VERMONT
AGENCY OF TRANSPORTATION

VERMONT RAIL PLAN

PASSENGER RAIL FORECASTING SCENARIOS

SUBMITTED BY
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MAY 2021

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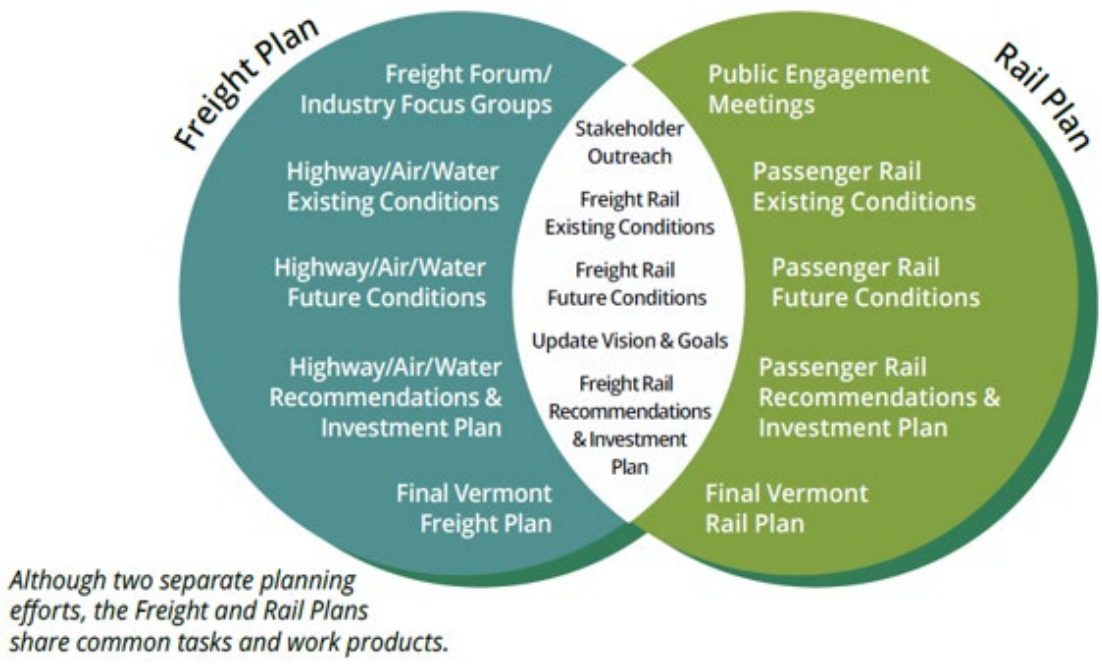
CAGR	Compound Annual Growth Rate
CLP	Clarendon and Pittsford Railroad
CTDOT	Connecticut Department of Transportation
COVID-19	Coronavirus Diseases 2019
EA	Environmental Assessment
FAST	Fixing America's Surface Transportation Act
FRA	Federal Railroad Administration
FY	Fiscal Year
MassDOT	Massachusetts Department of Transportation
NECR	New England Central Railroad
NNEIRI	Northern New England Intercity Rail Initiative
PRIIA	Passenger Rail Investment and Improvement Act
PTC	Positive Train Control
VTrans / AOT	Vermont Agency of Transportation

1.0 INTRODUCTION

In April 2020, the Vermont Agency of Transportation (AOT or VTrans) contracted with Cambridge Systematics to update its State Rail Plan (2015) and State Freight Plan (2012 with minor revisions in 2013, 2015 and 2017) to meet with Federal regulations under the Passenger Rail Investment and Improvement Act (PRIIA) and Fixing America's Surface Transportation (FAST) Act. Although two separate documents, there is a significant amount of overlap between the efforts as shown in Figure 1.1.

FIGURE 1.1 VERMONT FREIGHT AND RAIL PLAN ELEMENTS



Source: Cambridge Systematics, 2020.

The State Rail Plan provides a framework for maintaining and enhancing the state rail system. It is important to note that the State Rail Plan focuses on rail freight and intercity passenger service provided by Amtrak. Commuter rail is a form of public transit that is addressed as part of public transit plans.[1]

The State Freight Plan provides a framework for maintaining and enhancing all modes of freight movement in Vermont—rail, highway, air, and water.

This Technical Memo is the fourth of five which will provide the background material and information necessary to complete the final State Rail Plan and State Freight Plan.

[1] https://vtrans.vermont.gov/planning/PTPP

This technical memorandum was produced while the effort to develop the Vermont Rail Plan was underway. In case of discrepancies between the contents of this technical memo and the Vermont Rail Plan document, the Vermont Rail Plan document prevails.

In addition, extensive public outreach will inform development of both plans and will meet Federal Railroad Admininstration (FRA) requirements for the Vermont Rail Plan.

The remainder of this Technical Memo contains the following Sections:

- Section 2 – Describes the forecasting approach used.
- Section 3 – Provides modeling results for a number of passenger rail service scenarios.

The next Technical Memo will focus on prioritizing and assessing the expected impacts of initiatives and programs and identifying specific inititiatves for implementation as part of the Vermont Rail Plan.

Additional work evaluating performance and identifying needs and gaps for non-rail freight modes (highway, water, air) will be developed separately as part of the Vermont Freight Plan update.

