The Northeast Corridor Infrastructure Master Plan

MAY 2010

NEC Infrastructure Master Plan

Prepared by
The NEC Master Plan Working Group
Including representatives of twelve states, District of Columbia, Amtrak, FRA, eight commuter and three freight railroads operating on the NEC.

States and railroads working together to define and implement a vision for the future of rail transportation in the Northeast

version 1.a

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March 24, 2010

Thomas Carper
Chairman of the Board
National Railroad Passenger Corporation
60 Massachusetts Avenue, N.E.
Washington, DC 20002

Joseph H. Boardman
President and Chief Executive Officer
National Railroad Passenger Corporation
60 Massachusetts Avenue, N.E.
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Dear Messrs. Carper and Boardman:

As members of the Amtrak Northeast Corridor (NEC) Infrastructure Master Plan Policy Group, the twelve northeast states and the District of Columbia have worked cooperatively and collaboratively with Amtrak and the Federal Railroad Administration (FRA) to develop and review the Amtrak Northeast Corridor Railroad Infrastructure Master Plan (Master Plan). Started in 2007 and refined over three years, the Master Plan is a first. It is the first passenger rail infrastructure plan to incorporate a regional, corridor-wide perspective of the NEC Main Line and all its feeder lines. It is the first planning process to involve all the northeast states and the District of Columbia with Amtrak. It is the first to consider the plans and infrastructure needs of all the NEC users – intercity, commuter and freight. This foundational document identifies an initial baseline of infrastructure improvements needed to maintain the current NEC system in a state of good repair; integrate intercity, commuter and freight service plans; and move the NEC forward to meet the expanded service, reliability, frequency, and trip time improvements that are envisioned by the northeast states and the District. Therefore, we are pleased to endorse the collaborative planning process and Amtrak's Infrastructure Master Plan Final Report.

The Master Plan is the first in a series of planning activities that must be undertaken if an expanded NEC – as part of an integrated, intermodal regional transportation system – is to support future economic growth and environmental and energy goals. Many of the service and financial assumptions, data and analyses that underpin this report precede the recent actions by the Congress and the Administration to revitalize the nation's intercity passenger rail program. For example, the Passenger Rail Infrastructure and Investment Act of 2008 (PRIIA) establishes a new paradigm of state-led planning of intercity passenger rail corridors and authorizes significant funding for the development of these corridors. It also creates a Northeast Corridor Infrastructure and Operations Advisory Commission that is charged with developing comprehensive goals for the future development of the NEC as a transportation and economic corridor. Thanks to the infusion of funds for rail grants to states and Amtrak from the American Reinvestment and Recovery Act of 2009 (ARRA) and continuing yearly appropriations, passenger rail projects that were once a vision are now a real possibility.

The Master Plan process and report are an ongoing resource for the states, Amtrak, the FRA, and the NEC Advisory Commission, and we look forward to a continuing dialogue with Amtrak on updating this Master Plan as needed in the future. The report should be viewed as a foundational document that represents the improvements in operating flexibility and track capacity needed to support future enhanced, reliable and safe passenger rail service on the existing NEC system. As a longer term vision for the expansion of the NEC is developed, the collaborative process and this plan will serve as a prelude to the next phase of work. The Master Plan can be used now by the states, Amtrak, and the FRA to identify those specific projects which, covered by prior environmental analyses or other environmental assessments, can readily be determined as eligible for available High Speed Intercity Passenger Rail funding. Finally, the report can be used as the states continue to work collaboratively with Amtrak, the FRA and other key stakeholders to complete corridor-level service and related environmental planning required for the NEC to seek federal intercity passenger rail funding.

Our states and the District thank the Master Plan Working Group for all of their efforts and look forward to continuing the collaborative efforts that resulted in this important plan, particularly as the NEC Advisory Commission is established and begins to develop more comprehensive policy goals and plans for the Northeast Corridor.

Sincerely,

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Connecticut DOT

Carolann Wicks
Secretary
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The Northeast Corridor Infrastructure Master Plan

May 2010

Prepared by the NEC Master Plan Working Group

Including representatives of twelve states, the District of Columbia, Amtrak, the Federal Railroad Administration, eight commuter and three freight railroads operating on the Northeast Corridor

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Preface

The Northeast Corridor (NEC) Infrastructure Master Plan is the result of a precedent-setting region-wide collaboration among 12 Northeast states and the District of Columbia, Amtrak, the Federal Railroad Administration (FRA), eight commuter and three freight railroads operating on the Northeast Corridor.

This collaborative planning process is itself a significant achievement. It is the first time that the existing plans and infrastructure needs of all users of the NEC have been brought together in one document. Very few rail planning efforts have been as comprehensive or inclusive.

The Master Plan identifies an initial baseline of infrastructure investment needed to maintain the current NEC system in a state of good repair, integrate intercity, commuter and freight service plans, and move the NEC forward to meet the expanded service, reliability, frequency, and trip-time improvements that are envisioned by the Northeast states and the District.

Initiated in 2007, before passage of the 2008 Passenger Rail Investment and Improvement Act (PRIIA), the Master Plan reflects existing goals and plans through 2030, including an expected 59% increase in rail ridership, a 41% increase in train movements, and the need for $52 billion in capital investment over 20 years. This will ensure reliable service, expand capacity on the Corridor for the benefit of all users, and reduce by up to one half-hour intercity travel times between Boston and New York, and New York and Washington.

All key stakeholders recognize that publication of this Plan is not the end of a process, but a beginning. The Master Plan is the first in a series of planning activities that must be undertaken if an expanded NEC – as part of an integrated, intermodal regional transportation system – is to support future economic growth and environmental and energy goals.

The Master Plan process and this report will serve as an ongoing resource for the states, Amtrak, the FRA and the NEC Infrastructure and Operations Advisory Commission in the continuing dialogue that will define a longer term vision for the expansion of the NEC. As noted in the preceding letter of endorsement from the Northeast states, this report represents a "foundational" analysis upon which the future of the NEC will be defined and built.

An enhanced NEC passenger rail system is essential to meet the region's long-term mobility needs, stimulate economic growth and international competitiveness, enhance the livability of our communities, improve the environment and reduce dependence on foreign sources of energy. These are important goals that will help shape the future for residents of the Northeast – and the nation – for generations to come.

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Executive Summary

The Northeast Corridor Infrastructure Master Plan is the product of more than two years of collaboration between the key stakeholders of the Northeast Corridor: 16 railroads, 12 states, the District of Columbia, the Federal Railroad Administration (FRA), and regional policy and planning groups including the I-95 Coalition, the Coalition of Northeastern Governors, the Regional Plan Association, and the Port Authority of New York & New Jersey. This unique partnership has produced this Master Plan to secure widespread support for investment that will enable the Northeast Corridor's rail infrastructure to achieve its full potential as a critical component of the nation's transportation system.

The Northeast Megaregion and Rail Network Today

The Northeast hosts business and economic activity on a massive scale. With 55 million people and a $2 trillion economy, the Northeast was reported by the Wall Street Journal in 2008 to be the world's second-largest mega-region (behind only greater Tokyo). The economy of the Northeast is equal to one-fifth of the nation's gross domestic product. If the Northeast was an independent country, it would represent the fifth largest economy in the world.

The Northeast Corridor (NEC) rail network is a centerpiece of the transportation infrastructure that contributes to the economic vitality of the Northeast region. The NEC (including the Main Line between Boston and Washington D.C. and the branch lines to Springfield, Albany, Harrisburg, and Richmond[1]) is among the most heavily utilized rail networks in the world. The NEC links all the major cities of the Northeast; is the nation's only high-speed intercity rail line; hosts dozens of commuter lines; and, provides freight access to major ports and local industries. The NEC moves more than 259 million passengers and 14 million car-miles of freight per year.

The Potential to Transform the NEC

The creation of the Master Plan marks the beginning of a new era of collaborative regional rail planning. Recent Federal legislation, including the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) and American Recovery and Reinvestment Act (ARRA), provides policy guidance and, critically, new sources of funding for rail improvements. Action on the recommended set of infrastructure improvements in the Master Plan, which in turn are supported by the long-range plans of participating states and railroads, has the potential to transform the NEC. Examples abound: Vermont, Massachusetts and Connecticut are collaborating on Connecticut River and Springfield Line service that would evolve into a double-tracked, fully electrified railroad hosting commuter and

> *Make no little plans. They have no magic to stir men's blood and probably themselves will not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with ever-growing insistency. Remember that our sons and grandsons are going to do things that would stagger us. Let your watchword be order and your beacon beauty. Think big.*
>
> - Daniel Burnham, Chicago architect and city planner (1846-1912)

[1] This report uses the outlying terminal of a major branch line or segment to describe the segment rather than designations which may be specific to individual railroads and / or closely associated with branded train services.

intercity trains with service to dozens of destinations. Hourly *Acela* service would be provided to Boston, along with new MBTA commuter rail service to New Bedford and Fall River and MBTA/Rhode Island Department of Transportation commuter rail service to Wickford Junction. Massachusetts also plans to restart Inland Corridor *Regional* intercity service to Framingham, Worcester and Springfield.

The New York area will see dramatic expansions with its two signature commuter projects – LIRR's East Side Access project linking Long Island to Grand Central Terminal and NJT's ARC/MTT project that includes a new tunnel under the Hudson River at a new station at 34th Street in Midtown Manhattan, just north of the existing Pennsylvania Station. Immediately east across 8th Avenue from the existing station, a Port Authority of New York/New Jersey sponsored project will convert the Farley Post Office to a new Moynihan Station serving intercity rail. Service will be expanded, and trip times improved in upstate New York, with many more travel options linking upstate and downstate markets.

Pennsylvania, Delaware and Maryland are planning expanded commuter services as well as new corridors to locations including the Pocono Mountains of Northeastern Pennsylvania and the Delmarva Peninsula. Hourly peak-period service will be provided from Washington D.C. through to Richmond, with multiple frequencies beyond to Newport News, Norfolk, Raleigh and Charlotte, NC. These new or additional rail services will broaden the reach of the Northeast Corridor in ways unforeseen just a few years ago. Virtually all of these services link to and operate over portions of the Main Line between Boston and Washington.

Vision for the Future

The shared vision for the Northeast Corridor Network is one that recognizes the inherent efficiency of rail transportation and its potential to facilitate sustainable economic growth. Rail transportation uses land and fuel efficiently to move high volumes of passengers and freight. The Network supports regional economic growth by reducing travel times and expanding mobility options including improved landside access to airports. It fosters greater collaboration in all sectors of the economy; links core urban centers and outlying areas, and provides multi-modal connectivity to a wide range of business and leisure markets across the region. The Network has provided – and continues to provide – Northeast states and localities with the opportunity to expand rail services at relatively low marginal cost through access to a strategically located, high-value asset base.

Rail stations increasingly serve as transportation hubs that provide linkages to other modes, improving the overall efficiency of the broader transportation network. This, in turn, acts as an incentive to attract private investment in commercial, residential and institutional facilities in and around stations, supporting local and regional economic development. Integrated regional rail transportation strategies can help foster transit-oriented development, and redevelopment, particularly crucial for the Northeast's older urban core.

Like passenger rail, freight rail helps support economic development, reduces carbon pollution and mitigates highway congestion. The NEC is a critical part of the national

freight rail network, providing shippers with access to major ports, national and international markets and local industries throughout the region.

Every rail operator on the NEC and each state from Maine to Virginia is forecasting substantial increases in passenger and freight demand and calling for considerably higher levels of rail service. On average, as summarized in Table 1, above, passenger rail ridership on the NEC is forecast to increase by 59% through 2030, with a 40% increase in train movements. The relatively smaller percentage increase in train movements reflects plans by virtually all operators to use scarce infrastructure capacity as efficiently as possible by lengthening trains and/or improving seat utilization before adding new trains.

Table 1: Service Plan Summary

	States / Amtrak	Commuter RRs	Totals
Riders (millions)			
2010	13	246	260
2030	23	389	412
% Change	*76%*	*58%*	*59%*
Average Weekday Trains			
2010	154	2,207	2,361
2030	210	3,084	3,294
% Change	*36%*	*40%*	*40%*

Source: Master Plan Working Group; See Section 6 for additional discussion of service plans.

The Northeast governors have set a goal of doubling rail ridership in the region over the next 20 years. This plan does not fully achieve that goal – in part, because it is constrained in many cases by what participating states and agencies had in the pipeline when the planning process began in 2008 and/or have approved since then. There are both upside and downside risks to the estimates contained in this report and estimates will almost certainly evolve in line with overall economic output, federal funding opportunities and changes in external factors such as fuel prices (See also Chapter 9, Moving Forward).

Intercity/State Corridor Plans

Long-range plans for intercity service envision substantial growth in both Main Line and state-sponsored corridor services linking to or operating over the NEC Main Line. On the Main Line, projected intercity growth is driven in large measure by plans to reduce five- or six-stop express trip times by approximately 20 minutes between New York and Washington and between Boston and New York. These trip times will permit intercity service to capture a higher share of the auto and air markets. Preliminary plans call for introduction of *limited-stop Express* service in peak periods between New York and Washington, shaving a full half-hour off the current travel time between New York and Washington.

Regional service will operate trains (both on and off the Main Line) designed to provide small and intermediate markets throughout the Northeast region with robust intercity rail service, at a price attractive to budget-conscious business, leisure and student travelers. To achieve this goal without triggering unattainable infrastructure requirements, the long-range service plan is designed so that the majority of the state-sponsored trains will operate in "regional" slots on the NEC Main Line. This results in an

efficient use of scarce infrastructure and fleet capacity while providing state-sponsored trains with access to core urban markets which, as centers of population, employment and leisure activities, continue to be the major "attractors" of rail ridership. This integrated approach to regional and state sponsored services is intended to improve the economics of corridor trains, minimize operating expenses and broaden the reach of regional rail services in the Northeast.

Over the last nine months, Amtrak has worked closely with Northeast states to develop corridor improvement plans in the Northeast under the High Speed Intercity Passenger Rail Program (HSIPR). As a result of this work, the largest growth in regional rail service is projected to be in state-sponsored corridor services. Among the new markets and regions that will be served by NEC trains are: the southern Tidewater area of Virginia to Hampton Roads, the Delmarva Peninsula, the Pocono Corridor through Scranton, PA to Binghamton, NY, and Western Massachusetts via the newly-designated "Knowledge Corridor" from Greenfield to Springfield and New Haven, CT, as well as expanded service on the "Inland Route" between Boston and Springfield.

Expanding services, particularly to outlying areas of the region, is not without its challenges. A major issue to be addressed will be maintaining and improving the reliability of *Regional* services as more trains originate at off-corridor locations and operate over longer distances on non-Amtrak owned right-of-way. Another issue is how the cost of state-sponsored services which span multiple states will be assigned or allocated to states (For further discussion, see the Section 9, Moving Forward)

Commuter Plans

As with intercity service, plans developed by commuter rail agencies frequently envision expansion of their networks and providing services to underserved or outlying locations within their market area. As examples, Massachusetts is planning an expansion of MBTA rail service to its South Coast cities of Fall River and New Bedford. In Rhode Island, the state has partnered with MBTA and Amtrak to develop South County commuter rail service that will extend service from Providence to Warwick (T.F. Green Airport), Wickford Junction and potentially Kingston and Westerly in the longer-term. Connecticut's Shore Line East service is expected to more than double from New Haven to Old Saybrook and New London. Connecticut and Massachusetts also plan to initiate commuter service to/from New Haven to Hartford, CT and Springfield, MA, with the Springfield Line to be electrified under current plans. SEPTA is considering increasing Philadelphia-Trenton service, extending service from Thorndale to Coatesville and/or Parkesburg on the Harrisburg Line, and increasing service between Philadelphia and Newark, DE in conjunction with DelDOT. MARC service will increase substantially both north and south of Baltimore, with a possible extension to Elkton, MD or Newark, DE in the longer term.

At the same time, access to core urban centers – such as Boston, New York and Washington - remains a priority for the major commuter agencies, just as providing such access is an important principal of the intercity service plans. While demand is increasing for improved services to outlying areas and new markets, the anchor of rail service in the Northeast – both commuter and intercity – remains the attractiveness of high population, employment and leisure activities in the major urban centers of the

region. Commuter rail is especially sensitive to levels of employment since its primary function is still to get people to and from their place of work. Metro-North, for example, is evaluating Hudson and Hell Gate line service to Penn Station New York in the 2016 to 2019 timeframe after its MTA sister agency, the Long Island Rail Road, completes the East Side Access project and diverts some its trains to Grand Central Terminal. New Jersey TRANSIT is beginning construction of a new Hudson River Tunnel and station in midtown Manhattan that will eliminate transfers at Secaucus Junction for some of NJT's scheduled trains and boost ridership to both Penn Station New York and its new station at 34th Street. MARC and VRE both have plans to significantly increase service into Washington Union Station.

As with intercity service, the plans of most commuter agencies are designed to use rail capacity efficiently and limit the number of new trains into the major urban centers. Virtually all agencies have plans to extend existing trains to serve outlying areas and/or lengthen trains to use scarce capacity more efficiently. Still, total projected levels of service will increase by 11% at Boston, 39% to the existing Penn Station New York, and 55% into Washington Union Station. These terminals are at capacity today, and expanding services into them remains one of the major challenges facing the region as it looks to the future. (For further discussion, see Section 9, Moving Forward).

Freight Plans

The Northeast Corridor is also a critical transportation artery for rail freight. Approximately 50 Class 1 and regional freight trains use the NEC each day, operated by Conrail Shared Assets Corporation, Providence and Worcester, Pan Am Southern, Canadian Pacific, Connecticut Southern, Norfolk Southern and CSX Transportation. While intercity and commuter trains will continue to dominate operations, the Corridor's role in providing key freight rail linkages to Northeast ports and local industry is important to the economy of the region. Areas served by the freight railroads operating on the NEC include the ports of Baltimore, Wilmington, Philadelphia, New York/New Jersey, Quonset Point/Davisville and Providence, and cities and regions including Richmond, the Delmarva Peninsula, Coatesville, Lancaster, New Haven, New London, Boston and Albany.

There is broad agreement among policymakers that highways cannot continue to absorb all the expected growth in freight movement over the next twenty years and improved freight rail must be part of the solution and carry more of these goods. For this reason, it is critical to protect and enhance the NEC's ability to accommodate the freight rail needs of ports and industries adjacent to or accessed via the NEC. Among the most critical NEC freight needs is improved access to the Port of Baltimore and between Perryville, MD, and Newark, DE to serve the Delmarva Peninsula, but substantial freight growth is also anticipated in several other areas as described in Section 6, Future Service Plans.

Infrastructure Condition and Capacity Limit Growth

Growth, however, will be constrained without investment to improve the condition and capacity of the NEC infrastructure. NEC rail operators are challenged to deliver fast, reliable service on infrastructure that is congested, with major assets that are beyond their useful life. These include ten moveable bridges on the Main Line from Boston to Washington that average approximately 100 years in service, and the Baltimore and Potomac Tunnels, built in 1873. In addition, 24 of 66 segments on the Main Line are operating at above 75% of practical capacity, and eight of these exceed 100%. Capacity constrained areas of the Corridor include much of the territory between Trenton and Stamford as well as sections in the vicinity of Baltimore, Wilmington, and Boston. Infrastructure component failure and train interference are two of the major causes of delay on the NEC. Despite differences in their markets, NEC rail operators share a need for reliability to attract and retain customers. New infrastructure capacity, especially in constrained areas, is required for implementation of the long-term service plans and is one of the cornerstones of the Master Plan.

Discussion of Cost Estimates

Despite plans by NEC rail operators to lengthen trains and further improve the efficiency of infrastructure utilization, substantial additional capacity will be needed to meet 2030 service goals. The Master Plan identifies more than 300 capital projects to address chokepoints, increase capacity and improve reliability and travel times. Project costs are further detailed in Chapter 8 of this section, and Parts II and III of this report.

All costs in the Master Plan are preliminary, order-of-magnitude estimates in 2010 dollars unless otherwise noted and are considered reasonable estimates of future investment needs to meet the 2030 service levels defined in this report. A next phase of the planning effort, to be led by the Federal Railroad Administration (FRA), will include completing a Service Development Plan (SDP) and a Programmatic Environment Impact Statement (PEIS) for the Main Line. The PEIS will include evaluation of alternative growth scenarios and infrastructure configuration options, preliminary engineering and evaluation of environmental impacts. Cost estimates will be refined and updated as this work progresses.

Note that the costs shown incorporate the entire existing state of good repair (SGR) backlog because virtually all of these projects would be configured to improve reliability and accommodate future growth as the Master Plan is implemented. Examples include major bridge replacements, many of which are planned to be higher and wider than their original designs to minimize openings, improve reliability and speeds, and provide additional track capacity.

Table 2: NEC Infrastructure Capital Needs, 2010-2030 ($ Millions)

Cost Category	Total (Millions)
MASTER PLAN PROJECTS	
SAFETY / POSITIVE TRAIN CONTROL	**264**
SGR BACKLOG	**8,786**
CORE GROWTH	**32,245**
SPECIAL ISSUE	
Baltimore Freight Tunnel	**2,000**
SUBTOTAL MASTER PLAN	**43,295**
SGR NORMALIZED REPLACEMENT	**9,035**
TOTAL CAPITAL	**$52,330**

Note: This table should be read in conjunction with the accompanying discussion of cost estimates.
Sources: NEC Master Plan Working Group and individual railroads for estimate of state of good repair requirements; Master Plan projects are detailed in Part III, Capital Program Summary by Segment. All costs shown are order-of-magnitude for planning purposes stated in 2010 dollars.

Positive Train Control, a new safety mandate, SGR backlog costs and core growth requirements for capacity and speed, collectively total approximately $43 billion in estimated costs through 2030. Normalized replacement needs to maintain existing assets in good condition are estimated at an additional $9 billion between 2010 and 2030 for the Main Line and the branch lines of the corridor regardless of ownership, as shown in Table 2, above.

Normalized replacement projects are not itemized in this report, but rather are programmatic estimates with actual funding typically provided in the annual budgets of individual states and railroads. Including normalized replacement, total infrastructure capital investment, as shown in Table 2, is estimated at $52 billion through 2030. This is the estimated amount that will be required over the next 20 years to eliminate the SGR backlog, maintain existing assets in state of good repair, provide for normalized replacement and create the modern, fast, efficient, well-connected rail network required for growth. (See Section 8 for additional discussion of infrastructure costs and benefits)

Opportunities and Challenges

As a result of recent federal legislation, the nation is making significant investments in intercity and high-speed rail. The *Passenger Rail Investment and Improvement Act of 2008* (PRIIA) and the *American Recovery and Reinvestment Act of 2009* (ARRA) established guidelines for the development of intercity and high-speed rail corridors and provided more than $8 billion in new funding. For the Northeast region, which received more than $400 million in the initial round of grant awards, these legislative initiatives provide both significant opportunities and major challenges:

- No other region of the country enjoys the competitive advantage of an installed rail asset base to the extent the Northeast does, nor the opportunity to leverage that base to increase rail ridership and improve freight mobility. The NEC network has the potential to expand the market reach and attractiveness of connecting services while simultaneously supporting local and regional economic growth and improved environmental quality.
- Major challenges include coordinating among numerous owners, commuter, intercity and freight operators and other stakeholders and providing sufficient financial resources to improve NEC infrastructure and sustain growth. After years of deferred investment, it will be expensive to reach a state of good repair and to add needed capacity to the Corridor simultaneously. There is no obvious mechanism to provide the required level of investment (For further discussion, see Section 9, Moving Forward).

The NEC links 12 Northeast states from Maine to Virginia plus the District of Columbia. The NEC itself is overseen by the FRA, owned by five separate entities and hosts operations of nine passenger and seven freight railroads. The challenge is for all states, agencies and railroads to act collectively to support local development and the broader needs of the region in a very complex political, financial and operating environment.

PRIIA established a mechanism for addressing these issues by providing for an NEC Infrastructure and Operations Advisory Commission. Members will be drawn from the Northeast states, US DOT, Amtrak and include non-voting representatives of the freight railroads. The Commission, which will be established by the U.S. Department of Transportation in 2010, is charged with leading regional planning efforts, establishing guidelines for improving coordination among operators, and agreeing to equitable financing mechanisms and cost sharing formulas. The NEC Master Plan will provide the Commission with information that provides a baseline analysis of capital investment needs and helps to frame the regional coordination, planning and financing issues that the Commission will need to address.

Moving Forward

The NEC Master Plan represents a collaborative undertaking by the NEC states and railroads to envision a shared future, establish goals for expanded service and higher levels of ridership, and identify capital improvements to improve the reliability and efficiency of the Network and accommodate growth in services. The Master Plan represents an important step in the evolving partnership between the Federal government, Amtrak, the northeastern states and the other NEC operators, and sets a planning foundation for the new NEC Commission.

Anticipated next steps include supporting the efforts of the NEC Commission in setting priorities, defining funding options and working closely with the FRA and the Northeast states to create a Service Development Plan necessary to develop a Programmatic Environmental Impact Statement (PEIS) for the Main Line of the Corridor. The PEIS is expected to include additional alternatives analysis, environmental documentation, preliminary engineering and operations planning. In addition, major terminal studies at New York and Washington are already underway and Amtrak is also supporting development of state rail plans being prepared by most Northeast states in response to PRIIA, which requires such plans as a condition for HSIPR grants (although this proviso was waived in the initial round of awards announced in February 2009).

Amtrak and the Master Plan team thank the effort of the Working and Policy Groups, as well as interested stakeholders for their dedication and participation in developing this report. We look forward to implementing projects and programs and the opportunity to keep the Master Plan up-to-date and aligned as all stakeholders' plans evolve in the future.

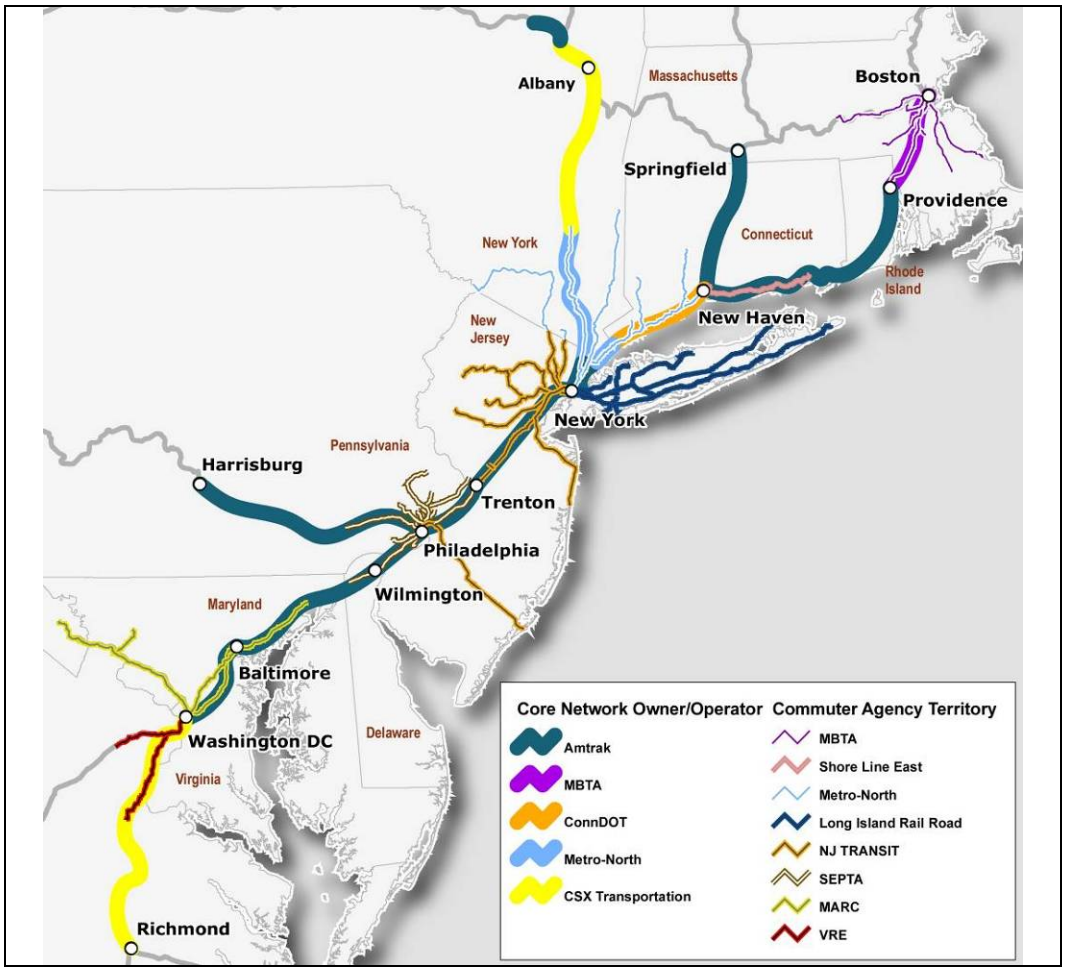
1. Regional Overview

One of the defining characteristics of the Northeast Corridor – and a challenge for long-term planning – is a complex ownership and operating structure that is the legacy of the Penn Central Railroad bankruptcy in the early 1970's, the creation of Amtrak, the accommodation of freight goods movement, and the expansion of local commuter rail operations. NEC passenger and freight agencies operate on the NEC under a variety of agreements, some crafted long ago.

In this complex environment, the NEC Master Plan has provided a framework for owners and operators to work collaboratively to define capital investment needs on the NEC "core" network.

The core network, shown in Figure 1 below, includes the NEC Main Line from Boston to Washington D.C., the Springfield, Albany, Harrisburg and Washington to Richmond lines. The NEC core network is distinguishable from other rail lines in the Northeast by several factors, including high frequencies (six or more daily round trips), joint intercity and commuter operations (current or proposed), high population densities or growth characteristics, and potential for improved high-speed service.

Figure 1: NEC Core Network and Feeder Lines

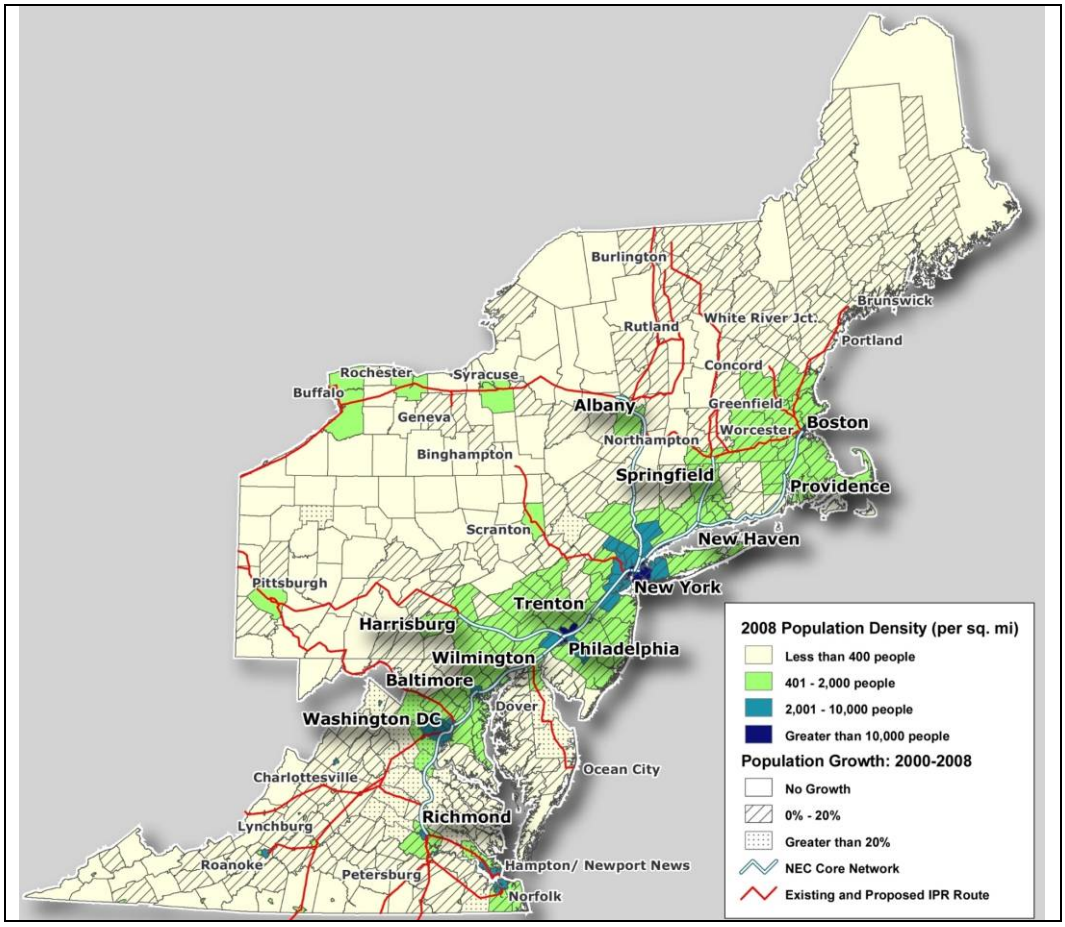


Source: Master Plan Working Group

Growth Returns to Urban Core

According to America 2050[2], the Northeast encompasses two percent of the U.S. land mass and houses 18 percent of the U.S. population. Population density along the core network is almost 4,700 people per square mile; compared to less than 600 outside the network. As shown in Figure 2**,** population density is very high along the Main Line.

Figure 2: NEC Area Population Density and Growth



Source: U.S. Census

After decades of population decline, the trend since 2000 suggests that population growth is returning to many of these urban areas. This trend is particularly evident between Washington, D.C. and Richmond, a segment that hosts eight of the ten fastest-growing counties in the Northeast.

More than two-thirds of Northeast counties with rail service experienced population growth between 2000 and 2008. According to a recent study prepared for the Coalition of

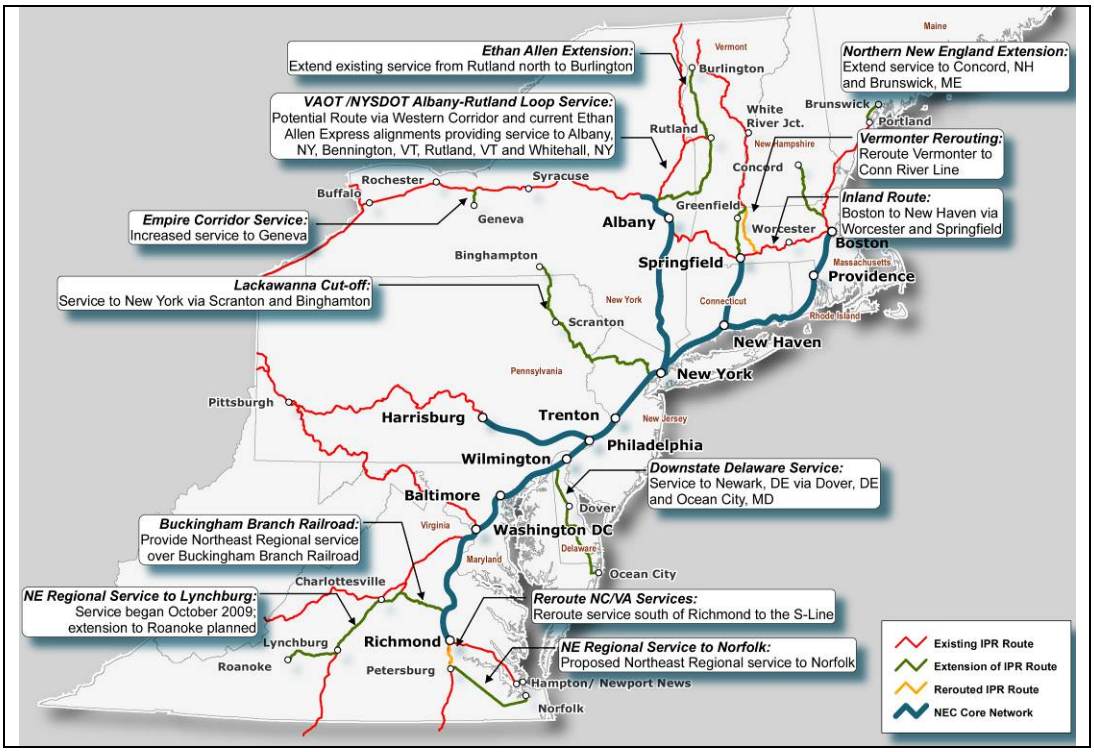
[2]America 2050 is a national initiative to meet the infrastructure, economic development and environmental challenges of the nation. See www.America2050.org for additional information.

Northeastern Governors[3], "The Northeast's population settlement patterns have been influenced by the transportation corridors shaped by geography and history," with 80 percent of the region's residents living with 25 miles of an existing or proposed multi-state rail service." America 2050 forecasts that Northeast mega-region population will reach 58 million by 2025 and that employment will increase from 29 million in 2000 to 36 million in 2025.

Regional Service Expansion

Amtrak has worked closely with the Northeast states in the development of applications for funding under the ARRA-Funded High-Speed Intercity Passenger Rail Program (HSIPR). As a result of this work, it is clear that virtually all states in the Northeast are considering expanding corridor services in the future, with most of these services linking to or operating over the NEC Main Line and/or branch lines. As discussed previously, this type of approach improves the economics of emerging corridors by allowing them to tap large core markets while simultaneously extending their reach to outlying areas, as illustrated in Figure 3, below.

Figure 3: Proposed Expansion or Reconfiguration of NEC Intercity Services



Source: Master Plan Working Group

Northeast states are considering expansions of intercity rail service from Portland to Brunswick, ME; Boston to Concord, NH; and on the inland route from Boston via

[3] A Regional Context for Intercity Passenger Rail Improvements in the Northeast, Prepared for CONEG Policy Research Center, Inc., August 2009, page 3.

Worcester, linking to the NEC at Springfield, MA. Additional proposals to expand and enhance intercity passenger rail services have been put forward by New York for the Albany Line, by Pennsylvania for the *Keystone* Corridor to Pittsburgh, and by Virginia for expanded services to Richmond, Newport News, Norfolk, Lynchburg, and Roanoke. Additional service is planned by Delaware and Maryland to the Eastern Shore, and New York and Pennsylvania are considering "Pocono Corridor" service to Scranton, PA and Binghamton, NY from Penn Station New York via a rebuilt Lackawanna Cutoff, an historic and scenic rail link. NJ Transit is currently reconstructing, as an extension of its Montclair-Boonton Line, seven of the approximately 88 miles needed to provide service to Scranton.

A number of proposals involve route changes designed to make existing service more efficient and expand market reach. Vermont proposes an extension of the *Ethan Allen Express* north from Rutland to Burlington, along the Western Corridor. Vermont and New York State plan to examine a service operating from Albany-Rensselaer to Bennington, VT over the Western Corridor to Rutland, looping westward to Whitehall, NY and returning to Albany via the current *Ethan Allen Express* route. A rerouting of the *Vermonter* via the Connecticut River Line is being implemented with HSIPR grant funding. Virginia plans to ultimately reroute all trains through Richmond Main Street, while North Carolina and Virginia plan to reestablish passenger service along the federally designated Southeast High-Speed Rail Corridor on the "S" Line between Raleigh and Richmond.

2. Existing Rail Services

Amtrak owns 363 route miles of the 457-mile Main Line plus the Springfield and Harrisburg lines and portions of the Albany Line. As owner, Amtrak's is the steward for most of the NEC infrastructure. The balance of the Main Line is owned by Connecticut DOT (46 route miles), Metro-North Railroad (10 route miles) and Massachusetts (38 route miles). Portions of the Albany Line are owned by Metro-North Railroad and CSX Transportation (CSXT). CSXT also owns the right-of-way between Washington D.C. and Richmond.

The NEC network hosts high-speed, intercity, commuter and freight trains on the same right-of-way. Each type of service has different characteristics, creating a complex, high-volume operating environment. A summary of current NEC rail operations is shown in Table 3.

Table 3: Current NEC Trains and Riders

	Daily Trains	Thousands Riders	Thousands Passenger Miles
Intercity			
Amtrak	154	13,092	2,354,556
Commuter			
MBTA / RIDOT	296	23,344	133,968
ConnDOT / Shore Line East	23	484	12,367
Metro-North	345	48,884	999,780
Long Island Rail Road	581	86,100	203,714
NJ Transit	387	57,980	850,657
SEPTA / DelDOT	374	17,830	203,810
MARC	83	8,000	159,416
Virginia Railway Express	29	3,825	72,121
Total Passenger	**2,272**	**259,539**	**4,990,390**
Freight	**50**		
(Pan Am, Conrail SA, P&W, CP, CS, NS, CSX)			

Source: Master Plan Working Group (2007-2008) Riders and passenger miles are annual figures.

High-Speed and Intercity Rail

Amtrak's *Acela Express*, America's flagship high-speed rail service, is the fastest train in North America, reaching speeds of 150 mph between Boston and New Haven. *Acela Express* caters to the business market, offering frequent, time-competitive travel between Boston, New York City, Washington D.C. and intermediate stations. *Acela Express* trains provide a faster trip with expanded amenities compared to Amtrak's *Regional* trains.

Amtrak also operates *Regional* trains as well as state sponsored services such as the Vermonter, Ethan Allen, Adirondack, Maple Leaf and Carolinian. *Regional* trains, operating at speeds of up to 125 mph, provide frequent service between Boston, New York City, Washington D.C., and intermediate stations. Regional trains primarily serve Boston to New York markets, but a number currently operate on the Springfield Line and south of Washington to Richmond, Newport News, and Lynchburg, VA. State sponsored trains typically serve outlying areas of the region, but a number of these, including the Vermonter, Carolinian and Pennsylvania-sponsored Keystone service, function as Regional trains when operating on the NEC Main Line. Amtrak also operates Empire service between New York, Albany and Buffalo.

In addition, Amtrak operates long distance trains over the NEC, including trains bound for Chicago, New Orleans and Miami. The *Downeaster* operates between Portland, Maine and Boston's North Station, with MBTA transit connections to the NEC.

Commuter Rail

The commuter railroads operate 2,400 weekday trains serving 245 million annual passengers via the NEC. In addition to serving the traditional city-bound employment

market, commuter railroads have experienced increased demand for reverse peak, off-peak and express services. As commuter rail operations have matured and their markets have diversified, they now address a broader range of regional mobility needs. Commuter agencies operating on the NEC include:

- Massachusetts Bay Transportation Authority (MBTA)
- Rhode Island DOT (RIDOT)
- Shore Line East (SLE)
- MTA Metro-North Railroad (MNR)
- MTA Long Island Rail Road (LIRR)
- New Jersey Transit Corporation (NJT)
- Southeastern Pennsylvania Transportation Authority (SEPTA)
- Delaware Department of Transportation (DelDOT)
- Maryland Rail Commuter (MARC)
- Virginia Railway Express (VRE)

Freight Rail

On a typical day, seven freight railroads operate up to 50 trains over Amtrak-owned portions of the NEC, including the Springfield and Harrisburg lines. NEC freight railroads include Conrail Shared Assets Corporation, Providence and Worcester, Pan Am Southern, Canadian Pacific, Connecticut Southern, Norfolk Southern, and CSX Transportation. Dozens of additional freights operate over freight-railroad-owned portions of the core network between Washington D.C. and Richmond, and between Poughkeepsie and Schenectady on the Albany Line.

Most freight operations take place at night when fewer passenger trains are operating, although a limited number of freight trains also operate during the daytime. Centers served by the freight railroads include the ports of Baltimore, Wilmington, Philadelphia, New York/New Jersey, Providence, and Quonset Point/Davisville and major economic areas such as Richmond, the Delmarva Peninsula, Coatesville, Lancaster, New Haven, New London, Boston and Albany. The only portions of the entire

Low speed freight trains and high-speed passenger trains operating at up to 150 mph share the NEC right-of-way as illustrated here by Amtrak *Acela Express* operating with Providence & Worcester.

NEC network without active freight service are between Queens, NY and Newark, NJ and between Landover, MD and Washington, DC.

