ES.1 Introduction

The National Railroad Passenger Corporation (Amtrak) is proposing to undertake the Sawtooth Bridges Replacement Project (Proposed Project) to replace Amtrak Bridges No. 7.80 and No. 7.96, collectively referred to as the "Sawtooth Bridges." The Proposed Project site is in the Town of Kearny, Hudson County, New Jersey between Newark Penn Station and Secaucus Junction (see Figure 1-1) and includes an approximately 1.1-mile long segment of existing transportation right-of-way along Amtrak's Northeast Corridor (NEC), located roughly between Mile Post (MP) 8.3 ("Hudson Interlocking") on the west end and MP 7.2 ("Swift Interlocking") on the east end. The Sawtooth Bridges do not cross any bodies of water; rather, they span over other rail tracks. Amtrak Bridge No. 7.80 carries two NEC tracks over four New Jersey Transit Corporation (NJ TRANSIT) rail tracks that serve the NJ TRANSIT Morris & Essex Line. Amtrak Bridge No. 7.96 carries the two NEC tracks over one Port Authority Trans-Hudson Corporation (PATH) Newark–World Trade Center (WTC) rail track and one Consolidated Rail Corporation (Conrail) freight rail track (see Figure 1-2).

The Proposed Project would include three new rail-carrying bridges and result in a new four-track segment of the NEC with higher design speeds. The purpose of the Proposed Project is to achieve a state of good repair, and to improve the reliability and resiliency of rail service along this critical segment of the NEC. The Federal Railroad Administration (FRA) is the lead federal agency for this Environmental Assessment (EA). Amtrak, as the Sawtooth Bridges owner and operator, is providing conceptual and preliminary engineering designs. NJ TRANSIT is serving as a Participating Agency.

FRA and Amtrak prepared this EA and draft Section 4(f) Evaluation for the Proposed Project in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq.) and other applicable federal statutes, rules, and regulations to evaluate alternatives and assess potential environmental effects of the Proposed Project. This EA examines the environmental effects of the No Action Alternative and the Preferred Alternative for the Proposed Project. Table ES-1 provides a summary of the environmental effects resulting from the No Action Alternative and the Proposed Project.

ES.2 Purpose and Need

The increasing age of the Sawtooth Bridges, their poor structural condition, and their two tracks (which are restricted to 60 miles per hour [mph]) limit the efficiency and reliability of rail operations throughout this segment of the NEC. The purpose of the Proposed Project is to achieve a state of good repair and to improve the reliability and resiliency of rail service along this critical segment of the NEC, while preserving the current functionality of Amtrak's NEC service and NJ TRANSIT's commuter rail service.

Aging Infrastructure

The Sawtooth Bridges are critical links on Amtrak's NEC. They currently present an existing bottleneck on this significant portion of the NEC. The Sawtooth Bridges date to 1907 and are nearing the end of their functional life. Amtrak rehabilitated the bridges in the early 1980s to strengthen selected columns, remove deteriorated concrete encasement from columns, perform bearing repairs, and install deck waterproofing and deck drains. Despite this rehabilitation effort, recent inspections of both bridges indicate that the Sawtooth Bridges continue to deteriorate. Amtrak conducted a special inspection and condition survey in

2013 and concluded the Sawtooth Bridges are in poor to very poor condition. Thus, Amtrak must replace the existing Sawtooth Bridges to achieve a state of good repair.

Reliability and Resiliency Challenges

Under normal peak period conditions, the existing two-track Sawtooth Bridges are at capacity. The Sawtooth Bridges do not provide redundancy for reliable train operations during maintenance work nor do they guarantee resiliency in the event of unexpected service disruptions. Therefore, any service disruption results in major passenger delays and substantial reductions to overall system flexibility, reliability, and on-time performance. These delays affect not only Amtrak passengers, but also NJ TRANSIT passengers because any NEC maintenance causes service disruptions to both railroads.

The Proposed Project would result in a total of four NEC tracks, which would provide the redundancy needed to divert trains to alternate tracks during scheduled maintenance and unexpected disruptions, therefore minimizing delays and resulting in more reliable and resilient rail service. In the longer-term, the additional capacity would accommodate future planned rail service increases, which would be possible only with other infrastructure improvements along the NEC. Therefore, as stated above, the purpose of the Proposed Project is to achieve a state of good repair and to improve the reliability and resiliency of rail service along this critical segment of the NEC, while preserving the current functionality of Amtrak's NEC service and NJ TRANSIT's commuter rail service.

Proposed Project Goals

FRA and Amtrak considered the Proposed Project's Purpose and Need, the larger planning context, and the design constraints to identify the following goals for the Proposed Project:

Primary Goals

- 1. Achieve a state of good repair for the bridges and their approach structures;
- 2. Reduce service disruptions and delays to improve rail service reliability and resiliency by providing redundant capacity; and
- 3. Reduce service disruptions and delays to improve rail service reliability and resiliency by increasing design speeds.

Secondary Goals

- 1. Maintain service and connectivity along the NEC during construction;
- 2. Optimize the use of existing infrastructure;
- 3. Accommodate current and planned future rail operations;
- 4. Minimize permanent and temporary impacts to the surrounding environment; and
- 5. Benefit the environment by improving the rail system as an energy-efficient mode of travel.

These Proposed Project goals are consistent with FRA's overall goals to improve the NEC, as envisioned in FRA's NEC FUTURE initiative. These goals support the Proposed Project's Purpose and Need, while not precluding the Gateway Program (i.e., the planned expansion and renovation of the NEC between Newark Penn Station, NJ and New York Penn Station) or other planned projects along this segment of the NEC in the long term.

ES.3 Project Alternatives

As part of the conceptual design phase, FRA and Amtrak conducted a rigorous alternatives development process that considered the spatial and operational constraints within the Proposed Project site, as well as

the need to maintain existing service along the NEC and adjacent rail lines. As a result, FRA and Amtrak identified the No Action Alternative, Rehabilitation Alternative, On-Line Replacement Alternative, and the New Alignment Alternative (including four alignment options). FRA and Amtrak performed a screening analysis that included a "fatal flaw" assessment, which evaluated the ability of the alternatives to meet the Purpose and Need for the Proposed Project. FRA and Amtrak developed three primary goals and five secondary goals for the Proposed Project and used these goals in evaluating the alternatives. The primary goals are directly related to the Proposed Project's Purpose and Need. FRA and Amtrak eliminated the alternatives that would not meet all three of the primary goals, as they were considered fatally flawed. FRA and Amtrak also evaluated each of the alternatives with respect to the secondary goals but did not consider the inability of an alternative to meet one or more of the secondary goals as fatally flawed. A description of each of the alternatives is included below.

No Action Alternative – Under the No Action Alternative, Amtrak would not replace the existing Sawtooth Bridges, and they would remain in service in their poor structural condition. Amtrak would continue to make critical repairs on an as-needed basis and continue the current maintenance regime. Eventually, Amtrak would be forced to take the Sawtooth Bridges out of service to avoid catastrophic failure.

Rehabilitation Alternative – The Rehabilitation Alternative would involve the proactive replacement of identified deficiencies, one at a time, thus extending the service life of the Sawtooth Bridges by another 10 to 20 years and allowing for a 90-mph design speed on the two existing NEC tracks. The Rehabilitation Alternative would not bring the Sawtooth Bridges to a state of good repair.

On-Line Replacement Alternative – The On-Line Replacement Alternative would include the replacement of the entire Sawtooth Bridges structures along their current alignment. With this alternative, Amtrak would need to completely shut down rail service along this segment of the NEC for an extended period of time (i.e., several years).

New Alignment Alternative – The New Alignment Alternative would include the construction of new Sawtooth Bridges that would carry a total of four NEC tracks. These new bridges would provide the redundant capacity needed for reliable and resilient service, and support the capacity expansion and service growth planned as part of NEC FUTURE and the Gateway Program. The New Alignment Alternative would replace the two existing bridges that carry two NEC tracks along a single alignment with two or three new parallel bridges that would carry four NEC tracks.

The No Action Alternative, Rehabilitation Alternative, and the On-Line Replacement Alternative do not meet the Purpose and Need for the Proposed Project and are therefore fatally flawed. The New Alignment Alternative meets the Purpose and Need of the Proposed Project and either meets or partially meets each of the secondary goals for the Proposed Project. Therefore, Amtrak further developed the New Alignment Alternative and considered four Alignment Options as part of the conceptual design phase to address operational and spatial constraints, maximize design speeds, and optimize the use of existing infrastructure.

All Alignment Options would result in four NEC tracks, maintain the existing two NEC tracks in service during construction, and be compatible with other planned rail projects. The Alignment Options are as follows:

- New Alignment Alternative Option 1
 - 1 NEC track on a viaduct structure to the north of the existing alignment

- o 2 NEC tracks on a viaduct structure along the existing alignment
- 1 NEC track on a viaduct structure to the south of the existing alignment
- Morris & Essex Line Track 5 would be reconstructed on a new viaduct structure north of the existing Morris & Essex Line Track 5 alignment
- New Alignment Alternative Option 2
 - o 1 NEC track on a viaduct structure to the north of the existing alignment
 - 3 NEC tracks on a viaduct structure along the existing alignment and to the south of the existing alignment
 - Morris & Essex Line Track 5 would be reconstructed on a new viaduct structure north of the existing Morris & Essex Line Track 5 alignment
- New Alignment Alternative Option 2A
 - 2 NEC tracks to the north of the existing alignment, referred to as Sawtooth Bridge North
 - 0 2 NEC tracks along the existing alignment, referred to as Sawtooth Bridge South
 - Morris & Essex Line Track 5 would be reconstructed on a new viaduct structure north of the existing Morris & Essex Line Track 5 alignment
- New Alignment Alternative Option 3
 - \circ 1 NEC track on a viaduct structure to the north of the existing alignment
 - o 2 NEC tracks on a viaduct structure along the existing alignment
 - 1 NEC track on a viaduct structure to the south of the existing alignment
 - Morris & Essex Line Track 5 would not need to be reconstructed and would only require minor realignment

Amtrak evaluated each of the four Alignment Options based on their ability to meet primary goal number 3 and secondary goal number 2 of the Proposed Project. The ability of the Alignment Options to meet these two goals was based on the following criteria:

- Allows for 90 mph for all permanent and temporary NEC tracks;
- Avoids NJ TRANSIT Red Bridge reconstruction and major Eastbound Waterfront Connection realignment;
- Avoids major realignment of the NJ TRANSIT Morris & Essex Line Track 5;
- Minimizes the number of viaducts;
- Minimizes reconstruction/realignment of temporary tracks; and
- Minimizes minor realignment and changes to interlockings, turnouts, and crossovers.

