HARRISBURG LINE CAPACITY IMPROVEMENTS

UPGRADE OF TRACK 2 FROM GLEN INTERLOCKING TO THORN INTERLOCKING

FEDERAL RAILROAD ADMINISTRATION FEDERAL-STATE PARTNERSHIP FOR STATE OF GOOD REPAIR PROGRAM GRANT APPLICATION

Lead Applicant: Southeastern Pennsylvania Transportation Authority (SEPTA)
Joint Applicant: Pennsylvania Department of Transportation (PennDOT)

FEDERAL FUNDING REQUESTED:	$8,337,500 (50%)
PROPOSED NON-FEDERAL MATCH:	$8,337,500 (50%)
TOTAL PROJECT COST:	$16,675,000
PROJECT LOCATION:	Caln Township, Downingtown Borough, East Caln Township, West Whiteland Township, & East Whiteland Township in Chester County, Pennsylvania - 6th Congressional District

No Federal Grant Application Previously Submitted for this Project

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Attachments

I. Project Summary

In partnership with the Pennsylvania Department of Transportation (PennDOT) and the National Passenger Railroad Corporation (Amtrak), the Southeastern Pennsylvania Transportation Authority (SEPTA) is requesting Federal Railroad Administration (FRA) State of Good Repair Partnership Grant funding in the amount of **$8,337,500** for the Harrisburg Line Capacity Improvements: Upgrade of Track 2 from Glen Interlocking to Thorn Interlocking project. FRA grant funding will support this $16.7 million, shovel ready project that is a critical step forward in a renewed effort between Amtrak, PennDOT, and SEPTA to optimize the Harrisburg Line and will generate benefits worth 3.5 to 11.5 times the project cost.

The Harrisburg Line has experienced sustained growth over the last 15 years. Ridership on SEPTA's Paoli-Thorndale Line, which runs headways as low as 15 minutes at peak, has grown by 14% since 2004. Amtrak's ridership has increased by 12% since 2015. Based on the Delaware Valley Regional Planning Commission's forecasted population growth along the corridor, Amtrak, SEPTA, and PennDOT are cooperatively evaluating short and long term opportunities to enhance rail service and operational flexibility to accommodate current and future ridership through a multi-faceted, phased process.

SERVICE SUMMARY		
Operator	**Annual Riders**	**Daily Trains**
Amtrak	1.78 M	28
SEPTA	5.97 M	88
Norfolk Southern		2

Due to right-of-way constraints, service increases can only be realized by effectively utilizing the existing track infrastructure. The Harrisburg Line operates revenue service as a four track railroad from Zoo Interlocking (Philadelphia, PA) to Paoli Interlocking (Chester County, PA) and a two track railroad west of Paoli Interlocking to Harrisburg, PA. Between Glen and Thorn interlockings a third tracks exists but current use is limited to minimal freight movement due to speed restrictions. The proposed project will upgrade the third track (Track 2) from Glen to Thorn Interlockings to an FRA Class 3 Track with Rule 562 Signaling.

Upgrading Track 2 will return the track to a state of good repair, reduce congestion, enhance operational flexibility, and increase operating speeds. In addition to revenue trains, SEPTA is using the main tracks (Tracks 1 and 4) from Glen to Thorn Interlockings for non-revenue trains leaving or arriving at Frazer Yard. These deadhead moves add an additional 11 trains per day to the segment. SEPTA has an order for new multi-level rail cars to be housed at Frazer Yard, which will further increase rail traffic. The proposed project will allow SEPTA's non-revenue trains to use Track 2 and avoid conflicts with revenue passenger trains. In addition, Norfolk Southern uses both Track 2 and Track 4 and the project will increase the operating speed for freight through this segment on Track 2 as well as further reducing congestion on Track 4. Finally, the proposed project is part of the long range, conceptual plans to return Track 2 to revenue service.

Intercity Rail will directly benefit from congestion reduction and the enhanced ability to mitigate unforeseen service impacts. The Harrisburg Line has a number of infrastructure and state of good repair needs. This project was specifically selected because it can be implemented quickly, intercity rail will realize immediate benefits, and it will allow future projects to advance. This collaboration between SEPTA, PennDOT, and Amtrak is consistent with the goals of the Federal-State Partnership grant program.

II. Project Funding

The Harrisburg Line Capacity Improvements: Upgrade of Track 2 from Glen Interlocking to Thorn Interlocking project is a collaborative effort between SEPTA, PennDOT and Amtrak (the Project Partners). Table 1 (below) provides a summary of the total $16,675,000 project cost, the amount of Federal funding requested, and the proposed non-Federal match. The Project Partners have committed $8,337,500 for a 50% match to the requested Federal funds. Letters of commitment from PennDOT and Amtrak are included in Attachment A. No previously expended or encumbered funds are included in the match.

Project Tasks	Cost
1. Final Engineering & Design	**$ 500,000**
Signal Improvements (Section 562) Final Design	$ 500,000
2. Construction	**$ 16,175,000**
Track 2 Improvements: Glen (MP 25.3) to Downs Interlocking (MP 32.1)	$ 2,300,000
Track 2 Improvements: Downs (MP 32.1) to Thorn Interlocking (MP 35.0)	$ 9,200,000
Rule 562 Signaling: Downs (MP 32.1) to Thorn Interlocking (MP 35.0)	$ 4,100,000
Overhead Contact System: Glen (MP 25.3) to Thorn (MP 35.0)	$ 575,000
Total Project Cost	**$ 16,675,000**
Funding Sources	
Federal Funding	**$ 8,337,500**
Federal Funds Received from Previous Grants (no applications pending)	$ 0
FRA Federal-State Partnership for State of Good Repair Program Federal Funding Request (50% Federal Share)	$ 8,337,500
Non-Federal Funding	**$ 8,337,500**
Non-Federal Funding (50% Committed by PennDOT, SEPTA, & Amtrak)	$ 8,337,500
Total Proposed Funding	**$ 16,675,000**

Project Budget & Funding Summary

Securing FRA funding may allow the project to advance to construction in calendar year 2020. Preliminary engineering is complete and the project is expected to qualify for a listed Categorical Exclusion determination under the National Environmental Policy Act (NEPA) review process. Track construction will be completed within a year, allowing the project to achieve immediate benefits. The signal installation will occur the following year adding a key element of operational flexibility to the project. In total, the project is expected to be complete within two years of a grant award.

SEPTA, PennDOT, and Amtrak have established goals and performance metrics that will be used to measure and report the performance of the project.

The project is located entirely within the Philadelphia-PA-NJ-DE-MD Urbanized Area, but positively affects a track segment used by services that connect to the Northeast Corridor.

There are no other pending Federal funding requests.