Working Together

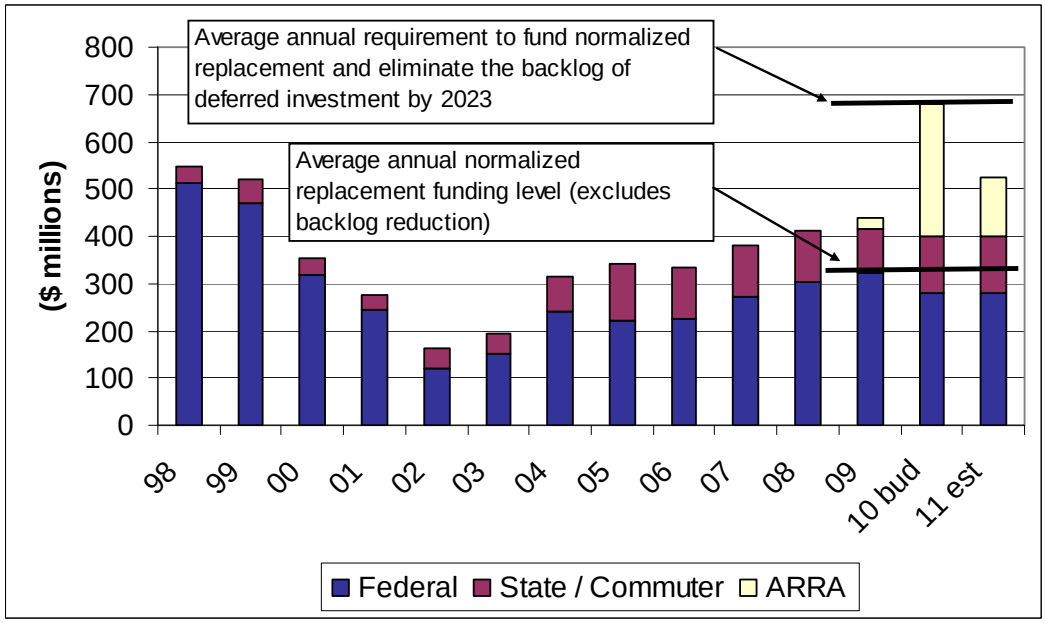
The NEC railroads together operate an enormous volume of highly successful rail services over the NEC. With a complexity that is virtually unknown elsewhere, passenger and freight trains with substantially differing operating speeds, lengths, weights, acceleration/deceleration rates, and station stopping patterns operate over the same rail infrastructure. The condition of that infrastructure is of critical importance to the safety, reliability and efficiency of this core transportation facility.

3. State of Good Repair

Infrastructure in good repair is integral to safe, reliable and efficient NEC service. The U.S. Department of Transportation defines a "state of good repair" as a condition in which the existing physical assets, both individually and in a system, are functioning within their useful lives and sustained through regular maintenance and replacement programs. When assets are beyond useful life (e.g., not in a state of good repair) operational reliability decreases due to asset failure and costs for emergency repair increase.

Most assets were not in good repair when the majority of the NEC was conveyed to Amtrak in 1976, and sufficient funding has not been available since that time to achieve good repair and maintain the network. Since conveyance, there have been large gaps between the annual funding needed to achieve a state of good repair (SGR) and the actual amount received. Figure 4 displays the more recent funding trends for Amtrak-owned or operated portions of the Northeast Corridor Main Line and branch lines. Additional detail is available in the NEC State of Good Repair Spend Plan in the Appendices.

Figure 4: Capital Funding (Amtrak Owned and Operated Northeast Infrastructure)[4]



Source: Amtrak Engineering Department, in year of expenditure dollars, except average annual amounts for Normalized Replacement and elimination of the Backlog of Deferred Investment. Higher Federal funding levels in 1998 and 1999 reflect approximately $2.2 billion made available to Amtrak as a result of the Taxpayer Relief Act of 1997 (P.L. 105-34), a portion of which was used on the NEC. Figures represent funding required for Amtrak owned/operated portions of NEC Main Line and branch lines and exclude the New Haven Line, Hudson Line, and Washington, DC to Richmond line.

[4] Average annual requirements for normalized replacement and to eliminate the backlog of deferred investment are summarized from Northeast Corridor State of Good Repair Spend Plan, Prepared by Amtrak Under Section 211 of the Passenger Rail Investment and Improvement Act (PRIIA) of 2008. See Appendices.

Funding for SGR has been increasing since 2004. Contributions from Northeast states and railroads have grown over the past decade and now account for about one-third of Amtrak's NEC capital program. This includes investments from states, such as Pennsylvania, which along with SEPTA, has contributed to capital improvements under the Keystone Corridor Improvement Program. Commuter railroads, including NJ Transit, DelDOT, MARC and VRE have also increased their contributions in recent years under Joint Benefit Capital Programs with the respective agencies[5]. Also shown in Table 4 are estimates of funding from recent federal legislation. In 2009, ARRA appropriated $453 million for NEC projects (as shown in Table 4). Virtually all of these projects are intended to maintain the corridor in a state of good repair or reduce the backlog of deferred investment.

Table 4: Amtrak ARRA-Funded NEC Projects

Category	Costs ($Millions)	Percent
Right-of-Way	75	17%
ADA Act Compliance	3	1%
Infrastructure	280	62%
Safety	55	12%
Stations	40	9%
Total NEC	**$453**	**100%**

Source: Amtrak. Costs are order-of-magnitude 2010 dollars.

State of Good Repair Needs: Notwithstanding recent progress, the backlog of Amtrak-owned NEC assets requiring investment to reach a state of good repair totals $5.2 billion as shown in Table 5. Assets in need of upgrade include reconstruction of tracks, upgrades to electric traction equipment and faculties, rehabilitation of the signal system, improved passenger stations, and replacement of bridges and tunnels. Table 5 is derived from the NEC State of Good Repair Spend Plan (See footnote 4) and represents only backlog costs.

The ten-mile New York State-owned segment of the NEC Main Line from New Rochelle to Port Chester is substantially in a state of good repair, although some work remains to be completed. Some ongoing SGR-type projects include overhead and undergrade bridge repairs and replacement, station rehabilitation and catenary painting. The majority of Metro-North capital investment effort along this segment is under the Normal Replacement capital investment categories. Connecticut estimates the SGR backlog for its portion of the New Haven Line to be $3.2 billion, bringing the backlog total for the NEC to $8.8 billion (See also Section 8, Table 14).

In addition to funding needed to eliminate the backlog of deferred investment, additional funding is required on an ongoing basis to maintain infrastructure in a state of good repair (i.e., normalized replacement). The SGR spend plan submitted to U.S. DOT by Amtrak in April 2009 estimated that Amtrak will need $7.2 billion through 2030 for normalized replacement; assets owned by Connecticut require an additional $1.0 billion

[5] For addition discussion of capital investment by Amtrak, states and other railroads in Northeast Corridor infrastructure, see The Northeast Corridor Infrastructure Master Plan, Phase I Project Development Report, February 2008.

through 2030. Metro-North estimates that $824 million will be required for its Main Line assets between New Haven and New Rochelle and on the MTA-owned portions of the Albany Line. Estimates of normalized replacement requirements were not provided by CSXT.

Table 5: Estimated Backlog of Deferred Investment (Amtrak-Owned Assets)

	Total (Millions)		Total (Millions)
Track		**Stations / Facilities**	
Interlocking Reconstruction	800	Facilities	85
Subgrade Replacement	185	Stations ADA (excluding level boarding)	230
Electric Traction System Rehabilitation		**Structures**	
Replace Substations (Ivy City, Southhampton) & Major Transformers	50	NY Tunnels Structural Rehab	214
Catenary System Rehabilitation	300	Conn River Bridge	200
		Pelham Bay Bridge	100
		Portal Bridge (1)	250
Signal System Rehabilitation		B & P Tunnel	1,500
Interlocking Signals Replacement	100	Bush Bridge	150
Automatic Block Signal (ABS) System Replacement	100	Susquehanna Bridge	500
		Gunpowder Bridge	200
CETC Construction	55	Fixed Bridge Replacement	225
Total			**$5,244**

Source: Amtrak NEC State of Good Repair Spend Plan (see Appendices) with SGR backlog estimate decreased by $500 million to reflect SGR for the Niantic River Bridge and three frequency converters, but increased by an identical amount to reflect revised cost estimates for the B&P Tunnels. Costs are order-of-magnitude 2010 dollars. Figures are based on a 2007 State of Good Repair Assessment by Amtrak's Engineering Department.
(1) The estimate for Portal Bridge reflects Amtrak's share for replacement of the existing 2-track bridge. NJT and Amtrak are instead advancing a project for a 5-track structure estimated to cost $1.8 billion.

Foundation for Growth

Despite past investment, the NEC is not in a full state of good repair. In addition, because of the need to maximize train volumes on the NEC, certain segments of the infrastructure are stretched to the limit. NEC operators encounter many day-to-day challenges in providing today's high-volume of reliable rail service.

Achieving and maintaining a state of good repair is essential for the reliable and efficient operation of today's passenger and freight service on the NEC. In addition, a state of good repair is necessary to lay the foundation for capacity and trip-time improvements so that rail services can be expanded to meet the growing needs of the NEC states and railroads. Many projects in the state of good repair backlog also have been planned to include both capacity and trip-time benefits, so that the most efficient project is constructed to address the long-term needs of the NEC. The service and infrastructure components of the Master Plan focus on growth and are therefore predicated on the assumption that the capital requirements to achieve a state of good repair will be met.

4. Costs and Performance

As the primary owner of the NEC, Amtrak is responsible for operating and maintaining most of the right-of-way, structures, and supporting facilities such as maintenance of way bases and key stations. Amtrak operates and maintains the NEC Main Line from Boston to Washington, except Metro-North territory, which is owned by the Connecticut Department of Transportation and the New York Metropolitan Transportation Authority and operated by Metro-North Railroad. Amtrak also operates and maintains the Harrisburg and Springfield branch lines and small portions of the Albany Line.

Other portions of the Albany Line are operated by Metro-North Railroad and CSX Transportation, which also owns and operates the Washington to Richmond corridor.

Shared Infrastructure Costs: Nearly all of the services provided by Amtrak for operations and maintenance also benefit the commuter and freight railroads that operate over the NEC.

Table 6: Shared Cost of NEC Infrastructure (Amtrak Owned and Operated)

Category	Total (Millions)
Shared Infrastructure Costs	
Infrastructure Maintenance	139
Dispatching	36
Police	30
Station Operating/ Maintenance	62
General and Administrative	20
Power Direction / Other Shared Yards	33
Subtotal	**$319**
Traction Power (Reimbursable)	**$111**
Total Shared Infrastructure	**$431**
Estimated Cost Shares (1)	
Amtrak	258
Freight	20
Commuter	153

Source: Amtrak, FY 2008 Actual.

(1) Estimated commuter shares are shown for illustrative purposes only and are calculated on a unit mile proportional allocation formula; except electric traction costs which are based on estimates of actual usage; cost shown differs from actual costs paid as discussed in the text of this section.

Examples of the NEC's shared costs include track maintenance; the costs of train dispatching centers in Boston, New York, and Washington D.C.; police and security; ushers, announcers, and utilities at NEC stations; corporate support functions, and electric traction power. Shared costs are allocated to more than 70 NEC operating segments corresponding to change points where groups of passenger trains enter or leave the NEC or begin or end operation. Shared costs for infrastructure, maintenance and inspection, dispatching, security, shared station usage, and electric traction power totaled $431 million in fiscal year 2008 (FY 08) as displayed in Table 6.

Today the NEC cost-sharing formula uses train miles, unit miles, and/or car miles (see Table 7) to estimate operating and maintenance costs shared by the NEC operators. Electric traction power costs are allocated separately based on estimates of actual power usage.

LIRR, NJT, SEPTA and MARC, the commuter agencies in existence when the NEC was transferred to Amtrak, are required to pay "avoidable" operating and maintenance costs that assume Amtrak is the primary NEC user with commuters paying only the additional costs required to support their operations. The newer commuter operators, such as Shore

Line East and Virginia Railway Express, share costs on a fully allocated basis. Freight operators share costs based on car miles. In addition to shared operating costs, several commuter agencies, recognizing the importance of reliable NEC infrastructure, have developed joint benefit capital programs with Amtrak to fund and construct NEC infrastructure recapitalization projects of shared value. These agencies include NJT, DelDOT, MARC and VRE.

The net result is that several methodologies for sharing the costs of operating, maintaining and investing in NEC infrastructure are currently in use. Because existing formulas are highly complex, outdated in some respects and not consistently applied, individual agreements are being negotiated separately between Amtrak and each operator. A new formula, better suited to accommodate a more diverse and developing set of high-speed, intercity, commuter and freight operations, is expected to be developed under the direction of the NEC Infrastructure and Operations Advisory Commission, as discussed below.

Table 7: Infrastructure Use Measures

	Thousands		
	Train Miles	Unit Miles	Car Miles
Amtrak	12,768	97,468	80,721
Commuter	12,438	94,754	88,559
Total	**25,207**	**192,222**	**169,280**
Amtrak %	**51%**	**51%**	**48%**

Source: Amtrak, FY 08

Shared Costs of Train Operations

Intercity operations on the Main Line of the Northeast Corridor, including *Acela* and *Regional* Services, generally cover the cost of operations, but do not cover fully allocated costs including capital investment. States sponsored trains and other branch line and off-corridor services typically operate at a net loss and require contributions to fully cover the cost of operations. A number of states provide such contributions to Amtrak under contractual agreements for state-sponsored trains operating on the NEC Network; other states receive the benefit of services but do not provide financial support for some or all the trains that operate within their states.

In the future, Amtrak's 2030 operating plan developed in conjunction with the Northeast states envisions a large increase in state-sponsored trains operating on the Main Line of the NEC in Regional "slots". These trains are designed to serve a dual function: provide service to states and outlying regions of the Northeast while also serving as a *Regional* train serving core intercity markets including New York, Philadelphia and Washington. This mode of operation is intended to maximize utilization of the Corridor and efficiently use scarce Network capacity for the maximum benefit of the entire region. However, current cost and revenue allocation formulas never envisioned, and do not adequately address, the extent of integration between state and Regional trains operating on the NEC Network, as proposed in Amtrak's 2030 operating plan.

Development of Revised Formulas

The Passenger Rail Investment and Improvement Act (PRIIA) of 2008 contains two provisions that are expected to result in revisions to cost sharing formulas for infrastructure access and train operations:

- Under Section 212, the Northeast Corridor Infrastructure and Operations Advisory Commission (when created) is authorized, among other requirements, to develop "a standardized formula for determining and allocating costs, revenues and compensation for Northeast Corridor commuter rail passenger transportation…" such that there is no "cross-subsidization" of commuter, intercity and freight rail.
- Under Section 209, Amtrak is required to work with the U.S. DOT and in consultation with the governors of affected states to develop a formula to fairly allocate operating and capital costs to states for state-supported trains.

Amtrak and the states are currently working to develop recommendations under both these provisions. A related effort underway is the development of a comprehensive long-range financial plan for the Main Line of the Northeast Corridor. Under guidance issued in the first round of HSIPR grant applications, such a plan is required - along with a completed Service Development Plan (SDP) and Programmatic Environmental Impact Statement (PEIS) – to advance a Track 2 application under the High Speed Intercity Passenger Rail Program (HSIPR) for a major program of improvements to the Main Line of the NEC. The comprehensive financial plan will include the impact of revised cost sharing formulas developed under the PRIIA provisions discussed above.

On-Time Performance

On-time performance (OTP) is a closely watched indicator because, as a measure of reliability, OTP influences the public's perception of rail services and therefore impacts ridership and revenue. OTP is calculated as the ratio of "late" trains to those trains arriving at their scheduled time or within an acceptable allowance.

Amtrak goals for future OTP on the Northeast Corridor are currently set at 95% for Acela and 90% for Regional trains to be achieved by 2014.

Commuter trains in general have better on-time performance than intercity trains, typically ranging from 85% to 95%, in part because the probability that delay-related incidents will occur is partly a function of distance traveled, and commuter trains typically travel much shorter distances on the NEC than intercity trains.

Table 8: On-time Performance

		Actuals		
	Goal	FY06	FY07	FY08
Intercity				
Amtrak: Acela	95%	85%	88%	85%
Amtrak: Regional	90%	79%	79%	76%
Commuter				
MBTA / RIDOT	95%	99%	97%	98%
ConnDOT: SLE	97%	95%	96%	92%
MNR: New Haven	97%	97%	97%	97%
MNR: Hudson Line	98%	99%	98%	98%
LIRR	95%	93%	95%	95%
NJT	95%	95%	93%	94%
SEPTA / DelDOT	95%	96%	96%	91%
MARC: Penn Line	93%	90%	88%	85%
VRE	90%	79%	89%	85%

Source: Amtrak and commuter agencies.

Train Delays

On-time performance (OTP) is closely correlated to the minutes of delay, another closely watched NEC performance measure. For high-speed and intercity passengers, the average trip on the NEC is approximately 150 miles. As shown in Table 9, below, in

FY 2008, the minutes of delay for a trip of 150 miles averaged seven minutes. Train delay minutes increased in FY 08 compared to the prior years, as shown in this table. There are many reasons for delays, including "train interference" and failures to rolling stock and infrastructure.

Delayed trains during the AM or PM rush hours when train volumes are the highest become particularly problematic. In the highly congested NEC, there is little or no flexibility to recover from equipment or infrastructure failures. A major failure, such as an electrical outage or an engine failure at a heavily trafficked, congested location such as New York can cascade through major portions of the NEC system with the potential to delay hundreds of trains for hours at a time. Such failures can have a significant negative impact on passenger perceptions of rail, cause ridership to decline, and act as a deterrent to future growth.

Because the heavily utilized NEC is at or approaching its capacity limits (see Section 7), it is critical that both infrastructure and equipment be in a state of good repair to minimize malfunctions and component failures that have the potential to delay trains and disrupt operations. Amtrak and its state and commuter partners have taken significant measures over the past several years to reduce delays and improve the reliability of services. Amtrak has improved maintenance procedures to reduce both equipment and infrastructure related failure rates. *Acela Express* rolling stock and infrastructure maintenance procedures have been revamped to target potential failures before they occur. In addition, increased capital spending, including substantial contributions from Northeast states and commuter railroads, has accelerated replacement of failure-prone infrastructure and rolling stock components.

Table 9: Minutes of Delay

Amtrak Acela and Regional Services
Boston to Washington

	FY06	FY07	FY08
Total Delay Minutes	380,422	380,263	431,963
Acela / Regional Train Miles			9,370,006
Minutes of Delay Per 150 Train Miles			7

Delay minutes data source: Amtrak On Time Performance and Delay Reporting System
Train miles data source: Amtrak Financial System

5. Goals for the Future

The goals for the Northeast Corridor, as expressed in this Master Plan, include providing reliable, efficient, competitive intercity, commuter and freight rail services that benefit the broader Northeast region; are integrated into the regional transportation network to maximize efficiency and reduce congestion, and that meet demand for future services. In this way, the NEC can provide enhanced mobility options, support regional and local economic development, and improve the quality of life and the environment for residents of the Northeast.

The Master Plan effort reflects significant regional collaboration and provides the framework for achieving the following goals:

- Support economic growth in the Northeast while simultaneously improving the quality of its environment
- Improve service reliability and reduce travel times to maintain and improve the attractiveness of rail compared to other modes
- Support the states in their vision of broad regional connectivity to destinations throughout the Northeast and beyond
- Maintain, improve, and expand rail infrastructure and inter and multi-modal connections to facilitate ease of travel, meet demand and improve the overall efficiency of the transportation network
- Accommodate a proposed doubling of intercity and commuter ridership
- Preserve and enhance freight rail access to Northeast ports and local industry

As discussed in the Executive Summary and the following section on Future Service Plans, plans developed jointly by Amtrak and the Northeast states improve the efficiency of rail service by lengthening and extending existing trains and closely integrating state sponsored services with regional trains operating over the core network This approach provides outlying areas of the region with the opportunity to link into the core network and expands the market reach of proposed intercity services, making the services more financially viable.

These goals also recognize the efficiency of rail transportation and its potential to facilitate sustainable economic growth with the benefits flowing to communities large and small throughout the region. Rail provides efficient, cost effective access to employment centers.

By far the highest volume station on the NEC, Penn Station New York has long been a focal point for infrastructure improvement projects. The Moynihan/Farley concept is currently under development.

Stations increasingly serve as "transportation hubs" providing linkages to other modes. This, in turn, can help attract private investment in satellite facilities and support economic development in the community in which the rail stations are located. Enhanced corridor services provide improved connections between major and minor business, educational, health care and leisure centers in the Northeast, creating new markets and fostering increased commercial opportunities and regional collaboration in areas such as technology, research and development.

According to an Amtrak analysis, electrified passenger rail in the Northeast consumes half the fuel on a per passenger mile basis than all other competing modes of transportation. A large proportion of the electricity used by rail is generated by clean-burning natural gas, nuclear and hydropower. Rail is also an efficient user of land resources at a time when available land to expand transportation facilities for all modes is increasingly scarce.

Finally, goals for the Northeast Corridor stakeholders include continued close collaboration among the Northeast states, the Federal Railroad Administration (FRA), the NEC Commission and Amtrak and other rail operators. The challenges are immense. They include how to finance proposed improvements and mitigate potential negative impacts of increased rail construction on the land and water resources, wildlife habitat, historic structures, and residential neighborhoods, among other resources. Environmental issues will be addressed in the next phase of the process to develop a Programmatic Environmental Impact Statement (PEIS) for the Northeast Corridor. This process will be led by the Federal Railroad Administration (FRA) closely coordinating with the Northeast states and Amtrak (For further discussion, see Section 9, Moving Forward).

6. Future Service Plans

Future service plans substantially improve intercity trip times on the Northeast Corridor and expand both intercity and commuter rail to better serve outlying regions as well as core urban markets, while continuing to provide and improve freight rail access to Northeast ports and local industries. Service growth is a centerpiece of the Master Plan. Implementation of the infrastructure and service components of the Master Plan would be transformational for the NEC. For example, the Springfield Line service would evolve from a relatively lightly-used rail shuttle to a double-tracked, fully electrified railroad hosting commuter and intercity service with trains to dozens of destinations. Hourly *Acela* service would be provided to Boston. Hourly service would be provided from Washington D.C. through to Richmond, with significant service beyond to Newport News, Petersburg and Norfolk. New or additional rail service is planned by the states to broaden the reach of the NEC in Massachusetts, Connecticut, New York, Pennsylvania, Maryland, Virginia, and North Carolina, with most of these services linking into, and operating over the Main Line between Boston and Washington.

In the densely populated Northeast, the NEC provides an important alternative to travel via the region's overburdened airports or congested interstate highways. As noted by the Northeast governors, an improved and expanded NEC rail network is vital to addressing the Northeast's energy, environmental, carbon control and economic development goals.

Forecast for 2030: More Riders and More Trains

Train movement and ridership estimates developed for 2030 reflect a service planning process in which the NEC states and railroads jointly considered alternative future scenarios reflecting different growth assumptions. Guided by the goals described in the preceding section, each operator or agency then provided a service or operating plan that specified service types, routes, frequencies and consists. These individual plans were merged into a single NEC 2030 service plan.

Each NEC agency provided a ridership forecast reflecting its own assumptions about population, employment growth, and other variables used to estimate travel demand. Intercity forecasts generally assume moderate increases in population and employment and also reflect improved trip times and on-time performance. Detailed operating schedules for intercity service and ridership forecasts are available in the Appendices. As shown in Table 10, the NEC passenger railroads together envision substantial growth – a 59% increase in NEC riders by 2030 and a 45% increase in NEC trains.

Table 10: Service Plan Summary—NEC Main Line and Branch Lines
Ridership and Revenue Train Movements

	Annual Riders (millions)			Daily Trains		
	Current	2030	% Chg	Current	2030	% Chg
Amtrak (1)	13	23	76%	154	210	36%
MBTA (2)	23	32	36%	296	318	7%
RIDOT	0	2	N/A	0	32	N/A
ConnDOT / SLE	1	2	260%	23	56	143%
MNR (3)	49	99	102%	345	612	77%
LIRR (4)	86	110	28%	581	836	44%
NJT (5)	58	99	71%	387	613	58%
SEPTA / DelDOT	18	23	26%	374	416	11%
MARC	8	16	98%	83	149	80%
VRE	4	7	76%	29	52	79%
Total	**260**	**412**	**59%**	**2,272**	**3,294**	**45%**

Source: Master Plan Working Group

(1) Amtrak's 2030 ridership figure is based on forecasts prepared in the Fall of 2009 for the "Core Network" from Boston to Richmond and the Springfield, Albany and Harrisburg branch lines. Subsequent forecasts prepared as this report was going to press indicated potential ridership of 28 million region-wide inclusive of significantly expanded state sponsored services to outlying areas of the corridor that link to, and operate over, the Core Network (See also discussion of "Regional Service Expansion", page 3).

(2) MBTA current figures include service operated for RIDOT.

(3) MNR 2030 trains include Penn Station NY (224 trains) and Grand Central Terminal (388 trains). Metro-North current and projected ridership and daily trains are for New Haven and Hudson Line services on NEC and Empire Corridor infrastructure

(4) LIRR 2030 trains include Penn Station NY (441 trains) and Grand Central Terminal (395 trains).

(5) NJT current ridership does not include intra-NJ NEC trips or trains on non-NEC infrastructure to 34th Street Station and does include Atlantic City trains.

Rolling Stock

The Master Plan is not intended specifically to deal with rolling stock issues. However, it is not feasible to completely separate the infrastructure and rolling stock from a planning perspective. Overall service delivery, including travel times and OTP, depend on the interaction of rolling stock and infrastructure. Implementation of future plans to expand services often requires additional rolling stock and is timed to coincide with plans to procure new equipment.

Amtrak's current plans are that it will begin to replace its entire Northeast Corridor fleet in the 2020 timeframe, with additional passenger cars available in the interim period to lengthen existing trains. New express equipment is planned to operate at maximum speeds of 160 mph, compared to 150 mph today, and combined with improved performance through curves, will contribute to improved trip times between Boston and Washington and help improve reliability by replacing older equipment with newer rolling stock less prone to age-related component failures.

Commuter agency plans include normal replacement of rolling stock and acquisition of additional equipment to operate new services and are summarized below.

- MBTA has 85 diesel locomotives and 515 bi-level coaches currently on order. MBTA is also considering a potential future conversion from diesel to electric consists.

- By 2030, RI DOT anticipates the purchase of ten bi-level coaches.
- MNR future purchases include five locomotives for switcher replacement/shuttle service in 2013; 342 M-8 cars for replacement and growth between 2009 and 2013; 244 cars for replacement and growth between 2016 and 2018 (M-3 replacements); 17 locomotives for replacement and growth; 112 electric multiple units (EMUs) for replacement in 2020-2021 (M-4/M-6 replacements); 113 coaches for replacement and growth in 2025-2026.
- LIRR plans for 2010-2014 include replacement of up to 84 cars. LIRR is also exploring power/carrying capacity and other rolling stock design efficiencies to maximize train capacity and to meet LIRR service demands based on forecast ridership growth.
- NJT plans a mix of Electrical Multiple Units (EMUs) and electric and dual-powered (electric/diesel), locomotive-hauled, multi-level coaches. NJT's current multi-level procurement will total 329 cars, including eight cars for Atlantic City Express service. NJT has 36 locomotives and 26 dual-powered locomotives on order.
- SEPTA is currently undergoing fleet vehicle replacement, including both purchase of new Silverliner V rolling stock and overhaul of existing rolling stock based on SEPTA's 2009-2020 budget.
- DelDOT has ordered four cars as part of SEPTA's Silverliner V purchase. They will be delivered by early 2011 to add capacity for SEPTA R-2 service between Philadelphia and Newark, DE.
- MARC's fleet vision for 2030 includes 20 electric locomotives (a 100% increase), 52 diesel locomotives (a 49% increase) and 230 total coaches (108 additional coaches, an 89% increase).
- VRE has an order of 10 gallery-style passenger coaches in production now, due to be delivered beginning in March 2010. This order supplements an order of 61 new coaches delivered to VRE in 2007 and 2008. VRE also has orders for 15 new locomotives with delivery beginning in 2010.

PRIIA Section 305 established that the states and Amtrak are to work together to define next generation rolling stock needs for state-sponsored services. The goal is to jointly develop common specifications for the next generation trainsets and agree on a common family of car types that could be constructed by multiple manufacturers, providing a national pool of rolling stock at a lower cost for all purchasers. Rolling stock for NEC *Regional* services is anticipated to fall under this collaborative process. For the rail operators using FTA funding for their equipment, this poses additional challenges, which may require the FRA and FTA to adopt coordinated policies, regulations and practices.

Intercity Service Plans

Acela Express trip time goals were set by Congress in conjunction with previous initiatives such as the NEC Improvement Program (NECIP) in the late 1970's and early 1980's, and the Northeast High Speed Rail Improvement Program (NHRIP) in the 1990's. *Acela*

Express goals were set at 3 hours between Boston and New York and 2 hours and 30 minutes between New York City and Washington D.C.

There are trade-offs between increased train speed and trip time savings, the ability of trains to stop at many of the stations along the NEC, market demand and service economics. Amtrak and other NEC operators have been striking a delicate balance between reducing travel times and growing ridership. The ability to address the total mobility needs of the NEC communities and states will continue to depend on the choices made when one considers these trade-offs, underscoring the importance of continued partnering for NEC planning and development.

As shown in Table 11, today's Boston to New York City *Acela Express* trip times are more than 30 minutes longer and New York City to Washington D.C. trips are 15 minutes longer than the goal. In part, the goals have not been met because of funding reductions in the NECIP and NHRIP programs prior to completion. The NECIP program, for example, was envisioned at $4 to $5 billion (1977 dollars); funded at $2.2 billion and then reduced to $1.8 billion (1979 dollars). Table 11 also shows updated trip time goals for Washington D.C. to Richmond and the Springfield, Albany and Harrisburg branch lines.

Achieving and maintaining improved trip times will require reliable infrastructure, sufficient capacity, changes to alignment such as curve modifications, and rolling stock capable of accelerating quickly and operating at high speeds. The Master Plan defines the set of necessary infrastructure projects. By 2030, the Master Plan currently assumes an *Acela Express* trip time of 3 hours and 8 minutes between Boston and New York City and 2 hours and 15 minutes for limited-stop *Express* service between New York City and Washington D.C., based in part on assumptions as to performance of next generation rolling stock discussed in the previous section, and introduction of limited stop express service between New York and Washington.

On-time performance goals for the Northeast Corridor, discussed in Section 4 on Costs and Performance, include improving Acela service to 95% OTP and Regional services to 90% by 2014, compared to current OTP of approximately 83% and 79% respectively for the two services. The Federal Railroad Administration (FRA), as part of its grant agreements with Amtrak, has set a goal of 95% OTP across the board for intercity and commuter services operating on the NEC. The ability to consistently achieve this goal, however, requires further analysis in the next phase of the planning process.

(See also discussion in Chapter 9, Moving Forward)

Table 11: Summary of Intercity Service Plan

	Weekday Round Trips			Avg Travel Time		
	2010	2020	2030	2010	2020	2030
NEC MAIN LINE						
Express Service						
Boston - New York	10	15	15	3:31	3:23	3:08
New York - Washington	15	11	11	2:45	2:37	2:21
New York - Washington (2-stop)	0	4	4	n/a	2:31	2:15
Regional / System (Operating Exclusively on Main Line)						
Boston - New York	5	5	5	4:12	4:07	4:06
New York - Washington	14	13	13	3:23	3:19	3:06
Regional / Corridor Trains (Operating on Main Line as Extensions of State-Sponsored Services)						
Boston - New York	4	4	4	4:12	4:07	4:06
New Haven - New York	2	2	5	1:53	1:42	1:34
New York - Washington	8	9	15	3:23	3:19	3:06
New York - Philadelphia	10	11	12	1:20	1:17	1:16
NY / Was - Newark, DE	0	0	3		Varies	
BRANCH LINES AND OFF-CORRIDOR SERVICES						
Regional / Corridor Trains Operating on Branch Lines						
Springfield - New Haven	6	6	14	1:22	1:21	1:12
Albany - New York	12	16	21	2:30	2:20	2:15
Harrisburg - Philadelphia	14	17	18	1:39	1:34	1:29
Off-Corridor Services (Linking To or Operating Over NEC Main and Branch Lines						
South of Washington	6	7	15	Varies		
West of Harrisburg	1	2	3			
North / East of Springfield / Greenfield	1	1	3			
North / West of Albany	5	10	16			
Eastern Shore	0	0	3			
Pocono Corridor	0	0	2			

Source: Amtrak in conjunction with Northeast states.
Note that trip times vary by train and are dependent on stopping patterns and other factors. Figures shown in this table are averages. Estimates of weekday round trips and average trip times (in hours and minutes) are shown here for illustrative purposes are subject to change based on additional planning and market analysis in conjunction with Northeast states. Detailed schedules for individual trains and train services are contained in the Appendix. See accompanying text for further discussion of intercity service plans including on-time performance goals. Figures shown are for corridor trains only (<750 miles) and exclude long-distance services (>750 miles). No significant change in the number of long-distance trains operating on the Northeast corridor is planned at this time. Long distance trains operating on the NEC include the Lake Shore from Boston and New York to Chicago; the Silver Meteor and Silver Star from New York to Miami; the Palmetto from New York to Savannah; the Crescent from New York through Atlanta to New Orleans; the Capitol Limited from Washington, D.C. to Chicago; and the tri-weekly Cardinal from New York through Washington, D.C. and Cincinnati to Chicago. The Auto Train also operates south of Washington from Lorton, VA to Sanford, FL but does not make intermediate stops.

Intercity Services and Ridership Demand

Acela Express and *Regional* trains provide a competitive alternative to air and auto travel, especially between New York City and Washington D.C. The NEC now handles 60% of the Boston-New York-Washington D.C. air-rail travel market. The South End generates 70% of all rail travelers. Travel between New York City and Washington D.C. or Philadelphia is the most important market, accounting for 38% of all intercity travel. Travel between Philadelphia and Washington D.C., or between New York City and Boston or Albany, are significant markets. The NEC also generates substantial travel between dozens of additional locations including Baltimore, Baltimore-Washington International Airport, Wilmington, Lancaster, Harrisburg, Providence, Back Bay, Route 128, Rhinecliff, Newark, Trenton and Metropark. Details are shown in Table 12.

Table 12: Top Intercity Travel Markets

City Pair	Ridership	% Total
New York - Washington	1,740,474	25.7%
New York - Philadelphia	1,548,212	22.9%
Philadelphia - Washington	701,136	10.4%
Boston - New York	663,919	9.8%
Albany - New York	623,829	9.2%
Baltimore - New York	378,961	5.6%
New York - Wilmington	308,087	4.6%
New York - Route 128	273,681	4.0%
BWI Airport - New York	266,923	3.9%
New York - Providence	263,432	3.9%
Total	**6,768,654**	**100.0%**

Source: Amtrak

Amtrak expects ridership growth on the NEC to range between 49% and 165% over the next 20 years through 2030 – or an average of between 2% and 5% annually. The lower end of the range primarily represents secular growth without improvements; the upper end of the range assumes substantial investment in new rolling stock and infrastructure improvements. Forecasts prepared for the Master Plan fall between the lower and upper ranges, and are considered to be in the conservative to moderate range – a 77% increase in ridership for the Northeast region, from approximately 13 million riders in 2009 to 23 million by 2030. (See also Chapter 7, Moving Forward, discuss of Demand Estimates)

Acela Express ridership growth is anticipated at North End stations such as New Haven, Connecticut illustrated here.

Amtrak's 2030 plan provides trip patterns that vary between peak and off-peak periods and by alternate hours, conforms to infrastructure capabilities and emphasizes standard trip patterns, providing better predictability for building commuter services. The plan accommodates greater regional demand through cities as well as the traditional trips to cities and provides for a 76% increase in ridership through 2030.

Strategies for *Acela Express* include trip times that provide an air-competitive journey; trains between 5:00 AM and 9:00 PM; train lengthening; hourly frequencies between Boston and Washington D.C. with New York City - Washington service including two hour and 15-minute *Limited Stop Express* trains during peak demand periods.

Strategies for core *Regional* service include train lengthening and approximate hourly frequencies between New Haven and Washington D.C.; with 12 additional round trips in the core New York to Philadelphia market as a result of continuing to pair regional trains with Keystone service operating to Harrisburg, Pittsburgh and Cleveland in the longer-term.

- Amtrak service between Boston and New York City will include 15 weekday round trip *Acela Express* trains by 2030, up from 10 currently , proving approximate hourly express service between the two cities. Additional service will include *Regional* trains operating between Boston and Washington D.C. plus additional trains operating to New York, Washington D.C. and points south via Springfield and New Haven as a result of pairings with state-sponsored trains.
- Amtrak services between New York City and Washington D.C. will include 15 *Acela Express* daily round trips throughout the day including four Limited Stop Express trains during the peak demand periods. Thirty-one *Regional* daily round trips will be operating between New York and Washington, with the majority of these – 16 – also serving off-corridor destinations south of Washington.

- Long-distance ridership to points south and west is not expected to grow significantly from current service levels and no additional frequencies are planned.

State Sponsored and Funded Intercity Services

Since its formation, Amtrak has had the key responsibility for planning, funding and operating NEC intercity services. A number of states have also funded additional trains including Vermont (the *Ethan Allen* and *Vermonter*), New York (the *Adirondack),* Pennsylvania (the *Keystone* and *Pennsylvanian*) and North Carolina (the *Carolinian*). Moving forward, PRIIA outlines an increased role for the states in planning and funding intercity rail services, and this enhanced role for the states has been reinforced by the FRA in its guidance for HSIPR grants. Service levels and capital investment proposals contained in the Master Plan reflect close collaboration between Amtrak and the Northeast states as required under PRIIA and the HSIPR program.

Services sponsored and funded by Northeast states are a substantial portion of the 2030 intercity service plan. Many of the state-sponsored routes will operate on both an NEC branch line and a portion of the Main Line between Boston and Washington D.C. This approach improves the viability of state sponsored trains by providing states and outlying areas of the region with access to core intercity markets while making efficient use of scarce core Network capacity.

Major state-sponsored initiatives planned for implementation by 2030 are summarized below. Additional detail is provided in Part II: Current and Future Service and Infrastructure by Segment.

- Massachusetts: Initiation of service on the "Inland Route" from Boston through Framingham and Worcester, re-connecting to the NEC at Springfield.
- Vermont, Massachusetts and Connecticut: Extension of multi-frequency service from Springfield to Greenfield, MA, on a redesignated "Knowledge Corridor," with improved Vermonter connections to the NEC via the Connecticut River Line through Greenfield.
- New York State: In conjunction with infrastructure improvements, a substantial increase in trains operating both west and south of Albany, including enhanced service to Cleveland, Buffalo, Syracuse, Saratoga and New York City, as well as service to Binghamton in conjunction with initiation of "Pocono Corridor" service from New York, through Northern New Jersey and Scranton, in partnership with the states of Pennsylvania and New Jersey.
- Pennsylvania: Increased service with improved travel times between New York, Harrisburg and Pittsburgh; "Pocono Corridor" service to Scranton in partnership with New York and New Jersey, which is rebuilding portions of the Lackawanna Cutoff through Northwestern New Jersey and helping to restore a critical link through the Delaware Water Gap to Northeastern Pennsylvania and Scranton.
- Virginia: Enhanced service from major Northeast cities to Richmond Main Street, Newport News and Lynchburg, with a future extension to Roanoke; major upgrades to existing freight trackage, facilitating new services to Petersburg and Norfolk.
- Delaware and Maryland: Initiation of service from New York and Washington, through Newark, DE and Dover, DE to Ocean City, MD, on the Eastern Shore.

Commuter Rail Plans

Commuter service plans are typically driven by State or regional mobility goals, population and employment growth, congested highways, a desire for improved access to job markets and a desire for improved quality of life. Individual commuter agency plans were merged with intercity and high-speed rail plans to create a unified service plan for the NEC. Major commuter rail initiatives are summarized below.

- The Massachusetts Department of Transportation and MBTA are finalizing plans for South Coast Rail service to Fall River and New Bedford.
- RIDOT is finalizing operating plans, including station construction, as part of its South County Commuter Rail service, which will provide an initial 16 start-up trains between Providence, Warwick (T.F. Green Airport) and Wickford Junction. Future plans to extend service to 32 trains by 2030 to Kingston and Westerly are currently being developed, including potential station stops in Pawtucket, East Greenwich, Cranston and West Davisville.
- Connecticut's Shore Line East service is envisioned to grow to 56 trains between New Haven and Old Saybrook. Service to New London will increase dramatically from two trains to 24 trains and service east of New London to the Connecticut state line or Westerly, Rhode Island is also being considered. Connecticut and Amtrak

are developing plans for new commuter rail service between New Haven, Hartford and Springfield providing 36 daily trains, with half-hour peak service.

- Metro-North is evaluating the provision of New Haven Line and Hudson Line service to Penn Station New York via Amtrak's Hell Gate Line and Empire Connection respectively. Approximately 121 trains via the New Haven Line and 103 trains via the Hudson Line to Penn Station New York are planned. In addition, Metro-North plans to operate 488 New Haven and Hudson Line revenue trains to Grand Central Terminal.
- LIRR is reconstructing Harold Interlocking as part of the East Side Access project that will enable LIRR service to Grand Central Terminal. By 2030, LIRR will be operating 441 trains to Penn Station New York and 395 trains to Grand Central Terminal.
- NJT's Access to the Region's Core (ARC) project will construct new commuter rail capacity under the Hudson River connecting to a new 34th Street Station adjacent to Penn Station New York. Service to midtown Manhattan will rise to over 1,000 daily trains (combined, at Penn and 34th Street stations) and a one-seat ride will be provided from many points in New Jersey that today require a passenger transfer. In addition, Atlantic City Line service to Philadelphia will increase from 28 trains to 42 trains.
- Service on SEPTA's R7 line between Philadelphia and Trenton will increase from 62 to 82 trains. In conjunction with DelDOT/DTC, service on SEPTA's R2 line between Philadelphia and Newark, DE is projected to increase from 18 trains to 26 trains. A downstate service to Dover, DE is also being considered. SEPTA's R5 future service plans include increased frequencies to Bryn Mawr and Paoli and an extension of service from Thorndale to Coatesville and/or Parkesburg.
- MARC's Penn Line service will increase significantly both north and south of Baltimore. Daily trains north of Baltimore will increase from 10 to 72 to provide frequencies of 20 minutes during the peak and hourly service throughout the day. Daily trains between Baltimore and Washington D.C. will increase from 42 to 150, providing 15-minute frequencies during the peak periods, and half-hourly service throughout the day. An extension of MARC north of Perryville to Elkton and/or Newark, DE is also under consideration.
- VRE plans to increase service on both the Fredericksburg and Manassas Lines from 30 trains to 52 trains, providing half-hourly service during the peak periods and hourly service throughout the day. In 2030, an estimated 28 trains will originate or terminate at Fredericksburg.

Table 13 on the following page summarizes current and projected intercity and commuter rail train movements by segment. Additional detail about the commuter rail plans including individual commuter agency data is provided in Part II: Current and Future Service and Infrastructure by Segment and in the Train Counts Appendix.

