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List of Acronyms

ADT	Average Daily Traffic
BGADD	Bluegrass Area Development District
CCRF	Critical Crash Rate Factor
CHAF	Continuous Highway Analysis Framework
EB	Eastbound
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HIS	Highway Information System
IPaC	Information for Planning and Consultation
KDFWR	Kentucky Department of Fish and Wildlife Resources
KSNPC	Kentucky State Nature Preserves Commission
KTC	Kentucky Transportation Center
KYTC	Kentucky Transportation Cabinet
LO/S	Local Officials/Stakeholders
LOS	Level of Service
LWCFA	Land and Water Conservation Fund Act
MP	Mile point
MPO	Metropolitan Planning Organization
N/A	Not Applicable
NB	Northbound
NHS	National Highway System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PDO	Property Damage Only
PIF	Project Identification Form
SB	Southbound
STAA	Surface Transportation Assistance Act
STIP	Statewide Transportation Improvement Program
SUA	Small Urban Area Study
TED	Transportation Enterprise Database
TWLTL	Two-way Left-Turn Lane
USFWS	US Fish and Wildlife Service
v/c	Volume-to-capacity ratio
vpd	Vehicles per day
WB	Westbound

EXECUTIVE SUMMARY

In late 2017, the Kentucky Transportation Cabinet (KYTC) initiated a Small Urban Area (SUA) Study for the city of Frankfort in Franklin County. The purpose of the study is to identify and prioritize transportation improvements related to safety and congestion needs in the city and its surrounding area. The study area was developed to encompass the Federal Highway Administration's (FHWA) Adjusted Urban Area Boundary of Frankfort, with minor additions to normalize the shape. The study area covers 50 square miles and includes over 70 centerline miles of state-maintained highway segments. Primary routes serving the area are Interstate 64 (I-64, omitted from this study), US 60, US 127, and KY 676.

The study focused on both short-term and long-term improvements. Specific project activities included completing an inventory of existing conditions, examining future conditions, proposing and analyzing practical solution improvement options, developing cost estimates, obtaining input from local leaders, prioritizing improvements, and documenting the study.

Following an inventory of existing conditions—traffic, crashes, and substandard geometrics—summarized in **Figure ES-1**, early coordination with the project team, project sponsors, and local officials/stakeholders occurred to gather insights on study area transportation needs. Key local issues were identified including:

- Redistribution of jobs due to demolition of the Capital Plaza tower
- Newly constructed offices along Sower Boulevard
- Expansion of the Farmdale sanitation district
- Desire for improved accessibility to several large tracts with development potential
- Significant expansion projects at both distilleries in town

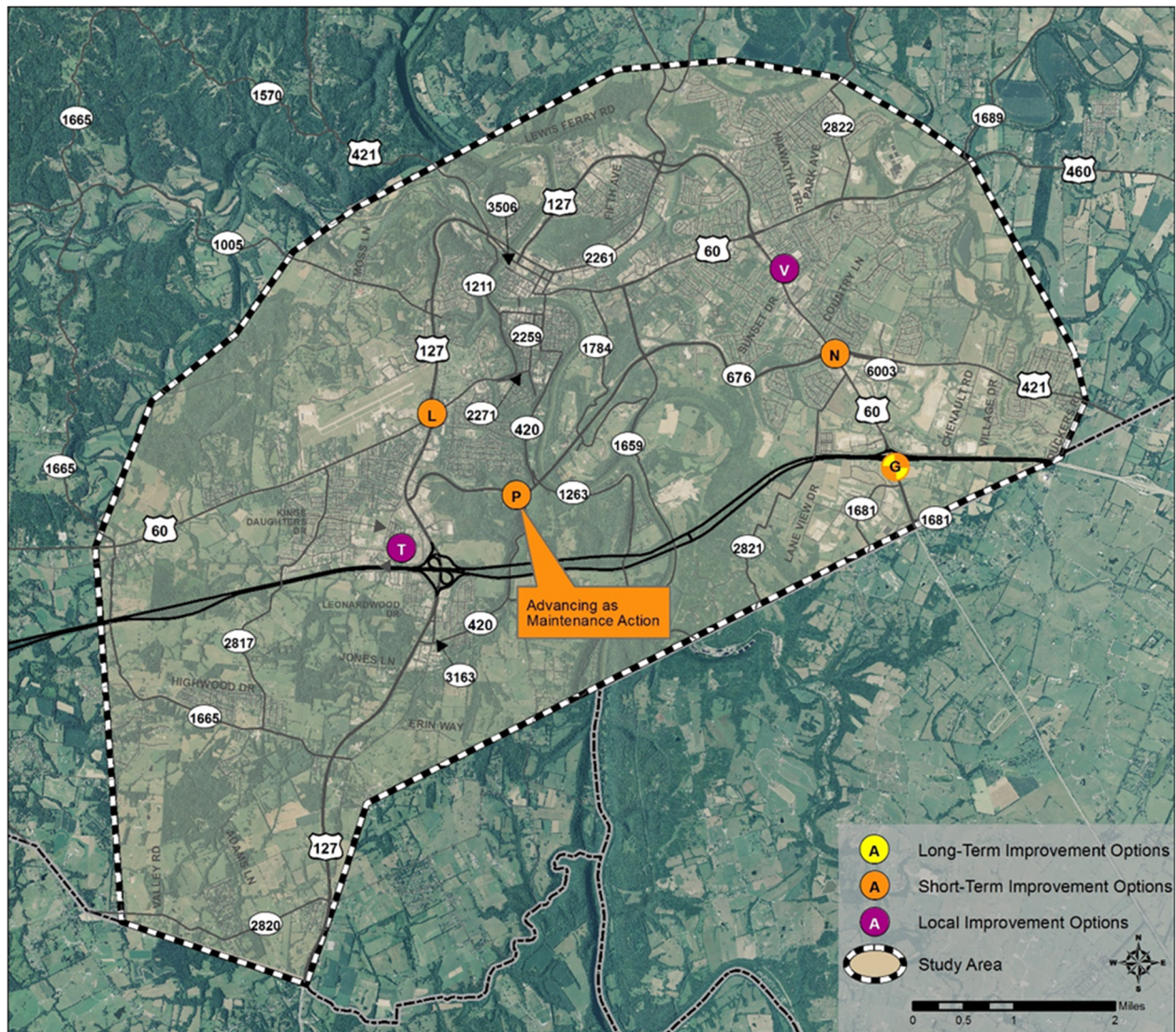
In May 2018, local officials/stakeholders also identified numerous locations throughout the city where transportation improvements could be considered. Suggestions ranged from improved signal timings and turn lane extensions to major widening projects and interchange reconstruction. These suggestions were considered alongside a review of existing conditions, anticipated development trends, field reconnaissance, and input from the KYTC to develop a series of improvement concepts to improve safety and congestion. Each concept can be categorized as one of three groups:

- Long-term projects are relatively high cost projects, often requiring additional right-of-way that will entail substantial investment to acquire. Most require additional project development activities and would need to be funded through traditional funding sources in the KYTC's biennial highway plan.
- Short-term projects are relatively lower cost projects that can be implemented in the near future. Many require little-to-no new right-of-way; several may be completed as maintenance actions.
- Local projects are improvements located beyond the state-maintained highway system. These would likely need to be funded by the City, the County, or a private developer.

An initial set of improvement concepts was developed and shared with both the project team and City and County project sponsors in September 2018, and then refined as needed based on their input. Cost estimates were developed based on planning-level pavement, structures, and earthwork quantities.

Each improvement concept was presented to local officials/stakeholders in January 2019 to gather their input on potential projects and prioritization. Final recommendations are categorized as high, medium, or low priorities, as summarized in **Figures ES-2 through ES-4**.

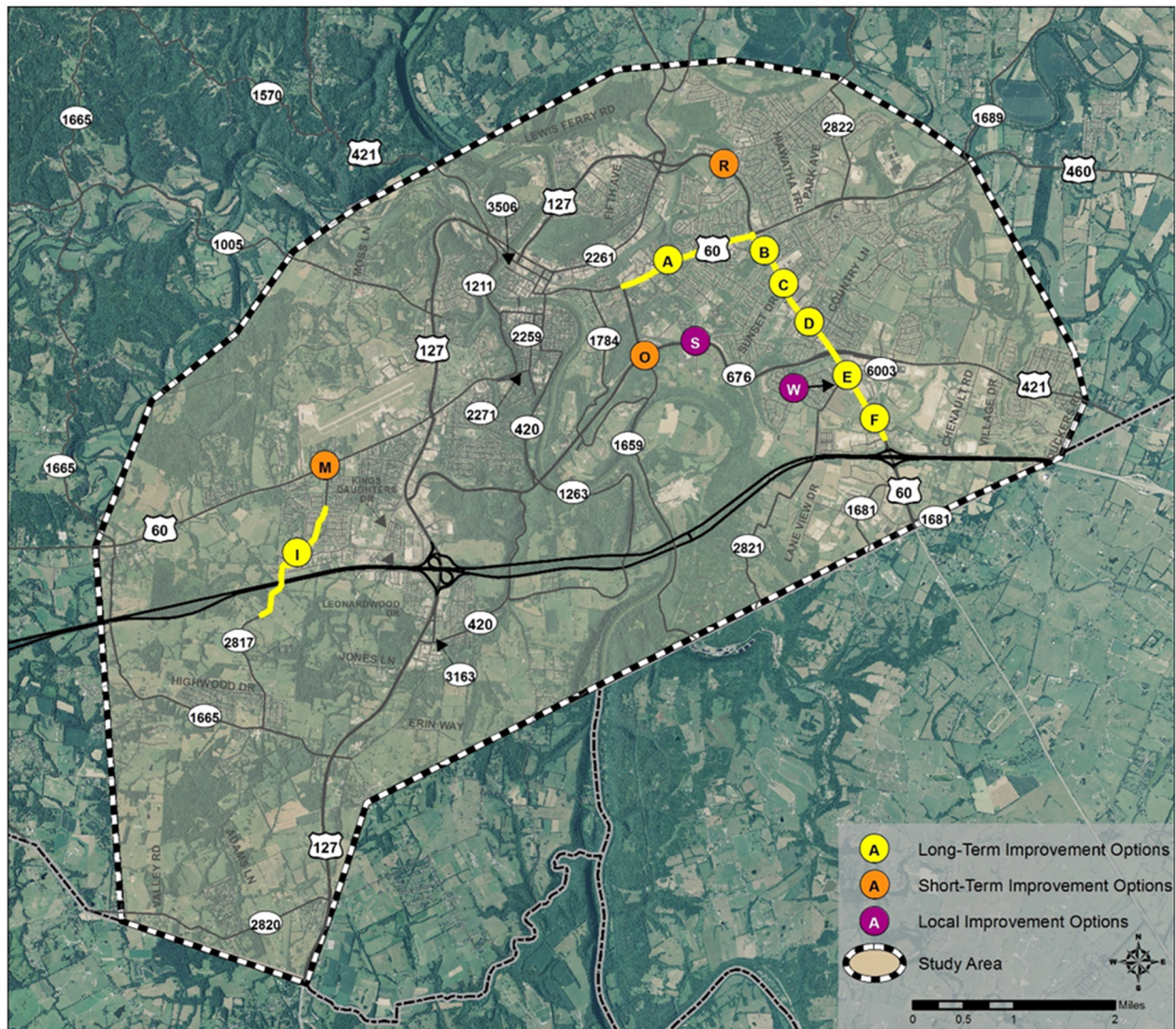




High Priority Improvement Concepts:

- **Site G:** Reconfigure US 60 (Versailles Road) Interchange with I-64, with Option G1 as a long-term option to reconstruct the interchange as a diverging diamond or Options G2/G3 as short-term options to improve left turn queue storage along US 60
- **Site L:** Intersection improvements at US 127 (Lawrenceburg Road) / US 60 (Louisville Road), including a lengthened northbound right turn lane and coordinated signal for the eastbound right turn movement
- **Site N:** Extend the eastbound KY 676 (East-West Connector) off-ramp to US 60 (Versailles Road), adding a coordinated signal for the eastbound right turn movement
- **Site P:** Maintenance action to improve signage along KY 420 (Old Lawrenceburg Road) approaching the KY 676 (East-West Connector) intersection
- **Site T:** Corridor-wide capacity and safety improvements along Leonardwood Drive; addressing landscaping that currently blocks sight distance could advance as a “quick win” solution
- **Site V:** Extend Sunset Drive for secondary connection to Brighton Park Shopping Center

