

# Connecting Lowell: Linking to the Concord River Greenway



*“Who hears the rippling of rivers will not  
utterly despair of anything.”*

~Henry David Thoreau



**Cover Photos:**

Right top: River Meadow Brook at Lincoln Street

Right bottom: River Meadow Brook, looking north from Plain Street

Left: Concord River Greenway

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# **Connecting Lowell: Linking to the Concord River Greenway**

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## Table of Contents

	Page No.
I. Introduction . . . . .	1
A. A Brief History of River Meadow Brook . . . . .	8
B. The Bruce Freeman Rail Trail . . . . .	10
C. The Concord River Greenway. . . . .	11
D. Zoning and Land Use within the Study Area . . . . .	12
E. River Meadow Brook Greenway Analysis – Plain St to Howard St. . . . .	13
II. Option 1 Analysis . . . . .	23
A. Cross Point to Industrial Avenue Segment . . . . .	23
B. Industrial Avenue to Meadow Brook Shopping Center Segment . . . . .	24
C. Meadow Brook Shopping Center to Maple Street Segment . . . . .	26
D. Gorham Street to Concord River Walkway Segment . . . . .	26
III. Option 2 Analysis . . . . .	27
A. Industrial Avenue to Gorham Street Segment . . . . .	27
B. Gorham Street to Meadowcroft Street Segment . . . . .	29
C. Moore Street to the Concord River Segment. . . . .	29
IV. Option 3 Analysis . . . . .	30
A. Cross Point to Industrial Ave East Segment . . . . .	30
B. Swan Street to Boston Road Segment . . . . .	30
C. Boston Road to Gorham Street Segment . . . . .	31
D. Gorham Street to Stromquist Street Segment . . . . .	32
E. Lundberg Street to Meadowcroft Street Segment . . . . .	32
F. Moore Street to the Concord River Greenway . . . . .	33
V. Option 4 Analysis . . . . .	34
A. Cross Point to Meadow Brook Shopping Plaza . . . . .	34
B. Meadow Brook Shopping Plaza to Howard Street . . . . .	35
C. Howard Street to Chambers Street . . . . .	35
D. Chambers Street to the Concord River Greenway . . . . .	38
VI. Findings . . . . .	39

### List of Maps

Map 1: Proposed River Meadow Brook Greenway Study Area . . . . .	2
Map 2: Bruce Freeman Rail Trail-Concord River Greenway Connection Options . . . . .	6
Map 3: Proposed River Meadow Brook Greenway – Plain St. to Lincoln St. . . . .	15
Map 4: Proposed River Meadow Brook Greenway – Lincoln St. to MBTA Rail line. . . . .	17

# Connecting Lowell: Linking to the Concord River Greenway.

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## I. Introduction

This study was funded in part by the Centers of Disease Control through a Community Transformation Grant provided by the Metropolitan Area Planning Council (MAPC). The purpose of the Community Transformation Grant program is to encourage healthy lifestyles through community level initiatives that prevent chronic diseases, such as cancer, diabetes and heart disease. Providing access to greenway facilities promotes increased levels of physical activity, which produces significant health benefits that help:

- Control weight and blood pressure;
- Reduce the risk of developing Type 2 diabetes, heart disease and cancer;
- Reduce the severity of depression and anxiety;
- Reduce arthritis pain and disability; and
- Prevent osteoporosis and falls.

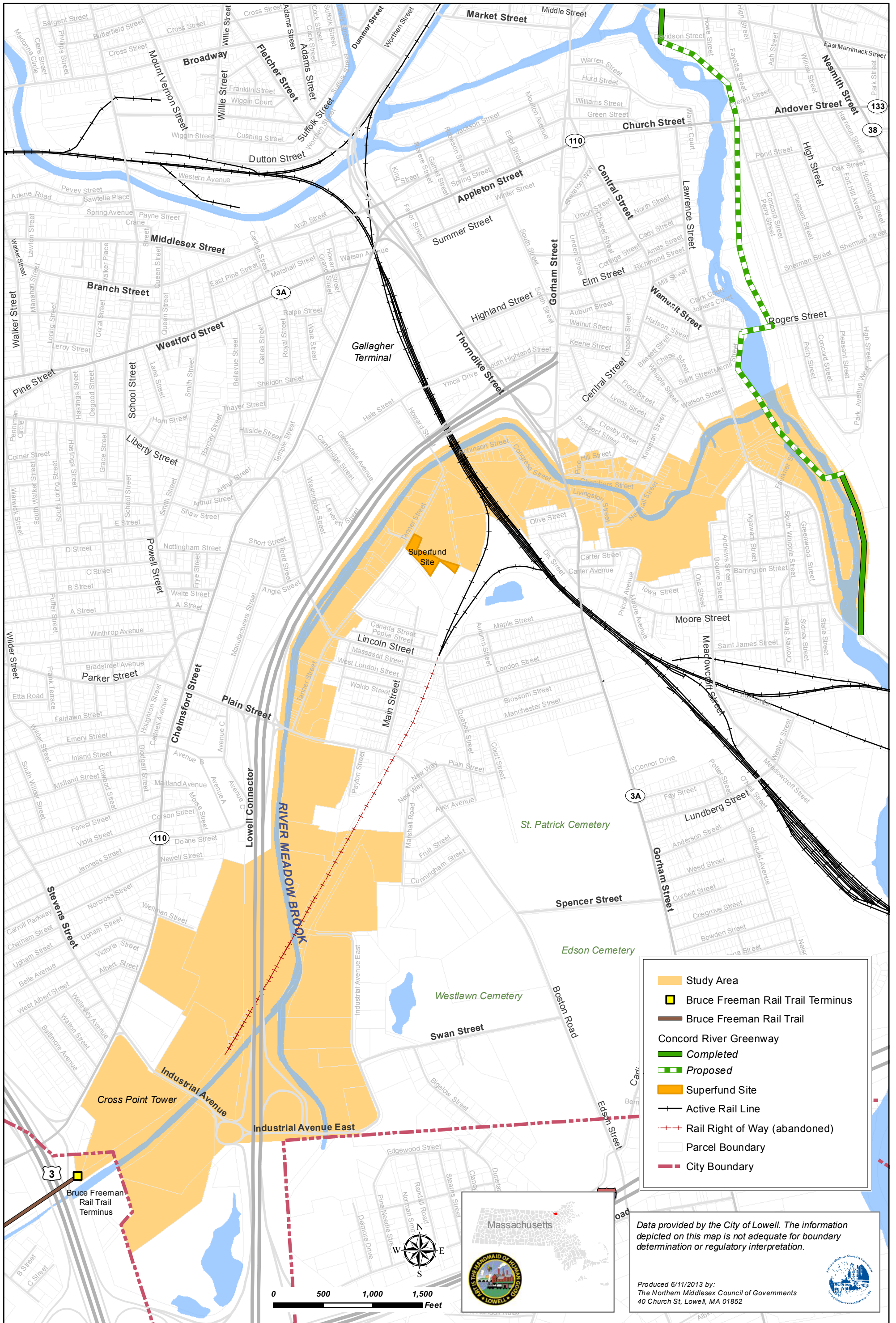
Overall, urban trails provide a wide variety of opportunities for increased physical activity through walking, running, hiking, rollerblading, cross-country skiing, snowshoeing, and wheelchair recreation.

There are a number of community benefits that would be realized by building a greenway and/or establishing a connection between the Bruce Freeman Rail Trail and the Concord River Greenway. These benefits include: encouraging healthier living through exercise, reducing automobile emissions by encouraging non-motorized transportation, providing economic benefits through improved access to area businesses, and providing increased recreational opportunities for residents.

MassDOT has also provided funding for this study through the region's Unified Planning Work Program. The development of pedestrian and bicycle facilities is consistent with MassDOT's Healthy Transportation Compact. The Compact was formed as part of the state's transportation reform initiative in 2009. Co-chaired by the Secretary of Transportation and the Secretary of Health and Human Services, and developed with the involvement of the Secretary of Energy and Environmental Affairs, MassDOT Highway Administrator, MassDOT Transit Administrator, and Commissioner of Public Health, this inter-agency initiative was designed to facilitate transportation decisions that balance the needs of all transportation users, expand mobility, improve public health, support a cleaner environment and create stronger communities.

This study investigated the feasibility of constructing a multi-use trail to establish a link between the Bruce Freeman Rail Trail and the Concord River Greenway in Lowell. The study area is shown on Map 1 on the following page. Connecting the Bruce Freeman Rail Trail and the Concord River Greenway would improve alternative transportation access to the eastern and western portions of Lowell and remove barriers for pedestrians and cyclists.

# Map 1: Proposed River Meadow Brook Greenway Study Area





## Connecting Lowell: Linking to the Concord River Greenway.

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To analyze options for connecting the two trails, NMCOG staff looked in depth at some alternatives previously proposed by the Lowell Parks and Conservation Trust in the “River Meadow Brook Natural Resource Inventory”. The first alternative follows an abandoned railroad line, while the second follows along existing roadways. NMCOG explored both options in great detail, outlining the obstacles for each and describing the measures that would need to be implemented to address them.

In total, the study examined three potential options for directly linking the Bruce Freeman Rail Trail and the Concord River Greenway, as shown on Map 2 on the following page and described below:

- **Option 1** begins at the entrance to the Bruce Freeman Rail Trail located at Cross Point and follows River Meadow Brook to Industrial Avenue. Crossing Industrial Avenue, the proposed trail follows an abandoned Boston and Maine rail line located immediately west of the Gervais car dealership. The trail crosses under the Lowell Connector via a railroad tunnel and continues along the rail line, crossing under Plain Street and Lincoln Street. After the rail line crosses under Lincoln Street, the trail heads east and joins Maple Street, and continues along Maple Street until it meets Gorham Street. Trail users would then cross under the railroad bridge on Gorham Street, head east to Moore Street, and follow Moore Street until it intersects with Lawrence Street where the Concord River Greenway can be accessed. It is approximately 2.19 miles between the Bruce Freeman Rail Trail and the Concord River Greenway, using this option.
- **Option 2** begins at the entrance to the Bruce Freeman Rail Trail located at Cross Point and follows the same course as Option 1 until reaching the Meadow Brook Shopping Center on the east side of the Lowell Connector. Option 2 continues along the edge of the American Paper Recycling property, ending at Industrial Avenue East. As Industrial Avenue East turns south, the proposed trail continues past Sterling Movers and into the parking lot of the Veteran’s Community Care Center on Marshall Street. The trail would then cut through the wooded area at the northeast corner of the Veteran’s Community Care Center parking lot and continue into the Westlawn Cemetery and cross Boston Road. The trail continues on to Saint Patrick Cemetery, along internal cemetery streets named Saint Martin Avenue and Saint Patrick Avenue. Once Gorham Street has been reached, the trail continues south along Gorham Street, and then turns east on to Lundberg Street to the intersection of Meadowcroft Street. The trail then follows Meadowcroft Street north, crossing an active rail line, to the intersection of Moore Street. The trail continues along Moore Street in an easterly direction to the intersection with Lawrence Street and users would then head southeast on to Lawrence Street. The approximate distance between the Bruce Freeman Rail Trail and the Concord River Greenway utilizing Option 2 is 2.51 miles.

