Abstract:

Lowell, MA, is a city of 108,000 residents located an hour north of Boston and near the Massachusetts/New Hampshire State Line. More than a quarter of its residents are foreign-born, including significant refugee populations. Lowell is also home to the University of Massachusetts, Lowell campus. One of Lowell's greatest assets is its commuter rail connection to Boston. The line largely serves as a method to get workers from Lowell to Boston and back home at night. But further analysis shows nearly 50,000 jobs within one mile of a stops *between* Lowell and Massachusetts. Is there untapped potential to connect Lowell residents— particularly immigrant and refugee populations— with jobs *along* the line? Further, recent developments have restarted talks about expanding the Lowell line north into New Hampshire. This route would run right past UMass Lowell, offering the potential to add a new station that both better serves university students and staff as well as the bordering Highlands neighborhood and its significant immigrant and refugee populations. This study analyzes the possible siting of that station and its potential benefits.

The Lowell Line

Among Lowell's greatest transportation assets is its commuter rail line to Boston, known as the Lowell Line. The 25.4-mile rail line connects Lowell to North Station in Boston, as well as seven stops in between, on a 45-minute journey that runs seven days a week. The Lowell Line has long served as an important commuter link for the city, but untapped potential and future expansion mean the rail line could serve an even higher opportunity for Lowell going forward—for all residents, including Lowell's significant immigrant and refugee populations. According to 2017 US Census estimates, 27.8% of Lowell residents are foreign born.[1]

A Brief History

To understand the Lowell Line's future is to appreciate it's past. In 1803, the Middlesex Canal was completed, linking Boston Harbor to the Merrimack River in Lowell and unleashing Lowell's full potential as the soon-to-be cradle of the American Industrial Revolution. Although the canal was an engineering marvel, the technology's preeminence lasted only three decades. In 1835, the Boston & Lowell Railroad opened, with many portions of the route following precisely along the canal. This new rail lane, one of the first permanent railroads in the United States, quickly proved superior to the canal, taking much of the canal's freight business with it.[2] Early on, local service was added to the line allowing passengers to stop and board at cities between Lowell and Boston. From its inception, the Lowell Line was an important link for immigrants traveling to and from Lowell in search of work and a better life.

The Boston & Main Railroad acquired the line in 1895 and passenger service, at its peak, carried passengers from Boston up to Concord, New Hampshire. In 1965, three stations along the route were shuttered and by 1967, passenger service was eliminated to New Hampshire, with Lowell becoming the new terminus. In 1973, the Massachusetts Bay Transportation Authority (MBTA) took ownership of the Lowell Line and subsequently closed another four stops within the following decade. For thirteen months in 1980-81, passenger service was reconnected to Concord, but operation ceased when federal funding was withdrawn.[3]

Today's Lowell Line

Today, the Lowell line runs 25 daily weekday trains from Lowell to Boston and 26 trips from Boston to Lowell. On weekends, eight trains run each way between the two cities. The Boston terminus is North Station. Each of the trips include seven stops: North Billerica, Wilmington, Anderson/Woburn, Mishawum, Winchester Center, Wedgemere, West Medford. However, some stations run as "flag stops." Although the MBTA still owns the Lowell Line, it is operated on contract, as are all MBTA commuter rail lines, by Keolis, a private rail operator based in France.

The first weekday train from Lowell to Boston departs at 5:35am, and the final train to Boston leaves at 11:05pm. The first weekday train from Boston to Lowell leaves North Station at 5:35am and the final train to Lowell departs Boston at 12:15am. As shown in Figure 1, the schedule leaves large gaps in nighttime service on weekdays and even larger gaps on weekends.

Ridership

The MBTA's most recent ridership records from 2015 indicate a weekday average ridership on the Lowell line of 11,485 passengers, including both inbound and outbound trips.[4] Average weekend ridership is 5,938[5] (although the MBTA has recently offered widely conflicting counts for weekend traffic across the system.[6]) According to 2013 data (the most recent data available), the MBTA estimates 1,770 weekday passengers board the line at the Lowell stop— making it the fourth-most popular stop on the entire commuter rail network. The Anderson/Woburn stop, with 1,502 weekday boardings, is listed as the network's seventh-most popular stop. The least-used stop on the Lowell Line is Mishawum, with a reported weekday boarding of just 42 passengers, although all other stations report at least 500 boardings.[7]

