Port Jervis Line Service Strategy Report

Appendix C: Port Jervis Line Capacity Improvements Analysis

January 2018
TABLE OF CONTENTS

Introduction .................................................................................................................................................. 1

1. Future PJL Service ................................................................................................................................... 1

2. Project Alternatives .................................................................................................................................. 2

  2.1. Double Track Alternative - Restoration of Second Track ................................................................. 3

  2.2. Passing Siding Alternative .................................................................................................................. 4

3. Evaluation of Alternatives ....................................................................................................................... 5

  3.1 Factors .................................................................................................................................................. 6

  3.2 Evaluation Findings ............................................................................................................................... 7

    3.2.1 Cost .................................................................................................................................................. 7

    3.2.2 Ability to Improve Service ............................................................................................................. 8

    3.2.3 Environmental Impacts .................................................................................................................. 8

4. Conclusion ............................................................................................................................................... 9

TABLES

Table 1: Potential Future Service on the PJL .............................................................................................. 1

Table 2: Location of Passing Sidings .......................................................................................................... 4

FIGURES

Figure 1: Extent of Proposed Double Track and Location of the "Middletown" Passing Siding .................... 3

Figure 2: Mid-Point Yard Zones and Proposed Passing Sidings Locations ............................................. 5

Technical Memoranda

Technical Memorandum 1 – Double Track Alternative

Technical Memorandum 2 – Passing Siding Alternative
**Introduction**

This Appendix details the analysis undertaken to identify potential alternatives to expand track capacity and increase service on Metro-North’s Port Jervis Line (PJL). The analysis presented herein includes the evaluation process and criteria that were used to evaluate the alternatives and concludes with a recommended approach that meets the project’s goals.

Two PJL capacity improvement alternatives to expand track capacity were considered to meet the project goals. The two alternatives are:

1. **Double Track Alternative** – includes the restoration of the second track on the PJL between Mile Post (MP) 34.4 and MP 54.7.
2. **Passing Siding Alternative** – includes the construction of new passing sidings at two or three locations between Tuxedo and Middletown.

Each of these capacity improvement alternatives allow for additional service. The benefits of both capacity improvement alternatives includes the ability to run reverse peak service and more frequent off-peak service. In this way, both track capacity improvement alternatives provides benefits to the service and operations of the Port Jervis Line independent of other improvements. However, track capacity improvements in combination with a new Mid-Point Yard (MPY) described in Appendix B: Mid-Point Yard Analysis, also enables the service objectives outlined in the Port Jervis Line Service Strategy Report to be achieved.

1. **Future PJL Service**

Essential to the increased attractiveness of the PJL and its ability to handle future ridership growth is an increase in service frequencies. A future service plan and schedule were developed that increase peak and off-peak period service and also introduce reverse peak service. The future service plan could be incrementally phased in as demand warrants. The following describes the proposed future service plans and those factors considered in the development of the train schedule that would implement the proposed future service plans.

A service plan with improved frequencies was developed. Similar to Metro-North’s East of Hudson Lines, the proposed service plan creates “Inner” and “Outer” services. Improved service frequencies would be provided within the “Inner” segment of the Line in order to serve the highest ridership areas.

The proposed service plan would increase the number of weekday trains from 27 to 44 trains (22 inbound trains and 22 outbound trains), operating as peak, off-peak, and reverse peak services. Table 1 shows the potential future service of this proposed service plan.

The service plan assumes that in addition to the construction of capacity improvements discussed in this section, there will also be the construction of a Mid-Point Yard (MPY). A parallel study to identify a suitable MPY location between Harriman Station and Middletown/Town of Wallkill Station was also conducted (see Appendix B: Mid-Point Yard Analysis). While the MPY would allow for increased service in peak directions, increased track capacity is necessary to operate more frequent off-peak and reverse peak services.

<table>
<thead>
<tr>
<th>Potential Future Service</th>
<th>Daily Trains</th>
<th>44</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>PM Peak</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Reverse Peak</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Off Peak</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

*Table 1: Potential Future Service on the PJL*
2. Project Alternatives

Two PJL capacity improvement alternatives were identified to meet the project's goals. Each of these alternatives includes improvements necessary to operate the proposed future service plan and schedules:

- **Double Track Alternative** – includes the restoration of the second track on the PJL between Mile Post (MP) 34.4 and MP 54.7, improving undergrade bridges, upgrading three stations, and constructing a new passing siding west of the Middletown/Town of Wallkill Station.