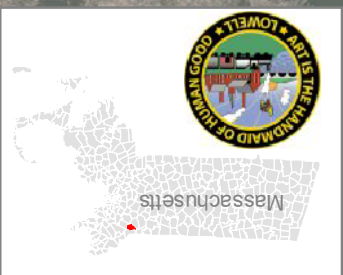
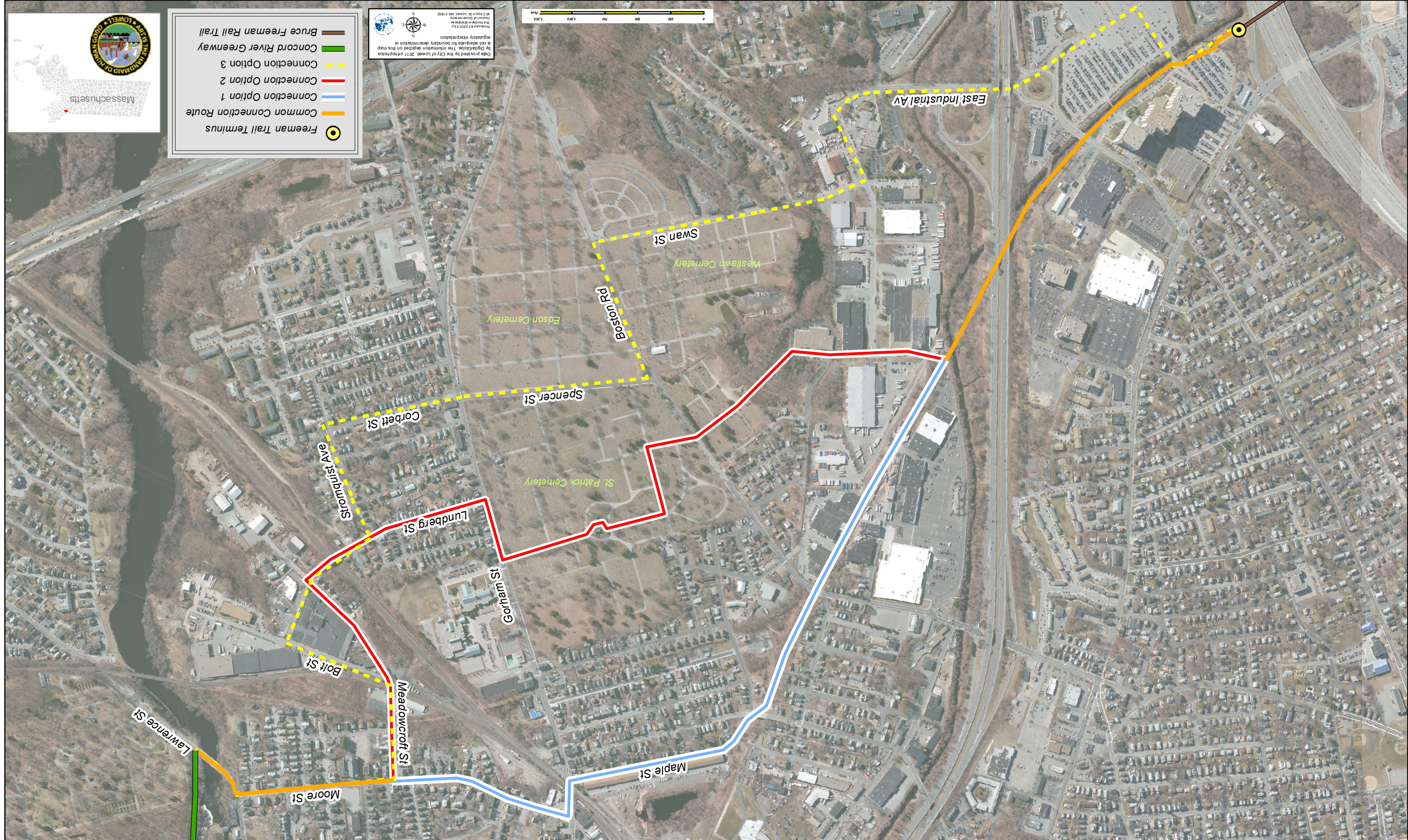


## Connecting Lowell: Linking to the Concord River Greenway.

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- **Option 3** is largely on-road and the route was examined as a comparatively low-cost approach for connecting the Bruce Freeman Rail Trail (BFRT) with the Concord River Greenway. The route extends from the existing terminus for the BFRT at Cross Point, through the parking lot to Industrial Avenue. The route then crosses under the Lowell Connector to Industrial Avenue East, and then continues east to Swan Street, to Boston Road, and then to Spencer Street. The route extends in a northwesterly direction along Spencer Street to Gorham Street, where it crosses Gorham Street and then continues onto Corbett Street and Stromquist Avenue. From Stromquist Avenue, the route continues on to Lundberg Street and then to Meadowcroft Street. The approximate distance of Option 3 is 2.74 miles
- **Option 4** lays out a path that follows the banks of the River Meadow Brook from the entrance to the Bruce Freeman Rail Trail at the Cross Point Towers to the point where the brook meets the Concord River. The trail begins at the BFRT entrance located on the Cross Point Towers property and follows the River Meadow Brook to Industrial Avenue. From Industrial Avenue the trail follows an abandoned Boston & Maine railroad line under the Lowell Connector to the southern tip of the Meadow Brook Shopping Plaza property. The trail then follows the brook along the western edge of the Meadow Brook Shopping Plaza property towards Plain Street. After crossing Plain Street, the trail would be located between the Lowell Connector and the western edge of the River Meadow Brook until it reaches Howard Street. The trail then follows Howard Street to Hale Street/ YMCA Drive, and the proceeds along an existing footpath around the back of the Gallagher Terminal where buses and commuter traffic currently exits. Adjacent to the Terminal site is an outlet which leads to a small clearing and footpath along the train tracks. The trail the footpath to Gorham Street southeast of the Lowell Connector. The trail would go along Gorham Street to Chambers and Newhall Street. The trail would follow Newhall Street until the Crosby Street intersection. Here the trail would head northwest along Crosby Street and then northeast on to Kinsman Street. The trail would then cross Whipple Street and continue on Swift Street. Finally, the trail would leave Swift Street, cross Lawrence Street towards the Concord River and the Concord River Greenway. The approximate distance of Option 4 is 3.05 miles

# Bruce Freeman Rail Trail - Concord River Greenway Connection Options 1, 2 & 3



**Freeman Trail Terminus**

**Common Connection Route**

**Connection Option 1**

**Connection Option 2**

**Connection Option 3**

**Concord River Greenway**

**Bruce Freeman Rail Trail**





# Connecting Lowell: Linking to the Concord River Greenway.

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In addition to examining the four options outlined above, a separate analysis was performed to explore the feasibility of constructing a trail along River Meadow Brook from Plain Street to Howard Street. The information generated from the analysis will be utilized in the City's Tanner Street District planning initiative which focuses on: promoting redevelopment and sustainability of the Tanner Street area through brownfields redevelopment, adaptive reuse of properties, and infrastructure improvements. In evaluating the feasibility of constructing a greenway along River Meadow Brook the following questions were addressed:

- Where might the trail or greenway go and what route could be utilized?
- What are the physical impediments that would need to be overcome?
- Who owns the land along the potential trail route?
- What steps will need to be taken to make the trail or greenway a reality?

## **A. A Brief History of River Meadow Brook**

The headwaters of River Meadow Brook are located in the Town of Westford. The brook then flows through Carlisle and Chelmsford to its confluence with the Concord River in Lowell. Before the founding of Lowell, several Chelmsford families owned sizeable farms along the section of River Meadow Brook that would become part of the City. Moses Hale acquired property in this area in the late-18th century and would soon play an important role in altering part of the meandering brook by constructing two dams and establishing a carding mill, in addition to saw and grist mills, and a gunpowder works.<sup>1</sup> Even today, many residents still refer the waterway as Hale's Brook.

In the 1850s, a real estate developer, Daniel Ayer, bought up large parcels of property along the brook. Mr. Ayer subdivided the land and established an industrial district that contained the area's largest tannery. He named his development "Ayer's New City" and advertised industrial and residential properties, promoting convenient access to the Boston & Lowell rail line that bisects the district.

While many Lowell residents struggled financially during the Civil War, due to the shutdown of the city's cotton mills, industries located along River Meadow Brook near the confluence of the Concord River prospered. The Wamesit Canal supplied water power to woolen mills, dye works, machine shops, wood-working shops, a grist mill, and the Lowell Bleachery, which employed 500 workers.

In the 1860s and 1870s new woolen mills and dye works were constructed on Centennial Island, between the Wamesit Canal and the Concord River. By the late 19th century, the area was home to numerous Irish, Swedish, and French Canadian immigrants. Many worked in the U.S. Cartridge Company factory, the U.S. Bunting mill, the American Bolt Company works, and the other woolen mills or small

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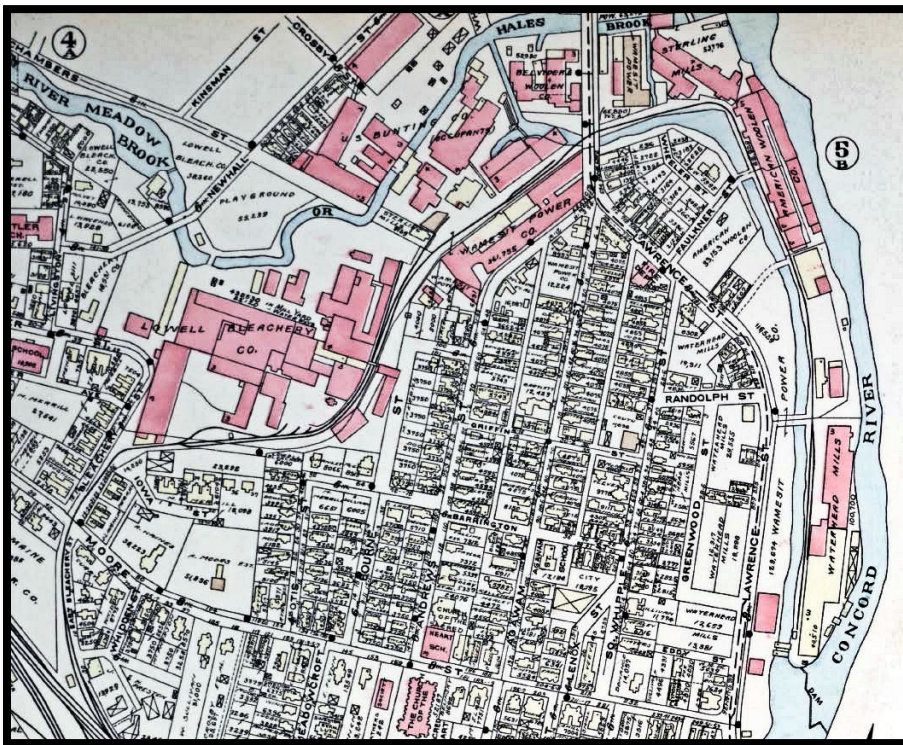
<sup>1</sup> Fitzsimons, Gray. *Changing Course: A History of River Meadow Brook in Lowell*, June 30, 2012.

