BARDSTOWN ROAD SAFETY STUDY

FROM BROADWAY TO I-264

December 17, 2018

To improve ***mobility and safety*** for all users of the corridor, while emphasizing safety for pedestrians.

DEVELOP LOUISVILLE
LOUISVILLE FORWARD

Louisville Metro Council District 8
Councilman Brandon Coan

BARDSTOWN ROAD
CORRIDOR SAFETY STUDY

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CHAPTER 1 - INTRODUCTION

Louisville Metro engaged in a study of the Bardstown Road/Baxter Avenue Corridor **(Figure 1)** through the Highlands Neighborhoods between September 2017 and August 2018. The study's purpose is to identify and devise measures to address safety and mobility needs along the corridor with an emphasis on non-motorized users. The study limits are Broadway to the north and I-264 to the south. Because the majority of the corridor is Bardstown Road, the study is identified as the *Bardstown Road Safety Study*.

1.1 Corridor Setting and History

The Louisville and Bardstown Turnpike was constructed in 1819. In 1871 electric streetcars began service on Baxter Avenue to Highland Avenue, and in 1912 that service was extended to Douglass Loop. In 1949 the first leg of the then-Inner Belt Expressway (renamed in 1952 after Henry Watterson) opened, initially linking Bardstown Road and Breckenridge Lane. A later extension would add further connections to other major roadways to the west and east. With its connection to I-264, the Bardstown Road corridor became one of the area's first arterial connections between the interstate network and Downtown Louisville.

Today, the Bardstown Road corridor serves three principal functions that contribute to its high volumes of vehicular and pedestrian traffic. First, the corridor continues to function as a **vital connection to the interstate network**, attracting thousands of motorists daily, particularly during peak commuting hours. Second, the corridor is a **cultural destination** with numerous restaurants, retail shops, churches, schools, and entertainment venues along or within a half-mile of its route. Finally, the corridor **connects some of Louisville's most densely-populated and**

historic neighborhoods, including Phoenix Hill, the Original Highlands, Cherokee Triangle, Tyler Park, Bonnycastle, Deer Park, Highland-Douglass, and Belknap.

Generations of Louisvillians have made Bardstown Road an iconic destination; however, it's continued status as one of the most crash-prone roads in the region is a strain on the corridor's long-term success. Therefore, Louisville Metro's goal for this study is to improve safety for all users of the corridor with particular emphasis being given to the safety of the corridor's most vulnerable users: pedestrians.

EXISTING CONDITIONS OVERVIEW

study area **4 miles**

20,000
25,000
Average Daily Traffic (ADT)

35 MPH

NO bike lanes

47 unsignalized intersections

Federal Designated **Route US 31E and US 150** (not a National Truck Route)

KYTC owned and maintained

TARC routes **23**, **17**
Express Rte. **40**

10' lanes to Woodford Place
12' lanes to I-264

18 signalized intersections

lane lights during peak hours

"Major Arterial" functional classification

On-street parking with peak-hour restrictions

SIDEWALKS along most of the corridor

AAA rated (80,000 lbs) for trucks

5 marked mid-block crossings

The need for the study was born of combination of factors:

> "My goal is to eliminate fatalities and severe injuries on Bardstown Road and Baxter Avenue. That means reducing driver confusion, speeding and conflict between motorized and non-motorized users. It ought to be safe to cross the street in the Highlands and this study will help make that a reality"
>
> Brandon Coan
> Metro Councilman D-8

PEDESTRIAN SAFETY

On average, nine pedestrian strikes per year have occurred along the corridor, one of the highest concentrations in Louisville.

The crosswalks along the corridor are substandard and in need of enhancement.

MOTORIST SAFETY

The corridor has a significantly high crash rate compared to other roads in Louisville and Kentucky that carry similar amounts of traffic. The vehicle critical crash rate factor (CCRF), a measure used to classify high-crash road segments, is greater than 3.0 along much of the corridor and greater than 1.0 in all but one small section south of Taylorsville Road. A CCRF of 1.0 or above indicates that roadway section has more crashes than is statistically probable in the absence of an unsafe condition(s). (See Section 3.3, *Crash Analysis*, for details.)

OUTDATED INFRASTRUCTURE

The street lighting is substandard and inconsistently located. Lane lights, which operate during the peak commuter traffic hours of 7:00 – 9:00 AM and 4:00 – 6:00 PM, were installed in the 1970s and upgraded in 2008 with new displays.

The majority of the corridor carries approximately 20,000 vehicles per day (VPD)—a range of average daily traffic (ADT) volumes that have remained constant the past 10 years, indicating the road is at its carrying capacity.

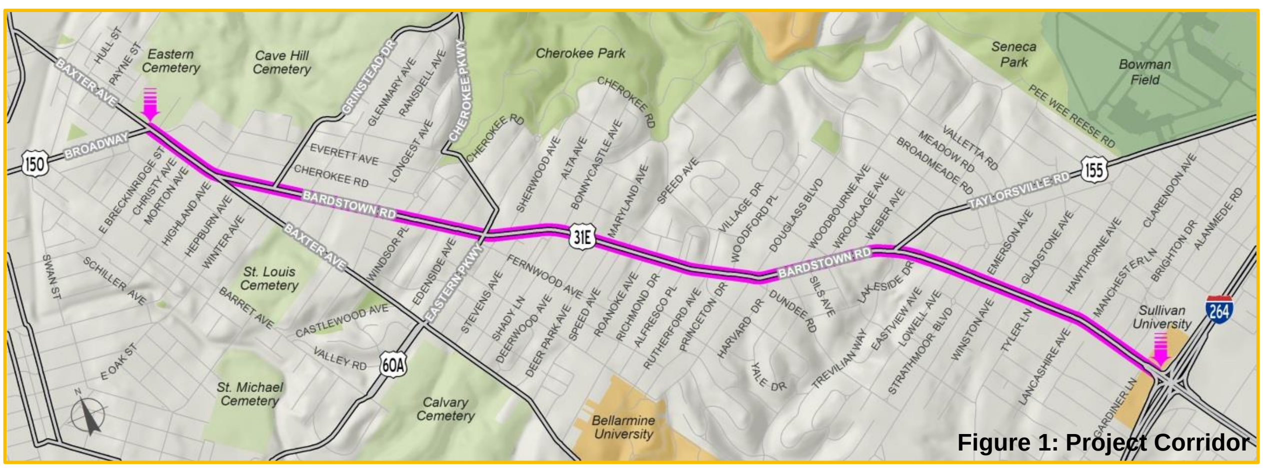


Figure 1: Project Corridor

1.2 Purpose and Scope of the Study

The **purpose** of the *Bardstown Road Corridor Safety Study* is to assess the current safety issues experienced pedestrians, bicyclists, transit users, and motorists, and develop alternative scenarios that would improve safety while meeting the corridor users' mobility needs.

Before any changes are made to the existing cross section, a detailed traffic (including transit) analysis will be conducted.

The **scope** of the study includes these major elements:

- Coordinate with Louisville Metro agencies and the Kentucky Transportation Cabinet (KYTC).
- Coordinate with businesses, residents and neighborhood associations, and other users of the corridor.
- Identify a broad range of possible alternative scenarios to meet the purpose of the study.
- Conduct a general traffic and operational analyses for the alternatives.
- Refine and eliminate and/or advance alternatives based on the traffic analyses, public input, costs, and engineering considerations.
- Develop cost estimates for the final set of recommended alternative concepts with corresponding cost estimates, and present the concepts to Metro Council for review and comment.
- Document the planning process and provide therein a recommended Preferred Alternative, with cost estimates, for submittal to Metro Council for prioritization and inclusion in Louisville Metro's budget.

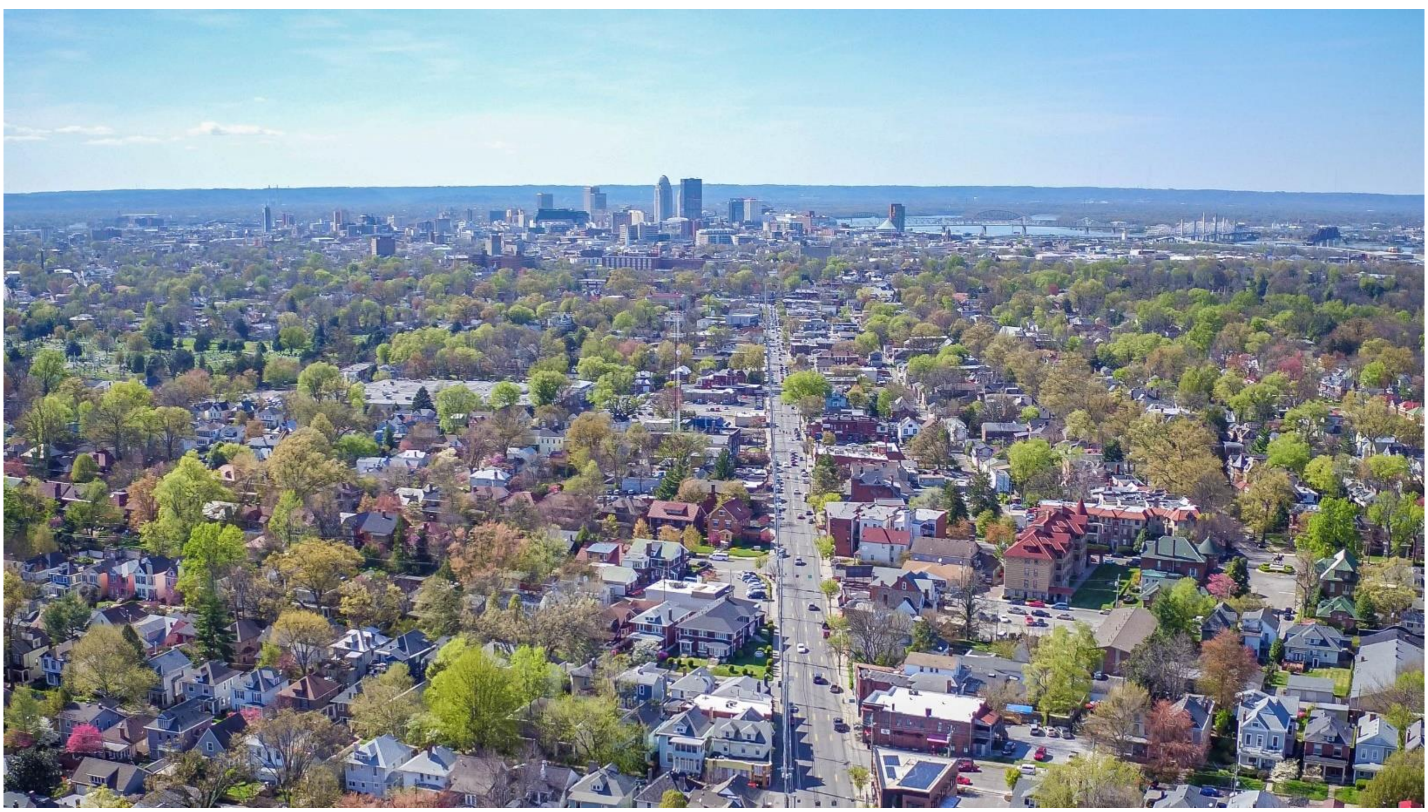


Figure 2: Aerial of the Corridor

CHAPTER 2 – PLANNING PROCESS

The planning process explored opportunities to improve safety conditions along this corridor. Concepts investigated were based on public input, agency coordination, Metro and neighborhood residents'/businesses' visions for improving safety in the area, and accepted transportation planning and engineering best practices. Near-term, low-cost improvement concepts were sought, as were higher cost items that could be implemented over time.

The planning process was multi-faceted and includes an on-going assessment of existing conditions, traffic and roadway engineering, analysis of alternatives, and public and agency involvement. The Project Team — Louisville Metro Develop Louisville staff, Public Works staff, Metro District-8 Councilman Brandon Coan, KYTC representatives, and consultants from Qk4 — continually reviewed conditions along the corridor as alternatives were developed, evaluated, and presented to the public. As a guiding principle for the development of alternatives, it was agreed that **all proposed changes would be within the existing rights-of-way and in nearly all cases within the existing curb limits.** Changes to the majority of the corridor will be based on restriping the existing road, altering traffic signal timing, improving crosswalk accessibility, upgrading lighting, etc.

Public involvement opportunities included a project web page that provided updated information; a survey—provided online and at a staffed booth on Bardstown Road—that garnered 443 (as of 11.07.17) responses from residents (67%), corridor visitors (17%), commuters (8%), employees (5%), and others (3%); numerous meetings; and occasions for providing input throughout the planning process. Among the methods used to obtain meeting participants' concerns and suggestions included blank "Sticky Note" boards (p. 5), which enabled people to post comments regarding five key categories of concern that surfaced during the survey: Bicycles, Pedestrians, Parking, Transit, and Traffic. Boards were also provided to solicit general comments: "What Problems Do You Have Along Bardstown Road?" and "What Should This Corridor Look Like in the Future?" All comments were reviewed and tabulated, and the results included for consideration among the comments received via the survey and other methods.

Stakeholders contributing crucial input as the planning process progressed included the Kentuckiana Regional Planning and Development Agency (KIPDA), Transit Authority of River City (TARC), Kentucky Transportation Cabinet (KYTC), Louisville-Jefferson County Metropolitan Sewer District (MSD), Metro's Parking Authority (PARC); as well as the neighborhood groups/associations, businesses, and schools with which meetings were held (see list, p. 6).

PROJECT TIMELINE

Oct '17	• Project Kickoff • CycLOUvia, Online Survey, Data Collection
Nov	• First Public Meeting
Dec	• Agency Meetings • Develop Alternatives
Jan '18	• Alternatives Analysis
Feb	• Internal Reviews
Mar	• Stakeholder Reviews
Apr	• Second Public Meeting • Agency Meetings
May	• Agency Reviews • Document Preparation
Jun	• Online Survey Complete (>1,100 Comments) • Local Neighborhood Meetings
Jul	• Local Neighborhood Meetings
Aug	• Document Review
Sep - Dec	• Document Finalization

CHAPTER 3 – PROJECT CORRIDOR

3.1 Roadway Characteristics

Baxter Avenue and Bardstown Road are both owned by the KYTC, as are the study area's north and south termini—Broadway and I-264, respectively. For planning purposes, the corridor is divided into five corridor sections **(Figure 7):**

- **SECTION 1 — "Lane Light Section." Broadway to Princeton Drive/Woodford Place (Figure 3):** The Lane Light Section begins approximately 0.4 mile north of Broadway (Lexington Road/Baxter Avenue, just outside the study area), and heads south 2.5 miles to Princeton Drive/Woodford Place. Curb-to-curb road width of 40 feet accommodates four 10-foot-wide travel lanes with curb and gutter, but not bicycle facilities.

  During morning and afternoon peak commuting hours of 7:00 to 9:00 AM and 4:00 to 6:00 PM, parking is prohibited and traffic flow is governed by lane lights that permit two travel lanes in the commuting direction (northbound in the AM, southbound in the PM); one dedicated two-way left-turn lane (TWLTL); and one travel lane in the non-commuting direction. The alternating lane lights are need continual maintenance or removal. Parked cars stay in place during parking-restricted peak hours, causing motorists in the blocked lane to stop or veer into the adjacent lane, which slows traffic or causes crashes when the adjacent lane is occupied. During non-peak times, on-street parking is permitted along nearly all of this section.

  SECTION 2 — Douglass Loop south 0.6 mile to Taylorsville Road (Figure 4): Bardstown Road widens to an average travel lane width of 12 feet with a curb-to-curb width of 55 feet. On-street parking is restricted and there are no bicycle facilities. Drainage is managed via curb and gutter.

