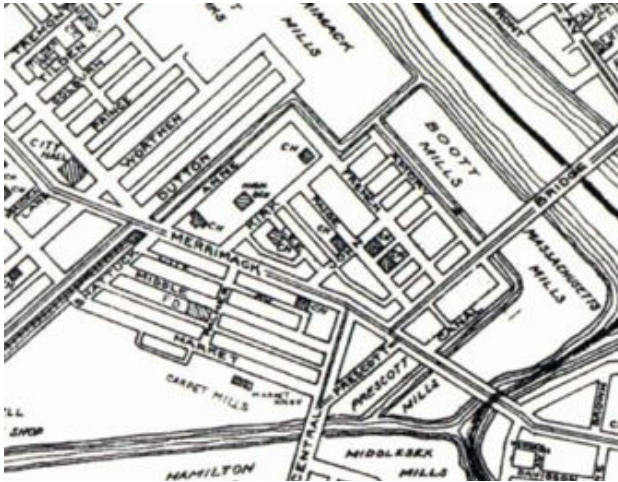


The streets are the arteries and veins of the city, and also its principal public spaces. While traffic is vital to sustain the life of a community, traffic patterns can cause inefficiencies in movement, impede retail viability, confuse visitors, and threaten pedestrian activity. The current one-way system in downtown begs study in terms of the trade-offs it presents, and opportunities for its reformation. Other downtown streets that encourage speeding must be considered for “road diets” and the inclusion of bicycle facilities. This section of the Plan takes a thorough review of downtown streets and makes specific recommendations for their modernization to fit a community focus on place and livability.



Before Arcand and Morrisette: This 1914 map shows the original downtown street network, including a connected Moody Street north of City Hall (at left).

Background

Downtown Lowell’s streets reflect its history as an industrial city. They follow the alignments of the canal system and provide land access to the mills and commercial buildings that were the city’s economic foundation. However, they also reflect more recent periods of its history, including the rise in automobile use after World War II and the need for cities—and especially their business districts—to accommodate these automobiles through parking. As Lowell matures and seeks to enhance its downtown, it should seek opportunities to tailor its streets to a new set of needs.

Lowell was blessed with a wonderfully extensive street network as a legacy of its founding fathers’ foresight. Downtown and the surrounding neighborhoods were built with a connected street system that, despite the presence of the two rivers and the industrial canals, provided the primary benefits of such a street framework: multiple route choices, good access to properties, and a great infrastructural capacity to subdivide and develop land. Over time, however, this network has been broken. The most notable causes of this disconnection are the Lowell Connector expressway and Dutton Street, the arterial that connects to it. The beneficial redundancy of routes and permeability that the town once gained from its street network have been severed in the name of the high speed travel enabled by the freeway-type design of these roads.

This lack of connectivity has repercussions not just for motorists, whose travel routes are extremely limited and, as a result, often congested. It has also likely contributed to the economic challenges faced by properties surrounding these facilities that remain discon-

nected from the vibrant downtown.

Interestingly, Dutton Street’s freeway-style design ends just south of downtown Lowell. This begs the question of why a high-speed design was not be carried all the way to the ultimate destination of most drivers. No doubt the City’s leadership eventually recognized the grave damage that such a highway would wreak upon its fragile historic downtown. It would appear that the last few thousand feet of freeway design along Thorndike and Dutton Streets, between the Lowell Connector and Broadway Street, provide negligible benefit to traffic flow. However, for the sake of any such benefit, much connectivity and virtually all quality of entry into downtown have been lost. Mitigating the impacts of this and similar reconfiguration is one goal of the proposals presented here.



Freeway, pedestrian mall, and 6000 parking spaces: The 1960s plan for Lowell, thankfully executed only in part, brought Father Morrisette Boulevard through the downtown in a continuous loop. The Morrisette/Arcand intersection can be seen to the upper left.

Streets in General

Balanced Street Design for Urban Areas

The last two decades have seen a renewed interest in urban living and a consequent focus on making urban infrastructure more responsive to quality-of-life concerns. The practice of street design has followed such a course, focusing on converting unnecessary travel-lane space to other uses, such as parking vehicles, bicycling, and walking. Such conversions are often referred to as “road diets,” even though they can often have net positive impacts on roadway capacity.

This change in thinking is rooted in an objective to provide high-quality, livable urban environments, yet there is more benefit to a balanced approach, even from a strictly vehicular perspective. The surrounding context of a street or road has become a critical factor in making design decisions, not simply because it defines the design constraints, but also because it defines motorist expectations. In urban areas, motorists have different expectations than in suburban or rural areas. Because of a network of blocks and streets with greater development densities, they understand that there is a need for more frequent turns, that vehicles parking on streets may momentarily slow traffic, and that there is likely to be more traffic in general. In suburban and rural areas, by contrast, lower densities and greater intersection spacing suggest to motorists that there are fewer impediments to freedom of traffic movement; as a result, these motorists are likely to tolerate less congestion.

