



Feats of Engineering: Bridging the Hackensack River and Cutting through Bergen Hill

Documentation for Three Historic Resources that
Help Move Commerce and Commuters throughout the
Port of New York and New Jersey

By Teresa D. Bulger

Prepared for:
The New Jersey Department of Transportation

May 7, 2019



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Feats of Engineering: Bridging the Hackensack River and Cutting through Bergen Hill

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The Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River, the New Jersey Railroad Bergen Cut Historic District, and the Hackensack River Lift Bridges Historic District

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1.0 INTRODUCTION

This Additional Research document has been prepared by RGA, Inc. (RGA) on behalf of the New Jersey Department of Transportation (NJDOT) and the Jacobs Engineering Group Inc. The publication is an outgrowth of NJDOT's plans to replace the Wittpenn Bridge with a new, vertical lift structure. In 2010, the NJDOT executed a Memorandum of Agreement (MOA) to mitigate the effects of replacing the Wittpenn Bridge. Stipulation #4 of the MOA, Additional Research, called for the NJDOT to ensure that additional research be carried out regarding three historic properties including the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack, the New Jersey Railroad Bergen Cut Historic District, and the Hackensack River Lift Bridges Historic District. These properties are eligible for listing in the National Register of Historic Places and represent three of the four eligible historic properties that were adversely affected by the replacement of the Wittpenn Bridge, the fourth property being the Wittpenn Bridge. Additional components of the project include measures such as the preparation of Historic American Engineering Record documentation of the Wittpenn Bridge and interpretive displays. All documentation will be placed on file with the NJDOT and the New Jersey Historic Preservation Office (NJHPO) in Trenton.

The purpose of this document is to serve as a reference tool and does not formally revise any prior opinion of the State Historic Preservation Officer (SHPO) or other regulatory finding.

Abbreviations:

Abbreviation	Full Name
C&ARR	Camden and Amboy Railroad
DL&WRR	Delaware, Lackawanna, and Western Railroad
D&RCC	Delaware and Raritan Canal Company
M&E	Morris and Essex Railroad
NJRR	New Jersey Railroad
P&HRR	Paterson and Hudson River Railroad
PATH	Port Authority Trans-Hudson Corporation
PRR	Pennsylvania Railroad
UNJRR&C Co.	United New Jersey Railroad and Canal Co.

Short Name	Full Name
Lower Hack Bridge	Lower Hack Draw Bridge over the Hackensack River
Harsimus Branch Bridge	Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River
PATH Bridge	Pennsylvania Railroad (PATH) Bridge over the Hackensack River
Wittpenn Bridge	Wittpenn (NJ Route 7) Bridge over the Hackensack River
Bergen Cut Historic District	New Jersey Railroad Bergen Cut Historic District

2.0 PENNSYLVANIA RAILROAD HARSIMUS BRANCH (CONRAIL/CSX) BRIDGE OVER THE HACKENSACK RIVER

UTM coordinates: 18T 577486 4510376 UTM

Location and Setting

Spanning the Hackensack River, City of Jersey City and Kearny Town, Hudson County, New Jersey (Figure 1).

The bridge's surroundings are characterized by low density, light industrial properties and an extensive road network. Nearby roads include the Pulaski Skyway (U.S. Route 1 & 9) to the south, and the U.S. Route 1 & 9 Truck route and NJ Route 7 on the east side of the river. NJ Route 7 crosses the Hackensack River over the Wittpenn Bridge, just north of and sharing its western piers with the subject bridge.

Current Owner

Private: Norfolk Southern Corporation and CSX Corporation via Conrail.

Current Function

Transportation - Rail-Related

Description

The Pennsylvania Railroad (PRR) Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River (Harsimus Branch Bridge) is one of a series of vertical lift bridges constructed in New Jersey during the early twentieth century as part of a “post WWI regional effort, led by the War Department to provide a steady and uninterrupted flow of railroad, vehicular, and marine traffic through and over the navigable waterways within the Port of New York” (Guzzo 2002). This structure carries two tracks of freight rail traffic over the Hackensack River, between Kearny Town and Jersey City, and once connected northern New Jersey with the former PRR’s Harsimus Cove terminal on the east side of Jersey City via the Bergen Cut (Figure 2).¹ Completed in 1930, the structure’s vertical lift design was intended to enable large vessels associated with marine commerce along the Hackensack River to utilize a wider navigation channel and greater clearances than was made available by the earlier swing-bridge design it replaced. The latter had been constructed between 1880 and 1887 by the PRR early in its campaign to improve freight movements into Jersey City. The lift bridge was designed in consultation with the firm of Waddell and Hardesty, renowned movable bridge engineers, and was constructed in coordination with the PRR’s adjacent sister bridge, the Pennsylvania Railroad (PATH) Bridge over the Hackensack (PATH Bridge), which carried passenger trains to Jersey City, and the Wittpenn (NJ Route 7) Bridge over the Hackensack (Wittpenn Bridge). Today the Harsimus Branch Bridge continues to carry freight traffic and is owned by Conrail Shared Assets Corporation which is controlled jointly by Norfolk Southern Corporation and CSX. This bridge represents a good example of movable bridge technology developed by American engineers in the early twentieth century (Hawley 1984 [HAER NJ-43]; Guzzo 2002).

The Harsimus Branch Bridge comprises the following spans: one through girder and four deck plate steel girder western approach spans, two Pratt truss tower spans, a Parker truss lift span, one deck plate steel girder, and a six span concrete-encased steel viaduct at the eastern approach. The bridge measures 1,188 feet long and rests on reinforced concrete piers. The lift span is 198 feet, 10 inches long with a 13-foot vertical clearance over mean high water in the closed position and a 135-foot clearance when opened. The relatively low 13-foot vertical clearance was determined by the elevation of PRR’s Meadow Yards (now part of the Kearny Intermodal Facility) located immediately to the west of the structure. As a result of

¹ This document’s description of the Harsimus Branch Bridge is drawn from the 2001 Cultural Resources Survey for the Wittpenn Bridge (Richard Grubb & Associates, Inc. 2002).

the low vertical clearance, the bridge opened more than 1,000 times a year in 2000, while the adjacent Wittpenn Bridge, seated at 35 feet above mean high water, only opened approximately 300 times in the same year (Parsons Transportation Group, Inc. 2000).

The towers consist of front vertical columns and rear inclined columns. Mounted atop the towers are sheaves over which pass steel wire ropes that are attached to counterweights and are used to lift the span. Gears move the span upward while simultaneously allowing the counterweights to move downward. Since its opening, the lift span has been controlled by a bridge operator stationed in the adjoining PRR PATH Bridge to the south.

History

The PRR traces its roots to 1846 when it began acquiring or leasing other lines throughout Pennsylvania. By the end of the Civil War, the PRR had extended its reach as far as St. Louis, Chicago, Washington, and Buffalo. Still, the PRR lacked a direct route to New York. In 1871, the PRR acquired a 999-year lease of the United New Jersey Railroad and Canal Company (UNJRR&C Co.), a consolidation of the New Jersey Railroad Company (NJRR), the Camden and Amboy Railroad (C&ARR) and Delaware & Raritan Canal Company (D&RCC), which together operated a rail line between Trenton and Jersey City. Renamed the Main Line of the New York Division, the newly leased trackage allowed the PRR to compete directly with the Erie Railroad and the New York Central Railroad for access of its western trade to the coveted New York market (Lane 1939: 318).

Prior to the PRR lease, the UNJRR&C Co. recognized the inadequate facilities it possessed along the Hudson River waterfront. The original double track running through the Bergen Cut and down Railroad Avenue to Exchange Place was woefully inadequate for growing traffic. The railroad campaigned for the purchase and filling of part of Harsimus Cove, an inlet north of the existing terminal at Exchange Place, in order to erect new freight yards and piers along the Hudson riverfront. Also sought was a connecting route between the existing main line and the proposed Harsimus Cove yards. Strenuous opposition stalled the project, but a bill (known as the Harsimus Cove Bill) finally passed the state legislature in 1868 granting the UNJRR&C Co. rights to build the Harsimus Cove facilities and connecting line with the condition that the railroad pay the state \$500,000 for the riparian land (Van Winkle 1924: 201; Hayden 2008). By forcing the UNJRR&C Co. to pay for the riparian rights, the state established a precedent in its exercise of control over the lands flooded by water (Platt 1973: 262; Development Commission 1920: 86). The following year, the Legislature made permanent the state's Riparian Commission (Development Commission 1920: 86).

Improvements at the Cove were completed in October 1873, before workers could finish connecting the yards to the main line through the Bergen Hill. The Cove was therefore reached by a temporary track built along the waterfront between the PRR main line near Exchange Place (Burgess and Kennedy 1949: 240). Finally, in 1875, the PRR's annual report noted that the "new railway to connect with the Harsimus Cove property has been opened for use through a portion of Bergen Hill from its connection with the Main Line" (PRR Annual Report 1875: 46). The Harsimus Yards, said to "exceed in their magnitude anything of the kind on the continent," comprised 1,100 feet of Hudson River waterfront with a 1,500-foot pier, grain elevator, stockyards, an abattoir, and an 80-foot tall warehouse. Tracks connected with pontoon bridges allowed for the daily transfer of nearly 500 railroad cars across the river (Shaw 1884: 196).

In 1878, the PRR began to straighten and widen the rest of the Bergen Cut between the Hackensack River and the branch to Harsimus Cove. This enabled the railroad to eliminate several sharp curves in the original structure and gain enough room to build a four-track main line through the cut (Pennsylvania Railroad 1878; 1881). The straightening project was undertaken by the team of Bernard M. and John F. Shanley of Newark, long-time PRR contractors (Messer and Roberts 2002: 187; The New York Times [NYT] 1911: 13). The newly straightened Bergen Cut, also known as "Shanley's Cut," opened in March 1882. It measured approximately a mile long, ran at an average depth of 25 feet, and cost over

\$500,000 (NYT 1882: 5). By straightening the line, the railroad obliterated most of the original 1830s Bergen Cut. It also enabled the company to create the two-track dedicated freight line and relocate the Harsimus Branch junction with the mainline eastward to a point near Waldo Avenue.

Meanwhile, on the west side of the Hackensack River, the PRR started building additional freight facilities in the Kearny meadows. Beginning in 1872, the railroad began laying out the Meadow Yard, designed as the principal engine terminal and key classification yard for the railroad's freight. This vast complex consisted of a roundhouse, turntable, lumberyards, storage sheds, and blacksmith and erecting shops. From this yard, the PRR's freight traveled over the Harsimus Branch Bridge and on toward shoreline of Jersey City. The west side of the Hackensack River also served as an important interchange point with the Delaware, Lackawanna, and Western Railroad (DL&WRR) at Kearny Junction at the west end of the yard (Condit 1980:166).

Until the Greenville Yards were established in 1905, all of the PRR's freight traffic was carried via the Harsimus Branch. With the vast improvements at Harsimus Cove and the Meadow Yards, freight traffic swelled to such an extent that the PRR's original swing bridge across the Hackensack River — built by the UNJRR&C Co. and upgraded from two to four tracks - could no longer handle the combined volume of passenger and freight traffic. Between 1880 and 1887, the PRR erected two new swing bridges over the Hackensack River, one each for its passenger and freight lines. Historic maps show that the bridges, no longer extant today, shared common piers at their eastern approach.

In 1926, in order to improve navigation and promote the economic vitality of the Port of New York, the War Department issued a directive requiring vertical clearance above the Hackensack and Passaic rivers be a uniform 35 feet over mean high water with a maximum vertical clearance of 135 feet. Plans were subsequently drawn up by the PRR to replace the old swing bridges and trestle approaches. The new Harsimus Branch Bridge was built north of the existing bridge and concurrently with the Wittpenn Bridge, which shares its westernmost eight piers, including all river piers.

The construction of the Harsimus Branch Bridge, as well as its neighboring bridges, was undertaken in a short time window between 1928 and 1930 (Figure 3). The completion of the bridges not only implemented a new clearance system above mean high water, but also involved the construction of a new channel for ships traveling on the Hackensack. As part of the construction process, the channel was shifted 400 feet east, toward the eastern shore of the Hackensack River (Railway Age 1931: 167).

As noted above, the Harsimus Branch Bridge was 1,188 feet long when completed, including viaduct approaches, and carried two tracks for freight traffic. The bridge was constructed on a skew rather than perpendicular to the shore, and formed a 60-degree, 59-minute angle with the shoreline of the Hackensack River. Its lift span was reported to be 198 feet, 10 inches long, center to center of its bearings providing a clear channel width of 158 feet (Railway Age 1931: 164). The bridge was constructed of carbon steel, with a basic unit stress of 16,000 lb. per sq. inch (Railway Age 1931: 165). The spans of the bridges are supported by concrete masonry piers, with the westerly piers built long enough to accommodate the support needed for the highway bridge to the north (the Wittpenn Bridge). The towers are supported by deep box girders placed outside the flanking deck girder spans, in contrast to the PRR PATH Bridge where the towers are integrated into the neighboring fixed-truss spans (Railway Age 1931: 165).

A network of counterweights and cables, known as an “equalizing arrangement,” functioned to pull the central span to a height of 135 feet above mean high water (Railway Age 1931: 166). The lift spans were connected to counterweights by twelve 1 7/8-inch cables at each corner of the span (Railway Age 1931: 165). These cables, in groups of six, passed over sheaves at the top of the towers at 167 feet above the piers below. Four auxiliary counterweights, one on each side of the two towers, were suspended at the mid-height of the upward travel of the lift span (Railway Age 1931: 166). The equalizing arrangement was designed to be easily accessible for inspection and repair, to avoid

potential interference with overhead aerial cables, to eliminate the cost associated with more traditional “rocker bent” equalizers, and to reduce the necessary weight of the counterweights due to their unique arrangement.