## Connecting Lowell: Linking to the Concord River Greenway.

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industrial shops. Upstream from the Wamesit Canal district, in Ayer's City, only two tanneries and a soap manufacturer were in operation as real estate values plummeted. While other sections of Lowell experienced rapid growth following the Civil War, Ayer's City became neglected.

One of the most intensive periods of development along River Meadow Brook occurred from the 1880s until the early 1920s. A number of factories, fuel and chemical storage facilities, coal yards, foundries, a brewery, and junk yards were established. New houses and tenements were constructed and occupied by working families. Pollution from domestic and industrial wastes flowed to or was dumped in River Meadow Brook. Despite the completion of a sewer along the brook in 1883, the stream's water quality continued to degrade.



**Photo 1: 1924 Lowell atlas showing River Meadow Brook and the surrounding neighborhoods.**  
(Source: Center for Lowell History).

Similar to the city overall, the population in Ayer's City peaked in the early 1920s. During the Depression, many of the City's large cotton mills closed. The Bleachery also ceased operating during this time, and the number of residents declined. A few textile firms, including the Stirling Mills and Ames Textiles continued to operate into the 1940s and 1950s, but by 1970, only the Stirling Mills remained open. Following World War II, numerous factory buildings, warehouses, and oil storage tanks were abandoned

## Connecting Lowell: Linking to the Concord River Greenway.

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or were torched by arsonists. One of the few industrial businesses to survive from this time period was Scannell Boiler Works and Foundry, which was among the area's largest employers.

The most dramatic change to the area occurred in the early 1960s, when the Lowell Connector was constructed and highway engineers rerouted much of the brook, using the straightened channel for runoff from the four-lane, divided highway. In the 1970s, an abandoned chemical storage and processing facility, Silresim, was declared an EPA Superfund site, further adding to the environmental and redevelopment challenges for the neighborhood. Today, much of land along River Meadow Brook in Lowell remains environmentally compromised. Remnants of its industrial history still stand alongside newer warehouse style buildings. Modest residential blocks are found along the lower section of the brook. The City is currently formulating a redevelopment plan for the area, and EPA is cleaning up the contamination emanating from the Silresim site.

### **B. The Bruce Freeman Rail Trail**

The Bruce Freeman Rail Trail is named for the late Bruce N. Freeman, who served as Chelmsford's State Representative from 1969 until his death in 1986. In June 1985, the first formal meeting was held to discuss creation of a recreational trail along the abandoned Penn Central railroad line from Industrial Avenue in Lowell heading south to Sudbury. Governor Michael Dukakis signed a bill naming the trail in memory of Bruce Freeman in April 1989.

Once completed in its entirety, the Bruce Freeman Rail Trail will extend 24.5 miles through seven communities. Phase 1 of trail has been completed and begins at the Lowell/ Chelmsford line, near the Cross Point towers, passes through Chelmsford Center, and ends at the intersection of Route 225 and Route 27 in Westford, covering a distance of 6.8 miles. Phase 2 of the trail will continue from the current Phase 1 terminus in Westford through the communities of Carlisle, Acton, and Concord, covering 8.7 miles. This phase is currently under design, with construction anticipated to begin in 2014. Phase 3 will continue through Sudbury and into Framingham.

## Connecting Lowell: Linking to the Concord River Greenway.

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**Photo 2: Bruce Freeman Rail Trail terminus at Cross Point Towers.**

### **C. The Concord River Greenway**

The creation of a greenway park along the Concord River has been a long-term goal of the Lowell Parks and Conservation Trust for many years. Once completed, the Concord River Greenway will extend 1.75 miles extending along the eastern bank of the Concord River in the City of Lowell. Much of the trail is



**Photo 3: Dam at the Concord River Greenway**

located along an abandoned railroad right-of-way. The Greenway connects Lowell's largest parks: Rogers Fort Hill Park and Shedd Park, with the Merrimack Riverwalk and a network of trails throughout the City. The Greenway will also fill a missing link in the 200-mile Bay Circuit Trail. The first section of the Greenway opened on June 12, 2010, during the annual RiverFest.

Construction of the Concord River Greenway is ongoing, and plans are underway to construct a foot bridge from the existing path off Lawrence Street to Centennial Island, connecting Centennial Island with the downtown end of the Greenway, and connecting the Lawrence Street end of the Greenway with downtown. The City of Lowell is overseeing construction of the project.

# Connecting Lowell: Linking to the Concord River Greenway.

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## D. Zoning and Land Use within the Study Area

In evaluating the zoning and land use along River Meadow Brook, the most recent edition of the City of Lowell’s zoning code (dated November 2010) was used. The zoning classifications for all parcels abutting the River Meadow Brook were mapped and a complete parcel-level land use Inventory (LUI) was developed for each trail option and is included in the appendices. The parcels in Chelmsford at the terminus of the Bruce Freeman Rail Trail were also included in the inventory. The Chelmsford zoning bylaw and map, dated April 2003, were used for the inventory.

It is important to note that zoning and land use are not synonymous. Zoning is a land use tool that identifies allowed uses within a particular zoning district or classification. Land use is a term used to describe the actual uses currently present on the land, such as commercial, industrial or residential. If a parcel of land is being used in a way that does not comply with the appropriate zoning class assigned, it is considered to be “non-conforming”. The parcel can be non-conforming due to the use itself, or due to lack of compliance with dimensional requirements prescribed within the zoning regulation, such as setback, height or lot coverage.

All of the land within the Chelmsford portion of the study area is zoned for Limited Industrial Development (IA). Five of the seven parcels in the study area are presently used for parking or electrical generation and transmission. The remaining lots are used for parking for the Cross Point Towers, which is an allowed use in the IA zone. There is also one narrow parcel of land in the area which is shown by the Chelmsford Assessor Map as a Right-of-Way for Concord Street.

There are nine different zoning classifications within the Lowell portion of the study area, extending from just east of the terminus of the Bruce Freeman Trail to the confluence of River Meadow Brook and the Concord River, as shown on the following table:

**Table 1: Zoning Classifications within the Lowell Portion of the Study Area**

ZONING CLASSIFICATION	ZONING SYMBOL	PRIMARY USES ALLOWED (not all inclusive)
High Rise Commercial	HRC	Commercial, office, mixed use
Downtown Mixed Use	DMU	Commercial, office, mixed use, recreation, institutional and educational
General Industrial	GI	Industrial, automotive, retail and public service
Light Industry Moving & Storage	LL	Industrial, automotive, retail and public service
Neighborhood Business	NB	Retail/commercial ≤5,000 ft <sup>2</sup>
Regional Retail	RR	Commercial/retail ≥5,000 ft <sup>2</sup> office, mixed use, recreation, institutional and educational



# Connecting Lowell: Linking to the Concord River Greenway.

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**Table 1: Zoning Classifications within the Lowell Portion of the Study Area**

ZONING CLASSIFICATION	ZONING SYMBOL	PRIMARY USES ALLOWED (not all inclusive)
Traditional Neighborhood Multi-Family	TMF	Residential buildings with up to six dwelling units
Traditional Neighborhood Two Family	TTF	One and two family dwellings
Urban Neighborhood Multi- Family	UMF	Residential, hotels
Urban Mixed Use	UMU	Commercial, office, mixed use, recreation, institutional and educational, residential

Source: Lowell Zoning Ordinance, Article XII

The “Primary Uses” in the above table are not meant to be all inclusive, nor are they meant to determine what uses are allowed by right. The table simply provides a description of uses most frequently found in each zoning district. The abutting land uses along the proposed routes under each option include commercial, industrial and residential properties. There are over 250 parcels within the study area. It is noted that the land on the west side of the Brook is owned by the Massachusetts Department of Transportation (MassDOT), and is part of the Lowell Connector Right-of-Way (ROW).

The two most prominent zoning classifications found along the Brook are High Rise Commercial (HRC) and General Industrial (GI) zoning. The former is occupied by office and commercial complexes such Cross Towers and the Target Plaza. The GI zone is found primarily from Plain Street north to the MBTA rail lines.

## **E. River Meadow Brook Greenway Analysis–Plain Street to Howard Street**

As discussed earlier in this report, this alternative was provided at the request of the City and is intended to tie into the Tanner Street District initiative now under study. This trail option does not provide an immediate connection between the Bruce Freeman Rail Trail and the Concord River Greenway.

This section of the River Meadow Brook parallels the Lowell Connector and Tanner Street, running from Plain Street to the MBTA rail lines, and covers a distance of .65 miles. After an initial site assessment by NMCOG staff, Lowell DPD planning staff and Lowell Parks and Conservation Trust, it was concluded that constructing a greenway on the Tanner Street side of the Brook is not feasible, due to the close proximity of industrial buildings to the bank of the Brook<sup>2</sup>. Therefore, the area adjacent to the western bank of River Meadow Brook has been evaluated in this study. This side of the Brook is entirely within

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<sup>2</sup> RMB, Lowell MA Natural Resource Inventory pg 16-17  
Liz Newlands, Mass Audubon Ecological Extension Service

## Connecting Lowell: Linking to the Concord River Greenway.

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the MassDOT Right-of-Way (ROW) for the Lowell Connector. There are approximately 16 catch basins with accompanying outflows from the Connector within the study area, as shown on Maps 3 and 4 on the following pages. Two roadways, Lincoln Street and Howard Street, cross the Brook in this area. The MassDOT Maintenance Depot and salt shed on the western side of the Brook, take up the entire parcel between Howard Street and the MBTA commuter rail lines. The Brook itself, up to the western bank, is owned by the various property owners along Tanner Street.