Without passenger data more recent than April 2013, it is difficult to determine ridership trends on the Lowell line. However, the April 2013 count of 7,054 Lowell Line inbound boardings was up over 6,038 boardings in June 2007 but down from 8,085 in November 2011.[8]

Commuter Share

According to the 2016 American Community Survey, 729 Lowellians used rail as their primary commuting option, representing 1.4% of city residents. MBTA data that reports 1,770 annual weekday boardings at the Lowell stop suggests a large share of non-Lowell residents are boarding the commuter rail at Lowell each morning.[9]

Further, American Community Survey data report that while 3.6% of native-born residents in Lowell commute by public transit, 4.5% of foreign-born non-citizens take public transit every day.

Reliability

For the 30 days between January 22 and February 20, 2018, the MBTA reports the Lowell line ran at an average on-time reliability of 91% matching the system-wide commuter rail average for that same period.[10]

Fares

The base fare for adults from Lowell to Boston is $10 each way. The stops along the line are located in layered fare zones and therefore have different fare prices. Figure 2 shows the ranges of fare prices between Lowell and stops along the line. For instance, a round trip base fare to North Billerica is $6.50. Additionally, regular passengers can save on fare by buying an unlimited monthly pass. Monthly pass costs vary depending on origin and destination. For a commuter traveling between Lowell to Boston five days a week, this monthly pass could bring the fare total down to under $15 round trip. For a commuter traveling between Lowell and North Billerica five days a week, for example, the monthly pass could bring the cost of a round trip fare down to just over $5.00, or approximately the same round trip fare on the rapid transit T system in Boston.[11]

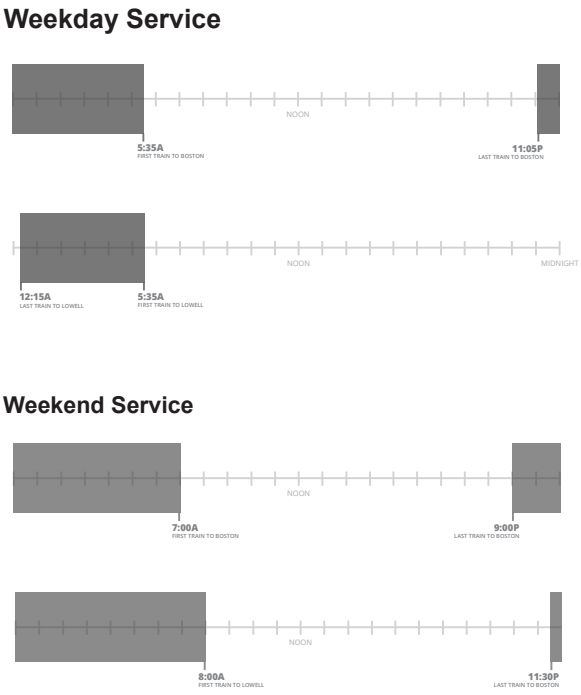


Figure 1 - Gaps in Lowell Line service, Lowell to Boston on top and Boston to Lowell at bottom
Data Source: MBTA

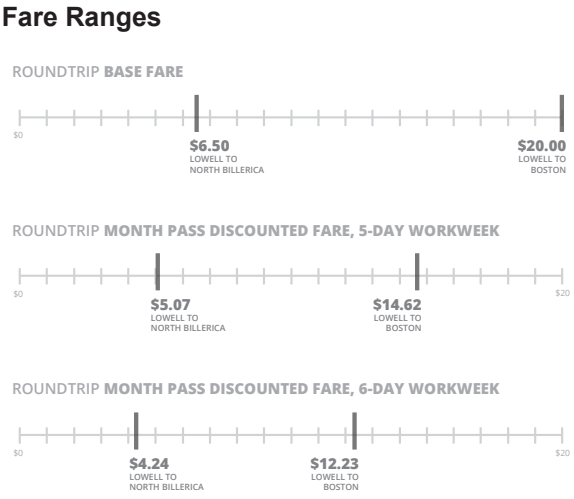


Figure 2 - Ridership fare ranges, including discounted fares
Data Source: MBTA

Commuter Rail Reach

Commuter rail, by its name, implies a focused role—helping passengers travel from home to their place of employment. The Lowell Line is designed primarily to carry passengers into Boston, although some passengers are also commuting between stops on the line. The Lowell Line achieves its function as a commuter option through a significant "park-and-ride" operation. With 6,215 average weekday boardings and 3,817 car parking spaces at stations along the line, there's one parking spot for every 1.6 passengers. In Lowell, however, that number is much lower with one parking spot for every 2.5 people.[12]