- **SECTION 3 — Taylorsville Road to Tyler Lane. (Figure 5):** This section provides access to a mix of businesses and subdivisions, and Assumption High School. There are four 10-foot travel lanes, grass

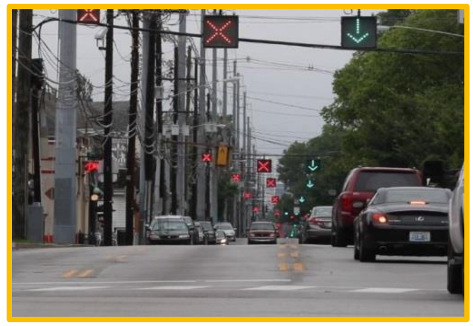


Figure 3: Section 1—Lane Light Section, Morning Commute

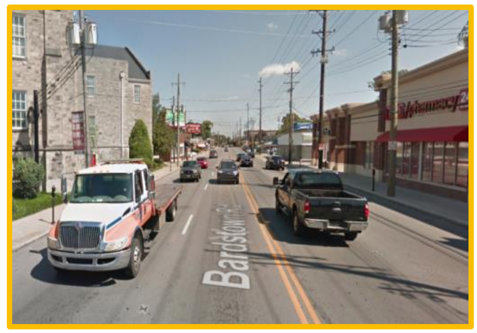


Figure 4: Section 2—Douglass Loop to Taylorsville Road (Source: Google Streetview)

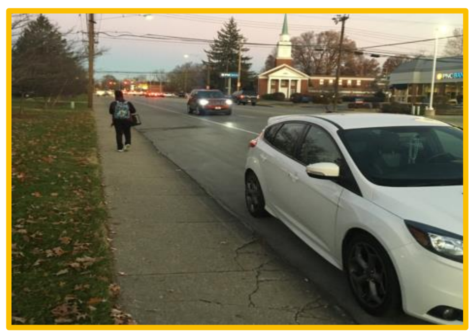


Figure 5: Section 3—Taylorsville Road to Tyler Lane

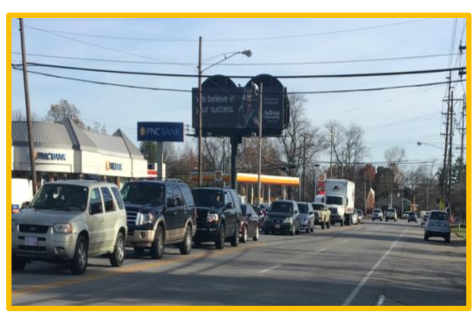


Figure 6: Section 4—Tyler Lane to Brighton Drive

shoulders for collecting drainage, and partial sidewalks. There is no on-street parking or bicycle accommodation.

- **SECTION 4 — Tyler Lane to Brighton Drive, north of I-264 (Figure 6):** Bardstown Road has four 10-foot-wide travel lanes and an approximately 10-foot-wide shoulder along the southbound side. Access is provided to residential areas, Strathmoor Presbyterian and St. Raphael Catholic churches, Hawthorne and St. Raphael elementary schools, Sullivan University, and a commercial area that includes the Gardiner Lane Shopping Center and extends past Brighton Drive to I-264. There is no on-street parking or bicycle accommodation. **SECTION 5 — Brighton Drive to I-264:** Minus two driveway accesses on the west side, this section provides only access to the Gardiner Lane Shopping Center, Wendell Avenue, Gardiner Lane, and the I-264 ramps. This 1,230-foot section changes from five lanes at Brighton Drive to eight lanes in the interchange area. There are sidewalks at pedestrian crossing of the ramps. No improvements are proposed through this section.

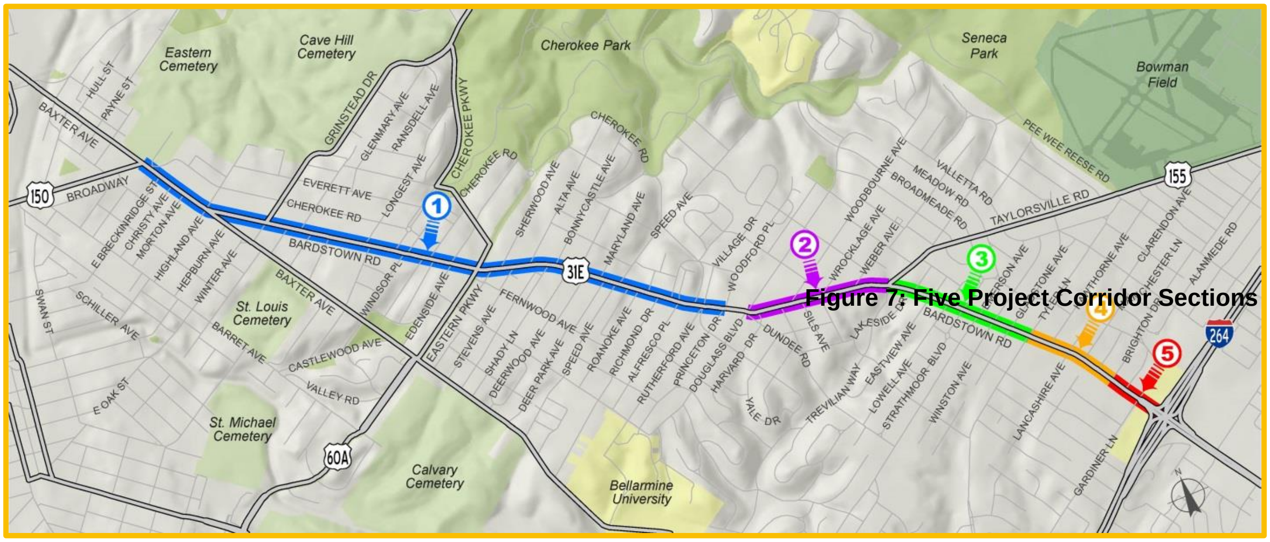


Figure 7: Five Project Corridor Sections

The average daily traffic (ADT) volumes between the four major intersections along the project corridor are shown at right. These volumes have remained relatively consistent over the past decade.

AVERAGE DAILY TRAFFIC VOLUMES

- **Highland Avenue to Broadway: 22,400**
- **Baxter Avenue to Eastern Parkway: 20,000**
- **Eastern Parkway to Taylorsville Road: 20,600**

3.2 Travel Times

Travel time data was collected using Miovision Connected equipment, which collects unique signatures from individual vehicles to track travel time to provide a sample data set of information. The travel time was collected on a weekday when school was in session, with no holidays during the week to provide an acceptable methodology for a sample data set. The average travel time (illustrated in **Figure 8** and recorded in **Table 1**) is the *median* (as opposed to *mean* or *mode*) time, because using the median time removed outliers that may have made brief stops, such as for gas, and then restarted their trips. For the PM and midday travel times, both the minimum and the averages are fairly similar.

A full report of the travel time collected is included in Appendix A.

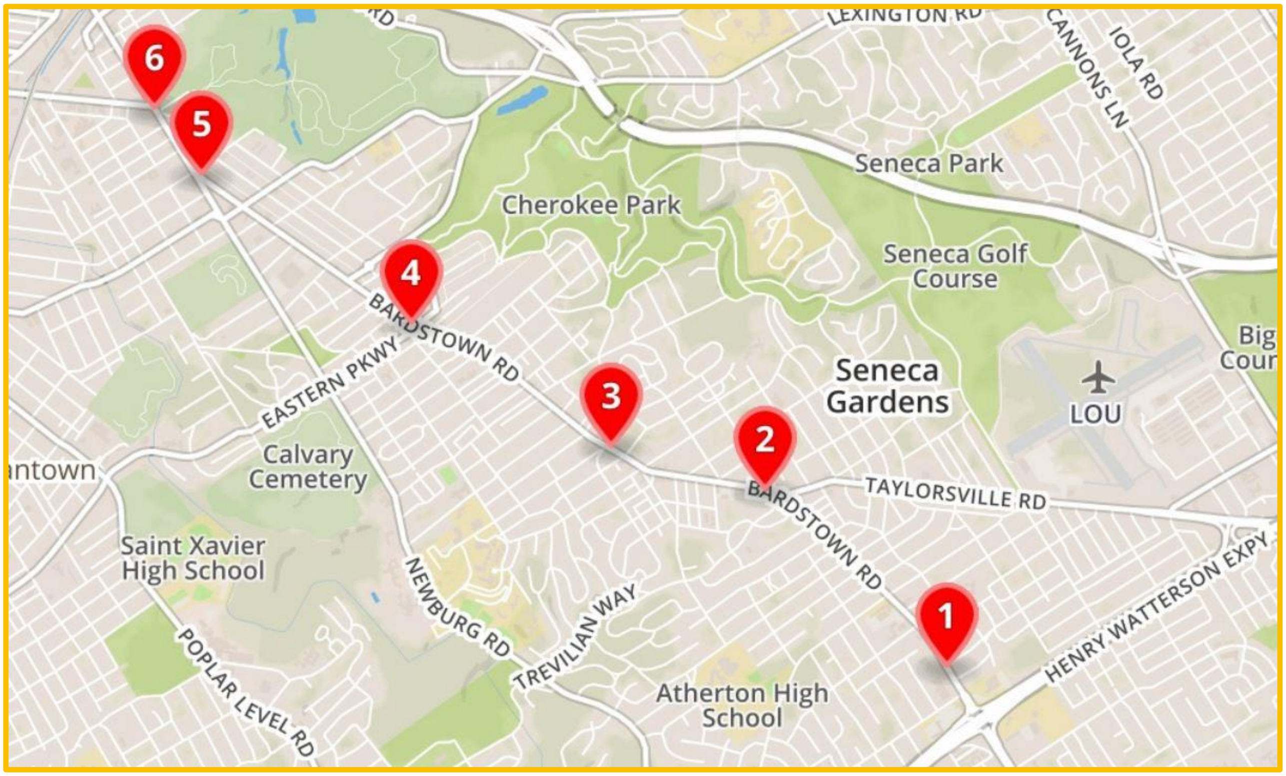


Figure 8: Travel Time Data Collection Nodes

Table 1: Corridor-Long Travel Times, in Minutes

Peak Periods		**Driving North: from Brighton Dr. (1) to Broadway (6)**	**Driving South: from Broadway (6) to Brighton Dr. (1)**
AM **6:30 to 9:30**	Minimum	7 minutes 30 seconds	7 minutes 20 seconds
	Median	10 minutes 40 seconds	13 minutes 00 seconds
Midday **11:30 AM to 1:00 PM**	Minimum	11 minutes 13 seconds	10 minutes 17 seconds
	Median	16 minutes 53 seconds	17 minutes 56 seconds
PM **3:30 to 6:30**	Minimum	11 minutes 40 seconds	11 minutes 11 seconds
	Median	17 minutes 22 seconds	17 minutes 48 seconds

3.3 Crash Analyses

Traffic data provided through the Kentucky State Police web site were gathered for the most recent five-year period for which comparative data was available (2013 – April 2018) to identify roadway sections where vehicle crashes and pedestrian strikes have occurred. Sections having abnormally high crash rates indicated the possible need for safety improvements.

Crashes are normally classified by severity into one of three categories: fatal, injury, or property damage only (PDO). Then, the average crash rates for roadway sections of various lengths are determined. Generally, the analysis includes gathering data along the entire length of the roadway under study, followed by comparing successively smaller roadway sections, especially those containing higher concentrations of crashes. Details of crash frequency and type along the corridor are shown on **Table 2** (p.11).

The critical crash rate was obtained from Kentucky Transportation Research Center's *Analysis of Traffic Crash Data in Kentucky (2002 – 2016)*. The "critical crash rate" is the maximum crash rate expected to occur on a roadway section, given the statewide average crash rate for that functional road class, the ADT volume, and the roadway section length. The ratio of these two rates (*i.e.*, the actual annual crash rate to the critical crash rate) produces a critical crash rate factor (CCRF), or a measure of crash frequency for each segment or spot location as compared to a peer road. If the roadway section's actual crash rate exceeds the critical rate—*i.e.*, the CCRF is greater than 1.0—then that section is classified as a high crash location. In other words, that roadway section has more crashes than is statistically probable in the absence of an unsafe condition(s).

All but one spot (near Emerson Avenue, Figure 9) of the Baxter Avenue and Bardstown Road corridor is has a CCRF greater than 1.0, and most of the corridor has a rate greater than 2.0 or 3.0. These conditions are significantly higher than what should be expected on a road with similar characteristics; therefore, identifying changes to reduce these rates is a driving force for this study.

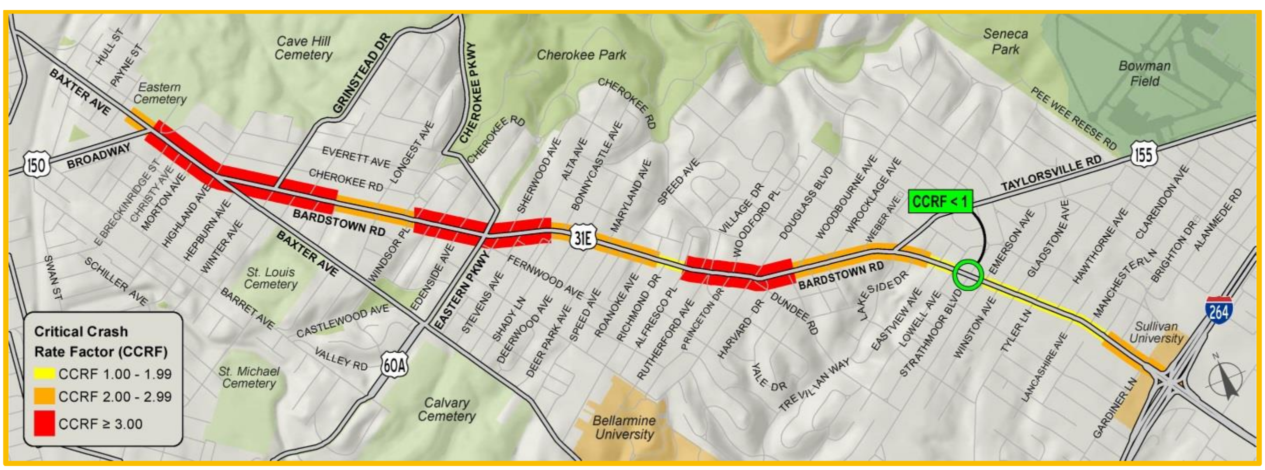


Figure 9: Crash Rates

Following are select statistics from the **2,585 crashes overall** for the five-year period —

40 per month	•… an average of 1.3 per day
351 resulted in injuries, and 1 resulted in a fatality	•… an average of 5.5 per month, representing 13.6% of total crashes, which is below the countywide average of 17.5%
49 involved pedestrians	•… an average of 9 per year, or 27.54 pedestrian strikes per HMVMT, versus the statewide average of 5.1 per HMVMT
22 involved bicycles	•… an average of 4 per year or 12.36 bicycle crashes per HMVMT, versus the statewide average of 2.0 per HMVMT
113 involved alcohol	•… 4.4% of crashes, almost double the 2.7% average for Jefferson County roadways
892 occurred at night	•… 35% of crashes, two-thirds higher than the 21% statewide average for urban 4-lane undivided roadways
527 occurred during wet conditions	•… 20%, close to the 18% statewide average for urban 4-lane undivided roadways

HMVMT = Hundred million vehicle miles traveled.

After analysis of this data, the Project Team reached the following conclusions related to this study:

- Pedestrian strikes are notably high. The mission of the proposed changes is to reduce them.
- Nighttime crashes are notably high. Improved lighting and visible crosswalks should be a top priority.
- Crashes involving bicycles are notably high (as indicated in **Figure 10**). Multiple constraints to the safe accommodation of bicycles exist; and, owing to these constraints, recommendations for improvements along the corridor do not include bicycle facilities. **Providing for a connected bicycle network along generally parallel and connecting roads should be considered.**

Figure 10: Ghost Bike Denoting Location of 2018 Bike Fatality along Corridor

Table 2 summarizes crash frequency and type along the corridor's 17 sections associated with crashes. These segments represent 0.30-mile segments generally centered on the listed intersection. Data for some segments overlap others by 0.10 mile. Consistently throughout the corridor, rear-end crashes predominated: 31% to 46% of all crashes through the 17 sections were rear-end crashes—a type most often associated with congested conditions and stop and go traffic that exist near signalized intersections. **Figure 11** (p. 12) shows the KIPDA rankings of vehicular, bicycle, and pedestrian high crash rate locations. Crash locations having critically high crash rate factors are a measuring stick for comparing crash rates with those of similar roads (functional class, volume and urban/rural setting) statewide. **Figure 12** (p. 13) identifies locations of pedestrian strikes by dates and timeframes (daylight/dark).

