06 TRANSPORTATION & UTILITIES

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TRANSPORTATION & UTILITIES

INTRODUCTION

This section details the transportation, infrastructure and utility needs expected in the future in The Triangle. Anticipated future transportation infrastructure, traffic volumes and utility needs were determined based on growth projections detailed in Chapter 3.

ANTICIPATED FUTURE TRANSPORTATION CONDITIONS

As outlined in Chapter 2: Existing Conditions, several areas of congestion have been identified through operational analysis as well as the public input process. With any future growth, whether local trips or through traffic, additional traffic delays are anticipated in the following areas:

- **MassPike Exit 13:** The ramp access to the MassPike attracts heavy traffic and results in congestion and queuing along Route 30 and Speen Street, despite multiple lanes and wide intersection approaches. Difficult access onto and off the MassPike interchange ramps creates weaving conflicts, which are exacerbated by frequent curb cuts and poor access management along Cochituate Road. Stakeholders within The Triangle have expressed their concerns regarding regional access being limited by the traffic in this vicinity. In addition, the scale of the MassPike interchange results in a hostile environment for pedestrians and bicyclists.
- **Speen Street:** Speen Street experiences significant congestion during peak periods, primarily as a result of traffic spillback from the MassPike interchange, but also due to high volumes of traffic circulating around Route 9 and local businesses.
- **Route 30:** The Route 30 corridor experiences peak hour congestion in the vicinity of the MassPike Interchange as well as at the signalized intersections to the west as a result of the high volumes of traffic using Route 30 to access the MassPike and local turning traffic.
- **Route 9:** Due to the high volume of commuter traffic in addition to the high volume of turns into and out of local businesses, Route 9 experiences peak hour congestion, especially when pedestrians attempt to cross Route 9.

POTENTIAL INFRASTRUCTURE IMPROVEMENTS

Infrastructure improvements within The Triangle are needed in order to accommodate future growth in The Triangle as well as to address some existing congestion points. Potential infrastructure improvements have been developed by MassDOT as well as by the project team for this study.

ROUTE 30 AT SPEEN STREET

Figure 6.1: Existing Route 30 at Speen Street
Source: MPO Study

The intersection of Route 30 with Speen Street (Fig. 6.1) was identified by the Boston region MPO as a critical intersection for improvement. Delays, queues and congestion at the Route 30 and Speen Street intersection inhibit safe and free-flow access to and from the retail establishments.

Short term improvements suggested by the MPO involve optimizing the AM and PM peak signal timings at the intersections. However, the MPO study shows that this will result in only minor improvements in capacity. The MPO study suggested adding a lane in the westbound direction of Route 30 at the intersection. The lane would begin at the TJX driveway, cross Speen Street and continue as an additional third lane between Speen Street and the I-90 on ramp, making the ramp two-lane. This change resulted in a 25 percent reduction in delay per vehicle and up to 40 percent reduction in queue lengths per the MPO study. The MPO also developed several long-term grade separated alternatives.

In 2014, MassDOT Office of Transportation Planning evaluated a new improvement scenario for the intersection. This alternative included a displaced left turn configuration at the intersection of Route 30 and Speen Street to improve operations by separating the northbound left turn to the west of the intersection (Fig. 6.2).

The displaced left turn design removes the conflict between the heavy northbound left turn from Speen Street onto Route 30 and the southbound through volumes along Speen Street. Removing that conflict allows more vehicles to be processed at one time reducing delays at the intersection. In order to work, the northbound left turns would turn left south of the intersection (in the vicinity of the existing Courtyard by Marriott) into a roadway that will run parallel to Speen Street on its west side. As shown in Figure 3, once the Speen Street northbound left turning traffic reaches the intersection with Route 30, it will proceed through the intersection at the same time as the north and southbound through traffic. In addition, because the eastbound right turn lane from Route 30 eastbound to Speen Street southbound will be located alongside the new left turn alignment, that traffic can also proceed at the same time. The more vehicles that can be processed in a single signal phase, the more green time available at the traffic signal.

Figure 6.2: Concurrent Traffic Movements at Displaced Left Turn. This drawing represents a very conceptual layout; the final layout and right-of-way would be determined during future design phases.

CONNECTIONS TO I-90 (MASSPIKE) EXIT 13 INTERCHANGE

To improve circulation of traffic and relieve congestion, new alternatives to the MassPike interchange were investigated. The recent removal of the toll plazas presents an opportunity as traffic no longer needs to pass that point in order to access the MassPike; additional right-of-way on which to consider alternatives is provided.

POTENTIAL DIRECT RAMP CONNECTIONS FROM SPEEN STREET TO MASSPIKE

In order to reduce traffic at the existing ramp termini at Route 30, other local access points were considered. The existing Speen Street alignment was investigated as a potential connection to reduce the volume at the existing interchange intersection. Because a fair number of Golden Triangle employers, as well as residents just outside of the Golden Triangle, are located on Speen Street, this connection would be desirable.

Because the existing Speen Street alignment is located too close to the split to and from the eastbound and westbound sides of the MassPike, any connection at this point would not be able to provide access to the westbound side of the MassPike. However, there could be a potential direct connection from Speen Street to the ramp to the eastbound MassPike (to points east). There potentially could be another connection from the MassPike eastbound (from points west) directly to Speen Street. Based on data from local employers, approximately 25 percent of office employees are coming from the west and could use that connection; and approximately 25 percent of office employees are likely to use the connection to the east.

A conceptual layout for these potential connections would have some challenges (Fig. 6.3). There are two structures located to the west of the existing MassPike ramps. A ramp connecting from the MassPike eastbound off ramp to Speen Street would be located very close to these structures. Additional design would need to occur in order to determine the impacts to the right-of-way as well as these structures.

The Cochituate Rail Trail follows an alignment to the north of Speen Street and would have to be crossed by the at-grade ramps to/from Speen Street. A potential layout of such a crossing is illustrated

in Figure 6.3. Further study would be required to determine whether the rail trail crossing could be grade separated. Finally, the TJX driveways located immediately adjacent to the potential on-ramp location would need to be relocated in such a concept to reduce conflicts at that location.