Table 13: Proposed Service Plan Detail: Intercity and Commuter Train Movements

	Current			2030		
	IPR	CR	Total	IPR	CR	Total
Boston - Westerly						
Boston - Tower1	40	296	336	58	318	376
Tower1 - Cove	38	177	215	48	199	247
Cove - Plains	38	136	174	48	144	192
Plains - Readville	38	104	142	48	110	158
Readville - Canton Jct.	38	68	106	48	92	140
Canton Jct. - Attleboro	38	32	70	48	50	98
Attleboro - Providence	38	30	68	48	32	80
Providence - Warwick	38	0	38	48	32	80
Warwick - Wickford Jct	38	0	38	48	32	80
Wickford Jct - Westerly	38	0	38	48	32	80
Westerly to New Haven						
Westerly - New London	38	0	38	48	0	48
New London - Old Saybrook	38	2	40	48	24	72
Old Saybrook - New Haven	38	23	61	48	56	104
New Haven to New Rochelle						
New Haven - Bridgeport	42	78	120	54	108	162
Bridgeport - S. Norwalk	42	86	128	54	108	162
S. Norwalk - Stamford	42	96	138	54	271	325
Stamford - New Rochelle	42	225	267	54	405	459
New Rochelle to New York						
New Rochelle - Sunnyside	42	0	42	54	121	175
Sunnyside - JO	42	581	623	54	562	616
JO Int. - A Int. (PSNY)	168	940	1,108	234	1,236	1,470
34th Street	0	0	0	0	433	433
New York to Trenton						
PSNY - Secaucus	100	359	459	136	571	707
Secaucus - Swift	100	359	459	136	571	703
Swift - Hudson	100	239	339	132	431	563
Hudson - Newark	100	313	413	132	431	563
Newark - Hunter	100	313	413	132	431	563
Hunter - Union	100	251	351	132	335	467
Union - County	100	155	255	132	198	330
County - Trenton	100	114	214	132	197	329

	Current			2030		
	IPR	CR	Total	IPR	CR	Total
Trenton to Newark, DE						
Trenton - Morris	100	62	162	132	86	218
Morris - Cornwells Hts.	100	62	162	132	86	218
Cornwells Hts. - Shore	100	62	162	132	86	218
Shore - N. Phila	100	90	190	132	128	260
N. Phila - Girard	100	144	244	132	182	314
Girard - PHL Lower	100	28	128	132	42	174
Phil - Marcus Hook	80	61	141	108	65	173
Marcus Hook - Wilmington	80	37	117	108	52	160
Wilmington - Newark, DE	80	18	98	108	26	134
Newark, DE to Washington						
Newark, DE - Elkton	80	0	80	110	0	110
Elkton - Perryville	80	0	80	110	73	183
Perryville - Baltimore	80	18	98	110	80	190
Baltimore - "C" Int.	80	52	132	110	149	259
Washington - Washington	82	112	194	112	201	313
Washington to Richmond						
Washington - Alexandria	18	29	47	40	52	92
Alexandria - Fredericksburg	16	13	29	34	28	62
Fredericksburg - Richmond	16	0	16	34	0	34
Philadelphia to Harrisburg						
PHL Lower - JO (Zoo)	28	119	147	36	133	169
JO (Zoo) - Bryn Mawr	28	95	123	36	109	145
Bryn Mawr - Paoli / Malvern	28	81	109	36	95	131
Paoli / Malvern - Frazer	28	77	105	36	54	90
Frazer - Thorndale	28	54	82	36	54	90
Thorndale - Lancaster	28	0	28	36	0	36
Lancaster - Harrisburg	28	0	28	36	0	36
New York to Albany						
PSNY - Spuyten Dyvil	26	0	26	44	103	147
Spuyten Dyvil - Croton-Harmon	26	120	146	44	207	251
Cronton-Harmon - Poughkeepsie	26	58	84	44	88	132
Poughkeepsie - Albany	26	0	26	44	0	44
Albany - Schenectady	12	0	12	36	0	36
New Haven - Springfield						
New Haven - Hartford	12	0	12	28	36	64
Hartford - Springfield	12	0	12	28	36	64

Source: Master Plan Working Group.
Details by agency are available in Part II: Current and Future Service and Infrastructure by Segment and the Appendices. The proposed service plan may change as additional work is undertaken in connection with the PEIS and other future Amtrak and State partner planning activities.
IPR=Intercity passenger rail, including corridor and long-distance trains. CR=commuter rail.

Freight Rail Plans

NEC freight services are operated by Conrail Shared Assets Corporation, Providence and Worcester, Pan Am Southern, Canadian Pacific, Connecticut Southern, Norfolk Southern and CSX Transportation. Some 50 Class 1 and regional freight trains use the NEC each day to serve industries, power plants and ports in the Northeast and Midwest. This heavy volume of freight traffic reinforces the NEC's role as a vital link in the national freight network and an important component of future regional and national economic growth. The Surface Transportation Policy Project[6] reported that a single intermodal freight train can carry the same load as 500 trucks. Freight shippers would have to add 50 million additional trucks to roadways across the U.S. if rail was not a viable alternative.

[6] Surface Transportation Policy Project, State of Nation's Intercity Rail, Decoding Transportation Policy & Practice Series #12, February 2004.

The future freight picture for the NEC looks substantially different from today. A national increase of 44% to 888 million tons is projected by 2030, with a commensurate increase expected on the NEC. According to the Mid-Atlantic Rail Operations Study (MAROps) performed for the I-95 Corridor Coalition, the traffic volume on the freight rail network in New Jersey, Pennsylvania, Delaware, Maryland and Virginia is anticipated to grow by 79%, equivalent to more than 60,000 trucks per day. MAROps detail is provided in the Appendices.

On the NEC, the most critical freight need is to provide improved freight capacity to the Port of Baltimore and between Newark, DE and Perryville, MD. Substantial freight growth is also anticipated along the NEC for the ports of Providence and Quonset/Davisville, and on-line freight customers in Coatesville, Lancaster, New Haven, New London, Wilmington, Philadelphia, Boston and Albany, as well as all NEC-accessed rail freight to Brooklyn, Queens and Long Island (via the Hell Gate Bridge), and the Delmarva Peninsula (via northern Maryland). The potential for expanded freight operating windows in Maryland will be discussed with the development of the Chesapeake Connector providing improved service between Northern Maryland and the Delmarva Peninsula. Freight operators have also stated a desire for more flexible freight operation on the NEC. Detail regarding freight issues and freight access to ports is provided in Part II: Current and Future Service and Infrastructure by Segment.

The Master Plan assumes that low-level station platforms on the NEC core will be converted to high platforms by 2030 to conform to ADA level boarding standards and improve infrastructure utilization by decreasing boarding times. High platforms, however, can interfere with freight movements on immediately adjacent tracks. Existing freight routes must be preserved by providing for a passing route around high platforms, either by diverting trains to center tracks with no adjacent platform; providing flip up edges on platforms, or a gauntlet or "run around" track. Amtrak also works with freight carriers to maximize freight utilization of the NEC in a way that does not interfere with passenger operations.

Service Growth Requires Infrastructure Investment

Today, NEC passenger train miles are approximately 19 million, up 90% from 1975. By 2030, passenger train miles are projected to increase by approximately 65% from current levels. New and expanded rail services, whether located on the NEC or feeding onto the NEC, will put additional pressure on the core NEC network. Service growth planned for the NEC can only be achieved if significant investment is made to restore the infrastructure to a state of good repair and to expand capacity. The necessary projects are described in Section 8.

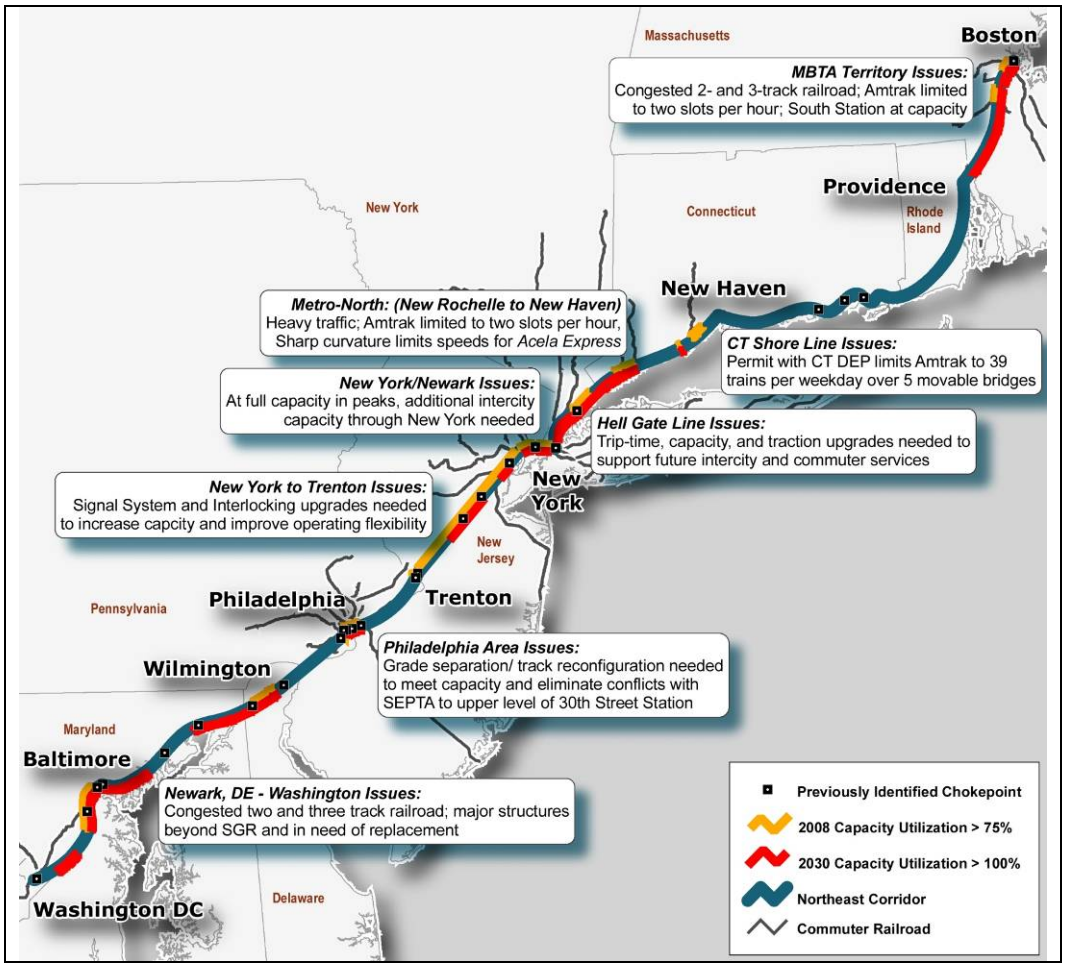
7. Capacity Constraints to Reliability and Growth

An analysis was performed to evaluate where the NEC is free-flowing and where it is capacity-constrained. The capacity utilization analysis found that 24 of 66 segments on the Main Line from Boston to Washington today exceed 75% of practical capacity, including much of the territory between Trenton and Stamford as well as sections in the vicinity of Baltimore, Wilmington, and Boston. Eight segments today are operating above 100% of practical capacity, including segments in Northern New Jersey through the

Hudson River Tunnels. The terminals in Boston, New York and Washington, DC were excluded from the analysis because of time and resource constraints in conducting the analysis; however, based on current train volumes these major terminals are already operating at or near maximum capacity. In late 2009, LIRR, MNR, MTA, NJT and Amtrak initiated a Penn Station New York capacity utilization study.

By 2030, at projected growth levels, the situation is expected to worsen significantly if nothing is done, with 29 of 66 segments exceeding 100% of practical capacity. Current and future capacity utilization detail is available in the Appendices. Figure 55 highlights constrained areas.

Figure 55: Capacity Constraints on the NEC



Source: NEC Master Plan Capacity Utilization, SYSTRA Consulting

The major NEC terminals—Boston, Penn Station New York and Washington D.C.—present some of the most difficult challenges facing the NEC. Each of these terminals is at effective capacity today with limited platform and yard space and constraints on train movements in and out of the terminals.

Penn Station New York is the most significant chokepoint on the NEC. Nearly half of all trains operating on the NEC operate into or through New York. Boston South Station is the terminus for all MBTA South End trains, and Washington D.C. hosts MARC service from the north and VRE from the south in addition to Amtrak *Acela Express, Regional* and long-distance trains and Virginia/North Carolina state-supported services.

Potential solutions include evaluating "run-through" services at New York City and Washington D.C. as well as capital improvements to add capacity at both locations. The extension of additional *Regionals* running from Washington Union Station through to Virginia is an example. Boston South is a stub-ended station, and thus additional run-through service is not a feasible alternative under the current configuration. The Master Plan includes a Boston South Station project to add up to six additional tracks and expand storage capacity at a location to be determined.

Because of the magnitude of potential costs to address terminal capacity in Boston, New York City and Washington D.C., each of these terminals will be subject to further evaluation and simulation in the Preliminary Environmental Impact Statement (PEIS) expected to begin in 2010. Alternatives will include new rail tunnels under the Hudson and East Rivers in New York and expanding capacity at Union Station in Washington D.C.

Additional capacity is required to ensure that the Northeast states and rail operators–Amtrak, commuter and freight–are able to implement their future service plans for the NEC. Alternatively, service in many segments will effectively be capped. That would limit or preclude new commuter rail services, new regional services, additional freight service, and new and faster intercity service, because shorter trip times can only be achieved in conjunction with increased capacity. Additional capacity is also required to allow for maintenance concurrent with rail operations. In addition, on-time performance can suffer due to slow orders and lack of redundant capacity. Even with modest growth, this will be a continuing issue.

Increasing Railroad Capacity

Types of projects evaluated to increase NEC capacity include the following:

- Tracks: Additional tracks to allow more train traffic, including passing tracks for higher speed trains to pass slower trains
- Bridges: Bridges with additional tracks to allow more train traffic and replacement of "moveable" bridges with high-level fixed structures, where feasible, to eliminate bridge openings due to boat traffic
- Curves: Modification of curves so that train speeds are not restricted
- Track and Platform: Improved layout at certain stations such as Washington, Wilmington, Rensselaer, and Springfield to move trains through more efficiently

- Passenger: Full train length high level station platforms to speed passenger boarding and disembarkation
- Signals: Upgraded signal system to allow trains to operate at closer spacing, greater speed and with improved operating flexibility
- Main-branch junctions: Redesign of Main Line - branch junctions to allow branch line trains to wait off of the Main Line for trains coming from the other direction
- High volume junctions: Redesign of very heavily used junctions such as New Rochelle to provide grade separated movement
- Train power: Adding additional power as additional cars are added to trains so that train performance is not degraded
- Yards: Adding maintenance and storage yards to reclaim Main Line capacity consumed by deadheading trains
- Side tracks: Construction of side tracks where trains that are reversing direction can be staged off of the Main Line to set up for the return trip.

Each of these projects/concepts will be evaluated to ensure the benefits justify the cost of investment.

8. Infrastructure Improvements – Costs and Benefits

The NEC offers the potential for expanded, faster rail service and the ridership, employment and economic gains that follow. That potential will be realized only if stable funding is made available to restore the infrastructure to a state of good repair (SGR) and to increase rail capacity. This section focuses on the infrastructure needed to achieve the growth and connectivity envisioned by the Northeast states and railroads.

On the South End of the Main Line, the existing two- or three-track railroad south of Claymont, DE would be expanded to three or four tracks to enable intercity and commuter rail expansion in Delaware, Maryland, and Virginia. In the New York Penn Station area, the most congested portion of the NEC, major expansion in the form of new river crossings and additional tracks and platforms under Manhattan is envisioned. On the North End, improvements between New Rochelle and New Haven and approaching South Station in Boston are needed to realize the full potential of the high-speed corridor.

The Master Plan collaboration produced a database of capital work required to support the future service levels that will achieve the vision established for the NEC. Projects were identified based on documentation of chokepoints, current and future capacity analysis, Amtrak's February 2009 report on station ADA accessibility, and capital planning efforts of the NEC owners and operators.

Master Plan project development focused on capacity and reliability; however, the universe of projects incorporates the entire SGR backlog because there is so much overlap. For example, several capacity projects would replace or expand bridges and tunnels in the SGR backlog. In total, the Master Plan database identifies $43 billion in investment needed over the next 20 years to meet SGR backlog and growth requirements as shown in Table 14.

Of the $43 billion in NEC Master Plan projects, positive train control (PTC) accounts for approximately $264 million in stand-alone costs,

Table 14: Infrastructure Capital Needs, 2010-2030 ($ In Millions)

Cost Category	Total (Millions)
MASTER PLAN PROJECTS	
SAFETY / POSITIVE TRAIN CONTROL - ALL SEGMENTS	**264**
SGR BACKLOG	**8,786**
Amtrak-owned main / branches	*5,244*
NEC main / New Haven Line	
Connecticut owned	*3,200*
New York owned	*100*
New York State / Albany Line	*242*
CORE GROWTH	**32,245**
SPECIAL ISSUE	
Baltimore Freight Tunnel	2,000
Subtoal NEC Master Plan	**43,295**
SGR NORMALIZED REPLACEMENT	**9,035**
Amtrak owned main / branches	7,211
NEC main / New Haven Line	
Connecticut owned	1,000
New York owned	824
Total Capital	**$52,330**

Source: SGR backlog and normalized replacement costs by owner. Growth projects by Master Plan Working Group; detail in Part III Capital Program Summary by Segment. Costs are order-of-magnitude 2010 dollars.

with some additional costs included in other signal system upgrade projects. PTC is a technology that can automatically bring trains to a stop and prevent collisions and derailments in many situations. A form of PTC including Automatic Train Control (ATC) and ACSES (Advanced Civil Speed Enforcement System) is already installed on many sections of the Northeast Corridor where speeds exceed 125 mph, including Boston to New Haven and smaller sections in New Jersey, Delaware and Maryland. However, under the Rail Safety Improvement Act of 2008, PTC must be installed on most intercity and commuter rail systems by December 2015, and the Master Plan reflects the cost of installing PTC on all sections of the Northeast Corridor and branch lines where it is not currently in operation.

State of Good Repair Backlog projects total approximately $8.8 billion, including Amtrak, Connecticut and New York-owned sections of the Network and the Albany Line to Schenectady. "Core Growth" requirements in the Master Plan include the estimated cost of trip-time improvements and capacity expansion as well as some mandated projects, including high-level platform construction to comply with level boarding requirements of the American with Disabilities Act (ADA), which also improve capacity utilization by facilitating faster boarding times. Core Growth requirements also include placeholder estimates totaling $11 billion for new tunnels under the Hudson and East rivers and the addition of up to six tracks in Penn Station, NY, to meet 2030 service levels. The magnitude of these costs require further analysis as to the timing of planned improvements and the potential for capacity mitigation in the short to medium term (see also Moving Forward section).

As shown in Table 14 under "Special Issues," the Master Plan also includes a new freight tunnel serving the Port of Baltimore. The new tunnel would not be directly on the Northeast Corridor, but would link to it and provide improved access to the Port. It is in included in the Master Plan because freight-related improvements to the corridor, particularly in the Baltimore to Newark, DE, section, need to be considered in close coordination with the proposed new tunnel.[7]

An estimated $9 billion of capital investment not included in the Master (shown as SGR Normalized Replacement in Table 14) will be needed over the same time period to replace existing assets as they reach the end of their useful lives in order to maintain those assets in a State of Good Repair. This $9 billion includes the estimated cost of normalized replacement on right-of-way owned by Amtrak, Connecticut, and New York. Estimates do not include normalized replacement requirements for freight-owned right-of-way on the Empire Line to Albany or between Washington D.C. and Richmond. Freight railroads, which are privately owned and operated, typically maintain their rights-of-way to freight standards from internally-generated funds as a matter of business practice.

Most costs in the Master Plan are preliminary order-of-magnitude estimates for planning purposes. The scope and cost of proposed projects represent the best judgment of participants in the planning process as to what is required to meet planned 2030 service levels as described in Section 6. However, additional planning and engineering work is

[7] As of the date of publication, Maryland and the freight operators were evaluating alternative alignments for a new tunnel to improve port access.

needed to confirm the optimum configuration to deliver proposed service levels in the most cost-effective manner. For example, the proposed addition of a fifth track east of Elmora Interlocking will require a new eastbound platform and station in Elizabeth, plus other related improvements to be developed. Once further determinations are made, typically through operations and simulation analysis, preliminary engineering will be required to assess site conditions, potential environmental impacts and constructability issues, and to refine cost estimates accordingly. Some of this additional work will begin during the Corridor-wide environmental documentation phase expected to start early this year (See further discussion, Section 9, Moving Forward).

Investment by Asset Type

Master Plan projects by major asset type are summarized in Table 15. As noted in the previous section, the **tunnels** category includes a placeholder for projected future capacity needs into and through midtown Manhattan. Alternatives to be evaluated include potential new tunnels under the Hudson and/or East Rivers. The category also includes replacement of the Baltimore and Potomac (B&P) Tunnels, built in 1873, as well as a new freight tunnel serving the Port of Baltimore.

The **major terminals** category includes the potential cost of capacity improvements at locations including Boston, New Haven, New York, Trenton, and Washington D.C.

Some ten **movable bridges** on the Corridor are due for replacement including Devon, Saga, Walk and Cos Cob on the ConnDOT-owned New Haven Line; Connecticut River in Connecticut, Pelham Bay in New York; Portal in New Jersey; and Susquehanna, Bush and Gunpowder in Northern Maryland. For preliminary planning purposes, it is assumed that a number of these spans will be higher, faster and wider than existing structures to minimize openings, improve speeds and accommodate higher levels of future rail traffic. **Fixed bridges** are typically those that cross highways or streams; there are several hundred of them on the corridor, many due for full replacement or rehabilitation, including deck upgrades that support higher speeds.

Table 15: Capital Project Details

Project Type	Total (Millions)
Infrastructure	**40,598**
Tunnels	13,742
Major Bridges	9,594
Fixed Bridges	1,552
Track - Interlockings	1,579
Other Track / Roadbed	6,600
Major Terminals	2,872
Signals	1,126
Catenary / Power Supply	2,202
Station Track & Platforms	1,331
Station Buildings	**1,456**
Yards / Facilities	**1,240**
Total	**$43,295**

Source: Master Plan project database. Costs are order-of-magnitude 2010 dollars.

The **track** category includes replacement or upgrade of interlockings (junctions and crossovers) needed to achieve a state of good repair and higher speeds. Other track improvements include the addition of new track to expand capacity. Track improvement estimates assume what is primarily a two- and three-track

railroad south of Claymont, DE potentially will be built-out to three or four tracks by 2030. In addition, the current plan includes the addition of incremental track capacity in northern New Jersey, on the Hell Gate Line north of New York, on the northern end of the New Haven Line between Devon and New Haven, south of Boston South Station and south of Wilmington, DE. Incremental track capacity would also be added by upgrading and adding sidings where feasible on the Shore Line between New Haven and Providence. Many of the proposed capacity improvements to the Shore Line were identified under the original NHRIP program in the 1990's but never implemented. Track costs also include curve modifications to achieve higher speeds at locations such as Elizabeth, NJ; northeast Philadelphia; and northern Maryland.

The **Signals** category include upgrades to the signal system for improved reliability and incremental capacity through the East River Tunnels, in New Jersey between Newark and Trenton, south of Baltimore in the vicinity of BWI station, and from New Carrollton, Maryland to Washington Union Station. **Catenary** costs include installation of a constant tension catenary system between New York and Washington to support higher speeds. **Station** categories – including track and platforms and building - include costs to convert all low-level platforms on the Main Line and the branch lines to high platforms by 2030 to meet ADA requirements for level boarding and to reduce boarding times and improve the efficiency of infrastructure utilization. Station costs also include ADA-related facility improvements to stations owned or used by Amtrak. **Yards/Facilities** primarily represent the cost of new commuter maintenance and storage yards – at locations such as Edgewood and Baltimore, MD and New London, CT – as well as upgrade costs to maintenance of ways bases and some yard facilities to support improved trip times and growth in services.

Investment is Needed in Every Segment of the NEC

Just as every segment of the NEC will see improved and expanded service in 2030, so too does every segment require investment to provide associated capacity for growth. Table 16 summarizes the improvements by major segment and type of asset. Part II: Current and Future Service and Infrastructure by Segment and Part III: Capital Project Detail List by Segment include detailed information about the projects required to deliver the quantity and quality of service envisioned for the NEC.

Table 16: Improvements in Major Segments

Segment	Infrastructure	Station Buildings	Yards / Facilities	Total (Millions)
North End	**6,114**	**294**	**55**	**6,463**
Boston-Westerly	877	62		939
Westerly-New Haven	681	55	55	791
New Haven-New Rochelle	4,556	177		4,733
New York City Area				
New Rochelle - New York	**13,385**	**160**		**13,545**
South End	**11,402**	**610**	**308**	**12,320**
New York-Trenton	3,035	31	116	3,181
Trenton-Newark, DE	878	247		1,125
Newark, DE-Washington	7,490	332	192	8,014
Branches	**5,779**	**392**	**689**	**6,860**
Washington-Richmond	3,308	109	649	4,066
Philadelphia-Harrisburg	587	241		828
New York-Albany	947	32	40	1,019
New Haven-Springfield	937	10		947
Multiple Segments	**3,918**		**188**	**4,106**
TOTAL	**$40,598**	**$1,456**	**$1,240**	**$43,295**

Source: Master Plan project database. Costs are order-of-magnitude 2010 dollars.
Costs are preliminary, order-of-magnitude, estimated by Amtrak. Cost components include SGR backlog and growth. New York City area costs include a placeholder to allow for increased capacity in the New York area including new river crossings and/or new station capacity.

NEC Main Line Phase I Priority Projects

Although total capital investment needs for growth are estimated at $43 billion through 2030, Amtrak and the Northeast states and railroads have jointly developed a set of high priority, Phase I projects that represent the required investment over the next 10 years to ensure the corridor accommodates the growth needs of all users (over and above SGR normalized replacement needs). The estimates were jointly developed by the Northeast states and Amtrak[8] and include supplemental estimates by Amtrak's Engineering Department to ensure the program meets intercity trip time goals and sufficiently

[8] Estimates developed by Amtrak and the Northeast states as part of an effort in the Spring of 2009 to develop a Track 2 (program) application under the HSIPR program for the Main Line of the Corridor. (The proposed application was never submitted because Federal Railroad Administration (FRA) guidance subsequently found the Main Line ineligible without a completed Programmatic Environment Impact Statement (PEIS).

addresses the state of good repair backlog to ensure a reliable foundation for future growth.

The result of this exercise is a listing of high-priority projects, totaling $13.8 billion, as summarized in Table 17, that is the necessary requirement to ensure the Main Line of the corridor from Boston to Washington (including non-Amtrak owned portions in Massachusetts, Connecticut and New York) provides a reliable foundation for existing services and meets short to medium term demand for growth, including improved trip times consistent with goals outlined in this report.

A detailed listing of these projects for Boston to New York and New York to Washington is contained in Tables 18 and 19 on the following pages.

Table 17: Summary of Phase I Program of Improvements for the NEC Main Line

Corridor	Total (Millions)
Boston - New York	4,711
New York - Washington	9,150
Total	**$13,861**

Source: Master Plan project database. Costs are order-of-magnitude in 2010 dollars.
Note: Details are shown on Tables 18 and 19 on the following pages.

High priority projects include major bridge replacements, upgraded electrical supply, catenary and signal systems, additional track in congested areas of the corridor, and curve modifications, fixed bridge improvements and interlockings to support higher-speeds. These are basic improvements, but they are essential to ensure the corridor is positioned for future growth.

Table 18: Phase I Program of Improvements, Boston – New York

State	Project / Program	
BOSTON - NEW YORK		
TRIP-TIME IMPROVEMENTS		
MA	Readville to Canton - 3rd Track	80
RI	Kingston Capacity and Track Improvements (MP-157-159)	15
CT	Conn River Bridge Replacement - High Level	500
NY	Pelham Bay Bridge Replacement and Hell Gate Curve Mods	500
		1,095
STATE OF GOOD REPAIR PROGRAMS		
NY	Pelham and Gate Interlocking Reconstruction	30
MULTI	Bridge Program	300
MULTI	Facilities	30
MULTI	ROW Fencing above 150mph	10
NY	Sunnyside Yard Facility Upgrade	100
NY	Hellgate Substation	50
MA	Southampton Substation	50
NY	Penn Terminal: ET Feeders, Signal Power and Catenary	75
NY	Penn Station Service Plant Upgrade and Tunnel Emergency Power	60
		705
OTHER CAPACITY AND RELATED IMPROVEMENTS		
MA	Boston South Station Capacity Improvements	150
MA	Ruggles Street - Congestion Mitigation	12
CT	Clinton - Universal Interlocking	5
CT	Palmers to Groton - 3rd Track Upgrade	7
CT	Shore Line East High Platforms / Pedestrian Overpasses	40
CT	Guilford Station - Tracks 3 and 4 Upgrade	27
CT	Old Saybrook Track and Catenary Improvements	15
CT	New London Layover Yard (Electrified)	55
CT	Branford Interlocking Reconfiguration	5
CT	Waterford Passing Siding	15
CT	Shoreline Junction Interlocking Reconfigurations	10
	CDOT / MTA New Haven Line Improvements	
CT	Replacement of the Walk and Saga Bridges	600
CT	New Haven Line Catenary Replacement	280
CT	Signal Up-grade, including PTC	300
CT	New Haven - Devon 4th Track	15
CT	Curve Mods / Ballast Deck Bridge Improvements	60
NY	Positive Train Control - New Rochelle to NY / CT state line	15
NY	Moynihan Station / Farley Redevelopment	1,300
		2,911
Total Boston - NY		**4,711**

Source: Amtrak, Master Plan project database. Costs are order-of-magnitude 2010 dollars.

Table19: Phase 1 Program of Improvements, New York-Washington

State	Project / Program	
NEW YORK - WASHINGTON		
TRIP-TIME IMPROVEMENTS		
Multi	Constant Tension Catenary (High-Speed Territory)	1,000
NJ	Portal Bridge Project (NEC Main)	750
NJ	NEC Signal System Upgrade - Newark to Trenton	100
NJ / PA	New Jersey / Pennsylvania Curve Realignments	500
MD	New Tracks Gunpow to Bacon	750
MD	Northern Maryland Bridge Replacements and Track Capacity Upgrad	2,000
MD	B&P Tunnel Replacement	1,000
MD	BWI - Phase I & II	100
MD/DC	NEC Signal System Upgrade - Baltimore to Washington	25
		6,225
STATE OF GOOD REPAIR PROGRAMS		
Multi	High Speed Interlocking Program	100
DE	Hook Interlocking Increase Speeds (Track & CS)	20
Multi	Ballast Cleaning, Subgrade Stabilization and Drainage	100
Multi	Bridge Rehab Program	500
NJ	Dock Bridge	40
NJ	Bridge Replacement High Line (Bridge over Transit, Bridge over Path	100
Multi	Facilities	100
Multi	ROW Fencing above 150mph	20
Multi	Automatic Block Signal Upgrades	40
PA	Communication and Signals N. & S. Penn	50
Multi	Backup Signal Power NY- Wash	50
Multi	Frequency Converters (Increase Capacity at SSYD, Metuchen and Je	200
Multi	New Substations (2 on NY to Trenton Segment, and 3 between Phila	100
		1,420
OTHER CAPACITY AND RELATED IMPROVEMENTS		
Multi	Positive Train Control - New York to Washington	65
NJ	Portal Bridge (NJT)	1,050
DE	Wilmington 3rd Track	40
MD	Chesapake Connector (Prince to Bacon)- New 3rd Track	200
MD	New Carrollton - High Level Center Platform and Station Track	50
DC	Union Station access and capacity Improvements	100
		1,505
Total NY - Washington		**9,150**

Source: Amtrak, Master Plan project database. Costs are order-of-magnitude 2010 dollars.

Operating Benefits of Investment

A summary of operating benefits that will be derived from different types of NEC projects is provided in Table 20.

Table 20: Operating Benefits Derived from NEC Projects

Type	Project Benefits
Terminals	Improve track capacity and support more flexible and efficient train operations at Boston, New York, Washington
Track Capacity	Alleviate chokepoints via the construction of second, third, fourth or fifth tracks; construction of passing sidings; and upgrading of existing tracks
Interlockings	Improve operating flexibility and higher train speeds via the installation of new or upgraded interlockings
HSR Track Capacity	Operate trains at higher speeds via the installation of constant tension catenary between New York and Washington D.C., realignment of track and utilization of higher unbalance throughout the NEC network
Stations	Enhance passenger facilities via the installation of ADA components including high platforms; construction of new stations; rehabilitation of heavily used stations
Propulsion	Improved propulsion reliability and reduction of outages via the assessment of power consumption needs and support of rail services expansion via the installation of propulsion facilities
Signals and Catenary	Improve operating reliability and flexibility via upgrading of PSNY third rail and signals. Installation of high density signals east of New York and installation of positive train control in all states
Maintenance and Storage	Improve operational efficiency and support of rail service expansion plans via the expansion or construction of rolling stock storage and yard facilities in several locations
Bridges	Address state of good repair and alleviate chokepoints such as the replacement of Portal (New Jersey), Connecticut River, Devon (Connecticut) and Pelham Bay (New York) moveable bridges
Grade Separations	Enhance operational efficiency and improve track capacity via replacement or construction of flyovers
Right-of-Way	Upgrade right-of-way via concrete ties, closing of highway crossings, rock slope stabilization, viaduct and bridge rehabilitation and protection of freight routes

Economic and Environmental Benefits of Investment

Investment in the NEC to improve high-speed, intercity, commuter and freight services will also provide economic and environmental benefits. At a macro level, as discussed in the executive summary, rail offers the potential to expand mobility options and stimulate increased economic growth while contributing to improved environmental quality. This is especially important in densely populated urban areas such as the Northeast where growth in attentive modes – such as auto and air travel- will likely be constrained by lack of available land for expansion and environmental concerns related to high per passenger fuel consumption and carbon emissions. At a micro level, benefits of rail investment include the economic and social value of travel time savings and improved environmental quality. These benefits are summarized in Table 2 and discussed in the narrative below the table. Further detail regarding the methodology for calculating benefits is provided in the Appendices. A detailed examination of the benefits of investment, at both a macro and a micro level, will be undertaken in the next phase (see also Moving Forward section).

Table 21: Economic and Environmental Benefits Derived from NEC Projects

Preliminary Estimated Benefits	2030 Compared to Base Year (2009)
Increased Rail Psgr Miles	4.3 billion
Vehicle (Auto) Miles Avoided	2.7 billion
Gasoline Saved	104 million gallons
Greenhouse Gas Saved	926 thousand tons of CO_2-e
Illustrative Value of Travel Time Savings	$34 million
	Annualized
Jobs Created / Maintained	64,400

All values are preliminary estimates. Environmental values based on estimated increase in rail passenger miles. Estimated travel time savings are illustrative only and assume that reliability and congestion on the rail network improve as other modes remain relatively constant. Greenhouse gas includes carbon dioxide or equivalents (methane and nitrous oxide). Jobs estimate includes direct and indirect jobs including supplier industries.

Source: Amtrak.

The American Public Transportation Association (APTA) has contributed significantly to research that demonstrates the relationship between public transportation spending and employment. A recent report prepared for APTA documents an average of

approximately 36,000 jobs per billion dollars of public transportation spending.[9] Therefore, funding the NEC's average annual capital requirement of $2.3 billion would maintain 64,400 jobs every year.

Investment in the NEC will also provide the benefit of improved travel reliability, over and above the benefit of reductions in scheduled rail trip times. As reliability increases, travelers collectively recover hours that would otherwise have been lost to congestion, component failure and other causes of delay. Industry literature provides a basis for expressing the value of those recovered hours in monetary terms.[10]

Given an average rate of seven minutes of delay per rider (see Section 4), 13 million intercity rail riders lose more than 1.5 million hours a year to delays. With travel time valued at $19 per hour[11], the annual cost of rail delays is approximately $28 million. However, investment in the NEC will improve rail on-time performance and reduce delays. Based on current ratios, if delays from train interference and unplanned engineering outages were reduced by 50%, the average delay per passenger would be reduced by 20%, resulting in savings of 305,480 hours of delay, or $5.8 million. These calculations assume that the average length of delay remains constant. The value of reliability will be higher as capital investment reduces the length of delays as well as the number of delays.

Improved rail reliability will also benefit travelers switching to rail from automobiles and planes. Based on Bureau of Transportation Statistics data, automobile usage in the Northeast averages about 22 minutes of delay per traveler[12], more than three times the delay associated with rail. Rail riders that switch from automobiles will avoid the congested travel times in NEC metropolitan areas that are about one-third longer than free-flow conditions. Rail riders that switch from airplanes will avoid the airport congestion and bad weather that cause about 25% of scheduled flights to be cancelled or delayed, often by an hour or more. If only 2% of those automobile and air travelers switched to rail, the improved reliability of the rail network would save six million travelers 15 minutes each. The value of that time savings would be over $28 million. As travelers shift from air and automobiles to rail, an additional benefit would be the reduction of capital investment required for the non-rail modes.

The NEC is vital to the shared environmental quality goals of the Northeast such as energy independence and reductions in greenhouse gas emissions. Increased passenger rail usage reduces vehicle miles traveled on the highway (VMT), which translates into gasoline savings and reduced carbon dioxide emissions. The passenger service plans developed for 2030 are estimated to produce an additional 5.8 billion NEC rail passenger

[9] Economic Development Research Group. Job Impacts of Spending on Public Transportation: An Update. April 29, 2009.
[10] See, for example, "Urban Mobility Report 2009," Texas Transportation Institute, July 2009.
[11] Derived from Bureau of Transportation Statistics, State Transportation Statistics, 2007 (midrange of NEC metropolitan areas).
[12] Calculated rate of delay based on Northeast metropolitan area data reported by the Bureau of Transportation Statistics, State Transportation Statistics, 2007.

miles. This translates into VMT reduction of 3.5 billion miles.[13] The VMT avoided would save 136 million gallons of gasoline ($545 million at current prices) and 1.2 million metric tons of carbon dioxide equivalents (CO_2-e).

Freight Benefits

The Northeast Corridor is also a critical transportation corridor for rail freight. The U.S. Environmental Protection Agency estimates that for every ton-mile carried, a typical truck emits roughly three times more nitrogen oxides and particulates than a locomotive. Related studies suggest that trucks emit six to 12 times more pollutants per ton-mile than do railroads, depending on the pollutant measured. According to the American Society of Mechanical Engineers, 2.5 million fewer tons carbon dioxide would be emitted into the air annually if 10 percent of intercity freight now moving by highway were shifted to rail.

In 2000, railroads moved a ton of freight an average of 396 miles per gallon. If 10 percent of the freight moved by highway were diverted to rail, the nation could save as much as 200 million gallons of fuel annually. With more advanced technology, rail now has the ability to ship one ton of goods 423 miles on one gallon of fuel producing only 2% of the greenhouse gases of all transportation sectors. On average, railroads are three or more times more fuel efficient than trucks. To highlight this point, a study published by the FRA found that, as distances increase, freight rail's fuel efficiency is compounded and is substantial. For shipments moving 500 to 1,000 miles, rail consumes 107 gallons to truck's 333 gallons of fuel. If the cargo moves 1,000 miles to 2,000 miles, fuel consumption for rail comes to 241 gallons as opposed to 943 gallons for trucks. This significantly reduces the region's use of energy and emission of carbon, thereby reducing the region's cost of doing business.

Freight rail plays a significant role in promoting the economic development of the NEC states. Freight rail provides goods necessary for many industries and communities in the region to thrive. Because the use of rail lowers transportation costs, the region's industries are in a better position to effectively compete with international rivals in a global marketplace. Railroad freight rates measured in constant dollars are lower than they were in 1980. These savings go directly to the region's shippers and consumers.

For these reasons, it is in the public interest to not only preserve freight rail capacity on this corridor, but to enhance its presence even as Amtrak and transit agencies increase their own service. The infrastructure improvements recommended by the Master Plan are intended to do just that.

[13] Methodology adapted from "Recommended Practice for Quantifying Greenhouse Gas Emissions from Transit (APTA Climate Change Standards Working Group, August 2009)." See Appendix for calculations.

9. Moving Forward

Starting later this year, it is expected the Northeast Corridor planning process will be overseen by a Northeast Corridor Infrastructure and Operations Advisory Commission. The Commission was authorized under the Passenger Rail Investment and Improvement Act of 2008 (PRIIA). It will include representatives of the Northeast states, the Federal DOT and Amtrak. The Commission's charge includes setting policy goals for the Corridor, defining cost allocation methods and funding opportunities, and leading cooperative planning efforts.

The Commission faces large challenges. The biggest one perhaps is funding, both capital and operating. As discussed in the previous section, the level of investment required to ensure reliable service and meet future service goals is enormous – preliminary estimates in the master plan total $43 billion through 2030 over and above basic "normalized replacement" for state of good repair. That is more than $2 billion a year over the next 20 years. High priority projects that should be undertaken in the next 10 years for the Main Line alone total approximately $14 billion, or $1.4 billion annually through 2020.

Coordination is another issue. The Northeast Corridor, including the Springfield, Albany and Harrisburg branch lines, directly operates through eight states and the District of Columbia. An additional five states currently have services that connect to or operate over the NEC. Ten agencies operate or contract to operate commuter services on the NEC.

The complexity of the operating environment, the number of states and rail operators and other stakeholders, and the magnitude of investment required to accommodate growth needs for all users dictates an approach that crosses state and local boundaries, marshals resources region-wide to address these issues, and challenges Federal, state and local policy makers to act in the interests of the broader Northeast region.

* * *

This balance of this section discusses immediate next steps in the planning process, including development of a Preliminary Environmental Impact Statement (PEIS) for the Northeast Corridor and longer-range planning issues that potentially could be considered as part of any ongoing evaluation of issues and opportunities related to future improvements to, and investment in, the Northeast Corridor rail network.

The American Recovery and Reinvestment Act (ARRA) of 2008 made $8 billion available nationwide for the development of High-Speed Intercity Passenger Rail (HSIPR) projects and programs, with $485 million of that amount earmarked for the Northeast Corridor Network in the first round of awards made in January 2010. The FY 2010 Consolidated Appropriations Act makes an additional $2.5 billion available for the program, with $50 million set aside for planning, including development of state rail plans, multi-state service development plans and environmental documentation.

A portion of this $50 million in FY 2010 planning funds is expected to be allocated by the Federal Railroad Administration (FRA) to proceed with the NEC Service Development Plan (SDP) and a Programmatic Environmental Impact Statement (PEIS). A completed SDP and PEIS are core requirements for submission of a corridor-wide "program" grant application under the HSIPR initiative. (No such corridor-wide application was submitted for the NEC Main Line in the first round of applications in October 2009 because an SDP and PEIS, among other tasks including a financial plan, had not been completed, although a number of states requested design and/or construction funding for individual Master Plan component projects on the NEC.)

Sunnyside Yard located in Queens, New York and shared by LIRR, NJ TRANSIT and Amtrak has no space for growth. Additional yard space is an important consideration for NEC development.

On April 1, 2010 the FRA announced the solicitation of proposals for Federally-led multi-state passenger rail corridor planning demonstration projects, leading to the development of a "passenger rail corridor investment plan" including both a Service Development Plan (SDP) and corridor-wide environmental documentation, as discussed in the following section on next steps. The Northeast states, with Amtrak support, are expected to apply for planning grant funds under this multi-state demonstration project.

The following section addresses next steps to better position the NEC Main Line for funding under the HSIPR program and includes further discussion of selected regional planning issues that will need to be considered as the planning process moves forward.

Next Steps in the Planning Process

To better position the Main Line for funding under the HSIPR program, the following steps are expected to be required:

1. Identification of Master Plan projects with independent utility;
2. Completion of a Service Development Plan (SDP) including identification of benefits;
3. Preparation of a Programmatic Environmental Impact Statement (PEIS); and,
4. Development a comprehensive long-range financial plan for the NEC.

The first item, above, is necessary to move forward with selected projects in advance of a completed SDP and PEIS for the corridor. The second through fourth items, are technical

requirements for submission of a program track (Track 2) application under the HSIPR program. Each of these items is discussed in more detail below.

1. **Identify Projects with Independent Utility:** Under HSIPR guidelines, projects with independent utility are eligible to move forward into project environmental documentation, final design and construction in advance of a completed SDP and PEIS. These types of projects may include those necessary to ensure safe and reliable operations, achieve a state-of-good-repair and/or mitigate congestion at existing service levels. Because it could take more than two years to complete a PEIS for the NEC Main Line, identifying projects with independent utility in advance of a completed PEIS will permit a subset of projects to move forward expeditiously.