Access to Jobs

However, the Lowell Line's potential for transporting Lowellians to jobs extends beyond just employment opportunities in Boston. An analysis of business data from 2016 shows 253,488 jobs within a one-mile radius of North Station in Boston (See Figure 3). But within a one-mile radius of the seven stops between Lowell and Boston are an additional 47,223 jobs. The Mishawum stop alone features 22,954 jobs within a one-mile radius of the commuter rail stop.[13] See figure 4 for a sampling of jobs.

Multiple surveys associated with Lowell Greater Gateway project have indicated jobs to be the top or second-highest priority need for residents,

COMMUTER RAIL STOP	TOTAL JOBS WITHIN 1 MILE
LOWELL	*21,408*
NORTH BILLERICA	5,626
WILMINGTON	3,279
ANDERSON/WOBURN / MISHAWUM	27,963
ANDERSON/WOBURN	16,932
MISHAWUM	22,954
WINCHESTER CTR / WEDGEMERE / W. MEDFORD	10,355
WINCHESTER CENTER	5,691
WEDGEMERE	4,136
WEST MEDFORD	4,478
NORTH STATION	253,488
TOTAL WITH NORTH STATION	337,992
TOTAL WITHOUT NORTH STATION	47,223

Figure 3 - Map of Lowell Line and one-mile radius around each station, shaded to show intensity of jobs within radius
Data Source: Mass GIS, ESRI Business Analyst

including immigrant and refugee populations.[14] The 47,233 jobs along the Lowell Line could be a huge, untapped opportunity to place Lowell residents in good-paying jobs.

The MBTA does not keep public data tracking how many passengers from Lowell disembark at one of the seven stations along the way to Boston, but observation reveals it to be a small fraction. Could these stops provide untapped potential for employment access from Lowell—especially for immigrant and refugee populations? Further research is needed, but the raw numbers indicate yes.

Affordability

A careful analysis is needed to determine whether the commuter rail is an affordable option—particularly for low-income and immigrant or refugee workers. If we assume an employee works eight hours a day at the Massachusetts state minimum wage of $11 and hour, that employee earns $88 dollars each day and takes home around $72.50 after taxes. Assuming a discounted monthly pass rate, an employee would pay from $5.07 per day to get to and from North Billerica, all the way up to $14.62 per day to get to and from North Station (See Figure 2). That represents a transportation cost of between 7% and 20.2% of total take-home pay.

But these numbers are calculated based off an "ideal" scenario where the employee only works one job in one location and where there are no additional commuting costs from their home to the Lowell stop or from their departure stop to place of employment. Additionally, many low-income earners work more than eight hours a day or more than five days a week—both could change the above calculation for the better if those hours are at the same job and worse if they're spread over jobs at multiple locations. Further research is needed to understand the affordability of commuter rail for low-income workers in Lowell and possible mechanisms to reduce cost—including reduced fares or transportation between stations and home or work.

SAMPLING OF LOWER-SKILL JOBS AVAILABLE ALONG LOWELL LINE

EMPLOYER	LOCATION	EMPLOYEES	OPEN JOB	PAY	DISTANCE FROM STATION
Marshalls Distribution Center	Commerce Way, Woburn	1100	Distribution Center Supervisor	$55,560	.7 miles
United Stationares Supply Co	Wildwood Ave, Woburn	300	Distribution Assoc 2 (2-10:30p)	14/hr	.9 miles
Peterson Party Ctr INC	Cabot Rd, Woburn	300	Dispatcher	18/hr + Benefits	1.2 miles
Potpourri Group Inc	Billerica Ave, Billerica	500	Call Center Representative	12/hr	1 mile
Pace Industries Cambridge Div	Falkner St, North Billerica	200	Assembler	$33.5k	.2 miles
Quad Graphics	Woburn		Print Operator	16/hr	.5 miles

Figure 4 - Sampling of available lower-skill jobs within close range of a commuter rail stop between Lowell and Boston
Data Source: Individual job listings

Untapped Potential: A Case Study

UMass Lowell

Lowell has one significant case study from which to gauge untapped commuter rail ridership potential. UMass Lowell is the city's second-largest employer with 2,071 employees[15] and has a student body of 17,062.[16] In 2011, the institution completed a comprehensive transportation study that included an analysis of students and staff commuting patterns. The study reported that 68% of undergrad students, 25% of graduate students and 84% of faculty/staff had purchased a campus parking permit.