- **Passing Siding Alternative** – includes the construction of new passing sidings at two to three locations between Tuxedo and Middletown. While the passing sidings possess their own independent utility from the Mid-Point Yard (MPY), the number and location of the new passing sidings is dependent on the final location of the Mid-Point Yard.
2.1. **Double Track Alternative - Restoration of Second Track**

Restoration of the second track would consist of the following major work components (For complete details refer to Appendix C, Technical Memorandum 1: Double Track Alternative):

- Restore approximately 20 miles of second track and embankment improvements
- Upgrade of 17 undergrade bridges and 16 culverts to meet capacity and fatigue criteria
- Upgrade of the Woodbury Viaduct (two options: rehabilitation or reconstruction)
- Improve and upgrade the Sloatsburg, Tuxedo, and Harriman stations
- Improve operations and systems including signals, a minimum of two new universal interlockings, and four grade crossings
- Construct a passing siding west of Middletown/Town of Wallkill Station

All work components were developed in accordance with design criteria established by a team of experts representing various disciplines at Metro-North and NJ TRANSIT. The track work was developed in accordance with Metro-North Track Design Criteria, including track centers of 14'-6" and a minimum passing siding length of one mile, with No. 20 turnouts to allow train speeds of up to 45 mph, on the divergent move of the turnouts.
The condition of the underground bridges and culverts was assessed based on a methodology developed to determine if the structures should be rehabilitated or replaced in order to meet the established Cooper E80\(^1\) design load and 20-year fatigue life criteria.

The improvements and upgrade of the Sloatsburg, Tuxedo, and Harriman stations would include high-level platforms that meet the requirements of the American with Disabilities Act (ADA). Both side and island platform concepts were evaluated. The side platforms were chosen over island platforms to minimize environmental impacts, including the encroachment on areas bordering the ROW. Other station elements under this alternative would include:

- Pedestrian overpass served by stairs and elevators that meet ADA requirements
- Gauntlet track to accommodate freight service

Modifications of the signal system would be required, consisting of up to three new universal interlockings and an upgrade of four grade crossing locations.

### 2.2. Passing Siding Alternative

The passing sidings locations were determined by an analysis performed by Metro-North’s Operations Planning Department to achieve the proposed service increase. The analysis determined that up to three passing sidings would be required, with the actual number of passing sidings to be constructed dependent upon the final location of the MPY.

Under the passing sidings scenario, new passing sidings would occur west of the Tuxedo Station, East of the Moodna Viaduct, and West of the Middletown/Town of Wallkill Station and would be approximately one-mile long. The locations of the passing sidings were based upon their ability to accommodate more frequent two-way service.

The Passing Siding alternative encompasses the construction of up to three passing sidings depending upon the location of the MPY as indicated in Table 2 and in Figure 2.

<table>
<thead>
<tr>
<th>Location of MPY</th>
<th>Locations of Passing Sidings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harriman Zone or Salisbury Mills Zone</td>
<td>2 Locations: “Tuxedo” and “Middletown”</td>
</tr>
<tr>
<td>Campbell Hall Zone</td>
<td>3 Locations: “Tuxedo,” “East of Moodna” Viaduct, and “Middletown”</td>
</tr>
</tbody>
</table>

*Table 2: Location of Passing Sidings*

---

\(^1\) Cooper E80 is the current train load rating standard established by the American Railway Engineering Association for rail bridges. It defines the design level for bridges to safely withstand 80,000 lbs/per driving axle loads exerted by a train on a bridge.
The major components of each passing siding would include the following:

- Restoring a minimum of one mile of second track for each passing siding with embankment improvements and turnouts
- Improving undergrade bridges and/or culverts (approximately 3 per each siding location)
- Implementing a train control signaling system

As indicated in the previous section, all work components were developed in accordance with design criteria established by a team of experts representing various disciplines at Metro-North and NJ TRANSIT.

For complete details refer to Appendix C, Technical Memorandum 2: Passing Siding Alternative.

3. Evaluation of Alternatives

A set of factors were identified to compare the two alternatives and provide input to the decision-making process. These factors helped to describe how each alternative addresses the project’s goal to increase service, improve service quality, and increase reliability for existing and future customers. This section describes the factors considered and the findings of the evaluation.
3.1 Factors

The following key factors were considered in evaluating the Double Track and Passing Siding alternatives. Based on the level of analysis performed in this study, these factors included both quantitative and qualitative measures. The factors considered included:

- Capital Cost
- Ability to Improve Service
- Environmental Impacts

Capital Cost

Estimated capital costs provide a projected level of investment required to achieve the desired benefits under a given alternative.