The Harsimus Branch Bridge was designed to be lifted concurrently with its sister bridge, the PRR’s passenger bridge over the Hackensack to the south (PATH Bridge) (Railway Age 1931: 166). As such, one operator, housed in the east tower of the passenger bridge, controlled both bridges. Power for both bridges was drawn from four sources to ensure reliable operation: two independent 650-volt d.c. circuits supplied by the third rails of the PRR passenger trains third rails, a connection with the 4,150-volt a.c. circuit of the Public Service Electric Company, and finally a back-up gasoline engine located in the machinery house of the lift span. The electric power was converted to 550-volts d.c. by motor-generator sets in a generator house in the east tower (Railway Age 1931: 166). While designed to work in concert, each bridge was capable of being opened independently if needed. The Harsimus Branch Bridge could be raised in two minutes if both bridges’ engines were working, though if opening independently, the lift took three minutes.

The Harsimus Branch Bridge went into service on November 4, 1930. The PRR personnel responsible for its construction included A.C. Watson, Chief Engineer of the New York District of the PRR, designed under the direction of A.R. Wilson, Engineer of Bridges and Buildings, and erected under the direction of T.W. Pinard, Engineer of Bridges and Buildings, and J.J. Vail, Construction Engineer (Railway Age 1931; Engineering New-Record 1930).

Trade journals of the time reported on the contractors involved in the construction project (Railway Age 1931; Engineering New-Record 1930). The steel for the bridge was fabricated by the Phoenix Bridge Company, of Phoenix, Pennsylvania. The Foundation Company of New York constructed the river piers and west approach piers while J. Rich Steers, Inc. of New York constructed the foundations and piers of the east approach structures. The concrete deck slab was constructed and placed by Federic Snare, Inc., of New York (Railway Age 1931: 170).

After World War II, the focus on highway construction and increased use of the automobile diverted passengers away from all railroads. By the 1960s, mergers between ailing carriers were believed to be the only means of survival. The PRR merged with the New York Central in 1968, but the company went bankrupt in 1970, the largest bankruptcy in American history up until that time. Its freight operations were subsequently taken over by Conrail and later acquired by Norfolk Southern and the CSX Corporation, with the latter now operating the eastern end of the former Meadow Yards as its Kearny Intermodal Facility (DeLeuw Cather & Company 1991: 53).

Description of Significance

The Harsimus Branch Bridge played an important role in the history of commerce and transportation in New Jersey and the Port of New York. It was one of several rail lines dedicated to handling freight traffic for the PRR in Jersey City and allowed the PRR to compete with its rivals by giving it a major presence in the Port of New York. In the process, these improvements contributed directly to the prosperity of the PRR and transformed the Jersey City waterfront.

After World War I, the need for adequate shipping channels along the Hackensack River became apparent, both to allow for the passage of vessels and to ensure a steady and uninterrupted flow of railroad and vehicular traffic into and out of Hudson River terminals. The Harsimus Branch Bridge carried vast quantities of freight for the PRR and was an integral part of the regional transportation network that supplied the Port of New York.

Additionally, the construction of the Harsimus Branch Bridge, in concert with its neighboring vertical lift bridges, represents a refinement of American bridge technology in the early twentieth century as applied to the crossing of long spans. Waddell and Hardesty, the firm of preeminent movable bridge engineer John L. Waddell, consulted on the construction of this and the PRR (PATH) Bridge to the south.

The Harsimus Branch Bridge is individually eligible for listing in the National Register of Historic Places (NRHP) under Criterion A in the area of Transportation for its association with the PRR's expansion of its freight operations in Jersey City and the War Department's efforts in the 1920s to create navigable waterways with adequate vertical clearance in order to promote the economy of the Port of New York (Richard Grubb & Associates, Inc. 2002; SHPO Opinions 2/7/2001 & 5/3/2002; Guzzo 2001, 2002). The Harsimus Branch Bridge is also eligible under Criterion C in the area of Engineering for its vertical lift design and its association with the firm of Waddell & Hardesty. The bridge is an increasingly rare example of an operable vertical lift design from the early twentieth century (Richard Grubb & Associates, Inc. 2002; SHPO Opinions 2/7/2001 & 5/3/2002; Guzzo 2001, 2002).

The period of significance for the bridge is 1930, when the bridge was completed (Guzzo 2002). In addition to being individually eligible for listing in the NRHP, the Harsimus Branch Bridge is also a key contributing resource to the NRHP-eligible New Jersey Railroad Bergen Cut Historic District (SHPO Opinion 5/3/2002). The Harsimus Branch Bridge is also a key contributing resource to the NRHP-eligible Hackensack River Lift Bridges Historic District (Guzzo 2002).

Major Defining Features

As a notable example of a vertical lift bridge, the Harsimus Branch Bridge has several major defining features associated with its operation, including the bridge's truss towers, its Parker truss lift span, and its steel construction.

The truss towers of the Harsimus Branch Bridge are distinctive in their appearance and construction. The towers are composed of front vertical columns and rear inclined columns, between which lie trusses that stabilize the structure. The Parker truss lift span is similarly distinctive, with its curved upper chord and diagonal members sloping toward the center of the bridge. Finally, the steel construction of the bridge is a defining feature. Steel, alloyed with carbon or silicon, was a standard construction material for railroad bridges in the early twentieth century. The Harsimus Branch Bridge's superstructure is constructed of steel members riveted together to create the truss system. To date, character-defining features have not been formally defined through consultation with the NJHPO.

Boundaries

The boundary for this historic property is delineated by the bridge footprint, which is 1,188 feet long and includes the movable span, approach spans, and substructure (Richard Grubb & Associates, Inc. 2002: 8-27). The Harsimus Branch Bridge shares common piers with the adjacent Wittpenn Bridge, a vehicular vertical lift bridge completed in 1930 as part of State Highway Route 10 (now NJ Route 7).

Visiting

As an active freight railroad bridge, the Harsimus Branch Bridge cannot be visited. However, because the bridge is situated within an extensive road and rail network, the bridge can be viewed from nearby thoroughfares. Motorists traveling over the Wittpenn Bridge, immediately to the north of the Harsimus Branch Bridge will gain the closest view of the structure as they pass over the Hackensack River. Similarly, passengers on PATH trains traveling between Newark and Jersey City can view the bridge from the adjacent PRR PATH Bridge over the Hackensack River, located just south of the Harsimus Branch Bridge. Views of the bridge can be attained from further afield as well, including from the Pulaski Skyway (U.S. Route 1 & 9). Google Earth imagery also offers an opportunity to explore the bridge from many angles remotely.

Major Bibliographic References

See Bibliography for full list of references

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1949 *Centennial History of the Pennsylvania Railroad Company, 1846-1946*. Pennsylvania Railroad Co., Philadelphia, Pennsylvania.

Messer, David W. and Charles S. Roberts

2002 *Triumph V: Philadelphia to New York, 1830-2002*. Barnard, Roberts and Company, Inc., Baltimore, Maryland.

Railway Age

1931 Special Features Used in New Lift-Span Bridges. *Railway Age* 91(5): 164-168.

Richard Grubb & Associates, Inc.

2002 Cultural Resources Survey, Route 7 Section 2, (Wittpenn Bridge) Over the Hackensack River, City of Jersey City, and Kearny Town, Hudson County, New Jersey. May 2002. On file at the New Jersey Historic Preservation Office, Trenton, New Jersey.

3.0 NEW JERSEY RAILROAD BERGEN CUT HISTORIC DISTRICT

Location of Property

UTM coordinates:

East: 18T 576831 4510435 UTM

Center: 18T 578661 4509881 UTM

West: 18T 579776 4508632 UTM

Location and Setting

Between the west side of the Hackensack River, Kearny Town and the east side of Bergen Hill, City of Jersey City, New Jersey, this historic district comprises approximately two miles of railroad bridges, embankments, and a massive, deep cut through the trap rock of Bergen Hill (Figure 4).

This railroad corridor's western end is characterized by a long embankment surrounded by low-standing, light industrial properties near its western terminus in Kearny Town and the Marion section of Jersey City, where a complex network of rail lines and vehicular roadways transport people and goods over the Hackensack River and along the western side of Bergen Hill. The eastern section of the historic district is characterized by a deep, massive cut through the trap rock of Bergen Hill to accommodate rail traffic at approximately 20-40 feet below the street grade.

Current Owner

Private: Norfolk Southern Corporation and CSX Corporation via Conrail Shared Assets Corporation.

Public: Port Authority of New York and New Jersey, Port Authority Trans-Hudson Corporation.

Current Function

Transportation - Rail-Related

Description

The New Jersey Railroad Bergen Cut Historic District is composed of a group of railroad resources associated with an approximately 2.7-mile long portion of the former New Jersey Railroad (NJRR) (later Pennsylvania Railroad [PRR]) right-of-way which approaches and passes through Bergen Hill in Jersey City, Hudson County, New Jersey (see Figure 4) (SHPO Opinion 5/21/1999; Guzzo 1999; Additions to the district: SHPO Opinion 2/7/2001; SHPO Opinion 5/3/2002; SHPO Opinion 2/27/2009; SHPO Opinion 7/14/2017; Guzzo 2001, 2002; Saunders 2009; Marcopul 2017).

The most important among the contributing resources comprising the historic district is the Bergen Cut (Bzdak 1998). Built as a cooperative effort between the New Jersey Railroad (NJRR) and the Paterson and Hudson River Railroad (P&HRR) between 1832 and 1838, the Bergen Cut is a one mile-long excavation ranging from 20 to 40 feet deep. A feat of engineering in its day, the Bergen Cut was also the first rail route opened through the massive trap rock formation known as Bergen Hill, a formidable natural barrier between interior rail networks of northern New Jersey and the Hudson River. The Bergen Cut provided the only passage through that landform for more than 20 years until completion of the Erie Tunnel in 1861. The Bergen Cut connected the wide-ranging network of New Jersey railroads in the west with the Jersey City waterfront, and ultimately with New York City. The Bergen Cut was widened and straightened beginning in the late 1870s. Today the Bergen Cut remains in use by the Port Authority Trans-Hudson Corporation (PATH) (Bzdak 1998).

Additional contributing resources to the New Jersey Railroad Bergen Cut Historic District are: the elevated right-of-way between the Hackensack River and the area west of Tonnel Avenue (SHPO Opinion 5/21/1999); the PATH Bridge over Wallis Avenue (SHPO Opinion 5/21/1999); the Wittpenn Bridge (NJ Route 7) Bridge over the Hackensack River (SHPO Opinion 2/7/2001); the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River (SHPO Opinion 2/7/2001); the Pennsylvania Railroad (PATH) Bridge over the Hackensack River (SHPO Opinion 5/3/2002); the Pennsylvania Railroad East Bound Bridge over National Docks & New Jersey Junction Connecting Railroad (SHPO Opinion 2/27/2009); and the Pennsylvania Railroad West Bound Bridge over National Docks & New Jersey Junction Connecting Railroad (SHPO Opinion 2/27/2009). Also contributing to the district are those resources within the Pennsylvania Railroad Harsimus Branch Right-of-Way Historic District, including the Second Bergen Cut, and the Harsimus Branch Embankment as well as the New Jersey Junction Railroad to Newark Avenue Iron Viaduct (Substructure Only), and the Newark Avenue Under-Grade Bridge (Substructure Only) (SHPO Opinion 7/14/17; Marcopol 2017). The New Jersey Railroad Bergen Cut Historic District overlaps with the Newark-to-Jersey City segment of the Pennsylvania Railroad (New York to Philadelphia) Historic District (Multiple SHPO Opinions) and is a key contributing element to that district.

The New Jersey Railroad Bergen Cut Historic District is eligible for the National Register of Historic Places under Criteria A and C, in the areas of Engineering and Transportation. The period of significance for the New Jersey Railroad Bergen Cut Historic District is 1832 to 1937.

History

Planning and Building the Bergen Cut

The Bergen Cut was built between 1832 and 1838 as part of the New Jersey Railroad and Transportation Company's (later just New Jersey Railroad, NJRR) initiative to connect Newark and Paterson with Jersey City in order to gain the most direct route possible for the delivery of products to and from New York City. Control of this route was part of a larger conflict about the control of rail transportation in New Jersey. In 1830, the Delaware & Raritan Canal Company (D&RCC) and the Camden & Amboy Railroad (C&ARR) were chartered as private corporations seeking to facilitate and control long distance freight transportation in New Jersey between Philadelphia and New York City. Northern New Jersey business interests, especially in Newark and Paterson, wanted to get involved in the railroad business. On January 21, 1831, the Paterson & Hudson River Railroad (P&HRRR) was chartered to build a railroad from Paterson to the Hudson River opposite New York City (Cunningham 1997: 49; Lucas 1944: 316). In February of 1831, the D&RCC and the C&ARR (Joint Companies) joined forces and secured a temporary monopoly on rail traffic between New York and Philadelphia (Freeman 1953: 103-105). The Joint Companies offered stock and discounted stock to the State of New Jersey in exchange for a permanently sanctioned monopoly (Freeman 1953:108).

Once the Joint Companies established their New York to Philadelphia monopoly, there was less opposition to a Hudson to New Brunswick route. The NJRR was able to obtain a charter for a railroad between the Hudson River at Jersey City and New Brunswick in March of 1832 (Freeman 1953: 111). The NJRR was not to connect with another railroad which connected with Pennsylvania and the C&ARR was to build a link between New Brunswick and Trenton (Baer 2015a).

A crucial portion of the route from Jersey City to New Brunswick involved traversing the Hackensack Meadowlands and Bergen Hill; the latter being a steep ridge composed of hard trap rock located between the Hackensack and Hudson rivers. On June 7, 1832, the NJRR met with Robert L. & Edwin A. Stevens of the Hoboken Ferry Company and the committee of the P&HRRR to discuss a route that would cross Bergen Hill (Baer 2015a). After reaching an agreement with the P&HRRR that they would share a passage through Bergen Hill, the NJRR surveyed a route that took advantage of meandering streams and erosion within the rock. In December of 1832, contractors for the NJRR began work on the Bergen Cut (Figures 5 and 6; Douglass 1841; Cunningham 1997).