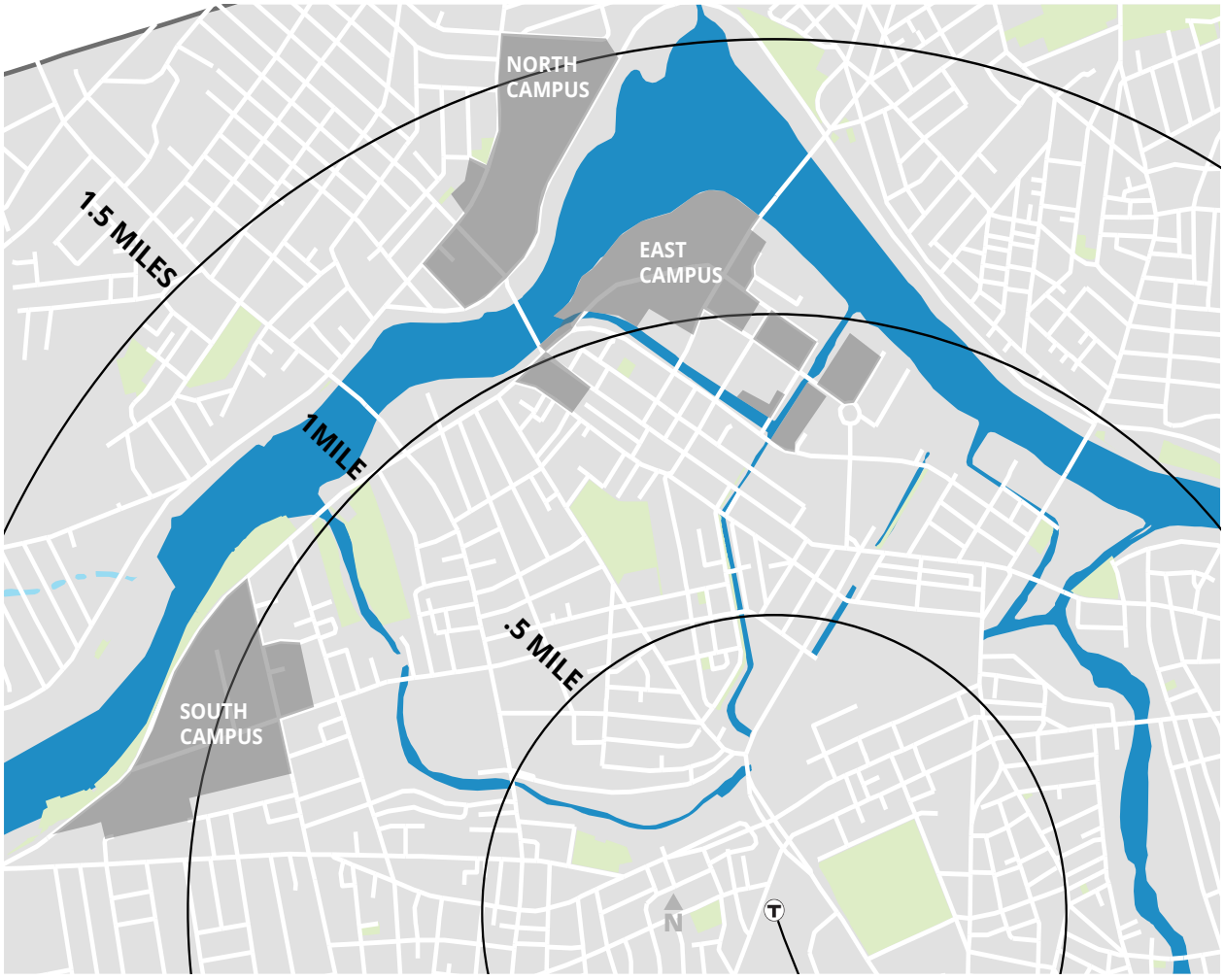


Figure 5 - UMass Lowell's three campuses in proximity to the commuter rail station
Data Source: Mass GIS, UMass Lowell