III. Applicant Eligibility

The Southeastern Pennsylvania Transportation Authority (SEPTA) is the lead applicant for this grant request. As a public agency and publicly chartered authority, SEPTA is eligible to apply for this program. SEPTA will serve as the grant administrator, project coordinator, and participate in cost sharing.

The Pennsylvania Department of Transportation (PennDOT) is a joint applicant for this request and is providing $2,000,000 of the committed matching funds. PennDOT is a unit of state government and an eligible joint applicant per Section C.1. of the Notice of Funding Opportunity.

The National Passenger Railroad Corporation (Amtrak) joins this request as a project partner responsible for project delivery and is providing $400,000. In coordination with SEPTA, PennDOT and FRA, Amtrak will be responsible for implementing the project.

Collectively, the project partners are fully committed to funding the long-term operation and maintenance of Track 2 from Glen Interlocking to Thorn Interlocking. Amtrak is committed to ensuring the operations and maintenance of the infrastructure. Funding is specifically made available through the Northeast Corridor Commission Cost Allocation Policy's Baseline Capital Charge (BCC) program for capital renewal of this type of infrastructure. Furthermore, the project partners have conceptual agreement on a long range plan that will return Track 2 to revenue service and; therefore, have a joint interest in the operation, maintenance, and capital renewal of the asset.

The Keystone Corridor is a state-supported asset on the Northeast Corridor. The project partners have a strong relationship and history of successfully completing major capital investments on the Harrisburg Line. Examples of this partnership include the $145 million Keystone Corridor Improvement Program completed in 2007 and the more recently completed Paoli Intermodal Transportation Center Accessibility Improvements project. Currently, the Ardmore Transportation Center Accessibility Project, another collaborative effort between SEPTA, Amtrak and PennDOT, is under construction.

The application is submitted by SEPTA with the full support of PennDOT and Amtrak, which have provided Letters of Commitment (Attachment A). Additional Letters of Support are included as Attachment B.

IV. NEC Project Eligibility

The Project is eligible for the FRA Federal-State Partnership for State of Good Repair Program per Section C of the Notice of Funding Opportunity.

Ownership Requirement

The Harrisburg Line is a segment of the Keystone Corridor, a 350-mile electrified rail corridor extending from 30th Street Station in Philadelphia to the Pittsburgh Transportation Center in downtown Pittsburgh. Both the 104.6 mile eastern segment of the Keystone Corridor between Philadelphia and Harrisburg (the "Keystone East") and the 154 mile western segment from Harrisburg to Pittsburgh (the "Keystone West") were owned by the Penn Central Transportation Company from 1968-1976. In 1976, as part of a national

rail reorganization, the Keystone East was conveyed to Amtrak, subject to an outstanding federal mortgage, while the Keystone West was conveyed to Conrail. Amtrak retained operating and other necessary rights for intercity passenger service on the Keystone West while Conrail retained all necessary operating and other rights for freight and commuter rail service on the Keystone East. In 1983, Conrail's commuter rights on the Keystone East were conveyed to SEPTA. In 1998, Conrail's ownership of the Keystone West and freight operating rights on the Keystone East were conveyed to Norfolk Southern. Today, Amtrak dispatches trains on the Keystone East while Norfolk Southern (and other freight operators) and SEPTA exercise their respective rights and services on that corridor, including the commuter rights conveyed to SEPTA in 1983. The Pennsylvania Department of Transportation subsidizes 100% of Amtrak's operation on both portions of the Keystone Line.

Both Amtrak and SEPTA will retain ownership and satisfactory continuing control of all assets that will be improved between Glen and Thorn Interlockings through the rights included in the 1976 and 1983 conveyances. The entire project is located within existing railroad right-of-way.

Planning Requirement

The 2020-2024 Northeast Corridor Commission (NECC) Capital Investment Plan (CIP) documents the investments required over the next five years to reverse decades of deterioration and to modernize Amtrak's shared national asset for future economic growth. The CIP includes initiatives that could be advanced over the next five years to lessen the state of good repair backlog if additional funding becomes available. These projects would increase train capacity and improve access to rail on NEC's century-old infrastructure, much of which has significantly deteriorated and creates risks of service interruptions.

The Harrisburg Line is identified in the CIP as a Regional Priority and the restoration of Track 2 from Glen to Thorn Interlockings has been included as a Special Project. As shown in the 2020-2024 CIP, Harrisburg Line Track & Interlocking Improvements will return the infrastructure to a state of good repair and allow for faster deadhead train moves between Frazer and Thorndale thereby reducing the number of trains using the main tracks.

Cost-sharing Requirement

The NEC is a shared resource with multiple right-of-way, station owners and service providers. Because the rail system serves multiple states and crosses many jurisdictions, it is important to determine cost-sharing expectations and partnerships early in the project development process and ensure they are consistent with the NEC Cost-Allocation Policy. Cost sharing for this project is being coordinated consistently with the Northeast Corridor Commission Cost Allocation Policy. SEPTA, PennDOT, and Amtrak utilized the Project Based Allocation Method (Section 5.5.3 of the Policy) to determine the cost sharing arrangement for this project. All agencies have agreed to the cost sharing arrangement as demonstrated by the letters of commitment (Attachment A). In addition, the project identification and planning phases were conducted in accordance with the Policy and included engagement from all impacted parties in the scoping and development of this application.

State of Good Repair Requirement

The Harrisburg Line is a critical element of passenger rail infrastructure in the Northeastern U.S., carrying approximately 8 million passengers per year. The Harrisburg Line extends 104.6 miles across Pennsylvania and connects Philadelphia (Pennsylvania's largest city) with the Commonwealth's capital as well as and Keystone Corridor service then extends 154 miles to Pittsburgh and ultimately connects to New York City. Both Amtrak and SEPTA operate passenger service on this corridor. The line was originally built as a four-track route by the Pennsylvania Railroad to transport both passengers and freight. Its use has changed significantly over the past century, and what was once a major, four-track mixed-use corridor now primarily serves intercity and commuter passenger rail with two tracks over most of its length.

As a consequence, the original track infrastructure does not meet its intended design function and is not in a state of good repair. The degraded condition of Track 2 sharply limits travel speed on it and the eastbound-only signals on the portion from Thorn interlocking to Downs interlocking exacerbate this, reducing what was once a mainline track of the Pennsylvania Railroad to a marginal one. Changes in service compounded by the age of the infrastructure, require that the railroad line be upgraded using modern technologies and standards that are optimized for shared use by intercity passenger, commuter, and freight rail.

At the time of enactment of Passenger Rail Reform and Investment Act on December 4, 2015, Track 2 from Glen to Thorn Interlockings had already been downgraded to Class 1 status.