In January of 1833, William Gibbs McNeill, engineer of the P&HRRR, reported on the costs to date for work on Bergen Hill, including the "purchase of mining tool and experiment on Bergen ridge and the Hackensack marshes" at an expense of \$2,199.63 (Lucas 1944: 101; citing McNeill 1833).

McNeill also reported that negotiations continued as to how the costs would be divided between the P&HRRR and the NJRR (Lucas 1944: 103-109). The final report, printed in the February 1833 issue of the *American Railroad Journal*, detailed the proposed arrangement between the two railroad companies. This arrangement stipulated that the NJRR would be responsible for the construction of the road through Bergen Hill, though P&HRRR would shoulder two-fifths of the cost at an expense of \$55,171.86 and two-fifths of the maintenance costs (Lucas 1944: 104, 115-116). As a result, the portion of the road that travelled through Bergen Hill was “to be common property of the two Companies, with equal privileges in all respects” (Lucas 1944: 104; citing Dickerson 1833: 147). Notably, the expenses incurred by the P&HRRR far exceeded the original estimates and overages the P&HRRR were responsible for amounted to \$166,490.17 (Lucas 1944: 148).

With the NJRR responsible for managing construction within Bergen Hill, the P&HRRR built its rail line to the west side of the hill. The P&HRRR's tracks intersected the NJRR at Marion Junction, at the western edge of the Bergen Cut. Rail stops within the Bergen Cut were built at Marion Junction and Summit Avenue (today Journal Square).

In November 1833, the New York-based *Spectator* reported that a one-half-mile section of Bergen Hill had been prepared for rail traffic. At the same time, the embankment in the meadowlands had been constructed between the Passaic and Hackensack rivers. The *Spectator* noted that until the cut was complete, the ridge would be traversed “by a suitable increase of propelling power, such as the addition of a horse or two to a car” to scale the heights between the Hackensack River and the Hudson River (*The Spectator* 1833). This temporary track over the ridge was laid by September 1834 and was traversed by horse-drawn cars.

In October of 1834, the NJRR and P&HRRR made an agreement that detailed the rights that each would have with respect to the Bergen Cut. The NJRR would build two tracks and grant trackage rights to P&HRRR for the route between the west side of Bergen Hill and the Hudson River in Jersey City (Freeman 1953: 114). Specifically, the NJRR would “lay two tracks from the junction of the Paterson road to Jersey City at a grade not exceeding 40 feet to the mile as soon as could be conveniently done and when completed the two roads should travel on the south track going to Jersey City and in returning, the north track” (Lucas 1944: 132-133). In addition to this, NJRR was also beholden to “lay down two tracks on any branch road which they might make to any ferry landing and allow the Paterson road to use it” (Lucas 1944: 133). The latter concession gave the P&HRRR access not only to the cut but also to the rail lines as they approached the Hudson River. Several other stipulations outlined scheduling minutia, the right-of-way for passenger cars, and the speed of trains. After the agreement was settled, P&HRRR agreed to pay tolls as follows: “For every passenger that shall enter upon the New Jersey road, six cents, and for every ton of merchandise, twelve cents. Empty cars and motive power were free of toll” (Lucas 1944: 133).

The NJRR completed its rail line from Jersey City to Rahway by late December of 1835 (Freeman 1953: 120). This road utilized horsepower to get over the ridge and left only the Bergen Cut and the bridge over the Raritan River to New Brunswick uncompleted before the charter of the NJRR was fulfilled. Passenger revenues from operations helped defray some of the mounting costs of the construction project in its final years.

Opening of the Bergen Cut

The Bergen Cut was finally completed on January 9, 1838. An article reporting on the progress of the NJRR appeared in the *Centinel of Freedom* in 1838, describing the feat as “Herculean” and noting that as a result of the continuous and convenient rail line it completed, “no public means of locomotion is likely to combine celerity and safety as to supersede Rail Roads” (*Centinel of Freedom* 1838). The article, written on the brink of the NJRR completing its charter, also noted that the C&ARR, which had opposed the NJRR building a railroad all the way to Trenton, had not yet completed its own branch line from New Brunswick to Trenton (*Centinel of Freedom* 1838).

When opened, the Bergen Cut was an average of 40 feet deep, established a grade of 26 feet per mile, and followed an S-shaped curve along an existing streambed in two sharp reverse curves (Freeman 1953: 123; Baer 2015b). Mid- to late nineteenth-century images of the cut illustrate its scale (Figures 7 and 8). Construction of the Bergen Cut cost \$455,121, of which \$40,000 was for powder (Freeman 1953: 123). Other major expenses were for more than 53,000 pounds of cast steel and 45,000 pounds of cast iron. During the course of construction, 18 men and two women were killed, in addition to the 100 workmen who were maimed or injured (Freeman 1953: 123). Rock tailings removed during the excavation were used to underpin a long embankment of earth that carried the tracks down from the hill on the east side of the ridge, near a place called Point-of-Rocks (near present-day Waldo Avenue), to the street level near Brunswick Street (Messer and Roberts 2002: 117).

The NJRR opened the Bergen Cut to locomotive traffic on January 22, 1838 when the first train traveled from Jersey City westward to Newark (Freeman 1953: 123). The completion of the Bergen Cut represented not only the first direct rail access between the east and west sides of Bergen Hill via steam locomotive but also an important link in the first rail line between Philadelphia and New York, once the C&ARR's connection between New Brunswick and Trenton was completed and opened for service on January 1, 1839 (Cunningham 1997: 61; Alexander 1947: 18-19).

With the introduction of the steam locomotives traveling through the Bergen Cut, the need for teams of horses to pull horse cars on the rails over the ridge was removed virtually overnight. With the inconvenience of a combination horse-and-steam system now eliminated, the NJRR was able to divert more resources to other projects to attract more passengers such as improved stations, lower fares, and heated cars (Freeman 1953: 124-125).

The Erie Railroad and the Morris & Essex Gain Access to the Bergen Cut

While the NJRR and P&HRRR shared rights to use the Bergen Cut, many railroads desired access to this avenue through Bergen Hill. In 1852, the larger New York & Erie Railroad (NY&ERR or Erie Railroad), in search of its own all-rail route between the New York state line and the Port of New York, formed the Union Railroad (a New York Corporation) to build a short one-mile connection between the Erie's main line in Suffern, New York and a subsidiary of the P&HRRR in New Jersey called the Paterson & Ramapo Railroad (P&RRR). On September 9, 1852, both the P&HRRR and the P&RRR were leased to the Union Railroad. The following day, the Union Railroad was assigned to the New York and Erie Railroad (later just "Erie Railroad") (Lucas 1944: 243). The series of contracts and agreements executed in association with these leases effectively made the P&HRRR part of the New York and Erie Railroad and formed the first direct all-rail route between the Great Lakes and New York Harbor by way of the Bergen Cut (Hungerford 1946: 132-133; Lucas 1944: 244).

In the fall of 1853, the former (1834) agreement between the NJRR and P&HRRR was revised with respect to the financing and access to the Bergen Cut (Freeman 1953: 141). The Erie Railroad agreed to pay the same rates as had the P&HRRR; however, the Erie Railroad was allowed to increase the gauge of the tracks through the Bergen Cut from the standard 4 feet, 10 inch gauge tracks, to the Erie standard, 6 feet, 0 inch gauge cars (Freeman 1953: 141; Lucas 1944: 244). This was accomplished with the laying of a third rail (Freeman 1953: 141; Lucas 1944: 262).

The news of Erie Railroad's control of the tracks was met with resistance by the residents of Paterson. With the transfer of ownership out of state, the needs of the local communities such as Paterson became secondary to the needs of the through traffic. Additionally, the difference in track gauges caused frequent derailments which were often fatal (Lucas 1944: 248). Switching between the gauges was accomplished manually and human error led to accidents, derailments, and delays.

The wider Erie Railroad rail cars presented an additional problem for the rail company as it tried to navigate through the narrow Bergen Cut. While some widening was undertaken in the fall of 1852, the minimal clearances between the cars and the walls of the cut soon demanded the cut be widened (Freeman 1953: 141). In 1853, the State legislature granted the NJRR permission to enlarge the Bergen

Cut and issue \$500,000 worth of stock to pay for the project. After the legislation was passed, however, the NJRR Board of Directors decided to divert the money toward other projects and the expansion of the cut fell by the wayside (Freeman 1953: 141).

After the Erie Railroad, the Morris & Essex Railroad (M&ERR) made a connection with the NJRR in Newark in 1853, and its trains traveled to Jersey City by way of the Bergen Cut (Taber 1977: 50). Eventually, each of these companies elected to construct its own right-of-way through Bergen Hill and opened tunnels of their own - in 1861 in the case of the Erie Railroad (via the Erie Railroad Bergen Hill Tunnel/Long Dock Tunnel) and 1877 in the case of the M&ERR (via the Bergen Tunnel).

The Pennsylvania Railroad and the Second Bergen Cut

In 1867, the NJRR was consolidated with the combined C&ARR and D&RCC to form the United New Jersey Railroad and Canal Company (UNJRR&C Co.). The new company then established a joint operating agreement with the Pennsylvania Railroad (PRR) and began making extensive improvements to its terminal facilities in Jersey City, including the filling in of part of Harsimus Cove, constructing a new freight rail yard, and blasting out a dedicated rail link from the east end of the Bergen Cut to the Cove. Finally, in 1871, the PRR leased the UNJRR&C Co. outright and achieved its long-sought-after outlet to the Hudson River through the Bergen Cut (Burgess and Kennedy 1949: 240).² The Second Bergen Cut was born of the PRR's aspirations to expand, widen, and straighten the existing Bergen Cut in order to streamline the new rail link from Bergen Hill to the Cove.

Improvements at the Cove were completed in October of 1873, before workers could finish blasting the new channel through the Bergen Hill. The Cove was therefore reached by a temporary track built along the waterfront between the PRR main line near Exchange Place (Burgess and Kennedy 1949: 240). The existence of this temporary connection was confirmed in the 1874 report of an investigating committee of the PRR stockholders, which noted: "To reach this property [Harsimus Cove], a temporary railroad has been constructed, which will answer the purpose until the coming fall, when a permanent connection will be made from the Bergen Cut to the Cove" (PRR Annual Report 1874: 90).

Work on the Second Bergen Cut progressed slowly. This expansion focused first on the widening the eastern terminus of the Bergen Cut to accommodate the route of the Harsimus Branch toward its new Sixth Street alignment. In November 1873, The New York Times reported "the laborers employed on the new cut for the PRR, through Bergen Hill, Jersey City, have had their wages reduced from \$1.50 to \$1.40 per day" (NYT 1873: 8). Finally, in 1875, the PRR's annual report noted that the "new railway to connect with the Harsimus Cove property has been opened for use through a portion of Bergen Hill from its connection with the Main Line" (PRR Annual Report 1875: 46). Thus, the northeastern-most section of the present-day Bergen Cut — still in active use by the Port Authority Trans Hudson Corporation (PATH) rapid transit system — was first constructed specifically for the Harsimus Branch.

In 1878, the PRR would begin to straighten and widen the rest of the Bergen Cut, which enabled it to eliminate several sharp curves in the original structure and gain enough room to build a four-track main line through the bottleneck (Pennsylvania Railroad 1878; 1881). The straightening project was undertaken by the team of Bernard M. and John F. Shanley of Newark, long-time PRR contractors (Messer and Roberts 2002: 187; NYT 1911: 13). The newly straightened Bergen Cut, also known as "Shanley's Cut," opened in March 1882. It measured approximately a mile long, ran at an average depth of 25 feet, and cost over \$500,000 (NYT 1882: 5). By straightening the line, the railroad obliterated most of the original 1830s Bergen Cut. It also enabled the railroad to relocate the main line passenger tracks and the junction with the Harsimus Branch freight tracks eastward to a point near Waldo Avenue. The straightened alignment opened in 1881 (Pennsylvania Railroad 1878; 1881) (Figures 9 and 10; Messer and Roberts 1997).

² For more information on PRR's acquisition of the UNJRR&C Co. see the above regarding the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River.

Over the course of the following decades, the PRR played a dominant role in the expansion of the network of terminal facilities, trunk lines, and secondary tracks within Jersey City. It is during this period that several of the contributing resources to the historic district were initially constructed, including the PRR East Bound Bridge over National Docks & New Jersey Junction Connecting Railroad, the PRR West Bound Bridge over National Docks & New Jersey Junction Connecting Railroad, the predecessors to the existing PRR (PATH) Bridge over the Hackensack River, and the PRR Harsimus Branch (CSX/Conrail) Bridge over the Hackensack River. Also at this time, the PRR built the Harsimus Branch along Sixth Street, which was widened over the years until in 1901, when construction on a seven-track wide masonry embankment, known as the Harsimus Branch Embankment, was begun. Iron bridges were constructed to carry the tracks over intersecting streets. On the west side of Bergen Hill during this period, the PRR built the elevated right-of-way between the Hackensack River and Tonnelle Avenue, also constructed of masonry embankments and iron bridges (Bzdak 1998).

The PRR's massive electrification project, carried out in stages across the system between 1903 and 1938, benefited freight service as much as passenger service. The process involved installing catenary poles, guy wires, and associated electric lines along the designated routes, including the rail lines running over the Harsimus Branch Bridge and the PATH Bridge. The electrification program also spurred the design and construction of new electric freight locomotives powerful enough to pull the heavy loads (Alexander 1947: 213-214). Electric freight service between New York, Philadelphia, Baltimore and Washington was inaugurated on May 20, 1935, allowing freight to move faster and more efficiently, allowing railroad overnight and third-day delivery for the first time. In 1938, The PRR electrified the last of the principal lines, including portions of the Meadows Yard and Waverly Yard (PRR Annual Report 1937: 5). The PRR electrification project represented the largest capital improvement program undertaken by a railroad up until that date. This comprehensive and irreversible step towards electrification called for the transition of America's largest railroad to a new form of motive power and effectively heralded the end of America's "Age of Steam" (Bezilla 1980: 143-145).