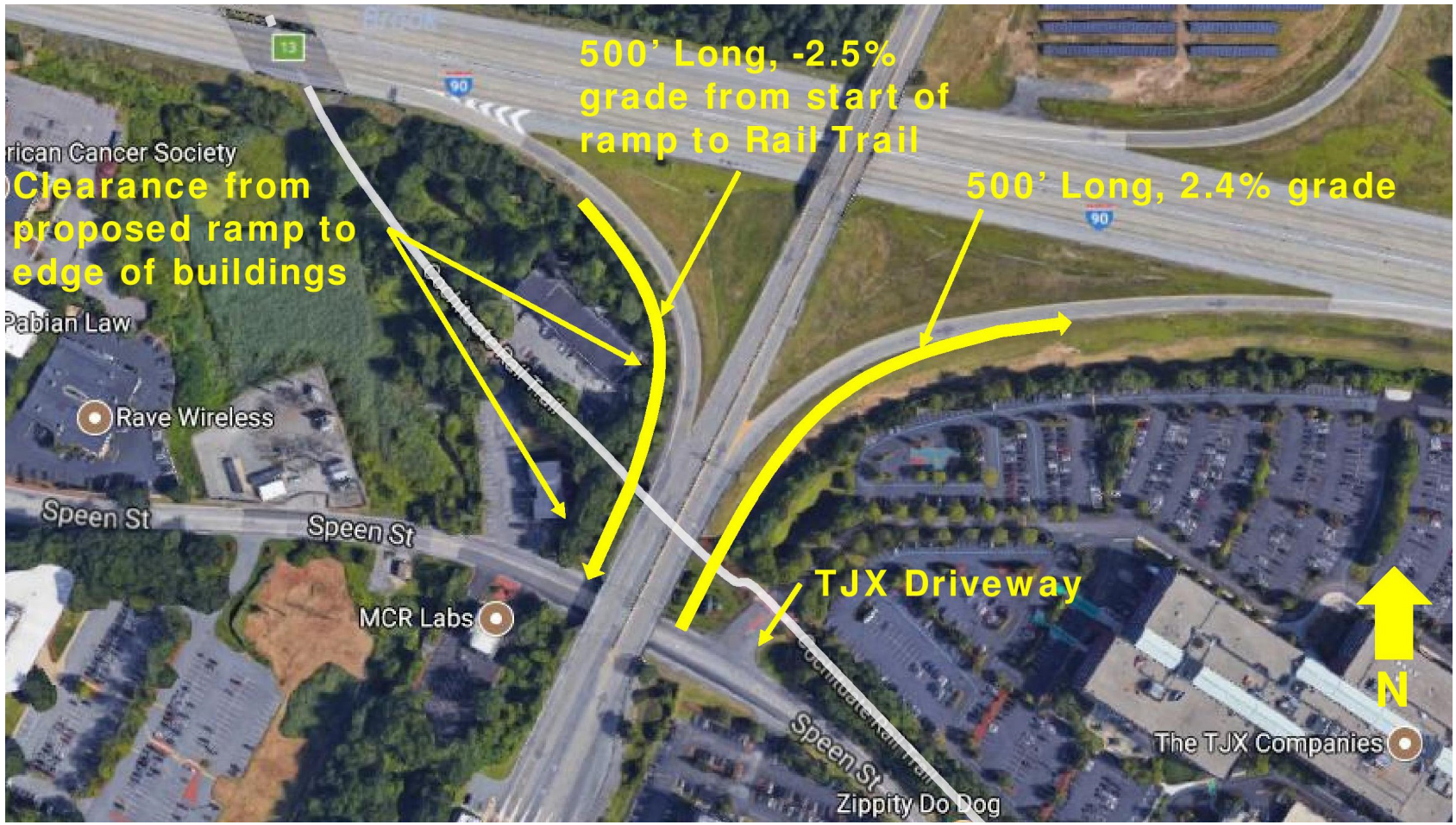


Figure 6.3: Potential Ramp Alignments to and from Speen Street

POTENTIAL SPEEN STREET RELOCATION

Figure 6.4: Potential Ramp Connection Intersections with Existing Speen Street

In order to provide a direct connection to accommodate more of the traffic with destinations along Speen Street, another longer-term alternative was developed. This, or a similar longer term alternative would be required to accommodate the 20 percent growth scenario described in Chapter 4: Build Out Analysis. If Speen Street were relocated so that it crossed the MassPike ramps alignment approximately 375 feet further to the south, full access to both directions of the Massachusetts Turnpike ramps may be accommodated. This shifting of alignment would require significant land acquisition, design and construction costs as well as significant political support. The benefit of accommodating traffic to and from Speen Street at Speen Street would be a reduction in traffic at the intersection of the ramps with Route 30. If enough traffic were reduced at Route 30, the connection to the MassPike ramps could be designed as a signalized intersection, not a highway interchange. This modification would provide a safer connection for bicyclists and pedestrians while maintaining an acceptable level of service for vehicles.

As shown in Figure 6.4, the relocated Speen Street would be located to the south of the previous location of the toll plaza (since removed). The actual ramp alignment may actually be able

to be accommodated within the right of way that had been taken up by toll plaza previously.