V. Detailed Project Description

Existing Conditions

Between Philadelphia and Thorndale, SEPTA operates the Paoli-Thorndale Line, an electrified commuter rail service. The Paoli-Thorndale Line is SEPTA's highest ridership Regional Rail (commuter rail) line, with a ridership of approximately 21,000 passenger trips on an average weekday, or nearly 6 million passengers per year. The Paoli-Thorndale Line runs frequently for a commuter rail service, with 88 train trips on an average weekday, reaching headways periodically below 15 minutes during peak periods. Off-peak, trains operate at 30 minute headways east of Paoli.

The Harrisburg Line thus hosts two frequent and highly used rail services from two separate carriers and twice daily freight service. With such high, varied service levels, the trains from the operators frequently interact, and each depends on the smooth operation and consistent reliability of the other. Seemingly small disruptions can ripple throughout regional networks, affecting SEPTA's 12 other Regional Rail lines, Amtrak's indispensable services on the Northeast Corridor and Norfolk Southern's expansive freight rail network. Therefore, reliability is critical for a well-functioning rail network in Southeastern Pennsylvania and beyond.

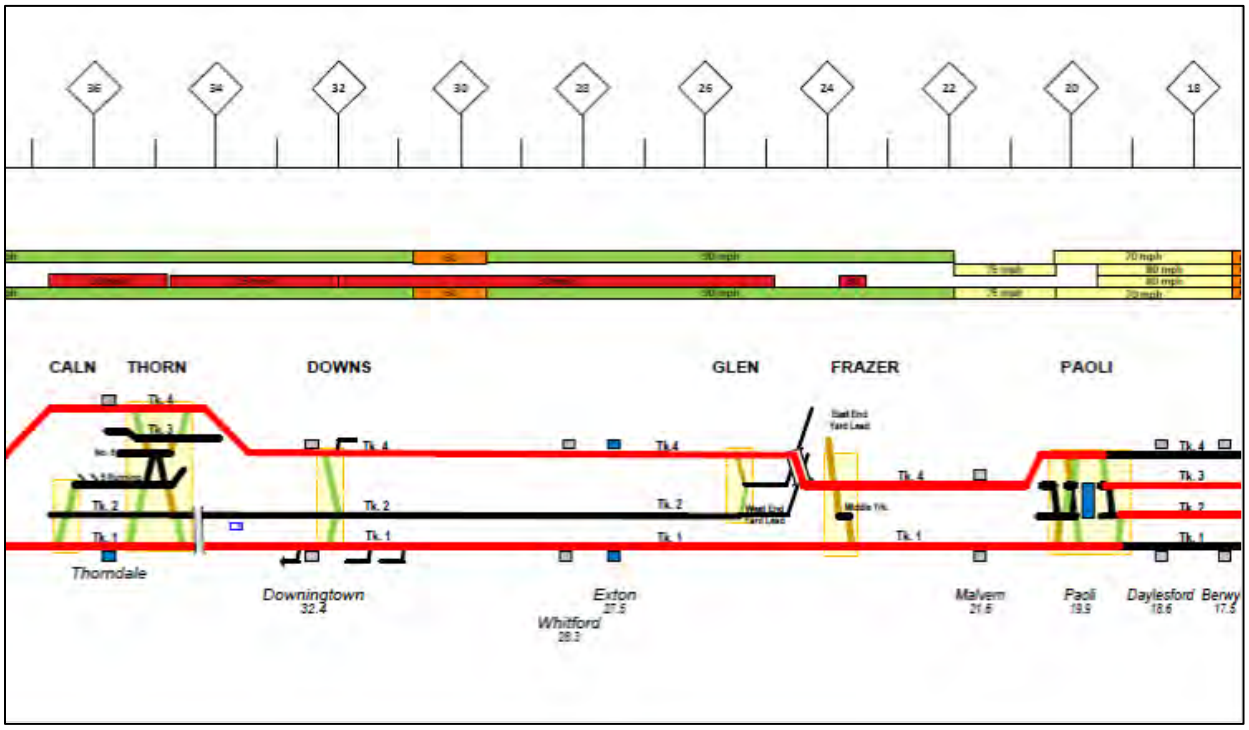
The project area is the Harrisburg Line from Glen Interlocking (MP 25.3) to Thorn Interlocking (MP 35.0).

Track

In the project area, there are three tracks. Tracks 1 and 4 are rated an FRA Class 6 (110 miles per hour). Track 3 is rated an FRA Class 1 (15 miles per hour).

Tracks 1 and 4 are used for all routine passenger revenue and non-revenue intercity and regional (commuter) rail operations. During routine operations, Track 2 is used exclusively by Norfolk Southern trains from Glen Interlocking eastward. From Glen Interlocking westward, Norfolk Southern trains use Track 4. Under unusual circumstances, SEPTA non-revenue trains may also use Track 2.

The limited use of Track 2 creates congestion on Tracks 1 and 4 and offers no resiliency if operational issues arise on those tracks, and prohibits future service expansion. Returning Track 2 to a state of good repair will remedy these issues.



Current Track Configuration

Signals

One of the primary goals for Project Partners on the Harrisburg Line is to upgrade the signal system. Amtrak, in coordination with PennDOT, is in the process of installing Rule 562 Signals from Park Interlocking to Paoli Interlocking on Tracks 1 and 4. Future plans include extending the Rule 562 Signal System east to the end of the line at Zoo Interlocking.

In the project area, Rule 562 Singling is installed on Track 2 from Glen to Downs Interlockings.

From Downs Interlocking to Thorn Interlocking, currently, there is a single-direction signal system. This system is signaled in the eastbound direction. For SEPTA to use Track 2 for non-revenue (deadhead) trains under the current configuration, dispatchers would need to issue instructions for movement against the signal. The authorization process is administratively time consuming and would further restrict train speed to 5 miles per hour, if SEPTA were to use Track 2 on routine basis.

Operational Issues

The physical conditions and signal configuration of Track 2 render it minimally useful, causing congestion, reducing operating speed, and inhibiting resiliency.

Congestion

There are 118 daily revenue passenger trains operating through this segment (88 SEPTA trains 28 Amtrak trains, 2 Norfolk Southern trains), making it a heavily used corridor. In addition, SEPTA operates 11 peak-hour non-revenue trains in this territory on a daily basis. The first inbound station on SEPTA's Paoli/Thorndale Line (Thorndale Station, MP 35.3) is approximately 10 miles west of Frazer Yard, where the rail cars are stored. To reach the station or to return to the yard, SEPTA's non-revenue (deadhead) trains are utilizing the Main Tracks (Tracks 1 and 4). In addition, Norfolk Southern is using Track 4 for westbound train moves, due to the condition of Track 2. SEPTA's eleven deadhead trains and Norfolk Southern trains are creating bottlenecks on the railroad and have impacted scheduling speeds.