In 1910, the PRR completed the North River Tunnel under Weehawken and the Hudson River, to terminate at the new Pennsylvania Station in midtown Manhattan (Bzdak 1998). This syphoned away most of the PRR's long-distance passenger traffic. Local commuter trains, however, continued to travel directly into Jersey City. In addition to the North River Tunnel, the Hudson and Manhattan Railroad (sponsored in part by the PRR) completed construction of the Hudson River tubes between Jersey City and lower Manhattan in 1911. Today the Hudson River tubes are utilized by the Port Authority Trans-Hudson (PATH) trains.

Despite the decline in passenger traffic through the Bergen Cut, the PRR continued to utilize it for commuter and freight service. In 1926, the United States War Department issued a directive requiring vertical clearance above the Hackensack and Passaic rivers to be a uniform 35 feet above mean high water with a maximum vertical clearance of 135 feet. Following this, in 1930 the PRR replaced its swing bridges over the Hackensack River with vertical lift bridges: the extant PRR Harsimus Branch Bridge and the PRR PATH Bridge over the Hackensack River. In addition to these structures, the Wittpenn Bridge carrying NJ Route 7 was constructed to meet similar clearance requirements over the river and shares its western piers, including all river piers, with the Harsimus Branch Bridge.

Description of Significance

Built under the auspices of the New Jersey Railroad and Transportation Company (NJRR) in conjunction with the Paterson and Hudson River Railroad, and completed in 1838, the Bergen Cut was a significant engineering accomplishment for its time, and it provided the first and only practical rail route through the Bergen Hill until the completion of the Erie Tunnel in 1861. As a result, other railroads vied for access to the Bergen Cut for their own businesses (Cunningham 1997: 60). In conjunction with the C&ARR, the NJRR formed the first all-rail route between New York and Philadelphia in 1839.

The New Jersey Railroad Bergen Cut Historic District is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A in the area of Transportation for its association with the NJRR, the third railroad incorporated in New Jersey (1832); as the first rail line connection between the east and west sides of Bergen Hill; and as a critical link in the first continuous all-rail route between Philadelphia and New York (Guzzo 1999; Bzdak 1998).

The New Jersey Rail Road Bergen Cut Historic District is also eligible under Criterion C in the area of Engineering as an example of early railroad engineering on a scale that had not before been attempted, involving the removal of tons of overburden and trap rock along its 28-foot wide, one-mile long passage through Bergen Hill to create a rail bed with a grade average of 26 feet to the mile (Guzzo 1999; Bzdak 1998). Also significant is the massive elevated right-of-way, supported on masonry walls and carried over the city streets via steel bridges (Richard Grubb & Associates, Inc. 2002).

Several of the contributing resources to the New Jersey Railroad Bergen Cut Historic District are individually eligible for listing in the NRHP. These include the following: the Wittpenn Bridge (NJ Route 7) over the Hackensack River (SHPO Opinion 2/7/2001); the Pennsylvania Railroad Harsimus Branch (CSX/Conrail) Bridge over the Hackensack River (SHPO Opinion 2/7/2001); and the Pennsylvania Railroad (PATH) Bridge over the Hackensack River (SHPO Opinion 5/3/2002).

The New Jersey Railroad Bergen Cut Historic District has a period of significance beginning in 1832, when the NJRR was incorporated. Its period of significance ends in 1937 with the completion of the Hudson & Manhattan Railroad extension into Newark's Pennsylvania Station.

Major Defining Features

While the New Jersey Railroad Bergen Cut Historic District comprises several varied and individual resources, they share defining features associated with their function as a railroad transportation corridor. These major defining features include the railroad right-of-way; cuts and fills; stone embankment walls; and under-grade steel through and deck plate girder bridges designed to carry rail traffic. The remains of the existing overhead electric transmission and catenary system installed by the PRR and part of the apparatus used to power trains through the Bergen Cut are also included.

Additionally, the right-of-way for the rail line is a linear corridor, today between approximately 100 and 350 feet wide. The Bergen Cut, originally only 28 feet wide and constructed to accommodate two lines of track, was subsequently widened and straightened. These improvement projects have resulted in substantial changes to the shape of the corridor in some areas. For example, in the case of the portion of the cut running through Journal Square Station, the original curves of the cut remain but have been bypassed by the straightened route resulting in the full width of the right-of way measuring as wide as 350 feet in certain places. To date, character-defining features have not been formally defined through consultation with the New Jersey Historic Preservation Office.

Boundaries

In general, the historic property is a linear resource which extends for approximately 2.7 miles along the former alignment of the New Jersey Railroad (later Pennsylvania Railroad), rail line between the west side of the Hackensack River to the eastern terminus of the Harsimus Branch Embankment (SHPO Opinions 5/21/1999, 2/7/2001, 5/3/2002, 7/14/2017; Guzzo 1999, 2001, 2002; Marcopul 2017). The district boundary is currently defined as extending from the westernmost limits of the approach spans of the key contributing Pennsylvania Railroad Harsimus Branch (now Conrail/CSX) Bridge over the Hackensack River to the easternmost limits of the Pennsylvania Railroad Harsimus Branch Right-of-Way Historic District, located at the intersection of Marin Boulevard and Sixth Street, Jersey City, New Jersey (see Marcopul 2017). The Bergen Cut is approximately one mile long through Bergen Hill.

Visiting

As an active railroad corridor, few sections of the New Jersey Railroad Bergen Cut Historic District can be visited in the traditional sense. The easternmost section of the district, which includes the Pennsylvania Railroad Harsimus Branch Right-of-Way Historic District, can be viewed from street level along Sixth Street and neighboring streets in Jersey City, between Division Street (at Newark Avenue) in the west and Marin Boulevard in the east. Because several of the contributing resources are within an active passenger rail system, most of the district can be experienced from inside of a rail car most readily. Passengers on PATH trains traveling between Newark and Jersey City will pass through the historic district, including riding over the PRR (PATH) Bridge over the Hackensack River, the elevated right-of-way between the Hackensack River and the area west of Tonnelle Avenue, the PATH Bridge over Wallis Avenue, and through the Bergen Cut as the trains approach the Journal Square PATH station in Jersey City. The cut is also crossed by numerous street bridges, which provide various vantage points though visibility is limited. Google Earth imagery also offers an opportunity to explore the historic district from many angles remotely.

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4.0 HACKENSACK RIVER LIFT BRIDGES HISTORIC DISTRICT

UTM Coordinates: 18T 577678 4510478 UTM

Location and Setting

Spanning the Hackensack River, City of Jersey City and Kearny Town, Hudson County, New Jersey (Figure 11).

This historic district’s surroundings are characterized by low density, light industrial properties and an extensive road network. Nearby roads include the Pulaski Skyway (U.S. Route 1 & 9) to the south and the U.S. Route 1 & 9 Truck route and NJ Route 7 on the east side of the river. NJ Route 7 crosses the Hackensack River over the Wittpenn Bridge.

Current Owner

Private: Norfolk Southern Corporation and CSX via Conrail Shared Assets Corporation.
Public: New Jersey Department of Transportation; Port Authority Trans-Hudson Corporation, a subsidiary of the Port Authority of New York and New Jersey.

Current Function

Transportation - Rail-Related

Description

The Hackensack River Lift Bridges Historic District is composed of four vertical lift bridges which cross the Hackensack River between Kearny Town and Jersey City in Hudson County, New Jersey (Figure 12). Three carry railroads and one carries a highway. All four were constructed in the early twentieth century as part of a “post WWI regional effort, led by the War Department to provide a steady and uninterrupted flow of railroad, vehicular, and marine traffic through and over the navigable waterways within the Port of New York” (Guzzo 2002). From north to south, contributing resources to the Hackensack River Lift Bridges Historic District include: the Lower Hack Draw Bridge over the Hackensack River (SHPO Opinion 9/18/1990); the Wittpenn Bridge (NJ Route 7) Bridge over the Hackensack River (SHPO Opinion 2/7/2001); the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River (SHPO Opinion 2/7/2001); and the Pennsylvania Railroad (PATH) Bridge over the Hackensack River (SHPO Opinion 5/3/2002).

The Lower Hack Draw Bridge over the Hackensack River (hereafter Lower Hack Bridge) is a three track, vertical lift bridge that is the northernmost bridge in the Hackensack River Lift Bridges Historic District (Figure 13). Completed in 1928, the Morris and Essex Division of the Delaware, Lackawanna, and Western Railroad (DL&WRR) constructed this bridge to carry freight and passengers across the Hackensack, replacing a swing bridge that had been built 65 feet upstream in 1902. The Lower Hack Bridge is made of steel and is constructed on reinforced concrete piers. The central truss lift span is flanked by two Pratt truss tower spans; the eastern approach comprises one deck plate, steel girder span; and the western approach comprises two deck plate steel girder approach spans and an 11-span reinforced concrete slab Kearny Viaduct span. Each tower is 153 feet tall and consists of a vertical Pratt truss with front vertical columns and rear inclined columns. At the top of each of the four tower legs are sheaves over which pass steel wire ropes that are attached at one end to concrete counterweights mounted in the towers. The Lower Hack Bridge has a minimum 40-foot clearance above mean high water when closed and allows a 150-foot clear channel. Today the bridge carries NJ Transit’s Morristown Line passenger rail line.

The Wittpenn Bridge (NJ Route 7) Bridge over the Hackensack River is a vertical lift bridge with several approach spans, carrying the Newark Turnpike (subsequently NJ Route 10 and NJ Route 7) over the Hackensack River (Figure 14). The Wittpenn Bridge was completed in

1930 and replaced an existing swing-bridge at this location. The bridge shares its westernmost eight piers with the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack (Harsimus Branch Bridge). In concert with the concurrent replacement of two PRR bridges to the south of the Wittpenn Bridge, the series of three vertical lift bridges provided a new means of safe navigation for large vessels on the Hackensack River and were collectively known as the “Triple Hack Bridges.” The bridge is named in honor of H. Otto Wittpenn, who was mayor of Jersey City from 1908 to 1913 and served as a member of the State Highway Commission between 1929 and 1931. The Wittpenn Bridge is made of steel and is constructed on reinforced concrete piers. According to the New Jersey Historic Bridge Survey, the vertical lift span is a “skewed Parker truss,” while the approach spans comprise “two camelback (Pratt) thru trusses, one modified thru Pratt truss span acting as a continuous span with its neighbors, a fixed tower truss span of modified Pratt form whose top chords rises from portal to tower face, a Pratt lift span with flat top chord, another fixed tower span and five deck girder spans forming the west approach” (Lichtenstein 2001).

The Pennsylvania Railroad (PRR) Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River (Harsimus Branch Bridge) is a vertical lift bridge which carries two tracks of freight rail traffic over the Hackensack River, between Kearny Town and Jersey City (see Figure 2). This rail line once connected northern New Jersey with the former PRR’s terminals on the east side of Jersey City via the Bergen Cut. The swing-bridge it replaced had been constructed between 1880 and 1887 by the PRR early in its campaign to improve freight movements into Jersey City. Completed in 1930, the lift bridge was constructed in coordination with the PRR’s adjacent sister bridge carrying the passenger main line to Jersey City (today known as the PRR [PATH] Bridge over the Hackensack) and the Wittpenn Bridge. This bridge comprises the following spans: one through girder and four deck plate steel girder western approach spans, two Pratt truss tower spans, a Parker truss lift span, one deck plate steel girder, and a six span concrete-encased steel viaduct at the eastern approach. The bridge is made of steel, measures 1,188 feet long and rests on reinforced concrete piers. While completed as part of the Post WWI directive to improve clearance along the Hackensack, the bridge rests only 13 feet above mean high water due to the low elevation of the adjacent PRR Meadow Yards (now part of the Kearny Intermodal Facility). Since its opening, the lift span has been controlled by a bridge operator stationed in the adjoining PRR (PATH) Bridge to the south. Today the Harsimus Branch Bridge continues to carry freight traffic and is now owned by Conrail Shared Assets Corporation, controlled jointly by Norfolk Southern Corporation and CSX.

The Pennsylvania Railroad (PATH) Bridge over the Hackensack River (PATH Bridge) is a vertical lift bridge that carries two tracks of passenger rail traffic over the Hackensack River between Kearny Town and Jersey City, New Jersey (Figure 15). The PATH Bridge is the sister bridge to the Pennsylvania Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River. As with the Harsimus Branch Bridge, the PATH Bridge was also part of the building campaign associated with navigation clearance that came in the late 1920s and was one component of a wider network of transportation corridors intended to allow for the free flow of traffic on the regions roadways, railroads, and waterways. This bridge is 2,950 feet long including approaches and comprises a three-span concrete viaduct, a through girder span, five deck plate steel girder spans and a deck truss span at the western approach, two Pratt truss tower spans, a Parker truss lift span, and eight deck plate girder, one through girder, and a three span concrete viaduct at the eastern approach. The lift span is 331 feet long with a 40-foot vertical clearance over mean high water in the closed position and 135 feet when opened. Horizontal clearance between the fenders is 158 feet.

History³

Early Lift Bridges and John Alexander Low Waddell

The first vertical lift bridges in America were built in 1872 by Squire Whipple over New York State’s canal system, none of which remain extant (Hool and Kinne 1943: 158). It is generally agreed that the first vertical lift bridge “of any size and importance” built in the United States was the South

³ The history presented below is drawn from a cultural resources survey conducted by Richard Grubb & Associates in 2002, associated architectural surveys of the bridges in the historic district, and additional research (Richard Grubb & Associates, Inc. 2002).