2. **Complete Service Development Plan (SDP):** An SDP includes long-range forecasts of service levels on the Corridor and a listing of capital projects necessary to support those service levels. The Master Plan itself represents a substantially formed SDP for the Northeast Corridor Main Line, including forecasts of intercity and commuter ridership and train movements by segment of the Corridor, detailed schedules for intercity services in 2020 and 2030 and preliminary capital project descriptions and costs. An SDP provides the baseline data needed to prepare an Environmental Impact Statement (see below).

3. **Prepare Programmatic Environmental Impact Statement (PEIS**): The PEIS includes a statement of purpose, analysis of alternatives, development of a preferred alternative, and evaluation of Corridor-wide environmental impacts and public outreach and input. As noted previously, this process is expected to be led by the FRA, which has primary statutory responsibility, with support from Amtrak and the Northeast states under policy and planning guidance provided the Northeast Corridor Infrastructure and Operations Advisory Commission when created. Evaluation of alternatives and development of a preferred alternative will require simulation modeling to identify project alternatives and determine the optimum configuration necessary to support anticipated future service levels.

4. **Develop Comprehensive Long-Range Financial Plan:** A completed financial plan is one of the requirements for submission of a "Track 2" program application under the HSIPR program. Amtrak is now in the process of developing a preliminary long-range financial plan for intercity service operating on the Main Line of the Corridor, including ridership, revenues, operating and capital costs through 2030, and the identification of policy alternatives and the financial impacts. It is anticipated that states will provide similar analysis for state-supported services operating on the NEC (some have done so already as part of the first round of HSIPR submissions).

Discussion of Selected Long-Range Planning Issues

In addition to immediate next steps, state policy officials and the Advisory Commission, when created, should be cognizant of the following planning issues, which could impact the efficiency of Corridor operations and long-term growth prospects:

1. **A Vision for the Corridor:** One of the roles of the Northeast Corridor Infrastructure Operations and Advisory Commission is to provide a vision for the future of the Northeast Corridor. This shared vision is especially critical in the Northeast because it is an economic region – with a "GNP-equivalence" that ranks it among the top economies of the world – but without a shared governance structure to facilitate decision-making. Among the decisions the region must make are what are the appropriate levels of (and mechanisms for) investment in transportation and other infrastructure to help ensure the region continues to grow its economy and maintains its competitive position in the Nation and the world. High-speed rail in the Northeast has a potential role to play in providing enhanced mobility options in a densely populated region in which expansion of other modes is increasing constrained by scarcity of available land and concern over the long-term effects of high levels of carbon emissions and global warming. One of the main functions of the Advisory Commission, on which the Northeast States, the FRA and Amtrak all sit, will be to define a future vision for the Northeast Corridor transportation network that addresses the longer-term economic and environmental issues facing the Northeast region in the 21st Century.

2. **Funding and Cost Sharing:** Levels of investment in Northeast Corridor improvements have been inadequate to maintain the Northeast Corridor in a State of Good Repair (SGR). The resulting backlog of deferred investment on Amtrak owned infrastructure alone totals approximately $5 billion, including major tunnels, bridges, track, signal and electrical supply systems. Additional investment needed to expand capacity for users is estimated at approximately $43 billion over the next 20 years, or about $2 billion annually. Past experience shows this level of capital investment need cannot be met with existing funding mechanisms. A stable, multi-year source of funding is needed to provide the certainty and predictability needed to undertake a major program of improvements. Under Section 212 of the Passenger Rail Investment and Improvement Act (PRIIA) of 2008, the Northeast Corridor Infrastructure and Operations Advisory Commission (when created) is authorized, among other requirements, to develop recommendations for "potential funding and financing mechanisms for projects of corridor-wide significance" as well as develop "a standardized formula for determining and allocating costs, revenues, and compensation for Northeast Corridor commuter rail passenger transportation…" such that there is no "cross-subsidization" of commuter, intercity and freight rail. Additionally, Section 209 of the act requires Amtrak working with the U.S. DOT and in consultation with the governors of affected states to develop a formula to fairly allocate operating and capital costs to states for state-supported trains. This latter provision will have a significant impact on the Northeast Corridor since Amtrak's 2030 operating plan envisions a large increase in state sponsored trains operating on the Corridor in order to maximize utilization of increasingly scarce capacity on the corridor while providing states and outlying areas of the region with access to core markets that are critical to the market reach and financial viability of their trains.

3. **Air – Rail Integration.** The Master Plan includes trip time improvements, including approximate 20 to 30-minute reductions in express service travel times between Boston and New York and New York and Washington. These improvements, if

implemented, are expected to result in higher mode share for intercity service versus short-haul air trips and could help relive congestion by diverting to rail some passengers that would otherwise use air shuttle services to travel within the region. Other improvements identified in the Plan will facilitate multi-modal landside access and help relieve roadway congestion. Examples includes complimentary rail and air facility improvements designed to foster convenient intermodal connections, direct rail service to some airports, and joint ticketing arrangements between air and rail operators. Amtrak is currently participating is a study being undertaken by the Airport Cooperating Research Program (ACRP) of the Transportation Research Board (TRB) to access planning process improvements and tools that can be used to better integrate air and rail passenger systems.

4. **Inter-Agency Operations:** The Master Plan discusses the potential expansion of trains shared by one or more agencies as a means to simultaneously improve infrastructure utilization and provide services to intermediate and thru-markets. Amtrak already cross-honors tickets on some intercity trains in cooperation with commuter sponsors. Alternative operating scenarios involving "run-through" services could be evaluated as part of the ongoing Penn Station, NY Capacity Study including defining the operating benefits of merging operations to increase capacity at the station. Similar potential exists for "run-through" service at Washington Union Station and Boston South Station if a new rail tunnel connecting to North Station were built. Whether these evaluations find operational benefits or not remains to be determined, but these concepts in particular elevate the importance of progressing joint ticketing and standardized, integrated train information.

5. **State Corridor Services:** Under the HSIPR program, most states along the Northeast Corridor submitted applications to improve feeder lines and expand corridor services, including expanded services on the inland route between Boston and Springfield, and the Springfield, Albany and Harrisburg branch lines, as well as service south of Washington to Virginia and North Carolina. Amtrak has worked closely with sponsoring states to integrate expanded corridor services into the integrated service plan for the NEC Main Line (See Appendix). In general, the Master Plan envisions most state sponsored corridor trains operating as regional or "system" services on the Main Line of the Corridor. This approach improves the viability of state sponsored trains by providing states and outlying areas of the region with access to core intercity markets. How operating and capital costs are allocated to states for state sponsored trains is an issue that is current being studied by Amtrak consistent with Section 209 of the Passenger Rail Investment and Improvement Act.

6. **Terminal Capacity:** The major terminals on the Northeast Corridor – including Boston, New York and Washington - are today operating at, or very close to, capacity. Capacity issues are especially acute in New York. The Master Plan includes "placeholder" estimates to expand capacity in all three locations. Joint capacity studies, which include representatives of the operating railroads and state agencies, have recently begun for New York and Washington. Additional inter-agency planning is needed to determine capacity needs in Boston South Station, including the potential impact of developing the "Inland" route for intercity service

between Boston South Station and Springfield, MA, as proposed by the State of Massachusetts. Additionally, the conceptual North-South Rail Link connecting the north and south regions of the MBTA commuter rail system may be considered as an option for its potential to both expand the Northern New England rail market while simultaneously facilitating run-through service and freeing up needed capacity in both South Station and Southampton Yard.

7. **Station Planning and Improvements:** The Master Plan also includes estimates to restore intercity stations in the Northeast to a state-of-good-repair (SGR) and meet requirements under the Americans with Disabilities Act (ADA). Amtrak's approved FY 10 capital budget includes $144 million in funding for SGR and ADA-related station improvements nationwide. Meanwhile, many states and commuter agencies have invested tens of millions in station improvements over the last decade that benefit both commuter and intercity services. New Jersey, for example, recently invested more than $70 million in a major upgrade and expansion of Trenton Station. While these improvement efforts are coordinated among affected agencies, mechanisms to coordinate the planning and implementation of station improvements with states and commuter agencies on a regional basis, however, are not well defined. For example, parking is at a premium in many areas of the Northeast Corridor, which constrains the ability of rail services to attract travelers who must otherwise drive. Additional planning and better defined process procedures, including corridor-wide planning and coordination with highway and air modes, is needed to ensure that future station designs adequately account for the need for expanded parking at many locations and improved intermodal connections to minimize transfer penalties and attract additional ridership to rail. In addition, improving station access and coordination with transit bus and employer shuttle services, as well as improving bicycle and pedestrian access, could further augment rail passenger patronage, while leveraging the Corridor's rail stations as a preferred location for urban reinvestment and transit-oriented development.

8. **Equipment Design:** The Master Plan assumes Amtrak will replace and upgrade its Northeast Corridor fleet within the next 10 years. Much of this equipment is at or nearing the end of its useful life. At press time, the next generation of intercity express equipment is planned to operate a maximum speed of 160 mph. *Regional* equipment will be designed to operate at a maximum speed of 125 mph. It is possible that higher speeds could be achieved with the advent of new technology that could allow the operation of lighter, faster equipment. This potential technology is still in the early development stages, however, and not considered sufficiently advanced even for long-range planning purposes. Nonetheless, this topic, along with use of a new generation of dual-mode (electric/diesel) locomotives to reduce terminal congestion, warrants continued evaluation because of its potential to facilitate further trip time reductions on the Corridor in the longer term.

9. **Demand Estimates:** Future demand for intercity rail passenger services depends on a number of factors, including many external to Amtrak, such as levels of investment, economic growth rates, fuel prices and public policies related to environmental protection and allocation of Federal resources. There currently exists a substantial degree of uncertainly with respect to external factors that could

influence future intercity rail ridership. The Master Plan foresees an approximate 77% increase in intercity ridership through 2030, but some consider this to be conservative. At the request of several groups, Amtrak is considering the potential benefits of additional modifications to the existing right-of-way and/or new alignments to achieve additional trip time savings and ridership gains in future long-term planning scenarios.

10. **Infrastructure Configuration:** The major types of projects on the Northeast Corridor Network include State-of-Good Repair, capacity and speed improvements. Typically, it is more efficient and cost effective to design and construct projects that serve multiple purposes. A bridge reaching the end of its useful life can be replaced with one that provides additional capacity and speed improvements. Typically, the marginal cost of the capacity and speed components are significantly less than if these issues were dealt with as separate projects. In addition, as discussed above, there is the future potential for robust demand for intercity rail service in the Northeast combined with efficiencies to improve infrastructure utilization. How these issues are addressed will almost certainly have an impact on infrastructure configuration decisions. The Master Plan, as an example, includes a placeholder estimate for a new intercity rail tunnel and station capacity expansion in Penn Station New York. Expanded inter-agency coordination and other operating improvements, however, have the potential to free up sufficient capacity to eliminate or delay the need for an additional tunnel. On the other hand, improved integration between air and rail in the New York region could create sufficient demand that this new tunnel and additional station capacity may be necessary. It is a complex undertaking to balance these types of issues across the entire Northeast Corridor Network. It is recommended that configuration decisions lean in the direction building projects that provide multiple benefits for all users and keeping options open for increased capacity investment rather than foreclosing them in moving forward with planning for infrastructure improvements and the development of a PEIS for the Northeast Corridor.

The Northeast Corridor Infrastructure Master Plan

MAY 2010

NEC Infrastructure Master Plan

Part II: Current and Future Service and Infrastructure by Segment

States and railroads working together to define and implement a vision for the future of rail transportation in the Northeast

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Part II: Current and Future Service and Infrastructure by Segment

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Introduction to Part II

Part II of the Master Plan provides a more detailed examination of each of the eleven geographic segments of the NEC. Descriptive detail regarding weekday train movements and capital plans is included.

All information is preliminary in terms of scope, phasing and staging. All projects were developed by stakeholders participating in the Master Plan process. Although plans are written in the declarative, it is recognized that this is a preliminary report, which does not obligate any agency to any individual programs.

The Master Plan is intended to be a foundation for continued collaborative planning for improvement to the Northeast Corridor rail infrastructure, facilities and services, and to be updated by the stakeholders as their respective programs advance.

Boston, Massachusetts to Westerly, Rhode Island

Physical Assets

This 88-mile segment is owned by Massachusetts (38 miles) and Amtrak (50 miles from the Massachusetts/Rhode Island state line to Westerly). Amtrak provides train dispatching and maintains the infrastructure over the entire segment, including the Massachusetts portion. The railroad is primarily two tracks with three- and four-track segments in selected areas, including the approach to Boston's South Station. South Station is the largest station in the segment and the northern terminus for MBTA commuter trains and Amtrak *Regional* and *Acela Express* services. Southampton Yard is the primary storage and layover facility for MBTA and Amtrak services.

Table 1: Current and Future Operating Statistics – Boston, MA to Westerly, RI

	Current	2030
Ridership (000)		
MBTA	23,344	31,563
RIDOT	0	2,000
Amtrak	1,970	3,857
Total	**25,314**	**37,420**
Train Miles (000)		
MBTA	752	804
RIDOT	0	552
Amtrak	1,093	1,381
Total	**1,845**	**2,737**
Passenger Miles (000)		
MBTA	152,624	210,437
RIDOT	0	144,435
Amtrak	132,508	259,449
Total	**285**	**614**
Avg Weekday Trains (Max in Segment)		
MBTA	296	318
RIDOT	0	32
Amtrak	40	58

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments.

Current Operations

Amtrak and MBTA (passenger), and CSXT and P&W (freight), operate in the segment. More than 330 weekday trains operate via South Station, second in volume only to Penn Station New York. Some 120 are MBTA's Dorchester/Old Colony trains that enter/exit the NEC at Tower 1 immediately west of the station. MBTA's Worcester, Needham, Franklin and Stoughton lines access the NEC Main Line within the first 15 miles west (south) of South Station. MBTA's Attleboro Line service operates entirely via the NEC Main Line, between Boston and Providence, with 32 trains (16 round trips), providing three round trips in the peak periods and hourly service in the off-peak. MBTA operates Rhode Island DOT's service in Rhode Island through the Pilgrim Partnership. There is currently no commuter service west of Providence.

P&W has substantial freight operations through Providence, from north of Pawtucket to the Port of Rhode Island and Quonset Point/Davisville, portions of which operate over high-speed rail trackage in 150 mph territory. Amtrak operates 38 trains (19 daily round trips) from Boston to New York and points south, providing approximate hourly service in the peaks and bi-hourly service in off peak periods with a mix of *Acela Express* and *Regional* services. Current and future passenger rail operating statistics are provided in

Table 1 above.

Future Plans

MBTA services on the NEC Main Line will increase modestly with two to four additional peak period trains (one or two daily round trips) for each line. By 2030, South Station will need to accommodate approximately 376 intercity and commuter trains, 40 trains (20 round trips) during the peak period, an increase of 10 peak trains (five round trips) over current levels.

Amtrak's 2030 plans call for increases in service between Boston and New York, from 38 daily trains (19 round trips) to 48 trains (24 daily round trips), providing hourly *Acela Express* and near hourly *Regional* services throughout the day. Five additional trains are projected to operate out of Boston over the "Inland Route" through Worcester to Springfield and New Haven. Amtrak is also planning up to 30 minutes of trip-time improvements between Boston and New York by 2030 which will benefit from proposed additional passing capability on this segment to maintain existing levels of reliability for all users.

In addition to regular MBTA and Amtrak services:

- Massachusetts is finalizing plans for South Coast Rail commuter service to Fall River and New Bedford, MA. Route alternatives under consideration are an Attleboro alignment, which would significantly affect NEC operations, and a Canton Junction alignment that would have a lesser impact.
- Rhode Island is preparing to initiate South County Commuter Rail service, including 16 trains (eight daily round trips) from Providence to Warwick (TF Green Airport) and Wickford Junction by 2011 operated under contract with MBTA.
- Amtrak, Massachusetts and Connecticut are developing a service plan for "Inland Route" service between Boston and New Haven via Worcester and Springfield. The Massachusetts alignment (along MBTA and CSXT-owned lines) is part of the federally-designated Northern New England High-Speed Rail Corridor. The Amtrak-owned Springfield to New Haven continuation of the segment would be electrified with significantly expanded intercity and commuter service.

Long-term potential service improvements not reflected in forecasts, include:

- The North-South Rail Link, previously proposed, connecting Boston's North and South Stations.
- Rhode Island plans to extend South County Commuter Rail service to the Rhode Island/Connecticut line by 2030 with potential stations in Pawtucket/Central Falls, Cranston, East Greenwich, West Davisville, Kingston, and Westerly.
- New passenger service from Providence to Woonsocket with connections to the NEC north of the proposed Pawtucket/Central Falls Station.
- MBTA Fairmont Line (Dorchester Branch) to be rehabilitated with four new stations and expanded service.

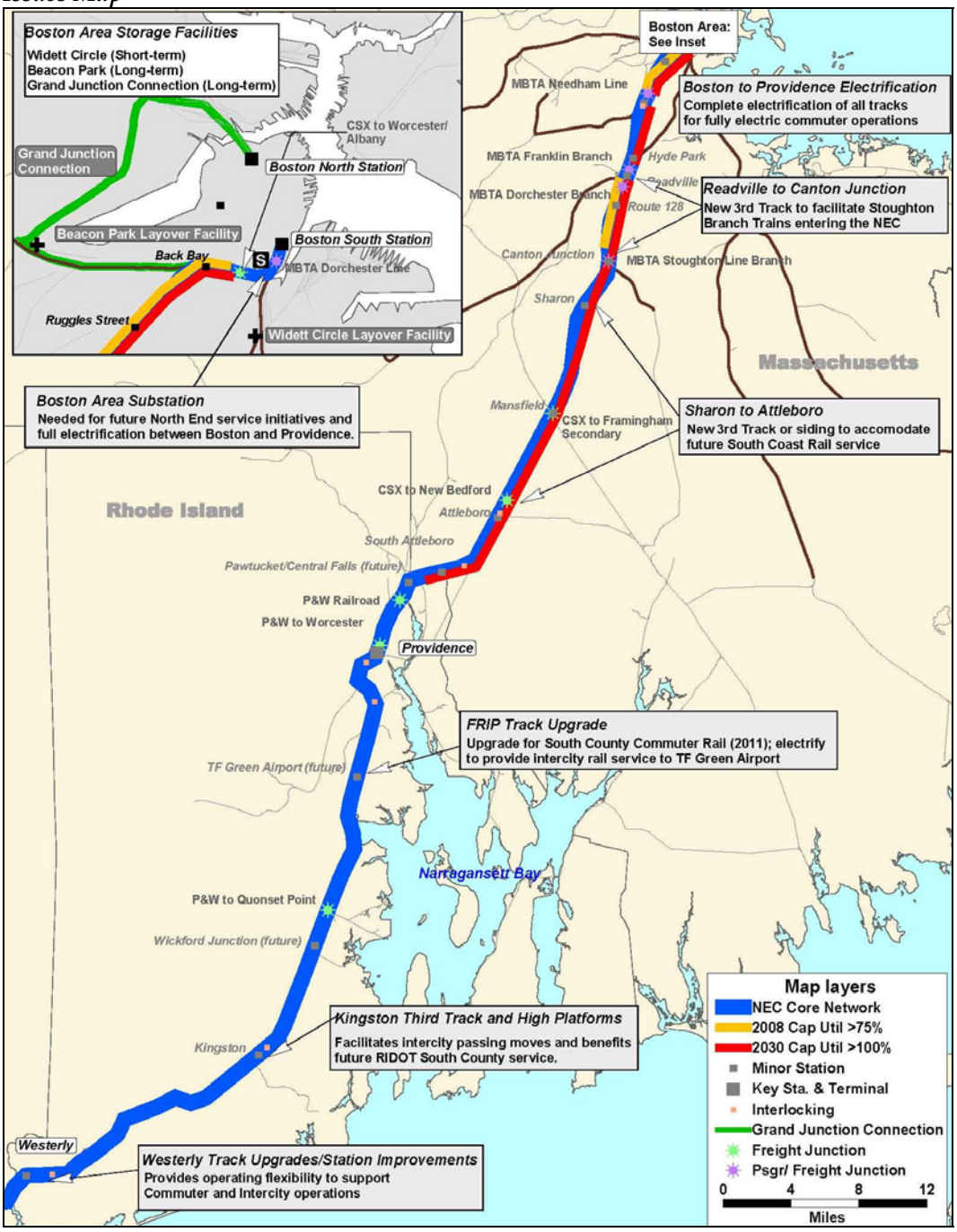
- MBTA Middleborough Line extension to Cape Cod.

Major Issues

The two-track NEC Main Line will need to accommodate significant increases in intercity and commuter rail services. Capacity utilization at South Station, Back Bay and Route 128 stations are already greater than 75%, without improvements. By 2030 virtually the entire railroad from Attleboro to South Station will be over 100% capacity. South Station and Southampton Yard are also at capacity. Lack of storage capacity at Southampton Yard requires trains to be stored on platforms, further limiting capacity at South Station. Intercity train passing locations are limited and are necessary to provide additional capacity and improve NEC North End trip-times. Portions of the terminal track are not electrified, further limiting operating flexibility for intercity services. A study of Boston South Station operations and infrastructure is proposed as a next step in the Master Plan.

Boston, Massachusetts to Westerly, Rhode Island

Issues Map



Capital Investment Programs

Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information including scope and costs are identified in the Appendices.

Segment Programs

Boston Terminal Storage and Capacity Improvements **$286m**

South Station and Southampton Street Yard are at capacity. Additional terminal capacity will be needed to accommodate 2030 service levels and equipment needs. These plans include initiating MBTA commuter service to Fall River/New Bedford and adding intercity trains to the "Inland Route" between Boston South Station and Springfield. Short-term plans call for adding up to six station tracks at South Station, undertaking a full Environmental Impact Statement (EIS) for the proposed North-South Rail Link and initiating a terminal capacity study similar to those currently underway in New York and Washington.

Attleboro Line Congestion and Capacity Improvements **$384m**

Capacity utilization analysis undertaken as part of the Master Plan process indicates that much of the line from Boston to Attleboro will be over capacity by 2030. Major components of this program include the addition of third track north and south of the Canton Viaduct in the vicinity of Route 128 Station, Sharon and Mansfield. These projects will help bridge a two-track section in what is otherwise a predominately three-track railroad. Electrification of main line tracks and sidings will improve infrastructure utilization and facilitate fully electric commuter operations in the long-term. High platforms would be installed at a number of stations, including Ruggles Street, Hyde Park, Readville, Sharon, Canton Junction, Mansfield and Attleboro, to further improve infrastructure utilization through decreased boarding times.

Rhode Island Service Expansion and Trip-time Improvements **$143m**

Rhode Island recognizes the potential for commuter rail service to reduce congestion and improve mobility, and has planned a 20-mile extension of existing commuter rail service from Boston to south of Providence, known as the South County Commuter Rail Service (SCCRS) to Wickford Junction. South County Commuter Rail will extend existing commuter service between Providence, Warwick Intermodal/T.F. Green Airport, and Wickford Junction. This commuter rail service is coming to Rhode Island through a partnership between Amtrak, RIDOT and the MBTA.

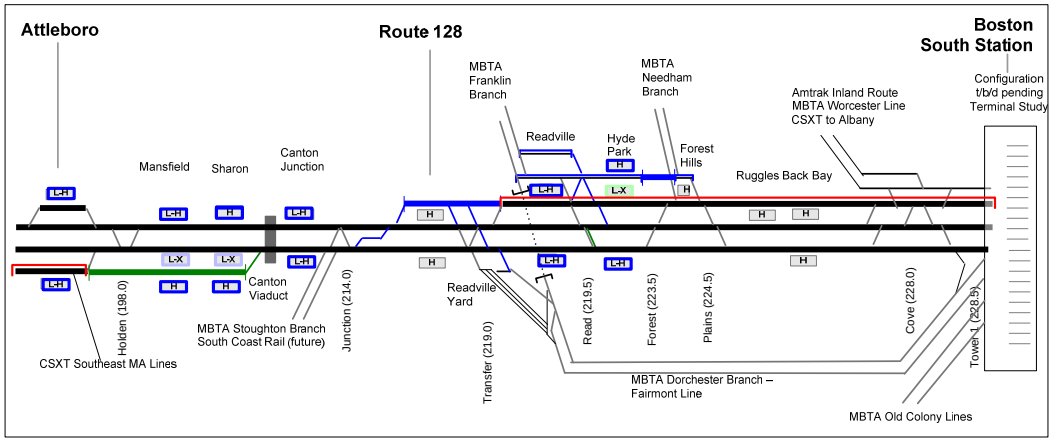
Scheduled to begin in 2012, this service will include new stations at Warwick Intermodal/T.F. Green Airport and Wickford Junction. Near term, projects under construction on the dedicated freight track adjacent to Amtrak's North East Corridor (NEC) include track upgrades and new interlockings to accommodate passenger rail. Long range plans under consideration would allow Amtrak intercity service to stop at Warwick Intermodal Station. Other improvements under review include added track capacity at Kingston and Westerly stations. Also in the long term, this section of railroad would potentially benefit from full electrification of all tracks to provide maximum operating flexibility for intercity and commuter services.

Station Improvements **$126m**

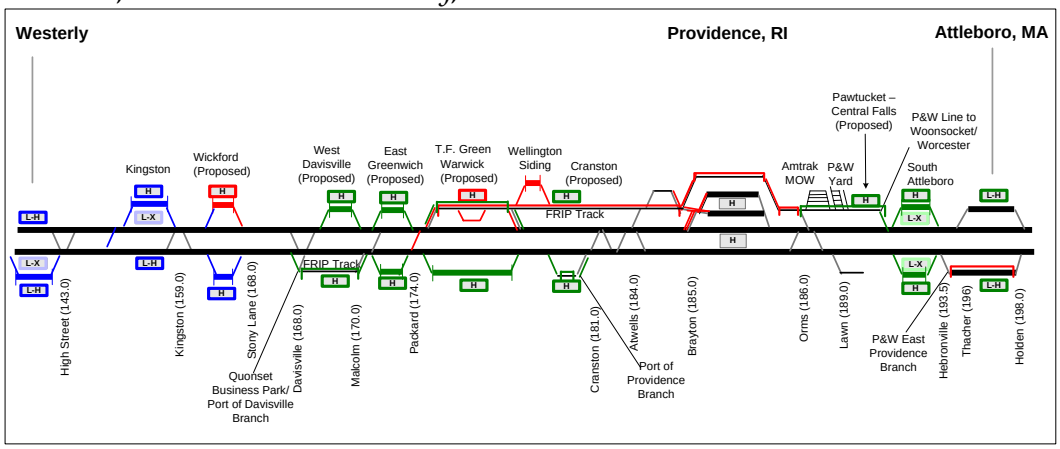
Station improvements are designed to bring facilities to a state of good repair and meet accessibility requirements under the Americans for Disabilities Act (ADA). There are 10 projects in this program of which six are ADA and SGR related improvements. In addition, two new stations are being constructed in the short-term, one at Warwick/T.F. Green Airport and the other at Wickford Junction. Potential additional station stops include Pawtucket/Central Falls and East Greenwich under a future phase of Rhode Island commuter rail service.

Track Schematics

Boston, Massachusetts to Attleboro, Massachusetts



Attleboro, Massachusetts to Westerly, Rhode Island



Legend:

Black color illustrates current conditions, red color illustrates short-term projects, blue color illustrates medium-term projects and green color illustrates long-term projects.

Colors are used to illustrate potential phases of program work—all estimates are preliminary and subject to refinement.

Projects identified on the schematics contain benefits and impacts which are not exclusive to Amtrak, but rather all users of the segment. Individual program and project information including scope and costs are identified in the Part III of the report and in the Appendices.

Westerly, Rhode Island to New Haven, Connecticut

Physical Assets

Amtrak owns and operates infrastructure on this 70-mile segment paralleling the Connecticut shoreline. The segment is primarily two-tracks with passing sidings near Groton, Old Saybrook, and Guilford, CT. There are five movable bridges in the segment within a 20-mile stretch from Mystic to Old Saybrook, all built in the early 1900's. The Thames River Movable Bridge was replaced in 2008. Two others- Niantic and Connecticut River- are scheduled for replacement within five years. Amtrak's Springfield Line joins this segment at Mill River Junction, north of Union Station New Haven. This important station is shared by Amtrak *Regional*, *Vermonter*, and *Acela Express* intercity services, as well as Shore Line East (SLE) and Metro-North (MNR) commuter rail services.

Table 2: Current and Future Operating Statistics –Westerly, RI to New Haven, CT

	Current	2030
Ridership (000)		
SLE	484	1,179
Amtrak	2,301	4,505
Total	**2,785**	**5,684**
Train Miles (000)		
SLE	202	580
Amtrak	863	1,090
Total	**1,065**	**1,670**
Passenger Miles (000)		
SLE	10,314	43,747
Amtrak	139,045	272,249
Total	**149,359**	**315,996**
Avg Weekday Trains (Max in Segment)		
SLE	23	56
Amtrak	38	48

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments.

Current Operations

Amtrak and SLE (passenger), and CSXT and P&W (freight), operate in or through the segment. SLE operates 23 trains (11 daily round trips) between New Haven and Old Saybrook, providing approximate half-hourly peak period service and hourly off-peak service. In peak periods, two morning trains are extended to Bridgeport and Stamford and two evening trains originate at Stamford and operate to Bridgeport, New Haven and the shoreline. Additionally, in the evening two trains (one round trip) provide service to New London.

The P&W is prominent in the segment, operating at least daily through freight trains serving regional industries on route, including several large quarries.

Amtrak operates 38 trains (19 daily round trips) on this segment en route to Boston and New York and points south, providing approximate hourly service in the peak and bi-hourly service in off peak periods, with a mix of *Acela Express* and *Regional* services. An additional 12 trains (six round trips) operate off the Springfield Line to New Haven; eight are shuttles operating between Springfield and New Haven; two trains, including the Vermonter, operate through New Haven to New York and points south. Current and future passenger rail operating statistics are provided in Table 2 above.

Future Plans

SLE is expected to grow from 23 trains (11 daily round trips) to 56 trains (28 daily round trips) between New Haven and Old Saybrook, providing approximate half-hourly peak service and hourly off-peak service throughout the day. SLE service to New London will increase dramatically from two trains (one daily round trip) to 24 trains (12 round trips). Future SLE service train numbers include a reduction of 12 deadhead trains with the anticipation of an east-end rail yard (potentially located in New London). Amtrak's 2030 plans call for an increase in service between Boston and New York from 38 trains (19 daily round trips) to 48 trains (24 daily round trips), providing hourly *Acela Express* and near hourly *Regional* service between Boston and New York.

Service off the Springfield Line, from Mill River Junction into New Haven Union Station, is expected to grow from 12 Amtrak intercity trains (six daily round trips) to 28 trains (14 daily round trips) by 2030, with an additional 36 New Haven-Hartford-Springfield commuter service trains, and supported by double-tracking and electrification of the line, with additional intercity trains from Boston over the Inland Route and Greenfield, Massachusetts over the Knowledge Corridor/Connecticut River Line.

Amtrak is also planning approximately 20 minutes of trip-time improvements between Boston and New York by 2030, reinforcing the need (as discussed below) to replace aging bridges, to install dual-side high platforms and a storage yard to minimize potential conflicts between intercity and commuter services.

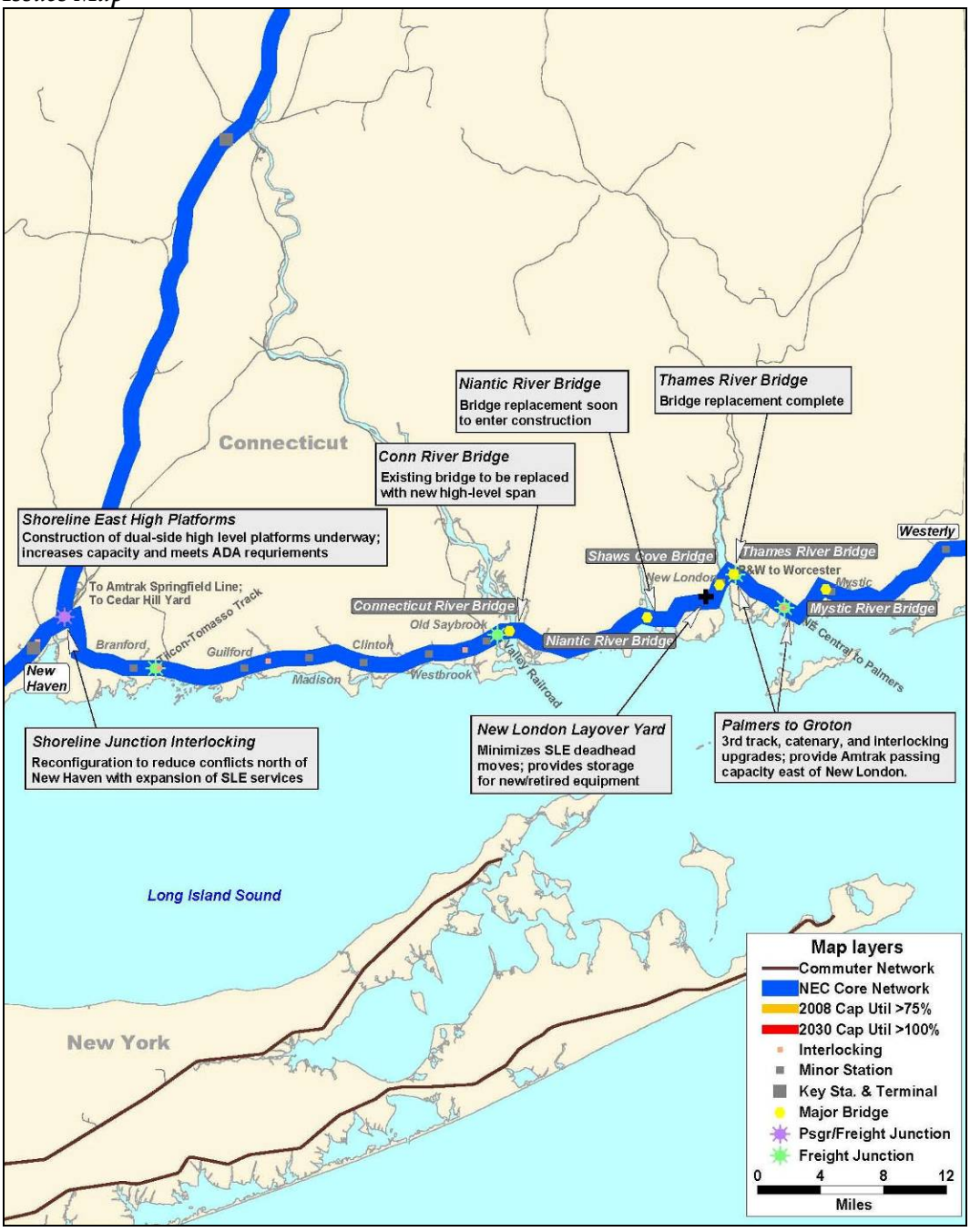
Major Issues

Coastal regulations designed to protect the fishing and boating industries by limiting movable bridge openings do not permit more frequent daytime service than is provided today. The Connecticut Department of Environmental Protection also limits Amtrak to 39 trains per weekday. An analysis must be conducted to pursue waivers needed to provide additional intercity and commuter frequencies; preliminary discussions are underway with the US Coast Guard. Replacement of the Niantic and Connecticut River bridges over the next five years will pose significant challenges to maintaining continuity of operations. Currently, SLE equipment is stored at New Haven and more than a dozen trains must "deadhead" between New Haven and Old Saybrook, consuming scarce capacity.

In order to significantly expand commuter service, an equipment storage yard is needed in the vicinity of New London, minimizing the service inefficiency of deadhead movements. The Connecticut Department of Transportation, which operates SLE service, is also in the process of upgrading platforms, from single-side, low-level to dual-side, high-level with pedestrian overpasses to minimize crossover moves that consume track capacity. Additional track capacity will be needed to accommodate expanded service, including new sidings or track upgrades at Guilford, Clinton, Old Saybrook, Waterford and Groton.

Westerly, Rhode Island to New Haven, Connecticut

Issues Map



Capital Investment Program

Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information including scope and costs are identified in the Appendices.

Segment Programs

Eastern Connecticut Service Expansion Improvements **$736m**

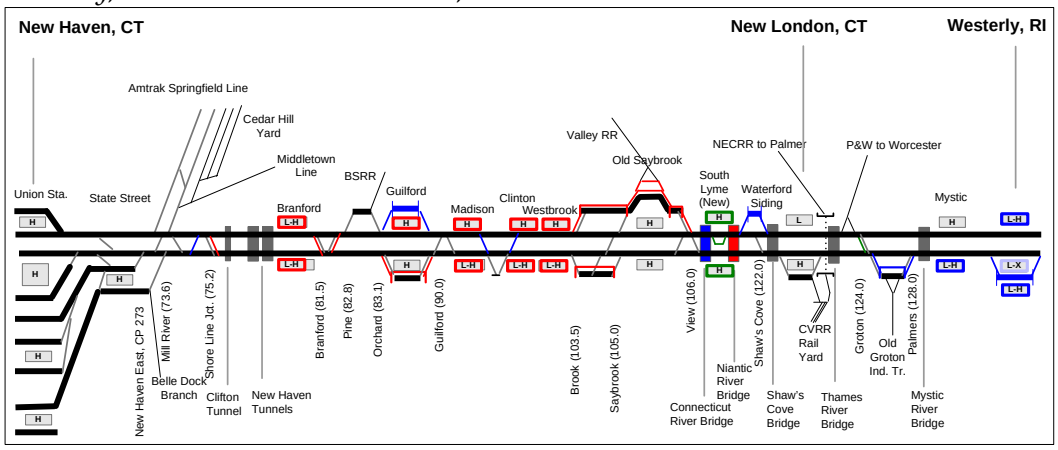
Amtrak and SLE 2030 service plans represent significant increases in service over current levels. SLE plans will significantly expand service to New Haven, Old Saybrook and New London. New London will require new storage and layover facilities to accommodate additional trains and reduce deadhead movements. Track, interlocking and electrification upgrades previously identified in the North End High Speed Rail Configuration Plan are needed to meet 2030 commuter and intercity service goals. Two movable bridges, the Niantic River and Connecticut River, are beyond SGR and decreasing in reliability, causing delays. Partial construction funding for the Niantic Bridge replacement is contained in Amtrak's capital program and not included here. Replacement of the Connecticut River bridge span is in design; feasibility analysis is underway to look at a potential high-level configuration to improve reliability and speeds and minimize bridge openings. Dual side high-platforms with pedestrian overpasses at SLE stations, portions of which are in construction or complete, will minimize crossover moves and improve capacity utilization.

Station Program **$55m**

There are four projects within this program, three of which provide state of good repair and accessibility improvements to Amtrak served stations. In the longer term, a potential plan calls for the construction of a new station on the eastern portion of this segment in the vicinity of South Lyme.

Track Schematic

Westerly, Rhode Island to New Haven, Connecticut



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New Haven, Connecticut to New Rochelle, New York

Physical Assets

This 56-mile New Haven Line is owned by the state of Connecticut and MTA in New York and operated by MTA Metro-North Railroad (MNR). The railroad consists of four tracks except an 11-mile three-track stretch between New Haven and Devon, CT. ConnDOT is undertaking a major upgrade program to this line.

Five movable bridges are located within 30 miles between Devon and Cos Cob, CT. The Pequonnock Bridge has been renewed, the other four (the Housatonic River, Saugatuck River, Norwalk River and Mianus River bridges) are scheduled for rehabilitation or replacement within the next ten years. Catenary replacement with a modern, constant tension system is currently underway and the signal system will be upgraded from four to six aspects on this densely trafficked segment. Union Station New Haven anchors the north end of the segment and the station is shared by Amtrak *Regional*, *Vermonter*, and *Acela Express* intercity services, as well as SLE and MNR commuter rail services.

Table 3: Current and Future Operating Statistics –New Haven, CT to New Rochelle, NY

	Current	2030
Ridership (000)		
MNR	34,190	57,007
Amtrak	2,759	5,402
Total	**36,949**	**62,409**
Train Miles (000)		
MNR	2,278	3,999
Amtrak	774	995
Total	**3,052**	**4,994**
Passenger Miles (000)		
MNR	585,521	1,171,597
Amtrak	152,667	298,920
Total	**738,188**	**1,470,517**
Avg Weekday Trains (Max in Segment)		
MNR	225	405
Amtrak	42	54

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments.

Current Operations

Amtrak and MNR (passenger), and CSXT and P&W (freight), operate in the segment. MNR trains operate between New Haven and New Rochelle, diverging from the NEC south of New Rochelle Station and terminating at Grand Central Terminal in Manhattan. MNR operates approximately 74 trains (37 round trips) between New Haven and Grand Central Terminal. South of New Haven, service is more frequent, with 82 daily trains (41 round trips) from Bridgeport, CT, 92 trains (46 round trips) from South Norwalk, CT, and 225 trains (112 round trips) from Stamford. Three branch lines – Waterbury, Danbury and New Canaan - enter the NEC at Devon, South Norwalk, and Stamford respectively. Most branch services terminate at the junction stations at the NEC with passengers transferring for access to Grand Central Terminal, (Waterbury Branch trains interchange passengers at Bridgeport). Some New Canaan Branch and Danbury Branch peak period trains operate through to Grand Central Terminal.

Amtrak operates 42 (21 round trips) *Acela Express*, *Regional*, and *Vermonter* intercity trains via this segment, providing approximate half-hourly service in the peak and hourly service in off-peak period. 19 daily round trips operate through to Boston South Station. The remaining four trains (two round trips) enter the segment via Amtrak's Springfield Line, connecting to the NEC at New Haven. Current and future passenger rail operating statistics are provided in Table 3 above.

Future Plans

A commuter rail service initiative under consideration by MNR is to extend some of its New Haven Line service to Penn Station via Amtrak's Hell Gate Line. This service would be in addition to increased MNR service to Grand Central Terminal. Approximately 284 trains (142 daily round trips) to Grand Central Terminal and 121 trains (60 daily round trips) to Penn Station are proposed, an increase of approximately 80 percent over current service levels to Grand Central Terminal today.

Amtrak intercity service between New Haven and Manhattan will increase from 42 trains (21 round trips) to 54 trains (27 round trips), providing four round trips during the peak hours and approximate half-hourly service during the off-peak period. Amtrak is also planning up to approximately 20 minutes of trip-time improvements between Boston and New York City by 2030, which will benefit from additional passing capability on this segment to maintain existing levels of reliability for all users. Amtrak will work with the states and commuter railroads to develop expanded rail service offerings to appeal to air and auto travelers.

Other long-term potential service improvements not reflected in forecasts include the following:

- Waterbury Branch improvements – increased service to Bridgeport Station with possible continuing service to Grand Central Terminal.
- Danbury Branch – long term plans call for increased service frequencies and a new station in Georgetown, CT. An extension of the Danbury Branch to New Milford, CT is being studied.

Major Issues

Capacity utilization is already greater than 75% in the vicinity of Bridgeport, Stamford, and New Rochelle stations and along the three-track section between New Haven and Devon. By 2030, capacity utilization at these locations, along with virtually all of the Main Line between Stamford and New Rochelle will be over 100%.