2.0 FORECASTING APPROACH

The forecasts in this document were not developed with a travel demand or sketch model but instead were derived using existing forecast results, latest ridership data, and professional opinion. The forecasting approach leveraged estimates from several prior studies, primarily:

- CTDOT **Environmental Assessment (EA)/Environmental Impact Evaluation for the New Haven – Hartford – Springfield High-Speed Intercity Rail Program** (2012)
- MassDOT **East-West Passenger Rail Study** (2020)
- MassDOT **Northern New England Intercity Rail Initiative (NNEIRI)** (2016)
- Pioneer Valley Planning Commission **Knowledge Corridor Passenger Rail Feasibility Study** (2009)
- VTrans **New York – Vermont Bi-State Intercity Passenger Rail Study** (2014)
- VTrans **Rutland – Burlington High-Speed Intercity Passenger Rail** (2009)
- VTrans **Vermont Statewide Intercity Bus Study Update** (2013)

In addition to these studies, the forecasts were derived by factoring the current ridership of Amtrak's *Ethan Allen Express* and *Vermonter* with a trip end or beginning in Vermont. Ridership associated with some stations outside of Vermont is also included in the analysis, as the responsibility for serving these stations and the associated costs would be borne by VTrans. This includes stations in Mechanicville, NY; Claremont, NH; and Montreal, PQ.

The forecast scenarios examined are shown in Table 2.1 below.

TABLE 2.1 FORECAST SCENARIOS

Rail Scenarios	
Vermonter Corridor	No Build (existing service)
	Vermonter day train extension to Montreal
	Extension of one Knowledge Corridor *Valley Flyer* train to White River Jct.
	Twice-daily *Vermonter* service, with both terminating in Montreal
	Boston connecting train at Springfield to *Vermonter* serving Montreal
	79 mph service on *Vermonter* (New Haven – St. Albans)
Ethan Allen Express / Western Corridor	No Build (includes extension to Burlington)

Rail Scenarios	
	Albany - Burlington via Bennington and *Ethan Allen Express* extension to Burlington (separate trains)
	79 mph service on the *Ethan Allen Express* (Vermont portion)
	Ethan Allen Express extension to Essex Junction

2.1 Annual Growth Factors & COVID-19 Recovery

In the 2015 plan, the long-term annual growth rate was set at 1.7 percent, compounded annually (CAGR), given no change in service frequencies, travel times, or reliability, which was more conservative than the ridership growth that had been occurring at the time. Since then, Amtrak system ridership growth has slowed down; between FY 2012 and 2019, national ridership grew from 31.24 million to 32.52 million riders, an overall growth of 4.2 percent, or a CAGR of around 0.57%. Factors driving this low level of growth appeared to be less affected by overall market demand rather than specific issues that included capacity constraints in some markets, poor operating performance on many routes, and a drive by Amtrak to maximize revenues. This performance was reflected in Vermont's trains, which have had essentially static ridership between FY 2016 and 2019.

Since the forecast is over a 20-year horizon, the impacts of COVID-19 are expected to occur at the beginning of the period, and thus should not affect ridership in the final forecast year. Thus, there is no further need to address COVID-related impacts in the forecast from the standpoint of FRA requirements. Nevertheless, in reaching this conclusion, it is useful to consider how service may recover from COVID. Since both the *Ethan Allan* and *Vermonter* have been suspended during much of calendar year 2020, the service will essentially start from 0 in late 2020 at the earliest. With broad availability of a vaccine to be unlikely prior to mid-2021, substantial recovery in ridership would not be able to commence until then.[2] It is also possible that broad availability of a vaccine will not occur until even later and/or that service would not resume until 2023. At best, once service resumes it is likely to take at least one year and possibly up to four years before travelers are fully comfortable with using public transportation again, which would place ridership back in-line with FY 2019 ridership levels starting from as early as 2022 to as late as 2027. Subsequently, ridership growth would be consistent with the specified long-term growth rates. At this point it is impossible to assess with any degree of accuracy how quickly the public will resume pre-COVID travel

[2]As of early December 2020, several vaccines were in the final stages of approval for public use with initial distribution expected by the end of 2020/early 2021. Public press accounts indicated that broad availability of vaccines would occur during Q2 2021. See for example https://nymag.com/intelligencer/2020/12/what-we-know-about-u-s-covid-19-vaccine-distribution-plan.html and https://www.biospace.com/article/covid-19-vaccine-rollout-timeline-possibly-beginning-distribution-in-december/.

habits, or whether they will be altered permanently. To account for this uncertainty in the growth rates we developed low, medium, and high values for the following variables:

- Year rail service is resumed to FY 2019 service levels: Low: 2021; Medium: 2022; High: 2023
- Length of time, once service returns, until passenger demand regains pre-COVID (FY 2019) ridership trends: Low: 1 Year; Medium: 2 Years; High: 4 Years

There is also uncertainty in population and employment growth along the Vermont rail corridors. We assumed that an average of the population and employment growth rates from the Vermont Long-Range Plan are considered the most reasonable county-level growth estimates available and are set as the Medium annual population/employment growth rates. It is also assumed that the minimum growth rates are, on average, 0.3 percent lower, and the maximum growth rates are 1.0 percent higher, as shown in Table 2.2. The larger range on the upper end, reflects the potential for a continuation of the COVID trend of migration away from large cities to smaller cities and more rural areas.

