East - West Passenger Rail Study Final Report

Massachusetts Department of Transportation

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1. Executive Summary

The Massachusetts Department of Transportation (MassDOT) launched the East – West Passenger Rail Study to examine the potential benefits, costs, and investments necessary to implement new passenger rail service connecting western Massachusetts communities with central and eastern Massachusetts (Figure ES-1). The 2018 Massachusetts State Rail Plan included a recommendation to evaluate a "Western Massachusetts to Boston Passenger Rail Service Study," and community leaders, stakeholders, and residents have expressed a desire for such a passenger rail link to enhance multi-modal transportation options available for Massachusetts communities west of Worcester.

Figure ES-1 -- Study's Central Question

The East – West Passenger Rail Study is intended to answer the central question:

How can we connect people in western Massachusetts with central and eastern Massachusetts using a passenger rail service that provides fast, frequent, attractive service in a cost-effective and achievable manner?

The East-West Passenger Rail Study:

- Identifies transportation corridors that provide new passenger rail connections between Pittsfield, Springfield, Worcester, Boston, and intermediate communities.
- Assesses the geographic, infrastructure, and demographic conditions in the East – West rail corridor.
- Evaluates potential improvement alternatives for enhancing passenger rail connections among the Corridor communities.
- Summarizes the projected benefits, costs, impacts, and trade-offs of the improvement alternatives.

The study has entailed a comprehensive civic engagement process involving residents, the study's Advisory Committee—a group comprised of individuals representing diverse perspectives from Pittsfield to Boston, and other stakeholders in a series of meetings and through online interaction. This included cooperative development of the following goals for the project:

- Provide better transportation options to and from Western Massachusetts
- Support economic development throughout the East – West rail corridor
- Improve the attractiveness of Western Massachusetts as an affordable place to live
- Reduce the number of automobile trips along the corridor
- Reduce greenhouse gas emissions and air quality impacts from transportation

MassDOT recognizes that a robust transportation system is essential to providing residents, businesses, and visitors with mobility to satisfy their economic, personal, and recreational needs. Passenger rail transportation can be an important component of a multi-modal transportation system that increases travel options and reduces greenhouse gas emissions.

Fast and frequent passenger rail service in the East-West Rail Corridor could enhance mobility and connectivity for Corridor communities, provide residents and stakeholders with additional travel options, and catalyze new economic opportunities, such as development around stations. Improved connectivity among job centers and better mobility for potential workers could increase employment opportunities for workers and expand the talent pool available to employers by better linking the western, central, and eastern regions of the Commonwealth with each other and with a broader travel market.

1.1. Preliminary Alternatives Analysis

The East – West Passenger Rail Study conducted an alternatives analysis in order to identify the best solution to the study "problem" – How to connect people in western Massachusetts with central and eastern Massachusetts using a passenger rail service that provides fast, frequent, attractive service in a cost-effective and achievable manner?

To answer this question, the alternatives analysis process developed a set of potential solutions, and evaluated how well each one balances these key considerations:

- Benefits: Maximize travel speeds, frequency, and service quality to attract the most riders
- Costs: Minimize capital, operations & maintenance costs
- Impacts: Minimize impacts to property, buildings, open space, and wetlands

To enable MassDOT, the Advisory Committee, residents, and other stakeholders to understand the full range of potential solutions and their trade-offs, six Preliminary Alternatives were developed from a broad set of potential concepts. These Preliminary Alternatives took different approaches to providing improvements, and achieved different levels of speed increase, travel time, frequency, service quality, cost, and impacts. The following are the key factors that were considered in assembling the Preliminary Alternatives.

