Appendix C: Transportation

Transportation

The Summary Document contains key recommendations concerning transportation for the Manchester Road corridor. This section of the Appendix provides additional background information concerning Existing Conditions and other transportation topics not covered in the Summary Document.

Existing Conditions

During Fall 2009, at the beginning of the Manchester Road Great Streets effort, the consultant team gathered data and documented the existing conditions along the corridor with regard to the roadway along Manchester Road and nearby side streets, transit facilities and transit performance, parking, sidewalks, bicycle and pedestrian facilities, and safety, including crash data. The team presented this information to the public at the initial series of open houses for the project in November 2009 and used the information in formulating transportation recommendations for the corridor.

Roadway

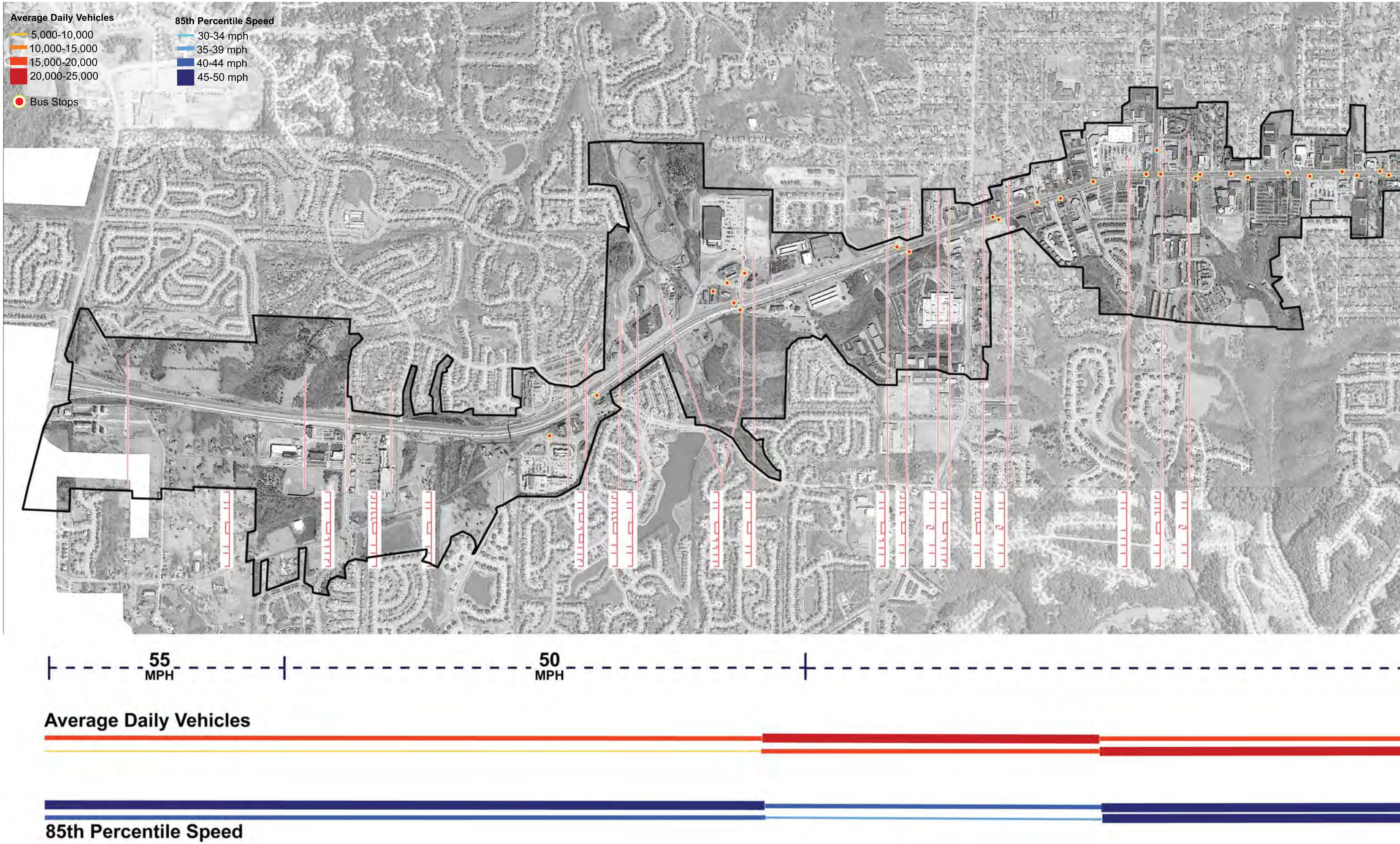
The Manchester Road corridor, also known as Missouri Route 100, includes a 7.4-mile long right of way, stretching from Route 141 west to Route 109. The street officially known as "Manchester Road" follows an older alignment of Route 66 to the south and west of the intersection of Route 100 and Manchester Road / Westglen Farms Drive in Wildwood. To the west of Westglen Farms Drive, local residents and MoDOT simply refer to the corridor as Route 100.

The entire corridor features two main travel lanes in each direction, with some variation in terms of the presence of turn lanes and medians. To the west of Old State Road in Ellisville and Wildwood, Route 100 resembles an expressway per MoDOT standards, with relatively limited access via at-grade intersections and a fairly wide grass median. The junction of Routes 100 and 109 includes a grade-separated, traditional "diamond interchange". From Old State Road east to Route 141, Manchester Road generally features two lanes in each direction with a center turn lane down the middle, allowing unregulated and unobstructed left turns. At Clarkson Road and at Route 141, the roadway includes two left turn lanes for eastbound traffic. In a few sections, on either side of Clarkson Road and between Ries / Seven Trails Road and Ballpark Drive in Ballwin, the roadway includes a raised median consisting of either pavement or landscaped materials, down the center of the right of way, in order to regulate left turns. The intersection at Clarkson Road features two left turn lanes for eastbound travelers. At the east end of the corridor study area, Route 141 passes over Manchester Road as an expressway and a grade separated interchange provides access to and from Route 141. The on and off-ramps for Route 141 intersect Manchester Road at a Single Point Urban Interchange (SPUI), in which one centralized traffic signal manages access to and from Route 141.

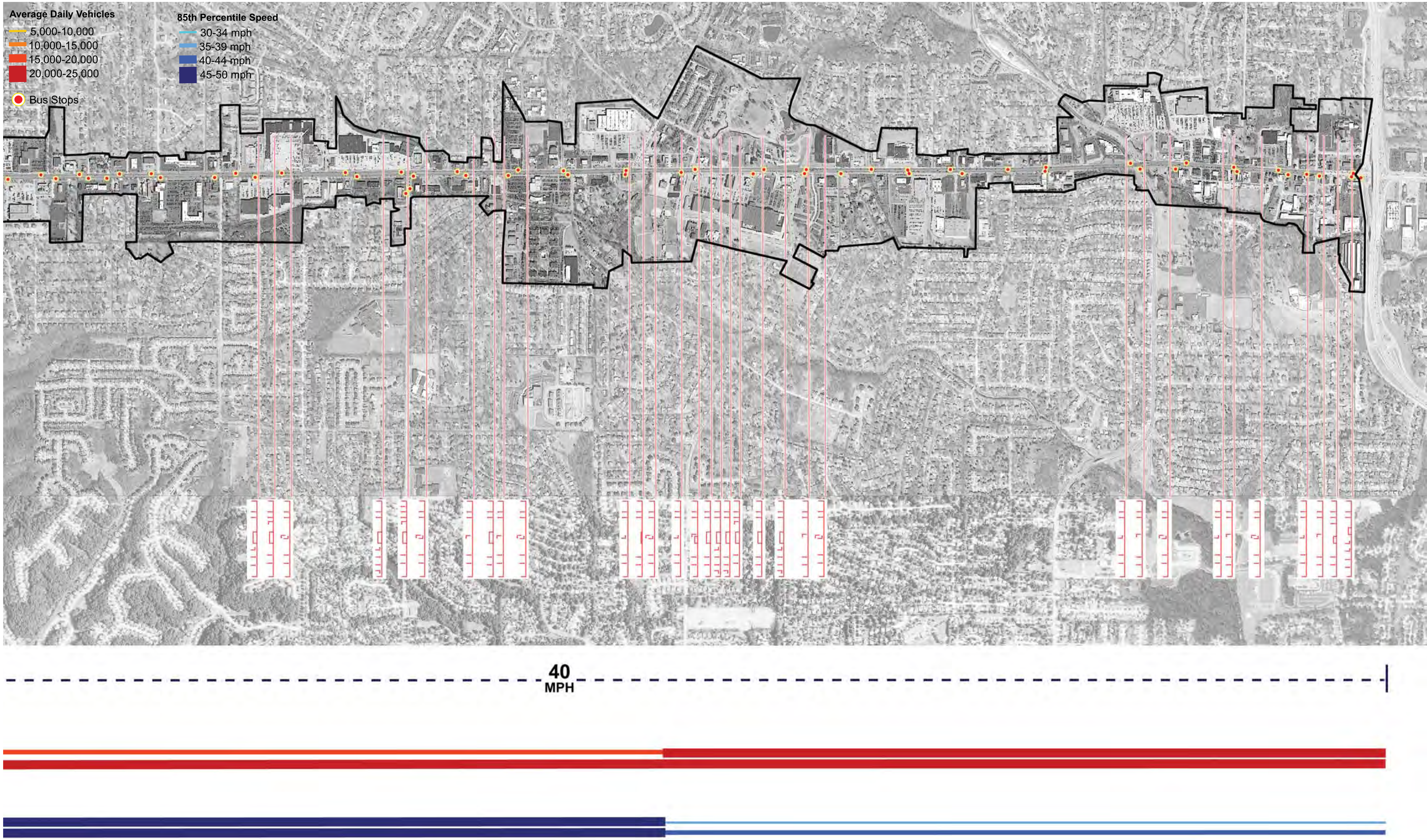
Route 100 in Wildwood: Looking East from Taylor Road

View of Predominant Street Section with Center Turn Lane: Manchester Road near Ramsey Lane, Ballwin

Roadway Configurations - Western Segment



Roadway Configurations - Eastern Segment



Volume and Speeds

Observed traffic volumes generally decrease from east to west along the corridor, from an average of around 45,000 vehicles per day (total) in Manchester, between Baxter Road and Route 141, to an average of around 20,000 vehicles per day at Westglen Farms Drive in Wildwood. Discussions with local stakeholders indicate that the greatest perceived congestion along the corridor exists between Baxter Road and Route 141 in Manchester during the morning and evening rush hours.

Manchester Road: Looking West from Ellisville Town Centre Drive, Ellisville

The speed limit along most of Manchester Road, from Route 141 to Old State Road, is posted consistently as 40 miles per hour. Between Old State Road and Westglen Farms Drive, MoDOT has posted a speed limit of 50 miles per hour, and between Westglen Farms Drive and Route 109, Route 100 includes a posted speed limit of 55 miles per hour.

Readings taken during October 2009 indicate that speeding is quite common along Manchester Road, particularly from Ellisville east to Manchester. Transportation departments typically use a statistical measurement known as the “85th percentile speed” to describe the prevailing speed of vehicles travelling along a roadway. To obtain the 85th percentile speed, one measures the speeds of 100 vehicles, sorts these speeds from fastest to slowest, and selects the 15th fastest speed as the “85th percentile speed”. As illustrated in the table below, while the speed limit from Old State Road to Route 141 is posted at 40 mph, the observed 85th percentile speed ranges from 45 to 49 mph.

Location	Posted Speed	85th Percentile Speed	
		Eastbound	Westbound
Westglen Farms Rd.	50 mph	31 mph	45 mph
Hutchinson Rd.	40 mph	44 mph	45 mph
Clarkson Rd.	40 mph	49 mph	48 mph
Baxter Rd.	40 mph	47mph	44 mph

Signals and Signal Timing

The Manchester Road corridor currently includes 17 traffic signals, including signals at Route 109 and Route 141. Signal cycles fluctuate between 100 and 150 seconds depending on the time of day, the frequency at which pedestrians activate “walk” signals to cross Manchester Road, the number and frequency of left turns, and other factors. In general, the signals operate on 120 second cycles.

Driveways and Curb Cuts

While retail-oriented corridors such as Manchester Road provide access to local businesses, the existing roadway contains a higher number of curbcuts and driveways than recommended, using normal metrics for access management and roadway planning.

MoDOT standards for driveway spacing and roadway spacing call for a minimum separation between driveways of 220 feet and a minimum spacing between intersections of 2,640 feet. As illustrated in the diagram below, much of Manchester Road from Old State Road east to Route 141 includes too many

Figure 17: *Driveways per Municipality*

The number of driveways in each municipality was counted to compute average distance between driveways.

Municipality	Boundary	Driveways	Road Frontage (miles)	Sides of Road	Total Frontage (miles)	Average distance between driveways (miles)	(feet)
Wildwood	Route 109 - Westglen Farms	1	1.5	2	3	NA	NA
Ellisville	Westglen Farms - Reinke	79	2.7	2	5.4	0.07	361
Ballwin	Reinke - 7 Trails	78	1.6	2	3.2	0.04	217
Winchester	7 Trails - Sulphur Springs	45	0.9	2	1.8	0.04	211
Manchester	Sulphur Springs - Route 141	32	0.65	2	1.3	0.04	215
		235	7.35	2	14.7	0.05	251

driveways. The table calculates the average distance between driveway for each municipality in the study area. In addition, the presence of a significant number of small residential streets intersecting Manchester Road, particularly in Ellisville and Ballwin, does not meet standards for intersection spacing for a suburban arterial street.

Multiple Curb Cuts: Manchester Road near Old Ballwin Road, Ballwin

Crashes

The consultant team reviewed available data concerning automobile crashes (including all incidents that warranted a police report, and not including minor fender-benders). The segment of Manchester Road from Clarkson Road to Route 141 reported the highest number of crashes. Data from 2007 was not available from all municipalities.

Manchester Road near Maple Lane in Ballwin: Each business along this section of road has one or two driveways, increasing the overall number of access points to Manchester Road

Parking

Retailers and other businesses must provide sufficient parking to attract and retain customers. The consultant team surveyed the inventory of parking for parcels directly fronting Manchester Road to determine whether the corridor has sufficient parking – or, too much parking – to service existing businesses and related activities.

The corridor includes 17,035 off-street parking spaces accessible directly from Manchester Road from a driveway or curb-cut. On-street parking does not exist anywhere along the corridor. Based on counts for a typical weekday in March, 2007, around 29 percent of the available spaces were in use, providing an excess of over 12,000 spaces. Utilization of parking spaces by municipality ranged from 24 percent to 35 percent.

Excess Parking: Parking Lot Behind Kohls, off Manchester Road and Ellisville Town Centre Drive, Ellisville. Photo taken July 23, 2009.

Retail and parking experts generally consider utilization rates of 70 to 85 percent to indicate that a parking facility is appropriately used. Utilization rates of over 85 percent generally indicate that capacity is constrained. Out of 165 parcels along Manchester Road included in the parking inventory, 155 had utilization rates of less than 70 percent. Five had utilization rates between 70 percent and 85 percent, and five parcels along the corridor reported utilization rates in excess of 85 percent.

In addition, the ten parcels that reported utilization rates above 70 percent include only 136 parking spaces collectively, or less than one percent of all spaces within the corridor study area. The vast majority of parcels along Manchester Road include excess parking spaces, and the corridor as a whole

Figure 18: *Parking Supply and Utilization by Municipality*

Municipality	Total Spaces	Spaces Occupied	Utilization	Area (sq ft)
Manchester	1,733	487	28%	454,046
Winchester	417	152	36%	109,254
Ballwin	7,500	2,205	29%	1,965,000
Ellisville	7,189	2,085	29%	1,883,518
Wildwood	196	47	24%	51,352
TOTAL	17,035	4,976	29%	4,463,170

Figure 19: *Parking Utilization by Municipality*

Municipality	Number of Parcels			
	Utilization less than 70%	Utilization 70%-85%	Utilization 85%-95%	Utilization greater than 95%
Manchester	35	0	1	0
Winchester	8	0	0	0
Ballwin	63	2	1	1
Ellisville	48	3	1	1
Wildwood	1	0	0	0
TOTAL	155	5	3	2

Figure 20: *Sites with Highest Parking Utilization*

Municipality	Parcel Number	Total Spaces	Spaces Occupied	Utilization
Manchester	12	20	18	90%
Ballwin	25	14	14	100%
Ballwin	138	27	24	89%
Ellisville	91	45	44	98%
Ellisville	93	30	28	93%
Total		136	128	94%

has much more parking than needed to support the existing level of development.

