

Appendix 8

TECHNICAL REPORT

Task 8: Identification of the Recommended Strategy

November 2014



New Hampshire

Capitol Corridor Rail & Transit Alternatives Analysis (Parts A & B)

State Project Numbers 16317 and 68067-A



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List of Acronyms

AA	Alternatives Analysis
BX	Boston Express
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
LPA	Locally Preferred Alternative
MBTA	Massachusetts Bay Transportation Authority
O&M	Operations and Maintenance
PAR	Pan Am Railways
TOD	Transit-Oriented Development

Project Purpose and Need Summary

Increasing transportation demand and growing concerns about mobility, economic development, and quality-of-life have led New Hampshire and Massachusetts citizens and officials to explore transit and/or intercity passenger rail service options in the 73-mile corridor (Capitol Corridor) between Boston, Massachusetts and Concord, New Hampshire.¹ The purpose of this Capitol Corridor Rail and Transit Alternatives Analysis (AA) Study is to evaluate a diverse set of rail and bus options to improve connectivity by leveraging existing transportation infrastructure, including Pan Am Railways (PAR), Route 3, and I-93. Investment in an improved transportation strategy is needed for several reasons:

- Projected population growth will result in increased roadway congestion
- New Hampshire's existing transportation network does not effectively connect existing modes
- The regional economy is singularly dependent on roads for movement of goods and passengers
- Improved transportation options will attract employers to New Hampshire and improve employment options for New Hampshire residents
- Young New Hampshire professionals are leaving the area to be closer to employment and cultural/social opportunities associated with larger urban centers
- New Hampshire's growing senior population needs more "car-light" mobility options
- Residential development patterns resulting from population growth may negatively impact the region's existing quality-of-life
- The existing transportation network cannot accommodate increased levels of demand without negative environmental consequences

Task Objectives

This task completes the technical analysis and decision-making process that comprise the AA Study's two main elements. The Study began with the Purpose and Need Statement (Task 2, Appendix 2 to the AA Final Report), which was a detailed definition of transportation and related problems that the alternative transit investment strategies were intended to address. The initial set of options, both rail and intercity bus, were defined in Task 4, Initial Conceptual Transit Alternatives (Appendix 4 to the AA Final Report). Those preliminary investment plans were then subjected to comparative evaluation, based on preliminary estimates of costs (both capital and operating) and benefits, including ridership, economic development, land use, and environmental impacts. This process led to the selection of seven alternatives for more rigorous analysis and evaluation (Task 5, Preliminary Evaluation of Conceptual Alternatives and Recommended Alternatives for Detailed Evaluation; Appendix 5 to the AA Final Report). The criteria used to evaluate the intermediate options were detailed in Task 6, Evaluation Criteria and Methodology (Appendix 6 to the AA Final Report). Finally, those alternatives were refined and assessed

¹ The report "Task 2: Project Purpose and Need" (Appendix 2 to the AA Final Report) provides an in-depth evaluation of the Capitol Corridor's historical, current, and future state, and how Massachusetts and New Hampshire citizens would benefit from a transit investment strategy responsive to transportation needs and the region's economic, social, and environmental climate

in great detail, a process discussed in Task 7, Detailed Evaluation of Alternatives (Appendix 7 to the AA Final Report).

That logical, sequential, analytical and selection process culminated in the selection of the recommended investment strategy through the application of assessments coming out of Task 7. While the term Locally Preferred Alternative (LPA) is commonly used to describe the recommended transit strategy resulting from an alternatives analysis such as the Capitol Corridor Study, it is probably more accurate to describe the recommended course of action as a comprehensive locally selected transit or intercity rail investment strategy, consisting of discrete investments, often implemented over a defined period of time. That is the case with the plans recommended for the Capitol Corridor.

This task had four purposes:

1. Describe each evaluation criterion, focusing on those most influential in driving selection of the preferred investment strategy
2. Describe each of the seven final alternatives, focusing on strengths and weaknesses relative to competing alternatives
3. Identify factors most important in determining the selection of the preferred strategy, the major differentiators
4. Describe the preferred investment strategy

1 The Intermediate Alternatives

Seven intermediate alternatives were discussed in detail in Task 5 (Appendix 5 to the AA Final Report):