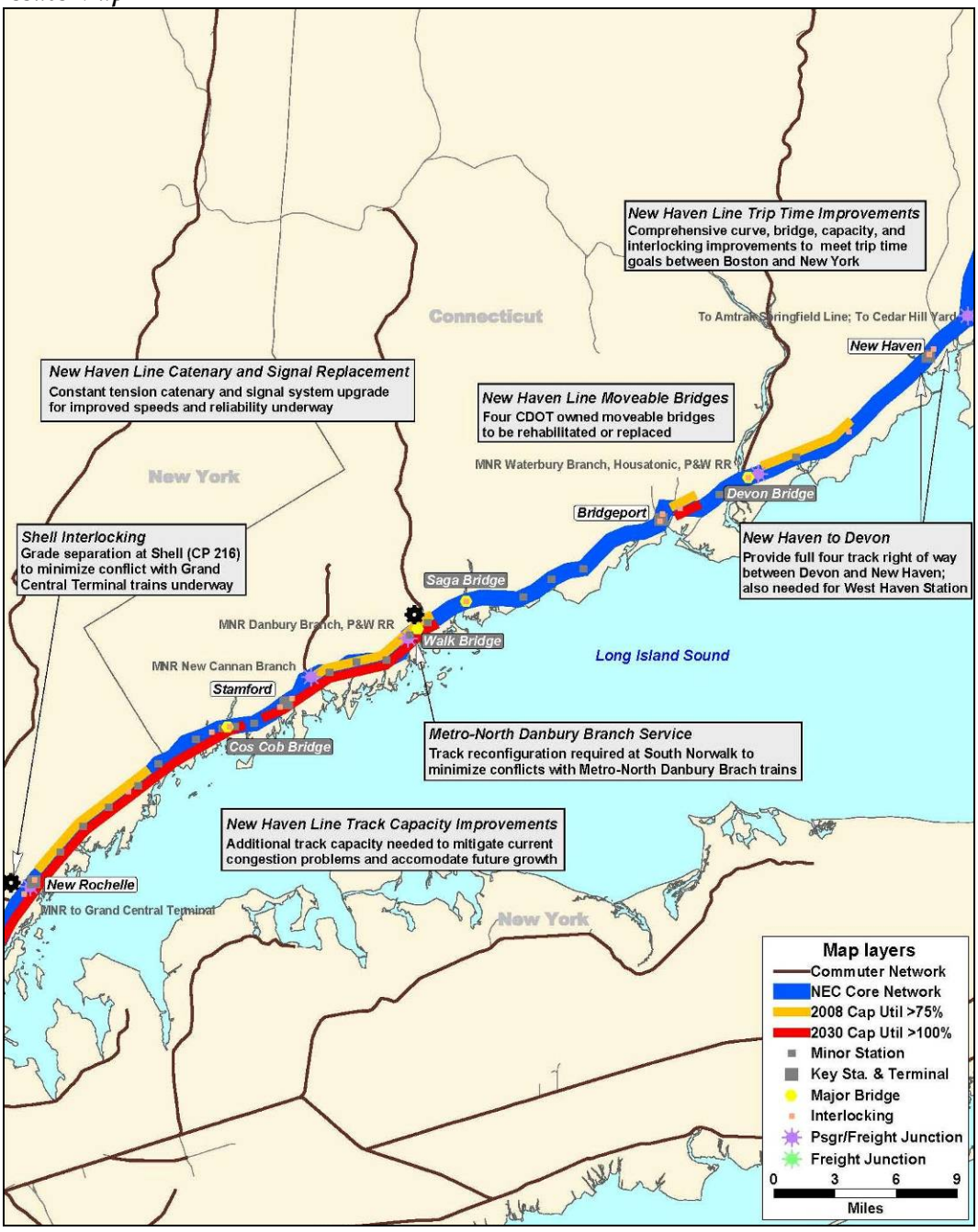
The four movable bridges that have not yet been addressed are beyond their useful life and in need of rehabilitation or replacement. Existing signal and catenary systems prohibit speeds needed to meet proposed intercity service levels and trip goals.

Heavy train traffic and sharp track curvature also affect operating speeds and capacity. Amtrak is limited to two trips per hour through the segment under an agreement with Metro-North. Grade separations at the Waterbury, Danbury, and New Canaan branch junctions may be needed as service levels increase.

A potential grade-separated junction (or "flyover") would allow Amtrak trains to bypass conflicting movements at New Rochelle, NY, between Amtrak's Hell Gate Line and the Metro-North's New Haven Line to Grand Central Terminal. This junction is one of the busiest on the Northeast Corridor, with traffic levels exceeding 265 trains per average weekday currently with that number expected to grow to more than 455 trains per day by 2030. This project was recommended under the Northeast Corridor Transportation Plan – New York to Boston, published in 1994, prior to a major program of improvements leading to introduction *Acela* high-speed service from Boston to Washington in 2002. However, the project was scaled-back due to budgetary constraints in the late 1990's to an "at-grade" (or non-elevated) configuration which was recently completed. FRA staff have recommended inclusion of the flyover project in the Master Plan; however, further study is needed to evaluate the benefits of a flyover, relative to the current, improved configuration, which has resulted in higher speeds and reduced the number of conflicts between Amtrak and Metro-North trains using this junction. Metro-North Railroad has indicated that it believes the short and long-term service disruptions and environmental impacts of a flyover have the potential to negate any benefits relative to the current configuration.

New Haven, Connecticut to New Rochelle, New York

Issues Map



Capital Investment Programs

Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information including scope and costs are identified in the Appendices.

Segment Programs

New Haven Line Trip-time and Capacity Improvements **$4,391m**

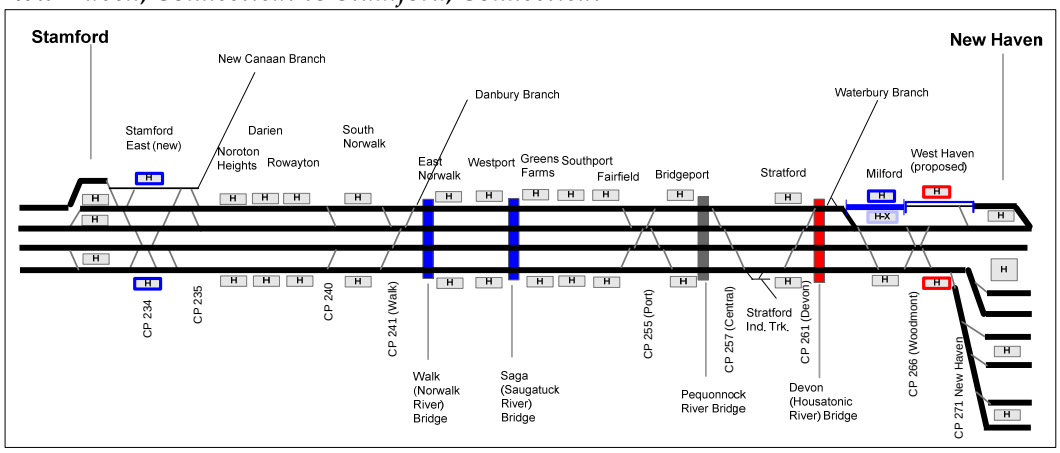
Track curvature, heavy congestion, and aging infrastructure constrain operating capacity on the New Haven Line. Four CDOT owned movable bridges are beyond SGR and in need of either rehabilitation (Norwalk and Saugatuck river bridges), or replacement (Devon and Cos Cob Bridges). ConnDOT is currently installing constant tension catenary on the Connecticut-owned portion of the line and upgrading tracks, with plans to upgrade the signal system in the future, including installation of Positive Train Control (PTC). Curve modifications and related ballast deck bridge improvements are needed to support higher speeds. Completion of the fourth track between New Haven and Devon will provide needed capacity on the eastern section of the line.

Station Program **$227m**

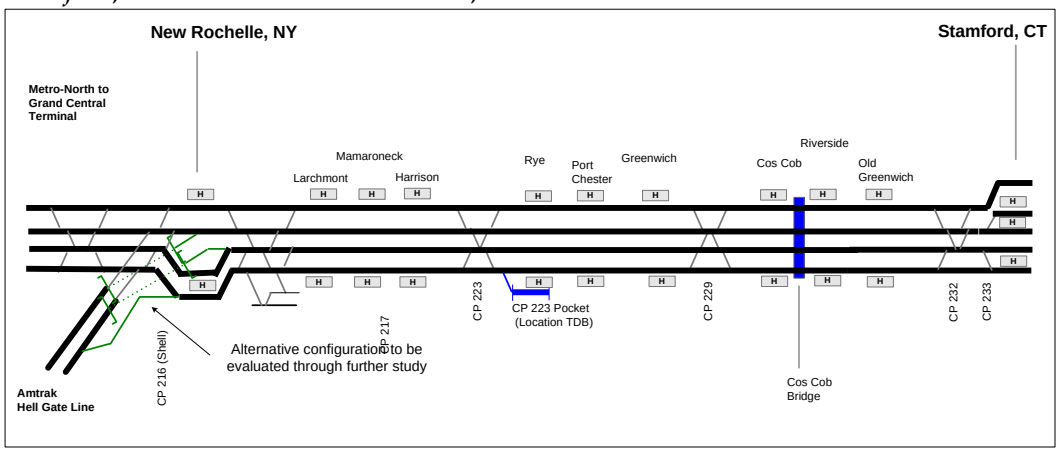
Station improvements are designed to meet ADA and State of Good Repair (SGR) requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are eight projects within this program. Four of the projects are for ADA and SGR related improvements. New or improved station facilities are proposed in West Haven, Bridgeport, Stamford, and Fairfield, CT.

Track Schematics

New Haven, Connecticut to Stamford, Connecticut



Stamford, Connecticut to New Rochelle, New York



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New Rochelle, New York to Penn Station New York

Physical Assets

The 22-mile segment between New Rochelle, NY and Penn Station New York, including the Hudson River tunnels, is the busiest and most complex segment of the NEC.

It includes the Hell Gate Line from New Rochelle, NY to Harold Interlocking in Queens, tunnels under the East River and Hudson Rivers into Manhattan and Penn Station New York. Penn Station is the busiest on the NEC and nationwide in terms of both passenger and train volumes. LIRR and NJT are the commuter rail tenants at Penn Station. NJT service is described in the Penn Station-Trenton segment.

Located in the Bronx, the Pelham Bay Movable Bridge on the Hell Gate Line is a two-track bridge built in the early 1900's. Train access to Penn Station is via the East River and North River tunnels. The East River tunnels consist of four single-track tubes connecting Queens and Manhattan. The North River Tunnels consist of two single-track tubes under the Hudson River connecting Weehawken, NJ and Manhattan. Both sets of tunnels were built in the early 1900's with the opening of Penn Station. Amtrak's Sunnyside Yard in Queens is shared with LIRR and NJT.

Table 4: Current and Future Operating Statistics –New Rochelle, NY to Penn Station New York

	Current	2030
Ridership (000)		
MNR	0	n/a
LIRR	86,100	109,812
Amtrak	2,781	5,445
Total	**88,881**	**115,257**
Train Miles (000)		
MNR	0	771
LIRR	721	547
Amtrak	326	421
Total	**1,047**	**1,739**
Passenger Miles (000)		
MNR	0	n/a
LIRR	214,726	162,985
Amtrak	52,839	103,459
Total	**268**	**266**
Avg Weekday Trains (Max in Segment)		
MNR	0	121
LIRR	581	441
Amtrak	168	234

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments. (Note: LIRR figures for 2030 are for Penn Station only and do not include trains diverted to Grand Central Terminal as a result of the East Side Access project.)

Current Operations

Amtrak, LIRR, and NJT (passenger), and CSXT and P&W (freight), operate in the segment. The ten LIRR branch lines – Port Washington, Hempstead, Oyster Bay, Port Jefferson, Ronkonkoma, Far Rockaway, West Hempstead, Long Beach, Babylon, and Montauk – operate 580 daily trains over five miles of Amtrak's Hell Gate Line between Sunnyside, Queens and Manhattan. NJT also operates dozens of trains between Penn Station and Sunnyside Yard for midday and overnight storage. Freight service is not permitted through Penn Station New York.

Amtrak operates 142 daily trains via Penn Station, including *Acela Express* and *Regional* services traveling through Penn Station to points north and south on the NEC. Almost all Amtrak long-distance routes on the East Coast (i.e. *Silver Service to Florida; the Crescent to New Orleans*; the *Palmetto to Charlotte, NC; the New York leg of the Lake Shore to Chicago and the tri-weekly Cardinal to Chicago*) originate or terminate at Penn Station and are serviced at Sunnyside Yard. Over 1,000 trains operated by LIRR, NJT, and Amtrak access Penn Station each weekday. Current and future passenger rail operating statistics are provided in Table 4 above.

Future Plans

Planned commuter rail expansions include the following:

- MNR is evaluating the potential to extend New Haven and Hudson Line service to Penn Station via Amtrak's Hell Gate Line and Empire Connection respectively, subject to the outcome of the Penn Station Operations Study, currently underway. MNR envisions about 60 daily round trips via the New Haven Line and 60 daily round trips via the Hudson Line.
- LIRR is constructing Eastside Access (ESA) infrastructure crossing under the Hell Gate Line in Queens to provide access to Grand Central Terminal and when completed will operate approximately 220 round trips to Penn Station and 200 round trips to Grand Central by 2030.
- NJT is constructing new Access to the Region's Core (ARC) infrastructure in northern New Jersey to connect to a new 34th Street Station north of Penn Station. NJT's capacity to midtown Manhattan will increase by over 200 daily round trips.

The number of Amtrak trains at Penn Station is planned to increase from 100 to 136 by 2030, providing expanded *Acela Express* and *Regional* service between Boston and Washington. Amtrak is also planning trip-time improvements between Boston and New York and between New York and Washington by 2030 which will benefit from additional passing capability on this segment to maintain existing levels of reliability for all users. Amtrak will work with the states and commuter railroads to develop expanded rail service offerings to appeal to air and auto travelers.

Other long-term potential service improvements not reflected in forecasts, include the following:

- MNR service to Stewart International Airport via the Port Jervis Line
- Potential joint operations of commuter rail service east and west though Penn Station New York

Major Issues

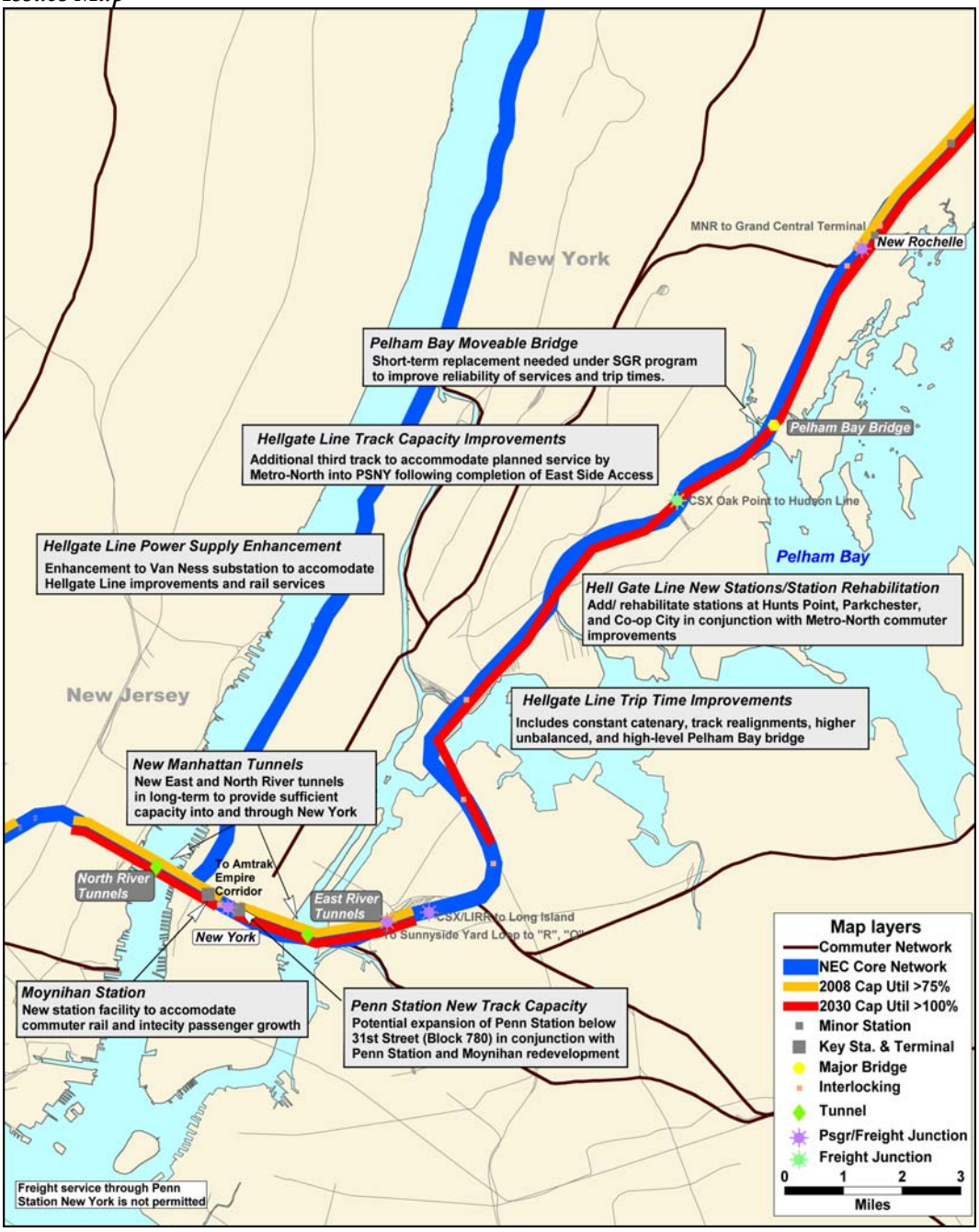
Current capacity at Penn Station is approaching 100%. Despite significant infrastructure improvements in ESA and ARC, capacity through both sets of tunnels will continue to be constrained. By 2030, virtually the entire segment between New Rochelle and Bergen Interlocking in New Jersey will be over 100%. The total net system capacity may prove to be insufficient, pending current capacity analysis. The increase in utilization is largely a result of increased intercity service between Boston and New York and potential MNR

commuter rail service to Penn Station that is intended, in part, to occupy the vacated service slots of LIRR as it redirects services to its new East Side Manhattan terminal facility. The potential configuration and cost for configuring the Hell Gate Line to accommodate commuter services will be subject to further analysis as part of the Penn Station Capacity Study before proposed major capital projects are progressed. The intensive maintenance requirements for major structures in the segment also affect capacity and operating reliability. The current New York tunnels, more than 100 years old, continue to require high levels of maintenance and track outages to keep the tunnels in service, adversely affecting operations in to and out of Penn Station. New intercity rail tunnels are needed to provide additional capacity for future Amtrak services through Manhattan and to relieve capacity constraints at Penn Station. The Pelham Bay Movable Bridge is beyond a state-of-good-repair (SGR) and must be replaced.

As one of the next steps, the Master Plan is proposing a more detailed study of key terminal locations, including Boston, New York and Washington, all of which are effectively at capacity today (see Part I, Section 7). The follow-up effort will identify options for providing additional capacity in the medium to long term, including the potential to expand track and platform facilities under Penn Station New York south of the current structures. Expansion of Penn Station to the Farley Post Office (Moynihan Station) across Eighth Avenue is entering the final design phase. This project will help improve passenger flows in Manhattan and provide a long-sought signature station facility suitable as a gateway to the nation's largest city. New North and East River Tunnels in the long-term are needed to provide sufficient capacity through New York.

New Rochelle, New York to Penn Station, New York

Issues Map



Capital Investment Programs

Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information including scope and costs are identified in the Appendices.

Segment Programs

Hell Gate Line Service Expansion and Trip-time Improvements **$817m**

Based on preliminary service plans and the capacity analysis performed for the Master Plan, the predominately two-track Hell Gate Line bridge is projected to be over capacity by 2030, due to an increase in intercity trains combined with proposed tentative plans to operate commuter service on this line. This report includes a "placeholder" for added track capacity and other supporting infrastructure on the Hell Gate Line, but these projects, if needed, will be defined in greater detail based on additional analysis and simulation modeling as part of the Penn Station Capacity Study, currently underway.

Penn Station New York Capacity Improvements **$12,568m**

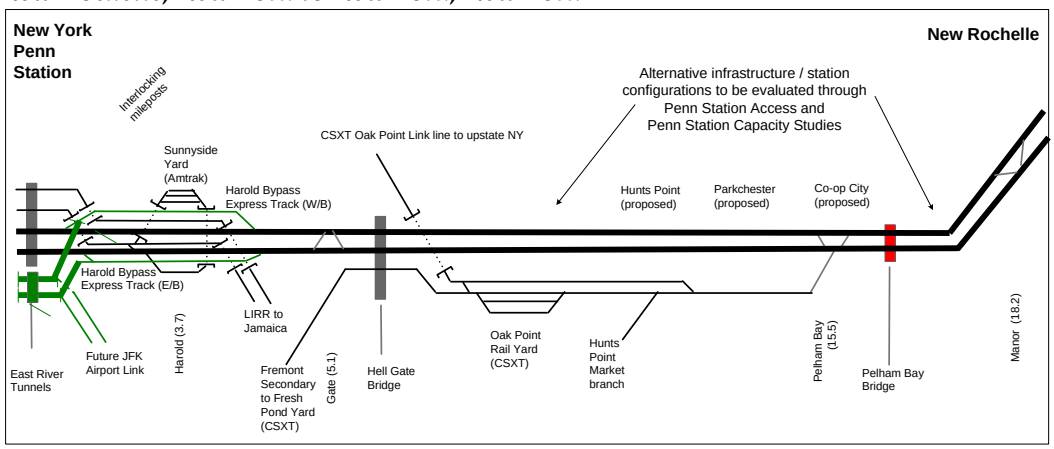
Over 1,000 Amtrak, NJ TRANSIT, and LIRR trains operate via Penn Station each weekday, consuming virtually all available track and platform capacity during extended peak periods. MNR's plans to provide service to Penn Station, via both the Empire Corridor and Hell Gate Line routes in the long-term will increase total volumes by an additional 200 trains to approximately 1,200 daily trains. In the short-term, high density signal systems have the potential to provide greater throughput for trains accessing Penn Station from the east. The stand-alone commuter rail facility initiatives currently under construction, LIRR East Side Access (ESA) and NJT Access to the Region's Core (ARC), will provide some capacity relief at Penn Station in the medium term, but the station is expected to be significantly over capacity by 2030. A new Moynihan Station in the Farley Post Office building will improve passenger flows and provide midtown Manhattan with a signature intercity passenger rail station befitting the nation's largest city. Given forecast growth and service plans, in the long run, additional capacity will be needed in Manhattan to accommodate future rail service levels. Alternatives to be evaluated in the next phase of the Master Plan include new tunnels under the East and Hudson Rivers, as well as expanded platform track capacity adjacent to, or under, the existing Penn Station facilities, and a direct link to JFK International Airport.

Station Improvements **$160m**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are two projects in this program. One project is related to ADA and SGR related improvements at Penn Station. The other project relates to potential new Hell Gate Line commuter rail stations in the Bronx, at Hunts Point, Parkchester and Co-Op City, as part of MNR access to Penn Station.

Track Schematics

New Rochelle, New York to New York, New York



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Penn Station New York to Trenton, New Jersey

Physical Assets

The infrastructure of the 58-mile segment between Penn Station New York (Penn Station) and Trenton is owned and operated by Amtrak. The segment is predominantly four tracks with two-track and three-track sections north of Newark Penn Station leading to the North River tunnels, and a six-track section between Elmora and Union interlockings.

Penn Station is owned by Amtrak, which operates *Regional*, *Acela Express*, and long-distance train routes traversing New Jersey. Penn Station is the Manhattan terminus for both NJT and LIRR. Trenton Station is the interchange point between NJT's Northeast Corridor Line and SEPTA's R7 Line. The two-track movable Portal Bridge, built in the early 1900's, is scheduled to be replaced in the short-term with fixed bridge spans and supporting infrastructure totaling five tracks. The project received environmental clearance in 2008 and is nearing completion of its preliminary engineering.

Table 5: Current and Future Operating Statistics –Penn Station New York to Trenton, NJ

	Current	2030
Ridership (000)		
NJT	57,782	98,625
Amtrak	6,282	11,248
Total	**64,064**	**109,873**
Train Miles (000)		
NJT	3,371	5,046
Amtrak	1,895	2,508
Total	**5,266**	**7,554**
Passenger Miles (000)		
NJT	805,588	1,302,480
Amtrak	353,657	633,178
Total	**1,159,245**	**1,935,658**
Avg Weekday Trains (Max in Segment)		
NJT	359	571
Amtrak	100	136

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments.

Current Operations

Amtrak and NJT (passenger), and CSXT and CSAO (freight), operate in the segment. NJT's Northeast Corridor Line service terminates at Trenton Station but many trains continue on to a storage and maintenance facility located in Morrisville, PA. The North Jersey Coast, Raritan Valley, Morris & Essex and Montclair-Boonton Lines operate partially via the NEC Main Line. NJT provides approximately 180 daily round trips to Penn Station; 21 during the peak hour. The NEC is busiest between Secaucus and Swift Interlocking where NJT Hoboken division trains enter and exit the corridor. Approximately 359 trains operate daily in this three-mile segment.

Amtrak operates 100 trains (50 round trips) between Penn Station and points south, providing approximately four round trips during the peak periods (*Acela Express*, *Regional*, *Keystone*, and long-distance services) and better than half-hourly service throughout the day. *Acela Express* service operates on "clock face" headways with

departures from Penn Station to Washington at the top of every hour. Current and future passenger rail operating statistics are provided in Table 5 above.

Future Plans

NJT is building new Access to the Region's Core (ARC) infrastructure adjacent to the NEC in northern New Jersey that will connect to a new 34th Street Station north of Penn Station New York. NJT service volume to midtown Manhattan will be more than double current levels, to approximately 285 daily round trips, serving Penn Station New York and 216 round trips serving 34th Street Station. The agreement between Amtrak and NJT in connection with ARC provides for NJT to transfer to Amtrak two slots in the peak AM hour in the existing North River Tunnels, which NJT had rights to under a prior agreement with Amtrak.

By 2030, Amtrak intercity service through New Jersey will increase from around 100 trains (50 round trips) to approximately 132 trains (66 round trips), providing better than half-hourly *Acela Express* and *Regional* services throughout the day and better than 15-minute frequencies during the peaks, which will include non-stop *Acela Super Express* service between New York and Washington. Amtrak is also planning up to 30 minutes of trip-time improvements between New York and Washington D.C. by 2030 which will require additional passing capability on this segment to maintain existing levels of reliability for all users. Amtrak will continue to work with the states and commuter railroads to develop expanded rail service offerings to appeal to air and auto travelers.

Amtrak and states of New York, New Jersey, and Pennsylvania are evaluating a service plan to provide two daily round trips between New York and Scranton/Binghamton via the previously abandoned Lackawanna Cutoff, a portion of which is currently being programmed for re-installation for a NJT commuter rail service extension. The proposed intercity service on this route, which is in the earliest stages of planning, will require an agreement with NJT to use their tracks west of a connection with the NEC between Newark and Penn Station New York, and may require other capital investment.

Major Issues

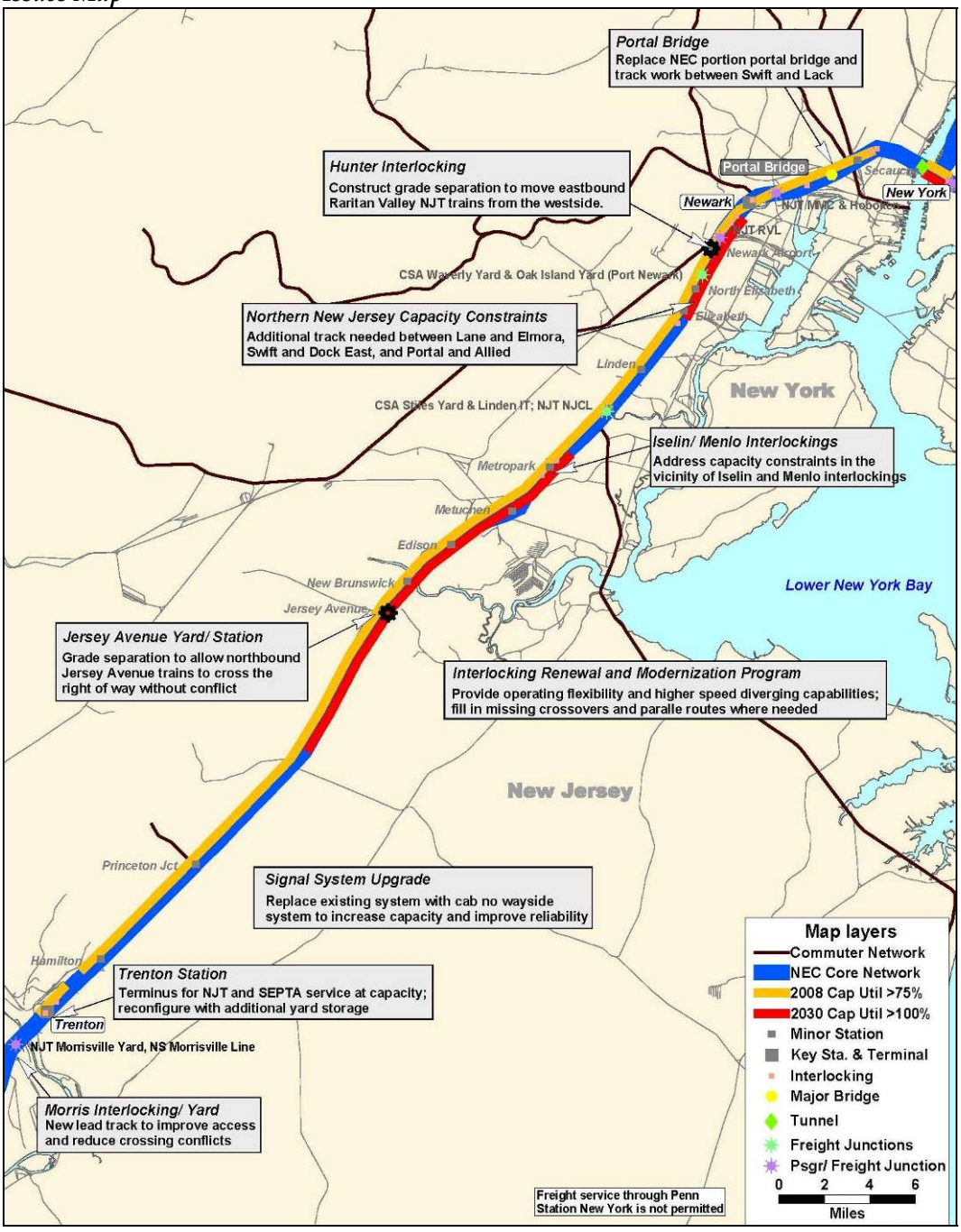
Heavy train volumes, along with two- and three-track chokepoints in northern New Jersey are key factors in trip-time and capacity constraints within the segment. Most of the segment is already operating at or above 75% capacity utilization and is over 100% between Newark and Elizabeth, as well as north of New Brunswick. Despite significant infrastructure improvements as a result of the ARC project and the Portal Bridge replacement, the 34-mile section between Penn Station and County Interlocking will largely be at capacity in 2030 unless additional investment are made. At-grade junctions through the segment also limit service expansion opportunities.

At-grade commuter rail junctions at County and Hunter interlockings consume Main Line capacity approaching Penn Station, contributing to delays during the AM peak period. The current configuration at Trenton Station limits capacity and degrades operating flexibility. Additional track, platform, and storage capacity is needed at Trenton Station to meet 2030 demand. Areas of sharp curvature, such as the "S" curve in Elizabeth and in the vicinity of Lincoln Interlocking near Metuchen constrain operating speeds and trip-times.

As one of the next steps, the Master Plan is proposing more detailed study of key terminal locations; including Boston, New York and Washington, all of which are effectively at capacity today (see Section 7). The follow-up effort will identify options for providing additional capacity in the medium to long term, including the potential to expand track and platform facilities under Penn Station New York south of the current structures. Conversion of the Farley Post Office to a new train hall would improve passenger operations at station level while providing a new landmark train hall in New York City. New North and East River Tunnels in the long-term are needed to provide sufficient capacity through New York. A Trenton area capacity study is also planned.

Penn Station New York to Trenton, New Jersey

Issues Map



Capital Investment Programs

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Segment Programs

Portal Bridge Improvements **$1,900m**

Portal Bridge is beyond SGR and a significant chokepoint for operations in northern New Jersey and the greater New York region. Amtrak and NJT are replacing the existing bridge span with two spans providing a five-track ROW across the Hackensack River. The Amtrak-owned northern span will consist of three tracks connecting to NEC infrastructure and a new third track between Swift and Lack interlockings.

New Jersey Trip-time and Capacity Improvements **$1,079**

The New York to Trenton segment is the busiest section on the South End. Despite significant infrastructure improvements in the ARC project and Portal Bridge Replacement, service growth will cause available capacity to decrease by 2030, particularly south of Newark Penn Station, unless major improvements are constructed. Signal system replacement and interlocking upgrades will permit higher speeds while increasing capacity throughout the segment. Additional running track segments in the vicinity of Secaucus, Newark and through Elizabeth will increase operating flexibility and mitigate congestion. Grade separations at Hunter Interlocking, where NJT Raritan Line trains merge with the NEC and potentially other locations, will eliminate commuter train crossing conflicts.

Trenton Area Capacity Improvements **$100m**

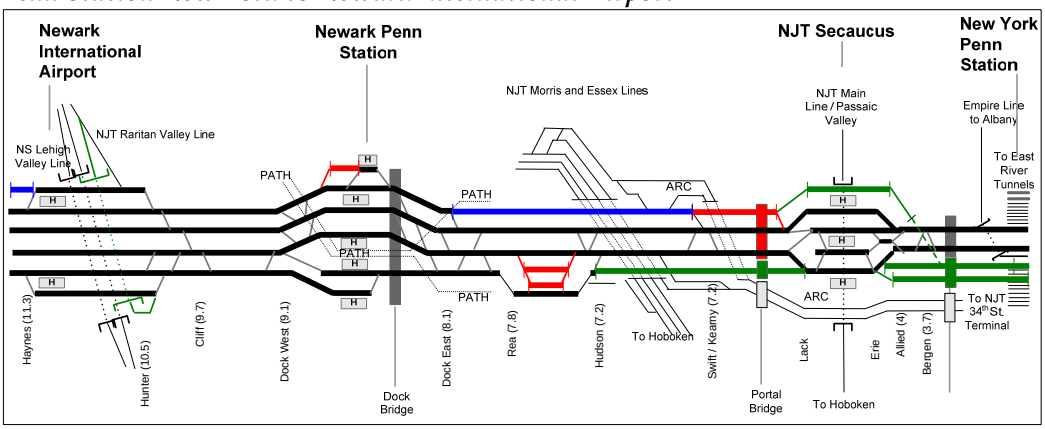
Existing station configuration and yard facilities at Trenton will not accommodate future service levels. SEPTA lacks adequate storage facilities and must deadhead trains to/from Trenton. Proposed SEPTA storage facilities at Barracks Yard would reduce SEPTA deadhead moves, freeing capacity for revenue operations. Morris Interlocking will also be improved, reducing crossing conflicts at Morrisville Yard. (Note: Parts of Trenton Station are already undergoing improvements).

Station Improvements **$102m**

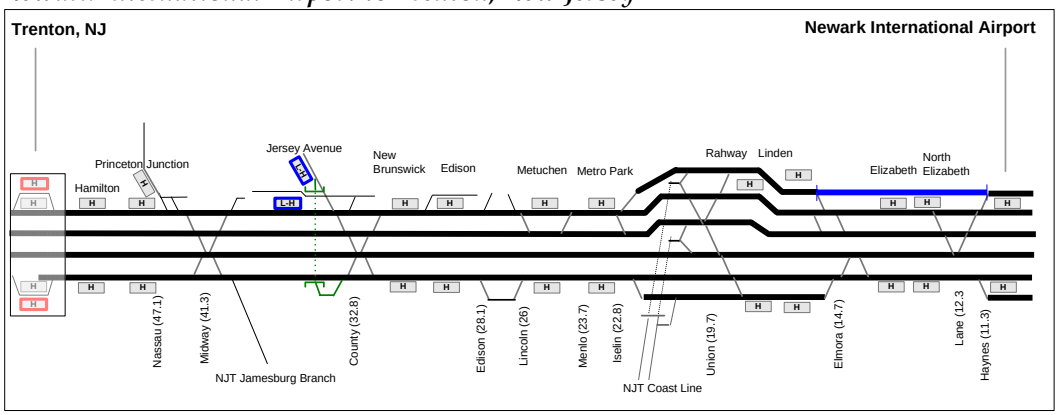
Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are nine projects in this program, seven of which are related to ADA and SGR improvements. The remaining two focus on improving Newark Penn Station operations.

Track Schematics

Penn Station New York to Newark International Airport



Newark International Airport to Trenton, New Jersey



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Trenton, New Jersey to Newark, Delaware

Physical Assets

This 70-mile Amtrak owned and operated segment, which runs parallel to Interstate 95, is predominantly four tracks with two- and three-track sections near Philadelphia and Wilmington. Philadelphia's 30th Street Station is the busiest station in the segment. Twenty-three intercity, long distance, and commuter routes serve the station on two platform levels. Amtrak and NJT share the lower level where nine Amtrak routes and one NJT route operate; SEPTA occupies the upper level, operating thirteen Regional Rail Line segments. Amtrak's Harrisburg Line joins the segment at North Penn Interlocking, connecting the Harrisburg Line to the NEC. NJT's Atlantic City Line joins the NEC at Shore Interlocking, eight miles north of 30th Street Station. Wilmington Station is Delaware's largest intercity and commuter rail station.

Table 6: Current and Future Operating Statistics –Trenton, NJ to Newark, DE

	Current	2030
Ridership (000)		
NJT	198	739
SEPTA	17,830	22,451
AMTRAK	6,290	11,262
Total	**24,318**	**34,452**
Train Miles (000)		
NJT	64	96
SEPTA	1,092	1,416
AMTRAK	2,032	2,711
Total	**3,188**	**4,223**
Passenger Miles (000)		
NJT	15,351	24,869
SEPTA	107,026	158,163
AMTRAK	395,134	707,439
Total	**518**	**890**
Avg Weekday Trains (Max in Segment)		
NJT	28	42
SEPTA	139	143
AMTRAK	100	132

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments.

Current Operations

Amtrak, NJT and SEPTA (passenger), and CSXT, CSAO, and NS (freight), operate in the segment. NJT's Northeast Corridor Line terminates at Trenton Station with a storage and maintenance facility located in Morrisville, PA. NJT's Atlantic City Line operates 14 round trips daily, providing approximately hourly service throughout the day. SEPTA operates two lines; the R7 between Trenton and Philadelphia and the R2 between Philadelphia and Newark, DE along the NEC. The R7 line operates 62 trains (31 round trips), providing three peak-period round trips and hourly service throughout the day. The R2 operates 18 trains (9 round trips), providing two peak-hour round trips and hourly service throughout each weekday. Other Regional Rail lines, the R1, R6, and R8 operate over short sections of the NEC near 30th Street Station.

Amtrak operates 100 trains (50 round trips) between Penn Station and points south, providing four round trips during the peak hours and hourly *Acela Express*, *Regional* and *Keystone* service throughout the day. South of Philadelphia, Amtrak volumes are slightly lower as *Keystone* and *Pennsylvanian* services diverge to Amtrak's Harrisburg Line. 80 trains (40 round trips) operate daily between Philadelphia and Washington, D.C., providing approximately hourly *Acela Express* and *Regional* service throughout the day

with increased levels of service during peak periods. Eight long-distance trains (four round trips) also operate on the segment daily. Current and future passenger rail operating statistics are provided in Table 6 above.

Future Plans

Commuter service improvements currently on the drawing board include:

- SEPTA Trenton Line service to Trenton, NJ is planned to increase from 62 trains (31 round trips) to 82 trains (41 round trips), providing three peak-hour round trips and half-hourly service throughout the day.
- SEPTA Wilmington/Newark Line service to Newark, DE is planned to increase from 18 trains (nine round trips) to 26 trains (13 round trips), providing four round trips per hour during peak periods.
- NJT Atlantic City Line service will increase from 28 trains (14 round trips) to 42 trains (21 round trips), providing half-hourly service during the peak periods and hourly service throughout the day.

Daily Amtrak service between Trenton and Philadelphia is planned to increase from 100 (50 round trips) to 132 trains (66 round trips), providing four round trips during the peak periods and better than half-hourly *Acela Express* and *Regional* service throughout the day, including non-stop *Super Express* Amtrak service between New York and Washington during peak demand periods. Daily service between Philadelphia and Washington, D.C. is planned to increase from 80 trains (40 round trips) to 108 trains (54 round trips), providing four round trips during the peak periods and half-hourly *Acela Express* and *Regional* throughout the day, including *Super Express* service described above. Amtrak is also planning up to 30 minutes of trip-time improvements between Washington and New York by 2030 which will benefit from additional passing capability on this segment to maintain existing levels of reliability for all users. Amtrak will also work with the states and commuter railroads to develop expanded rail service offerings to appeal to air and auto travelers.

Amtrak and the States of Delaware and Maryland are evaluating a service plan for new corridor service between New York and the Maryland Eastern Shore via Newark and Dover, DE. The service would run on the NEC Main Line between New York and Newark, DE before diverting to the NS-owned Delmarva Secondary. Two daily round trips are planned for 2030.

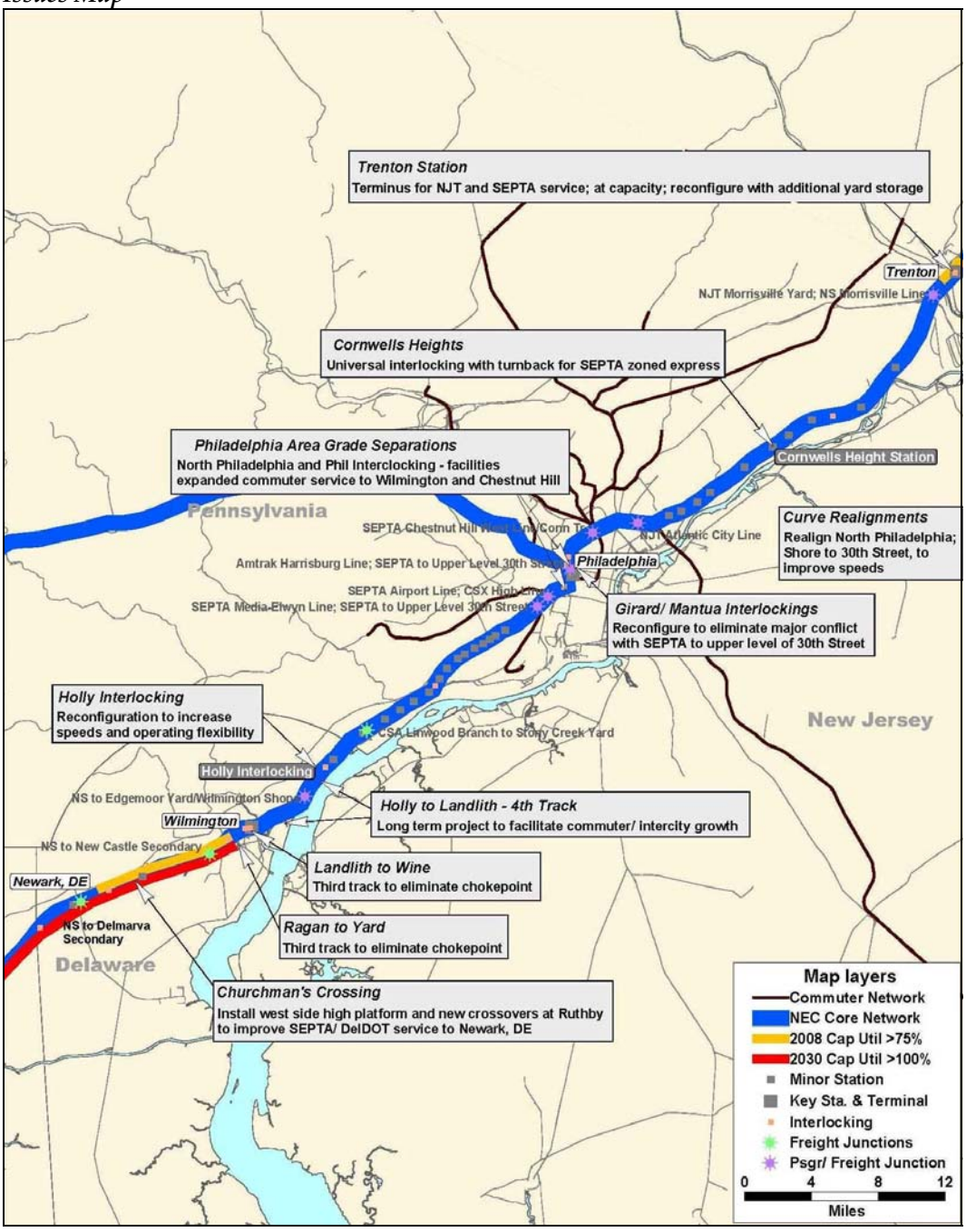
Major Issues

Capacity is constrained around the two- and three-track bottlenecks in Philadelphia and Wilmington. The constraints are particularly evident as the number of tracks decrease from four to two in the six miles between Holly and Wine interlockings, and the two-track segment between Yard and Ragan interlockings, in northern Delaware. Sharp curvature which exists between Trenton and Philadelphia constrain trip-times and operating speeds. At-grade commuter rail junctions at North Philadelphia, Penn, and Phil interlockings consume track capacity and contribute to delays entering and exiting 30th Street Station. Crossing conflicts at Morrisville Yard contribute to delays south of

Trenton. Lack of high-level platforms on Track 1 at Wilmington Station impairs operating flexibility for both intercity and commuter services.