Parking Demand: Assuming an average peak-hour parking demand of 4,976 spaces, the ideal parking supply for the corridor (sufficient to achieve 85 percent peak-hour utilization) would include approximately 5,854 spaces. Thus, this calculation indicates that the corridor currently has an excess supply of 11,181 spaces. Assuming an average of 282 square feet per parking space, this excess supply of parking is equivalent to 62 acres of underutilized land.

Spaces Occupied

4,976

Supply Needed for 85% Utilization

5,854

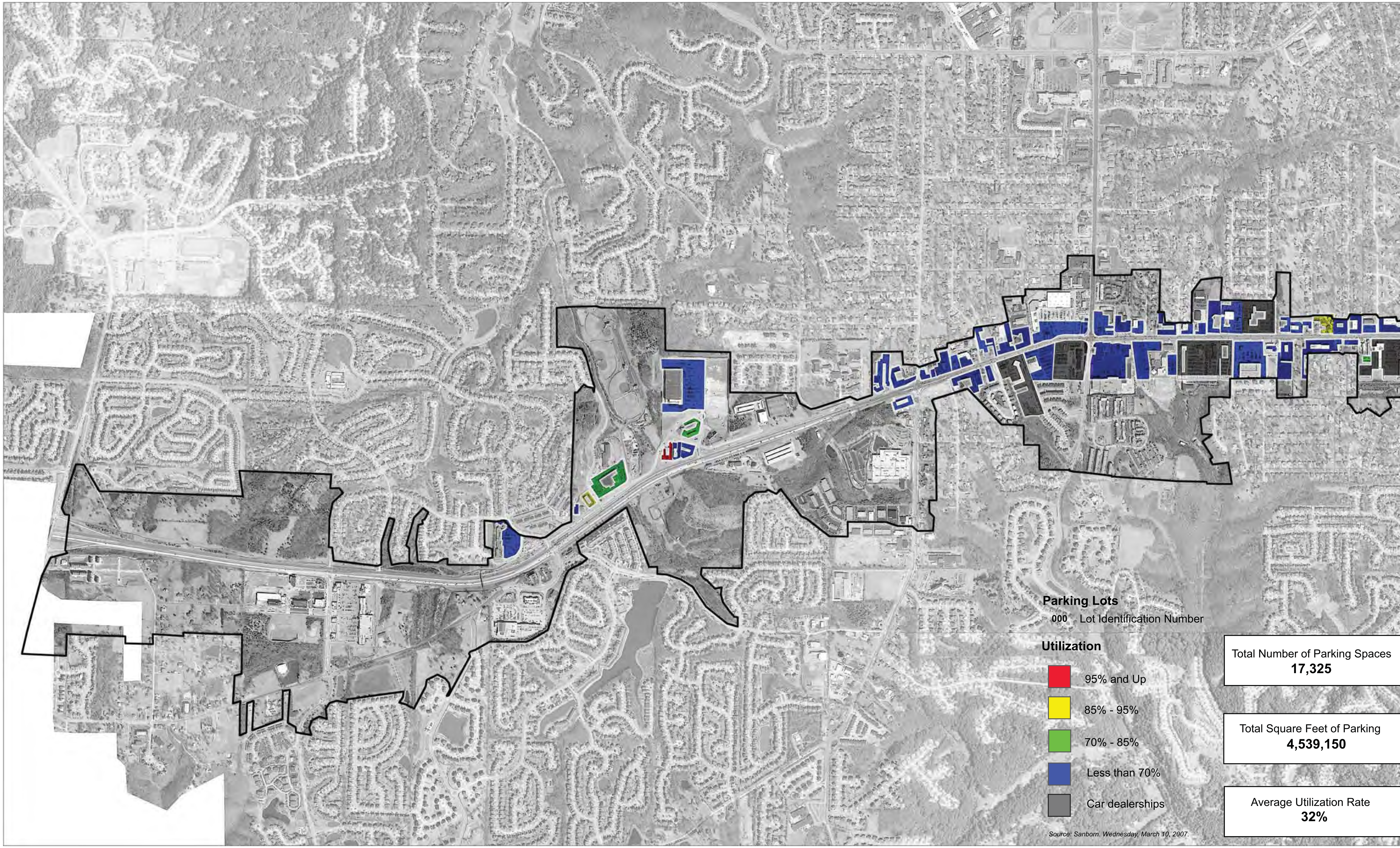
Excess Parking Spaces

11,181

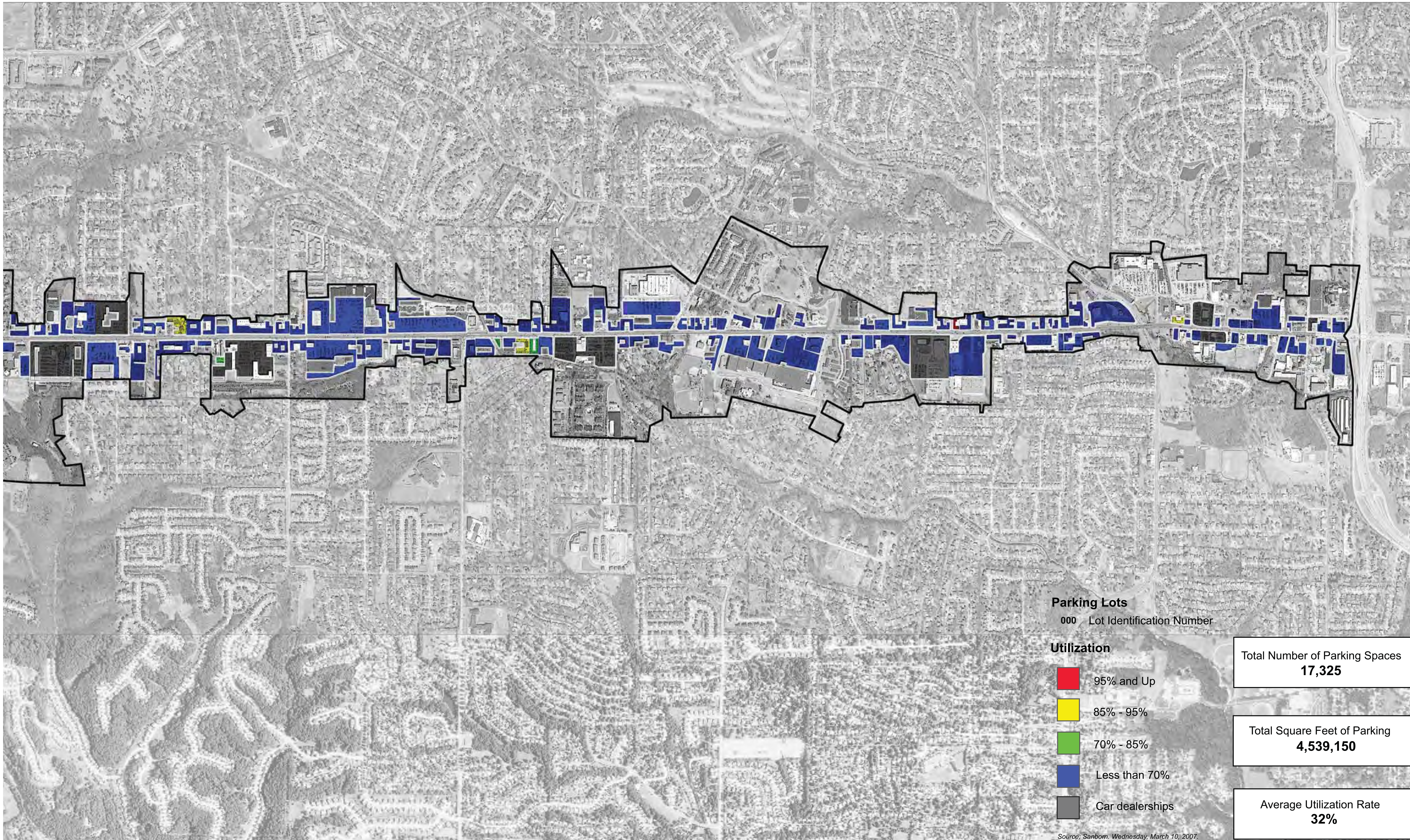
Excess Square Footage

2,929,391

Parking Supply and Utilization - Western Segment



Parking Supply and Utilization - Eastern Segment



Zoning and Parking Management: With the exception of Wildwood, which has instituted a shared parking plan for its town center along Route 100, zoning along the corridor mandates that each development provide its own inventory of parking. This approach, in which each parcel owner provides sufficient parking to service the peak level of demand in a given year, produces the overall excess inventory of parking spaces along the corridor.

The excess parking along the Manchester Road corridor produces the following negative outcomes:

- Significant areas of parking typically exist between the road and buildings, creating a "sea of parking" fronting Manchester Road that lowers the overall aesthetic quality of the corridor.
- Existing parking requirements applied to each parcel owner reduce the potential economic viability of redeveloping or re-using a parcel given the significant development costs associated with providing excess parking spaces. In addition, the existing parking regulations constrain potential building footprints for redevelopments, thus lowering the potential return to investment resulting from redeveloping or revitalizing a given parcel. In a few constrained locations along the corridor, such as historic Manchester, providing sufficient parking would require either constructing structured parking (such as parking garages) or demolishing existing buildings.
- Excessive existing parking requirements discourage individual businesses from sharing parking, a strategy that would allow customers to park once and walk to multiple locations. Instead, the current situation encourages consumers to take a greater number of short trips from business to business. The resulting turn-ons and turn-offs from Manchester Road add to congestion along the corridor.
- Providing parking on a parcel by parcel basis, and discouraging the use of shared parking, contributes to an excessive number of curb cuts along the corridor. The higher number of access points adds to congestion along Manchester Road and discourages pedestrian movement along sidewalks fronting Manchester Road.

Pedestrian Network

The quality of the pedestrian network varies by location along the corridor as well as by the quality of sidewalk constructed and the number of driveways and access points from Manchester Road that interrupt pedestrian movement.

The western portion of the corridor includes a multi-use trail along both sides of Route 100, running from Route 109 east to Westglen Farms Drive (see picture below). A pedestrian bridge over Route 100, located about midway between Taylor Road and Westglen Farms Drive, connects the two trails. To the east of Westglen Farms, the presence and quality of sidewalks varies significantly. The higher speed, expressway portion of Manchester Road between Westglen Farms and Old State Road generally does not include any trails or sidewalks. From Old State to Route 141, sidewalks are generally present. In some sections, however, asphalt paved shoulders along the edge of the travel lanes provide the only areas along the street for pedestrians to use. Many sidewalks along Manchester Road do not connect with sidewalks that run along cross streets. In Ellisville, Ballwin, Winchester, and Manchester, the presence of driveways every 20 to 100 feet interrupts pedestrian movement significantly. In addition, channelized turn lanes present at major intersections (including Sulphur Springs Road, Seven Trails Drive, Clarkson Road, Old State Road and Westglen Farms Drive) tend to provide limited pedestrian accommodation, further reducing the comfort level for pedestrians.

Crosswalks

The cities along the corridor have worked over the years to encourage construction of sidewalks along Manchester Road. There are east-west crosswalks at every signalized intersection except at the Best Buy in Ellisville, at Ballwin Plaza, and at Maple Lane. There are north-south crosswalks on at least one side at all signalized locations. In addition, signals designed for pedestrian crossings are located at Ries Road, Holloway, and New Ballwin Road.

Bicycle

The limited presence of biking facilities, the volume of vehicular traffic, the number of intersecting curb-cuts and driveways, and relatively high vehicle speeds all contribute to discourage bicyclists from traversing the Manchester Road corridor. The existing travel lanes along Manchester Road do not include bike lanes or any extra space to accommodate bicyclists. The five foot wide sidewalks present along most of the corridor do not sufficiently accommodate both pedestrians and cyclists. The multi-use path along both sides of Route 100 in Wildwood does facilitate and encourage bicycle activity, but to the east of Wildwood bike facilities are almost non-existent.

As discussed in the parks and open space section of the summary document, the communities along the corridor have worked to establish a bike path and trail plan that would connect the significant park and open space resources located in the general area, to the north and south of Manchester Road. The five communities currently do not have active plans in place to encourage or enhance bicycle activity along Manchester Road itself.

Bike / pedestrian trail along Route 100, east of Taylor Road, Wildwood.

Manchester Road, just west of Strecker / Ruck Roads: Much of this section, from Old State west to Westglen Farms, includes a paved shoulder but does not feature dedicated pedestrian or bicycle facilities.

Fragmented sidewalk connection. In many locations along the corridor, grade changes from one parcel to another have discouraged property owners from connecting sidewalks. Manchester Road just east of Devore Drive, Ellisville

Sidewalk quality: The sidewalk along Manchester Road in many areas consists merely of asphalt pavement attached to the main travel lanes (as shown). Manchester Road just west of Pretoria Lane, Ellisville.

Walk Score

Walk Score is the first large-scale, public access walkability index used in the United States to rank communities based upon how many businesses, parks, theaters, schools, and other common destinations are within walking distance of a given starting point. The Walk Score algorithm awards points based on the distance to the closest amenity in a series of categories (schools, parks, etc.). The system assigns the highest point ranking if amenities are located within one-fourth mile of a given starting point, and the number of points declines as the distance approaches one mile. The presence of amenities greater than one mile from a given starting point produces a score of zero in that amenity category. Scores for the various amenity categories are weighted equally and points are summed and normalized to produce a score ranging from zero to 100. The higher the Walk Score, the more likely people in a given area are to walk.

The following page includes a map of the various ranges of Walk Scores for locations along the Manchester Road corridor. The Walk Score ranges from the mid 20s in parts of Wildwood that remain undeveloped and somewhat rural to the mid 70s in parts of Ballwin and Manchester. Despite the challenge of walking along and near Manchester Road, the presence of a variety of amenities in this part of the study area, including parks, city halls, schools, and churches, increases the Walk Score toward the east end of the corridor.