Train Scheduling & Operating Speeds

SEPTA's non-revenue (deadhead) trains and Norfolk Southern trains traveling west are slotted between Amtrak and SEPTA revenue trains, compelling both SEPTA and Amtrak to incorporate slowdowns into their schedules to accommodate these trains.

In addition, Norfolk Southern is using Track 2 east of Glen Interlocking at the FRA Class 1 speed of 15 miles per hour.

Resiliency

For intercity and regional (commuter) trains, the project area effectively operates as a two track railroad. This means operational flexibility is severely limited and the railroad cannot recover well from unforeseen conditions without impacting customers. Since January 2014, there are more than 675 delays in Amtrak service that may have been avoided if Track 2 operated as a Class 3 Standard and was considered a viable alternative during unforeseen conditions or unusual circumstances.

Future Needs

Short Term

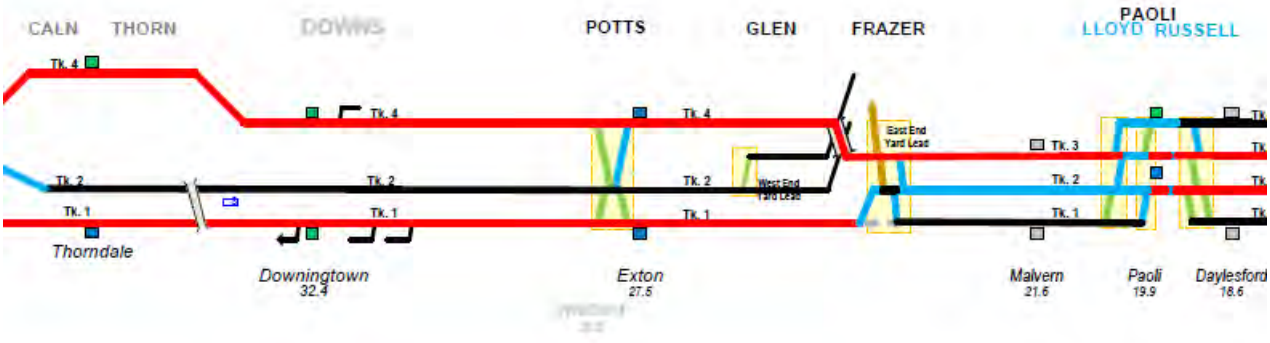
To meet the demands of increasing ridership on the Paoli/Thorndale Regional Rail Line, SEPTA has ordered new, multi-level rail cars to expand its fleet. Currently SEPTA's Frazer Yard and Shop is under construction to accommodate the thirty-five (35) new rail cars that are expected to be delivered in 2022. With the new cars SEPTA anticipates adding 3 additional trains to its schedule. This would result in 14 daily trains, using Track 1 and 4 for non-revenue moves. The proposed project will provide for the infrastructure needed to make enhancing rail service operationally efficient and secure track capacity to allow Amtrak, PennDOT, and SEPTA more options for deploying additional service along the Harrisburg Line.

West end of Frazer Yard new storage tracks

Long Term

The Harrisburg Line has experienced and sustained significant growth over the last 15 years. Ridership on SEPTA's Paoli-Thorndale Line has grown by 14% since 2004 while Amtrak's ridership has surged by 12% since 2015. Based on the Delaware Valley Regional Planning Commission's forecasted population growth of 28.4% in Chester County by 2045, the Project Partners are expecting the growth trend to continue.

This project is part of the conceptual, long range plan by the Project Partners to enhance service by returning Track 2 to revenue service. In the current configuration, Track 2 cannot be used for revenue service because there is no ability for trains to cross-over from Track 2 to the main tracks and access the stations (Exton and Downingtown Station) through this segment. Future plans for the line include construction of a new interlocking (referred to as Potts Interlocking) that would allow trains to make the moves necessary to enhance service in this area.



Conceptual Long Range Plan

Project Activities

The proposed project will improve Track 2 to the FRA Class 3 Standard with a Rule 562 signal system. The project is being advanced in two phases with independent utility.

Track

The first phase of the project will return of Track 2 from Mileposts 25.3 to 35.0 on the Harrisburg Line to a state of good repair, FRA Class 3 (60 miles per hour).

Once the track work is complete, trains will be able to immediately realize the benefits of the upgraded Track and will begin operational use of the track at the higher speeds while the second phase of the project advances.

Scope: Replacement of approximately 40% of ties along with ballast and track materials in the project area or 51,216 feet. The overhead contact system will also be upgraded as needed.

Schedule: Construction may be advanced as early as fall 2020. Initial plans for Amtrak forces include track renewal in the project area next fall and, if funding is secured and resources are available, the proposed project could be advanced concurrently with these efforts.

Cost: $11,500,000.

Signal System

The second phase of the project is the final design and installation of a Rule 562 In-cab, Bi-directional Signal System from Downs Interlocking (MP 32.1) to Thorn Interlocking (MP 35.0).

Scope: Final Design of the signal system and installing the signal system (receivers and transmitters) for Rule 562 signals from Milepost 32.1 to Milepost 35.0.

Schedule: Final design will begin immediately following a grant award and installation will begin following the completion of the track work. Installation may begin as early as fall 2021.

