

I-89 Commuter Transit Feasibility Study

Technical Memorandum: Commuter Service Alternatives

Upper Valley Lake Sunapee Regional Planning
Commission

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1. ALTERNATIVES OVERVIEW

In developing alternatives to evaluate for this study, UVLSRPC considered the response received from the public outreach effort, the market analysis, and the existing conditions in the study area. Five alternatives are presented for evaluation. The alternatives are based on a core route connecting the origins and destinations with the highest demand at either end of the corridor and each have different service characteristics including destinations served and level of service. Characteristics applicable to all alternatives are discussed first and include:

- Routing and stops
- Technology/amenities
- Capital requirements
- Fare structure

Each alternative is then described in greater detail in terms of:

- Routing and stops
- Operating hours
- Frequency of service

Pros and cons of each alternative are presented for evaluation purposes. After consultation with the Project Advisory Group, a preferred alternative will be selected to move forward for further study.

2. ALTERNATIVE CHARACTERISTICS

Routing

The core route would begin at Colby-Sawyer College, travel through downtown New London using flag stops¹, serve the hospital on request² and continue to the Exit 12 Park-and-Ride lot. In the morning, the bus would stop at the Exit 12 Park-and-Ride on every northbound trip and by request in the southbound direction. In the afternoon the reverse would hold true. The route would then take I-89 to the Exit 13 Park-and-Ride, which would be served on every trip in both directions except the first southbound morning trip. The route would then continue on I-89 to DHMC via Exit 18, Route 120 and Heater/Mountain Support Road. Service to Centerra Parkway would be provided after serving DHMC in the morning and before serving DHMC in the afternoon. On certain trips and alternatives the bus would

¹ The bus only stops on request - at any safe location, usually an intersection - and does not have posted stops

² Patrons would call ahead to request a pick-up or request a drop-off onboard the bus.



stop at Hyperthem on Heater Road, travel along Etna/Great Hollow Road, use Exit 17 to serve downtown Lebanon, or continue onto downtown Hanover.

A one-way trip between Colby-Sawyer College and DHMC, serving both the Exit 12 and 13 Park-and-Ride lots, and not accounting for deviations/limited service areas is 28 miles. The one-way travel time varies greatly throughout the day and is dependent on deviations, direction of travel and time of day with longer times during peak hours and directions. It ranges between 35 and 58 minutes. Time checks and layovers would be held at the Colby-Sawyer loop, the east entrance to DHMC and in downtown Hanover at the Green. The schedule is designed to have minimal layover at DHMC to avoid conflict with the 8 different routes that currently serve the East Entrance at DHMC³. The only conflicts at Colby-Sawyer would be occasional charter trip buses. The Hanover Inn stop in Hanover has three spaces and is served by 10 routes and several providers.

All alternatives would serve The Green on two separate trips. The only trip that would conflict with the existing usage of The Green bus stop is the 8:55 AM trip, which would be utilizing the space at the same time the 9 AM Dartmouth Coach trip is loading. This trip terminates at the Green and could easily serve the stop without laying over. This trip does not have layover time and can serve the stop quickly. All other conflicts are avoided unless routes are running behind schedule.

All alternatives are designed to serve many of the major employers in in Hanover, Lebanon and New London with peak-period trips that correlate to many of the dominant start and end times.

Hanover Routing and Stops

From DHMC, the route would use Medical Center Drive and Route 120 when heading towards Hanover, except if it is serving Centerra Parkway first. From Route 120, three options (Figure 1) have been developed for routing in downtown Hanover. All three options would stop on The Green in front of the Hopkins Center. When serving Etna Road and Great Hollow Road, flag stops would be used in place of traditional stops due to the length of the corridor and dispersal of businesses. The route would not stop along Greensboro Road.

- Option 1 follows Park Street to College Street, Wentworth Street, North Main Street and East Wheelock Street back to Park Street. The loop is 2.1 miles long and would also stop at Vail DMS, Main Street and on South Park Street in front of the Athletic Center.
- Option 2 follows Park Street to College Street, Maynard Street, North Main Street and East Wheelock Street back to Park Street. The loop is 2.2 miles long and would also stop at the Webster Street Bus stop in addition to those locations listed in Option 1.
- Option 3 follows Lebanon Street to North Main Street, Wheelock Street, and South Park Street. The loop is 2.1 miles long and would also stop on South Park Street in front of the Athletic Center, by Crosby Street, and along South Main Street.

³ The routes are: the Upper Valley Commuter, River Route, 89ER, Vermont Transit Lines Route 4, Blue Route, Lot 9 Shuttle, Lot 20 Shuttle, and the DHMC intercampus shuttle

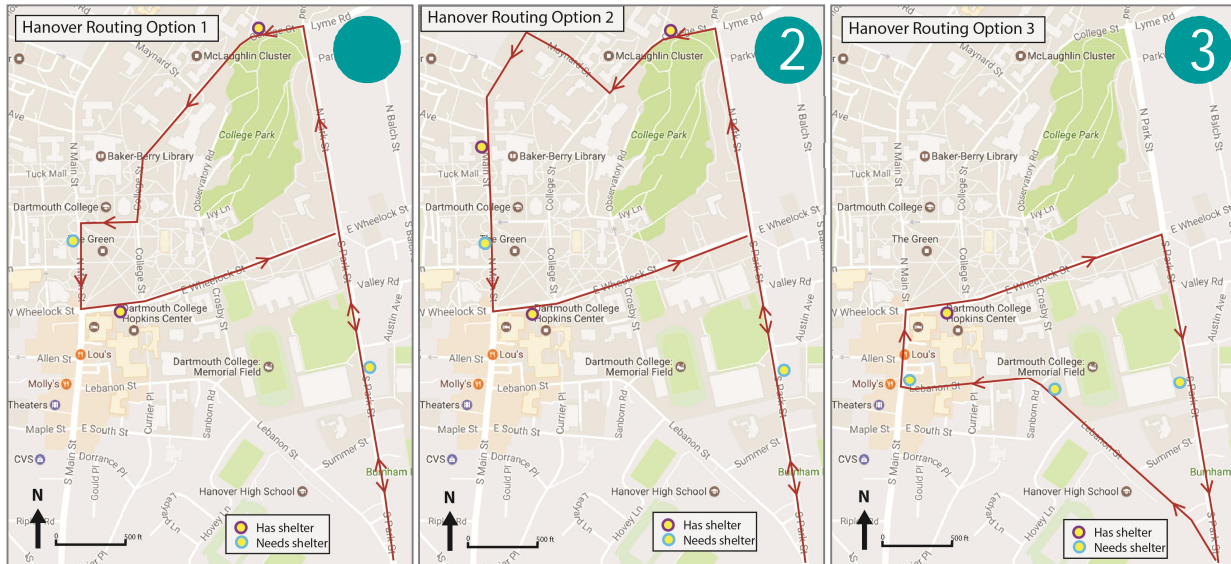


Figure 1: Downtown Hanover Routing Options and Stops

All stops listed in options 1 and 2 are existing Advance Transit (AT) stops. The Webster, Vail DMS, and Hopkins Center/Hanover Inn stops have shelters; the Green and Park Street stops do not. In option 3, the route would be traveling northbound on Lebanon Street; there are no existing stops on this street northbound and amenities would need to be added. The stop on the corner of South Main Street and East South Street at the Hanover Post office is currently a drop-off only stop for the AT Orange Route and has no amenities.

DHMC Routing and Stops

During the morning the Route would use Mountain Support Road heading northbound and Route 120 heading southbound. The afternoon would be the opposite. At DHMC, the route would stop at Coburn Hill, the East Entrance and the Outpatient Surgery Center. Along Centerra Parkway the route would circulate clockwise and stop at the Co-Op Food Store, Evergreen 2 building, and the River Valley Club.

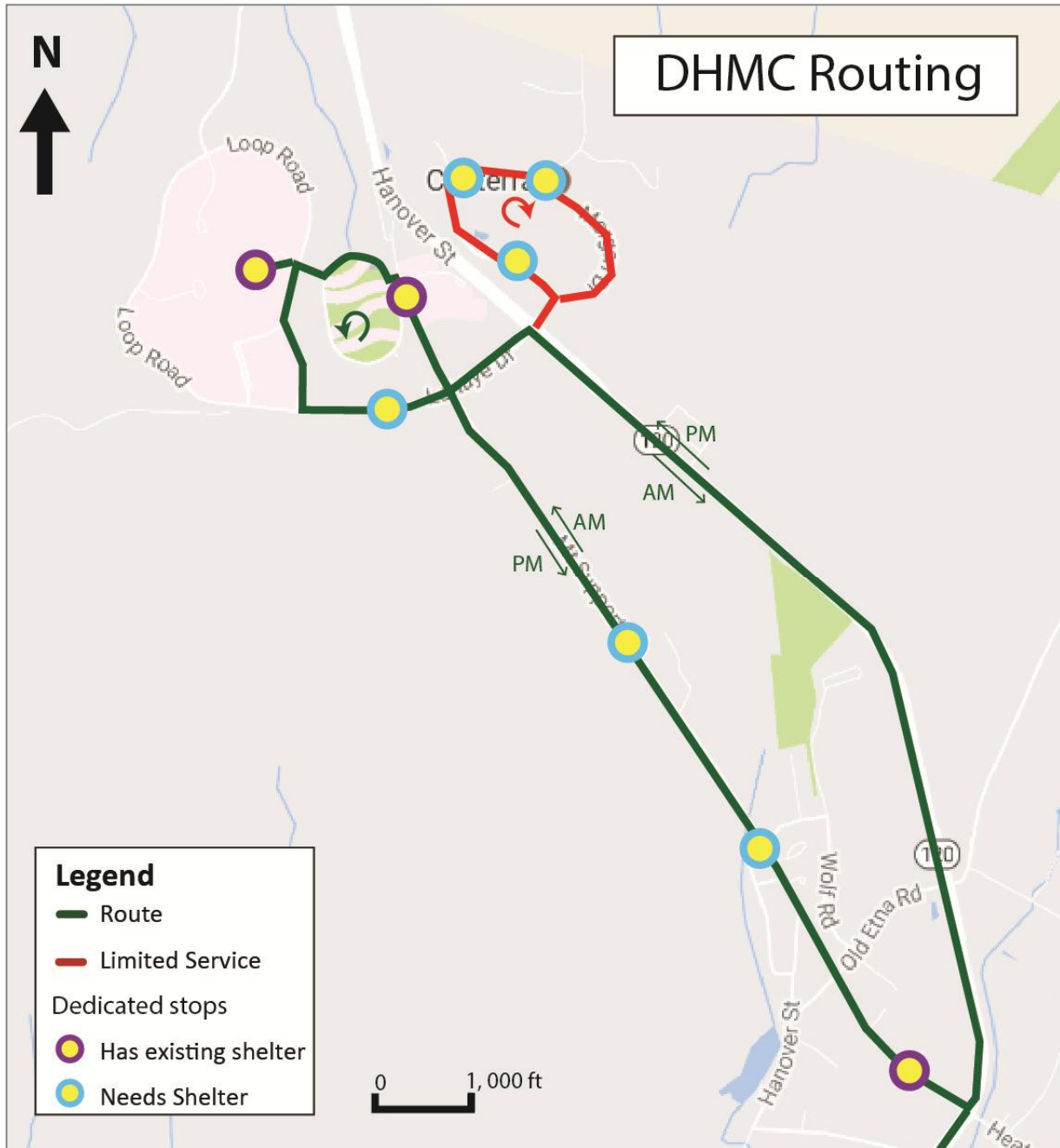


Figure 2: DHMC Routing and Stops



Lebanon Downtown Routing and Stops

Routing through downtown Lebanon would operate on a limited basis using Exit 17 and Routes 4 and 120. Stops would occur at the Lebanon Middle School, Spark! Community Center, Lebanon City Hall and along Hanover Street at existing AT stops.



Figure 3: Downtown Lebanon Routing and Stops

New London Downtown Routing and Stops

In New London the route would have designated stops at the Colby-Sawyer College Circle, New London Hospital, New London Shopping Center and at the Exit 12 Park-and-Ride lot. Shelters or waiting locations would be needed at the New London Shopping Center and at Colby-Sawyer College. Between Seamans Road and Everett Park, the Route would operate using flag stops.