1. **No Build.** Existing intercity bus service, Concord-Manchester-Boston via I-93 and Route 3; there is no additional investment
2. **Manchester Regional Commuter Rail.** Downtown Manchester-Manchester Airport-Nashua-Nashua South-Boston; eight round trips per weekday to Manchester, 17 to Nashua
3. **Nashua Minimum Commuter Rail.** Nashua South-Boston; eight round trips
4. **Intercity 8.** Intercity rail service, Concord-Downtown Manchester-Manchester Airport-Nashua-Boston; four round trips
5. **Expanded Base.** Manchester-Boston; 20 additional round trips
6. **Bus on Shoulder.** Existing intercity bus service running on reserved shoulder lanes on I-93 in Massachusetts
7. **Expanded Bus on Shoulder.** Expanded service noted above using shoulder lane in Massachusetts

(During completion of the Study there was discussion by New Hampshire officials of extending Massachusetts Bay Transportation Authority [MBTA] service from Lowell to Tyngsborough, Massachusetts, immediately south of the state line, with the expense being entirely borne by Massachusetts. However, there is no reference to such service in Massachusetts transportation plans,

and there was no discussion of the subject during extensive discussions between the Study team and Massachusetts transit officials. The MBTA never broached the subject.)

2 Evaluation Criteria

The seven final alternatives were evaluated against five technical criteria analyzed in detail in Task 7/Appendix 7 to the AA Final Report:

1. **Costs, both capital and operations and maintenance (O&M).** What would it cost to implement each option, including land acquisition, construction, and equipment (buses or trains)? And what would it cost, annually, to operate each alternative?
2. **Mobility impacts, primarily ridership.** How many passengers would ride the new service? And especially, how many new riders (in addition to current transit riders) would the service attract within New Hampshire?
3. **Environmental and equity impacts.** What are the major differences among alternatives in terms of environmental and equity impacts, both positive and negative?
4. **Land use.** What are the differences among alternatives in terms of their likelihood of promoting more compact, sustainable development, especially near stations?
5. **Economic development.** What would be the relative impact of each option in terms of enhancing the New Hampshire economy, as measured by new employment, new residential construction, and commercial development?

In addition to technical evaluations, in assessing the alternatives the Study team considered extensive input from the public and key stakeholders, including business leaders; regional planning commissions; elected officials at local, state, and national (U.S. Senate and House of Representatives) levels; and the Federal Railroad Administration and Federal Transit Administrations (FRA and FTA, respectively). Finally, the team considered input from existing transit providers, Boston Express (BX)/Concord Coach and MBTA, and was also guided by its extensive experience working on similar analyses in regions throughout the U.S. and by the extensive record of research conducted over decades on major transit projects in the U.S.

3 Evaluation of the Intermediate Alternatives

The results of the comparative evaluation of the seven alternatives are summarized in Table 3.1. The remainder of this section is a detailed discussion of that summary table. Evaluation and analysis led to the selection of the preferred investment strategy for the New Hampshire Capitol Corridor, as presented in the following, and concluding, section of this report.

The vertical axis of the table includes the seven final alternatives, as listed above in Section 1. The horizontal axis includes key evaluation criteria, including several critical performance measures derived from results of the analyses. It is important to note that the focus is on those factors that are most important in drawing critical differences among alternatives or, in some cases, among sets of

alternatives. Thus, for example, although environmental impacts – both positive, such as reduced air pollution resulting from fewer cars on the road, and negative, such as noise from railroad locomotives – are important, they did not constitute a major differentiator among alternatives studied.

Table 3.1: Final Screening of Alternatives

NH Capitol Corridor Rail and Transit Study														
Alternative	New NH Transit Passenger Trips	Economic Benefits - Residential Units	Economic Benefits - Jobs	Total Capital Cost (In Millions, 2014\$)	NH Costs after Federal Grants and MA Contribution	Annual Operating Cost (In Millions, 2012\$)	Net Operating Cost (In Millions, 2012\$)	Annual NH Debt Service (20 Year Bond)	Annual NH Total Cost (Debt Service and Operating Deficit)	Annual NH Cost per New Rider	Ridership New Riders	Cost Capital/O&M	Land Use	Economic Development
No Build	0	0	0	\$0	\$0	\$6	\$1	\$0	\$1	\$0				
Manchester Regional Commuter Rail	2,568	3,600	5,600	\$246	\$72	\$11	\$1	\$6	\$7	\$10				
Nashua Minimum Commuter Rail	670	1,100	2,500	\$120	\$39	\$4	\$1	\$3	\$4	\$22				
Intercity 8	946	1,600	2,400	\$256	\$128	\$8	\$5	\$10	\$15	\$61				
Expanded Base	338	0	0	\$10	\$10	\$3	\$2	\$1	\$3	\$32				
Bus on Shoulder	48	0	0	\$7	\$1	\$0	\$0	\$1	\$1	\$68				
Expanded Bus on Shoulder	374	0	0	\$17	\$17	\$3	\$2	\$2	\$4	\$37				

Better Worse

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In considering the evaluation factors used in this report, it is also important to look for *major* differences among alternatives and groups of alternatives. Despite the apparent precision of the numbers regarding costs and benefits, they are, in fact, estimates, with margins of error. Thus, a difference of, for example, 100 riders per day between two options should be seen as no difference; they are equivalent. The same could also be said about a difference in capital cost of, for example, \$10 million.