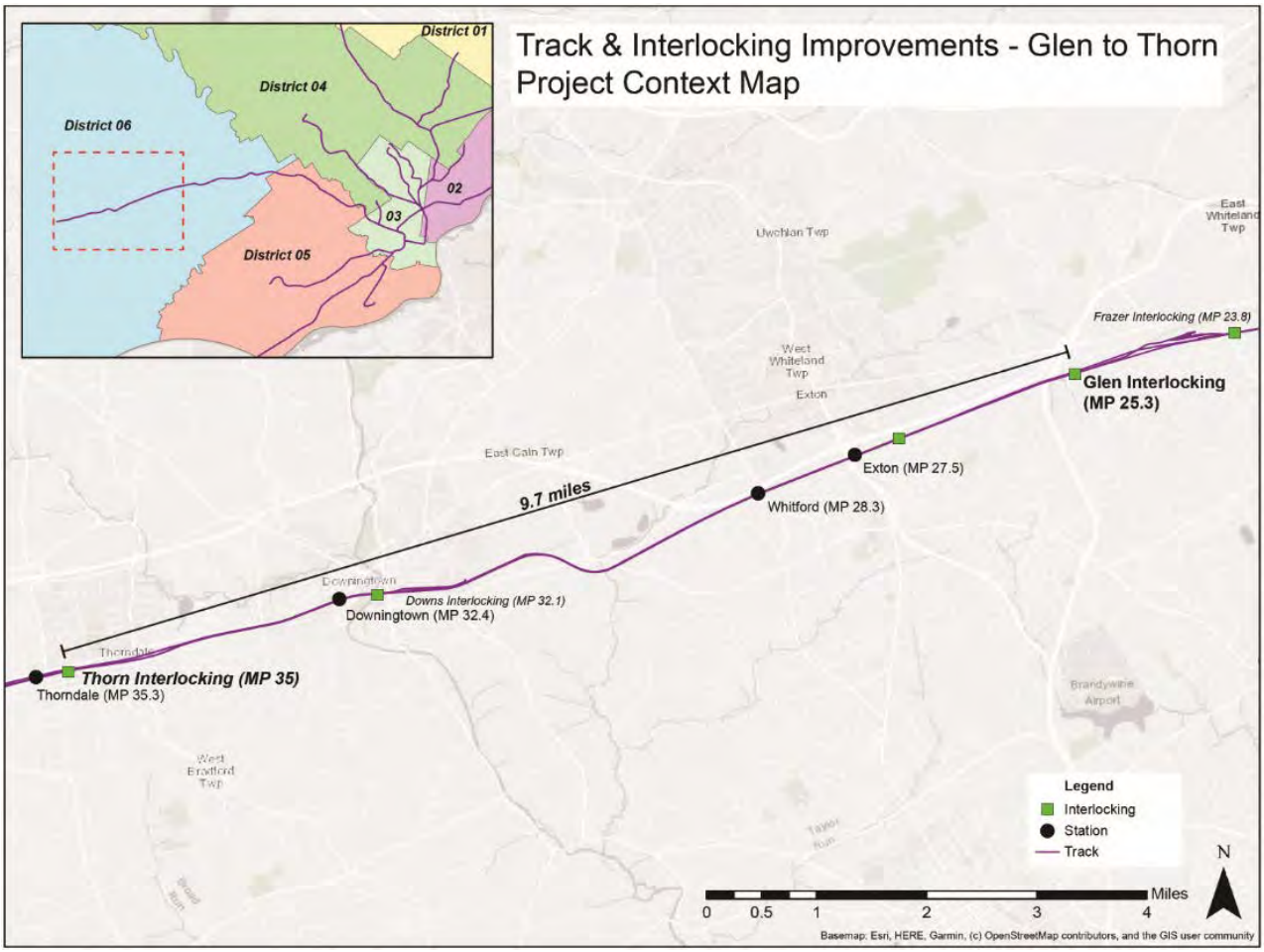
Cost: $5,175,000.

Project Phase	Activities
Track Construction	Replace an estimated 40% of existing ties along 51,216 feet of right-of-way along with new ballast and track materials
Signal System Design & Installation	Final Design of the signal system and installing the signal system (receivers and transmitters)

VI. Project Location

The Harrisburg Line Capacity Improvements: Restoration of Track 2 from Glen Interlocking to Thorn Interlocking project is located on Amtrak's Philadelphia to Harrisburg Main Line (Keystone Corridor) within Chester County, Pennsylvania. The track improvements will be made from mile post 25.3 (Glen Interlocking) to mile post 35.0 (Thorn Interlocking) on Track 2 of the Harrisburg Line. The Rule 562 in-cab no-wayside bidirectional signal system will be installed from Downs Interlocking (MP 32.1) to Thorn Interlocking (MP 35.0).

Overall, the track and signal improvements will span Caln Township, Downingtown Borough, East Caln Township, West Whiteland Township, & East Whiteland Township in the 6th Congressional District of Pennsylvania. These municipalities have a collective population, as of the 2010 census, of 48,194, which represents an increase of 15.1 % over 2000 census.



Project Location

VII. Evaluation & Selection Criteria

Evaluation Criteria

Technical Merit

The project achieves the Technical Merit as outlined in Section E of the FY 2019 Federal-State Partnership for State of Good Repair Notice of Funding Opportunity (NOFA) and is summarized below.

The tasks and subtasks outlined in the Statement of Work are appropriate to achieve the expected outcomes of the project. PennDOT, SEPTA, and Amtrak have extensive experience in administering Federal grant programs and completing projects within the defined schedule and budget.

SEPTA, PennDOT, and Amtrak bring qualified and experienced personnel to the project team and will work in close coordination throughout the duration of the project to ensure all work tasks are completed within the proposed timeframe and budget.

The Project Partners have the legal, financial, and technical capacity to carry out the proposed project. The project team's mutual strategy for project implementation is summarized in the Project Implementation and Management section below.

The project team expects the work will qualify for a Categorical Exclusion (CE) under the National Environmental Policy Act (NEPA) review process. No design work is needed for the track improvements; however, Final Design of the signal system is expected to commence during track construction so that the system can be installed as soon as the track work is complete.

The Project is consistent with Pennsylvania planning guidance and documents including the 2015 Pennsylvania State Rail Plan:
http://www.planthekeystone.com/State%20Rail%20Plan%20Documents/Chapter%203_Proposed%20Passenger%20Rail%20Improvements%20and%20Investments.pdf

The completion of the Project also advances the PA On Track Statewide Personal and Freight Mobility Goal to "Expand and improve system mobility and integrate modal connections." Additionally, "Implement station improvements and interlocking projects on the Keystone Corridor" is highlighted as a strategy for advancing personal and freight mobility in Pennsylvania in the plan available at:
https://www.penndot.gov/ProjectAndPrograms/Planning/Documents/PennDOT-LRTP%20-%20FINAL%20August%202016.pdf

Project Benefits

State of Good Repair

The proposed project will return the Harrisburg Line Track 2 from Glen Interlocking (MP 23.5) to Thorn Interlocking (MP 35.0) to a state of good repair as an FRA Class 3 track.

Congestion Reduction

The proposed project will eliminate the daily need for SEPTA's 11 peak hour, non-revenue trains and Norfolk Southern's trains from using the main tracks on the Harrisburg Line. This will immediately

alleviate the bottleneck through this segment of track. Long term, the project will reduce congestion and allow for service increases following the completion of companion projects.

Travel Time Savings

Passenger rail will realize benefits of travel time savings of an estimated 7 minutes per peak period train traveling on the segment through congestion reduction.

Freight travel time in the eastbound direction will also be reduced.

Benefit-Cost Analysis

The planned improvements provide numerous benefits to rail operations specifically and society in general. The project will: speed travel and reduce uncertainty for current rail passengers, reduce the need for vehicle miles traveled by residents and workers who will choose public transportation over automobile travel, increase competitiveness to the region for both passenger and freight rail operators, decrease air pollution, increase safety due to the implementation of bidirectional signaling and fewer car crashes, and reduce maintenance and operations costs for automobile owners and infrastructure maintenance and repair entities.