Walk Score Diagram - Western Segment

Legend

- StudyArea
- City Boundaries
- Buildings
- Public School
- Back of Curb
- Trails
- Hydrology
- NWI Wetlands
- 500 Yr Flood

Parks & Open Space

ACCESS

- PUB
- PVT

GameGrid

Walk Score

- 23
- 24 - 25
- 26
- 27 - 29
- 30 - 31
- 32
- 33 - 35
- 36 - 37
- 38
- 39 - 40
- 41 - 42
- 43
- 44 - 45
- 46
- 47 - 49
- 50 - 51
- 52
- 53 - 54
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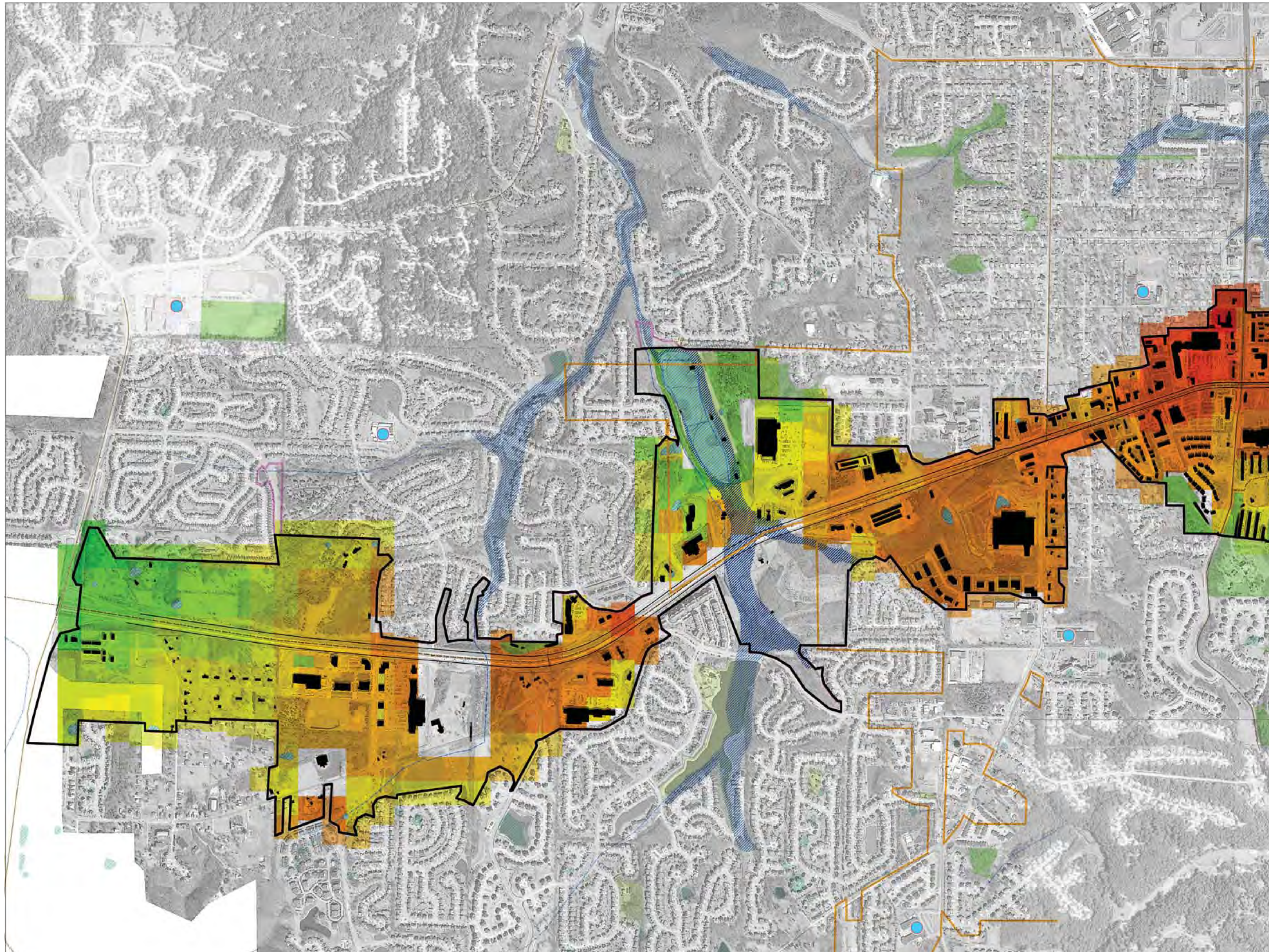
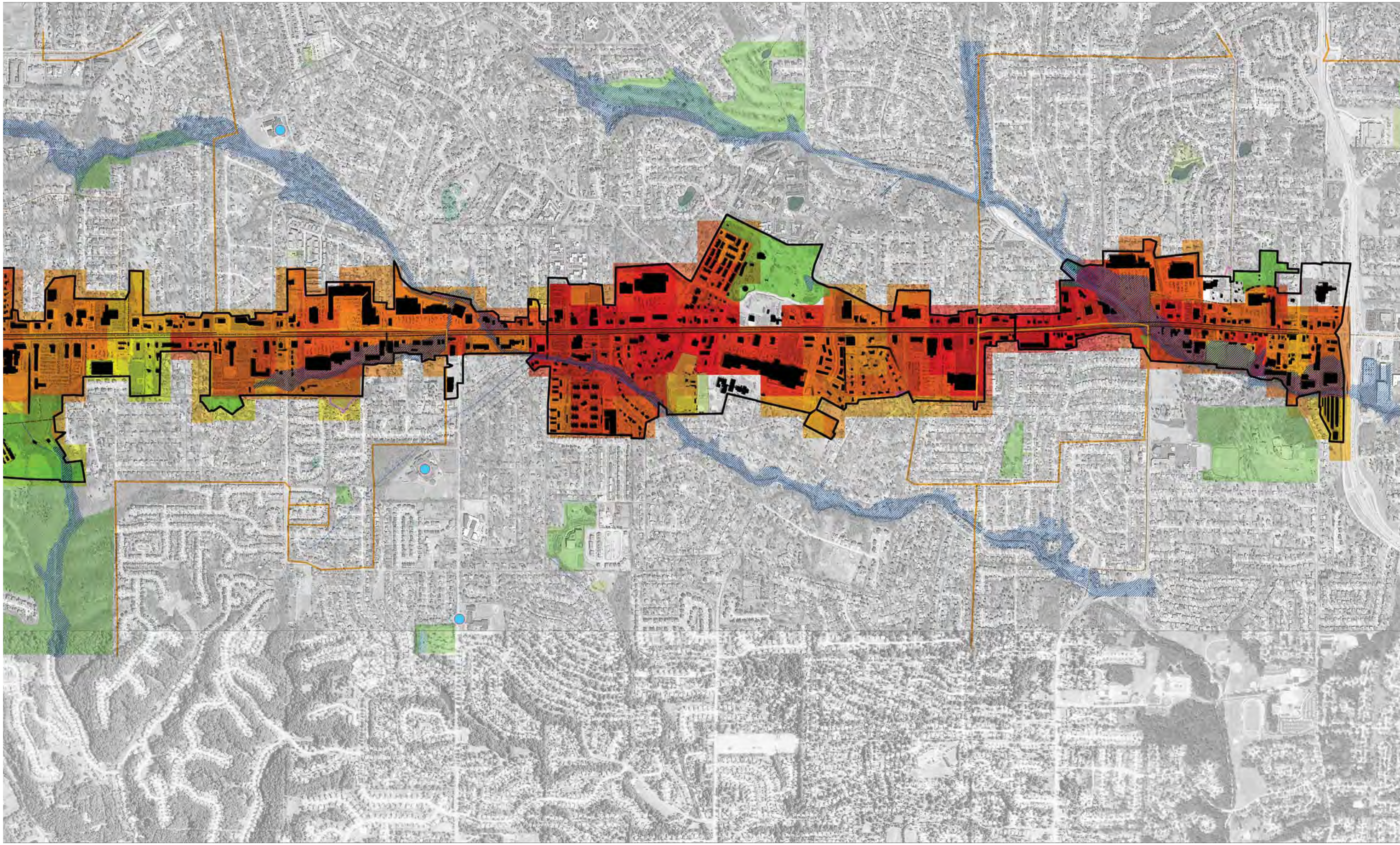
- 70 - 71
- 72
- 73 - 78



Walk Score Diagram - Eastern Segment



By comparison, some well known urban districts in the Midwest rank near the top of the Walk Score index. The Westport district and Country Club Plaza in Kansas City report Walk Scores of 99 and 95, respectively. The Lincoln Park neighborhood on Chicago's North Side reports a Walk Score of 94. The Downtown area of St Louis earns Walk Scores between 95 and 100. Scores from 90 to 100 indicate a "walker's paradise". Walk scores from 70 to 89 are "very walkable", 50 to 69 are "somewhat walkable" and below 50 indicates a "car dependent" location.

Importantly, the Walk Score only considers geographic proximity in determining walkability and does not account for poor street and sidewalk design, lack of sidewalks, safety issues, barriers to pedestrians, topography, setbacks of buildings from the road, and the prevalence of a "car culture" as opposed to a "sidewalk culture". However, the Walk Score does provide a reliable, objective metric concerning the pedestrian environment that the communities can use to monitor the progress of the plan over the next few decades.

Transit Facilities

As a major arterial linking West County to suburbs to the east and to St. Louis, Manchester Road has historically featured bus service provided by Metro, the regional transit agency in the St. Louis region. For a portion of 2009, Metro cut all bus service west of Interstate 270 in order to bridge a budget gap. In the second half of 2009, Metro was able to temporarily restore bus service along Manchester Road and other areas in West County.

Currently, the 57 Manchester bus line operates along the corridor, from Route 141 west to Manchester Road / Westglen Farms Drive. The bus turns south and west on Manchester Road, then turns north on Taylor Road before returning east along Route 100 and heading east along Manchester Road back to Route 141. The 57 route continues east from Route 141 and eventually connects to 14th and Spruce Streets in Downtown St. Louis, providing connections to the MetroLink light rail line at the Maplewood and Civic Center stations, and the Gateway Multimodal Transportation Center. The 57 also connects to a number of north-south bus routes in St Louis County and St. Louis City. Route 57 runs in the Manchester Road study area Monday through Saturday from 5 AM to 11 PM (approximately hourly) and on Sunday from 6:30 AM to 10 PM (running approximately every 80 minutes).

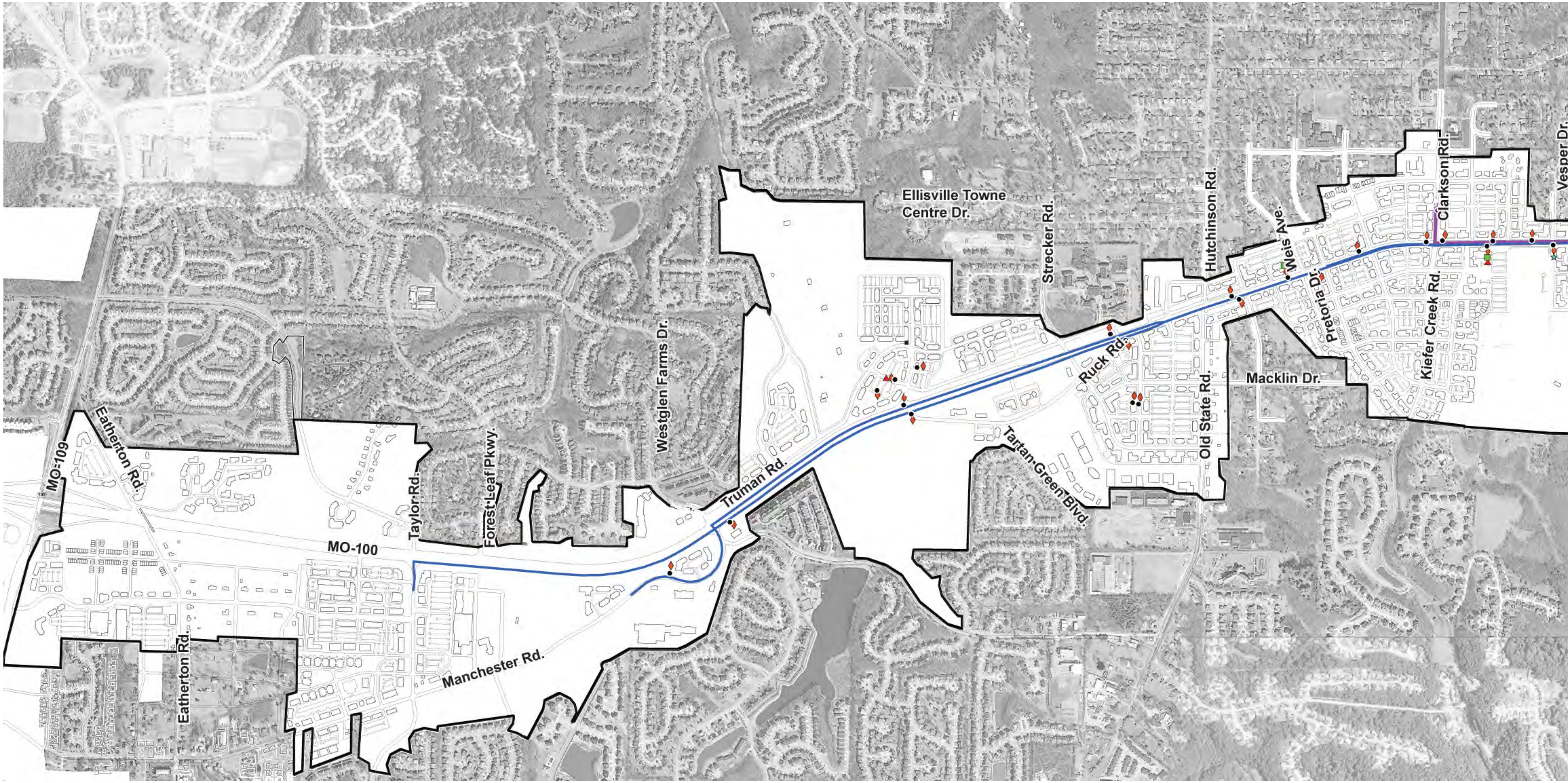
The 58X Twin Oaks Express line operates along Manchester Road from New Ballwin Road to Clarkson Road, and then connects north to the Ballas Transit Center and east into downtown St. Louis. This route provides connections to MetroLink light rail service at Civic Center, Convention Center, 8th and Pine, and the Grand Station, as well as to several other local and express Metro bus routes. The 58X service operates Monday through Friday, with six trips eastbound in the morning (approximately every 30 minutes from 4AM to 7AM), and five westbound trips in the evening (from 3:40PM to 5:40PM).

Bus Stops

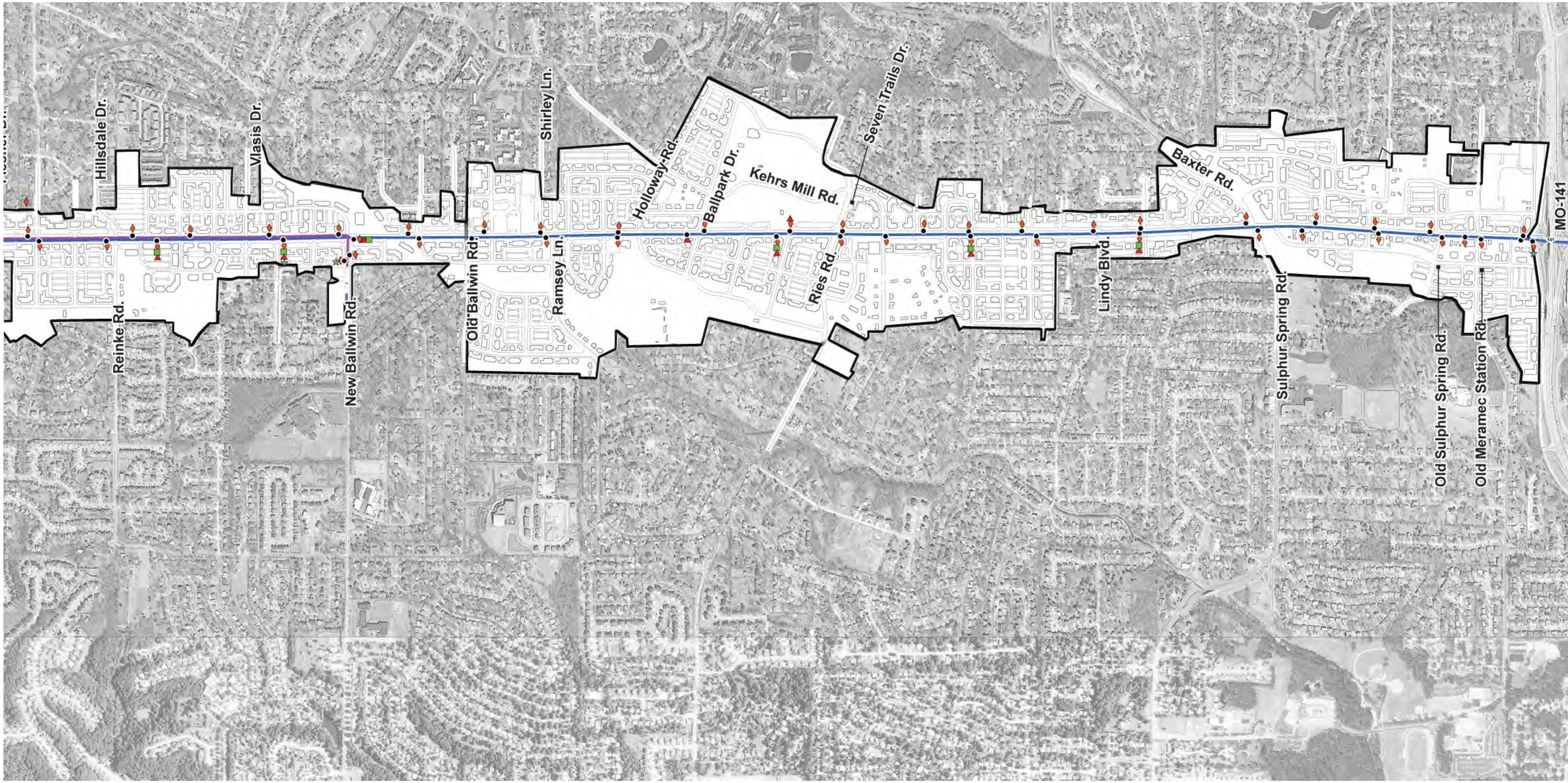
Metro has spaced bus stops along Manchester Road approximately every two to three blocks. The amenities for these bus stops, including shelters, benches, informational signs, and lighting, vary a good deal from location to location. Generally, bus stops along the south side of Manchester Road, servicing commuters heading eastbound toward St. Louis in the morning, feature shelters and higher levels of amenities, whereas westbound stops often include merely a sign indicating the location for the stop (with no shelters). The following diagram outlines the amenities present at bus stops in the area.