The potential realignment of Speen Street would extend north from the existing intersection of Route 30/Speen Street to the south of the building at 111 Speen Street and continue west underneath the MassPike ramp connection before turning to the north and reconnecting with the current Speen Street alignment approximately 250 feet east of the intersection of Speen Street at Leggatt McCall Road. ***Although this concept would require significant right-of-way acquisition and potential wetlands impacts, it is the preferred long-term concept.***

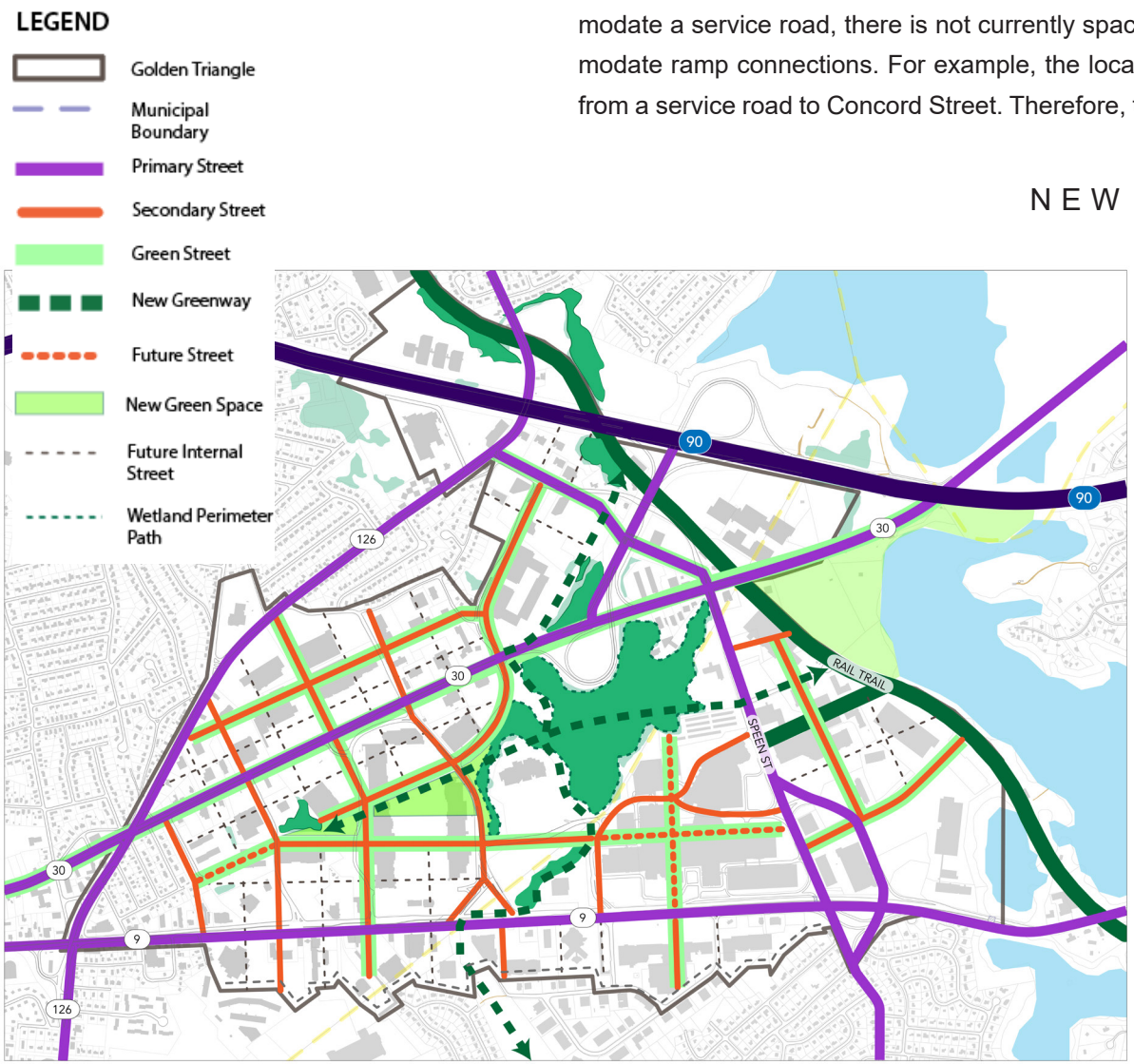
OTHER INTERCHANGE CONCEPTS

Other interchange concepts were also considered. Another opportunity that is presented with the removal of toll plazas is that exits could potentially change locations or each direction could provide connections at different locations. However, in this immediate vicinity, there is not enough right-of-way available to relocate a westbound ramp location. In addition, it is likely that a ramp system created to connect to another arterial would create similar problems at a new location and would not serve The Triangle as well.

Figure 6.5: Potential Interchange Configuration at I-90 and Route 30/Speen Street. This drawing represents a very conceptual layout; the final layout and right-of-way would be determined during future design phases.

A service road concept was considered on the south side of the MassPike to attempt to provide additional access to the area. Although there is right-of-way available along the MassPike to accommodate a service road, there is not currently space available in the vicinity of the arterials to accommodate ramp connections. For example, the location of Cherry Street would preclude a connection from a service road to Concord Street. Therefore, this option was dropped from further consideration.

NEW ROADWAY CONNECTIONS



The existing roadway system within The Triangle is such that only Route 9 and Route 30 provide an east-west connection. Therefore, traffic from major commercial, office and retail establishments use these major arterials for even short trips within The Triangle and compete with commuter traffic. Additional roadway connections would accommodate vehicular, bicycle and pedestrian trips within each of the large development blocks. The proposed roadway connections would connect nearby land uses east-west, thereby creating a grid system within The Triangle. This roadway system will reduce the strain on the major arterials and lead to reduction of the turning traffic at the intersections along the major arterials. Potential roadway and greenway connections are shown on Figure 6.6 and discussed in more detail in Chapter 5.

Figure 6.6: Potential Roadway Connection Locations

IMPROVEMENT IN PEDESTRIAN AND BICYCLE ACCOMMODATIONS

As outlined in Chapter 3: Existing Conditions, there are plans to construct the next section of the Cochituate Rail Trail between the Natick Center MBTA Commuter Rail Station in Natick, MA and Route 30 in Framingham, MA. In addition, a connection from the Cochituate Rail Trail to the commercial properties to the west along Speen Street along an existing path, called the Wonder Bread Spur, is also planned. It is recommended that either a connection to a nearby signalized intersection be provided or that a mid-block crossing with traffic control (HAWK[37] or Rectangular Rapid Flashing Beacon) be installed to provide a safe crossing to the properties to the west of Speen Street. This type of connection will also address a concern raised on coUrbanize that there are inadequate pedestrian crossing location. Potential pedestrian crossings are shown on Figure 6.7 below. The graphic on the left illustrates an unsignalized crossing with supplemental signage. The graphic on the right illustrates a potential recommended treatment for this location on Speen Street as it includes a refuge island in the center of the street and provides a Rectangular Rapid Flashing Beacon.