TABLE 2.2 ANNUAL POPULATION/EMPLOYMENT ANNUAL GROWTH ASSUMPTIONS

	Low Growth	Medium (LRTP) Growth	High Growth
County	**Ridership**	**2040 Forecast**	**2040 Forecast**
Rutland	0.0%	0.2%	1.2%
Franklin	0.7%	1.0%	2.0%
Chittenden	0.6%	0.9%	1.9%
Washington	0.2%	0.5%	1.5%
Orange	0.5%	0.8%	1.8%
Windsor	0.2%	0.5%	1.5%
Windham	0.2%	0.5%	1.5%
Addison	0.4%	0.7%	1.7%
Chittenden	0.8%	1.1%	2.1%
Bennington	0.0%	0.1%	1.1%
Weighted average of FY 2019 Annual Growth	0.3%	0.6%	1.6%

Combining all three sets of uncertainties together resulted in 27 potential growth rates. The median (50 percentile) growth rate was 0.5 percent, while the 10th percentile rate was 0.2 percent and the 90th percentile rate was 1.4 percent. The medium and low growth rates were considered reasonable estimates for low and medium annual growth in ridership. The high growth rate was increased to 2.5 percent to reflect additional improvements in service reliability, improved travel times due to full realization of the Knowledge Corridor investments, and stronger population and employment growth in non-Vermont cities along the current and planned Vermont rail lines. The final set of ridership growth rates by station are shown in Table 2.3.

TABLE 2.3 ANNUAL RIDERSHIP GROWTH ASSUMPTIONS

		Low Growth	Medium Growth	High Growth
Station	**County**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Castleton, VT	Rutland	0.0%	0.2%	2.2%
Rutland, VT	Rutland	0.0%	0.2%	2.2%
St. Albans, VT	Franklin	0.6%	1.0%	3.0%
Essex Junction, VT	Chittenden	0.5%	0.9%	2.9%
Waterbury, VT	Washington	0.1%	0.5%	2.5%
Montpelier, VT	Washington	0.1%	0.5%	2.5%
Randolph, VT	Orange	0.4%	0.8%	2.8%
White River Junction, VT	Windsor	0.1%	0.5%	2.5%
Windsor-Mt. Ascutney	Windsor	0.1%	0.5%	2.5%
Claremont, NH	Sullivan	0.0%	0.0%	2.0%
Bellows Falls, VT	Windham	0.1%	0.5%	2.5%
Brattleboro, VT	Windham	0.1%	0.5%	2.5%
Middlebury, VT	Addison	0.3%	0.7%	2.7%
Burlington, VT	Chittenden	0.7%	1.1%	3.1%
Manchester, VT	Bennington	0.0%	0.1%	2.1%
N. Bennington, VT	Bennington	0.0%	0.1%	2.1%
Weighted average of FY 2019 Ridership		0.2%	0.5%	2.5%

2.2 Intra-State Trips

Forecasts in this memorandum are presented in terms of ridership per station and total ridership per corridor. Ridership per station is the sum of boardings and alightings at that station. The total ridership is the sum of all trips with at least one trip end in Vermont or a through trip, which applies to the scenarios extending *Vermonter* service to Montreal. Therefore, to avoid double counting intra-state trips, which have both a boarding and alighting at a Vermont station, the percentage of intra-state trips is required. Currently, there are no intra-state trips on the *Ethan Allen Express*, although intra-state trips are expected once the service is extended to Burlington. The latest available intra-state rate of 9.0 percent from the *Vermonter* is used for both *Vermonter* and *Ethan Allen Express* / Western Corridor extensions excluding trips to Montreal.

3.0 PASSENGER SERVICE SCENARIOS

The following sections describe each scenario, source data, and forecast method. All forecasts assume that current service reliability is maintained, and that demand is not capacity constrained, which is not necessarily true. By assuming that growth would not be capacity constrained, the forecasts can be used to evaluate how well existing and planned services can accommodate future demand.

3.1 No Build – *Vermonter* and *Ethan Allen Express* to Burlington

The basis for this scenario are the *Vermonter* and *Ethan Allen Express* services. The *Vermonter* is assumed to operate exactly as it did in 2019, terminating at St. Albans. For the *Ethan Allen Express*, this scenario includes its extension to Burlington from Rutland, which is expected to be operational sometime during FY 2022. The trackage between Rutland and Burlington is assumed to support speeds of up to 59 mph, producing a travel time of approximately 90 minutes. Specific station locations and other aspects of operation are assumed to be consistent with the Preferred Alternative defined in the *Environmental Assessment: Rutland – Burlington High-Speed Intercity Passenger Rail* (2009), apart from the addition of a stop at Vergennes which was not included in the study.

This scenario assumes that service times and reliability are similar to those experienced in FY 2019, and that future demand does not exceed capacity.

Source Data

- FY 2019 ridership for the *Ethan Allen Express* and *Vermonter* with at least one trip end in Vermont.
- **Environmental Assessment: Rutland – Burlington High-Speed Intercity Passenger Rail** (2009) (Western Corridor EA)

Method

For the *Vermonter*, the forecasts were developed by growing the FY 2019 ridership by the annual growth rates shown in Table 3 for each station. Ridership grows by 8 percent for the Medium growth forecast scenario over the 20-year period from 2020 to 2040.