A proposed greenway along the Lowell Connector side of the Brook in this area would be accessed from Plain Street, between the Tanner Street intersection and the Lowell Connector northbound on ramp. Plain Street is an Urban Minor Arterial under the jurisdiction of the City of Lowell and carries approximately 20,900 vehicles per day.<sup>3</sup> The Plain Street Bridge is owned by MassDOT and is in good condition with a 2012 AASHTO rating of 99.<sup>4</sup> There appear to be no physical limitations to accessing the area from Plain Street, apart from the relatively high volume of traffic. Providing access will require modification to the guard rails at the intersection of Plain Street with the northbound on-ramp to the Connector. There is also a traffic signal controller in this location which may need to be relocated, as can be seen in the photograph on the following page.

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<sup>3</sup> Northern Middlesex Regional Traffic Volume Report: 2011 edition

<sup>4</sup> MassDOT 2012 NMCOG Bridge Ratings

# Proposed River Meadow Brook Greenway - Plain St to Lincoln St



— Elevation Contour  
● Lowell Connector Drainage Outfall  
↗ % Grade/Slope



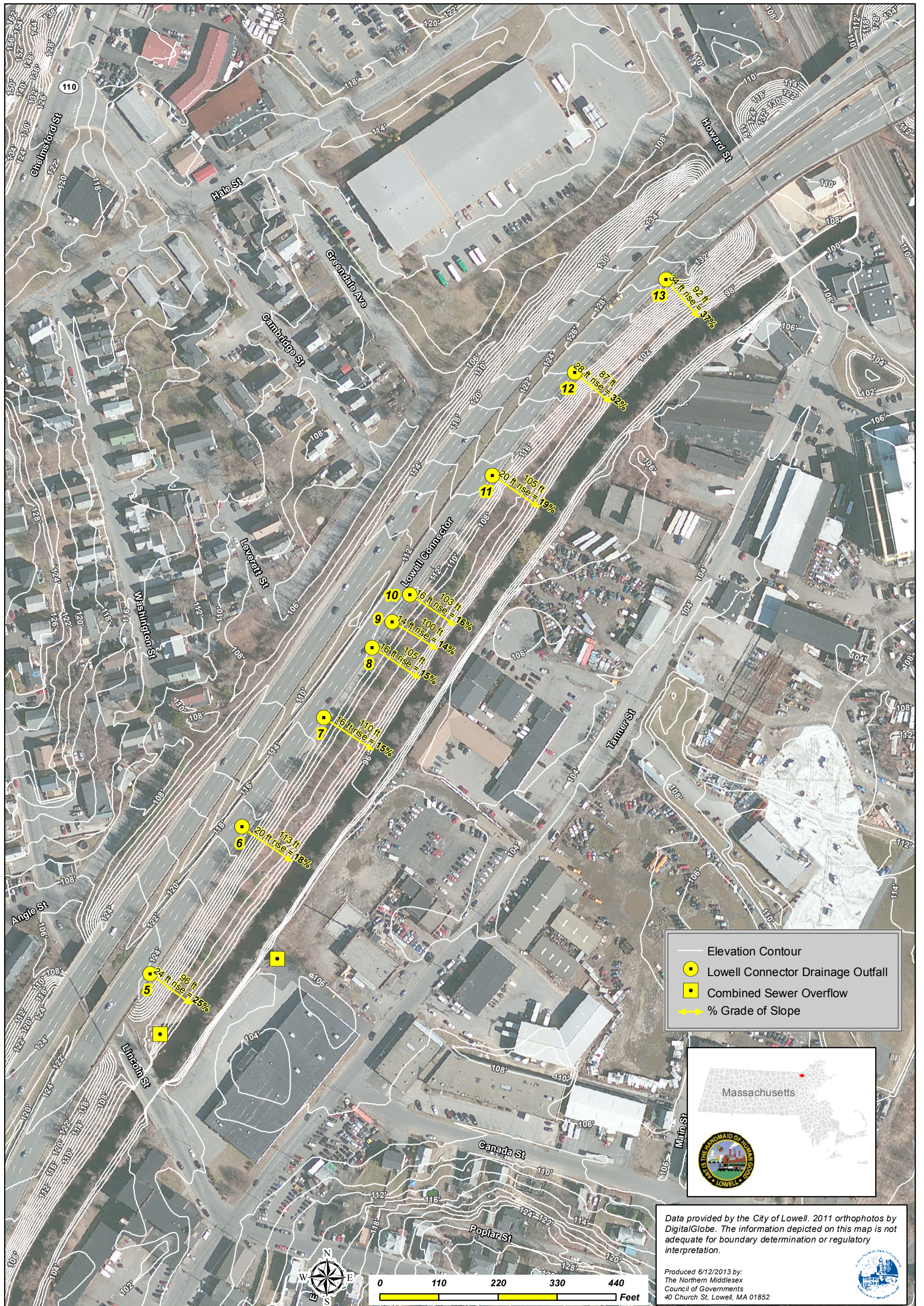
Data provided by the City of Lowell. 2011 orthophotos by DigitalGlobe. The information depicted on this map is not adequate for boundary determination or regulatory interpretation.

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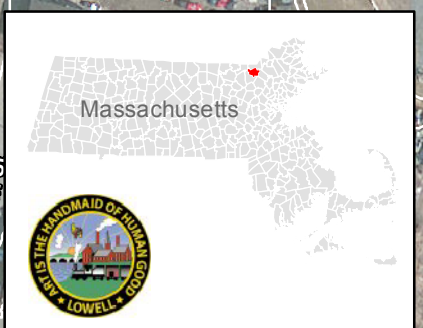




# Proposed River Meadow Brook Greenway Lincoln St to MBTA Rail Road



— Elevation Contour  
 ● Lowell Connector Drainage Outfall  
 ■ Combined Sewer Overflow  
 ↗ % Grade of Slope



Data provided by the City of Lowell. 2011 orthophotos by DigitalGlobe. The information depicted on this map is not adequate for boundary determination or regulatory interpretation.

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**Photo 4: Plain Street/ Lowell Connector intersection.**

The topography of the proposed greenway between Plain Street and Lincoln Street, a distance of .23 miles, has slopes of varying degree. Many locations have steep slopes, and construction of a trail will require the use of a boardwalk cantilevered out over a portion of the brook, in order to comply with requirements of the Americans with Disabilities Act (ADA). Map 3 shows the elevation contours and illustrates the slope/grade from the edge of the Connector guardrail to the edge of the Brook. The section of the parcel adjacent to the Lowell Connector northbound on-ramp is flat, with over 50 feet separating the Connector on-ramp and the bank of the Brook. Access to the Brook will not be an issue in the Plain Street area given the level terrain. There are a few large trees that will need to be removed, along with tall grass and shrub vegetation, including significant Japanese Knotweed, which is an invasive species.

Continuing along the greenway will require crossing Lincoln Street, an Urban Collector under the jurisdiction of the City of Lowell, with an ADT of 4,000 west of the Connector<sup>5</sup>. The Lincoln Street Bridge over the River Meadow Brook is owned by MassDOT and is considered in good condition with a 2012 AASHTO rating of 82.6.<sup>6</sup> Access to the Brook from Lincoln Street is blocked by a chain linked fence to the south, and more chain link fencing and jersey barriers to the north. However, it should be noted that there is a gap between two of the jersey barriers, and a well warn footpath along the Brook. Clearly this access point is already being used by pedestrians in the area.

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<sup>5</sup> NMCOG 2012 Traffic counts

<sup>6</sup> MassDOT 2012 NMCOG Bridge Ratings

## Connecting Lowell: Linking to the Concord River Greenway.

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**Photo 5; Break in the chain link fence on Lincoln St.**

The area approximately halfway between Lincoln Street and Howard Street is relatively flat and a narrow footpath is already present. This footpath provides access to a number of encampments used by the homeless. Immediately north of Lincoln Street, on the west bank of the Brook, is a combined sewer overflow (CSO) structure, which in extreme rainfall conditions, allows combined storm and sanitary sewer to overflow into the Brook. There is a second CSO structure on the opposite bank approximately 100 yards north of Lincoln Street. Both of these structures are shown on Map 4.

The existing footpath ends about half way between Lincoln and Howard Streets and the vegetation becomes noticeably thicker and the slopes more significant. Currently, there is a chain link fence on the south side of Howard Street preventing access to the Brook. However, the slope is less significant in this section making the building of a greenway less difficult than in other sections previously noted.

Howard Street is a local road under the jurisdiction of the City, and carried 1,400 vehicles per day south of the Connector<sup>7</sup>. The Howard Street Bridge over the Brook is owned by MassDOT and considered to be in good condition with a 2012 AASHTO rating of 95.8.<sup>8</sup> On the other side of Howard Street, the MassDOT Maintenance Depot and Salt Shed cover the entire parcel. At this point, the Brook runs under the MBTA Commuter Rail lines. From this point, users of the greenway would have to travel on Howard Street, Hale Street and YMCA Drive, to Thorndike Street in order to access Gallagher Intermodal Center (MAP 5). Currently, no safe way to cross the MBTA rail lines from the Salt Shed has been identified.

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<sup>7</sup> NMCOG 2012 traffic counts

<sup>8</sup> MassDOT 2012 Bridge Ratings



## Connecting Lowell: Linking to the Concord River Greenway.

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**Photo 6: MassDOT owned salt shed on Howard St.**

Throughout this section of the greenway, there are several drainage structures servicing runoff from the Lowell Connector. All of the drainage structures directly discharge into the Brook, either by drainage pipes with outlets in the bank, or by discharge some distance from the brook, creating erosion gullies. It is nearly impossible to find or locate all these outfalls due to the very heavy vegetation and, in some cases, steep slopes. None of the basins appear to have oil separators. All of the basins found along this section of the Connector are shown on Maps 3 and 4. The maps also identify the locations of 16 catch



**Photo 7: Drainage structure on the Lowell Connector.**

basins, as the specific location and type of outflow of each catch basin will have an impact on how the greenway is designed. Additionally, there are two Combined Sewer Outflow (CSO) systems in the study area, draining into the Brook from Tanner Street.