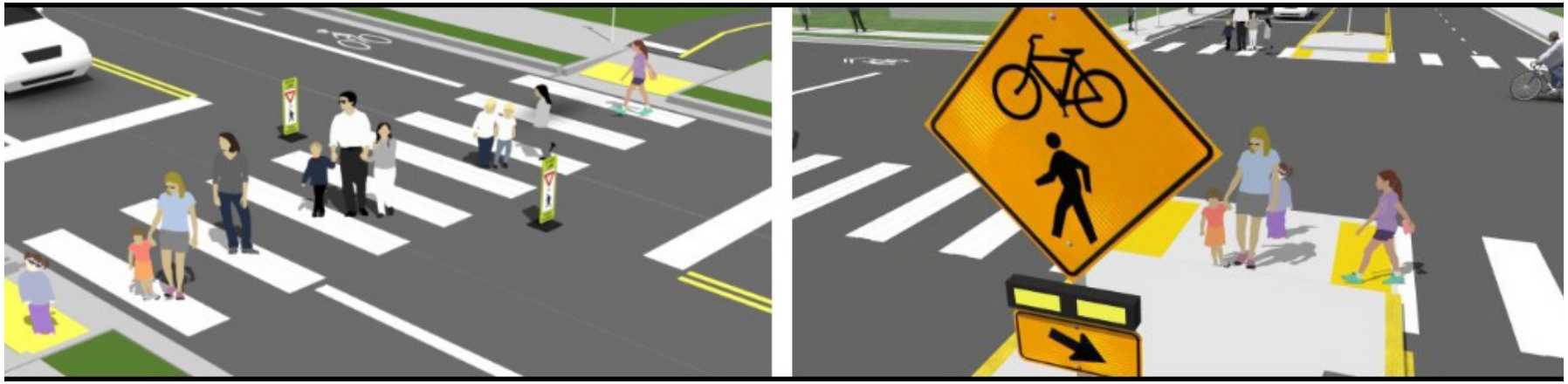


Figure 6.7: Examples of Unsignalized Pedestrian Crossings: at left, supplemental signage; at right, refuge island and rectangular rapid flashing beacon

37 ***H**igh-Intensity **A**ctivated Cross**W**al**K***

The coUrbanize comments regarding the inhospitable pedestrian and cyclist environment in the vicinity of the MassPike ramps would be addressed if the interchange were downgraded to a signalized intersection with slower speeds and vehicles under traffic signal control. In the event that an improvement of that type is not pursued, or in the short term while it is being pursued, the municipalities could work with MassDOT to improve the pedestrian and cyclist experience through this area.

Chapter 4 evaluates the potential for cycle tracks along Route 9 and Route 30 to further encourage bicycling as an alternate mode of travel. Based on this analysis, there is the potential for the provision of a cycle track for a stretch of each roadway. Until connections to other facilities are built, the cycle tracks would leave commuter cyclists in inhospitable environments at either end. However, the provision of any facility would encourage shorter trips to be made by bicycle.

As outlined in Chapter 4, in addition to vehicular connections throughout the district, pedestrian and bicyclist connections are also recommended. Connections between land uses can easily be completed on bicycle or on foot if the facilities are put in place. Key to the success of these connections is a commitment by the municipalities to snow removal to allow for safe passage during all seasons. The municipalities should work with private property owners to ensure that public paths on private property are also cleared.

Both Framingham and Natick participate in the MassDOT Complete Streets program. It is recommended that both municipalities continue to incorporate Complete Street concepts into the public and private roadways within The Triangle. As noted in Chapter 2, there are many disconnects in the existing pedestrian and bicycle network. It is recommended that these users needs be incorporated into any infrastructure projects as well as any redevelopment in The Triangle.

TRANSIT IMPROVEMENTS

Chapter 2: Existing Conditions details the public transportation issues within The Triangle. Potential improvements in bus routes and the potential introduction of a Bus Rapid Transit (BRT) service are described below. As described on the following pages, property owners will need to become major players in transit improvements, including lobbying MassDOT and the MWRTA for improvements, providing employee incentives for commuting by transit and providing on-site transit amenities.

MWRTA BUS ROUTES

The Triangle Consultant Team met with the MetroWest Regional Transit Authority (MWRTA) to discuss future transit operations. The MWRTA has identified a number of locations where insufficient bus stops are likely the result of low ridership. Along Route 9, there are no pullout areas for the buses, so the bus will dwell in a travel lane of Route 9 while passengers enter and exit the bus. In addition, at many locations, there is not a sidewalk for passengers to either wait on or land on when exiting the bus and thus passengers are dropped in the street itself. Finally, there are locations without cross-

Figure 6.8. Potential Bus Service Improvements. Potential bus stop locations are conceptual; exact locations would be determined based on land uses at the time of implementation and could be moved as land uses change.

walks for passengers to get to destinations on the opposite side of the street. All of these issues are pointed to as reasons that ridership is not higher. The MWRTA has indicated that because individual projects and property owners are not required to fully accommodate transit, many do not. The MWRTA recommends that pull out areas for bus stops, shelters/overhangs and pedestrian amenities be required in all development projects. With the right amenities, transit ridership on existing routes would be expected to increase.