Figure 4: Downtown New London Routing and Stops

Capital Requirements

Technology/Amenities

Several technologies should be considered to improve the experience for the passengers. Front-mounted bicycle racks could be installed on all buses to link bicycling and transit to improve mobility and sustainability. The cost per bicycle rack is approximately \$500⁴. Due to the commuter type of trip being taken on the bus, it should provide a comfortable ride and offer amenities for the longer trip such as internet (Wi-Fi) access and power outlets. The cost per Wi-Fi unit averages \$300-\$500 plus an additional monthly cost of \$40-\$50 for cellular service. Wi-fi can act as marketing tool to capture additional riders who want to convert their commute time into productive time.

The schedule information should be available in real-time with a mobile application so that passengers can monitor the vehicle location, minimizing wait time at the stops. The schedule should be converted to a General Transit Feed Specification (GTFS) and imported into Google Maps⁵.

⁴ A return on investment of bikes-on-bus programs. By the National Center for Transit Research 2005. http://www.sportworks.com/assets/files/Bike_on_Bus_ROI_Study.pdf

⁵ The National Rural Transit Assistant Program (RTAP) has a free GTFS builder application which helps transit providers convert their schedule information into the GTFS format.

Mobile payments should be considered. On one mobile payment system, a rider downloads an application onto a smart phone, payment is processed through the application and a transit pass is produced on the person's phone. This technology is used by 36 transit providers across the US with several more currently in deployment. The current cost to deploy such a system for a small size transit provider ranges from \$50,000-\$70,000 but several of the technology providers are working to bring the cost down by offering shared platforms.

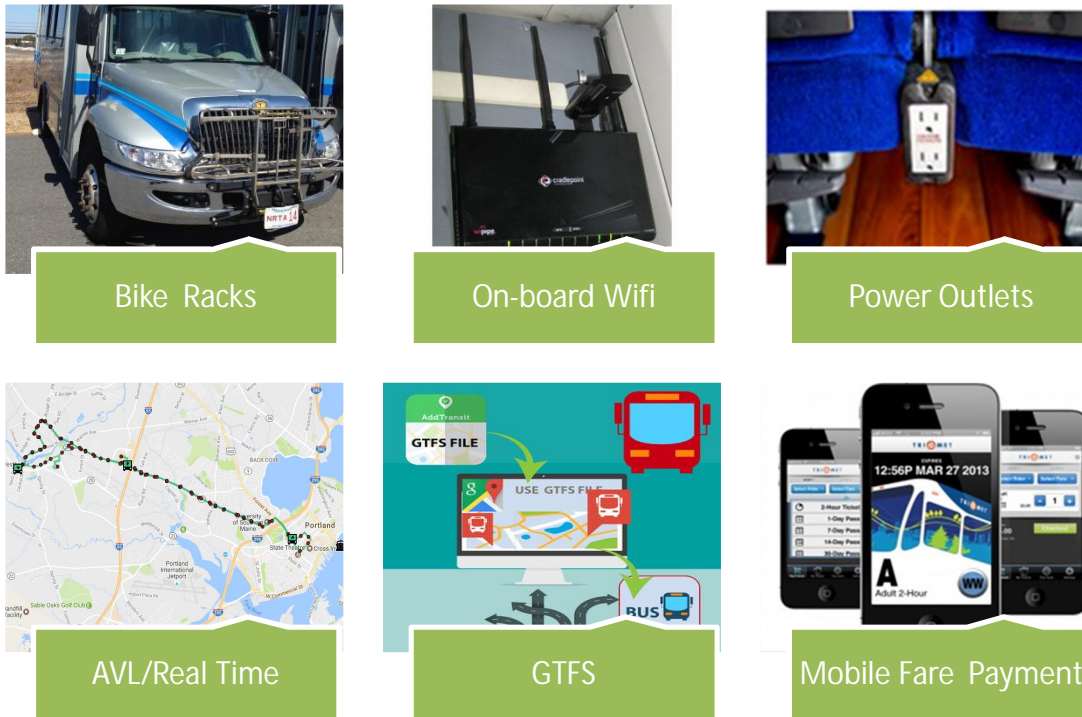


Figure 5: Transit Technologies/Amenities for Commuter Bus Service

Equipment

To implement the service, equipment and materials would need to be purchased. It is assumed that the operator of the service has a facility in the vicinity of the service area and that a new one would not be required. Equipment includes not only buses but also shelters, benches, signage, and vehicle location hardware and software. Medium-duty 25-foot cutaway buses with 18-26 seats may be appropriate for this service. The range of costs for a diesel bus of this nature is \$75,000 to \$100,000⁶; hybrids are closer to \$175,000. Vehicles should be ADA



Figure 6: Example of 25' Cutaway Bus

⁶ Source: Bus lifecycle cost model for federal land management agencies produced by the John A. Volpe National Transportation Systems Center



compliant with lift access and equipped with bicycle racks, automatic vehicle location and if possibly have Wi-Fi. These additional amenities cost approximately \$50,000. The bus service needs to be able to be marketed to entice commuters to use the bus instead of individual vehicles so that they can use their commute time for non-driving activities.

Many of the stops in the proposed alternatives are already equipped with benches and waiting areas, but at some bus stops they would need to be installed as the service area experiences challenging weather conditions. Shelters and benches cost \$5,000-\$8,000. Also, signs would be needed to point patrons to Park-and-Ride locations and at bus stops to provide riders with scheduling and other information. Signage would cost \$6,000-\$8,500.

Funds should also be set aside for the production of schedules, maps, brochures and advertising of the service. The cost of the marketing, advertising, and service description material production varies based on the amount, quality and duration of the various items. An estimated range of cost for the startup of a new transit service in a region of this size for schedules/maps and marketing material would be \$8,000-\$12,000.



Figure 7: Example of Shelter

Parking Facilities

Park-and-Ride facilities along the corridor would provide access to the commuter bus service for most riders, except those that are able to board in a downtown location. As previously discussed, Park-and-Ride lots are located at Exits 12 (New London) and 13 (Grantham) on I-89. Exit 12 is over utilized and Exit 13 is underutilized. Based on the input collected during the outreach effort, another Park-and-Ride Lot in Enfield or East Lebanon would be convenient in the future to allow patrons to access the commuter bus service. Currently some carpoolers use space off Exit 16 as an unofficial Park-and-Ride location. It may be possible to develop an official Park-and-Ride lot off Exit 16 through coordination/partnership with local land owners. US Route 4 comes into I-89 at Exit 17, which may be another possible connection location. Figures 8 and 9 show the current configurations of Exits 16 and 17.

Currently the Exit 12 Park-and-Ride lot in New London is over capacity during peak periods of travel throughout the year. There is limited capacity for expansion due to wetlands and slope constraints. However, based on a illustrative analysis of the parcel with roadway setbacks, wetland locations and buffers, and slope constraints, it appears that there is approximately 86,000 square feet of land adjacent to the existing lot that could potentially be used for parking. Based on the analysis, the lot could potentially accommodate an additional 110-144 parking spaces (see Figure 8), which is far more than would be needed for any of alternatives developed for this study.



Figure 10: Exit 16 Area



Figure 9: Exit 17 Area

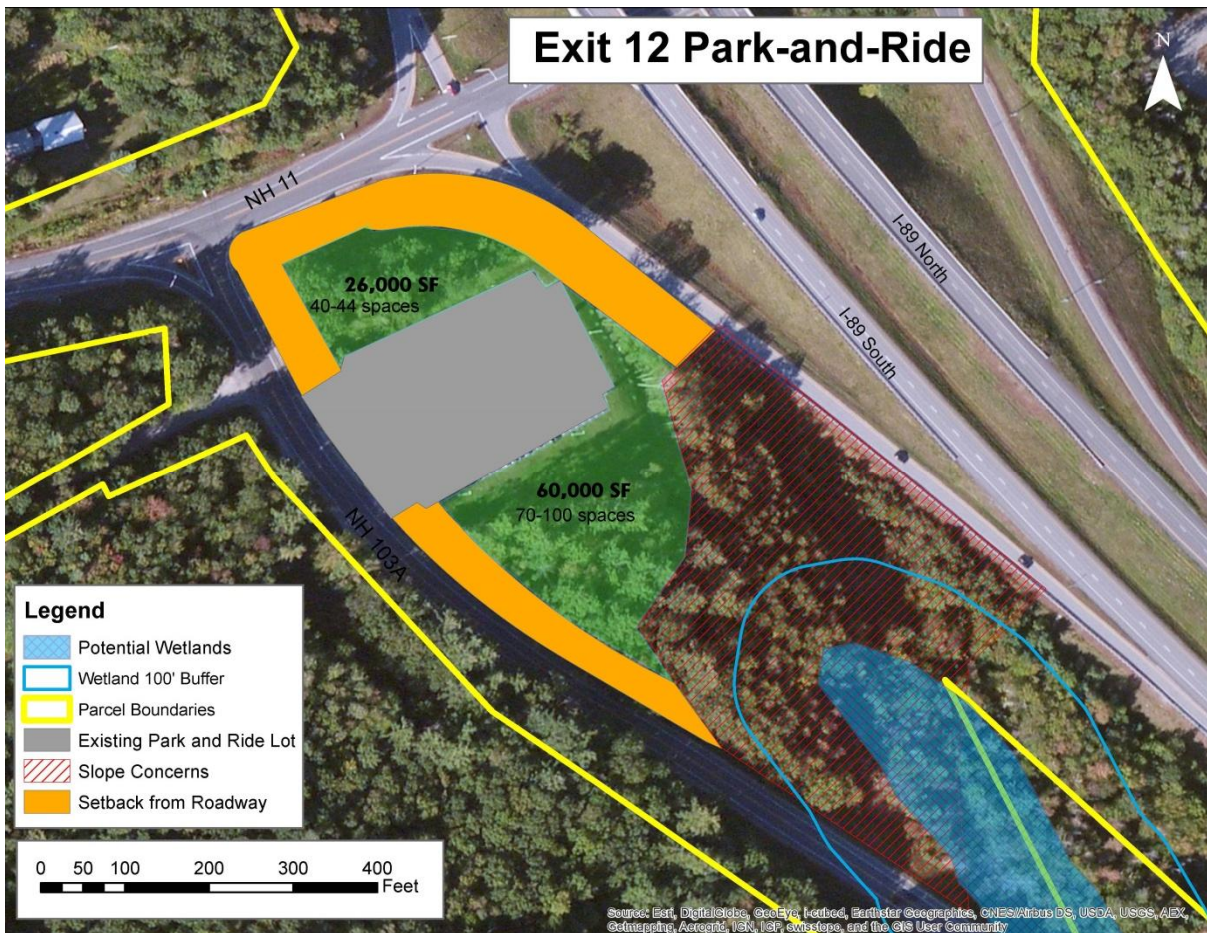


Figure 8: Exit 12 Park-and-Ride Lot



Fare Structure

To generate revenue from the service while offering affordable means of transportation, fares could be set up using a flat fee structure, which is simple for patrons to understand and simple to administer. As an example fare structure, the one-way single fares could be \$3 with an assortment of multi-duration passes (see Table 1). A fare higher than \$3 would discourage ridership as was evident from the survey responses. Half-price fares should be made available to seniors and those with disabilities. In this example fare structure, the monthly pass is structured in such a way that those who take three or more round trips a week are paying less than \$2.50 per trip. In general, passes should be made available for purchase at several locations and online in order to maximize convenience for patrons. This example fare structure was used to estimate projected fare revenue for each alternative.

Cash Fares – Single One-way Trip	
Adult	\$3.00
Seniors 65 & Older	\$1.50
Individuals with Disability	\$1.50
Children under 4	Free
Passes	
10-Ride	\$25.00
Monthly – Adult	\$60.00
Monthly – Senior or Disabled	\$30.00

Table 1: Possible Fare Structure

3. ALTERNATIVE 1

Alternative 1 is oriented towards commuters but provides a mid-day trip for medical and shopping trips. Figure 11 presents a map of the service area; green indicates the core route and red indicates areas with limited service. Detailed routing and stop information in downtown Hanover, Lebanon and New London can be found in Section 2 of this report. On certain trips the route will stop at Hyperthem on Heater Road, travel along Etna/Great Hollow Road, use Exit 17 to serve downtown Lebanon, or continue onto downtown Hanover.

Service would be provided on weekdays only between 5:40 AM - 9:55 AM in the morning peak period and 1:20 PM - 7:00 PM in the afternoon/evening peak period. There would be 11-12 trips daily in each direction. In the morning, seven trips would be provided northbound and 4.5 southbound. In the afternoon there would be five northbound trips and seven southbound trips. Table 2 provides a preliminary schedule for each direction of travel.