With such an understanding in mind, the design of the street cross-section does not need to be focused on maximizing vehicular capacity in places where demand for such capacity is not present. In fact, road diets present multiple functional benefits when they

tailor a street’s capacity to its need, as presented in the recommendations in this section of the Plan.

Maintaining Adequate Flow

The above notwithstanding, this study was completed with a full understanding that many of Lowell’s downtown streets are congested much of the time. Head-shaking complaints about the 2:30 post-high-school peak and cut-through commuters are heard daily. The continued challenges to downtown traffic flow illustrate that widening roadways and adding lanes cannot shorten travel times if key intersections are experiencing delays. Lowell’s limited number of river crossings place an undue burden on Bridge Street and all the streets that connect to it, while the one-way system’s concentration of trips on the Dutton-Thorndike axis can put undue pressure on the Merrimack/Dutton intersection and others. These natural and manmade interruptions to an otherwise fine-grained network result in a lot of car storage—stacking—on streets that can actually handle considerably more traffic than their intersections allow them to. In this situation, additional roadway capacity only leads to speeding during off-peak hours, without reducing peak-hour congestion.

Such a system can be optimized by improved intersection design and synchronized signalization, the latter a relatively inexpensive fix that should be undertaken before the former is considered. But independent of that effort, the above understanding of how the system functions explains why many streets in the downtown can receive road diets without significantly reducing network capacity.

That said, every street required individual study. The

revised circulation patterns and roadway configurations proposed below were fully modeled in a Synchro traffic simulation program, and are presented with confidence that the resulting traffic flows will meet a level of service appropriate to a downtown environment. More information on the traffic-simulation model can be found in this Plan’s Appendix.

A Focus on Walkability

Perhaps the greatest decline in urban mobility has been in infrastructure and facilities for the pedestrian. Street widening to accommodate vehicles has often come at the expense of streetscape and sidewalks, especially when buildings prohibit expansion of right-of-way. This Plan promotes a richer, more functional pedestrian environment as a principal driver of balanced street design.

Walkability, however, is about more than sidewalks. Pedestrians are to cities what canaries were to coal mines. Their presence is an indication of a life and vibrancy that is clear to any visitor. The absence of pedestrians sends a signal to everyone that they are in a place which one leaves when finished with business. Other components of the physical environment and street design are instrumental in providing a better pedestrian realm, including those discussed in the following paragraphs.

A Safe Walk

While crime is always a concern, most people who avoid walking do so because the walk feels dangerous due to the very real threat of vehicles moving at high speed near the sidewalk. Statistically, automobiles are much more dangerous to pedestrians than crime, and

the key to making a street safe is to keep automobiles at reasonable speeds and to protect pedestrians from them. This is achieved by meeting the following criteria, each of which will be addressed individually:

- A network of many small streets;
- Lanes of the proper width;
- Limiting use and length of left-hand turn lanes;
- Avoiding swooping geometries;
- Limiting curb cuts;
- Two-way streets;
- Continuous on-street parking; and
- Continuous street trees.

A Network of Many Small Streets

Generally, the most walkable cities are those with the smallest blocks. This is because many small blocks allow for many small streets. Because traffic is dispersed among so many streets, no one street is required to handle a great amount of traffic, and that traffic does not reach a volume or speed that is noxious to the pedestrian. In a recent California study, cities with larger blocks suffered more than three times as many vehicular fatalities as cities with smaller blocks. (Marshall and Garrick: "Street Network Types and Road Safety.") Downtown Lowell is made up of relatively small blocks, and therefore has a porous network of many streets. However, because many of these streets are one-way, the network is only half as porous as it appears. Streets like Market, which are sized for moderate-speed two-way traffic, instead carry high-speed one-way traffic. Additionally, around the JFK Civic Center, we can see what happens when the network is snipped, with traffic concentrated on the high-speed streets of Arcand Drive and Father Morrisette Boulevard. This is predictably the least walkable part of downtown.

Lanes of Proper Width

Different-width traffic lanes correspond to different travel speeds. A typical urban lane width is 10 feet, which comfortably supports speeds of 30 MPH. A typical highway lane width is 13 feet, which comfortably supports speeds of 60 MPH or more. Drivers instinctively understand the correlation between lane width and driving speed, and speed up when presented with wider lanes, even in urban locations. For this reason, any urban lane width in excess of 10 feet encourages speeds that can increase risk to pedestrians. This 10-foot dimension is entirely consistent with the AASHTO Policy on Geometric Design, a national guidebook. A number of streets in downtown Lowell contain lanes that are 12 feet wide or more, and drivers can be observed approaching highway speeds when using them.