Table 2: Baxter Avenue and Bardstown Road Crash Data: 2013 – April 2018

Location	CCRF[1]	Total Crashes	Fatal Crashes	Injury Crashes	PDO[2] Crashes	Predominant Crash Types (RE = Rear End; Angle; SS = Sideswipe)
Interstate 264	2.49	264	0	36	228	46% RE / 22% Angle / 19% SS
Tyler Ln.	1.74	184	1	31	152	40% RE / 31% Angle / 31% SS
Gladstone Ave.	1.60	170	0	28	141	43% RE / 25% Angle / 15% SS
Strathmore Blvd.	0.81	86	0	17	69	45% RE / 32% Angle / 8% SS
Kaelin Ave.	1.87	167	0	20	147	43% RE / 20% SS / 19% Angle
Taylorsville Rd.	2.86	256	0	30	226	39% RE / 24% SS / 17% Angle
Sils Ave.	1.98	177	0	18	159	.36% RE / 32% SS / 17% Angle
Douglas Blvd.	3.09	276	0	36	240	41% RE / 27% SS / 20% Angle
Grasmere Dr.	1.05	94	0	13	81	45% RE / 22% SS / 21% Angle
Speed Ave.	2.71	242	0	22	220	37% RE / 26% SS / 22% Angle
Stevens Ave.	2.37	212	0	21	191	37% RE / 28% SS / 20% Angle
Eastern Pkwy.	3.84	333	0	38	295	35% RE / 27% SS / 25% Angle
Cherokee Pkwy.	1.73	150	0	14	136	35% RE / 23% Angle / 22% SS
Beechwood Ave.	2.42	210	0	20	190	35% RE / 21% Angle / 19% SS
Grinstead Dr.	3.86	335	0	39	296	34% RE / 28% Angle / 16% SS
Highland Ave.	3.70	356	0	49	307	35% RE / 24% Angle / 17% SS
Broadway	2.30	221	0	23	198	31% RE / 25% Angle / 23% SS

1. *The Critical Crash Rate (CCRF) 1 or greater is a rate that is statistically greater than the average crash rate for similar roadways and represents a rate at which crashes could be said to be occurring in a non-random fashion. The formula includes the number of crashes occurring within a roadway section, average daily traffic, and the number of years for which crash data is being examined. Historically, the crash rate has been compared to the Critical Crash Rate for similar types of roadways using a procedure developed at the Kentucky Transportation Center.*

2. *PDO = Property Damage Only.* *CCRF = Critical Crash Rate Factor.*

As shown in **Table 2**, angle crashes were the next most prevalent crash type for 9 of the 17 roadway segments. Angle type crashes represented 16% to 32% of crashes through the sections. This crash type is most often found near intersections or access points, and is often associated with traffic entering or leaving the roadway. Excessive numbers of angle crashes can sometimes be corrected with access management strategies and/or signal modifications.

For the remaining segments, same-direction sideswipes were the second most frequent crash type, representing 8% to 32% of crashes through the segments. These types of crashes are most commonly associated with inattentive driving during lane changes that are either intentional (lane jockeying) or inadvertent (forced by a suddenly stopped car ahead). Lane-change crashes generally increase during non-peak hours. With no dedicated left-turn lanes during non-peak hours, vehicles use the inside through lane as a left-turn lane, thereby causing drivers behind these vehicles to change lanes in order to keep moving.

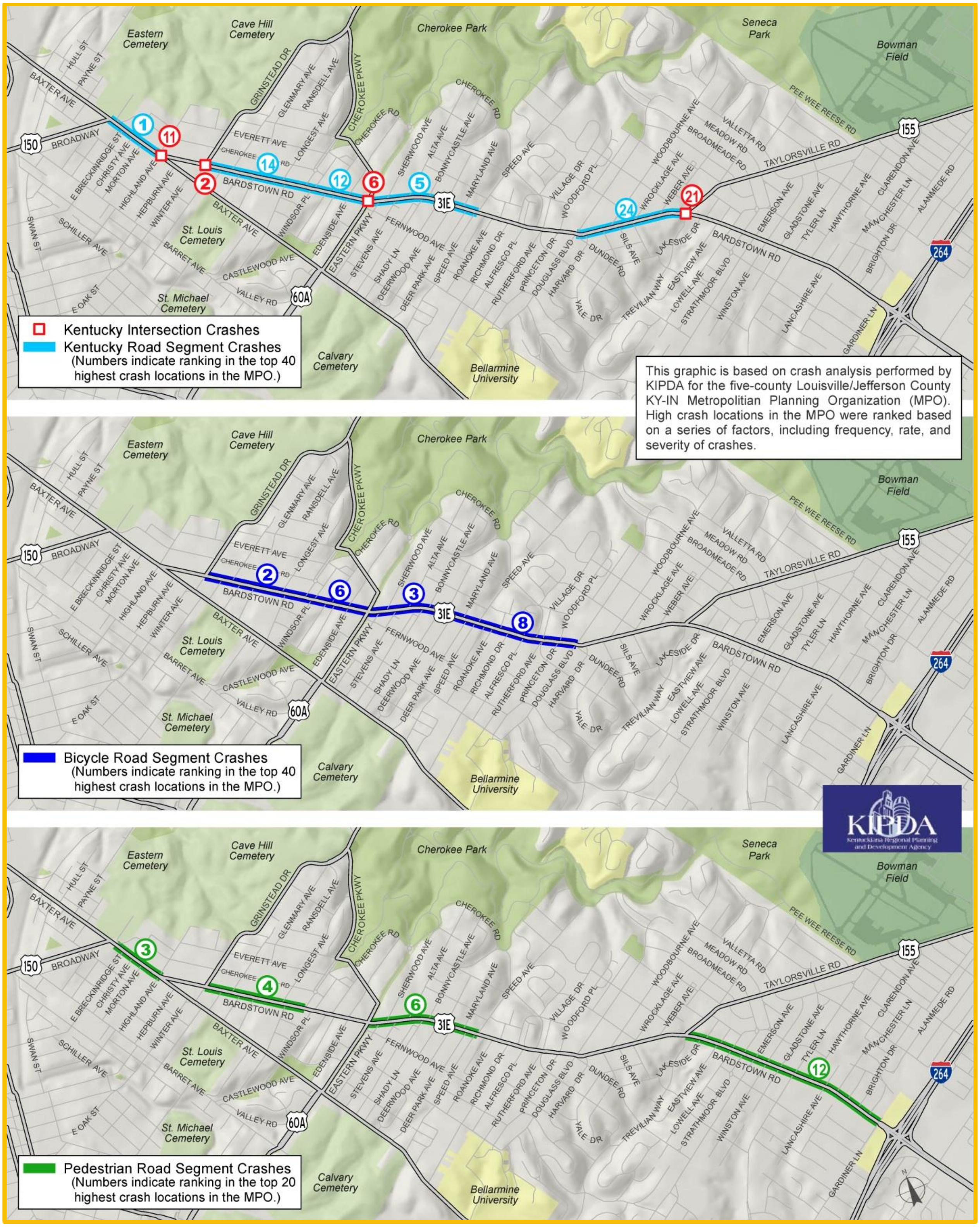


Figure 11: KIPDA Regional Crash Data—Bardstown Road Project Corridor

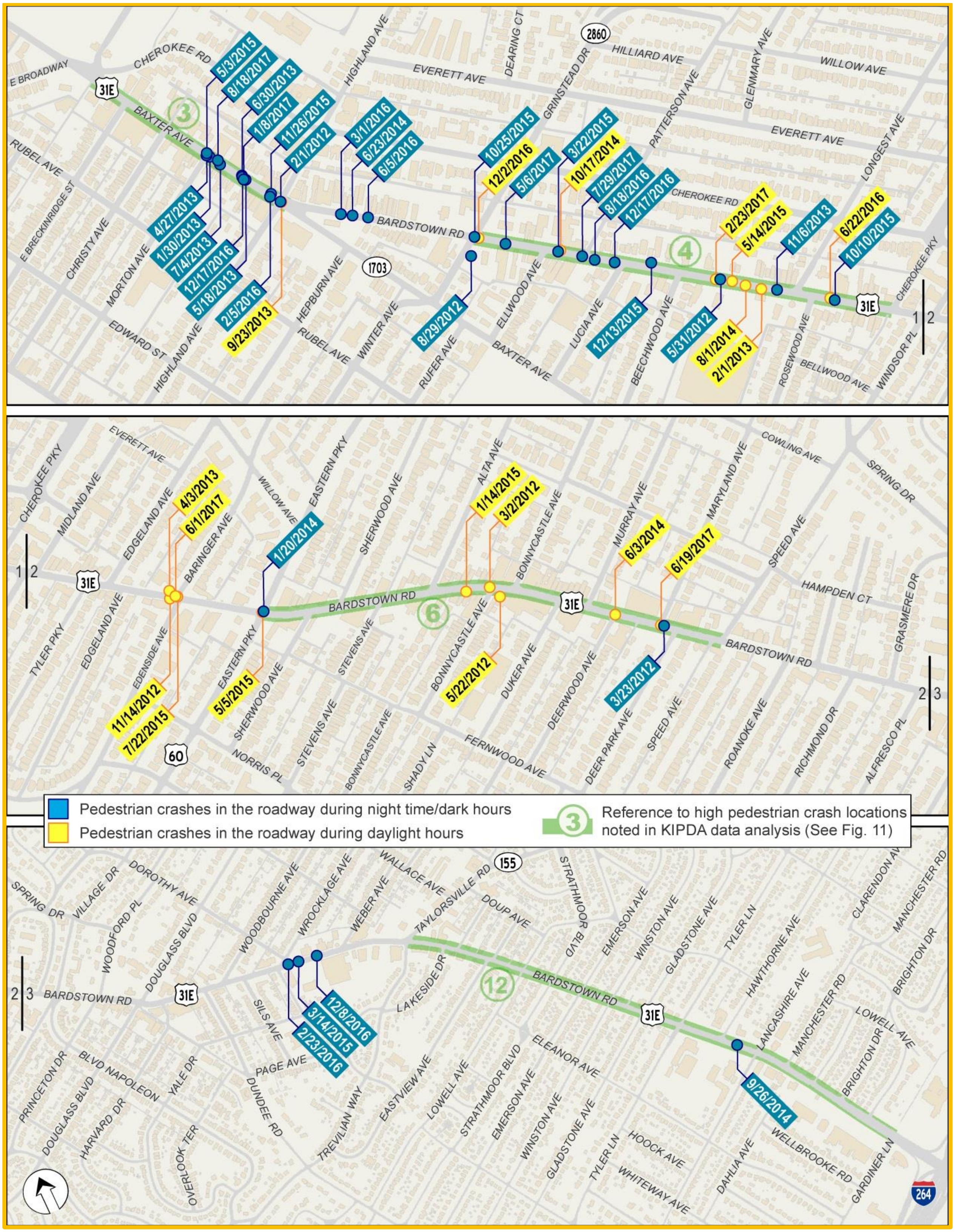


Figure 12: Pedestrian Strike Locations by Dates and Timeframes (Dark/Daylight)

3.4 Bicycle Network

This study does not recommend providing bicycle facilities on Bardstown Road. Developing a connected bicycle network along other area roads would be safest approach for bicyclists. While crashes involving bicycles are notably high, multiple constraints to the safe accommodation of bicycles exist along the corridor:

- Along this heavily traveled corridor, high traffic volumes occur throughout the day and especially during peak hours. Therefore, for safer travel, bicyclists would benefit from bike lanes that are buffered from adjacent driving lanes. The existing curb-to-curb widths and on-street parking do not allow for buffered bike lanes.
- Dense development hems in the roadway on both sides, leaving no room for widening the roadway to accommodate a bike lane while retaining the existing four lanes.
- Numerous access driveways and intersecting streets are located along the entire length of the corridor, generating sight-distance and turning activity that are hazardous for bicycles.

Over the years Metro has implemented a network of bicycle facilities on nearby roads, including bike lanes, neighborways/sharrows, and signed bike routes, as illustrated on **Figure 13**.

It is recommended Metro continue to strengthen existing facilities, and expand this bicycle network by analyzing needs, and identify the most appropriate and safe treatment for bicycle mobility on other routes.

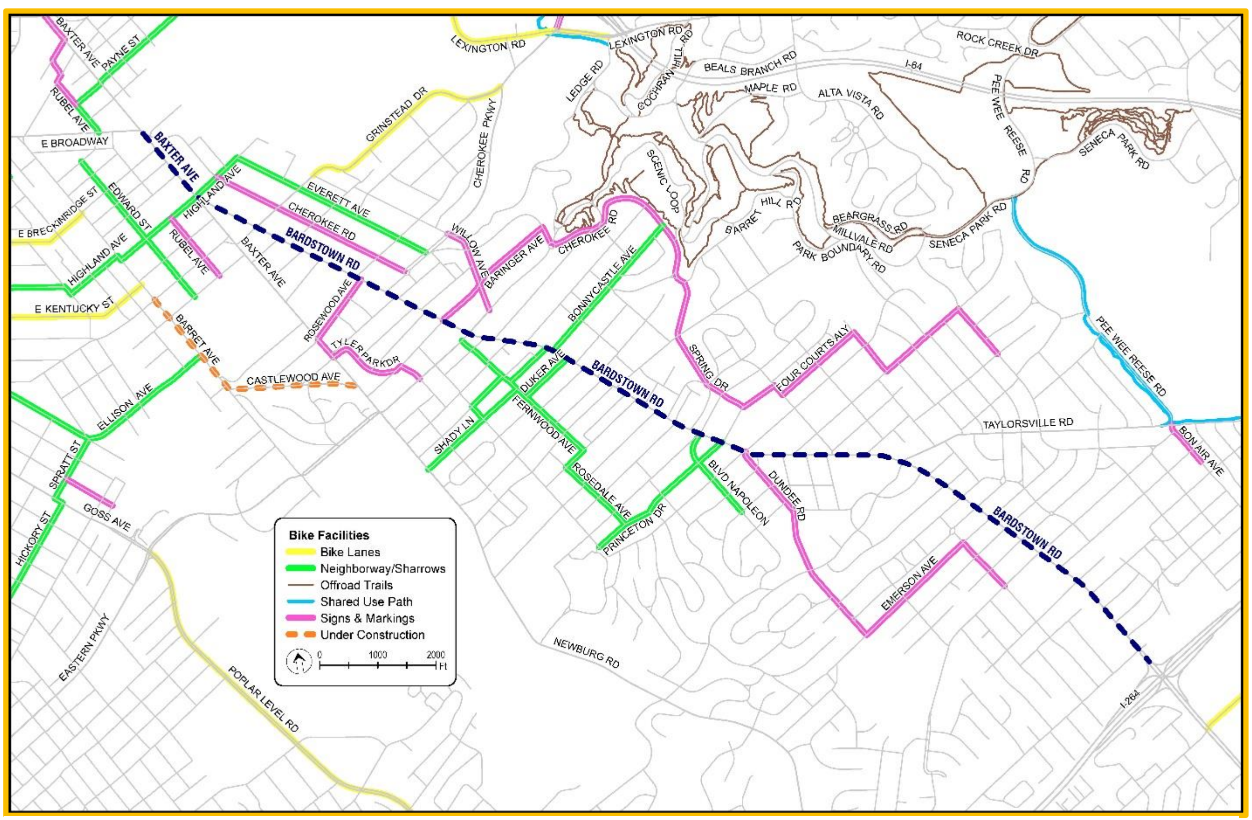


Figure 13: Area Bicycle Facilities East and West of the Baxter Avenue/Bardstown Road Corridor (as of 2017)

CHAPTER 4 – ALTERNATIVES

Chapter 4 presents an overview of the corridor-wide improvement concepts that have been considered, followed by details of the recommended alternative concepts.

4.1 Overview

The proposed concepts for addressing issues along the project corridor were presented for public feedback during the second public meeting; on the project web site; and at meetings with neighborhood groups, businesses, and other stakeholders. **Figure 14** shows one of the “sticky note” boards used at public meeting to encourage comments. Key issues addressed within the context of this study, with the benefit of extensive public input, are summarized in sections 4.1.1 through 4.1.5. The recommended preferred alternative concepts concluding this study are described and illustrated in Sections 4.2 through 4.2 (**Figure 15)**. Section 4.6 presents a discussion of the recommended concepts’ traffic operations and concept implementation options.