Sign along Manchester Road in Manchester indicating the suspension of Metro bus service in early 2009.

Bus Stop Amenities - Western Segment



Bus Stop Amenities - Eastern Segment



Summary of Existing Conditions

After gathering existing data and conducting discussions with stakeholders and officials along the corridor, the consultant team arrived at the following key conclusions with regard to Manchester Road's existing transportation conditions:

- While Manchester Road experiences significant traffic volumes between Baxter Road and Route 141, and around Clarkson Road, during rush hour periods, the overall impediment to improved traffic performance relates to access management problems. The preponderance of curb cuts and intersecting residential streets along Manchester Road, and the lack of connectivity between individual retail parcels, funnels almost all traffic in the area on to Manchester Road and creates conflict between travelers using the corridor to commute and those using it to access individual businesses. The significant number of vehicles turning into and out of individual parcels creates safety issues.
- The lack of a grid or more coordinated street network contributes to Manchester Road's transportation problems. In most parts of the Midwest, a grid of streets, including secondary streets running parallel to main arterials, helps to disperse traffic and relieve bottlenecks on main streets (such as Manchester Road). In contrast, very few significant north-south arterials intersect Manchester Road. Very few roads run parallel to Manchester. As a result, almost all traffic in the area funnels onto Manchester Road, creating congestion at peak periods.
- The inconsistency in the quality and presence of sidewalks, crosswalks, and bicycle facilities discourages pedestrian and bike activity along – and near – Manchester Road.
- A significant excess inventory of parking decreases the visual quality of the corridor.

The presence of the center turn lane, allowing unobstructed left turns in all locations, contributes to confusion along the corridor and has contributed to a significant number of accidents over the years as motorists attempt left turns without protection from oncoming traffic.

Prototypical sidewalk section in Ellisville: Five foot sidewalk separated from the main travel lanes by grass area.

Historic Manchester: Example of attached sidewalk (with brick pavers) prevalent on south side of Manchester Road in historic Manchester.

Transportation Recommendations

Over the course of the project, the consultant team drew from input provided at a series of public meetings and its experience working on corridors around the country to develop alternative roadway concepts, a preferred alternative, and the final recommended transportation plan for the Manchester Road corridor.

Access Management

The consultant team focused on strategies to improve access management, and thus the overall performance of the corridor, at public meetings in December 2009 and February 2010. The key message articulated concerning access management was that higher speeds, all other factors being equal, safely accommodate fewer access points along a given road. The slower the posted speed limit, the more driveways and curb cuts a roadway can accommodate in order to provide efficient access management and traffic movement.

“Access management” consists of a series of tools and policies that can improve safety, aesthetics, and traffic flows. From a traffic standpoint, roads perform two distinct functions: providing access to property, and accommodating the through-movement of traffic. At the extremes, expressways provide no direct access to property but move large volumes of traffic, while cul-de-sacs do just the opposite.

In theory, traffic movement is the main function of arterial highways and a major function of collector roads. In practice, arterials such as Manchester Road often become so cluttered with driveways and other access points that they function more like local streets.

To counter this tendency, comprehensive access management systems establish minimum separations between driveways, traffic signals, and median openings. Access management policies place restrictions on turning movements into and out of properties and require turn lanes or acceleration / deceleration lanes where necessary to avoid conflicts with through traffic. Requirements vary with the type of roadway and nature of the area served.

The following factors influence access management and its effects on overall roadway performance:

- Median breaks
- Driveway spacing and density
- Corner clearance
- Spacing and clearance for right-in, right-out driveways
- Clearance of functional areas of public road intersections
- Sight distance
- Driveway geometrics and driveway corner clearance
- Two-way left turn lanes (“five lane” facilities)

An existing bus shelter along eastbound Manchester Road, Winchester area.

Spacing for Corner Clearance, U-Turns, Driveway, and Crosswalk Spacings

The spacings of these roadway elements influence the overall safety of a road for all users. Corner clearance represents the distance between an intersection and the next driveway down the street, and spacing for corner clearance influences the amount of acceleration or deceleration at intersections. A shorter corner clearance usually produces overall lower speeds throughout a corridor, while more lengthy corner clearance provides for space for motorists to accelerate, increasing the overall speed through a corridor.

On a road such as Manchester Road, providing additional U-turn opportunities between intersections would help to provide access to the numerous businesses located between signalized intersections. U-turn locations help to channel traffic to a desired location, rather than having all vehicles converge and turn at one location, at a signalized intersection. In analyzing the feasibility of allowing U-turns at a given intersection, officials should consider the ability of trucks to navigate the U-turn.

The spacing between driveways affects access to individual properties, pedestrian and bicycle safety, and the prevailing speed along a corridor. Access management strategies seek to balance the need to combine driveways in order to provide for a more orderly flow of traffic through a corridor or to increase speed, and the need to provide sufficient driveways to service businesses and provide for a lower overall traffic speed along a corridor. As driveway spacing decreases, the overall traffic speed decreases as well. The consultant team recommends a general spacing for crosswalks across Manchester Road of 220 to 330 feet. The precise spacing of crosswalks depends on a number of factors, including the surrounding land uses. In addition, the master plan recommends that the communities and MoDOT time traffic signals to provide sufficient crossing time for pedestrians and allow additional lead time for pedestrians to begin crossing Manchester Road before vehicles begin their movements at signalized locations.

Strategies to Improve The Corridor Transportation Network

Many of the prominent arterial and neighborhood streets serving the Manchester Road corridor and much of West County evolved from older farm to market roads and old trails that date to the original settlement of the area. As opposed to the grid system present in much of the Midwest, the eastern portion of Missouri near St Louis mainly evolved from older roads that followed the topography of a given area and connected local farm towns. Whereas government leaders in Illinois or Kansas laid out county roads on a one-mile spacing and demarcated plots of land based upon sections and clearly defined township boundaries, governments in eastern Missouri have maintained a network of occasionally diagonal roads and streets following creeks and old territorial paths. In West County, the lack of a grid network has produced a limited number of north-south and east-west roads to service local suburbs over the last half century. Routes 109 and 141, for example, are the only north-south roads in the study area that connect all the way to Interstate 44 south of the Meramec River. Clarkson Road (Route 340) is one of the few major arterials that connect Manchester Road directly to Interstate 64 and Chesterfield to the north. Other neighborhood connectors, such as Kerrs Mill and Baxter Road, traverse parts of Manchester and Chesterfield in a diagonal, northwest-southeast orientation, and do not connect directly to the southern parts of Manchester or Ballwin. Clayton Road provides east-west connectivity from the City of St Louis all the way to Route 109, but the only other east-west route running parallel to Manchester Road, Big Bend, only connects as far west as Kiefer Creek Road in Ballwin. The lack of alternative north-south and east-west routes in the West County area has funneled a significant portion of regional traffic, including east-west commuter traffic, onto Manchester Road by default. The Manchester Road corridor in many cases represents the only viable option to traverse this portion of West County, given the lack of connectivity to the south and limited routes to the north.

At the same time Manchester Road serves as one of the few major roads traversing West County from end to end, the local street network along the corridor compounds access management and traffic flow problems. A significant number of dead-end residential streets connect with Manchester Road, making the corridor the only point of access for these residents. Many residents and developers following World War II intentionally created subdivisions and clusters of homes along and near the corridor connected only to Manchester Road, in order to prevent cross traffic from using the residential streets to access other neighborhoods or to travel to other parts of town. A number of north-south streets, particularly in Ballwin and Ellisville, connect with Manchester Road in only one direction (to the north, or to the south) and several of these streets connect with Manchester Road just to the east or the west of another north-south street. For example, Reinke Road and Hillsdale Drive in Ellisville and Ballwin connect with Manchester Road less than a few hundred feet apart. The pattern of dead end streets and north-south streets connecting with Manchester Road creates difficulties for local residents accessing the main road. Drivers wishing to enter or exit these local roads must compete with regional-oriented traffic traversing the corridor at a higher speed and have a limited number of signalized intersections and safe access points to use along the corridor.

In addition, many drivers accessing one business and wishing to visit another one just down the street must use Manchester Road because alternative routes, such as connections across parking lots or streets running behind businesses, typically do not exist in the study area.

All of these regional and local dynamics create pressure on Manchester Road. The road must serve as both a local and regional transportation conduit, and the confusion of access points along the corridor adds to challenges with access management in the area.

The consultant team identified the following “tool box” of access management strategies and presented them during the public meetings in December, February and March, as well as in one on one discussions with property owners and other business people along the corridor. The Design Workshop team drew from this menu of transportation alternatives in producing alternative, preferred, and final transportation recommendations for the Manchester Road corridor.

Back streets

As the corridor study area redevelops, the communities, along with the private sector, could install streets running generally parallel to Manchester Road, in order to provide additional east-west access for local traffic along the corridor. These roads would relieve traffic along Manchester Road. The back streets could function as “service roads” behind businesses, or in some situations could function as “main streets” for various shopping districts or town center areas, emphasizing walkability, pedestrian and bicycle amenities and connections, and slower traffic speeds. Back streets could also run north-south in particular areas along the corridor, such as town center districts, in order to provide for a downtown-like grid of streets – similar to the pattern present in Kirkwood and other small towns in the Midwest. Given the scale of the Manchester Road study area, back streets would likely be installed over many years, as redevelopment progresses.

Connected Parking Lots and Cross Access Agreements

By providing alternative access from one shopping area or business to another on the same side of Manchester Road, as opposed to simply having motorists use the main road, connections between parking lots would relieve the main travel lanes of Manchester Road of local traffic. Several of the communities in the West County area, including Ballwin and Ellisville, have encouraged the dedication of Cross Access Agreements over the years to facilitate connections between businesses. The corridor as a whole could actively encourage parking lot connections in order to relieve traffic flow from Manchester Road and improve access management along the corridor.

Extensions of Existing Service Roads

In the newer sections of the study area, in Ellisville and Wildwood, service roads provide local access to businesses in select locations. However, these service roads do not connect all the way through, in most cases, to other arterials. For example, Truman Road serves as a frontage road along the north side of Manchester Road, between Westglen Farms Drive and Ellisville Town Centre Drive, and provides local access to a car dealership, fast food restaurants, and a batting cage operation. However, Truman Road dead ends to the east and does not connect all the way through to Strecker Road in Ellisville.

Extensions of Truman Road and a few other service roads in Ellisville and Wildwood would provide local access to businesses and relieve traffic flow from Manchester Road and Route 100.

Multi-Way

Multi-way roads include local access lanes running directly adjacent and parallel to the main lanes of traffic that serve higher speed, commuter-oriented traffic. A fairly narrow median often separates these local and express lanes along a multi-way. Multi-way configurations help to minimize the conflicts between regional and local traffic along streets such as Manchester Road and improve connectivity to local businesses. The consultant team explained to participants at public meetings from the outset that construction of the multi-way along most of the corridor, from Ellisville east toward Route 141, would require additional right of way. In addition, constructing a multi-way in the Manchester area would present challenges as many of the existing buildings, particularly on the south side of the road, already exist in very close proximity to the travel lanes of Manchester Road. Installing a multi-way in Manchester could require removal of some of these buildings.

Boulevard

A boulevard configuration would include the installation of a median to control the number and safety of access points for left turns or U-turns along Manchester Road. This arrangement would likely decrease the number of crashes and direct local traffic to clearly defined access points along the corridor. Boulevards in the United States traditionally have also included landscaping treatments to improve aesthetic quality as well as improvements geared toward pedestrians and bicyclists, such as crosswalks, improved sidewalks, and enhanced bike lanes.

The consultant team presented conceptual ideas about each of these access management and transportation strategies at the December public meeting and asked a series of questions concerning the preferred solutions for various segments along the corridor. As illustrated in the results from keypad polling from December, the public generally preferred the use of a boulevard median, connected parking lots and back streets in order to improve the performance of Manchester Road going forward.

Public Input – Speed Versus Access Points

At the December public meetings, the consultant team presented general information about the potential access management strategies and provided diagrams showing how the number of access points would vary with the prevailing speed along Manchester Road. Presented with a series of questions asking participants to choose various access management spacings (for crosswalks, driveway spacings, median breaks, and U-turn opportunities), the public consistently selected the spacing appropriate for a 40 mile per hour speed limit along Manchester Road.

Signal Spacing and Speed Management

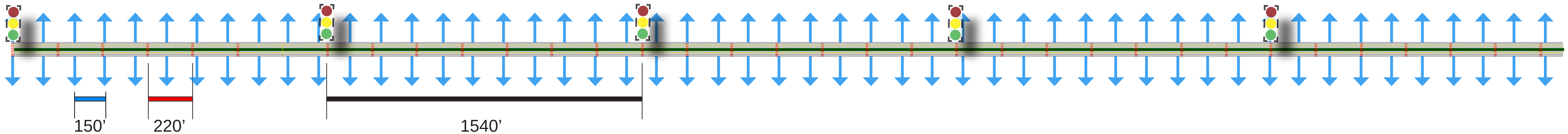
Posted speed limits along Route 100 / Manchester Road range from 55 miles per hour from Route 109 to Taylor Road, to 50 miles per hour from Taylor Road to Westglen Farms Drive, to 40 miles per hour from Westglen Farms Drive to Route 141. However, actual observed speeds along the corridor range from 22 percent to as much as 60 percent above the posted speed limit, depending on the particular location. The spacings of signalized intersections greatly affect the observed speed along a corridor and the overall flow of traffic.

More significant spacings between signalized intersections facilitate higher speed limits and limit access points to particular locations and properties along a corridor. However, greater spacings also limit opportunities for pedestrians and bicyclists to cross the corridor and limit signalized access points to individual businesses. All other factors being equal, a business owner along Manchester Road would prefer a location at a signalized intersection. Traffic stopped at the intersection would have greater opportunities to view the business and the signalized intersection would provide a safe and clearly demarcated access point to reach the particular business. Greater signal spacings can encourage pedestrians to pursue hazardous mid-block crossings. Nationally, up to 80 percent of pedestrian deaths occur at mid-block, non-intersection locations.