By geocoding addresses attached to each issued permit, the study also analyzed students, faculty and staff who currently buy parking passes but live within three miles of commuter rail stop. The study identified 140 faculty/staff and 550 students who owned a parking permit but lived within three miles of a stop along the Lowell Line.[17]

The UMass Lowell report indicated barriers to these potential rail users as:

- Three-seat ride (car to train to bus)
- Inefficient connections to campus from terminal
- Lengthy total trip time
- High cost
- Lack of parking at commuter rail stations
- Lack of flexibility or control

At the time of publication, the UMass Lowell transportation study recommended focusing on Carpool, Bicycle and Walking as alternatives to emphasize.[18] In 2018, UMass Lowell staff remain interested in brining more faculty, staff and students to campus by rail. “Very much so,” said Adam Baacke, UMass Lowell Director of Campus Planning and Development. “The biggest challenge is the “last mile” problem of getting from the Gallagher Terminal to campus. We’d like to see a healthy combination of bus service aligned with the train schedule, improved bicycle routes, and more on-demand shared ride-hailing services.”[19]

Focusing on the above listed barriers could help UMass Lowell and the city of Lowell reduce the amount of daily commuting traffic and parking needed by shifting more mode share to commuter rail.

The Future

Extension to New Hampshire

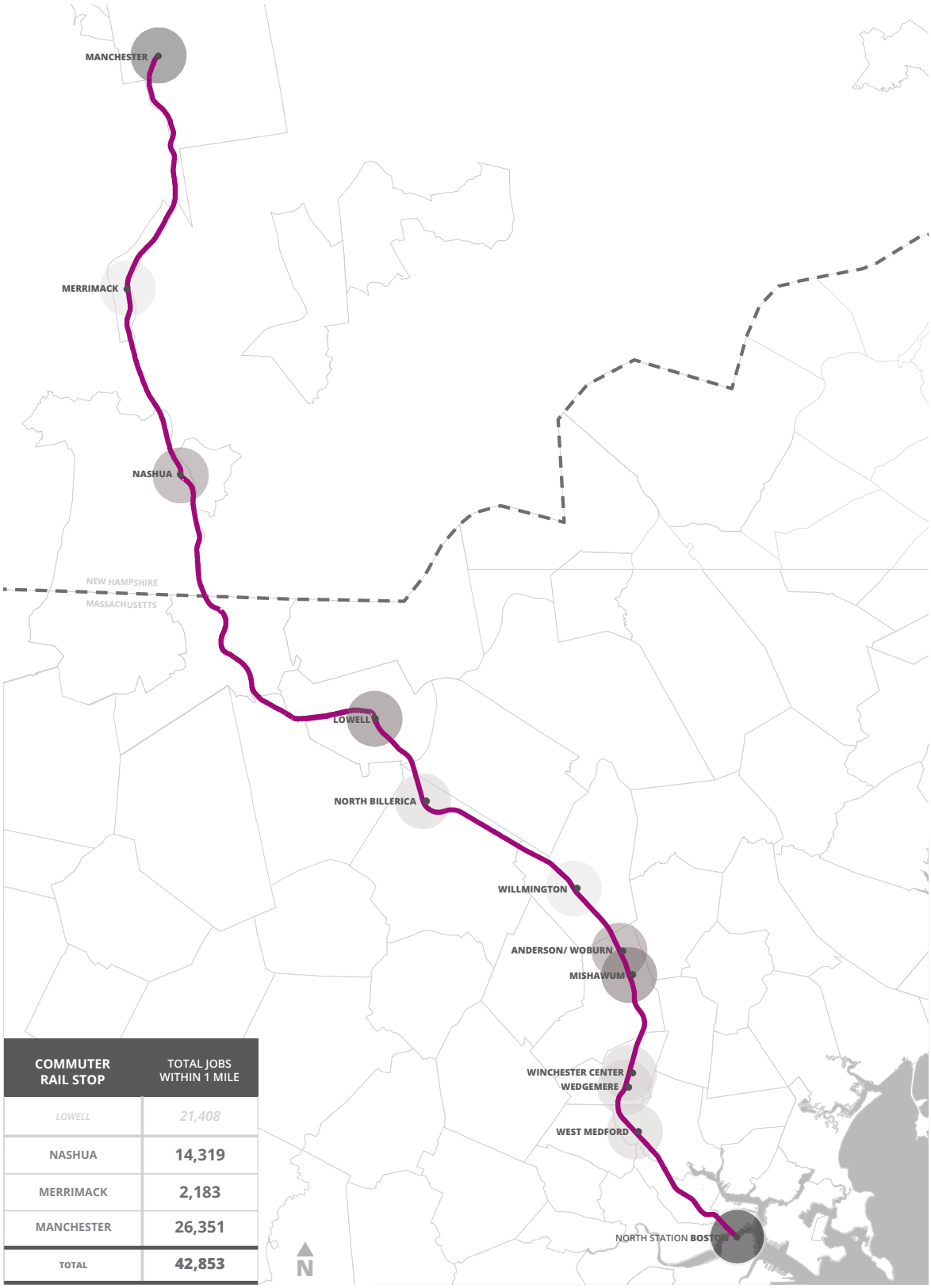
The future of the Lowell Line is largely a conversation about extension into New Hampshire. It's now been 37 years since the Lowell Line has offered service to New Hampshire and more than 50 years since permanent service. Within the last few years, momentum for a proposal to once again bring Lowell Line service into New Hampshire has faced a series of significant advances and setbacks.