Long-Term Outcome	Associated Benefit Types
System and Service Performance	Reduced SEPTA and Amtrak Operating Costs Reduced Vehicle Operating Costs
Safety, Competitiveness, Reliability, Trip or Transit Time, and Resilience	Travel Time Savings Reduced Fuel Costs Reduced Car Crashes – Injuries and Fatalities Reduced Car Crashes – Property Damage VMT Reduction – Reduced Pavement Wear and Tear VMT Reduction – Air Pollution
Improved Integration with Other Modes	Bidirectional Signaling Reduced Freight Shipment Costs
Ability to Meet Existing or Anticipated Demand	

Baseline Assumptions

The Benefit Cost Analysis ("BCA") compares the proposed project against the baseline over a span of forty years. The baseline projection used in this BCA assumes that the track and signal improvements on the Paoli/Thorndale Line are not made.

Project Costs

The development costs of the project relevant to this application are $16.675 million. For benefit-cost purposes the most appropriate cost to use is not the actual construction cost but the opportunity cost of the resources used to build the project. In instances in which minimum labor rates are set by law, for example, wages paid to workers are greater than the wages they could command in the open, unregulated labor market. The unregulated wage rate is the appropriate rate to use for benefit cost purposes. In this case, we have adjusted the projected hard cost down by 15 percent to account for the effect of non-market conditions in the project costs. After adjustments, the present value of the project cost is $14.7 million. Construction will take two years in total to complete, with an anticipated in service date of June 2022.

The analysis below monetizes the benefits listed in Figure 1 and monetizes those benefits over forty years. Benefits are then discounted to 2019 dollars and compared with project costs to calculate the benefit cost ratio. This detailed Benefit-Cost Analysis (BCA) approach indicates that the quantifiable benefits are 3.5 to 11.5 times the total costs of the project, as shown in Figure 2.

Figure 2: Benefit Cost Summary

Metric	Nominal Sum	Present Value (3%)	Present Value (7%)
Present Value of Benefits	$168,836,487	$86,958,199	$44,378,197
Present Value of Costs	$14,674,000	$13,834,674	$12,831,513
Net Present Value	**$154,162,487**	**$73,123,525**	**$31,546,684**
Benefit / Cost Ratio	**11.5**	**6.3**	**3.5**

System & Service Performance

Pennsylvania has the highest number of operating railroads in the country (65) and has one of the highest numbers of total track mileage (over 5,600 miles). This network is frequented by several businesses carrying passengers and commodities within and beyond the state. By improving the operability of the railroad network surrounding the project site, businesses and individuals will experience reductions in operating costs. Due to the reduction in these costs for both individuals and businesses in the affected areas, the proposed project will have significant performance implications.

Reduced SEPTA Operating Costs

The track and signal improvements will create significant time savings for SEPTA and Amtrak operations. Currently, when the east (main) exit from Frazer yard experiences a failure and closes, trains must leave the yard through the west exit. In doing so, the trains must travel seven miles along track with a speed limit of five miles per hour. Such failures occur approximately ten times per year, causing significant time delays for SEPTA each year. As a result of these delays, Amtrak has adjusted their schedules to buffer for these events, which directly translates to an increase in operating costs. The proposed track and signal improvements will enable SEPTA and Amtrak trains to travel full speed the entire length of track, creating significant operating time savings for both entities.

Currently, the normal operations with trains leaving the yard from the east exit causes delays, as each time a train must back out of the yard and enter the main line before heading west to the beginning of its run. The track and signal improvements proposed will change the operations so that all trains leave the

west exit, which is more direct and will allow for full travel speeds upon completion. This improvement will lead to significant time savings for SEPTA, as well as for Amtrak trains traveling on the track, and ultimately save an average of $581,954 per year in operations costs.

Reduced Vehicle Operating Costs

With the proposed project, those choosing to use SEPTA or Amtrak as an alternative to driving would benefit from overall vehicle operation cost savings, created by maintenance and tire wear, as well as depreciation. These incremental savings are estimated at an average of $641,091 per year.

Figure 3: System and Service Performance Benefit Cost Summary

Associated Benefits	Average Annual Value	Nominal Value	3% Discount Value	7% Discount Value
Reduced SEPTA Operating Costs	$540,971	$23,532,247	$12,858,256	$7,081,648
Reduced Vehicle Operation Costs	$641,091	$27,887,456	$15,237,986	$8,392,277
Subtotal	**$1,182,062**	**$51,419,703**	**$28,096,242**	**$15,473,924**

Safety, Competitiveness, Reliability, Trip or Transit Time, and Resilience

The economic benefits created by the proposed track and signal improvements will directly affect both passengers and businesses utilizing the railroad network. Completing the project will take vehicles off the road in favor of SEPTA and Amtrak usage and will thus present a large measure of savings for riders, including reductions in travel time and fuel costs.

Further, the proposed project will increase safety and prevent injuries and damage from crashes. Reducing the likelihood of injury and mortality is a highly significant social benefit.

Travel Time Savings

The proposed track and signal improvements would improve overall performance and reliability for both SEPTA and Amtrak services. At present, Amtrak builds in extra time into their schedules for trains affected by Frazer Yard disruptions. The planned improvements would allow Amtrak to tighten the timetable for each affected train, which in turn will save significant time for every rider using the service. SEPTA is likewise impacted when there are disruptions, leading to delays of over an hour for each disruption. For SEPTA and Amtrak combined, these incremental savings are estimated at $963,884 per year.

In addition to decreasing the travel time of existing riders, the proposed track and signal improvements would increase the appeal of using SEPTA or Amtrak for those who would have otherwise chosen to use another form of transportation (e.g. automobile). With fewer delays after project completion, using SEPTA or Amtrak offers a shorter and more consistent travel time than commuting via automobile. This saving will result in new riders due to the increased perception of reliability and decrease in time lost to delays or signal failures on the track. These incremental savings are estimated at a total of $112,307 per year. In total, the travel time savings will be an average of $1,076,191 each year for all riders.

Reduced Fuel Costs

The reduction in commuting by automobile as described above will reduce vehicle miles traveled (VMT) by 2.8 million, saving an estimated 106,779 gallons of gas that would have been used traveling by automobile. The average annual savings on fuel cost are estimated to be $281,791 per year.

Reduced Car Crashes – Injuries and Fatalities

The reduction in VMTs by Amtrak and SEPTA as a result of the proposed track and signal improvements will reduce injuries and fatalities due to crashes. Fatal and non-fatal injury valuations can be calculated on a per-mile basis using national averages, and valued using US DOT injury valuation data. These incremental savings are estimated at $668,707 each year.