- Infrastructure Investments and Speed Improvements. These investments correspond to the general approach to providing a new or improved rail line, the type and degree of physical improvements to the rail infrastructure, and the degree to which passenger and freight traffic can be separated. It is these investments that determine one of the most important characteristics of the East – West passenger rail service, the travel speed. The greater the level of infrastructure improvement and separation of passenger and freight operations, the higher the speed of service.
- Service Elements. The following are service quality characteristics that were assigned to the Preliminary Alternatives to enable a full assessment of their benefits and impacts.
    - Frequency – The frequency of East – West passenger rail service varies across the Preliminary Alternatives, and generally increases with the degree of infrastructure investment.
    - Extent of Rail Service – Some of the Preliminary Alternatives entail passenger rail service to Pittsfield, while some extend rail service to Springfield, with a bus connection to Pittsfield.
    - Stations Served – All Preliminary Alternatives serve the major corridor cities of Pittsfield, Springfield, Worcester, and Boston, while some also serve intermediate towns.

Table ES-1 provides a summary of the six Preliminary Alternatives and their key characteristics:

- The maximum speed increases steadily across the alternatives, and the travel time steadily decreases.
  - Compared to the existing Lake Shore Limited service, Alternative 3, which provides a one-seat ride between Pittsfield and Boston, cuts roughly 30 – 45 minutes off the trip between Pittsfield and Boston, and roughly 25 – 40 minutes off the trip between Springfield and Boston.
    - NOTE: The range describes variations in travel times for each alternative, depending upon the specific level of infrastructure improvements.
  - A dedicated passenger-only track parallel to the existing CSX rail line between Springfield and Worcester to adhere to CSX policy for accommodating passenger rail service on its right-of-way adds significant cost and complexity. Alternative 4 saves an additional 10 minutes compared to Alternative 3 at an estimated additional cost of $1.5 billion.
  - Several "shortcut" realignments in Alternative 5 between Springfield and Worcester save an additional 10 minutes versus Alternative 4.
  - By building a completely new, separated rail alignment in the straighter I-90 corridor, Alternative 6 provides the fastest travel time of all the alternatives: 2:15 to 2:30 for Pittsfield – Boston travel, and 1:15 to 1:30 for Springfield – Boston travel. However, the cost of implementing a totally new railroad line is much higher than the other alternatives.
- Alternatives 1, 2, and 5 would provide bus service between Pittsfield and Springfield, and would require a transfer to the rail service. This has significant negative impacts on travel time and attractiveness of the service.

Table ES-1 – Passenger Rail Service Characteristics – Preliminary Alternatives

METRIC /	ALTERNATIVE	NO-BUILD	1	2	3	4	5	6
CORRIDOR TYPE +	ALIGNMENT	SHARED + EXISTING	SHARED + EXISTING	SHARED + EXISTING	SHARED + EXISTING	SHARED + SEPARATE	SHARED + SEPARATE	SEPARATE + NEW
FREQUENCY	RAIL ROUND TRIPS	1	5	7	8	10	10	18
SPEEDS	MAX. PERMITTED (MPH)	80	80	80	90	110	110	150
TRAVEL TIMES RANGE	PITTSFIELD – BOSTON	3:50	3:55 – 4:10	3:35 – 3:50	3:05 – 3:20	2:55 – 3:10	2:55 – 3:10	2:15 – 2:30
TRAVEL TIMES RANGE	SPRINGFIELD – BOSTON	2:28	2:40 – 2:55	2:10 – 2:25	1:50 – 2:05	1:40 – 1:55	1:30 – 1:45	1:15 – 1:30
EAST-WEST STATIONS	PITTSFIELD	√	(Bus)	(Bus)	√	√	(Bus)	√
EAST-WEST STATIONS	LEE	-	(Bus)	(Bus)	-	-	(Bus)	√
EAST-WEST STATIONS	CHESTER	-	-	-	√	√	-	-
EAST-WEST STATIONS	BLANDFORD	-	(Bus)	(Bus)	-	-	(Bus)	√
EAST-WEST STATIONS	SPRINGFIELD	√	√	√	√	√	√	√
EAST-WEST STATIONS	PALMER	-	√	√	√	√	-	√
EAST-WEST STATIONS	WORCESTER	√	√	√	√	√	√	√
EAST-WEST STATIONS	LANSDOWNE	√	√	√	√	√	√	√
EAST-WEST STATIONS	BACK BAY	√	√	√	√	√	√	√
EAST-WEST STATIONS	SOUTH STATION	√	√	√	√	√	√	√