The northern end of The Triangle is served only by Massachusetts Bay Transit Authority (MBTA) Bus Route 10 with no stops north of Cochituate Road. A review of the transit map (Fig. 5.9) reveals that a commuter bus that extends along Speen Street and connects to the commuter rail station could provide last mile service for employees in The Triangle and then pick up residents in the corridor for the return trip to the commuter rail station. This route could be reversed in the afternoon to best serve riders. Based on a review of typical peak hour travel times, it is likely that this shuttle would connect to either the Natick or West Natick commuter rail station to provide the most efficient ride (approximately seven minutes either to or from TJX during a typical Wednesday at 5:15pm with no stops), as a connection to the Framingham commuter rail station would likely increase the trip length by five minutes each way. The exact routing and stops would be determined based on future development patterns (and therefore potential ridership) and peak hour traffic delays in order to provide the most efficient service.

As outlined in Chapter 2: Existing Conditions, a number of the routes only operate from Monday through Friday and have infrequent headways. Shorter bus service headways, improving weekend services and providing better pedestrian connections to bus stops within The Triangle to serve the potential ridership will result in lower congestion on roadways and improved transit utilization. Careful thought as to the placement of bus pullouts will also reduce the impact a bus stopping has on the traffic operations.

This will reduce the current strain imposed by single occupancy cars on the arterials and will improve their levels of service.

LOGAN EXPRESS

The Logan Express garage is frequently at capacity. The municipalities should work with MassPort to incorporate additional parking capacity onto the existing site.

POTENTIAL BUS RAPID TRANSIT (BRT)

Over the years, the potential for Bus Rapid Transit has been raised for a number of corridors. The MassPike right-of-way seems adequate to accommodate such a service from the western suburbs into Boston. However, such a service would not likely change the trip patterns in The Triangle significantly because commuters would still have to drive to transit stops and may require trips within The Triangle similar to those taken today.

More recently, the potential for BRT along Route 9 has been raised as a way to encourage alternate modes of travel. Similar to a BRT along the MassPike, a BRT along Route 9 would still require patrons to travel to the stations, likely by vehicle, which may not result in a significant decrease in travel through the Golden Triangle. Unlike the MassPike, Route 9 does not have the right-of-way available consistently to accommodate BRT without the loss of general vehicular travel lanes. It would likely be difficult to convince the traveling public that such a dramatic change to the use of the right-of-way is a good idea. While the BRT along Route 9 would be difficult to implement as a result of reduced vehicular capacity **and** the resulting political opposition, the option should remain under long-term consideration.

The potential for a BRT within The Triangle was examined. The one right-of-way where BRT may make sense would be along the Cochituate Rail Trail (CRT). Because the right-of-way of the CRT varies, it may only be able to accommodate the path along with a singular BRT lane (not for general traffic). The BRT routes could be designed to travel along the CRT right-of-way for the critical direction in order to provide the most efficient route from the station to key employers, but then use local roadways for the return trip to the station. This potential would face many challenges as the CRT is currently only permitted as a path and major roadway crossings are not designed to accommodate vehicular traffic.

TRANSPORTATION TECHNOLOGIES

The technology of transportation is rapidly changing. Not long ago, traffic signals were set up to allow the main street to have a green traffic signal indication for a set time and then the side street for a set time regardless of the time of day or traffic patterns. Improvements in traffic signal technology have greatly increased the efficiency with which vehicles can be processed by constantly adapting to the current demand. The Route 30 and Route 9 corridors have recently undergone traffic signal upgrades that ensure that optimal performance is being reached.

Moving into the future, the potential for connected and autonomous vehicles will change the transportation landscape. If a vehicle is able to communicate with traffic signals to determine whether the signal will be green or red when the vehicle arrives, that vehicle can accelerate or decelerate accordingly, creating more efficiency and consistency in the traffic stream, and likely leading to greater capacity and safety. The signal system will see a platoon of vehicles coming and turn green to process the most vehicles per cycle.

Autonomous vehicles are expected to be able to travel at closer distances to other vehicles which will increase the capacity and efficiency of our infrastructure. However, the ability to send a driverless vehicle to run an errand or pick up a child may increase the number of vehicle trips made per household. Or, the lengthy commute by car may be less an imposition if the worker can sleep or work during that commute. These items may increase the number of trips or length of trips and result in more vehicles on the road to take up that increased capacity. Another challenge is the increase in empty trips. People may choose to get dropped off at the door of each destination, resulting in an empty vehicle that then needs to go somewhere to either park or just drive around until the person is ready to be picked up. The individual will not experience the delay and congestion that results from this trip, but the system will. If the congestion can be addressed, driverless vehicles could reduce the need for vast areas dedicated to vehicle storage, potentially freeing up land for other uses.

Moving forward, it is important that all infrastructure projects in The Triangle continue to contemplate this upcoming technology to ensure that the traffic operations in The Triangle remain as efficient as possible. Although it is not currently known exactly how these technologies will affect the capacity or demand on the roadway network, future traffic signal projects should be compliant with US DOT guidance on automated and connected vehicles.

FUTURE CONDITION TRAFFIC VOLUMES

Two potential build out scenarios were contemplated for future transportation analysis based on the build-out analysis detailed in Chapter 3:

- 10 percent growth in built square footage of all land uses
- 20 percent growth in built square footage of all land uses

Trip generation was calculated for each alternative based on the net additional square footage compared to existing land use. Both growth scenarios assume that all land uses see growth in built area and assessed value. Also, the growth scenarios have been allocated square footage based upon likely future development patterns. As discussed in Chapter 3: Build-Out Analysis, it is likely that future development patterns would include a more diverse mix of land use and not be as retail-centric.

TRIP GENERATION

The net increase in Build condition square footage compared to existing conditions for each of the following land uses was calculated for the two growth scenarios (i.e., 10 percent growth and 20 percent growth).

- Residential
- Office
- Retail
- Indoor Recreation/Entertainment
- Storage, Warehouse and Distribution
- Hotel/Motel
- Exempt or Other

The vehicular trips generated by the net square foot increase for each of the above-mentioned land uses was calculated using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition.

Daily, weekday AM Peak, weekday PM Peak and Saturday Peak trip generation was determined for the land uses shown in Table 6.1.