Based on this screening process, Amtrak selected the New Alignment Alternative – Option 2A as the Preferred Alternative for the Proposed Project. Option 2A would entail the construction of two new tracks and associated viaduct structures to the north of the existing Sawtooth Bridges (referred to as the Sawtooth Bridge North) while the existing bridges and tracks remain in service. Once construction of the new tracks is complete, Amtrak would move service from the existing bridges onto the new Sawtooth Bridge North and demolish the existing bridges. Amtrak would then construct a new bridge with two tracks along the existing alignment (referred to as the Sawtooth Bridge South).

ES.4 Affected Environment and Environmental Consequences

Table ES-1 below summarizes the potential environmental effects resulting from both the No Action Alternative and the Proposed Project.

Table ES-1: Summary of Environmental Effects

| Environmental Category | Alternative | Environmental Effects | | | | |
|---|--------------------|---|--|--|--|--|
| | | Continued deterioration of the Sawtooth Bridges | | | | |
| | No Action | • Increasingly unpredictable bridge maintenance costs and disruptions | | | | |
| | | • Eventual lack of service affecting mobility and the regional economy | | | | |
| | | • Four-track crossing and design speeds of 90 mph to improve railroad operations | | | | |
| Transportation | | • Improved resiliency, redundancy and reliability, continued rail connectivity, and supports possibility of | | | | |
| | Proposed Project | future capacity increases in conjunction with other planned rail improvement projects | | | | |
| | 1 toposed 1 toject | • Temporary track outages throughout construction with no significant adverse effects to Amtrak or | | | | |
| | | other railroad operators | | | | |
| | | No anticipated roadway, traffic or parking changes | | | | |
| | No Action | No impact | | | | |
| | | No residential or commercial property acquisition | | | | |
| Land Use | Proposed Project | • 5.25 acres of property acquired from Conrail | | | | |
| | rioposed rioject | No impacts to parkland or land use | | | | |
| | | No anticipated construction-period adverse effects to land use | | | | |
| | No Action | No impact | | | | |
| Zoning / Public Policy | Proposed Project | Consistent with surrounding zoning classifications during construction and operation of the Proposed | | | | |
| | | Project | | | | |
| | No Action | No disproportionate impacts to minority or low-income populations | | | | |
| Socioeconomic Conditions | | • Suspension of service would have significant adverse effects to the regional economy and mobility | | | | |
| / Environmental Justice | Proposed Project | • No disproportionate impacts to minority or low-income populations from construction or operation of | | | | |
| | | . No shares to visual and easthetic conditions with the execution of further deterioration to the Sourteeth | | | | |
| T 7' 1 / A / 1 /' | No Action | Bridges | | | | |
| Visual / Aesthetic | Proposed Project | • No permanent or temporary adverse impacts to visual or aesthetic resources | | | | |
| Resources | | • Elevation of the new Sawtooth Bridges would be up to approximately 5 feet higher | | | | |
| | | • Project elements would remain in context with the Proposed Project site and industrial surroundings | | | | |
| | No Action | • Extensive repairs to the existing Sawtooth Bridges would likely diminish their historic integrity | | | | |
| Cultural Basauraas | | • Adverse effect to the Pennsylvania Railroad New York to Philadelphia Historic District (the existing | | | | |
| | | Sawtooth Bridges are a contributing element) | | | | |
| | Proposed Project | • Measures to avoid, minimize, and mitigate effects to cultural resources are included in the Section 106 | | | | |
| Cultural Resources | | Programmatic Agreement (PA) | | | | |
| | | No anticipated adverse effects to archaeological resources | | | | |
| | | • Qualified archaeologist would review additional information regarding potential for specific sub- | | | | |
| | | surface impacts | | | | |

| Environmental Category | Alternative | Environmental Effects | | | | |
|---|------------------|--|--|--|--|--|
| Floodplains / | No Action | No impact | | | | |
| Riparian Zones | Proposed Project | No impact | | | | |
| Coostal Zana | No Action | • No impact | | | | |
| Coastal Zolle | Proposed Project | No impact | | | | |
| | No Action | No impact | | | | |
| Wetlands, Open Water, Water Quality | Proposed Project | No adverse impacts to water quality 1.04 acres of potential permanent regulated wetland impacts Temporary disturbance of up to one acre of wetlands and open waters due to construction activity Coordination with regulatory agencies to identify measures to minimize the temporary and permanent effects on wetlands | | | | |
| Threatened and | No Action | No impact | | | | |
| Endangered Species | Proposed Project | • No adverse impacts to critical habitats or threatened and endangered species from operation of the Proposed Project | | | | |
| | No Action | Sawtooth Bridges would eventually be taken out of service and would disrupt NEC passenger rail service, thus resulting in more vehicular traffic and increasing air pollutant emissions | | | | |
| Air Quality | Proposed Project | No significant adverse air quality impacts Operation of the Proposed Project would result in regional air quality benefits when considered with other rail improvements Construction would not interfere with the State Implementation Plan (SIP) for applicable National Ambient Air Quality Standards (NAAQS) and would not require a conformity determination | | | | |
| Noise and Vibratian | No Action | • No impact | | | | |
| | Proposed Project | No adverse noise or vibration impacts | | | | |
| Contaminated / Hazardous | No Action | No impact Ongoing remediation activities within the study area would continue | | | | |
| Materials | Proposed Project | No adverse impacts to contaminated and hazardous materials Protocols for managing, excavating, transporting, and disposing of potential hazardous materials to avoid adverse impacts during construction | | | | |
| | No Action | • Amtrak would eventually need to take the existing Sawtooth Bridges out of service to avoid safety problems and catastrophic failure | | | | |
| Public Health and Safety | Proposed Project | No adverse impacts to public health and safety More reliable infrastructure for continued safe rail passenger service Site-specific plans to be incorporated into all contract documents to ensure health and safety | | | | |
| | No Action | No impact | | | | |
| Irreversible & Irretrievable Commitment of Resources | Proposed Project | No impact Proposed Project would use construction materials, fossil fuels, and electricity, but would not have adverse impacts on their continued availability | | | | |

| Environmental Category | Alternative | Environmental Effects | | |
|---|------------------|---|--|--|
| | No Action | No impact | | |
| Indirect and Cumulative Effects Proposed Project | | No adverse indirect impacts to land use; zoning and public policy; visual and aesthetic resources; cultural or natural resources; air quality; noise and vibration; contaminated and hazardous materials; public health, safety and security Beneficial indirect impacts to the local economy Cumulative transportation benefit with the implementation of other NEC FUTURE elements | | |
| | No Action | • No Section 4(f) use | | |
| Draft Section 4(f) Evaluation | Proposed Project | Use of Section 4(f) property: Pennsylvania Railroad New York to Philadelphia Historic District due to the demolition of the Sawtooth Bridges, which are contributing resources to the Historic District No feasible and prudent alternatives that would avoid use of Section 4(f) property Amtrak and FRA, in conjunction with NJ Historic Preservation Office (NJHPO), developed measures to avoid, minimize, or mitigate the adverse effect on the contributing resources of the Pennsylvania Railroad New York to Philadelphia Historic District, as set forth in the Section 106 PA | | |

1.1 Introduction

The National Railroad Passenger Corporation (Amtrak) is proposing to replace Amtrak Bridges No. 7.80 and No. 7.96, collectively referred to as the "Sawtooth Bridges," which are critical links and existing bottlenecks on Amtrak's Northeast Corridor (NEC). The NEC is one of the busiest transportation systems in the world. The Sawtooth Bridges are in the Town of Kearny, Hudson County, New Jersey between Newark Penn Station and Secaucus Junction (see Figure 1-1). The Sawtooth Bridges do not cross any bodies of water; rather, they span over other rail tracks. Amtrak Bridge No. 7.80 carries two NEC tracks over four New Jersey Transit Corporation (NJ TRANSIT) rail tracks that serve the NJ TRANSIT Morris & Essex Line. Amtrak Bridge No. 7.96 carries the two NEC tracks over one Port Authority Trans-Hudson Corporation (PATH) Newark–World Trade Center (WTC) rail track and one Consolidated Rail Corporation (Conrail) freight rail track (see Figure 1-2). Figures 1-3A through 1-3E present photographs of the existing Sawtooth Bridges.

The age of the Sawtooth Bridges, their poor structural condition, and their two tracks (which are restricted to 60 miles per hour [mph]) limit the efficiency and reliability of rail operations throughout this segment of the NEC. The purpose of the Sawtooth Bridges Replacement Project (Proposed Project) is to achieve a state of good repair and to improve the reliability and resiliency of rail service along this critical segment of the NEC, while preserving the current functionality of Amtrak's NEC service and NJ TRANSIT's commuter rail service.

The Federal Railroad Administration (FRA) and Amtrak prepared this Environmental Assessment (EA) and draft Section 4(f) Evaluation in accordance with the National Environmental Policy Act (NEPA); FRA's Procedures for Considering Environmental Impacts (FRA Environmental Procedures) (64 Federal Register [FR] 28545 [May 26, 1999] and 78 FR 2713 [January 14, 2013]); Section 106 of the National Historic Preservation Act of 1966, as amended; Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966; Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations; and other applicable federal statutes, rules, and regulations. NJ TRANSIT is serving as a Participating Agency.

1.2 Project Location

The Proposed Project site includes an approximately 1.1-mile long segment of existing transportation rightof-way along the NEC, located roughly between Mile Post (MP) 8.3 ("Hudson Interlocking") on the west end and MP 7.2 ("Swift Interlocking") on the east end (see Figure 1-4). The segment of the NEC that includes the Proposed Project site is known as the Highline. The Highline extends from Newark, NJ to the entrance of the North River Tunnel in Weehawken, NJ, which carries the NEC under the Hudson River.