Figure 14: “Sticky Notes” Board with Comments from Public Meeting Attendees

- **SECTION 1 —** Broadway to Princeton Drive/Woodford Place / “Lane Light Section”
- **SECTION 2 —** Douglass Loop south 0.6 mile to Taylorsville
- **SECTION 3 —** Taylorsville Road to Tyler Lane
- **SECTION 4 —** Tyler Lane to Brighton Drive, just north of I-264

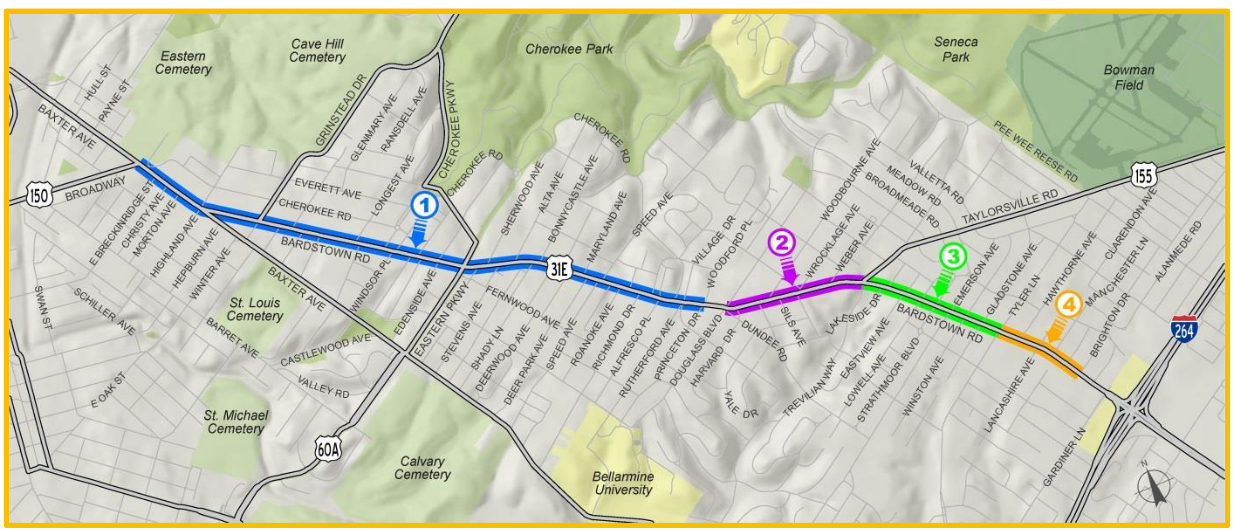


Figure 15: Project Sections along Which Improvements Are Proposed

Select images to illustrate the recommended Alternative Concept in each section are provided in Section 4.2 through 4.5. Note that, for Section 1, the images from the Broadway/Baxter Avenue intersection south to Lucia Drive were taken from 2-dimentional concept drawings and a 3-dimentional video of the alternative. For the rest of Section 1 and Sections 2 through 4, only the 2-dimentional concept drawings were available.

4.1.1 Roadway Reconfiguration

For the four corridor sections, several alternatives were considered, as were minor intersection reconfigurations that could be implemented independent of an overall redesign.

The guidelines for the roadway reconfiguration alternatives were as follows:

- No new right-of-way or major construction would be required.
- In Section 1, the lane lights could be removed.
- Bicycle lanes would not be provided along the corridor. Although this decision was not an initial guiding principle, it became apparent early-on that bicycle lanes could not be safely or practicably added.

4.1.2 Transit

Safe and well-planned facilities for Transit Authority of River City (TARC) buses at strategic locations should be planned, and the number of TARC's signed stops should be reduced. Coordination with TARC on the final layout of the road will need to occur prior to any changes to the existing cross sections.

Figure 2: Example of a Well-Lit Urban Corridor

4.1.3 Lighting

Regardless of the future configuration of travel lanes, a plan for street lights along the corridor is needed and warranted, based on the high number of pedestrian strikes and night-time crashes. At present, the lighting is inconsistent and inadequate in terms of appearance and effectiveness. Acorn-shaped lights are present in some locations, while cobra head lights are present elsewhere. Much of the night-time street lighting comes from businesses that either illuminate their outdoor areas or have interior lighting that shines outward through their windows. **Figure 16** illustrates a well-lit area along an urban corridor.

4.1.4 Parking

Along the corridor where parking is permitted, there are daily instances where vehicles are parked illegally, i.e., closer than 30 feet from an intersection or traffic control device. Often vehicles are parked so close to these prohibited locations that the sight distance for turning vehicles is obscured by the parked vehicles, thereby posing a safety hazard that contributes to crashes and, in some instances, pedestrian strikes. The "30-foot rule" is in the Kentucky Revised Statutes (KRS), and in the Louisville Metro Code of Ordinances (Metro Code):

- **Metro Code, Chapter 72: Parking Regulations: §72.035 Limitations of Stopping and Parking —** *It shall be a parking violation for the operator of any vehicle to stop or park such vehicle … [o]n each corner and all eight sides of an intersection, within 30 feet from* *the beginning and/or ending of any intersection, flashing beacon, stop sign, or traffic control signal located at the side of a roadway*. (p. 9 of 35)

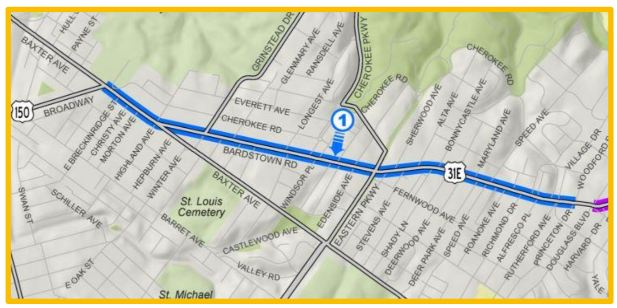
- **KRS 189.450(5)(f) —** *No person shall stop or park a vehicle…within thirty (30) feet upon the approach to any flashing beacon, stop sign, or traffic control signal located at the side of a roadway.*

4.1.5 Crash Reduction

The Federal Highway Administration's (FHWA's) Road Safety Manual notes the reduction from four lanes to two lanes is one of several proven safety countermeasures with **a crash reduction factor of 30%, on average**, and reduced vehicle speed differential. In addition, reducing to one the number of lanes to be crossed would notably improve safety for pedestrians and left-turning vehicles, both entering and leaving the road.

4.2 Section 1 — Broadway to Princeton Drive/Woodford Place ("Lane Light Section")

This section of the corridor (**Figures 17 – 30)** generated the most complex set of alternative analyses, design issues, and public comments, questions, and concerns. Section 1 (includes the majority of the crashes, as illustrated on Figure 11 (p. 12), and represents more than half of the corridor, but warranted notably more than half of the planning efforts and analyses due to the complexities.



Section 1 - Key Question

If the lane lights are removed, how should the road be reconfigured to meet the different needs of the corridor—those of the pedestrians, patrons, employees, residents, transit users, drivers (local and commuters)—while meeting the objective of improved safety, staying within the exiting footprint, and adhering acceptable roadway engineering design standards?

The Project Team began by identifying all feasible alternative concepts for repurposing and restriping the existing roadbed (i.e., not rebuilding the road outside the curb lines). The only four roadway reconfiguration concepts that proved viable for this section of the corridor are summarized below.

- **Alternative Concept A, No Change:** As standard practice, the first alternative is to make no changes—simply take no action. If this alternative is selected, the lane lights will need to be continually maintained. The No Change alternative is not recommended, as there would be no mitigation of the high crash rates.

Figure 17: Concept A—Existing Configuration

Figure 18: Existing conditions along the corridor

- **Alternative Concept B:** Remove lane-lights and make no other changes. This is not desirable as it would operate less effectively and safely than Alternative Concept A.

- **Alternative Concept C:** Remove lane-lights; and restripe road to be a three-lane roadway with a center turn/dual left lane, one travel lane in each direction, and parking restricted to one side. This concept is not desirable because the loss of parking on one side would not be acceptable to corridor businesses, and unsafe jaywalking would be expected to increase.

- **Alternative Concept D:** Remove lane-lights and restripe road to be one lane in each direction, with left-turn lanes at each of the signalized intersections and permanent on-street parking. Parking would not be permitted near the major intersections to allow room for the through lanes to go around the left-turn lane. **This is the recommended alternative in Section 1 because it would:**
  - Retain most of the parking on which local businesses and residents depend.
  - Remove the peak-hour parking restrictions, which are difficult to enforce; frequently not obeyed; and a hindrance to local businesses, employees and residents.
  - Improve safety at vehicle and pedestrian conflict points.

- Provide opportunities for shorter and more visible crosswalks, including "bump outs" and curb extensions.
- Provide left-turn storage for vehicles at major intersections, which will allow through traffic to go around the left-turning vehicles.
- Provide offsets at intersections for larger vehicles (including buses) to facilitate their required wider turns.
- Provide flexibility in the type and design of designated TARC facilities.
- Improve non-peak-hour capacity.

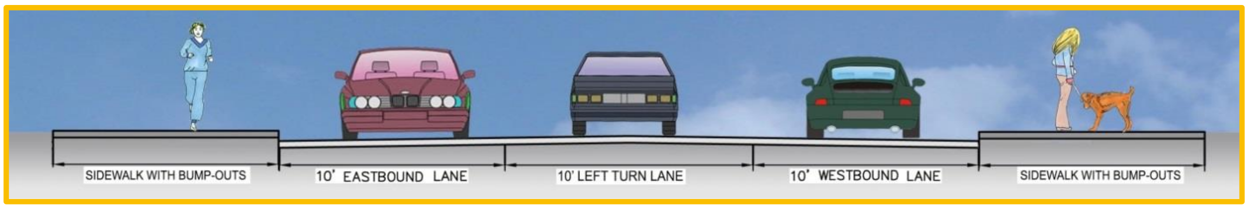


Figure 19: Concept D—Major Intersection Configuration for Section 1

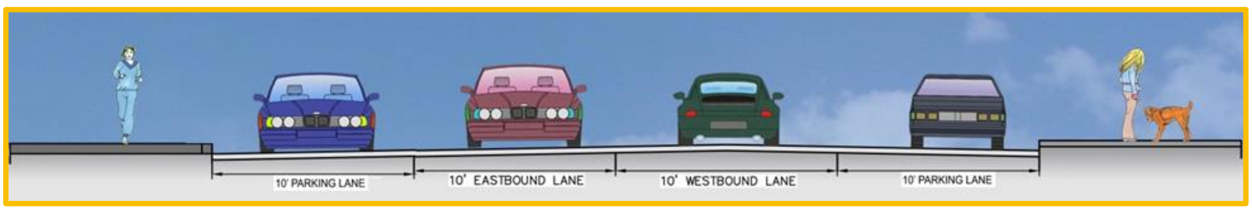


Figure 20: Concept D—Typical Lane Configuration for Section 1

Typical cross sections (**Figures 19** and **20)** illustrate recommended Alternative Concept D, which would provide one through lane in each direction and a center left-turn lane at major intersections together with bump outs on both sidewalks. Away from the intersections, there would be one travel lane in each direction, and parking would be provided along most of the route.

Various determinants/comparison matrices for the alternatives regarding performance are compared in **Figure 21** (p.19). Alternative Concept D has higher rankings in all areas over the No Change concept in the following determinants: non-peak hour traffic, maximization of parking, vehicle safety, pedestrian safety, and meeting conventional driver expectations (e.g., predictable lane configuration, non-illegally parked cars, standard striping, etc.), except peak hour traffic. None of the reconfigurations—including Alternative Concept D, as discussed below—would provide as much peak-hour carrying capacity as the No Change concept, but most perform better in every other matrix. Through the planning process it was important to consider all users during all times of the day equally important; whereas, peak hour traffic is not the predominant purpose of the road.

Alternative Concept D Traffic Operations—The ability to reduce congestion during peak and non-peak hours would differ with the recommended preferred Alternative Concept D; therefore, measures to achieve the best-case reduction scenario during each time period are incorporated into the concepts proposed along the corridor.

During the **non-peak-hours**, this alternative will perform better than the current configuration that has one lane for parking in each direction, one shared right/through/left lane in each direction, and no turn lanes. The proposed configuration would have the same through lane in each direction but would add turn lanes at most intersections by limiting parking near these intersections.

During the **peak hours**, this alternative will add to the congestion currently experienced during these time periods. The effective green time for the peak direction in the PM peak hours was between 40% and 50% at the major signalized intersections. The proposed design would reduce the number of through lanes in the peak direction from two to one. With this lane reduction and the effective green time that was found, the peak direction through movement would be over capacity at these intersections by 150 to 300 vehicles. This means during the peak hours, the peak direction traffic would experience more congestion and delays. At times during these peak hours, traffic would not make it through each signal in one cycle, increasing queues at these signalized intersections. As congestion increases, it is expected that some of this excess local traffic will either take a parallel route, such as Cherokee Road, Baxter Avenue, Fernwood Avenue, and Norris Place. Commuter traffic making long trips along this corridor may find completely different routes. Other drivers may use a different mode of transportation, such as biking, walking, or public transportation.

To mitigate these impacts, the signals along the corridor should be timed to provide as much progression as possible between the individual signals to minimize time spent braking or accelerating. Signal timing could also be adjusted to increase green time on mainline Bardstown Road, thereby minimizing delays to through traffic as much as possible without adding undue delay to the side streets.

Regarding pedestrian signals, implementing Alternative Concept D would require replacing each traffic and pedestrian signal along this section of the corridor—mast arms and signage included. It is recommended the pedestrian signals automatically activate prior to the green light for vehicles, without requiring the push of a button.

During the design phase, it is recommended that a micro-simulation model of the corridor be developed to help identify the location and length of turn lanes and to aid in signal timing. A model would allow tweaks to the initial design to ensure traffic flows as smoothly as possible through the corridor during the peak hours.

Following Figure 20, sub-sections 4.2, 4.3, 4.4, and 4.5 of this report identify and illustrate, by corridor section, the proposed improvement concepts that comprise Preferred Alternative Concept D.

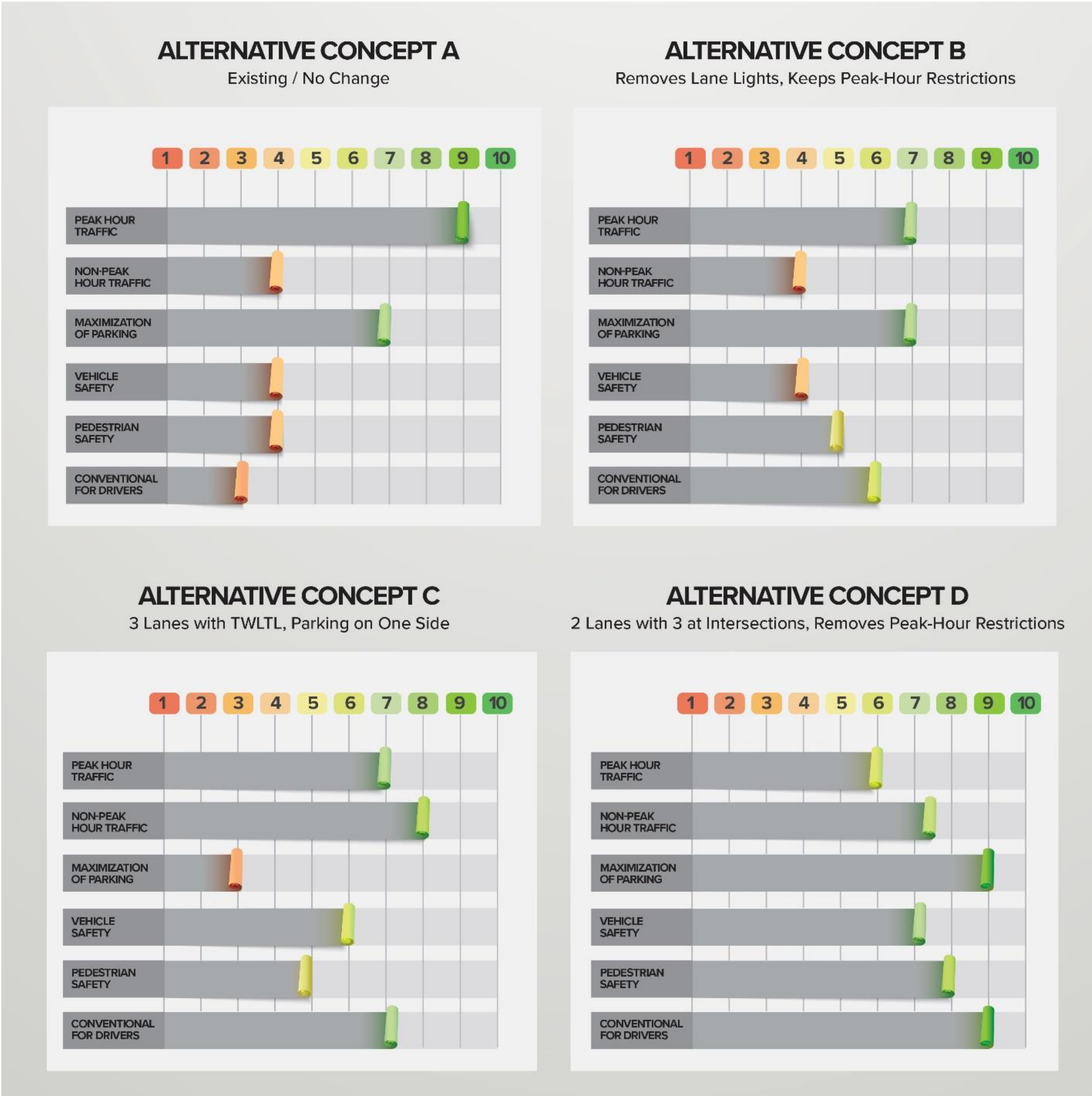


Figure 21: Section 1 Summary—Comparison of Alternative Concepts A, B, C, and Recommended Concept D

4.2.1 Broadway at Baxter Avenue

This concept would include a crosswalk across Cherokee Road where none currently exist. The new crosswalk requires the extension of the island between Cherokee Road and Baxter Avenue.