Limiting Use and Length of Left-hand turn Lanes

Left-hand turn lanes are by no means the standard approach to intersection design. They should be used only at intersections where congestion is caused due to cars turning left. Four-lane streets with limited volumes do not need left-hand turn lanes, as the right lane provides an unimpeded path through the intersection. When unnecessary left-hand turn lanes are provided, the extra pavement width encourages speeding and lengthens crossing distances. When justified, left-hand turn lanes should be just long enough to hold the number of cars that stack in them in standard rush-hour conditions. When they are longer, they create excess unused pavement that could otherwise be used for on-street parking. Downtown Lowell does not generally suffer from an excess of left-hand turn lanes because they are made unnecessary by its one-

way circulation system; any return to two-way traffic must be certain to use left-hand turn lanes judiciously, and not oversize them.

Avoiding Swooping Geometries

Pedestrian-centric environments, particularly in cities, can be characterized by their rectilinear and angled geometries and tight curb radii. It is rare to find a swooping curve in a walkable city, except when it forms the edge of a circular or oval park. In contrast, suburban auto-centric environments are characterized by long, swooping curves and generous curb radii that collectively allow drivers to coast through intersections without slowing down signifi-



Smaller blocks and narrower streets characterize the most walkable parts of downtown.

Streets in General

cantly. Wherever suburban swooping geometries are introduced into otherwise urban cities, cars speed up, and pedestrians feel unsafe. Father Morrisette Boulevard, Arcand Drive, and Warren Street are three locations where the downtown has been retrofitted with higher-speed suburban street geometries.

Limiting Curb Cuts

Every time a driveway crosses a sidewalk, pedestrians are endangered. In most downtowns, only rear alleys are allowed to break the curb, at a rate of one per block face. Entries into parking lots and structures, when not from alleys, must be limited and



Large blocks and wider streets create an inhospitable pedestrian environment while also providing less vehicle capacity than a porous grid.

well marked. When it crosses a sidewalk, a driveway should maintain the material of the sidewalk to indicate the continuity of the pedestrian route. Drive-throughs and drop-offs—in which a vehicular path cuts into the sidewalk for driver convenience—are a suburban solution that does not belong in cities. Any drive-throughs should be accessed off of rear alleys, and drop-offs can be accomplished simply by reserving a few parking spaces for that use. Downtown Lowell is relatively free from such curb cuts, but those places where they do exist—such as along East Merrimack Street—are noticeably less welcoming to pedestrians.

Two-Way Streets

Drivers tend to speed on multiple-lane one-way streets because there is less friction from opposing traffic, and because of the temptation to jockey from lane to lane.



Downtown residents complain that drivers routinely reach 50 MPH on this stretch of Market Street, with its two oversized one-way lanes.

Whichever lane you are in, the other seems faster. In contrast, when two-way traffic makes passing impossible, the driver is less likely to slip into the “road racer” frame of mind. Speeding in Lowell’s one-way network is most evident on Market Street, but it occurs as expected throughout the system. Incidentally, one-way streets can also be detrimental to downtown businesses due to the way they limit the visibility of cross-street storefronts, as the attached graphic illustrates.

Continuous On-Street Parking

On-street parking provides a barrier of steel between the roadway and the sidewalk that is necessary if pedestrians are to feel fully at ease while walking. It also causes drivers to slow down out of concern for possible conflicts with cars parking or pulling out. On-street parking also provides much-needed life to city streets, which are occupied in large part by people walking to and from cars that have been parked a short distance from their destinations. A number of streets in downtown Lowell, like Dutton, have lost their parallel parking in order that additional travel lanes could further ease traffic flow. The resulting unprotected sidewalks are not hospitable to walking, and the lack of on-street parking capacity has contributed to the need for unattractive surface parking lots.

Continuous Street Trees

In the context of pedestrian safety, street trees are similar to parked cars in the way that they protect the sidewalks from the cars moving beyond them. They also create a perceptual narrowing of the street that lowers driving speeds. A consistent cover of trees can go a long way towards mitigating the impacts of an otherwise uncomfortable street space. Lowell has recognized this benefit,

and has recently added street trees in some key locations. But sparse tree spacing on certain im-



A “pork chop” on Warren Street communicates a higher-speed, auto-oriented environment.