1.2. Final Alternatives Analysis

Based on the results of the Preliminary Alternatives analysis and feedback from the Advisory Committee, stakeholders, and members of the public, the alternatives were narrowed to a set of three Final Alternatives that all include the following preferred characteristics:

- Rail operations for the full East – West Corridor, from Pittsfield to Boston, via the Boston – Albany railroad mainline.
- Service to all stations in the Corridor, including in smaller intermediate communities: Pittsfield, Chester, Springfield, Palmer, Worcester, Lansdowne, Back Bay, and South Station.
- Passenger rail service in the existing rail corridor; the cost of building a new railroad line in the I-90 corridor (in Alternative 6) was judged to be not worth the incremental travel time savings.

Therefore, the three Final Alternatives comprise the following:

- **Alternative 3** (same as Preliminary Alternative 3, shown in Figure ES-2) could provide direct passenger rail service between Pittsfield and Boston along a shared track / shared CSX and MBTA corridor. Up to 8 round trips (7 new East-West round trips) could be provided, with an average travel time of 3:09 between Pittsfield and Boston, and 1:57 between Springfield and Boston. The figures on the following pages for the Final Alternatives show the alignment of the alternative; the stations served; and the improvements proposed for the alignment (e.g. double-tracking, new rail alignment, etc.). The figures also show a diagram of the rail line with the “Speed Operated:” this is the calculated speed for each segment of the corridor, based on the detailed train performance calculations and service schedule.
- **Alternative 4** (same as Preliminary Alternative 4, shown in Figure ES-3) could provide direct passenger rail service between Pittsfield and Springfield along a shared track / shared CSX corridor, along an independent passenger track between Springfield and Worcester, and along a shared track/shared MBTA corridor between Worcester and Boston. Up to 10 round trips (9 new East-West round trips) could be provided, with an average travel time of 2:59 between Pittsfield and Boston, and 1:47 between Springfield and Boston.
- **Hybrid Alternative 4/5** (combines elements of Preliminary Alternatives 4 and 5, shown in Figure ES-4) could provide direct passenger rail service between Pittsfield and Springfield along a shared track / shared CSX corridor, along an independent passenger track with high-speed shortcuts between Springfield and Worcester, and along a shared track/shared MBTA corridor between Worcester and Boston. Up to 10 round trips (9 new East-West round trips) could be provided, with an average travel time of 2:49 between Pittsfield and Boston, and 1:37 between Springfield and Boston.

The following key metrics have been evaluated for the alternatives analysis:

- **Ridership.** The ridership forecasts for the alternatives are a critical metric of the overall attractiveness of the proposed alternatives for travelers; it is determined by a combination of demographics (residents and jobs) surrounding the stations and the service quality (travel time and frequency to the traveler’s destination). Ridership is the basis for determining project benefits relative to travel time savings, motor vehicles taken off the highways, air quality improvements, and other measures of project benefit. The total annual trips described on the following page are the trips that are projected on the East – West passenger trains for a mature service in the year 2040. These numbers represent “boardings,” i.e.

each time a passenger gets onto a train is a boarding (a round trip would count as two). The ridership range was produced by two independent forecasts, with different assumptions, that used two different proxy rail corridors (i.e., the CTrail Hartford Line and the Downeaster) as the starting point. On average, roughly 62% of the estimated ridership is expected to be trips between Springfield and Boston.

  - Alternative 3 is projected to be used by 922 to 1,188 passengers per weekday.
  - Alternative 4 is projected to be used by 1,157 to 1,379 passengers per weekday.
  - Hybrid Alternative 4/5 is projected to be used by 1,296 to 1,554 passengers per weekday.