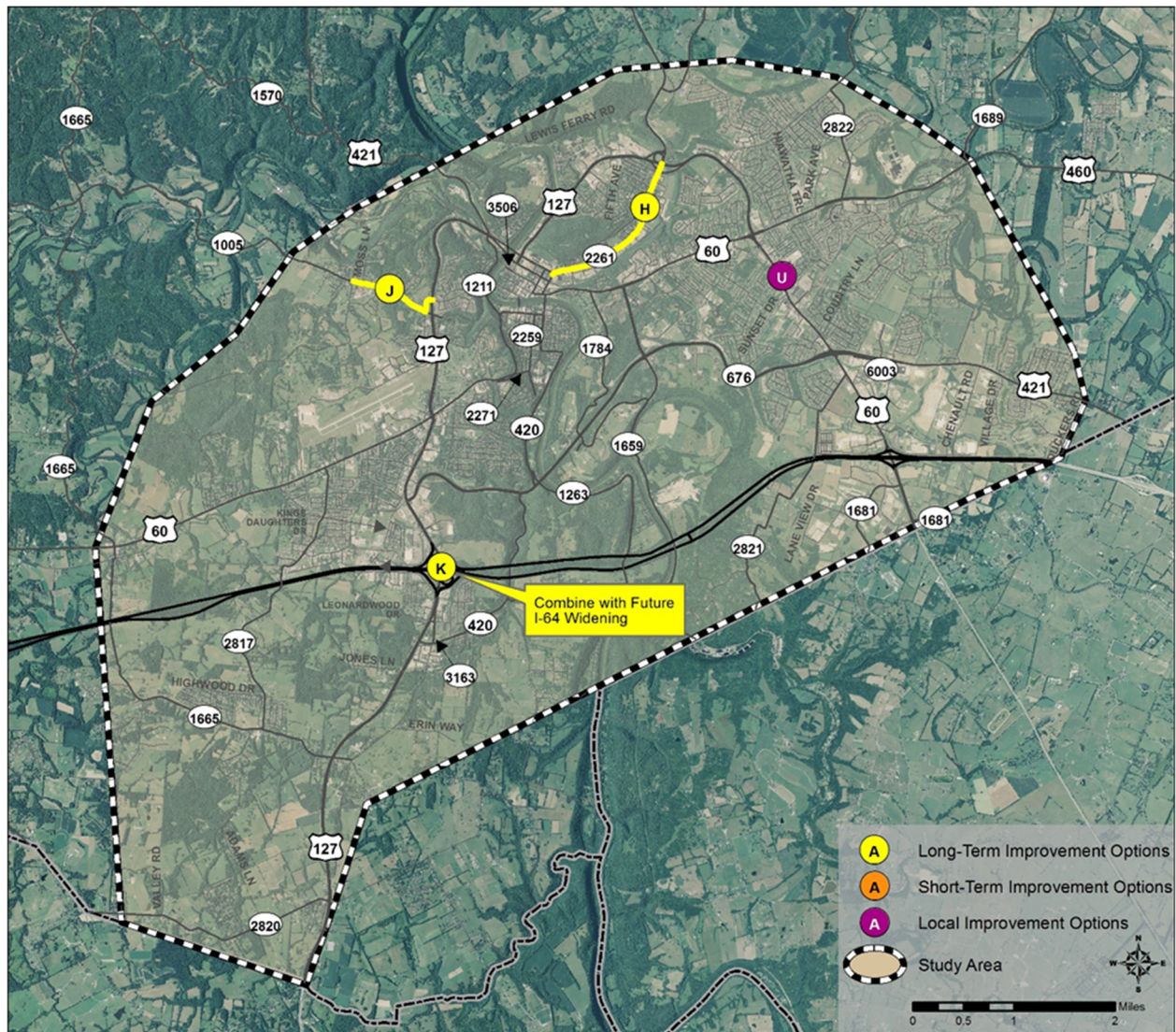
Figure ES-2: Summary of High Priority Improvement Concepts



Medium Priority Improvement Concepts:

- **Site A:** Planning study for US 60 (East Main Street) road diet and access management
- **Sites B-C:** Access management and pedestrian safety measures along US 60 (Versailles Road), from East Main Street to Brighton Park Boulevard
- **Sites D-F:** Access management along US 60 (Versailles Road), from Brighton Park Boulevard to Jett Boulevard
- **Site I:** Spot improvements along KY 2817 (Cardwell Lane) to improve curves and grade
- **Site M:** Signal improvements at US 60 (Louisville Road) intersections with KY 2817 (Cardwell Lane) and Meadowview Lane
- **Site O:** Intersection improvements at KY 1659 (Martin Luther King Jr Boulevard) / KY 676 (East-West Connector), including signage, signal timing, and turn lane extension
- **Site R:** Intersection improvements at US 421 (Wilkinson Boulevard) / Schenkel Lane to add advance warning flashers and high visibility signal backplates
- **Site S:** New connection from Sower Boulevard to KY 1659 (Glenns Creek Road)
- **Site W:** Extension of KY 2821 (Hanly Lane), realigning skewed northbound approach

Figure ES-3: Summary of Medium Priority Improvement Concepts



Low Priority Improvement Concepts:

- **Site H:** Reconstruct KY 2261 (Holmes Street) corridor, from KY 420 (Mero Street) to US 421 (Wilkinson Boulevard)
- **Site J:** Reconstruct KY 1005 (Devils Hollow Road), from Pea Ridge Road to US 127 (Wilkinson Boulevard)
- **Site K:** Extend southbound US 127 (Lawrenceburg Road) left turn lane to I-64 eastbound on-ramp, to be considered as part of the future I-64 widening project
- **Site U:** New connection between Eastwood Shopping Center and Forest Hills Drive

Figure ES-4: Summary of Low Priority Improvement Concepts

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1. INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated a Small Urban Area (SUA) Study for the city of Frankfort in Franklin County. The purpose of the study is to identify and prioritize transportation improvements related to safety and congestion in the city and its surrounding area.

The study focused on (1) short-term improvements—projects that can be quickly and effectively implemented at both an individual intersection level and at an area-wide level; and (2) long-term future improvement projects requiring more significant resources to implement. The focus of the study was to examine state-maintained roads; however, two local roads integral to traffic operations were included in the analysis set as well.

Specific project activities included compiling an inventory of existing conditions, examining future conditions, proposing and analyzing practical potential improvement options, developing cost estimates, obtaining input from local leaders, prioritizing improvements, and documenting the study process and its results.

1.1 Study Area

The study area was developed to encompass the Federal Highway Administration's (FHWA) Adjusted Urban Area Boundary of Frankfort, with minor additions to normalize the shape. Shown in **Figure 1**, the study area covers 50 square miles and includes over 70 centerline miles of state-maintained highway segments. The highest volume routes serving the area are Interstate 64 (I-64, which falls beyond the scope of this study¹), US 60, US 127, and KY 676. **Table 1** summarizes the analysis routes within the study area, including local designations and mile point (MP) limits.

According to the U.S. Census Bureau, Franklin County has a total area of 208 square miles. The county was formed in 1795 from portions of Mercer, Shelby, and Woodford counties and was named after inventor and statesman Benjamin Franklin. The county's population as of the 2010 census was 49,285. The county seat is Frankfort, which also serves as the capital of Kentucky.

Frankfort is located in central Kentucky, along I-64 where it crosses the Kentucky River. The downtown area began to develop on the banks of the river in the late 1700s and was served by the route that would become US 60. Today, topography has shaped Frankfort into a south-facing crescent, with distinct east, west, and downtown areas. It is served by two interchanges with I-64: US 127 (exit 53) on the west side and US 60 (exit 58) on the east side. The city is an employment hub, particularly for public administration services; 2013 census journey-to-work estimates show 14,512 employees commute into Franklin County, making up roughly 45% of persons employed in the county.

¹ KYTC considers interstate needs through separate mechanisms

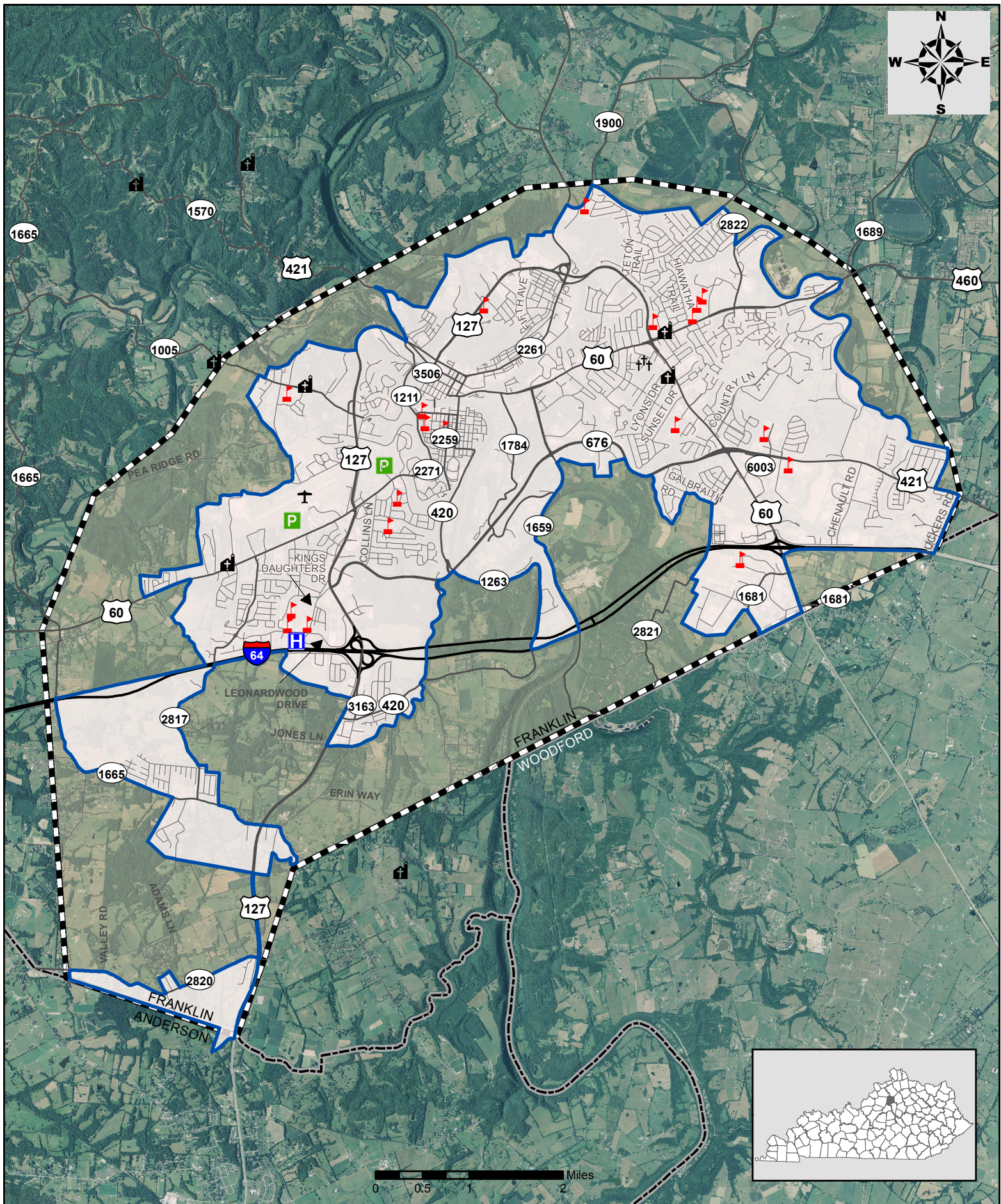


Figure 1: Study Area Boundary

- | | | | | | |
|---|----------|---|-----------|--|---------------------------|
| ✈ | Airport | H | Hospitals | | Study Area |
| ⛔ | Cemetery | 🚩 | Schools | | FHWA Urbanized Areas 2010 |
| ⛪ | Church | P | Park | | |

Table 1: Analysis Roadways within Study Area

HIGHWAY	ROAD NAME	BMP	EMP
US 60	Louisville Rd W Second St Capital Ave E Main St Versailles Rd	2.727	14.038
US 60X	Bridge St or "Singing Bridge"	0.000	0.077
US 127	Lawrenceburg Rd West Plaza Connector Rd Wilkinson Blvd Holmes St Owenton Rd	0.000	11.910
US 421	Leestown Rd Wilkinson Blvd Bald Knob Rd	0.478	5.445
US 460	Georgetown Rd	0.000	2.310
KY 420	Old Lawrenceburg Rd E Todd St Capital Ave W Main St High St Mero St	0.000	4.732
KY 420 -1	W Main St Ann St W Clinton St	4.145	4.732
KY 676	East-West Connector	0.000	5.287
KY 1005	Devils Hollow Rd	5.829	7.45
KY 1211	Taylor Ave	0.000	0.889
KY 1263	Big Eddy Rd	0.000	3.567
KY 1659	Glenns Creek Rd Martin Luther King Jr Blvd	0.000	4.086
KY 1665	Evergreen Rd	0.000	4.102
KY 1681	Duncan Rd Old Frankfort Pike	0.000	1.147
KY 1689	Switzer Rd	0.000	0.084
KY 1784	Coffee Tree Rd Old Glenns Creek Rd	0.000	2.632
KY 1900	Peaks Mill Rd	0.000	0.456
KY 2259	Shelby St	0.000	0.785
KY 2261	Ann St W Clinton St Holmes St	0.000	1.832
KY 2271	Lafayette Dr	0.000	0.309
KY 2817	Cardwell Ln	0.000	3.074
KY 2820	Green Wilson Rd	0.320	2.530
KY 2821	Hanly Ln	0.000	2.905
KY 2822	Steadmantown Ln	0.000	1.336
KY 3163	Lawrenceburg Rd	0.000	0.464
KY 3166	Burlington Ln	0.000	0.036
KY 3300	KY 3300	0.000	0.099
KY 3505	Devils Hollow Rd	0.000	0.176
KY 3506	KY 3506	0.000	0.185
KY 6003	Access Rd No 1	0.000	0.290
CS-1419	Kings Daughters Dr	0.000	0.562
CS-1569	Leonardwood Dr	0.000	0.801

1.2 Previously Identified Studies and Projects

An SUA planning study for the city of Frankfort was completed in 2000. The study inventoried the existing transportation system, coordinated with key stakeholders to identify concerns, and developed recommended improvements for short-term operations and long-term growth. The study fed the city/county comprehensive planning process during subsequent plan updates; several of the SUA recommendations have been incorporated over the intervening years.