Industrial uses, major roadways, rail corridors, the Passaic River, wetlands, and landfills characterize the 750-foot-wide study area surrounding the Proposed Project site. Roadways within the Proposed Project site include Interstate-95 (New Jersey Turnpike), Interstate-280 (Essex Freeway), and the Newark-Jersey City Turnpike. Rail lines within the 750-foot-wide study area include Amtrak's NEC, NJ TRANSIT's Morris & Essex Line, NJ TRANSIT's Eastbound Waterfront Connection, Conrail's Center Street Industrial Track (former Conrail Center Street Branch), and the PATH Newark–WTC rail line. The Proposed Project site is within the Hackensack Meadowlands District.





SAWTOOTH BRIDGES REPLACEMENT PROJECT



Photograph View Direction and Reference Number (Refer to Figures 3B, 3C, 3D, and 3E for photographs)

SAWTOOTH BRIDGES REPLACEMENT PROJECT



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



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



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



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



View of one of the Sawtooth Bridges (Amtrak Bridge No. 7.96) to the left and the NJ Transit Red Bridge to the right, facing northeast



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



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



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

Site Photographs Figure 1-3E



Project Site Figure 1-4

SAWTOOTH BRIDGES REPLACEMENT PROJECT

1.3 Project Purpose and Need

The purpose of the Proposed Project is to achieve a state of good repair and to improve the reliability and resiliency of rail service along this critical segment of the NEC, while preserving the current functionality of Amtrak's NEC service and NJ TRANSIT's commuter rail service. The following subsections describe the need for the Proposed Project.

1.3.1 Aging Infrastructure

The Sawtooth Bridges date to 1907 and are nearing the end of their functional life. The existing bridges carry two tracks on staggered viaduct structures, giving the bridges their "sawtooth" appearance. Amtrak rehabilitated the bridges in the early 1980s to strengthen selected columns, remove deteriorated concrete encasement from columns, perform bearing repairs, and install deck waterproofing and deck drains. Despite this rehabilitation effort, recent inspections of both bridges indicate that the Sawtooth Bridges continue to deteriorate. Amtrak conducted a special inspection and condition survey in 2013 and concluded the Sawtooth Bridges are in poor to very poor condition. The inspection also noted that the floor beams are not visible (except for the bottom flanges) at both bridges. The deck waterproofing has broken down and seepage, coupled with calcite formation, has contributed to corrosion of the floor beam webs. Previous inspections have noted the girders of Bridge No. 7.96 have developed cracks on two separate occasions requiring immediate repairs.¹ These conditions are indicative of the age and shortcomings of the bridge's design. As Bridge No. 7.80 is of a similar design, Amtrak expects similar deficiencies to develop on this bridge. Moreover, as these bridges are over 110 years old, they do not meet current design standards, including track clearances.

The *Critical Infrastructure Needs on the Northeast Corridor*² report, prepared by the Northeast Corridor Infrastructure and Operations Advisory Commission, discusses the structural conditions of the various bridges on the Highline, including the Sawtooth Bridges, and recommends replacement. Based on these findings, Amtrak concluded that the Sawtooth Bridges have reached, if not exceeded, their functional life and that they must be replaced to achieve a state of good repair. FRA concurs with this assessment of the Sawtooth Bridges.

1.3.2 Reliability and Resiliency Challenges

The Sawtooth Bridges do not provide redundancy for reliable train operations during maintenance work nor do they guarantee resiliency in the event of unexpected service disruptions. Therefore, any service disruption results in major passenger delays and substantial reductions to overall system flexibility, reliability, and on-time performance. These delays affect not only Amtrak passengers, but also NJ TRANSIT passengers because any NEC maintenance causes service disruptions to both railroads. To avoid taking a track out of service during peak periods, Amtrak typically must perform scheduled maintenance during nights and weekends.

Without the Proposed Project, the challenge of providing reliable and resilient service will be greater in the future and the lack of redundant capacity will become increasingly problematic. Under normal peak period conditions, the existing two-track Sawtooth Bridges are at capacity. As traffic along the NEC increases, fewer suitable time periods will be available for maintenance, creating additional operational constraints.

¹ Bridge Condition Inspection Report of Amtrak UG7.96 Northeast Corridor over Conrail and PATH, City of Harrison, Hudson County, NJ – Inspection Date: August 25, 1997.

² Critical Infrastructure Needs on the Northeast Corridor Report, the Northeast Corridor Infrastructure and Operations Advisory Commission, published January 2013 (http://www.nec-commission.com/wp- content/uploads/2013/01/necc_cin_20130123.pdf).

The Highline—along with the North River Tunnel and Portal Bridge — already forms part of the most significant capacity bottleneck on the NEC.³

The Proposed Project would result in a total of four NEC tracks, which would provide the redundancy needed to divert trains to alternate tracks during scheduled maintenance and unexpected disruptions, therefore minimizing delays and resulting in more reliable and resilient rail service. Building two additional tracks, also referred to as "run around" or "bypass" tracks, would enable continuous rail service while Amtrak demolishes and replaces the existing Sawtooth Bridges. In the longer-term, the additional capacity in this location would accommodate future planned rail service increases; however, such increase would only be possible with other infrastructure improvements along the NEC.

1.4 Planning Context

The NEC is one of the busiest, most complex, and economically vital transportation systems in the world, connecting eight states and the District of Columbia (DC). The NEC Main Line is 457 miles long, traversing major cities in the northeast region including Washington, DC, Baltimore, Philadelphia, New York, and Boston. With the addition of connecting corridors to Richmond, VA, Harrisburg, PA, Albany, NY, and Springfield, MA, the NEC network spans a total of 899 miles.⁴

The NEC accommodates more than 260 million passenger trips per year, a figure that is projected to reach 412 million by 2030.⁵ More than 2,100 passenger trains (approximately 820,000 passenger trips) and 60 freight trains operate on some portion of the NEC each day.⁶ Approximately 26 percent of the 2,100 daily passenger trains on the NEC pass through the Highline, with a total of 347 trains traveling on the Sawtooth Bridges (see Table 1-1).⁷

| | | Peak PM Hour | | | | |
|-------------|----------------------------|-------------------------------|--|--|--|--|
| NEC Service | Daily (Both Directions) | Peak Direction (Westbound) | Reverse Peak Direction (Eastbound) | Total Peak (Peak and Reverse Peak Direction) | | |
| Amtrak | 107 | 4 | 5 | 9 | | |
| NJ TRANSIT | 240 | 11 | 6 | 17 | | |
| Total | 347 | 15 | 11 | 26 | | |

| | | | | | Т | able 1-1 |
|------------|----------------------|---------|---------|------------|----------|----------|
| Existing V | Veekdav ⁻ | Frain V | Volumes | Across the | Sawtooth | Bridges |

Source: Amtrak Operations, April 2018.

Note: The peak hour for NJ TRANSIT trains is different from the peak hour for Amtrak trains. The table shows train volumes for the Friday afternoon 6 PM to 7 PM peak, which is the hour when the total number of trains over the Sawtooth Bridges is greatest.

The demand for rail service along the NEC is at record levels. This growth is due in part to a relative rebound in population and employment growth in urban centers along the NEC; increasing delays in

³ Ibid.

⁴ About the NEC. Retrieved February 9, 2018 (https://nec.amtrak.com/about-the-nec/)

⁵ Amtrak, Northeast Corridor Infrastructure Master Plan published May 2010. Retrieved March 25, 2019.

⁶ About the NEC. Retrieved February 9, 2018 (https://nec.amtrak.com/about-the-nec/)

⁷ Amtrak Operations, data based on schedules for trains crossing the Sawtooth Bridges.

highway and air travel; and the convenience of intercity and local rail travel.⁸ In the context of such heavy daily use of this segment of the NEC and its vital importance to the regional mobility and economy, Amtrak must maintain service along the corridor throughout the Proposed Project construction.

1.4.1 Related Transportation Plans and Projects

There are two major rail transportation initiatives that include the Proposed Project – 1) NEC FUTURE, FRA's comprehensive plan for future investment in the Northeast Corridor, and 2) the Gateway Program, Amtrak's investment program to improve current rail services, enhance resiliency, and create new capacity for a critical section of the NEC. Both initiatives recognize that the Sawtooth Bridges are aging and are existing bottlenecks; thus, these initiatives envision their replacement. While the Proposed Project has independent utility because it can achieve an independent purpose without the completion of other adjacent rail transportation infrastructure projects, it supports the larger vision and goals of NEC FUTURE and the Gateway Program, which are progressing separate from the Proposed Project. Amtrak would design the Proposed Project so as not to preclude these larger initiatives and to integrate the Proposed Project with the long-term rail service improvements envisioned for the region, including improvements that would increase capacity, which would be realized by making other system-wide enhancements. In addition, several planned projects and projects underway relate to the Proposed Project. The following sections describe each of these initiatives and explain the need to design the Proposed Project so as not to preclude these larger to be project so as not to preclude these enhancements. In addition, several planned projects and projects underway relate to the Proposed Project. The following sections describe each of these initiatives and explain the need to design the Proposed Project so as not to preclude these other efforts.

1.4.1.1 NEC FUTURE

Led by FRA, NEC FUTURE is a comprehensive planning effort that considers the future role of passenger rail service on the NEC in the context of current and future transportation demands. The purpose of NEC FUTURE is to upgrade aging infrastructure and to improve the reliability, capacity, connectivity, performance, and resiliency of future passenger rail service on the NEC for both intercity and regional trips⁹, while promoting environmental sustainability and economic growth.