In 2014, the NH Capitol Corridor Study was released, detailing the potential scope and cost of an extension from Lowell. At the time, the cost of expanding the passenger service through Nashua and up to Manchester came with an estimated capital cost of $245.6 million.[20] Various plans have also included additional stops in Merrimack or at the Manchester-Boston Regional Airport. The New Hampshire Rail Transit Authority estimates a demand of 668,000 riders in the first year.[21] Importantly, Pan Am Railways, owners of the track between Lowell and Manchester, have already agreed to a right-of-way deal with the MBTA to allow passenger trains on the tracks.[22]

In 2016, the New Hampshire gubernatorial race focused significant attention of the issue of passenger rail service from Lowell into the state. The ultimate victor in the race, Republican Chris Sununu, opposed the commuter rail, and in February 2017, the New Hampshire state legislature voted to kill $4 million in federal funding to study the Capitol Corridor expansion.[23] New Hampshire has a long received criticism for opposing rail projects, including largely refusing to support Maine's eventually successful endeavor to establish rail service from Portland to Boston.[24] In January 2018, however, Gov. Sununu changed course and stated he was now open to using the federal funding to study a train line. The Governor indicated that the state's failed bid to attract Amazon's second headquarters forced him to think twice about the value of passenger rail in the state.[25]

Jobs Access

The debate over a Lowell Line extension north is currently largely centered around citizens of New Hampshire gaining access to Massachusetts. However, an analysis of business data shows that within a one-mile radius of three stops proposed along the extension—Nashua, Merrimack and Manchester—are 42,853 jobs, nearly the same number of jobs accessible from the seven current stops between Lowell and Boston (See Figure 3). In Manchester alone, more than 25,000 jobs are within a one-mile radius of a potential commuter rail station.[26]



COMMUTER RAIL STOP	TOTAL JOBS WITHIN 1 MILE
LOWELL	21,408
NASHUA	14,319
MERRIMACK	2,183
MANCHESTER	26,351
TOTAL	42,853

Figure 6 - Proposed route extension into New Hampshire with one mile radius around each proposed station, shaded to display job intensity within each radius.
Data Source: Mass GIS, ESRI Business Analyst

Additionally, UMass Lowell's 2011 transportation study reported that a significant number of faculty, staff and students are commuting from Nashua.[27] A commuter rail stop in Nashua could provide options for UMass Lowell commuters and potentially reduce the number of cars commuting into and out of the city every day.

A Second Lowell Station

Within recommendations for an extension into New Hampshire is an idea to construct a second Lowell stop on the line at the UMass Lowell south campus. This second station would be almost exactly one mile down the tracks from the current Lowell stop, which is close, but not unprecedented. In fact, on the Lowell Line itself, the Winchester Center and Wedgemere stops are less than a half mile apart and the Anderson/ Woburn and Mishawum stops are just under one mile apart.

