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RE: Initial Analysis of East-West Passenger Rail Study – PPT from February 6, 2020

Initial Analysis of East-West Passenger Rail Study Feb 2020 Results

Introduction and Purpose

The Massachusetts Department of Transportation (MassDOT) has produced a draft set of results for an alternatives analysis of passenger rail enhancements in the Boston-Springfield-Pittsfield corridor. Known as the East-West Passenger Rail (EWPR) Study, the February 2020 results start to detail the travel time, ridership, benefits, costs, service operations, and infrastructure improvements of six options which are supposed to be narrowed to down three alternatives for further analysis.

The objective of this memo is to provide an assessment of the PowerPoint (PPT) document of draft results in terms of capital and operating costs, ridership, and service options. As further context, the current study follows on the heels of the Northern New England Intercity Rail Initiative (NNEIRI) study that was completed by MassDOT with other state partners in July 2016. Similar to the new study, NNEIRI explicitly examined in the detail the feasibility of expanded passenger rail service in the Worcester-Springfield corridor which is key to unlocking broader rail connections as suggested by the Inland Route service development which would provide direct (one-seat ride) service between Boston, Worcester, Springfield, Hartford and New Haven.

In addition, this memo includes some comparisons to other existing intercity rail services such as the Downeaster from Boston to Maine, and the more recently implemented Hartford Line commuter rail service between New Haven, Hartford and Springfield. The memo is organized around four topics: 1) service alternatives; 2) capital costs; 3) ridership estimates; and 4) other analysis considerations.

The overarching finding is that the capital costs are MUCH higher than the NNEIRI study estimates and the ridership estimates are measurably lower, especially when considering service operations (frequency and speed of trains). Given that the NNEIRI study produced benefit-cost ratios for the Inland Route at a range of 0.7 to 0.9, it is fully expected that if MassDOT continues on the current path based on the interim results, the more detailed analysis will produce even weaker benefit-cost numbers.

So, now is the time to pause, consider, and scrutinize the draft results to ensure that we're working with reasonable assumptions, thoughtful modeling methodologies, useful service alternatives, and defensible cost estimates.



Service Alternatives

The EWPR study evaluated six alternatives with capital costs ranging from about \$2 billion to \$25 billion. Comments and questions related to these alternatives include:

- **Alternative 1** is the lowest cost and the lowest level of service. In fact, it doesn't even offer a direct (one-seat ride) service between Springfield and Boston as riders would need to transfer in Worcester. The rationale for this service alternative does not make sense and never would be implemented. In fact, the scheduled rail travel time between Springfield and Boston is worse in this alternative (2:46 hours) compared to 2:21 hours on the existing Amtrak Lakeshore Limited (partly because of the transfer). If looking at this alternative from the perspective of capital improvements to the corridor, it would only make sense if some kind of direct rail service could be provided such as an Amtrak shuttle or similar. Only four roundtrips on this alternative.
- **Alternative 2** adds rail service to Pittsfield and eliminates the Worcester transfer requirement for travel to Boston. This reduces the Springfield travel time a bit down to 2:14 hours but that is an enormous amount of work to only gain a few minutes compared to the Lakeshore Limited. This rail travel time is not likely to be competitive for many travelers, especially if they can get to/from Boston while avoiding congested time periods. Six roundtrips on this alternative.
- **Alternative 3** makes further enhancements, especially Pittsfield-Springfield and Worcester-Boston, which raises the total capital costs to \$3.2 billion but does reduce the Springfield-Boston time below 2 hours to 1:55 hours. It's my belief that the only alternatives that should be considered for this kind of effort would be to have a rail trip of 2 hours or less (ideally closer to 90 minutes) between Springfield and Boston. This alternative includes seven roundtrips which is similar to the eight recommended by NNEIRI. Despite this service level and speed, the Springfield ridership is only 16,750 (compared to 33,500 in the NNEIRI study which has a slower speed and 1 more train).
- **Alternative 4** goes further in the existing east-west rail corridor to find new alignments to straighten curves and gain speed, resulting in a 1:47 travel time from Springfield and increasing to nine roundtrips with an estimated cost of \$4.1 billion. This service frequency and travel time should be competitive to gain strong ridership yet the estimates are lower than NNEIRI even though NNEIRI had slower train times and one fewer train.
 - The ridership gain for Springfield between Alt 3 and 4 needs to be checked, especially relative to other service comparisons (I strongly suspect there is a calculations error). The increase is from 16,750 to 28,750 which is much bigger than other comparators especially given just an increase from 7 to 9 trains and an 8 minute time gain.
- **Alternative 5** includes even more corridor enhancements to improve speed with a very competitive 1:34 travel time between Springfield and Boston (and keeping with nine roundtrips). Despite this significant gain in speed, the ridership