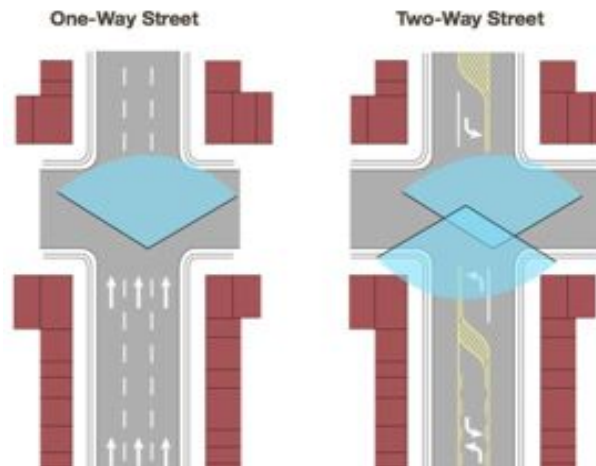
portant streets, including Merrimack and Market, creates an uneven level of pedestrian comfort in the downtown. In some cases, underground vaults impede the insertion of tree pits, but there are fewer such impediments than the number of missing trees would suggest.

While we are on the subject of trees, it is worth stressing that most cities underestimate the value of healthy street trees. This is an easy error to make, because it is difficult to monetize the short- and long-term benefits of consistent tree cover. But the benefits are great, and include the following:

- absorption of the first 30% of most precipitation, reducing storm-water runoff;
- 5 to 15 degrees local sidewalk heat reduction in summer;
- 4 to 7 degree reduction in overall urban temperature in summer;

- ultraviolet ray protection;
- significant absorption of tailpipe emissions;
- significant reduction in ozone;
- \$15-25,000 increase in typical home or business value;
- 12% higher income streams to businesses;
- 40% to 60% lengthening of pavement life.

It is plain to see how many of the benefits above ultimately accrue to City coffers. City tree-planting and maintenance policy, including the use of structural soils to ensure long life, should reflect this powerful reality. Indeed, once you do the math, it seems fiscally irresponsible to not plant trees in great quantity until consistent cover is achieved. Towards this end, it is recommended that the City launch



In a one-way street system, fully half of the businesses on cross-streets lack driver visibility. Moreover, one-way systems can result in certain shops only receiving adequate traffic half the day—and sometimes the wrong half. For example, a breakfast shop that is located along the path out of town will only entice visitors once it has closed.

a *Lowell Continuous Canopy Campaign*.

The above eight criteria have been brought to bear on the analysis and recommendations that follow, in terms of both the general circulation pattern and the individual street designs. All of this chapter’s proposals are made in service of a single larger goal: to improve the pedestrian—and driver—experience downtown without contributing significantly to traffic delays.

Traffic Circulation

Among first-time visitors and long-time locals alike, the most frequent complaint one hears about downtown regards the one-way circulation system. Visitors describe the many minutes spent circling—often lost—in search of a destination. Locals describe their frustration at having to drive great distances to reach nearby destinations. Both of these situations deserve our attention.



Visitors walking along Dutton Street to the American Textile History Museum must brave a narrow sidewalk against highway-width driving lanes, protected by neither parallel parking nor street trees.

Streets in General

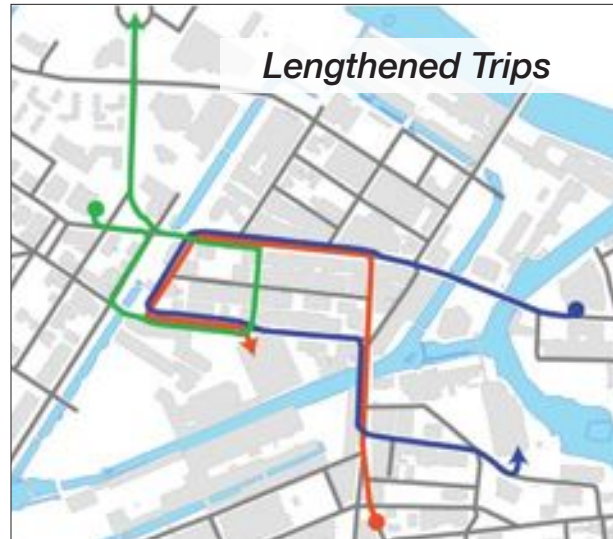
Existing Conditions

All one-way systems have the potential to create driver confusion, but in Lowell, that confusion is particularly profound, as the underlying street network lacks clarity; most cities with one-way systems benefit from a simple rectilinear grid. Lowell's overlay of a one-way system upon a cranky medieval-style street network can objectively be said to have created one of the most disorienting downtowns in America. For first-time visitors (such as this author), that confusion can lead to many minutes wasted circling in search of a destination.

Similarly, all one-way systems result in lengthened trips, but few such systems are applied to cities with as many discontinuities as Lowell. Because its limited canal crossings have resulted in an interrupted street grid, one-way loops take drivers much farther out of their way than is the norm in other cities. Some of the more preposterous trips are shown in the accompanying graphic. In addition to causing frustration, these long trips share another feature, which is that they all bring drivers through the very same few intersections, especially the confusing concatenation of Dutton, Merrimack, and Arcand. This combination of lengthened trips and concentrated traffic undermines much of the efficiency that the one-way system was intended to provide.