In July 2017, FRA released the Record of Decision (ROD) for the NEC FUTURE Tier I Environmental Impact Statement (EIS).¹⁰ The ROD identifies the Selected Alternative, which represents FRA's vision for growth along the NEC. The NEC FUTURE Selected Alternative includes replacement of the Sawtooth Bridges to relieve this bottleneck on the NEC. The ROD also envisions a new segment between North Brunswick and Secaucus, NJ, which includes the Proposed Project site, to create a four- to six-track NEC that would accommodate a mix of passenger rail services. The Proposed Project is consistent with the NEC FUTURE Selected Alternative because it upgrades aging infrastructure, improves reliability, redundancy and resiliency, and supports future capacity increases. While NEC FUTURE design speed targets range from 110 to 160 mph, such speeds are not feasible in the Proposed Project site. The proximity of rail stations (Secaucus Junction, Harrison PATH Station, and Newark Penn Station), neighboring river rail bridges (Amtrak's Portal Bridge over the Hackensack River and Amtrak's Dock Bridge over the Passaic River), the curvature of the track alignment, limited rights-of-way, and the proximity of other active railroads, limit the maximum achievable speed through the Proposed Project site (see Figure 1-5). As discussed further in Chapter 2, "Alternatives" Amtrak determined that the maximum feasible design speed for the Proposed

⁸ Critical Infrastructure Needs on the Northeast Corridor Report, the Northeast Corridor Infrastructure and Operations Advisory

Commission, published January 2013 (http://www.nec-commission.com/wp- content/uploads/2013/01/necc_cin_20130123.pdf). ⁹ Intercity trips refer to rail service between metropolitan areas, whereas regional trips refer to rail service within a metropolitan area.

¹⁰ FRA. NEC FUTURE Record of Decision published July 2017. Accessed August 16, 2018. https://www.fra.dot.gov/necfuture/tier1_eis/rod/



Proposed Project Site

----- Northeast Corridor

Project is 90 mph. A design speed of 90 mph would be a 30-mph improvement to the existing 60 mph speed restriction over the Sawtooth Bridges and is therefore consistent with the spirit of increasing the speeds along the corridor, envisioned by NEC FUTURE.

1.4.1.2 Gateway Program

The Gateway Program is the planned expansion and renovation of the NEC between Newark Penn Station, NJ and New York Penn Station. This comprehensive program of strategic rail infrastructure improvements will enhance current services and create new capacity that will allow doubling of the number of passenger trains crossing under the Hudson River. The program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark Penn Station and New York Penn Station, including a new two-track Hudson River Tunnel, two new Portal Bridges across the Hackensack River, and the new Sawtooth Bridges.

The program also includes updates to, and modernization of, existing infrastructure, such as the electrical system that supplies power to the roughly 450 weekday trains using this segment of the NEC. By eliminating these bottlenecks and creating additional tunnel, track, and station capacity in the most congested segment of the NEC, the Gateway Program will provide greater levels of service, increase redundancy, add reliability for shared operations, and add capacity for the future increases in commuter and intercity rail service.

A continuous four-track service planned as part of the Gateway Program is also essential to unlocking the full capacity gains envisioned by NEC FUTURE.¹¹ The Proposed Project needs the additional tracks to provide system redundancy, thereby improving reliability and resiliency, as well as to maintain continued service during construction. The design of the Proposed Project would not preclude the planned capacity increase between Newark Penn Station and New York Penn Station; therefore, the Purpose and Need for the Proposed Project is consistent with the Gateway Program.

1.4.1.3 NJ TRANSIT Rail Operations and Infrastructure Planning Services: NEC Initiatives Between DOCK 8.5 and SWIFT 7.2 (Final Recommendation Report)

NJ TRANSIT completed the NEC Initiatives Between DOCK 8.5 and SWIFT 7.2 Final Recommendations Report (NEC Initiatives Report) in 2015, which outlines the various improvement projects being undertaken by NJ TRANSIT, Amtrak, and Port Authority of New York and New Jersey (PANYNJ) along the NEC between Dock Interlocking and Swift Interlocking in New Jersey. The purpose of the report was to document the various discrete yet interconnected rail transportation initiatives occurring between Dock and Swift Interlockings in order to establish a high level of coordination among the involved transportation agencies. In doing so, rail operators could maximize the operational benefits derived from these projects, exclude elements of projects that might affect the mutual constructability of other initiatives, and take advantage of mutually beneficial service and track outages that would reduce overall schedule and capital costs. The report analyzed the following initiatives: NJ TRANSIT Westbound Waterfront Connection, NJ TRANSIT Harrison-Kingsland Branch, Amtrak Sawtooth Bridges Replacement Project, Amtrak Portal Bridge, and PATH Harrison Station Improvements. The NEC Initiatives Report concluded that these planned improvements would temporarily affect NJ TRANSIT's operations and enumerated specific recommended implementation strategies including but not limited to improvements to Rea and Hudson

¹¹ Critical Infrastructure Needs on the Northeast Corridor Report, the Northeast Corridor Infrastructure and Operations Advisory Commission, published January 2013 (http://www.nec-commission.com/wp- content/uploads/2013/01/necc_cin_20130123.pdf).

Interlockings. The conceptual design of the Proposed Project would not preclude these planned improvement initiatives discussed in the NEC Initiatives Report.

1.4.1.4 Portal North Bridge Project

In its role as project sponsor for the Portal North Bridge project, NJ TRANSIT has submitted a financial plan in coordination with the Gateway project partners to the Federal Transit Administration in the Capital Investment Grant (CIG) Core Capacity grant program. The FTA will evaluate and rate the most recent financial plan for inclusion in the President's Fiscal Year 2021 budget. NJ TRANSIT and Amtrak have previously completed the design and FRA-led environmental review to replace the aging swing-span Portal Bridge over the Hackensack River with a two-track fixed-span bridge, known as Portal North Bridge. Approximately 450 trains per day cross the Portal Bridge, which is a major bottleneck and source of delay of train traffic along the NEC. As the alignment of the Portal North Bridge Project is already designed, the track alignment design for the Sawtooth Bridges must meet the alignments of the Portal North Bridge Project.

1.4.1.5 Hudson Tunnel Project

The purpose of the Hudson Tunnel Project is to rehabilitate the existing NEC tunnel beneath the Hudson River (known as the North River Tunnel), while maintaining uninterrupted passenger rail service. The existing tunnel is over a century old and was damaged during Superstorm Sandy. When completed, the Hudson Tunnel Project will provide redundancy at the critical NEC Hudson River crossing. However, while the Hudson Tunnel Project addresses maintenance and resilience of the NEC Hudson River crossing, it will not increase rail capacity and therefore will not facilitate an increase in rail service. Ultimately, an increase in peak period rail capacity and service between Newark Penn Station and New York Penn Station cannot be realized until other substantial infrastructure capacity improvements are built in addition to a new Hudson River rail tunnel. Similar to the Proposed Project, the Hudson Tunnel Project addresses an urgent need to rehabilitate existing infrastructure and maintain existing passenger rail service, while not precluding other future projects to expand capacity.

1.4.1.6 Moynihan Train Hall at Penn Station

The Moynihan Train Hall at Penn Station project will renovate and expand the existing station into the historic James A. Farley Post Office Building. Moynihan Station is being constructed in two phases. Phase I, now complete, created the "West End Concourse". The new concourse provides new stairs and elevators to boarding platforms, passenger circulation space and a new entrance across 8th Avenue from Penn Station. Phase II, now in early-stage construction, will create the Moynihan Train Hall, a world-class intercity and commuter passenger boarding concourse for Amtrak and the Metropolitan Transportation Authority (MTA) Long Island Rail Road (LIRR) passengers. The facility will provide relief to Penn Station's crowded boarding conditions for Amtrak's intercity passengers and MTA LIRR commuter rail passengers.

1.4.1.7 NJ TRANSIT Westbound Waterfront Connection

The existing Eastbound Waterfront Connection provides a link on the NJ TRANSIT Morris & Essex Line between Newark Penn Station, the Meadows Maintenance Complex (MMC), and Hoboken Terminal in New Jersey. Currently, the Eastbound Waterfront Connection is also used for westbound movements, which creates conflicts as westbound trains using the Eastbound Waterfront Connection cut across multiple other tracks to reach the westbound platforms at Newark Penn Station.

NJ TRANSIT is undertaking the Westbound Waterfront Connection project to eliminate these conflicts and provide a westbound route for trains on the Morris & Essex Line from Hoboken and from the MMC to connect with the NEC just east of Newark Penn Station. Its importance has become more significant with the increased need for revenue service¹² capacity between Newark Penn Station and Hoboken Terminal, especially after Superstorm Sandy. The Westbound Waterfront Connection would provide the opportunity to run additional service and meet expected passenger demand on the Raritan Valley Line, the NEC, and the North Jersey Coast Line to Newark and then to Hoboken Terminal.

In addition, the Westbound Waterfront Connection is a resiliency measure, which would enable quick movement of NJ TRANSIT trains during severe weather events from the MMC and Hoboken to safe-harbor storage locations to the west. Amtrak would design the Proposed Project so as not to preclude the construction of the proposed NJ TRANSIT Westbound Waterfront Connection and will continue to coordinate with NJ TRANSIT.

1.5 Existing Operations and Site Constraints

The Sawtooth Bridges are in an area where four different railroads use the tracks: Amtrak, NJ TRANSIT, PATH, and Conrail. The tracks serve the NEC, the Morris & Essex Line, the Eastbound Waterfront Connection, Conrail Center Street Industrial Track, and the PATH's Newark-WTC Branch. The narrow space between the Passaic River to the south and regulated wetlands to the north constrain the existing track layout and design of the Proposed Project. At the location of Amtrak Bridge No. 7.96, the distance between the Passaic River and the wetland area is less than 300 feet. This narrow strip of land currently accommodates 13 rail tracks. Considering the number of tracks, coupled with the need for clearances between tracks, catenary systems, retaining walls, and bridge piers, the spatial constraints greatly limit the design options for the Proposed Project.

Furthermore, two New Jersey Turnpike overpasses cross over the Proposed Project site, with rail tracks passing under the highway and in between the highway piers (see Figure 1-3B and Figure 1-3D). A total of 13 tracks currently pass under the two New Jersey Turnpike overpasses (the western and eastern spur). There are three slots between the piers of the New Jersey Turnpike western spur overpass, and four slots between the piers of the New Jersey Turnpike eastern spur overpass that the NEC, New Jersey Transit, PATH, and Conrail tracks currently pass through. There is limited space for additional tracks to pass through these slots between the New Jersey Turnpike piers, presenting another design constraint.

The existing Sawtooth Bridges further constrain the existing rail right-of-way. The bridges consist of staggered viaduct structures (three staggered viaducts for Amtrak Bridge No. 7.80 and two staggered viaducts for Amtrak Bridge No. 7.96 [see Figure 1-6]). The existing structures constrain not only the design of the Proposed Project, but also the construction methods that Amtrak can employ since the existing bridges must remain in service while Amtrak builds the replacement bridges. For example, certain cranes and other large equipment may be unable to access the site due to the proximity of active rail lines. The existing bridge structures also limit improvements to horizontal and vertical clearances to the tracks that run beneath the bridges.