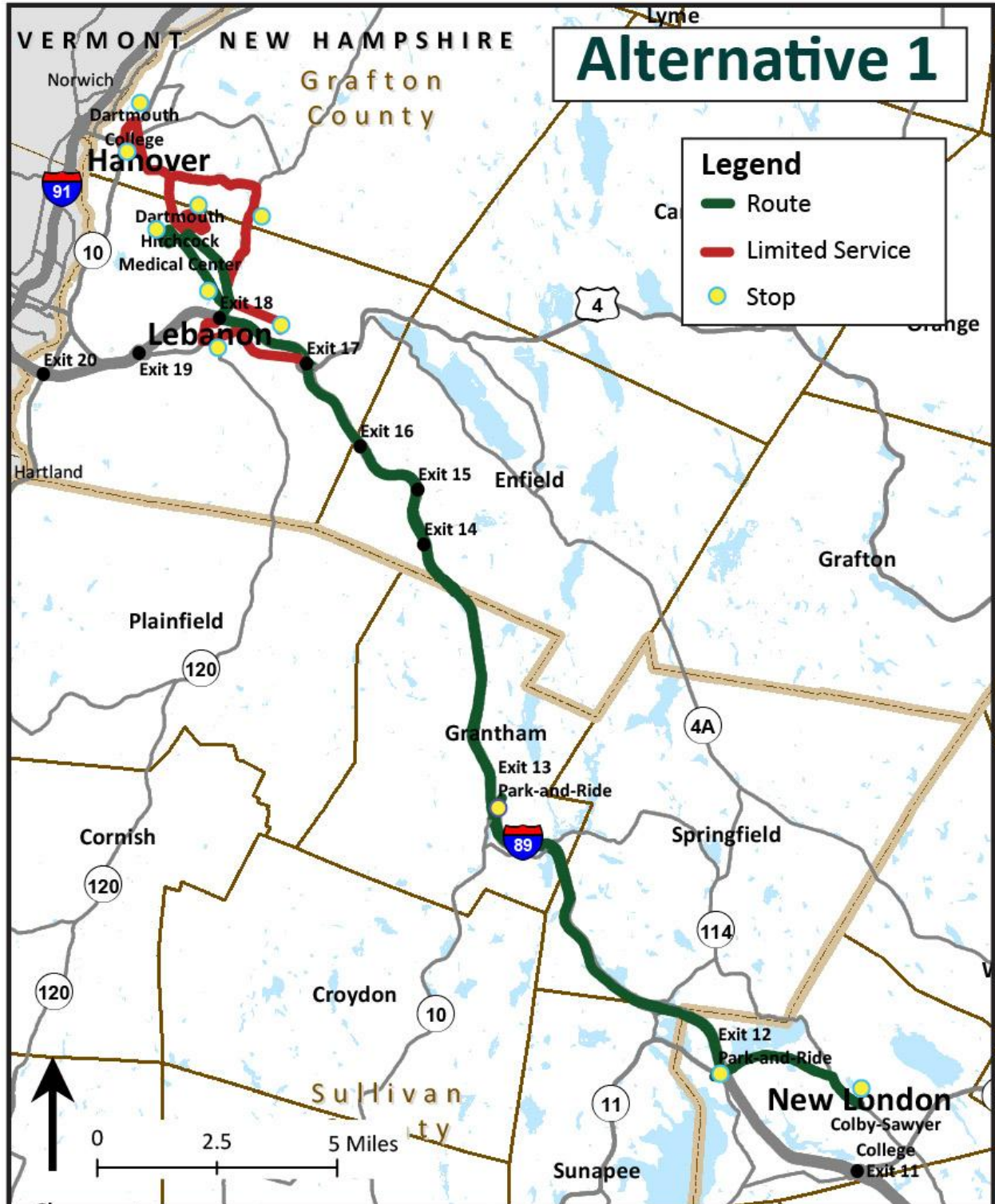


Figure 11: Alternative 1 Map



Northbound AM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Downtown Lebanon	Heater Road	Great Hollow Rd	DHMC	Centerra	Downtown Hanover
5:40 AM	Yes	No	Yes	Yes	No	No	No	6:23 AM (A)	No	No
6:00 AM	Yes	No	Yes	Yes	No	No	No	6:48 AM (A)	On Request	No
6:12 AM	Yes	No	Yes	Yes	No	No	6:55	7:10 AM	Yes	No
7:00 AM	Yes	No	Yes	Yes	No	No	No	7:51 AM (A)	Yes	No
7:15 AM	Yes	No	Yes	Yes	Yes via exit 17	Yes	No	8:10 AM	On Request	No
7:45 AM	Yes	On Request	Yes	Yes	Yes via exit 17	No	No	8:40 AM	On Request	8:55 AM
9:00 AM	Yes	On Request	Yes	Yes	No	No	No	9:45 AM (B)	No	No

Northbound PM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Heater Road	Great Hollow Rd	Centerra	DHMC	Centerra	Downtown Hanover	Downtown Lebanon
2:30 PM	Yes	On Request	Yes	Yes	No	Yes	No	3:45 PM (A)	Yes	No	No
4:05 PM	Yes	On Request	No	Yes	No	No	No	4:45 PM	Yes	5:00 PM	No
4:30 PM	Yes	On Request	On Request	Yes	No	No	Yes	5:20 PM	No	5:35 PM	No
5:10 PM	Yes	On Request	On Request	Yes	Yes	No	No	6:00 PM (A)	No	No	No
No	No	No	6:05 PM	Yes	No	No	No	6:45 PM	No	No	7:00 PM

Southbound AM

Downtown Hanover	DHMC	Centerra	Heater Road	Downtown Lebanon	Exit 13 PR	Exit 12 PR	NLH	New London	Colby Sawyer
No	6:25 AM (C)	No	No	No	No	No	On Request	Yes	7:00 AM
No	6:55 AM (C)	No	No	No	Yes	No	On Request	Yes	7:45 AM
No	7:51 AM (D)	Yes	8:10 AM	---	---	---	---	---	---
No	8:10 AM	On Request	No	No	Yes	On Request	On Request	yes	8:55 AM
8:55	9:05 AM (E)	On Request	On Request	No	Yes	On request	On Request	Yes	9:55 AM

- A. Transfers to AT Blue route in both directions
- B. Transfer to AT Blue route from Lebanon
- C. Transfer from AT Blue Route both directions
- D. Transfer from AT Blue Route from Hanover
- E. Transfer from AT Blue Route from Lebanon

Southbound PM

Hanover Downtown	Great Hollow	Centerra	DHMC	Heater Road	Downtown Lebanon	Exit 13	Exit 12	NLH	New London	Colby-Sawyer
No	No	1:20 PM	1:30 PM (C)	On request	No	Yes	Yes	On Request	Yes	2:20 PM
No	3:35 PM	No	3:45 PM (D)	No	No	Yes	Yes	On Request	Yes	4:30 PM
No	No	4:04 PM	4:09 PM (C)	No	No	Yes	Yes	On Request	Yes	5:00 PM
4:30 PM	No	Yes	4:45 PM	No	No	Yes	Yes	On Request	Yes	5:35 PM
No	No	5:00 PM	5:05 PM (C)	Yes	Yes	Yes	6:05 PM	No	No	No
5:05 PM	No	Yes	5:20 PM	Yes	No	Yes	Yes	On Request	Yes	6:15 PM
5:35 PM	No	Yes	5:50 PM	Yes	No	Yes	Yes	No	Yes	6:40 PM

Table 2: Alternative 1 Preliminary Schedule



Operating Requirements

The cost to operate the service annually is estimated based on the number of revenue hours the service is operated. The estimated operating cost, based on 22.5 revenue hours a day for weekday service only, exclusive of holidays, would be between \$463,000 and \$587,000 annually. This would include 251 days of service and is based on an average hourly operating cost between \$82 and \$104⁷. The average annual cost would be \$525,000, which equates to \$89.04 per hour.

For this alternative, five vehicles would be required during the peak period plus at least one spare. Other required start-up costs include shelters, wayfinding, marketing/advertising, and bike racks. These elements (including vehicles) would have a capital cost of \$522,000 to \$712,000. Optional capital equipment includes on-board Wi-Fi, power outlets, GTFs, AVL, and mobile fare technology. These elements would have a capital cost of \$112,000 to \$163,000. The total estimated capital cost for both the required and the optional elements is projected to be \$644,000 to \$875,000.

Ridership and Performance

Alternative 1 is projected to have between 116 and 173 passenger trips daily with an average of 145⁸. Ridership is expected to be lower during the summer months and higher during the fall and spring semesters due to the cohort of riders represented by Colby-Sawyer nursing students. Table 3 and Table 4 show the demand for each location during the peak hours; these numbers show the raw demand and have not been adjusted to actual ridership based on the ridership propensity scoring.

Location	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM
Colby Sawyer College	1	6	5	12	39	5	14	6	15
Downtown New London	0	0	5	3	13	6	3	0	3
New London Hospital	0	2	6	7	5	3	1	0	0
Along Lyme Road	1	2	3	6	5	2	0	0	0
Great Hollow Road	1	2	15	5	10	2	2	0	0
Downtown Hanover/Dartmouth College	1	4	4	16	30	22	31	7	7
Along Etna Road	1	1	2	7	8	1	0	0	0
Along Heater Road	2	0	5	11	21	2	2	0	0
Centerra	0	0	11	15	40	8	3	0	0
Colburn Hill	0	0	1	4	7	3	1	0	0
DHMC Main Campus	27	55	113	73	161	18	11	3	2
Downtown/Hanover St		1	5	0	18	10	4	0	1

Provides direct service
 Service available via transfer to the AT Blue Route

Table 3: Alternative 1 AM Peak Demand

⁷ The cost per revenue hour range is the peer cost per revenue hour and the average among rural reporters in New England for commuter bus service according to the National Transit Database (NTD).

⁸ Ridership is based off the survey results and the individual's propensity to take transit was calculated based off responses. The calculations were based on the schedule's ability to meet an individual's work hours and days, travel time, fare levels, and reported level of usage.



Location	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM
Colby Sawyer College	6	7	18	4	34	11	4	2	3
Downtown New London	2	2	2	4	11	5	2	0	2
New London Hospital	0	1	2	4	6	4	1	1	5
Along Lyme Road	2	2	5	4	4	1	0	0	0
Great Hollow Road	4	11	2	9	7	2	1	0	0
Downtown Hanover/Dartmouth College	8	8	7	23	35	9	10	1	3
Along Etna Road	0	1	4	6	8	0	0	0	0
Along Heater Road	0	3	1	14	13	5	3	0	0
Centerra	0	3	7	14	42	6	2	0	2
Colburn Hill	0	1	1	6	5	3	0	0	0
DHMC Main Campus	16	33	42	74	137	42	27	9	20
Downtown Lebanon/Hanover St	0	1	2	6	17	1	4	0	3

Provides direct service
 Service available via transfer to the AT Blue Route

Table 4: Alternative 1 PM Peak Demand

Performance Measures	Alternative 1
Fare Revenue	\$117,460
Passengers/ Hour	6.42
Passengers/ One-way Trip	6.15
Cost Efficiency	\$11.24
Cost/ Passenger	\$14.48
Farebox Recovery Ratio	22%

Table 5: Alternative 1 Performance Measures

Transit performance measures serve as a guide to understand how a transit service is projected to perform. In the case of proposed services, they allow for the quantification of demand and determination of financial efficiency that can be compared across several alternatives based on projected ridership. Higher passengers per hour or passengers per one-way trip and lower cost efficiency and cost per passenger numbers

indicate better performing alternatives. The performance measures for Alternative 1 are presented in Table 5.

Environmental Impacts

This alternative would result in removing 60 cars daily from I-89 (though they would still be operated locally to access the Park-and-Ride lot). This correlates to a reduction in Vehicle Miles Traveled (VMT)⁹ of approximately 590,000 miles annually.

From a parking perspective, this alternative would remove the need for the following number of parking spaces at each location:

- Colby-Sawyer College: 9
- Downtown Lebanon: 1.5
- DHMC: 41
- Downtown Hanover: 1.5

⁹ Correlated to reduction in greenhouse gases (GHGs).



Pros and Cons

The pros and cons of Alternative 1 are presented in Figure 12.