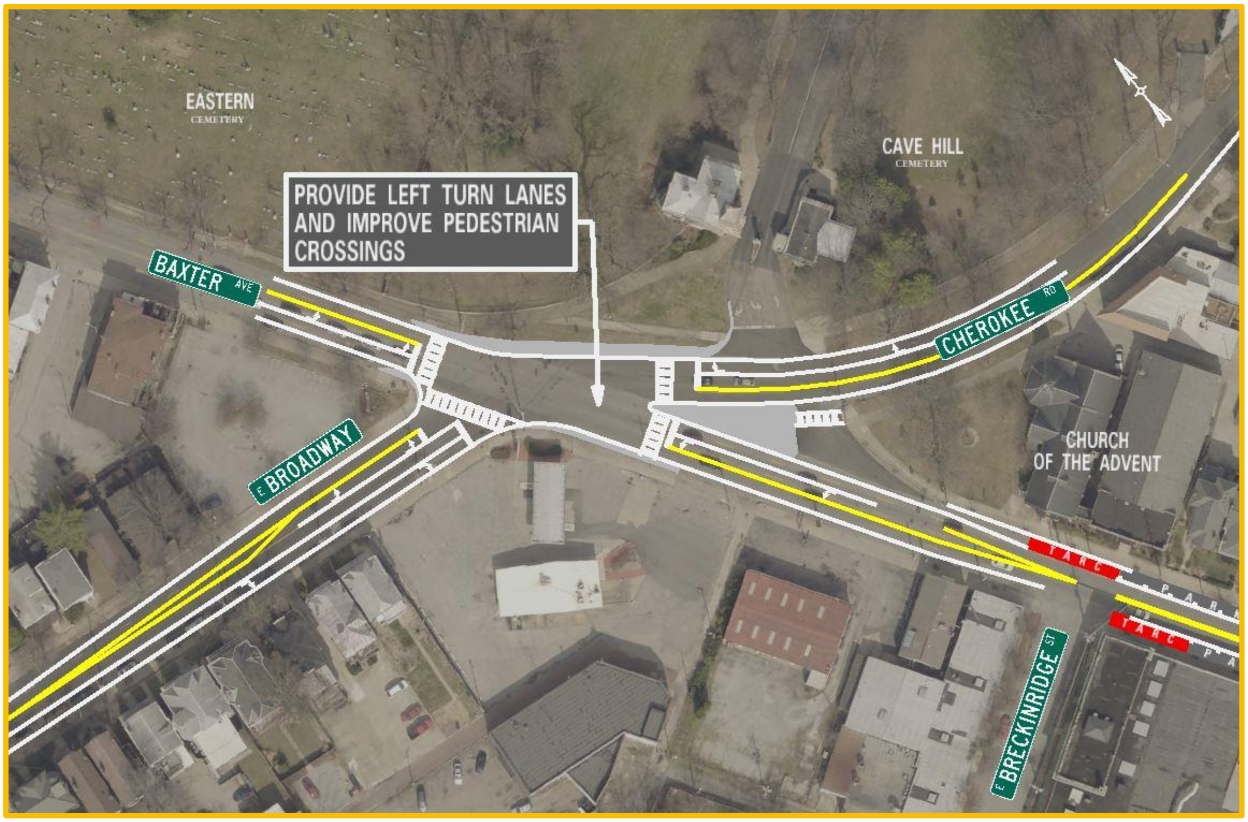


Figure 22: Broadway at Baxter Avenue—Proposed Configuration

4.2.2 Baxter Avenue at Morton Avenue

This section would be converted to a two-lane road with parking on both sides. This change would allow for curb bump outs, as shown at Morton Avenue. This is the highest pedestrians strike area along the corridor, and these changes would be anticipated to greatly improve pedestrian safet

Figure 23: Baxter Avenue at Morton Avenue—Proposed Configuration

4.2.3 Baxter Avenue/Bardstown Road at Highland Avenue

This configuration would provide a crosswalk on the south side of Bardstown Road where Baxter Avenue and Bardstown Road split. Jaywalking in this section is a very frequent occurrence, as the path with crosswalks is over 400’ to use the crosswalk at Highland Avenue.

Figure 24: Baxter Avenue/Bardstown Road at Highland Avenue—Proposed

4.2.4 Bardstown Road at Grinstead Drive

The concept at Grinstead Drive and other major intersections would remove on-street parking from the intersection approaches, allowing and providing TARC stops as close as possible to their current settings. Left-turn lanes would meet the traffic needs and allow through traffic to go around left-turning vehicles.

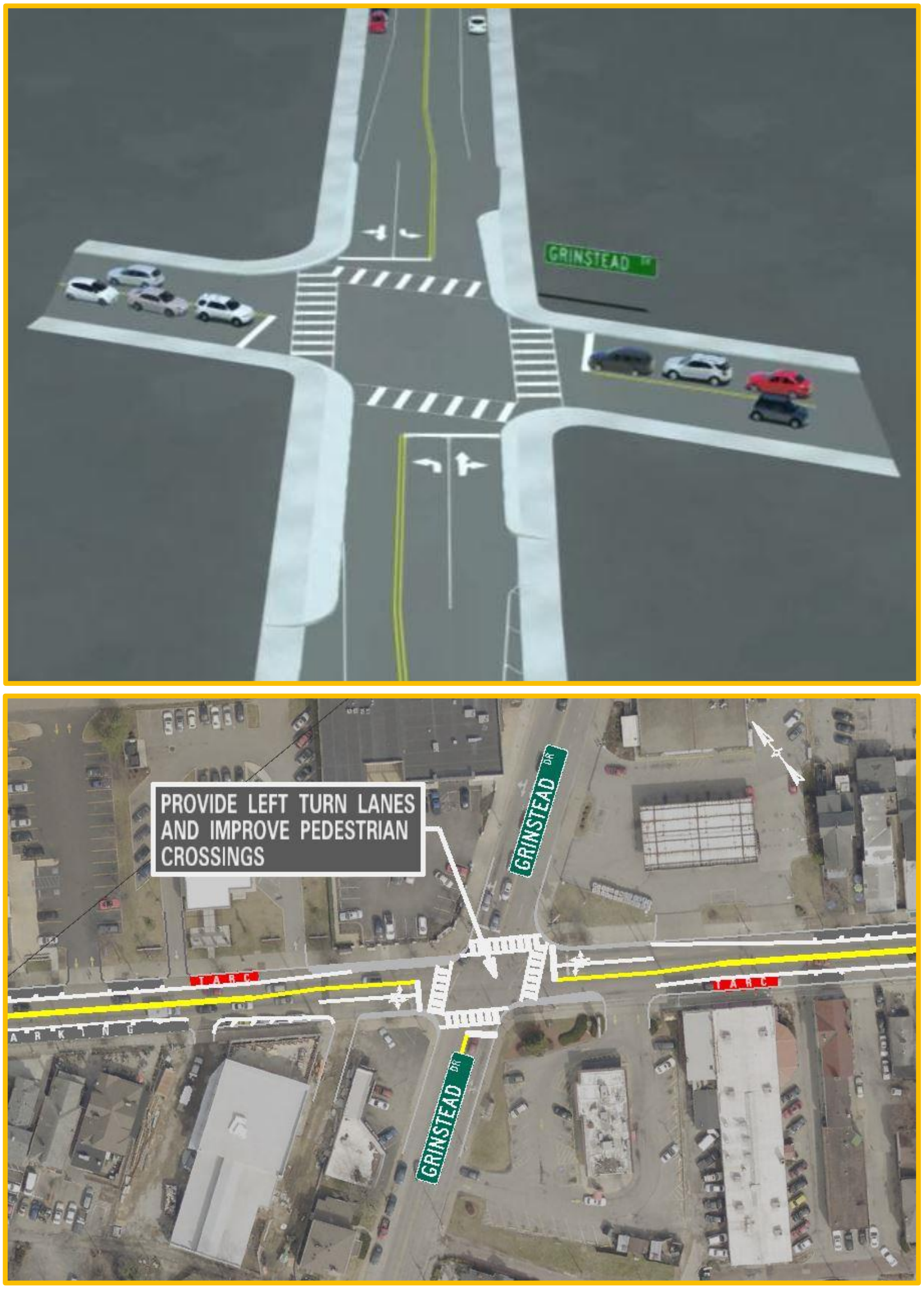


Figure 25: Bardstown Road at Grinstead Drive—Proposed Configuration

4.2.5 Bardstown Road at Lucia Avenue

Similar to the concept at Morton Avenue, curb extensions and bump outs would shorten the pedestrian crosswalk in this heavily pedestrian-traffic section. The presence of Bloom Elementary School on Lucia Avenue contributes to the high number of pedestrians in this area.

Figure 26: Bardstown Road at Lucia Avenue—Proposed Configuration

4.2.6 Bardstown Road at Mid-City Mall and Longest Avenue

At Mid-City Mall, this concept would continue to allow on-street parking along the north side of the road, which was key request of local businesses.

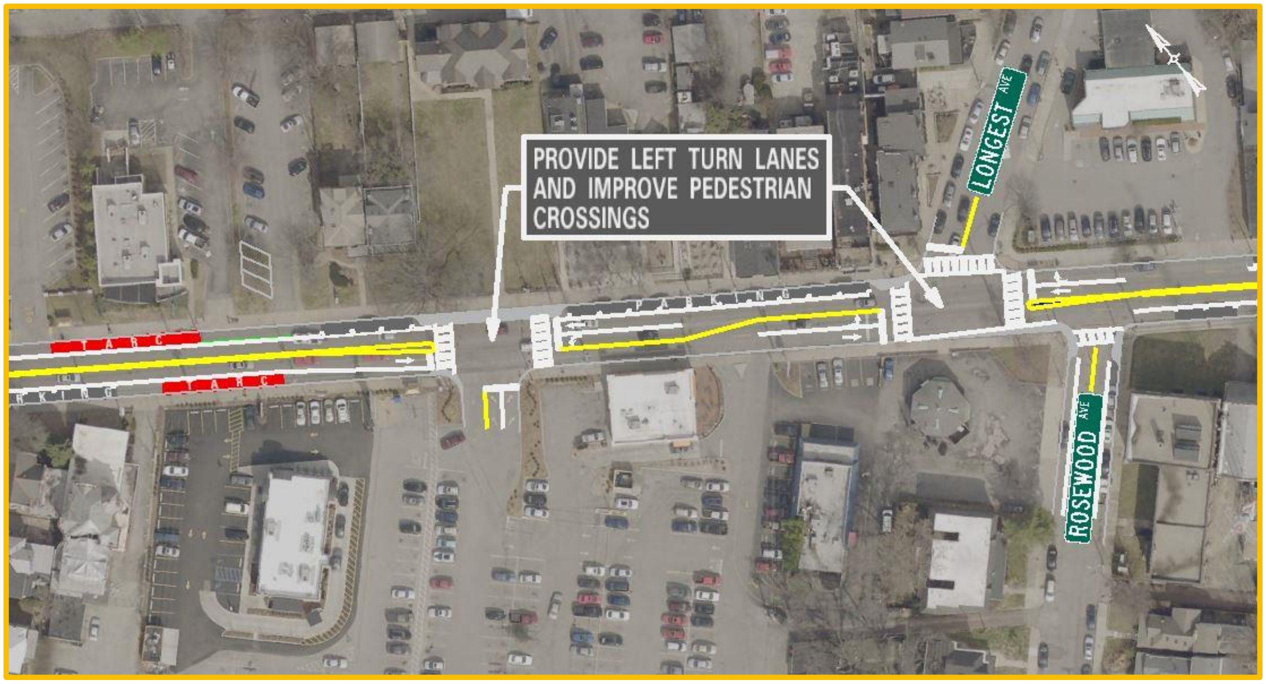


Figure 27: Bardstown Road at Mid-City Mall and Longest Avenue—Proposed Configuration

4.2.7 Bardstown Road at Eastern Parkway

Key elements of the concept at Eastern Parkway are the inclusion of left-turn lanes and the removal of the unsafe on-street parking near this major intersection.

Figure 28: Bardstown Road at Eastern Parkway—Proposed Configuration

4.2.8 Bardstown Road at Bonnycastle Avenue

On-street parking int between the two legs of Bonnycastle Avenue would not be possible to maintain; however, the parking needs would continue to be met with permanent on-street parking on both sides north and south of Bonnycastle Avenue. This concept would also allow for the widening of the sidewalks to improve pedestrian flow and shorten crosswalks.

Figure 29: Bardstown Road at Bonnycastle Avenue—Proposed Configuration

4.2.9 Bardstown Road at Speed Avenue

In addition to the proposed changes of adding one lane in each direction and providing a left-turn bay, the converting the southbound leg of the intersection at Speed Avenue to one-way, southbound, is also recommended. The northbound movement from this leg of Speed Avenue to Bardstown Road causes additional conflict points and signal delays, and the sight distance for northbound traffic to see to the left is limited by a retaining wall. Making this leg one-way southbound would improve the operations and safety of the intersection. This one-way direction would not impede the traffic network, since Deer Park Avenue is one-way northbound, and Roanoke Avenue (to the south) is a two-way road.

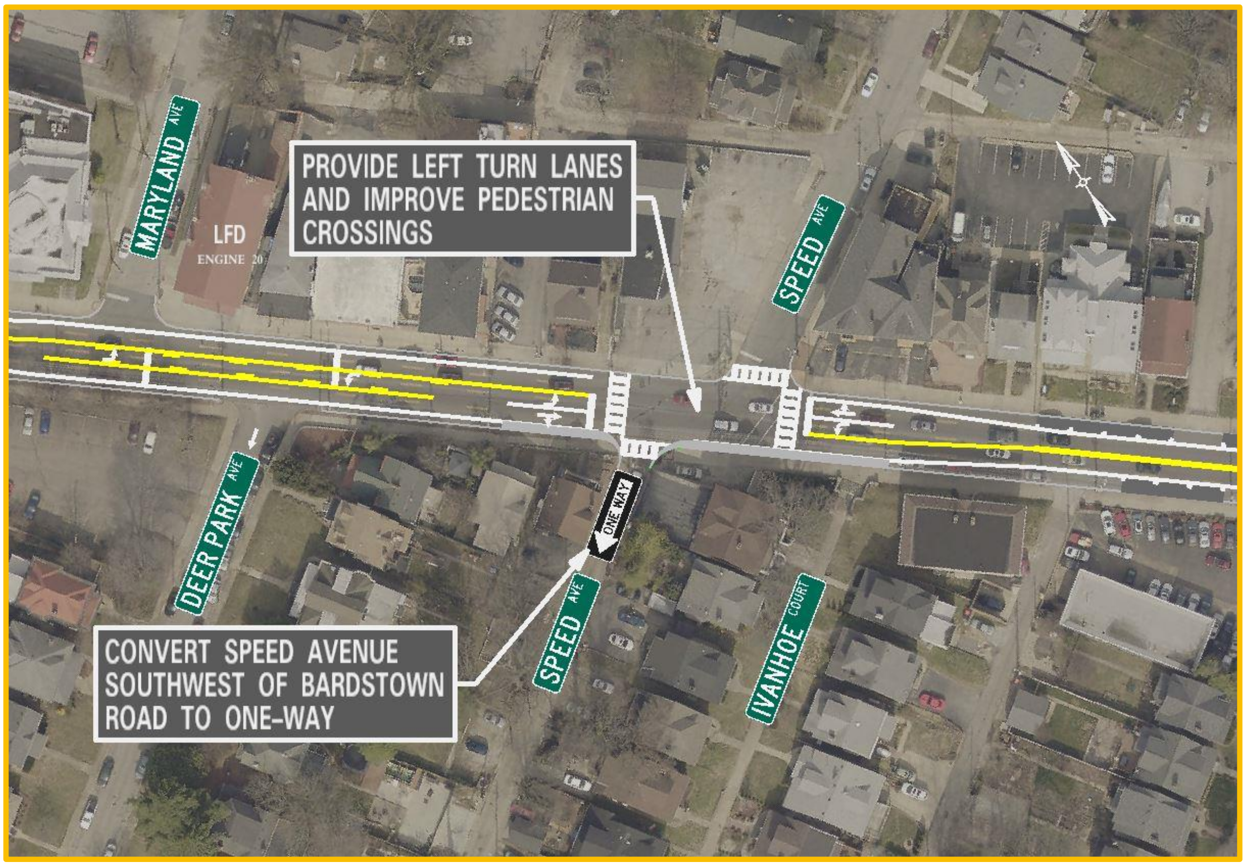


Figure 30: Bardstown Road at Speed Avenue—Proposed Configuration

4.2.10 Bardstown Road at Boulevard Napoleon

The proposed concept would allow for curb extensions with an improved crosswalk at Alfresco Place; while at Boulevard Napoleon all current traffic movements would remain and roadway markings would be enhanced. On-street parking on both sides would be provided where possible between Alfresco Place and Boulevard Napoleon. South of Boulevard Napoleon, a three-lane section with a center turn lane is proposed as a transition to a possible five-lane section at Douglass Loop. The “Lane Light” section ends at the Bardstown Road/Princeton Drive/Woodford Place intersection.