For the *Ethan Allen Express*, the Western Corridor EA forecasts are first normalized to the FY 2019 actual ridership. Vergennes station ridership is assumed to pull 5 percent of forecasted ridership away from the Middlebury and Burlington stations and additional ridership is added to the Vergennes station such that ratio of ridership of Vergennes to Middlebury is consistent with the ratio in population between these two areas. The updated baseline is then grown using the station level growth rates shown in Table 2.

Results

The ridership forecasts are shown in Table 3.1.

TABLE 3.1 *ETHAN ALLEN EXPRESS* AND *VERMONTER* NO BUILD RIDERSHIP FORECAST

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Ethan Allen Express				
Burlington, VT	0	12,700	13,800	20,800
Vergennes, VT	0	1,100	1,200	1,800
Middlebury, VT	0	3,800	4,200	6,300
Rutland, VT	12,566	13,100	13,700	20,800
Castleton, VT	3,995	4,200	4,400	6,600
Route Total	**16,561**	**34,900**	**37,300**	**56,300**
Vermonter				
St. Albans, VT	3,733	4,200	4,600	7,000
Essex Jct., VT	21,029	23,300	25,300	38,200
Waterbury, VT	5,377	5,500	6,000	9,000
Montpelier Jct., VT	7,909	8,100	8,800	13,300
Randolph, VT	2,053	2,200	2,400	3,700
White River Jct., VT	13,513	13,700	14,900	22,600
Windsor-Mt. Ascutney, VT	1,198	1,200	1,300	2,000
Claremont, NH	2,320	2,300	2,300	3,500
Bellows Falls, VT	4,776	4,800	5,300	8,000
Brattleboro, VT	16,765	17,000	18,500	28,000
Route Total	**78,673**	**82,400**	**89,400**	**135,200**
State Total	**95,234**	**117,300**	**126,700**	**191,500**

3.2 Service Between Albany NY and Burlington via Bennington

In this scenario a new service would operate a daily train between Albany, NY and Burlington, VT via Bennington, VT, in addition to an extended *Ethan Allen Express* service to Burlington. It is assumed that operation north of Rutland would be similar to that described in the Western Corridor EA and operation between Albany and Rutland would be similar to that analyzed in the Bi-State Study. The net service gain would be two daily trains between Rutland and Burlington. Thus, there would be two services between the Albany area (and points south) and Rutland and Burlington—one being the existing Ethan Allen Express service via Whitehall, NY, and the other being a new service (or variant of the Ethan Allen Express) via Bennington. There are potential alternative operation schemes, however, including rerouting existing Ethan Allen Express service via Bennington. Careful consideration of the effects of adding or removing service

from communities in this area must be part of any planning efforts, along with continued discussions and coordination between Vermont and New York.

Source Data

- FY 2019 ridership with at least one trip end in Vermont.
- **Environmental Assessment: Rutland – Burlington High-Speed Intercity Passenger Rail** (2009) (Western Corridor EA)
- **New York – Vermont Bi-State Intercity Passenger Rail Study** (2014) (Bi-State Study)

Method

There are several steps to generating the forecast for this scenario because a direct forecast is not available so the results from two studies need to be combined. The steps are as follows:

1. Bi-State and Western Corridor study forecasts are normalized to the FY 2019 actual ridership.
2. Transferring ridership is identified and forecasts are adjusted to account for the transfer at Albany.
3. Additional ridership at Rutland, which would be served by two daily trains, is identified.
4. Additional demand between Manchester, N. Bennington, and Mechanicville and Middlebury and Burlington are derived.
5. The intra-state percentage of the additional trips from steps 3 and 4 is asserted to be 9.0 percent.
6. The updated baseline is then grown using the station-level growth factors to 2040 ridership.

Results

The ridership forecasts are shown in Table 3.2.

TABLE 3.2 ALBANY-BURLINGTON VIA BENNINGTON WITH *ETHAN ALLEN EXPRESS* RIDERSHIP FORECASTS

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
***Ethan Allen Express* and Albany-Burlington**				
Burlington	N/A	21,300	23,100	34,900
Vergennes	N/A	1,900	2,000	3,100
Middlebury	N/A	6,500	7,000	10,600
Rutland	12,566	16,500	16,900	21,900
Castleton	3,995	4,200	4,400	6,600

	FY 2019	Low Growth	Medium Growth	High Growth
Manchester	N/A	3,800	3,800	4,700
N. Bennington	N/A	5,600	5,600	6,900
Mechanicville	N/A	4,300	4,400	5,400
Route Total	**16,561**	**63,900**	**67,400**	**94,000**

3.3 *Vermonter* Day Train Extension to Montreal

This scenario assumes that the *Vermonter* is extended to Montreal as a day train. The forecast method implies inclusion of the *Northern New England Intercity Rail Study* assumptions, which entail full implementation of New Haven-Hartford-Springfield service, with a total 23 round trips between New Haven and Springfield. That service would be provided by a mix of ConnDOT and Amtrak operated trains.