barely grows (Springfield numbers only go from 28,750 to 29,300 – a gain of only 550 annual riders, or 1.5 boardings per day).

- This alternative removes Palmer as a station. It's unclear why this is a 'binary' choice in the alternatives. Wouldn't it be more likely to include a few trains that stop in Palmer, and a few that don't? Most international rail services include variations with some more 'express' trains with fewer stops, and some that include all stations.
- **Alternative 6** is by far the most expensive as it creates a new rail corridor along I-90 for much of the route, thus increasing costs to a staggering \$25 billion. Of note, the costs for Pittsfield to Springfield rise from \$568 million in Alternative 4 to \$9.1 billion in Alternative 6. If you kept that segment at Alt 4 levels, it would reduce the still costly project to \$16.4 billion but much less than \$25 billion. This alternative includes 17 roundtrips and a travel time of 1:19 from Springfield to Boston. So, despite lowering travel times by 15 minutes and almost doubling train frequency (9 to 17), this alternative only generates 53,650 Springfield riders compared to 29,300 for Alt 5 which completely goes against logic as train ridership increases with frequency (the more options, the more likely you'll choose that mode), and that's not even considering the time gain.

To summarize, these alternatives require further consideration and suggest that variations on them could be more logical. For example, I would suggest that:

- a) Alternatives 1 and 2 probably should be discarded;
- b) Alternatives 3 and 4 may need to be studied more carefully to understand why the ridership difference is so large;
- c) Alternatives 4 and 5 could consider having some 'express' trains that avoid smaller stations like Chester and Palmer, but include some trains with them (whereas 5 currently removes Palmer and is a bus between Pittsfield and Springfield); and
- d) Alternative 6 should consider a lower cost rail solution for the Pittsfield-Springfield segment (like in Alt 4).

Capital Costs

In general, the new capital costs estimates are very high and deserve closer scrutiny and greater understanding compared to previous studies and other comparable rail corridors.

To begin with, it's worth documenting the capital costs estimated by HDR Engineering (a well-respected transportation consultancy that has worked on numerous rail projects for MassDOT). The upfront capital costs they identified to implement and Inland Route service were comprised of a mix of infrastructure investments (primarily from Worcester to Springfield) and rolling stock purchases (train sets). HDR estimated capital costs to



be \$554 to \$660 million with more than half of those costs stemming from rolling stock purchases.

Given that the rail infrastructure is generally in good shape for most of the Inland Route corridor (except for Worcester to Springfield) and uses existing rail right-of-way, the infrastructure costs were estimated at a cost range of \$273 to \$309 million. Key components of this cost estimate were:

- Worcester-Springfield second track restoration = \$120 to \$139 million
- Other track and bridge improvements (primarily from Worcester to Springfield) = \$96 to \$108 million
- Station improvements at Worcester (new platform) and new station in Palmer = \$29 to \$33 million
- Signal improvements along corridor = \$29 million

By comparison, the new EWPR study estimates a minimum infrastructure cost of \$1.8 billion for the Worcester-Springfield segment which is about \$1.5 billion more than estimated by HDR. The major question is why? I don't have an answer to that but stakeholders deserve a detailed, credible answer from MassDOT.

Comparisons to Other Rail Corridors

The South Coast Rail project is estimated to be just over \$1 billion for Phase 1, and another \$3.2 billion for the Full Build alternative¹, so these costs are actually not out of line with most of the alternatives being considered. Rather than focusing just on cost per rider, we think that MassDOT should also prepare cost per mile of construction estimates to help understand relative costs.

Meanwhile, the entire New Haven-Hartford-Springfield rail corridor project is estimated to be approximately \$1.2 billion with approximately \$500 million to fully upgrade and double-track the Hartford-Springfield segment. So, this is a project with significantly lower costs than what is estimated for the EWPR study. And as noted above in the assessment of alternatives, it's also worth better understanding why certain costs and infrastructure assumptions are grouped together when a more cost-effective solution may be possible.