- **Capital Costs.** The capital cost estimate is a key determinant of the challenge of implementation for a given alternative. The capital cost estimates reflect one-time investments in new infrastructure, e.g. new/upgraded stations, track, bridges, yards, utility relocation, signals, property acquisition, vehicle procurement, and professional services. The total also includes a series of contingencies in accordance with standard practices. These capital costs, expressed in 2020 dollars, range from $2.4 billion for Alternative 3 to $3.9 billion for Alternative 4 and $4.6 billion for Hybrid Alternative 4/5.
- **Operations & Maintenance Costs.** These are the annual costs associated with operating and maintaining the service, including labor, fuel, upkeep of facilities and vehicles, and administration.
- **Environmental and Community Impacts.** These include impacts to public and private property, open space, and environmental resources such as open water and wetlands. Grade crossings are included as a safety-related impact.
  - For example, Alternative 3 has the fewest impacts to wetlands by total acreage (0.45 acres). This increases with the addition of separated track—Alternative 4 impacts 7.73 acres. Similarly, affected Article 97 lands comprise 3 acres under Alternative 3 and more than triple under Alternative 4, and comprise nearly 15 acres under Hybrid Alternative 4/5.
  - Compared to the 2040 Future No-Build, the net CO2 emissions (in metric tons) increase and range from approximately 7,000 to 8,000 under Alternative 3 and increase up to over 14,000 under Alternative 4 and the Alternative 4/5 hybrid.
  - Alternatives 3 and 4 require 30 improved at-grade crossings; Hybrid Alternative 4/5 requires 27.

Figure ES-2 -- Final Alternative 3 – Passenger Rail, Pittsfield – Boston, on Upgraded Existing Railroad Tracks