Pros	Cons
<ul style="list-style-type: none"> • Provides service to all major employers • Timed to serve major start and end times • Highest ridership • Supplements AT service gaps in the evening • Mid-day service • Maximizes transfers with the AT Blue Route 	<ul style="list-style-type: none"> • Most expensive to operate • Requires the largest amount of capital equipment

Figure 12: Alternative 1 Pros and Cons

4. ALTERNATIVE 2

Alternative 2 is similar to Alternative 1 but with four fewer trips daily. Alternative 2 is oriented towards commuters but provides a mid-day trip for medical and shopping trips. Figure 13 presents a map of the service area; green indicates the core route and red indicates areas with limited service. Detailed routing and stop information in downtown Hanover, Lebanon and New London can be found in Section 2 of this report. On certain trips the bus would stop at Hyperthem on Heater Road, travel along Etna/Great Hollow Road, use Exit 17 to serve downtown Lebanon, or continue onto downtown Hanover.

Service would be provided on weekdays only between 5:40 AM - 8:55 AM during the morning peak period and between 1:20 PM - 7:00 PM in the afternoon/evening peak period. There would be 9-10 trips daily in each direction. In the morning, six trips would be provided northbound and 4.5 southbound. In the afternoon, there would be four northbound trips and six southbound trips. Table 6 provides a preliminary schedule for each direction of travel.

Operating Requirements

The cost to operate the service annually is estimated based on the number of revenue hours the service is operated. The estimated operating cost, based on 18.5 revenue hours a day for weekday service only, exclusive of holidays, would be between \$381,000 and \$483,000 annually. This would include 251 days of service and is based on an hourly operating cost between \$82 and \$104. The average annual cost would be \$432,000 which equates to \$88.23 per hour.

For this alternative four vehicles would be required during the peak plus at least one spare. Other required start-up costs include shelters, wayfinding, marketing/advertising, and bike racks. These elements (including vehicles) would have a capital cost of \$447,000 to \$611,000. Optional capital equipment includes on-board Wi-Fi, power outlets, GTFS, AVL, and mobile fare technology. These elements would have a capital cost of \$101,000 to \$148,000. The total estimated capital cost for both required and optional elements is projected to be \$548,000 to \$759,000.

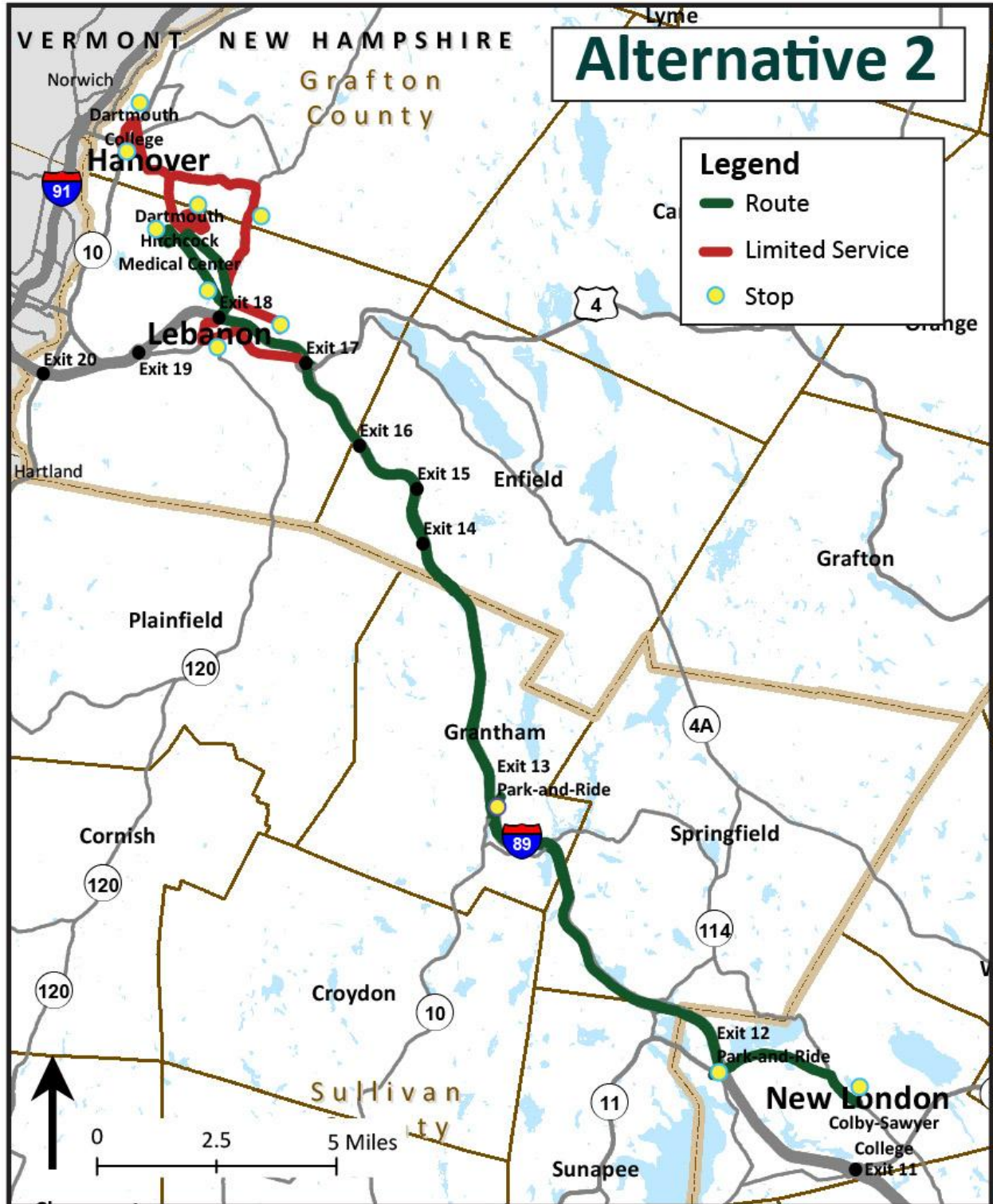


Figure 13: Alternative 2 Map



Northbound AM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Downtown Lebanon	Heater Road	Great Hollow Rd	DHMC	Centerra	Downtown Hanover
5:40 AM	Yes	No	Yes	Yes	No	No	No	6:23 AM (A)	No	No
6:00 AM	Yes	No	Yes	Yes	No	No	No	6:48 AM (A)	On Request	No
6:12 AM	Yes	No	Yes	Yes	No	No	6:55	7:10 AM	Yes	No
7:00 AM	Yes	No	Yes	Yes	No	No	No	7:51 AM (A)	Yes	No
7:15 AM	Yes	No	Yes	Yes	Yes via exit 17	Yes	No	8:10 AM	On Request	No
7:45 AM	Yes	On Request	Yes	Yes	Yes via exit 17	No	No	8:40 AM	On Request	8:55 AM

Northbound PM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Heater Road	Great Hollow Rd	Centerra	DHMC	Centerra	Downtown Hanover	Downtown Lebanon
2:30 PM	Yes	On Request	Yes	Yes	No	Yes	No	3:45 PM (A)	Yes	No	No
4:30 PM	Yes	On Request	On Request	Yes	No	No	Yes	5:20 PM	No	5:35 PM	No
5:10 PM	Yes	On Request	On Request	Yes	Yes	No	No	6:00 PM (A)	No	No	No
No	No	No	6:05 PM	Yes	No	No	No	6:45 PM	No	No	7:00 PM

Southbound AM

Downtown Hanover	DHMC	Centerra	Heater Road	Downtown Lebanon	Exit 13 PR	Exit 12 PR	NLH	New London	Colby Sawyer
No	6:25 AM (C)	No	No	No	No	No	On Request	Yes	7:00 AM
No	6:55 AM (C)	No	No	No	Yes	No	On Request	Yes	7:45 AM
No	7:51 AM (D)	Yes	8:10 AM	---	---	---	---	---	---
No	8:10 AM	On Request	No	No	Yes	On Request	On Request	yes	8:55 AM
8:55	9:05 AM (E)	On Request	On Request	No	Yes	On request	On Request	Yes	9:55 AM

Southbound PM

Hanover Downtown	Great Hollow	Centerra	DHMC	Heater Road	Downtown Lebanon	Exit 13	Exit 12	NLH	New London	Colby-Sawyer
No	No	1:20 PM	1:30 PM (C)	On request	No	Yes	Yes	On Request	Yes	2:20 PM
No	3:35 PM	No	3:45 PM (D)	No	No	Yes	Yes	On Request	Yes	4:30 PM
No	No	4:04 PM	4:09 PM (C)	No	No	Yes	Yes	On Request	Yes	5:00 PM
4:30 PM	No	Yes	4:45 PM	No	No	Yes	Yes	On Request	Yes	5:35 PM
No	No	5:00 PM	5:05 PM (C)	Yes	Yes	Yes	6:05 PM	No	No	No
5:35 PM	No	Yes	5:50 PM	Yes	No	Yes	Yes	No	Yes	6:40 PM

Table 6: Alternative 2 Preliminary Schedules



Ridership and Performance

Alternative 2 is projected to have between 104 and 156 passenger trips daily with an average of 130. Ridership is expected to be lower during the summer months and higher during the fall and spring semesters due to the cohort of riders represented by Colby-Sawyer nursing students. Table 7 and Table 8 show the demand for each location during the peak hours; these numbers show the raw demand and have not been adjusted to actual ridership based on the ridership propensity scoring.

Location	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM
Colby Sawyer College	1	6	5	12	39	5	14	6	15
Downtown New London	0	0	5	3	13	6	3	0	3
New London Hospital	0	2	6	7	5	3	1	0	0
Along Lyme Road	1	2	3	6	5	2	0	0	0
Great Hollow Road	1	2	15	5	10	2	2	0	0
Downtown Hanover/Dartmouth College	1	4	4	16	30	22	31	7	7
Along Etna Road	1	1	2	7	8	1	0	0	0
Along Heater Road	2	0	5	11	21	2	2	0	0
Centerra	0	0	11	15	40	8	3	0	0
Colburn Hill	0	0	1	4	7	3	1	0	0
DHMC Main Campus	27	55	113	73	161	18	11	3	2
Downtown Lebanon/Hanover St		1	5	0	18	10	4	0	1

Provides direct service
 Service available via transfer to the AT Blue Route

Table 7: Alternative 2 AM Peak Demand

Location	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM
Colby Sawyer College	6	7	18	4	34	11	4	2	3
Downtown New London	2	2	2	4	11	5	2	0	2
New London Hospital	0	1	2	4	6	4	1	1	5
Along Lyme Road	2	2	5	4	4	1	0	0	0
Great Hollow Road	4	11	2	9	7	2	1	0	0
Downtown Hanover/Dartmouth College	8	8	7	23	35	9	10	1	3
Along Etna Road	0	1	4	6	8	0	0	0	0
Along Heater Road	0	3	1	14	13	5	3	0	0
Centerra	0	3	7	14	42	6	2	0	2
Colburn Hill	0	1	1	6	5	3	0	0	0
DHMC Main Campus	16	33	42	74	137	42	27	9	20
Downtown Lebanon/Hanover St	0	1	2	6	17	1	4	0	3

Provides direct service
 Service available via transfer to the AT Blue Route

Table 8: Alternative 2 PM Peak Demand



Performance Measures	Alternative 2
Fare Revenue	\$107,816
Passengers/ Hour	7.03
Passengers/ One-way Trip	6.67
Cost Efficiency	\$9.93
Cost/ Passenger	\$13.23
Farebox Recovery Ratio	25%

Table 9: Alternative 2 Performance Measures

Transit performance measures serve as a guide to understand how a transit service is projected to perform. In the case of proposed services, they allow for the quantification of demand and determination of financial efficiency that can be compared across several alternatives based on projected ridership. Higher passengers per hour or passengers per one-way trip and lower cost efficiency and cost per passenger numbers

indicate better performing alternatives. The performance measures for Alternative 2 are presented in Table 9.

Environmental Impacts

This alternative would result in removing 52 cars daily from I-89 (though they would still be operated locally to access the Park-and-Ride lot). This correlates to a reduction in VMT of approximately 550,000 miles annually.