There will be a number of environmental permitting issues associated with constructing a proposed Greenway along this section of River Meadow Brook. Should MassDOT provide funding for the project, all of the permitting procedures outlined in MassDOT's Project Development and Design Guide, specifically Chapter 11 on Shared Use Pathways and Greenways, would have to be followed. The details of these procedures are included in Appendix B. The number and type

of permits will in part depend on the final alignment of the greenway, the specific geometric aspects of

## Connecting Lowell: Linking to the Concord River Greenway.

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design and the presence of resource areas, and the methods of planned construction. There are no known priorities or estimated habitats of endangered species in the subject area, or any known historical structures.

There are clearly wetland and riverfront permitting issues that will need to be addressed. The scope of the wetlands permit(s) will depend on the extent of actual wetlands, the wetlands buffer, and the 25 foot riverfront area, impact on the bank of the Brook, the limit of the flood plain, excavation, soil type, sediment, slope stabilization, and drainage. All of these issues will need to be researched by a qualified wetlands scientist, a surveyor and a civil engineer. At a minimum, based on field observations, there will be impacts on the bank in the vicinity of the drainage outfalls from the Connector, significant tree and vegetation clearing, and slope excavation with associated fill and stabilization.



**Photo 8: CSO on River Meadow Brook.**

A MEPA filing will likely be required. However, actual engineering and wetland delineation would have to be undertaken to make this determination. Some of the potential MEPA thresholds that might be met include: alteration of  $\geq 5,000$  ft<sup>2</sup> of bordering vegetative wetlands, altering  $\geq$  one half acre of wetlands or alteration of  $\geq 500$  linear feet of bank. (The distance from Plain Street to Lincoln Street is 1,320 ft. A 5' wide path would therefore equal 6,600 ft<sup>2</sup>, not counting the additional work for drainage, slope stabilization, fill, excavation, etc.) Given that the distance from

Plain Street to Lincoln Street is 1,320 ft.; the distance from Lincoln Street to Howard Street is 1,938 ft.; and MassDOT design standards require a minimum width of 8 feet for a multi use path; the total area of the path would be at least 26,064 square feet.

A Chapter 91 permit/license may be required given that the Brook does not necessarily meet the exception in 301 CMR 9.04(1) (e) that states that a stream that is "not normally navigable during any season by any vessel including canoe, kayak, raft or rowboat"<sup>9</sup> is not jurisdictional. The trail, if constructed in any part of the Brook, such as a cantilevered boardwalk type structure, is an activity that would normally require a Chapter 91 permit/license. Therefore, MassDEP should be consulted on whether a permit/license is required. While the term "navigable" is not defined in 310 CMR 9.00, which is the regulation governing waterways, the courts have ruled that if a waterway is navigable in fact, it is navigable in law. It does not appear that an Army Corp of Engineers 404 permit would be necessary even if the stream is determined to be navigable.

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<sup>9</sup> Chapter 91

## Connecting Lowell: Linking to the Concord River Greenway.

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In conclusion, construction of a greenway adjacent to the Brook within the Lowell Connector right-of-way is feasible to construct using a boardwalk partially reaching over River Meadow Brook between Plain Street and Howard Street. However, a more detailed evaluation by a qualified wetland scientist and civil engineer is needed. Additionally, extensive design and environmental permitting will be necessary. Construction of the Greenway in this location will be challenging and costly, as will the required environmental mitigation that will be necessary to move forward. If the trail were to extend over the waterway, the underlying sediment must be examined for stability and type, to ascertain if it is suitable to support the pilings for any cantilevered platform or boardwalk. Any trail construction in the area, will require significant cutting and filling of the slopes, bank and/or stream bed. Erosion control and maintenance, both during and after construction, must be a priority given the steep slopes in most of the area.

Currently, there is no safe way to cross the MassDOT salt shed parcel or MBTA rail line. A structural analysis of the Lowell Connector Bridge over Howard Street could determine if it is feasible to cantilever a pedestrian bridge on the side of the bridge. However, using the existing facilities, Greenway users could access the Gallagher Terminal and Downtown Lowell from Howard Street.

### **II. Option I Analysis**

Option 1 begins at the entrance to the Bruce Freeman Rail Trail located at Cross Point and follows River Meadow Brook to Industrial Avenue. Crossing Industrial Avenue, the proposed trail follows an abandoned Boston and Maine rail line located immediately west of the Gervais car dealership. The trail crosses under the Lowell Connector via a railroad tunnel and continues along the rail line, crossing under Plain Street and Lincoln Street. After the rail line crosses under Lincoln Street, the trail would head east and join Maple Street, and then continue on Maple Street until it meets Gorham Street. Trail users would then cross under the railroad bridge on Gorham Street, head east on to Moore Street, and follow Moore Street until it intersects with Lawrence Street. The entrance to the Concord River Greenway is located north of Lawrence Street between the Concord River and the Lowell Cemetery, as shown on Map 2 on page 4.

#### **A. Cross Point to Industrial Avenue Segment**

Cross Point LTD Partnership owns and maintains the lot abutting the current terminus of the Bruce Freeman Rail Trail. Gaining permission to traverse the Cross Point property is essential to the viability of Options 1, 2 and 3, in terms of establishing a direct connection to the rail trail. A previous report by Massachusetts Audubon suggested that the 500-foot so-called “finger lot” parking area, adjacent to the existing rail trail and located along the northwest bank of the brook, be utilized to establish a trail. This would require either reconfiguring the parking area or eliminating 40 spaces entirely. The trail through

## Connecting Lowell: Linking to the Concord River Greenway.

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Cross Point could then be delineated using paint or by constructing a railing system or barrier. A small foot bridge would be needed to cross a drainage basin located near the entrance to the rail trail. The trail would then extend along the northwest bank of the brook to the sidewalk on Industrial Avenue.<sup>10</sup> Based upon the analysis performed for this report, NMCOG concurs with the recommendations put forth by Massachusetts Audubon.

Much of infrastructure is already in place for a pedestrian or bicyclist to navigate through the Cross Point Towers parking lots. Eight-foot wide sidewalks run along the southeast bank of the river from the access road that leads to the Bruce Freeman Rail Trail entrance all the way to Industrial Avenue. A crosswalk would need to be painted where each access road would cross the proposed trail, and warning signs for motorists alerting them that bicyclists and pedestrians are crossing would need to be erected.

The Audubon report indicated a desire to see a trail constructed along the northwest bank of the brook, in order to minimize the flow of traffic along the trail, and to maximize the aesthetic appeal of the view near the brook. While the desire to provide the user of the trail with the most enjoyable experience possible is understandable, these amenities would increase the cost of constructing the project. Therefore, utilizing existing infrastructure where it is available and safe and practical to do so, would allow available funding to be used on other sections of the trail where additional infrastructure is needed. Since this portion of the proposed trail is located on private property, the impacts on the property owner should be minimized. During site visits to the Cross Point property, it was noted that the grassy strip on the northwest side of the brook houses multiple drainage structures that would have to be mapped and addressed, as well as picnic tables and a guard shack which would need to be relocated.

There are a number of issues associated with constructing a trail in the Cross Point area. Given the proximity of the proposed trail to the brook, a number of environmental permits will be needed to address wetland and riverfront issues. The final number and type of permits will depend on the location and design of the trail, and the construction techniques used. In addition access and right-of-way will need to be acquired from the private property owner(s).

### **B. Industrial Avenue to Meadow Brook Shopping Center Segment**

Industrial Avenue is classified as an urban minor arterial with average daily traffic (ADT) of 9,000 vehicles per day east of the Lowell Connector northbound ramps, and an ADT of 12,300 vehicles per day south of

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<sup>10</sup>“ River Meadow Brook Natural Resource Inventory” prepared for the Lowell Parks and Conservation Trust, Liz Newlands, Massachusetts Audubon Ecological Extension Service

## Connecting Lowell: Linking to the Concord River Greenway.

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Route 110 (Chelmsford Street)<sup>11</sup>. To ensure the safety of bicyclists and pedestrians accessing and using the trail, accommodations for bicyclists and pedestrians should be implemented as part of the trail project. Currently, Industrial Avenue has two crosswalks: the first crosswalk is located at the intersection of Industrial Avenue and Chelmsford Street (Rte 110), and the second is across Industrial Avenue east of Lowe's Way. There is also a crosswalk located on Lowe's Way at Industrial Avenue.

The majority of this section of the trail would run along an abandoned rail line between the southeast bank of River Meadow Brook and the Gervais Auto Dealership at 6 Industrial Avenue. Aerial photos and



**Photo 9: Graffiti under the Lowell Connector**

field surveys indicate that there may be some encroachment into the rail right-of-way by adjacent property owners. The abandoned rail line crosses over River Meadow Brook and tunnels under the Lowell Connector, providing access across the heavily traveled highway. Inside the tunnel, there is evidence of youth socializing and graffiti is present on the tunnel walls. The ground is littered with refuse, which needs to be removed. The graffiti is quite impressive, and is not the work of novices, as shown in the photos below. If the trail were to be established through this tunnel, consideration should be given to allowing the graffiti to remain as public art. This would give this portion of the trail a unique identity from the rest of the trail.



**Photo 10: Graffiti under the Lowell Connector**

Upon leaving the tunnel, the vegetation is less dense and the land becomes upland meadow with scenic views of the brook. There is also a small railroad bridge crossing the brook as it heads north, allowing for a rare overview perspective of River Meadow Brook. A structural analysis will be needed to ensure that the bridge is structurally sound. The railroad bed continues northeast following the back edge of the Meadow Brook Shopping Center.

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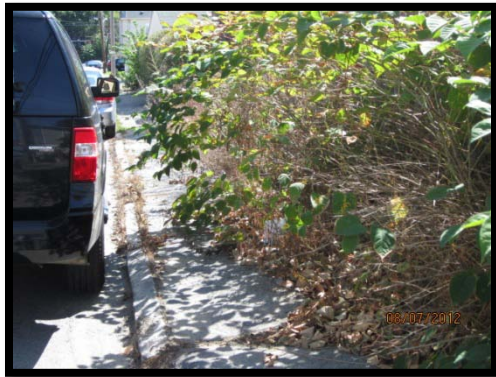
<sup>11</sup> NMCOC, 2011 Traffic Counting Report

# Connecting Lowell: Linking to the Concord River Greenway.

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## C. Meadow Brook Shopping Center to Maple Street Segment

Option 1 continues along the abandoned rail line for approximately 0.64 miles in a northeasterly direction, to the corner of Quebec Street and Maple Street. The trail then continues east down Maple Street to the intersection with Gorham Street (Route 3A). Maple Street is 31 feet wide and has a continuous six-foot wide sidewalk on the north side of the street. The south side of Maple Street has a five-foot wide sidewalk, but it does not run the entire length of the street. There is a crosswalk at the intersection of Autumn Street and Maple Street and another crossing on Maple Street.