Several other studies have been undertaken locally that help define the existing transportation system and the city's vision for the future.

- The 2007 *Holmes Street Redevelopment Master Plan* detailed improving a back entry to downtown Frankfort along KY 2261 (Holmes Street), including a three-lane roadway to promote a pedestrian friendly, neighborhood feel. The study also includes a grand scale redevelopment concept for the corridor, which is beyond the purview of the current SUA effort. The City sought a federal grant in 2018 to further define the scope of transportation improvements along the corridor but was not awarded funding.

- The 2014 *US 60 Versailles Road Traffic Study* considered three corridor-level improvements to US 60 on the east side of town, ranging from incorporating access management to widening US 60 to six lanes.
- The 2015 *US 60 Corridor Pedestrian and Bicycle Safety Assessment* identified pedestrian specific improvements from a KYTC/FHWA field audit. It recommended measures like improved lighting, sidewalk reconstruction, signal timing adjustments, and midblock pedestrian refuges along the Versailles Road corridor.
- The 2016 *Frankfort/Franklin County Comprehensive Plan Update* incorporates projects identified in KYTC's then-current Highway Plan and stresses the need to update the 2000 *Transportation Plan* while incorporating a complete streets philosophy.
- The 2016 *City of Frankfort and Franklin County Pedestrian and Bicycle Master Plan* identifies four tiers of bicycle/pedestrian project priorities along or between existing roadways.
- The 2018 *Downtown Frankfort Master Plan* is intended to capitalize on momentum associated with the ongoing Capital Plaza redevelopment to define an integrated vision for the downtown area. Occurring concurrently with this SUA effort, the master planning effort represents a massive community engagement effort to “maximize Frankfort’s sense of place, increase its economic activity, and celebrate and reinforce its character.”

The findings of each of these previous planning studies were reviewed and incorporated as appropriate into the planning process for this SUA effort.

Additionally, a number of projects have been identified previously, some of which are under development within the study area. Summarized in **Figure 2**, transportation projects were identified based on KYTC Highway Plans, Project Identification Forms (PIFs)², and other ongoing efforts promoted by the City or County. Any projects funded in Kentucky’s FY 2018–FY 2024 Highway Plan or through other funding streams (see colored boxes in **Figure 2**) are assumed to be advancing independent of this SUA planning effort; others were reviewed and incorporated as appropriate into the planning process for this SUA study.

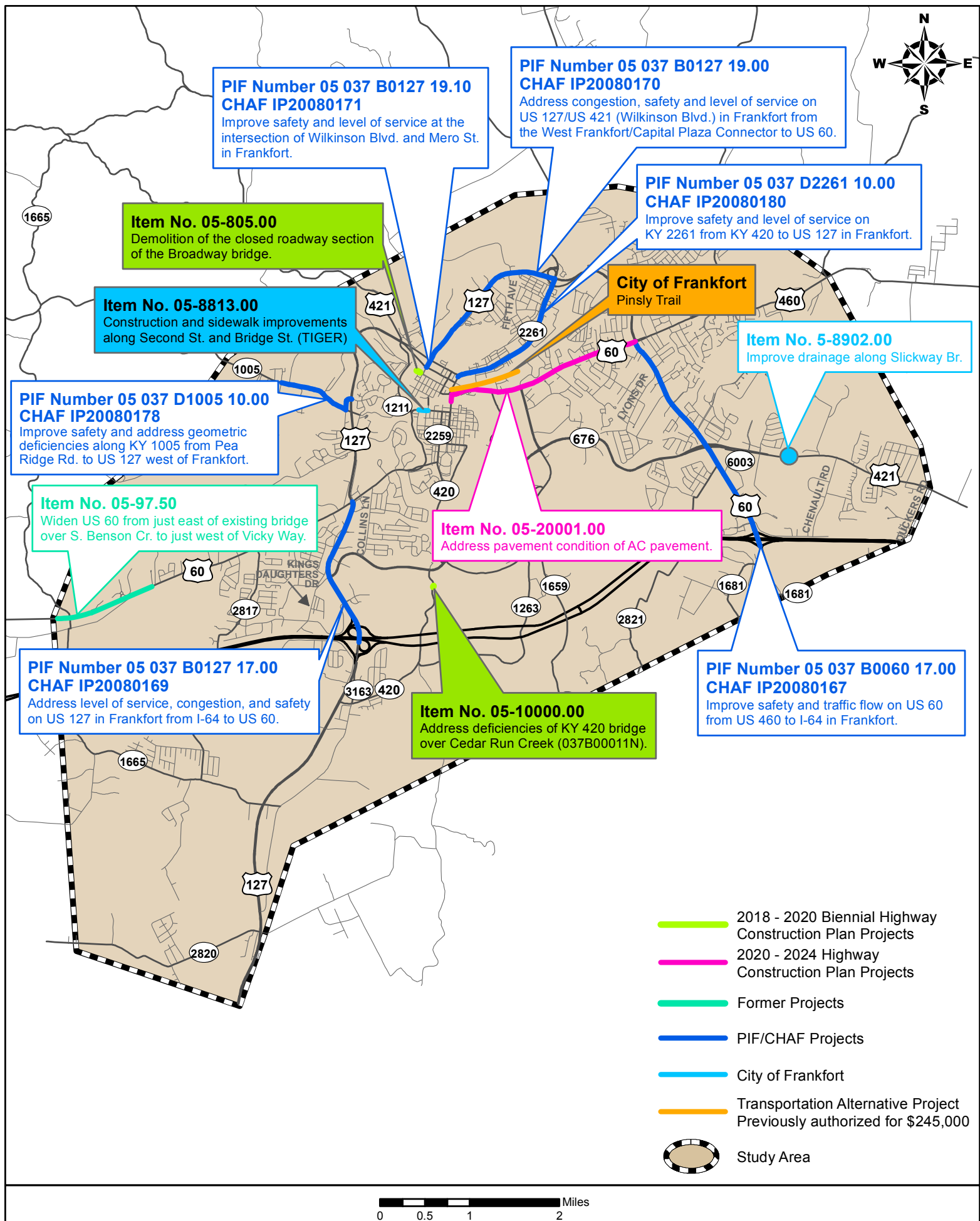
1.3 Study Scope

The study scope was to conduct an SUA planning study for the city of Frankfort and portions of the surrounding, unincorporated areas of Franklin County. This study examines existing transportation conditions in terms of both safety and operational characteristics. Basic project tasks include:

- Evaluating existing conditions, crash history, and geometric deficiencies to identify possible safety issues.
- Evaluating capacity needs of state-maintained routes and key routes of local significance.
- Working with Local Officials/Stakeholders (LO/S) and the project team to identify trouble spots and potential projects to address congestion and safety.
- Developing a list of short-term and long-term recommendations KYTC, the City of Frankfort, Franklin County, and/or private developers could advance for further project development and implementation.
- Prioritizing local, short-term, and long-term improvement recommendations.
- Documenting the study process and recommendations.

The following chapters explore these topics.

² KYTC’s PIF database was replaced with the Continuous Highway Analysis Framework (CHAF) database during the course of this study. Where applicable, both names are presented throughout the report.



2. EXISTING CONDITIONS

The study area's existing transportation network conditions are described in the following sections. The information includes roadway facilities and geometrics, crash history, and traffic volumes. Data for this section were collected from KYTC's Highway Information System (HIS) database, KYTC's Transportation Enterprise Database (TED) collision database, bridge inspection reports, National Bridge Inventory forms, traffic counts, and field reviews.

2.1 Roadway Systems Characteristics

Functional classification is the process of grouping streets and highways according to the character of travel service they provide. This classification system recognizes travel involves movement through a hierarchical system of facilities that progress from lower classifications handling short, locally oriented trips to higher classifications serving longer distance travel at a higher level of mobility.

Over the years, functional classification has come to assume additional significance. Functional classification includes expectations about roadway design, such as vehicle speed, capacity, and relationship to existing and future land use development. Federal legislation uses functional classification in determining eligibility for funding under the Federal-aid program. Transportation agencies describe roadway system performance, benchmarks, and goals by functional classification. The following are short definitions of major functional classes for this SUA:

- Freeways and Interstates provide high speed, high mobility links for long distance trips. They are beyond the scope of this study as KYTC considers these needs through other mechanisms.
- Principal Arterials serve major centers of metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas.
- Minor Arterials provide service for trips of moderate length, serve geographic areas smaller than their higher arterial counterparts, and offer connectivity to the higher arterial system. The primary difference is usually multiple arterial routes serve a particular urban area, radiating from the urban center to serve the surrounding region. In contrast, an expanse of a rural area of equal size would often be served by a single arterial.
- Collectors gather traffic from Local Roads and funnel them to the arterial network. Within the context of functional classification, collectors are categorized as either Major Collectors or Minor Collectors. In the rural environment, collectors generally serve primarily intra-county travel and shorter trips.
- Local Roads are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their direct access to abutting land. They are often designed to discourage through traffic.

Figure 3 shows the functional classification of roadways within the study area. Excluding I-64, the highways providing the highest levels of mobility are US 127 (Lawrenceburg Road and West Plaza Connector Road), US 421 (Wilkinson Boulevard), US 60 (Versailles Road), and KY 676 (East-West Connector).

The National Highway System (NHS) consists of roadways important to the nation's economy, defense, and mobility (shown in **Figure 4**). Area NHS roadways include the same principal arterial highway segments discussed above: US 127, US 421, US 60, and KY 676. The NHS designation includes the following subsystems of roadways:

- Interstate: The complete Interstate System of highways is listed on the NHS.
- Other Principal Arterials: Highways in rural and urban areas which provide access between an arterial and a major port, airport, public transportation facility, or another intermodal transportation facility.

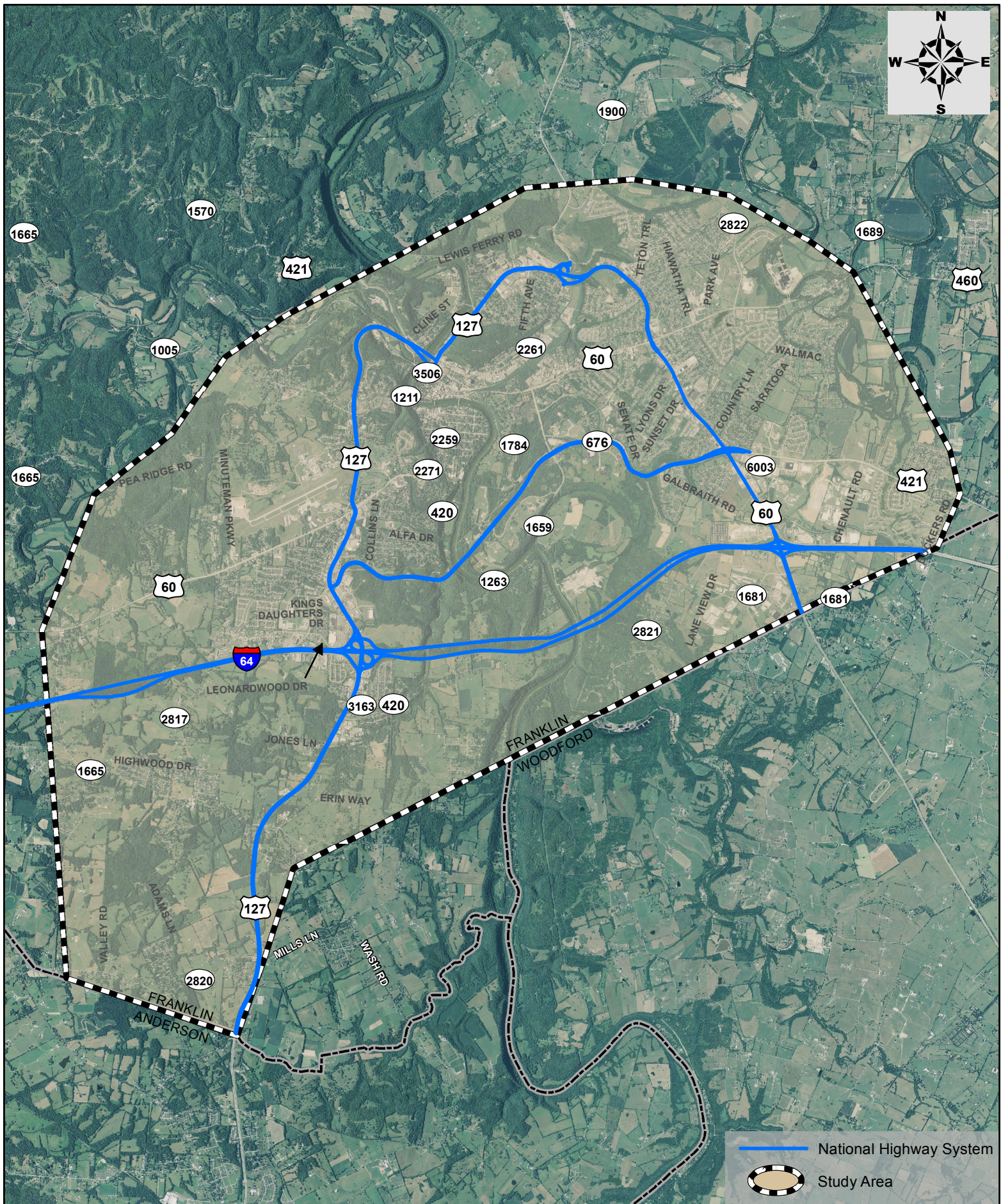


Figure 4: National Highway System (NHS) Routes

In compliance with the Surface Transportation Assistance Act of 1982 (STAA), Kentucky has established a network of highways on which commercial vehicles with increased dimensions may operate. These “STAA” vehicles include semi-trailers with 53-foot-long trailers and single-unit trucks with a total length of 45 feet.