Trenton, New Jersey to Newark, Delaware

Issues Map



Capital Investment Programs

Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information, including scope and costs are identified in the Appendices.

Segment Programs

Philadelphia Area Commuter and Intercity Improvements **$270m**

Increased train volumes through Shore, Zoo, and Phil interlockings is resulting in conflicts near 30th Street Station. Grade separations in the long-term at North Philadelphia and Phil interlockings and improved configuration at Zoo interlocking would reduce the conflicts between commuter, freight, and intercity trains operating through Philadelphia. This will be evaluated via capacity analysis. Interlocking improvements in the vicinity of Cornwells Heights would permit SEPTA zoned express service on its R7 Trenton Line to Philadelphia.

Delaware Track Expansion and Interlocking Improvements **$399m**

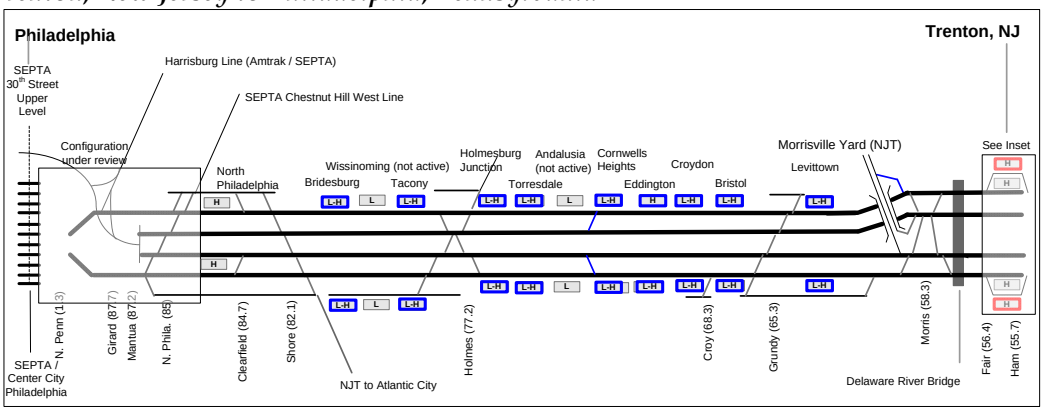
Sections of the NEC in Delaware will be at capacity by 2030, particularly near Wilmington Station where two- and three-track bottlenecks exist. Installation of a third track between Yard and Ragan interlockings and a new Orange Street Bridge will provide some relief south of Wilmington Station. Third and fourth track and interlocking improvements north of Wilmington will also improve track capacity and operations. Reconfiguration of Holly and Ruthby interlockings will provide operational flexibility through Wilmington. Reconfiguration of the Newark, DE station area infrastructure will provide additional station capacity, operating flexibility and storage facilities for SEPTA and future MARC commuter rail services while providing a freight bypass track and station access for future Delaware downstate services.

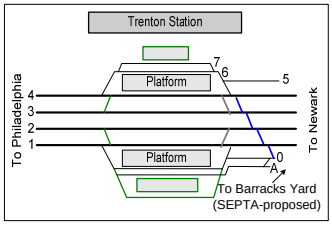
Station Improvements **$456m**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are 14 projects in this program, seven of which are related to ADA and SGR improvements. The remaining seven focus on improving and expanding service through new or relocated stations and platform improvements (Freight trains currently operate through the northbound platforms at Bridesburg, Tacony and Eddington on the R7 Trenton Line).

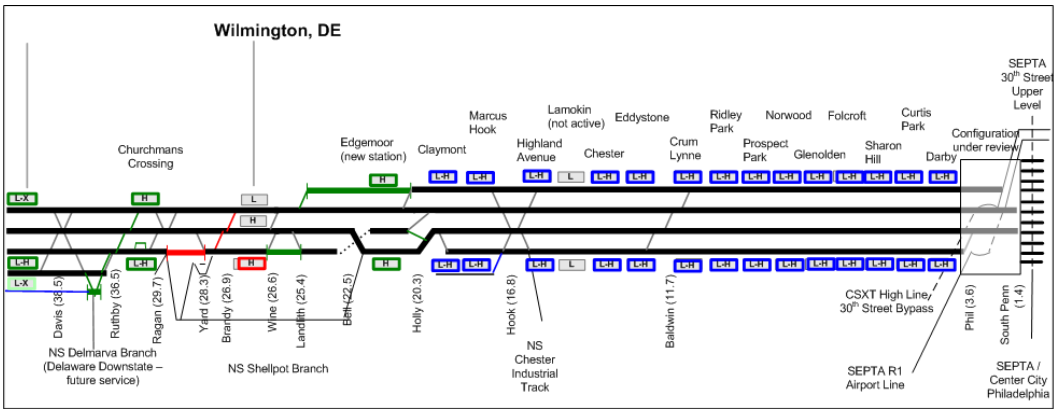
Track Schematics

Trenton, New Jersey to Philadelphia, Pennsylvania





Philadelphia, Pennsylvania to Newark, Delaware



Legend:

Black color illustrates current conditions, red color illustrates short-term projects, blue color illustrates medium-term projects and green color illustrates long-term projects.

Colors are used to illustrate potential phases of program work—all estimates are preliminary and subject to refinement.

Projects identified on the schematics contain benefits and impacts which are not exclusive to Amtrak, but rather all users of the segment. Individual program and project information including scope and costs are identified in the Part III of the report and in the Appendices.

Newark, Delaware to Washington Union Station

Physical Assets

This 97-mile Amtrak owned and operated segment between Newark, DE and Washington Union Station (Washington) consists of two- and three-track sections with two-track areas primarily in the northern sections and on the approaches to Baltimore and Washington.

Built in the late 1800's, the two-track B&P Tunnels in Baltimore are a major chokepoint for intercity, commuter, and freight operations in the northeast. There are also three major bridges located within a 20-mile stretch in northern Maryland, two of which are movable. Obsolescent bridge design limits capacity and speed at these crossings. The B&P Tunnels and major bridges have all exceeded their useful life and require replacement.

Table 7: Current and Future Operating Statistics –Newark, DE to Washington Union Station

	Current	2030
Ridership (000)		
MARC	6,600	15,800
Amtrak	4,953	8,867
Total	**11,553**	**24,667**
Train Miles (000)		
MARC	712	2,552
Amtrak	2,556	3,515
Total	**3,268**	**6,067**
Passenger Miles (000)		
MARC	159,416	628,715
Amtrak	458,216	820,379
Total	**617,632**	**1,449,094**
Avg Weekday Trains (Max in Segment)		
MARC	83	149
Amtrak	82	112

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership figures represent the estimated maximum number of riders within the segment including those traveling to / from other segments.

Baltimore Penn Station (Baltimore Station) and Washington Union Station are the two largest stations in the segment. Baltimore Station is shared by Amtrak and MARC commuter rail services. Washington Union Station is shared by Amtrak, including state-supported and long-distance trains, MARC and VRE commuter rail services. BWI Airport Station provides intercity and commuter rail service connecting to BWI Airport, located one mile from the station via shuttle bus.

Current Operations

Amtrak and MARC (passenger), and CSXT and NS (freight), (CP retains currently-inactive freight trackage rights), operate in the segment. MARC operates Penn Line service between Perryville and Baltimore, with 18 trains (nine round trips) during the peak periods. More Penn Line service is provided between Baltimore and Washington where MARC operates 52 trains (26 round trips), providing half-hourly service during peak periods and hourly service during off-peak periods. MARC's Camden and Brunswick Lines also provide service to Washington but operate only on a small section of the NEC Main Line between "C" Interlocking and Washington Union Station.

This segment also hosts up to 28 daily through freight trains serving the ports of Baltimore and Wilmington, and the Delmarva Peninsula.

Amtrak operates approximately 80 trains (40 round trips) daily via the segment, providing approximately hourly *Acela Express* and *Regional* service throughout the day with increased levels of service during peak periods. Eight long-distance trains (four round trips) travel through the segment each day. Amtrak's *Capitol Limited* route operates daily between Washington and Chicago, traveling a short distance over the NEC Main Line between Washington and "C" Interlocking. Current and future passenger rail operating statistics are provided in Table 7 above.

Future Plans

Maryland has identified a major rail expansion program (MARC Growth and Investment Plan) which envisions significant increases in service. MARC Penn Line service levels will increase significantly both north and south of Baltimore, providing transit-like services to meet demand at such locations as Aberdeen Proving Ground, Fort Meade (Odenton), Martin Airport, Elkton, MD and Newark, DE. The number of daily round-trips north of Baltimore will increase from nine to 36 round trips, providing frequencies of 20 minutes during the peak periods and hourly service throughout the day. Service between Baltimore and Washington Union Station will increase from 21 to 75 daily round trips, providing 15-minute frequencies during the peak periods and half-hourly service throughout the day.

Daily Amtrak service between Newark, DE and Washington will increase from 80 trains (40 round trips) to 110 trains (55 round trips), providing four round trips during the peak periods and half-hourly *Acela Express* and *Regional* trains throughout the day, including non-stop *Super Express* Amtrak service between New York and Washington during peak demand periods. Amtrak is also planning up to 30 minutes of trip-time improvements between New York and Washington by 2030. Amtrak will also work with the states and commuter railroads to develop expanded rail service offerings to appeal to air and auto travelers.

Major Issues

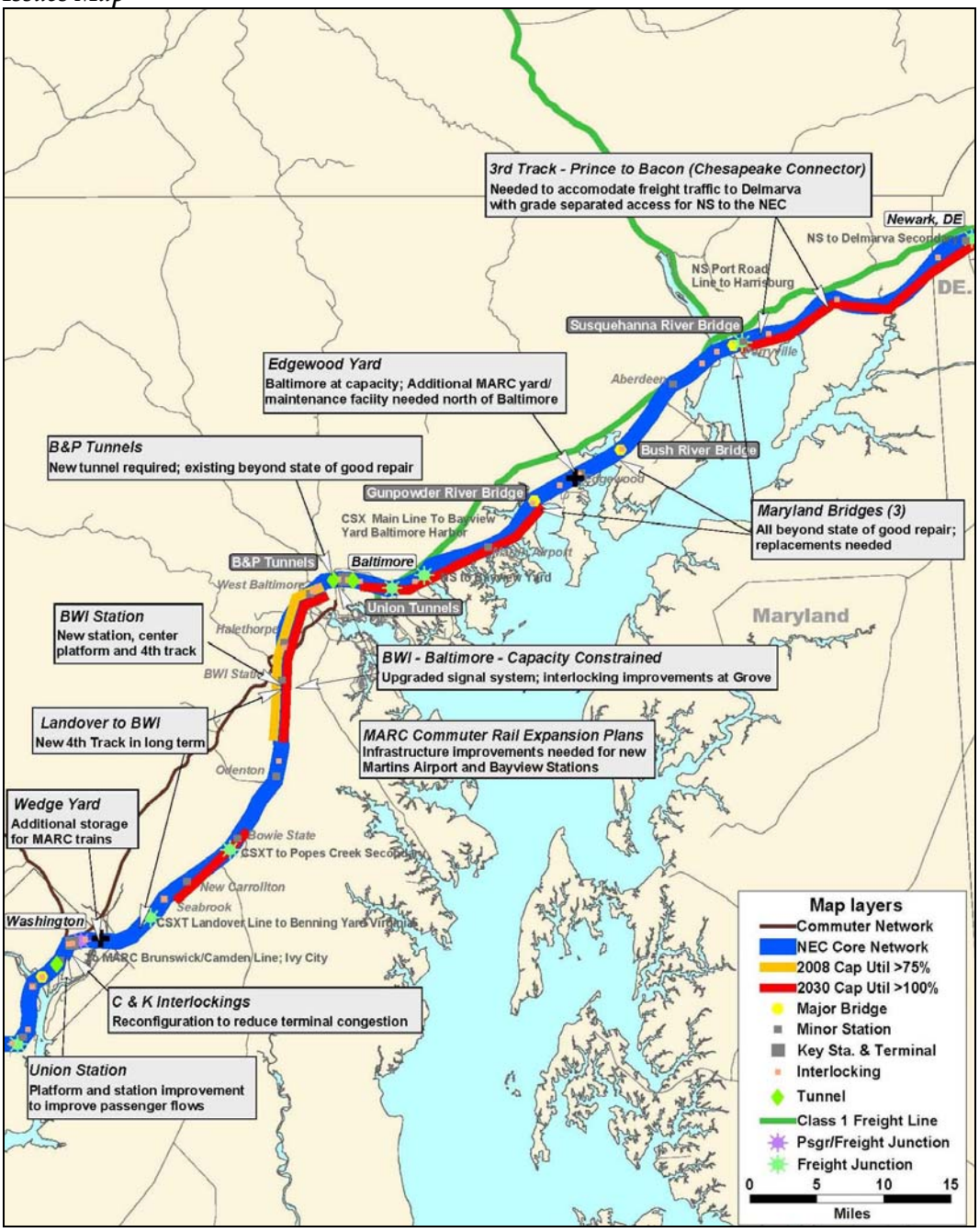
Much of the segment between Washington and Perryville will be approaching capacity or over capacity by 2030. Freight access to the Port of Baltimore is spatially constrained: able to accommodate wide dimension freight but not able to accommodate double-stack trains. The low clearance, sharp curvature and steep grades in the B&P Tunnels limit operating speeds. The three major bridges in northern Maryland (Susquehanna, Bush and Gunpowder rivers) are all two-track spans and reaching the end of their useful lives. Growth at BWI - Thurgood Marshall Airport Station is constrained by the lack of island platforms and undersized station facilities. The lack of storage and layover facilities in the segment forces equipment to be stored at Baltimore and Washington stations, consuming platform capacity. Additional capacity is needed at Washington Union Station, to meet 2030 MARC, VRE and Amtrak service levels, and north of Baltimore to accommodate expanded service to Perryville and Elkton, MD and Newark, DE.

As one of the next steps, the Master Plan is proposing a more detailed study of key terminals including Boston, New York and Washington, all of which are effectively at capacity today (see Part I, Section 7). The follow-up effort will identify options for providing additional capacity in the medium-to-long term. In the short-term, a

comprehensive analysis must performed to better understand the operational needs of Washington Union Station as new and increased passenger rail services, including expanded electrified commuter rail operations, will require access to the station.

Newark, Delaware to Washington Union Station

Issues Map



Capital Investment Programs

Capital projects are grouped into four programs described below. Programs consist of a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information, including scope and costs are identified in Appendices.

Segment Programs

Northern Maryland Bridge and Track Expansion Improvements **$3,065**

The two- and three-track NEC Main Line in northern Maryland will largely be at capacity by 2030. Three bridges in the section, at the Susquehanna, Bush and Gunpowder rivers are all beyond their useful life. Replacement of all three bridges will also improve operating efficiencies. Potential track upgrades between Perry and Prince interlockings and new track to accommodate improved freight operations as well as expanded passenger service between Iron and Prince, and Grace and Bush interlockings will mitigate future bottlenecks. A new storage facility is needed to accommodate MARC 2030 commuter services in northern Maryland. Upon completion, the bridge and track improvements will create a three- and four-track Main Line through northern Maryland capable of accommodating Amtrak, improved freight and MARC future service plans.

Baltimore Penn Station Capacity Improvements **$3,511m**

The current Baltimore Penn Station track and platform configuration cannot accommodate future MARC overnight storage needs. MARC presently stores all of the equipment that operates in peak period Penn Line trains at Penn Station Baltimore. The facility is at capacity and prevents expansion of trains to meet demand. In association with the Northern Maryland Track Expansion Improvements, this project relocates overnight storage from Penn Station to eliminate this constraint. South of the station, the two-track Baltimore and Potomac (B&P) Tunnels are beyond their useful life and cannot adequately serve the mix of trains currently operating in the tunnel. A new commuter and intercity rail tunnel will replace the B&P Tunnels. Freight traffic will benefit from a new freight tunnel connection through Baltimore with connections north and south. North of the station (geographic east), the Paul Interlocking Reconfiguration project is intended to eliminate conflicts between MARC and Amtrak train movements.

Baltimore to Washington Trip-time and Capacity Improvements **$595m**

The two- and three-track Main Line between Baltimore and Washington is expected to be largely at capacity by 2030. The existing signal system design is insufficient to accommodate increased train volumes and reduced trip times. Corridor improvements including signal system, track class and interlocking upgrades, and new track between Bridge and Landover interlockings will result in a three- to four-track Main Line that can accommodate future commuter, freight, and intercity rail services and trip time goals. New track and higher capacity signal improvements south of Landover will facilitate rail traffic in and out of Washington Union Station.

Washington Union Station Capacity Improvements **$309m**

The lower level (through) track and platform configuration constrains commuter and intercity services operating on this level. MARC and VRE commuter railroads will require additional midday storage facilities outside of the station in order to free platform capacity needed as a result of increased services. Interlocking reconfigurations may be required to support expanded operations.

Station Improvements **$534m**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve.

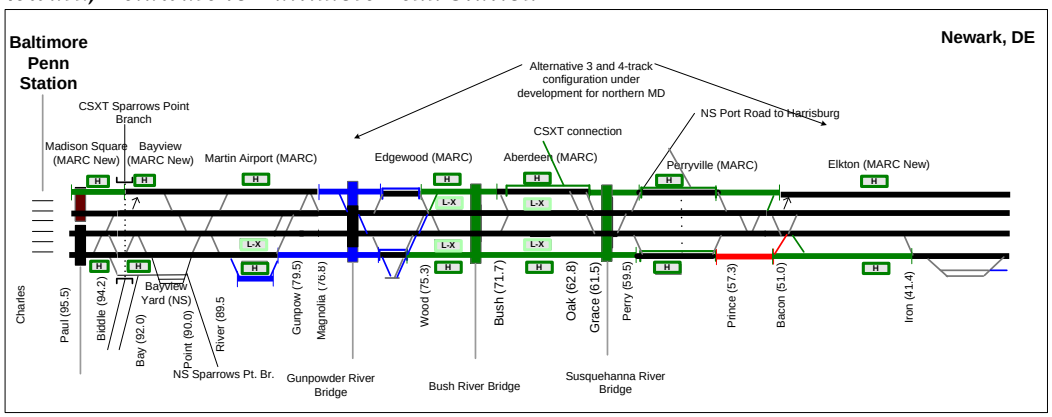
Maryland is planning a new Bayview MARC station in eastern Baltimore to serve the Johns Hopkins Bayview Medical Center via an intermodal interface with the planned Metro Red Line and featuring convenient access to I-895. Enhancements are planned at the Martin State Airport MARC station, one of the most heavily patronized on the Penn Line. Proposed is a new, slightly relocated intermodal station with light rail connections and direct access to the adjacent state airport, which serves charter, corporate, and general aviation and the Maryland Air National Guard. The area is surrounded by existing major industries and the new Crossroads office/industrial/commercial development. MDOT plans to site the new station facility to serve a proposed Transit Oriented Development (TOD) project that would compliment other transit-focused redevelopment in the area. This site has potential as a future Amtrak stop, as it is central to a considerable amount of existing and planned mixed-use development. The community is supportive of a new station and is actively planning for redevelopment of the historic Martin Aviation factory hangars as part of the station facility, museum and mixed-use development.

At Washington Union Station, short-term improvements to the intercity concourse are planned, as well as longer-term improvements to the lower level that are expected to include commercial development of the air rights. The District is interested in developing an intermodal hub to the north of the existing concourse and improving the connection between Metro subway and trains.

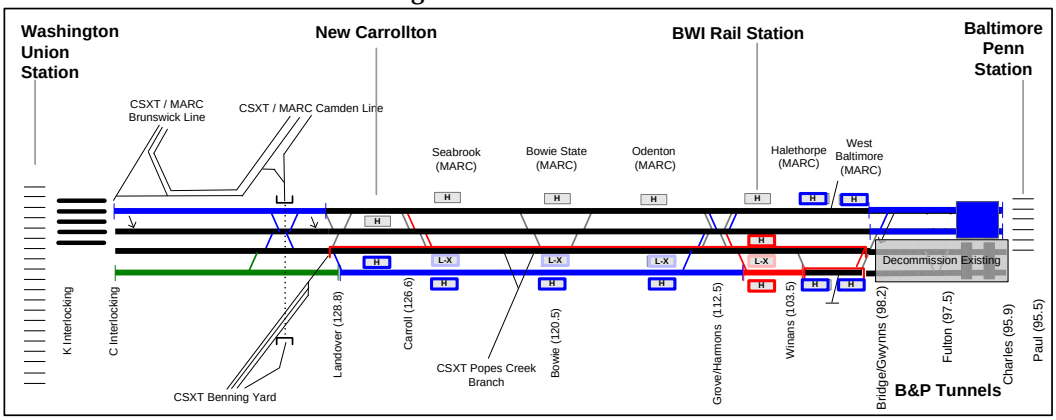
There are 20 projects in this program, six of which are related to ADA and SGR improvements. The remaining projects focus on improving and expanding service through new or relocated stations and platform improvements.

Track Schematics

Newark, Delaware to Baltimore Penn Station



Baltimore Penn Station to Washington Union Station



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Colors are used to illustrate potential phases of program work—all estimates are preliminary and subject to refinement.

Projects identified on the schematics contain benefits and impacts which are not exclusive to Amtrak, but rather all users of the segment. Individual program and project information including scope and costs are identified in the Part III of the report and in the Appendices.

Washington Union Station to Richmond, Virginia

Physical Assets

South of the Amtrak-owned two-track tunnel approach to Union Station, CSXT owns and operates the infrastructure of the 115-mile segment between Washington and Richmond. The segment consists of three tracks on either approach to L'Enfant Station (Washington D.C.), two tracks over the Potomac River Long Bridge, three tracks between Crystal City and Alexandria, VA; three tracks from Alexandria to Franconia (completion 2010), and from Fredericksburg to Hamilton and two tracks elsewhere. The segment is part of the federally-designated Southeast High-Speed Rail Corridor through Virginia, North Carolina, South Carolina, and Georgia. The segment is not electrified but is planned for high-speed intercity passenger rail service up to 90 MPH and eventually 110 MPH in certain sections.

Table 8: Current and Future Operating Statistics –Washington Union Station to Richmond, VA

	Current	2030
Ridership (000)		
VRE	3,825	6,675
Amtrak	1,449	5,118
Total	**5,274**	**11,793**
Train Miles (000)		
VRE	213	437
Amtrak	578	1,233
Total	**791**	**1,670**
Passenger Miles (000)		
VRE	72,121	147,824
Amtrak	132,278	467,143
Total	**204,399**	**614,967**
Avg Weekday Trains (Max in Segment)		
VRE	29	52
Amtrak	18	40

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership and passenger mile estimates include riders traveling through Washington and within Virginia to Richmond, Newport News and Lynchburg as well as proposed services to Norfolk and Roanoke.

Washington Union Station, shared by Amtrak, MARC and VRE, is the largest station in the segment and second largest on the NEC. Platforms are located on two levels; the upper level is used by MARC and Amtrak *Acela Express* and *Regional* services. The lower level is used by VRE and all Amtrak intercity services which operate south of Washington D.C. The single-track Virginia Avenue Tunnel south of Washington Union Station allows freight traffic to bypass the passenger station. Although not physically located on the segment, the tunnel affects operations as trains often wait on the segment before accessing the tunnel. The Long Bridge, built in the early 1900's, carries Amtrak and VRE (passenger) and CSXT (freight) rail traffic. The substandard condition of the aging bridge affects trip-times and operating capacity for passenger trains traveling south of Washington.

The southern end of this segment is anchored by the greater Richmond metropolitan area. Richmond, gateway to the Southeast, is currently served by suburban Staples Mill Road and downtown Main Street stations. Main Street Station is insufficient to meet the region's needs due to CSXT's Acca Yard and Richmond Terminal, one of the major railroad congestion points along the east coast, requires all intercity passenger trains to operate through its congested territory, especially when traveling between Richmond's

Staples Mill Road and Main Street stations, and presents a very substantial operating constraint.

Current Operations

Amtrak and VRE (passenger), and CSXT and Norfolk Southern (freight), operate in the segment. NS operations along the segment are currently limited to the vicinity of Alexandria. VRE operates service south of Washington over its Fredericksburg Line (which travels over the Richmond Line route) and the Manassas Line (which diverges south of Alexandria). Approximately 30 trains (15 round trips) serve Union Station via the two branches, providing half-hourly morning and evening service. Of those, 14 trains (seven round trips) originate in Fredericksburg including one deadhead move northbound to Washington D.C. There is no commuter service on weekends.

Amtrak operates 16 trains (eight round trips) between Washington and Richmond Staples Mill Road Station, of which eight trains (four round trips) are *Regional* services. Of the four *Regional* trains, two operate south to the Hampton Roads region through Richmond Main Street Station. The remaining trains consist of medium-and long-distance intercity routes (*Silver Meteor, Silver Star, Palmetto, Carolinian),* serving Virginia, North Carolina and points south, bypassing Main Street Station. *(Amtrak's Cardinal, Crescent, and Auto Train long-distance trains travel over portions of the segment, but do not serve Richmond*) Intercity service between Washington and Staples Mill Road Station is provided approximately every 90 minutes. Virginia, in partnership with Amtrak, recently began providing one round trip to Lynchburg, VA by extending *Northeast Regional* trains to/from Washington Union Station, diverging from the segment south of Alexandria. Current and future passenger rail operating statistics are provided in Table 8 above.

Future Plans

The Virginia Department of Rail and Public Transportation (VDRPT) has identified in its State Rail Plan a program of improvements necessary to increase capacity and service, and decrease trip-times in the segment. Improvements such as third track additions, passing sidings, and station improvements are needed to increase capacity and accommodate additional service frequencies. Substantial track improvements at Acca Yard and throughout the Richmond Terminal area will improve trip-times and permit all intercity services to access Main Street Station. The improvements also permit better service south of Richmond including state-supported and long-distance services to the Carolinas and points south.

VRE plans to increase service on both the Fredericksburg and Manassas Lines from 30 trains (15 round trips) to 52 trains (26 daily round trips), providing half-hourly service during the peak periods and hourly service throughout the day. In 2030, an estimated 28 trains (14 round trips) will originate in Fredericksburg.

Most intercity service improvements are driven by projects set forth in the Virginia State Rail Plan, a number of which are already completed, such as third track improvements and Acca Yard improvements described earlier. Service between Union Station and Richmond is projected to increase from 16 trains (eight round trips) to approximately 34 trains (17 round trips), providing hourly service in the segment. Service improvements consist of increases to existing services as well as new corridor services between

Washington and points south. The "S" Line, an abandoned right-of-way owned by CSXT between South Collier, VA and Norlina, NC, will be rebuilt to support new high-speed rail services between Washington and Charlotte, NC. Amtrak's *Silver Star* service between New York and Florida will also utilize this reconstructed track.

Major Issues

Capacity in this segment is constrained by a two-track main line, with three-track segments in Alexandria, Fredericksburg and Richmond, on a multi-use rail corridor. The capacity limits were documented, separate from the Master Plan, by Virginia DRPT, CSXT and Amtrak. Operating speeds are limited to a maximum 70 mph due to track geometry, infrastructure condition and CSXT operating practices.

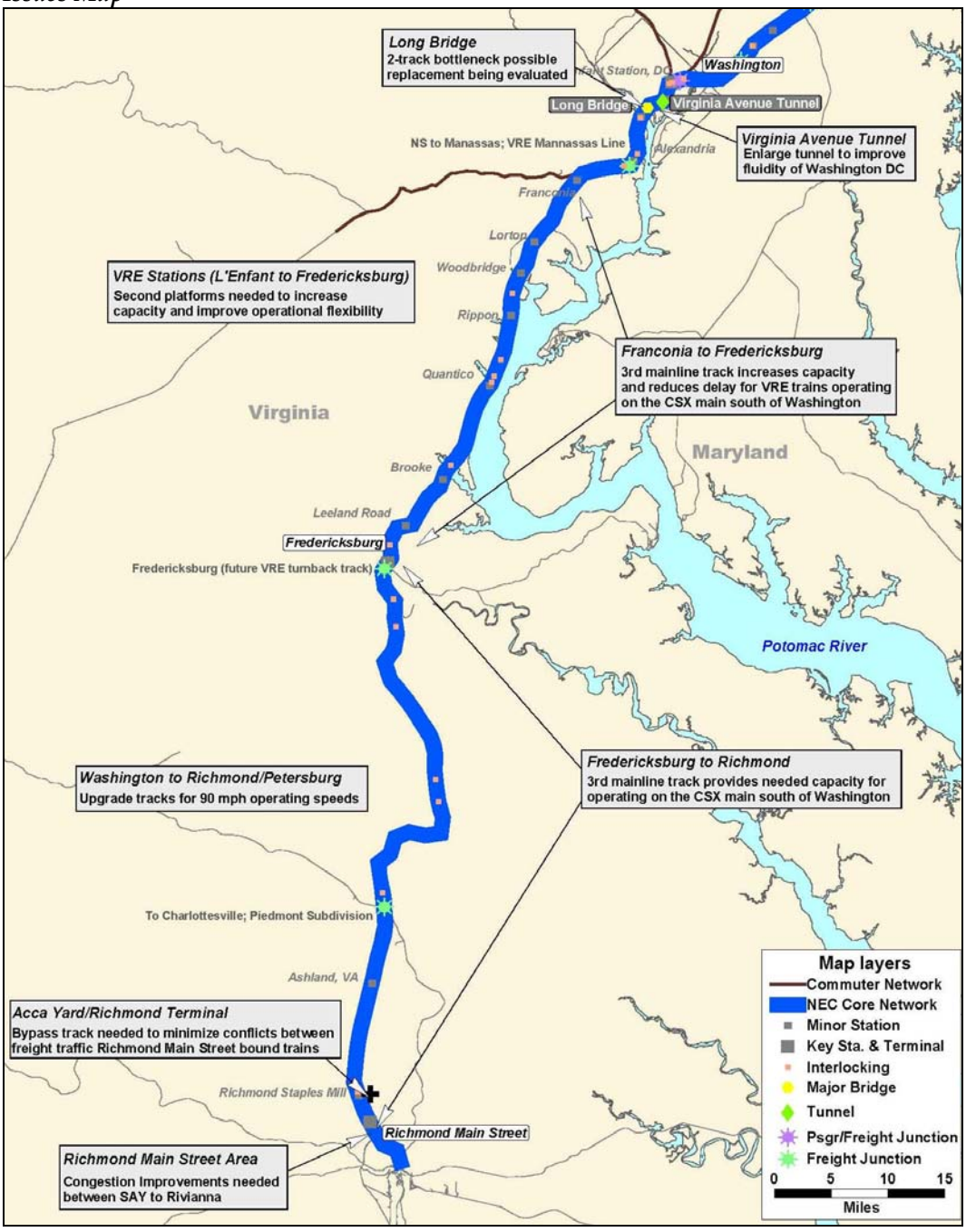
Additional capacity is needed at the Virginia Avenue Tunnel and Long Bridge to increase fluidity and reduce the bottlenecks which affect operations south of Washington Union Station. CSXT's National Gateway project will provide clearance for double stack freight trains in the Virginia Avenue Tunnel, which will provide some intermediate-term relief to freight train congestion in the Richmond-to-DC corridor. The three-track Alexandria Station lacks ADA facilities, limiting service to only one platform. Heavily congested Acca Rail Yard and the Richmond Terminal area is a significant chokepoint and cause of delay for passenger trains, and the current configuration of its main track prohibits long-distance trains from serving both Richmond area stations. Main Street Station is currently unable to accommodate trains operating south to the Carolinas and Florida.

Single-sided platforms at VRE Fredericksburg Line stations require crossover moves to access them, consuming available capacity while increasing trip-times and causing delays. Additional track and platform capacity is also needed at the lower level of Washington Union Station to meet 2030 service levels of Amtrak and VRE.

Passenger rail service in the segment is contractually limited and any increase in service must be negotiated with CSXT. In addition, no additional passenger service can be considered until a third main track is in place over the entire segment, with a fourth main track north of AF Interlocking.

Washington Union Station to Richmond, Virginia

Issues Map



Capital Investment Programs

Capital projects are grouped into programs described below. The State of Virginia, CSXT, VRE and Amtrak participated in separate full-capacity simulations of the corridor between Washington D.C. and Richmond, which led to a detailed program of improvements. These simulations identified an initial set of projects valued at approximately $72 million which would permit expansion of VRE and Amtrak service south of Washington D.C. The agencies completed further simulation which identified an additional second phase of improvements necessary to advance high-speed services within Virginia and beyond to the Carolinas. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information including scope and costs are identified in the Appendices.

Segment Programs

Washington to Richmond Trip-time and Capacity Improvements **$3,157**

The extension of high-speed rail south of Washington is an important goal in this rapidly growing region. Improving key infrastructure is necessary to facilitate this expansion. Significant bottlenecks affecting future service improvements immediately south of Washington Union Station are the Virginia Avenue Tunnel and the Long Bridge. A second track through the Virginia Avenue tunnel will allow freight trains to clear the segment faster. A new bridge over the Potomac River will increase throughput in and out of Union Station. Constructing new ADA-compliant platforms at the three-track Alexandria Station will eliminate current operating limitations. Comprehensive track, siding and high-speed interlocking and signal improvements will permit 90 mph passenger service between Richmond and Washington.

Richmond Area/Acca Yard Improvements **$649m**

The configuration of Acca Yard track constrains certain short- and long-distance intercity services from serving Richmond Main Street Station, limiting service expansion to the Hampton Roads and southern Virginia/North Carolina regions. VDRPT and CSXT have identified a series of improvements to separate freight and intercity movements at Acca Yard, including bypass tracks around the yard and a new passenger rail yard near Brown Street. Construction of the bypass tracks will allow intercity routes to access Main Street Station (at 45 mph versus 15 mph) and better serve Hampton Roads and southern Virginia/North Carolina regions. A new suburban Richmond station at Parham Road, with expanded parking and station facilities, will replace the Staples Mill Road Station.

Positive Train Control **$30m**

Positive train control will need to be installed to meet federal mandate. The specific technology and installation is still under review by the railroads.

Station Improvements **$230m**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel and encourage intermodalism. There are 12 projects in this program, seven of which are related to ADA and SGR improvements. VRE is in the process of installing second platforms at all Fredericksburg Line stations as funding becomes available to improve interoperability and on-time performance. Richmond's Main Street Station will be substantially expanded to accommodate passenger trains on four tracks, as opposed to the existing single track. The remaining projects focus on improving service through envisioned new stations (Parham Road, Carmel Church), relocated stations and platform improvements. Costs are contained in infrastructure, capacity and trip-time improvements categories.

Philadelphia, Pennsylvania to Harrisburg, Pennsylvania

Physical Assets

Amtrak owns and operates the infrastructure on the 104-mile Harrisburg Line between Philadelphia and Harrisburg. The segment is four-tracks between Philadelphia and Paoli, two- and three-tracks between Paoli and Parkesburg, and two-tracks between Parkesburg and Harrisburg. The Harrisburg Line is served by SEPTA's R5 Regional Rail Line (SEPTA's busiest), and Amtrak's *Keystone* and *Pennsylvanian* services.

Table 9: Current and Future Operating Statistics –Philadelphia, PA to Harrisburg, PA

	Current	2030
Ridership (000)		
SEPTA	7,374	9,041
Amtrak	1,972	4,171
Total	**9,346**	**13,212**
Train Miles (000)		
SEPTA	823	876
Amtrak	954	1,227
Total	**1,777**	**2,103**
Passenger Miles (000)		
SEPTA	80,625	97,891
Amtrak	163,984	346,811
Total	**244,609**	**444,702**
Avg Weekday Trains (Max in Segment)		
SEPTA	119	133
Amtrak	28	36

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership and passenger mile estimates include riders traveling through Philadelphia and Keystone and Pennsylvanian services to Harrisburg, Pittsburgh and Cleveland (proposed).

Philadelphia's 30th Street Station is the busiest station in the segment and a significant junction with high-speed intercity and commuter rail NEC services. Harrisburg Station is the western terminal for *Keystone* service. The Harrisburg Line joins the NEC Main Line at North Penn/Zoo Interlocking, which filters Amtrak and SEPTA commuter rail services in and out of 30th Street Station. The segment is part of the federally-designated Keystone High-Speed Rail Corridor between Philadelphia and Pittsburgh.

Current Operations

Amtrak and SEPTA (passenger) and NS (freight) operate in the segment. SEPTA's R5 Line operates 54 trains (27 round trips) between Philadelphia and Thorndale, providing approximately half-hourly service during the peak periods and hourly service throughout the day. Service is more frequent approaching Philadelphia, with 81 trains (40 round trips) from Paoli, and 95 trains (48 round trips) from Bryn Mawr. The R6 Line also operates over a short section of the Harrisburg Line near Zoo Interlocking and 30th Street Station.

Amtrak operates 28 weekday trains (14 round trips) between Philadelphia and Harrisburg. Amtrak's *Pennsylvanian* operates a daily round trip between New York and Pittsburgh. The *Keystone* consists of 26 daily trains (13 round trips) providing hourly service between Philadelphia and Harrisburg throughout the day. 18 *Keystone* trains (nine round trips) operate through to New York, providing approximately 90-minute headway service between New York, Philadelphia, and Harrisburg throughout the day. Current and future passenger rail operating statistics are provided in Table 9 above.

Future Plans

SEPTA's R5 Line service plans include increased frequencies to Villanova and Exton, and extension of service west of Thorndale. SEPTA service to Paoli is planned to increase from 81 trains (40 round trips) to 95 trains (48 round trips), providing four round trips during the peak hour and half-hourly service throughout the day. Service to Villanova will increase from 95 trains (48 round trips) to 109 trains (55 round trips) providing approximate 10-minute headways during peak periods and better than half-hourly service throughout the day. Service west of Exton includes 54 trains (27 round trips), providing half-hourly service during the peak periods and hourly service throughout the day.

Daily Amtrak service between Philadelphia and Harrisburg is planned to increase from 28 trains (14 round trips) to 36 (18 round trips), providing half-hourly service during the peak periods and hourly service throughout the day. Increases envisioned include one additional *Keystone* and *Pennsylvanian* round trip. In addition, Amtrak and Pennsylvania are developing a potential service plan for new service between New York City and Altoona and/or Harrisburg with Thruway bus service connecting to State College.

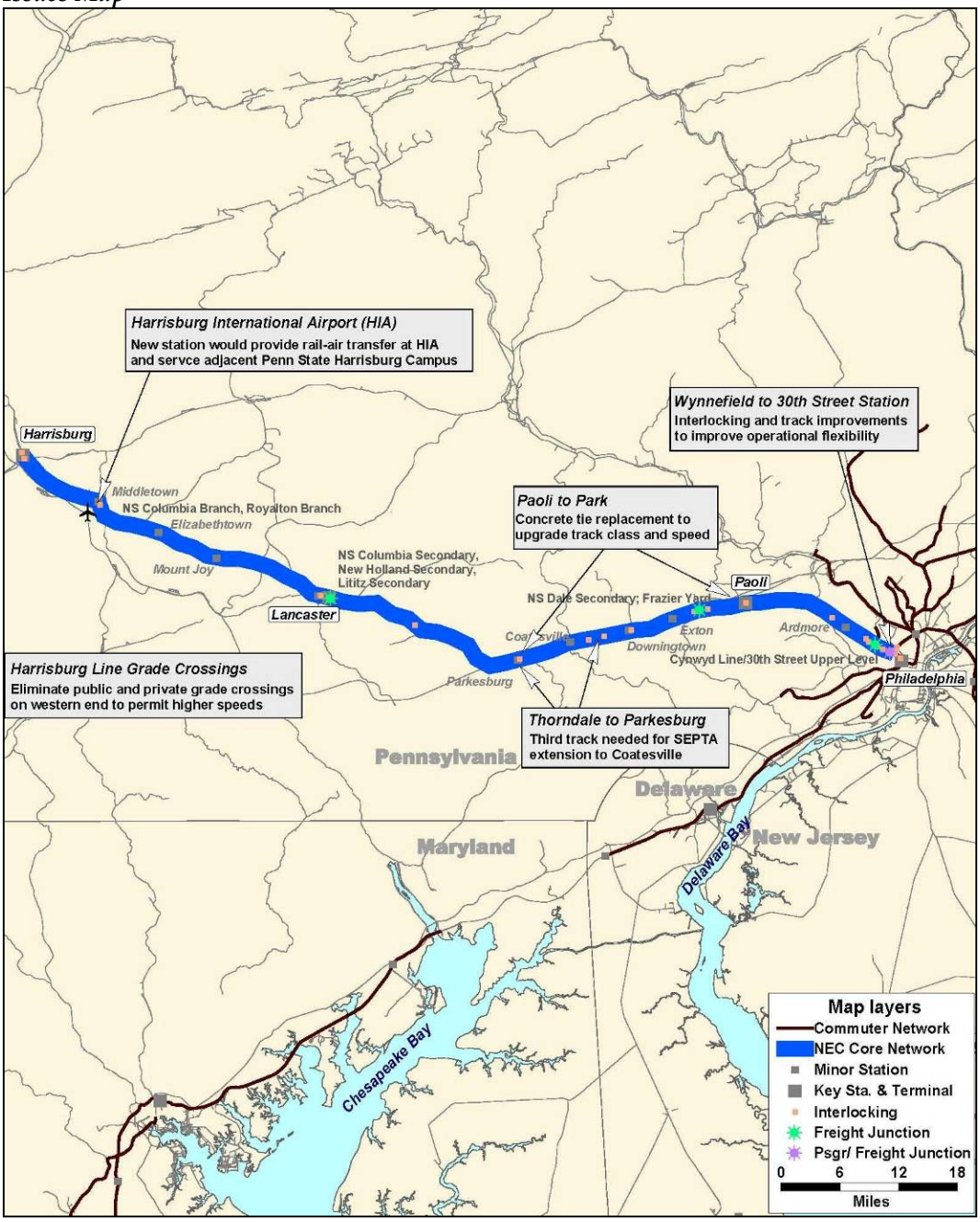
Amtrak and PennDOT are identifying improvements that are necessary to provide one-hour-35-minute trip-times with increased frequencies between Philadelphia and Harrisburg. Speed and trip-time improvements on NEC branch lines are coincident with improved North- and South End trip-times detailed in Part I of the report.

Major Issues

New third track improvements at Paoli and Thorndale are needed to accommodate increased services, including zoned-express SEPTA service. Track improvements, grade crossing eliminations, and new interlockings are needed west of Parkesburg to complete the scope of work envisioned in the Keystone Corridor Improvement Program. Reconfiguration of Zoo Interlocking will upgrade obsolete assets and permit trip-time improvements. Signal system upgrades are needed implement higher speeds and more frequent train operations.

Philadelphia, Pennsylvania to Harrisburg, Pennsylvania

Issues Map



Capital Investment Programs

Capital projects are grouped into programs described below. Programs consist of a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information, including scope and costs are identified in Appendices.