**Photo 11: Brush crowding the sidewalk on Maple St.**

The greatest challenge to developing a trail along this segment is the need to acquire right-of-way along the former rail corridor through an easement or by acquisition in fee. The rail line north of the Lincoln Street Bridge is blocked with debris, heavy vegetation and furniture which will have to be removed if the trail is to extend to Quebec/Maple Street. The sidewalks on the north side of Maple Street appear to be in good condition, and navigable for people with disabilities. The sidewalks on the south side of the street are in fair condition but do not meet ADA standards. Obstacles such as hydrants, vegetation and utility poles make navigating the sidewalks difficult, especially for

those with mobility issues.

## D. Gorham Street to Concord River Greenway Segment

Leaving Maple Street, the trail turns north on to Gorham Street. Gorham Street (Route 3A), classified as an urban principal arterial, is a two-lane roadway with a north south orientation, and approximately 36 feet wide. Gorham Street carries approximately 16,400 vehicles per day<sup>12</sup> and provides access to Route 3 and I-495 via the Lowell Connector, and to downtown Lowell, the businesses and residences in southern Lowell, northeastern Chelmsford and northern Billerica. Sidewalks are found on both sides of Gorham Street along the majority of the roadway.

The route then immediately turns east on to Moore Street. Moore Street is classified as an urban collector and carries approximately 10,100 vehicles per day<sup>13</sup>. Moore Street is a two-lane roadway that runs in an east-west direction, connecting Route 3A and Lawrence Street. Land uses include dense residential development interspersed with some business and institutional uses. The roadway is

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<sup>12</sup> MassDOT 2007 Traffic Data

<sup>13</sup> MassDOT 2007 Traffic Data

## Connecting Lowell: Linking to the Concord River Greenway.

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approximately 28 feet wide and 0.49 miles long, and has a five-foot wide sidewalk that runs along both the north and south side of the street throughout the corridor. The sidewalks on the north and south side of Moore Street towards the Gorham Street intersection are in fair to poor condition and are not ADA compliant.

The route then continues along Moore Street until reaching Lawrence Street. At Lawrence Street, the proposed trail turns in a southeasterly direction and follows Lawrence Street over the Concord River to the Concord River Greenway. The Concord River Greenway is located off Lawrence Street on the east side of the Concord River next to the Lowell Cemetery.

### **II. Option 2 Analysis**

Option 2 begins at the entrance to the Bruce Freeman Rail Trail located at Cross Point and follows the same course as Option 1 until reaching the Meadow Brook Shopping Center on the east side of the Lowell Connector. The route continues along the edge of the American Paper Recycling property, ending at Industrial Avenue East. As Industrial Avenue East turns south, the proposed trail continues past Sterling Movers and into the parking lot of the Veteran's Community Care Center on Marshall Street. The trail would then cut through the wooded area at the northeast corner of the Veteran's Community Care Center parking lot and continue into the Westlawn Cemetery and cross Boston Road. The trail would then continue on to Saint Patrick Cemetery, along internal cemetery streets named Saint Martin Avenue and Saint Patrick Avenue. Once Gorham Street has been reached, the trail continues south along Gorham Street, and then turns east on to Lundberg Street to the intersection of Meadowcroft Street. The trail then follows Meadowcroft Street north, crossing an active rail line, to the intersection of Moore Street. The trail continues along Moore Street in an easterly direction to the intersection with Lawrence Street and users would then head southeast on to Lawrence Street and the Concord River Greenway.

#### **A. Industrial Avenue to Gorham Street Segment**

Option 2 begins at the entrance to the Bruce Freeman Rail Trail located at Cross Point and follows the same course as Option 1 until reaching the Meadow Brook Shopping Center on the east side of the Lowell Connector. The route then continues along edge of the American Paper Recycling Corporation for storage, ending at Industrial Avenue East. A sidewalk is located on the north side of Industrial Avenue East and continues to the main entrance of the Sterling Movers Company. As Industrial Avenue East turns south, the proposed trail continues past Sterling Movers and into the parking lot of the Veteran's Community Care Center at 130 Marshall Street. The proposed trail would then cut through the wooded area at the northeast corner of the Veteran's Community Care Center parking lot and continue into the Westlawn Cemetery and across Boston Road. From there, the trail would continue on

## Connecting Lowell: Linking to the Concord River Greenway.

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to Saint Patrick Cemetery, along internal cemetery streets named Saint Martin Avenue and Saint Patrick Avenue, to Gorham Street.

The most significant challenge to creating a trail along this segment is that most of the property is privately owned. The sidewalks along Industrial Avenue East provide a publicly-owned corridor but the trail, as it has been proposed, skirts the property lines of the companies in this area, or in the case of the Veteran's Community Care Center (VCCC), passes directly through the parking lot. A dedicated trail in this location would require the removal of some parking spaces. In addition, the Veterans Community Care Center property contains wetlands along the eastern perimeter of the property. When field visits were conducted in July 2012 standing water was not visible from Marshall Road, but water marks could be seen on the tree trunks and plants normally found in wetlands and bogs were flourishing. Any construction in or around the wetlands would require permitting from applicable state and local agencies, and would be subject to added costs for constructing a boardwalk within the wetland.



**Photo 12: Wetland vegetation at the edge of the pavement at the Veteran Community Care Center.**

As it stands today, the fence along the south west side of the Westlawn Cemetery property is continuous and without any access gates. If trail access is allowed at the Westlawn Cemetery, gates would need to be installed along the existing fence. Consideration must also be given to any plans the cemetery may have for future burial plots near the proposed trail. The Westlawn Cemetery has restrictions for use posted at each entrance. Regulations concerning access are as follows:

- The cemetery is closed to the public one hour after sunset until one hour before sunrise.
- Pets are not allowed on cemetery grounds.
- Jogging and bicycles are prohibited.



**Photo 13: Posted restrictions at Westlawn Cemetery**

If the trail is constructed at this location, the rules and regulations should be posted well in advance, so that visitors know what is expected of them before entering the grounds.



## Connecting Lowell: Linking to the Concord River Greenway.

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Photo 14: Saint Patrick Cemetery

The Saint Patrick Cemetery is owned by the Roman Catholic Archdiocese of Boston and allows public access between the hours of 8 A.M. to 7 P.M. in the summer and 8 A.M. to 4 P.M. in the winter. Dogs are also prohibited from the cemetery grounds.

### B. Gorham Street to Meadowcroft Street Segment

The trail continues south along Gorham Street for approximately .1 miles, turns east on to Lundberg Street, and continues for .27 miles to the intersection of Meadowcroft Street. The trail then follows Meadowcroft Street north for .32 miles, crossing an active rail line, to the intersection of Moore Street.



Photo 15: tree roots pushing through the sidewalk on Meadowcroft St.

The sidewalk on the western side of Meadowcroft Street is continuous from the Lundberg/ Meadowcroft Street intersection to 149 Meadowcroft Street. From that point, the sidewalk is intermittent until reaching Exchange Place where it ends. The sidewalk on the eastern side of the street is continuous throughout the length of the corridor, but is in poor condition, especially in the section between Lundberg Street and the railroad crossing. Roof drains from the businesses on this side of the street drain onto the sidewalk, producing areas of wet asphalt and many portions are impassable due to tree root damage.

### C. Moore Street to the Concord River Segment

From Meadowcroft Street, the trail turns east on to Moore Street and continues on Moore Street until reaching Lawrence Street. The trail then turns south on to Lawrence Street, crossing over the Concord River. The parking lot for the Concord River Greenway is located on the northeastern side of Lawrence Street, between the Concord River and the Lowell Cemetery. Lawrence Street is classified as an Urban Minor Arterial, and carried 10,000 vehicles per day in 2011. There are 5-foot sidewalks on both sides of

## Connecting Lowell: Linking to the Concord River Greenway.

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Lawrence Street, although there are no crosswalks located along this section of the roadway. A pocket park can be found on the western bank of the river, on the south side of Lawrence Street.

### **IV. Option 3 Analysis**

In order to connect the Bruce Freeman Rail Trail with the Concord River Greenway as quickly as possible at the least cost, an on-street route utilizing existing infrastructure was explored. This on-street route, referred to as “Option 3” and shown on Map 2, also presents fewer permitting challenges than the other options studied. The total mileage for Option 3, from the Bruce Freeman Rail Trail to the Concord River Greenway, is 2.74 miles. The route could be demarcated with signage along the side of the roadways, or be denoted using colored lines painted on the sidewalks or roadways throughout the length of the proposed route. Trail guides could be developed and offered at the northern terminus of the Bruce Freeman Rail Trail at Cross Point Towers and the southern end of the Concord River Greenway on Lawrence Street. These trail guides could also promote the landmarks, amenities, businesses and attractions that users might enjoy by going slightly off the path, such as Manning Park on Boston Road or Jack Kerouac’s burial site in the Edson Cemetery.

#### **A. Cross Point to Industrial Avenue East Segment**

Option 3 begins at the Bruce Freeman Rail Trail trailhead at Cross Point and initially follows the same route as Options 1 and 2. Much of infrastructure is already in place for a pedestrian or bicyclist to navigate through the Cross Point parking lots. Eight-foot wide sidewalks run along the southeast bank of the Brook to Industrial Avenue. If a trail were developed through this area, a crosswalk should be delineated where each access road meets the proposed trail, and appropriate warning signs should be installed.

After leaving Cross Point, bicyclists and pedestrians will head east toward Industrial Avenue East. A sidewalk network encircles the outside perimeter of the Industrial Avenue Rotary and crosswalks around the rotary allowing a safe route for navigating the rotary. Industrial Avenue East is forty-two feet wide, with eight-foot sidewalks along the westbound side of the road that are only broken up by the ramps to the Lowell Connector. East of the Connector ramps, the sidewalk is continuous. The eastbound side of the roadway has a continuous sidewalk throughout the length of Industrial Avenue East.

#### **B. Swan Street to Boston Road Segment**

From Industrial Avenue East the route continues on to Swan Street. Swan Street is functionally classified as an Urban Minor Arterial with an east/west directional orientation and an average daily traffic (ADT) of

## Connecting Lowell: Linking to the Concord River Greenway.

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4,900<sup>14</sup> vehicles per day. This road is approximately twenty-eight feet wide and has a four-foot sidewalk on the eastbound side of the street, beginning east of Bigelow Street and extending to the Boston Road intersection. Swan Street contains a mixture of light industry towards the Industrial Avenue East portion of the road, while residential homes are located in the center of the roadway segment, and the route is bounded by the Westlawn Cemetery to the north.

