yet the remnants of wharves, piers and bulkheads at the South Amboy terminal site make it clear just how reliant the Camden and Amboy Railroad and Pennsylvania Railroad were on wood during the 19th century and well into the 20th century. Wood was a traditional material of choice for construction in a marine environment, particularly for foundational elements submerged in water and soft sediments, where this material was likely to survive relatively well for very long periods in an anaerobic environment.

This documentation project has identified within the tidal zone, peeking out above the mudflats, an impressive concentration of piles, bulkheads and cribs, particularly in the area of the Camden and Amboy Railroad/Pennsylvania Railroad wharves. There is a high likelihood that the wood that historically formed the foundational underpinnings of the wharves survives to depths of from 10 to 15 feet below the low water line for cribs and bulkheads, and up to 40 to 50 feet for piles. Records compiled by the ICC in 1916 suggest that there was knowledge among railroad employees of the techniques used during the 19th century to build the piers and wharves. ICC inspectors discussed this construction with them in an attempt to estimate quantities of logs, piles and other submerged materials in order to place a monetary value on the marine terminal's various structures. The inspectors even took down details regarding species of trees, noting that hemlock was usually used for the logs of "old" submerged cribs and piles, that white oak was used for newer piles, and yellow pine for caps, sheeting and decking.

Timber piles and sheeting extending upward into the tidal zone, where the wood is repeatedly exposed to air, deteriorate more rapidly than submerged wood members, as is abundantly clear at the site where little survives intact above the lower water line. Unprotected, exposed wood timbers and logs are generally judged to have a working life of only about ten years but this can be extended to 35 years or longer with applications of various oils and mineral compounds. This suggests that much of the wood seen above the low water line at South Amboy is not that old, although quite possibly a replacement in-kind of older materials, especially for the exterior sheeting and walls of piers and bulkheads.

A preservative technology that appears to have been employed at South Amboy is the lengthening of the service life of piles and sheeting through creosoting. Creosote is present in piles, horizontal runners and timber sheeting at the Westmoreland Pier. Most of the piles in the Camden and Amboy Railroad/ Pennsylvania Railroad wharves area are also creosoted. Starting in the late-19th century, engineers sought methods to extend the life of wood through various chemical treatments. The most common process was creosoting, developed in England in the late 1830s but not widely used in the United States until the 1870s when railroads first adopted it for treating railroad ties. The process was soon transferred to the construction of the underpinnings of bridges and piers. Creosote is a distillation of coal tar. Precut timbers are impregnated with creosote in a pneumatic process that removes the moisture from the wood and replaces it with creosote at the cellular level. Creosoted wood is not water soluble and is very resistant to decay. Presumably, the earliest Camden and Amboy Railroad wharf of the 1830s would not have been creosoted, but at some point, possibly by the 1870s or 1890s at the latest, this process was in use at South Amboy (Hool and Kinne 1924:648-49).

During the last quarter of the 19th century and certainly into the 20th century, materials other than wood came into use nationally for the construction of wharves and other marine structures (International Library of Technology 1905: 51-58). Although steel and concrete piles came into use by the first decades of the 20th century, none were seen at the site with the exception of the steel Z-sheet piles encasing the elevations of the Lehigh Pier. The Z-sheet piles are of relatively recent origin, probably the 1950s or later. Iron tie rods are frequently noted throughout the site, particularly when connecting the structural timbers in bulkheads and fenders. Concrete is found almost exclusively in the foundations for the coal-car dumpers, hoists and buildings constructed on the Westmoreland and Lehigh piers in the early 1910s or later.

The hundreds of piles visible at the site can be categorized as serving a variety of purposes. One purpose is a structural one where the piles once supported wood plank decks for walkways, wagon ways, railroad tracks or working spaces where vessels were loaded or unloaded. The extensive grid of regularly spaced piles in the area of the Camden and Amboy Railroad/ Pennsylvania Railroad wharves indicates there was a substantial area once covered by a wood deck. These piles would have supported timber cap beams secured to the caps of the piles, probably by iron spikes, with the wood deck nailed or spiked to the cap beams. The frame formed by the piles and cap beams is sometimes referred to as a bent. In terms of sequence of construction, the piling grid would appear to postdate a system of bulkheads dating to the early Camden and Amboy Railroad period of the 1830s and likely is related to alterations made to the wharf in the early 1870s or later.

Another purpose of the piles is to serve as fenders or points to tie up barges and other shallow-bottom watercraft. The long barge rack to the northeast of the Camden and Amboy Railroad/Pennsylvania Railroad wharves was a location for temporarily docking or storing barges, but it also served to keep vessels from drifting into the area of the old wharves and grounding upon the many submerged features of their derelict structure. A line of piles was placed for a similar purpose to the north of the Westmoreland Pier following the munitions pier explosion of May 1950.

Perhaps more interesting than the piles from the perspective of 19th-century engineering are the numerous surficial expressions of timber cribs, bulkheads and even a corduroy-like ramp structure observable at low water in the mud flat just northwest of the Camden and Amboy Railroad/Pennsylvania Railroad wharves.

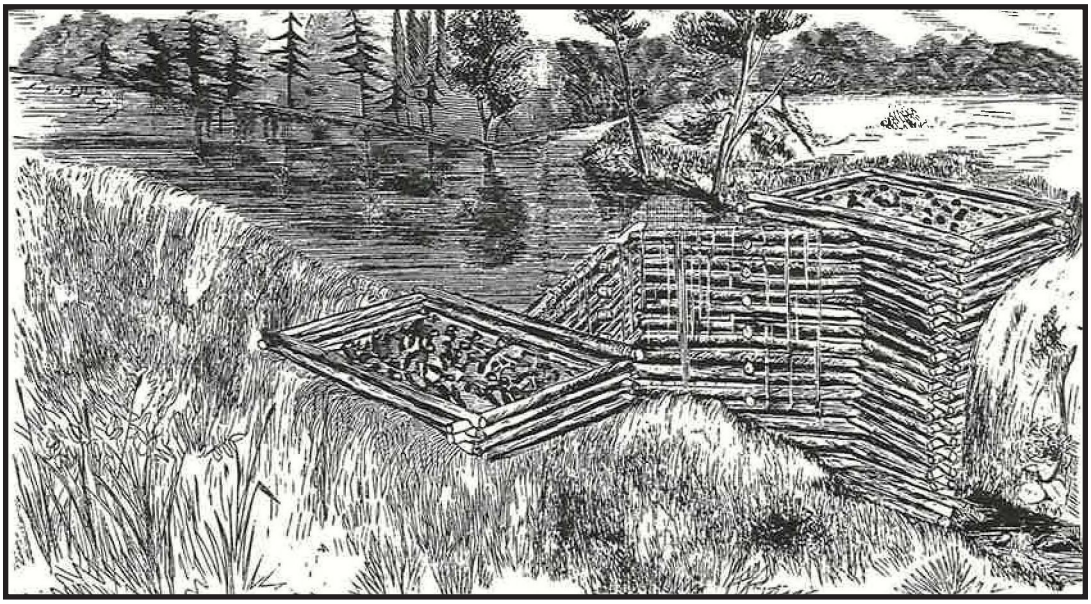


Figure 4.3. Typical log crib construction as seen in a 19th-century dam. Source: *Leffel's Construction of Mill Dams* 1881:22.

Cribs formed the solid and immovable underpinnings of piers and wharves that carried the heavy loads related to the operations of the railroads on the decks above. It is assumed, based on the ICC documentation of 1916, that the main supporting foundational crib structures submerged deep in the bed of the bay are indicative of efforts to stabilize existing landforms from erosion, build up earth-retaining structures and support the heavy superstructure of the wharves and piers by spreading the weight out over a wide area. These structures, very similar to coffer dams, were usually set into placing following dredging and often with the driving of piles to serve as guides (Jacoby and Davis 1941:238-272).

These types of timber crib and bulkhead structures have been observed in other archaeological investigations and are described at some length in archaeologist Molly R. McDonald's monograph on the subject of "Wharves and Waterfront Retaining Structures as Vernacular Architecture" published in *Historical Archaeology* in 2011. McDonald describes a traditional typology of four main types of structures: 1). cribs; 2). solid-filled box-shaped frames and bulkheads; 3). cobb construction of open-work boxes; and 4). grillage. All of these structures rely on a framework of horizontal wood members laid in varying patterns and levels of preciseness, joinery methods and tightness of fit. The terminology is imprecise and fluid, particularly in the vernacular vocabulary of their builders. As observed and described at South Amboy, the structures within the Westmoreland and Lehigh piers most likely fit the most common definition of a crib as a loose "Lincoln log" like box suitable for containing coarse fills of large cobbles, rock and earth (Figure 4.3). Bulkheads, which may consist of vertical piles guiding or supporting horizontal beams or "runners," are solid-filled frames, with the tighter fit of the horizontal beams able to retain finer fills such as sand, soil and refuse. These types of solid-filled frames or bulkheads often have horizontal tiebacks securing them back into the earth fill. A short section of this type of bulkheading is observable at the western end of the slip between the Lehigh and Westmoreland piers. Within the Camden and Amboy Railroad/ Pennsylvania Railroad wharves area the corduroy-like structure may in fact be the top layer of grillage, layers of logs laid at right angles to each other and intermittently weighted with stone rubble fill, although no vertical framing members were noted. Cobb construction may also be present at South Amboy; however, no structures of this type were observable in sufficient vertical profile to determine whether the open-work type of box or more closely fitted cribs were present.

The techniques observed were hardly new in the 19th century and have been speculated by McDonald and others to originate in medieval wharf building practices of Scandinavia or Germany, as distinct from the building practices of medieval England, which relied more heavily on revetments of braced horizontal walls. While the process of technological transfer is not entirely clear, the Scandinavian or German practice had become the dominant one in the northeastern American colonies by the middle of the 18th century, and, in fact, remained the dominant tradition in the United States until the middle decades of the 19th century and possibly later. While more data would be required from the South Amboy site, it does appear from the surficial evidence to fit the dominant American pattern of wharf and pier foundational construction from at least the 1750s to the 1850s, and persisting at least at South Amboy into the 1870s. In this latter decade or later, the main structural form at South Amboy appears to have shifted away from earth-retaining structures, such as cribs and bulkheads, to open work grids of timber piles supporting cap beams and/or wood plank decks above the high water line. This form of construction is observable in the historic images of the explosives piers and catwalks. It also appears to be reflected in the grid patterns of piles piercing the older cribs and bulkheads in the area of the Camden and Amboy Railroad/Pennsylvania Railroad wharves. These piles presumably reflect the wharves' latter stages of evolution before it went out of service and became derelict around 1920.

Chapter 5

CONCLUSIONS

This program of archaeological documentation has revealed that a vast range of archaeological remains survives on the site of the Camden and Amboy Railroad/Pennsylvania Railroad terminal in South Amboy. These remains are spread across a roughly 2,000-foot length of the Raritan Bay shoreline, extending northwest from the Lehigh Pier, and may be grouped as follows:

1. upstanding structural remains of the Westmoreland and Lehigh piers, including timber bulkheads and log crib boxes, rubble fill, timber and steel sheeting, timber piles, and, on the Lehigh Pier, concrete building and dumper foundations;

2. visible surface features onshore, both within the tidal zone and along the non-tidal beach and bay frontage, including the remains of timber bulkheads, stone and timber pier footings, log crib boxes, stone railroad abutments and embankments, a timber corduroy ramp, wood hurdles and a plethora of artifacts, most notably: stone sleepers and sills re-used or discarded from original Camden and Amboy Railroad rail bed construction at the terminal; brick and stone building debris; utility pipes; and iron hardware from pier, railroad and building construction.

3. visible and partially submerged offshore features both within and beyond the tidal zone, most obviously in the form of timber piles and traces of barge wrecks

Beyond what is visible, one may also predict the survival below ground – onshore, offshore and throughout the tidal zone, perhaps extending to depths of ten feet or more – further substantial timber and stone structural remains and additional artifacts. The vast majority of these remains will relate to the Camden and Amboy Railroad/Pennsylvania Railroad terminal facility and its almost 150-year period of operation, but there is also the prospect of pre-railroad-era, and even Native American, archaeological resources surviving below ground on the natural promontory where the first Camden and Amboy Railroad pier was situated.

Key factors in the survival of these archaeological resources along the Raritan Bay littoral are tidal fluctuation, rising sea level and the increasing frequency of storms, all of which take their toll not only on the fragile, but also on the sturdy and seemingly immovable, physical remains of the South Amboy terminal. This documentation exercise has provided a snapshot of visible cultural resources along the shoreline as of 2019-20, but this dynamic coastal environment is continually eroding these remains. Even in the space of the single year that this documentation was completed, changes were observed in the shoreline configuration and the visibility/invisibility of the remains. In some cases, erosion laid bare new, previously unseen features or displaced artifacts on the beach, while in others the deposition and re-deposition of sediment concealed features that had previously been visible. Ultimately, as the sea level rises and the shoreline recedes in this particular location, erosion and displacement will win out over burial beneath sediment, with loss of the archaeological record generally gaining the upper hand over preservation in place.

Documentation of the Westmoreland and Lehigh piers was undertaken to the New Jersey state-level standards of the Historic American Engineering Record (HAER) and provides both historical and descriptive information and an engineering analysis, although the below-ground fabric of both piers is only minimally visible. Documentation of the Camden and Amboy Railroad/Pennsylvania Railroad wharves was initially focused on the timber piles, as per the requirement of Stipulation III of the MOA. This task was especially challenging as the piles were located within the tidal zone and therefore most visible and accessible for survey only within a brief window of time at extreme low tide, either on foot from the shoreline or by boat under calm water conditions. As this work progressed it became obvious that the piles would be best understood within the broader context of the many other types of stone and timber structural remains that were ranged along the shoreline within and just above the tidal zone. Indeed, in retrospect, the piles represent one of the less informative sets of archaeological data present at the South Amboy terminal site. In contrast, the timber bulkheads and cribbing and stone and brick masonry features have the potential to yield much critical information about the layout and evolution of the terminal site. For this reason, considerable effort was expended on documenting and interpreting these latter types of archaeological resource, in addition to surveying and documenting the many hundreds of timber piles.

In perusing the archaeological documentation, it is important to appreciate not only how little of the terminal site still survives today above ground, but also how much of it may still be present below the sand and mud of Raritan Bay, both onshore and offshore. On the one hand, one must visualize an entire port facility, complete with terminal buildings, wharves, ferry slips, rail lines and all manner of transshipment infrastructure, that once existed at elevations of ten to 15 feet above the present-day water level, all of which has been stripped away. Yet, on the other hand, the underpinnings for the structures that supported the ferry service and transshipment of freight and coal, are still largely present, an archaeological expression of the massive movement of people and goods that took place here from the 1830s through the 1970s. The subsurface evidence of the South Amboy terminal's structural underpinnings is projected as substantial, extending to depths of between ten and 20 feet below the beach and bay floor, and may yet yield important historical information. This zone of archaeological sensitivity, extending north of the Westmoreland Pier for a distance of roughly 800 feet along the shoreline, lies beyond the limits of the South Amboy IFTC project site and broadly coincides with the limits of the 19th-century Camden and Amboy Railroad/ Pennsylvania Railroad terminal as shown above in Figure 4.1.

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Appendix A

MEMORANDUM OF AGREEMENT, 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

TECHNICAL PROPOSAL

HUNTER RESEARCH

Richard W. Hunter
PRESIDENT

Patrick Harshbarger
VICE PRESIDENT

James S. Lee
VICE PRESIDENT

Patricia A. Madrigal
VICE PRESIDENT

HISTORICAL AND ARCHAEOLOGICAL SERVICES
FERRY FACILITY DESIGN AND PERMITTING
CITY OF SOUTH AMBOY, MIDDLESEX COUNTY, NEW JERSEY

TECHNICAL PROPOSAL

Hunter Research, Inc.
September 20, 2018, Revised March 29, 2019

This technical proposal is for historical and archaeological services in support of design and permitting for the proposed Intermodal Ferry Transportation Center (ITFC) on the south shore of Raritan Bay in the City of South Amboy. Hunter Research has detailed knowledge of the project site gained over a period of more than 15 years conducting historical and archaeological studies and performing archaeological monitoring of soil remediation actions. For the design and permitting phase of this project, Hunter Research anticipates providing historical and archaeological input into the design process, assisting the project engineers and City of South Amboy in coordinating with state and federal agencies, and helping ensure that Stipulations III and IV of the 2009 Memorandum of Agreement (MOA) are appropriately met.

The following technical proposal was prepared by Hunter Research on September 20, 2018 to address the MOA stipulations and assist the design team, led by French & Parrello, with development of an ITFC design that fulfills historic preservation considerations. This work has been scoped based on tasks associated with a Request for Proposal issued by the City of South Amboy on August 23, 2018. Based on a revised concept plan presented by French & Parrello at a meeting of the City of South Amboy, the New Jersey Department of Transportation (NJDOT) and the New Jersey Historic Preservation (NJHPO) on March 4, 2019, Hunter Research has revised "Task 2 – Surveying" to include: 1). documentation of pilings on all offshore areas north of the Lehigh pier to the former Camden and Amboy piers; and 2). preparation of Historic American Engineering Record (HAER) documentation of the remains of the Westmoreland pier, one of the more intact former coal piers, which is proposed to be reconstructed and modified for ferry service. This documentation is intended to fully satisfy Stipulation III of the MOA.

Task 1 – Project Management

Hunter Research will assist the project team and the City of South Amboy in coordinating with NJDOT, the Federal Highway Administration (FHWA), NJHPO and other relevant agencies concerning the 2009 MOA. This task will entail preparing for and attending and two meetings to discuss approach and findings to fulfilling the MOA. Additional time is provided for coordination through phone calls, e-mails or memorandum, as necessary.

Task 2 – Surveying

Hunter Research will undertake archaeological documentation of the offshore pilings to satisfy Stipulation III of the 2009 MOA and will assist the project team's landscape architect by providing historical and archaeological data and insights in support of satisfying Stipulation IV, which may include, for instance, salvage and re-use of stone sleepers found on site as shoreline protection.

The offshore and shoreline pilings are 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. Documentation will record pertinent data relating to pilings in the offshore area and along the shoreline, offshore of the mean low water line. Lines of piles and other cultural features that clearly extend from offshore beyond the mean low water line on to the shore itself will also be included in the documentation. These piles once supported piers or tie-ups for barges. The goal of the documentation is to provide sufficient documentation to develop an understanding of the evolution of the piling system from the 1830s to the 1960s.

A suggested procedure for the piling documentation is provided below and will be discussed with NJHPO staff prior to implementation. If NJHPO requires a substantially different approach to this work, Hunter Research reserves the right to revise the scope and cost for this task. Archaeological documentation will typically be undertaken under low tide conditions over a period of approximately one to two weeks using a shallow boat for access to the offshore pier locations. Those piers and wharf remains along the shoreline and within pedestrian reach of the shore will be examined and documented on foot. It is anticipated that the offshore work will take place intermittently in roughly four-hour blocks of time, possibly on non-contiguous days, in order to make best use of low tide conditions. GPS technology (Trimble GeoExplorer 7X with sub-foot accuracy) will be used to survey the locations of key pilings, e.g., those at the ends of lines of piers of similar type, or those of particular interest. GPS survey data will be supplemented with information gathered from drone-acquired georeferenced photomosaic aerials and currently available geo-rectified aerial photographs to provide comprehensive mapping. The 1979 aerial coverage, for example, is high-resolution and of exceptional quality, showing many piers that are just below the water surface. General views of lines of

pier/wharf remains will be recorded with high resolution digital photography and selected digital photographs will be taken of representative pilings and of individual pilings of particular interest (e.g., those with hardware). No artifacts will be retained during the course of the documentation and no sampling of piers for species identification will be undertaken.

In combination with the piling documentation, Hunter Research will also examine and survey the shoreline of the project site, recording the presence of re-used stone sleepers through land-based and drone photography. Spot elevations will be taken selectively on stone sleepers where they form clear linear arrangements of shoreline protective masonry. The existence and distribution of stone sleepers visible at the ground surface will mapped and their approximate quantity and condition will be discussed in the technical report.

A brief technical report on this work will be prepared and included as a supplement/appendix to the document produced in 2015. The report will detail the methodology used for the piling and stone sleeper documentation, provide mapping showing the locations of the piers/wharves and shoreline structures, and incorporate a selection of photographs. The report will also broadly interpret the documented remains, placing them within the context of the history and evolution of the Camden and Amboy Railroad ferry terminal as presented in the 2015 document. The report (supplement/appendix only) will be submitted in draft for review purposes in .pdf format. The final report (supplement/appendix only) will be submitted in both digital and printed form. The hard copy version of the report (supplement/appendix only) will include photographs printed in high resolution .tiff format. Three printed copies of the final report (supplement/appendix only) will be submitted, including one copy prepared to NJHPO specifications. Hunter Research will supply the project team and the City of South Amboy with a DVD containing all GIS files, digital photographs, aerials and mapping generated by this documentation project.

In documenting the Westmoreland coal pier, Hunter Research will prepare a Historic American Engineering Record (HAER) documentation package consisting of a historic narrative, photographs and measured drawings. This documentation will be prepared to state-level standards as typically required by NJHPO. The photographs will consist of high-quality digital 35mm photography to National Register standards (2000 x 3000 dpi). Photographs will be printed on a printer using archivally stable inks on acid-free 4 x 6 inch paper, as well as provided on DVD/CD.

The documentation package will include a written narrative that includes the name of the property, location, builder, a narrative of historical and architectural significance, and the names of the preparers and sponsoring organizations. The narrative will provide an overview history of the coal pier. The narrative will include high-quality reproduction of historic images and maps.

Measured drawings will be prepared in elevation view and cross section, to the extent safety and visibility allows, given the dilapidated nature of the structure. Hunter Research proposes to capture this data through a combination of photogrammetry and

hand measuring techniques, assisted by drone technology. Photogrammetry will be digitally rectified and measured drawings produced from digital and manually gathered data. The measured drawings will be provided as a digital PDF at a size of 24 inch by 36 inch, and reduced to quarter size pullouts for inclusion in the documentation package. Four hard copies of the HAER documentation package will be provided, with accompanying CDs.

In addressing Stipulation IV Hunter Research will advise and assist the project landscape architect to ensure that pertinent features of the designed ferry facility will be compatible with the historic architecture and engineering characteristics, features and setting of the Camden and Amboy Railroad (Main Line) Historic District and 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*. Hunter Research's Principal Archaeologist and Principal Architectural Historian will conduct a site visit with the landscape architect and other project team members to impart their detailed knowledge of the project site's historic and archaeological features. Through a combination of meetings and memoranda, Hunter Research will also assist in developing landscaping plans that incorporate on-site interpretive materials and/or displays making use of historic railroad artifacts (notably catenary structures and stone sleepers) and other historic railroad-related features.

Task 3 – Site Design

During the design process, Hunter Research anticipates reviewing the project plans as they evolve for compliance with the stipulations of the 2009 MOA. Hunter Research will provide the project design team with historical and archaeological input and ideas as needed, with particular attention being given to ways in which the re-use of historic materials and the use of new materials can reflect the project site's significant history. Potential project impacts on archaeological resources (e.g., from new construction, grading, drainage, utility installations) will be assessed with reference to the considerable body of archaeological knowledge already compiled for the site. Recommendations will be offered concerning how to proceed with addressing archaeological impacts either before or during construction.

Task 4 – Architectural Services

No Hunter Research involvement.