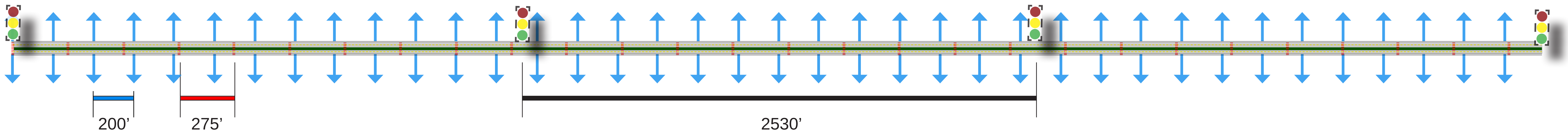
People generally believe that the existence of fewer traffic signals, aligned at uniform spacings (every one-fourth or one-half mile, for example) improves vehicle traffic flow and reduces delays for motorists. In practice, however, a thoroughfare with a greater number of traffic signals, properly timed by using the latest technologies, can in fact demonstrate improved traffic flow compared to a poorly timed stretch of road with fewer traffic signals. The traffic signals along Manchester Road are currently timed at 120 second cycles.

Signal Spacing and Speed Management

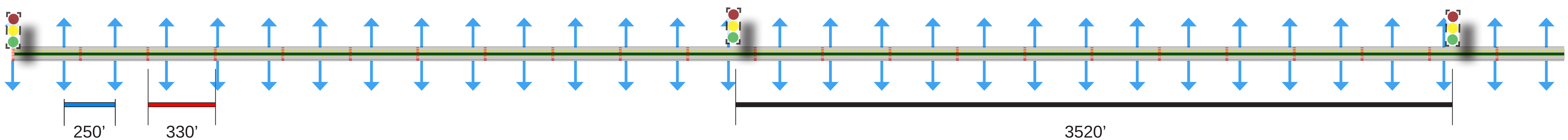
35 mph



40- 45 mph

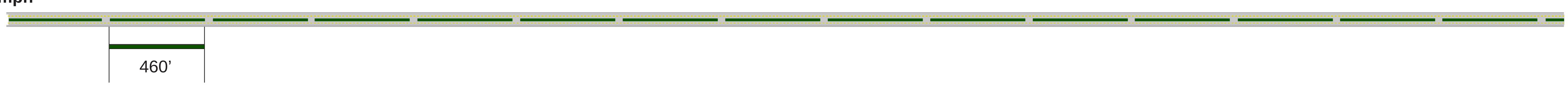


50+ mph

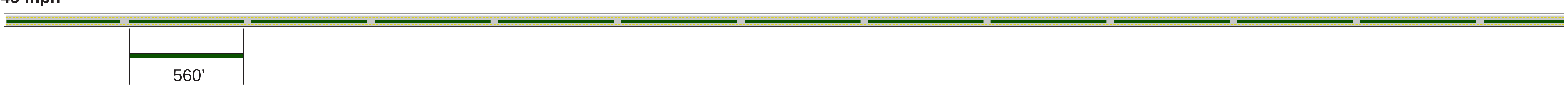


MEDIAN SPACING

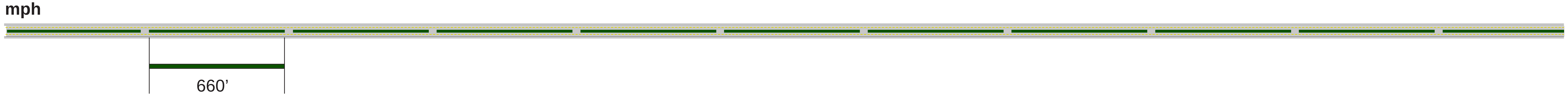
35 mph



40- 45 mph



50+ mph



Signal Spacing as a Function of Progression Speed and Cycle Length

As the consultant team approached preliminary and final recommendations for the transportation plan for the Manchester Road corridor, it considered various factors concerning traffic signals and worked to balance the interests of businesses, pedestrians and cyclists with the goal of moving traffic smoothly along the corridor. In the end, a single magic formula does not exist with respect to the locations of traffic signals. The team worked to provide for the transportation functionality of the corridor while enhancing the needs of businesses and local residents.

The consultant team presented initial information concerning the relationship between design speeds and traffic signal spacing at the December public meeting. When presented with choices of a 35 mph speed (with traffic signal spacing of 1,540 feet or 3/10 mile), a 40 to 45 mph speed (with spacing of 2,530 feet or one-half mile), and 50-plus mph (with spacing of 3,520 feet or 2/3 mile), 76 percent of respondents at the public meetings selected the 40 to 45 mile per hour design speed.

Based upon feedback from the public and guidance from officials at MoDOT, the consultant team outlined transportation recommendations for the corridor based upon the existing speed limits along Manchester Road and Route 100. Although the 40 mph speed limit is not ideal for pedestrian safety, several elements of the plan will enhance the pedestrian environment. The final plan features a series of parallel streets and Main Streets within and between the town centers along Manchester Road that will incorporate lower speed limits (under 30 mph). The plan for the Manchester Road right of way includes the introduction of a number of additional signalized crosswalk locations. Landscape buffers and street trees will separate the travel lanes of Manchester Road from the sidewalks and bike paths on either side of the road, throughout the length of the corridor. All of these elements will combine to create a safer pedestrian environment.

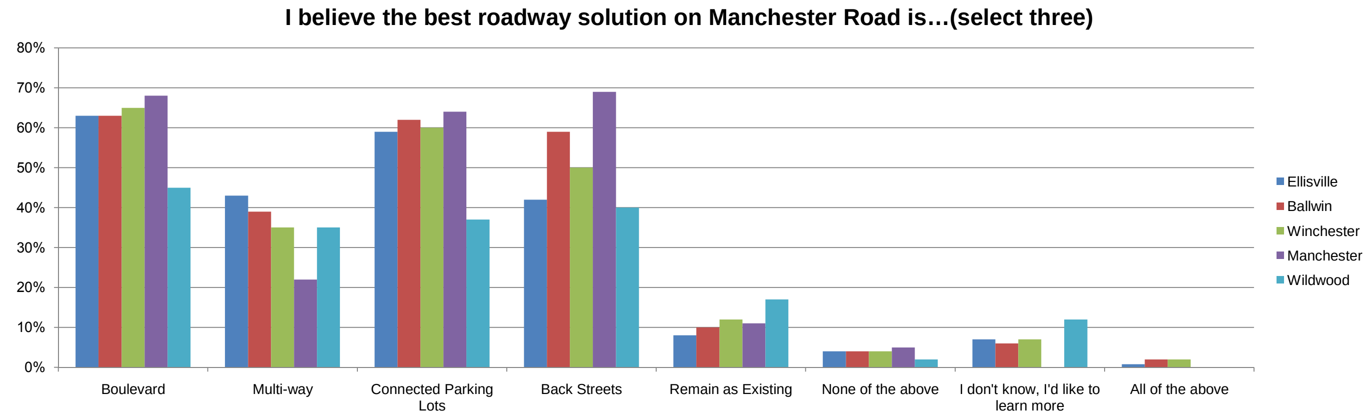
Figure 21: *Signal Spacing as a Function of Progression Speed and Cycle Length*

Cycle Length	Speed						
	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
	Signal Spacing (feet)						
60 sec	1,100	1,320	1,540	1,760	1,980	2,200	2,420
90 sec	1,630	1,980	2,310	2,640	2,970	3,300	3,630
120 sec	2,200	2,640	3,080	3,520	3,960	4,400	4,840

Evolution of the Plan: Alternatives Presented at February Meeting

Following presentation of the general ideas underlying access management and transportation design at the December meeting, the consultant team presented general alternative concepts for the transportation plan for review and public input in February 2010. The alternatives outlined potential spacings for driveways, intersections, traffic signal locations, and crosswalks for three different predominant travel speeds: 35 miles per hour; 40 to 45 miles per hour; and 50-plus miles per hour. The alternative plans also articulated how strategies to provide backstreets, connected parking lots, and medians would be incorporated for each alternative.

Given background information concerning access management and transportation planning presented at the December and February public sessions, community members consistently selected the design options associated with the 40 to 45 mile per hour speed limit (correlating to the predominant existing speed limit along Manchester Road). At the February public meetings, 68 percent of respondents to keypad polling favored the 40 to 45 mile per hour alternative transportation plan, compared to 26



Results from Keypad Polling, December 2009 Visioning Sessions

percent favoring the plan associated with a 35 mile per hour speed, and only 4 percent favoring the plan associated with a 50-plus mile per hour design speed. In terms of the online version of the keypad polling questions, 69 percent favored the 40 to 45 mile per hour option, 15 percent favored the 35 mile per hour option, and just over 15 percent favored the 50-plus mile per hour option.

Preferred and Final Transportation and Access Management Plans

Based upon feedback from the public in favor of the transportation alternative tied to a general speed limit of 40 to 45 miles per hour, and based upon discussions with and feedback from local business and property owners, city officials, the Transportation Technical Committtee, the Steering Committee, St. Louis County officials, and MoDOT representatives, the consultant team presented a preferred alternative for transportation and access management at the March public meetings. The team further refined the plan based upon continued comments from public and private sector sources and presented the final draft version of the transportation and access management plan at the May 2010 series of public meetings.

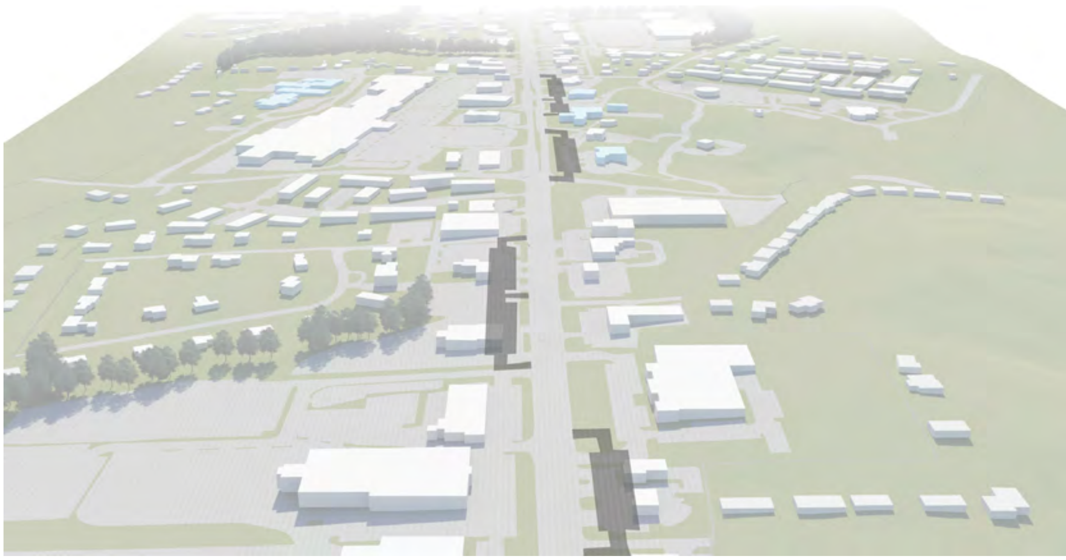
The following sections outline the key transportation recommendations associated with the final plan for the Manchester Road corridor study area.

Manchester Road, Route 141 to Old State Road

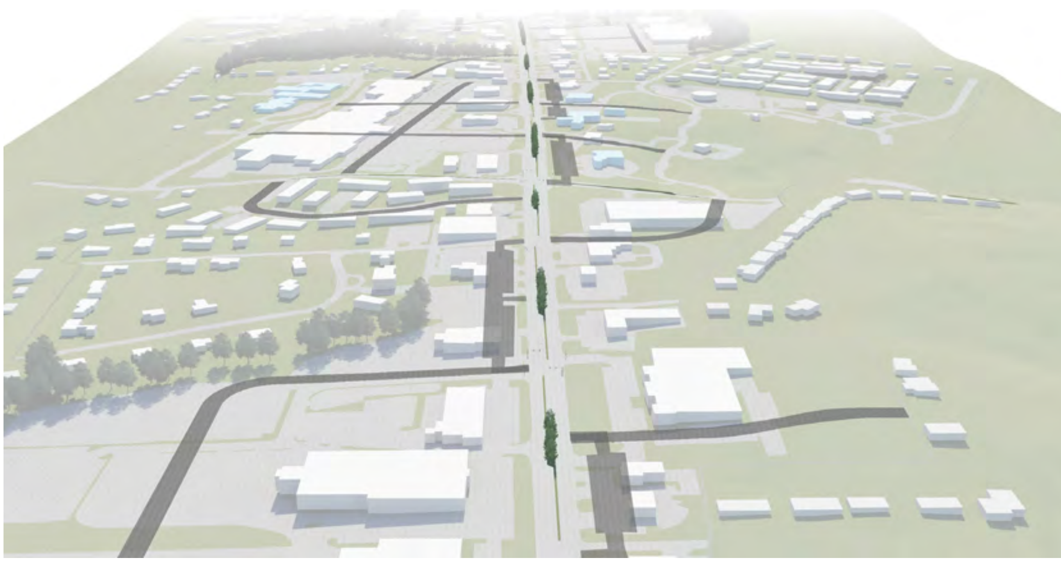
The consultant team recommends that MoDOT and the local communities pursue the creation of a boulevard along Manchester Road from Old State Road to Route 141 over time, as the revitalization and redevelopment of the study area proceeds over the next few decades.

In this portion of the corridor, including parts of Ellisville, Ballwin, Winchester, and Manchester, MoDOT manages a fairly limited right of way along Manchester Road, ranging from 85 to over 100 feet in width. While open space within the official right of way exists at certain locations along this portion of the corridor, in general expanding the number of lanes or adding to the width of the street section for Manchester Road would require acquisition of private property to provide sufficient right of way. Members of the public and private sector interests along the corridor, in public meetings and in stakeholder interviews, expressed significant reservations about the public sector acquiring additional land for transportation expansions along the corridor.

At the same time, the consultant team concluded, based upon its analyses and discussions with transportation officials and city representatives, that the key problem facing Manchester Road involves access management, rather than traffic volume. Problems associated with left turns and access into and out of businesses and local neighborhoods outweigh issues tied to the overall volume of traffic along



Phase I



Phase III

Phase IV

the corridor. While parts of the corridor experience heightened congestion at peak times (such as the morning and afternoon rush hours), the consultant team and local officials determined that the current condition does not warrant expansion of the number of lanes or the overall capacity of Manchester Road. Rather, by working to provide backstreets as alternative east-west routes and better managing access into and out of properties along the corridor, the overall performance of the corridor will improve over time.

The final transportation recommendation for the study area calls for the existing roadbed of Manchester Road from Old State Road to Route 141 to remain unchanged (including two lanes in each direction), and for the local communities and private landowners to work with MoDOT to provide streetscape improvements and install a boulevard median down the middle of the street over time, as revitalization progresses. The median would provide for left turn pockets at designated locations along the corridor. However, installation of the median would likely not occur until redevelopment along at least one side of Manchester Road progresses. The likely scenario for the installation of a median would include the redevelopment of properties along Manchester Road in conjunction with the creation of associated access management strategies, including the connection of adjacent parking lots and the creation of parallel backstreets. Once these alternative access management tools are in place and the access points to local businesses are clearly identified, installation of the center median along Manchester Road would proceed. Private landowners and business owners along Manchester Road, in stakeholder discussions with the consultant team, expressed reservations concerning the installation of a median along Manchester Road, without providing alternative access tools and strategies to reach their properties. However, assuming that backstreets, connected parking lots, and traffic signals were in place to direct motorists to their locations, many participants saw the value of installing a median to enhance safety and manage congestion along the corridor. In addition, members of the public and business owners understood that the recommended signage and wayfinding program for the corridor would help to guide visitors to backstreets and shared parking facilities located behind businesses. Assuming that the street plan provides alternative access and signage provides sufficient guidance to locate businesses, the benefits of the boulevard median should outweigh potential negatives.