From a parking perspective, this alternative would remove the need for the following number of parking spaces at each location:

- Colby-Sawyer College: 6.5
- Downtown Lebanon: 1.5
- DHMC: 41
- Downtown Hanover: 1.25

Pros and Cons

The pros and cons of Alternative 2 are presented in Figure 14.

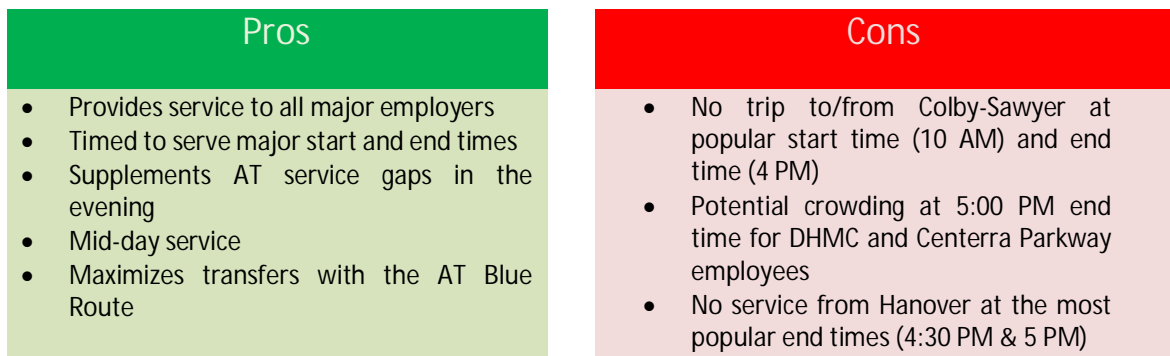


Figure 14: Alternative 2 Pros and Cons



5. ALTERNATIVE 3

Alternative 3 is similar to Alternative 1 but with four fewer trips daily and no service along Etna/ Great Hollow Road. Alternative 3 is oriented towards commuters but provides a mid-day trip for medical and shopping trips. Figure 15 presents a map of the service area; green indicates the core route and red indicates areas with limited service. Detailed routing and stop information in downtown Hanover, Lebanon and New London can be found in Section 2 of this report. On certain trips the bus would stop at Hyperthem on Heater Road, use Exit 17 to serve downtown Lebanon, or continue onto downtown Hanover.

Service would be provided on weekdays only between 5:40 AM - 9:55 AM in the morning peak period and between 1:20 PM - 7:00 PM in the afternoon/evening peak period. There would be 9-10 trips daily in each direction. In the morning six trips would be provided northbound and 4.5 southbound. In the afternoon there would be four northbound trips and five southbound. Table 10 provides a preliminary schedule for each direction of travel.

Operating Requirements

The cost to operate the service annually is estimated based on the number of revenue hours the service is operated. The estimated operating cost, based on 18.25 revenue hours a day for weekday service only, exclusive of holidays, would be between \$376,000 and \$476,000 annually. This would include 251 days of service and is based on an hourly operating cost between \$82 and \$104¹⁰. The average annual cost would be \$426,000 which equates to \$87.04 per hour.

For this alternative three vehicles would be required during the peak plus at least one spare. Other required start-up costs include shelters, wayfinding, marketing/advertising, and bike racks. These elements (including vehicles) would have a capital cost of \$371,000 to \$511,000. Optional capital equipment includes on-board Wi-Fi, power outlets, GTFS, AVL, and mobile fare technology. These elements would have a capital cost of \$91,000 to \$132,000. The total estimated capital cost for both required and optional elements is projected to be \$462,000 to \$643,000.

¹⁰ The cost per revenue hour range is the peer cost per revenue hour and the average among rural reporters in New England for commuter bus service according to the NTD.

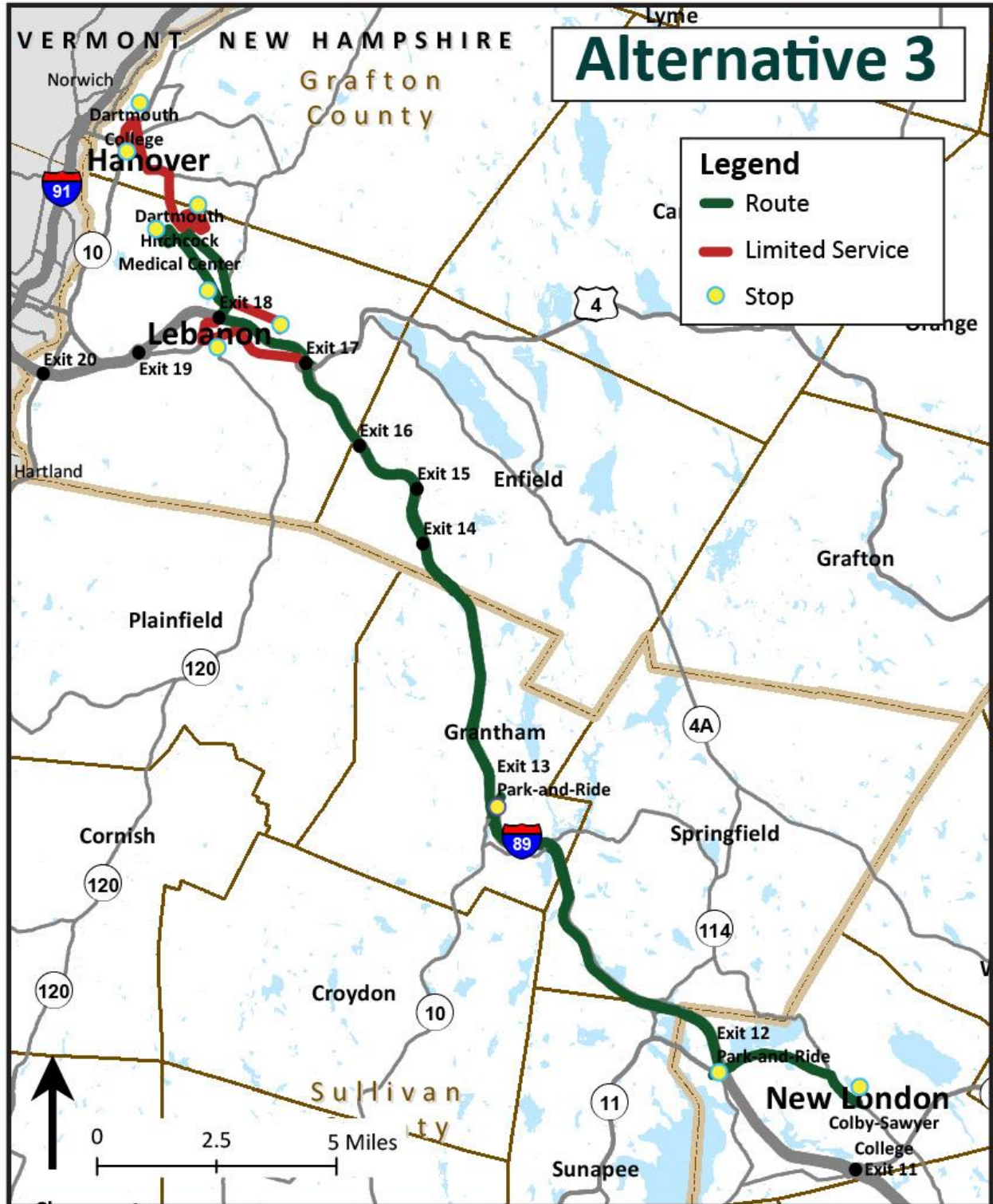


Figure 15: Alternative 3 Map



Northbound AM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Downtown Lebanon	Heater Road	Great Hollow Rd	DHMC	Centerra	Downtown Hanover
5:40 AM	Yes	No	Yes	Yes	No	No	No	6:23 AM (A)	No	No
6:00 AM	Yes	No	Yes	Yes	No	No	No	6:48 AM (A)	On Request	No
7:00 AM	Yes	No	Yes	Yes	No	No	No	7:51 AM (A)	Yes	No
7:15 AM	Yes	No	Yes	Yes	Yes via exit 17	Yes	No	8:10 AM	On Request	No
7:45 AM	Yes	On Request	Yes	Yes	Yes via exit 17	No	No	8:40 AM	On Request	8:55 AM
9:00 AM	Yes	On Request	Yes	Yes	No	No	No	9:45 AM (B)	No	No

Northbound PM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Heater Road	Great Hollow Rd	Centerra	DHMC	Centerra	Downtown Hanover	Downtown Lebanon
2:30 PM	Yes	Yes	Yes	Yes	No	No	Yes	3:45 PM (A)	Yes	No	No
4:30 PM	Yes	On Request	On Request	Yes	No	No	Yes	5:20 PM	No	5:35 PM	No
5:10 PM	Yes	On Request	On Request	Yes	Yes	No	No	6:00 PM (A)	No	No	No
No	No	No	6:05 PM	Yes	No	No	No	6:45 PM	No	No	7:00 PM

Southbound AM

Downtown Hanover	DHMC	Centerra	Heater Road	Downtown Lebanon	Exit 13 PR	Exit 12 PR	NLH	New London	Colby Sawyer
No	6:25 AM (C)	No	No	No	No	No	On Request	Yes	7:00 AM
No	6:55 AM (C)	No	No	No	Yes	No	On Request	Yes	7:45 AM
No	7:51 AM (D)	Yes	8:10 AM	---	---	---	---	---	---
No	8:10 AM	On Request	No	No	Yes	On Request	On Request	yes	8:55 AM
8:55	9:05 AM (E)	On Request	On Request	No	Yes	On request	On Request	Yes	9:55 AM

- A. Transfers to AT Blue route in both directions
- B. Transfer to AT Blue route from Lebanon
- C. Transfer from AT Blue Route both directions
- D. Transfer from AT Blue Route from Hanover
- E. Transfer from AT Blue Route from Lebanon

Southbound PM

Hanover Downtown	Great Hollow	Centerra	DHMC	Heater Road	Downtown Lebanon	Exit 13	Exit 12	NLH	New London	Colby-Sawyer
No	No	1:20 PM	1:30 PM (C)	On request	No	Yes	Yes	On Request	Yes	2:20 PM
No	No	No	3:45 PM (D)	No	No	Yes	Yes	On Request	Yes	4:30 PM
No	No	4:04 PM	4:09 PM (C)	No	No	Yes	Yes	On Request	Yes	5:00 PM
No	No	5:00 PM	5:05 PM (C)	Yes	Yes	Yes	6:05 PM	No	No	No
5:35 PM	No	Yes	5:50 PM	Yes	No	Yes	Yes	No	Yes	6:40 PM

Table 10: Alternative 3 Preliminary Schedules



Ridership and Performance

Alternative 3 would have between 68 and 102 passenger trips daily with an average of 85. Ridership is expected to be lower during the summer months and higher during the fall and spring semesters due to the cohort of riders represented by Colby-Sawyer nursing students. Table 11 and Table 12 show the demand for each location during the peak hours; these numbers show the raw demand and have not been adjusted to actual ridership based on the ridership propensity scoring.

Location	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM
Colby Sawyer College	1	6	5	12	39	5	14	6	15
Downtown New London	0	0	5	3	13	6	3	0	3
New London Hospital	0	2	6	7	5	3	1	0	0
Along Lyme Road	1	2	3	6	5	2	0	0	0
Great Hollow Road	1	2	15	5	10	2	2	0	0
Downtown Hanover/Dartmouth College	1	4	4	16	30	22	31	7	7
Along Etna Road	1	1	2	7	8	1	0	0	0
Along Heater Road	2	0	5	11	21	2	2	0	0
Centerra	0	0	11	15	40	8	3	0	0
Colburn Hill	0	0	1	4	7	3	1	0	0
DHMC Main Campus	27	55	113	73	161	18	11	3	2
Downtown Lebanon/Hanover St		1	5	0	18	10	4	0	1

Provides direct service
 Service available via transfer to the AT Blue Route

Table 11: Alternative 3 AM Peak Demand

Location	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM
Colby Sawyer College	6	7	18	4	34	11	4	2	3
Downtown New London	2	2	2	4	11	5	2	0	2
New London Hospital	0	1	2	4	6	4	1	1	5
Along Lyme Road	2	2	5	4	4	1	0	0	0
Great Hollow Road	4	11	2	9	7	2	1	0	0
Downtown Hanover/Dartmouth College	8	8	7	23	35	9	10	1	3
Along Etna Road	0	1	4	6	8	0	0	0	0
Along Heater Road	0	3	1	14	13	5	3	0	0
Centerra	0	3	7	14	42	6	2	0	2
Colburn Hill	0	1	1	6	5	3	0	0	0
DHMC Main Campus	16	33	42	74	137	42	27	9	20
Downtown Lebanon/Hanover St	0	1	2	6	17	1	4	0	3

Provides direct service
 Service available via transfer to the AT Blue Route

Table 12: Alternative 3 PM Peak Demand



Performance Measures	Alternative 3
Fare Revenue	\$86,371
Passengers/ Hour	4.66
Passengers/ One-way Trip	4.36
Cost Efficiency	\$15.92
Cost/ Passenger	\$19.97
Farebox Recovery Ratio	20%

Table 13: Alternative 3 Performance Measures

Transit performance measures serve as a guide to understand how a transit service is projected to perform. In the case of proposed services, they allow for the quantification of demand and determination of financial efficiency that can be compared across several alternatives based on projected ridership. Higher passengers per hour or passengers per one-way trip and lower cost efficiency and cost per passenger numbers

indicate better performing alternatives. The performance measures for Alternative 3 are presented in Table 13.