Task 5 – Permitting

It is assumed that the 2009 MOA addresses all potential historical and archaeological issues that may arise in the design process. Permitting procedures that might normally trigger cultural resources review by the NJHPO (e.g., Freshwater Wetlands Protection Act, Waterfront Development Permit) will not come into play in this instance. On this basis, there will be no Hunter Research involvement in this task.

Task 6 – Meetings

Hunter Research anticipates preparation for and attendance at four of the eight regular progress meetings and one pre-application meeting with NJDEP. It is not expected that the Principal Archaeologist and Principal Historian/Architectural Historian will both attend all of these meetings; in some instances, one or other of these individuals may attend depending on the content of the meeting agenda.

Appendix C

WESTMORELAND PIER – STATE-LEVEL HAER DOCUMENTATION

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy
Middlesex County
New Jersey

DIGITAL PHOTOGRAPHS

DRAWINGS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

STATE-LEVEL HISTORIC DOCUMENTATION
Historic American Engineering Record – Level III Equivalent
New Jersey Historic Preservation Office
501 East State Street
Station Plaza Building 5, 4th Floor
Trenton, NJ 08609

INDEX TO COLOR DIGITAL PHOTOGRAPHS

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy
Middlesex County
New Jersey

Photographers: Joshua Butchko, James S. Lee III and Evan Mydlowski

Photographs were taken with a combination of drone photography using a DJI Phantom 4 Pro camera and surface-level photography using Panasonic TS3 and Olympus TG6 digital cameras. Original images were captured in JPEG format and converted to TIF format for archival stability with minimum of 1600 x 1200 pixels and 300 dpi. Digital contact sheets were made for reference and appended to the report.

Photograph No.

1 General setting, aerial view looking south with Westmoreland Pier center of view and Lehigh Pier in background. Evan Mydlowski, photographer. June 4, 2019.

2 General setting, aerial view looking east with Westmoreland Pier at bottom right and Lehigh Pier at top. Evan Mydlowski, photographer. August 8, 2019.

3 Westmoreland Pier, aerial view looking northeast along the long axis of the pier. Evan Mydlowski, photographer. June 4, 2019.

4 South side of the Westmoreland Pier, view looking north from shoreline. Joshua Butchko, photographer. June 3, 2019.

5 North side of the Westmoreland Pier, view looking east from shoreline. James S. Lee III, photographer. September 1, 2020.

6 East end of the Westmoreland Pier, view looking west from water. Joshua Butchko, photographer. August 8, 2019.

7 South side of the eastern end of the Westmoreland Pier, view looking north from the water. Joshua Butchko, photographer. August 8, 2019.

8 East end of the Westmoreland Pier, looking west from the water. Joshua Butchko, photographer. August 8, 2019.

9 Northeast corner of the Westmoreland Pier, looking south from the water. Joshua Butchko, photographer. August 8, 2019.

10 Detail of pilings on south side of the Westmoreland Pier, view looking northwest. Joshua Butchko, photographer. August 9, 2019.

11 Detail of wood sheeting on north elevation of the Westmoreland Pier, view looking southeast. James S. Lee III, photographer. September 1, 2020.

12 Northeast corner of the Westmoreland Pier, looking north along line of pilings extending into the bay. Joshua Butchko, photographer. June 11, 2019.

13 View looking southwest along top of the south side of the Westmoreland Pier. Joshua Butchko, photographer. June 4, 2019.

14 Chain embedded in concrete, east end of the Westmoreland Pier, view looking north. Joshua Butchko, photographer. June 4, 2019.

15 Cleat attached to concrete, east end of the Westmoreland Pier, view looking northeast. Joshua Butchko, photographer. June 4, 2019.

AUGUST 2019

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy Middlesex County New Jersey

PHOTOGRAPH KEY
Drawn by Hunter Research, Inc./E. Mydlowski (Nov. 2020)

NJ_Middlesex County_South Amboy_Westmoreland Pier_01

NJ_Middlesex County_South Amboy_Westmoreland Pier_02

NJ_Middlesex County_South Amboy_Westmoreland Pier_03

NJ_Middlesex County_South Amboy_Westmoreland Pier_04

NJ_Middlesex County_South Amboy_Westmoreland Pier_05

NJ_Middlesex County_South Amboy_Westmoreland Pier_06

NJ_Middlesex County_South Amboy_Westmoreland Pier_07

NJ_Middlesex County_South Amboy_Westmoreland Pier_08

NJ_Middlesex County_South Amboy_Westmoreland Pier_09

NJ_Middlesex County_South Amboy_Westmoreland Pier_10

NJ_Middlesex County_South Amboy_Westmoreland Pier_11

NJ_Middlesex County_South Amboy_Westmoreland Pier_12

NJ_Middlesex County_South Amboy_Westmoreland Pier_13

NJ_Middlesex County_South Amboy_Westmoreland Pier_14

NJ_Middlesex County_South Amboy_Westmoreland Pier_15

INDEX TO DRAWINGS

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy
Middlesex County
New Jersey

Delineators: Michael Brown, James S. Lee III and Evan Mydlowski

Drawing No.

0 15 30 60 90 120

Feet

AUGUST 2019

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy Middlesex County New Jersey

DRAWING NO. 1
AERIAL PLAN WITH OVERALL DIMENSIONS
Drawn by Hunter Research, Inc./E. Mydlowski (Nov. 2020)

Section 1

Match Line

10

0

Feet

0 10

Section 2

Match Line

Section 1

Section 2

Match Line

30

0

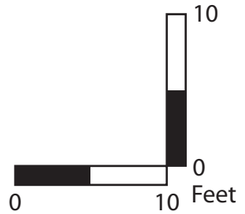
Feet

0 30

AUGUST 2019

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy Middlesex County New Jersey

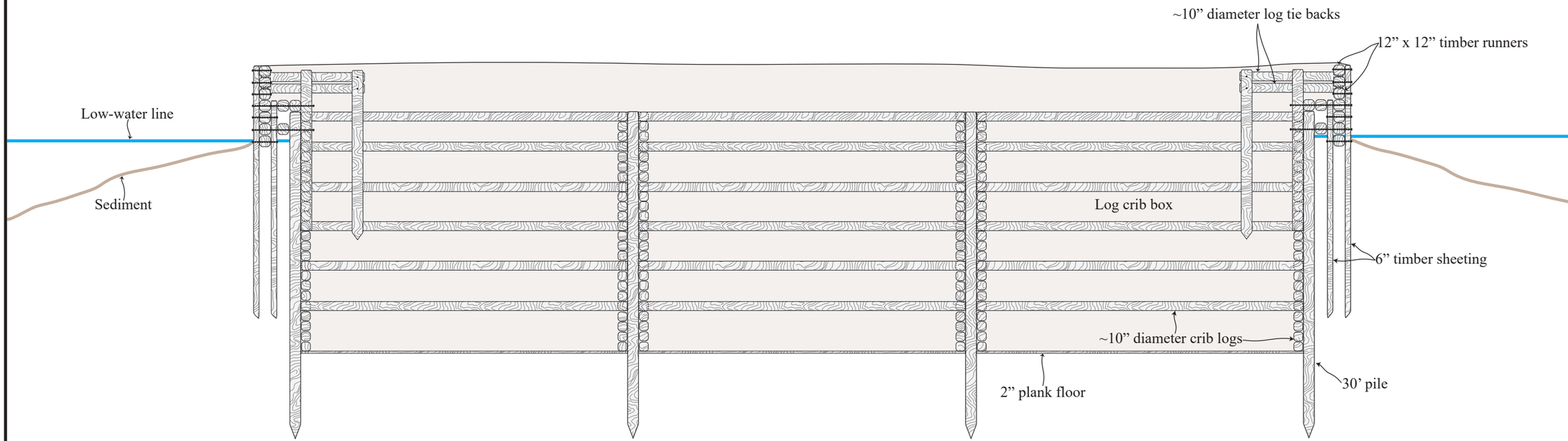
DRAWING NO. 2
RECTIFIED PHOTOMOSAIC OF SOUTH ELEVATION
Drawn by Hunter Research, Inc./E. Mydlowski (Nov. 2020)



AUGUST 2019

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy Middlesex County New Jersey

DRAWING NO. 3
RECTIFIED PHOTOMOSAIC OF EAST ELEVATION
Drawn by Hunter Research, Inc./E. Mydlowski (Nov. 2020)



0 10

Feet (*approx.*)

N

Iron

Earth Fill

Wood

SEPTEMBER 2020

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)
City of South Amboy Middlesex County New Jersey

DRAWING NO. 4
IDEALIZED CROSS SECTION
Drawn by Hunter Research, Inc./M. Brown (Nov. 2020)

STATE-LEVEL HISTORIC DOCUMENTATION
Historic American Engineering Record – Level III Equivalent

WESTMORELAND PIER
(Pennsylvania Railroad Pier A)

Location:	Main Street, City of South Amboy Middlesex County, New Jersey The approximate center point of the Westmoreland Pier is located at latitude 40.489522, longitude -74.275840 (New Jersey State Plane Coordinate System, NAD 83). The pier is on the southwestern shore of Raritan Bay between 2,000' to 2,800' to the east of Main Street.
Date(s) of Construction:	*circa* 1872, reconfigured *circa* 1911.
Architect/Engineer/ Builder:	United New Jersey Railroad and Canal Company, *circa* 1872 Pennsylvania Railroad Company, New York Division, *circa* 1911
Original Owner And Use:	The original owner was the United New Jersey Railroad and Canal Company, a corporate successor of the Camden and Amboy Railroad. The Westmoreland Pier was built *circa* 1872 as a coal trestle pier at the railroad's South Amboy marine terminal. It was reconfigured as a bunker coal pier to supply steamships *circa* 1911.
Present Owner And Use:	The present owner is the City of South Amboy. The Westmoreland Pier is currently out of use.
Summary of Significance:	The Westmoreland Pier is the remnant of a coal trestle pier that was built *circa* 1872 to transfer coal via gravity from railroad cars to barges and lighters.[1] In the early decades of the pier's operation, coal arrived by train from bituminous coal mines in Westmoreland County in western Pennsylvania (hence the name) and neighboring coalfields in western Maryland. Bituminous coal was primarily used to generate steam for industrial applications and was sometimes referred to as "steam coal." Coal yards and factories in and around New York City's harbor were the ultimate destination for much of the coal.

[1] Lighters, as discussed in this document, are small, shallow-draft boats used for loading coal to ships waiting offshore.

The construction of the Westmoreland Pier and its neighboring Lehigh Pier, which handled anthracite coal, marked a major shift in operations at the South Amboy railroad terminal. South Amboy served the Camden and Amboy Railroad as a passenger and freight tidewater terminal beginning in 1831, marking it as one of the first tidewater terminals in the United States; however, it was increasingly used to handle slower moving freight and bulk materials, particularly coal, during the third quarter of the 19th century and by the last quarter of the century was almost exclusively handling coal by tonnage. Additional piers were built at South Amboy for handling munitions and fuel oil during the first quarter of the 20th century.

In its original configuration of *circa* 1872, the Westmoreland Pier supported a single-story timber trestle across its entire width and length. This trestle carried bottom-dumping coal cars out over a series of chutes that directed the coal into waiting barges and lighters by the force of gravity. The remnant pier, as it exists today, is judged to retain a log crib box substructure that was built to support the heavy weight of the trestles and the cars carrying their loads of coal. The crib substructure was built by the United New Jersey Railroad and Canal Company, which formed in 1872 from a merger of the Camden and Amboy Railroad, New Jersey Railroad and the Delaware and Raritan Canal, all of which were then immediately leased to the Pennsylvania Railroad. The upgrade of the coal-handling wharfs at South Amboy was a key part of the Pennsylvania Railroad's strategy of competing in the New York City region.

The coal-handling operations at the Westmoreland Pier were reduced in scale in 1911 when the neighboring Lehigh Pier was improved with two McMyler coal dumpers. The Pennsylvania Railroad removed the Westmoreland Pier's coal trestle *circa* 1911 and then shortened the pier to about half of its original 800' length. It reconfigured the pier by adding a single coal hoist to load bunker coal into lighters, tugs and other smaller steamships. A walkway and tie-up rack were added off the northeast end of the pier for docking tugboats and barges. The Westmoreland Pier ceased being used for coal transfer with the economic collapse of railroad operations at South Amboy during the 1970s. For a period from the mid-1980s to 2013, it supported a neighboring aggregate shipping business.

The Westmoreland Pier is historically significant as a remnant example of railroad marine terminal operations and pier construction techniques of the 1870s to the 1910s. Resources of this type were vital to the commercial growth of the New York City region. The pier is located in the Camden and Amboy Railroad Main Line Historic District, which was first opined eligible by the New Jersey Historic Preservation Office in 1987, with subsequent revisions and boundary clarifications.

Description: The Westmoreland Pier is a rectangular plan, wood and earthen structure measuring approximately 420' long on its west-to-east axis as measured along its northern elevation extending eastward into Raritan Bay.[2] The pier's southern elevation is considerably shorter at 224' long due to the angle of the shoreline and sedimentation south of the pier. The pier is approximately 99' wide on its south-to-north axis, as measured at the eastern end of the pier. The land end of the pier is slightly wider at 104'. An additional line of timber piles extends 412' eastward from the pier's northeast corner. These piles, which originally supported a walkway following the reconfiguration of the pier *circa* 1911, historically served as a tie-up rack for barges and other watercraft.

The pier has a relatively level earth-filled deck with an elevation of approximately 7' to 8' feet above sea level. Erosion of the deck, particularly at the eastern end of the pier, has exposed rock masonry fill, mixed with building debris. Also visible at the east end of the pier are a metal ship cleat, which is bolted to a concrete block embedded in the deck, and two links of a large metal chain with one end embedded in concrete. The remainder of the deck is for the most part covered in vegetation. The pier historically supported a coal trestle (*circa* 1872-1910) and later an office and coal hoist (*circa* 1911-1975). A concrete frame with protruding square reinforcing bars is visible in an eroded area of the deck at the southern edge of the pier, approximately 45' to 60' west of the pier's southeastern corner. This location corresponds to where a coal hoist was located from 1911 to 1975. The frame is a U-plan structure approximately 15' wide at the base along the edge of the pier with 10' legs extending at right angles northward and under the pier's earth deck.

The north and south edges of the Westmoreland Pier are defined by a perimeter of timber sheet pilings or whalers, meant to protect the pier from wave action and the crushing motion of docked watercraft bumping against it. The timber sheet piles are driven into the bottom of the bay and secured by metal bolts to horizontal 12" x 12" creosoted timber runners. The sheeting and top rows of timber runners are secured into the pier with timber log tiebacks embedded in the earth and visible at several locations where erosion has occurred. The east end of the pier is similarly constructed although with an additional row of timber fender piles located at the water's edge outside the timber sheeting. The age of the timber sheeting is unknown but it comports with sheeting described as existing at the pier in 1916. At that time, an Interstate Commerce Commission (ICC) inspector reported that the sheeting was being continually repaired and replaced as needed at a rate of about 50 percent every eight to ten years. It

[2] The Westmoreland Pier's long axis trends southwest-to-northeast but for purposes of consistency and clarity the landward end of the pier will be referred to as the west end of the pier, and the two sides of the pier are described as the north elevation and the south elevation.

appears from the condition of the existing sheeting that the railroad kept up this practice well into the 20th century.[3]

The interior construction of the Westmoreland Pier, although not visible to inspection, is assumed to be the oldest and least altered of its structural elements. In 1916, the ICC reported that the interior was composed of a series of box-shaped timber crib boxes (resembling Lincoln log construction), measuring 100' long by 30' wide by 22' high. These crib boxes are judged to have been part of the pier's original construction *circa* 1872. Based on overall dimensions, the surviving remnant of the Westmoreland Pier is likely composed of 12 timber crib boxes for an overall plan of 400' x 90', not including the outer layers of timber sheet piles and runners. The boxes were reported as having 2"-thick plank slab floors, open tops and log sides joined by log ties, all composed of hemlock. These crib boxes were pre-built and floated into place following dredging. After being sunk to the bottom, the boxes were filled with mud and earth and leveled to achieve the desired final elevation, reportedly about 9' to 11' above the low water line, which also conforms well with the pier's present-day elevation. An idealized schematic cross section has been prepared based on an interpretation of the ICC records.[4]

History: The Westmoreland Pier was built *circa* 1872 by the United New Jersey Railroad and Canal Company, which formed that year from a merger of the Camden and Amboy Railroad, the New Jersey Railroad and the Delaware and Raritan Canal. The Camden and Amboy Railroad's tidewater marine terminal at South Amboy was established in 1831 as that railroad's original northeastern terminus where ferries transferred passengers and freight bound to and from New York City and other points around New York harbor. The pioneering railroad, known for its association with the Stevens family of Hoboken, enjoyed many technological firsts, including perhaps most importantly the development of a T-shaped iron rail that became an American and eventually a worldwide standard. The Camden and Amboy Railroad's original pier was built out from a sandy spit of land located between 300' and 500' northwest to northeast of the Westmoreland Pier.[5]

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[3] Interstate Commerce Commission (ICC), Valuation Records for the United New Jersey Railroad and Canal Company, "Pier A, South Amboy", November 22, 1916, Section 3.2, Record Group 34, on file at the National Archives and Records Administration, Washington, D.C.

[4] Ibid.

[5] For more on the Camden and Amboy Railroad's pier, see Hunter Research, Inc., Cultural Resource Investigations, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey, Prepared for City of South Amboy (December 2015, Supplemental January 2018), and Hunter Research, Inc., Archaeological Documentation, Camden and Amboy Railroad/Pennsylvania Railroad Wharves (Intermodal Ferry Transportation Center), City of South Amboy, Middlesex County, New Jersey, Prepared for City of South Amboy (November 2020).

More than 100,000 passengers and 10,000 tons of freight passed through South Amboy annually during the 1830s, but by the early 1840s the original terminal had been surpassed by a more direct railroad connection between Philadelphia and New York City. This new route passed through Newark, New Brunswick and Trenton, roughly corresponding to the present-day Amtrak Northeast Corridor. As this new line took over the bulk of the passenger and fast freight service crossing the state, the terminal at South Amboy was relegated to local passenger service and handling slower freight and bulk materials.

As the region's rail systems became ever more connected in the third quarter of the 19th century, South Amboy's role was increasingly that of handling shipments of coal arriving from the coalfields of eastern Pennsylvania (anthracite) and eventually western Pennsylvania and Maryland (bituminous), much of it bound for market in New York City. When the Pennsylvania Railroad leased the United New Jersey Railroad and Canal Company in 1872 to ensure its access to the Port of New York, South Amboy was well on its way to becoming one of the port's major coal terminals with the Lehigh Pier designated for anthracite coal and the Westmoreland Pier designated for bituminous coal. Competing coal docks in northern New Jersey were those of the Erie Railroad in Weehawken, the Delaware, Lackawanna & Western Railroad in Hoboken, the Central Railroad of New Jersey in Jersey City and Bayonne, and the Lehigh Railroad in Perth Amboy. The Pennsylvania Railroad also built a coal dock at Greenville in Jersey City in 1904.[6]

With the vast financial resources at the disposal of the Pennsylvania Railroad, little time was wasted improving and expanding coal-handling operations at South Amboy. In 1872, the company's annual report noted construction of "a large trestle, for storing and transferring bituminous coal to vessels, was erected at South Amboy," obviously referring to the Westmoreland Pier.[7] The pier's earliest appearance on one of the standard maps of the era is the *Combination Atlas Map of Middlesex County, New Jersey*, published by Everts & Stewart in 1876 (Figure 1).[8] The map

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[6] Carl W. Condit, *The Port of New York; A History of the Rail and Terminal System from the Beginnings to Pennsylvania Stations,* Volume 1 (Chicago: University of Chicago Press, 1981).

[7] Pennsylvania Railroad Company, *Twenty-Sixth Annual Report of the Board of Directors of the Pennsylvania Railroad Co. to the Stockholders, March 11, 1873,* (Philadelphia: E. C. Markley & Son, 1873), p. 69. Pennsylvania Railroad Company records, which are fragmentary and stored in several repositories, were searched at the Hagley Museum and Library in Wilmington, Delaware, and indexes reviewed at the Pennsylvania State Archives in Harrisburg and the Pennsylvania Railroad Museum in Strasburg, Pennsylvania. No plans for the Westmoreland Pier were identified predating the 1910s.

[8] Matthew Hughes, *Map from Newark Bay to Washington Rock* (1868), copy on file, Osborn Cannonball House Museum, Scotch Plains, New Jersey; Everts & Stewart, *Combination Atlas Map of Middlesex County, New Jersey* (1876). In 1916, the ICC estimated the Westmoreland Pier had been built in 1859, apparently based on information

illustrates the western end of an approximately 800'-long pier accommodating six tracks, and a photograph of roughly the same date confirms these tracks were carried on a trestle-like structure that extended out onto a pier (Figure 2).

The Westmoreland Pier's operations appear to have been typical of mid- and late-19th-century coal trestle piers, also referred to as coal pocket piers. These piers supported timber trestles carrying rails that ran to the outer end of the pier. A coal car was placed over the top of a pocket, the doors at the bottom of the car opened, and the coal dropped from the car into the pocket to run down a chute into a waiting barge. The Pennsylvania Railroad modified the Westmoreland Pier in 1892, installing a patented Dodge Coal Storage Company conveyor system beneath the trestle for greater efficiency. The system, invented by James M. Dodge of Philadelphia in 1888, involved chain or rope-driven conveyors and elevators, powered by steam engines, which moved coal from large storage piles beneath the trestles into the barges. One of the principal advantages of this system was the ability of the coal pier and the adjacent yard to store excess supply of coal. The coal was stockpiled waiting to be on-loaded to barges, while empty coal cars were returned to service. This was especially important in winter when demand for coal was high and rail operations were sometimes disrupted by freezing temperatures and snow. A particular challenge was moisture freezing the coal within the open-top cars, meaning the coal could not be dumped until the weather warmed. Two views of the Westmoreland Pier, likely dating to *circa* 1900, show rows of barges and lighters against the sides of the pier (Figures 3 and 4).[9]

The Pennsylvania Railroad initiated a major change in the coal-handling system at South Amboy with the introduction of two McMyler car-dumping machines at the Lehigh Pier in 1910-11. The dumping machines replaced the trestles on the Lehigh Pier and were supported by a steam-powered coal-car thawing plant several hundred feet to the southwest of the pier. The new thawing and dumping system at the Lehigh Pier handled a continuous flow of higher tonnage coal cars in all weather and made the Westmoreland Pier's coal trestle functionally obsolete. By 1912, the Westmoreland Pier had been reconfigured as a smaller operation supplying lighters, steam tugs and other harbor vessels with bunker coal to power their marine engines. In modifying the pier, the Pennsylvania

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provided by South Amboy's foreman carpenter who was unlikely to have been present at South Amboy nearly 57 years earlier. It is believed that the atlas maps represent a more accurate assessment and that 1872 is a more plausible date than 1859.

[9] Hunter Research, Inc., Cultural Resource Investigations, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey, Prepared for City of South Amboy (December 2015, Supplemental January 2018), pp. 5-53 to 60.

Railroad removed the entire coal trestle superstructure and shortened the pier from 800' to 420', not including a narrow walkway and tie-up rack extending from the pier's northeast corner. At this point, the pier took on the overall plan that is evident today.