TABLE 6.1: TRIP GENERATION LAND USE & SQ.FT. FOR THE TWO GROWTH SCENARIOS

LAND USE	ITE LAND USE CODE (LUC)	10% GROWTH	20% GROWTH
RESIDENTIAL	LUC 220/LUC 230	175 UNITS/175 UNITS	350 UNITS/350 UNITS
OFFICE	LUC 710	206,478 SF	412,955 SF
INDOOR RECREATION/ ENTERTAINMENT	ITE ARTICLE	103,239 SF	206,477 SF
HOTEL/MOTEL	LUC 310	147 UNITS	295 UNITS
RETAIL	LUC 826	258,097 SF	516,194 SF

LUC : Land Use Code

10 PERCENT GROWTH DEVELOPMENT

When calculating the trip generation of the 10 percent growth development, the trip generation of the individual components was reduced to account for a number of factors (e.g. cross trips, multi-modal trips) that are anticipated to be included in the future redevelopment of space. ITE data indicates that up to 20 percent of trips to a mixed-use district could be expected to be internal trips and alternate mode trips.

In order to ensure acceptable levels of service at most study area intersections, the number of trips generated by each of the above-mentioned land uses was reduced by 20 percent to account for increased transit use in the Golden Triangle as well as the cross trips between the different proposed land uses and existing uses in the area. For example, if additional residential square footage is developed adjacent to the Natick Mall, those residents will likely shop at the new Wegmans and other retail creating a cross trip that would not leave the immediate area. In addition, it is likely that employees in area office space may be interested in living in nearby residential units creating a cross trip that would not impact nearby arterials.

Finally, with the provision of a dedicated transit connection to and from the commuter rail station as well as a bicycle connection via the Wonder Bread Spur to the Cochituate Rail Trail and new potential pedestrian amenities, some residents will use these alternate modes to travel to the commuter rail and other communities that it connects to.

This 20 percent reduction of new trips represents only four percent of all trips to the area which is a reasonable goal for the number trips switching from vehicular travel to alternate modes. The adjusted trip generation values are shown in Table 6.2 and Table 6.3.

Approximately 13,200 additional daily vehicular trips would be expected to be generated for the 10 percent growth alternative. About 600 vehicles are added to the network during the AM peak and 1,000 vehicles are added to the network during the PM peak hour. The actual impact on Route 30, Route 9 and Speen Street could be significantly less as new connector roadways will reduce the demand on these arterials by providing connections between sites within The Triangle. Retail trips that currently enter and exit Route 30 at a number of points in the future will be able to conduct many linked trips within The Triangle, reducing the volume impact of both proposed AND existing trips on those arterials.

Figure 6.9 illustrates the existing vehicular trip generation of The Triangle with the added 10 percent growth alternative. The second column illustrates that both the existing and future trips can be reduced by as much as 20 percent by having a mix of uses; vehicular, pedestrian and bicycle accommodations between sites; and transit connections among uses and as a first mile/last mile connection to the commuter rail. When the different types of trips to the existing and future developments are combined (the last column), the resulting vehicular impact on Route 9, Route 30, and Speen Street can be less than what is currently traveling there today (first column). An exact transit ridership number is not available, but anecdotal information indicates that it is currently very low.

TABLE 6.2: VEHICULAR TRIP GENERATION - 10 % GROWTH

TRIPS	DAILY	WEEK-DAY AM PEAK	WEEK-DAY PM PEAK
RESIDENTIAL			
IN	872	25	106
OUT	872	108	54
TOTAL	1744	133	160
OFFICE			
IN	911	227	42
OUT	911	31	204
TOTAL	1822	258	246
INDOOR RECREATION/ENTERTAINMENT			
IN	N/A	27	273
OUT	N/A	0	168
TOTAL	N/A	27	441
HOTEL/MOTEL			
IN	526	46	40
OUT	526	33	42
TOTAL	1052	79	82
RETAIL			
IN	4290	83	231
OUT	4290	53	294
TOTAL	8580	136	525