Ridership Estimates

While it's understood that the east-west rail market in Massachusetts is largely unproven beyond Worcester because of a lack of rail service, ridership estimates are far and away the most important benefit metric for any rail benefit-cost analysis², so it's critical to understand and scrutinize the draft results, and consider future possibilities in line with stated goals around economic development and housing, and improving the attractiveness of Western Mass as a place to live (and work).

¹ <https://www.mbta.com/projects/south-coast-rail>

² Virtually all benefit concepts (travel time savings, reduced GHG, congestion relief, safety) are derived based on ridership estimates.



This segment of the review is organized into three sections: a) review compared to the NNEIRI study, focused on Springfield and the differences between alternatives; b) ridership comparisons to similar rail corridors such as the Downeaster and the Hartford Line³; and c) other ridership estimation considerations, including transit-oriented development (TOD) and induced demand.

Comparisons to NNEIRI study and Between Alternatives

The 2016 NNEIRI study estimated a total Inland Route ridership of 371,040 in 2020 (year of assumed service initiation) and grows to 428,642 per year in 2035. The stations with the largest ridership are estimated to be:

- Boston (South Station and Back Bay) = 141,700 boardings
- Worcester = 50,100
- Springfield = 33,500
- New Haven = 29,400
- Framingham = 24,500
- Hartford = 17,800

This is based on trains with speeds up to 79 MPH leading to a travel time between Springfield and Boston of just over 2 hours (3 to 8 minutes depending on the train) with eight roundtrips in addition to the existing Lakeshore Limited. This service assumed direct (one-seat ride) to/from Hartford and New Haven as extensions of the current north-south 'shuttle' service which is up to 12 roundtrips between New Haven and Springfield.

The nearest comparison service alternative is Alternative 3 which provides a slightly better travel time (1:55 hours) and one fewer train (7 roundtrips) with service extended to Pittsfield and transfer possibilities in Springfield from Connecticut markets. This scenario is only estimated to generate 72,250 riders and just 16,750 from Springfield. So, assuming this is for a future year akin to 2035, that equates to only 17% of the ridership estimated in NNEIRI and exactly 50% the ridership in Springfield.

As noted earlier, the jump to Alternative 4 (with 9 roundtrips and slightly faster travel times from Springfield) increases total ridership to 117,100 and Springfield ridership to 28,750 (unclear why such a big jump from Alt 3 – it seems suspect). However, this of course comes with a total capital cost of over \$4 billion compared to NNEIRI's roughly \$300 million price tag.

Ridership Comparisons to Downeaster and Hartford Line

Although the EWPR study makes some comparisons to the South Coast Rail project in terms of cost per rider, we think these are essentially meaningless without actual ridership to compare it to. Instead, we think the most comparable corridors are the

³ Ridership comparisons to South Coast Rail are essentially meaningless as we only have projections on that service (and MassDOT has incentive to inflate those numbers now that it is being implemented).



Downeaster and the Hartford Line (which includes Springfield and provides recent ridership data based on a new service implementation).

The Downeaster travels from Portland to Boston in 2 hours and 20 minutes (116 miles). That's an average of 49.7 MPH and near-term initiatives are hoping to reduce that travel time to 2 hours. The Downeaster generated far more riders (535,000) with fewer daily round-trips (5) in 2018 than most of the alternatives and smaller markets. In other words, each serves Boston but the Worcester and Springfield markets (with Hartford area connections) are much larger than the comparable areas served in Maine and New Hampshire.

To state more directly, the Downeaster in recent years has generated over 500,000 riders whereas even with high-speed rail and 17 trips per day, the new EWPR estimates less than half that ridership while serving larger markets (247,700). This is not credible, and obviously the ridership numbers are much worse for alternatives that are much more similar (e.g., a service with 7 roundtrips and 1:55 travel time from Springfield) generates 72,250 rides, or less than 14% of the ridership. This, despite crippling traffic on the Mass Pike / I-90 getting in and out of Boston that is likely to only get worse.