Environmental Impacts

This alternative would result in removing 37 cars daily from I-89 (though they would still be operated locally to access the Park-and-Ride lot). This correlates to a reduction in VMT of approximately 360,000 miles annually.

From a parking perspective, this alternative would remove the need for the following number of parking spaces at each location:

- Colby-Sawyer College: 7
- Downtown Lebanon: 1
- DHMC: 32
- Downtown Hanover: 0.5

Pros and Cons

The pros and cons of Alternative 3 are presented in Figure 16.

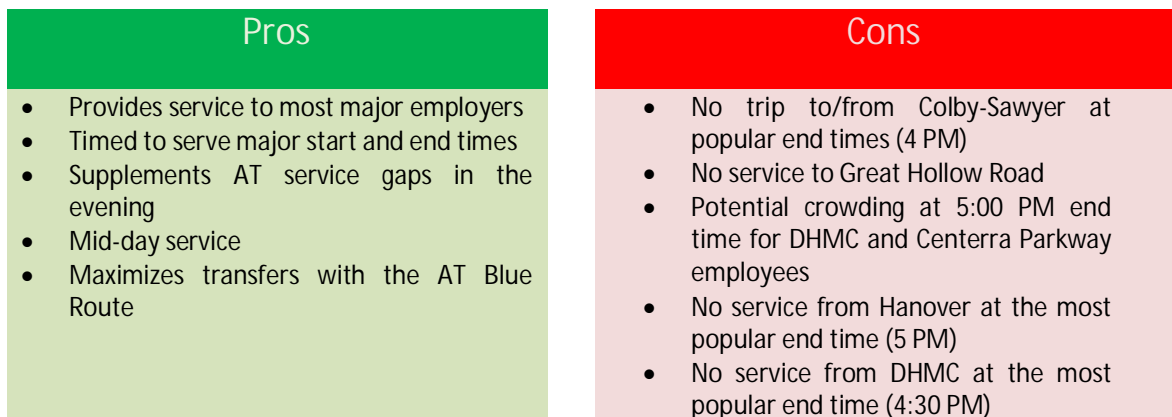


Figure 16: Alternative 3 Pros and Cons



6. ALTERNATIVE 4

Alternative 4 similar to Alternative 3 but with six fewer trips daily, no service along Etna/ Great Hollow Road, and no mid-day service. Figure 17 presents a map of the service area; green indicates the core route and red indicates areas with limited service. Detailed routing and stop information in downtown Hanover, Lebanon and New London can be found in Section 2 of this report. On certain trips the route would stop at Hyperthem on Heater Road, use Exit 17 to serve downtown Lebanon, or continue onto downtown Hanover.

Service would be provided on weekdays only between 5:40 AM - 9:45 AM during the morning peak period and between 3:00 PM - 6:40 PM in the evening peak period. There would be 6-7 trips daily in each direction. In the morning four trips would be provided northbound and 2.5 southbound. In the afternoon there would be three northbound trips and four southbound trips. Table 14 provides a preliminary schedule for each direction of travel.

Operating Requirements

The cost to operate the service annually is estimated based on the number of revenue hours the service is operated. The estimated operating cost, based on 13 revenue hours a day for weekday service only, exclusive of holidays, would be between \$266,000 and \$339,000 annually. This would include 251 days of service and is based on an hourly operating cost between \$82 and \$104¹¹. The average annual cost would be \$303,000 which equates to \$89.56 per hour.

For this alternative, three vehicles would be required during the peak period plus at least one spare. Other required start-up costs include shelters, wayfinding, marketing/advertising, and bike racks. These elements (including vehicles) would have a capital cost of \$371,000 to \$511,000. Optional capital equipment includes on-board Wi-Fi, power outlets, GTFS, AVL, and mobile fare technology. These elements would have a capital cost of \$91,000 to \$132,000. The total estimated capital cost for both required and optional elements is projected to be \$462,000 to \$643,000.

¹¹ The cost per revenue hour range is the peer cost per revenue hour and the average among rural reporters in New England for commuter bus service according to the NTD.

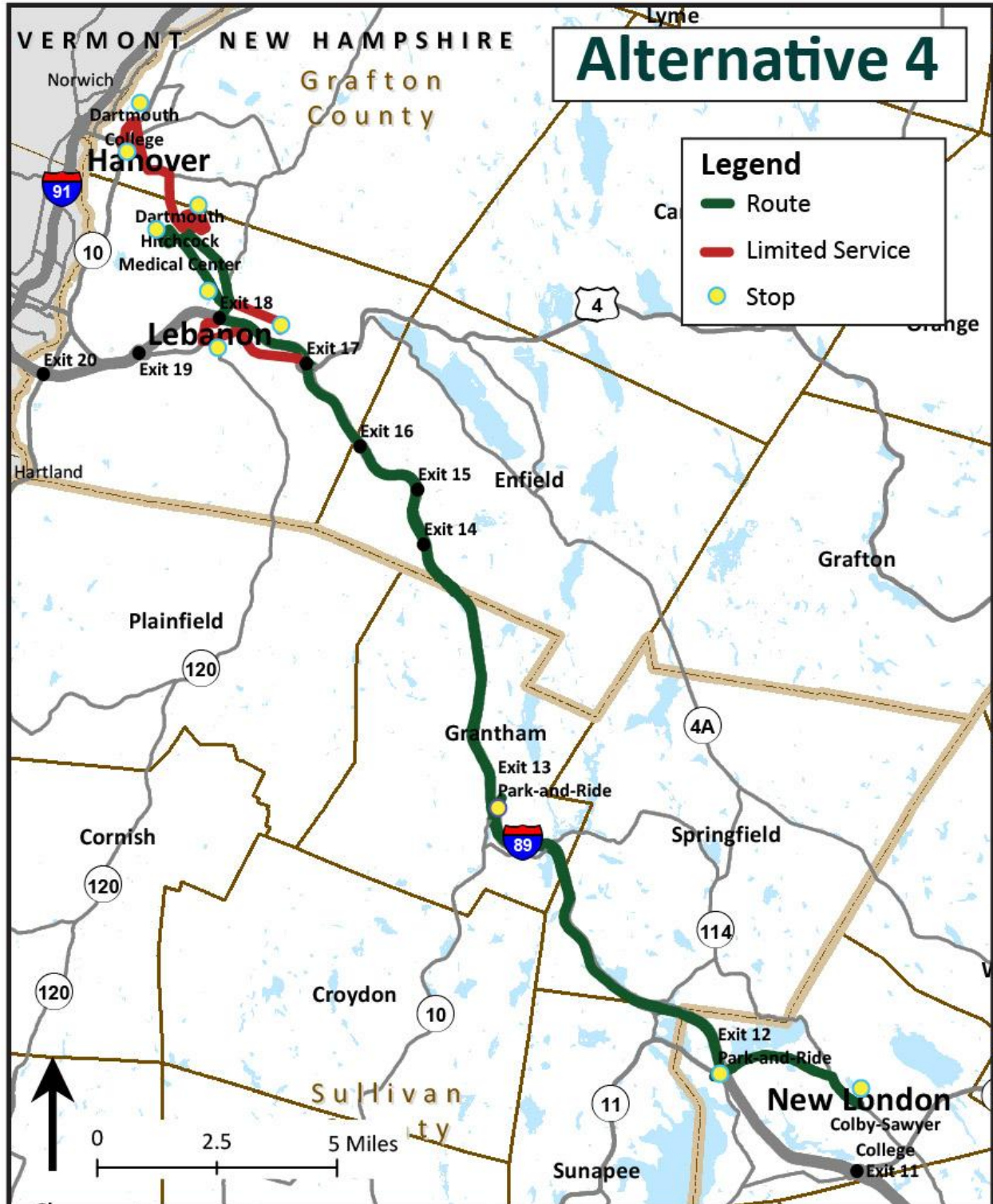


Figure 17: Alternative 4 Map



Northbound AM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Downtown Lebanon	Heater Road	Great Hollow Rd	DHMC	Centerra	Downtown Hanover
5:40 AM	Yes	No	Yes	Yes	No	No	No	6:23 AM (A)	No	No
6:00 AM	Yes	No	Yes	Yes	No	No	No	6:48 AM (A)	On Request	No
7:00 AM	Yes	No	Yes	Yes	No	No	No	7:51 AM (A)	Yes	No
7:45 AM	Yes	On Request	Yes	Yes	Yes via exit 17	No	No	8:40 AM	On Request	8:55 AM

Northbound PM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Heater Road	Great Hollow Rd	Centerra	DHMC	Centerra	Downtown Hanover	Downtown Lebanon
3:00 PM	Yes	On Request	Yes	Yes	No	No	No	3:45 PM (A)	Yes	No	No
4:30 PM	Yes	On Request	On Request	Yes	No	No	Yes	5:20 PM	No	5:35 PM	No
5:10 PM	Yes	On Request	On Request	Yes	Yes	No	No	6:00 PM (A)	No	No	No

Southbound AM

Downtown Hanover	DHMC	Centerra	Heater Road	Downtown Lebanon	Exit 13 PR	Exit 12 PR	NLH	New London	Colby Sawyer
No	6:25 AM (C)	No	No	No	No	No	On Request	Yes	7:00 AM
No	6:55 AM (C)	No	No	No	Yes	No	On Request	Yes	7:45 AM
No	7:51 AM (D)	Yes	8:10 AM	---	---	---	---	---	---

- A. Transfers to AT Blue route in both directions
- B. Transfer to AT Blue route from Lebanon
- C. Transfer from AT Blue Route both directions
- D. Transfer from AT Blue Route from Hanover
- E. Transfer from AT Blue Route from Lebanon

Southbound PM

Hanover Downtown	Great Hollow	Centerra	DHMC	Heater Road	Downtown Lebanon	Exit 13	Exit 12	NLH	New London	Colby-Sawyer
No	No	No	3:45 PM (D)	No	No	Yes	Yes	On Request	Yes	4:30 PM
No	No	4:04 PM	4:09 PM (C)	No	No	Yes	Yes	On Request	Yes	5:00 PM
No	No	5:00 PM	5:05 PM (C)	Yes	Yes	Yes	6:05 PM	No	No	No
5:35 PM	No	Yes	5:50 PM	Yes	No	Yes	Yes	No	Yes	6:40 PM

Table 14: Alternative 4 Preliminary Schedules



Ridership and Performance

Alternative 4 would have between 60 and 80 passenger trips daily with an average of 70. Ridership is expected to be lower during the summer months and higher during the fall and spring semesters due to the cohort of riders represented by Colby-Sawyer nursing students. Table 15 and Table 16 show the demand for each location during the peak hours; these numbers show the raw demand and have not been adjusted to actual ridership based on the ridership propensity scoring.