The phasing diagrams (showing an example from the Ballwin area) demonstrate how the evolution of a boulevard configuration along Manchester Road may progress over time. In Phase I of revitalization, property owners along the corridor would work to connect parking lots in front of buildings, thereby enhancing access to individual properties and relieving Manchester Road of some of the traffic moving from one business to another along the corridor. In Phase II, the installation of backstreets would provide alternative east-west routes to Manchester Road, relieving the main road of additional local traffic. In Phase III, installation of a median would begin in select sections of the corridor in order to provide safer and more clearly defined left turn locations for travelers along Manchester Road. Finally, in Phase IV, completion of the boulevard median would progress along with significant redevelopment of private properties along and near Manchester Road.

The Ballwin Olde Town Plaza development, which includes big box retailers such as Lowe’s and Ultimate Electronics as well as several restaurants, provides an example of how the evolution of the boulevard along Manchester Road may progress in other segments of the corridor. Prior to redevelopment, the south side of Manchester Road (including the current site of the Olde Town Plaza) featured a multitude of curb cuts with access directly onto Manchester Road. Motorists lined up in the center turn lane to access these properties, but the significant number of driveways created confusion for drivers. East-west streets running parallel to Manchester Road did not exist on the south side of Manchester Road, meaning that all local traffic had to use Manchester Road for access to local properties. In addition, the north-south streets (Ries Road and Seven Trails Drive) did not “line up”, thereby creating two separate intersections with Manchester Road.

The site plans for the Olde Town Plaza solved many of the transportation issues in this part of the corridor, providing for a more vibrant retail environment. The creation of a parallel backstreet, Jefferson Avenue, running behind the shopping center to the south of Manchester Road, provided an alternative east-west route and provided a way for shoppers to use Ballpark Drive and Ries Road in order to travel to destinations to the north and south in Ballwin. The site plan for the shopping center featured a continuous parking lot, running in front of the main row of stores, between Ries Road and Ballpark Drive. This continuous connection allows shoppers at one store to access another part of the shopping center without using Manchester Road. The redevelopment provided for full-movement traffic signals at intersections with Ballpark Drive at the west end of the development and Ries Road / Seven Trails at the east end. The installation of a center median between Ballpark Drive and Ries / Seven Trails limited the number of uncontrolled left turns along this portion of Manchester Road, thereby increasing overall traffic safety, and directed shopping center traffic to the main signalized intersections. The design also provided right-in, right-out access points from eastbound Manchester Road into the shopping center. Together, these strategies have created a more logical and organized traffic pattern in and around Olde Town Plaza. As other parts of the study area redevelop over the next few decades, the cities and developers can use the “tool box” of transportation strategies to improve the performance of Manchester Road and adjacent side streets.

Manchester Road / Route 100: Old State Road to Route 109

From Old State Road to Route 109, MoDOT has designed Route 100 as a higher speed facility with limited access points and some of the key characteristics of expressways in the state, including wide center medians, a significant right of way width including sizeable clear zones and shoulders, and a grade-separated diamond interchange at Route 109.

Because Route 100 serves primarily as a commuter-oriented road through the west end of the study area and a number of parallel and frontage roads already provide access to local shopping areas (including Truman Road in Ellisville and Manchester Road / Historic Route 66 in Wildwood), the consultant team determined that this portion of the corridor required limited modification in terms of roadway layout. The communities and MoDOT should work to extend the bike trail that currently ends at Westglen Farms Drive to the east, into Ellisville and points east. The “parkway” street section presented in the Summary Document illustrates the recommended road section for this part of the corridor. The communities and MoDOT should focus on enhancing the landscaping and vegetative amenities along the very wide shoulders of this portion of the corridor, in order to minimize noise pollution resulting from the higher travel speeds along Route 100 and to provide a visual buffer between residential neighborhoods and the highway.

Pedestrian and Bicycle Facilities

The key principles of the Great Streets Initiative in the St. Louis metropolitan area call for the creation of streets and districts made for walking and designed for all modes of transport, including bicycles. While parts of Route 100 / Manchester Road include land uses or higher speed sections not naturally conducive to walking and bicycling, the consultant team looked for opportunities to create places designed for non-motorized travel throughout the study area. In keypad polling and online surveys, members of the public expressed a desire to plan for walkability and bicycling along and near Manchester Road.

Perceptions of safety and the creation of areas that appear inviting for walking influence the overall quality of the pedestrian environment. The key strategies the consultant team employed to create elements of the plan geared to walking include:

- Creation of continuous, accessible sidewalks that take people to where they want to go;
- Sidewalks of adequate width, separated by a buffer area from travel lanes;

- Use of pedestrian-scale lighting that does not cast large shadows;
- Development of well-lit storefronts that do not include any dark or recessed areas;
- Inclusion of sidewalk amenities including benches, trees, planters, and cafes; and
- Provision for crosswalks that make crossing the street easy

Pedestrian catchment areas (also known as “pedsheds”) describe the typical distance people are willing to walk to reach a given destination. Pedshed distances may include measurements between two different land use destinations, or measurements between an access location (such as a parking facility or transit stop) and a destination (such as a business, residence, or civic facility). Transportation planners often describe pedsheds in terms of distance (for example, one-fourth mile). However, the consultant team recommends that the communities analyze pedsheds along Manchester Road in terms of travel times (for example, five minutes). The time-oriented metric is more appropriate because most people remember the length of their journeys in terms of travel times, and because the crossing of a given area may not include a significant physical distance, but may involve a significant wait for a traffic signal, thus discouraging one from making the trip. The consultant team denoted areas for town centers on the illustrative plan in order to provide for pedsheds of no greater than five minutes from the transit stops along Manchester Road to the outer edges of the town centers. Planning for a limited pedshed helps to maximize the marketability of land uses within the town center areas and provides for more direct access from town center areas to parking facilities and potential transit services along Manchester Road.

Sidewalks

The consultant team recommends that the streetscape along Manchester Road and nearby side streets and backstreets include sidewalks of a width of five feet or greater. The communities and developers should plan for wider sidewalks whenever possible, and in particular in town center areas, along “Main Streets”, to facilitate shopping and outdoor dining.

The communities should provide for a planted landscape buffer of at least three feet between the travel lanes of Manchester Road and the combined sidewalk / bike lanes running parallel to the street, from Old State Road east to Route 141. Setting the sidewalk back from Manchester Road with a landscaped buffer will reduce the impact of vehicular noise on pedestrians and provide for enhanced safety.

Design Standards for Parking

Parking facilities often impede the creation of inviting pedestrian environments and detract from the overall visual quality of an area. Therefore, the communities should implement the following design standards in order to better integrate parking with the surrounding urban environment and encourage walkability along the Manchester Road corridor.

As the areas around the town centers evolve and redevelop over time, the cities should work to minimize surface parking in these areas in particular and encourage the construction of structured parking facilities (parking garages) wrapped or hidden by surrounding land uses over time. As redevelopment initially proceeds, the creation of structured parking may remain infeasible given the higher cost of structured spaces (construction costs often exceed $20,000 per space for structured, versus $5,000 per space for surface spots). However, as the density of development increases, structured parking will become feasible and the cities should encourage it to create a more walkable town center environment. This strategy will ensure that developers use valuable, highly visible land in the town center areas for future residential, retail, entertainment, or office uses. In a downtown or town center area, the presence of a surface parking lot disrupts the urban fabric from one block to another and diminishes the pedestrian experience. Surface lots expand the distances between destinations and increase the number of curb cuts intersecting with sidewalks, thereby detracting from the concept of a town center.

In addition, the five communities and MoDOT should design the corners at intersections between major cross streets and Manchester Road to be handicap accessible, in accordance with ADA standards. Depending on the slope and corner radii, the communities should modify many of the existing east-west intersection crossings to create safer areas for walking. In general, MoDOT and the communities should design for driveway radii of 15 feet, and the width of two-way driveways intersecting with Manchester Road should not exceed 30 feet.

Bicycle Facilities

A bicycle transportation network involves the same elements present in transportation planning for vehicular traffic. A complete bicycle network involves a system of signs, roads, roadway markings, and parking, laid out in an efficient pattern. Like a well-designed roadway system, people should be able to travel locally via bicycle without needing a map.

Bicycle facilities may include the following:

- “Sharrow” systems that allow for vehicular and bicycle traffic to share the same travel lane;
- Bike lanes separated from vehicular traffic (by a pavement marking, for example) but contained within the roadway footprint;
- Bike lanes running parallel and in close proximity to a roadway (often separated by a landscape buffer);
- Bike trails that may run parallel to a roadway, or in other areas within communities (often included as part of greenway or parks systems along creeks and similar natural features)

In keypad and online polling, the public expressed a distinct preference for bike lanes separated from the main travel lanes, rather than providing for a distinct bicycle lane within the roadway along Manchester Road. Members of the public commented at the visioning sessions that they could not conceive of Manchester Road providing an ideal environment for bicycle traffic to share pavement space with vehicular traffic.

Furthermore, the consultant team concluded that reconfiguring the Manchester Road street section to accommodate sharrows or bike lanes contained within the roadway would require a major reconstruction effort and the potential acquisition of additional right of way. The significant volume of vehicular traffic, the relatively high vehicular travel speeds, the presence of a significant number of driveway intersections, and the higher capacity nature of the street do not create an ideal environment on Manchester Road for bicycle traffic.

Therefore, the consultant team recommends that the communities accommodate bicycle traffic along and near Manchester Road through the following two main strategies:

- Provide bike lanes attached to sidewalks that run parallel to Manchester Road. A landscape buffer would separate this combined sidewalk / bike lane from the vehicular travel lanes of Manchester Road. This bike lane configuration would apply to the portion of the corridor from Old State Road to Route 141 that features relatively limited right of way space and significant physical constraints due to nearby parking lots and commercial properties. These bike lanes along Manchester Road could connect toward the west end of the corridor with existing bike trails in Wildwood that flank either side of Route 100.

- The provision of bike trails, running either parallel to Manchester Road / Route 100 or following the natural open spaces in and near the five communities. These bike trails would feature asphalt or gravel surfaces and would traverse through more natural spaces along and near the corridor in West County. The existing bike trails along either side of Route 100 serve as a potential example for the kinds of bike trails the communities could install in the area, connecting with Manchester Road. The Summary Document includes a map that shows a recommended bike and trail plan for this portion of the West County area. As described further in the parks and trails section of the Summary Document, bike trails would connect the shopping areas and town centers for the communities along Manchester Road with the significant park and open space amenities in the area, including sizeable state and county parks to the west and south, in Wildwood and near the Meramec River. Residents have extensively utilized the existing bike trail along Route 100 in Wildwood, and installation of similar trails along and near Manchester Road would likely attract similar enthusiasm and utilization.

Parking

Parking requirements and policies enacted by the five communities will have a significant impact on the physical layout and quality of urban form created along the Manchester Road corridor in the future. Carefully planning for parking in order to support local businesses and to provide for more walkable and vibrant areas of activity will help to create a Great Street in the future.

As mentioned earlier, the corridor includes a significant over-supply of parking spaces for retail areas along Manchester Road. This pattern consumes significant quantities of land that could be re-invested in other uses (retail, office, residential, entertainment or green space) and it creates an environment hostile to pedestrians and shoppers. For example, signage in many parking lots informs visitors that, should they venture on foot from their current location to adjacent retail properties without moving their car, property owners may tow their car away. Ironically, while property owners have installed these signs to prevent visitors from using their spaces to access neighboring properties, this strategy places many retailers along Manchester Road at a disadvantage compared to the larger shopping areas and malls in the West County area. For example, visitors to Chesterfield Mall or some of the larger shopping areas along Manchester Road often park their cars in a centralized lot and then visit two or three stores at a time on foot. These larger centers are employing a “park once” strategy that accommodates shoppers and encourages them to spend more time and money at the shopping center.

Pursuing a Shared Parking Strategy

Many new shopping districts are pursuing shared parking strategies to meet their parking needs. Shared parking includes the sharing of parking spaces between uses with different peak demand times, such as a church and a movie theater, and the sharing of spaces between different land uses (for example, between office and residential uses). Shared parking strategies may involve on-street parking spaces, surface parking lots, or shared parking garage facilities. Importantly, shared parking strategies pertain to satisfying parking requirements for an overall district or project jointly, rather than adhering to fixed parking requirements for individual stores or parcels. Sharing parking reduces the cost of providing parking and frees up additional land for development or open space.

Specifically, shared parking strategies would reduce the number of daily vehicle trips along the Manchester Road corridor and the number of required parking spaces in three ways:

- Supporting Park-once. Visitors arriving by automobile can easily complete multiple shopping trips or errands on foot without having to return to their vehicle each time to seek a new parking space.
- Taking Advantage of Off-Setting Peak Times. Shopping districts can efficiently share parking spaces between uses that have different peak hours, peak days, and peak seasons of parking demand (for

example, demand for parking at offices peaks during the day, but parking demand for apartments and retail may peak in the evening).

- Spreading Peak Parking Loads. The communities along Manchester Road should require property owners to provide sufficient parking spaces to meet the average parking load (rather than the maximum possible anticipated parking load). Providing a sufficient average level of parking balances the needs of shops, offices and residences with above average parking demands with those of locations or uses that have below-average parking loads.

Long Term Benefits of the "Park-Once" Strategy

- The shared parking strategy will present a more welcoming image to customers and visitors to the corridor.
- The creation of reduced parking supplies, strategically located in key areas such as town centers and other development nodes, helps to provide for an improved sense of place and opens up additional space for development or the provision of open space.
- Shared parking strategies encourage and enable the construction of shared facilities that are more cost effective and therefore enhance the viability of new development or redevelopment along the corridor.

Providing Incentives to Encourage Shared Parking

Although the existing parking inventory along the Manchester Road corridor remains underutilized, the private and public sector currently provide little incentive for individual property owners to reduce parking capacities and share parking facilities. Given this situation, the corridor will likely not fully achieve a Park-Once parking strategy in the near term. However, the adoption of modified parking requirements across the five communities over time will help to improve the efficiency of local parking supplies.

Example of a painted bicycle lane, separated from the travel lane designated for vehicular traffic

Example from Berkeley, CA of a pavement marking for a "sharrow" in which vehicular and bicycle traffic shares the same space

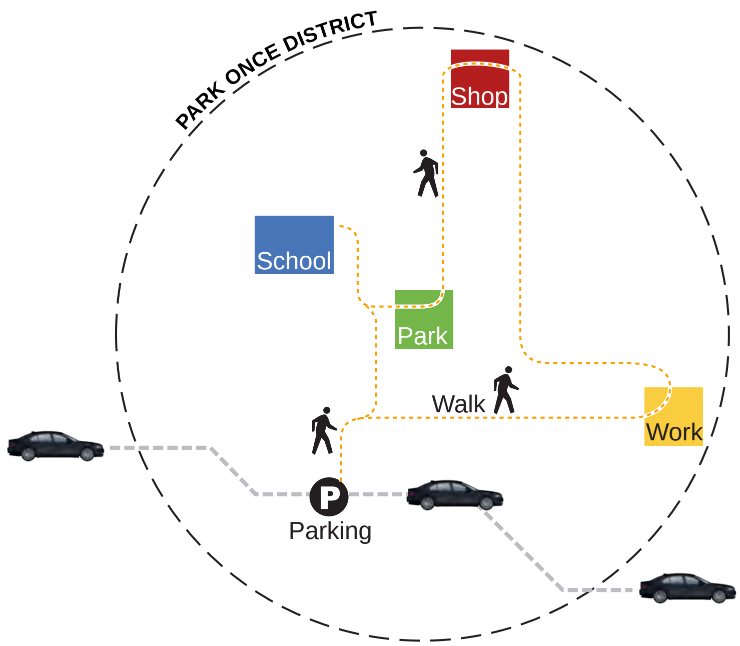
The five communities should consider adoption of the following parking incentives to facilitate a shared parking strategy along the corridor:

- Increased regulatory flexibility to encourage sharing of parking facilities. At the very least, this should include:
  - Elimination of any stipulation against shared parking facilities in city codes;
  - Implementation of a shared parking model (such as one provided by the Urban Land Institute) to provide for reduced requirements for parking for different uses. The ULI model includes tools to accurately estimate parking requirements and case studies that describe how shared parking may be implemented. It allows users to experiment with different mixes of office, retail,

- hotel, restaurant, and residential space and quickly determine the optimal parking requirements applicable through shared parking strategies.
- Elimination of any code-based requirements that discourage public access between or the merging of adjacent parking lots.