Halstead Street Bridge in Chicago, designed in 1892 by John Alexander Low Waddell (1854-1938) (Hool and Kinne 1943: 158). The Halstead Street Bridge had a 130-foot lift span with a 155-foot vertical clearance in the open position (Hool and Kinne 1943: 158). The overhead trusses between the sheaves at the top of each tower leg became known as the “Waddell-type” vertical lift, and in 1895, Waddell received a patent for this design.

John Alexander Low Waddell was born in Ontario, Canada, received a Civil Engineering degree from Rensselaer Polytechnic Institute in 1875, and was professor of civil engineering at the University of Tokyo. Upon returning to the United States, Waddell joined the Phoenix Bridge Company before starting his own practice in Kansas City in 1886. In 1892, Waddell submitted a design for a lift bridge with a 250-foot span and a raised height of 140 feet for a ship canal in Duluth, Minnesota. Although the plan was chosen for the project, it was rejected by the War Department (Plowden 1974: 188; NYT1938).

A few months after cancellation of the Duluth project, the City of Chicago commissioned Waddell to modify the design for the South Halstead Street Bridge over the Chicago River. For over a decade, the South Halstead Street Bridge remained the only example of a lift bridge, while bascule spans dominated movable bridge construction. The greatest obstacle to acceptance of the vertical lift type was the fact that the South Halstead Bridge had certain mechanical flaws that, in addition to high construction costs, gave lift bridges the reputation for being expensive to maintain and operate.

Waddell practiced under his own name until 1899 when he entered a partnership with Ira G. Hendrick as Waddell & Hendrick (1899-1907) and then with John Lyle Harrington as Waddell & Harrington (1907-1917). Harrington was a skilled civil and mechanical engineer who, as partner in his own firm of Harrington, Howard and Ash, was largely responsible for reworking Waddell’s patented design into a “rational and well integrated design” (A.G. Lichtenstein Associates 1994: 63).

Between 1917-1919, Waddell partnered with N. Everett Waddell as Waddell & Son, and in 1920 he moved from Kansas City to New York, practicing independently until 1927 when he formed a partnership with Shortridge Hardesty as Waddell & Hardesty (1927-1945). In addition to consulting on the PRR passenger and freight bridges over the Hackensack River, Waddell & Hardesty designed the Newark Bay Bridge between Elizabethport and Bayonne for the Central Railroad of New Jersey (demolished in 1980), which featured two pairs of parallel double-track vertical lift spans (Plowden 1974: 188). During Waddell’s 50-year career, he designed the Goethals Bridge and Outerbridge Crossing over the Arthur Kill in addition to bridges in Canada, Mexico, Europe and New Zealand (Petroski 1995; NYT 1938).

By the 1930s, the refinement of the vertical lift bridge into an economical type to build and operate had made it the preferred bridge to span long crossings. This was especially true along the Hackensack River, an integral waterway within the burgeoning Port of New York. Twenty-three bridges, mostly of the swing span type built in the previous century, crossed the Hackensack and Passaic rivers, carrying the state’s far-reaching railroad network to a vast terminal complex along the Hudson River. But the complex goods handling system in New Jersey, operated by many private, independently owned railroad companies, precluded the development of a unified shipping network.

Early Crossings over the Hackensack

Beginning in the eighteenth century, the Hackensack River was an important part of the regional transportation network. Before bridges, traversing the river required passenger ferries, the first of which was established in 1759 by John Douw (Winfield 1874: 273). Douw’s ferry connected Kearny with Jersey City and linked roads that crossed the Hackensack Meadowlands. Road improvements came in the 1790s, after the New Jersey State Legislature authorized the construction of a road between Newark Court House and the ferry at Powles (Paulus) Hook Jersey City to New York. Bridge construction across the Passaic and Hackensack rivers began shortly thereafter.

The first bridge over the Hackensack River to Jersey City, completed by the summer of 1795, was a wooden drawbridge, 980 feet in length, with piers and abutments built of stone quarried from nearby Snake Hill (Brydon 1974:186). Drawbridges to be built over the Hackensack and Passaic rivers had to have at least a 24-foot opening to permit unimpeded navigation (Lane 1939: 123).

Transportation improvements in the area continued with the establishment of the Newark Turnpike Company in 1804, which operated a toll road between Jersey City and Newark, using the Hackensack River Bridge and the Passaic River Bridge to the west (Eaton 1899: 78). Later, the Hackensack and Passaic River Bridge Company acquired a franchise and use of the bridges (Shaw 1884: 1040).

The Newark Turnpike was rebuilt several times over the course of the nineteenth century to address the ruts, washouts and otherwise near continuous deterioration of the roadway due to high traffic and storm damage. In 1911, Hudson County completed a new bridge with a 225-foot swing-span and three fixed spans. The bridge had channel clearance of 80 feet and sat nine feet above the water in the closed position. The bridge was designed by Alexander S. Hamill, Hudson County Engineer. A contemporary observer unimpressed with the new structure concluded that, “there are no remarkable features in the design” (Engineering Record 1911; USACE 1926: 9). This bridge was the predecessor to the Wittpenn Bridge, which would replace it in 1930.

In addition to traffic from overland coaches and trucks, railroads sought passage over the Hackensack River in the early nineteenth century on the way to the rail yards of Jersey City. The New Jersey Railroad and Transportation Company, the third railroad incorporated in the state, became the first to reach Jersey City when it laid its tracks across the meadows in 1834. By 1838, the railroad had cut through the trap rock in Bergen Hill to reach the Hudson River waterfront. The following year, the New Jersey Railroad connected with the Camden and Amboy Railroad (C&ARR) at New Brunswick to provide the first direct rail service between New York and Philadelphia (Lane 1939: 312).

To cross the Hackensack River, the New Jersey Railroad set its sights on jointly using the Newark Turnpike Bridge. The New Jersey Railroad acquired a majority of the Hackensack and Passaic River Bridge Company’s stock and built a bridge adjacent to the south side of the turnpike bridge. In 1846, after the Grand Jury of Hudson County objected to the joint use of the bridge, the railroad erected an independent structure south of the turnpike bridge dedicated solely to railroad use (Lane 1939: 312).

In 1867, the New Jersey Railroad was absorbed by the United Canal and Railroad Company of New Jersey, which was then leased in 1871 by the PRR for a term of 999 years. After the PRR completed its freight terminal at Harsimus Cove on the Hudson River in Jersey City, the single bridge across the Hackensack River could no longer handle the burgeoning flow of freight traffic. In the mid-1880s, the PRR built a new bridge over the Hackensack River for the sole purpose of carrying freight to Harsimus Cove Yard. The new swing-span bridge was constructed between its passenger bridge to the south and the Newark Turnpike Bridge to the north. The freight bridge was rebuilt by 1894 (Table 1980: 181).

The opening of Harsimus Cove and Meadow Yards caused a swell in freight traffic. Two swing spans were built over the Hackensack River between 1880 and 1887. Other infrastructure improvements, like the straightening of the Bergen Cut in the 1880s, also improved freight transportation and put a further strain on the Hackensack River freight crossings (Lane 1939).

The PRR aligned the swing-span openings of its freight and passenger bridges to form one continuous channel. The freight bridge had two openings of 61 and 60 feet and cleared the water by a mere 5.5 feet (USACE 1926: 9). The PRR replaced its passenger bridge in 1905 with a new swing-span structure six feet above mean high water with 56- and 58-foot channel openings (NYT 1905).

The Morris & Essex Division of the DL&WRR originally crossed the Hackensack River north of its current location via a bridge completed in 1862 by the Hoboken and Newark Railroad (Taber 1977: 59). The DL&WRR built a new bridge across the river in 1877 to directly access its own cut through

the Palisades, called the Bergen Tunnel, for its main line and Boonton Branch. The DL&WRR replaced the bridge in 1902 with a double-track swing bridge that lay 12 feet above mean high water (Taber 1980: 22). The original 1862 bridge north of the DL&WRR was abandoned by 1910 and removed the following year (USACE 1912: 7).

Commerce, Industry, and Navigation on the Hackensack River

Maritime commerce utilizing the Hackensack River had increased at the turn of the twentieth century when heavy industrial concerns were established in Kearny and Jersey City. Late nineteenth century industrial growth fostered a vast increase in maritime traffic and led to the passage of more legislation and appropriation of more funds to facilitate navigation along the nation's waterways.

The increase in maritime activity and the use of larger ships with deeper drafts, mostly north of Jersey City, prompted the Army Corps of Engineers to initiate the first dredging project of the Hackensack River authorized by the Rivers and Harbors Act of 1912. The existing navigable depth of the Hackensack River from the head of Newark Bay to the Central Railroad's Newark & New York Railroad bridge was about eight feet and then increased to approximately 12 feet north of the bridge (USACE 1918: 317). The dredging project called for an increase of navigable depth to 20 feet, with a 300-foot wide channel at Newark Bay. From Newark Bay, the Army Corps of Engineers project called for dredging and maintaining a consistent 12-foot deep, 200-foot wide channel from Newark Bay to Little Ferry, a distance of 13 miles. North of this, a 150-foot channel would be dredged to 12 feet. The Army Corps of Engineers completed the dredging project on November 14, 1914 and reported favorably that larger boats were being used and were less dependent on tides (USACE 1918: 318).

The dredging project could not have come at a better time. War broke out in Europe in July 1914. Even though the United States proclaimed its neutrality, American industry still provided the Allies with needed goods to aid the war effort. American entry into the hostilities in 1917 stimulated the need to for more wartime production. Industries seeking to capitalize on supplying American troops with the necessary material sought new building sites and looked to the undeveloped meadows along the Hackensack River.

Industrial chemical factories were quickly established after the First World War broke out. Whereas Germany had once dominated the market in chemicals for the production of explosives, the supply of these chemicals ended with the beginning of WWI. In 1916, three chemical-producing companies took up sites adjacent to each other in Kearny at the bend in the Hackensack River north of the DL&WRR's bridge. Even though the United States still proclaimed its neutrality, the chemical industries provided direct aid to the Allies (Cannadine 2006: 253).

Chemical businesses included the Martin Dennis Company of Newark, the White Tar Company, and the Seaboard By-Product Coke Company (Cannadine 2006: 253). These companies produced a host of chemicals with military and domestic applications. By far the largest chemical company to be established along the Hackensack River during this period was the Seaboard By-Product Coke Company which opened in 1917. Coke gas, more efficient than coal, had broad industrial uses and was distributed to fuel the furnaces of nearby industries turning out goods for the war effort (Engineering News 1916).

In addition to the burgeoning industrial corridor beginning to flourish along the Hackensack River, the unabated growth of the Port of New York, a commercial region that surrounds New York City, meant large influxes of railroad traffic and more maritime traffic plying the Hackensack River (Condit 1980: 6). The limitations of navigation along the Hackensack River became painfully acute as thousands of full railroad cars lay idle at the docks unable to be loaded or unloaded. Only after the federal government assumed control of railroad operations were the possibilities of economy and efficiency in a unified terminal operation demonstrated. Thus began a regional effort to integrate the planning, operation and development of all waterways, railroads, highways, bridges and ferries located within the jurisdiction of the Port of New York.

Nearly two million tons of goods moved along the Hackensack River in 1923, the most since 1919. The total value of those commodities – \$15.5 million – set a record (USACE 1926: 10). In 1924, total commerce on the Hackensack River eclipsed 2.3 million tons, and the value of shipped goods rose to \$26.4 million, a 70 percent increase. As in previous years, most of that commerce began and ended at one facility: Seaboard By-Product Coke Company. Across the river from Seaboard, the Public Service Marion electric generating facility imported 115,000 tons of coal, which it received by barge from South Amboy. Combined, Seaboard and Public Service imported all the coal transported on the river. Other river borne products included sand, gravel, and crushed stone, chemicals and fertilizer, petroleum products, and lumber (USACE 1926: 2, 11 and 18).

The low vertical clearance of the existing swing bridges over the Hackensack River was a hindrance to navigation, required constant opening, and caused frequent delays in railroad and highway traffic. The situation was a source of much irritation to commuters and even more to railroad executives who feared losing paying customers. For years, the railroad companies operating in northern New Jersey urged the War Department to allow the bridges to remain closed during rush hours; however, ship and barge operators, besides claiming a “prior right” to the channel, pointed out that rush hour closings were impractical since only during high tide, which varied from day to day, could they navigate the upper reaches of the Passaic and Hackensack rivers (NYT 1926).

During the summer of 1924, Colonel H.C. Newcomer of the Army Corps of Engineers held hearings concerning the Hackensack River bridges at the Army Building on Whitehall Street in lower Manhattan. The Army Corps was considering citing the bridges as obstructions to navigation, due to their low clearances above the water and narrow draw openings (Newark Evening News 1924a). The hearings took place largely at the behest of Seaboard officials who wanted unimpeded service to their docks (Newark Evening News 1924b). Speakers representing Jersey City, Newark, and the New Jersey Board of Commerce and Navigation all urged for larger bridges that would provide a minimum clearance of 35 to 40 feet to allow nearly all tugs to pass unimpeded.

Lift Bridge Technology on the Hackensack River

In 1924, the DL&WRR announced its intention to replace its railroad swing bridge over the Hackensack River. Nearly 3,000 of its trains were delayed annually by bridge openings due to deliveries and shipments to Seaboard. The rush hour openings were especially onerous and a great source of ire among its passengers (Newark Evening News 1924b).

On October 30, 1924, Secretary of War John W. Weeks officially ordered the DL&WRR to replace its bridge over the Hackensack River. The railroad was required to reconstruct its bridge within four years and provide a 150-foot wide channel and a vertical clearance of no less than 35 feet (USACE 1926: 9). On April 28, 1925, Secretary Weeks signed the order notifying the PRR and Hudson County to replace their Hackensack River bridges within four years, too. The Army Corps would dredge a new shipping channel on the east side of the river, and the bridges had to provide a continuous 150-foot wide channel through all three draws.