Which reminds us of a joke. A traffic engineer was once presented with a great idea for improving traffic flow. His colleagues told him, "it's really effective. It has been shown to work very well in practice." "That's fine," he responded. "But how does it work in theory?"

The one-way system in Lowell is an excellent example of an idea that works well in theory. In practice, it also



- Lowell Auditorium to Lower Locks Garage
- Central Street to Roy Garage
- City Hall to Tsongas Center

provides some distinct advantages that should not be overlooked. These include principally the capacity to allow unimpeded left-hand turns without sacrificing parallel parking, both important to a busy downtown. Any changes considered to the existing system must be accomplished with little or no loss of curbside parking, and must provide left-hand turn lanes where that motion is common. This mandate limits the extent of changes that are possible but, as we shall see, is far from prohibitive.

Proposed Modifications

A full range of one-way to two-way conversions was considered and modeled in this study, including a

complete conversion of the entire system. Certain streets were quickly eliminated from the discussion because they could not accept two-way traffic without losing important parallel parking and/or turn lanes; these included Middle, Palmer, and Prescott Streets. The key street under intense scrutiny, necessarily, was Merrimack, whose surprisingly low traffic volumes suggest that a return to two-way traffic could be accomplished with little increased congestion. This solution was ultimately rejected, however, due to the fact that an inefficient and hard-to-change loading-zone regime would make the street's businesses extremely difficult to service in a two-way configuration. However, as will be described, one block of Merrimack can easily be converted with benefits to the larger system.

Beyond Merrimack, it was determined that the remaining one-way streets in the downtown core could all be returned to two-way traffic—Market, Central, and Shattuck—thus creating a far less circuitous



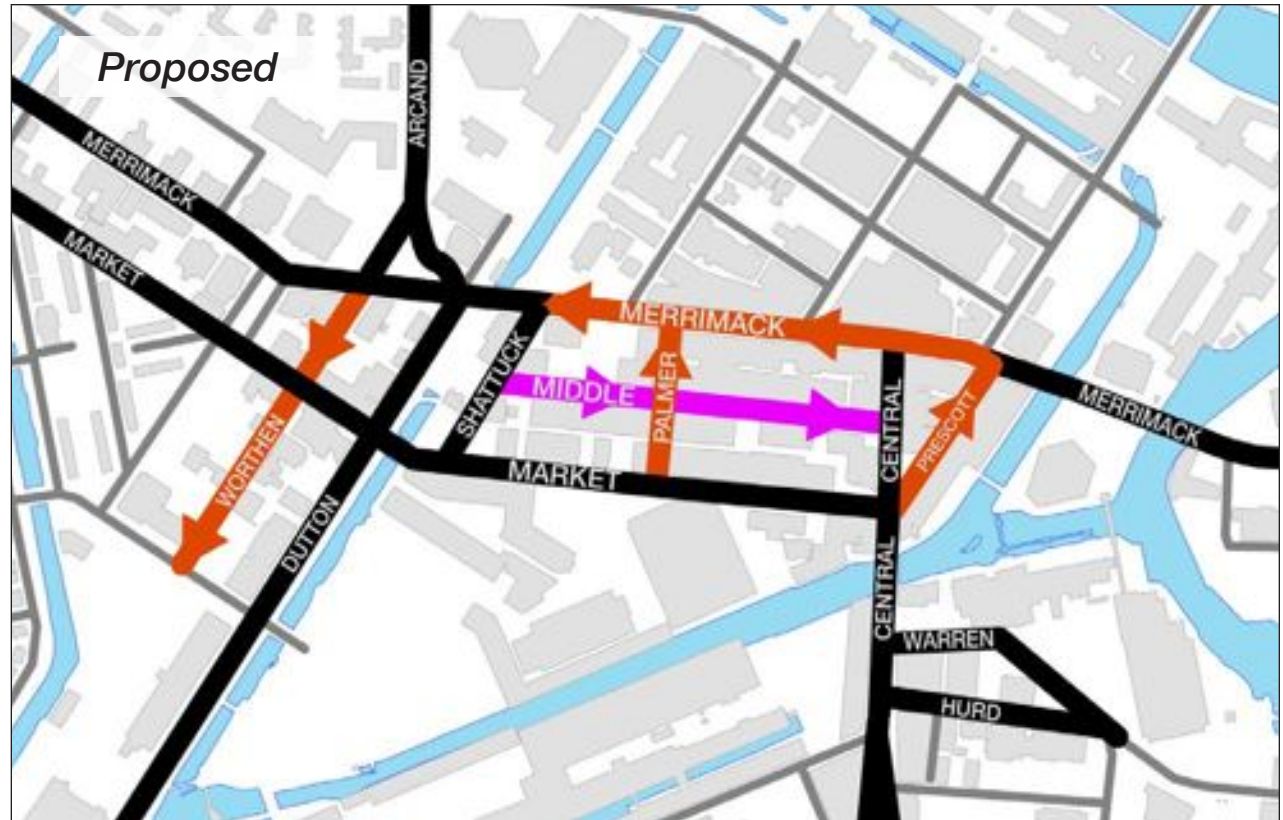
Theory vs. practice: Illegal truck unloading causes unanticipated backups on Merrimack Street.