Reduced Car Crashes – Property Damage

The reduction in VMT also leads to fewer car crashes. This reduces future property damage costs incurred by the avoided crashes. Direct risk reduction effects, in addition to the decrease in vehicle miles travelled, will avoid approximately 4 property-damaging crashes each year. Incremental savings from avoided property damage are estimated at $18,294 per year.

VMT Reduction – Reduced Pavement Wear and Tear

Less VMT directly reduces the amount of damage and wear on the roadway system. This effectively extends the useful life of the road, as it reduces the required maintenance associated with damage from use. The incremental savings from this reduction in damage are estimated at $165,771 per year.

VMT Reduction – Air Pollution

Reductions in VMTs detailed above will directly reduce vehicle emissions in the area. For each mile not travelled by an automobile, the pollutants that would be generated to travel that mile are avoided, and the corresponding negative environmental impact is also avoided. The reduction in VMTs due to an increased use of SEPTA reduces costs associated with air pollution. Avoided emissions (NOx, SO2, CO, PM10, etc.) yield incremental savings estimated at $146,180 per year.

Figure 4: Safety, Competitiveness, Reliability, Travel or Transit Time, and Resilience Benefit Cost Summary

Associated Benefits	Average Annual Value	Nominal Value	3% Discount Value	7% Discount Value
Travel Time Savings	$1,076,191	$46,814,310	$25,579,810	$14,088,006
Reduced Fuel Costs	$281,791	$12,257,896	$6,697,838	$3,688,815
VMT reduction - Air pollution	$146,180	$6,358,818	$3,474,522	$1,913,583
Reduced Car Crashes - Injuries and Fatalities	$668,707	$29,088,762	$15,894,392	$8,753,790
Reduced Car Crashes - Property Damage	$18,294	$795,796	$434,831	$239,482
VMT reduction - Reduced pavement wear and tear	$165,771	$7,211,052	$3,940,191	$2,170,049
Subtotal	**$2,356,934**	**$102,526,635**	**$56,021,583**	**$30,853,725**

Improved Integration with Other Modes

Reduced Freight Shipment Costs

While Amtrak owns the track that is involved in the proposed project, SEPTA uses the track for passenger transportation, and Norfolk-Southern uses the affected railroad for freight operations. The current configuration of the track at the site prohibits freight trains from moving faster than 5 miles per hour. Otherwise, freight and passenger trains are forced to use the same tracks, and pose delays for one another. This currently causes fuel inefficiencies and increased operating costs for Norfolk-Southern. With the proposed track and signal improvements, freight trains will be able to increase speed to 30 miles per hour, creating significant time savings and benefiting all stakeholders of the railroad network in the project area, which will subsequently lead to reduced operating costs. In total, the average cost savings associated with increasing fuel efficiency and operating in a faster, more efficient manner will be $264,528 per year.

Bidirectional Signaling

Track 2 is equipped with bidirectional signaling west of Downs interlocking; however, within the current configuration, it is only signaled in an eastbound direction between Downs and Thorn interlockings. The implementation of bidirectional signals between these interlockings will increase the quality of integration along the rail transportation network, and generate an average of $36,792 in safety benefits each year.

Figure 5: Improved Integration with Other Modes Benefit Cost Summary

Associated Benefits	Average Annual Value	Nominal Value	3% Discount Value	7% Discount Value
Reduced Freight Shipment Costs	$264,528	$11,506,954	$6,287,515	$3,462,831
Bidirectional Signaling Benefits	$36,792	$1,600,450	$874,502	$481,629
Subtotal	**$301,320**	**$13,107,403**	**$7,162,017**	**$3,944,460**

Ability to Meet Existing or Anticipated Demand

This Benefit-Cost Analysis was completed with the expectation that there will be an increase in service levels, regardless of whether the proposed project is completed. In order to adequately meet the anticipated demand accompanying increased service levels, the proposed track and signal improvements should be completed to offer riders the long-term outcomes described in this analysis. By completing the proposed improvements, SEPTA will become able to meet the anticipated demand from riders, both existing and new.

Results of the Benefit-Cost Analysis

On the basis of the benefit-cost analyses presented above, SEPTA estimates that the benefits of the proposed improvements over forty years will be approximately $87.0 million and the construction costs will be $13.8 million. These benefits and costs are the present values of future benefits and costs, and are discounted at 3% to 2019. The Net Present Value (NPV) of the project, calculated as benefits minus costs, is approximately $73.1 million, and the benefit-cost ratio is 6.3. The project has an Internal Rate of Return (IRR) of 24%. Alternatively, if we use a 7% discount rate, the benefits are $44.4 million, the costs are $12.8 million, and the benefit cost ratio is 3.5.

Selection Criteria

Application Partnerships

PennDOT, Amtrak and SEPTA have a demonstrated track record of working collaboratively and communicating frequently on the needs and priorities of the Harrisburg Line. In 2007, PennDOT, Amtrak, SEPTA, and Norfolk Southern completed the $145 million Keystone Corridor Improvement Program to reduce the state of good repair backlog of infrastructure on the Keystone Corridor and improve operations. This joint effort has continued with the Zoo interlocking improvements project.

In 2009, Amtrak and PennDOT partnered to complete several major projects funded in part through the FRA High Speed and Intercity Passenger Rail Program, including a $40+ million full replacement of the State Interlocking located outside of Harrisburg, Pennsylvania. Other projects included the sealing of the Keystone Corridor through the elimination of three public at-grade crossings and preliminary engineering and environmental for interlockings and for Automatic Block Signaling (ABS improvements).

The partnerships between SEPTA, PennDOT, Amtrak, and Norfolk Southern have continued, with investments in more than 6 complete station reconstruction projects (one completed, two underway, and several others in the preliminary engineering and design stages). SEPTA, Amtrak, and PennDOT focus on targeted marketing efforts to increase ridership and prioritize capital expenditures through State and Federal funding streams.

Supporting Economic Vitality

Passenger rail is an essential element of America's surface transportation system and the Harrisburg Line is an important feeder to the NEC, which is the most heavily traveled portion of the national passenger rail corridor. As highway congestion within major population centers has grown, so has Amtrak and SEPTA's role as an efficient alternative to driving. The Paoli-Thorndale line has the highest ridership in SEPTA's Regional Rail system and runs through a growingly populous and prosperous region. Norfolk Southern operates a vast freight network that sprawls over most of the eastern United States, supplying a valuable connection to local industry. Upgrading Track 2 from Glen to Thorn will bring it to a state of good repair, reduce the risk of travel and hauling delays, and accommodate future additional service by SEPTA and Amtrak.