Furthermore, the tracks along this segment of the rail corridor are skewed. The curvature of the tracks limits speeds and creates additional design constraints. Maintaining Amtrak and other railroad service during

¹² Revenue service is service associated with transporting passengers or freight (as opposed to non-revenue service, which includes empty trains, trains transporting employees, or rail equipment).



construction is critical, given the high train volumes through the Proposed Project site, including the volumes across the Sawtooth Bridges (see Table 1-1). Maintaining existing operations with minimal disruption to schedules, while building new structures within the tight confines of the Proposed Project site and linking new and existing infrastructure is a considerable challenge for the Proposed Project.

1.5.1 Project Goals

FRA and Amtrak considered the Proposed Project's Purpose and Need, the larger planning context, and the design constraints to identify the following goals for the Proposed Project:

Primary Goals:

- 1. Achieve a state of good repair for the bridges and their approach structures;
- 2. Reduce service disruptions and delays to improve rail service reliability and resiliency by providing redundant capacity; and
- 3. Reduce service disruptions and delays to improve rail service reliability and resiliency by increasing design speeds.

Secondary Goals:

- 1. Maintain service and connectivity along the NEC during construction;
- 2. Optimize the use of existing infrastructure;
- 3. Accommodate current and planned future rail operations;
- 4. Minimize permanent and temporary impacts to the surrounding environment; and
- 5. Benefit the environment by improving the rail system as an energy-efficient mode of travel.

These Proposed Project goals are consistent with FRA's overall goals to improve the NEC, as envisioned in NEC FUTURE. The Proposed Project goals support the Proposed Project's Purpose and Need, while not precluding the Gateway Program or other planned projects along the Highline segment of the NEC in the long term.

1.6 Applicable Permits, Regulations and Approvals

The Proposed Project would require federal and state permits and approvals. In addition to these permits, the Proposed Project must comply with numerous laws, including those regarding worker and public safety. As the Proposed Project proceeds, Amtrak will continue to coordinate with the National Oceanic and Atmospheric Administration (NOAA) – National Marine Fisheries Service (NMFS), US Fish and Wildlife Service (USFWS), US Army Corps of Engineers (USACE), NJ Department of Environmental Protection (NJDEP), US Department of the Interior (USDOI), NJ Historic Preservation Office (NJHPO) and other applicable agencies to identify and acquire the required federal and state permits and approvals. Amtrak will submit permit applications during subsequent preliminary design and permitting phase of the Proposed Project. Table 1-2 lists the permits and approvals that Amtrak currently anticipates would be needed.

Table 1-2

| Permit/Approval | Responsible Agency | Activity | | |
|--------------------------------------|----------------------------|---------------------------------------|--|--|
| National Historic Preservation | FRA NIHPO | Consultation pursuant to National | | |
| Act, Section 106 | | Historic Preservation Act | | |
| Policy on lands, wildlife and | | Analysis of use of Section 4(f) | | |
| waterfowl refuges, and historic | FRA, USDOI, NJHPO | properties | | |
| sites (referred to as Section 4(f)) | | | | |
| Section 404, Clean Water Act | USACE | Wetlands and water quality | | |
| Endangered Species Act, | NMES/LICEWS | Effects to federally-listed rare, | | |
| Section 7 Consultation | INIVIF 5/05F W 5 | threatened or endangered species | | |
| Magnuson-Stevens Fishery | | | | |
| Conservation and Management | NOAA | Essential fish habitat consultation | | |
| Act | | | | |
| Clean Water Act, Section 401 | NJDEP | Water quality certificate | | |
| New Jersey Soil Erosion and | Hudson-Essex-Passaic | Applicable soil erosion and sediment | | |
| Sediment Control Act | Soil Conservation District | control measures during construction | | |
| New Jersey Site Remediation | NIDED | Execution of contominated materials | | |
| Reform Act | NJDLF | Excavation of containinated materials | | |
| New Jersey Flood Hazard Area | NIDED | Structures within a floodway | | |
| Control Act | INJ U LI | Structures within a floodway | | |
| Note: Other permits may be required. | | | | |

2.1 Introduction

This chapter describes the alternatives development and screening process, discusses the No Action Alternative, and identifies the Preferred Alternative retained for detailed study in this EA. The No Action Alternative is the baseline condition for evaluation of the Proposed Project.

As discussed in the following sections of this chapter, the New Alignment Alternative is the only alternative that meets the Purpose and Need of the Proposed Project. Based on the Purpose and Need and goals of the Proposed Project discussed in Chapter 1, "Purpose and Need," FRA and Amtrak selected the New Alignment Alternative—Option 2A as the Preferred Alternative. Amtrak and FRA considered other alternatives including the Rehabilitation Alternative, the On-Line Replacement Alternative, and the New Alignment Alternative, and its three other Alignment Options (Option 1, Option 2, and Option 3) and two Bridge Span Designs Options for the New Alignment Alternative. For the reasons discussed below, FRA and Amtrak did not consider those alternatives for further analysis in the EA.

This chapter discusses each of these Alternatives, Alignment Options, and Bridge Span Designs, their evaluation with respect to the Purpose and Need and goals for the Proposed Project, and the identification of the Preferred Alternative.

2.2 Alternatives Development

As described in Chapter 1, spatial and operational constraints within the Proposed Project site limit the range of reasonable alternatives. Figure 2-1 presents the existing operational conditions along the Sawtooth Bridges, and Figure 2-2 presents the existing NEC track and structural configuration schematic. Furthermore, the need to maintain existing service along the NEC and adjacent rail lines during construction limits the range and number of alternatives considered. Amtrak identified three Build Alternatives to assess in the alternatives development and screening process—the Rehabilitation Alternative, the On-Line Replacement Alternative, and the New Alignment Alternative. The following text describes the No Action Alternative and potential Build Alternatives.

2.2.1 No Action Alternative

Under the No Action Alternative, Amtrak would not replace the existing Sawtooth Bridges. The existing Sawtooth Bridges would remain in service in their current structural condition. Amtrak would continue to make critical repairs on an as-needed basis and continue the current maintenance regime. The Sawtooth Bridges would continue to deteriorate, causing safety and operational problems. Amtrak would conduct more inspections and repairs, with the nature and timing of these repairs becoming increasingly unpredictable. Eventually, Amtrak would be forced to take the Sawtooth Bridges out of service to avoid catastrophic failure.

2.2.2 Rehabilitation Alternative

The Rehabilitation Alternative would involve the proactive replacement of identified deficiencies, one at a time. The Rehabilitation Alternative would not bring the Sawtooth Bridges to a state of good repair; however, it could extend their service life by another 10 to 20 years and allow for a 90-mph design speed on the two existing NEC tracks. The work would include one-by-one replacement of columns supporting the bridges. The Rehabilitation Alternative would involve work on every weekend and some weekday work over a three- to four-year period.

April 2018



Operational Schematic: Newark to Weehawken, NJ



2.2.3 On-Line Replacement Alternative

The On-Line Replacement Alternative would include replacement of the entire Sawtooth Bridges structures along their current alignment. This alternative would result in new Sawtooth Bridges with an acceptable service life and avoid open water and wetland impacts. With this alternative, Amtrak would need to completely shut down rail service along this segment of the NEC for an extended period during project construction, likely several years.

2.2.4 New Alignment Alternative

The New Alignment Alternative would include the construction of new Sawtooth Bridges that would carry a total of four NEC tracks. Amtrak would first construct one or two new bridges (depending upon the Alignment Option) parallel to the alignment of the existing Sawtooth Bridges, while the two existing Sawtooth Bridges remain in service. Once Amtrak completes construction of the new bridges (which would carry a total of two NEC tracks) the existing NEC service would move to the new bridge(s). Amtrak would then demolish both existing Sawtooth Bridges. Next, Amtrak would construct another new two-track Sawtooth Bridge, approximately along the alignment of the existing Sawtooth Bridges. This new bridge would provide the redundant capacity needed for reliable and resilient service in the near-term and support the capacity expansion and service growth planned as part of NEC FUTURE and the Gateway Program. In essence, the New Alignment Alternative would replace the two existing bridges that currently carry two NEC tracks along a single alignment with two or three new parallel bridges that would carry four NEC tracks.

2.3 Alternatives Screening

Presented below is the screening analysis that FRA and Amtrak performed to identify alternatives that are viable and warrant further consideration. The screening analysis included a "fatal flaw" assessment, which evaluated the ability of the alternatives to meet the Purpose and Need for the Proposed Project. Amtrak eliminated the alternatives that would not meet the three primary Proposed Project goals as fatally flawed. Amtrak also evaluated each of the alternatives with respect to the secondary goals in the screening analysis. Amtrak evaluated each alternative as meeting the goal, partially meeting the goal, or not meeting the goal. The results of the evaluation are presented in Table 2-1 and further discussed in this chapter.

| Primary Goals | No Action | Rehabilitation Alternative | On-Line Replacement Alternative | New Alignment Alternative |
|--|-----------|-------------------------------|---------------------------------------|------------------------------|
| Achieve a state of good repair for the bridges and their approach structures | • | 0 | 0 | 0 |
| Reduce service disruptions and delays to improve rail service reliability and resiliency by providing redundant capacity | • | • | • | • |
| Reduce service disruptions and delays to improve rail service reliability and resiliency by increasing design speeds | • | • | • | • |
| Meets Purpose and Need | \$ | × | × | ✓ |
| | | | | |
| Secondary Goals | No Action | Rehabilitation Alternative | On-Line Replacement Alternative | New Alignment Alternative |
| Maintain service and connectivity during construction | 0 | • | • | • |
| Optimize the use of existing infrastructure | ightarrow | • | ightarrow | 0 |
| Accommodate current and planned future rail operations | • | • | • | • |
| Minimize permanent and temporary impacts to the surrounding environment | ightarrow | • | ightarrow | 0 |
| Benefit the environment by improving the rail system as an energy-efficient mode of travel | • | 0 | 0 | • |
| Meets goal Partially meets goal Does not meet goal Not applicable Meets Purpose and Need Does not meet Purpose and Need | | | | |

Table 2-1 Alternative Screening & Project Goals

2.3.1 No Action Alternative

As noted in Table 2-1, the No Action Alternative does not meet the primary goals or the Purpose and Need because it would not achieve a state of good repair and it would not improve the reliability and resiliency of rail service along this critical segment of the NEC. If the existing Sawtooth Bridges deteriorate to the point that Amtrak would need to take them out of service, Amtrak, NJ Transit, PATH, and Conrail operations would be severely disrupted, affecting the movement of people and goods throughout the region. Moreover, the No Action Alternative would not accommodate projected future ridership demand along the Highline. The No Action Alternative would be inconsistent with larger planned improvements to the NEC, including those envisioned as part of NEC FUTURE and the Gateway Program, and would not result in an environmental benefit associated with improvements to rail transportation as an energy-efficient mode of travel.