The capital cost estimates were developed based on the “Capital Cost Estimation Methodology Report Phase II – Update” prepared for the WHRTAS Phase II project. That report presents the methodology, key assumptions, and the overall framework used to develop the capital cost estimates. Generally, construction cost estimates were based on representative unit costs developed from similar projects and applied to quantity approximations.

An order-of-magnitude cost estimate for the two PJL capacity improvement alternatives was prepared and presented in 2012 dollars. For each alternative, the estimate considered the major elements required to construct additional track along the existing PJL and other associated improvements.

For consistency, and to ensure eligibility for federal funding programs, the estimated costs were prepared using the Federal Transit Administration’s Standard Cost Categories (SCC). The application of the SCC for unit costs and basic quantities for standard categories also makes it easier to compare and determine the approximate initial capital investment that would be required to implement each of the PJL alternatives.

The major construction components include the following:

- Guideways and track elements (ballasted track elements, bridges, and culverts)
- Stations and stops
- Site work and special conditions (earthwork)
- Systems (interlockings, signals and system work)

The estimated costs also included contingencies, design and construction management, and allowances for flagging, utilities relocation, environmental mitigation, and mobilization/demobilization.

Ability to Improve Service

This factor considers the extent to which an alternative can meet the service goals established in the service plan, improve the quality and attractiveness of service to customers, and provide the flexibility to expand service beyond the initial future service goals.

The improvement in service provided by an alternative was evaluated under the following measures:

- Increased Service – The ability to operate service frequencies of up to 44 trains per day as proposed in the future service plan (see Table 1), resulting in service improvements for the majority of PJL customers.
• **Reliability** – The ability to minimize delays caused by scheduled or unscheduled events, particularly when a late train causes delays to other trains. Service reliability directly affects the attractiveness of the service and customers confidence in on-time departures and arrivals.

• **Flexibility** – The ability to minimize changes in train headways and travel times due to planned activities on the PJL. Changes to the PJL schedule are presently made throughout the year for maintenance, construction activities, and special events.

• **Service to Stewart International Airport** - This measure considers whether an alternative would provide sufficient capacity to operate potential future service to Stewart Airport. Implementing this airport service would require an increase in service frequency on the PJL.

**Environmental Impact**

This factor defines the effect of each alternative on the natural and built environment based on an initial environmental assessment. The potential for impacts to the following environmental resources due to the proposed alternatives were assessed:

• **Waters and wetlands** - Early studies found that the PJL is adjacent to or crosses a number of bodies of water and wetlands. The analysis identified the approximate acreage of bodies of water and wetlands that would be directly or indirectly impacted by the alternatives based on available GIS data, aerial maps, visual inspection, and wetland resource data.

• **Historic resources** - Historic resources are known to be located within the project limits.

• **Parklands** - Parklands border on the PJL ROW in many locations.

• **Transportation** - Potential reconfiguration of stations could affect station access, pedestrian circulation, and parking.

• **Property** - Adding track capacity to the PJL would potentially require extending the ROW beyond its current limits in certain locations. In these cases, strips of land or temporary or permanent easements may be required.

### 3.2 Evaluation Findings

The following presents the findings of the evaluation of alternatives using the factors and measures described in Section 3.1.

#### 3.2.1 Cost

The estimated capital cost of the Double Track Alternative is $334 million (for a cost breakdown summary see Appendix C, Technical Memorandum 1: Double Track Alternative, Section 5.2). The key cost drivers for this alternative are the reconstruction of the Woodbury Viaduct, installing ballasted track, reconstruction/rehabilitation of 10 undergrade bridges, expanding the embankment in various locations along the right-of-way, reconstruction of three stations, and construction of the passing siding west of Middletown/Town of Wallkill Station.

The capital cost for the Passing Siding Alternative was estimated as follows:

- Passing Sidings in “Tuxedo” and “Middletown” (when the MPY is to be located in either the Harriman or the Salisbury Mills Zone) - $36 million
- Passing Sidings in “Tuxedo”, “East of Moodna,” and “Middletown” (MPY is to be located in the Campbell Hall Zone) - $55 million
The key cost drivers for the Passing Siding Alternative are expanding the existing signal system, ballasted track, and reconstruction/rehabilitation of five underground bridges.

### 3.2.2 Ability to Improve Service

**Increased Service:** Both alternatives would meet the goal of increased service on the PJL. They would accommodate the proposed increase in peak, off-peak, and reverse-peak services as described in Section 1.1. In addition to increased service frequency, the Double Track Alternative would additionally offer some improvement in trip times as a result of high-level platforms at stations (resulting in quicker boarding and shorter station dwell times).