In its post-1911 configuration, the Westmoreland Pier was served by a railroad track that ran out onto the southern side of the pier along side of a coal hoist. This hoist, a tall steel-frame structure with a roughly 10' square operator's house, was located approximately 100' west of the southeast corner of the pier (Figure 5). The hoist was equipped with a bucket conveyor for filling the bunkers of vessels that tied up to the pier. The U-plan concrete base of the hoist is the only evidence of this operation that remains today. The Westmoreland Pier also supported a wood-frame office building, located in the northeast corner of the pier and measuring 12'-6" x 16'-6".[10]

The South Amboy terminal emerged as an important transshipment point for munitions during World War I, a role that expanded during World War II due to concerns of storing and transferring munitions near the population centers of New York City's inner harbor. When railroad cars and barges loaded with dynamite and anti-tank mines exploded at the South Amboy munitions pier, just to the north of the Westmoreland Pier, on May 19, 1950, all of the surrounding buildings were leveled or heavily damaged, including the coal hoist and office on the Westmoreland Pier. After the explosion, the Westmoreland Pier was returned to service with an old coal hoist relocated from the Pennsylvania Railroad's Greenville terminal in Jersey City. The office was also rebuilt (Figures 6 and 7). By the early 1970s, the Westmoreland Pier had ceased supplying bunker coal to steamships, a result of most vessels shifting from coal to oil. As judged by aerial photographs, two out-of-service freighters languished to either side of the pier from 1972 until the early 1980s. The pier's hoist, office and track were gone by 1979. Tugs and barges tied up to the pier until 2013. Most of these vessels were likely in service to Amboy Aggregates, a sand and gravel shipping business, which operated from South Amboy from *circa* 1984 to 2013.[11]

Sources:

Condit, Carl W. *The Port of New York; A History of the Rail and Terminal System from the Beginnings to Pennsylvania Stations.* Volume 1. University of Chicago Press, Chicago, Illinois. 1981.

[10] ICC, Valuation Records, 1916.

[11] National Environmental Title Research (NETR), *Historic Aerials* [aerial photographs from 1931 to 2017], on-line at www.historicaerials.com [accessed November 2020]; Tom Flagg, Aerial View of the Penn-Central South Amboy Ferry Terminal, 1972; New Jersey State Beach Erosion Commission, Commission Meeting, July 24, 1996; Greater Media, "So. Amboy Sand and Gravel Company on Track to Close," *Central Jersey Archives* (August 28, 2012).

Fancy, George. *South Amboy.* Images of America Series. Arcadia Publishing, Charleston, South Carolina. 1998.

Flagg. Tom. Aerial View of the Penn-Central South Amboy Ferry Terminal. 1972. Copy on file, Hunter Research, Inc., Trenton, New Jersey.

Hughes, Matthew. *Map from Newark Bay to Washington Rock*. 1868. Copy on file, Osborn Cannonball House Museum, Scotch Plains, New Jersey.

Everts & Stewart. *Combination Atlas Map of Middlesex County, New Jersey*. Everts & Stewart, Philadelphia, Pennsylvania. 1876.

Greater Media. "So. Amboy Sand and Gravel Company on Track to Close." *Central Jersey Archives.* August 28, 2012.

Hunter Research, Inc. Archaeological Documentation, Camden and Amboy Railroad/Pennsylvania Railroad Wharves (Intermodal Ferry Transportation Center), City of South Amboy, Middlesex County, New Jersey. Prepared for City of South Amboy. November 2020. On file, New Jersey Historic Preservation Office, Trenton, New Jersey.

_____. Cultural Resource Investigations, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey. Prepared for City of South Amboy. December 2015, Supplemental January 2018. On file, New Jersey Historic Preservation Office, Trenton, New Jersey.

Interstate Commerce Commission. United New Jersey Railroad Company, Trenton Division, Valuation Records (1914-1958), Section 3.2. Record Group 134. On file, National Archives, Washington, D.C.

National Board of Fire Underwriters and the Fire Insurance Rating Organization of New Jersey. *The South Amboy Port Explosion, South Amboy, N.J., May 19, 1950.* The National Board of Fire Underwriters, New York, New York.

National Environmental Title Research (NETR). *Historic Aerials* [aerial photographs from 1931 to 2017]. On-line at www.historicaerials.com [accessed November 2020].

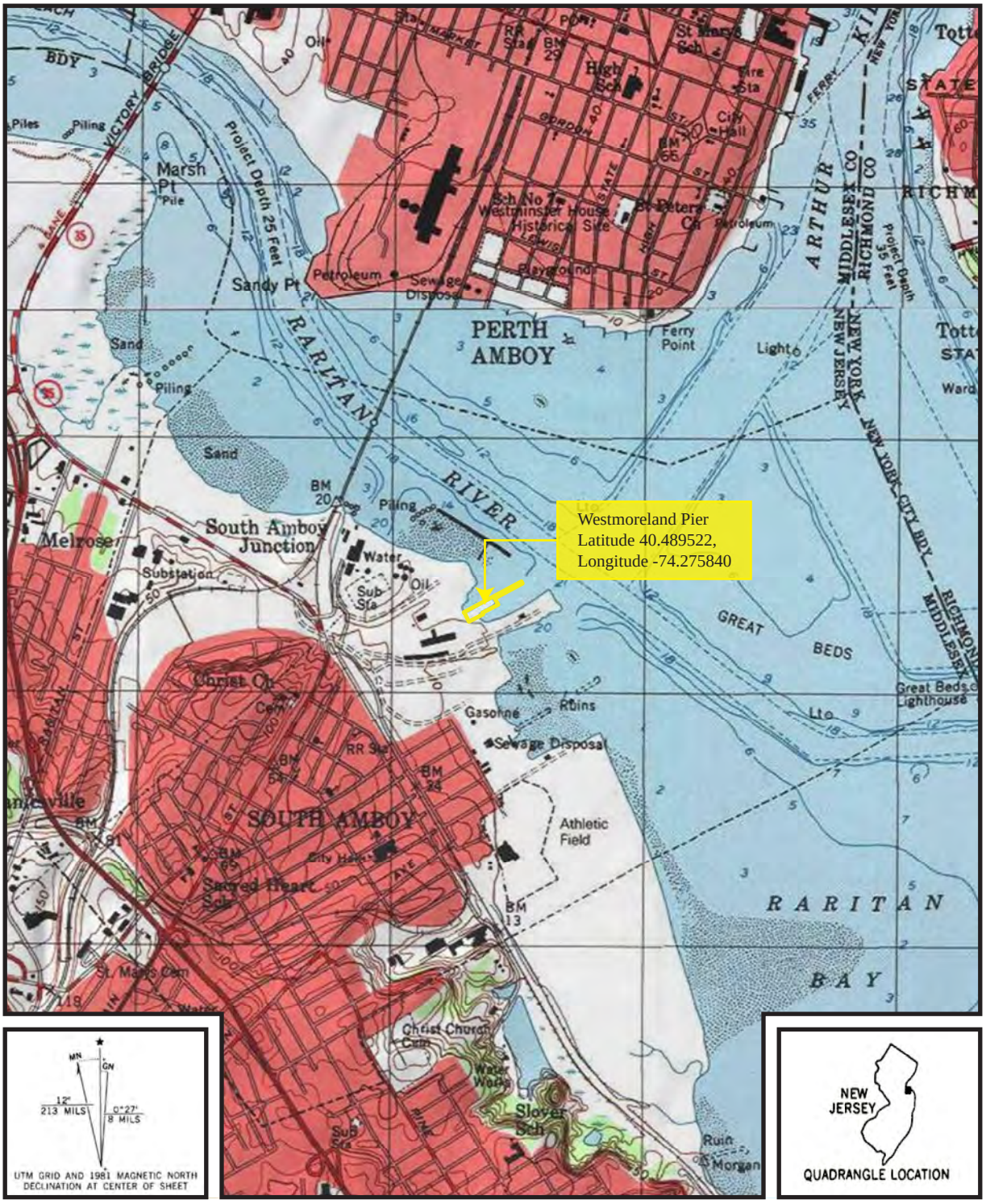
New Jersey State Beach Erosion Commission. Commission Meeting. July 24, 1996.

Pennsylvania Railroad Company. *Restoration of Facilities Damaged and Destroyed by Explosion, May 19, 1950.* Eastern Region, New York Division, United New Jersey Railroad and Canal Company, South Amboy, New Jersey. *Circa* 1951. On file, Hagley Museum and Library, Wilmington, Delaware.

Pennsylvania Railroad Company. *Twenty-Sixth Annual Report of the Board of Directors of the Pennsylvania Railroad Co. to the Stockholders, March 11, 1873.* E.C. Markley & Son, Philadelphia, Pennsylvania. 1873.

Historian: Patrick Harshbarger, November 2020

Project Information: Hunter Research, Inc. documented the Westmoreland Pier as cultural resources sub-consultant to French & Parrello Associates, consulting engineers. The work was executed on behalf of the City of South Amboy as part of the planning for redevelopment of the former South Amboy railroad terminal site as an Intermodal Ferry Transportation Center. This historic documentation partially fulfills a stipulation contained in a Memorandum of Agreement (MOA) executed in 2009 among the City of South Amboy, the New Jersey Department of Transportation and the New Jersey Historic Preservation Office. That MOA requires documentation of pilings and wharves impacted by project activities.



Detailed Location of the Westmoreland Pier, City of South Amboy, Middlesex County, New Jersey.

Source: USGS 7.5' Quadrangle: South Amboy, N.J. [1954, photorevised 1981].

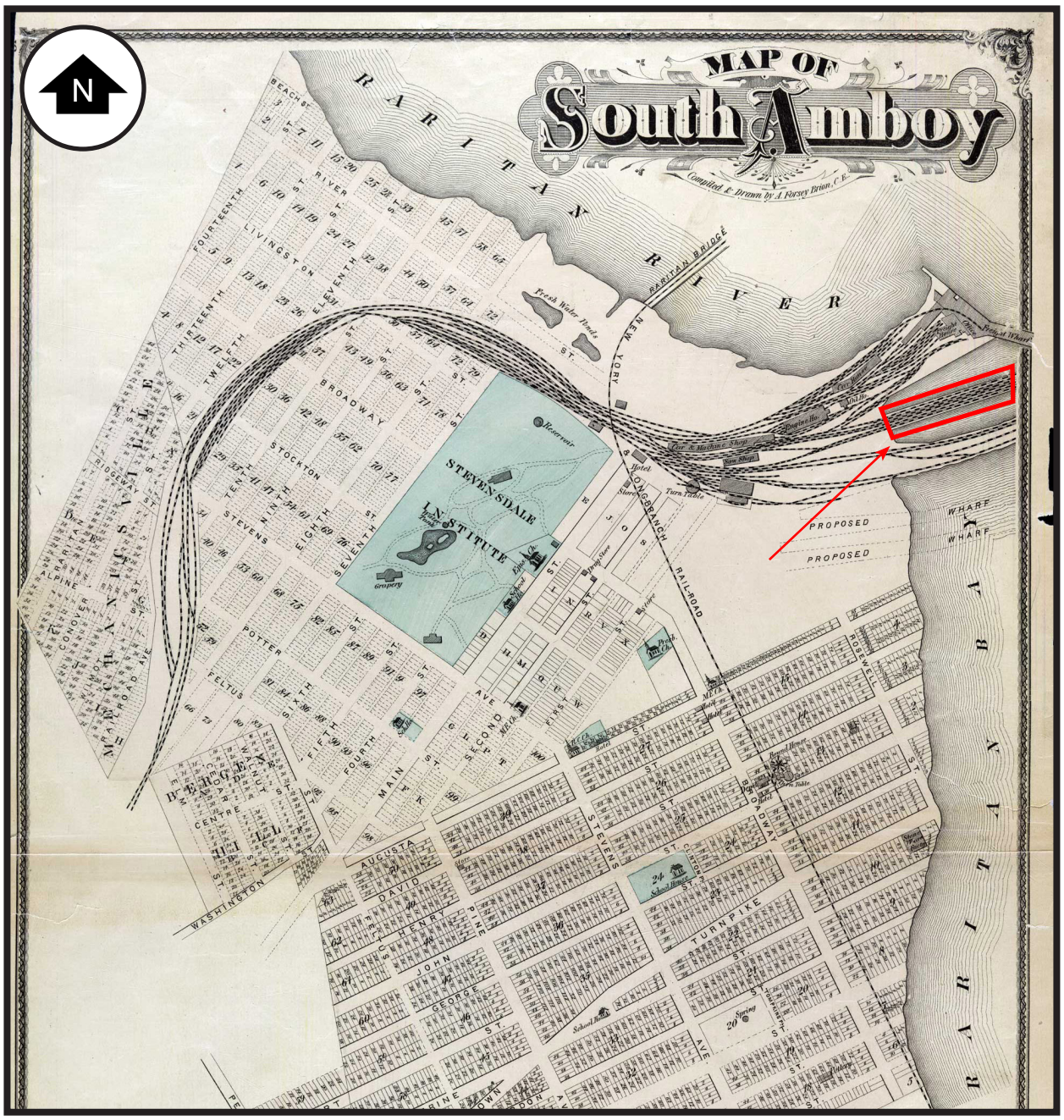


Figure 1. Everts & Stewart. Map of South Amboy. *Combination Atlas Map of Middlesex County, New Jersey.* 1876. Westmoreland Pier outlined. Scale: 1 inch = 1,200 feet (approximately).

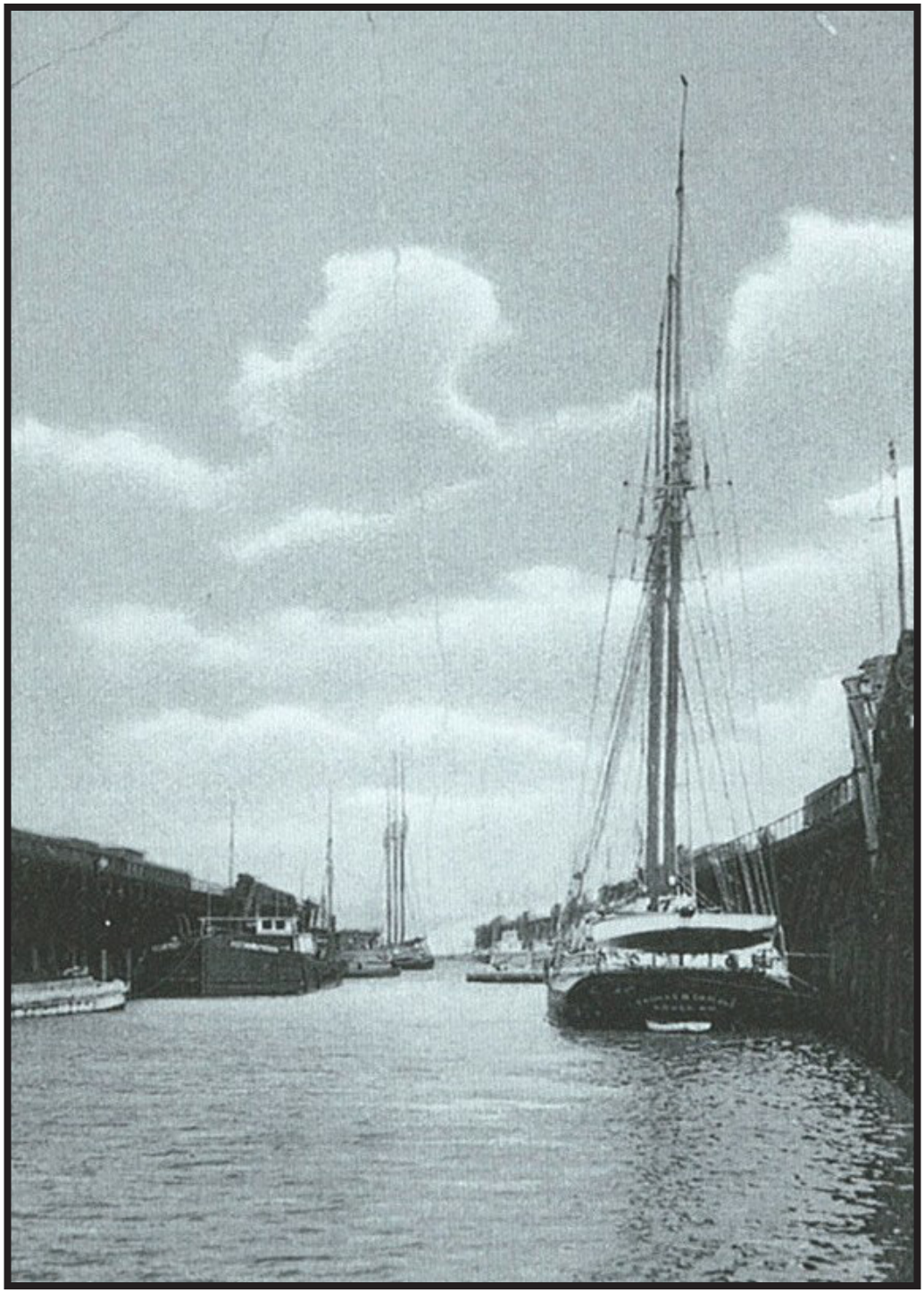


Figure 2. View looking northeast between the Westmoreland Pier (left) and the Lehigh Pier (right) at the South Amboy railroad terminal. *Circa* 1880 (Source: Francy 1998).

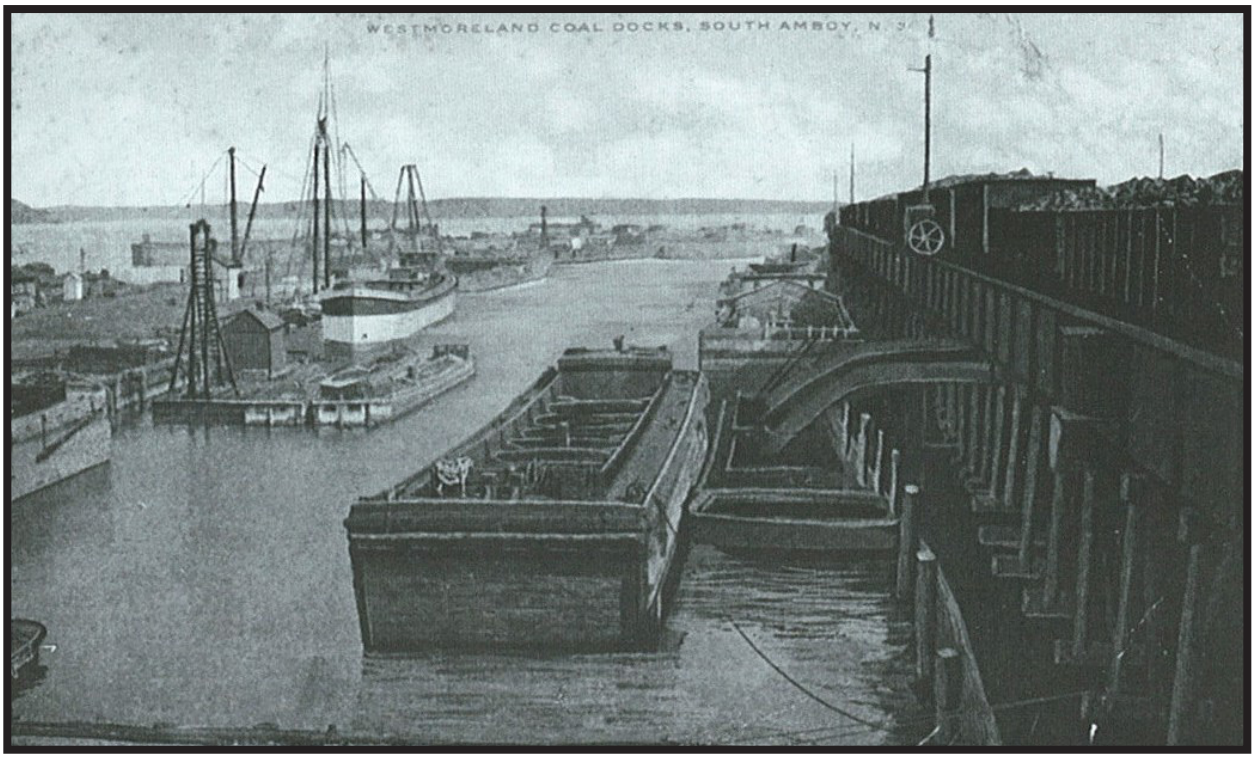


Figure 3. View looking northeast between the Westmoreland Pier (right) and the old Camden & Amboy Railroad freight pier (left). *Circa* 1900 (Source: Francy 1998).

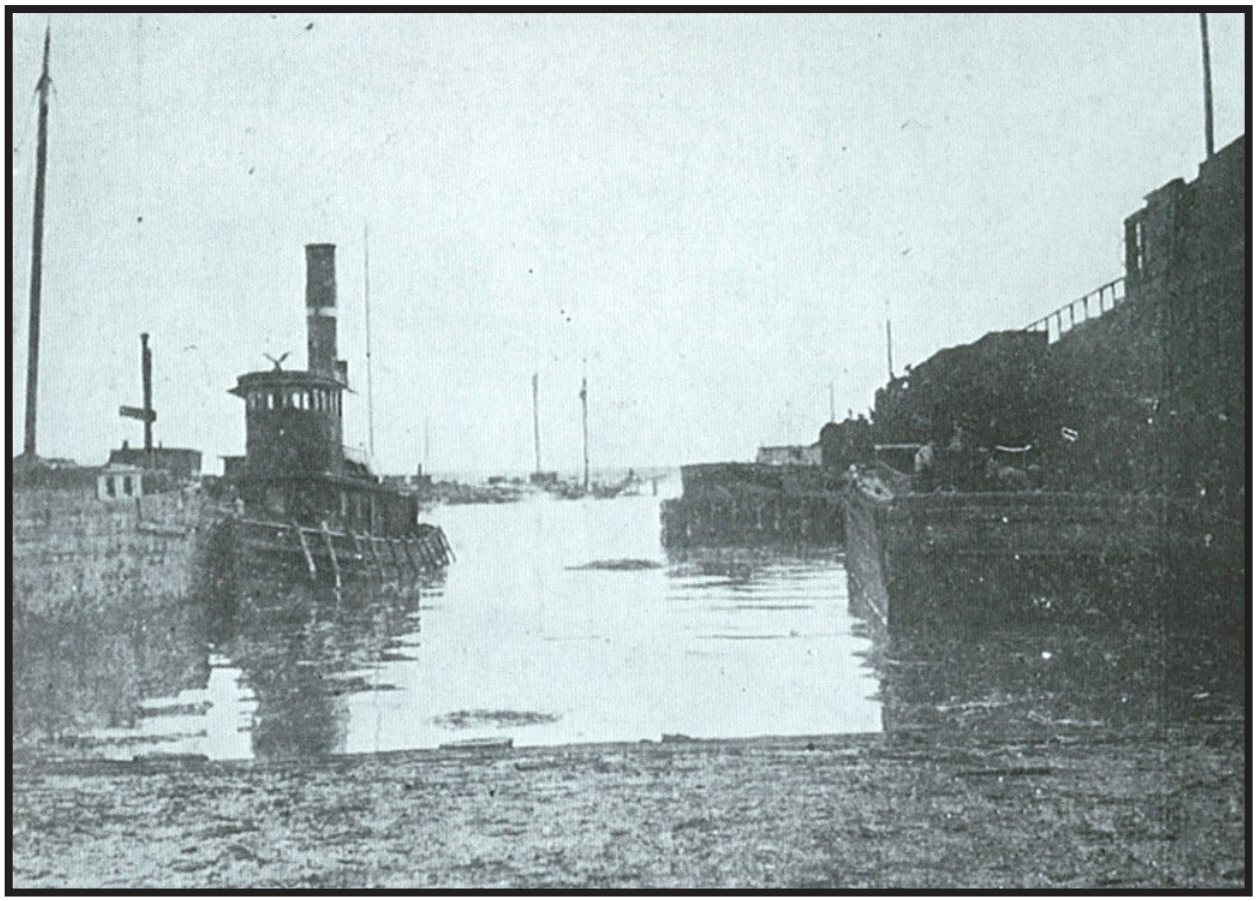


Figure 4. View looking northeast between the Westmoreland Pier (right) and the old Camden & Amboy Railroad freight pier (left). *Circa* 1900 (Source: Francy 1998).