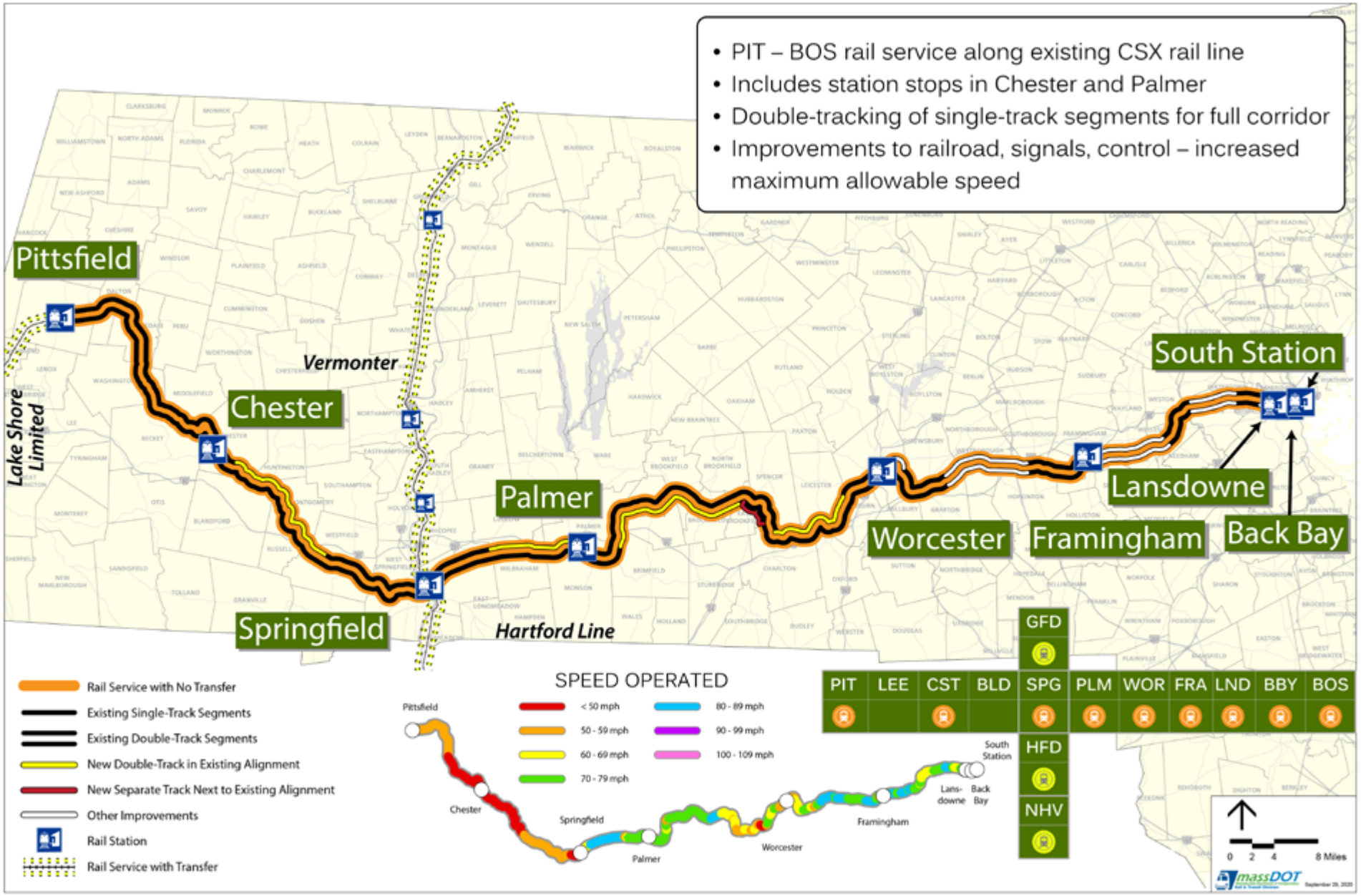
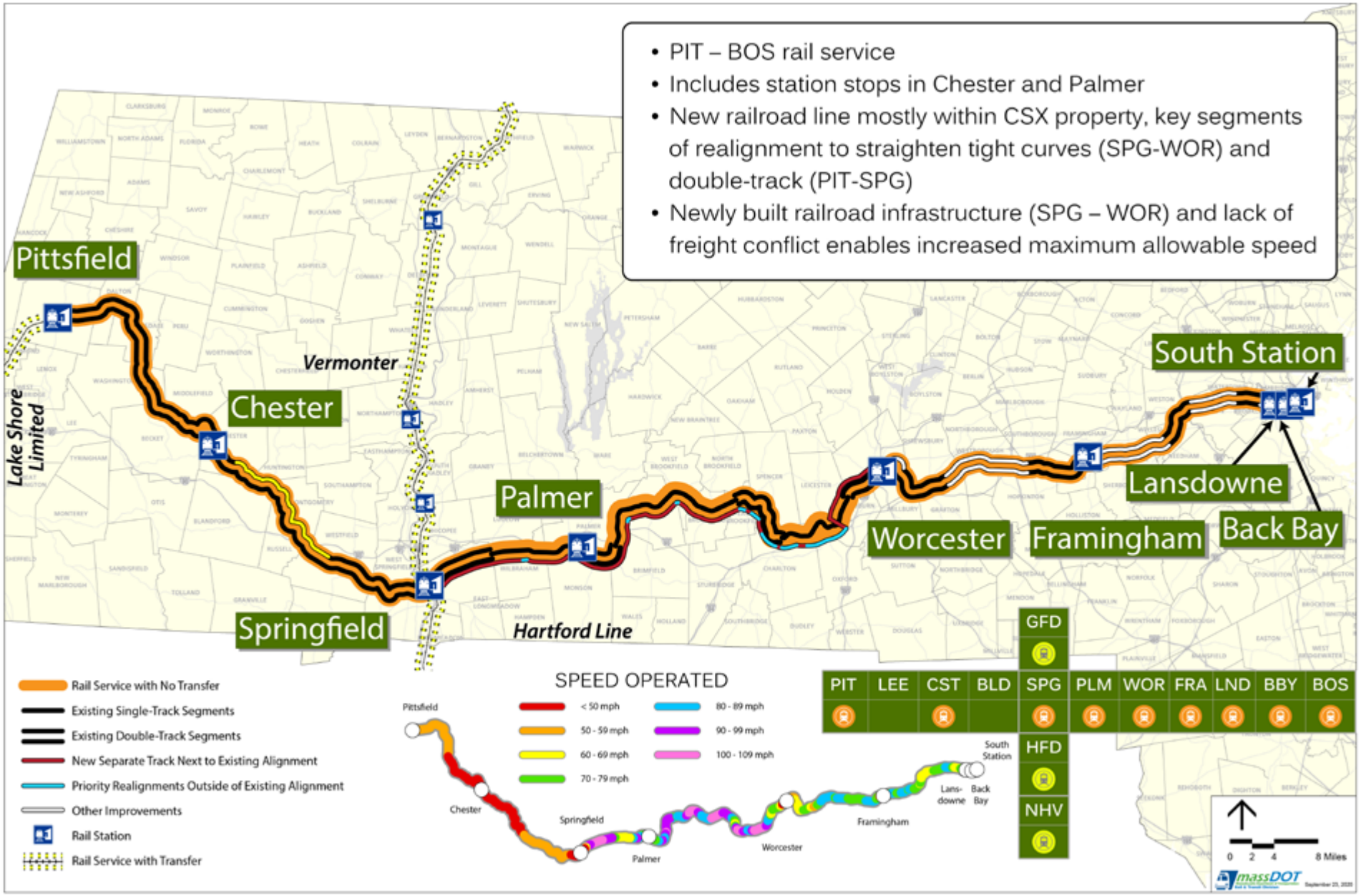