LUC : Land Use Code
Note: N/A indicates data not available

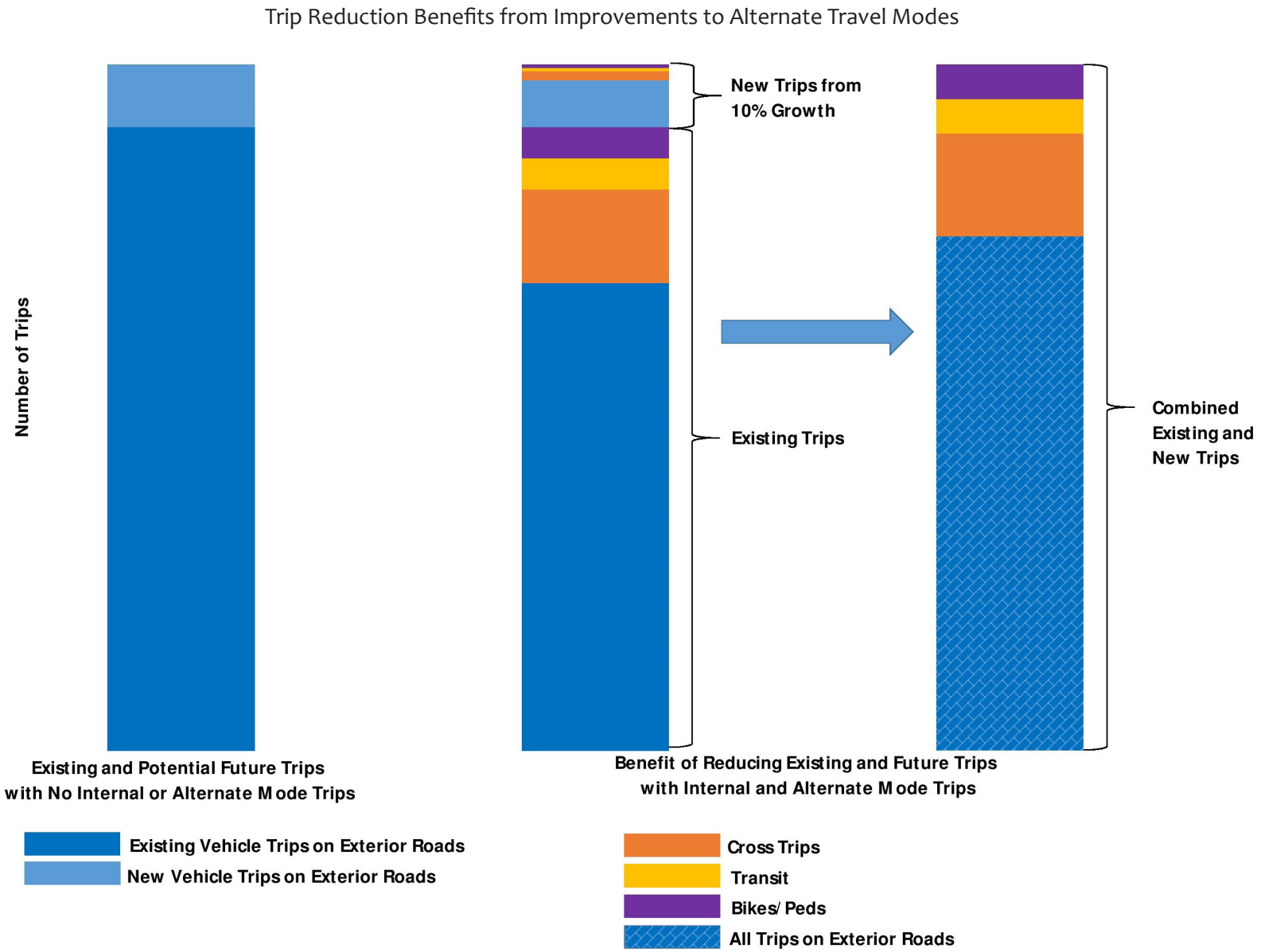


Figure 6.9. Example of benefit of tools to reduce vehicular trips
Note: The graph is hypothetical, based on evidence from other similar projects, but does not represent any actual or specific data.

20 PERCENT GROWTH DEVELOPMENT

Due to limitations in capacity of the roadway network, it is anticipated that an additional reduction in expected vehicular trips would be required for a 20 percent development program in order to keep the majority of study area intersections operating at acceptable levels of service. The 20 percent development program results in the need to reduce vehicular impacts at existing and proposed development in the Golden Triangle by eight percent (or 40 percent of new development only). As outlined above, with a true Mixed-use development with pedestrian, bicycle and transit connections to other uses in the area as well as to the commuter rail, the vehicular trips in the Golden Triangle can be reduced.

Approximately 21,000 additional daily trips are expected for the 20 percent growth alternative. About 1,000 vehicles are added to the network during the AM peak and 2,300 vehicles are added to the network during the PM peak hour.

TRIP DISTRIBUTION

The anticipated trips were distributed throughout the network. Residential trips were distributed based on the local residence journey to work (JTW) data published by the United States Census Bureau. Office trips were distributed based on the trip distribution data provided by two large local employers. Retail and entertainment trips were distributed based on existing traffic patterns.

The additional trips were added to the existing traffic volumes at the intersections to arrive at 10 percent build and 20 percent build volumes. Volume spreadsheets are included in the Appendix.

TABLE 6.3 : VEHICULAR TRIP GENERATION - 20% GROWTH

TRIPS	DAILY	WEEKDAY AM PEAK	WEEKDAY PM PEAK
RESIDENTIAL - LUC 220/230 - 412955 SF - 350 UNITS			
IN	1309	37	158
OUT	1309	163	82
TOTAL	2618	200	240
OFFICE - LUC 710 - 206478 SF			
IN	1366	340	63
OUT	1366	46	307
TOTAL	2732	386	370
INDOOR RECREATION/ENTERTAINMENT - 103239 SF			
IN	N/A	43	438
OUT	N/A	0	268
TOTAL	N/A	43	706
HOTEL/MOTEL - LUC 310 - 51620 SF - 147 UNITS			
IN	790	69	61
OUT	790	50	63
TOTAL	1580	43	124
RETAIL - LUC 826 - 258097 SF			
IN	6863	133	370
OUT	6863	85	470
TOTAL	13726	218	840

LUC : Land Use Code
Note: N/A indicates data not available

BUILD CONDITIONS INTERSECTION CAPACITY ANALYSIS

10 PERCENT GROWTH ALTERNATIVE

As outlined in Chapter 3, some of the operational issues along the Route 30 and Route 9 corridors were being improved through traffic signal optimization. However, due to the heavy traffic along these arterials, congestion will continue into the future. Traffic congestion is a problem today, and it is recommended that implementation of the improvements outlined for the 10% growth level should begin in the short-term to accommodate existing traffic as well as future growth. With redevelopment at the 10 percent growth level, and to accommodate current traffic demand, the following infrastructure changes are required:

- The displaced left turn lane configuration at Route 30 and Speen Street.
- Mixed-use redevelopments that capture trips internally (both future development trips as well as trips between existing uses and future uses).
- Connections between parcels within The Triangle to accommodate vehicles, pedestrians and bicyclists.
- Incorporation of transit amenities into redevelopment projects as well as at existing demand locations.
- Provision of a new commuter shuttle connecting to the Commuter Rail with limited stops.

Although interchange connections were investigated for the 10 percent growth alternative, the modifications proposed by MassDOT at the intersection of Route 30 and Speen Street will improve the operations of the area without a significant investment into temporary interchange improvements.

20 PERCENT GROWTH ALTERNATIVE

In order to accommodate the 20 percent growth alternative, all of the tools described above will continue to be required. In addition, to accommodate the future traffic growth, an interchange redesign would need to be considered. A concept that includes ramp connections to Speen Street while maintaining a grade separated connection over it to reach Route 30 (described previously) would ensure that the traffic volumes at Route 30 are reduced enough to contemplate an at-grade intersection.