system. Across the Lower Locks, Warren and Hurd Streets were also deemed easily returned to two-way traffic, simplifying trips, reducing visitor confusion, and slowing vehicle speeds to a more pedestrian-friendly standard.

It is encouraging to know that similar two-way conversions have been accomplished on Lowell's Appleton and Middlesex streets, the latter as recently as 2006, with only positive outcomes and supportive public comment. That experience mirrors a nationwide trend and a growing body of literature documenting the growing number of cities—more than a hundred nationwide, including West Palm Beach, Chattanooga, and Minneapolis—in which similar conversions have contributed significantly to downtown revitalization.

It is clear that the changes proposed here are not minor and will take some getting used to, but their anticipated benefits—based on experience, not theory—are expected to far outweigh their cost and temporary inconvenience.



Key Recommendations

- 1 Monument Square: two-way Worthen
- 2 Merrimack: eastbound lane to Shattuck
- 3 Shattuck: two-way
- 4 Market: two-way
- 5 Middle: Flow reversed
- 6 Central: two-way
- 7 Warren and Hurd: two-way

Traffic Analysis

The Evolution Plan study team performed traffic analysis to test the performance of downtown Lowell's transportation system after implementation of the Plan's recommendations. As the Plan was focused on Lowell's historic downtown core and surrounding neighborhoods, the traffic analysis covers a relatively small portion of the city; however, many of the intersections and streets analyzed are critical links to regional connections in and out of downtown. Many of the recommenda-

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tions discussed in this Plan report relate to streetscape and pedestrian enhancement, and the primary actions that would affect traffic operations are the conversion of one-way streets to two-way operations.

This analysis was undertaken to illustrate two principle outcomes: how well downtown processed vehicular traffic if certain one-way streets were converted to two-way traffic flow, and how this system would continue to work in the future if traffic increases from new development and population growth. With this, the Plan study team assumed an alternative distribution of traffic onto the street network to represent newly-available travel patterns. These included, among other reassignments, that morning traffic from across the Merrimack River on Bridge Street would now access the Roy Garage directly using Central and Market Streets, and not proceed through the downtown 'loop,' and that traffic accessing Dutton Street in the afternoons could use Market in addition to Merrimack. The team also forecast traffic growth into the future, assuming that it would increase by one percent per year (or a total of over 22 percent during the 20-year period for which traffic growth was assumed).

Generally speaking, traffic volumes throughout downtown Lowell are relatively evenly distributed and are not heavily focused on one street or even a small number of intersections. For this reason, the traffic analysis suggests that few intersections experience significant congestion today. However, it is the combined effect of multiple intersections in close proximity and the unique layout of downtown Lowell's street system that complicates the real-time performance of the system and leads to motorist perceptions of traffic congestion.

When changes are made to the flow of the street system

through two-way conversions, most intersections studied do not experience significant increases in congestion, even with the application of over 20 percent of additional traffic into the future. Those intersections that do experience notable increases in congestion do so primarily because of an increase in movements that compete for signal phase time, and the analysis explored a number of mitigation approaches to reduce overall delay. The Traffic Analysis Table on the following page details these particular intersections and discusses what recommendations would help to mitigate problems. It should be noted that even with forecast traffic growth and several changes in traffic flow, no intersections operate at a failing level of service by conventional engineering standards.

TRAFFIC ANALYSIS TABLE

Refer to Appendix A for a more detailed discussion of the traffic analysis and its assumptions, as well as detailed output reports from the traffic software models constructed for the purposes of this analysis.