### **C. Boston Road to Gorham Street Segment**

From Swan Street, the route continues to Boston Road and then to Spencer Street. Boston Road is functionally classified as an Urban Collector between the Billerica town line and Spencer Street, while north of Spencer Street it is classified as Urban Minor Arterial. The Edson and the Saint Patrick Cemeteries border Boston Road to the east and north of Ayer Avenue. The eastern side of Boston Road contains a mix of homes and businesses while the western side of Boston Road, north of Spencer Street, contains primarily single-family homes.

Boston Road is one of the few streets within Option 3 that does not already have some existing pedestrian infrastructure in place. The right-of-way for Boston Road in the vicinity of Spencer Street is fifty feet wide, of which twenty-eight feet is paved, leaving eleven feet of right-of-way available for bicycle and pedestrian accommodations. If additional bicycle or pedestrian amenities are constructed, safety features would need to be taken into consideration, such as crosswalks at the Swan Street/ Boston Road intersection and at the Spencer Street/ Boston Road intersection.

Spencer Street is located between Boston Road and Gorham Street and is bordered by the Saint Patrick Cemetery to the north and the Edson Cemetery to the south. The street has an east/west orientation and is classified as an Urban Minor Arterial with an average daily traffic of 3,800<sup>15</sup> vehicles per day. The roadway is twenty-eight feet wide with a five foot sidewalk along the westbound side of the street that connects to the existing sidewalk network on Gorham Street. A crosswalk from the terminus of the Spencer Street sidewalk across Gorham Street would need to be installed for bicyclist and pedestrian safety.

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<sup>14</sup> NMCOG, 2011 Traffic Count Report

<sup>15</sup> NMCOG, 2010 Traffic Count Report

# Connecting Lowell: Linking to the Concord River Greenway.

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## D. Gorham Street to Stromquist Street Segment

After crossing Boston Road at Spencer Street, the route continues onto Corbett Street, a local road with an east-west orientation. The roadway is twenty-eight feet wide with on-street parking on both sides. Four-foot wide sidewalks run along both sides along the majority of the roadway, ending at 86 Corbett Street on the eastbound side and ending across from 60 Corbett Street on the westbound side. The sidewalk is in good to fair condition, but the presence of utility poles within the sidewalk means that the eastbound side not ADA compliant.



**Photo 16: Bridge over railroad tracks on Lundberg St.**

From Corbett Street, the route continues onto Stromquist Avenue. Stromquist Avenue runs in a north-south orientation. The section of Stromquist Avenue

studied for this report runs from the Corbett Street/Stromquist Avenue intersection to the Lundberg Street/Stromquist Avenue intersection, a distance of .16 miles. The roadway is twenty-eight feet wide with a six-foot wide sidewalk on the northbound side, and a four-foot wide sidewalk on the southbound side. The sidewalk is in good condition and continues along the entire length of the roadway on the southbound side. The road inclines slightly toward the Lundberg Street intersection to meet Lundberg

Street, just east of where Lundberg Street crosses over the railroad line. The incline is not very steep, but may prove to be an obstacle for users with limited mobility. The northbound sidewalk ends just north of Kathleen Circle, begins again at 12 Stromquist, and continues to the Lundberg Street intersection. If this route is chosen, it is recommended that the northbound sidewalk be utilized, since it is wider and has fewer obstructions within the sidewalk, when compared to the southbound side. Residents of Stromquist Avenue utilize on-street parking on both the north and southbound sides of the road. No signage exists denoting any parking restrictions.



**Photo 17: Stromquist Ave north of Corbett St.**

## E. Lundberg Street to Meadowcroft Street Segment

From Stromquist Avenue, the route continues to Lundberg Street. Lundberg Street is classified as an Urban Collector and runs in an east-west direction from Gorham Street (Rte 3A) to the Meadowcroft Street intersection. This study examined the section of Lundberg Street extending from the Lundberg

## Connecting Lowell: Linking to the Concord River Greenway.

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Street/ Stromquist Avenue intersection to the Lundberg Street/Meadowcroft Street intersection. The eastern end of Lundberg Street gently rises and crosses over railroad tracks, just west of the Meadowcroft Street intersection. Six-foot wide sidewalks run the entire length of Lundberg Street on both sides of the roadway. The sidewalks are in good condition.

From the terminus of Lundberg Street, the route would turn on to Meadowcroft Street and head northwest for .32 miles until reaching the intersection of Meadowcroft Street and Moore Street. As stated in the previous discussion of Option 2, the sidewalk on the western side of Meadowcroft Street is continuous from the Lundberg/Meadowcroft Street intersection to 149 Meadowcroft Street. From that point, the sidewalk is intermittent until Exchange Place where it ends. The sidewalk on the eastern side of the street is continuous throughout the length of the corridor, but is in poor condition, especially in the section between Lundberg and the railroad crossing. Roof drains from the businesses on this side of the street drain onto the sidewalk, producing areas of wet asphalt and many portions of the sidewalk are impassable due to tree root damage.

An at-grade railroad crossing occurs on Meadowcroft Street directly north of the Bolt Street intersection. The crossing has gates, as well as visual and audio warning devices, to prohibit vehicles from crossing when a train is approaching. However, this location lacks safety measures to prevent bicyclists or pedestrians from crossing the tracks as a train approaches.

### **F. Moore Street to the Concord River Greenway**

At the Meadowcroft Street/Moore Street intersection, users of Option 3 would turn east on to Moore Street, and proceed along Moore Street for .23 miles until arriving at the Lawrence Street intersection. At the Moore Street/Lawrence Street intersection the route turns south on to Lawrence Street towards the bridge crossing over the Concord River. The parking lot for the Concord River Greenway is located on the northeastern side of Lawrence Street, between the Concord River and the Lowell Cemetery. A pocket park can be found on the western bank of the river, on the south side of Lawrence Street.

Moore Street carries approximately 10,100 vehicles per day<sup>16</sup>, and is a two-lane roadway that runs in an east-west direction connecting Route 3A and Lawrence Street. Land uses include dense residential development interspersed with some business and institutional uses. The roadway is approximately 28 feet wide and .49 miles long. A five-foot wide sidewalk runs along both the north and south side of the street throughout the corridor. The sidewalks on the north and south side of Moore Street, towards the Gorham Street intersection, are in fair to poor condition and are not ADA compliant.

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<sup>16</sup> MassDOT 2007 Traffic Data

# Connecting Lowell: Linking to the Concord River Greenway.

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Lawrence Street is classified as an Urban Minor Arterial and has an average daily traffic (ADT) of 10,000 vehicles per day at the Concord River<sup>17</sup>. The northbound side of Lawrence Street has a five-foot wide sidewalk throughout the entire length of the street, allowing access to the Concord River Greenway from north and south of the Greenway. The southbound side also has a five-foot sidewalk, but it ends just south of the Concord River crossing.

## **V. Option 4 Analysis**

Option 4 was incorporated into this report based on comments received from the City of Lowell Mayor's Office. This most closely follows River Meadow Brook and connects the neighborhoods that were severed by the construction of the Lowell Connector.

Option 4 begins at the entrance to the Bruce Freeman Rail Trail at Cross Point Towers and follows River Meadow Brook along the same course as the previous three options until the trail reaches the Meadow Brook Shopping Plaza. The trail would then cross Plain Street and follow the brook along the Lowell Connector towards Howard Street.

The trail would then deviate from the brook and continue along an on-street portion of the trail that would be created on Howard Street and YMCA Drive. The trail would then lead to an existing foot path around the rear of the Gallagher Terminal property, following the train tracks toward Gorham Street, where the trail would emerge from the tracks and continue once more along the brook toward Gorham Street. The trail would then cross Gorham Street and follow River Meadow Brook along Chambers and Newhall Street. The trail would turn onto Crosby Street from Newhall Street and utilize an existing alley way, cross Whipple Street, and emerge on to Lawrence Street. The trail would end along the eastern shore of the Concord River, potentially along an easement at 538 Lawrence Street.

### **A. Cross Point Towers to Meadow Brook Shopping Plaza**

As stated above, Option 4 begins at the entrance to the Bruce Freeman Rail Trail located on the Cross Point Towers property. Cross Point Towers has already placed infrastructure around the edge of the brook and through the parking lot that services the Towers and the other businesses around the property. Eight-foot wide sidewalks are in place along the southeastern bank of the brook and a small bridge crosses the brook which will allow access from the BFRT entrance to the sidewalks already located on the southeastern bank. Crosswalks would be painted where each access road intersect the proposed trail and warning signs would be erected informing motorists that bicyclists and pedestrians would be active in the area. The sidewalk along the brook on the Cross Point Towers property would be

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<sup>17</sup> NMCOCG, 2011 Traffic Count Report

# Connecting Lowell: Linking to the Concord River Greenway.

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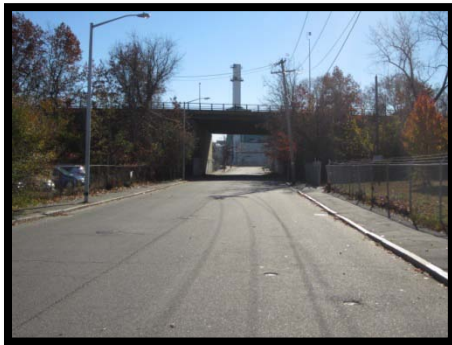
followed towards Industrial Avenue. The trail would cross Industrial Avenue and follow the abandoned railroad line under the Lowell Connector. The analysis for Options 1 and 2 describes this portion of the trail in greater detail.

## **B. Meadow Brook Shopping Plaza to Howard Street**

The trail would leave the abandoned railroad line at the southern edge of the Meadow Brook Shopping Plaza and would follow the brook north toward Plain Street. Crossing Plain Street, the trail would follow the western bank of the brook toward Howard Street, for a distance of 0.65 miles.

The section of the proposed trail between Plain Street and Howard Street will be the most difficult to construct under current existing conditions. The previous section entitled *River Meadow Brook Greenway Analysis- Plain Street to Howard Street*, details the issues that would need to be addressed to create a trail between the brook and the Lowell Connector under current conditions. If MassDOT and the City of Lowell decide to change the grade of the Lowell Connector to create a boulevard, thus creating at-grade intersections with the local streets, the construction of a trail would be much less difficult. Redesigning this section of the Connector would eliminate the grade changes and steep slopes that exist today, reducing the complex engineering that would otherwise be required, resulting in a simplified permitting process.