Figure ES-3 -- Final Alternative 4 – Passenger Rail, Pittsfield – Boston: Upgraded Existing Rail (PIT – SPG), New Rail in CSX Corridor (SPG – WOR)

Figure ES-4 -- Final Alternative 4/5 Hybrid – Passenger Rail, Pittsfield – Boston: Upgraded Existing Rail (PIT – SPG), New Rail with Priority Realignments (SPG – WOR)



1.3. Key Findings

Key findings from the Final Alternatives analysis include:

- A reduction in travel times by as much as one hour over currently feasible times could be possible with new investment in the rail infrastructure between Pittsfield and Boston.
- Commuter, business, and recreational travel markets are present to varying degrees along the corridor. The study did not examine the possible long-term impacts of the COVID-19 pandemic on travel patterns or demographics.
- Passenger rail and CSX operations within an enhanced shared-track environment would require careful coordination of services and clear operational criteria, as well as an agreement with CSX as owner of the line west of Worcester.
- Passenger rail service operated between Springfield and Worcester over an independent alignment adjacent to CSX track(s) appears to be feasible, could eliminate most of the interference between the two types of operations (passenger and freight) in this segment, and could reduce travel time in the segment by 10 minutes. However, building this independent alignment to adhere to CSX requirements for passenger service on their right-of-way adds significant cost and complexity. The estimated capital cost of complying with CSX design criteria is approximately $1.5 billion. Additional alignment improvements that are expected to save an additional 10 minutes are projected to cost $765.4 million.
- Each alternative offers a set of positive (Pro) and negative (Con) attributes that must be considered to make an informed decision on the overall benefits provided by the alternative.

MassDOT acknowledges the preference of several Advisory Committee members to prioritize the 4/5 hybrid alternative, but at this stage MassDOT recommends keeping Alternatives 3 and 4 under consideration, as additional information may be worth considering before the focus is narrowed to one alternative. Moreover, the necessary next steps do not require the selection of one alternative.

There is additional work to be done to fully complete the conceptual planning stage for East-West Rail service. This work includes discussions with CSX about its requirement for complete separation of the passenger operations from its own tracks, the development of a governance structure for passenger rail outside the MBTA service area, and a more detailed study of economic and community benefits and impacts. These tasks and others could advance opportunities for turning East-West Passenger Rail from a subject of study to a project that can be designed, permitted, funded, built, and operated.