UMass Lowell Director of Campus Planning and Development Adam Baacke expressed enthusiasm for the idea of a second station on the school's south campus:

"This would be a wonderful thing that we have proposed on many occasions in conjunction with the discussions of expanded rail to New Hampshire. Unfortunately, it has generally been received with little enthusiasm by MassDOT/ MBTA. It would not be a complete cure for the last mile issues though, since we likely have greater demand for commuter students and employees to access East and North Campus from the Gallagher than South."[28]

This second station could provide three major benefits:

1. A more direct connection for UMass Lowell students, faculty and staff to access work and school via the commuter rail, potentially helping shift mode share from car to rail.
2. New access to commuter rail for significant portions of Lowell outside university populations. Figure 7 shows 5 and 10-minute walksheds from a proposed second station, comparing that coverage with walksheds of the current station. Significant sections of immigrant-heavy Highlands neighborhood would now also be within walking distance of the rail.
3. New housing, office and educational facilities in large under-utilized parcels in the immediate vicinity of a new station.

Although this additional station has largely only been discussed within the context of a commuter rail line extension to New Hampshire, Lowell, including its immigrant and refugee populations, could still reap all three above benefits by only extending the line one mile to reach the UMass Lowell south campus. This option should be explored further.

Figure 7 - Walkshed coverage of current Lowell commuter rail stop (right) compared to potential additional walkshed coverage from a second stop (left)
Data Source: Mass GIS

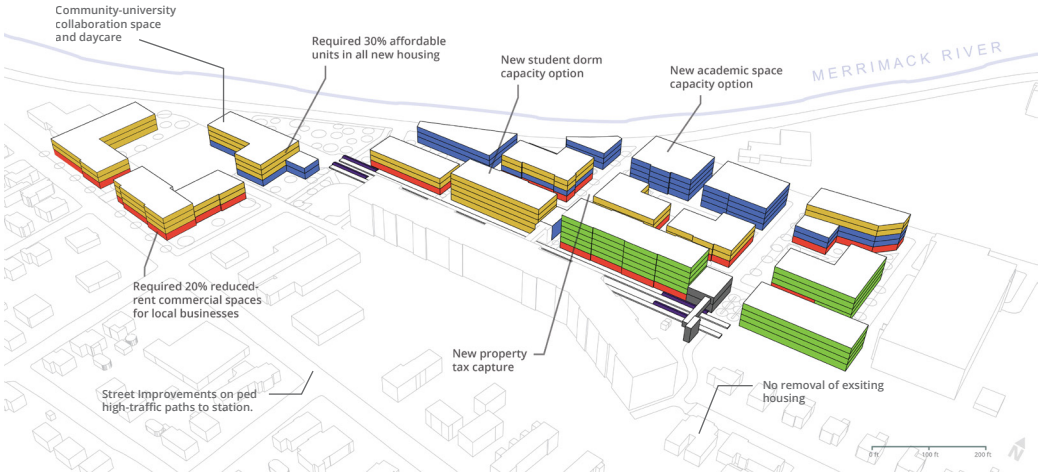


Figure 8 - Initial massing and programming model showing potential TOD around new commuter rail stop that benefits both the neighboring university and immigrant populations.

Summary and Recommendations

The Lowell line is a critical transportation link between not only Lowell and Boston but the seven stops between the two cities as well. While nearly 300,000 jobs are located within a mile radius of eight stops connected to Lowell by commuter rail, fewer than 750 Lowell residents rely on the train to get to work. Analysis shows 50,000 of those jobs are located proximate to stations between Lowell and Boston. City and nonprofit officials should not ignore these job opportunities when working with residents seeking work. Further study is needed to determine opportunities for Lowell residents to access work in cities along the commuter rail line, not just in Boston.

Additionally, Lowell is home to one of the largest refugee populations per capita in the United States. Special consideration needs to be taken to understand how the commuter rail can better serve this vulnerable population.

Further, how could a commuter rail extension into New Hampshire open up additional job opportunities for Lowell residents? More study is also needed to determine the feasibility and impact of a second station in Lowell, at the border of the UMass Lowell South Campus and Highlands neigborhood. But analysis shows siting a station at the campus would not be unprecedented.

The commuter rail provides opportunities for residents of Lowell to connect to work outside the city while also connecting outside residents to jobs within Lowell by means other than personal automobile. This study suggests the current Lowell Line presents potentially untapped potential for further connecting students and workers of all skill sets and backgrounds.

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