The remainder of this section will consist of, first, a column-by-column discussion of the evaluation factors in Table 3.1, followed by a row-by-row discussion of the alternatives, and concluding with a listing of the most important differences among those options.

3.1 Transit Ridership

Task 7 (Appendix 7 to the AA Final Report), Detailed Evaluation of Alternatives, includes a very detailed evaluation of ridership forecasts for each alternative: a breakdown of ridership for each station, as well as totals for each option. For purposes of selecting the preferred investment strategy, the focus is on

new transit passenger trips to and from New Hampshire, which are riders in addition to those on existing intercity bus service. This is considered to be the best measure of transportation benefits for the state. By that measure, Manchester Regional Commuter Rail service outperforms all other options, with approximately 2,570 new New Hampshire riders per weekday, almost all of whom are going to or from Boston. The other two rail alternatives are a distant second and third, with the three bus options having about half or fewer riders than the weakest rail option, Nashua Minimum Commuter Rail.

3.2 Economic Benefits

Economic benefits were also discussed in great detail in Task 7 (Appendix 7 to the AA Final Report). Here, the focus is on the number of new residential units around new stations, especially strong in downtown Manchester and a potential Spit Brook Road station in Nashua, and on new jobs resulting from service implementation. Both measures point to a similar conclusion: Manchester Regional Commuter Rail clearly outperforms the other two rail options, with Nashua Minimum Commuter Rail being a distant third. The bus options do not produce significant economic benefits, the reasons for which are discussed in Task 7 (Appendix 7 to the AA Final Report). This overall picture is consistent with experience both nationally and in New England.

3.3 Financial Costs

The column for total capital cost shows that the rail options are all significantly more expensive than any of the bus alternatives, with Manchester Regional Commuter Rail and Intercity 8 both at about \$250 million, double the Nashua Minimum Commuter Rail service, and far above the bus range of \$7 to \$17 million.

The next cost column is New Hampshire costs after federal grants and Massachusetts contributions. The assumption is, as is typically the case with a project such as this, that approximately half of the capital cost of the rail alternatives will be covered by federal contributions. And, since the two commuter rail options are extensions of existing Boston-Lowell service, the MBTA (the presumed operator) would also share some of the costs. The resulting numbers reflect similar ratios to the total costs, though at a much lower level, at most half of the total. Among rail options, Nashua Minimum Commuter Rail is half the cost of Manchester Regional Commuter Rail, with the still-highest Intercity 8 number reflecting the absence of a Massachusetts contribution.

The two operating cost columns, total annual and net after fares and other revenues, show that the net operating costs are all \$2 million or less, with the exception of the Intercity 8 at \$5 million.

The assumption, again a typical one, is that the state would issue bonds to cover the capital cost not covered by federal or Massachusetts support. The column labeled annual “NH Debt Service” reflects the annual cost of paying off the debt, and also portrays the higher cost of all the rail options, highest for Intercity 8 and Manchester Regional Commuter Rail, all much higher than any bus alternative.

Finally, by adding the net operating cost and debt service the result is the state’s total annual cost, and answers that vital question: What is the total amount that New Hampshire would need annually to build and operate each alternative? The number ranges from \$6 to \$15 million for the rail options (Intercity 8 highest, Nashua Minimum Commuter Rail lowest) to \$1 to \$4 million for the bus alternatives.

3.4 Cost/Benefit

The Capitol Corridor AA Study is essentially a large cost/benefit exercise with fairly large ranges of both, and with benefits tending to increase along with costs. For the purpose of helping to select the preferred alternative for the corridor, probably the single best measure of cost/benefit is the annual cost to New Hampshire to obtain each new rider. Results are shown in the final numerical column. They show that – other than the No Build option, which is very low for both costs and benefits – the Manchester Regional Commuter Rail has the lowest (best) ratio of about \$14 million, followed, distantly, by Nashua Minimum Commuter Rail and the two expanded bus options, all essentially the same. The highest (worst) cost per new rider is Intercity 8.