Key trade-offs among the Final Alternatives are shown in Table ES-2.

Table ES-2 – Pros and Cons of Final Alternatives

ALTERNATIVE	ALTERNATIVE 3	ALTERNATIVE 4	4/5 HYBRID
PROS	• Convenient and comfortable travel • Lowest capital cost • Fewest land impacts • Fewer grade-crossing impacts	• Convenient and comfortable travel • Reduced travel times / faster speeds • Higher ridership • Reduced passenger / freight interference	• Convenient and comfortable travel • Lowest travel times / fastest speeds • Highest ridership • Reduced passenger / freight interference • Fewer grade-crossing impacts
CONS	• Longest travel times / slowest speeds • Lowest ridership • Greatest passenger / freight interference	• Higher capital cost • Greater land impacts • Higher grade-crossing impacts	• Highest capital cost • Greatest land impacts

1.4. Next Steps and Recommendations

The East – West Passenger Rail Study is a substantial step forward in realizing the potential for enhanced service within the corridor. The following areas have been identified as next steps to continue advancing the conceptual planning phase for East-West Passenger Rail.

During this time of fiscal uncertainty, MassDOT will review what federal transportation planning grants may be available to support some of the work described. These next steps are recommended to gather additional information that could inform the development of an East-West Passenger Rail corridor beyond the analysis contained in this study.

Further Discussion of CSX Requirements

Simply put, CSX policy regarding accommodation of passenger rail service on its right-of-way adds significant cost and complexity because it favors complete separation of the passenger operations from its own tracks whenever possible. The estimated additional capital cost for complying with CSX's design criteria is approximately $1.5 billion.

Therefore MassDOT will:

- Continue discussions with CSX to ascertain the basis for their policies and requirements related to shared operations with passenger service and whether their support for an East-West passenger service is possible and, if not, what other options exist;
- Ask CSX to cooperate in additional analysis such as rail capacity modeling and right-of-way condition;
- Seek to conduct a life-cycle cost analysis, if possible, to determine the full spectrum of costs associated with greater control over the right-of-way; and
- As commenters such as the Metropolitan Area Planning Council (MAPC) and the Sierra Club have suggested, a phased approach may be worth considering and discussing with CSX.

  Phasing has proved useful with other projects in Massachusetts – most recently the South Coast Rail project. A phased approach could focus on specific improvements that offer benefits such as safety and increased reliability or could address infrastructure in a particular segment. Whether a pilot service would be worthwhile is uncertain given the current operational impediments, but it may be explored as part of a phased approach and could also include working with Amtrak on any plans for service to Albany.

Detailed Study of Economic and Community Benefits and Impacts

Several stakeholders have correctly noted that this study does not fully capture some of the potentially transformative economic and demographic impacts and benefits of East-West Passenger Rail, i.e., an exploration of long-term demographic and growth patterns for western Massachusetts and how an East-West rail corridor could be one of several focused policies to promote affordable living and economic development in western Massachusetts. This study did not include these important issues because such travel and demographic changes are not captured by a standard transportation analysis, but MassDOT agrees that such an analysis is a critical next step to more fully understand the benefits of East-West rail.

Exploring this issue would require investigation of current and prospective factors affecting regional growth. Such a study would begin with a literature review and an examination of case studies of similar projects elsewhere. The inquiry could then focus on what economic and demographic results were achieved and what other changes – apart from new rail service – were significant contributors to the results. If funded, MassDOT would look for significant participation in developing the study parameters and assumptions by the Metropolitan Planning Organizations and businesses. That input would be particularly important to assessing factors other than improved train service.

These might include changes in regional land use or housing policy.

Several commenters also noted that this study does not consider the long-term travel impacts of the current pandemic – particularly the possibility that remote working will become more common and that for many people the home-work distance will be lengthened.