Location	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM
Colby Sawyer College	1	6	5	12	39	5	14	6	15
Downtown New London	0	0	5	3	13	6	3	0	3
New London Hospital	0	2	6	7	5	3	1	0	0
Along Lyme Road	1	2	3	6	5	2	0	0	0
Great Hollow Road	1	2	15	5	10	2	2	0	0
Downtown Hanover/Dartmouth College	1	4	4	16	30	22	31	7	7
Along Etna Road	1	1	2	7	8	1	0	0	0
Along Heater Road	2	0	5	11	21	2	2	0	0
Centerra	0	0	11	15	40	8	3	0	0
Colburn Hill	0	0	1	4	7	3	1	0	0
DHMC Main Campus	27	55	113	73	161	18	11	3	2
Downtown Lebanon/Hanover St		1	5	0	18	10	4	0	1

Provides direct service
 Service available via transfer to the AT Blue Route

Table 15: Alternative 4 AM Peak Demand

Location	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM
Colby Sawyer College	6	7	18	4	34	11	4	2	3
Downtown New London	2	2	2	4	11	5	2	0	2
New London Hospital	0	1	2	4	6	4	1	1	5
Along Lyme Road	2	2	5	4	4	1	0	0	0
Great Hollow Road	4	11	2	9	7	2	1	0	0
Downtown Hanover/Dartmouth College	8	8	7	23	35	9	10	1	3
Along Etna Road	0	1	4	6	8	0	0	0	0
Along Heater Road	0	3	1	14	13	5	3	0	0
Centerra	0	3	7	14	42	6	2	0	2
Colburn Hill	0	1	1	6	5	3	0	0	0
DHMC Main Campus	16	33	42	74	137	42	27	9	20
Downtown Lebanon/Hanover St	0	1	2	6	17	1	4	0	3

Provides direct service
 Service available via transfer to the AT Blue Route

Table 16: Alternative 4 PM Peak Demand



Performance Measures	Alternative 4
Fare Revenue	\$69,688
Passengers/ Hour	5.38
Passengers/ One-way Trip	5.19
Cost Efficiency	\$13.31
Cost/ Passenger	\$17.27
Farebox Recovery Ratio	23%

Table 17: Alternative 4 Performance Measures

Transit performance measures serve as a guide to understand how a transit service is projected to perform. In the case of proposed services, they allow for the quantification of demand and determination of financial efficiency that can be compared across several alternatives based on projected ridership. Higher passengers per hour or passengers per one-way trip and lower cost efficiency and cost per passenger numbers

indicate better performing alternatives. The performance measures for Alternative 4 are presented in Table 17.

Environmental Impacts

This alternative would result in removing 30 cars daily from I-89 (though they would still be operated locally to access the Park-and-Ride lot). This correlates to a reduction in VMT of approximately 290,000 miles annually.

From a parking perspective, this alternative would remove the need for the following number of parking spaces at each location:

- Colby-Sawyer College: 0
- Downtown Lebanon: 0
- DHMC: 28
- Downtown Hanover: 0

Pros and Cons

The pros and cons of Alternative 4 are presented in Figure 18.

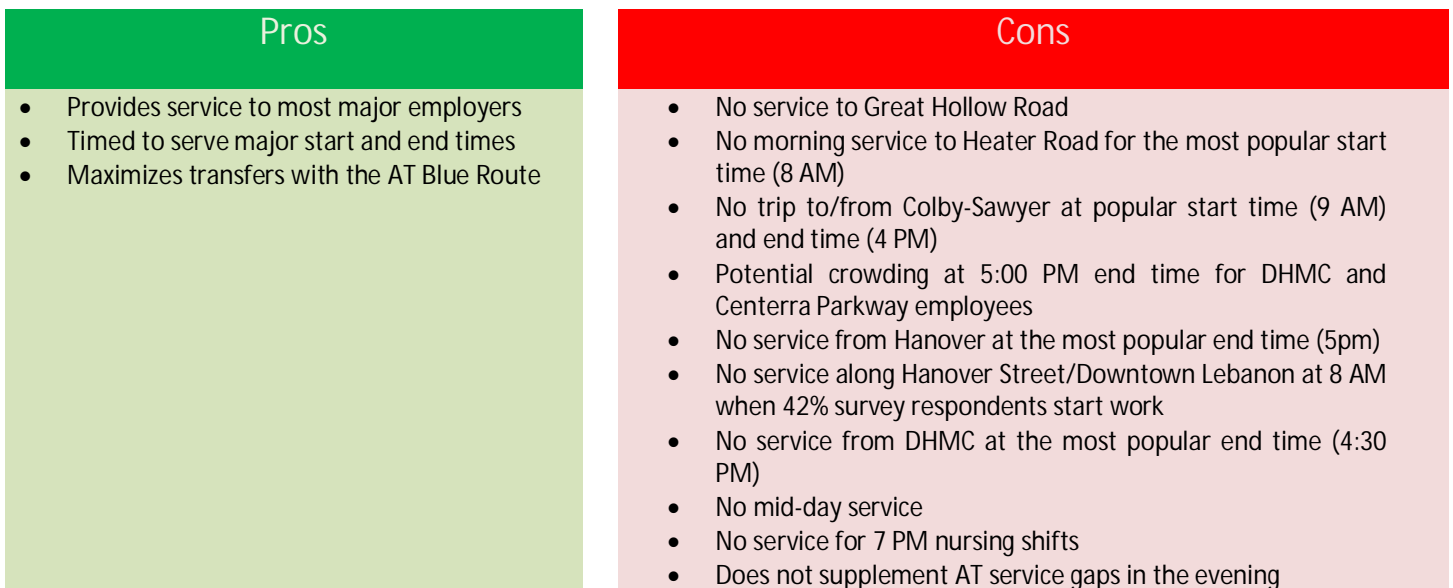


Figure 18: Alternative 4 Pros and Cons



7. ALTERNATIVE 5

Alternative 5 is similar to Alternative 4 but with three fewer trips daily. There is no service along Etna/ Great Hollow Road and no mid-day service. Figure 13 presents a map of the service area; green indicates the core route and red indicates areas with limited service. Detailed routing and stop information in downtown Hanover, Lebanon and New London can be found in Section 2 of this report. On certain trips the bus would stop at Hyperthem on Heater Road, use Exit 17 to serve downtown Lebanon, or continue on to downtown Hanover.

Service would be provided on weekdays only between 5:40 AM - 9:45 AM in the morning peak period and between 3:45 PM - 7:00 PM in the evening peak period. There would be 5-6 trips daily in each direction. In the morning four trips would be provided northbound and two southbound. In the afternoon there would be two northbound trips and three southbound trips. Table 18 provides a preliminary schedule for each direction of travel.

Operating Requirements

The cost to operate the service annually is estimated based on the number of revenue hours the service is operated. The estimated operating cost, based on 10.25 revenue hours a day for weekday service only, exclusive of holidays, would be between \$211,000 and \$268,000 annually. This would include 251 days of service and is based on an hourly operating cost between \$82 and \$104¹². The average annual cost would be \$239,000, which equates to \$86.66 per hour.

For this alternative, two vehicles would be required during the peak plus at least one spare. Other required start-up costs include shelters, wayfinding, marketing/advertising, and bike racks. These elements (including vehicles) would have a capital cost of \$296,000 to \$410,000. Optional capital equipment includes on-board Wi-Fi, power outlets, GTFS, AVL, and mobile fare technology. These elements would have a capital cost of \$81,000 to \$117,000. The total estimated capital cost for both required and optional elements is projected to be \$377,000 to \$527,000.

¹² The cost per revenue hour range is the peer cost per revenue hour and the average among rural reporters in New England for commuter bus service according to the NTD.

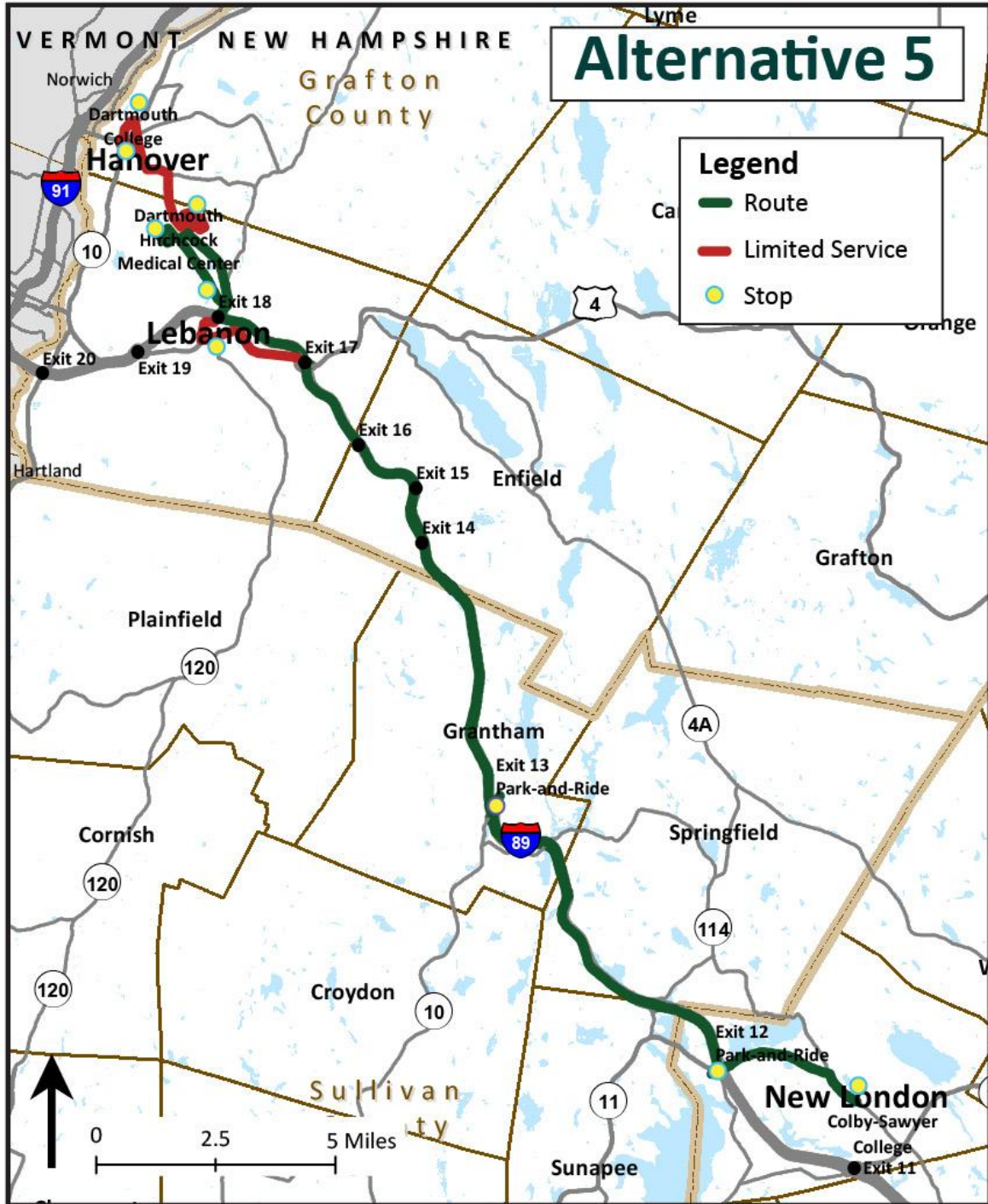


Figure 19: Alternative 5 Map



Northbound AM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Downtown Lebanon	Heater Road	Great Hollow Rd	DHMC	Centerra	Downtown Hanover
5:40 AM	Yes	No	Yes	Yes	No	No	No	6:23 AM (A)	No	No
6:00 AM	Yes	No	Yes	Yes	No	No	No	6:48 AM (A)	On Request	No
7:00 AM	Yes	No	Yes	Yes	No	No	No	7:51 AM (A)	Yes	No
7:45 AM	Yes	On Request	Yes	Yes	Yes via exit 17	No	No	8:40 AM	On Request	8:55 AM

Northbound PM

Colby-Sawyer	New London	NLH	Exit 12 PR	Exit 13 PR	Heater Road	Great Hollow Rd	Centerra	DHMC	Centerra	Downtown Hanover	Downtown Lebanon
4:30 PM	Yes	On Request	On Request	Yes	No	No	Yes	5:20 PM	No	5:35 PM	No
No	No	No	6:05 PM	Yes	No	No	No	6:45 PM	No	No	7:00 PM

Southbound AM

Downtown Hanover	DHMC	Centerra	Heater Road	Downtown Lebanon	Exit 13 PR	Exit 12 PR	NLH	New London	Colby-Sawyer
No	6:25 AM (C)	No	No	No	No	No	On Request	Yes	7:00 AM
No	6:55 AM (C)	No	No	No	Yes	No	On Request	Yes	7:45 AM

- A. Transfers to AT Blue route in both directions
- B. Transfer to AT Blue route from Lebanon
- C. Transfer from AT Blue Route both directions
- D. Transfer from AT Blue Route from Hanover
- E. Transfer from AT Blue Route from Lebanon

Southbound PM

Hanover Downtown	Great Hollow	Centerra	DHMC	Heater Road	Downtown Lebanon	Exit 13	Exit 12	NLH	New London	Colby-Sawyer
No	No	No	3:45 PM (D)	No	No	Yes	Yes	On Request	Yes	4:30 PM
No	No	5:00 PM	5:05 PM (C)	No	Yes	Yes	6:05 PM	No	No	No
5:35 PM	No	Yes	5:50 PM	No	No	Yes	Yes	No	Yes	6:40 PM

Table 18: Alternative 5 Preliminary Schedules



Ridership and Performance

Alternative 5 will have between 45 and 65 passenger trips daily with an average of 55. Ridership is expected to be lower during the summer months and higher during the fall and spring semesters due to the cohort of riders represented by Colby-Sawyer nursing students. Table 19 and Table 20 show the demand for each location during the peak hours; these numbers show the raw demand and have not been adjusted to actual ridership based on the ridership propensity scoring.