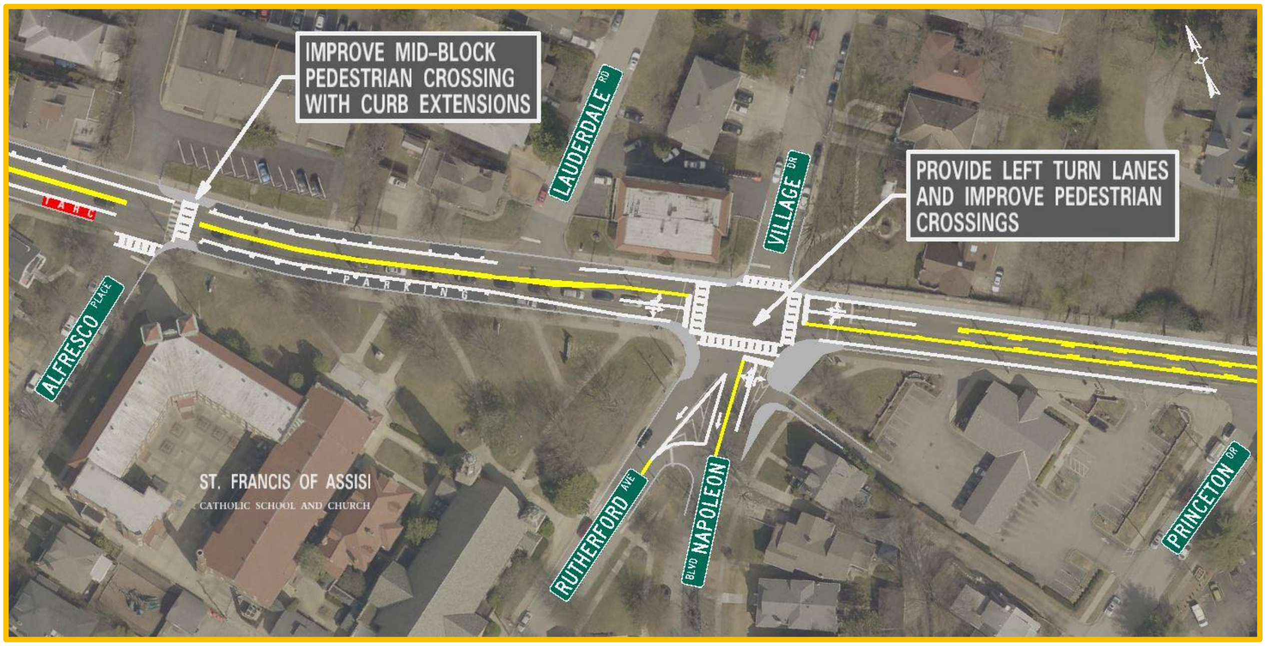
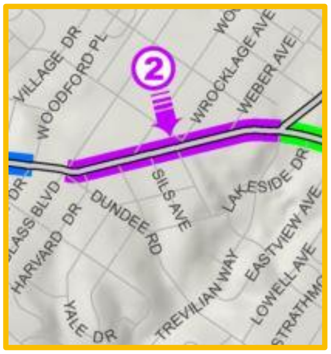


Figure 31: Bardstown Road at Boulevard Napoleon—Proposed Configuration

4.3 Section 2 – Douglass Boulevard to Taylorsville Road



Through Section 2 (**Figures 32 – 35**), the improvements primarily consist of providing five travel lanes—two through lanes in each direction and a two-way left-turn lane—and modifying crosswalks via curb extensions (i.e., bump-outs, shown in light gray) to shorten the crossing distance for pedestrians and improve the ability of drivers and pedestrians to see each other.

4.3.1 Bardstown Road at Douglass Boulevard

Left-turn lanes at Douglass Boulevard and Harvard Drive would improve through traffic flow. At present, the inside lanes are through lanes, but the high volume of left-turn movements encourages drivers to use the outside lane.

Regarding parking, north of Douglass Boulevard, unrestricted parking would be permitted along both sides of the Bardstown Road. South of Douglass Boulevard, there is currently a mix of no on-street parking and peak-hour restricted on-street parking. Local business owners have expressed a desire to keep peak-hour restricted on-street parking where possible; however, it would be an impediment to safety and mobility and is not recommended. However, if off-street parking cannot meet the parking needs, on-street parking could be allowed with peak-hour restrictions and not within 30-feet of any intersection.

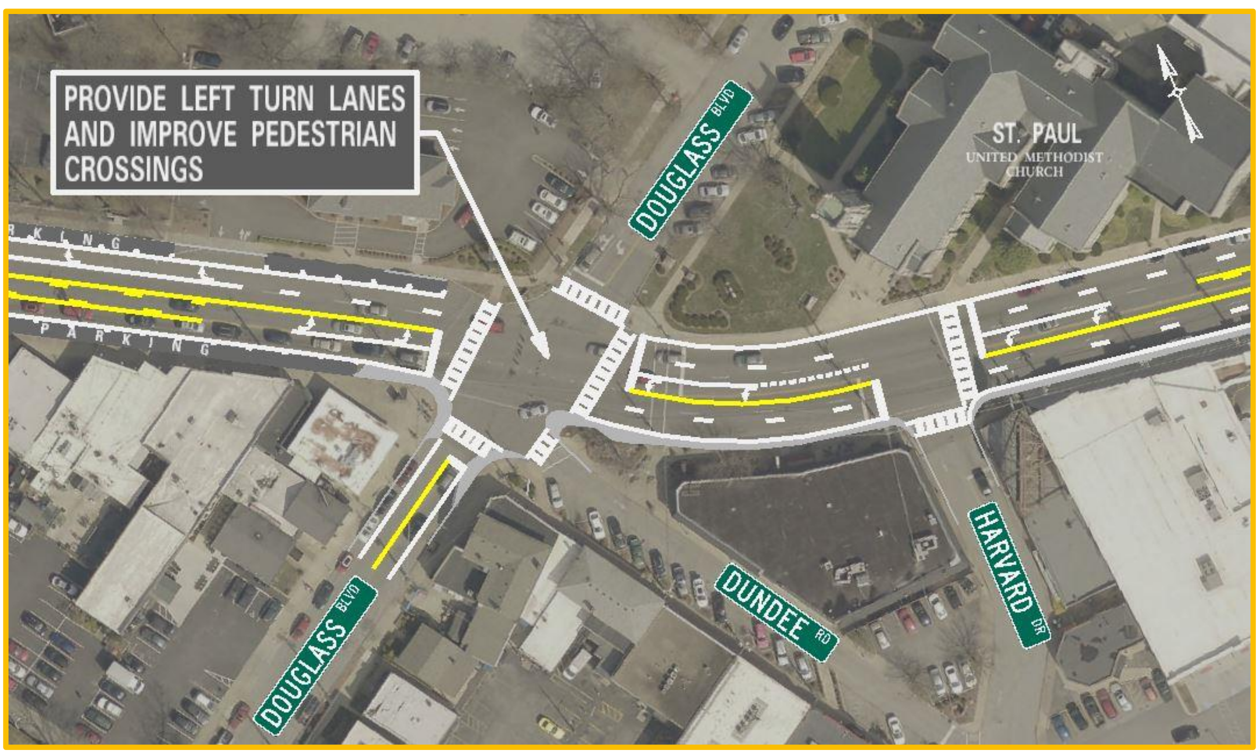


Figure 32: Bardstown Road at Douglass Boulevard—Proposed Configuration

4.3.2 Bardstown Road at Wrocklage Avenue

The intersection at Dorothy Way and Wrocklage Avenue should be "squared up," per conventional design, to meet driver's expectations and to allow for shorter crosswalks.

Figure 33: Bardstown Road at Wrocklage Avenue—Proposed Configuration

4.3.3 Bardstown Road at Taylorsville Road/Trevilian Way

At present there are only three crosswalks at this intersection; no crosswalk exists at the north leg of the intersection. If the Taylorsville Road approach to the intersection is “squared up” with a curb extension to improve the pedestrian crossing a crosswalk could be installed and the mid-block crosswalk at Weber Avenue could be removed, which is an underused and dangerous crossing.

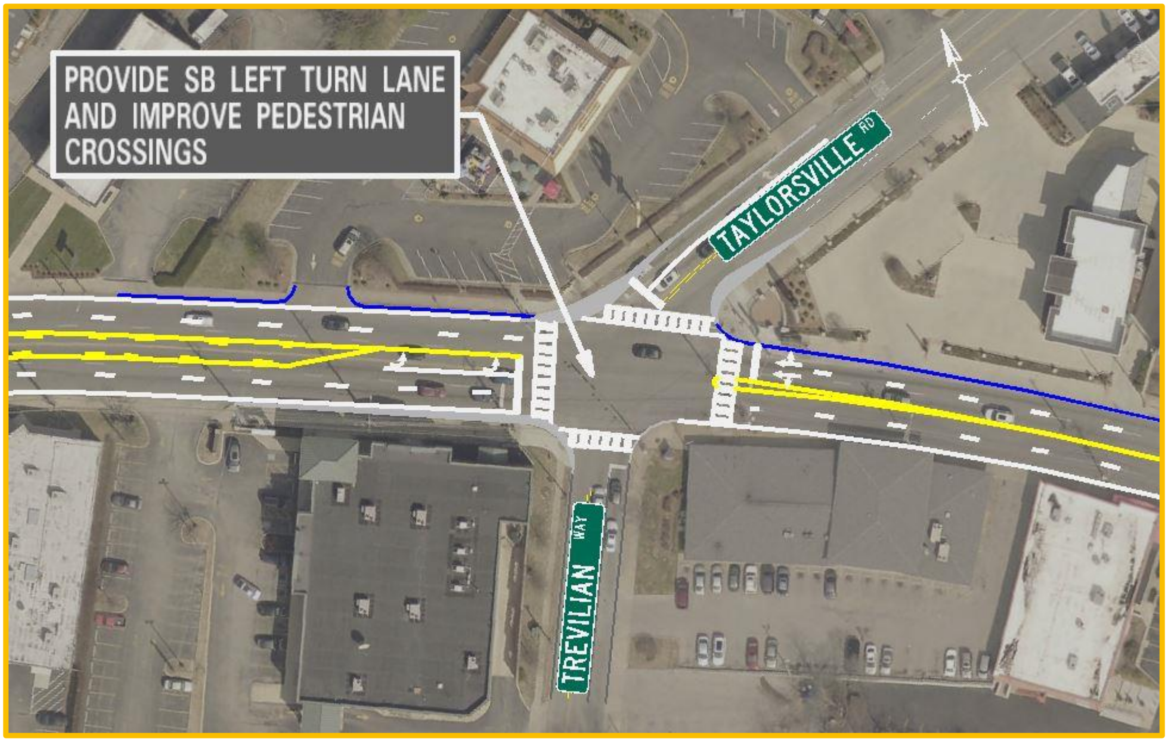


Figure 34: Bardstown Road at Taylorsville Road/Trevilian Way—Proposed Configuration

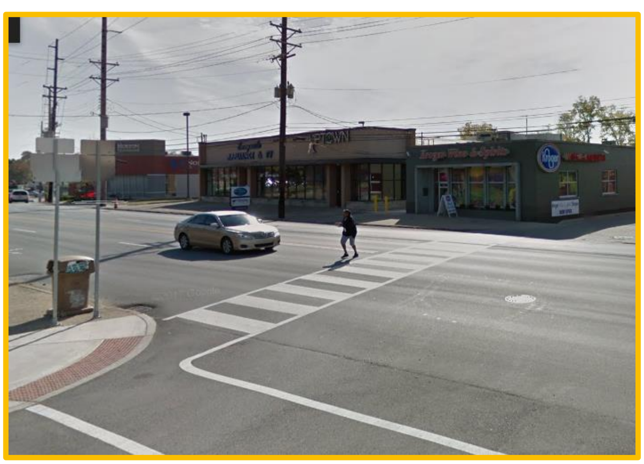
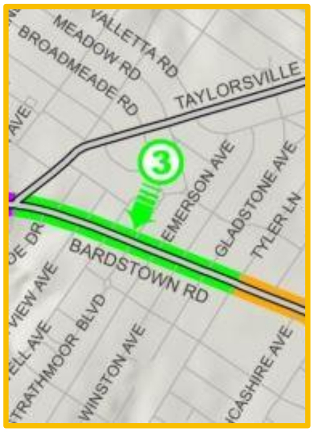


Figure 35: Bardstown Road crosswalk to Weber Avenue crosswalk (unstriped)

4.4 Section 3 – Taylorsville Road to Tyler Lane



Improvements along this corridor section **(Figure 36)** are to the sidewalks, only—reconstruction of existing sidewalks and instillation of new sidewalks where none exist on the north side of the road. The sidewalks should include curb and gutter, where feasible, to manage storm water runoff and provide an added benefit of calming excessive traffic speeds that are a common complaint of area residents. However, note that 85% of the travel speeds recorded during the AM, Midday, and PM peak hours ranged from 18 MPH (Midday northbound) to 35 MPH (AM southbound), which are within the posted speed limit through this area (see Appendix A).

No improvements to the roadway are warranted because the crash volumes are relatively low, and the limited right-of-way availability would not permit the addition of turn lanes. A traffic signal warrant analysis was conducted at Emerson Avenue, but the turning-movement volume to through-movement volume ratio does not meet the signal warrants; therefore, a signal is not recommended at this location.

One public commenter suggested the sidewalk on the west side be reconstructed to a 10-foot-wide multi-use path (MUP) from Eastview Avenue to Tyler Lane. Implementing this suggestion would benefit the nearby residents and students who walk and bike to the area schools; therefore, it is recommended for consideration during the design phase.