The Hartford Line, with expanded rail service in the New Haven-Hartford-Springfield corridor, recently passed 1 million in ridership and is exceeding ridership forecasts.⁴ This is the clearest demonstration of the type of rail market to be found in the east-west rail corridor with Boston being a huge generator of trips. Somewhat misleadingly, the EWPR states that the Hartford Line generated 583,500 trips in Year 1 when the latest data (for all of 2019) demonstrates annual ridership of 731,000. But whatever the year, these CT-MA corridor ridership totals dwarf the estimated ridership potential for east-west rail despite serving the first, second, and fourth largest cities in New England (Boston, Worcester, Springfield).

The Springfield ridership estimates of 16,000 to 30,000 (for most alternatives) are surprisingly low, especially when you consider that the rail station generates over 100,000 riders per year. In other words, the EWPR study estimates only a 20-30% increase in ridership at the station despite the fact that connecting to Boston is the most important inter-city market for the greater Springfield area (not to mention the growing attractiveness of Worcester for restaurants, minor league baseball, etc.). There is also no explicit recognition of the positive economic development momentum in Springfield and the opportunities to leverage this and build on it, such as:

- MGM Springfield's resort casino in downtown Springfield;
- MassMutual's dual major office locations in Springfield and Boston;
- Springfield's Transformative Development Initiative (TDI) district which is located directly next to Union Station and the state's investments to support Valley Venture Mentors and other opportunities in this neighborhood;
- Springfield's cultural attractions like the Basketball Hall of Fame and Dr. Seuss Museum; and

⁴ <https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases/2020/01-2020/Governor-Lamont-Announces-Hartford-Line-Surpasses-One-Million-Riders>



- The start of a revitalized market-rate housing sector in downtown Springfield, including successful residential development projects within a short walk of the station including Silver Bricks and other new projects currently being advanced.

Other Ridership Estimation Questions / Issues / Considerations

The very low ridership estimates generated by the EWPR study fundamentally point to issues and questions about the methodology, why it is so much lower than the NNEIRI study, and more importantly, why the numbers are so low compared to other actual ridership experiences and data. In addition to comments and comparisons above, other ridership estimate questions and considerations include:

- To what extent does this analysis take into account the current and projected highway travel conditions on the MassPike into and out of Boston where:
 - Average travel times cannot be used given the huge variation and unreliability of travel times from Western Mass to Boston – most drivers add at least 30 minutes of buffer time to all trips.
 - The 'rush hour' of Boston area traffic keeps extending earlier and later such that you typically need to leave Boston by 2:30pm to avoid traffic coming back to Western Mass and making it for morning meetings means allowing 2.5 to 3 hours of travel time.
 - Growth projections for greater Boston suggest that highway travel conditions will only get worse not better (even with automated vehicles) so looking ahead, rail becomes even more attractive than it is today.
- The study states that it includes no land use or demographic changes induced by rail as part of the ridership estimation despite the fact that one of the biggest reasons to do this project is to make it more attractive and competitive for people to live and work in Springfield and Western Mass more generally. This is not credible and at the very least, some sensitivity testing is needed. As an example, a recent MassINC study estimated the transit-oriented development (TOD) potential at Springfield (and Worcester), and from that, was able to project increases in rail ridership due to more people living and working near rail stations. This work continues and MassINC and other partners are actively working to increase the tools and policies to facilitate TOD in Gateway Cities: <https://massinc.org/our-work/policy-center/ttod/> and <https://massinc.org/research/the-promise-and-potential-of-transformative-transit-oriented-development-in-gateway-cities/>
 - TOD near rail stations is not just 'wishful thinking' but is being realized in very tangible ways along Connecticut's Hartford Line with [\\$430 million in mixed use development projects](#) and 1,400 residential units with much more TOD to come in future years as CT's cities have done advanced planning to facilitate TOD opportunities. This provides a very real example



that TOD near rail stations supports clustering of residential and mixed use development to further support rail ridership.⁵