MassDOT will be evaluating how travel patterns have changed and may continue to change and apply this evaluation in a variety of contexts, not only to the demand for passenger rail but also to issues such as its effects on congestion in greater Boston and potential increases in off-peak travel demand. A new travel option along the East-West corridor could be one of the scenarios examined as part of that broader inquiry.

These analyses may also be useful in determining whether phasing development of the corridor could provide a more viable path forward. For example, because roughly 62% of the estimated ridership is expected to be trips between Springfield and Boston, this segment may be a worthwhile starting point.

Understand Governance Options for Expanded Passenger Rail in Western Massachusetts

MassDOT does not have the capacity to operate as a railroad or to manage rail operations, and the MBTA is limited to operations within its legislatively-mandated service area. Given these limitations, a new public governance structure would be needed to support and direct operation of any of the three Final Alternatives, as well as any other non-pilot, permanent passenger rail services in western Massachusetts.

While the Legislature must ultimately decide how to best address the issue of governance for passenger rail in western Massachusetts, MassDOT would be happy to help advance the public debate and frame the legislative options by convening key elected stakeholders to discuss the legal and policy implications of different governance structures. MassDOT will rely on the input from these stakeholders to scope and develop a white paper to identify options for a governance structure for passenger rail outside the MBTA service district. This white paper could also form the basis of a legislative proposal. This collaboration with legislators will help ensure that policy goals are met and there is a viable mechanism to address governance for passenger rail within the Commonwealth.

While the exact form and substance of the white paper's scope will be determined in consultation with these elected stakeholders, MassDOT expects the work to consider issues such as the following:

- Legal/regulatory, operational, and financial characteristics of intercity and commuter rail service
- Structure and capacity of public entity to:
  - Evaluate and develop information about options
  - Develop funding and financing strategy, including fare policy
  - Provide management and oversight during
    a. Construction
    b. Operation
- Powers and authority of passenger rail entity, including:
  - Legal ability to provide or contract for commuter rail and/or intercity service
  - Technical capacity to provide or contract for commuter rail and or intercity service
  - Eligibility to receive and manage federal and other funds
  - Liability limitations and risks
  - Establishing balance between operating independence and public control
- Life-cycle costs of acquiring and supporting public interest in the right-of-way and related assets
- Funding sources and financing methods
  - Development through construction
  - Operations (including any subsidy required for the assumed fare policy)
  - Maintenance and capital renewal
- Scope of functions to be undertaken by an operating railroad, including:
  - Maintenance of the right-of-way, including stations and layover areas
  - Safety and regulatory compliance
  - Securing and maintaining equipment, including locomotives and coaches
  - Development of service plan and terms under which schedule can be altered
  - Providing security
  - Handling ticket sales and fare collection, engaging, and directing personnel
  - Operating trains safely and on schedule
- Dispatching all trains and/or coordinating with dispatch operations of other railroads

Evaluation of Funding Sources and Strategies

The East – West Passenger Rail project is a large and complex project that would require large capital investments as well as ongoing operations and maintenance funding, likely necessitating a combination of many different funding sources and strategies. MassDOT will coordinate efforts with state and federal elected officials and other key stakeholders to evaluate and identify potential funding sources. Project phasing, as discussed earlier, can also be evaluated in context with funding opportunities.

A major impediment to federal funding is the current methodology used by the U.S. Department of Transportation to conduct the benefit-cost analysis. Because the federal methodology considers only a limited range of benefits, the Commonwealth could not obtain any federal funding for South Coast Rail and likely would not qualify for federal funding for East-West Rail. MassDOT will work with the Congressional delegation and other key stakeholders to advocate for changes to the federal benefit-cost analysis method to better capture all of the potential benefits of investment in passenger rail.

MassDOT will also work with elected officials and key stakeholders to catalogue existing and potential federal funding sources, an effort that will depend in part on the findings from the governance white paper with respect to what entity would be the recipient of such funding.