- Identification of available pooled liability protection programs or insurance policies whereby owners of different parking facilities can pool resources and purchase a joint replacement policy. This type of policy would provide for public access across multiple parking lots at lower insurance rates compared to existing policies.

As properties continue to redevelop along the corridor, the parking supplies of new developments should join existing shared parking arrangements or “Park Once” districts. Property owners may create new joint public parking facilities as part of development agreements for various sites. Alternatively, conditions of approval on new developments may require that property owners make their privately-owned parking supplies available for public use.



“Park Once” District

Zoning Standards Tied to Parking

In order to encourage the more efficient use of parking and in the process provide additional land for development or for open space uses, the communities along the corridor should modify their zoning regulations for parking accordingly. Creating a consistent parking standard along Manchester Road that significantly reduces the minimum parking requirements for individual landowners, establishes flexible maximum parking standards, and emphasizes the sharing of parking will help to create more vibrant spaces along the corridor and prevent the creation of vast areas of largely vacant parking facilities.

Traditionally, cities across the country have established parking standards in their zoning codes that require a minimum number of spaces for various land uses (per dwelling unit, for a given square footage of building area, per employee or restaurant table, etc.). Most cities over the years have adopted minimum parking requirements to “alleviate or prevent traffic congestion and shortages of curbside parking spaces.” The overarching goal has been to provide enough parking to ensure plenty of availability at every destination, even when parking is free.

Despite the predominance of minimum parking requirements across the country over the last half century, traffic congestion has continued to worsen. At the same time, communities have lost a good deal of potentially developable acreage to the provision of parking spaces that remain vacant over time. High minimum parking requirements have also discouraged businesses, communities, and employers from considering strategies to reduce automobile traffic or encourage travel by other modes.

The consultant team recommends that the five communities implement the following parking standards as part of their zoning codes:

- The elimination of minimum parking requirements for parcels containing less than 20,000 square feet in land area.
- For parcels over 20,000 square feet in land area, the cities should implement the following requirements:
    - A minimum of 1 and 1/8 parking spaces per residential unit, of which a minimum of 1/8 parking space per residential unit will be provided as Shared Parking.
    - For non-residential uses, a minimum of 3.5 spaces per 1,000 square feet of non-residential Gross Floor Area (GFA) will be provided for Shared Parking. Maximum limits for Shared Parking will not exist. New on-street parking spaces created in conjunction with a development, above and beyond what previously existed, may be counted toward the minimum requirement for Shared Parking.
    - A maximum of 5 spaces per 1,000 square feet of non-residential GFA or two spaces per residential unit may be provided for Reserved Parking.

The consultant team recommends that the cities require that any property owner wishing to provide parking above the maximum amount be required to pay a fee toward the creation of a Corridor-Wide Transportation Management Association that would eventually provide structured parking to areas along the corridor, as development evolves and becomes more dense over time. In addition, the Transportation Management Association could accept payments that could be used to fund structured parking from property owners that elect to not construct the minimum parking required, in favor of the creation of structured parking for a given area along the corridor. In addition, property owners should be allowed to satisfy parking requirements by providing spaces either on-site or within one-half mile of the development in question. Studies have shown that Americans generally are willing to walk up to one-half mile to reach shopping or entertainment destinations.

Where developers pursue surface parking along the corridor, the cities should require that property owners place these facilities primarily between or behind buildings. This strategy would prevent the creation of a "sea of parking" in front of each retailer or land use along Manchester Road and would enhance the pedestrian experience along the corridor. Locating parking between or behind buildings also more readily encourages the sharing of parking between adjacent properties.

Design standards for surface parking lots should also include:

Example of Parking Structures Wrapped by a Liner Building

- Requirements for surface parking lots with more than 50 spaces to include pedestrian walkways at a higher grade than the surrounding parking lot pavement
- Maximum curb cut dimensions of 15 to 25 feet, depending on the size of development area
- On-street parking spaces should be at least 8 feet wide and 22 feet long. For each parallel parking space, the adjacent drive lane must be at least 10 feet wide and must provide at least 20 feet of clear maneuvering area in front of the space in the drive lane adjacent to the space. If striping is not required (in the event parking meters are not installed), the 8 feet width would still be applicable with no individual space length needed.
- Prohibition of at- and above-grade parking within 25 feet of a required building line (this essentially forbids surface parking adjacent to the street and provides incentives for the construction of parking structures wrapped by liner buildings)
- Prohibition of surface parking lots on sites that formerly included historic structures
- Requirements for property owners to provide connections or grant easements for connections to adjacent parking lots on neighboring properties

Near-Term Parking Strategies

The revitalization of Manchester Road will proceed over several decades, and many properties that feature large, relatively underutilized surface parking lots will remain in use in their current condition for a number of years. While the recommended parking strategies will apply to larger areas of the corridor over time, the communities should explore the following ideas to better utilize existing parking facilities in the near term.

Example of angled parking from Downtown Kirkwood

Example of a portion of a parking area reclaimed to provide visual, informational, and functional amenities

Re-Use Options

The communities should consider requiring investment in design, landscaping, and multi-modal improvements associated with surface lots that will likely not attract redevelopment prospects for some time.

Potential investments may include:

- Adding green space and porosity to pavement surfaces in order to improve aesthetics and reduce the quantity of rainwater runoff from existing lots. These strategies may also include the installation of perimeter landscaping, pocket parks and gardens, and bioswales.
- Improving pedestrian connectivity between destinations in order to generate foot traffic and support the sharing of parking between properties. Quality pedestrian through-paths across parking lots would shorten walking distances, provide direct connections between multiple uses, and improve overall safety.

- Adding bicycle parking facilities to existing parking lots to encourage non-motorized commuting and local travel.
- Remove reserved spots for employee parking from key locations designated for bus stations and bicycle facilities in order to encourage the use of these alternative modes of travel.
- General design and aesthetic improvements along the corridor, including: the creation of improved transition zones between Manchester Road and existing parking lots, including places to rest; the installation of improved wayfinding and information systems; and, the creation of opportunities for pedestrian shelters.

These improvements can improve the overall performance and appearance of the corridor in the near term, prior to the redevelopment or conversion of existing land uses along the corridor.

In addition, in the near term, the cities can work with groups of landowners to coordinate shared parking arrangements along the corridor. For example, a city could work with the owner of an auto parts store that closes by 5PM to arrange for neighboring restaurants to use his or her parking spaces after hours. The communities should also work with individual property owners to arrange for users of bus services along the corridor to use vacant parking spaces along the corridor during commuting hours.

Creation of a Transportation Management Association

The five communities over time should consider establishing a Transportation Management Association (TMA), a member-controlled organization that encourages the efficient use of transportation and parking resources in a finite area. For example, the TMA could organize parking strategies for each of the town center nodes along the Manchester Road corridor. A 1996 study by the TDM Resource Center estimates that TMAs can reduce total commute trips by 6 to 7 percent if implemented alone, and significantly more if implemented along with other TDM strategies.

A TMA along the corridor could accept fees paid in lieu of providing minimum thresholds of parking and could distribute funds for public investments and infrastructure along Manchester Road. Potential projects the TMA may pursue include improvements for sidewalks, bicycle storage, transit, and potentially district-wide parking garages.

Transit

Planning for a Great Street includes exploring how a variety of modes of travel, including mass transit, may integrate with the planning of streets and corridors. The consultant team explored four potential transit modes along Manchester Road (local bus service, bus rapid transit / rapid bus, streetcar, and urban light rail) – as well as an option to provide no mass transit services whatsoever along the corridor. The consultant team considered the general characteristics, common service applications, vehicles, stations, and rights of way, as well as potential costs and implementation factors for the various transit options, in arriving at an overall recommendation for mass transit along Manchester Road.

Modes	Mode Characteristics	Vehicle Characteristics
Local Fixed Route Mixed Flow Streetcar	Slower speeds, frequent stops Operates in shared right-of-way Streetcars have higher capacity	Standard bus/trolleybus: 40’ Articulated bus/trolleybus: 60-65’ Streetcar: ~66’
Bus Rapid Transit Light Rail Grade-separated Streetcar	Higher speeds, limited stops, faster boarding/alighting Typically operates in exclusive right-of-way but can also operate in non-exclusive right-of-way	Standard bus/trolleybus: 40’ Articulated bus/trolleybus: 60-65’ Light Rail: 80-90’ Streetcar: ~66’

Transit options along Manchester Road include a variety of potential transit modes and transit vehicles. A transit mode, or service delivery mode, encompasses the total system of service delivery and operational features. In contrast, a transit vehicle represents one component of the service delivery mode. While vehicle choice is important, it is arguably the least important element of mode selection. Other factors contributing to mode selection include:

- Operating characteristics, including headway, service span, stop spacing, and other basic elements that define the daily operation of a transit line;
- Right-of-way management, including right of way treatments ranging from exclusive grade separated lanes to operation of transit lines in mixed flow traffic with no priority provided for transit vehicles; and
- Facility design: this includes station characteristics ranging from simple stops to stations with a high level of design and passenger amenities.

The figure on the previous page provides a basic comparison table between the transit service modes considered for Manchester Road and the transit vehicle used to deliver the service.

Comparison of Modes

Light Rail Transit

Light rail is a medium-performance transit mode, filling the gap between streetcar or bus service and rail rapid transit metro service. Light rail can be similar to both streetcar and rail rapid transit metro service. Light rail operating in a fully exclusive, grade-separated right-of-way (like St. Louis' MetroLink) is very similar to rapid transit, while light rail operating with at-grade intersection crossings is more similar to a mixed flow streetcar (like Portland's MAX).

St. Louis' MetroLink Light Rail
Source: http://www.flickr.com/photos/paytonc/1945128358/sizes/l/, Creative Commons

Service Characteristics

Light rail station spacing is usually longer than for fixed-route bus service, but shorter than rapid transit metro or commuter rail. Stations are typically spaced between one-fourth and one half mile apart but can be located every few blocks in more urban settings. Headways tend to be short to medium term in duration, depending on the demand for service, and are typically focused on commute periods.

Operating speeds can be variable, with slow speeds when trains are operating in mixed traffic and faster speeds when operating in fully segregated right-of-way.

MAX Light Rail in Portland

Vehicles

Light rail vehicles are similar to streetcars, but often are slightly larger. Typical vehicles are 60 to 90 feet long, articulated, and bi-directional, allowing them to operate in two directions. They can be strung together, with trains of one to four cars being common. This allows one driver to operate multiple vehicles at the same time, thereby improving efficiency. Vehicles are electrically powered, typically by overhead power lines, although technology to draw power safely from lines located below the vehicles has been developed.

Stations

Like bus rapid transit stations, the design of light rail stations can vary greatly. Stations for lines running in the street right-of-way may be very simple, including only a shelter, ticket vending machine, and route information. Other stations, particularly on elevated or subway sections of track, can be very complex and appear similar to rapid transit metro stations.

Right-of-Way

Light rail can operate in different rights-of-way, but generally utilizes exclusive or segregated right-of-way whenever possible. Light rail can also be flexible enough to operate in shared right-of-way in cases where exclusive right-of-way is difficult to obtain. Many systems have vehicles operating on different right-of-way categories on the same route. While lines with exclusive right-of-way are the most expensive to construct, they allow light rail to operate reliably and at higher average speeds.

Bus Rapid Transit

Bus rapid transit is an operating concept used to make bus transit more like fixed-rail service through the use of different technologies, rights-of-way, and operating strategies compared to traditional bus systems. The term bus rapid transit is very flexible and can describe many different types of operations. On one end of the spectrum is “Bus Rapid Transit Full,” which is typically used to describe operations that mimic rail. On the other end of the spectrum is “Bus Rapid Transit Lite” that describes services that utilize some bus rapid transit elements but are more similar to local fixed route operations.

The ultimate goal of most bus rapid transit services is to increase speed, reliability, and comfort, which will increase ridership and allow the service to have a greater impact on the community. Many bus rapid transit services have unique “branding” to distinguish them from traditional bus service. For example, the innovative TransMilenio system in Bogota, Colombia has a distinctive look.

Service Characteristics

In general, bus rapid transit systems provide fast, reliable passenger service by combining varying degrees of exclusive right-of-way, traffic signal priorities, improved station amenities and off-board fare payment systems in order to speed boardings. Bus rapid transit systems typically offer shorter headways and extended hours of service on a daily basis. Station spacing tends to be longer than for local bus service, which also increases operating speeds. Longer stop spacing may also require a local underlay service or local bus routes designed to feed the high capacity bus rapid transit line. If ridership is heavy, service can be provided 24 hours per day.

Vehicles

A wide variety of vehicle types can be used in bus rapid transit operations. While some operators use conventional buses, others opt for more advanced “BRT” buses with more advanced technology and more amenities. Vehicles used for bus rapid transit typically have some or all of the following characteristics:

- Size – Buses are typically at least forty feet in length, and can reach sixty feet with one articulation or eighty feet with two articulations.
- Passenger Amenities – Amenities to improve the passenger’s experience include comfortable seats, air conditioning, bright lighting, and large windows.
- Easy Boarding and Alighting – Low floor buses can be used to make boarding and alighting easier and to decrease the amount of time it takes for both to occur. This can also be accomplished by matching the heights of the bus floor and station platform.
- Increased Number of Door Channels – Multiple doors can be provided to improve boarding and alighting speed, which can lead to improvements in operating speed and reliability. Multi-door boarding is usually combined with an off-board payment system.
- Wide Aisles – Increases passenger comfort and improves circulation within the vehicle.
- Propulsion – Bus rapid transit buses can use any of the propulsion systems also used in fixed-route local service. These include diesel, electric trolley, diesel-electric hybrid, compressed natural gas, liquefied natural gas, liquefied petroleum gas, ethanol, methanol, and hydrogen.
- Guidance Systems – Electronic and mechanical guidance systems may be used to improve performance during station docking. These systems take over for the driver as the bus nears the station and position the bus very close to the station platform, improving boarding and alighting convenience.
- Distinctive Appearance and Branding – Vehicles with unconventional styling, distinctive paint jobs, and different names help distinguish bus rapid transit from other bus services.

BRT Station Characteristics

Stations

Many station types are used in bus rapid transit operations, from simple bus stops with basic passenger amenities to stations with extensive amenities and technology typically found in rail stations. Bus rapid transit stations usually differ from conventional bus stops by being more comfortable and offering greater passenger convenience and information. Bus rapid transit stations also tend to be spaced farther apart than conventional bus stops, which not only improves operating speeds but also concentrates capital investments on fewer stations with more amenities. Greater investment in station design also leads to better route performance, particularly where in-line boarding platforms and off-vehicle payment are included.