This would allow a design that would better serve bicycle and pedestrian traffic and open up potential development parcels.

Transit opportunities in The Triangle will need to be continually expanded as development comes on line. Evaluation of routes and headways, stop locations and amenities, and pedestrian connections to potential destinations will need to be evaluated periodically to ensure that transit is a viable alternate mode for employees, residents and visitors to The Triangle.

ANTICIPATED FUTURE UTILITY CONDITIONS

The anticipated demand on utilities in The Triangle as a result of the contemplated development programs was reviewed. The findings are summarized below.

STORMWATER SYSTEM

As described in Chapter 3, storm drainage in The Triangle is accomplished by catch basins with direct connections to nearby drainage systems. Because the existing impervious surface is not anticipated to increase as a result of the redevelopment and may in fact decrease with the introduction of new open space, the existing stormwater system should continue to operate as in the existing condition. As indicated, there is currently a drainage concern at the intersection of Route 30 and Speen Street and flooding at the end of the MassPike ramp to Route 30 westbound where it meets and along Route 30 has been noted on coUrbanize. Drainage improvements would be included as an important component of reconstruction of the intersection in order to address existing grade issues at this intersection. Flooding at the intersection of Route 9 and Route 126 was also identified on coUrbanize and should be further examined.

WATER SUPPLY SYSTEM

Hydrant flow test data in the study area shows that the lines have reasonable fire flow. When future development is considered, additional tests should be performed along with water line cleaning or lining to ensure that adequate pressure remains available.

SEWER SYSTEMS

Similar to the methodology used to determine the estimated flows for the existing condition, the land use square footage anticipated under each of the future development conditions was determined. Title 5 estimated flows were then applied to the different land uses to get a combined sewer flow. Based on the calculated Title 5 flows and after applying a peaking factor of 2, the existing 24-inch line in Framingham and the 18-inch line in Natick appear to have adequate capacity for the proposed future condition flows. Because the Natick system may include flows from parcels outside The Triangle, further analysis with actual flow tests would need to be done to confirm that the existing pipe could accommodate the flows generated with the type of development that is proposed on that line.

ELECTRICAL SYSTEMS

Existing electric and other utility information on poles was not available. Therefore, no existing deficiencies were determined. Moving forward, in order to create a more pedestrian friendly, dense, Mixed-use Golden Triangle, it is recommended that where possible, utilities be placed underground as parcels are redeveloped.

GAS SYSTEMS

No gas utility data was available from Framingham or Natick.

OTHER UTILITY CONCERNS

It remains a concern that no GIS sewer information is provided for the Shoppers World area or the "big box" retail area north of Route 30. Framingham should attempt to gather plans for incorporation into the overall utility network and ultimately GIS layers.

BROWNFIELD SITES

There are currently no recommended developments proposed on the identified brownfields site (Cochituate Rail Trail – Lots 3b, 14a, and 250 in Framingham were identified as brownfield sites in historic brownfield documents).

SUMMARY RECOMMENDATIONS

As shown, in order to meet the goals of 10 to 20 percent increase in developed space in The Triangle, a number of steps need to happen to reduce the vehicular traffic conflicts. Recommended actions for municipalities to include:

TRANSPORTATION INFRASTRUCTURE

- **The municipalities should work with MassDOT and their legislative delegation to secure funding for the infrastructure that is needed to reach the desired growth. Specifically, MassDOT should be approached regarding:**
  - **Providing bus pull outs and shelters along Route 9 and Route 30 in order to encourage use of transit. Incorporating the transit accommodations into any infrastructure projects.**

- Providing funding for the proposed commuter route which will provide a first mile/last mile transit connection from the Commuter Rail to the Golden Triangle.
- Accommodating pedestrians and bicyclists in infrastructure projects.
- Committing to snow removal to allow for safe passage during all seasons. The municipalities should work with private property owners to ensure that public paths on private property are also cleared.
- Designing and constructing the displaced left turn concept at the intersection of Route 30 and Speen Street.
- Interchange improvements required to meet the long-term 20% growth goals of this study, including providing more direct access to Speen Street in order to reduce traffic at the ramp connection to Route 30. The realignment of Speen Street, which eliminates the need for a grade separated Route 30/MassPike intersection, is the preferred long-term concept.

• Transit opportunities in The Triangle will need to be continually expanded as development comes on line. Evaluation of routes and headways, stop locations and amenities, and pedestrian connections to potential destinations will need to be evaluated periodically to ensure that transit is a viable alternate mode for employees, residents and visitors to The Triangle.

• The municipalities should work with MassPort to incorporate additional parking capacity onto the existing Logan Express site.

• Property owners will need to become major players in transit improvements, including lobbying MassDOT and the MWRTA for improvements, providing employee incentives for commuting by transit and providing on-site transit amenities.

- The municipalities should continue to monitor changes in transportation technology to ensure that the transportation system accommodates new technologies and traffic operations in The Triangle to remain as efficient as possible.

ZONING AND PERMITTING (TO SUPPORT TRANSPORTATION)

- The municipalities should include zoning that allows for the mixed-use types of projects that will result in lower exterior trip generation.
- When permitted, projects should be required to include pedestrian, cyclist and transit accommodation as well as provide appropriate connections to adjacent properties, either through constructing those connections as described in detail in Chapter 5, or providing easements and paying into a fund to allow them to be constructed at a later date when adjacent properties are redeveloped.
- Development projects should be required to join the Transportation Management Association (TMA) which joins together employers and then uses that larger employment base to support transit, carpooling and other tools to reduce single occupant vehicular traffic.

UTILITIES

- All redevelopments will need to comply with local and state regulations to ensure that adequate water supply is available and that capacity exists for the resulting wastewater.
- When projects are redeveloped in the area of Route 30 and Speen Street, and in other locations where flooding has been observed, special attention should be given to the stormwater in light of existing flooding occurrences.
- When possible, underground power, cable and telephone should be considered.