Source Data

- FY 2019 ridership with at least one trip end in Vermont.
- **Northern New England Intercity Rail Initiative** (2016)

Method

The Local service, 60mph alternative forecasts from the *Northern New England Intercity Rail Study* were used as the baseline ridership. These forecasts, however, were developed with four daily round trip trains between Boston and Montreal, via Springfield. To account for the reduced frequency, a 0.95 frequency elasticity was applied, which is consistent with the elasticity used in the *Knowledge Corridor Passenger Study*. Therefore, reducing service from four trains to one effectively reduces ridership by approximately 74 percent. Another difference between this scenario and the NNEIRI study is that this scenario excludes ridership associated with a connecting train between Boston and Springfield, MA. Nineteen percent of the trips were associated with this line, so the trips were further reduced by 19 percent. The refactored ridership increase is then added to FY 2019 ridership forecasted to Year 2035 which is the same year as the *Northern New England Intercity Rail Study* and then further projected out to 2040.

Results

The ridership forecasts are shown in Table 3.3.

TABLE 3.3 *VERMONTER* DAY TRAIN EXTENSION TO MONTREAL FORECAST (1 TRAIN / DAY) RIDERSHIP FORECASTS

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Vermonter				
Montreal, PQ	N/A	64,600	65,900	72,700
St. Albans, VT	3,733	5,800	6,200	8,700
Essex Jct., VT	21,029	32,300	34,500	48,400
Waterbury, VT	5,377	8,200	8,700	12,100
Montpelier Jct., VT	7,909	11,000	11,800	16,600
Randolph, VT	2,053	2,300	2,500	3,700
White River Jct., VT	13,513	22,500	23,900	32,500
Windsor-Mt. Ascutney, VT	1,198	1,300	1,400	2,100
Claremont, NH	2,320	3,500	3,500	4,800
Bellows Falls, VT	4,776	5,100	5,500	8,300
Brattleboro, VT	16,765	30,400	32,100	43,000
Route Total	78,673	187,000	196,000	252,900

3.4 *Vermonter* Train Extension to Montreal, 2 Daily Trains

This scenario is identical to the preceding scenario except that there are two daily trains operating across the entire route between Montreal, Springfield, New Haven and Washington.

Method

The increased frequency over the Vermont day train extension to Montreal is accounted for by applying a 0.95 factor to the single train scenario forecast ridership. Thus, the estimate does not take into account differences in time of day during which the trains may operate, or the presence of different services between the two trains, such as the presence of sleeping cars on an overnight train.

Results

The ridership forecasts are shown in Table 3.4.

TABLE 3.4 *VERMONTER* DAY TRAIN EXTENSION TO MONTREAL FORECAST (2 TRAINS / DAY) RIDERSHIP FORECASTS

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Vermonter				
Montreal, PQ	N/A	126,000	128,600	141,800
St. Albans, VT	3,733	11,300	12,100	17,000
Essex Jct., VT	21,029	63,000	67,300	94,300
Waterbury, VT	5,377	15,900	17,000	23,500
Montpelier Jct., VT	7,909	21,500	23,000	32,400
Randolph, VT	2,053	4,500	4,900	7,300
White River Jct., VT	13,513	43,900	46,600	63,300
Windsor-Mt. Ascutney, VT	1,198	2,500	2,700	4,000
Claremont, NH	2,320	6,900	6,900	9,400
Bellows Falls, VT	4,776	9,900	10,800	16,100
Brattleboro, VT	16,765	59,300	62,700	83,900
Route Total	78,673	364,700	382,600	493,000

3.5 Boston to Montreal Connection at Springfield

This scenario is identical to the *Vermonter* day train extension shown previously, except that it includes a connecting train between Springfield and Boston that would be operated as part of expanded service along the I-90 corridor that may be advanced by Massachusetts. The connecting time at Springfield would be 30 minutes or so, and the service performance between Boston and Springfield would reflect the improvements envisioned in the *Northern New England Intercity Rail* Study. The forecast method implies inclusion of the NNEIRI study assumptions, which entail full implementation of New Haven-Hartford-Springfield service, with a total 23 round trips between New Haven and Springfield. That service would be provided by a mix of CTDOT and Amtrak operated trains.

Source Data

- FY 2019 ridership with at least one trip end in Vermont.
- **Northern New England Intercity Rail Initiative (NNEIRI)** (2016)

Method

The Local service, 60mph alternative forecasts from the *Northern New England Intercity Rail Study* were used as the baseline ridership. These forecasts, however, were developed with 4 daily round trip trains between Boston and Montreal, via Springfield. To account for the reduced frequency, a 0.95 frequency elasticity was applied, which is consistent with the elasticity used in the *Knowledge Corridor Passenger Study*. Therefore, reducing service from four trains to one effectively reduces ridership by approximately 74 percent. Another difference between this scenario and the Northern NE study is that trips between the Boston to Springfield leg and Vermont or Montreal would require a transfer. A transfer factor of -0.32 is applied to those trips. The refactored ridership increase is then added to FY 2019 ridership forecasted to Year 2035 which is the final forecast year specified in the NNEIRI study, and then further extrapolated out to Year 2040.

Results

The ridership forecasts are shown in Table 3.5.