Even as the railroads drew up plans for new bridges spanning the Hackensack River, they took up another battle against Seaboard. In March 1926, six railroads joined the North Jersey Transit Commission, the State Highway Commission, and the Hudson County Board of Chosen Freeholders, to file an application with the War Department to keep closed two dozen drawbridges over the Hackensack River, the Passaic River and Newark Bay during the morning and evening rush hours. The purpose was to allow for the unobstructed passage of some 350,000 railroad and vehicular commuters. If the measure passed, ships would have to wait up to 12 hours for the next high tide (NYT 1926b; NYT 1926c).

The City of Newark, firmly supportive of the proposal in an effort to develop a port for deep sea ships, claimed that the measure would save thousands of dollars a year in freight charges and lower the price of foodstuffs. Not only did the committee want to alleviate the “daily chaos” in commuter train service but also future traffic problems posed by the opening of the Holland Tunnel (NYT 1926).

The Army Corps of Engineers heard public testimony in May 1925 but denied the request to keep the bridges closed. The War Department decided against the committee's proposal. Instead, they ordered that the bridges over the Hackensack and Passaic rivers have a minimum 35-foot vertical clearance over mean high water. Since the first River and Harbor Act was enacted in 1852, the War Department had assumed jurisdiction over the nation's navigable waterways and had, at various times, dredged the rivers, bays and channels around the Port of New York to allow for the safe and free passage of vessels. The Hackensack River was included in a federal navigation project in 1912 and subsequently modified between 1922 and 1927 (Parsons Transportation Group 2000: Appendix F2). The River and Harbor Act of 1927 called for dredging a channel in the Hackensack River 30 feet deep and 400 feet wide from the upper end of Newark Bay to the Central Railroad of New Jersey Bridge (U.S. Board of Engineers for Rivers and Harbors 1955: 60).

The first of the four bridges built in the Hackensack River Lift Bridges Historic District was the DL&WRR Bridge, today known as the Lower Hack Draw, completed in 1928. Two years later in 1930, the State of New Jersey constructed a vertical lift bridge to carry vehicular traffic over the Hackensack River. This crossing was named the Wittpenn Bridge after H. Otto Wittpenn, who was mayor of Jersey City from 1908 to 1913 and served as a member of the State Highway Commission between 1929 and 1931. The Wittpenn Bridge was constructed concurrently with the vertical lift bridge that the PRR constructed for its freight rail line, the Harsimus Branch Bridge. The two bridges share long concrete piers on their western ends. Also completed in 1930 was the PRR's PATH Bridge which was the PRR's passenger rail line. The Wittpenn Bridge, the Harsimus Branch Bridge, and the PATH Bridge were together known as the Triple Hack Bridges.

The firm Ash, Howard, Needles and Tammen was responsible for the design of the lift span on the Wittpenn Bridge. Several of the principal members of the firms began their careers under the tutelage of Waddell. In the case of the Triple Hack Bridges, the firm Waddell and Hardesty served as consulting engineers.

During bridge construction along this section of the Hackensack River, the ship channel was shifted from the west to the east side of the river, widened, and dredged to a navigable depth. While piers were dug for the new bridges, fill taken from the bottom of the river to deepen and widen the channel was added to Jersey City's western shore, thereby adding several hundred acres of shoreline. Unusually deep piers were required for all the bridges. Pneumatic caissons (essentially a bottomless steel box that is pressurized to keep water from rising) to set the piers were sunk between 110-122 feet below mean high water through 60 feet of soft muck and rock. The river was closed to navigation from November 2 to November 6, 1930 and during this period the spans over the old navigation channel were closed and the old bridges were removed (see Figure 3; Engineering News-Record 1930; Railway Age 1931).

Description of Significance

The bridges within the Hackensack River Lift Bridges Historic District were built as part of a directive issued by the War Department to provide adequate vertical clearance over the navigable waterways within the Port of New York. After World War I, the need became apparent for adequate shipping channels along the Hackensack River, both to allow for the passage of vessels and to ensure a steady and uninterrupted flow of railroad and vehicular traffic into and out of Hudson River terminals. The bridges that comprise the district are integral parts of a regional transportation network built to serve some of the most densely populated areas in the state, and they are a testament to the primary role that Jersey City played in the economic and industrial development of the region.

The Hackensack River Lift Bridges Historic District is eligible for listing in the National Register of Historic Places under Criterion A in the area of Transportation for its association with the Post-WWI navigation clearance project intended to promote industry and commerce on the rivers within the Port of New York. The Hackensack River Lift Bridges Historic District is also eligible under Criterion C in the area of Engineering as an assemblage of movable bridges which represent good examples of a type of lift bridge developed and refined by notable civil engineer John A.L. Waddell and his engineering firms.

The firm Waddell and Hardesty served as consulting engineers on the Lower Hack Bridge, the Harsimus Branch Bridge and the PATH Bridge. The lift span on the Wittpenn Bridge was designed by one of Waddell's successor firms, Harrington, Howard and Ash, who did much to promulgate the bridge type. Waddell's influence is evidenced in the number of practicing engineering firms that can trace their lineage to him: Hardesty & Hanover, Howard Needles Tammen and Bergendoff (or HNTB) and Harrington & Cortelyou, Inc.

The Hackensack River Lift Bridges Historic District represents largely unaltered, operable, and increasingly rare examples of historically and technologically significant bridge types. All four bridges replaced swing span types, which had dominated bridge construction over long spans until the early twentieth century. By the first quarter of the twentieth century, important advances in structural steel construction and technological refinement of the lifting machinery made the vertical lift the preferred type to span long crossings.

In addition to being contributing resources to the Hackensack River Lift Bridges Historic District, each bridge is also individually eligible for listing in the NRHP (SHPO Opinion 9/18/1996; Guzzo 1999).

The period of significance of the district is 1928-1930, which represents the timeframe within which the lift bridges in the historic district were completed (Guzzo 2002).

Major Defining Features

The major defining features of the bridges within the historic district are related to the vertical lift technology which each employs. Technological developments in the 1890s in "efficient electric motors and systems of counterweighting" made the vertical lift design possible (DeLeuw, Cather and Co. 1991). Major defining features include Pratt truss tower spans with vertical front columns and inclined rear columns, Parker truss lift spans, and the sheaves mounted in the towers through which steel cables pass connecting the concrete counterweights to the lift span. To date character-defining features have not been formally defined through consultation with the New Jersey Historic Preservation Office.

Boundaries

Boundaries for the district include the four lift bridges and their approach spans. The district extends from the PRR (PATH) Bridge in the south to the Lower Hack Bridge in the north, a distance of approximately 2,000 feet. The east-west boundaries of the historic district correspond with the boundaries of the approach spans for each bridge, in addition to their movable spans.

Visiting

Made up of active railroad and vehicular bridges, the Hackensack River Lift Bridges Historic District can be visited in two ways. The Wittpenn Bridge has a sidewalk, accessible to pedestrians. Additionally, because the bridges are situated within an extensive road and rail network, the district can be viewed from nearby thoroughfares. Passengers on PATH trains traveling between Newark and Jersey City can view the bridges while riding over the Pennsylvania Railroad (PATH) Bridge over the Hackensack River, located just south of the Harsimus Branch Bridge. Views of the bridges can be attained from further afield as well, including from the Pulaski Skyway (U.S. Route 1 & 9). Google Earth imagery also offers an opportunity to explore the bridge from many angles remotely.

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ATTACHMENTS

FIGURES

ATTACHMENTS

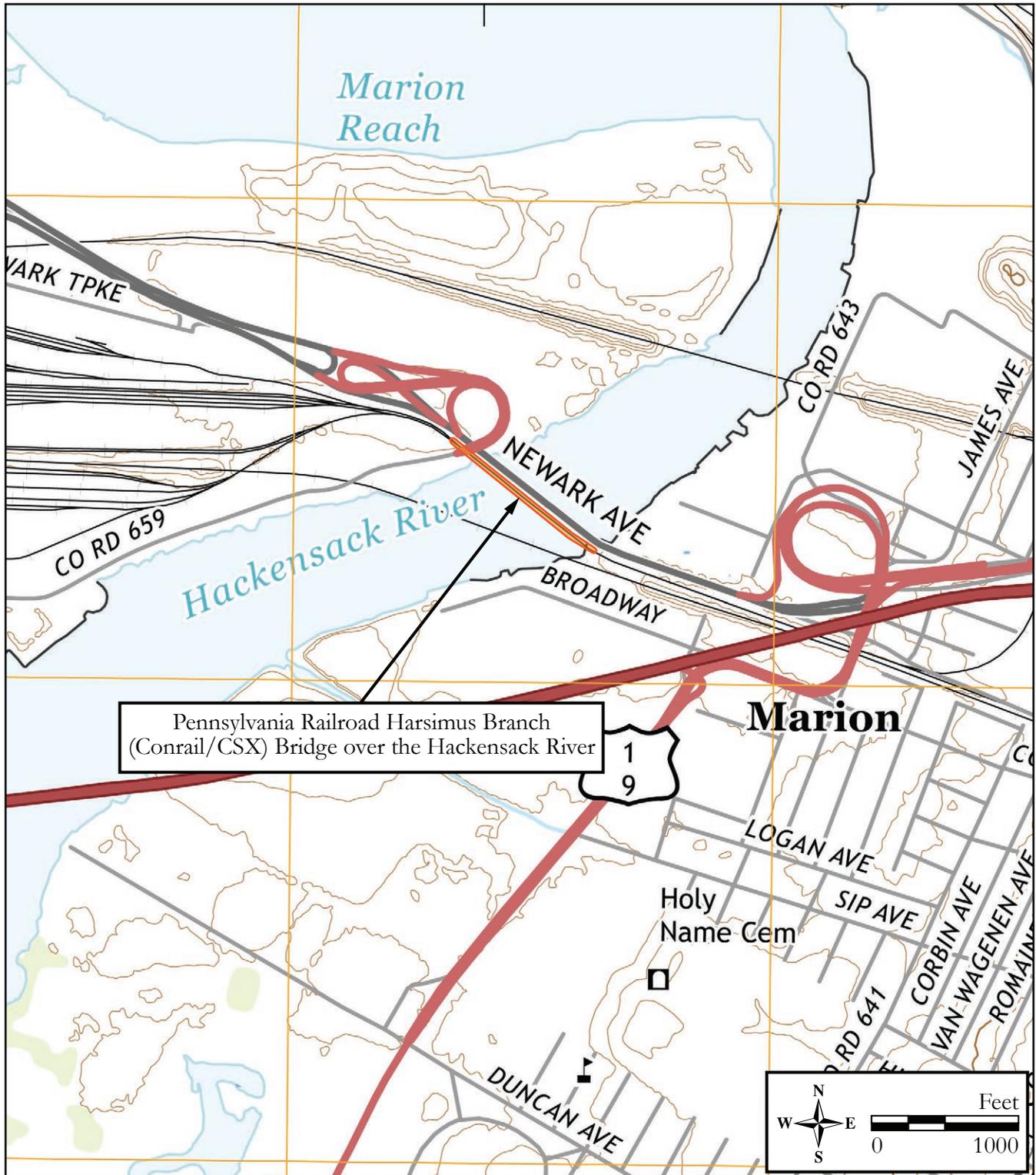


Figure 1: Portion of 2016 U.S.G.S. Topographic Map, 7.5' Quadrangle: Jersey City, NJ, showing the location of the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River.



Figure 2: Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River in 1978. View Northwest. Harsimus Branch Bridge is the center bridge. Photo from HAER Survey: NJ-43, “Conrail Bridge, Spanning Hackensack River, Kearny, Hudson County, NJ.” (Boucher 1978a; Photograph NJ-43-1 from HAER NJ-43 — Conrail Bridge; *Courtesy of the Library of Congress*).