Leveraging Federal Funding

SEPTA, PennDOT, and Amtrak have collectively committed a 50% match ($8,337,500) for the project. Life cycle costs have been accounted for in the benefits-cost analysis, as summarized on page 10 and fully documented in Attachment D. Consistent with other ongoing state-of-good-repair projects, it is the intention of SEPTA, PennDOT, and Amtrak to continue making regular investments in infrastructure replacement and upgrades, which this project represents as a component of a broader strategy to control long-term costs.

Preparing for Future Operations and Maintenance Costs

Once completed, the project will improve reliability and operational flexibility for both Amtrak and SEPTA and form a foundation for future operations.

Allowing track to be used at speeds as high as 60 MPH will make it fully viable as a means for SEPTA to move trains out of Frazer Yard. In both near and far-terms, improving Track 2 to speeds viable for passenger operations will decongest Tracks 1 and 4, reducing the risk of delay to Amtrak.

Using Innovative Approaches to Improve Safety and Expedite Project Delivery

Project delivery will be expedited using Amtrak forces that will already be proximate to the work location to complete construction of the project, which will also help to minimize service disruption and coordination. Beyond these labor efficiencies, use of recycled rail will also be considered as a means to realize material and environmental efficiencies.

Accountable and Measurable Outcomes

SEPTA has established goals and performance metrics in cooperation with PennDOT and Amtrak for measuring and reporting on the project that include the following:

- SEPTA, PennDOT, Amtrak, and FRA representatives will have progress meetings to review schedule and budget.
- Amtrak, in conjunction with SEPTA, will have a dedicated work force for this project. In addition, Amtrak will have a project manager on site during work.
- Amtrak will develop and verify track outages are utilized efficiently.
- SEPTA will submit timely progress, financial, interim, and final performance reports to the FRA.

Non-Federal Project Share

The project will be completed using a mix of State, Local, and Federal funds, shown in Table 2 below. PennDOT has identified $8,337,500 in non-federal funding commitments to be used towards the project. The 50% local match will come from PennDOT' s Commonwealth of Pennsylvania Act 89 funding, SEPTA's Commonwealth of Pennsylvania Act 89 funding and requisite local match funds, and funding provided by Amtrak. Letters of commitment are included as Attachment A.

Agency	Amount	Share
Amtrak	$400,000	2%
PennDOT	$2,000,000	12%
SEPTA	$5,937,500	36%
Federal Railroad Administration	$8,337,500	50%
TOTAL PROJECT COST	**$16,675,000**	**100%**

Project Funding Plan

Life cycle costs have been accounted for in the BCA, as summarized above included in the supporting documentation (Attachment D). As with other ongoing projects, it is SEPTA, Amtrak, and PennDOT's intention to continue making regular investments in infrastructure replacement and upgrades, and this project represents a component of this broader strategy to control long-term costs.

Project Readiness

The project team expects the project will qualify for a Categorical Exclusion (CE) determination through the National Environmental Policy Act (NEPA) review process. The physical project elements (track restoration and signal system installation) will be implemented in two Amtrak construction cycles over a total 18 month period). The track restoration work will be completed in the first cycle (starting fall 2020).

While the track work progresses, the project partners will also advance the final design of the Rule 562 Signal System so that is can be completed in the second construction cycle (starting fall 2021). Securing FRA funding will allow the track restoration to advance in 2020. PennDOT, SEPTA, and Amtrak have established goals and performance metrics that will be used to measure and report the performance of the project.

The Project Partners have a long history of successfully completing joint capital projects, from the $145 million Keystone Corridor Improvement Program in 2007 to the more recently completed reconstruction of State Interlocking in Harrisburg, PA funded by FRA) in 2015 and the recently completed Paoli Intermodal Transportation Center Accessibility Improvements project. This strong relationship will be leveraged to successfully implement the Project and assure FRA of a quick project initiation.

VIII. Project Implementation & Management

SEPTA understands that the project delivery team must develop an accurate and realistic delivery schedule to ensure successful project implementation. The schedule outlined in the table below represents the earliest possible advancement of the project. This schedule is dependent upon grant award or pre-award authority and availability of Amtrak resources. However, this schedule was developed in consultation with Amtrak and, if funding is available, the project may realistically be ready for construction as early as the fall of 2020 when Amtrak track crews are preliminary scheduled to be in the project area.

This project was specifically selected as an application for funding because the project partners believe that its relative simplicity will allow for efficient implementation. The Harrisburg Line has many state of good repair needs; this is a project that the project partners were most confident in the ability to advance quickly.

The project scheduled has identified critical path items and these will be proactively managed. A detailed project schedule will be reviewed and updated at monthly team meetings which will include SEPTA, Amtrak, PennDOT, and FRA representatives. At each meeting, discussion will include construction issues and coordination concerns, the schedule and budget, and a recovery plan to get the project back on track if necessary.

Activity	Start Date	End Date	Responsible Party
Track Construction	11/15/2020	3/30/2021	Amtrak
Signal Final Design	1/15/2021	7/31/2021	Amtrak
Signal Construction	11/15/2021	3/30/2022	Amtrak
Substantial Complete / Project Closeout	4/1/2022	6/30/2022	SEPTA

Project Schedule

SEPTA, as the Grantee, will also perform and/or designate all tasks required for the project through a coordinated process, which will involve affected railroad owners, operators, and funding partners. The coordination strategy may evolve and require periodic update, with the discussion and agreement of all impacted parties. Amtrak will coordinate in advance with SEPTA and PennDOT, including developing the final Work Plan with SEPTA input intended to minimize service disruption to SEPTA and Amtrak riders. FRA will be invited to participate in regular meetings to discuss project status, upcoming activities, and any coordination issues.

SEPTA will be responsible for facilitating the coordination of all activities necessary for implementation of the project. Upon award of the project, SEPTA will monitor and evaluate the project's progress through regular meetings scheduled throughout the period of performance. SEPTA, in conjunction with Amtrak will:

- Participate in a project kickoff meeting with FRA
- Coordinate with Amtrak during the installation and construction
- Conduct monthly status/review meetings
- Perform a project close-out audit to ensure contractual compliance and issue close-out report
- Submit to FRA required project deliverables and documentation on-time and according to schedule, including periodic receipts and invoices
- Comply with FRA project reporting requirements, including, but not limited to:
    - Status of project by task breakdown and percent complete and updated project schedule
    - Changes and reason for change in project scope, schedule and/or budget
    - Description of unanticipated problems and any resolution since the immediately preceding progress report
    - Summary of work scheduled for the next progress period

IX. Environmental Readiness

The proposed project is expected to qualify for a Categorical Exclusion (CE) determination through the National Environmental Policy Act (NEPA) review process. The project setting is along the rail line within Chester County, Pennsylvania and all work will occur within the existing railroad right-of-way.