Designated truck routes are shown in **Figure 5**. In addition to I-64, US 127 (Lawrenceburg Road), US 421 (Wilkinson Boulevard), KY 676 (East-West Connector), and US 60 (Versailles Road) south of KY 676 are Federal Designated Truck Routes. US 127 (West Plaza Connector Road), US 127 (Owenton Road), and US 60 (Versailles Road) north of KY 676 are State Designated Truck Routes. Plus, sections of KY 420 (High and Mero streets) and KY 2261 (Holmes Street) downtown, KY 1659 (Martin Luther King Jr Boulevard), US 60 (East Main Street), US 421 (Leestown Road), and US 460 (Georgetown Road) are on the Kentucky Highway Freight Network.

2.2 Geometric Characteristics

The current number of lanes and approximate lane widths along study area roadways are shown in **Figure 6**. Current KYTC design guidelines suggest a minimum of 11-foot-wide lanes on arterial and collector roadways (12-foot-wide lanes for 2,000 or greater daily traffic volumes). Throughout the study area, lane widths are generally adequate, although the typical sections of lower classification/lower volume routes tend to decrease in steeper terrain sections outside the city and within the downtown core.

Approximate shoulder widths along study area roadways are shown in **Figure 7**. KYTC design guidelines suggest arterial routes should have shoulders at least eight feet wide, the recommended minimum for such roadways.

2.3 Bridges

The KYTC’s Bridge Data Miner shows 32 bridges along study area roads, as shown in **Figure 8**. In accordance with federal standards, bridges are inspected every two years to evaluate their conditions and other elements. Bridge conditions are rated as Good, Fair, or Poor condition based on their deck, superstructure, and substructure. Beyond I-64, there are three poor condition bridges along study area routes: KY 1665 (Bridgeport-Benson Road) over South Benson Creek (037B00038N), US 60X (Bridge Street, locally known as the “Singing Bridge” over the Kentucky River, 037B00065N), and KY 420 (Old Lawrenceburg Road) over Cedar Run Creek (037B00011N).

In 2018, KYTC launched the “Bridging Kentucky” program, intended to rehabilitate, repair, or replace more than 1,000 bridges over the next six years. One bridge within the study area is being addressed through this program: KY 420 over Cedar Run Creek, Bridge 037B00011N in **Figure 8**.