Intersection	Today's Traffic and One-Way Streets				2030 Traffic with Recommended Two-Way Streets				Recommendations for mitigating potential traffic problems
	Morning Peak Period		Afternoon Peak Period		Morning Peak Period		Afternoon Peak Period		
	Level of Service	Average Intersection Delay	Level of Service	Average Inter-section Delay	Level of Service	Average Inter-section Delay	Level of Service	Average Inter-section Delay	
Merrimack at Prescott-Bridge	B	12 sec	B	20 sec	B	14 sec	B	12 sec	
Merrimack at Central	A	8 sec	A	8 sec	B	11 sec	B	11 sec	
Merrimack at Dutton	A	9 sec	A	10 sec	B	11 sec	B	11 sec	
Merrimack at Worthen	A	6 sec	A	5 sec	B	6 sec	B	11 sec	
Market-Prescott at Central	B	13 sec	B	11 sec	D	40 sec	C	21 sec	
Market at Dutton	E	78 sec	F	87 sec	B	18 sec	B	17 sec	Use signal timing that allows northbound and southbound traffic to share a phase. This may require new signal infrastructure in the future.
Market at Roy Garage Entrance	Not evaluated under one-way traffic patterns				C	31 sec	B	11 sec	If westbound left turns into the garage are desired with two-way traffic, add a traffic signal that gives these turns a protected phase.
Broadway at Dutton	C	23 sec	C	34 sec	B	16 sec	C	20 sec	
Arcand at Worthen	A	No delay	A	No delay	A	1 sec	A	1 sec	
Arcand at Father Morissette	B	14 sec	B	16 sec	D	38 sec	C	31 sec	Consider an actuated signal to provide protected turning phases when needed but to make the most efficient use of signal time outside of peak periods.
French at Bridge	B	11 sec	B	11 sec	B	11 sec	B	14 sec	

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Bicycle Accommodation

Given its large student population, it is surprising to see how few people ride bikes in downtown Lowell. Of those few that do, most seem to occupy the sidewalk, inconveniencing pedestrians. Both of these circumstances result not from any local cultural tradition, but rather from a street network that is unaccommodating to bicyclists in the extreme. Bicycle facilities of any sort are rarely visible, and potential bicyclists respond to this condition principally by choosing to drive instead.

It need not be this way. The last decade has witnessed a dramatic resurgence of bicycling in American cities, largely the outcome of specific local improvements in bicycle infrastructure. In New York City, for example, a commitment to an upgraded bike network caused a 35% increase in bicycling in one year alone. The experience in most places has been “build it and they will come.”

Becoming more welcoming to bicyclists is important to Lowell's future success. As many younger (and some older) adults turn increasingly to biking as a more affordable, healthy, and sustainable alternative to driving, those cities that have superior biking systems will win them as residents. This group is one of the key demographics repopulating Lowell's downtown and, for many of them, the current lack of biking infrastructure is a significant black mark that they must choose to overlook.

Lowell deserves some sympathy for its current condition, as it has been very difficult to consider adding bike lanes to historic narrow streets, some of them

cobblestone, that are already overtaxed with other uses. Fortunately, an effective bike network need not include every downtown street, or even the majority of them. Rather, it must connect key destinations and communicate the fact that bikes are welcome. This end is achieved through a variety of means, only some of which require dedicated roadway.

Design

An effective cycling network consists of three basic types of facilities: bicycle paths, bicycle lanes, and shared routes. Bicycle Paths are physically separated from traffic and often occupy parks. Bicycle lanes are demarcated within moderate-speed roadways and are ideally 5' wide. Shared routes—the majority of thoroughfares—are low-speed streets in which cars and bikes mix comfortably; shared routes holding high volumes are best demarcated with a “sharrow” insignia that reminds drivers of the cyclists' presence. All three of these facility types must be put to use if Lowell is to establish an effective network. Fortunately, such infrastructure is not expensive; the major cost, which must be committed to up front, is their regular repainting—sometimes every spring.