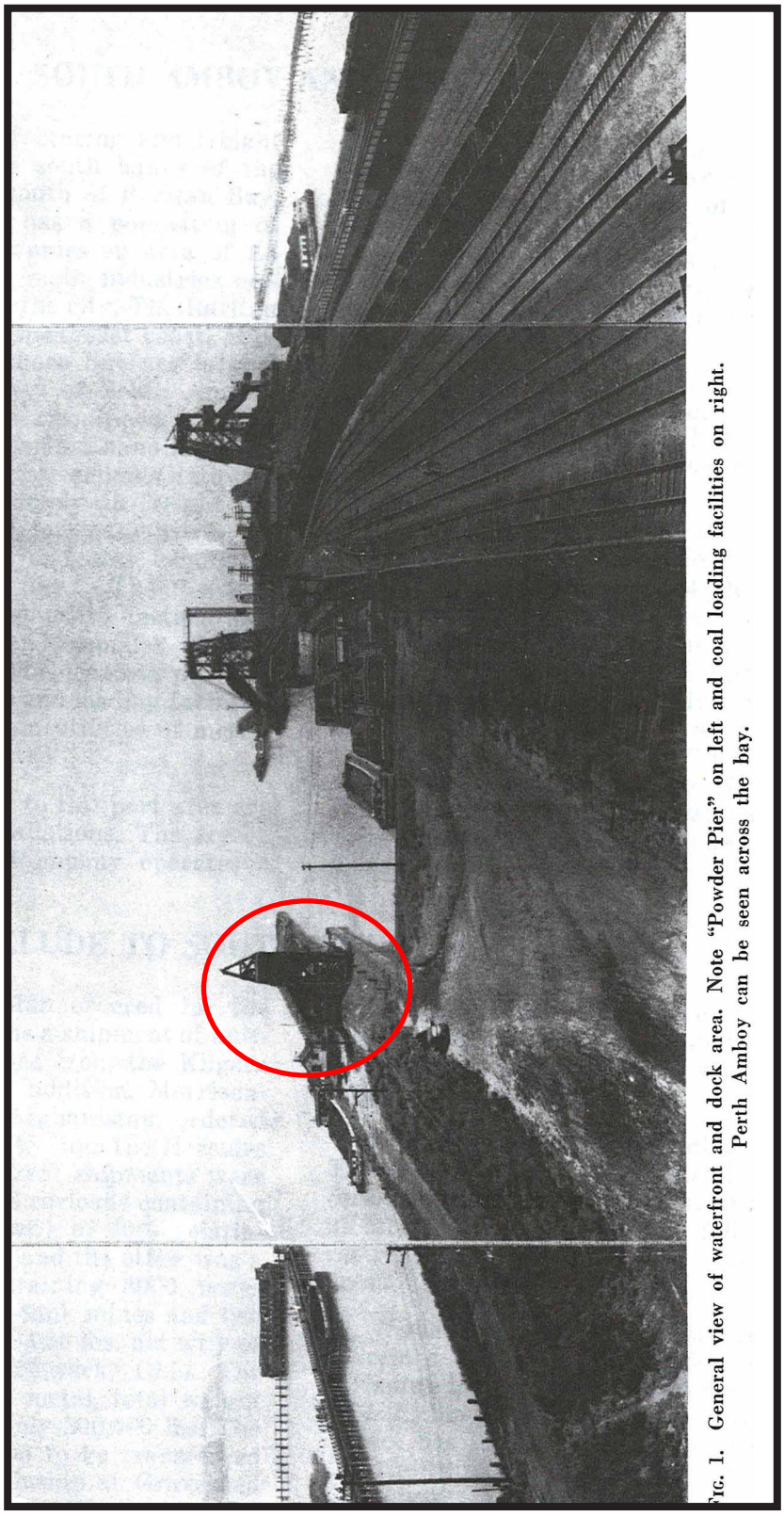


FIG. 1. General view of waterfront and dock area. Note "Powder Pier" on left and coal loading facilities on right. Perth Amboy can be seen across the bay.

Figure 5. Panoramic view looking northeast with the Westmoreland Pier (circled) and the Lehigh Pier (right). Clearly visible on the Westmoreland Pier are the coal hoist and office. Beyond the hoist is a raft of barges tied up to the pier's walkway and tie-up rack. *Circa* 1950. Source: National Board of Fire Underwriters *circa* 1953.

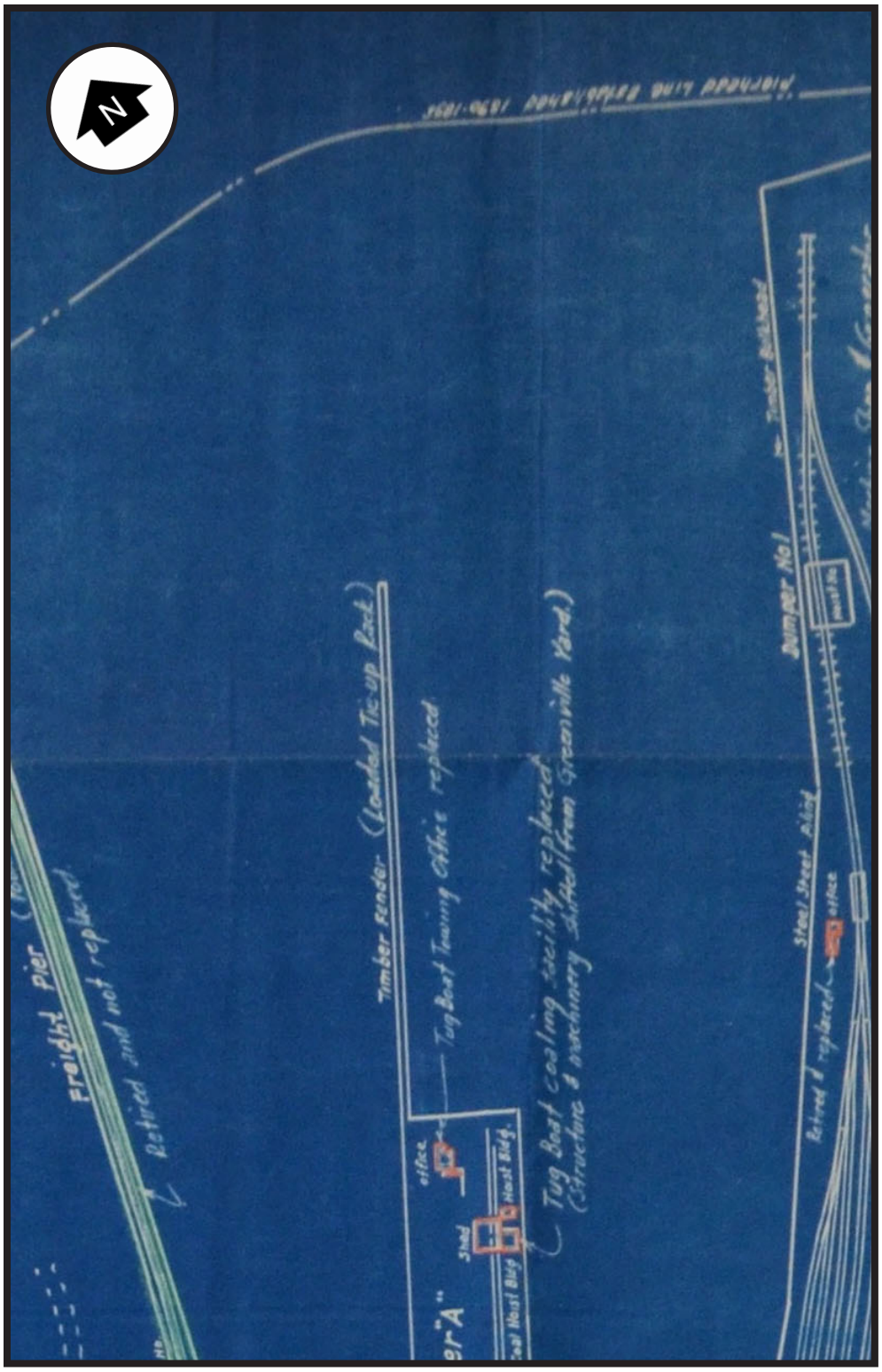


Figure 6. Pennsylvania Railroad. Restoration of Facilities Damaged and Destroyed by Explosion, May 19, 1950. Detail of Westmoreland Pier (Pennsylvania Railroad Pier A). *Circa* 1951. Scale: 1 inch = 160 feet (approximately).

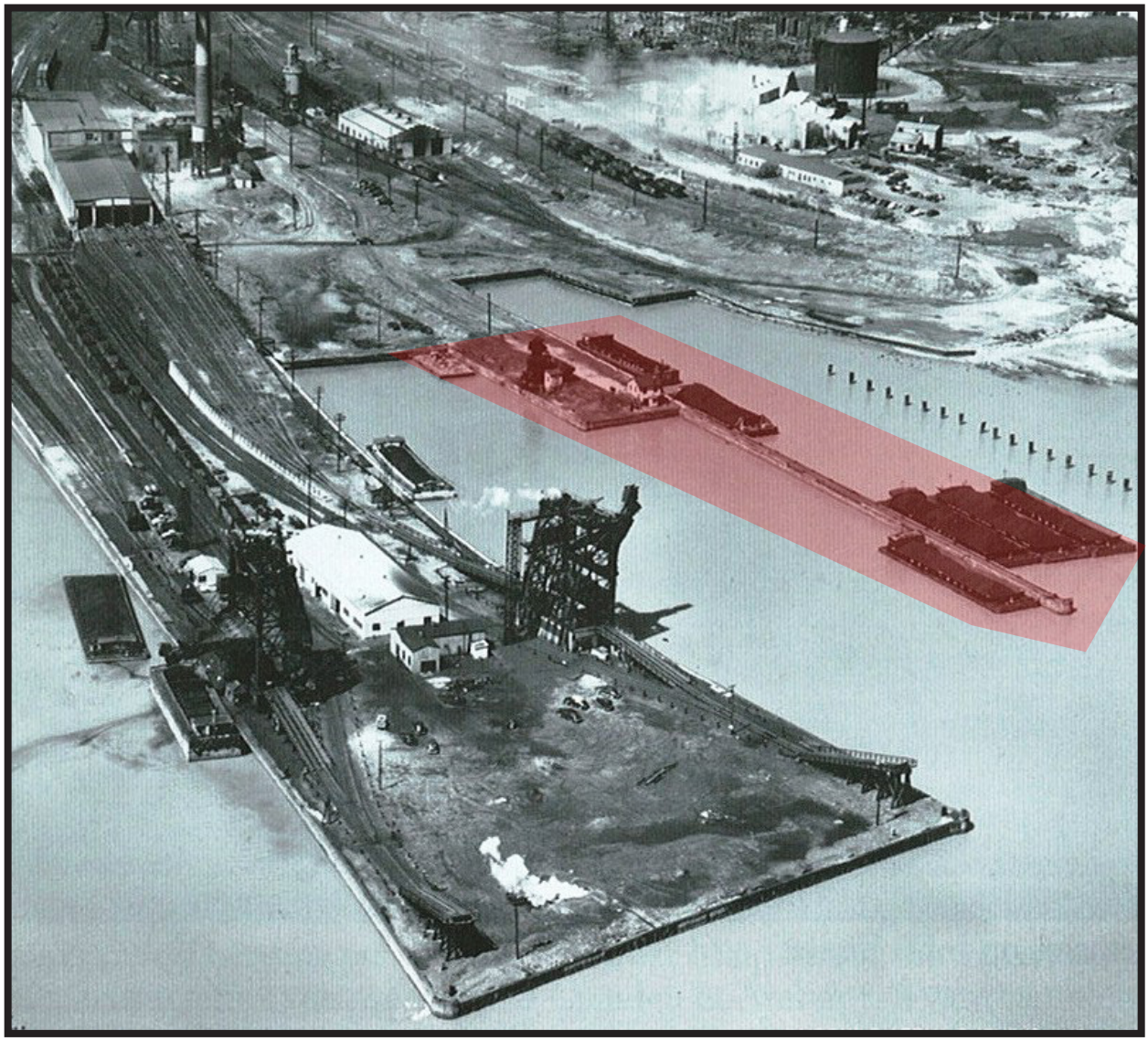


Figure 7. Aerial view of the South Amboy terminal, looking west, with the Westmoreland Pier (shaded). *Circa* 1953 (Source: Francy 1998).

Appendix D

LEHIGH PIER – STATE-LEVEL HAER DOCUMENTATION

LEHIGH PIER
(Pennsylvania Railroad Pier B)
City of South Amboy
Middlesex County
New Jersey

DIGITAL PHOTOGRAPHS

DRAWINGS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

STATE-LEVEL HISTORIC DOCUMENTATION
Historic American Engineering Record – Level III Equivalent
New Jersey Historic Preservation Office
501 East State Street
Station Plaza Building 5, 4th Floor
Trenton, NJ 08609

INDEX TO COLOR DIGITAL PHOTOGRAPHS

LEHIGH PIER
(Pennsylvania Railroad Pier B)
City of South Amboy
Middlesex County
New Jersey

Photographers: Alexis Alemy, Joshua Butchko and Evan Mydlowski

Photographs were taken with a combination of drone photography using a DJI Phantom 4 Pro camera and surface-level photography using Panasonic TS3 and Canon EOS Rebel SL2 digital cameras. Original images were captured in JPEG format and converted to TIF format for archival stability with minimum of 1600 x 1200 pixels and 300 dpi. Digital contact sheets were made for reference and appended to the report.

Photograph No.

1 General setting, aerial view looking east with Lehigh Pier top of view and Westsmoreland Pier bottom of view. Evan Mydlowski, photographer. August 8, 2019.

2 Lehigh Pier, aerial view looking east. Evan Mydlowski, photographer. June 3, 2019.

3 Lehigh Pier, southwest end of pier, view looking northeast. Joshua Butchko, photographer. June 24, 2019.

4 Lehigh Pier, south elevation sheet piling from the shoreline, view looking northeast. Joshua Butchko, photographer. June 24, 2019.

5 Detail of sheet piling at the northwest corner of the Lehigh Pier, view looking south. Evan Mydlowski, photographer. June 12, 2019.

6 Detail of sheet piling on the north side of the Lehigh Pier, showing corrosion and interior timbers. View looking south. Joshua Butchko, photographer. August 29, 2019.

7 East end of the Lehigh Pier, view looking southeast from the northeast corner of the pier. Alexis Alemy, photographer. June 24, 2020.

8 East end of the Lehigh Pier, view looking northeast from the south side of the pier. Alexis Alemy, photographer. June 24, 2020.

9 Lehigh Pier, view looking southwest from the east end of the pier with South Amboy in the background. Alexis Alemy, photographer. June 24, 2020.

10 Lehigh Pier, view from east end of pier looking west with the concrete foundation of the McMyler Dumper No. 1 in right center of view and Westmoreland Pier in the background. Alexis Alemy, photographer. June 24, 2020.

11 Concrete foundation of McMyler Dumper No. 1 on the north side of Lehigh Pier, view looking northwest. Alexis Alemy, photographer. June 24, 2020.

12 Concrete foundation of McMyler Dump No. 1, view looking northeast at west end of foundation. Alexis Alemy, photographer. June 24, 2020.

13 Concrete foundation of McMylder Dumper No. 2 on the south side of Lehigh Pier, view looking south. Alexis Alemy, photographer. June 24, 2020.

14 Concrete foundation of McMyler Dumper No. 2 on the south side of the Lehigh Pier, view looking west at east end of foundation. Alexis Alemy, photographer. June 24, 2020.

15 Flat slab foundation of former machine shop near center of Lehigh Pier, view looking northeast. Alexis Alemy, photographer. June 24, 2020.

16 Concrete-filled, welded steel tubes at northeast corner of the Lehigh Pier, view looking northeast. Alexis Alemy, photographer. June 24, 2020.

AUGUST 2019

LEHIGH PIER
(Pennsylvania Railroad Pier B)
City of South Amboy Middlesex County New Jersey

PHOTOGRAPH KEY
Drawn by Hunter Research, Inc./E. Mydlowski (Nov. 2020)

NJ_Middlesex County_South Amboy_Lehigh Pier_01

NJ_Middlesex County_South Amboy_Lehigh Pier_02

NJ_Middlesex County_South Amboy_Lehigh Pier_03

NJ_Middlesex County_South Amboy_Lehigh Pier_04

NJ_Middlesex County_South Amboy_Lehigh Pier_05

NJ_Middlesex County_South Amboy_Lehigh Pier_06

NJ_Middlesex County_South Amboy_Lehigh Pier_07

NJ_Middlesex County_South Amboy_Lehigh Pier_08

NJ_Middlesex County_South Amboy_Lehigh Pier_09

NJ_Middlesex County_South Amboy_Lehigh Pier_10

NJ_Middlesex County_South Amboy_Lehigh Pier_11

NJ_Middlesex County_South Amboy_Lehigh Pier_12

NJ_Middlesex County_South Amboy_Lehigh Pier_13

NJ_Middlesex County_South Amboy_Lehigh Pier_14

NJ_Middlesex County_South Amboy_Lehigh Pier_15

NJ_Middlesex County_South Amboy_Lehigh Pier_16

INDEX TO DRAWINGS

LEHIGH PIER
(Pennsylvania Railroad Pier B)
City of South Amboy
Middlesex County
New Jersey

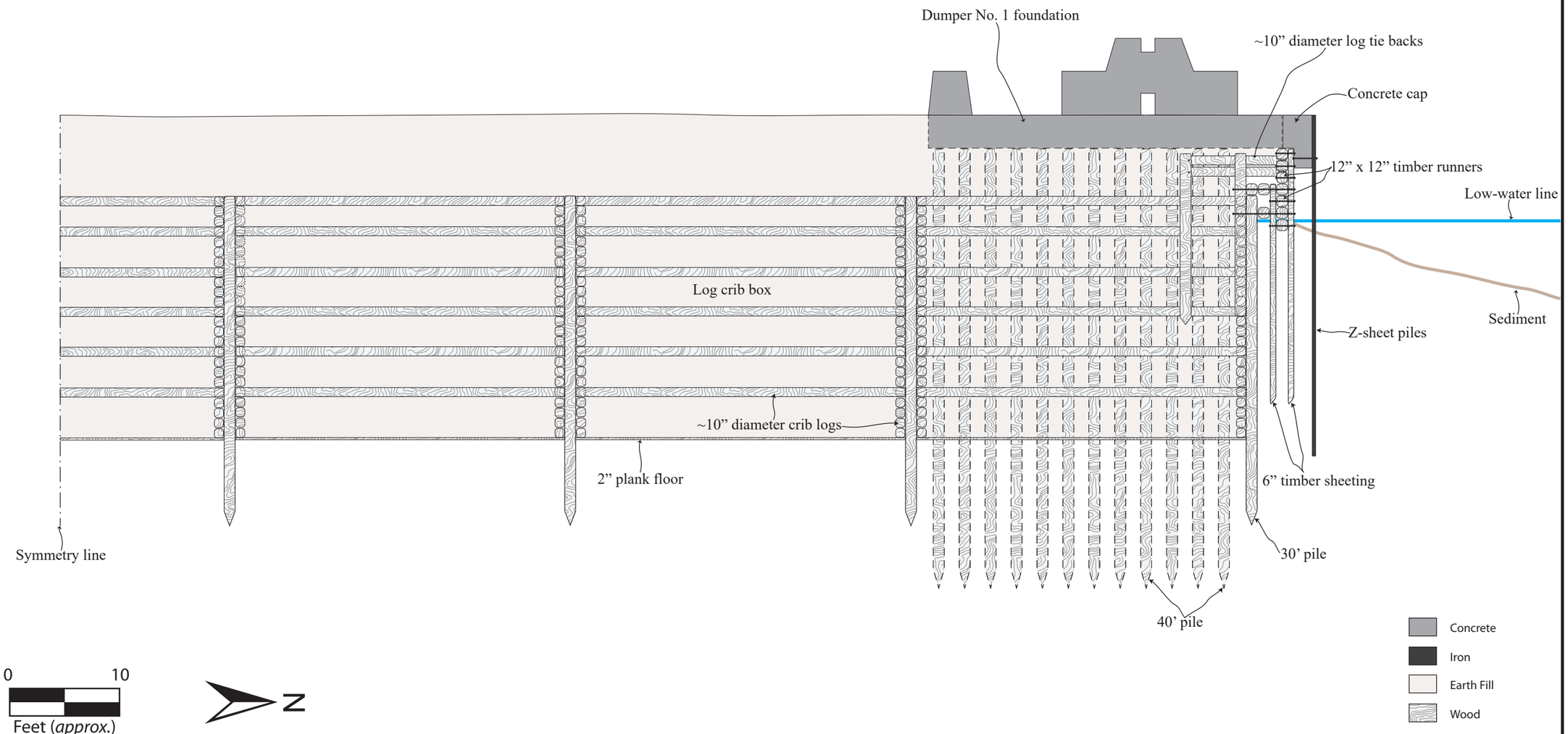
Delineators: Michael Brown, James S. Lee III and Evan Mydlowski

Drawing No.

AUGUST 2019

LEHIGH PIER
(Pennsylvania Railroad Pier B)
City of South Amboy Middlesex County New Jersey

DRAWING NO. 1
AERIAL PLAN WITH OVERALL DIMENSIONS
Drawn by Hunter Research, Inc./E. Mydlowski (Nov. 2020)



SEPTEMBER 2020	**LEHIGH PIER** **(Pennsylvania Railroad Pier B)** City of South Amboy Middlesex County New Jersey	DRAWING NO. 2 IDEALIZED CROSS SECTION Drawn by Hunter Research, Inc./M. Brown (Nov. 2020)

STATE-LEVEL HISTORIC DOCUMENTATION
Historic American Engineering Record – Level III Equivalent

LEHIGH PIER
(Pennsylvania Railroad Pier B)

Location:	Main Street, City of South Amboy Middlesex County, New Jersey The approximate center point of the Lehigh Pier is located at latitude 40.489147, longitude -74.273984 (New Jersey State Plane Coordinate System, NAD 83). The pier is on the southwestern shore of Raritan Bay from 2,000' to 3,000' to the east of Main Street.
Date(s) of Construction:	*circa* 1872, reconfigured *circa* 1910.
Architect/Engineer/ Builder:	United New Jersey Railroad and Canal Company, *circa* 1872 Pennsylvania Railroad Company, New York Division, *circa* 1910
Original Owner And Use:	The original owner of the Lehigh Pier is the United New Jersey Railroad and Canal Company. The Lehigh Pier was built *circa* 1872 as a coal trestle pier at the railroad's South Amboy marine terminal. The trestle superstructure was removed and the pier reconfigured to accommodate a patented McMyler automated coal-car dumper system *circa* 1910.
Present Owner And Use:	The present owner is the City of South Amboy. The Lehigh Pier is currently out of use.
Summary of Significance:	The Lehigh Pier is the remnant of a coal pier that was built *circa* 1872. The pier's original configuration featured a timber trestle superstructure used to transfer coal via gravity from railroad cars to barges and lighters.[1] In the early decades of the pier's operation, coal arrived by train from anthracite coalfields in Lehigh County and other neighboring counties in northeastern Pennsylvania, hence the name. Anthracite was a high-grade coal widely used from the 1840s to the 1930s to heat buildings, as well as in various industrial applications. Coal was shipped from the pier to coal yards throughout the New York City metropolitan area.