- The Palmer station ridership estimates are strikingly low – with only 3,900 in Alt 3, that implies about 1.5 riders per train (with 7 trains per day). While Palmer is a small town, if there is effective parking options at the station, it could easily become a critical 'park and ride' station drawing Western Mass travelers to jump on the train rather than drive into the city. For example, many UMass-related faculty, staff and students travel regularly to Boston and the most common route is to drive south through Palmer to get onto the MassPike. This is a very plausible ridership market.
- The failure of this study to consider direct rail service to Connecticut (e.g., one-seat ride via Springfield to Hartford and New Haven) inherently lowers the ridership potential of this corridor even though: a) there is no good rail service between these markets; b) the Hartford region's leaders strongly support this rail connection; and c) it is not difficult to conceive of rail service alternatives where 3-4 of the east-west trains would extend directly to CT. The EWPR study does include estimates of transfers in Springfield from CT, but this ridership market is undoubtedly held back by the study's assumption of a transfer for all trips.
- Further, this lack of one-seat ride to CT largely ignores the potential to provide a viable rail route from Worcester to New York City and other markets. Enhancing the rail segment directly west of Worcester opens up multiple rail markets for New England's 2nd largest city. Worcester is doing very well with new development near the station (such as City Square, Canal District, WooSox Polar Park), and could find connections to CT markets and onto NYC a very appealing service as they currently have no good rail options to travel to those markets. In short, there are reasons to think that the ridership to/from Worcester should be larger.

Other Analysis Considerations

Two other operational and strategic considerations are worth noting:

Shared Passenger-Freight Rail in the Corridor

The EWPR study seems to imply that CSX's freight rail operations present a major conflict with passenger rail service in the corridor. While some conflict is likely, it is worth reminding that the NNEIRI study explicitly modeled how freight and passenger service could co-exist, especially if double-tracking was implemented between Worcester and Springfield. Specifically, the NNEIRI (HDR) study stated that:

⁵ For example, see: <https://ctmainstreet.org/as-five-towns-wait-for-hartford-line-train-stations-transit-oriented-developments-move-forward-hartford-business-journal/> and <https://www.nhhsrail.com/pdfs/tod%202018.pdf> and <https://portal.ct.gov/DOT/Transit-Oriented-Development/Transit-Oriented-Development-Home-Page>



“The level of proposed service was further analyzed using a train network operations model. The Inland Route was modeled utilizing the service plan in the Recommended Alternative to assess the impacts of the service on corridor capacity when operated with future freight and passenger rail services. Utilizing a modeling process identified by the FRA that isolates capacity needs for different corridor services, the results indicate that with the recommended infrastructure improvements, the corridor will have sufficient capacity to meet the projected needs of the freight railroad, commuter rail operations, and the recommended intercity rail services.” (source: page iii of NNEIRI Inland Route SDP, and see Appendix E for further details which include the operational analysis of increasing freight rail volumes growing at 2.2% per year and maintaining a 92% on-time performance level)

Operational Options West, South and North

The EWPR study alternatives solely focus on east-west travel and it appears that it is assumed that all roundtrips will travel the entire corridor (e.g. all nine roundtrips on Alt 4 presumably start or end in Pittsfield). As noted above, years of work exploring an Inland Route service (with one-seat ride to/from CT) is ignored with the need for a transfer in Springfield. More recently, the NNEIRI study also demonstrated how direct service could travel north from Springfield to the rest of the Pioneer Valley and beyond to Vermont (and potentially Montreal). The point is that a more effective service operation plan would consider direct trains such that if doing nine roundtrips with Springfield you could consider alternatives along the lines of:

- Three to four trains that extend west all the way west to/from Pittsfield;
- One to two trains that extend north to Pioneer Valley and Vermont; and
- Three to four trains that extend south to Connecticut.

While more complicated and requiring multi-state coordination, a forward-looking plan should not be constrained by such limited options as presented thus far, and instead should assess how best to leverage already realized rail corridor investments (like north and south of Springfield).

Summary Conclusions

- The rail service alternatives should be re-visited and not accepted as face value as other options seem more logical, viable or cost-effective;
- The capital cost estimates are extremely high, highlighted by the \$1.5 billion difference in Worcester-Springfield infrastructure costs between NNEIRI and EWPR studies, and these cost differences require more justification.
- The ridership estimates are surprisingly low, especially when compared to other rail corridors (Downeaster, Hartford Line), and require much closer scrutiny.
- Further, the relative ridership estimates between alternatives appears suspect with an unexplainably large gain in ridership (from Springfield) between Alternatives 3 and 4, and remarkably small gain between 4 and 5.