Keystone Corridor improvements were framed around the ongoing Keystone Corridor Improvement Program. This collaborative effort between PennDOT, Amtrak and SEPTA identified the scope of work and investment needs for the line.

Segment Programs

Zoo to Parkesburg Rail Capacity Improvements **$398m**

The current track configuration of the Harrisburg Line between Zoo interlocking and Exton cannot adequately handle 2030 SEPTA and Amtrak service plans. Improvements include a new third track between Paoli and Exton, and between Thorndale and Parkesburg (for freight). Improvements include track and interlocking upgrades and concrete tie replacement, which are also needed to accommodate increased services and improve operating speeds.

Parkesburg to Harrisburg Intercity Rail Improvements **$52m**

The improvements will include completion of new interlockings at Park (formerly Atglen), Leaman Place and Harrisburg, eliminate the last three public grade crossings on the line, and replace remaining wood tie sections with concrete ties.

Positive Train Control **$25m**

Project includes Installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than 125 mph) as mandated by the Federal Rail Safety Improvement Act of 2008.

Station Improvements **$353m**

Major upgrades are envisioned to several intercity stations at Harrisburg, Elizabethtown, Lancaster, and Exton. New intercity stations are planned at Middletown, Mount Joy, Paradise, potentially Coatesville, Downingtown, Paoli and Ardmore. SEPTA's plans include installation of high-level platforms at all of its stations on the Harrisburg Line.

Penn Station New York to Albany, New York

Physical Assets

This 160-mile segment is owned by three railroads. Amtrak owns the sections between Penn Station New York (Penn Station) and Spuyten Duyvil (Bronx) and between Schenectady and Hoffmans, near Amsterdam. Metro-North (MNR) owns the portion between Spuyten Duyvil and Poughkeepsie. CSX Transportation (CSXT) owns the section of track between Poughkeepsie and Schenectady, although Amtrak handles track maintenance-of-way between Stuyvesant and Schenectady.

Table 10: Current and Future Operating Statistics – Penn Station New York to Albany, NY

	Current	2030
Ridership (000)		
MNR	14,694	41,954
Amtrak	1,195	2,009
Total	**15,889**	**43,963**
Train Miles (000)		
MNR	1,618	2,997
Amtrak	1,277	2,252
Total	**2,895**	**5,249**
Passenger Miles (000)		
MNR	415,781	878,049
Amtrak	164,454	276,454
Total	**580,235**	**1,154,503**
Avg Weekday Trains (Max in Segment)		
MNR	120	207
Amtrak	26	44

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership and passenger miles estimates include New York Penn Station to Albany and Ethan Allen and Adirondack routes.

The line is primarily two tracks between Penn Station and Spuyten Duyvil except for the single-track tunnel under West Side Yard and the connection between Amtrak- and MNR-owned sections at Spuyten Duyvil. North of Spuyten Duyvil, there are fours tracks to Croton-Harmon, two tracks between Croton-Harmon and Albany, and one track between Albany and Schenectady. The corridor is electrified on the immediate tunnel approach to Penn Station New York with over-running direct-current third rail, and between Spuyten Duyvil and Croton-Harmon, with under-running direct-current third rail, used only by Metro-North. The segment is part of the federally-designated Empire High-Speed Rail Corridor connecting New York City, Albany, and Buffalo.

There are two movable bridges in the segment. The Spuyten Duyvil Bridge is a single-track swing bridge spanning the Bronx River separating Manhattan and the Bronx. The Spuyten Duyvil Bridge was rebuilt in the late 1980's by New York State to bring upstate intercity passenger services into Penn Station, and is able to accommodate two tracks. The Livingston Avenue Bridge is a two-track swing span crossing the Hudson River between Albany and Rensselaer, built almost 130 years ago, and in need of replacement.

Current Operations

Amtrak and MNR (passenger), and CSXT and CP (freight), operate in the segment. MNR operates its Hudson Line service between Poughkeepsie and Grand Central Terminal, operating approximately 58 trains (29 round trips), providing better than half-hourly service during the peak hours and hourly service throughout the day. South of Croton-

Harmon, MNR service to Grand Central Terminal via the Hudson Line is more frequent, with 120 daily trains (60 round trips) providing 10-minute headways during the peak periods and half-hourly service throughout the day. Through freight operates over the segment between rail yards located in the Bronx and Selkirk Yard (both located off-corridor) and with local service en route and in the Albany/Schenectady area. CSXT owns and operates the former New York Central Railroad main line to Buffalo and points west. Freight service is not permitted through Penn Station New York.

Amtrak operates five routes in the segment, running 26 trains (13 round trips) between Penn Station and Albany. Amtrak's *Ethan Allen Express* and *Adirondack* continue north off the segment to Rutland, Vermont and Montreal, Canada, respectively. Operating west beyond the segment, the *Empire Service (multiple frequencies)* and the *Maple Leaf* continue on to Buffalo/Niagara Falls and Toronto, Canada, respectively; the *Lake Shore Limited* continues on to Buffalo and Chicago. Current and future passenger rail operating statistics are provided in Table 10 above.

Future Plans

A service initiative under consideration by MNR is to extend some of its Hudson Line service to Penn Station via Amtrak's Empire Connection track along the west side of Manhattan. Approximately 104 trains (52 round trips) will continue via MNR's current route to Grand Central Terminal and 103 trains (51 round trips) serving Penn Station are proposed, an increase of approximately 73 percent over current service levels to Grand Central Terminal. This service would be in addition to planned service increases to Grand Central Terminal via the New Haven Line.

New York's Empire Corridor High-Speed Intercity Passenger Rail Program contemplates a significant increase in intercity train trip frequencies, with a proposed increase from 26 trains (13 round trips) to 44 trains (22 round trips) per day, by 2030. In addition, the Program contemplates substantial increases in trip frequencies and improved reliability on the Empire Corridor to the west and north of Schenectady.

Amtrak and New York State, along with other stakeholders, are identifying improvements necessary to further decrease the trip-time between Albany and Penn Station. Speed and trip-time improvements on NEC branch lines are coincident with improved North- and South End trip-times as detailed in Part I of the report.

Major Issues

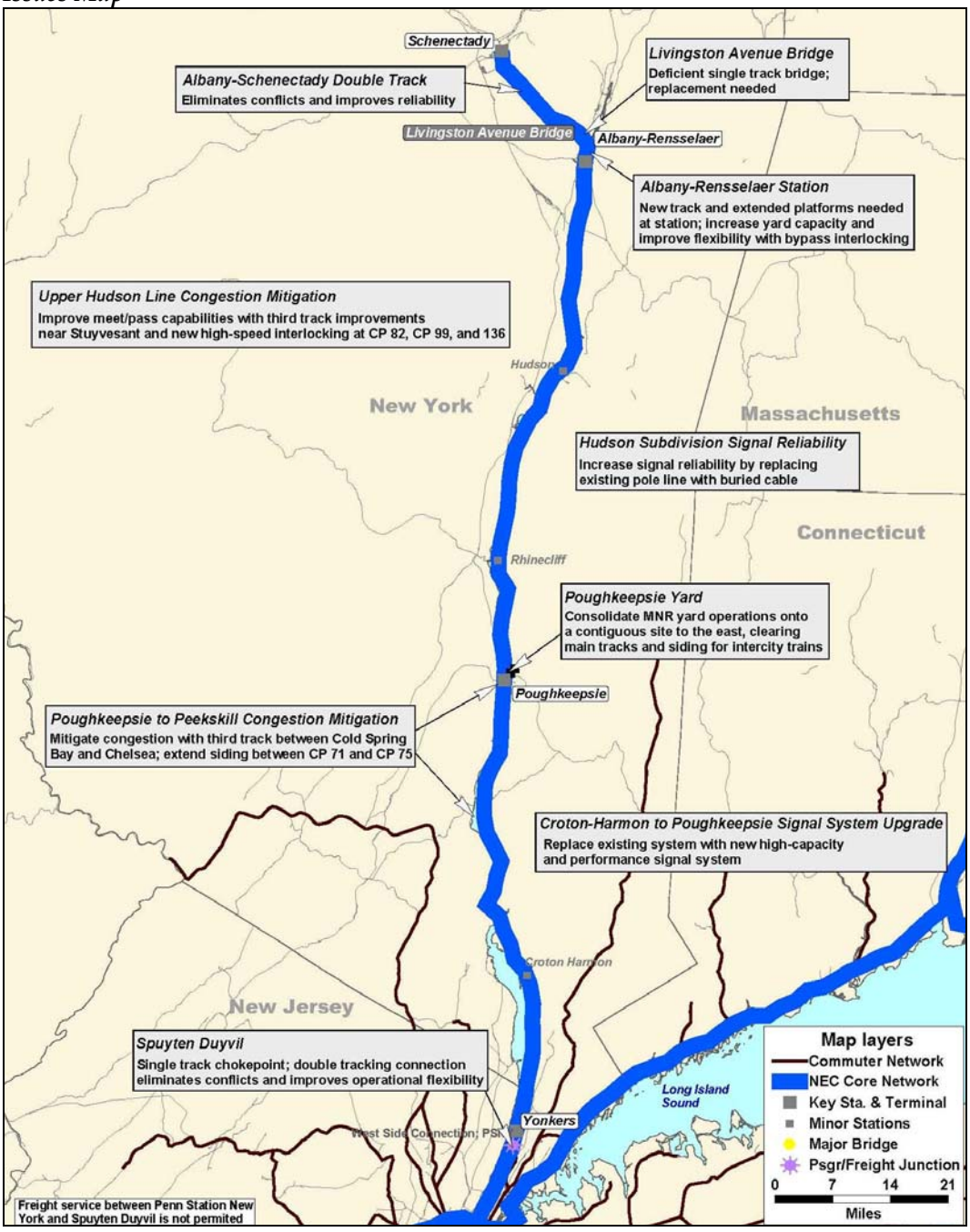
Conditions along this segment of the Empire Corridor present a number of significant challenges to the reliability and convenience of both existing and proposed intercity passenger rail service. Among the challenges are numerous chokepoints that are caused by obsolete or inadequate track and signals systems, which constrain capacity and speed. Following is a sample list of chokepoints: the single-track West Side connection at CP 12 is a conflict for opposing Amtrak trains between Amtrak's CP Inwood and CP 12 on Metro-North. The conflict will be exacerbated by proposed additional service to Penn Station. The Hudson Line Joint Users Study, circa 2005, formulated plans for adding a second track and a new CP 13 to eliminate this chokepoint. Similarly, MNR terminal and yard improvements in Poughkeepsie are needed to accommodate increased services and to eliminate operating conflict as Poughkeepsie. The Joint User's Study also

recommended installation of a new high-capacity signal system between Poughkeepsie and Croton-Harmon to accommodate planned service increases.

The Livingston Avenue Bridge is not in a state-of-good-repair and is in need of overhaul or complete replacement. Until completed, intercity operations are constrained. The single-track section of the segment between Albany and Schenectady is among the greatest points of conflict for intercity trains operating over the Empire Line. Additional track and extended platform and yard facilities are needed in the Albany-Rensselaer Station to alleviate current congestion and accommodate increased service. Improvements are also needed on freight-only infrastructure in this area to minimize conflicts between freight and intercity rail service. These improvements include interlockings, the connection to the Troy Industrial Track and an improved station bypass track to accommodate wide-car freight trains.

Penn Station New York to Albany, New York

Issues Map



The Hudson Line was the subject of a detailed capacity and simulation study (Hudson Line Joint Users Study) which recommended a series of improvement projects and estimated costs. The Joint Users study led to early implementation of certain projects by Metro-North. In addition, the State's 2009 State Rail Plan identifies some of the same projects as the Joint Users Study as well as many additional rail improvements projects. Both studies form the basis for recommendations found in the Master Plan, as well as the State's HSIPR ARRA grant applications.

Capital Investment Programs

Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information, including scope and costs are identified in the Appendices.

Segment Programs

Albany/Empire Connection Improvements **$63m**

The single track portion of the West Side Connection approaching CP 12 present conflicts for opposing Amtrak trains between Amtrak's CP Inwood and CP 12 on MNR. This conflict can also produce residual delays for MNR Hudson Line services due to Amtrak trains waiting for the single track section to clear. Double-tracking the connection, which includes the Spuyten Duyvil Swing Bridge, will eliminate the delay between opposing trains.

Albany/Hudson Line Commuter and Intercity Improvements **$366m**

Upgraded track, interlocking, and wayside infrastructure are needed to accommodate increased service while maintaining operational flexibility and service reliability. Track and yard improvements at Poughkeepsie and new third track at Cold Spring Bay and Tarrytown are needed to meet accommodate services. Updated signal and train control systems will permit higher speeds and closer headways, increasing capacity on the line.

Albany/Empire Line Improvements **$163m**

New high-speed rail interlockings are needed to facilitate more efficient train movements by minimizing crossover delays, and provide additional connectivity between the main tracks in the northern section. Additional capacity improvements are being considered at the junction of the Hudson and Schodack Subdivisions in Stuyvesant. Active warning devices at grade crossings are needed to improve safety on this CSXT-owned portion of the line.

Albany-Rensselaer Station and Yard Capacity Improvements **$266m**

Lack of track and platform space at Albany-Rensselaer Station causes conflicts for both intercity and Empire services. Currently, certain trains must wait outside of the station for extended periods while waiting for track space. A fourth station track and center platform conversion improvements will increase the number of trains that can simultaneously access the station. Expanded yard capacity at Albany-Rensselaer will be needed to accommodate future storage requirements based on expanded Amtrak Empire Corridor Service with potential Rensselaer train originations. Freight bypass capability must be maintained for CSX (and CP trackage rights) traffic.

Positive Train Control **$121m**

On the CSX-owned portion of the line, positive train control will need to be installed to meet federal mandate. The specific technology and installation is still under review by the railroads on this section. MNR is considering installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than 125 mph) as mandated by The Rail Safety Improvement Act of 2008.

Station Improvements **$40m**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are seven projects in this program, five of which are related to ADA and SGR improvements. A major overhaul project is planned for Schenectady. A relocation of the Hudson Station is also under consideration. The remaining projects focus on improving and expanding service through new or relocated stations and platform improvements.

New Haven, Connecticut to Springfield, Massachusetts

Physical Assets

This 60-mile branch of the NEC is owned and operated by Amtrak and runs parallel to Interstate 91 through Hartford. The Springfield Line connects to the NEC Main Line at Mill River Junction near New Haven and CSXT's Boston Subdivision at Springfield. The branch line is two tracks between Mill River and Cedar interlockings and single-track with sidings between Cedar Interlocking and Springfield Union Station.

Springfield Union Station, at the northern terminus of the branch, is served by two Amtrak intercity routes including the *Lakeshore Limited* operating between Chicago and Boston and *Vermonter* between Washington and St. Albans, Vermont.

Union Station New Haven at is the branch's southern terminus and shared by Amtrak *Acela Express*, *Regional*, the *Vermonter* and intercity services, as well as SLE and MNR commuter rail services. The segment is part of the larger, federally-designated multi-route Northern New England High-Speed Rail Corridor which runs through the states of Vermont, New Hampshire, Maine, Massachusetts, Connecticut, and New York.

Table 11: Current and Future Operating Statistics –New Haven, CT to Springfield, MA

	Current	2030
Ridership (000)		
CDOT	0	617
Amtrak	1,215	3,399
Total	**1,215**	**4,016**
Train Miles (000)		
CDOT	0	571
Amtrak	245	571
Total	**245**	**1,142**
Passenger Miles (000)		
CDOT	0	43,129
Amtrak	54,598	152,698
Total	**54,598**	**195,827**
Avg Weekday Trains (Max in Segment)		
CDOT	0	36
Amtrak	12	28

Sources: Ridership and Average Weekday Trains, Master Plan Working Group. Train miles and passenger miles, estimated by Amtrak. Figures shown above are estimates based on revenue train movements only. Amtrak ridership and passenger mile estimates include riders traveling through New Haven to Springfield as well as the Springfield, and Vermonter routes and proposed services to Boston via Worcester and Framingham and Greenfield, MA.

Current Operations

Amtrak (passenger) and CSXT, Connecticut Southern, and Pan Am Southern (freight) operate in the segment. Amtrak operates 12 trains (six round trips) daily between Springfield and New Haven including round trips for *Vermonter* and *Regional* services, providing service to New York and points south. The remaining eight trains (four round trips) are *Shuttle* routes which operate each weekday between New Haven and Springfield connecting to NEC *Regional* trains at New Haven. There is no commuter rail service currently operating on the segment. Current and future passenger rail operating statistics are provided in Table 11 above.

Future Plans

Connecticut is developing plans for New Haven-Hartford-Springfield (NHHS) commuter rail service along this segment. Initial plans call for 36 trains (18 round trips) each day, providing half-hourly service during the peak hours and approximately hourly service throughout the day. This service would be supported by an electrified, double-track infrastructure. Initially, service would operate along the Springfield Line, with additional service possible to Stamford, CT. The Springfield Line is part of the federally-designated Northern New England High-Speed Rail Corridor.

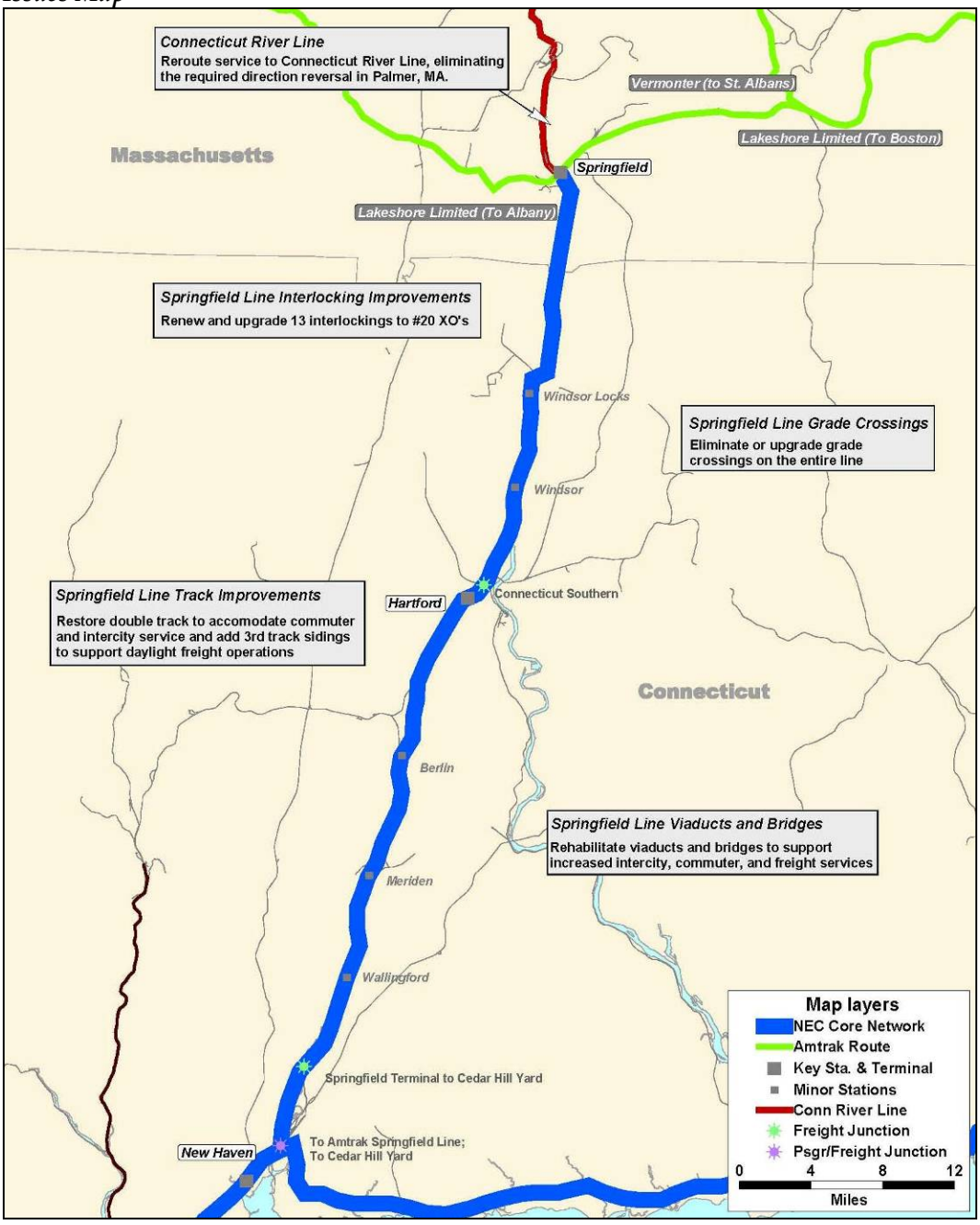
Daily Amtrak service between Springfield and New Haven will increase from 12 trains (6 round trips) to 28 (14 round trips) providing near hourly service throughout the day. Alternate trains will terminate at New Haven, or continue to Penn Station New York or Washington D.C. Service on the line would be further integrated with emerging corridors such as the Inland Route via Boston and Worcester and the Knowledge Corridor to Greenfield, MA. Other improvements include rerouting *Vermonter* service to the Connecticut River Line as part of the overall *Knowledge Corridor* service plan. This will improve trip-times while serving the Holyoke, Northampton, and Greenfield communities and eliminating the required direction reversal in Palmer, MA.

Major Issues

Electrification, double tracking and potential third-track sidings are needed to support new commuter and increased intercity rail services in the segment. Fixed bridges and the Hartford viaduct require rehabilitation or replacement to accommodate increased traffic along the segment. Existing and new interlockings need to be designed to accommodate the electrification and double-track program, affording increased speed and operating flexibility.

New Haven, Connecticut to Springfield, Massachusetts

Issues Map



Capital Investment Programs

Connecticut and Amtrak are jointly developing corridor improvements between New Haven and Springfield which will accommodate the introduction of commuter service and expanded intercity corridor service. Vermont, Massachusetts, Connecticut and Amtrak are developing plans for the *Knowledge Corridor* service, which extends services from the Springfield Line northward, paralleling I-91 through Massachusetts and Vermont. Massachusetts is advancing planning for the development of the *Inland Route* service between Boston, Worcester and Springfield which would permit the extension of Springfield Line corridor services to Boston. These three distinct but interrelated programs will be subject to capacity analysis leading to the identification of recommended improvements and programs.

The Master Plan uses work already completed in these areas as the basis for the capital costs shown. Capital projects are grouped into programs described below. Programs are a set of similar projects designed to deliver a defined set of benefits and performance goals. Individual project information, including scope and costs are identified in the Appendices.

Segment Programs

Springfield Line Track and Interlocking Upgrades **$834m**

Electrification, double tracking and the addition of third track sidings are included to support new commuter and increased intercity rail services in the segment. Fixed bridges and the Hartford viaduct will be rehabilitated or replaced, and when complete will permit operation of 286,000-pound freight car service. Existing and new interlockings will be designed to support electrification, the double track program and increased speeds. Additionally, new or increased train servicing and layover requirements will be defined at Greenfield, Springfield and New Haven terminals.

Positive Train Control **$8m**

The Springfield Line includes installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than110 mph) as mandated by The Rail Safety Improvement Act of 2008. PTC design for the Knowledge Corridor and Inland Route will be determined by Pan Am Southern and CSXT for their respective routes.

Station Improvements **$105m**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are seven projects in this program, six of which are related to ADA and SGR improvements.

The City of Springfield and its metropolitan planning organization are currently evaluating alternatives for the potential restoration of historic Springfield Union Station. If a decision is made to rehab the historic station, platform and track modifications will be included to effectively serve trains operating via the Knowledge Corridor, Springfield Line and Inland Route to Boston.

All existing intercity stations including Hartford will require expansion and modification to accommodate double tracking of the line. Modifications will include additional platforms, ADA compliance and facilities to accommodate excess dimension freight traffic shipments. In addition, three new commuter stations are proposed along with expansion of State Street Station in New Haven.

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The Northeast Corridor Infrastructure Master Plan

MAY 2010

NEC Infrastructure Master Plan

Part III: Master Plan Capital Program Summary by Segment

States and railroads working together to define and implement a vision for the future of rail transportation in the Northeast

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Northeast Corridor Infrastructure Master Plan
Part III: Capital Program Summary by Segment

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Boston, MA - Westerly, RI

Program: — *OofM Cost ($ millions)*

BOSTON TERMINAL STORAGE AND CAPACITY IMPROVEMENTS — **286**

South Station and Southampton Street Yard are at capacity. Additional terminal capacity will be needed to accommodate 2030 service levels and equipment needs. These plans include initiating MBTA South Coast commuter service to Fall River and New Bedford and adding intercity trains to the "Inland Route" between Boston South Station and Springfield. Short-term plans call for adding up to six station tracks at South Station, undertaking a full Environmental Impact Statement (EIS) for the proposed North-South Rail Link and initiating a terminal capacity study similar to those currently underway in New York and Washington.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
114	BOSTON SOUTH STATION - TRACK CAPACITY IMPROVEMENTS	0	0	☐	☑	☐
660	GRAND JUNCTION CONNECTION - PURCHASE	0	0	☐	☑	☐
675	BOSTON - NEW LAYOVER YARD FACILITY (LOCATION TBD)	0	0	☐	☑	☐
788	NORTH-SOUTH RAIL LINK - ENVIRONMENTAL IMPACT STATEMENT	0	0	☐	☑	☐

Program: — *OofM Cost ($ millions)*

ATTLEBORO LINE CONGESTION AND CAPACITY IMPROVEMENTS — **384**

Capacity utilization analysis undertaken as part of the Master Plan process indicates that much of the line from Boston to Attleboro will be over capacity by 2030. Major components of this program include the addition of third track north and south of the Canton Viaduct in the vicinity of Route 128 Station, Sharon and Mansfield. These projects will help bridge a two-track section in what is otherwise a predominately three-track railroad. Electrification of main line tracks and sidings will improve infrastructure utilization and facilitate fully electric commuter operations in the long-term. High platforms would be installed a number of stations, including Ruggles Street, Hyde Park, Readville, Sharon, Canton Junction, Mansfield and Attleboro, to further improve infrastructure utilization through decreased boarding times.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
667	SOUTHAMPTON SUBSTATION	0	0	☑	☑	☑
661	BOSTON TO PROVIDENCE - ELECTRIFY SECONDARY TRACK FOR COMMUTER OPERATIONS	1	44	☐	☑	☐
777	RUGGLES STREET STATION CONGESTION MITIGATION	2	2	☐	☑	☐
484	ATTLEBORO LINE/MBTA STATIONS - HIGH-LEVEL PLATFORMS	8	32	☑	☑	☑

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
113	READVILLE TO CANTON JUNCTION - NEW THIRD TRACK	9	15	☐	☑	☑
111	SHARON TO ATTLEBORO - NEW THIRD TRACK	18	21	☐	☑	☐
567	SHARON PASSING SIDING	18	21	☐	☑	☐

Program: — *OofM Cost ($ millions)*

RHODE ISLAND SERVICE EXPANSION AND TRIP TIME IMPROVEMENTS — **143**

Rhode Island recognizes the potential for commuter rail service to reduce congestion and improve mobility, and has planned a 20-mile extension of existing commuter rail service from Boston to south of Providence, known as the South County Commuter Rail Service (SCCRS) to Wickford Junction. South County Commuter Rail will extend existing commuter service between Providence, Warwick Intermodal/ T.F. Green Airport, and Wickford Junction. This commuter rail service is coming to Rhode Island through a partnership between Amtrak, RIDOT and the MBTA. Kingston station track capacity improvements is entering the design state under an HSIPR approved grant.

Scheduled to begin in 2012, this service will include new stations at Warwick Intermodal / T.F. Green Airport and Wickford Junction. Near term projects under construction on the Freight Rail Improvement Project (FRIP) track adjacent to Amtrak's North East Corridor (NEC) include track upgrades and new interlockings to accommodate passenger rail. Long range plans under consideration would allow Amtrak intercity service to stop at Warwick Intermodal Station. Other improvements under review include added track capacity at Westerly station. Also in the long term, this section of railroad would potentially benefit from full electrification of all tracks to provide maximum operating flexibility for intercity and commuter services.

Projects Included in this Program:

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
524	MALCOLM TO DAVISVILLE - FRIP TRACK UPGRADE (FUTURE PHASE)	44	61	☐	☑	☐
525	BRAYTON TO PACKARD - FRIP TRACK UPGRADE	44	54	☐	☑	☐
568	PROVIDENCE TO WICKFORD JUNCTION - FRIP TRACK ELECTRIFICATION	44	61	☐	☑	☐
677	ATWELLS INTERLOCKING - RECONFIGURATION (PHASE I)	44	44	☐	☑	☐
176	WELLINGTON PASSING SIDING (PHASE I)	50	51	☐	☑	☐
477	WARWICK INTERMODAL/T.F. GREEN AIRPORT STATION INFRASTRUCTURE (NEW) - PHASE I	51	51	☐	☑	☐
181	WICKFORD (STONY LANE) - NEW INTERLOCKING AND SIDING (FUTURE PHASE)	62	63	☐	☑	☐
478	KINGSTON AREA TRACK AND CAPACITY IMPROVEMENTS	70	72	☐	☑	☑

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
388	WESTERLY - TRACK UPGRADES / STATION IMPROVEMENTS	88	88	☐	☑	☐

Program: — *OofM Cost ($ millions)*

STATION IMPROVEMENTS — 126

Station improvements are designed to bring facilities to a state of good repair and meet accessibility requirements under the Americans for Disabilities Act (ADA). There are 10 projects in this program of which six are ADA and SGR related improvements. In addition, two new stations are being constructed in the short-term, one at Warwick / T.F. Green Airport; the other at Wickford Junction. Potential additional station stops include Pawtucket / Central Falls and East Greenwich and Wickford Junction under a future phase of Rhode Island commuter rail service.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
602	BOSTON SOUTH STATION - ADA / SGR IMPROVEMENTS	0	0	☑	☐	☐
603	BOSTON BACK BAY STATION - ADA / SGR IMPROVEMENTS	1	1	☑	☐	☐
604	ROUTE 128/WESTWOOD STATION - ADA / SGR IMPROVEMENTS	12	12	☑	☐	☐
386	PAWTUCKET/CENTRAL FALLS - NEW STATION	40	40	☐	☑	☐
605	PROVIDENCE STATION - ADA / SGR IMPROVEMENTS	44	44	☑	☐	☐
569	WARWICK INTERMODAL/T.F. GREEN AIRPORT - EAST SIDE STATION TRACK AND HIGH PLATFORM	53	53	☐	☑	☐
187	EAST GREENWICH - NEW STATION (FUTURE PHASE)	57	57	☐	☑	☐
389	WICKFORD JUNCTION - NEW STATION AND PLATFORMS (PHASE 1)	62	64	☐	☑	☐
606	KINGSTON STATION - ADA / SGR IMPROVEMENTS	70	70	☑	☐	☐
607	WESTERLY STATION - ADA IMPROVEMENTS	88	88	☑	☐	☐

Totals for: Boston, MA - Westerly, RI

# of Projects: 30 Order of Magnitude Segment Costs ($m) 939

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Westerly, RI - New Haven, CT

Program: — *OofM Cost ($ millions)*

EASTERN CONNECTICUT SERVICE EXPANSION IMPROVEMENTS — 736

Amtrak and SLE 2030 service plans represent significant increases in service over current levels. SLE plans will significantly expand service to New Haven, Old Saybrook and New London. New London will require a new storage and layover facilities to accommodate additional trains and reduce deadhead movements. Track, interlocking and electrification upgrades previously identified in the North End High Speed Rail Configuration Plan are needed to meet 2030 commuter and intercity service goals. Two movable bridges, the Niantic River and Connecticut River, are beyond SGR and decreasing in reliability, causing delays. Partial construction funding for the Niantic Bridge replacement is contained in Amtrak's capital program and not included here. Replacement of the Connecticut River bridge span is in design; feasibility analysis is underway to look at a potential high-level configuration to improve reliability and speeds and minimize bridge openings. Dual side high-platforms with pedestrian overpasses at SLE stations, portions of which are in construction or complete, will minimize crossover moves and improve capacity utilization.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
487	SHORE LINE EAST STATIONS - HIGH-LEVEL PLATFORMS / PEDESTRIAN OVERPASSES	97	154	☑	☑	☐
190	PALMERS TO GROTON INTERLOCKINGS - THIRD TRACK UPGRADE	101	105	☐	☑	☐
492	NEW LONDON LAYOVER YARD (ELECTRIFIED)	106	106	☐	☑	☐
195	WATERFORD - NEW PASSING SIDING	108	110	☐	☑	☐
471	CONNECTICUT (CONN) RIVER MOVABLE BRIDGE REPLACEMENT	122	122	☑	☑	☑
199	OLD SAYBROOK - TRACK AND CATENARY IMPROVEMENTS	124	124	☑	☑	☐
200	CLINTON - UNIVERSAL INTERLOCKING UPGRADE	132	132	☐	☑	☐
203	GUILFORD STATION - TRACK 4 CATENARY UPGRADE	138	138	☐	☑	☐
570	GUILFORD - TRACK 3 UPGRADE	138	138	☐	☑	☐
204	BRANFORD INTERLOCKING RECONFIGURATION	147	147	☐	☑	☐
206	SHORELINE JUNCTION - INTERLOCKING RECONFIGURATION	154	154	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**55**
There are four projects within this program, three of which provide state of good repair and accessibility improvements to Amtrak served stations. In the longer term, a potential plan calls for the construction of a new on the eastern portion of this segment in the vicinity of South Lyme.						
Projects Included in this Program:						
608	MYSTIC STATION - ADA / SGR IMPROVEMENTS	97	97	☑	☐	☐
609	NEW LONDON STATION - ADA / SGR IMPROVEMENTS	106	106	☑	☐	☐
198	SOUTH LYME - NEW STATION	117	117	☐	☑	☐
610	OLD SAYBROOK STATION - ADA / SGR IMPROVEMENTS	124	124	☑	☐	☐

Totals for: Westerly, RI - New Haven, CT

# of Projects: 15 Order of Magnitude Segment Costs ($m) 791

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

New Haven, CT to New Rochelle, NY

Program: — *OofM Cost ($ millions)*

NEW HAVEN LINE TRIP TIME AND CAPACITY IMPROVEMENTS — **4,391**

Track curvature, heavy congestion, and aging infrastructure constrain operating capacity on the New Haven Line. Four CDOT owned movable bridges are beyond SGR and in need of either rehabilitation (Norwalk and Saugatuck river bridges), or replacement (Devon and Cos Cob Bridges).

ConnDOT is currently installing constant tension catenary on the Connecticut-owned portion of the line, and upgrading tracks, with plans to upgrade the signal system in the future, including installation of Positive Train Control (PTC). Curve modifications and related ballast deck bridge improvements are needed to support higher speeds. Completion of the fourth track between New Haven and Devon will provide needed capacity on the eastern section of the line. Subject to need determination through further analysis, a flyover junction may be recommended in the longer term to better segregate Amtrak and Metro-North trains and minimize operating conflicts where Amtrak's Hell Gate Line merges with the New Haven Line at New Rochelle.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
490	CDOT/NEW HAVEN LINE - CATENARY REPLACEMENT	155	212	☑	☑	☑
539	CDOT/NEW HAVEN LINE - SIGNAL UPGRADE INCLUDING POSITIVE TRAIN CONTROL (PTC)	155	212	☑	☑	☑
540	CDOT/NEW HAVEN LINE - FIXED BRIDGES UPGRADE	155	212	☑	☑	☑
565	CDOT/NEW HAVEN LINE - TRACK CAPACITY IMPROVEMENTS	155	212	☐	☑	☑
779	CDOT/NEW HAVEN LINE - CURVE MODS/BALLAST DECK BRIDGE IMPROVEMENTS	155	212	☐	☐	☑
208	NEW HAVEN TO DEVON - REINSTALL FOURTH TRACK	157	168	☐	☑	☑
207	DEVON MOVABLE BRIDGE REPLACEMENT	168	168	☑	☑	☐
538	WALK AND SAGA MOVABLE BRIDGES - REHABILITATION	185	187	☑	☑	☐
218	SOUTH NORWALK TRACK IMPROVEMENTS	187	188	☑	☑	☐
537	COS COB MOVABLE BRIDGE REPLACEMENT	199	199	☑	☑	☐
574	HARRISON POCKET TRACK	205	205	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**227**

Station improvements are designed to meet ADA and State of Good Repair (SGR) requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are eight projects within this program. Four of the projects are for ADA and SGR related improvements. New or improved station facilities are proposed in West Haven, Bridgeport, Stamford, and Fairfield, Connecticut.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
612	NEW HAVEN STATION - ADA IMPROVEMENTS	157	157	☑	☐	☐
235	WEST HAVEN - NEW STATION	159	159	☐	☑	☐
457	BRIDGEPORT STATION - NEW STATION AND PARKING GARAGE	173	173	☐	☑	☐
611	BRIDGEPORT STATION - ADA / SGR IMPROVEMENTS	173	173	☑	☐	☐
489	FAIRFIELD STATION DEVELOPMENT	179	179	☐	☑	☐
613	STAMFORD STATION - ADA IMPROVEMENTS	195	195	☑	☐	☐
231	STAMFORD - NEW STATION AT EAST MAIN STREET	195	195	☐	☑	☐
614	NEW ROCHELLE STATION - ADA / SGR IMPROVEMENTS	212	212	☑	☐	☐

Totals for: New Haven, CT to New Rochelle, NY

# of Projects: 19 Order of Magnitude Segment Costs ($m) 4,618

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

New Rochelle, NY - Bergen, NJ

Program: — *OofM Cost ($ millions)*

HELL GATE LINE SERVICE EXPANSION AND TRIP TIME IMPROVEMENTS — **817**

Based on preliminary service plans and the capacity analysis performed for the Master Plan, the predominately two-track Hell Gate Line is projected to be over capacity by 2030, due to an increase in intercity trains combined with proposed potential plans to operate commuter service on this line. This report includes a "placeholder" for added track capacity and other supporting infrastructure on the Hell Gate Line, but the capacity and efficiency of existing infrastructure will be further investigated prior to progressing these major capital improvements. These proposed projects will be defined in greater detail based on additional analysis and simulation modeling as part of the Penn Station Capacity Study, currently underway.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
562	HELL GATE LINE - TRACK CAPACITY IMPROVEMENTS (NEED T/B/D)	213	227	☐	☑	☐
573	HELL GATE LINE - SUBSTATION	213	227	☑	☑	☑
210	PELHAM BAY MOVABLE BRIDGE REPLACEMENT AND HELL GATE CURVE MODIFICATIONS	216	216	☑	☑	☑
789	PELHAM AND GATE INTERLOCKINGS - RECONSTRUCTION	216	216	☑	☑	☑
819	HELL GATE LINE - STATION PLATFORMS AT 3 POTENTIAL NEW COMMUTER STATIONS	217	222	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
PENN STATION NEW YORK CAPACITY ENHANCEMENTS						**12,568**
	Over 1,000 Amtrak, NJ TRANSIT, and LIRR trains operate via Penn Station each weekday, consuming virtually all available track and platform capacity during extended peak periods. MNR's plans to provide service to Penn Station, via both the Empire Corridor and Hell Gate Line routes in the long-term will increase total volumes by an additional 200 trains to approximately 1,200 daily trains. In the short-term, high density signal systems will potentially provide greater throughput for trains accessing Penn Station from the east.					
	The stand-alone commuter rail facility initiatives currently under construction, LIRR East Side Access (ESA) and NJT Access to the Region's Core (ARC), have the potential to provide some capacity relief at Penn Station in the medium term, but the station is expected to be significantly over capacity by 2030. A new Moynihan Station in the Farley Post Office building will improve passenger flows and provide midtown Manhattan with a signature intercity passenger rail station befitting the nation's largest city. Given forecast growth and service plans, in the long run, additional capacity will be needed in Manhattan to accommodate future rail service levels. Alternatives to be evaluated in the next phase of the Master Plan include new tunnels under the East and Hudson Rivers, as well as expanded platform track capacity adjacent to the existing Penn Station, and a direct link to JFK International Airport.					
Projects Included in this Program:						
88	NEW YORK EAST - HIGH DENSITY SIGNALS	227	231	☑	☑	☐
398	NEW YORK PENN STATION - NEW TRACK (BLOCK 780)	231	231	☑	☑	☑
461	NEW YORK PENN STATION - THIRD RAIL AND SIGNALS	231	231	☑	☐	☐
814	NEW YORK TERMINAL AREA - ELECTRIC TRACTION FEEDERS - SIGNAL POWER AND CATENARY	231	231	☑	☑	☐
815	SUNNYSIDE YARD FACILITY UPGRADE	231	231	☐	☑	☐
816	NEW YORK PENN STATION - SERVICE PLANT UPGRADE AND TUNNEL EMERGENCY	231	231	☑	☑	☐
79	NEW MANHATTAN TUNNELS	232	231	☐	☑	☑
86	NEW YORK MOYNIHAN STATION	232	232	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

Northeast Corridor Infrastructure Master Plan
Part III: Capital Program Summary by Segment

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**160**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are two projects in this program. One project is related to ADA and SGR related improvements at Penn Station. The other project relates to three potential new Hell Gate Line commuter rail stations in the Bronx, at Hunts Point, Parkchester and Co-Op City, as part of MNR access to Penn Station.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
662	HELL GATE LINE - 3 POTENTIAL NEW COMMUTER STATIONS (BRONX)	213	227	☐	☑	☐
615	NEW YORK PENN STATION - CAPACITY AND ADA / SGR IMPROVEMENTS	231	231	☑	☑	☐

Totals for: New Rochelle, NY - Bergen, NJ

# of Projects: 15 Order of Magnitude Segment Costs ($m) 13,545

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Bergen, NJ - Trenton, NJ

Program: — *OofM Cost ($ millions)*

PORTAL BRIDGE IMPROVEMENTS — 1,900

Portal Bridge is beyond SGR and a significant chokepoint for operations in northern New Jersey and the greater New York region. Amtrak and NJT are replacing the existing bridge span with two spans providing a five-track ROW across the Hackensack River. The Amtrak-owned northern span will consist of three tracks connecting to NEC infrastructure and a new third track between Swift and Lack interlockings.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
666	PORTAL BRIDGE (NEC PORTION) - NEW THIRD TRACK - LACK TO SWIFT INTERLOCKINGS	236	239	☑	☑	☑
81	PORTAL BRIDGE REPLACEMENT PROJECT (NEC PORTION)	237	237	☐	☑	☐

Program: — *OofM Cost ($ millions)*

NEW JERSEY TRIP TIME AND CAPACITY IMPROVEMENTS — 1,079

The New York to Trenton segment is the busiest section on the South End. Despite significant infrastructure improvements in the ARC project and Portal Bridge Replacement, service growth will cause available capacity to decrease by 2030, particularly south of Newark Penn Station, unless major improvements are constructed. Signal system replacement and interlocking upgrades will permit higher speeds while increasing capacity throughout the segment. Additional running track segments in the vicinity of Secaucus, Newark and through Elizabeth will increase operating flexibility and mitigate congestion. Grade separations at Hunter Interlocking, where NJT Raritan Line trains merge with the NEC, and potentially other locations, will eliminate commuter train crossing conflicts.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
465	NEW YORK TO TRENTON - SIGNAL SYSTEM REPLACEMENT AND UPGRADE	232	291	☑	☑	☑
80	SECAUCUS - FIFTH STATION TRACK	235	237	☐	☑	☐
813	SECAUCUS AREA/HIGH LINE - BRIDGE REPLACEMENT	238	238	☐	☑	☐
82	SWIFT TO DOCK EAST - NEW THIRD TRACK	239	241	☐	☑	☐
83	SWIFT TO HUDSON - NEW FOURTH TRACK	239	240	☐	☑	☑
812	DOCK BRIDGE REHABILITATION	241	241	☑	☐	☐
85	HUNTER INTERLOCKING GRADE SEPARATION	243	243	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
523	LANE TO ELMORA INTERLOCKINGS - INSTALL NEW FIFTH TRACK THROUGH ELIZABETH	253	256	☐	☑	☐
77	ISELIN CAPACITY IMPROVEMENTS / FEASIBILITY ANALYSIS	256	256	☐	☑	☐
73	MIDWAY INTERLOCKING RECONFIGURATION	274	274	☑	☑	☑
75	JERSEY AVENUE STORAGE YARD	274	274	☐	☑	☐
522	JERSEY AVENUE/COUNTY INTERLOCKING GRADE SEPARATION	274	274	☐	☑	☐

Program: *OofM Cost ($ millions)*

TRENTON AREA CAPACITY IMPROVEMENTS — 100

Existing station configuration and yard facilities at Trenton will not accommodate future service levels. SEPTA lacks adequate storage facilities and must deadhead trains to/ from Trenton. Proposed SEPTA storage facilities at Barracks Yard would reduce SEPTA deadhead moves, freeing capacity for revenue operations. Morris Interlocking will also be improved, reducing crossing conflicts at Morrisville Yard. (Note: Parts of Trenton Station are already undergoing improvements).