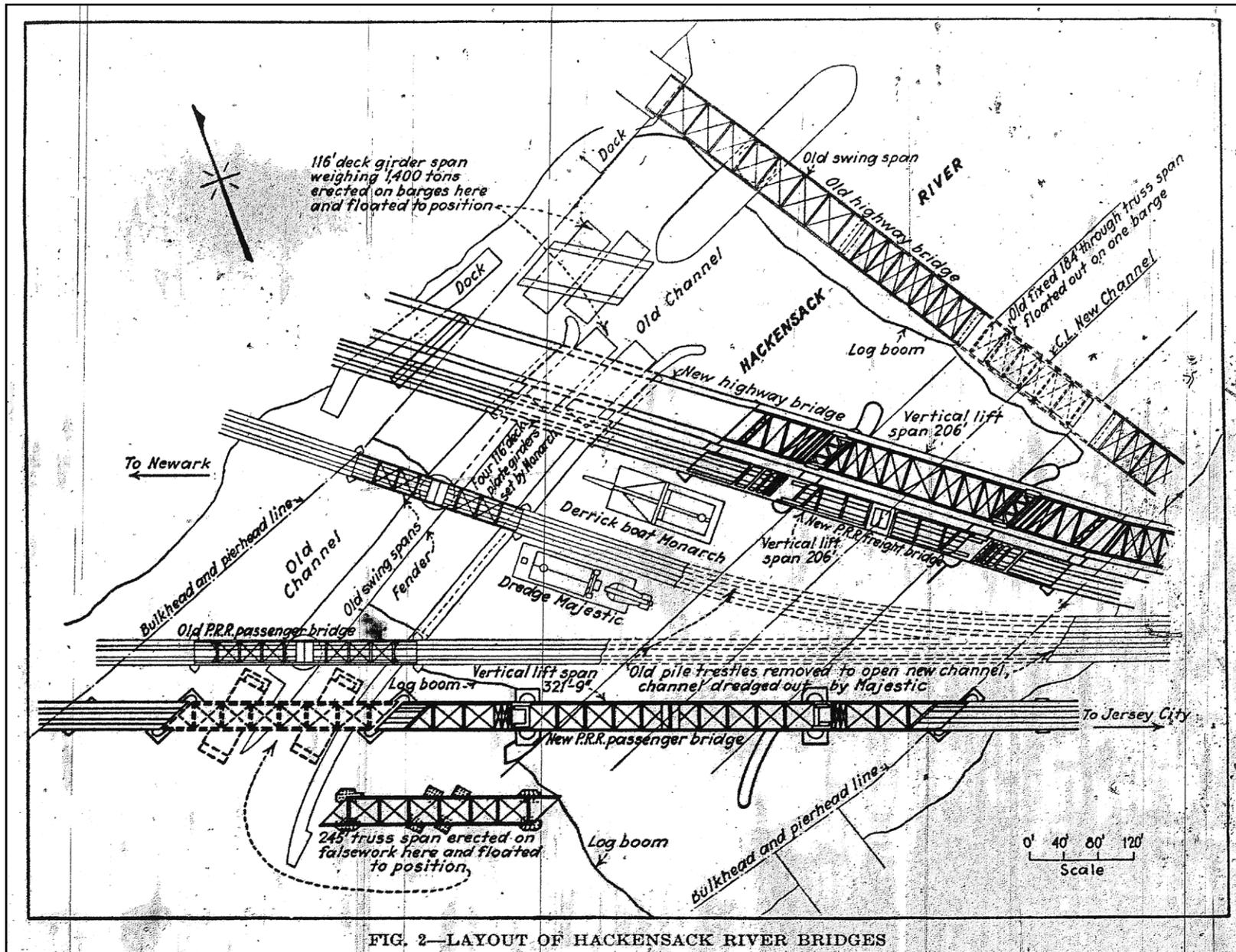


Figure 3: Layout of the Hackensack River Bridges showing the sequence of construction in 1930. (Two Bridge Spans Floated Into Place on Hackensack River, *Railway Age*, 13 Nov 1930: 778).

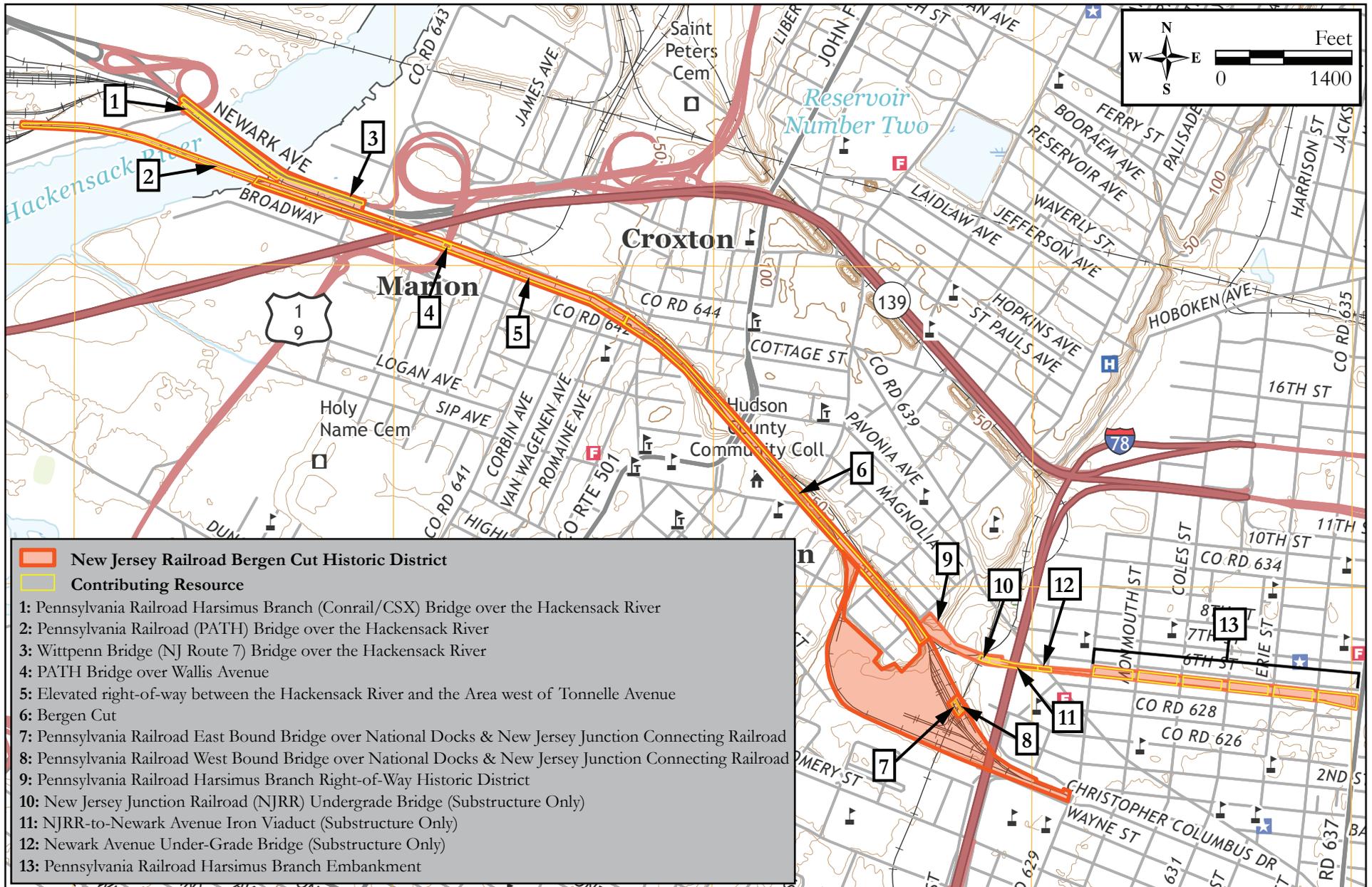


Figure 4: Portion of 2016 U.S.G.S. Topographic Map, 7.5' Quadrangle: Jersey City, NJ, showing location of the New Jersey Railroad Bergen Cut Historic District.

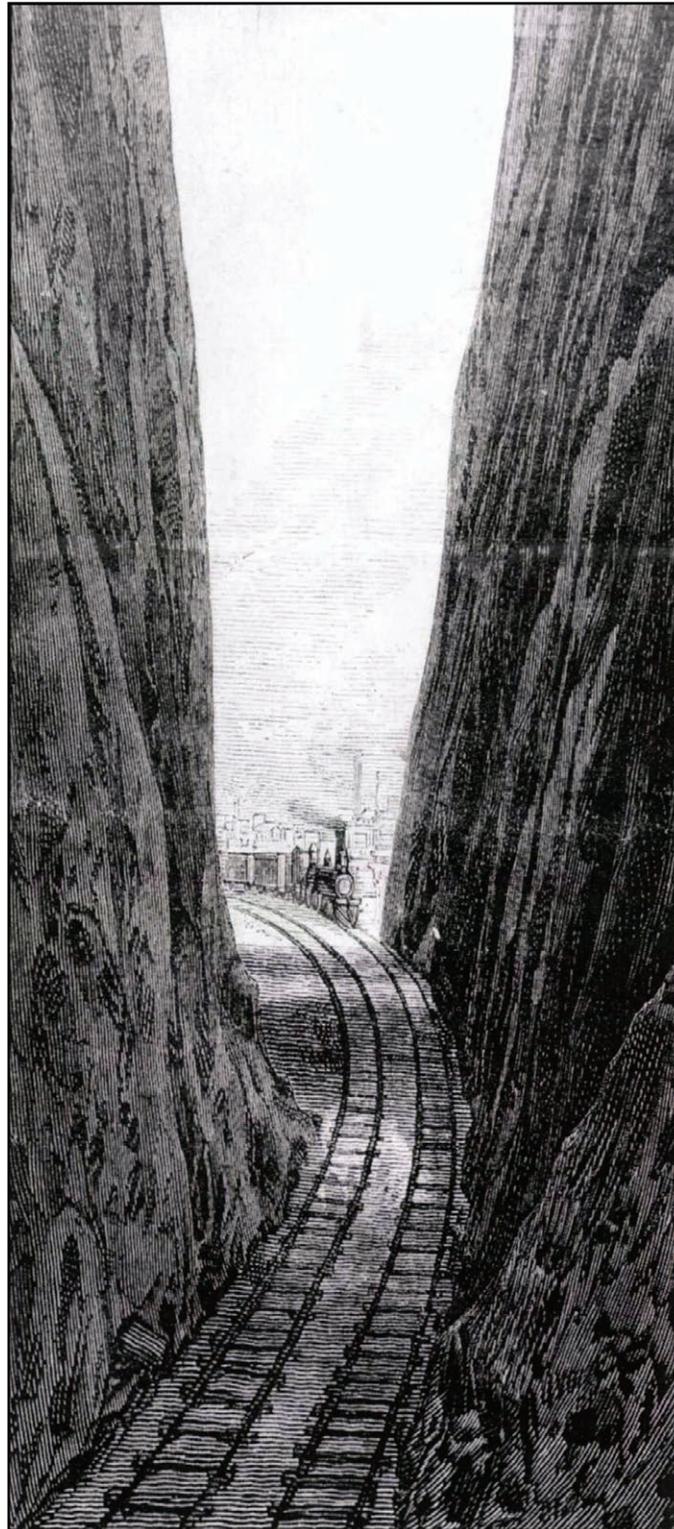


Figure 5: Undated view of the 1830s original Bergen Cut with Jersey City in the background (Cunningham 1997: 60).

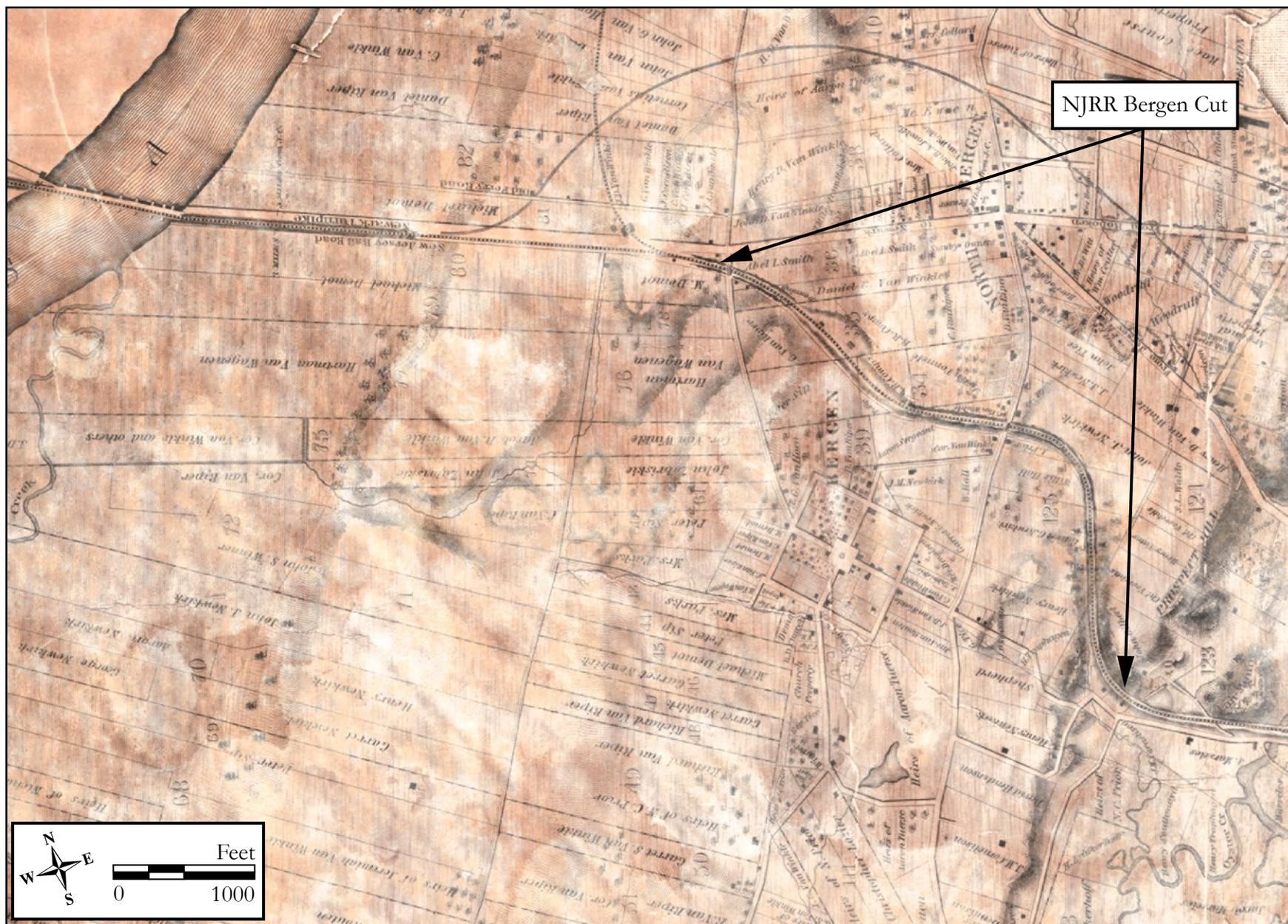


Figure 6: 1841 L.F. Douglass, Topographical Map of Jersey City, Hoboken, and the Adjacent Country. Note, winding alignment of Bergen Cut through the Bergen Ridge. (Douglass 1841; *Courtesy of the Library of Congress*).