3.5 Qualitative Assessment Summary

The final four columns on Table 3.1 summarize the relative performance of the alternatives against four important evaluation criteria: new New Hampshire riders, costs (capital and O&M), land use impacts, and economic development potential. They reflect relative performance in that the alternatives are judged against each other, not by any national standard. They also reflect the calculations discussed above for costs and benefits, and the collective professional judgment of the Study team, especially regarding land use impacts, specifically the likelihood that an alternative will promote denser, mixed-use development (Transit-Oriented Development or TOD) near stations. This subject is discussed in detail in Task 7 (Appendix 7 to the AA Final Report). That judgment reflects experience working on similar projects in New Hampshire and throughout the U.S.

The use of the shaded circles helps provide a quick visual summary of each option's strengths and weaknesses. A full circle indicates a very strong performance and an empty circle a very weak performance, with gradations reflecting intermediate performance. Basically, the darker a circle, the stronger an alternative is within that evaluation criterion.

3.6 Alternatives: Relative Strengths and Weaknesses

3.6.1 *No Build (No Additional Transit Service)*

Strengths: By far, this option's great strength is that there would be no incremental cost. It should be noted that the No Build option continues successful intercity bus service on both the I-93 and Route 3 corridors.

Weaknesses: Its greatest weakness is the opportunity cost of not addressing the transportation and other problems discussed in the Study's Purpose and Need Statement (Appendix 2 to the AA Final Report). Essentially, there are the social and economic costs of not receiving the benefits resulting from investments in transit improvements. There would be no congestion relief, environmental benefits, or economic benefits resulting from the attraction of new residents and employees.

3.6.2 *Manchester Regional Commuter Rail*

Strengths: In terms of benefits alone, the Manchester Regional Commuter Rail service outperforms all other alternatives in all evaluation categories, often by a wide margin. Its new New Hampshire ridership total is two and one-half times the second best option, Intercity 8. Because it provides service to

Manchester, with its dense core and an existing “feel” of TOD, and its higher service level than Intercity 8, this option would have a stronger impact on land use and economic development. And the alternative’s cost per new rider (cost for New Hampshire) is half that of its closest competitor, Nashua Minimum Commuter Rail.

Weaknesses: All those benefits come with a price tag, and the Manchester Regional option, together with Intercity 8, is the most expensive for both capital and O&M.

3.6.3 *Nashua Minimum Commuter Rail*

Strengths: This alternative was designed to answer the frequently asked question: What is the least expensive rail option that passes any test of reasonableness? Therefore, its major – perhaps only – benefit is low cost and, possibly, the ease of implementation, perhaps as phase one of the Manchester Regional Commuter Rail alternative. Its capital cost is half that of the other two rail options, although, partly because of its relatively poor ridership, the annual cost to New Hampshire is 60 percent of the Manchester Regional service. Finally, given its relatively low cost, this option could be eligible for federal funding from programs that would not be available for more expensive rail options.

Weaknesses: Nashua Minimum Commuter Rail’s low (financial) cost also comes with relatively poor performance compared with other rail options, in terms of ridership, land use, and economic development impacts. Especially noteworthy is the new daily ridership total of 670, versus 2,570 for the Manchester Regional service, and, consequently, a cost-per-new-rider that is two and one-half times that for the Manchester Regional service.

3.6.4 *Intercity 8*

Strengths: This is the only rail alternative that provides service to Concord, as well as to downtown Manchester, although with fewer trains than the Manchester Regional Commuter Rail. Therefore, it outperforms the Nashua Minimum Commuter Rail and all bus alternatives in terms of land use and economic development and ridership, but trails Manchester Regional service by a wide margin.

Weaknesses: This is the highest-cost alternative in terms of capital, net operations, and total annual cost to New Hampshire (at least 50 percent higher than all other build options), which is especially noteworthy given its relatively weak service level and ridership performance. One reason for the high cost is the assumption that the project would include the purchase of new train sets, with no support from Massachusetts. Finally, there are two potential issues with the MBTA south of Lowell: capacity for additional trains on shared trackage between Lowell and Boston and availability of capacity at North Station for additional trains.

3.6.5 *Intercity Bus Improvements*

Strengths: New Hampshire already has strong bus service to Boston (directly to South Station and Logan Airport) from Concord, Manchester, and Nashua. The three bus alternatives considered in the Capitol Corridor AA Study would improve service by adding buses and/or running buses on reserved shoulder lanes on I-93 in Massachusetts. The major benefit is low cost: All three options are the least costly by far

in terms of capital, between \$7 and \$17 million, although net operating costs for expanded service are similar to rail.