2.3.2 Rehabilitation Alternative

The Rehabilitation Alternative would not meet the Purpose and Need for the Proposed Project. Amtrak has already encased the columns in concrete to reinforce the structure, but further repairs would be necessary as this temporary measure does not provide the needed structural stability over the long term. The Rehabilitation Alternative would address the structural deficiencies of the Sawtooth Bridges but would not achieve a lasting state of good repair. Amtrak has determined that incremental repairs would not restore the Sawtooth Bridges to an acceptable condition as irreparable damage has already occurred. The Rehabilitation Alternative would not allow for continued rail use due to the current condition of the Sawtooth Bridges and the infeasibility of rehabilitating the bridges to a state of good repair without significant cost and disruptions to rail operations. Rehabilitating the existing bridges without a new adjacent bridge already in service would result in prolonged shutdowns of rail operations during costly rehabilitation and would adversely affect the operations of Amtrak, NJ Transit, PATH, and Conrail, all while achieving a limited benefit. The Rehabilitation Alternative would not increase the number of tracks across the Proposed Project site and would therefore not result in the redundant capacity needed to achieve the reliability and resiliency goals. The Rehabilitation Alternative would also be inconsistent with NEC FUTURE and the Gateway Program. FRA and Amtrak therefore eliminated the Rehabilitation Alternative from further consideration.

2.3.3 On-Line Replacement Alternative

With the On-Line Replacement Alternative, Amtrak could achieve a state of good repair; however, the On-Line Replacement Alternative would not include additional tracks and would therefore not provide the redundant capacity needed for reliable and resilient service. Thus, the On-Line Replacement Alternative would not meet the primary Proposed Project goals. During construction, the two NEC tracks would need to be taken out of service entirely for several years, resulting in a significant adverse effect to rail operations and regional mobility. Therefore, the On-Line Replacement Alternative would not meet the secondary Proposed Project goal of maintaining service and connectivity during construction. Furthermore, the On-Line Replacement Alternative would not meet the goal to accommodate planned future rail operations, including increased capacity and ridership envisioned by NEC FUTURE and the Gateway Program. Thus, FRA and Amtrak eliminated the On-Line Replacement Alternative from further consideration.

2.3.4 New Alignment Alternative

The New Alignment Alternative would meet all three primary project goals, achieving a state of good repair and improving reliability and resiliency (see Table 2-1). It would also meet or contribute to meeting the secondary project goals by maintaining current service throughout construction, accommodating current and planned operations, and benefiting the environment by improving the rail system. Amtrak, in consultation with FRA, advanced the design of the New Alignment Alternative and evaluated several track alignment options (Alignment Options 1, 2, 2A, and 3), as discussed in the following sections of this chapter. All Alignment Options would equally meet the three primary goals and meet or partially meet the secondary goals but would differ in the extent to which they optimize the use of existing infrastructure and the extent to which they maximize design speeds.

2.4 New Alignment Alternative – Alignment Options

Amtrak considered the Alignment Options described below as part of the conceptual design phase to address operational and spatial constraints, maximize design speeds and optimize the use of existing infrastructure. FRA concurred with Amtrak's assessment. Amtrak developed the Alignment Options using the following criteria as the basis of design:

- Maintain passenger rail service throughout construction;
- Keep existing two NEC tracks in service throughout construction of the new bridges;
- Maximize design speed, with a minimum of 60 mph;
- Ensure that the east end of the new Sawtooth Bridges track alignments meets the proposed alignments of the Portal North Bridge Project;
- Ensure compatibility of the west end of the new Sawtooth Bridges track alignment with the Hudson Interlocking;
- Minimize realignment of tracks owned and operated by other railroads between Swift Interlocking and Hudson Interlocking and minimize service disruption on those tracks¹; and
- Does not preclude the construction of the proposed NJ Transit Westbound Waterfront Connection.

All Alignment Options would keep the existing two NEC tracks in service during construction, be compatible with the Portal North Bridge Project alignment, and would not preclude the proposed Portal South Bridge Project or the Westbound Waterfront Connection.

The Alignment Options differ with respect to the locations of the four proposed NEC tracks in relation to the existing Sawtooth Bridges, the need to relocate other existing tracks and associated rail infrastructure (including the Hudson Interlocking), and the achievable design speeds on temporary tracks. See Figure 2-3 for a schematic representation of the Alignment Options. The Alignment Options also differ because some would require structures for temporary tracks ("runaround" or "bypass" tracks) that Amtrak would need to demolish and then reconstruct for the permanent alignment. During construction, Amtrak would continue to provide existing service on the temporary tracks.

2.4.1 New Alignment Alternative – Option 1

Option 1 would result in four NEC tracks as follows:

- 1 NEC track on a viaduct structure to the north of the existing alignment
- 2 NEC tracks on a viaduct structure along the existing alignment
- 1 NEC track on a viaduct structure to the south of the existing alignment

Option 1 would construct two new tracks and associated elevated structures—one to the south of the existing Sawtooth Bridges and one to the north of the existing Sawtooth Bridges—while the existing Sawtooth Bridges remain in service. Once Amtrak constructs the new tracks, Amtrak would move service from the existing bridges onto the new tracks and demolish the existing Sawtooth Bridges. Finally, Amtrak would construct a new, two-track bridge along the existing alignment. See Figure 2-4 for an illustration of the New Alignment Alternative – Option 1.

The new track to the north of the existing alignment would be on a viaduct structure between Hudson Interlocking and the New Jersey Turnpike overpasses. The new track to the south of the existing alignment would be on a viaduct structure from the current approach to the NJ Transit Bridge 0.35 (also called the

¹ Amtrak considers minor realignment acceptable. Minor realignment of tracks is realignment that can be accomplished by taking one or two tracks out of service during weekends and off-peak weekday periods without affecting passenger schedules.





New Alignment Alternative - Option 1 Figure 2-4



New Alignment Alternative - Option 2 Figure 2-5



New Alignment Alternative - Option 2A Figure 2-6



New Alignment Alternative - Option 3 Figure 2-7

"Red Bridge",² which serves NJ Transit's Eastbound Waterfront Connection), across PATH, Conrail, and NJ Transit tracks, and under the New Jersey Turnpike overpasses to Amtrak's Substation 41. To accommodate the new southern NEC track, Amtrak would demolish and reconstruct the Red Bridge.

To accommodate the new northern NEC track in between the New Jersey Turnpike piers, Option 1 would require the reconstruction of the NJ Transit Morris & Essex Line Track 5 through a new slot between the New Jersey Turnpike piers north of the existing Morris & Essex Line Track 5 location. The new Morris & Essex Line Track 5 would be on a new permanent viaduct structure from the west end of Swift Interlocking, over wetlands, to just east of Hudson Interlocking where it would connect to the existing Morris & Essex Line Track 5 at grade.

2.4.1.1 Design Speed

All four tracks would have a design speed of 90 mph upon completion of the Proposed Project. During construction of the two-track structure along the existing alignment, the design speed for the temporary runaround track on the structure to the north of the existing alignment would be 60 mph.

2.4.1.2 Temporary Tracks

The speed on the temporary track to the north of the existing alignment would be limited to 60 mph due to the track curvature, which Amtrak could not optimize until the completion of the permanent structure along the existing alignment. The temporary track to the north would therefore be realigned for use as a permanent NEC track with a design speed of 90 mph.

2.4.1.3 Existing Infrastructure Modification

Option 1 would demolish and reconstruct the Red Bridge to realign the Eastbound Waterfront Connection track. It would also construct a new viaduct structure to realign the Morris & Essex Line Track 5. Less extensive infrastructure changes for Option 1 include the construction of a temporary turnout³ at Swift Interlocking and the realignment of PATH tracks. The temporary turnout at Swift Interlocking would enable routing of service from one of the existing NEC tracks onto the temporary runaround NEC track to the south of the existing alignment.

2.4.2 New Alignment Alternative – Option 2

Option 2 would result in four NEC tracks as follows:

- 1 NEC track on a viaduct structure to the north of the existing alignment
- 3 NEC tracks on a viaduct structure along the existing alignment and to the south of the existing alignment

Option 2 would involve the construction of two new temporary tracks and associated viaduct structures to the north of the existing Sawtooth Bridges while the existing bridges and tracks remain in service. Once the construction of the new tracks is complete, Amtrak would move service from the existing Sawtooth Bridges onto the two new tracks and demolish the existing bridges. Amtrak would then construct a new bridge with three tracks along the existing alignment and to the south of the existing alignment and move the service from one of the temporary tracks onto the three-track structure (see Figure 2-5). Amtrak would then remove

² The Red Bridge is located adjacent to the existing Sawtooth Bridge No. 7.96 and carries the NJ Transit Eastbound Waterfront Connection over PATH and Conrail tracks.

³ A turnout or switch enables the train to change route onto a different track.

one of the temporary tracks from the structure to the north and realign the remaining track to achieve a higher design speed.

The new temporary tracks to the north of the existing alignment would tie into the existing NEC tracks at Hudson Interlocking and under the New Jersey Turnpike. Between these points, the tracks would be on a viaduct that would cross over PATH, Conrail and NJ Transit tracks. The permanent Sawtooth Bridge alignment would be a three-track bridge with two tracks approximately in their existing location, and one track immediately to the south.