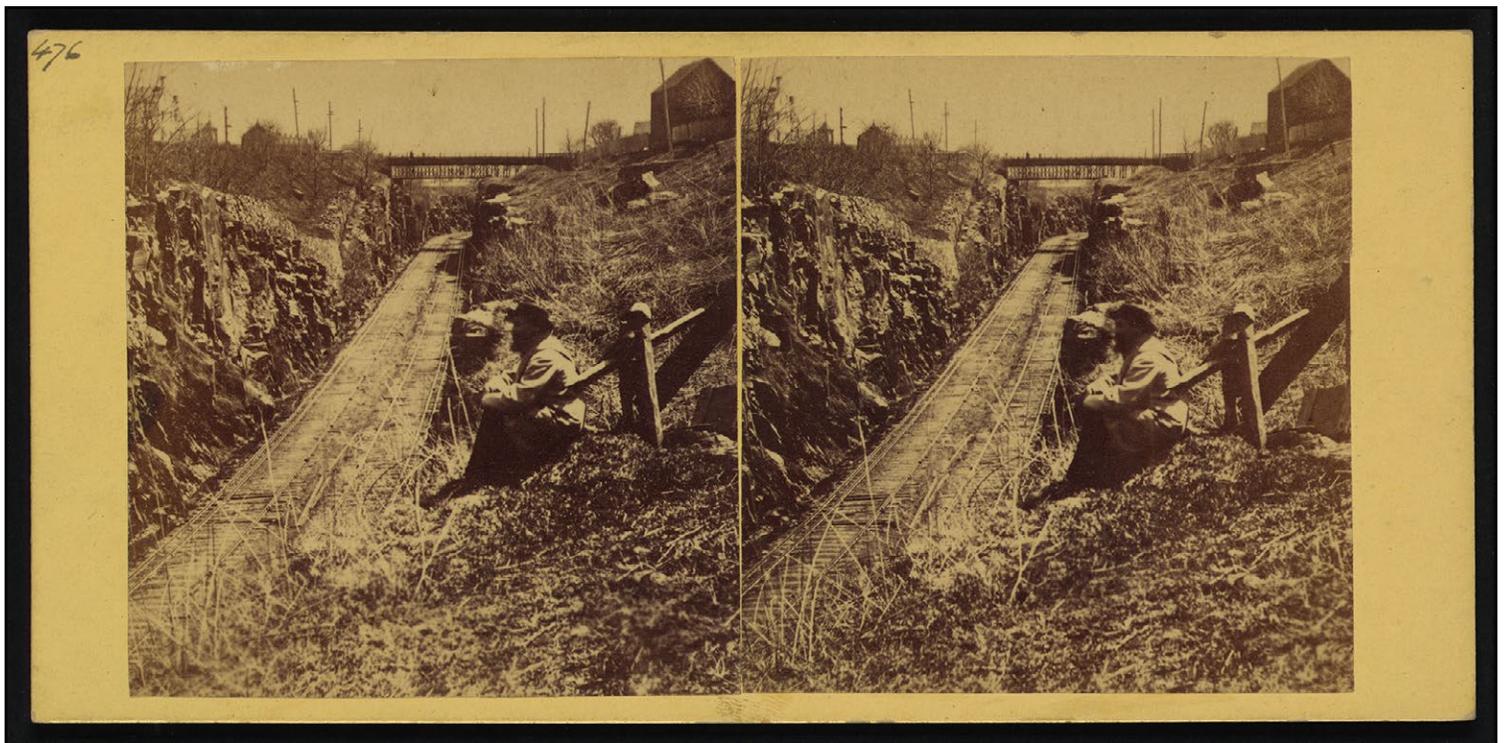


Figure 7: 1863 Stereograph view of the Bergen Cut. (Mead 1863; *Courtesy of the Library of Congress*).

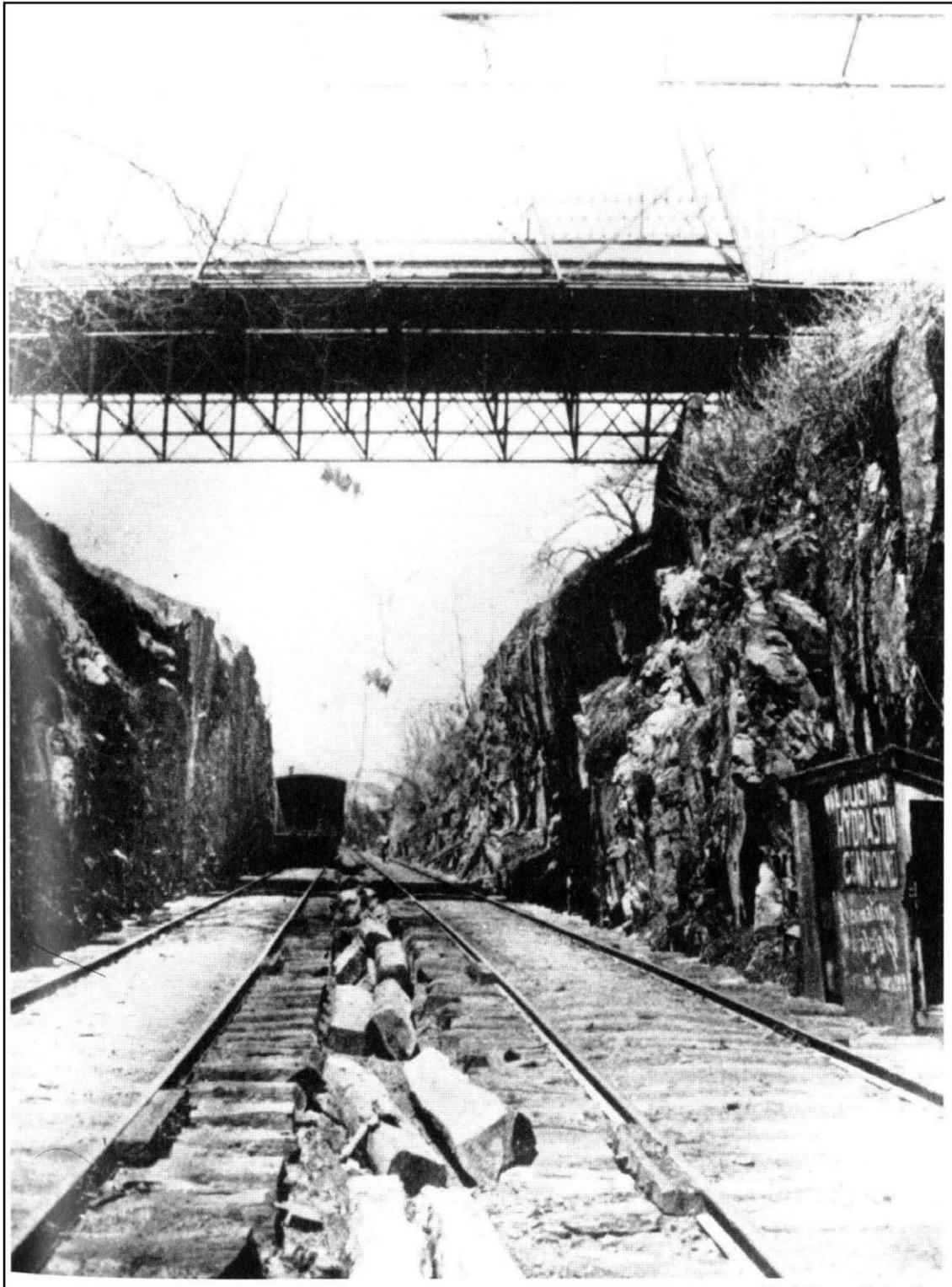


Figure 8: Circa 1870 view of the original Bergen Cut near the Summit Avenue over-grade crossing. The cut was later widened and straightened, nearly obliterating the original excavation (Messer and Roberts 2002, Ted Xaras Collection).



Figure 9: 1878 G.M. Hopkins, Outline and Index Map of Hudson County, New Jersey. Showing a portion of the old New Jersey Railroad alignment of the Bergen Cut and a portion of the new Pennsylvania Railroad straightened alignment.



Figure 10: Bergen Cut, circa late nineteenth or early twentieth century, when it was controlled by the Pennsylvania Railroad. Near present-day Journal Square Station. *Courtesy of the New Jersey State Library.*

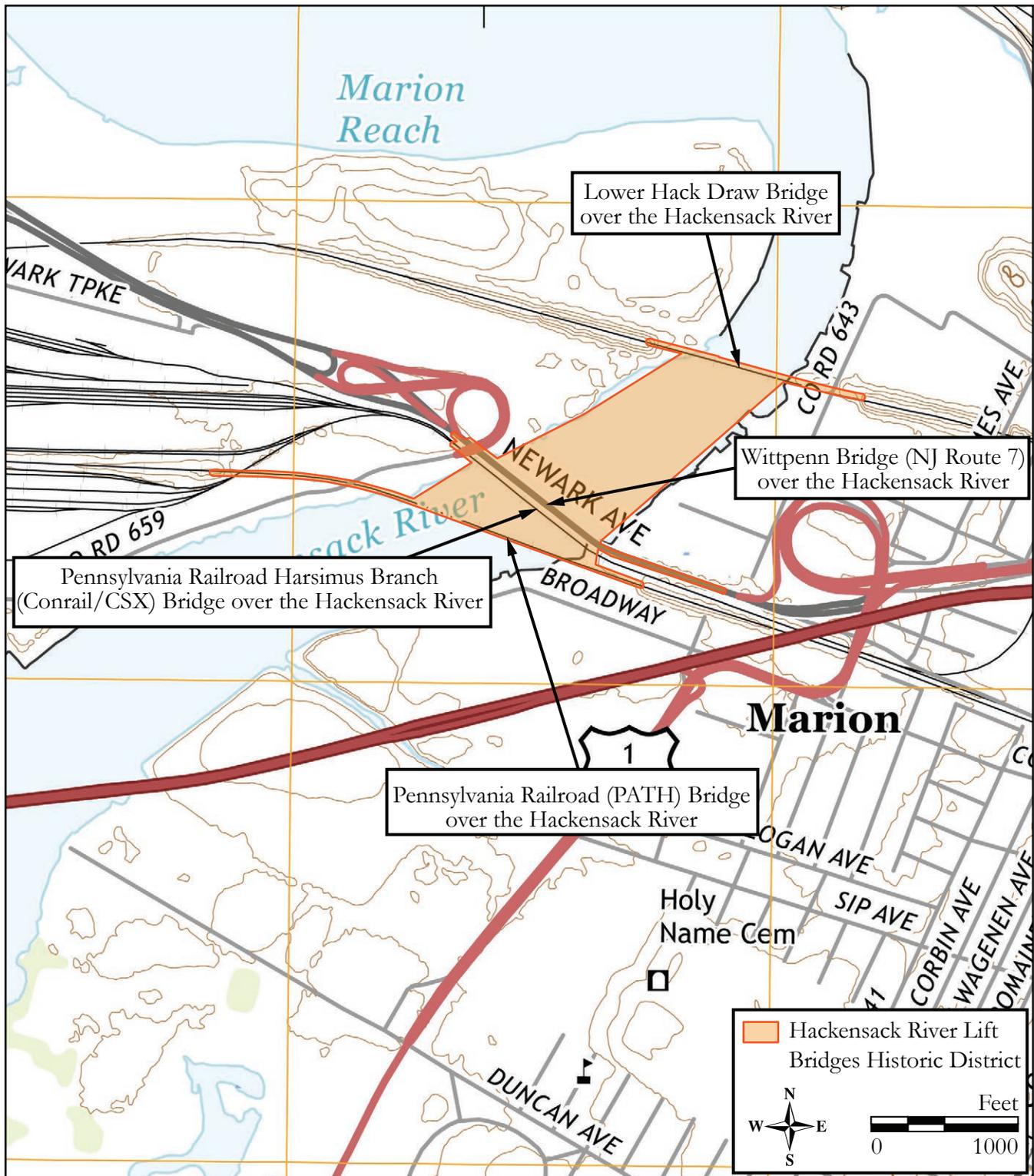


Figure 11: Portion of 2016 U.S.G.S. Topographic Map, 7.5' Quadrangle: Jersey City, NJ, showing the location of the Hackensack River Lift Bridges Historic District Boundaries.



Figure 12: 1979 Aerial view south of the Hackensack River Lift Bridges Historic District. In the foreground is the Lower Hack Draw Bridge over the Hackensack River. In the middle-ground are the “Triple Hack” Bridges — the Wittpenn (NJ Route 7) Bridge, the Pennsylvania Railroad Harsimus Branch (Conrail/CSX) Bridge over the Hackensack River, and the Pennsylvania Railroad (PATH) Bridge over the Hackensack River. In the distance the Pulaski Skyway, the Lincoln Highway Hackensack River Bridge and the Vincent R. Casciano Turnpike Extension Bridge (Newark Bay Bridge) are visible. (Boucher 1979; Photograph NJ-42-3 from HAER NJ-42 — Erie & Lackawanna Railroad Bridge [Delaware, Lackawanna & Western Railroad Bridge]; *Courtesy of the Library of Congress*).



Figure 13: The Lower Hack Draw Bridge over the Hackensack River, also known as the Delaware, Lackawanna and Western Railroad Bridge, in 1979. (Boucher 1979; Photograph NJ-42-1 from HAER NJ-42 — Erie & Lackawanna Railroad Bridge [Delaware, Lackawanna & Western Railroad Bridge];
Courtesy of the Library of Congress).



Figure 14: The Wittpenn Bridge in the open position in 2005. (Elliott 2005; State Level Historic American Engineering Record Recordation: NJ Route 7- Wittpenn Bridge over Hackensack River, NJDOT Structure No. 0909-150).



Figure 15: The Pennsylvania Railroad (PATH) Bridge over the Hackensack, also known as the PATH Bridge, in 1978. (Boucher 1978b; Photograph NJ-44-1 from HAER NJ-44 —PATH Transit System Bridge [Port Authority Bridge]; *Courtesy of the Library of Congress*).