Weaknesses: As noted above, costs and benefits tend to rise – and fall – together. Improved bus service, especially with Bus on Shoulder implemented by Massachusetts, is inexpensive, but the benefits are minimal. (Note that what is important here are benefits above the considerable mobility benefits from existing bus service.) Ridership gains for all three bus options are well below those of the rail alternatives and, as noted above and in detail in Task 7 (Appendix 7 to the AA Final Report), economic development and land use benefits resulting from intercity bus service, in New England and throughout the country, are minimal.²

(Note: If passenger rail service is implemented, some existing bus riders would shift from bus to rail, possibly allowing for a reduction in existing bus service, especially on Route 3, where the rail line closely parallels the highway. This would, of course, reduce overall costs for combined rail-bus transit service in the corridor. This issue is discussed in detail in Task 7 (Appendix 7 to the AA Final Report), and the Study team recommends further discussion of modifying – or retaining some or all – bus service if a rail project is adopted.)

4 Recommended Strategy

Based on the analysis completed for this Study, including the evaluation discussed in this chapter, and on the progress made in the decision-making process in New Hampshire, the Study team concluded that additional discussion, debate, and input by state policymakers is required before a definitive decision on next implementation steps can be made. In the context of moving toward and making that recommendation, it is especially important that further progress be made on a financial plan, or plans, that could include federal, state (New Hampshire and Massachusetts), and local support. (A discussion of potential funding sources is contained in the financial analysis in Task 3, Appendix 3 to the AA Final Report.)

To help guide that process, the Study team recommended narrowing the range of options to five: No Build, Manchester Regional Commuter Rail, Nashua Minimum Commuter Rail, Intercity 8, and Bus on Shoulder operation for existing intercity bus service on I-93 in Massachusetts. Each of these was evaluated above, and the strengths and weaknesses of each, as noted in that evaluation, should serve as the basis of the ongoing public debate.

The rationale for selecting each option recommended for further review follows:

- **No Build.** Maintenance of the status quo, which includes existing intercity bus service, obviously is the lowest-cost (in terms of new investment dollars) alternative of all those considered.

² An important note on ridership: Ridership gains result far more from the addition of more buses than from reliability improvements stemming from shoulder operation in Massachusetts

- **Manchester Regional Commuter Rail.** From an effectiveness standpoint (consideration of the complete range of benefits), this option is clearly the strongest alternative considered in the Study. It performs very well in terms of ridership, economic development impact, and land-use impact. However, on the cost side, it is one of the most expensive options.
- **Nashua Minimum Commuter Rail.** This is the lowest-cost rail option. And while it does not stand out in terms of ridership and economic or land-use impacts, it could serve as the first phase of the implementation of Manchester Regional Commuter Rail service.
- **Intercity 8.** This was judged to be the preferred intercity rail option of the three assessed earlier in the Study. Intercity 8 is the lowest-cost option of the intercity alternatives considered and, if implemented, could serve as the first phase of more robust service, following the implementation strategy for the original Amtrak Portland-Boston *Downeaster* service. As a relatively expensive alternative, this would require federal support for capital costs. While there is currently no source for such funds, that situation could change, as then could the prospects for Intercity 8 development.
- **Bus on Shoulder (for existing intercity bus service).** This is an option low on cost and low on benefits. It is also dependent on a decision by Massachusetts, as construction of any required Bus on Shoulder lanes on I-93 would be in the Commonwealth close to Boston. The possibility of financial support from New Hampshire for this strategy should be part of the forthcoming policy discussion, as should the potential for reducing existing bus service if rail is implemented, as discussed in Task 7 (Appendix 7 to the AA Final Report).

During future discussions, it should be noted that the recommended options do not have to be considered as a single investment package. Bus on Shoulder could be implemented without movement on passenger rail. And rail could be recommended without action on Bus on Shoulder. Similarly, Nashua Minimum Commuter Rail could be adopted as the first phase of the Manchester Regional Commuter Rail service – or as an independent project on its own merit. And Manchester Regional Commuter Rail service could be recommended with or without phasing.

In terms of next steps, specific project development actions will emerge as policymakers get closer to a recommended strategy, since alternative strategies can have very different requirements for engineering, project development, and management, including the identification of governance entities to lead implementation activities and operations.

To conclude, it should be emphasized again that it is critical during discussion of the remaining options that serious thought be given to, and progress be made on, a realistic financial plan, options for which are discussed in Task 3 (Appendix 3 to the AA Final Report). This is necessary for any progress to be made on implementation and for the procurement of federal funding, which is assumed to be necessary for any of the more expensive alternatives.