[1] Lighters, as discussed in this document, are small, shallow-draft boats used for loading coal to ships waiting offshore.

The construction of the Lehigh Pier and its neighboring Westmoreland Pier, which handled bituminous coal, marked a major shift in operations at the South Amboy railroad terminal. South Amboy served the Camden and Amboy Railroad as a passenger and freight tidewater terminal beginning in 1831, marking it as one of the first tidewater terminals in the United States; however, it was increasingly used to handle slower moving freight and bulk materials, particularly coal, during the third quarter of the 19th century and by the last quarter of the century was almost exclusively handling coal by tonnage. Additional piers were built at South Amboy for handling munitions and oil during the first quarter of the 20th century.

In its original configuration of *circa* 1872, the Lehigh Pier supported a single-story timber trestle across its entire width and length. This trestle carried bottom-dumping coal cars out over a series of chutes that directed the coal into waiting barges and lighters by the force of gravity. The remnant pier, as it exists today, is judged to retain a log crib box substructure that was built to support the heavy weight of the trestles and the cars carrying their loads of coal. The crib substructure was built by the United New Jersey Railroad and Canal Company, which formed in 1872 from a merger of the Camden and Amboy Railroad, New Jersey Railroad and the Delaware and Raritan Canal, all of which were then immediately leased to the Pennsylvania Railroad. The upgrade of the coal-handling wharfs at South Amboy was a key part of the Pennsylvania Railroad's strategy of competing in the New York City region.

The trestle was removed from the pier *circa* 1910 and replaced with two McMyler coal-car dumpers, ingenious machines that picked up and flipped over entire coal cars to dump their contents into barges and lighters. The dumpers, one located to each side of the pier, increased coal-handling capacity and quickly returned emptied cars into service. A powerhouse was located on the pier along with support buildings such as a machine shop, oil house and office. The Lehigh Pier ceased being used for coal handling with the economic collapse of railroad operations at South Amboy during the 1970s and 1980s. Until 2013, Amboy Aggregates, a firm that shipped sand and gravel, used the pier to dock barges.

The Lehigh Pier is historically significant as a remnant example of railroad marine terminal operations and pier construction techniques of the 1870s to the 1910s. Resources of this type were vital to the commercial growth of the New York City region. The pier is located in the Camden and Amboy Railroad Main Line Historic District, which was first opined eligible for inclusion in the National Register of Historic Places by the New Jersey Historic Preservation Office in 1987, with subsequent revisions and boundary clarifications.

Description:

The Lehigh Pier is a steel, wood and earthen structure measuring approximately 1,048' long on its west-to-east axis as measured along its southern elevation extending eastward into Raritan Bay.[2] The pier has an irregular five-sided plan, which flares in the direction of the pier's northeast corner. The pier's minimum width is approximately 223' on its south-to-north axis as measured at its landward end and its maximum width is 370' as measured at the bay-facing eastern end.

The Lehigh Pier has an earth-filled deck with an elevation of approximately 12' to 13' feet above sea level. The deck is relatively level, although there is a large earthen pile near the eastern end of the pier. This pile may be building debris or leftover material related to a sand and gravel shipping business that made use of the pier from 1984 to 2013. The southern and eastern edges of the pier have areas where the sidewalls have failed revealing rock and earth fill. In some places newer stone riprap has been placed for stabilization.

Z-shaped steel sheet piles form the pier's southern and northern elevations. These sheet piles are not original to the pier, likely added in the 1950s or later. The steel sheet piles encase an earlier fender system of creosoted timber piles and timber sheeting, which is visible at the eastern end of the pier and partially visible in a few locations where the steel sheet piles have corroded and failed. In some locations, concrete fills the gap between the top of the Z-shaped steel sheet piles and the older timber fenders. This timber fender system comports with descriptions found in Interstate Commerce Commission (ICC) valuation records of 1916. At the time, the ICC inspector commented that the timber sheeting, which is braced from behind by horizontal timber beams or runners, was in a constant state of being repaired and renewed, with about 50 percent of the wood material being replaced every eight to ten years.[3]

The interior construction of the Lehigh Pier, although not available to inspection, is assumed to be the oldest and least altered of its structural elements. An ICC inspector, following an interview with the Pennsylvania Railroad's master carpenter, reported in 1916 that the Lehigh Pier's original interior was composed of a series of box-shaped timber crib boxes (resembling Lincoln log construction), which were sunk in place *circa* 1872. These boxes were gauged to be similar in construction to the technique used to construct the adjacent Westmoreland Pier, also of *circa* 1872, which was known by the master carpenter to be composed of boxes

[2] The Lehigh Pier's long axis trends southwest-to-northeast but for purposes of consistency and clarity the landward end of the pier will be referred to as the west end of the pier, and the two sides of the pier are described as the north elevation and the south elevation.

[3] Interstate Commerce Commission (ICC), Valuation Records for the United New Jersey Railroad and Canal Company, "Pier A South Amboy" and "Pier B, South Amboy", November 22, 1916, Section 3.2, Record Group 34, on file at the National Archives and Records Administration, Washington, D.C.

measuring 100' long by 30' wide by 22' tall. The boxes were reported as having 2"-thick plank slab floors, open tops and log sides joined by log ties, all composed of hemlock. These crib boxes were pre-built and floated into place following dredging. After being sunk to the bottom, some 13' below the low water line, the boxes were filled with earth and the deck of the pier brought up to the desired elevation. [4]

The Lehigh Pier once supported a series of buildings and structures related to coal-handling operations. Very little physical evidence of this operational superstructure remains, with the exception of the remnant concrete foundations of two steel McMyler coal-car dumpers of 1910-1911, referred to as Dumper No. 1 and Dumper No. 2 in Pennsylvania Railroad records. The concrete foundation of Dumper No. 1 is visible on the north side of the pier as a set of concrete plinths and walls on a slab, with a rectangular plan of 30' x 60' with the long axis parallel to the edge of the pier. The concrete foundation of Dumper No. 2 on the south side of the pier is less complete with only three remaining walls. According to ICC records from 1916, each of the dumper's concrete foundations rest on mats of over 200 timber piles with lengths ranging from 35' to 50'.[5] Near the center of the pier is a 155' x 45' concrete slab, the foundation of a machine shop, which was built in late 1950 to replace an earlier machine shop destroyed by a massive explosion (see more below).[6]

History: The Lehigh Pier was built *circa* 1872 by the United New Jersey Railroad and Canal Company, which formed that year from a merger of the Camden and Amboy Railroad, the New Jersey Railroad and the Delaware and Raritan Canal. The Camden and Amboy Railroad's tidewater marine terminal at South Amboy was established in 1831 as that railroad's original northeastern terminus where ferries transferred passengers and freight bound to and from New York City and other points around New York harbor. The pioneering railroad, known for its association with the Stevens family of Hoboken, enjoyed many technological firsts, including perhaps most importantly the development of a T-shaped iron rail that became an American and eventually a worldwide standard. The Camden and Amboy Railroad's original pier was built out from a sandy spit of land located between 500' and 1000' northwest to northeast of the Lehigh Pier.[7]

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[4] Ibid.

[5] ICC Valuation Records, "Pier B Dumpers," 1916.

[6] Pennsylvania Railroad Company, *Restoration of Facilities Damaged and Destroyed by Explosion, May 19, 1950,* Eastern Region, New York Division, United New Jersey Railroad and Canal Company, South Amboy, New Jersey. *Circa* 1951, on file, Hagley Museum and Library, Wilmington, Delaware.

[7] For more on the Camden and Amboy Railroad's pier, see Hunter Research, Inc., Cultural Resource Investigations, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey, Prepared for City of South Amboy (December 2015, Supplemental January 2018), and Hunter Research, Inc., Archaeological Documentation, Camden and Amboy Railroad/Pennsylvania Railroad Wharves (Intermodal Ferry Transportation Center), City of South Amboy, Middlesex County, New Jersey, Prepared for City of South Amboy (November 2020).

More than 100,000 passengers and 10,000 tons of freight passed through South Amboy annually during the 1830s, but by the early 1840s the original terminal had been surpassed by a more direct railroad connection between Philadelphia and New York City. This new route passed through Newark, New Brunswick and Trenton, roughly corresponding to the present-day Amtrak Northeast Corridor. As this new line took over the bulk of the passenger and fast freight service crossing the state, the terminal at South Amboy was relegated to local passenger service and handling slower freight and bulk materials.

As the region's rail systems became ever more connected in the third quarter of the 19th century, South Amboy's role was increasingly that of handling shipments of coal arriving from the coalfields of eastern Pennsylvania (anthracite) and eventually western Pennsylvania and Maryland (bituminous), much of it bound for market in New York City. When the Pennsylvania Railroad leased the United New Jersey Railroad and Canal Company in 1872 to ensure its access to the Port of New York, South Amboy was well on its way to becoming one of the port's major coal terminals with separate docks for bituminous and anthracite coal. Competing coal docks in northern New Jersey were those of the Erie Railroad in Weehawken, the Delaware, Lackawanna & Western Railroad in Hoboken, the Central Railroad of New Jersey in Jersey City and Bayonne, and the Lehigh Railroad in Perth Amboy. The Pennsylvania Railroad also built a coal dock at Greenville in Jersey City in 1904.[8]

With the vast financial resources at the disposal of the Pennsylvania Railroad, little time was wasted improving and expanding coal-handling operations at South Amboy. In 1872, the company's annual report noted the enlargement of the facilities for transshipping anthracite "by the erection of an additional trestle, and by the construction of a canal one thousand feet in length, with a width at the outer end of one hundred and fifty feet, and at the inner end of seventy-five feet."[9] The "canal" likely refers to dredging of a channel along the pier's northern side. The report goes onto describe how coal was delivered to the pier's shipping trestles by a gravity railroad feeding loaded cars from a rail yard about two miles

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[8] Carl W. Condit, *The Port of New York; A History of the Rail and Terminal System from the Beginnings to Pennsylvania Stations,* Volume 1 (Chicago: University of Chicago Press, 1981).

[9] Pennsylvania Railroad Company, *Twenty-Sixth Annual Report of the Board of Directors of the Pennsylvania Railroad Co. to the Stockholders, March 11, 1873,* (Philadelphia: E. C. Markley & Son, 1873), p. 69. Pennsylvania Railroad Company records, which are fragmentary and stored in several repositories, were searched at the Hagley Museum and Library in Wilmington, Delaware, and indexes reviewed at the Pennsylvania State Archives in Harrisburg and the Pennsylvania Railroad Museum in Strasburg, Pennsylvania. No plans for the Westmoreland Pier were identified predating the 1910s.

to the west. The pier's earliest appearance on one of the standard maps of the era is the *Combination Atlas Map of Middlesex County, New Jersey*, published by Everts & Stewart in 1876 (Figure 1).[10] The map shows a pier with two tracks on its northern side and one track on its southern side. A photograph of roughly the same date confirms these tracks were carried on a trestle-like structure that extended out onto the pier (Figure 2). A U.S. Army Corps of Engineers chart of 1885 indicates that the Lehigh Pier's plan flared out at its northeast corner, conforming rather closely to the footprint of the pier as it exists today.[11]

The Lehigh Pier's operations were typical of coal trestle piers, also referred to as coal pocket piers, of the mid- and late 19th century. These piers supported timber trestles carrying rails that ran to the outer end of the pier. A coal car was run out from the landward end of the pier, either by gravity or by a switching engine, positioned over the top of a pocket, the doors at the bottom of the car opened, and the coal dropped from the car into the pocket to run down a chute into a waiting barge or lighter. The Pennsylvania Railroad modified the Lehigh Pier in 1892, installing a patented Dodge Coal Storage Company conveyor system beneath the trestle for greater efficiency. The system, invented by James M. Dodge of Philadelphia in 1888, involved chain or rope-driven conveyors and elevators, powered by steam engines, which moved coal from large storage piles beneath the trestles into the barges (Figure 3). One of the principal advantages of this system was the ability of the coal pier and the adjacent yard to store excess supply of coal. The coal was stockpiled waiting to be on-loaded to vessels, while empty coal cars were returned to service. This was especially important in winter when demand for coal was high and rail operations were sometimes disrupted by freezing temperatures and snow. A particular challenge was moisture freezing the coal within the open-top cars, meaning the coal could not be dumped until the weather warmed. A view of the Lehigh Pier, likely dating to *circa* 1900, illustrates a row of vessels against the pier's north side (Figure 4).[12]

The Pennsylvania Railroad initiated a major change in the coal-handling system at South Amboy with the demolition of the coal trestle and the introduction of two McMyler car-dumping machines at the Lehigh Pier in

[10] Matthew Hughes, *Map from Newark Bay to Washington Rock* (1868), copy on file, Osborn Cannonball House Museum, Scotch Plains, New Jersey; Everts & Stewart, *Combination Atlas Map of Middlesex County, New Jersey* (1876). In 1916, the ICC estimated the Westmoreland Pier had been built in 1859, apparently based on information provided by South Amboy's foreman carpenter who was unlikely to have been present at South Amboy nearly 57 years earlier. It is believed that the atlas maps represent a more accurate assessment and that 1872 is a more plausible date than 1859.

[11] U.S. Army Corps of Engineers, *Raritan River, New Jersey from Its Mouth to Sayreville* (1885).

[12] Hunter Research, Inc., Cultural Resource Investigations, Intermodal Ferry Transportation Center, City of South Amboy, Middlesex County, New Jersey, Prepared for City of South Amboy (December 2015, Supplemental January 2018), pp. 5-53 to 60.

1910-11. Named after engineer and inventor John McMyler of Cleveland, Ohio, who applied for a dumper patent in February 1910, the dumpers became the dominant technology for emptying fully loaded coal cars from the 1910s to the 1940s and were installed at piers and coal yards across the United States by the McMyler Interstate Company. At the same time as switching to a new innovative coal handling technology at South Amboy, the Pennsylvania Railroad sublet the Lehigh Pier's operations to the Eastern Coal Dock Company, a firm apparently created for the purpose of investing in McMyler dumper operations at Pennsylvania Railroad coal piers in South Amboy and Philadelphia. The Pennsylvania Railroad retained ownership of the piers, while the Eastern Coal Dock Company, headquartered in Cleveland where McMyler dumpers were manufactured, owned the machinery.[13]

A McMyler car-dumper picked up an entire coal car within a cradle, tipped the car over and dumped its contents onto an apron, which directed the coal into the hold of a waiting barge or lighter (Figures 5-8). The two South Amboy dumpers, as originally designed, handled a maximum car length of 47' and a loaded 40-ton car. These remarkable machines raised cars to a height of 11.5' by use of counterweights. A steel-frame powerhouse was built near the center of the pier, roughly equidistant between the two dumpers (Figures 9-10). It was two-and-one-half stories tall, was covered in corrugated-metal siding and had a rectangular plan of 35' x 45'. Three coal-fired boilers produced steam for conversion by a generator into the direct-current electric power for the dumper motors. Also supporting the dumpers' operations on the pier were a single-story machine shop, oil house, office, storage shed and "car rider shanties." The powerhouse was demolished around 1940, when electricity began to be supplied from PSE&G. Simultaneously, the dumpers were modified to handle larger 50-ton and 70-ton coal cars.[14]

The McMyler car-dumper system allowed the Pennsylvania Railroad to reorganize the overall approach to handling coal at South Amboy. The rail yard about two miles to the west of the Lehigh Pier was expanded to have space for 3,500 coal cars continuously feeding the dumpers for maximum efficiency. From the coal yard, coal cars were advanced to the pier along one of eight inbound tracks, five for Dumper No. 1 and three for Dumper No. 2. About 300' from the dumpers, the cars were hooked to a "Barney hoist," a mechanized hoist that moved the car up an incline trestle to a height of about 15' above the level of the pier until resting in the cradle of the dumper. After being tipped, the empty cars were rolled down a slight grade by gravity to a kickback at the end of the pier, which reversed the

[13] Pennsylvania Railroad Company, Engineering Department Correspondence, 1920-1943, on file at the Hagley Museum and Library, Wilmington, Delaware.
[14] Ibid.

empties back up the pier along one of four outbound tracks and onto a siding where they were formed into a train to be pulled back to the yard by a switching engine and returned to service. Just to the west of the landward side of the Lehigh Pier, the railroad also built two coal-thawing houses and a steam plant for use during the winter when coal often became frozen in the cars. This operation injected steam into several dozen carloads of coal at a time, thawing the coal so it would release when the cars were tipped upside down by the dumpers.[15]

The South Amboy terminal emerged as an important transshipment point for munitions during World War I, a role that expanded during World War II due to concerns of storing and transferring munitions near the population centers of New York City's inner harbor. When railroad cars and barges loaded with dynamite and anti-tank mines exploded at the munitions pier to the north of the Westmoreland Pier on May 19, 1950, all of the surrounding buildings were leveled or heavily damaged, including the dumpers and buildings on the Lehigh Pier (Figure 12). The Pennsylvania Railroad returned the Lehigh Pier to service six months later in January 1951, following repair of Dumper No. 1 and construction of a new machine shop building (Figure 13). Later that same year, Dumper No. 2 returned to service, but with a dumper salvaged from Jersey City's Greenville coal pier, which had closed due to a declining market for coal.

The merger of the Pennsylvania Railroad into the Penn Central Transportation Company in 1968, followed by the abrupt financial collapse of the Penn Central in 1970 marked the latter days of the South Amboy coal terminal and the Lehigh Pier. Despite the financial troubles and the shrinking market for coal, the Lehigh Pier's remarkable car-dumping system remained operational until the late 1970s (Figure 14). Conrail absorbed the Penn Central's assets in 1976 and finding little profitability in transshipping coal eventually removed the McMyler dumpers and their supporting buildings from the Lehigh Pier between 1987 and 1995. The pier remained in use, mostly in service to Amboy Aggregates, a sand and gravel shipping business, which operated from South Amboy from *circa* 1984 to 2013.[16]

Sources:

[15] ICC Valuation Records, 1916; Scott W. Linn, "Coal Car Thawing Plant Built of Precast Concrete Units," *Engineering News-Record*, Volume 80, Number 5 (January 31, 1918), pp. 213-16.
[16] National Environmental Title Research (NETR), *Historic Aerials* [aerial photographs from 1931 to 2017], on-line at www.historicaerials.com [accessed November 2020]; Tom Flagg, Aerial View of the Penn-Central South Amboy Ferry Terminal, 1972; New Jersey State Beach Erosion Commission, Commission Meeting, July 24, 1996; Greater Media, "So. Amboy Sand and Gravel Company on Track to Close," *Central Jersey Archives* (August 28, 2012).

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McMyler, J. Car Unloading Machine. U.S. Patent No. 950,238. February 22, 1910.

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Pennsylvania Railroad Company. Engineering Department Correspondence. 1920-1943. On file at the Hagley Museum and Library, Wilmington, Delaware.

Pennsylvania Railroad Company. *Pennsylvania Railroad Harbor Facilities/Port of New York*. 1949. Brochure on file, Hagley Museum and Library, Wilmington, Delaware.

Pennsylvania Railroad Company. Plan of the Lehigh Pier from *Proposed Steam Pipe Line and Boiler Installation at South Amboy, New Jersey.* 1932. On file at the Hagley Museum and Library, Wilmington, Delaware.

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Pennsylvania Railroad Company. *Twenty-Sixth Annual Report of the Board of Directors of the Pennsylvania Railroad Co. to the Stockholders, March 11, 1873.* E.C. Markley & Son, Philadelphia, Pennsylvania. 1873.

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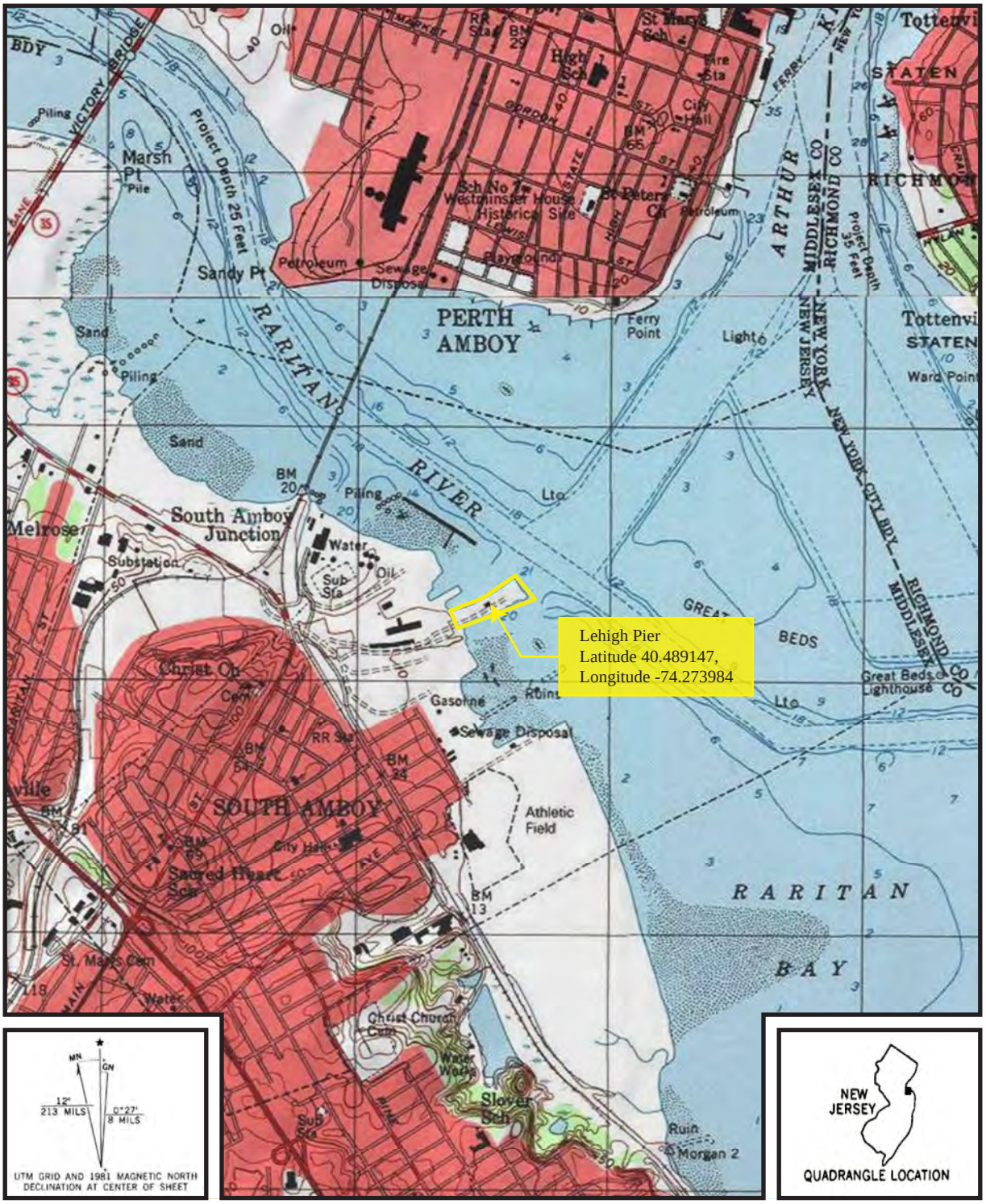
U.S. Army Corps of Engineers. *Raritan River, New Jersey from Its Mouth to Sayreville.* Washington, D.C. 1885.