“Singing Bridge” in downtown Frankfort, constructed 1893

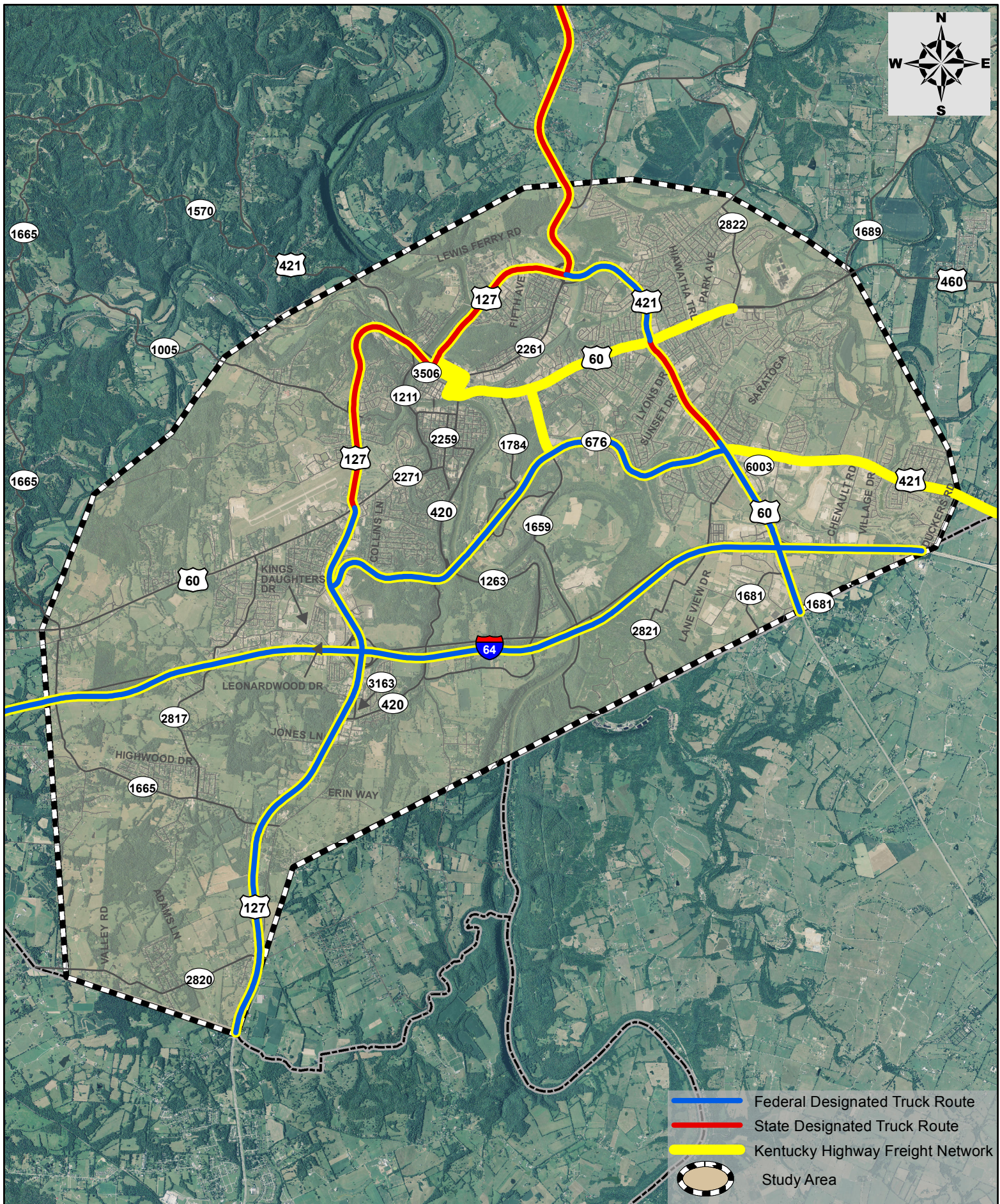


Figure 5: Designated Truck Routes

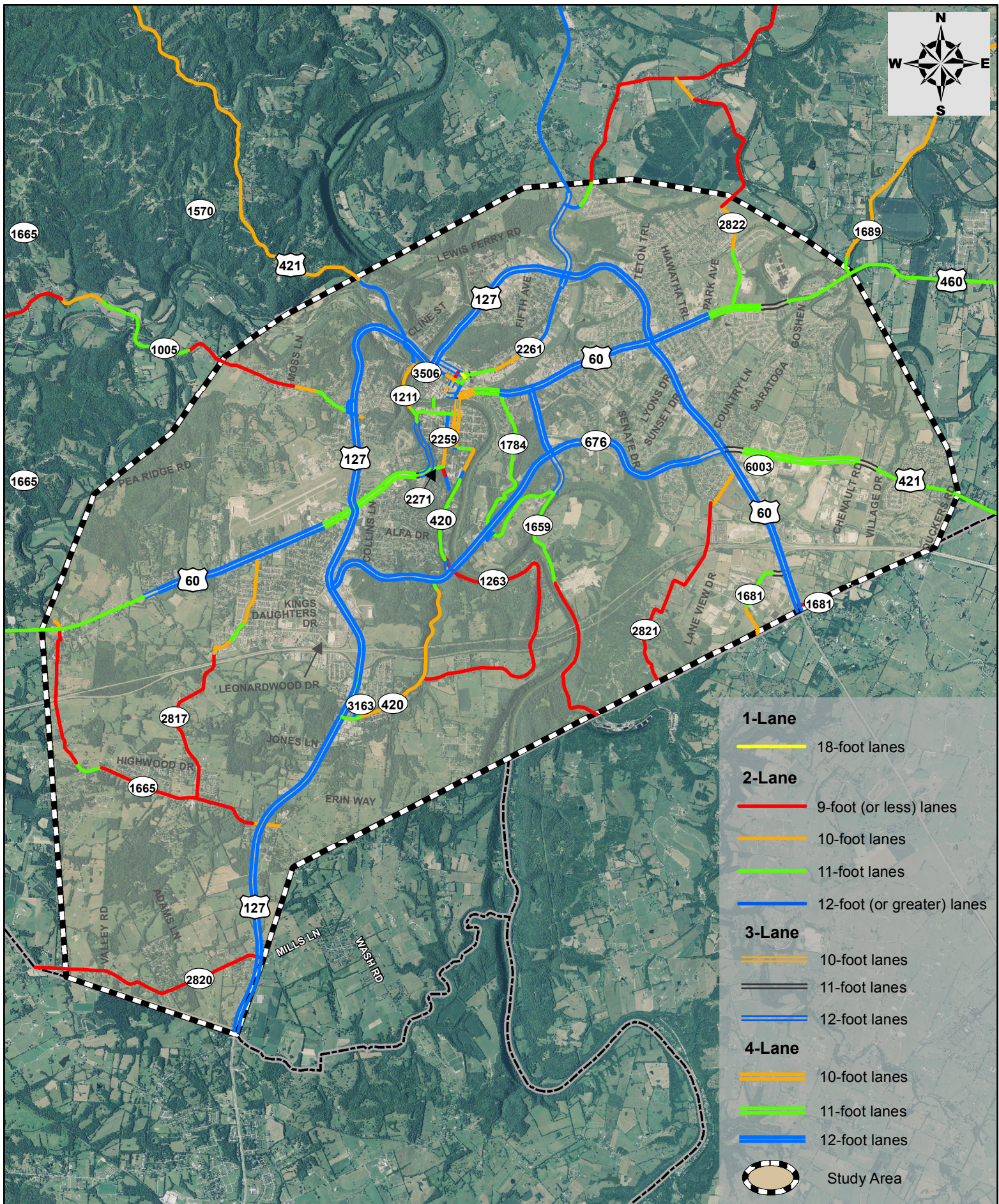


Figure 6: Number of Lanes and Lane Widths

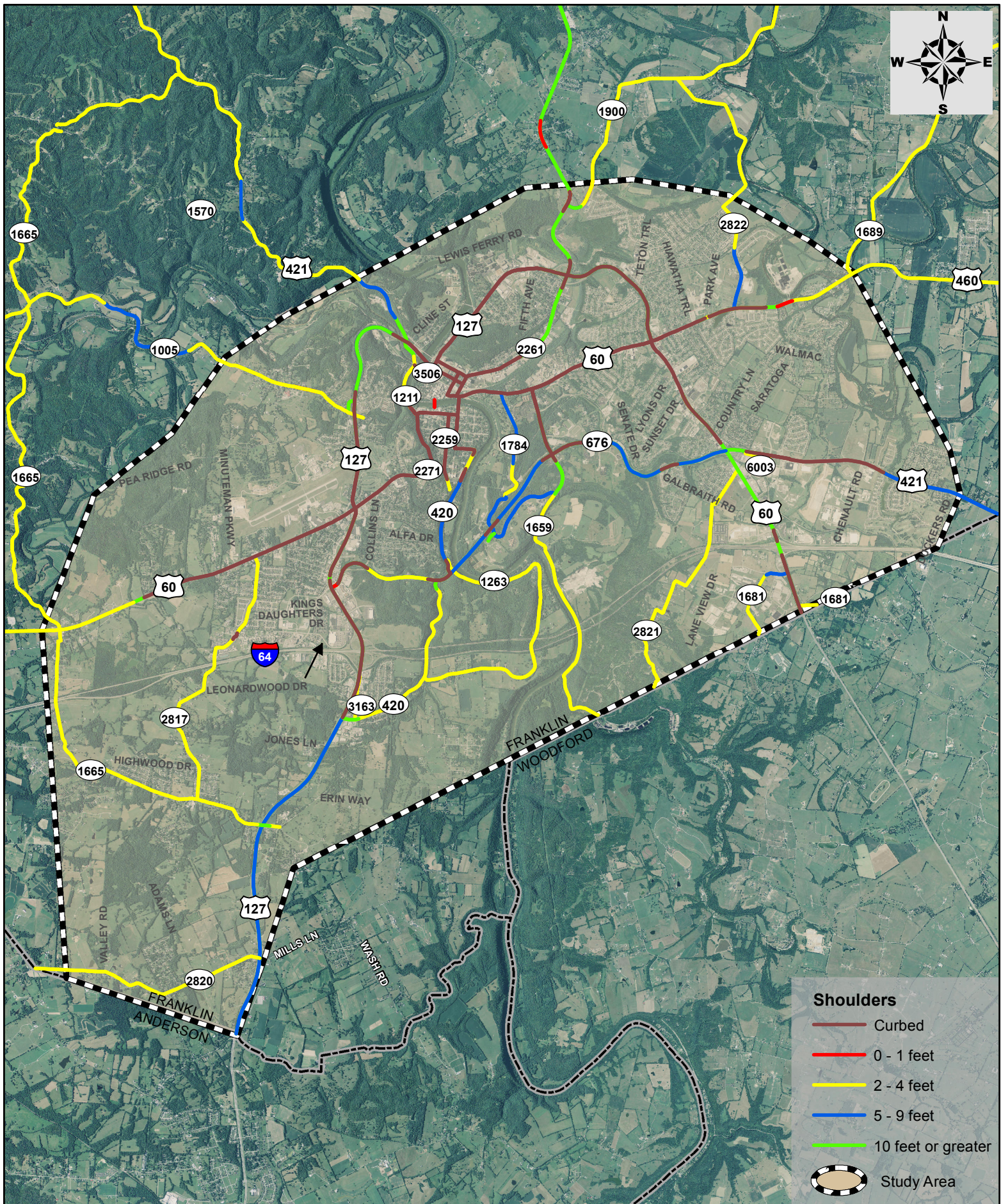


Figure 7: Shoulder Widths

2.4 2018 Traffic Volumes and Operations

The Frankfort SUA study area roadways and their associated 2018 average daily traffic (ADT) volumes are shown in **Figure 9** and **Appendix A**. ADT volumes on state-maintained roadways range from 20 vehicles per day (vpd) on KY 3506 to 31,350 vpd on US 127. The highest ADT volumes are along US 60 through east Frankfort and US 127 through west Frankfort, followed by the KY 676 and US 421 connectors. As part of the SUA effort, 12-hour turning movement counts were also collected at nine intersections throughout the study area, circled in **Figure 9**. Intersection counts were conducted at the following locations.

- I-64 at US 60 ramps
- I-64 at US 127 ramps
- US 60 at US 460
- US 127 at Leonardwood Drive
- US 127 at Kings Daughters Drive
- KY 676 at Sower Boulevard
- KY 12265 at KY 2817

Metrics used to describe traffic conditions in the study area include ADT, level of service (LOS), volume to capacity ratio (v/c), delay, and queue lengths at intersections. Definitions and procedures for these metrics are defined in the *Highway Capacity Manual (HCM)*, 6th Edition.

LOS is a qualitative measure that describes traffic conditions based on measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. LOS typically represents a driver's perspective of traffic conditions based on perceived congestion. LOS A is associated with free flow conditions, high freedom to maneuver, and little or no delay. Conditions at or near capacity typically are associated with LOS E. At LOS F, traffic conditions are oversaturated and beyond capacity, with low travel speeds, little or no freedom to maneuver, and high delays. Although LOS C or better is desirable in urban areas, LOS D is generally acceptable.

Another measure, v/c, compares the traffic volume using a facility to its theoretical capacity over a specific duration, one hour in this instance. A v/c ratio greater than 1.0 indicates a route has exceeded its theoretical capacity; additional lanes may be justified. As v/c is measured over an hour period by segment, a roadway or intersection could be congested during peak commuter periods but show a relatively low v/c averaged over a longer duration.

2018 Traffic Operations

Summarized in **Figure 9**, the majority of study roadways operate at acceptable LOS based on the ADT segment-level analysis. Exceptions are the US 60 (Capital Avenue Bridge) and CS-1569 (Leonardwood Drive), both of which operate at LOS E. All v/c ratios for study routes are less than 0.60, indicating no major segment capacity issues based on HCM analyses. However, capacity at intersections may be further constrained due to signalization.

For the nine intersections counted, a similar capacity analysis was completed based on design hour volumes, existing signal timings, and roadway geometry. Shown as rings in **Figure 9**, most intersections operate at LOS D or better during the PM peak hour, with the following exceptions:

- KY 676 (East-West Connector) at Sower Boulevard operates at LOS E overall. Northbound left and right turn movements operate at LOS F with queue spillbacks; that is, the number of vehicles waiting to turn exceeds the storage length of the turn lane provided.
- US 60 (Versailles Road) at KY 676 (East-West Connector) operates at LOS D overall but several movements are at LOS E: eastbound ramp left and right, northbound left, and southbound left.
- US 60 (Versailles Road) at both I-64 ramp termini experience queue spillbacks for left turn movements to interstate on-ramps. Eastbound and westbound left turn movements to US 60 from interstate off-ramps operate at LOS E and F respectively.

- The northbound right turn movement from US 60 (Versailles Road) to US 460 (Georgetown Road) operates at LOS F with queue spillback: signage at the intersection prohibits right turns on red.
- The US 127 (Lawrenceburg Road) intersection with Kings Daughters Drive operates at LOS E overall, with queue spillbacks for the eastbound left, eastbound right, and westbound left movements.
- The US 127 (Lawrenceburg Road) intersection with Leonardwood Drive operates at LOS F overall, with queue spillbacks for the eastbound right, westbound left, northbound left, and northbound right movements.

2.5 Crash History

Historical crash data were plotted along study area roadways for a three-year period between July 1, 2014 and June 30, 2017 (**Figure 10**). A total of 2,530 crashes were reported. As shown in **Table 2**, the majority of the crashes occurred on three major routes: US 60, US 127, and KY 676. Crashes were sorted by severity into one of three categories: fatality, injury, or property damage only (PDO).

Seven fatality crashes occurred within the study area over the three-year analysis period. One involved a pedestrian crossing US 60 (MP 10.974); this is one of 11 pedestrian collisions reported within the study area, seven of which occurred on US 60. Another fatality involved a motorist pulling out of a cross street into oncoming traffic (US 60, MP 11.116). Two involved motorists running red lights and hitting turning vehicles: US 60 at the Country Lane intersection (MP 11.913) and US 127 at the KY 676 intersection (MP 5.194). The remaining three involved motorists losing control of their vehicles: US 127 at the US 421 northbound ramps (MP 11.014), KY 420 at the curve with Ninevah Road and KY 1263 (MP 1.021), and KY 1659 (Glenns Creek Road) at the curve just north of the railroad crossing (MP 0.641).

Of the 11 reported collisions involving pedestrians, one (9%) resulted in a fatality, six (55%) resulted in an injury, and four (36%) were PDO. Of the 11 records, two (18%) occurred in adjacent business parking lots and two involved pedestrians under the influence of alcohol who were in the travel lanes after dark.

All crashes by crash type are mapped in **Figure 11**; the supporting dataset of raw crash information is in **Appendix B**. **Figure 12** summarizes the crash type trends within the full study area: 42% rear end collisions, 24% turning-related (i.e., classified as “angle” or “opposing left turn” in reports), and 18% single vehicle crashes.

Critical Crash Rate Factors

The KYTC uses a systematic procedure to identify locations having high crash rates. The actual number of crashes, as obtained from KYTC’s TED database, occurring within a roadway segment is used to calculate the Actual Crash Rate using the roadway length, annualized ADT, and the number of years for which crash data are being examined. Using an analysis procedure from the Kentucky Transportation Center (KTC) and referenced in *The Analysis of Traffic Crash Data in Kentucky (2012-2016)*, Actual Crash Rates are compared to the Critical Crash Rate for similar types of Kentucky roadways. The Critical Crash Rate is the rate which is statistically greater than the average crash rate for similar roadways, and represents a rate above which crashes may be occurring in a non-random fashion. This ratio of Actual Crash Rate to the Critical Crash Rate is the Critical Crash Rate Factor (CCRF). A CCRF greater than 1.0 indicates crashes may be occurring more often than can be attributed to random occurrence. This procedure is a screening technique indicating locations where further analysis may be needed. It is neither a definitive statement of nor a measurement of a crash problem.

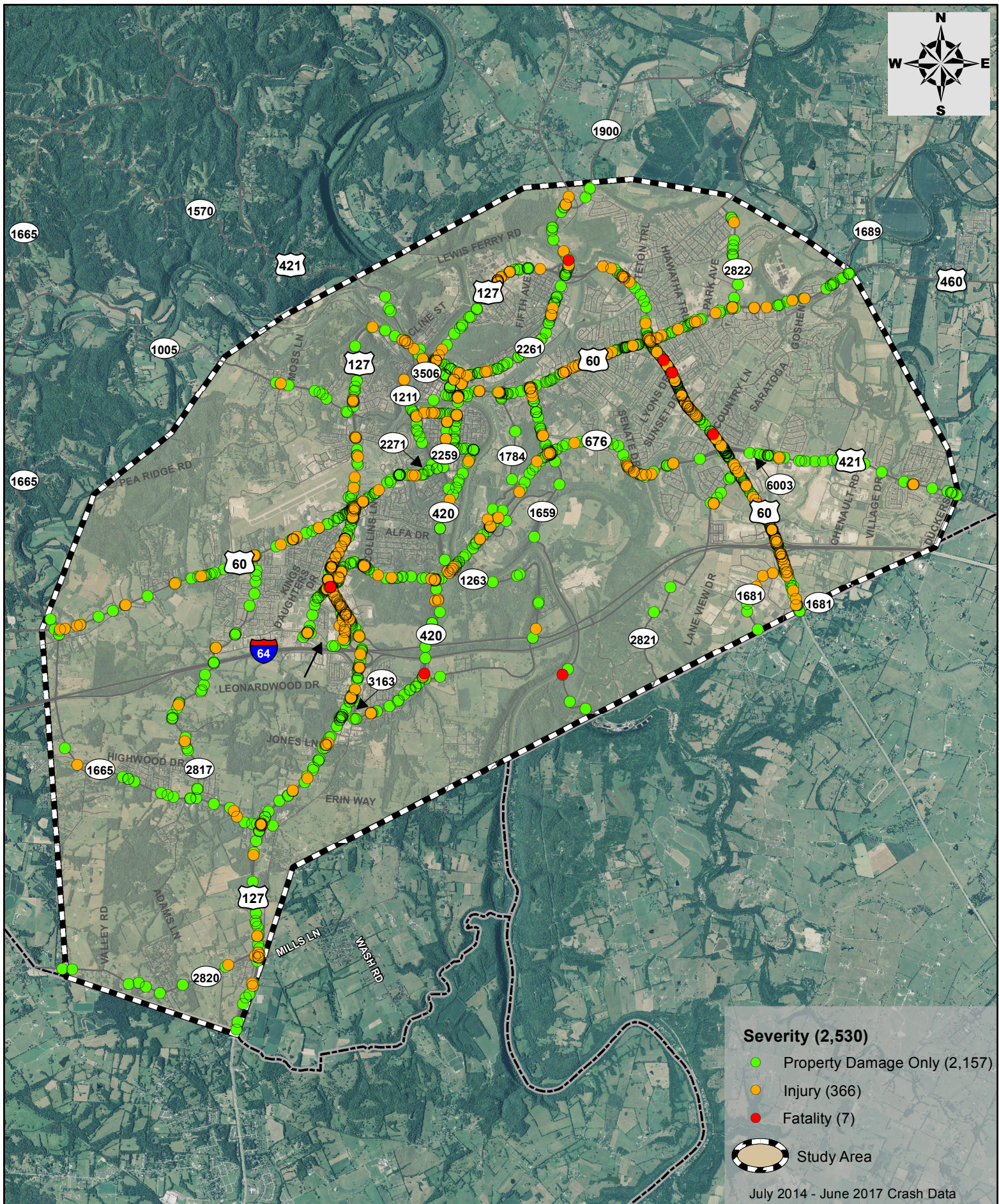


Table 2: Study Area Roads and Crash Types

Roadway	Length (mi)	Total Crashes	Fatality	Injury	PDO	Bike/Ped*	% Total
US 60	11.311	971	3	123	845	7	38%
US 127	11.910	618	2	115	501	0	24%
KY 676	5.287	239	0	39	200	0	9%
KY 420	4.732	119	1	15	103	2	5%
US 421	4.967	96	0	16	80	0	4%
US 460	2.310	67	0	11	56	0	3%
KY 2261	1.832	62	0	9	53	0	2%
KY 1659	4.086	60	1	4	55	0	2%
CS-1569 (Leonardwood Drive)	0.801	57	0	8	49	1	2%
CS-1419 (Kings Daughters Drive)	0.562	47	0	4	43	0	2%
KY 2817	3.074	39	0	3	36	0	2%
KY 1665	4.102	24	0	3	21	0	1%
KY 420-001	0.587	16	0	0	16	0	1%
KY 2821	2.905	14	0	2	12	0	1%
KY 2822	1.336	14	0	2	12	0	1%
KY 2259	0.785	13	0	3	10	1	1%
KY 1005	1.621	11	0	1	10	0	<1%
KY 1681	1.147	11	0	3	8	0	<1%
KY 1784	2.632	11	0	1	10	0	<1%
KY 2820	2.210	11	0	2	9	0	<1%
KY 1263	3.567	9	0	1	8	0	<1%
KY 1211	0.889	6	0	1	5	0	<1%
KY 2271	0.309	5	0	0	5	0	<1%
KY 1900	0.456	3	0	0	3	0	<1%
KY 1689	0.084	2	0	0	2	0	<1%
KY 3163	0.464	2	0	0	2	0	<1%
KY 3166	0.036	2	0	0	2	0	<1%
US 60X	0.077	1	0	0	1	0	<1%
Study Area Total	74.604	2,530	7	366	2,157	11	100%

* No bicycle collisions reported; pedestrian strikes only

Note: No crashes reported on KY 3300, 3505, 3506, or KY 6003

As defined in the KTC methodology report, two analysis types were examined: “segments” and “spots.”