TABLE 3.5 BOSTON TO MONTREAL CONNECTION AT SPRINGFIELD RIDERSHIP FORECASTS

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Vermonter				
Montreal, PQ	N/A	74,700	76,200	84,000
St. Albans, VT	3,733	6,000	6,400	9,000
Essex Jct., VT	21,029	33,700	35,900	49,900
Waterbury, VT	5,377	8,600	9,100	12,500
Montpelier Jct., VT	7,909	11,500	12,200	17,100
Randolph, VT	2,053	2,300	2,500	3,800
White River Jct., VT	13,513	23,900	25,300	34,000
Windsor-Mt. Ascutney, VT	1,198	1,300	1,400	2,100
Claremont, NH	2,320	3,700	3,700	5,000
Bellows Falls, VT	4,776	5,100	5,600	8,300
Brattleboro, VT	16,765	32,500	34,300	45,400
Route Total	78,673	203,300	212,600	271,100

3.6 Extension of Knowledge Corridor Train to White River Junction

This scenario includes one additional daily frequency north of Greenfield, MA to White River Junction, in addition to the *Vermonter*, with continuing service to Washington, D.C. The intent is for the additional frequency to provide greater flexibility to travelers along the Knowledge and Northeast Corridors. With Massachusetts presently covering the cost of extending two daily Knowledge Corridor (*Valley Flyer*) trains to Greenfield, with relatively modest effort it may be feasible to extend one train on to White River Junction, a distance of 87 miles. Extending a second frequency to Brattleboro, located only 24 miles north of Greenfield, was also considered. Though current Vermonter ridership at Brattleboro is similar to that of White River Junction, this option was eliminated due to the lack of infrastructure necessary for turning a train in Brattleboro.

Source Data

- FY 2019 ridership with at least one trip end in Vermont.

Method

This scenario assumes that there is one additional daily frequency of service between White River Junction and Washington D.C. with identical operating conditions as the existing *Vermonter*. Therefore, two trains per day are assumed for all Vermont stations from White River Junction to the south. To account for the increased frequency, a 0.95 frequency elasticity was applied, which is consistent with the elasticity used in the *Knowledge Corridor Passenger Study*. Therefore, increasing service from one to two daily trains effectively increases ridership by approximately 90 percent. For all ridership between White River Junction and Washington, D.C., FY 2019 ridership was increased by 1.9 and then growth rates were applied to forecast ridership to Year 2040.

Results

The ridership forecasts associated with the additional frequency are shown in Table 3.6. Since this service did not exist in 2019, FY 2019 ridership entries are indicated as N/A.

TABLE 3.6 EXTENSION OF KNOWLEDGE CORRIDOR TRAIN TO WHITE RIVER JUNCTION RIDERSHIP FORECASTS

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Valley Flyer				
White River Jct., VT	N/A	11,200	12,200	18,500
Windsor-Mt. Ascutney, VT	N/A	900	1,000	1,500
Claremont, NH	N/A	1,900	1,900	2,900

Bellows Falls, VT	N/A	3,600	3,900	6,000
Brattleboro, VT	N/A	12,900	14,100	21,300
Train Total		**30,500**	**33,100**	**50,200**

3.7 *Ethan Allen Express* Extension to Essex Junction

This scenario entails extending the *Ethan Allen Express* from Burlington to Essex Junction over the New England Central Railroad's (NECR) 7.8 mile Winooski Branch. The principal purpose would be to enable a connection between the *EAE* and the *Vermonter*, to allow travelers to continue on to Montreal once that service has been restored.

From an intercity travel perspective, Essex Junction serves essentially the same market as Burlington. The driving distance to Burlington Union Station from the north on I-89 is shorter than to Essex Junction, while from the east on I-89 the distance to Essex Junction is roughly four miles shorter, but involves a considerably longer drive on surface roads. The trip by train along the NECR's Winooski branch between Essex Junction and Burlington will consume at least 15 minutes, which will exceed any potential time savings driving to Essex Junction instead of Burlington from the east.[3]

The modeling conducted for this scenario assumes the following:

- The *Ethan Allen Express* and *Vermonter* retain their existing schedule patterns, with only minor adjustments to ensure roughly 30-minute connections between trains for traffic going to and from Montreal at Essex Junction.
- Interaction effects for commonly served markets across the three trains serving the Champlain region – *Vermonter*, *Ethan Allen Express* and *Adirondack* – that would arise from an Essex Junction connection beyond those already accounted for in the *Vermonter* extension to Montreal were not considered. Thus, the principal ridership impacts arising from an *Ethan Allen Express* connection to Montreal and St. Albans, would be the linkage to communities along Vermont's Western Corridor south to Rutland and Castleton.
- While there is a possibility of some local travel in the Essex Junction – Burlington – Charlotte region using the *Ethan Allen Express*, a single daily frequency is unlikely to be attractive, particularly given the present late evening northbound schedule. Thus, commutation traffic was not examined.

[3] More detailed exploration of service options in the context of an integrated passenger network serving Vermont may be worth examining through a Service Development Plan (SDP). This SDP could examine the impacts on passenger demand of north- and south- connectivity at Essex Junction, and the specific impacts of particular schedules and frequencies, such as daytime versus overnight services.