## **C. Howard Street to Chamber Street**



**Photo 18: Howard St looking towards the Lowell Connector.**

Due to some physical impediments, such as the MassDOT owned salt shed and the MBTA owned commuter rail lines, the trail would leave the west bank of the River Meadow Brook and continue on Howard Street. Howard Street is approximately 35 feet wide with 5 foot sidewalks along both sides of the roadway. If the roadway was re-striped so that the two travel lanes were reduced from 17.5 feet to 12.5 feet, a 5-foot wide bicycle lane could be constructed along both sides of

the street. The bicycle lane would be striped so that the flow of bicycle traffic mirrored the flow of vehicular traffic. The sidewalks would remain for pedestrian traffic.

## Connecting Lowell: Linking to the Concord River Greenway.

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**Photo 19: YMCA Dr. looking towards Thorndike St.**

Hale Street/ YMCA Drive are classified as urban local roadways and run eastward from the Chelmsford Street/ Lincoln Street intersection to the YMCA Drive / Thorndike Street intersection. From the Chelmsford Street/ Lincoln Street intersection to the bridge that spans the MBTA commuter rail lines, the street is known as Hale Street. From the bridge to Thorndike Street, the roadway is known as YMCA Drive. In 2011 an Automatic Traffic Count (ATR) was taken on YMCA Drive west of Thorndike and recorded an Average Daily Traffic (ADT) amount of 3,700 vehicles<sup>18</sup>.

Hale Street between Howard Street and the bridge is 31 feet wide with a 6 foot wide sidewalk on the eastbound side and a 10 foot wide sidewalk along the westbound travel lane. The shoulders are 2.5 feet wide along both sides of the roadway. The sidewalks and shoulders narrow slightly on the bridge spanning the MBTA commuter rail line. YMCA Drive, between the bridge and the Thorndike Street intersection, widens to accommodate the need turning radius and maneuvering space. This portion of the roadway is 36 feet wide with an 8-foot sidewalk on the eastbound side and a 6-foot wide sidewalk on the westbound side. Shoulders on both sides of the roadway are less than 1 foot wide in this location. The width of the bridge spanning the commuter rail line limits the potential roadway cross section in this area. Therefore, it is recommended that beginning at the Howard/Hale Street intersection the

travel lanes be reduced to 12 feet wide in each direction, and that a 5-foot wide bicycle lane be added adjacent to the eastbound travel lane, leaving enough room for a 1-foot shoulder on the westbound side of the road. Even though the roadway on either side of the bridge is wider, it may be prudent to keep this lane configuration along Hale Street to provide continuity. If a separate bicycle lane is not deemed desirable sharrows should be provided, along with “share the road” signage. Shared lane markings or sharrows, help convey to motorists and bicyclists that they must share the roads on which they are operating. The purpose of the markings is to create improved conditions for bicyclists, by clarifying where they are expected to ride, and to remind motorists to expect bicyclists on the road.



**Photo 20: Share the road signage.**

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<sup>18</sup> NMCOCG, 2011 Traffic Count Report



# Connecting Lowell: Linking to the Concord River Greenway.

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**Photo 21: Outlet leading to the rail road tracks at Gallagher Terminal**

Once the trail crosses the bridge, the proposed trail will leave the public roadways, turning on to the Gallagher Terminal access road. Users of the trail would follow the road towards an outlet which leads to a small clearing along the train tracks that currently has several worn footpaths.

Sidewalks should be

constructed along the access road from YMCA Drive to the Gallagher Terminal or at the very least to the outlet that

leads to the railroad tracks.



**Photo 22: Crossing under the Lowell Connector along the rail road tracks**

The trail would follow the railroad line under the Lowell Connector towards the northern bank of River Meadow Brook. The MBTA will

require that fencing be constructed to keep the trail

users away from the tracks. The span of the trail that crosses under the Lowell Connector is shielded from natural light and appears dark and uninviting, even during daylight hours. Lighting will need to be incorporated into the design for this section of the trail.



**Photo 23: Path following River Meadow Brook south of the Lowell Connector**

The trail would follow the brook eastward towards Gorham Street until River Meadow Brook crosses under Gorham Street and flows along Chamber Street.



**Photo 24: Chambers St facing Newhall St.**

Gorham Street has the infrastructure in place to accommodate pedestrians - a sidewalk runs along the southbound side of Gorham Street, from the Lowell Connector ramp for Route 3A south to the crossing of Gorham Street near Chambers Street. A crosswalk that connects the trail along the southbound side of Gorham Street to the proposed Chambers Street section will be needed. Due to the width of Gorham Street at this location, a refuge for pedestrians and bicyclists would be recommended as part of the cross walk design. This could be accomplished by widening the island located in Gorham Street at the Chambers Street intersection. A pedestrian light could also be considered

# Connecting Lowell: Linking to the Concord River Greenway.

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to enhance pedestrian safety. Further study will be needed to determine if MUTCD warrants are met at this location.

## D. Chamber Street to the Concord River

River Meadow Brook crosses under Gorham Street and heads eastward between Chambers and Livingston Street. The trail would cross Gorham Street and follow the brook eastward along Chambers Street to Newhall Street. Chambers Street is classified as a local street and has a roadway width of 20 feet with a 4-foot wide sidewalk along the westbound side. The majority of the structures are located along the westbound side of the roadway. The eastbound side of the road has only one business and the majority of the open space in the area is used for residential parking. The building located along the eastbound side of the street is very close to the edge of the brook, therefore it will be challenging to create a trail between the building and the brook. A sidewalk could be installed on the eastbound side of Chambers Street, which connects to the sidewalk network on Gorham Street. This sidewalk could lead trail users down Chambers Street, past Murphy Plumbing, to the open space that is currently used as parking by the residents. Construction of the sidewalk at the end of Chambers Street and locating the trail along the open space area will impact the residents currently using the property for parking. The path would also lead bicyclists and pedestrians to Chambers Park, which is located at the intersection of Chambers and Newhall Street.



**Photo 25: crosswalks at the intersection of Newhall and Crosby St.**

Newhall Street is a 27-foot wide local road with 5-foot sidewalks along the northbound side, and 4-foot wide sidewalks along the southbound side. Newhall Street is classified as an urban local road and runs from Livingston Street to



**Photo 25: Cat Alley between Crosby and Whipple St.**

Lawrence Street. Existing infrastructure could serve as the trail along this section, but the facility should be enhanced through way finding signage, stenciling on the pavement, or using different material for sidewalks and walkways, to ensure that users can easily follow the trail.

The trail will follow Newhall Street towards Crosby Street, turn left on to Crosby Street and right once on Crosby Street to access “Cat Alley”, a City of Lowell-owned passageway that runs from Crosby through Whipple to Lawrence Street.

From the alley, it is only a short

## Connecting Lowell: Linking to the Concord River Greenway.

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distance to a property owned by David Koch, Back Central's neighborhood president. The property at 546 Lawrence Street, opposite Watson Street, has



**Photo 27: Potential easement at 538 Lawrence St.**

been used as a neighborhood orchard. Recently, the property two houses down at 538 Lawrence Street was also acquired, directly across from the entrance to Cat's Alley. An easement along this property would allow for a trail connection to the Concord River Greenway. By



**Photo 26: Cat Alley between Whipple and Lawrence St.**

connecting the River Meadow Brook Trail to the Greenway here, a more direct route is established for those inclined to use the trail for commuting. Moreover, while crossing Crosby, Whipple and Lawrence Streets does create a few interruptions, this segment would be a quieter, more attractive trail connection for pedestrians and bicyclists compared to other options outlined in this report.

### VI. Findings

In researching the "missing connection" from the Bruce Freeman Rail Trail to the Concord River Greenway, NMCOG staff found that there are a number of issues associated with the four primary options presented in this report. The issues specific to each individual option have been discussed in earlier sections of this report, and it is important to note that each option is physically viable, assuming that there is community support and the ability to obtain the financial resources needed to design, permit and construct the project.

For each option, it will be necessary to obtain access or right-of-way over what is now private property. There are environmental impacts and associated permitting issues that will need to be addressed during the design phase, wherever construction is considered in an area subject to local and the State wetlands regulations. All four options involve streets and sidewalks that are not ADA compliant presently, and they will need to be brought up to current standards. Appropriate signage, striping and other accommodations will be needed to ensure the safety of pedestrians and bicyclists. Of all the options studied, the most expeditious and least costly connection would be established through Option 3, providing that the necessary private property easements, e.g. Cross Point, can be obtained. This may be an option that the City wishes as an interim measure.

The environmental permitting requirements that would have to be met to construct a trail along River Meadow Brook, between the Lowell Connector and the Brook, from Plain Street to Howard Street are extensive. Most of the corridor lies within the 25-foot riverfront area, which is protected under the

## Connecting Lowell: Linking to the Concord River Greenway.

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Massachusetts Wetlands Protection Act. In addition, there are stormwater structures and steep slopes that impede development of a trail. It will require extensive engineering to address these issues under current conditions. Cantilevering a walkway is one possible solution, but it will be difficult to permit and maintain, and expensive to construct. Furthermore, this solution may have significant impacts to ecology of the Brook.

While the option of constructing a trail along the Brook in the vicinity of the Meadow Brook Center Plaza off Plain Street was investigated, it was found not to be feasible given the steep grades (59%) that exist, unless an agreement can be worked out with the property owner to relinquish some of the existing parking area. Given the narrowness of the land area between the Connector and the Plaza property, significant engineering would be required and retaining walls would be needed to create a trail outside of the current paved area. In addition, there is a small channel running from the Connector into the Brook just north of the rail line that would have to be bridged.

NMCOG staff found that a trail along Tanner Street in the public right-of-way would be problematic. While the pavement width is 40 feet and the right-of-way is 50 feet wide, there are no sidewalks on either side of the roadway. Furthermore, many of the businesses along the street have extended their business activities up to the edge of pavement. In addition, the businesses along Tanner Street are either industrial, with significant truck traffic, or automobile-oriented, such as used car dealerships and repair facilities, which could create conflicts among pedestrians, bicyclists and vehicles.

While Option 4 opens up the Brook to the Public, it would require a long-term, phased approach. The idea of connecting people to the River Meadow Brook is important, and there may be opportunities to provide access in limited locations more immediately, in a way that minimizes impacts to resource areas. As part of the Tanner Street Planning Project, the City has an opportunity to work with area property owners to identify potential locations where access to the Brook can be opened up through future development projects and renewal initiatives. The City has approached MassDOT with a concept plan that involves de-elevation of the Lowell Connector from Plain Street to Gorham Street, creating a parkway. Should this plan come to fruition it would provide an opportunity to develop a trail as part of the project. Given the grading changes that would be needed to create the parkway, the environmental impacts related to the trail construction would be greatly reduced. The City may view this option as their long-term preferred alternative and work to assemble the needed access agreements as opportunities arise.