- Segments vary in length and are divided along roadways as geometry or traffic volumes change.
- Spots are defined by analyzing 0.1-mile-long sections where crashes are concentrated.

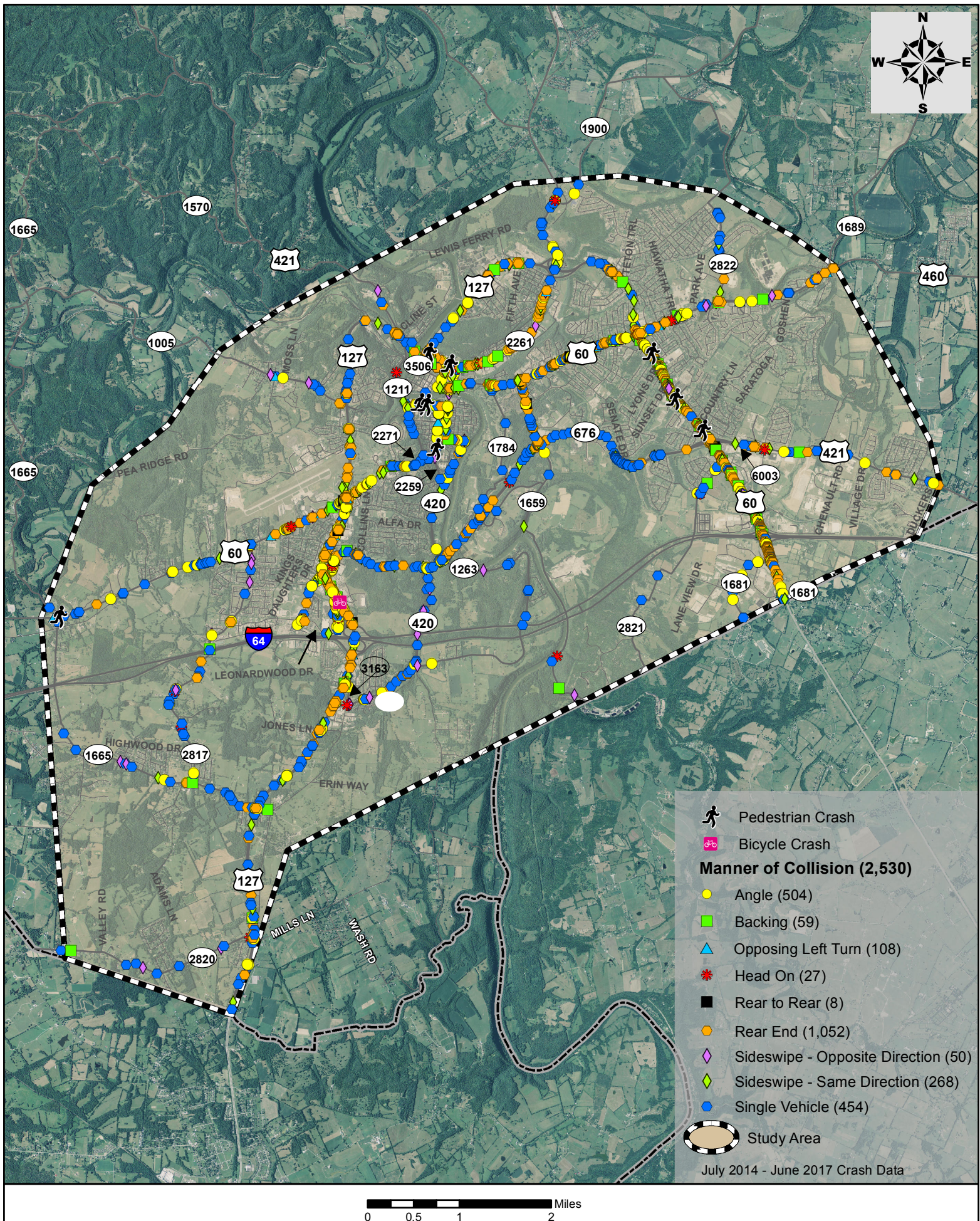


Figure 11: Crash History by Manner of Collision

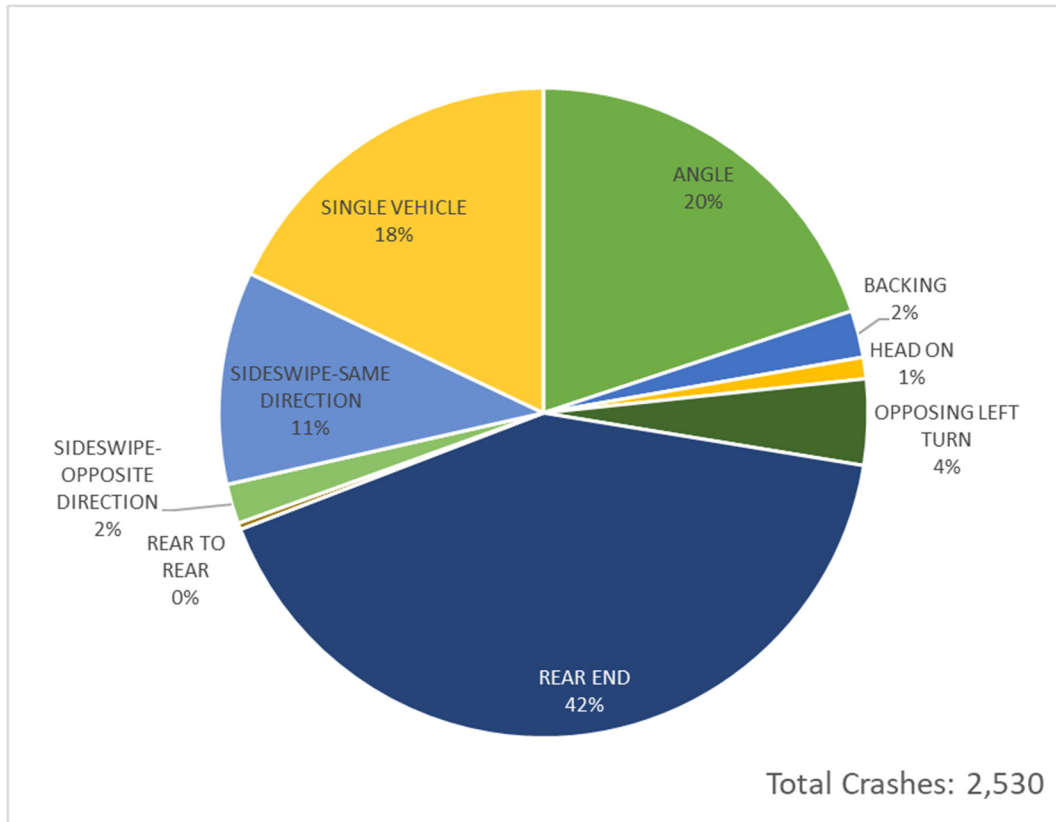


Figure 12: Distribution of Crashes by Manner of Collision (All Study Routes)

Segment locations with CCRF values greater than 1.0, shown in **Figure 13**, are listed below:

- CS-1419 (Kings Daughters Drive), MP 0.000–0.075, west approach to the intersection with US 127: 23 crashes including two injury collisions, CCRF = 2.84
- KY 2261 (Ann and Clinton streets), MP 0.000–0.162, Ann Street from Mero Street to Clinton Street plus Clinton Street from Ann Street to High Street: 12 crashes including 3 injury collisions, CCRF = 1.81
- US 60 (Versailles Road), MP 13.130–13.252, from Jett Boulevard to the I-64 westbound ramps: 39 crashes including 7 injury collisions, CCRF = 1.61
- KY 420 (Mero Street), MP 4.426–4.732, entire length: 20 crashes including 5 injury collisions, CCRF = 1.28
- CS-1569 (Leonardwood Drive), from the intersection with Kings Daughters Drive to the Lowes/Gas Station Entrance: 53 crashes including 8 injury collisions, CCRF = 1.20
- US 60 (East Main Street), MP 10.585–10.667, from the intersection with Beechwood Avenue to US 460 / US 421: 12 crashes including 1 injury collision, CCRF = 1.14
- US 127 (Lawrenceburg Road), MP 3.333–5.273, from Jones Lane to Harrodsburg Lane: 232 crashes including 1 fatality and 35 injury collisions, CCRF = 1.08
- US 60 (Versailles Road), MP 13.400–14.038, from I-64 eastbound ramps to Woodford County line: 79 crashes including 12 injury collisions, CCRF = 1.04

- US 60 (East Main Street), MP 10.164–10.585, from Rolling Acres Drive to Beechwood Avenue: 49 crashes including 5 injury collisions, CCRF = 1.02
- KY 676 (East-West Connector), MP 0.000–0.512, from US 127 to Collins Lane: 61 crashes including 5 injury collisions, CCRF = 1.01

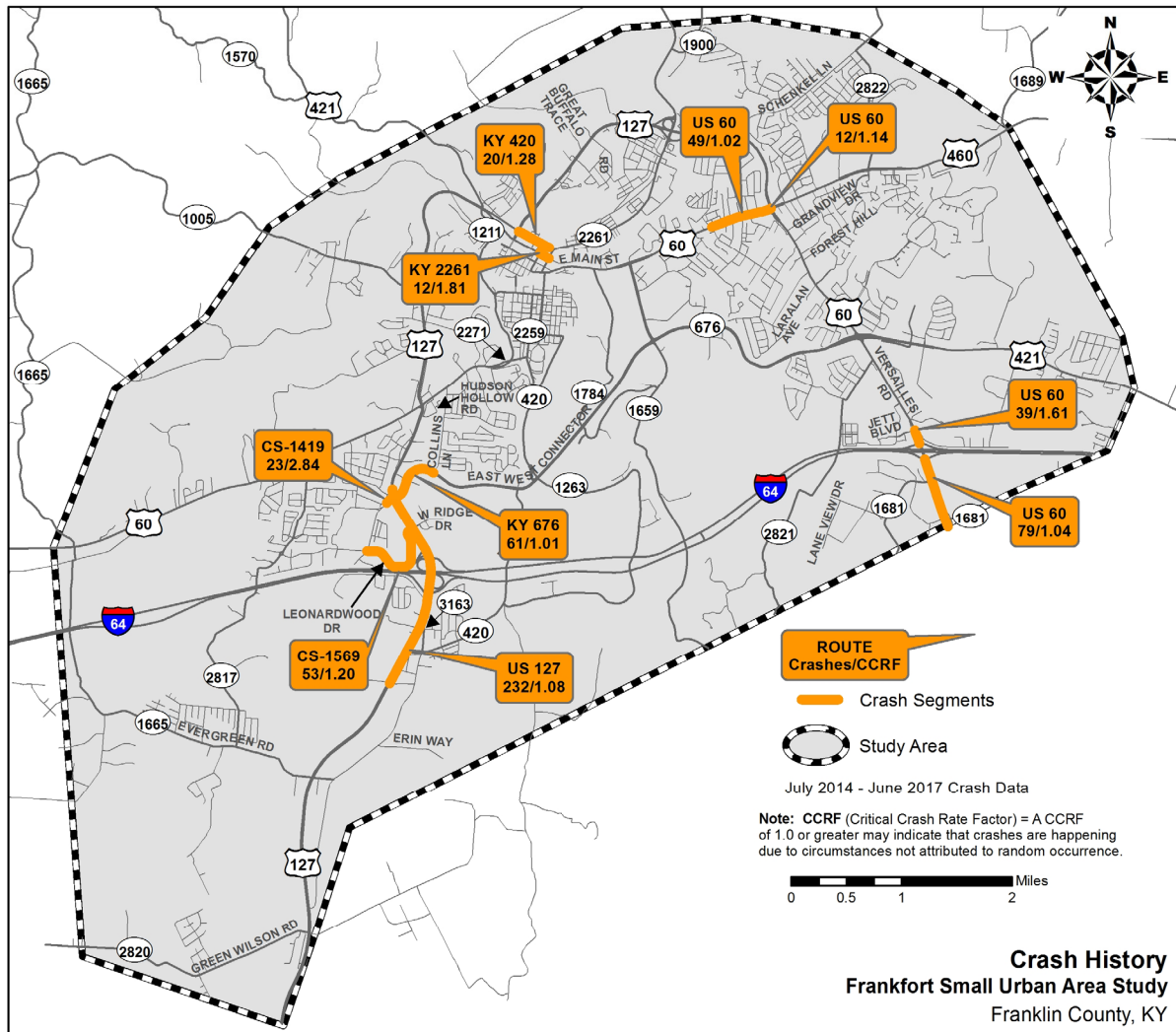


Figure 13: High CCRF Segments

CCRFs for 0.1-mile spots were also calculated for study area routes. Forty-one 0.1-mile spots that exhibited CCRF values greater than 1.0 are summarized in **Table 3** and shown in **Figure 14**.