Source Data

- FY 2019 ridership with at least one trip end in Vermont.
- **Environmental Assessment: Rutland – Burlington High-Speed Intercity Passenger Rail** (2009) (Western Corridor EA)
- **Northern New England Intercity Rail Initiative** (2016)

Method

The scenario assumes that there is no additional ridership on the *Vermonter* due to the connection to the *Ethan Allan Express* at Essex Junction, so the *Vermonter* ridership forecasts remain identical to the *Vermonter* Day Train Extension to Montreal Forecast (1 train / day) scenario, with the exception of ridership between Essex Junction and Montreal. The scenario also assumes that all *Ethan Allan Express* riders in the Burlington-Essex Junction region will continue to board at Burlington, therefore there are no boardings at Essex Junction on the *Ethan Allan Express* except for those transferring to the *Vermonter*. Since all stations outside of Vermont on the *Ethan Allan Express* are also served by the *Adirondack*, there are no additional boardings on the *Ethan Allan Express* for stations outside of Vermont.

Thus, the only additional ridership is between stations on the *Ethan Allan Express* in Vermont and Montreal, via a transfer at Essex Junction to the Vermonter. The increase in boardings on the *Vermonter* for Vermont stations due to the extension to Montreal was calculated and then discounted by the transfer penalty of 32 percent. The average percent increase in boardings with transfer penalty was then calculated and then applied to all Vermont stations on the *Ethan Allan Express* south of Burlington. The total increase in boardings was then added to the boardings at Essex Junction for both the *Ethan Allan Express* and *Vermonter* and to Montreal station on the *Vermonter* to account for the transfer at Essex Junction and the final destination at Montreal.

Results

The ridership forecasts are shown in Table 3.7. Overall, the net ridership gain from establishing a connection would range between 4,900 for the low growth and 7,800 riders for the high-growth scenario by 2040 beyond growth expected from the *Ethan Allen Express* No Build and the *Vermonter* extension to Montreal. This potential ridership gain for the *Ethan Allen Express* amounts to approximately 14 percent of the train's projected Vermont ridership once the Burlington extension has been completed.

TABLE 3.7 *ETHAN ALLEN EXPRESS* LINKAGE WITH *VERMONTER* AT ESSEX JUNCTION RIDERSHIP FORECAST

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Ethan Allen Express				
Essex Junction, VT	N/A	4,900	5,200	7,800

Burlington, VT	N/A	12,700	13,800	20,800
Vergennes, VT	N/A	1,400	1,500	2,200
Middlebury, VT	N/A	4,700	5,100	7,700
Rutland, VT	12,566	16,000	16,700	25,400
Castleton, VT	3,995	5,100	5,300	8,100
Vermonter				
Montreal, PQ	N/A	69,500	71,100	80,500
St. Albans, VT	3,733	5,800	6,200	8,700
Essex Jct., VT	21,029	37,200	39,700	56,200
Net change vs. base	*N/A*	*4,900*	*5,200*	*7,800*
Total Ridership (includes all stations on *Ethan Allen Express* and *Vermonter* routes)*	**95,234**	**191,000**	**238,500**	**317,000**

**May include some double-counting from riders traveling between a Vermont station and Montreal*

3.8 79 Mile Per Hour Service on *Vermonter* and *Ethan Allen Express* Routes

These scenarios examine the ridership impacts arising from increased speeds on the *Vermonter* and *Ethan Allen Express* routes from a current maximum of 59 mph to a maximum of 79 mph where conditions permit in locations that currently lack wayside signal systems. Time savings would be gained not only in locations where speeds could be raised beyond 59 mph, but also potentially in terminal areas that are currently subject to yard limit operations.

On the *Vermonter*, increasing speeds beyond 59 mph would require the installation of Positive Train Control (PTC) west of White River Junction, and between Greenfield Massachusetts and Brattleboro, as well as some minor track improvements along the entire NECR route, as described in Alternative 2 of the NNEIRI study. The potential travel time improvement between New Haven and Montreal would amount to approximately 1:30, versus the base case.[4] These savings include fully capturing the benefits from ongoing improvements that are being undertaken between New Haven and Springfield that, among other things, includes maximum speeds in excess of 79 mph.

On the *Ethan Allen Express* route, speeds of up to 79 mph are already possible between Albany and Whitehall, but improvements would be required between Whitehall, NY and Burlington, VT. PTC would have to be installed on the Clarendon and Pittsford (CLP) between Whitehall and Rutland, and VTR on to Burlington. Track improvements would be required along the route as well. The specific physical requirements for such an upgrade remain to be determined.

[4]Northern New England Intercity Rail Initiative **Preliminary Service Options Performance Report**, April 2014, pp. 9-11

As there is no available analysis of potential time savings that the Ethan Allen Express could gain from signal installation and increased speeds of up to 79 mph, a very high-level estimate was developed:

- On the 23.7-mile segment between Whitehall and Rutland on the CLP, the present scheduled running time for the *Ethan Allen Express* is 48-49 minutes, depending on direction, for an average speed of 29.6 mph. Improvements to 79 mph from the current 59 mph maximum would result in a 5-minute travel time savings, for an average speed of 33.1 mph. This relatively slow running time is associated with extended operations through terminal trackage in Whitehall and Rutland, as well as schedule padding intended to ensure a punctual hand-off between host railroads CP and Vermont Rail System at Whitehall. Potentially, improvements in operational reliability could result in further reductions in running time over this segment.
- Between Rutland and Burlington, a distance of 64 miles, current projected running time is 90 minutes, including intermediate stops, resulting in an average speed of 42.7 mph. Boosting maximum speeds to 79 would generate around 10 minutes in travel time savings, decreasing running time to 80 minutes, and an average speed of 48 mph.