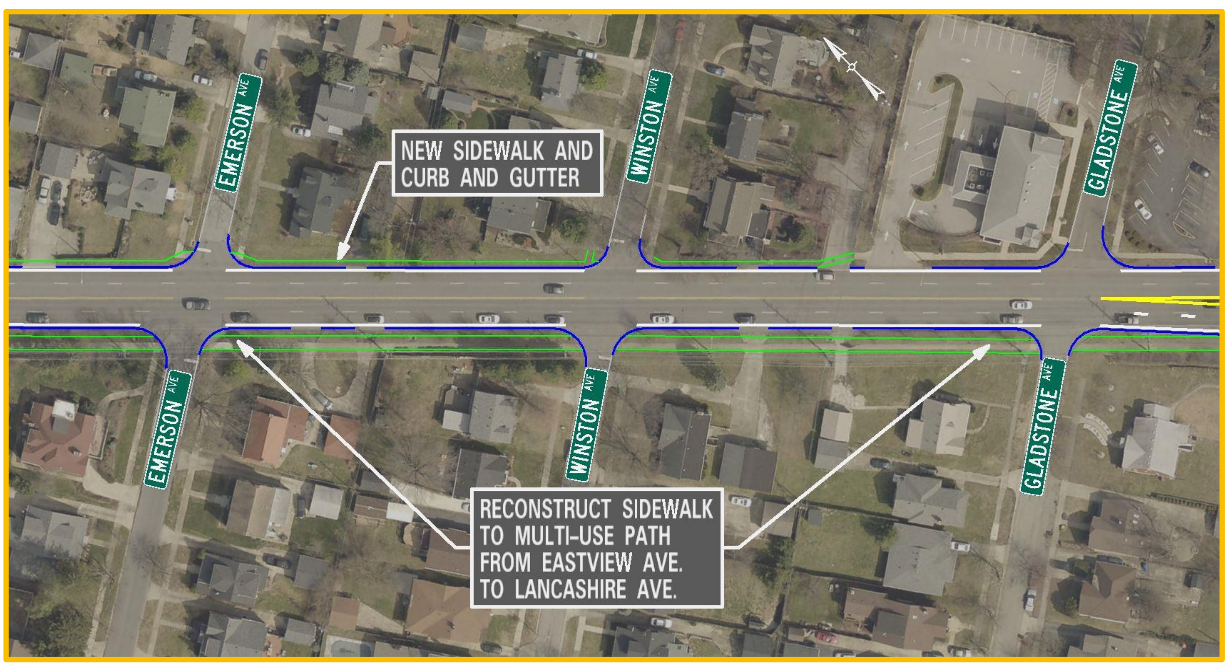
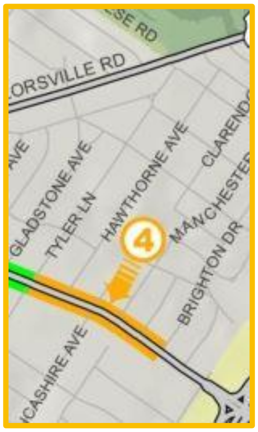


Figure 36: Bardstown Road from Emerson Avenue to Gladstone Avenue—Proposed Configuration

4.5 Section 4 – Tyler Lane to Brighton Drive



This roadway section **(Figures 37 and 38)** would be converted from four lanes to five by adding a left-turn lane along Bardstown Road. In addition, crosswalks would be improved, and a 10-foot-wide multi-use path (MUP) along the west side of Bardstown Road would be continued from Tyler Lane to Brighton Drive to facilitate pedestrian and bicycle movements to and from schools in the immediate area.

4.5.1 Bardstown Road at Tyler Lane

Left-turn lanes at both approaches to Tyler Lane will facilitate movement of traffic to and from Assumption High School. The crosswalks at the intersection would be enhanced (relocated and added) to improve pedestrian safety.

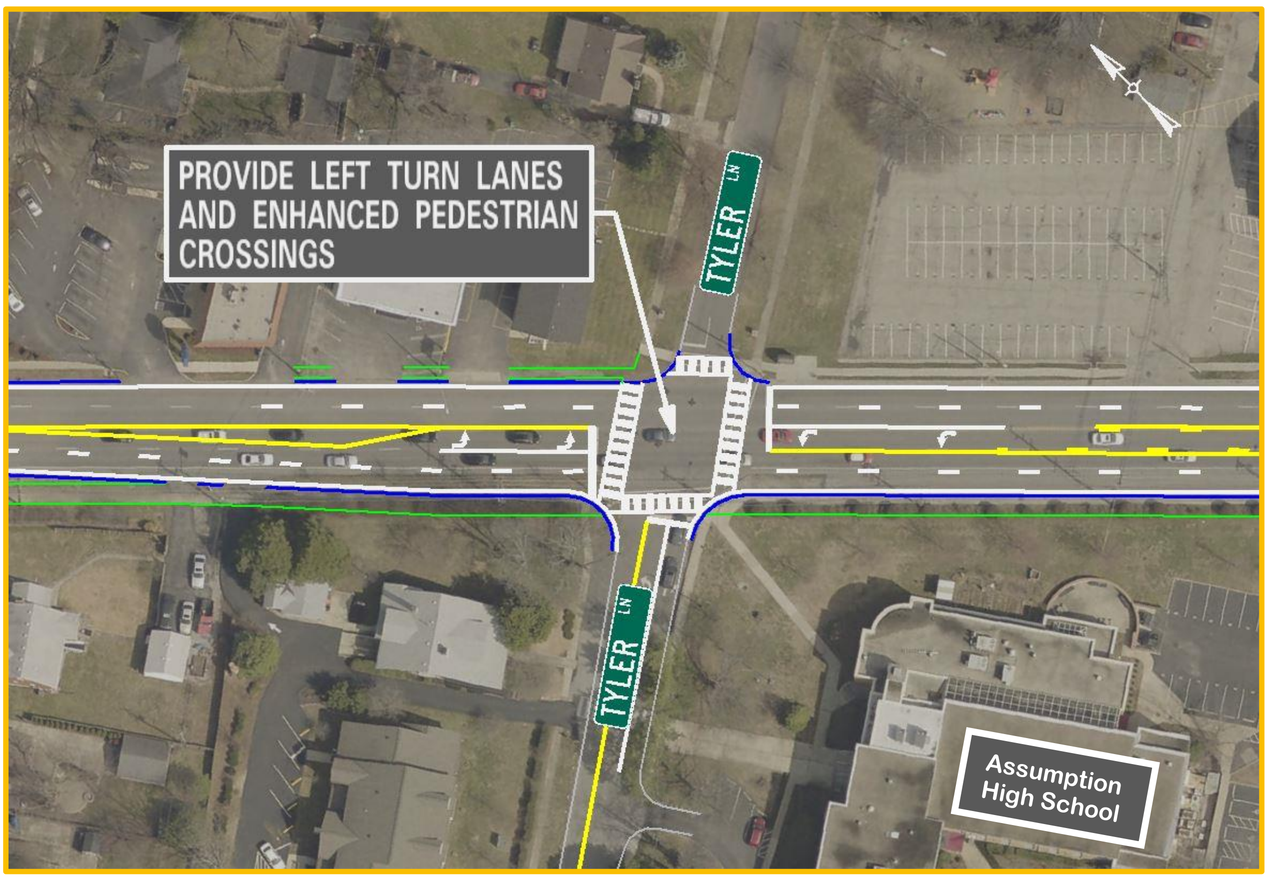


Figure 37: Bardstown Road at Tyler Lane—Proposed Configuration

4.5.2 Bardstown Road at Assumption High School and St. Raphael Church/School

Adding a two-way left-turn lane on Bardstown Road would improve traffic flow and mobility through this three-school zone—**Assumption High School** and **St. Raphael Elementary School,** which are on the west side of Bardstown Road and have adjacent parking lots with entrances in close proximity; and **Hawthorne Elementary School** on the east side of Bardstown Road, which has an exit drive that intersects Bardstown Road and is adjacent to Assumption's secondary parking lot.

At present, Bardstown Road's southbound shoulder provides temporary parking for drivers waiting to enter the schools' parking lots to pick up students in the afternoon. Temporary, on-street parking at this location is unsafe and should be eliminated in favor of improving student/pedestrian and motorist mobility and safety. A center turn lane could be added by converting the 10-foot-wide shoulder into an outside southbound lane, then converting the inside southbound lane to a center turn lane.

Long-term concepts that could facilitate traffic flow onto the adjacent Assumption/St. Raphael campuses include creating a single point of access to serve both schools and locating that access across from Hawthorne Lane. This would greatly reduce the complexities of conflicting turns that take place within a short distance, especially during the schools' peak hours. Hawthorne Elementary School would also benefit from the improved traffic flow. The final layout and implementation of the single point of access concept would be the responsibility of the two schools, but should include Louisville Metro as a facilitator.

Figure 38: Concepts for Improving Traffic Flow along Bardstown Road at Assumption and St. Raphael Schools

4.6 Implementation Strategy – Preferred Alternative Concept D

The proposed improvements proposed with Alternative Concept D in any of the four sections may be treated as stand-alone projects that can be implemented independently as funding becomes available. **Figure 39** illustrates the recommended reconfiguration of the travel lanes for the entire corridor that was presented to the public and stakeholders for comment. A white paper presenting comments from stakeholders and the public is in Appendix B, and a visualization of the types of comments is provided in **Figure 40**.

Figure 39: Overview of General Corridor Recommendations

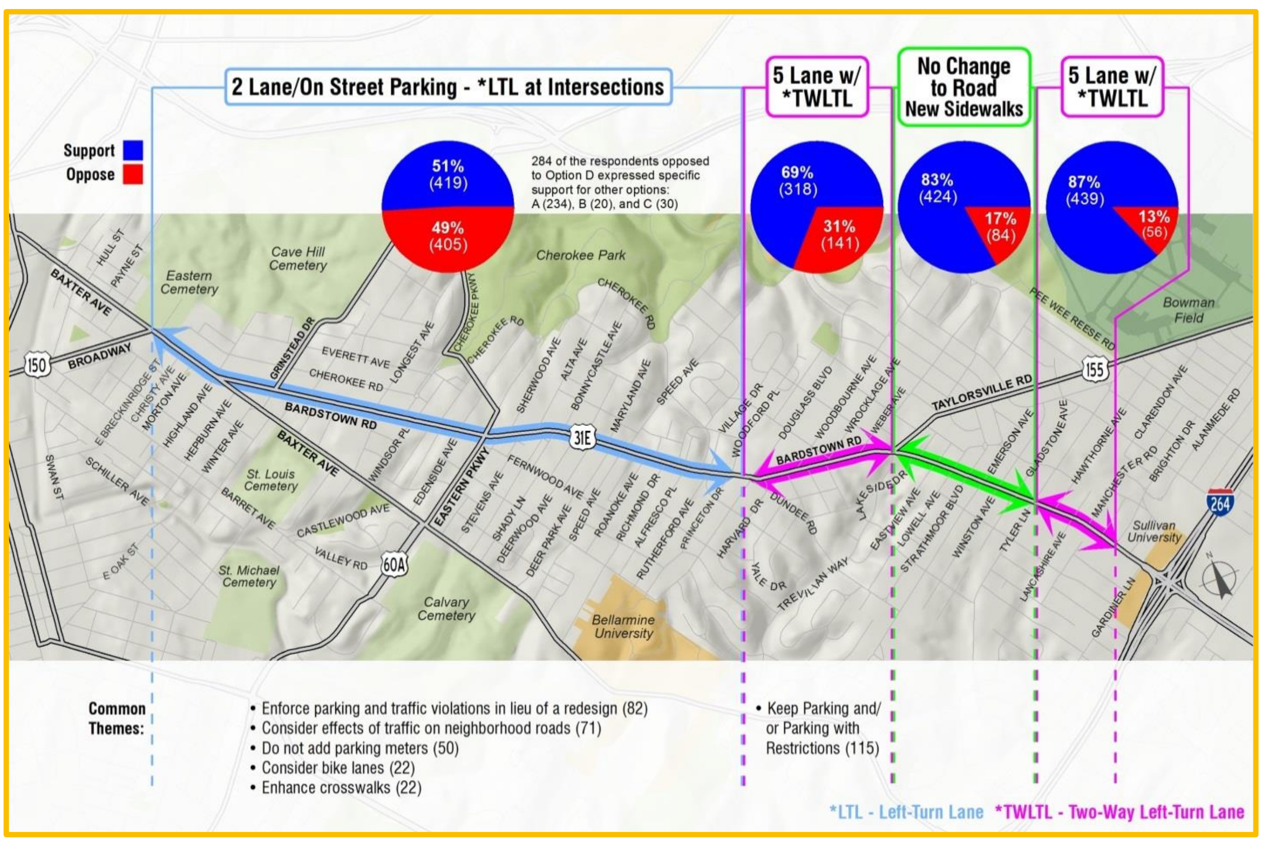


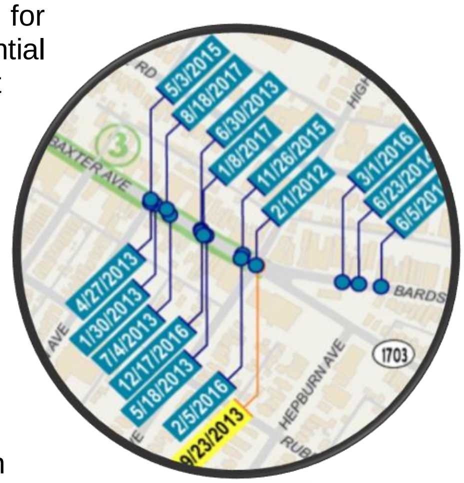
Figure 40: Summary of Public Commenters' Recommendations/Concerns

CHAPTER 5—BARDSTOWN ROAD CORRIDOR IMPLEMENTATION PLAN

The previous chapters have presented the steps taken in the planning process, such as data gathering, alternative consideration, public engagement, and recommendations. The steps for implementing the recommendations plan are addressed below. **Table 3** provides planning-level roadway cost estimates and **Table 4** provides a matrix of recommended projects along the corridor.

ENHANCED LIGHTING

A strategic street and sidewalk lighting plan would be a notable benefit for the safety along the corridor and can proceed independently of any potential changes to the existing street configuration. As stated earlier in the report nighttime crashes and pedestrian strikes are notably high; therefore, improved lighting and visible crosswalks should be a top priority. The roadway reconstruction could occur with or without new lighting. Lighting instillation would require placing conduit under the sidewalk and coordination with other electrical services. Without knowledge of subsurface utilities and locations cost estimates for installing lighting are difficult to predict.



The first step toward developing a master plan and cost estimates would be an exploratory meeting with LG&E. It is the recommendation of this plan the new, coordinated aesthetic lighting that be installed first between Morton and Highland avenues, at a minimum, since this block is where the majority of the nighttime crashes and pedestrian strikes have occurred.

PEDESTRIAN IMPROVEMENTS

The Bardstown Road Corridor Safety Study specifically emphasizes the need for improvements that will promote the safety of pedestrians and non-motorized users along the corridor.

Crosswalk improvements along the corridor are a top priority. Some recommended crosswalk improvements will be long-term projects that can only be implemented in conjunction with reconfigurations to the existing roadway. However, several recommended crosswalk improvements do not necessitate alterations to the roadway and can be implemented quickly at a relatively low cost. **Table 4** outlines specific crosswalk improvements along the corridor and delineates them based on feasibility.

Recommended improvements to Section 3 of the study area should be a high priority for implementation as it would provide an immediate pedestrian benefit by adding new sidewalks. The cost estimates in **Table 3** include providing a 10-foot-wide multi-use path along the south side of Bardstown Road. While this path would benefit bicyclists and pedestrians, it would also be an *enhancement to the existing sidewalk* rather than a *new a sidewalk where none currently exists*—as is the case of the more pressing and less expensive need along the north side.

ROADWAY RECONFIGURATIONS

- **STEP 1 — Detailed Traffic Synchro Model**
- **STEP 2 — Design**
- **STEP 3 — Funding**
- **STEP 4 — Construction**
- **STEP 5 — Evaluation of Project Effectiveness**

Before any changes are made to the existing cross section, a detailed traffic (including transit) analysis will need to be conducted.

STEP 1 — TRAFFIC SIMULATION MODEL

Synchro Model. A primary public concern for the recommended alternative is how traffic will operate during the peak hours. The project planners and engineers generally agreed that, for the majority of the day, traffic operation would improve in Section 1 primarily due to the left-turn lanes at key intersection in. Public input questioned the impacts of removing the lane lights during the peak hours. To better understand those impacts, a detailed traffic Synchro model would need to be developed for the corridor and adjacent roadways for Section 1, to analyze how that section would transition into Section 2. Sections 3 and 4 would most likely not warrant a Synchro model. The model would simulate traffic flow based on turning movement counts for the corridor with the proposed changes. Completing this model was beyond the scope of this planning study; however, it is a top recommendation for implementation.

STEP 2 — DESIGN

Construction Plans. The principal task that must occur between the project planning and implementation stages is the development of construction plans contractors will use to prepare their bids. Before the final construction plans for the BTR Corridor can be readied for submittal to contractors, the following design sub-steps are necessary:

1a. Detail Traffic Signal Timing and Signal Design Plans.

1b. TARC Stop Removal/Relocation Plans.

1c. Asphalt Application Prior to Striping. When applying a new striping configuration to an existing roadway, the best practice is to lay new asphalt before apply the new striping. The costs for milling the old asphalt and replacing it with new asphalt are included.

The end product will include a Plans, Specifications, and Estimates (PS&E) package to be published for bid.