Table 3: 0.1-Mile Spots with CCRF Greater than 1.0

Route	BMP	EMP	ADT	Crashes	Fatal Crashes	Injury Crashes	PDO Crashes	CCRF
CS-1419 Kings Daughters Dr	0.0	0.1	8,777	25	0	2	23	2.53
CS-1419 Kings Daughters Dr	0.5	0.6	8,777	12	0	2	10	1.07
CS-1569 Leonardwood Dr	0.4	0.5	6,847	37	0	3	34	3.90
KY 420 Old Lawrenceburg Rd	2.0	2.1	5,351	10	0	0	10	1.24

Route	BMP	EMP	ADT	Crashes	Fatal Crashes	Injury Crashes	PDO Crashes	CCRF
KY 420	4.1	4.2	2,550	8	0	1	7	1.58
KY 420 Mero St	4.7	4.8	3,469	6	0	3	3	1.11
KY 676 E-W Connector	3.1	3.2	18,073	24	0	3	21	1.45
KY 1211 Taylor Ave	0.0	0.1	2,036	4	0	0	4	1.27
KY 1263 Big Eddy Rd	1.5	1.6	366	2	0	0	2	1.36
KY 1263 Big Eddy Rd	2.6	2.7	366	2	0	0	2	1.36
KY 1659 Martin Luther King Jr Blvd	4.0	4.1	15,617	21	0	3	18	1.42
KY 1665 Evergreen Rd	3.8	3.9	747	2	0	0	2	1.02
KY 1784 Old Glenns Creek Rd	2.5	2.6	918	3	0	0	3	1.04
KY 2259 Shelby St	0.7	0.8	1,418	4	0	2	2	1.10
KY 2261 Ann St & Clinton St	0.0	0.1	2,424	11	0	2	9	2.24
US 60 Louisville Rd	5.6	5.7	12,472	17	0	5	12	1.06
US 60 Louisville Rd	6.3	6.4	12,639	29	0	2	27	1.79
US 60 E Main St	9.3	9.4	17,771	17	0	2	15	1.04
US 60 E Main St	10.1	10.2	17,916	35	0	2	33	1.66
US 60 E Main St / Versailles Rd	10.6	10.7	18,698	23	0	2	21	1.36
US 60 Versailles Rd	11.1	11.2	31,419	40	1	3	36	1.22
US 60 Versailles Rd	11.2	11.3	28,800	33	0	4	29	1.08
US 60 Versailles Rd	11.3	11.4	28,800	37	0	8	29	1.21
US 60 Versailles Rd	11.4	11.5	28,800	50	0	4	46	1.63
US 60 Versailles Rd	11.5	11.6	28,800	32	0	7	25	1.04
US 60 Versailles Rd	12.1	12.2	25,511	28	0	0	28	1.01
US 60 Versailles Rd	13.1	13.2	24,739	38	0	6	32	1.81
US 60 Versailles Rd	13.2	13.3	24,739	31	0	5	26	1.48
US 60 Versailles Rd	13.4	13.5	24,141	25	0	4	21	1.22
US 60 Versailles Rd	13.5	13.6	24,141	29	0	3	26	1.41
US 127 Lawrenceburg Rd	0.7	0.8	16,390	12	0	2	10	1.77
US 127 Lawrenceburg Rd	0.8	0.9	16,606	8	0	2	6	1.17
US 127 Lawrenceburg Rd	2.2	2.3	18,439	15	0	6	9	2.06
US 127 Lawrenceburg Rd	4.8	4.9	21,100	40	0	6	34	2.16
US 127 Lawrenceburg Rd	4.9	5.0	21,100	30	0	5	25	1.62
US 127 Lawrenceburg Rd	5.0	5.1	21,100	28	0	6	22	1.51
US 127 Lawrenceburg Rd	5.1	5.2	21,616	40	1	4	35	2.12
US 127 Lawrenceburg Rd	5.4	5.5	29,700	40	0	10	30	1.66
US 127 Lawrenceburg Rd	6.0	6.1	29,700	27	0	3	24	1.12
US 127 Wilkinson Blvd	10.1	10.2	16,289	16	0	10	6	1.05
US 421 Wilkinson Blvd	3.8	3.9	20,210	21	0	5	16	1.17

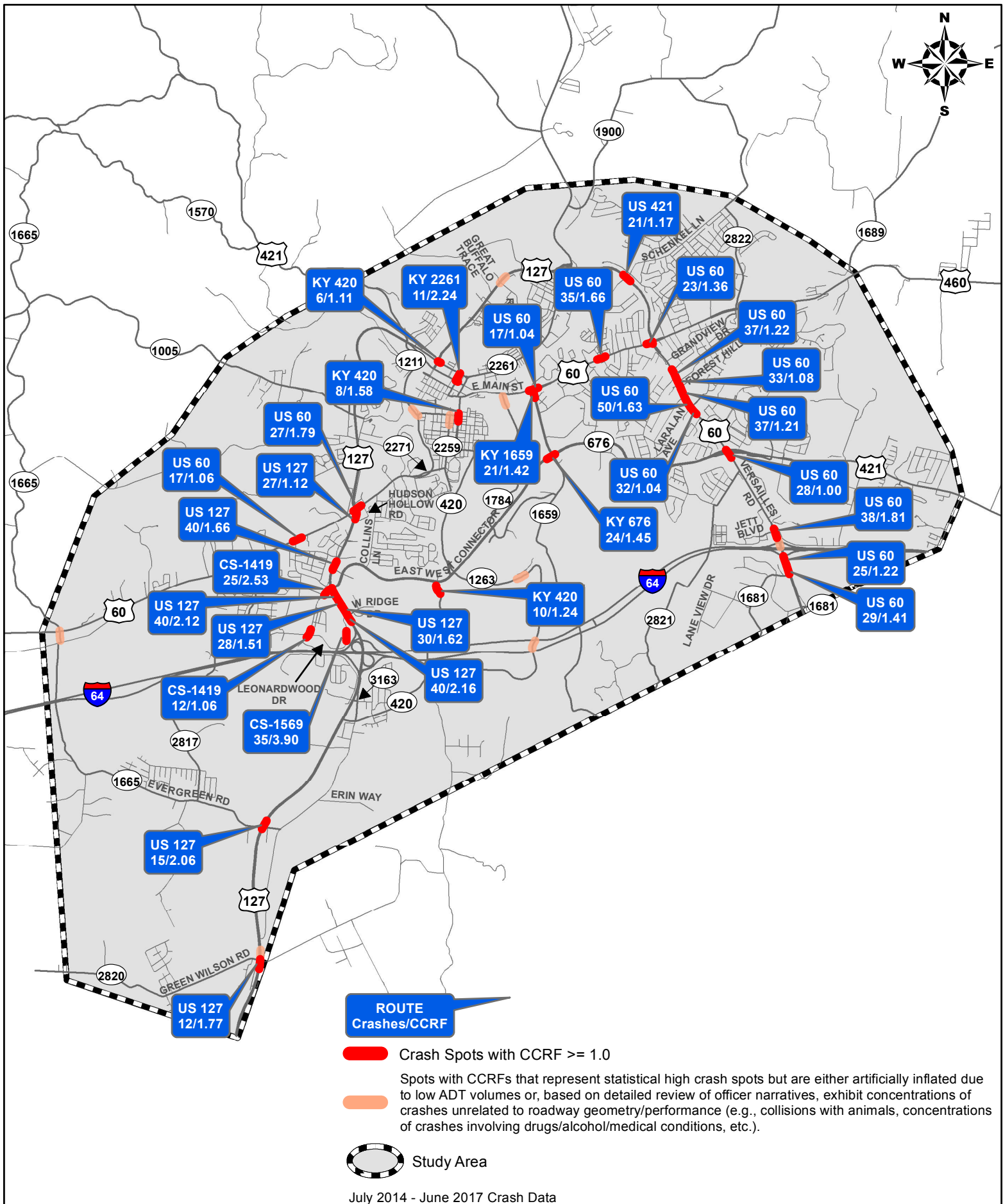


Figure 14: High CCRF Spots

Analysts then reviewed detailed officer comments for individual crash records at each high CCRF spot to understand crash trends. Spots were divided into two categories, deemphasizing those where the CCRF calculation mathematically results in a statistical concentration but where values are inflated due to low ADT volumes or where, based on officer comments, crashes are unrelated to roadway geometrics or performance. For example, a spot along KY 1263 (Big Eddy Road) has a CCRF greater than 1.0; however, the ADT is so low that two crashes over three years results in a concentration. Alternatively, a spot along US 127 (Wilkinson Boulevard) has a CCRF of 1.05 but 38% of crashes within this spot are tied to drug or alcohol impairment or drivers with medical conditions; removing these outliers results in a CCRF well below 1.0. This sorting methodology was applied to spots shown in **Figure 14**: all high CCRF spots are shown, while pink spots represent those inflated by low ADTs or dropped below 1.0 when unrelated crash types were omitted.

3. ENVIRONMENTAL OVERVIEW

An environmental overview was conducted to identify resources and potential issues for consideration during the development of transportation improvement concepts. As a high-level planning overview for a large study area, the environmental overview looked at general, county-wide issues rather than site-specific issues. Natural and human environmental resources were identified from a literature/database review. Study area environmental resources are shown in **Figure 15** and summarized in the following sections. The intent is to identify potential environmental issues that merit investigation during any future project development activities rather than to quantify impacts.

3.1 Natural Environment

The natural environment typically refers to all living and non-living things found to occur in nature, and includes aquatic ecology such as rivers, streams, and wetlands; threatened and endangered species; farmlands; and geotechnical resources.

Rivers and Streams

The most notable water resource within the county is the Kentucky River, which meanders north-south through the region and lies 350 to 400 feet below the adjacent upland ridges. The river bisects downtown Frankfort between north and south and divides the larger community of Frankfort into distinct east and west sections.

Major creeks are Benson Creek, primarily west of the city, and Elkhorn Creek, mostly north and east of the city. The Kentucky River (pools 3 and 4) and Elkhorn Creek are designated as blue water trails by the Kentucky Department of Fish and Wildlife Resources (KDFWR). Other named streams include: Armstrong Branch, Cedar Run, Glenns Creek, Hickman Branch, Penitentiary Branch, Slickway Branch, Vaughn Branch, and Yeatmans Branch. One stream, an unnamed tributary to the Kentucky River north of downtown, is designated an Outstanding State Resource Water.

In addition to these named features, hundreds of unnamed streams are documented.

Impacts to streams and wetlands require permit coordination with the US Army Corps of Engineers, US Coast Guard, and/or Kentucky Division of Water, depending on the scale of the water resource and potential disturbance.

Wetlands and Ponds

The National Wetlands Inventory (NWI) has documented 51 wetlands throughout the study area, with the majority being freshwater forest/shrub and freshwater emergent. The same data shows approximately 192 ponds within the study area, primarily beyond the developed urban limits.

Groundwater

Approximately 491 water wells are known: 431 monitoring wells, 35 remediation wells, seven domestic/single household use, five irrigation wells, and 13 wells of unknown use.