Location	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM
Colby Sawyer College	1	6	5	12	39	5	14	6	15
Downtown New London	0	0	5	3	13	6	3	0	3
New London Hospital	0	2	6	7	5	3	1	0	0
Along Lyme Road	1	2	3	6	5	2	0	0	0
Great Hollow Road	1	2	15	5	10	2	2	0	0
Downtown Hanover/Dartmouth College	1	4	4	16	30	22	31	7	7
Along Etna Road	1	1	2	7	8	1	0	0	0
Along Heater Road	2	0	5	11	21	2	2	0	0
Centerra	0	0	11	15	40	8	3	0	0
Colburn Hill	0	0	1	4	7	3	1	0	0
DHMC Main Campus	27	55	113	73	161	18	11	3	2
Downtown Lebanon/Hanover St		1	5	0	18	10	4	0	1

Provides direct service
 Service available via transfer to the AT Blue Route

Table 19: Alternative 5 AM Peak Demand

Location	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM
Colby Sawyer College	6	7	18	4	34	11	4	2	3
Downtown New London	2	2	2	4	11	5	2	0	2
New London Hospital	0	1	2	4	6	4	1	1	5
Along Lyme Road	2	2	5	4	4	1	0	0	0
Great Hollow Road	4	11	2	9	7	2	1	0	0
Downtown Hanover/Dartmouth College	8	8	7	23	35	9	10	1	3
Along Etna Road	0	1	4	6	8	0	0	0	0
Along Heater Road	0	3	1	14	13	5	3	0	0
Centerra	0	3	7	14	42	6	2	0	2
Colburn Hill	0	1	1	6	5	3	0	0	0
DHMC Main Campus	16	33	42	74	137	42	27	9	20
Downtown Lebanon/Hanover St	0	1	2	6	17	1	4	0	3

Provides direct service
 Service available via transfer to the AT Blue Route

Table 20: Alternative 5 PM Peak Demand



Performance Measures	Alternative 5
Fare Revenue	\$63,000
Passengers/ Hour	5.37
Passengers/ One-way Trip	5.00
Cost Efficiency	\$12.79
Cost/ Passenger	\$17.33
Farebox Recovery Ratio	26%

Table 21: Alternative 5 Performance Measures

Transit performance measures serve as a guide to understand how a transit service is projected to perform. In the case of proposed services, they allow for the quantification of demand and determination of financial efficiency that can be compared across several alternatives based on projected ridership. Higher passengers per hour or passengers per one-way trip and lower cost efficiency and cost per passenger numbers

indicate better performing alternatives. The performance measures for Alternative 5 are presented in Table 21.

Environmental Impacts

This alternative would result in removing 23 cars daily from I-89 (though they would still be operated locally to access the Park-and-Ride lot). This correlates to a reduction in VMT of approximately 220,000 miles annually.

From a parking perspective, this alternative would remove the need for the following number of parking spaces at each location:

- Colby-Sawyer College: 0
- Downtown Lebanon: 0
- DHMC: 25
- Downtown Hanover: 0

Pros and Cons

The pros and cons of Alternative 5 are presented in Figure 20.

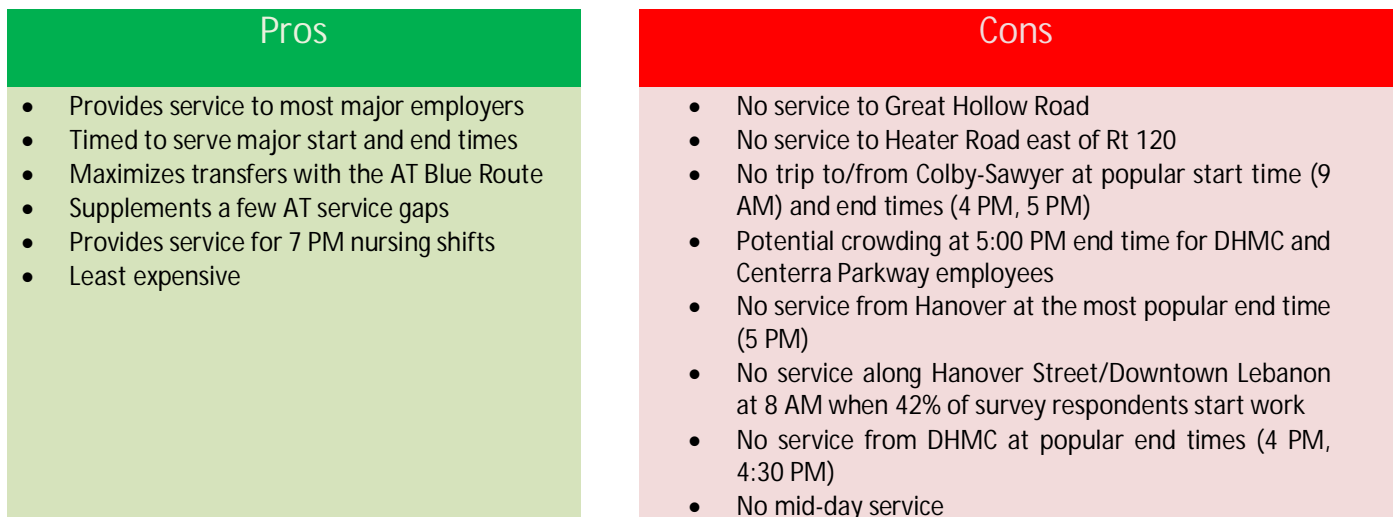


Figure 20: Alternative 5 Pros and Cons



8. ALTERNATIVES COMPARISON

For direct comparison purposes, Table 22 lists the main service characteristics of each alternative. Table 23 lists the pros and cons of each alternative.

9. PREFERRED ALTERNATIVE

The Project Advisory Group will meet on February 8, 2017 to discuss the alternatives and choose a preferred alternative to move forward for further analysis. This section will be updated to reflect the selected alternative after the meeting.

10. POTENTIAL PHASING OF IMPLEMENTATION

In order to get to a preferred alternative (ideal) level of service, sometimes a phased approach to implementation may be appropriate. An example phasing plan is presented in Figure 21 where a core level of service (represented by Alternative 5 here) is implemented first and service is added and expanded as awareness of the service and ridership grows until the ideal level of service is reached (represented here by Alternative 1). Additionally, although not explicitly part of this study, there were many requests throughout the outreach process to also implement service between the study corridor and Concord. In this phased scenario, select trips could be added to Concord as an expansion on the Preferred Alternative.

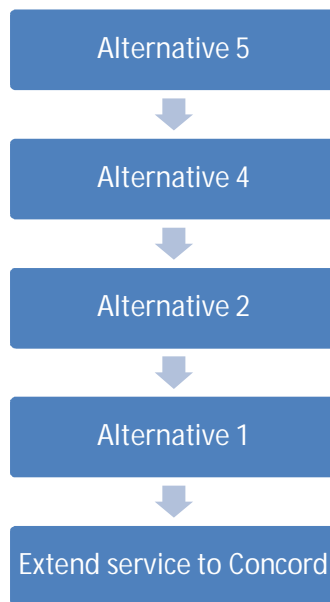


Figure 21: Possible Phased Approach to Service Implementation



ALT	Span of Service	# Daily Trips	Daily Revenue Hours of Service	Annual Average Operating Cost	Peak Vehicles Required	Capital Cost Range (Required – Optional)	Projected Average Daily Ridership	Projected Fare Revenue	Passengers / Hour	Passengers / Trip	Cost Efficiency	Cost / Passenger	Farebox Recovery Ratio
1	5:40 – 9:55 AM 1:20 – 7:00 PM	23.5	22.5	\$525,000	5	\$522,000- \$875,000	145	\$117,460	6.42	6.15	\$11.24	\$14.48	22%
2	5:40 – 8:55 AM 1:20 – 7:00 PM	19.5	18.5	\$432,000	4	\$447,000- \$459,000	130	\$107,816	7.03	6.67	\$9.93	\$13.23	25%
3	5:40 – 9:55 AM 1:20 – 7:00 PM	19.5	18.25	\$426,000	3	\$371,000- \$643,000	85	\$86,371	4.66	4.36	\$15.92	\$19.97	20%
4	5:40 – 9:45 AM 3:00 – 6:40 PM	13.5	13	\$303,000	3	\$371,000- \$643,000	70	\$69,688	5.38	5.19	\$13.31	\$17.27	23%
5	5:40 – 9:45 AM 3:45 – 7:00 PM	11	10.25	\$239,000	2	\$296,000- \$527,000	55	\$63,000	5.37	5.00	\$12.79	\$17.33	26%

Table 22: Alternatives Quantitative Comparison



ALT	Pros	Cons
1	<ul style="list-style-type: none"> Provides service to all major employers Highest ridership Supplements AT service gaps in the evening Mid-day service Timed to serve major start and end times Maximizes transfers with the AT Blue Route 	<ul style="list-style-type: none"> Most expensive to operate Requires the largest amount of capital equipment
2	<ul style="list-style-type: none"> Provides service to most major employers Supplements AT service gaps in the evening Mid-day service Timed to serve major start and end times Maximizes transfers with the AT Blue Route 	<ul style="list-style-type: none"> No trip to/from Colby-Sawyer at popular start time (10 AM) and end time (4 PM) Potential crowding at 5:00 PM end time for DHMC and Centerra Parkway employees No service from Hanover at the most popular end times (4:30 PM & 5 PM)
3	<ul style="list-style-type: none"> Provides service to most major employers Supplements AT service gaps in the evening Mid-day service Timed to serve major start and end times Maximizes transfers with the AT Blue Route 	<ul style="list-style-type: none"> No trip to/from Colby-Sawyer at popular end times (4 PM) No service to Great Hollow Road Potential crowding at 5:00 PM end time for DHMC and Centerra Parkway employees No service from Hanover at the most popular end time (5 PM) No service from DHMC at the most popular end time (4:30 PM)
4	<ul style="list-style-type: none"> Provides service to most major employers Timed to serve major start and end times Maximizes transfers with the AT Blue Route 	<ul style="list-style-type: none"> No service to Great Hollow Road No morning service to Heater Road for the most popular start time (8 AM) No trip to/from Colby-Sawyer at popular start time (9 AM) and end time (4 PM) Potential crowding at 5:00 PM end time for DHMC and Centerra Parkway employees No service from Hanover at the most popular end time (5pm) No service along Hanover Street/Downtown Lebanon at 8 AM when 42% survey respondents start work No service from DHMC at the most popular end time (4:30 PM) No mid-day service No service for 7 PM nursing shifts Does not supplement AT service gaps in the evening
5	<ul style="list-style-type: none"> Provides service to most major employers Supplements a few AT service gaps Provides service for 7 PM nursing shifts Timed to serve major start and end times Maximizes transfers with the AT Blue Route Least expensive 	<ul style="list-style-type: none"> No service to Great Hollow Road No service to Heater Road east of Rt 120 No trip to/from Colby-Sawyer at popular start time (9 AM) and end times (4 PM, 5 PM) Potential crowding at 5:00 PM end time for DHMC and Centerra Parkway employees No service from Hanover at the most popular end time (5 PM) No service along Hanover Street/Downtown Lebanon at 8 AM when 42% of survey respondents start work No service from DHMC at popular end times (4 PM, 4:30 PM) No mid-day service

Table 23: Alternatives Qualitative Comparison