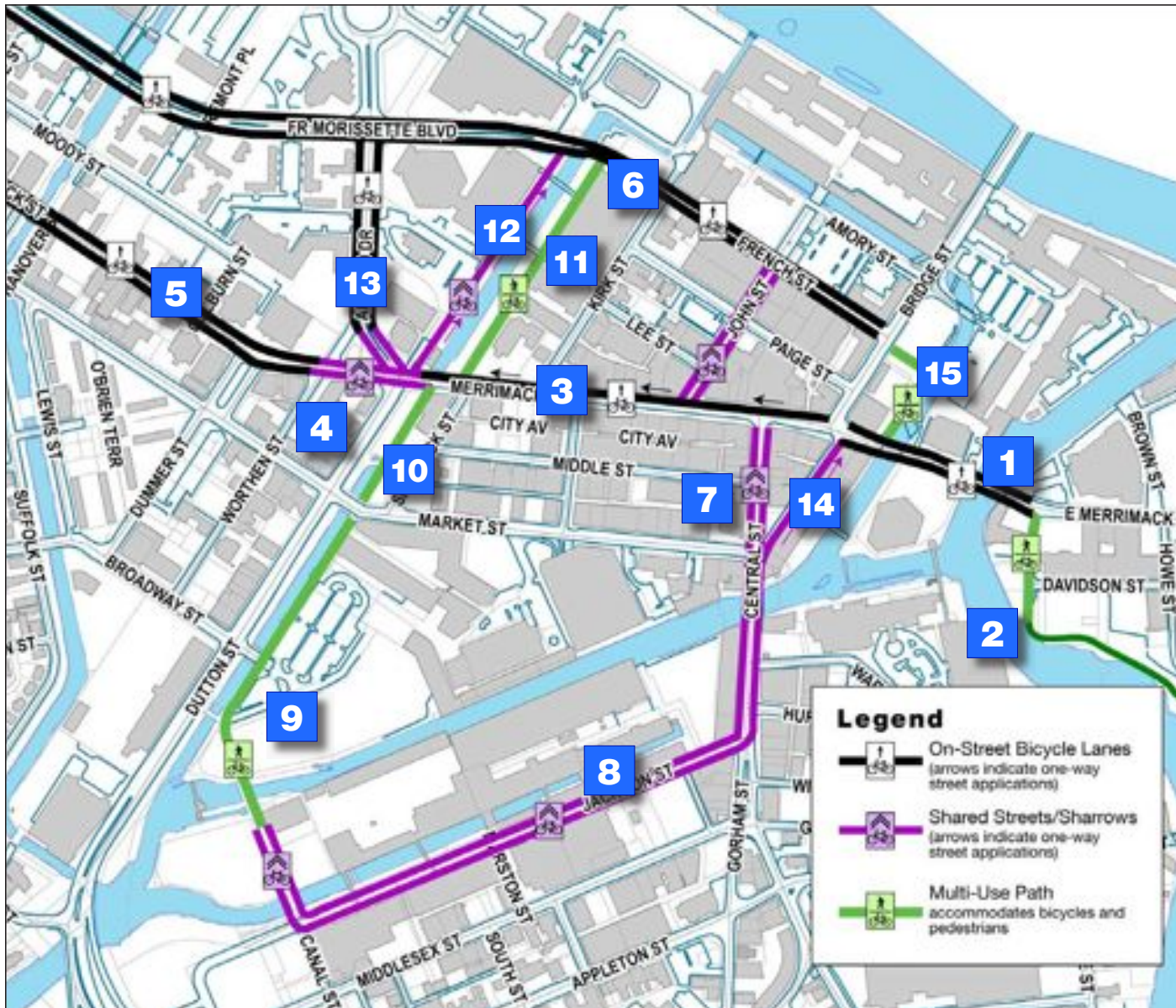
In creating a bicycle network for Lowell, a number of key destinations were identified. These include the following:

- The downtown core between French and Market Streets;
- Lowell High School;
- The three campuses of UMass Lowell;
- The main Middlesex Community College campus;
- The Gallagher Intermodal Transportation Center;
- The Merrimack River bridges and;
- The almost-completed 200-mile Bay Circuit Trail.

As visible in diagram at right, the proposed bicycle network includes all three facility types, and can be further described as follows:

1. Bike lanes are placed on Merrimack from Bridge to Davidson, connecting the MCC campus and the Lowell Civic Auditorium to the downtown core.
2. A clear path south of East Merrimack connects to the Bay Circuit Trail along the Concord River.
3. Westbound Merrimack is restriped to include a westbound bike lane.
4. Sharrows are placed through the Ladd and Whitney Monument Square intersection to carry the bicycle connection through to West Merrimack.
5. Merrimack is restriped west of Memorial Square to include bike lanes.
6. Bicycle lanes are added to French and Father Morrisette Boulevard.
7. Sharrows are placed on Central from Merrimack to Jackson.
8. Sharrows on Jackson complete the loop to the Hamilton Canal District.
9. A sharrow and a multi-use path run through the Hamilton Canal District, as outlined in the District Master Plan. From here, the network continues south to reach the Gallagher Transportation Center.
10. A multi-use path is formalized along the Merrimack Canal between Market and Merrimack.
11. The existing trail between Merrimack and French is used to connect through Lucy Larcom Park on the Lowell High School campus.
12. A proposed LHS redesign extends Dutton into a one-way sharrow.

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13. Arcand Drive is restriped to receive bike lanes between Merrimack and Morrisette.
14. Sharrows are added to the right lane of Prescott to allow cyclists access to Merrimack without dismounting between Central and Prescott.
15. A connection through Jack Kerouac Park between French and East Merrimack is made up of an east-west path along the south edge of the park and a north-south path along the canal.

Most of these modifications are illustrated in greater detail in the individual street reconfigurations that follow.

A final note: with all the talk about biking and bikeways, it is easy to overlook the need for bike racks, which seem to be in short supply, both downtown and at Lowell's educational institutions. It is recommended that the City, Lowell High School, UMass Lowell, and Middlesex Community College collaborate in short order to complete a collective bike rack inventory and plan.