STEP 2 — PROGRAMMING AND FUNDING

There are a variety of programming steps and funding sources that should be explored by Louisville Metro in partnership with the KYTC and KIPDA as the project(s) are programmed for implementation.

Prior to any project receiving funding, Louisville Metro should submit the project descriptions and planning level cost estimates to KIPDA for inclusion in the Long Range Metropolitan Transportation Plan (MTP) and the Transportation Improvement Plan (TIP). This is a necessary first step.

As a KYTC-owned and maintained route, the projects must be included in the KYTC Highway Plan, which is a biennium plan and will be republished next in Spring 2020. While seeking inclusion of the project in KIPDA's MTP and TIP, Metro should concurrently seek its inclusion in KYTC's Highway Plan. The KYTC prioritizes projects for the Highway Plan based on a method known as SHIFT, which scores projects state-wide on the following factors:

- Safety Improvements
- Congestion Reduction
- Preserving Existing Infrastructure/Asset Management
- Cost-Benefit Analysis (including the benefits of safety and congestion improvements vs. construction costs)
- Freight and Economic Growth

The Bardstown Road Corridor should score well in this analysis, as the roadway is an economic corridor for Louisville, which is an economic engine for the Commonwealth. The project would improve safety on one of the highest crash rate corridors in the state, reduce overall congestions, and be completed within the existing infrastructure's footprint. Avoiding right-of-way acquisition and incurring long-term maintenance costs should lead to a significantly competitive cost-benefit ratio.

Funding Sources. While Louisville Metro collects local taxes, it does not collect a local gas tax. State gas taxes support the general road fund, which is notably underfunded for the state-wide road program. Therefore, State Funds are scarce and competition for them is strong. Federal funding sources include:

- Federal Congestion Mitigation and Air Quality Improvement Funds (CMAQ)
- Federal Transportation Alternatives Program (TAP)
- Federal Funds Dedicated to Louisville (SLO)
- Federal Statewide Transportation Funds (STP)

The above is an overview of various steps and funding sources. Coordination with KIPDA and KYTC will be necessary to determine which funding sources would be most appropriate for the identified improvements.

STEP 3 — CONSTRUCTION PHASING

Construction could be divided into the four study area sections and prioritized according to funding availability. Based on the analysis in this planning process, the proposed recommendations are as follows:

Section 4, which received the most public support (87%), is the recommended top priority for implementation because improvements to this section would provide the following advantages:

- Least costly ($900,000).
- Acquire no additional right-of-way.
- Require no Synchro traffic signal modeling.
- Improve motorist and pedestrian/bicycle safety along a road having a crash rate greater than 1.0.
- Provide quantifiable travel-time savings for the traveling public via added turn lanes and improved signal timing that minimize delays.

Section 3 would also be a top priority for implementation as it would provide an immediate pedestrian benefit by adding new sidewalks. The cost estimates below include providing a 10-foot-wide multi-use path along the south side of Bardstown Road. While this path would benefit bicyclists and pedestrians, it would also be an enhancement to the existing sidewalk rather than a new a sidewalk where none currently exists—as is the case of the more pressing and less expensive need along the north side.

Section 1 has the most complex set of needs and would experience the greatest benefit from proposed improvements. However, the complexities—including the transition to Section 2—would require Synchro traffic signal modeling. It is recommended a top priority for developing the traffic model to better understand the traffic flow changes among sections, and then schedule design work while seeking funding for implementation.

Section 2 is the recommended final section for improvement because coordination with a Synchro traffic model will be required in development of design details for the transition from Section 1 to Section 2.

The above recommendations are for consideration only, and details should be based on further analysis and funding opportunities.

STEP 4 — EVALUATION OF PROJECT EFFECTIVENESS

Annual traffic counts and speed counts should be completed on Bardstown Road and the surrounding road network to monitor changes in traffic patterns due to the implementation of any of these recommendations—especially those in Section 1, where peak-hour capacity will be reduced. Specifically, baseline traffic and speed volumes should be collected before any changes in Section 1 are made; and roads that would likely become alternate routes, such as Norris Place and Cherokee Road, should be monitored annually to identify potential effects of traffic diversion.

Table 3: Planning-Level Roadway Cost Estimates

STEP	DESCRIPTION		UNIT	UNIT COST	QUANTITY	COST	
						RETROFIT SIGNALS	NEW SIGNALS
Section 1 Broadway to Woodford Place							
1.1	**Design**					**$250,000**	**$370,000**
1.2	**Implementation**					**$2,500,000**	**$3,700,000**
1.2.a	Remove Lane Lights (Lexington Road to Woodford Place)		Each	$10,000	27	$270,000	
1.2.b	Pavement Resurface (Broadway to Woodford Place)		SY	$6	70,000	$420,000	
1.2.c	Restriping		LS	$105,000	1	$105,000	
1.2.d	Sidewalks, bump outs, and curb extensions		SY	$103	3,000	$310,000	
1.2.e	Curb		LF	$34	5,000	$170,000	
1.2.f	Signals	Retrofit on Existing Spans	Each	$50,000	10	$500,000	
		New (Span or Mast Arm)	Each	$140,000	10		$1,400,000
1.2.g	Other (MOT, Drainage, etc.)		LS	$220,000	1	$220,000	
1.2.h	Miscellaneous		LS	25%	1	$500,000	$750,000
Section 1	**Total Cost Estimate (rounded-up)**					**$2,800,000**	**$4,100,000**
Section 2 Woodford Place to Taylorsville Road							
2.1	**Design**					**$80,000**	**$130,000**
2.2	**Implementation**					**$820,000**	**$1,300,000**
2.2.a	Pavement Resurface		SY	$6	30,000	$180,000	
2.2.b	Restriping		LS	$50,000	1	$50,000	
2.2.c	Sidewalks, bump outs, and curb extensions		SY	$103	700	$75,000	
2.2.d	Curb		LF	$34	2,000	$70,000	
2.2.e	Signals	Retrofit on Existing Spans	Each	$50,000	4	$200,000	

STEP	DESCRIPTION		UNIT	UNIT COST	QUANTITY	COST	
						RETROFIT SIGNALS	NEW SIGNALS
		New (Span or Mast Arm)	Each	$140,000	4		$560,000
2.2.f	Other (MOT, Drainage, etc.)		LS	$80,000	1	$80,000	
2.2.g	Miscellaneous		LS	25%	1	$165,000	$260,000
Section 2	**Total Cost Estimate (rounded-up)**					**$900,000**	**$1,500,000**
Section 3 Taylorsville Road to Tyler Lane							
3.1	**Design**					**$80,000**	
3.2	**Implementation**					**$800,000**	
3.2.a	Pavement	Resurface	SY	$6	20,000	$120,000	
		Full Depth	SY	$61	400	$25,000	
3.2.b	Restriping		LS	$10,000	1	$10,000	
3.2.c	Sidewalks, bump outs, and curb extensions		SY	$103	2,600	$270,000	
3.2.d	Curb		LF	$34	3,300	$115,000	
3.2.e	Other (MOT, Drainage, etc.)		LS	$70,000	1	$70,000	
3.2.f	Miscellaneous		LS	25%	1	$160,000	
Section 3	**Total Cost Estimate (rounded-up)**					**$900,000**	
Section 4 Tyler Lane to Brighton Drive							
4.1	**Design**					**$80,000**	
4.2	**Implementation**					**$800,000**	
3.2.a	Pavement	Resurface	SY	$6	10,000	$60,000	
		Full Depth	SY	$61	2,200	$135,000	
3.2.b	Restriping		LS	$20,000	1	$20,000	
3.2.c	Sidewalks, including a 10-foot-wide Multi-Use Path on the south side		SY	$103	2,000	$210,000	
3.2.d	Curb		LF	$34	1,800	$65,000	

STEP	DESCRIPTION		UNIT	UNIT COST	QUANTITY	COST	
						RETROFIT SIGNALS	NEW SIGNALS
4.2.e	Signals	New (Span or Mast Arm)	Each	$100,000	1	$100,000	
4.2.f	Other (MOT, Drainage, etc.)		LS	$40,000	1	$40,000	
4.2.g	Miscellaneous		LS	25%	1	$160,000	
Section 4	**Total Cost Estimate (rounded-up)**					**$900,000**	

ABBREVIATIONS: SY = Square Yards LF = Linear Feet LS = Lump Sum MOT = Maintenance of Traffic

NOTE: Unknown factors related to new signals and above/below ground utilities could notably change these planning-level costs estimates.

Table 4: Project Recommendation Matrix

PROJECT	DESCRIPTION	AGENCY	REFERENCE
PEDESTRIAN ENHANCMENTS			
Broadway, Cherokee Rd, & Baxter Ave	Extend the island between Cherokee Rd and Baxter Ave.	Louisville Metro KYTC	Figure 22
Broadway, Cherokee Rd, & Baxter Ave	Install new crosswalks at all intersections currently without facilities. Installation of island extension will be required to improve crossing distances.	Louisville Metro KYTC	Figure 22
Morton Ave & Baxter Ave	Install mid-block crossing with bump outs to shorten crossing distance. *	Louisville Metro KYTC	Figure 23
Highland Ave, Bardstown Rd, & Baxter Ave	Extend the Island between Bardstown Rd and Baxter Ave	Louisville Metro KYTC	Figure 24
Highland Ave, Bardstown Rd, & Baxter Ave	Install new shortened crosswalks that connect with the extended island on the south side of the intersection	Louisville Metro KYTC	Figure 24
Highland Ave, Bardstown Rd, & Baxter Ave	Extend pedestrian landing area/sidewalk on both sides of the west side of Highland Ave. *	Louisville Metro KYTC	Figure 24
Bardstown Rd & Grinstead Dr	Install bump outs and extend the sidewalk at all corners of the intersection. *	Louisville Metro KYTC	Figure 25
Bardstown Rd & Lucia Ave	Install bump outs to shorten the mid-block crossing. *	Louisville Metro KYTC	Figure 26
Bardstown Rd at Mid-City Mall	Install bump out on north side of Bardstown Rd to shorten the mid-block crossing. *	Louisville Metro KYTC	Figure 27

PROJECT	DESCRIPTION	AGENCY	REFERENCE
Bardstown Rd, Longest Ave, & Rosewood Ave	Install bump outs to shorten the mid-block crossing. *	Louisville Metro KYTC	Figure 27
Bardstown Rd & Edenside Ave	Install bump out on north side of Bardstown Rd to shorten the mid-block crossing. *	Louisville Metro KYTC	Figure 28
Bardstown Rd & Eastern Pkwy	Extend pedestrian landing area/sidewalk on all sides of the intersection. *	Louisville Metro KYTC	Figure 28
Bardstown Rd & Sherwood Ave (west leg)	Install bump outs on both sides of Sherwood Ave. *	Louisville Metro KYTC	Figure 28
Bardstown Rd & Bonnycastle Ave	Install bump outs and extend the sidewalk at all sides of both intersections. *	Louisville Metro KYTC	Figure 29
Bardstown Rd & Speed Ave	Install bump outs and extend the sidewalk on the south side of Bardstown Rd. *	Louisville Metro KYTC	Figure 30
Bardstown Rd & Alfresco Pl	Install bump outs to shorten the mid-block crossing. *	Louisville Metro KYTC	Figure 31
Bardstown Rd, Village Dr, Rutherford Ave, & Boulevard Napoleon	Install bump outs and extend the sidewalk at all sides of each intersections. *	Louisville Metro KYTC	Figure 31
Bardstown Rd & Douglass Blvd	Install bump outs and extend the sidewalk on the south side of Bardstown Rd. *	Louisville Metro KYTC	Figure 32
Bardstown Rd & Douglass Blvd	Realign crosswalk on east side of intersection to lineup with small crossing at Dundee Rd.	Louisville Metro KYTC	Figure 32
Bardstown Rd & Harvard Dr	Install bump outs and extend the sidewalk on the south side of Bardstown Rd. *	Louisville Metro KYTC TARC	Figure 32
Bardstown Rd, Wrocklage Ave, & Dorothy Ave	Extend the both corners of Dorothy Ave on the north side of Bardstown Rd.	Louisville Metro KYTC	Figure 33
Bardstown Rd & Weber Ave	Remove existing mid-block crossing.	Louisville Metro KYTC TARC	Figure 35
Bardstown Rd & Taylorsville Rd	Install bump outs and extend the sidewalk on all sides of the intersection.	Louisville Metro KYTC	Figure 34
Bardstown Rd & Taylorsville Rd	Install new crosswalks on the west and north sides of the intersection.	Louisville Metro KYTC	Figure 34
Bardstown Rd: Taylorsville Rd to Tyler Lane	Reconstruct existing sidewalk on north side of Bardstown Rd.	Louisville Metro KYTC	Figure 36
Bardstown Rd: Taylorsville Rd to Tyler Lane	Complete sidewalk network (fill in gaps) on north side of Bardstown Rd.	Louisville Metro KYTC	Figure 36

PROJECT	DESCRIPTION	AGENCY	REFERENCE
Bardstown Rd: Taylorsville Rd to Brighton Dr	Reconstruct sidewalk on south side of Bardstown Rd as a 10' shared use path.	Louisville Metro KYTC	Figure 36 & 37
Bardstown Rd & Tyler Lane	Add crosswalks to all sides of the intersection.	Louisville Metro KYTC	Figure 37
Bardstown Rd: Tyler Ln to Lancashire Ave	Reconstruct existing sidewalk with new curbs.	Louisville Metro KYTC	Figure 38
Corridor-wide crosswalk restriping	Restripe crosswalks proposed to remain.	Louisville Metro KYTC	N/A
ROADWAY RECONFIGURATIONS			
Baxter Ave/ Bardstown Rd and side streets: Broadway to Woodford Pl/Princeton Dr	Conduct a detailed traffic analysis along section 1 of the study area to determine the feasibility of the proposed reconfiguration and impacts to surrounding streets. Transit analysis will be a critical component.	Louisville Metro KYTC TARC	Section 4.2
Baxter Ave/Bardstown Rd: Broadway to Woodford Pl	Remove lane-lights and restripe road to be one lane in each direction, with left-turn lanes at each of the signalized intersections and permanent on-street parking. Parking would not be permitted near the major intersections to allow room for the through lanes to go around the left-turn lane. Reconfiguration would need to be extended north from Broadway to Lexington Rd (Outside study area).	Louisville Metro KYTC TARC	Figures 19 & 20
Speed Ave	Convert Speed Ave south of Bardstown Rd to a one-way, southbound roadway.	Louisville Metro	Figure 30
Bardstown Rd: Princeton Dr/Harvard Pl to Douglass Blvd	Add center turn lane, full time parking on both sides of the street, and dedicated right turn lane from Bardstown Rd (northbound) to Woodford Pl. This section will serve as the transition between sections 1 & 2.	Louisville Metro KYTC TARC	Figure 31
Bardstown Rd: Douglass Blvd to Taylorsville Rd	Reconfigure the street to a five-lane cross section consisting of 2 travel lanes in each direction with a two-way left turn lane. Provide dedicated left turns at signalized intersections. Traffic and parking analysis will need to be conducted to determine feasibility.	Louisville Metro KYTC TARC	Figure 31 – 34
Dorothy Ave, & Wrocklage Ave	"Square up" the intersection of Wrocklage Ave and Dorothy Ave.	Louisville Metro	Figure 33
Bardstown Rd & Tyler Ln	Construct left turn lanes from Bardstown Rd onto Tyler Lane in both directions.	Louisville Metro KYTC	Figure 37

PROJECT	DESCRIPTION	AGENCY	REFERENCE
Bardstown Rd: Tyler Ln to Brighton Dr	Convert from 4 lanes to 5 lanes by utilizing existing shoulder on the south side of Bardstown Rd that is currently used for parking and student drop-off.	Louisville Metro KYTC TARC	Section 4.5
MISCELLANEOUS			
Corridor-wide lighting plan	Improve lighting throughout the corridor at a pedestrian scale. The northern section of the study area is the highest priority.	Louisville Metro KYTC LG&E	Figure 16
Bardstown Rd: Taylorsville Rd to Tyler Ln	Construct curbs along both sides of Bardstown Rd.	Louisville Metro KYTC	Section 4.4
Assumption High School, Hawthorne Elementary, & St Raphael	Work with schools to create a safe plan for student/faculty arrival and departure.	Louisville Metro	Figure 38

* *Installation of any bump outs or curb extensions can only be done in conjunction with the roadway reconfiguration recommendations for Section 1*