**Reliability:** Under the Passing Siding Alternative, a disabled or delayed train travelling in one direction could impact the schedule of another train operating in the same or opposite direction at sections of railroad without passing sidings or double track. Under the Double Track Alternative this would not occur. For example, a second track would allow trains travelling in either direction to bypass the disabled or delayed train while maintaining the schedule.

**Greater Flexibility:** The Double Track Alternative would allow for greater flexibility than the Passing Siding Alternative in implementing planned schedule changes (i.e. maintenance, construction activities and special events) and would reduce potential conflicts with other operators on the Line. The Passing Siding Alternative would meet the proposed future service plan; but would require additional upgrades to meet service increase beyond that. The Passing Siding Alternative does, however, provide the opportunity to incrementally add track over time to the full Double Track configuration.

**Service to Stewart Airport:** The Double Track Alternative would offer greater flexibility in scheduling future service to Stewart International Airport and allow the system to more easily accommodate possible additional service increases in the future. As noted above, the Passing Siding Alternative could be upgraded overtime to the two-track configuration of the Double Track Alternative should it be needed for a Stewart Airport Service.

### 3.2.3 Environmental Impacts

**Waters and wetlands:** Impacts to wetlands and to other bodies of water would be minimal for both alternatives in areas where bridges would be widened, rehabilitated, or reconstructed. Although wetland delineation has not been conducted, it is estimated that the Double Track Alternative would impact a combined total of approximately 3.5 acres of wetlands and other bodies of water. The Passing Siding Alternative would impact approximately 0.3 acres of wetlands and other bodies of water.

Based upon the required New York State Department of Environmental Conservation (NYSDEC) mitigation ratio of 1:3 (impacted acreage to mitigated acreage), approximately 11 acres of new wetlands would be required to mitigate the impacts of the Double Track Alternative compared to one acre for the Passing Siding Alternative. The specific acreage of impact for both alternatives would be confirmed during a subsequent environmental review process.

In addition, the Double Track Alternative may require a retaining wall on the north (east) side of Harriman Station to avoid encroachment on the Ramapo River.

It is anticipated that the replacement of the Woodbury Viaduct under the Double Track Alternative would have no direct impacts on Woodbury Creek. However, the reconstruction of the viaduct would need to be managed to minimize erosion and sedimentation.
**Historic/Archaeology:** The reconstruction of existing platforms and the overall improvements considered for the three stations for the Double Track Alternative could impact the Tuxedo Station building, which is a National Register-Listed historic structure. Any improvements to the station would require the development of context-sensitive design as a mitigation measure to comply with federal rules.

The Passing Siding Alternative would not impact any known historic or archaeological resources.

**Parkland:** Under the Double Track Alternative, the construction of a second platform at the Sloatsburg Station may require the acquisition of a 10 foot sliver of parkland along the east side of the platform’s entire length. The Passing Siding Alternative would likely have a negligible impact or no impact to parkland.

**Transportation:** The Double Track Alternative may require the realignment of Mill Street at the Sloatsburg Station and the reconfiguration of parking facilities at both the Sloatsburg and Tuxedo Stations to accommodate the recommended platforms and related improvements. The addition of the new platforms and a pedestrian overpass at both Sloatsburg and Tuxedo Stations would result in improved pedestrian circulation in the vicinity of the stations.

**Property:** Under the Double Track Alternative, most improvements would be within the existing ROW; however, there would be approximately 1.1 acres over 1.4 miles where the construction of the second track could extend 3 to 8 feet beyond the ROW. These estimates were based on 1960 VAL maps provided by Metro-North. These estimates should be reconfirmed during the environmental review.

The limits of disturbance resulting from construction of the second platform at the Sloatsburg and Harriman stations would extend beyond the ROW by approximately 0.1 acres at the Sloatsburg Station and 0.2 acres at the Harriman Station.

No encroachment outside the ROW is anticipated for the Passing Siding Alternative.

4. **Conclusion**

Both the Double Track and Passing Siding Alternatives could support the proposed future PJL service plan and could meet future growth with increased service, improved service quality, and increased reliability for existing and future customers. However, Double Tracking the PJL would trigger greater environmental impacts than constructing the Passing Sidings, and at an estimated $334 million ($2012), the capital cost for the Double Tracking is significantly higher than the estimated $55 million ($2012) for the Passing Siding Alternative. Further, the Passing Sidings could be expanded to the Double Track configuration at some future time.

Therefore, the construction of Passing Sidings is considered a more cost-effective solution for short/mid-term implementation. Double Tracking should be considered in the longer-term when increased demand requires markedly higher service levels.