Typically, BRT or light rail vehicles run in the center of the street, where limited interference from other traffic allows them to operate most efficiently and safely. On streets with insufficient right of way to install median platforms or where

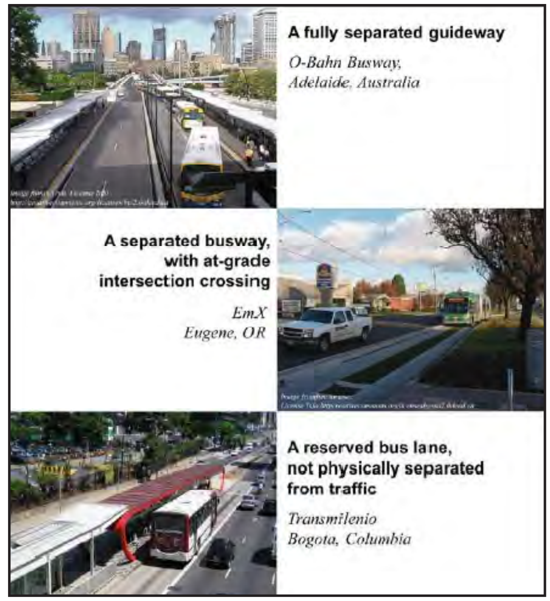
	Center	Side	Sidewalk Plaza
Conflicts with other traffic	+	-	O
Tram Speed	+	O	-
Pedestrian waiting comfort	-	+	+
Pedestrian/Cyclist Interference	+	O	-
Right-turn Interference	+	-	O
Driveway Interference	+	-	-
Left-turn Interference	-	+	+
Pedestrian Realm Vitality	-	O	+
More Right-of-way required for platforms	-	+	+

Advantages and Disadvantages of Alignment Placement

\+ *Advantage*   O *Neutral*   - *Disadvantage*

Images of Potential Transit Modes Considered for the Manchester Road corridor.

BRT Vehicle Characteristics



BRT Vehicle Characteristics

transit efficiency is not a priority, vehicles may be operated in the curb lane. Vehicles may be operated for short distances on sidewalks for specific reasons (such as to connect across a plaza where the street grid does not connect).

Right-of-Way

Right-of-way management is one of the most important elements of bus rapid transit design. The "rapid" in bus rapid transit is generally a function of varying degrees of right-of-way exclusivity depending on the corridor. Rights-of-way treatment can range from fully exclusive (grade separated) to the sharing of right-of-way with other vehicles. Truly rapid service in an urban corridor requires some form of dedicated lane capacity, priority movements through busy intersections, and limited stop operations. These features can make BRT competitive with auto travel.

Streetcar

Streetcars, also known as trams or trolleys, are rail vehicles that typically run on city streets. Streetcars were used extensively during the late 19th and early 20th centuries, but were mostly replaced by buses in North American cities during the middle of the 20th century. They have recently made a comeback in North America, with modern streetcars recently opening in places like Portland, Seattle, Tampa, and Little Rock.

BRT in Bogota, Columbia

Service Characteristics

Recent applications of modern streetcars have been introduced in high-density urban environments where the service is designed to provide short circulation trips. This application typically leads to a mixed-flow operation and short station spacing. When operating in less dense areas, station spacing could be longer in order to increase average operating speed. Because of the capital investment, streetcar service is frequent, generally every 10 and 15 minutes throughout the day. Operating speeds are often slow because stops are frequent and the cars have no special priority over other vehicles using the street. Streetcars are excellent for urban circulation, especially in a central city, where high frequency of service is desired. While there are few recent examples in the United States, streetcars are suitable for serving as neighborhood connections, and can provide fast, reliable service, especially when segregated from other traffic.

Streetcars in Tampa (left) and Little Rock (right)

Vehicles

Streetcar vehicles used in North America and Europe generally consist of three types:

- Modern streetcars;
- Renovated vintage/historic streetcars; and
- Modern replicas of vintage/historic streetcars.

The most common modern streetcars today have capacities of 60 to 70 seated passengers and maximum capacities of 110 passengers (seated and standing). Streetcars are generally not “strung together” in trains like light rail service, and instead operate as a single car on the track; however, modern streetcar technology allows for the formation of longer trains. They are usually smaller than light rail vehicles. Streetcars are powered by electricity, usually via an overhead power line. This gives the vehicles smooth, powerful acceleration. Because the train operates on rails, the ride is much smoother than that of a bus operating on pavement.

Stations

In dense urban areas, stations tend to be close together, but can be spaced farther apart if faster service is desirable. Streetcar stations tend to be very basic in design and consist of a sign, bench, and perhaps a shelter. Like any transit mode, streetcar stations can also include real-time rider information and other amenities that enhance the passenger experience.

Right-of-Way

Most streetcar systems utilize shared right-of-way with the vehicles operating in mixed traffic. Streetcar, like light rail, can also operate in varying degrees of exclusive right-of-way depending on the particular corridor or segment.

Express and Local Bus

Fixed-route local bus service is the most widely used form of transit in the United States. This is the type of transit service predominantly operating currently along Manchester Road (Metro's Route #57). Buses are flexible and typically operate on regular streets along with other traffic. They can be used for short distance travel between neighborhoods, may provide circulation functions, or may feed passengers into a larger rapid transit system. They can also be used for longer distance travel within cities or regions.

Service Characteristics

Local bus service is one of the most flexible public transit systems available, and thus allows operators to customize the system based on when and where service is needed. Service spans on fixed route systems can range from peak-only service to 24-hour service on routes with heavy ridership. Headways are variable, and can be as short as five minutes and as long as an hour or more. Station spacing tends to be short; two blocks is a common distance between stops. Operators can increase the distance between stops to increase operating speed.

Size/capacity

Buses can be purchased in sizes ranging from 22 feet to 40 feet in length. By adding one or two articulations, bus length can be stretched by about 20 feet for each articulation. Forty foot buses generally have seats for 35 to 42 people, while buses with one articulation have space for 60 to 64 seated passengers. The buses can hold additional standing passengers and more passengers can be accommodated by removing seats.

Propulsion

A variety of different types of propulsion systems are available for buses:

- Diesel – The majority of buses in the United States run on diesel. Low-sulfur diesel fuel can be used to reduce emissions.
- Diesel-Electric Hybrid – These vehicles utilize diesel and electric engines to improve fuel economy, reduce emissions, and improve performance.
- Electric Trolleybus – These buses are powered by overhead power lines. They produce no air pollution themselves, are quiet, are well-suited to climbing steep grades, and may last longer than conventional buses. Trolleybuses tend to cost more than conventional buses, as there is a small market for them. These vehicles are also restricted to corridors with overhead power lines already installed. The presence of overhead lines may be considered visually unattractive and may garner opposition to trolley system expansion.
- Alternative Fuels – Some vehicles can operate on alternative fuels, such as compressed natural gas, liquefied natural gas, liquefied petroleum gas, ethanol, methanol, and hydrogen.

Stations

The majority of bus stations are minimal bus "stops" indicated only by a sign. Additional amenities can be added, including benches, garbage cans, and shelters.

The placement of bus stops along blocks should take into consideration numerous variables, such as bus conflicts with turning traffic, pedestrian sight distance, and driver sight distance.

Right-of-Way

Buses typically operate on surface streets in mixed traffic. Express buses may also operate on expressways. Some buses operate on roads with high occupancy vehicle (HOV) or transit-only lanes, which can improve bus speed and reliability. Some buses operate in exclusive busways, either at the surface, on elevated platforms, or in tunnels. This is often considered an element of Bus Rapid Transit.

Transit Recommendation

The consultant team recommends the implementation of Rapid Bus service along the Manchester Road corridor and has incorporated this assumption into the recommended plans for street sections, roadway and sidewalk improvements, and the overall transportation network. The continued transformation of the Manchester Road corridor from Route 141 to the Maplewood Metrolink station, and the interconnection of the Rapid Bus service along Manchester Road in West County with this light rail connection is critical to the success of redevelopment in the corridor. This connectivity will increase the benefits (in terms of increased transit usage) to the corridor study area and will help to better connect the corridor to the rest of the metro area. The following factors led to this overall recommendation:

- The cost for installing light rail along Manchester Road is very high and would require the completion of a line to tie with the existing MetroLink system (most likely at the Maplewood station). METRO has shifted its focus in transit planning in recent years to the development of Bus Rapid Transit service along interstates in the St Louis area and cities around the Midwest have found that BRT or Rapid Bus provides more “bang for the buck” in terms of serving local customers. Similarly, the cost of new streetcar systems is significant and would require linking the streetcar with networks elsewhere in the metropolitan area. Given the limited financial resources at hand at the local, state and federal levels over the next ten years, maximizing the return on investment in transit facilities is critical.
- The physical limitations of the Manchester Road corridor limit the potential to include BRT with dedicated lanes for buses or to include light rail or streetcar systems. As mentioned earlier, the existing right of way along most of Manchester Road faces significant physical constraints, and adding lanes for buses, light rail or streetcar services would require significant land acquisition. Based upon feedback at the public meetings, citizens in the area are in favor of land acquisition only in very limited cases. Acquiring sufficient land for light rail, streetcar, or dedicated BRT lanes in some locations, such as the historic part of Manchester, would also result in the removal of existing buildings.
- The anticipated densities of housing and retail in the town center areas, using normal rules of thumb for transit planning employed by agencies such as METRO, would not normally support the development of streetcar or light rail systems along Manchester Road.

Based upon the physical, financial, and market limitations present along Manchester Road, even after build-out of the corridor’s redevelopment, the communities should work with MoDOT and METRO to pursue enhanced Rapid Bus service.

Rapid Bus service along Manchester Road should include the consolidation of some bus stops along the corridor and enhancements of the key rapid bus stops at town center locations. The communities should actively promote the development of these key nodes at higher densities of land use in order to demonstrate to METRO that the corridor will, with time, feature sufficient ridership to support rapid bus improvements.

Bus stops for the rapid service should align with development nodes at roughly one-mile spacings. Additional support stops should be located every half-mile, in between the key nodes or town center locations.

Proposed Transit Operations

The communities should work with METRO and MoDOT to reduce impediments to smooth rapid bus operations, including conflicts with automobiles, roadway congestion, frequent stops, and slow passenger boarding times. These factors could combine to reduce transit efficiencies and discourage ridership. Future transportation planning along Manchester Road should include the following strategies to ensure efficient and high quality rapid bus service along the corridor.

Traffic Signal Priority

The timing of traffic signals can significantly affect bus travel times. MoDOT should work with METRO to adjust signals, either passively or actively, in order to improve transit operations. Potential traffic signal priority systems would enhance public transit operations by adding an electronic device to transit vehicles that would trigger traffic signal responses as the transit vehicle approaches intersections. Typically, these systems help to extend the length of green lights in the transit right-of-way to allow the transit vehicle to move through intersections. These systems would allow vehicles traveling along with the rapid bus in the travel lanes of Manchester Road to receive a longer green light as well. Normal traffic control signal operations would resume once the transit operator terminates the remote signal from the bus to the traffic signal. The transit system could automatically trigger a traffic signal priority or, depending on the system, the transit operator in the rapid bus vehicle could manually trigger the system if the vehicle is running off-schedule.

	Advantages	Disadvantages
Far-Side Stop	• Minimizes conflicts between right-turning vehicles and buses • Provides additional right turn capacity by making curb lane available for traffic • Minimizes sight distance problems on approaches to intersection • Encourages pedestrians to cross behind the bus • Creates shorter deceleration distances for buses since the bus can use the intersection to decelerate • Results in bus drivers being able to take advantage of the gaps in traffic flow that are created at signalized intersections	• May result in the intersections being blocked during peak periods by stopping buses • May obscure sight distance for crossing vehicles • May increase sight distance problems for crossing pedestrians • Can cause a bus to stop far side after stopping for a red light, which interferes with both bus operations and all other traffic • May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light • Could result in traffic queued into intersection when a bus is stopped in travel lane
Near-Side Stop	• Minimizes interferences when traffic is heavy on the far side of the intersection • Allows passengers to access buses closest to crosswalk • Results in the width of the intersection being available for the driver to pull away from curb • Eliminates the potential of double stopping • Allows passengers to board and alight while the bus is stopped at a red light • Provides driver with the opportunity to look for oncoming traffic, including other buses with potential passengers	• Increases conflicts with right-turning vehicles • May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians • May cause sight distance to be obscured for cross vehicles stopped to the right of the bus • May block the through lane during peak period with queuing buses • Increases sight distance problems for crossing pedestrians
Midblock Stop	• Minimizes sight distance problems for vehicles and pedestrians • May result in passenger waiting areas experiencing less pedestrian congestion	• Requires additional distance for no-parking restrictions • Encourages patrons to cross street at midblock (jaywalking) • Increases walking distance for patrons crossing at intersections

	Cost to Improve Right of Way
Traditional Bus	None (only costs relate to constructing stations)
Bus Rapid Transit (BRT) (with buses sharing lanes with other vehicles)	\$100,000 to \$290,000 per lane-mile
Bus Rapid Transit (BRT) (with dedicated lanes for BRT buses)	\$500,000 to \$10.2 million per lane-mile
Streetcar	\$15 million to \$25 million per one-track mile (assuming the streetcar runs at grade and at street level)
Light Rail (LRT)	\$15 million per one-track mile

Figure 22: *Cost of Construction for Mass Transit Options (Not Including Cost of Stations)*

	Desired Minimum Residential Density *(Dwelling Units / Acre)*
Traditional Bus	7 - 10
Bus Rapid Transit (BRT) (with buses sharing lanes with other vehicles)	20
Bus Rapid Transit (BRT) (with dedicated lanes for BRT buses)	20
Streetcar	20 - 30
Light Rail (LRT)	30 or more

Figure 23: *Typical Desired Residential Densities to Support Provision of Transit Modes*

Pre-Payment of Fares

METRO should work with the cities to provide systems for riders to pre-pay before entering the rapid bus. Significant delays result from customers searching for fare money during bus stops. For example, riders on St Louis' Metrolink who pay in advance are able to enter through any door on a train. Some cities around the world require that any passenger waiting at a platform or bus stop have proof of pre-payment in hand in order to prevent delays upon the transit vehicle. Riders on these systems must either purchase tickets as they enter a station or hold a proof of payment stub that must be surrendered to fare enforcement officials upon request.

Summary Of Transportation Recommendations

Building from input from the public over the series of five public meetings and interactions with MoDOT and other government officials and property owners along the corridor, the consultant team developed a composite transportation plan for Manchester Road that outlines future improvements to Route 100 itself, as well as a variety of street improvements within the larger study area.

As mentioned earlier, the West County area suffers from a lack of north-south connectivity. As the consultant team approached the overall street network plan for the corridor, it identified a number of primary north-south connectors intersecting Manchester Road. The consultant team calls for the creation of new north-south connectors at the Reinke / Hillsdale alignment in Ballwin and Ellisville, and at the New Ballwin / Steamboat alignment in Ballwin. In addition, the communities should continue working with other government partners to ensure that the other, existing north-south connectors in the area remain conducive to relieving traffic from the Manchester Road corridor. For example, Wildwood should work with MoDOT to plan for any improvements to Route 109 necessary to provide adequate north-south access in that community and relieve Route 100 as much as possible.

In order to create a system of backstreets and a grid network conducive to support the creation of viable town centers along the corridor and to relieve local traffic from Manchester Road, the consultant team developed a Thoroughfare Hierarchy Diagram that outlines the various types of future roads and streets along and near the Manchester Road study area. In addition to backstreets and side streets, the plan calls for the designation of Main Streets in the town center districts in order to focus pedestrian and retail activity. Portions of the study area that feature greater depth (or width, north to south) feature a higher number of backstreets. In contrast, areas that feature very shallow lots fronting Manchester Road feature fewer backstreets and frontage roads.

The Access Management Plan summarizes the overall plan for roadways, including backstreets and side streets, crosswalks, and traffic signals along the Manchester Road corridor. The consultant team presented a preferred version of this plan to the public at the March round of meetings and, based upon input and comments from community members in March and input from MoDOT and community leaders, revised the plan for presentation of a final version in early May. The plan shown in the Summary Document represents the final access management plan for the corridor over the long-term. As mentioned previously, the exact phasing of improvements for certain segments or for certain categories of improvements (traffic signals, versus crosswalks and backstreets) will depend on funding availability and how redevelopment projects progress along different segments of the corridor.