Historian: Patrick Harshbarger, November 2020

Project Information: Hunter Research, Inc. documented the Westmoreland Pier as cultural resources sub-consultant to French & Parrello Associates, consulting engineers. The work was executed on behalf of the City of South Amboy as part of the planning for redevelopment of the former South Amboy railroad terminal site as an Intermodal Ferry Transportation Center. This historic documentation partially fulfills a stipulation contained in a Memorandum of Agreement (MOA) executed in 2009 among the City of South Amboy, the New Jersey Department of Transportation and the New Jersey Historic Preservation Office. That MOA requires documentation of pilings and wharves impacted by project activities.



Detailed Location of the Lehigh Pier, City of South Amboy, Middlesex County, New Jersey.

Source: USGS 7.5' Quadrangle: South Amboy, N.J. [1954, photorevised 1981].

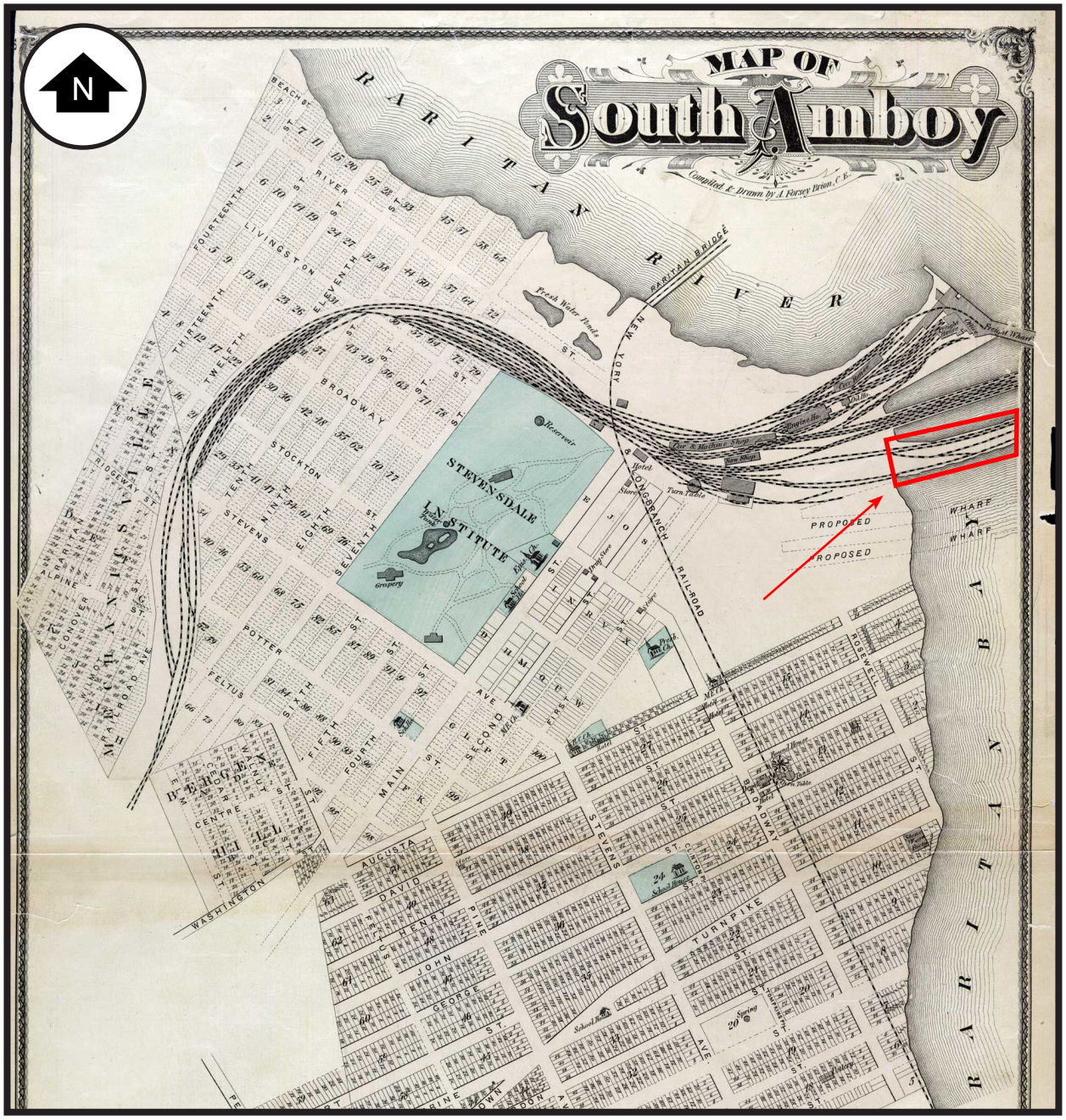


Figure 1. Everts & Stewart. Map of South Amboy. *Combination Atlas Map of Middlesex County, New Jersey.* 1876. Westmoreland Pier outlined. Scale: 1 inch = 1,200 feet (approximately).

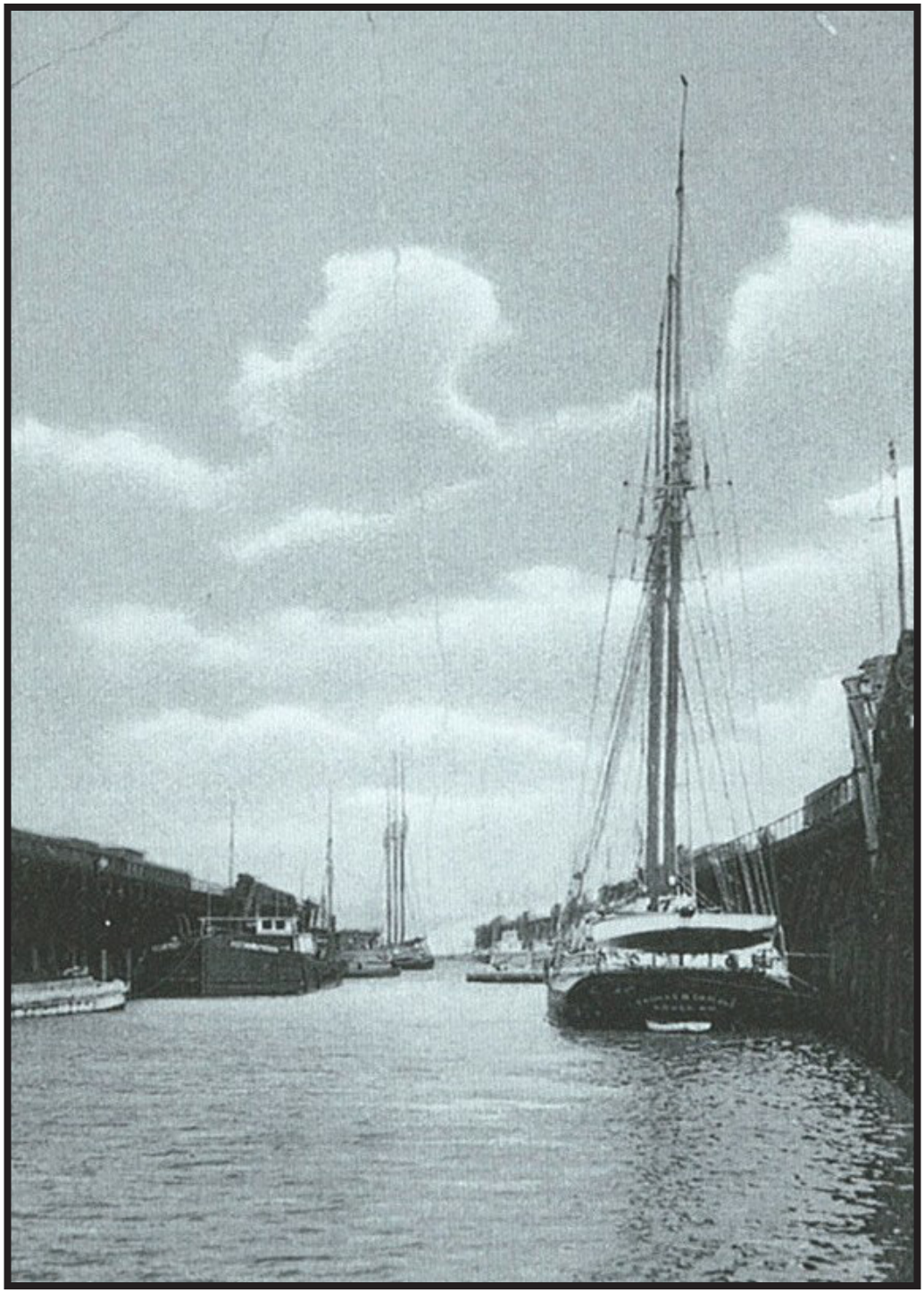


Figure 2. View looking northeast between the Westmoreland Pier (left) and the Lehigh Pier (right) at the South Amboy railroad terminal. *Circa* 1880 (Source: Francy 1998).

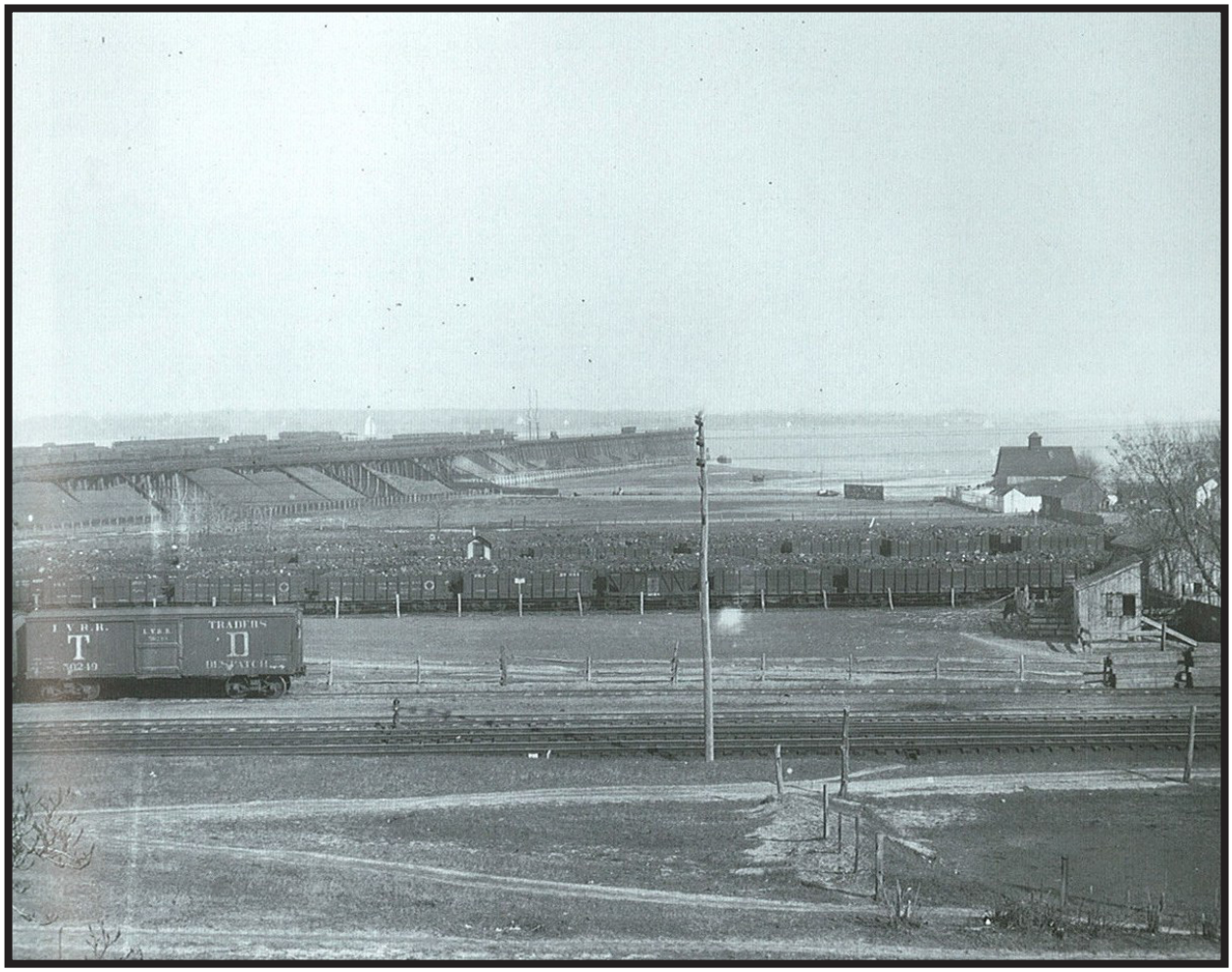


Figure 3. Panoramic view looking northeast from South Amboy with the Lehigh Pier in the distance. This photograph can be dated to the period when the Dodge conveyor system was in use (*circa* 1891-1909) due to the large coal piles under the trestle leading out to the pier (Source: Francy 1998).

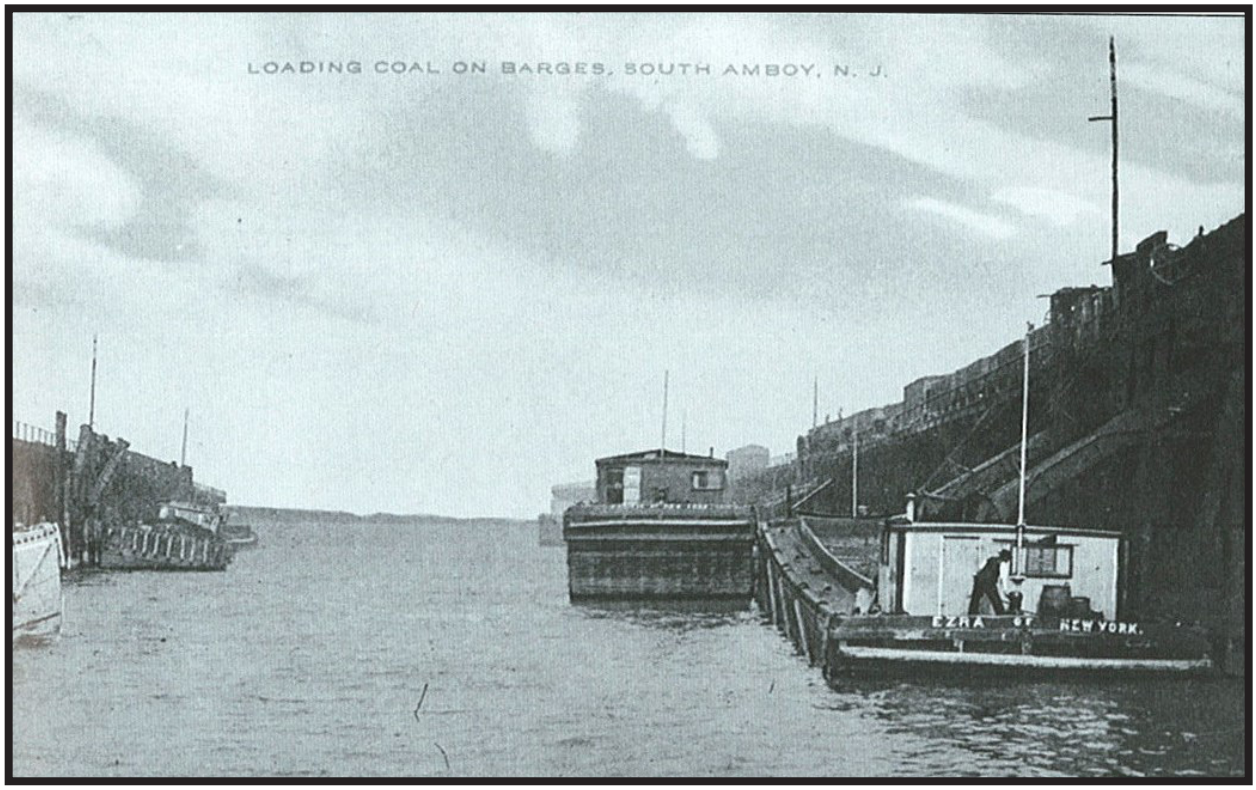


Figure 4. View looking northeast between the Lehigh Pier (right) and the Westmoreland pier (left). *Circa* 1900 (Source: Francy 1998).

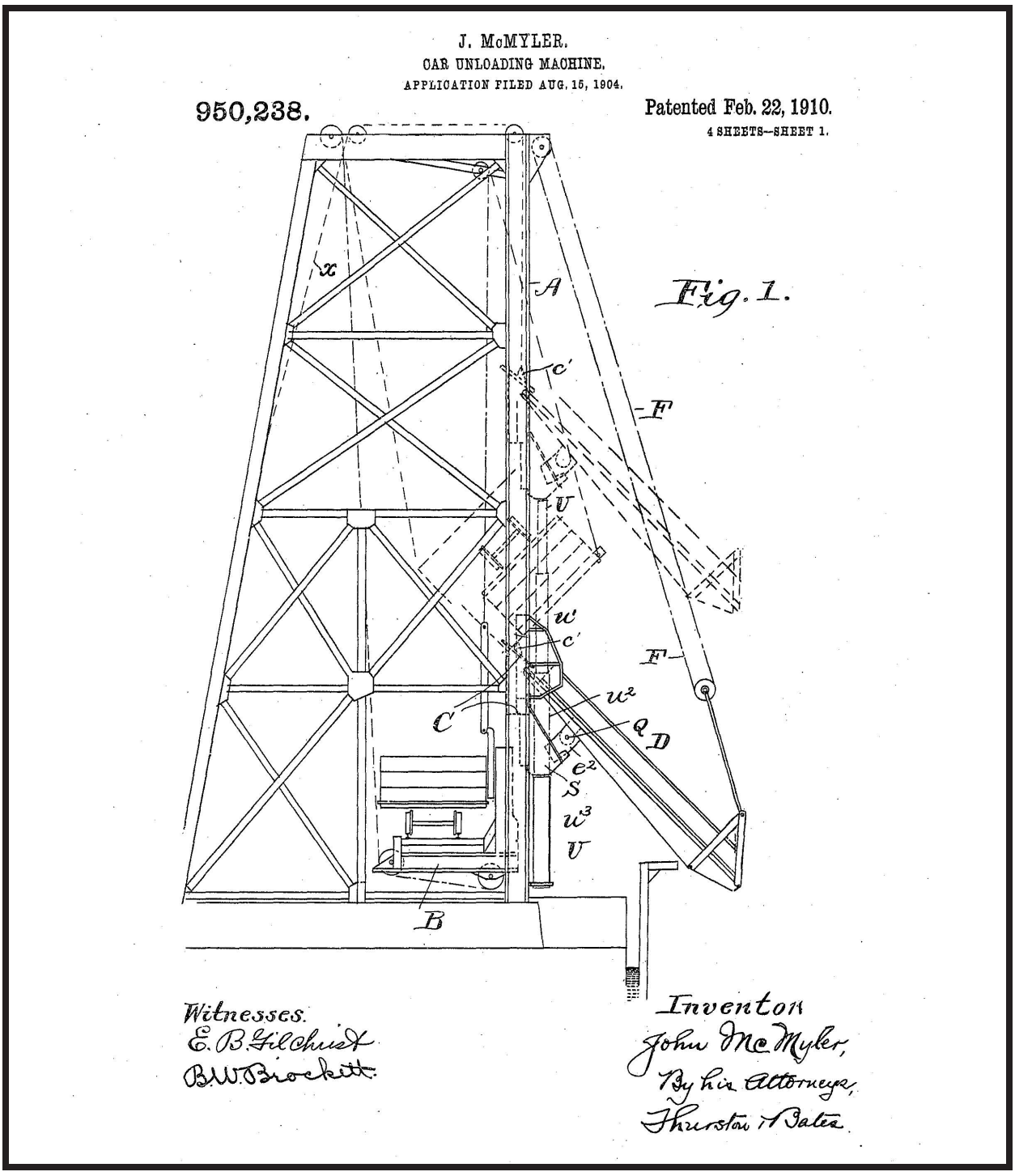


Figure 5. McMyler, J. Patent Drawing for Car Unloading Machine. 1910 (U.S. Patent No. 950,238).

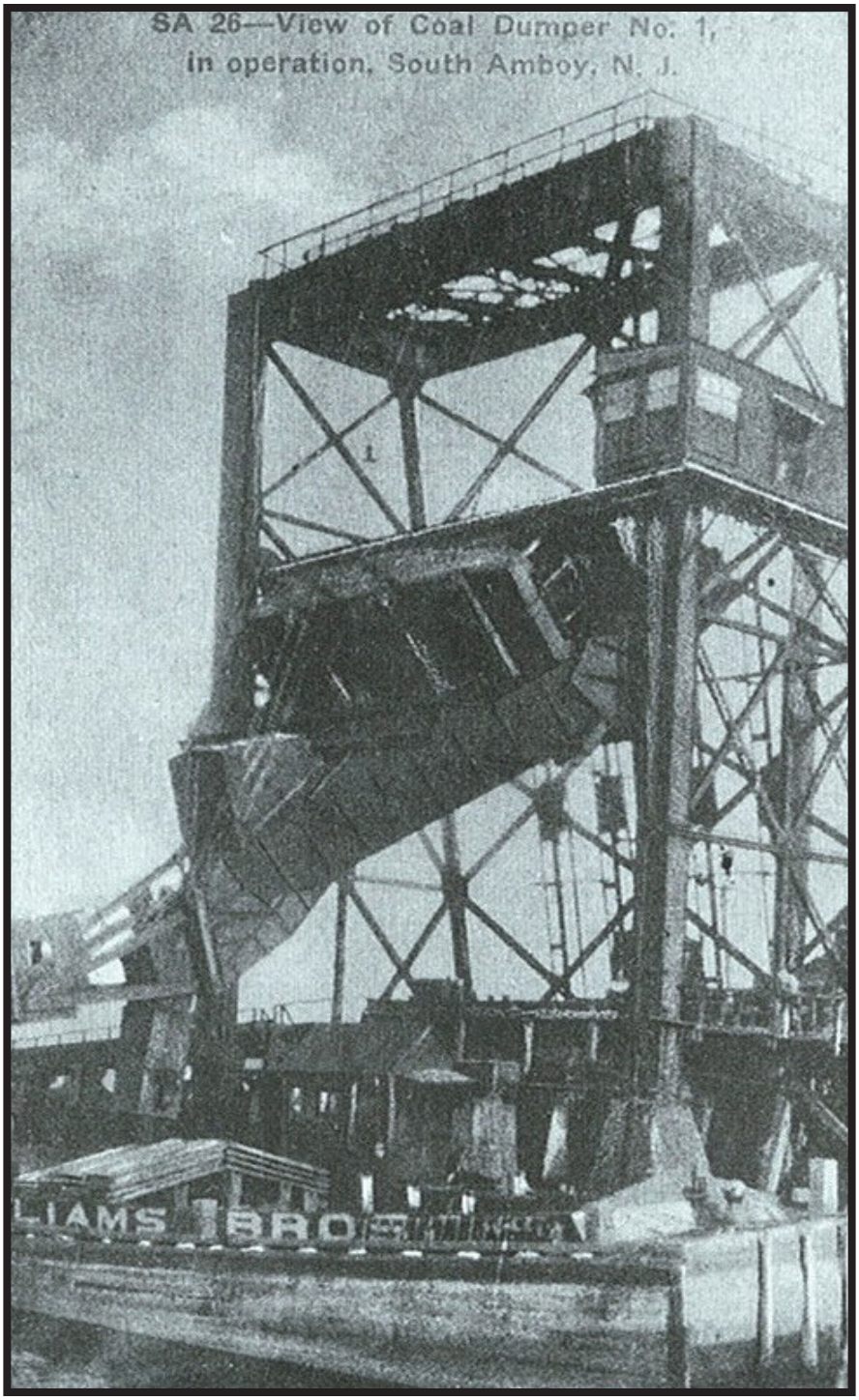


Figure 6. View of Coal Dumper No. 1 in operation on the Lehigh Pier, South Amboy, New Jersey. *Circa* 1920 (Source: Francy 1998).