2.4.2.1 Design Speed

All four tracks would have a design speed of 90 mph upon completion of the Proposed Project. During construction, the two temporary tracks to the north of the existing alignment would have a design speed of 60 mph. After the reconstruction of the NEC tracks along the existing alignment, the new structure to the north would be modified to carry just one NEC track with a design speed of 90 mph.

2.4.2.2 Temporary Tracks

During construction, the viaduct structure to the north would accommodate two temporary NEC tracks. Due to the curvature of the temporary tracks, the speed on these tracks would be limited to 60 mph. Once Amtrak completes construction of the new three-track structure along the existing alignment and to the south, only one track would need to remain on the viaduct to the north (see Figure 2-3, Option 2). Amtrak would not need to reconstruct the viaduct but would demolish the two temporary tracks and construct one permanent track that would decrease curvature and allow for 90 mph design speeds.

2.4.2.3 Existing Infrastructure Modification

Option 2 would require the reconstruction of the Morris & Essex Line Track 5 on a viaduct structure to accommodate the new northern NEC tracks in between the New Jersey Turnpike piers. Amtrak would design a crash wall to fit against the south piers of the New Jersey Turnpike due to limited space between the proposed NEC tracks and the piers. Option 2 would also demolish and reconstruct the Red Bridge to realign the Eastbound Waterfront Connection track. Track 5 realignment would not affect NJ Transit operations because Amtrak would complete the construction of the Track 5 viaduct and the new rail tracks before taking the existing Morris & Essex Line Track 5 out of service.

2.4.3 New Alignment Alternative – Option 2A

Option 2A would result in four NEC tracks as follows:

- 2 NEC tracks to the north of the existing alignment, referred to as Sawtooth Bridge North
- 2 NEC tracks along the existing alignment, referred to as Sawtooth Bridge South

Option 2A would involve the construction of two new tracks and associated viaduct structures to the north of the existing Sawtooth Bridges (Sawtooth Bridge North) while the existing bridges and tracks remain in service. Once construction of the new tracks is complete, Amtrak would move service from the existing bridges onto the new tracks and demolish the existing bridges. Amtrak would then construct a new bridge with two tracks along the existing alignment (Sawtooth Bridge South) (see Figure 2-6).

With Option 2A, the Hudson Interlocking would shift approximately 500 feet to the west to reduce track curvature and thereby enable a design speed of 90 mph. Sawtooth Bridge North would be on a viaduct structure from the shifted Hudson Interlocking, across PATH, Conrail, and NJ Transit tracks to the existing NEC tracks at grade under the New Jersey Turnpike overpasses.

2.4.3.1 Design Speed

With Option 2A, all four tracks would have a design speed of 90 mph, both during and after construction.

2.4.3.2 Temporary Tracks

With Option 2A the runaround tracks and the viaducts constructed to carry the runaround tracks would remain and continue to be used for permanent NEC service.

2.4.3.3 Existing Infrastructure Modification

Similar to Option 1 and Option 2, Option 2A would require the reconstruction of the Morris & Essex Line Track 5 on a viaduct structure to a new slot between New Jersey Turnpike piers. The alignment of Track 5 would be the same under these three options. As with Option 2, Amtrak would design a crash wall to fit against the south piers of the New Jersey Turnpike due to limited space between the proposed NEC tracks and the piers. Unlike Option 1 and Option 2, Option 2A would not require the demolition of the Red Bridge. Less extensive infrastructure changes for Option 2A would include the removal or relocation of the Hudson Interlocking, relocation of a crossover⁴ to support the realignment of the Morris & Essex Line Track 5, a new turnout to the Eastbound Waterfront Connection track, the realignment of the Eastbound Waterfront Connection track, and the relocation of a Conrail crossover to a NJ Transit track.

Whether Amtrak would remove or relocate the Hudson Interlocking depends on the timing of the Proposed Project construction and the timing of the construction of Portal North Bridge Project. If the construction of Portal North Bridge Project is completed before the Proposed Project construction phase that would tie the new NEC tracks to the Hudson Interlocking, Amtrak would remove the interlocking. Otherwise, Amtrak would relocate the interlocking. Amtrak would coordinate any necessary outages with NJ Transit and Conrail. Amtrak anticipates that temporary track outages on the NJ Transit Morris & Essex Line would be necessary to support construction of the new structures (see Section 3.1.4.1 for a detailed explanation).

2.4.4 New Alignment Alternative – Option 3

Option 3 would result in four NEC tracks as follows:

- 1 NEC track on a viaduct structure to the north of the existing alignment
- 2 NEC tracks on a viaduct structure along the existing alignment
- 1 NEC track on a viaduct structure to the south of the existing alignment

Option 3 would be the same as Option 1, except that the NEC track to the north of the existing alignment would pass through a slot between New Jersey Turnpike piers north of the slot between the existing piers (approximately at the location proposed for the Morris & Essex Line Track 5 under Option 1) and Morris & Essex Line Track 5 would not need to be relocated (see Figure 2-7). The track to the north of the existing alignment would be on a viaduct structure from the west end of Swift Interlocking to Hudson Interlocking, crossing over wetlands, then over NJ Transit, Conrail, and PATH tracks.

2.4.4.1 Design Speed

As with Option 1, all four tracks under Option 3 would have a design speed of 90 mph upon completion of the Proposed Project. During construction, the design speed for the track on the structure to the north of the existing alignment would be 60 mph.

⁴ A crossover connects two rail tracks, allowing a train on one track to cross over to the other.

2.4.4.2 Temporary Tracks

The speed on the temporary track to the north of the existing alignment would be limited to 60 mph due to the track curvature, which Amtrak could not optimize until the completion of the permanent structure along the existing alignment. Therefore, the temporary track to the north would need to be realigned for use as a permanent NEC track with design speed of 90 mph.

2.4.4.3 Existing Infrastructure Modification

Option 3 would demolish and reconstruct the Red Bridge to realign the Eastbound Waterfront Connection track. Less extensive infrastructure changes include the construction of a temporary turnout at Swift Interlocking, a minor realignment of Track 5 to the north, and the realignment of PATH tracks. The reconstruction of the Red Bridge would result in a major disruption of service on the Eastbound Waterfront Connection line. The realignment of Track 5 and the PATH tracks would not result in a major disruption to passenger service, as Amtrak could accomplish the work during weekend and off-peak track outages.

2.5 Alignment Options Screening

Amtrak evaluated each of the four Alignment Options based on the extent to which they meet the primary and secondary goals of the Proposed Project. The number of existing infrastructure elements that would require modification with the various Alignment Options was not the critical factor; rather, Amtrak considered the level of effort and service disruption associated with the modification of each rail infrastructure element and with the construction of each new element.

The original construction of the Red Bridge, as part of the Eastbound Waterfront Connection completed in 1991, was a major undertaking that cost \$16 million. While this cost is relatively small as compared to the cost of the Proposed Project, it is much larger than the cost of minor track realignment. In addition, the need to demolish and reconstruct the Red Bridge as part of the Proposed Project would require extensive effort and more time than minor track realignment and would result in a prolonged disruption of service to the Eastbound Waterfront Connection track.

The realignment of the Morris & Essex Line Track 5 would not result in extensive disruption of service. However, the realignment of the Morris & Essex Line Track 5 is not a minor realignment because it requires the construction of a new viaduct structure across a wetland area, as discussed in more detail in Chapter 3.

Amtrak strived to minimize the number and footprint of structures over other railroads, as the construction over existing, actively-used, electrified tracks is challenging. Moreover, fewer viaducts and associated structural supports would also result in less ground disturbance and associated environmental concerns. With fewer viaducts, there would also be less need for maintenance of elevated structures and less challenge with maintenance of tracks that pass below the viaducts.

Therefore, in evaluating the Alignment Options, Amtrak placed a greater importance on avoiding the reconstruction of the Red Bridge, minimizing the construction of new viaducts (including Morris & Essex Line Track 5), and minimizing the footprint of structures that would pass over existing rail lines, than it did on avoiding minor infrastructure changes. Minor infrastructure changes include minor shifts in existing track alignment (e.g., laterally moving tracks several feet from their existing location without crossing or needing to realign other existing tracks) and moving or installing new turnouts or crossovers. Amtrak could modify turnouts and crossovers and relocate the Hudson Interlocking during weekends over several months, with single-track outages, which would not disrupt service. Amtrak also considered the ability of the

Alignment Options to minimize the need to reconstruct or realign temporary tracks, and the extent to which the Alignment Options would optimize operations and maintenance.

Table 2-2 presents a comparison of the Alignment Options based on the primary goal of design speed and the infrastructure element factors considered in evaluating performance with respect to the secondary goal to optimize the use of existing infrastructure.

| Factor | Option 1 | Option 2 | Option 2A | Option 3 |
|--|------------|--------------|--------------|--------------|
| Allows 90 mph for all permanent and | × | × | √ | × |
| temporary NEC tracks | •• | •• | • | •• |
| Avoids Red Bridge reconstruction | 5 2 | * | | * |
| and major EWC realignment | • | • | • | |
| Avoids major Track 5 realignment | × | × | × | \checkmark |
| Minimizes the number of viaducts | × | \checkmark | ✓ | × |
| Minimizes | | | | |
| reconstruction/realignment of | * | × | \checkmark | * |
| temporary tracks | | | | |
| Minimizes minor realignment and | | | | |
| changes to interlockings, turnouts, | * | \checkmark | * | * |
| and crossovers | | | | |
| Note: EWC – NJ Transit's Eastbound Waterfront Connection track | | | | |

Table 2-2Comparison of Alignment Options

2.5.1 Evaluation Based on Design Speed

As Table 2-2 shows, Alignment Option 2A is the only alignment with which a 90-mph design speed would achievable for all four NEC tracks during and after construction. Under Option 1 and Option 3, the design speed for the temporary track on the northern viaduct structure would be 60 mph. Under Option 2, the design speed for two temporary tracks would be 60 mph.

2.5.2 Evaluation Based on Avoidance of the Red Bridge

Alignment Option 2A is the only alignment that would avoid the reconstruction of NJ Transit's Red Bridge and the major realignment of the Eastbound Waterfront Connection track.