Thus, the net reduction in running time between Whitehall, NY and Burlington would total around 15 minutes.

Source Data

- FY 2019 ridership with at least one trip end in Vermont.
- **Environmental Assessment: Rutland – Burlington High-Speed Intercity Passenger Rail** (2009) (Western Corridor EA)
- **Northern New England Intercity Rail Initiative** (2016)

Method

For the Vermonter, the scenario assumes the 1 train/day extension to Montreal train is increased to 79 mph where track geometry and conditions permit. Both 59 mph and 79 mph options were examined in the NNEIRI study, with Alternative 1 covering the former, and Alternative 2 the latter. NNEIRI included a sensitvity test to measure the impact of the shorter train schedules on passenger volumes while holding the frequency of service constant. The percent change in ridership by station from that analysis was applied to the *Vermonter* day train extension to Montreal (1 train / day) ridership forecasts as shown in Table 3.5.

For the Ethan Allan Express, factor increases in travel time was calculated using FRA's CONNECT in-vehicle travel time sensitivities. The analysis focused on calculating difference in number of trips between the Vermont stations and New York City since over eighty percent of travel is to/from New York Penn Sation and then applying that factor change in trips to all boardings at that station.

Results

TABLE 3.8 79 MPH *VERMONTER* AND *ETHAN ALLEN EXPRESS* RIDERSHIP FORECAST

	FY 2019	Low Growth	Medium Growth	High Growth
Route/Station	**Ridership**	**2040 Forecast**	**2040 Forecast**	**2040 Forecast**
Ethan Allen Express				
Burlington, VT	N/A	13,600	14,800	22,300
Vergennes, VT	N/A	1,200	1,300	1,900
Middlebury, VT	N/A	4,000	4,400	6,600
Rutland, VT	12,566	13,400	14,100	21,300
Castleton, VT	3,995	4,300	4,500	6,800
Route Total	**16,561**	**36,500**	**39,100**	**58,900**
Net change vs. base	*0*	*1,400*	*1,800*	*2,600*
Vermonter				
Montreal, PQ		78,700	80,200	88,500
St. Albans, VT	3,733	6,300	6,800	9,500
Essex Jct., VT	21,029	36,700	39,200	54,900
Waterbury, VT	5,377	9,200	9,900	13,600
Montpelier Jct., VT	7,909	12,200	13,100	18,400
Randolph, VT	2,053	2,700	3,000	4,400
White River Jct., VT	13,513	26,000	27,600	37,500
Windsor-Mt. Ascutney, VT	1,198	1,500	1,600	2,400
Claremont, NH	2,320	4,000	4,000	5,500
Bellows Falls, VT	4,776	5,900	6,300	9,500
Brattleboro, VT	16,765	34,900	36,900	49,400
Route Total	**78,673**	**218,100**	**228,600**	**293,600**
Net change vs. base	*0*	*31,100*	*32,500*	*40,900*
State Total	**95,234**	**254,600**	**267,700**	**352,500**

Ridership gains on the *Vermonter* are significantly higher than for the *Ethan Allen Express*. With the latter gaining a running time of only 15 minutes, ridership impacts will be modest at approximately 1,800 passengers annually for the medium growth scenario. In contrast, the 1:30 gain in travel time for 79mph Vermonter over the much longer route between New haven and Montreal produces a more substantial ridership increase.

3.9 Summary

Table 3.9 on the following page provides a summary of the results detailed above.

TABLE 3.9 PASSENGER RAIL MODELING – SUMMARY RESULTS

Rail Scenarios		FY2019 Ridership	2040 Ridership			
			Low Growth	Medium Growth	Percent Change (Medium Growth – 2019 Base)	High Growth
***Vermonter* Corridor**	No Build (existing service)	78,673	82,400	89,400	14%	135,200
	Vermonter day train extension to Montreal	78,673	187,000	196,000	149%	252,900
	Extension of one Knowledge Corridor *Valley Flyer* train to White River Jct.	0	30,500	33,100	N/A	50,200
	Twice-daily *Vermonter* service, with both terminating in Montreal	78,673	364,700	382,600	386%	493,000
	Boston connecting train at Springfield to *Vermonter* serving Montreal	78,673	203,300	212,600	170%	271,100
	79 MPH service	78,673	218,100	228,600	191%	293,600
***Ethan Allen Express* / Western Corridor**	No Build (includes extension to Burlington)	16,561	34,900	37,300	125%	56,300
	Albany - Burlington via Bennington and *Ethan Allen Express* extension to Burlington (separate trains)	16,561	63,900	67,400	307%	94,000
	79 MPH service on the *Ethan Allen Express*	16,561	36,500	39,100	136%	58,900
	Ethan Allen Express extension to Essex Junction. Total ridership inclusive of *Ethan Allen* No Build and *Vermonter* extension to Montreal (*Net increase*)	95,234	191,000 (*4,900*)	238,500 (*5,200*)	150%	317,000 (*7,800*)

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