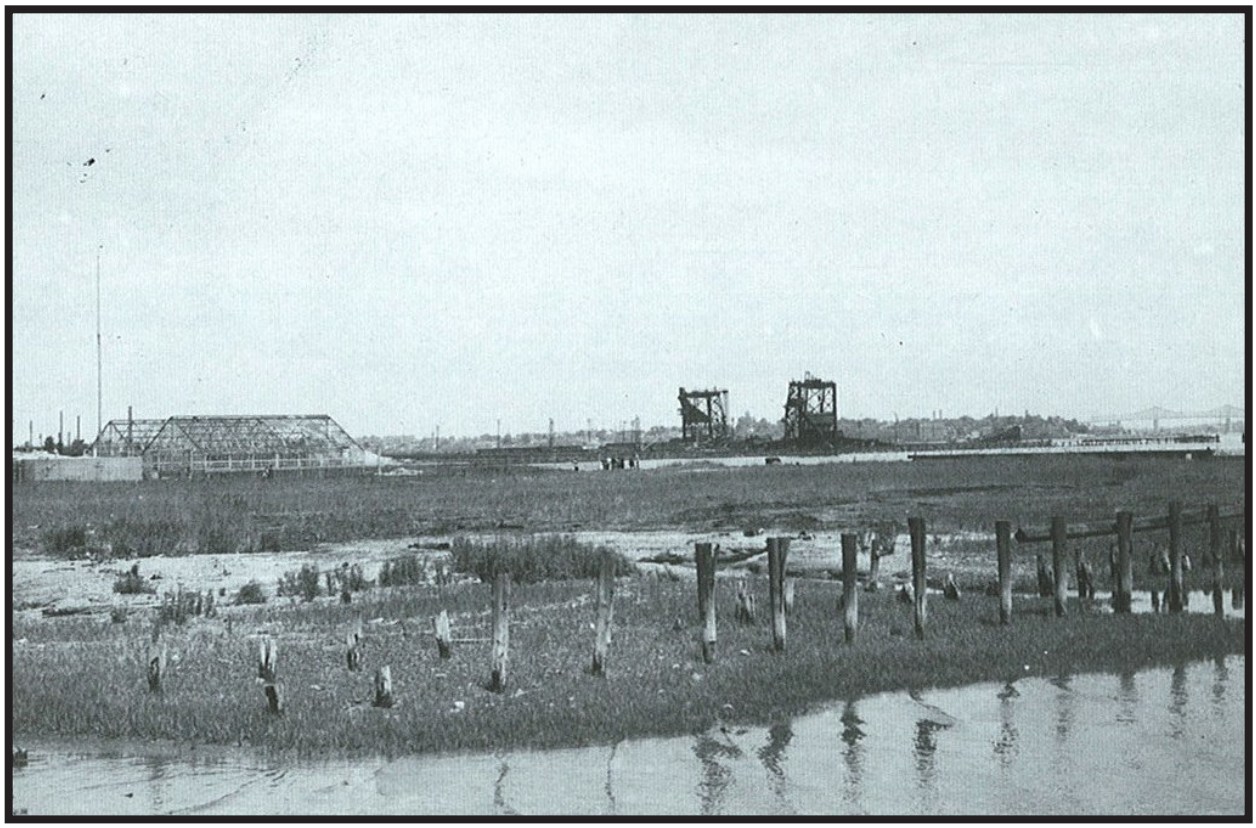


Figure 7. Panoramic view looking north from South Amboy with the Lehigh Pier and its coal dumpers in the background. *Circa* 1950 (Source: Francy 1998).

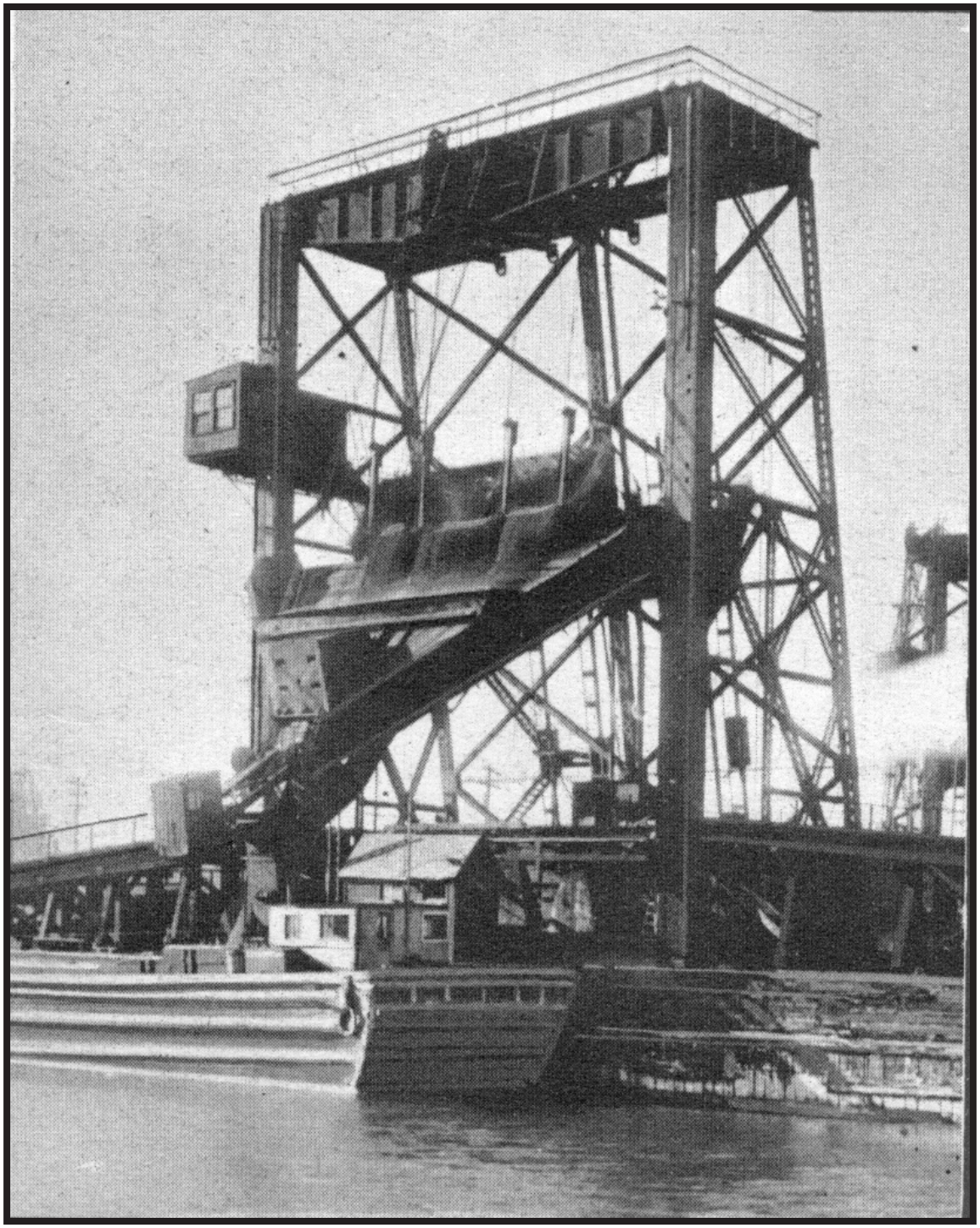


Figure 8. View of Coal Dumper No. 1 shortly before the explosion of May 19, 1950 (Source: Pennsylvania Railroad Company 1949).

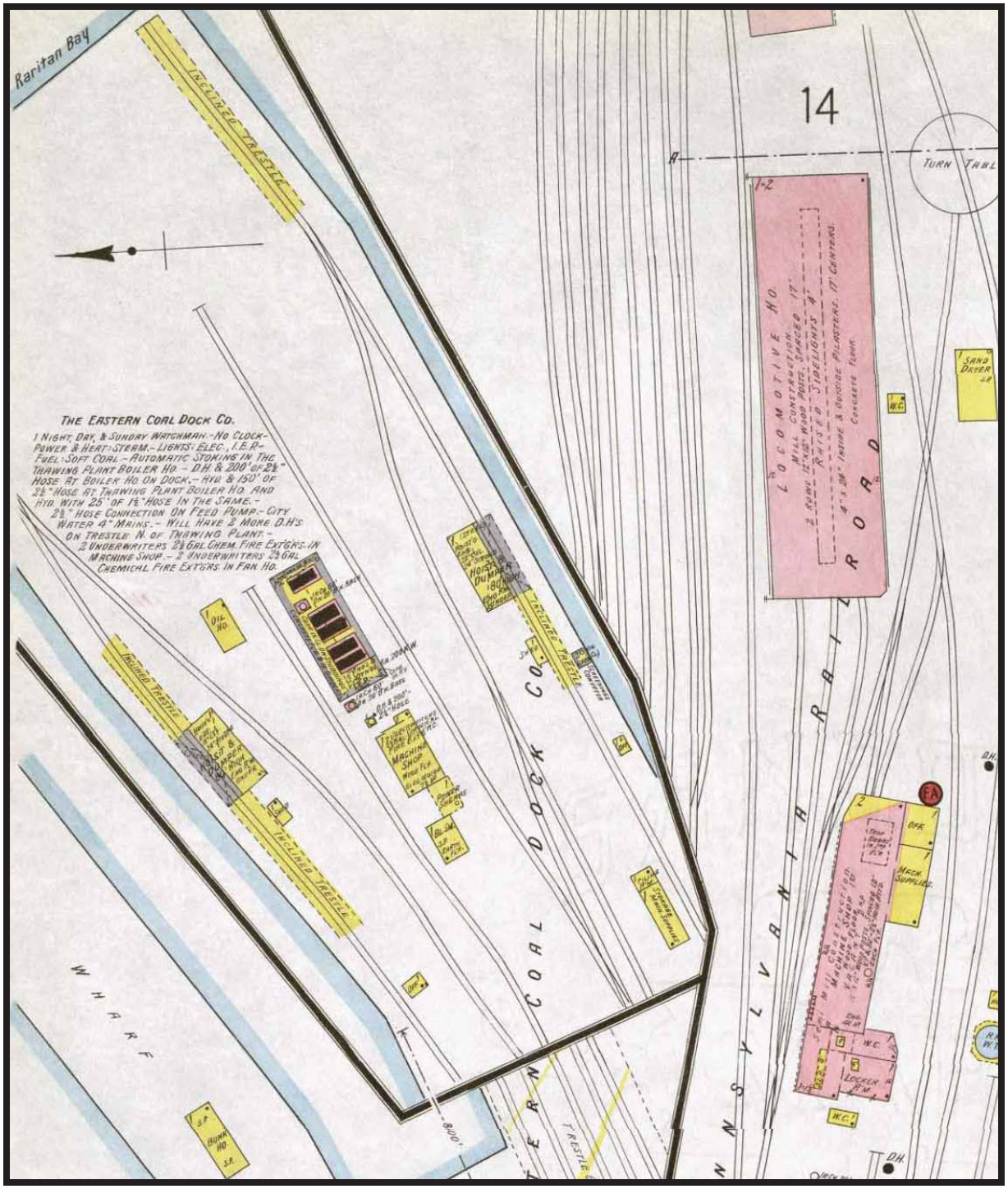


Figure 9. Sanborn Map Company. Detail of Lehigh Pier. *Insurance Maps of South Amboy, Middlesex County, New Jersey.* 1918. The Lehigh Pier is shown in the inset at top left. The inset to the right is of the locomotive shops on fast ground to the west of the Westmoreland Pier. Scale 1 inch = 110 feet (approximately).

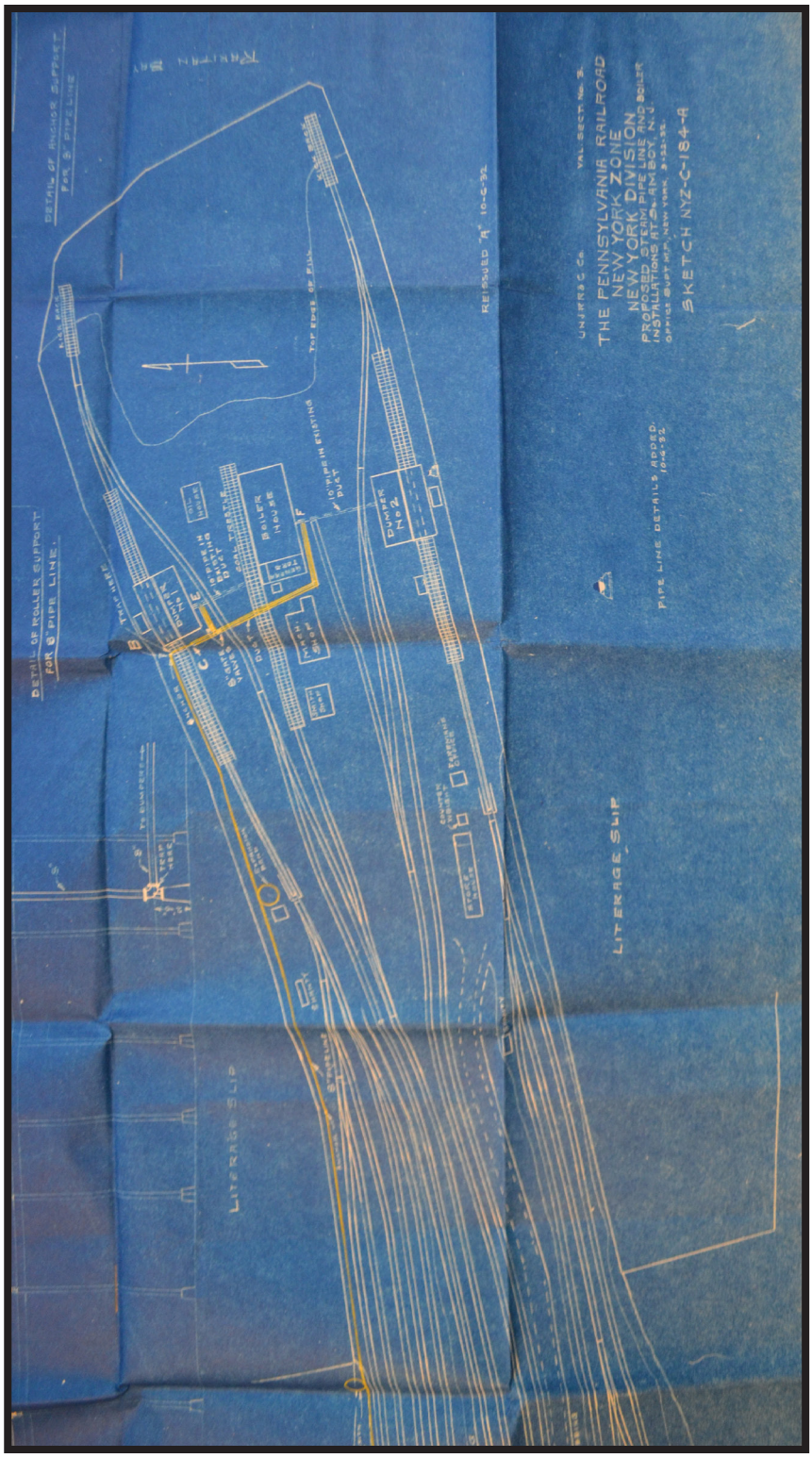


Figure 10. Pennsylvania Railroad Company. Plan of the Lehigh Pier from *Proposed Steam Pipe Line and Boiler Installation at South Amboy, New Jersey*. 1932. Scale 1 inch = 150 feet (approximately).

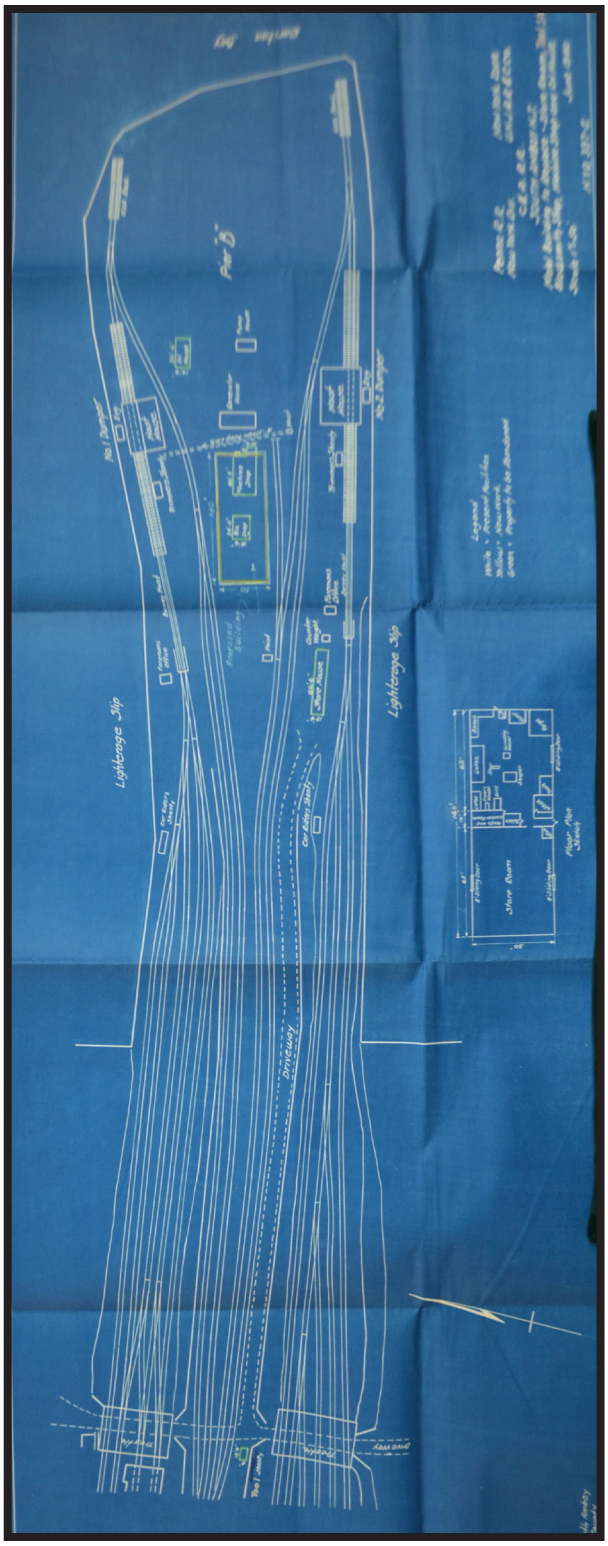


Figure 11. Pennsylvania Railroad Company. Plan of the Lehigh Pier from *Metal Buildings to Replace Shops at South Amboy, N.J.* 1940. Scale 1 inch = 200 feet (approximately).

Figure 12. Aerial view looking down on the Lehigh Pier, showing damage from the explosion of May 19, 1950 (Source: Pennsylvania Railroad Photographs Collection).

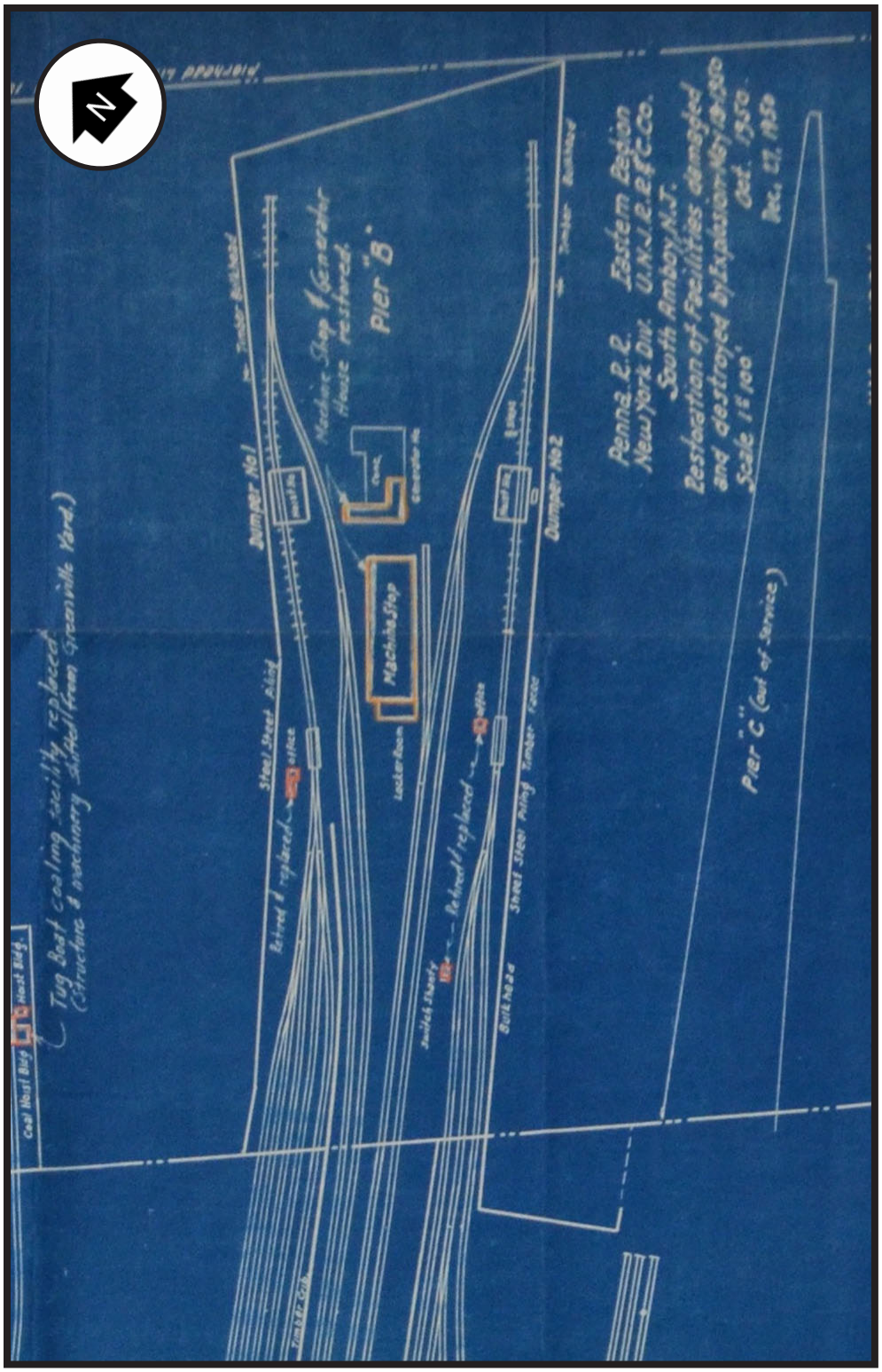


Figure 13. Pennsylvania Railroad. *Restoration of Facilities Damaged and Destroyed by Explosion, May 19, 1950*. Detail of Lehigh Pier (Pennsylvania Railroad Pier A). *Circa* 1951. Scale: 1 inch = 160 feet (approximately).