Projects Included in this Program:

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
510	TRENTON STATION RECONFIGURATION	289	298	☑	☑	☐
420	TRENTON YARD EXPANSION	290	290	☐	☑	☐
53	MORRIS INTERLOCKING IMPROVEMENT AND YARD ACCESS	291	300	☑	☑	☐

Program: *OofM Cost ($ millions)*

STATION IMPROVEMENTS — 102

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are nine projects in this program, seven of which are related to ADA and SGR improvements. The remaining two focus on improving Newark Penn Station operations.

Projects Included in this Program:

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
463	NEWARK PENN STATION - TRACK AND PLATFORM IMPROVEMENTS	241	242	☑	☑	☐
623	NEWARK PENN STATION - ADA IMPROVEMENTS	241	241	☑	☐	☐
669	NEWARK PENN STATION - PLATFORM EXTENSION	241	241	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

Part III: Capital Program Summary by Segment

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
622	NEWARK LIBERTY INTERNATIONAL AIRPORT STATION - ADA IMPROVEMENTS	244	244	☑	☐	☐
621	METROPARK STATION - ADA IMPROVEMENTS	256	256	☑	☐	☐
464	NEW BRUNSWICK PLATFORM EXTENSION	272	272	☐	☑	☐
620	NEW BRUNSWICK STATION - ADA / SGR IMPROVEMENTS	272	272	☑	☐	☐
618	PRINCETON JUNCTION STATION - ADA / SGR IMPROVEMENTS	288	288	☑	☐	☐
617	TRENTON STATION - ADA / SGR IMPROVEMENTS	289	289	☑	☐	☐

Totals for: Bergen, NJ - Trenton, NJ

# of Projects: 26 Order of Magnitude Segment Costs ($m) 3,181

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Trenton, NJ - Newark, DE

Program: — *OofM Cost ($ millions)*

PHILADELPHIA AREA COMMUTER AND INTERCITY RAIL IMPROVEMENTS — **270**

Increased train volumes through Shore, Zoo, and Phil interlockings is resulting in conflicts near 30th Street Station. Grade separations in the long-term at North Philadelphia and Phil interlockings and improved configuration at Zoo interlocking would reduce the conflicts between commuter, freight, and intercity trains operating through Philadelphia. This will be evaluated via capacity analysis. Interlocking improvements at Cornwells Heights would permit SEPTA zoned express service on its R7 Trenton Line to Philadelphia.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
422	CORNWELLS HEIGHTS INTERLOCKING	314	314	☐	☑	☐
419	NORTH PHILADELPHIA JUNCTION GRADE SEPARATION	318	318	☐	☑	☐
809	NORTH AND SOUTH PENN INTERLOCKINGS - SIGNAL IMPROVEMENTS	322	322	☑	☑	☐
63	PHIL INTERLOCKING GRADE SEPARATION	324	324	☐	☑	☐
599	MARCUS HOOK TURNBACK TRACK	338	341	☐	☑	☐

Program: — *OofM Cost ($ millions)*

DELAWARE TRACK EXPANSION AND INTERLOCKING IMPROVEMENTS — **399**

Sections of the NEC in Delaware will be at capacity by 2030, particularly near Wilmington Station where two- and three-track bottlenecks exist. Installation of a third track between Yard and Ragan interlockings and a new Orange Street Bridge will provide some relief south of Wilmington Station. Third and fourth track and interlocking improvements north of Wilmington will also improve track capacity and operations. Reconfiguration of Holly and Ruthby interlockings will provide operational flexibility through Wilmington. Reconfiguration of the Newark, Delaware station area infrastructure will provide additional station capacity, operating flexibility and storage facilities for SEPTA and future MARC commuter rail services while providing a freight bypass track and station access for future Delaware downstate services.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
803	HOOK INTERLOCKING - INCREASE SPEEDS (TRACK AND C&S)	338	338	☑	☐	☑
60	HOLLY TO LANDLITH INTERLOCKINGS-TRACK UPGRADE	341	346	☑	☐	☐
368	HOLLY INTERLOCKING RECONFIGURATION	341	341	☑	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
521	HOLLY TO LANDLITH INTERLOCKINGS - NEW FOURTH TRACK	341	346	☐	☑	☐
520	LANDLITH TO WINE - NEW THIRD TRACK	346	347	☐	☑	☐
366	ORANGE STREET BRIDGE RENOVATION	348	348	☐	☑	☐
360	YARD TO RAGAN INTERLOCKINGS - NEW THIRD TRACK	349	350	☐	☑	☐
367	RUTHBY INTERLOCKING EXPANSION	357	357	☐	☑	☐
55	NEWARK, DE STATION RELOCATION (INFRASTRUCTURE CHANGES)	359	359	☐	☑	☐

Program: — *OofM Cost ($ millions)*

STATION IMPROVEMENTS — **456**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are 14 projects in this program, seven of which are related to ADA and SGR improvements. The remaining seven focus on improving and expanding service through new or relocated stations and platform improvements (Freight trains currently operate through the northbound platforms at Bridesburg, Tacony and Eddington on the SEPTA Trenton Line).

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
66	LEVITTOWN TO BRIDESBURG - HIGH LEVEL PLATFORMS	304	321	☑	☐	☐
616	CORNWELLS HEIGHTS STATION - ADA / SGR IMPROVEMENTS	314	393	☑	☐	☐
628	NORTH PHILADELPHIA STATION - ADA / SGR IMPROVEMENTS	318	318	☑	☐	☐
631	30TH STREET STATION - ADA / SGR IMPROVEMENTS	322	322	☑	☐	☐
52	WILMINGTON LINE/SEPTA - HIGH-LEVEL PLATFORMS - ADA COMPLIANCE - DARBY TO MARCUS HOOK	324	338	☑	☐	☐
508	DELAWARE STATIONS - HIGH-LEVEL PLATFORMS - ADA COMPLIANCE	338	362	☑	☐	☐
362	CLAYMONT STATION RELOCATION	340	340	☐	☑	☐
364	EDGEMOOR - NEW STATION	344	344	☐	☑	☐
58	WILMINGTON STATION - HIGH-LEVEL PLATFORM	347	347	☑	☐	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Project Benefits Category: Congestion / Capacity	Project Benefits Category: Trip Time
630	WILMINGTON STATION - ADA IMPROVEMENTS	347	347	☑	☐	☐
56	CHURCHMAN'S CROSSING STATION - WEST SIDE HIGH-LEVEL PLATFORM	355	355	☐	☑	☐
619	NEWARK, DE STATION - ADA / SGR IMPROVEMENTS	360	360	☑	☐	☐

Totals for: Trenton, NJ - Newark, DE

# of Projects: 26 Order of Magnitude Segment Costs ($m) 1,125

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Newark, DE - Washington, DC

Program: — *OofM Cost ($ millions)*

NORTHERN MARYLAND BRIDGE AND TRACK EXPANSION IMPROVEMENTS — 3,065

The two- and three-track NEC Main Line in northern Maryland will largely be at capacity by 2030. Three bridges in the section, at the Susquehanna, Bush and Gunpowder rivers are all beyond their useful life. Replacement of all three bridges will also improve operating efficiencies. Potential track upgrades between Perry and Prince interlockings and new track to accommodate improved freight operations as well as expanded passenger service between Iron and Prince, and Grace and Bush interlockings will mitigate future bottlenecks. A new storage facility is needed to accommodate MARC 2030 commuter services in northern Maryland. Upon completion, the bridge and track improvements will create a three- and four-track Main Line through northern Maryland capable of accommodating Amtrak, improved freight and MARC future service plans.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
376	IRON TO PRINCE INTERLOCKINGS - NEW FOURTH TRACK	362	378	☐	☑	☐
28	BACON TO PRINCE INTERLOCKINGS - NEW THIRD TRACK (CHESAPEAKE CONNECTOR)	372	378	☐	☑	☐
790	BACON TO GUNPOW INTERLOCKINGS - NEW FOURTH TRACK	372	400	☑	☑	☑
518	PRINCE TO PERRY INTERLOCKINGS - TRACK 1 AND TRACK 4 UPGRADE	378	380	☐	☑	☑
377	SUSQUEHANNA RIVER BRIDGE REPLACEMENT	380	382	☑	☑	☑
371	BUSH RIVER BRIDGE REPLACEMENT	392	396	☑	☑	☑
373	GUNPOWDER RIVER BRIDGE REPLACEMENT	396	400	☑	☑	☑
21	EDGEWOOD - SIDINGS AND INTERLOCKING UPGRADE	396	398	☐	☑	☐
30	EDGEWOOD - NEW MARC STORAGE AND MAINTENANCE FACILITY	397	397	☐	☑	☐
19	GUNPOW TO BIDDLE INTERLOCKING - TRACK A UPGRADE	400	415	☐	☑	☐
374	UNION TUNNEL - NEW FOURTH TRACK	414	415	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
BALTIMORE PENN STATION CAPACITY IMPROVEMENTS						**3,511**
The current Baltimore Penn Station track and platform configuration cannot accommodate future MARC overnight storage needs. MARC presently stores all of the equipment that operates in peak period Penn Line trains at Penn Station Baltimore. The facility is at capacity and prevents expansion of trains to meet demand. In association with the Northern Maryland Track Expansion Improvements, this project relocates overnight storage from Penn Station to help eliminate this constraint. South of the station, the two-track Baltimore and Potomac (B&P) Tunnels are beyond their useful life and cannot adequately serve the mix of trains currently operating in the tunnel. A new commuter and intercity rail tunnel will replace the B&P Tunnels. Freight traffic will benefit from a new freight tunnel connection through Baltimore with connections north and south. North of the station (geographic east), the Paul Interlocking Reconfiguration project is intended to eliminate conflicts between MARC and Amtrak train movements.						
Projects Included in this Program:						
408	BALTIMORE TUNNELS - FREIGHT ALIGNMENT	415	417	☑	☑	☐
16	PAUL INTERLOCKING RECONFIGURATION	416	416	☑	☑	☐
380	BALTIMORE - B & P REPLACEMENT TUNNEL	417	418	☑	☑	☑
Program:						*OofM Cost ($ millions)*
BALTIMORE TO WASHINGTON TRIP TIME AND CAPACITY IMPROVEMENTS						**595**
The two- and three-track Main Line between Baltimore and Washington is expected to be largely at capacity by 2030. The existing signal system design is insufficient to accommodate increased train volumes and reduced trip times. Corridor improvements including signal system, track class and interlocking upgrades, and new track between Bridge and Landover interlockings will result in a three- to four-track Main Line that can accommodate future commuter, freight, and intercity rail services and trip time goals. New track and higher capacity signal improvements south of Landover will facilitate rail traffic in and out of Washington Union Station.						
Projects Included in this Program:						
547	BALTIMORE TO WASHINGTON - SIGNAL SYSTEM UPGRADE	416	457	☑	☑	☑
5	BRIDGE TO LANDOVER - TRACK UPGRADE	419	450	☑	☑	☐
13	BRIDGE/GWYNNS - NEW INTERLOCKING	420	420	☑	☑	☑
511	BWI PHASE I - WINANS TO GROVE - NEW FOURTH TRACK	424	433	☐	☑	☑
372	GROVE TO LANDOVER INTERLOCKINGS - NEW FOURTH TRACK	433	450	☐	☑	☐
495	GROVE/HARMONS INTERLOCKING RECONFIGURATION	433	433	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
10	CARROLL INTERLOCKING UPGRADE	447	447	☑	☑	☐
7	NEW CARROLLTON - NEW TRACK 1 PLATFORM	448	448	☐	☑	☐
512	LANDOVER TO C - THIRD TRACK	450	456	☐	☑	☐
513	LANDOVER TO C - HIGH DENSITY SIGNALS	450	456	☐	☑	☐
399	LANDOVER/HANSON INTERLOCKING RECONFIGURATION	450	450	☑	☑	☐

Program: *OofM Cost ($ millions)*

WASHINGTON UNION STATION CAPACITY IMPROVEMENTS — **309**

The lower level (through) track and platform configuration constrains commuter and intercity services operating on this level. MARC and VRE commuter railroads will require additional midday storage facilities outside of the station in order to free platform capacity needed as a result of increased services. Interlocking reconfigurations may be required to support expanded operations.

Projects Included in this Program:

4	VRE STORAGE YARD	455	455	☐	☑	☐
1	MARC WEDGE YARD	456	456	☐	☑	☐
3	WASHINGTON TERMINAL - C TO K INTERLOCKINGS - RECONFIGURE	456	457	☑	☑	☐
2	WASHINGTON UNION STATION - LOW TO HIGH PLATFORMS	457	457	☑	☑	☐
401	WASHINGTON UNION STATION - TRACK / PLATFORMS IMPROVEMENTS	457	457	☑	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**534**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve.

Maryland is planning a new Bayview MARC station in eastern Baltimore to serve the Johns Hopkins Bayview Medical Center via an intermodal interface with the planned Metro Red Line and convenient access to I-895. Enhancements are planned at the Martin State Airport MARC station, one of the most heavily patronized on the Penn Line. Proposed is a new, slightly relocated intermodal station with light rail connections and direct access to the adjacent state airport, which serves charter, corporate, and general aviation and the Maryland Air National Guard. The area is surrounded by existing major industries and the new Crossroads office/industrial/commercial development. MDOT is planning to site this new station to align with a planned Transit Oriented Development (TOD) project that would compliment transit-focused redevelopment in the area. This site has potential as a future Amtrak stop, is it is central to a considerable amount of existing and planned mixed-use development. The community is supportive of a new station and is actively planning for redevelopment of the historic Martin Aviation factory hangars as part of the station facility, museum and mixed-use development.

At Washington Union Station, short-term improvements to the intercity concourse are planned, as well as longer-term improvements to the lower level that are expected to include commercial development of the air rights. The District is interested in developing an intermodal hub to the north of the existing concourse and improving the connection between Metro subway and trains. There are 20 projects in this program, six of which are related to ADA and SGR improvements. The remaining projects focus on improving and expanding service through new or relocated stations and platform improvements.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
29	ELKTON - NEW STATION	366	366	☐	☑	☐
507	PENN LINE/MARC STATIONS - HIGH-LEVEL PLATFORMS - ADA COMPLIANCE	380	457	☑	☑	☐
629	ABERDEEN STATION - ADA / SGR IMPROVEMENTS	384	384	☑	☐	☐
25	ABERDEEN - NEW STATION AND HIGH-LEVEL PLATFORMS	386	386	☑	☐	☐
22	MARTIN AIRPORT - STATION IMPROVEMENTS AND HIGH LEVEL PLATFORMS	405	405	☑	☑	☐
378	BALTIMORE BAYVIEW-HOPKINS - NEW STATION - TRACK REALIGNMENT	412	412	☐	☑	☐
33	BALTIMORE MADISON SQUARE - NEW STATION	414	414	☐	☑	☐
627	BALTIMORE PENN STATION - ADA / SGR IMPROVEMENTS	416	416	☑	☐	☐
32	WEST BALTIMORE STATION RELOCATION	419	419	☐	☑	☐
15	HALETHORPE MARC STATION - NEW HIGH LEVEL PLATFORMS	424	424	☑	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Project Benefits Category: Congestion / Capacity	Project Benefits Category: Trip Time
8	BWI PHASE I - TRACK AND PLATFORM IMPROVEMENTS	427	427	☐	☑	☐
496	BWI THURGOOD MARSHALL AIRPORT STATION - NEW STATION BUILDING	427	427	☑	☐	☐
626	BWI THURGOOD MARSHALL AIRPORT STATION - ADA / SGR IMPROVEMENTS	427	427	☑	☐	☐
514	NEW CARROLLTON - HIGH-LEVEL CENTER PLATFORM	448	448	☑	☐	☐
625	NEW CARROLLTON STATION - ADA / SGR IMPROVEMENTS	448	448	☑	☐	☐
624	WASHINGTON UNION STATION - ADA / SGR IMPROVEMENTS	457	457	☑	☐	☐

Totals for: Newark, DE - Washington, DC

# of Projects: 46 Order of Magnitude Segment Costs ($m) 8,014

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Washington, D.C. - Richmond, VA

Program: — *OofM Cost ($ millions)*

WASHINGTON TO RICHMOND TRIP TIME AND CAPACITY IMPROVEMENTS — 3,156

The extension of high-speed rail south of Washington is an important goal in this rapidly growing region. Improving key infrastructure is necessary to facilitate this expansion. Significant bottlenecks affecting future service improvements immediately south of Washington Union Station are the Virginia Avenue Tunnel and the Long Bridge. A second track through the Virginia Avenue tunnel will allow freight trains to clear the segment faster. A new bridge over the Potomac River will increase throughput in and out of Union Station. Constructing new ADA-compliant platforms at the three-track Alexandria Station will eliminate current operating limitations. Comprehensive track, siding and high-speed interlocking and signal improvements will permit 90 mph passenger service between Richmond and Washington.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
594	VIRGINIA AVENUE TUNNEL IMPROVEMENT	458	458	☐	☑	☐
551	LONG BRIDGE (POTOMAC RIVER) - REPLACEMENT	459	459	☑	☑	☐
596	RO TO AF INTERLOCKINGS - NEW FOURTH TRACK	459	465	☐	☑	☐
576	WASHINGTON TO RICHMOND - MAS 90	460	564	☐	☐	☑
772	WASHINGTON TO RICHMOND - HIGH SPEED INTERLOCKINGS	460	564	☐	☑	☑
773	WASHINGTON TO RICHMOND - SIGNAL IMPROVEMENTS FOR MAS 90	460	564	☐	☐	☑
579	ALEXANDRIA STATION - STATION IMPROVEMENTS AND METRO CONNECTION	464	464	☑	☑	☐
597	CAMERON RUN - NEW BRIDGE OVER NORFOLK SOUTHERN	466	466	☐	☑	☑
770	FRANCONIA TO NORTH OCCOQUAN - NEW THIRD TRACK	470	479	☐	☑	☑
582	NORTH OCCOQUAN TO POWELLS CREEK - THIRD TRACK	479	486	☐	☑	☑
410	POWELLS CREEK TO ARKENDALE - NEW THIRD TRACK	486	496	☐	☑	☑
590	ARKENDALE TO DAHLGREN AND AQUIA BRIDGE - NEW THIRD TRACK	497	508	☐	☑	☑

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
589	DAHLGREN TO FREDERICKSBURG - NEW THIRD TRACK	509	569	☐	☑	☑
595	FB TO MINE ROAD - NEW FOURTH TRACK	510	518	☐	☑	☑
767	CROSSROADS TO HAMILTON - NEW THIRD TRACK	513	516	☐	☑	☑
588	HA TO XR INTERLOCKINGS - NEW THIRD TRACK	513	516	☐	☑	☑
593	MILFORD TO GUINEA - NEW THIRD TRACK	521	539	☐	☑	☑
598	BUCKINGHAM BRANCH RAILROAD - PASSING SIDINGS AND SIGNALS	544	549	☐	☑	☐
587	NORTH DOSWELL TO COLEMAN MILL - NEW THIRD TRACK	546	539	☐	☑	☑
586	GREENDALE TO ELMONT - NEW THIRD TRACK	553	564	☐	☑	☑
771	ELMONT TO PARHAM ROAD - NEW THIRD TRACK	558	562	☐	☑	☑
534	RICHMOND MAIN STREET STATION AREA IMPROVEMENTS	567	567	☐	☑	☐

Program: — *OofM Cost ($ millions)*

RICHMOND AREA/ ACCA YARD IMPROVEMENTS — **650**

The configuration of Acca Yard track constrains certain short- and long-distance intercity services from serving Richmond Main Street Station, limiting service expansion to the Hampton Roads and southern Virginia/ North Carolina regions. VDRPT and CSXT have identified a series of improvements to separate freight and intercity movements at Acca Yard, including bypass tracks around the yard and a new passenger rail yard near Brown Street. Construction of the bypass tracks will allow intercity routes to access Main Street Station (at 45 mph versus 15 mph) and better serve Hampton Roads and southern Virginia/ North Carolina regions. A new suburban Richmond station at Parham Road, with expanded parking and station facilities, will replace the Staples Mill Road Station.

Projects Included in this Program:

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
559	RICHMOND AREA / ACCA YARD IMPROVEMENTS - PHASE I	556	569	☑	☑	☐
768	RICHMOND AREA / ACCA YARD IMPROVEMENTS - PHASE II	564	569	☐	☑	☑
581	RICHMOND AREA TURNING AND STORAGE FACILITY	565	566	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
POSITIVE TRAIN CONTROL						**30**
Positive train control will need to be installed to meet federal mandate. The specific technology and installation is still under review by the railroads.						
Projects Included in this Program:						
563	POSITIVE STOP TRAIN CONTROL - WASHINGTON TO RICHMOND	459	569	☑	☐	☐
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**230**
Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel and encourage intermodalism. There are 12 projects in this program, seven of which are related to ADA and SGR improvements. VRE is in the process of installing second platforms at all Fredericksburg Line stations as funding becomes available to improve interoperability and on-time performance. Richmond's Main Street Station will be substantially expanded to accommodate passenger trains on four tracks, as opposed to the existing single track. The remaining projects focus on improving service through envisioned new stations (Parham Road, Carmel Church) relocated stations and platform improvements. Costs are contained in infrastructure, capacity and trip-time improvements categories.						
Projects Included in this Program:						
769	VRE PLATFORM EXTENSIONS	459	511	☑	☑	☐
580	CRYSTAL CITY STATION IMPROVEMENTS - SECOND PLATFORM	460	460	☑	☑	☐
632	ALEXANDRIA STATION - ADA / SGR IMPROVEMENTS	464	464	☑	☐	☐
558	VRE SECOND PLATFORMS - PHASE I	465	485	☐	☑	☐
633	FRANCONIA/SPRINGFIELD STATION - ADA IMPROVEMENTS	472	472	☑	☐	☐
634	WOODBRIDGE STATION - ADA IMPROVEMENTS	480	480	☑	☐	☐
585	CHERRY HILL - NEW STATION	487	487	☐	☑	☐
578	VRE SECOND PLATFORMS - PHASE II	501	507	☐	☑	☐
635	FREDERICKSBURG STATION - ADA / SGR IMPROVEMENTS	510	510	☑	☐	☐
584	CARMEL CHURCH - NEW STATION	532	532	☐	☑	☐
636	ASHLAND STATION - ADA / SGR IMPROVEMENTS	555	555	☑	☐	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
637	RICHMOND STAPLES MILL STATION - ADA / SGR IMPROVEMENTS	564	564	☑	☐	☐
638	RICHMOND MAIN STREET STATION - ADA IMPROVEMENTS	567	567	☑	☐	☐

Totals for: Washington, D.C. - Richmond, VA

# of Projects: 39 Order of Magnitude Segment Costs ($m) 4,066

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Philadelphia, PA - Harrisburg, PA

Program: — *OofM Cost ($ millions)*

ZOO TO PARKESBURG CAPACITY IMPROVEMENTS — **398**

The current track configuration of the Harrisburg Line between Zoo interlocking and Exton cannot adequately handle 2030 SEPTA and Amtrak service plans. Improvements include a new third track between Paoli and Exton, and between Thorndale and Parkesburg (for freight). Improvements include track and interlocking upgrades and concrete tie replacement, which are also needed to accommodate increased services and improve operating speeds.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
159	PHILADELPHIA HIGH LINE INTERMODAL FREIGHT CONNECTION TO NEC	2	2	☐	☑	☐
160	WYNNEFIELD TO ZOO (JO) INTERLOCKINGS - TRACK RECONFIGURATION	2	2	☐	☑	☐
476	ZOO TO PAOLI - SIGNAL SYSTEM UPGRADE - CAB NO WAYSIDE	2	20	☐	☑	☐
783	ABS CENTRALIZED CONTROL - PHILADELPHIA TO LANCASTER	2	68	☑	☑	☐
774	ZOO AND JO INTERLOCKING SYSTEM IMPROVEMENTS	3	3	☑	☑	☑
415	52ND STREET - PAXON CONNECTION	4	5	☐	☑	☐
161	WINNFIELD - NEW INTERLOCKING	5	2	☑	☑	☐
474	VILLA/ NOVA - NEW INTERLOCKINGS	12	12	☐	☑	☐
136	PAOLI TO FRAZER - REINSTALL TRACK 3	20	24	☐	☑	☐
473	PAOLI INTERLOCKING RECONFIGURATION	20	20	☑	☑	☑
674	PAOLI TO PARK - CONCRETE TIE REPLACEMENT	20	44	☐	☐	☑
134	THORNDALE TRACK CONFIGURATION	24	37	☐	☑	☐
672	GLEN TO DOWNINGTOWN - TRACK 2 UPGRADE	26	33	☐	☐	☑
673	THORNDALE TO PARKESBURG - NEW THIRD TRACK	35	44	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
Program:						*OofM Cost ($ millions)*
PARKESBURG TO HARRISBURG INTERCITY RAIL IMPROVEMENTS						**52**
The improvements will include completion of new interlockings at Park (formerly Atglen), Leaman Place and Harrisburg, eliminate the last three public grade crossings on the line, and replace remaining wood tie sections with concrete ties.						
Projects Included in this Program:						
731	STRUCTURAL IMPROVEMENTS-BRIDGE REHAB AND OTHER UPGRADES	2	105	☐	☑	☐
130	PARK - NEW INTERLOCKING	47	47	☐	☑	☐
775	LEAMAN INTERLOCKING IMPROVEMENT	57	57	☐	☑	☐
98	PUBLIC HIGHWAY CROSSINGS ON HARRISBURG LINE	59	79	☑	☐	☐
99	PRIVATE GRADE CROSSING ELIMINATION	80	80	☑	☐	☐
95	STATE INTERLOCKING RECONFIGURATION	104	104	☑	☐	☐
Program:						*OofM Cost ($ millions)*
POSITIVE TRAIN CONTROL						**25**
Project includes Installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than150 mph) as mandated by the Federal Rail Safety Improvement Act of 2008.						
Projects Included in this Program:						
500	POSITIVE STOP TRAIN CONTROL - HARRISBURG LINE	2	105	☑	☐	☐
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**353**
Major upgrades are envisioned to several intercity stations at Harrisburg, Elizabethtown, Lancaster, and Exton. New intercity stations are planned at Middletown, Mount Joy, Paradise, potentially Coatesville, Downingtown, Paoli and Ardmore. SEPTA's plans include installation of high-level platforms at all of its stations on the Harrisburg.						
Projects Included in this Program:						
526	HARRISBURG LINE - ADA COMPLIANCE - SEPTA HIGH LEVEL PLATFORMS	6	28	☑	☐	☐
659	ARDMORE STATION - ADA IMPROVEMENTS	9	9	☑	☐	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Project Benefits Category: Congestion / Capacity	Project Benefits Category: Trip Time
776	ARDMORE STATION UPGRADE AND IMPROVEMENTS	9	9	☑	☑	☐
140	PAOLI STATION RECONSTRUCTION	20	20	☑	☑	☐
657	PAOLI - NEW STATION	20	20	☐	☑	☐
671	EXTON STATION - ADA / SGR IMPROVEMENTS	28	28	☑	☐	☐
656	DOWNINGTOWN STATION - ADA / SGR IMPROVEMENTS	34	34	☑	☐	☐
655	COATESVILLE STATION - ADA / SGR IMPROVEMENTS	38	38	☑	☐	☐
654	PARKESBURG STATION - ADA / SGR IMPROVEMENTS	44	44	☑	☐	☐
129	PARADISE - NEW STATION WITH HIGH LEVEL PLATFORMS AND FREIGHT BYPASS	57	57	☐	☑	☐
653	LANCASTER - STATION RENOVATIONS	68	68	☑	☐	☐
652	MOUNT JOY STATION - ADA / SGR IMPROVEMENTS	80	80	☑	☐	☐
651	ELIZABETHTOWN - STATION RENOVATIONS	87	87	☑	☐	☐
650	MIDDLETOWN STATION - ADA / SGR IMPROVEMENTS	95	95	☑	☐	☐
96	HARRISBURG INTERNATIONAL AIRPORT - NEW STATION	97	97	☐	☑	☐
649	HARRISBURG STATION - ADA / SGR IMPROVEMENTS	105	105	☑	☐	☐

Totals for: Philadelphia, PA - Harrisburg, PA

# of Projects: 37 Order of Magnitude Segment Costs ($m) 828

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

New York, NY - Albany, NY

Program: — *OofM Cost ($ millions)*

ALBANY/ EMPIRE CONNECTION IMPROVEMENTS — **63**

The single track portion of the West Side Connection approaching CP 12 presents conflicts for opposing Amtrak trains between Amtrak's CP Inwood and CP 12 on MNR. This conflict can also produce residual delays for MNR Hudson Line services due to Amtrak trains waiting for the single track section to clear. Double-tracking the Connection, which includes the Spuyten Duyvil Swing Bridge, will eliminate the delay between opposing trains.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
120	SPUYTEN DUYVIL - DOUBLE TRACK AMTRAK CONNECTION	12	13	☐	☑	☐

Program: — *OofM Cost ($ millions)*

ALBANY/ HUDSON LINE COMMUTER AND INTERCITY RAIL IMPROVEMENTS — **366**

Upgraded track, interlocking, and wayside infrastructure are needed to accommodate increased service while maintaining operational flexibility and service reliability. Track and yard improvements at Poughkeepsie and new third track at Cold Spring Bay and Tarrytown are needed to meet accommodate services. Updated signal and train control systems will permit higher speeds and closer headways, increasing capacity on the line.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
121	TARRYTOWN - POCKET TRACK AND NEW CP 24	24	24	☐	☑	☐
125	CROTON-HARMON TO POUGHKEEPSIE - NEW HIGH CAPACITY SIGNAL SYSTEM	46	52	☐	☑	☐
528	COLD SPRING BAY TO CHELSEA - THIRD MAIN LINE TRACK	52	53	☐	☑	☐
678	POUGHKEEPSIE THIRD MAIN TRACK - CP 71 TO CP 75	71	75	☐	☑	☐
124	POUGHKEEPSIE YARD AND MAIN LINE IMPROVEMENTS	73	75	☐	☑	☐
695	POUGHKEEPSIE TO RENSSELAER - SMALL BRIDGE REPLACEMENTS	76	144	☑	☐	☐
765	HUDSON SUBDIVISION SIGNAL RELIABILITY/TRAIN CONTROL SYSTEM	76	144	☑	☐	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
694	GERMANTOWN TO SCHODACK ROCK SLOPE STABILIZATION	105	130	☑	☐	☐

Program: — *OofM Cost ($ millions)*

ALBANY/ EMPIRE LINE IMPROVEMENTS — 163

New high-speed rail interlockings are needed to facilitate more efficient train movements by minimizing crossover delays, and provide additional connectivity between the main tracks in the northern section. Additional capacity improvements are being considered at the junction of the Hudson and Schodack Subdivisions in Stuyvesant. Active warning devices at grade crossings are needed to improve safety on this CSXT-owned portion of the line.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
763	HUDSON LINE - HIGHWAY/ RAIL GRADE CROSSING SAFETY IMPROVEMENTS	75	143	☑	☐	☐
698	NEW CP-82	82	82	☐	☑	☐
697	NEW CP-99	99	99	☐	☑	☐
529	STUYVESANT - NEW THIRD TRACK AND INTERLOCKING IMPROVEMENTS	124	124	☐	☑	☐
764	CASTLETON - NEW PIPELINE AT GREEN AVENUE GRADE CROSSING	134	134	☑	☐	☐
68	NEW CP-136	136	136	☑	☐	☐
766	SOUTH RENSSELAER PORT CONNECTOR GRADE SEPARATION	141	141	☑	☐	☐
460	ALBANY TO SCHENECTADY - REINSTALL DOUBLE TRACK	144	160	☐	☑	☐

Program: — *OofM Cost ($ millions)*

ALBANY-RENSSELAER STATION AND YARD CAPACITY IMPROVEMENTS — 266

Lack of track and platform space at Albany-Rensselaer Station causes conflicts for both intercity and Empire services. Currently, certain trains must wait outside of the station for extended periods while waiting for track space. A fourth station track and center platform conversion improvements will increase the number of trains that can simultaneously access the station. Expanded yard capacity at Albany-Rensselaer will be needed to accommodate future storage requirements based on expanded Amtrak Empire Corridor Service with potential Rensselaer train originations. Freight bypass capability must be maintained for CSX (and CP trackage rights) traffic.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
69	ALBANY-RENSSELAER STATION - FOURTH TRACK	142	144	☐	☑	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
71	ALBANY-RENSSELAER - EXPANDED YARD CAPACITY	142	143	☐	☑	☐
527	ALBANY RENSSELAER STATION - LOW TO HIGH PLATFORM (CENTER ISLAND)	142	143	☑	☑	☐
72	ALBANY-RENSSELAER STATION - INTERLOCKING OF WYE	143	143	☐	☑	☐
459	ALBANY-RENSSELAER - LIVINGSTON AVENUE BRIDGE REPLACEMENT	143	143	☑	☑	☐
163	ALBANY-RENSSELAER STATION - FREIGHT BYPASS INTERLOCKING	144	143	☐	☑	☐

Program: — *OofM Cost ($ millions)*

POSITIVE TRAIN CONTROL — **121**

On the CSX-owned portion of the line, positive train control will need to be installed to meet federal mandate. The specific technology and installation is still under review by the railroads on this section. MNR is considering installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than 150 mph) as mandated by The Rail Safety Improvement Act of 2008.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
502	POSITIVE STOP TRAIN CONTROL - ALBANY LINE - EMPIRE CONNECTION AND CP 125 TO SCHENECTADY	0	11	☑	☐	☐
504	POSITIVE STOP TRAIN CONTROL - ALBANY LINE - SPUYTEN DUYVIL TO POUGHKEEPSIE (MTA OWNED)	11	74	☑	☐	☐
823	POSITIVE STOP TRAIN CONTROL - ALBANY LINE - POUGHKEEPSIE TO CP 125	74	125	☑	☐	☐

Program: — *OofM Cost ($ millions)*

STATION IMPROVEMENTS — **40**

Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are seven projects in this program, five of which are related to ADA and SGR improvements. A major overhaul project is planned for Schenectady. A relocation of the Hudson Station is also under consideration. The remaining projects focus on improving and expanding service through new or relocated stations and platform improvements.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
648	POUGHKEEPSIE STATION - ADA / SGR IMPROVEMENTS	73	73	☑	☐	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

Northeast Corridor Infrastructure Master Plan
Part III: Capital Program Summary by Segment

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Project Benefits Category: Congestion / Capacity	Project Benefits Category: Trip Time
647	RHINECLIFF STATION - ADA / SGR IMPROVEMENTS	88	88	☑	☐	☐
162	HUDSON STATION REVISED CONFIGURATION	114	115	☐	☑	☐
646	HUDSON STATION - ADA / SGR IMPROVEMENTS	114	114	☑	☐	☐
645	ALBANY-RENSSELAER STATION - ADA IMPROVEMENTS	142	142	☑	☐	☐
644	SCHENECTADY STATION - ADA / SGR IMPROVEMENTS	159	159	☑	☐	☐
685	SCHENECTADY - REHABILITATE / REPLACE PASSENGER STATION	159	159	☑	☐	☐

Totals for: New York, NY - Albany, NY

# of Projects: 33 Order of Magnitude Segment Costs ($m) 1,019

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

New Haven, CT - Springfield, MA

Program: — *OofM Cost ($ millions)*

SPRINGFIELD NEW TRACK AND INTERLOCKING UPGRADES — 834

Electrification, double tracking and the addition of third track sidings are included to support new commuter and increased intercity rail services in the segment. Fixed bridges and the Hartford viaduct will be rehabilitated or replaced, and when complete will permit operation of 286,000-pound freight car service. Existing and new interlockings will be designed to support electrification and the double track program and increase speeds. Additionally, increased train servicing and layover requirements will be defined at Greenfield, Springfield and New Haven terminals.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
541	SPRINGFIELD LINE - DOUBLE TRACK AND SIDINGS	2	62	☑	☑	☑
542	SPRINGFIELD LINE - INTERLOCKING UPGRADES	2	62	☐	☑	☐
543	SPRINGFIELD LINE - GRADE CROSSING UPGRADES / ELIMINATION	2	62	☑	☐	☑
544	SPRINGFIELD LINE - VIADUCTS AND BRIDGES - STRUCTURAL REHAB	2	62	☑	☐	☐
785	SPRINGFIELD LINE - ELECTRIFICATION	2	62	☐	☑	☑
722	KNOWLEDGE CORRIDOR - SPRINGFIELD LINE CONNECTION	62	62	☐	☑	☐

Program: — *OofM Cost ($ millions)*

POSITIVE TRAIN CONTROL — 8

The Springfield Line includes installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than150 mph) as mandated by The Rail Safety Improvement Act of 2008. PTC design for the Knowledge Corridor and Inland Route will be determined by Pan Am Southern and CSXT for their respective routes.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
501	POSITIVE STOP TRAIN CONTROL - SPRINGFIELD LINE	2	62	☑	☐	☐

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Project Benefits Category: Congestion / Capacity	Project Benefits Category: Trip Time
Program:						*OofM Cost ($ millions)*
STATION IMPROVEMENTS						**105**
Station improvements are designed to meet ADA and SGR requirements, facilitate ease of travel, encourage intermodalism, and integrate stations into the economic fabric of the communities they serve. There are seven projects in this program, six of which are related to ADA and SGR improvements. The City of Springfield and the metropolitan planning organization are currently evaluating alternatives for the potential restoration of historic Springfield Union Station. If a decision is made to rehab the historic station platform and track modifications will be included to effectively serve trains operating via the Knowledge Corridor, Springfield Line and Inland Route to Boston. All existing intercity stations including Hartford will require expansion and modification to accommodate double tracking of the line. Modifications will include additional platforms, ADA compliance and facilities to accommodate excess dimension freight traffic shipments.						
Projects Included in this Program:						
782	SPRINGFIELD LINE - HIGH LEVEL PLATFORMS	2	62	☑	☑	☑
658	WALLINGFORD STATION - ADA / SGR IMPROVEMENTS	12	12	☑	☐	☐
643	MERIDEN STATION - ADA / SGR IMPROVEMENTS	18	18	☑	☐	☐
642	BERLIN STATION - ADA / SGR IMPROVEMENTS	25	25	☑	☐	☐
641	HARTFORD STATION - ADA / SGR IMPROVEMENTS	36	36	☑	☐	☐
640	WINDSOR STATION - ADA / SGR IMPROVEMENTS	42	42	☑	☐	☐
639	WINDSOR LOCKS STATION - ADA / SGR IMPROVEMENTS	47	47	☑	☐	☐

Totals for: New Haven, CT - Springfield, MA

# of Projects: 14 Order of Magnitude Segment Costs ($m) 947

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time

Segment:

Multi-Corridor

Program: — *OofM Cost ($ millions)*

POSITIVE TRAIN CONTROL — 65

Project includes installation of ACSES wayside transponders incorporating positive stop and civil speed control in areas of the corridor where ACSES is not currently installed (operating speeds greater than150 mph) as mandated by the Federal Rail Safety Improvement Act of 2008.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
499	POSITIVE STOP TRAIN CONTROL - BOSTON TO WASHINGTON	0	458	☑	☐	☐

Program: — *OofM Cost ($ millions)*

HIGH SPEED RAIL IMPROVEMENTS / OTHER CORRIDOR WIDE — 4,041

Amtrak, the states and commuter agencies have identified improvements necessary for 15-minute trip time reductions between Boston and New York by 2015; and 30-minute reductions by 2028 after completion of State of Good Repair (SGR). Additional improvements above 30–minutes are also being explored.

Projects Included in this Program:

ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time
89	LONG TERM POWER CONSUMPTION AND SUPPLY STUDY	0	458	☑	☑	☐
407	PROTECTION OF FREIGHT ROUTES	0	458	☐	☑	☐
761	MAJOR TERMINAL S&I FACILITY IMPROVEMENTS	0	458	☐	☑	☐
762	STORAGE TRACK AND FACILITY IMPROVEMENTS	0	458	☐	☑	☐
791	BOSTON TO NEW YORK - BRIDGE REHABILITATION PROGRAM	0	231	☑	☑	☑
792	BOSTON TO NEW YORK - FACILITY IMPROVEMENT PROGRAM	0	231	☑	☑	☑
793	BOSTON TO NEW YORK - ROW FENCING ABOVE 150 MPH	0	231	☑	☐	☑
556	HIGH SPEED RAIL - TRIP TIME IMPROVEMENTS - NEW HAVEN LINE	155	212	☐	☐	☑
545	HIGH SPEED RAIL - NEW YORK TO WASHINGTON - CONSTANT TENSION CATENARY	231	458	☑	☑	☑

Note: Costs shown are preliminary, order of mangnitude for planning purposes; NEC mileposts are cumulative from Boston to Richmond; except branch lines, mileposts are from station intersecting the NEC Main Line to outlying station.

ID	Project Title	Milepost From	Milepost To	Project Benefits Category: ADA / Safety / Reliability	Congestion / Capacity	Trip Time
548	FREQUENCY CONVERTER CAPACITY EXPANSION - SUNNYSIDE YARD, METUCHEN AND JERICHO PARK	231	458	☑	☑	☐
784	NEW YORK TO WASHINGTON - INTERLOCKING RENEWAL/ MODERNIZATION	231	458	☑	☑	☐
802	NEW YORK TO WASHINGTON - HIGH-SPEED INTERLOCKING PROGRAM	231	458	☐	☐	☑
804	NEW YORK TO WASHINGTON - BALLAST CLEANING, SUBGRADE STABILIZATION AND DRAINAGE	231	458	☐	☑	☑
805	NEW YORK TO WASHINGTON - BRIDGE REHABILITATION PROGRAM	231	458	☑	☑	☑
806	NEW YORK TO WASHINGTON - FACILITY IMPROVEMENT PROGRAM	231	458	☑	☑	☑
807	NEW YORK TO WASHINGTON - ROW FENCING ABOVE 150 MPH	231	458	☑	☐	☑
808	NEW YORK TO WASHINGTON - AUTOMATIC BLOCK SIGNAL UPGRADES	231	458	☑	☑	☑
810	NEW YORK TO WASHINGTON - BACKUP SIGNAL POWER	231	458	☑	☑	☑
811	NEW YORK TO WASHINGTON - NEW SUBSTATIONS	231	458	☐	☑	☑
746	CURVE REALIGNMENT - ELIZABETH	255	255	☐	☐	☑
747	CURVE REALIGNMENT - LINCOLN INTERLOCKING AREA	267	267	☐	☐	☑
748	CURVE REALIGNMENT - NESHAMINY	303	304	☐	☐	☑
749	CURVE REALIGNMENT - TORRESDALE	306	308	☐	☐	☑
750	CURVE REALIGNMENT - FRANKFORD	314	315	☐	☐	☑
751	CURVE REALIGNMENT - SHORE TO 30TH STREET	315	322	☐	☐	☑

Totals for: Multi-Corridor

# of Projects: 26 Order of Magnitude Segment Costs ($m) 4,106

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		Milepost		Project Benefits Category		
ID	Project Title	From	To	ADA / Safety / Reliability	Congestion / Capacity	Trip Time

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