2.5.3 Evaluation Based on Avoidance of Major Track 5 Realignment

Option 3 is the only alignment that would avoid the major realignment of the Morris & Essex Line Track 5 and thereby the construction of the Morris & Essex Line Track 5 viaduct structure over the wetland area to the north of the existing alignment. However, Option 3 would place one of the NEC tracks on a viaduct over the wetland area. Option 3 would therefore neither avoid the construction of a single-track viaduct structure, nor avoid the effect on the wetlands. Under the options that require the major realignment of the Morris & Essex Line Track 5 (Option 1, Option 2, and Option 2A), Amtrak would minimize the disruption to NJ Transit's service by first building the viaduct structure, while existing Morris & Essex Line Track 5 remains in service and then transferring the Morris & Essex Line Track 5 operations to the new viaduct. Amtrak anticipates that service could be transferred to the new Morris & Essex Line Track 5 viaduct with minimal effect to NJ Transit service.

2.5.4 Evaluation Based on Minimization of Viaducts and Reconstruction/Realignment of Temporary Tracks

Both Option 1 and Option 3 would construct three viaduct structures for the NEC tracks. Option 1 would additionally include the Track 5 viaduct, for a total of four viaduct structures. Therefore, these two Alignment Options do not minimize structures over other railroads. While Option 2 and Option 2A would also construct viaducts, there would be two, rather than three, permanent viaducts for the NEC tracks and one viaduct for the Morris & Essex Line Track 5. Overall, Option 2 and Option 2A would have a smaller viaduct footprint than Option 1 and Option 3, with Option 2 having a slightly smaller permanent footprint than Option 2A.

Option 2A is the only option with which Amtrak would not have to reconstruct or realign the temporary runaround tracks. The temporary runaround tracks that Amtrak would use during construction of Option 2A could seamlessly become the permanent tracks as part of Phase II for construction of the Proposed Project (see Section 2.8).

2.5.5 Evaluation Based on Minor Infrastructure Changes

Option 2 would not require any minor track realignment or infrastructure changes. Option 1 and Option 3 would both require the realignment of PATH tracks. Amtrak could realign the PATH tracks during weekend and other off-peak track outages, without affecting passenger service. While Option 2A would require the realignment of the Conrail track, the train volumes on this track are relatively low and short-term outages during construction would have a lesser effect than PATH outages would have under Option 1 and Option 3. Option 1 and Option 3 would require a temporary turnout at Swift Interlocking. Option 2A would require a greater number of minor infrastructure changes, including:

- Removal of Hudson Interlocking or relocation approximately 500 feet to the west to connect the tracks along the new northern alignment (Sawtooth Bridge North) to the existing NEC tracks;
- Relocation of the No. 15 crossover at the west end of NJ Transit's Kearny Junction Interlocking to accommodate the realignment of Track 5;
- Installation of a new No. 15 turnout to NJ Transit's Eastbound Waterfront Connection; and
- Relocation of the Conrail crossover to a NJ Transit track.

Overall, while the minor infrastructure changes under Option 2A are numerous, they require less effort, time, and disruption than the reconstruction of the Red Bridge and realignment of the Eastbound Waterfront Connection track. All options would also include new catenary supports throughout the Proposed Project site to electrify the relocated tracks. Amtrak would continue to coordinate with NJ Transit and would install new catenary poles so as not to preclude future electrification along the Conrail track if NJ Transit proceeds with the Westbound Waterfront Connection. All options would also include the installation of new crossovers and turnouts, which would be identified in future design phases to connect the new alignment to the east and west and provide operational flexibility.

2.6 Preferred Alternative

All Alignment Options would demolish the existing Sawtooth Bridges (which are contributing resources to the Pennsylvania Railroad Historic District from New York to Philadelphia). All Alignment Options would also construct a viaduct structure over the wetland area to the north of the existing Sawtooth Bridges. As such, all Alignment Options affect resources protected under Section 106 of the NHPA, Section 4(f) of the USDOT Act, and Section 404 of the Clean Water Act, as fully described in the remaining chapters of this

EA. Based on the Proposed Project's Purpose and Need, the project goals, and constructability constraints (see Tables 2-1 and 2-2), FRA, in concert with Amtrak, selected the New Alignment Alternative – Option 2A as the Preferred Alternative. FRA and Amtrak eliminated Option 1, Option 2, and Option 3 from further evaluation in this EA. The Preferred Alternative would also address aging infrastructure and improve rail system reliability and resiliency along this critical segment of the NEC. The Preferred Alternative would also minimize disruption to existing service, optimize speeds, and maximize the use of existing infrastructure, with minimum adverse effects and maximum beneficial effects on the environment. The term "Proposed Project" refers to the Preferred Alternative (New Alignment Alternative – Option 2A) throughout the remainder of this EA.

2.7 Bridge Span Design

As part of the conceptual design, Amtrak considered both short-span and long-span options for the viaduct structures and determined that both would be viable. Span refers to the distance between support structures (piers or columns) that hold up the bridge deck and rail tracks. Short spans are typically less than 40 feet long and long spans are typically more than 100 feet long. The long-span option would place the superstructure (deck and tracks) on fewer but sturdier supports (concrete columns) than the short-span option, which would place the deck on a greater number of thinner supports (thin wall concrete piers).

While the short-span design would require extensive and potentially disruptive substructure (i.e., pier) construction, Amtrak could construct the substructure within the tight confines of the Proposed Project site. Amtrak could construct the long-span substructure with less disruption, but the placement and launching of the long span superstructure during construction in such a confined space would be very challenging and require long track outages. In other words, the construction of the long-span would be more challenging but faster, whereas the short-span would be simpler but take longer. There would be fewer track outages during the long-span design, as compared with the short-span design, but each of the outages would last longer than and outage with the short-span design.

During preliminary engineering, Amtrak would further evaluate both the short-span and long-span design. Amtrak based this EA on the short-span design, since the short-span design provides a conservative estimate of subsurface disruption and wetland impacts.

2.8 Project Phasing, Schedule, and Cost

Amtrak would construct the Proposed Project in two phases to maintain service on the NEC, as summarized in the list below.

Phase I (Partial Build-Out):

- Build new Morris & Essex Track 5 viaduct and move Track 5 service to this new alignment;
- Construct the new Sawtooth Bridge North;
- Relocate the service from the two existing NEC tracks to the new Sawtooth Bridge North; and
- Decommission and remove the existing Sawtooth Bridges.

Phase II (Full Build-Out):

- Construct the new Sawtooth Bridge South (along the alignment of the existing Sawtooth Bridges);
- Move one of the tracks from the new Sawtooth Bridge North to the new Sawtooth Bridge South (for optimal full build-out alignment); and

• Add one new track to Sawtooth Bridge North and one new track to Sawtooth Bridge South.

The Proposed Project requires scheduling and coordination between various railroad operators. Before construction commences, Amtrak must complete preliminary and final design, environmental permitting, and contractor procurement. The Phase I and Phase II of the Proposed Project would take a total of approximately seven years to build, primarily due to the site constraints and the need to maintain active rail operations. Depending on funding availability, construction could begin in 2022, after the final design and permitting phase. Both Phase I and Phase II could be completed and operational by 2029.

2.9 Construction Considerations

The construction means and methods discussed in this EA are based on the current conceptual design and Amtrak's experience on similar projects. While Amtrak's construction contractors would ultimately determine the construction techniques for the Proposed Project, Chapter 3 represents an assessment of reasonable worst-case conditions and the identified measures to minimize adverse effects would likely be similar.

Construction activities for the Proposed Project would include demolition and decommissioning of the existing Sawtooth Bridges; excavation and grading; removal of contaminated soils, if any; pile driving, construction of concrete foundations and substructure units; superstructure erection; installation of tracks and rail systems equipment (overhead contact system, signals, etc.) and associated utility work.

The process of demolishing, removing and decommissioning the existing bridges in an area with a complicated infrastructure network, including multiple actively-used rail tracks, is a difficult construction task. Amtrak would need to complete all demolition and removal work within limited work windows to minimize rail power and service outages. An additional construction challenge stems from inadequate space for large cranes. Amtrak would therefore limit the size and weight of construction cranes.

Within the limited space and limited duration of track outages, placing the new bridge spans onto the support structures (columns or piers) would be challenging. In cases when an entire span of the superstructure cannot be set into place during the allotted track outage, Amtrak would have to secure the span to the span launching device so that train service can resume.

Based on preliminary research, there are several major public utility components within the Proposed Project site. Amtrak would coordinate with the utility companies, including Williams Gas, Public Service Electric and Gas Company (PSE&G), and fiber optic companies regarding any potential utility relocations before commencing construction.

2.9.1 Site Access and Staging

Access along the Proposed Project site is significantly limited, and the presence of substantial railroad infrastructure further limits access opportunities. Based on conceptual design, the main corridors for access would likely be through the following:

- 5th Street in Harrison To the west of the Proposed Project site, there is an access point to an existing gravel road between the NEC and Morris & Essex Line. This roadway continues east to the existing Sawtooth Bridge No. 7.96.
- Harrison Avenue Adjacent to the inactive Harrison Branch Bridge on Harrison Avenue, access to the Proposed Project site may be possible via the driveway to the Weldon Asphalt Plant and contractor equipment storage area (Block 284). NJ Transit owns a swath of right-of-way through

Block 284, which Amtrak could potentially use to access the existing gravel road parallel to the Morris & Essex Line (along the westbound track on the north side).

 New Jersey Turnpike and Newark-Jersey City Turnpike – Access to existing gravel roadways is available below the New Jersey Turnpike overpasses. In addition, the Newark-Jersey City Turnpike (Route 7) provides access via a roadway adjacent to 1-D Landfill and parallel to the New Jersey Turnpike overpasses western spur. There is also an existing gravel road to Substation 41 that Amtrak may use as a supplemental access point.

The following features may be necessary to facilitate access to the above-mentioned roads and for construction of the replacement structures (tracks, bridges and rail system components):

- Timber matting within Cedar Creek Marsh and the lagoon area adjacent to the landfill, along the proposed reconstructed Morris & Essex Line Track 5;
- A grade transition between the proposed Morris & Essex Line Track 5 and the existing railroad embankment, from the existing access roadways up to track level (to facilitate construction).

For the duration of construction, Amtrak would need staging areas likely at the intersection of the main access roads mentioned above. If as part of future design efforts Amtrak concludes that additional commercial properties would be needed for site access or for material staging, Amtrak would seek consent and approval of the property owners.