Figure 14. Aerial view of the Lehigh Pier, looking northwest. 1972 (Photographer: Tom Flagg. Used by permission).

Appendix E

RESUMES

RICHARD W. HUNTER
President/Principal Archaeologist, Ph.D., RPA

EDUCATION

Ph.D., Geography, Rutgers University, New Brunswick, New Jersey, 1999.
Dissertation Title: *Patterns of Mill Siting and Materials Processing: A Historical Geography of Water-Powered Industry in Central New Jersey*

M.A., Archaeological Science, University of Bradford, England, 1975

B.A., Archaeology and Geography, University of Birmingham, England, 1973

EXPERIENCE

1986-present President/Principal Archaeologist
Hunter Research, Inc., Trenton, NJ

Founder and principal stockholder of firm providing archaeological and historical research, survey, excavation, evaluation, report preparation, historic exhibit development and public outreach services in the Northeastern United States. Specific expertise in historical and industrial archaeology (mills, iron and steel manufacture, pottery manufacture), historical geography, historic landscape analysis, historic interpretive design and public outreach products. Participation in:

- Project management, budgeting and scheduling
- Proposal preparation and client negotiation
- Hiring and supervision of personnel
- Supervision of research, fieldwork, analysis and report preparation
- Historic exhibit development, popular and academic publications and public presentations

1999-2004 Faculty Member, Certificate in Historic Preservation
Office of Continuing Education, Drew University, Madison, NJ

Courses: The Role of Archaeology in Preservation
25 Years of Public Archaeology in New Jersey

1983-1986 Vice-President/Archaeologist
Heritage Studies, Inc., Princeton, NJ

Principal in charge of archaeological projects. Responsibilities included:

- Survey, excavation, analysis, and reports
- Client solicitation, negotiation, and liaison
- Project planning, budgeting, and scheduling
- Recruitment and supervision of personnel

1981-1983 Principal Archaeologist
Cultural Resource Group, Louis Berger & Associates, Inc., East Orange, NJ

Directed historical and industrial archaeological work on major cultural resource surveys and mitigation projects in the Mid-Atlantic region. Primary responsibility for report preparation and editing.

1979-1981 Archaeological Consultant, Hopewell, NJ

1978-1981 Adjunct Assistant Professor, Department of Classics and Archaeology, Douglass College, Rutgers University, NJ

1978-1979 Research Editor
Arete Publishing Company, Princeton, NJ

Prepared and edited archaeological, anthropological, and geographical encyclopedia entries (*Academic American Encyclopedia*, 1980).

1974-1977 Archaeological Field Officer
Northampton Development Corporation, Northampton, England

Supervised archaeological salvage projects executed prior to development of the medieval town of Northampton (pop. 230,000).

Experience included:

- Monitoring of construction activity
- Supervision of large scale urban excavations
- Processing of stratigraphic data and artifacts
- Preparation of publication materials

1969-1970 Research Assistant
Department of Planning and Transportation, Greater London Council

SPECIAL SKILLS AND INTERESTS

- water-powered mill sites
- canals and urban water powers
- iron and steel manufacture
- pottery manufacture
- historic cartography
- scientific methods in archaeology
- historic sites interpretation and public outreach

SELECTED PUBLICATIONS

"New York's Urban Archaeology. The Forts Landscape Reconstruction Project: Central Park's Revolutionary War Forts." *Archaeological Institute of America, New York Society News*, Winter 2015:6-8.

Sartori to Sacred Heart: Early Catholic Trenton. Sacred Heart Church [2014] (with Patrick Harshbarger).

"Historical Archaeology in Trenton: A Thirty-Year Retrospective." In *Historical Archaeology of the Delaware Valley, 1600-1850*, edited by Richard Veit and David Orr. University of Tennessee Press, Knoxville, Tennessee [2013] (with Ian Burrow).

"A Sugar Bowl of William Young & Sons or William Young's Sons." *Trenton Potteries* 13 (1):1-3 [2013].

"Internal Oxidation of Cast Iron Artifacts from an 18th-century Steel Cementation Furnace." *Journal of Archaeological Science* XXX, 1-8 [2012] (with Colin Thomas and Robert Gordon).

"Steel Away: the Trenton Steel Works and the Struggle for American Manufacturing Independence." In *Footprints of Industry: Papers from the 300th Anniversary Conference at Coalbrookdale, 3-7 June 2009*, edited by Paul Belford, Marilyn Palmer and Roger White. *BAR British Series* 523 [2010] (with Ian Burrow).

"Early Milling and Waterpower." In *Mapping New Jersey: An Evolving Landscape*, edited by Maxine N. Lurie and Peter O. Wacker, pp. 170-179. Rutgers University Press [2009].

"On the Eagle's Wings: Textiles, Trenton, Textiles, and a First Taste of the Industrial Revolution." *New Jersey History* 124, Number 1, 57-98 [2009] (with Nadine Sergejeff and Damon Tvaryanas).

"The Historical Geography and Archaeology of the Revolutionary War in New Jersey." In *New Jersey in the American Revolution*, edited by Barbara J. Mitnick, pp.165-193. Rutgers University Press [2005] (with Ian C.G. Burrow).

"Lenox Factory Buildings Demolished." *Trenton Potteries* 6 (2/3):1-9 [2005].

Fish and Ships: Lamberton, the Port of Trenton. New Jersey Department of Transportation and Federal Highway Administration [2005] (28-page booklet).

Power to the City: The Trenton Water Power. New Jersey Department of Transportation and Federal Highway Administration [2005] (24-page booklet).

Rolling Rails by the River: Iron and Steel Fabrication in South Trenton. New Jersey Department of Transportation and Federal Highway Administration [2005] (24-page booklet).

Quakers, Warriors, and Capitalists: Riverview Cemetery and Trenton's Dead. New Jersey Department of Transportation and Federal Highway Administration [2005] (24-page booklet) (with Charles H. Ashton).

"Keeping the Public in Public Archaeology." In: *Historic Preservation Bulletin*, pp. 6-9. New Jersey Department of Environmental Protection, Division of Parks and Forestry, Historic Preservation Office [2004].

"A Coxon Waster Dump of the Mid-1860s, Sampled in Trenton, New Jersey." In: *Ceramics in America*, edited by Robert Hunter, pp. 241-244. University Press of New England [2003] (with William B. Liebeknecht and Rebecca White).

"The Richards Face – Shades of an Eighteenth-Century American Bellarmine." In: *Ceramics in America*, edited by Robert Hunter, pp. 259-261. University Press of New England [2003] (with William B. Liebeknecht).

"The Pottery Decorating Shop of the Mayer Arsenal Pottery Company." *Trenton Potteries* 4(2):1-7 [2003].

"Minutes of the Potters Union (Part 2)." *Trenton Potteries* 4(1):1-5 [2003].

"Minutes of the Potters Union (Part I)." *Trenton Potteries* 3(4):1-5 [2002].

"Eighteenth-Century Stoneware Kiln of William Richards Found on the Lamberton Waterfront, Trenton, New Jersey." In: *Ceramics in America*, edited by Robert Hunter, pp. 239-243. University Press of New England [2001].

"William Richards' Stoneware Pottery Discovered!" *Trenton Potteries* 1(3):1-3 [2000]. Reprinted in *Bulletin of the Archaeological Society of New Jersey* 59:71-73 [2004].

"Trenton Re-Makes: Reviving the City by the Falls of the Delaware." *Preservation Perspective* XVIII (2): 1, 3-5 [1999]

"Mitigating Effects on an Industrial Pottery." *CRM* 21(9):25-26 [1998] (with Patricia Madrigal).

From Teacups to Toilets: A Century of Industrial Pottery in Trenton, Circa 1850 to 1940, Teachers Guide sponsored by the New Jersey Department of Transportation, 1997 (with Patricia Madrigal and Wilson Creative Marketing).

"Pretty Village to Urban Place: 18th Century Trenton and Its Archaeology." *New Jersey History*, Volume 114, Numbers 3-4, 32-52 [Fall/Winter 1996] (with Ian Burrow).

Hopewell: A Historical Geography. Township of Hopewell [1991] (with Richard L. Porter).

"Contracting Archaeology? Cultural Resource Management in New Jersey, U.S.A." *The Field Archaeologist* (Journal of the Institute of Field Archaeologists) 12, 194-200 [March 1990] (with Ian Burrow).

"American Steel in the Colonial Period: Trenton's Role in a 'Neglected' Industry." In *Canal History and Technology Proceedings* IX, 83-118 [1990] (with Richard L. Porter).

"The Demise of Traditional Pottery Manufacture on Sourland Mountain, New Jersey, during the Industrial Revolution." Ch. 13 in *Domestic Potters of the Northeastern United States, 1625-1850.* Studies in Historical Archaeology, Academic Press [1985].

PROFESSIONAL AFFILIATIONS

Register of Professional Archaeologists (RPA) [formerly Society of Professional Archeologists] (accredited 1979; certification in field research, collections research, theoretical or archival research)
Preservation New Jersey (Board Member, 1994 - 2003)
New Jersey State Historic Sites Review Board (Member, 1983 -1993)
Society for Historical Archaeology
Society for Industrial Archaeology
Society for Post-Medieval Archaeology
Historical Metallurgical Society
Council for Northeast Historical Archaeology
Professional Archaeologists of New York City
Archaeological Society of New Jersey (Life Member; Fellow, 2011)

OTHER AFFILIATIONS

Mercer County Cultural & Heritage Commission (Commissioner, 2011 – present)
Trenton Downtown Association (Board Member, 1998 – present; Board Chair, 2007 - 2008)
Trenton Museum Society, (Trustee, 2011 – present)
Hopewell Township Historic Preservation Commission (Member, 1998 - 2006; Chair 2003 - 2004)
Hopewell Valley Historical Society (Trustee, 2014 – present)

Richard W. Hunter
PRESIDENT

Patrick Harshbarger
VICE PRESIDENT

James S. Lee
VICE PRESIDENT

Patricia A. Madrigal
VICE PRESIDENT

PATRICK HARSHBARGER
Vice President
Principal Historian/Architectural Historian/Industrial Archaeologist, M.A., M.P.A.

EDUCATION

M.A., History, Hagley Fellow, University of Delaware, Newark, Delaware, 1990

- Fields of Study: History of Technology (focus on built environment, structural engineering and architecture); American Colonial History; American Labor History; European Industrialization

Museum Studies Certificate, University of Delaware, Newark, Delaware, 1990

M.P.A., Public Administration, Florida International University, Miami, Florida, 1988

- Focus on non-profit management

B.A. *magna cum laude*, American History, Brown University, Providence, Rhode Island, 1984

EXPERIENCE

2015-present Vice President
Hunter Research, Inc., Trenton, New Jersey

As a member of the firm's senior management team, Mr. Harshbarger participates in all aspects of business management, development and strategic planning.

2010-present Principal Historian/Architectural Historian
Hunter Research, Inc., Trenton, New Jersey

Technical and day-to-day managerial responsibilities for historical and archival research in support or historic architecture and archaeology. Participation in:

- federal Section 106, state and municipal preservation law compliance review
- historical architectural survey, evaluation and recording of buildings and structures
- historical research
- preservation planning
- public outreach
- historical exhibits and signage
- interpretive planning and development
- report preparation
- proposal preparation

1996-2016 National Editor, *Society for Industrial Archeology Newsletter*
(www.sia-web.org/siapubs/publications.html)

Full editorial responsibilities inclusive of identifying and providing assistance to contributing authors and photographers, copy editing and oversight of graphic design and production on a quarterly basis. The SIA is the leading North American organization for the documentation and preservation of industrial heritage.

1991-2010 Senior Historian/Preservation Planner
TranSystems Corp. (formerly Lichtenstein Consulting Engineers)
Langhorne, Pennsylvania and Paramus, New Jersey

Served as one of two staff historians to a national engineering and transportation consulting firm specializing in historic bridges and roads, as well as general cultural resources management services and architectural surveys (Sections 106 and 4f), to a client base consisting mainly of local, state and federal agencies.

1991-2009 Historian
McKelvey Museum Services, Wilmington, Delaware

On-call interpretive planning, exhibit development and collections management for historic sites and museums in the Mid-Atlantic region inclusive of historical research, meetings with trustees and staff, and report preparation and editing.

1990 Historian, National Park Service
Historic American Engineering Record, Boston, Massachusetts

1989 Architectural Historian Intern
Bucks County Conservancy, Doylestown, Pennsylvania

1986-88 Special Assistant/Newsletter Editor
Office of the Vice President, Florida International University, Miami, Florida

1984-1986 Deputy Director
Slater Mill Historic Site, Pawtucket, Rhode Island

CONTINUING EDUCATION AND CERTIFICATIONS

- Secretary of the Interior's Professional Qualifications Standards for Historians (36 CFR Part 61)
- Secretary of the Interior's Professional Qualifications Standards for Architectural Historians (36 CFR Part 61)
- Architectural History Seminar and Workshop, New Hampshire Division of Historical Resources, Manchester, New Hampshire, 2014.
- National Register Nomination Preparation, New Jersey Historic Preservation Office and National Register of Historic Places Joint Workshop, Trenton, New Jersey, 2011
- Iron and Steel Preservation Workshop Certificate, Lansing Community College, Lansing, Michigan, 2010, 2012 (also presenter)
- Section 106 Training Certificate, Ohio Department of Transportation, Columbus, Ohio, 2010
- HAZWOPER 24-hr. Training
- Section 106 Training Workshop, Pennsylvania Department of Transportation, Allentown, Pennsylvania, 2009
- Museum Studies Certificate, University of Delaware, Newark, Delaware, 1990
- Hagley Fellow in the History of Industry and Technology/Museum Studies, Hagley Museum & Library, Wilmington, Delaware, 1988-1991

SPECIAL SKILLS AND INTERESTS

- historic engineering and bridges
- historic transportation systems (roads, canals, railroads)
- preservation of historic machinery and tools
- industrial and commercial architecture
- engineering heritage
- industrial archaeology
- public history and heritage tourism
- photography

PROFESSIONAL AFFILIATIONS

Association for Industrial Archaeology (U.K.)
National Railway Historical Society
National Society for the Preservation of Covered Bridges
National Trust for Historic Preservation
Newlin Foundation, Vice Executive Trustee
Society for Commercial Archeology
Society for the History of Technology
Society for Industrial Archeology
Society for the Preservation of Old Mills
Vernacular Architecture Forum

AWARDS

New Jersey State Historic Preservation Award for *A Gentleman's Pursuit: The Commodore's Greenhouse* with the Morven Museum, 2018.
General Tools Award for Distinguished Service to Industrial Archeology, Society for Industrial Archeology, 2017.
Preservation Award, County of Passaic, State of New Jersey for Contributions to Historic Preservation, 2016.
Preservation Award, City of Paterson, New Jersey for Intensive-Level Architectural Survey of the Dublin Workers' Neighborhood, 2016.
Preservation Award, City of Paterson, New Jersey for Intensive-Level Architectural Survey of Paterson's Industrial Complexes and Mills, 2012.
New Jersey State Historic Preservation Award for Petty's Run Site Archaeological Explorations, 2010.

SELECTED PUBLICATIONS AND REPORTS

Co-author with Richard W. Hunter. *Sartori to Sacred Heart: Early Catholic Trenton.* Sacred Heart Parish, Trenton, New Jersey, 2014.

New Jersey Department of Transportation's Fernwood Service Station, Serving New Jersey's Highways Since 1922. New Jersey Department of Transportation, Trenton, New Jersey. 2014.

"Two Pioneering American Roadways." *Proceedings of the Institution of Civil Engineers – Engineering History and Heritage*. London, England, May 2010.

Editor. *Abstracts of American Truss Bridge Patents, 1817-1900*. Society for Industrial Archeology, Houghton, Michigan, 2009.

Robert John Prowse, New Hampshire State Bridge Engineer. New Hampshire State Historic Preservation Monograph Series. Concord, New Hampshire, 2009.

Co-author. *National Guidelines for Historic Bridge Rehabilitation and Replacement*. Washington, D.C.: American Association of State Highway and Transportation Officials, 2008.

"Defining Historic Roads." *Proceedings of the 6th Preserving the Historic Road in America Conference*. Albuquerque, New Mexico, 2008.

Historic Bridge Basics. South Carolina Department of Transportation. Columbia, South Carolina, 2004.

"Strategies for Historic Evaluation of Standard Highway Bridges, 1920-1960." *Proceedings of the Preserving the Recent Past 2 Conference*. Philadelphia, Pennsylvania, October 2000.

"So Your Dualized Highway is 50 Years Old? Is It Historic?" *Proceedings of the Preserving the Historic Road in America Conference*. Morristown, New Jersey, April 2000.

Editor and Co-author. *Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads*. 2nd Edition Revised. Dover, Delaware: Delaware Department of Transportation, 2000.

"Metal Truss Bridges and Their Builders in Historical Perspective: Some Thoughts from a Case Study of the Phoenix Bridge Company." *Spans of Time*. Historic Ithaca: Ithaca, New York, 1999.

"The Providence School Board Reform Movement, 1898-1924." *Rhode Island History*, Volume 44, Number 2 (May 1985).

Richard W. Hunter
PRESIDENT

Patrick Harshbarger
VICE PRESIDENT

James S. Lee
VICE PRESIDENT

Patricia A. Madrigal
VICE PRESIDENT

JOSHUA J. BUTCHKO
Principal Investigator/Laboratory Supervisor, M.A., RPA

EDUCATION

M.A. Public History, Rutgers-The State University of New Jersey, Camden, NJ, 2012

B.A. Anthropology and Classics, Drew University, Madison, NJ, 2003

EXPERIENCE

2012-present Principal Investigator and Laboratory Supervisor
Hunter Research, Inc., Trenton, NJ

Technical and managerial responsibilities for survey, evaluation and mitigation of selected archaeological projects. Technical and managerial responsibility for archaeological collections including laboratory, curatorial, and transport components of all archaeological projects. Responsible for company safety policy, training and development as Company Safety Officer. Participation in:

- overall site direction and day-to-day management of Archaeological Monitoring Programs and Phase I, II and III Archaeological Investigations
- coordination and management of public archaeology programs
- development and implementation of research, excavation and analysis strategies for prehistoric and historic archaeological sites
- report writing and proposal preparation
- management of laboratory operations and supervision of personnel
- preparation and computerization of artifact inventories, data and analysis
- assistance in artifact display assembly

2008-2012 Laboratory Supervisor and Senior Archaeologist
Hunter Research, Inc., Trenton, NJ

Technical and managerial responsibilities for laboratory components of archaeological projects. Participation in:

- management of laboratory operations
- supervision of personnel
- management of field equipment and site logistics
- computerization of artifact data
- historic ceramic analysis
- preparation of artifact inventories
- writing artifact section of reports

2006-2008 Senior Archaeologist
Hunter Research, Inc., Trenton, NJ

Technical and supervisory responsibilities for selected field, laboratory, drafting operations and report preparation. Participation in:

- on-site project management
- survey and excavation
- stratigraphic and artifact analysis
- supervision of personnel
- field photography
- report preparation
- supervision of mechanically assisted excavation
- guidance and instruction at on-site public archaeology service days

2003-2006 Field Assistant
Hunter Research, Inc., Trenton, NJ

Worked on various archaeological field projects in New Jersey, Delaware, New York, Pennsylvania, and Washington, DC. Participation in:

- excavation and survey
- field recording
- laboratory processing of artifacts

2003 Volunteer
Monmouth University Archaeological Field School

Technical and supervisory responsibilities for selected field operations at the Abraham Staats House in Bound Brook, NJ. Participation in:

- survey and excavation
- stratigraphic and artifact analysis

2002 Field Assistant
Drew University Archaeological Field School in Ecuador

Worked at multiple sites in the Los Congrejitos area. Participation in:

- survey and excavation
- stratigraphic and artifact analysis
- field photography
- artifact processing and analysis

SAMPLE OF PRESENTATIONS/PAPERS

Eastern States Archaeological Federation, 81st Annual Conference, Solomons MD, October 2014
Commodore Stockton's Morven Greenhouse: Form and Function c. 1852 to c.1890

Society for Historical Archaeology, 49th Annual Conference, Washington D.C. January 2016
Examining Cemetery Investigations at the First Presbyterian Church of Elizabeth and First Reformed Dutch Church of New Brunswick, New Jersey: A Discussion of Remembrance and Regulation

CERTIFICATIONS

HAZWOPER 40 Hour Certification
HAZWOPER 8 Hour Supervisor Training
HAZWOPER 8 Hour Confined Space Entrant Certification
NJ DEP SHPO 7 Hour CRM Essentials Training Program

AFFILIATIONS

Registered Professional Archaeologist (RPA)
National Council on Public History (NCPH)
Society for Historical Archaeology (SHA)
Archaeological Society of New Jersey (ASNJ)

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 Bay
U.S.G.S. Quadrangle:	South Amboy, N.J.-N.Y.
Project:	Archaeological Documentation, Camden and Amboy Railroad/Pennsylvania Railroad Wharves Westmoreland Pier and Lehigh Pier, (Intermodal Ferry Transportation Center Site), City of South Amboy, Middlesex County, New Jersey
Level of Survey:	Documentation
Cultural Resources:	Camden & Amboy Railroad; Pennsylvania Railroad

Appendix G

PROJECT ADMINISTRATIVE DATA

APPENDIX G

Project Administrative Data

HUNTER RESEARCH, INC.
PROJECT SUMMARY

Project Name:	Archaeological Documentation, Camden and Amboy Railroad/Pennsylvania Railroad Wharves Westmoreland Pier and Lehigh Pier, (Intermodal Ferry Transportation Center Site), City of South Amboy, Middlesex County, New Jersey
Level of Survey:	Documentation
HRI Project Reference:	19013
Date of Report:	December 2020
Client:	City of South Amboy
Prime:	French & Parrello Associates
Review Agency:	NJHPO
Agency Reference:	N/A
Artifacts/Records Deposited:	N/A

PROJECT CHRONOLOGY

Date of Contract Award:	5/2/2019
Notice to Proceed:	5/2/2019
Background Research:	May - June 2019
Fieldwork:	May - June 2019
Analysis:	N/A
Report Written:	May 2019 - December 2020

PROJECT PERSONNEL

Principal Investigator(s):	Richard W. Hunter, James Lee, Joshua Butchko
Background Researcher(s):	Patrick Harshbarger
Field Supervisor(s):	Joshua Butchko
Field Assistant(s):	Alexis Alemy, Michael Brown, Evan Mydlowski
Analyst(s):	N/A
Draftperson(s):	Michael Brown, Evan Mydlowski
Report Author(s):	Patrick Harshbarger, Richard Hunter, Joshua Butchko