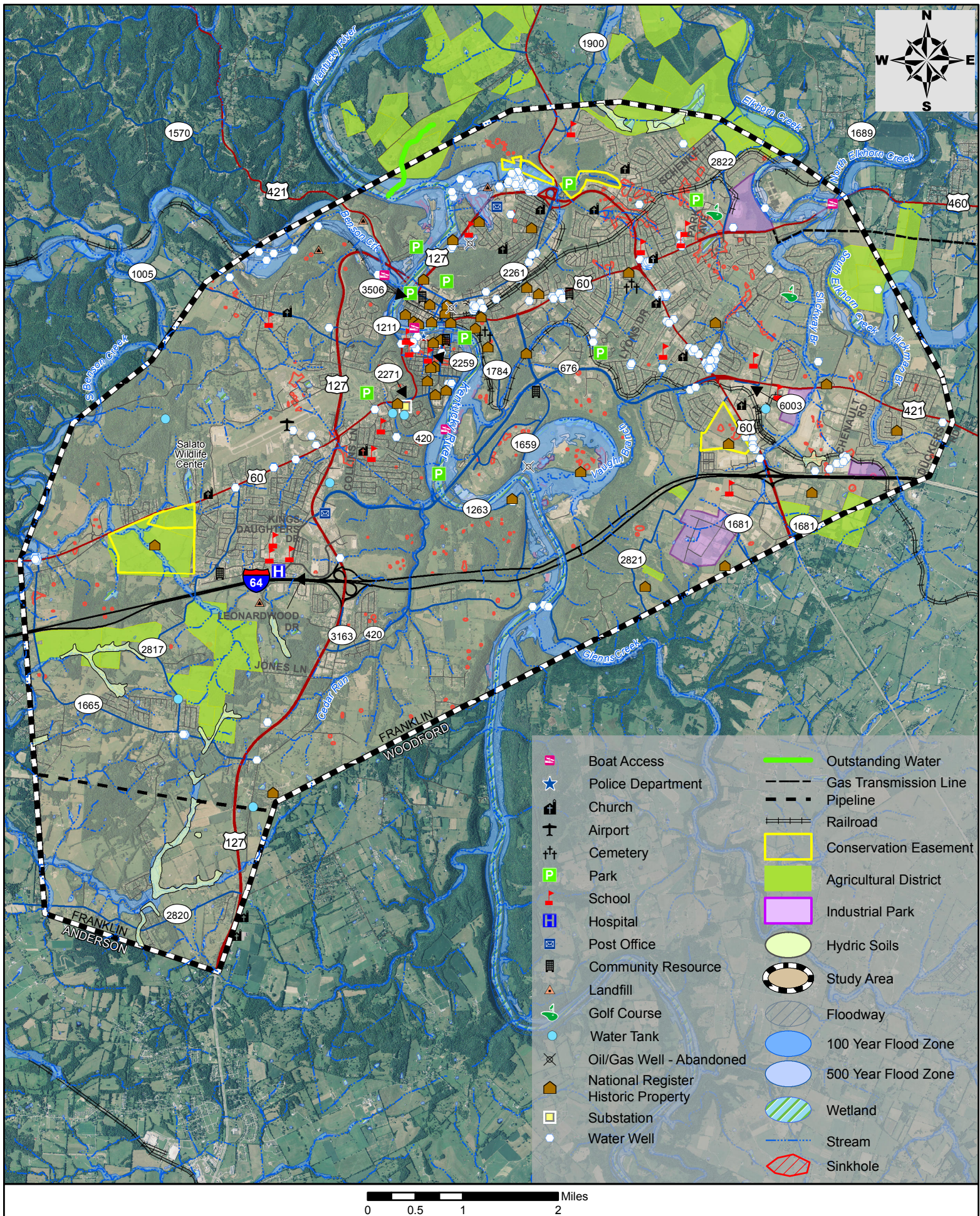


Figure 15: Environmental Overview Map

Floodplains

Federal Emergency Management Agency (FEMA) flood hazard zones and floodways occur primarily along the Kentucky River, Benson Creek, and Elkhorn Creek. A series of levees and other flood structures protect much of the downtown area from flood events.

Threatened and Endangered Species

The KYTC Comprehensive Species list (January 2018) identifies seven threatened or endangered species occurring within Franklin County, as summarized in **Table 4**.

Table 4: Threatened/Endangered Species in Franklin County

Group	Name	Scientific Name	Listing Agency ¹	Status
Plants	Braun's rockcress	<i>Arabis perstellata</i>	KSNPC, USFWS	Endangered
Plants	Running buffalo clover	<i>Trifolium stoloniferum</i>	USFWS	Endangered
Plants	Short's bladderpod	<i>Physaria globosa</i>	KSNPC, USFWS	Endangered
Mammals	Gray bat	<i>Myotis grisescens</i>	KDFWR, KSNPC, USFWS	Endangered
Mammals	Indiana bat	<i>Myotis sodalis</i>	KDFWR, USFWS	Endangered
Mammals	Northern long-eared bat	<i>Myotis septentrionalis</i>	KDFWR, KSNPC, USFWS	Threatened, with 4D Rule
Mussels	Northern riffleshell	<i>Epioblasma rangiana</i>	KSNPC	Endangered
Mussels	Sheepnose	<i>Plethobasus cyphus</i>	USFWS	Endangered

¹ Agencies: U.S. Fish and Wildlife Service (USFWS), Kentucky State Nature Preserves Commission (KSNPC), Kentucky Department of Fish and Wildlife Resources (KDFWR)

Further, the USFWS Information for Planning and Consultation (IPaC) service identifies critical habitats for both Braun's rockcress (wooded steep slopes with limestone outcrops) and Short's bladderpod (steep, rocky, wooded slopes and talus areas adjacent to streams and on south to west facing slopes) within the study area. As of the 2004 designation, 14 of 22 critical habitats for Braun's rockcress were located within Franklin County.

Projects that occur within known bat habitat will require project-specific evaluation to assess appropriate minimization/mitigation measures. For other federally listed species, specific ecological surveys may be required for projects that have the potential to impact habitat. Coordination with the USFWS Kentucky Field Office will be necessary to determine the need for future project-specific surveys.

Farmland Classifications

The Natural Resource Conservation Service (NRCS) soil survey shows nearly 35% of soils in the study area represent prime farmlands. If drained or otherwise protected from flooding, an additional 4% of soils meet the criteria for prime farmland. Additionally, 36% represent farmlands of statewide importance. The remaining 25% are not prime farmland soils. The geographic distribution of these designations is shown in **Figure 16**.

Several agricultural districts have been established on the periphery of the city to protect farmlands from conversion to non-agricultural uses (**Figure 15**). The program is administered by the Kentucky Department for Natural Resources Division of Conservation.

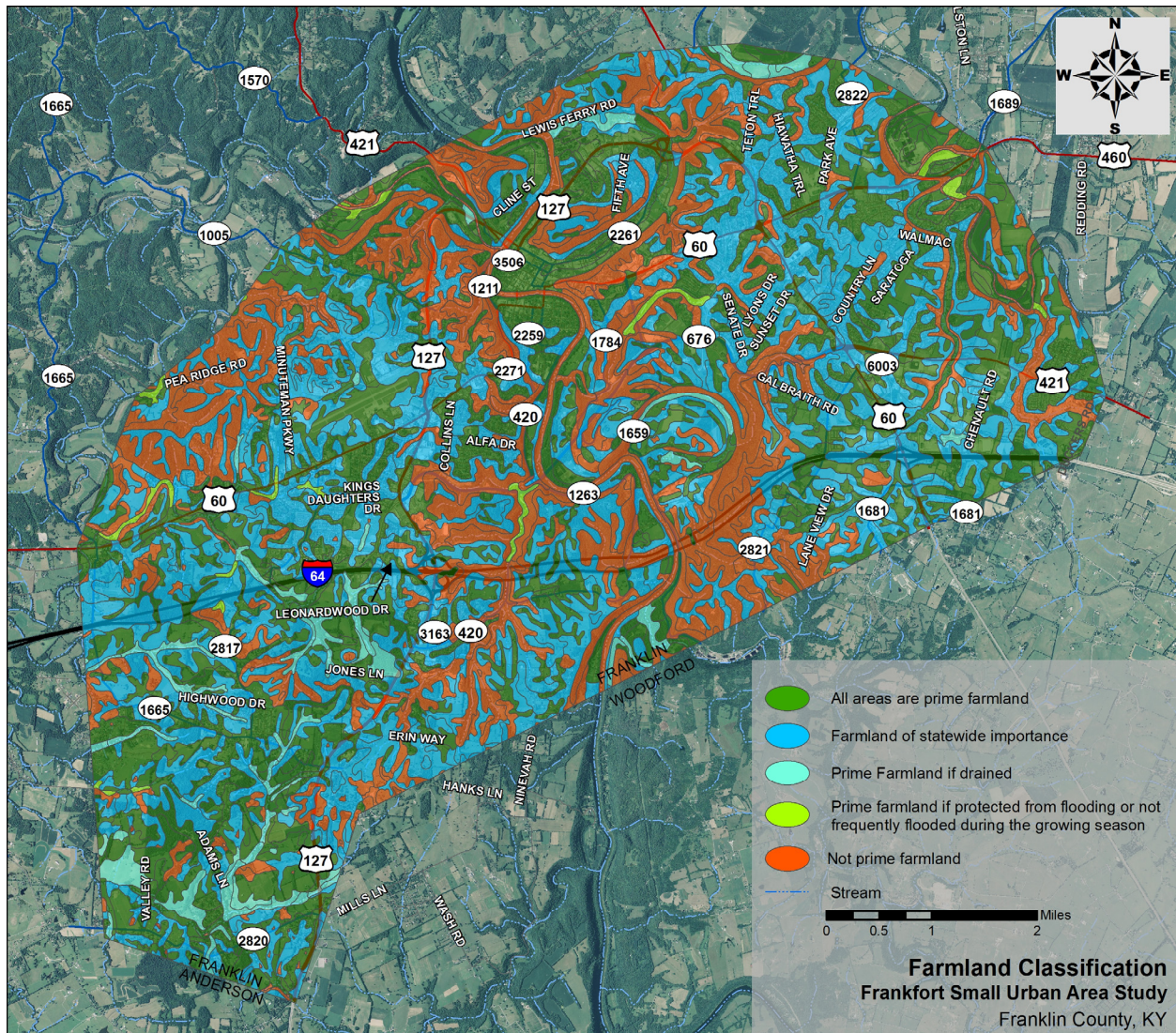


Figure 16: Farmland Soil Classifications

Geotechnical and Karst Potential

The study area lies within both the Inner and Outer Bluegrass Physiographic Regions. The Inner Bluegrass is characterized by gently rolling hills and rich, fertile soils. The gently rolling hills are caused by the weathering of relatively thick-bedded limestone that characterize the Ordovician strata of central Kentucky that has been pushed up along the crest of the Cincinnati Arch. The Outer Bluegrass is characterized by deeper valleys, with little flat land, because the bedrock in this area is mostly composed of interbedded Ordovician limestones and shales that are more easily eroded than the limestones of the Inner Bluegrass. The county is primarily an upland limestone area, dissected by streams. The most conspicuous topographic features are valleys associated with the Kentucky River and its major creeks.

The Kentucky Geologic Survey classifies karst potential using three simplified classes (intense, prone, and non-karst) to show the tendency of an area to develop karst terrain: sinkholes, caves, springs, or other solution features. The city itself is mostly underlain with limestone with a high karst potential; the surrounding county is a combination of limestone and shale with a high to medium karst potential. Sinkholes are present, scattered throughout the study area. Available mapping indicates some faults in the northeastern portion of the county but beyond the study area.

According to NRCS Web Soil Survey data, the study area encompasses nearly 32,000 acres and is predominantly silt loam (nearly 85%), followed by rock outcrop complexes (10%) and silty clay/silty clay loam (4%) with the remaining area water. The *Abbreviated Geotechnical Overview Report* prepared for this study is in **Appendix C**.

3.2 Human Environment

The human environment is often defined as the built environment or as the communities where we live. Such resources that could be impacted by roadway projects are discussed in the following sections.

Land Use

Beyond the urbanized area of Frankfort, Franklin County is primarily rural. Small crossroads communities scattered around the countryside include Benson, Flag Fork, Bridgeport, Peaks Mill, Swallowfield, Switzer, and Woodlake.

The *Frankfort/Franklin County Comprehensive Plan Update 2016* defines the existing and future land use patterns for the area. Commercial uses generally line US 60 and US 127 and are concentrated at both I-64 interchanges. Large employment centers are also located near these interchanges, plus downtown and along US 421 (Leestown Road) and KY 676 (East-West Connector). Clusters of special public uses located throughout the study area are associated with various government offices and the Capital City Airport. Beyond a collection of parks (discussed below) and two large distilleries, the remainder of the incorporated area is devoted to residential uses.

Employment

According to 2015 data published by the Bureau of Labor Statistics, Franklin County employs 31,689 persons over all industries, with 56% of these representing private industries. The Kentucky Cabinet for Economic Development identifies six manufacturers with over 200 employees:

- Montaplast of North America (800 employees), a plastic injection molding automotive supplier
- Buffalo Trace Distillery (353 employees), bourbon and whiskey distiller
- TOPY America Inc. (325 employees), manufacturer of steel road wheels
- Beam Suntory (320 employees), distilled liquor bottling operation
- Beam Suntory (305 employees), production and value added packaging for spirits
- Greenheck Fan Corporation (250 employees), commercial and industrial air moving and control equipment manufacturer/distributor

Industrial areas are primarily located on the east side of town, concentrated near I-64. **Figure 17** shows major freight generators within the study area.

As a civic center for the state, Frankfort has a large commuter population. Journey-to-work data published by the US Census Bureau in 2013 shows 17,454 individuals both live and work in Franklin County. For comparison, 4,251 persons live in Franklin County and work elsewhere (primarily Fayette, Woodford, and Scott counties) while 14,512 persons commute into Franklin County and live elsewhere (primarily Anderson, Fayette, Shelby, Woodford, and Scott counties).

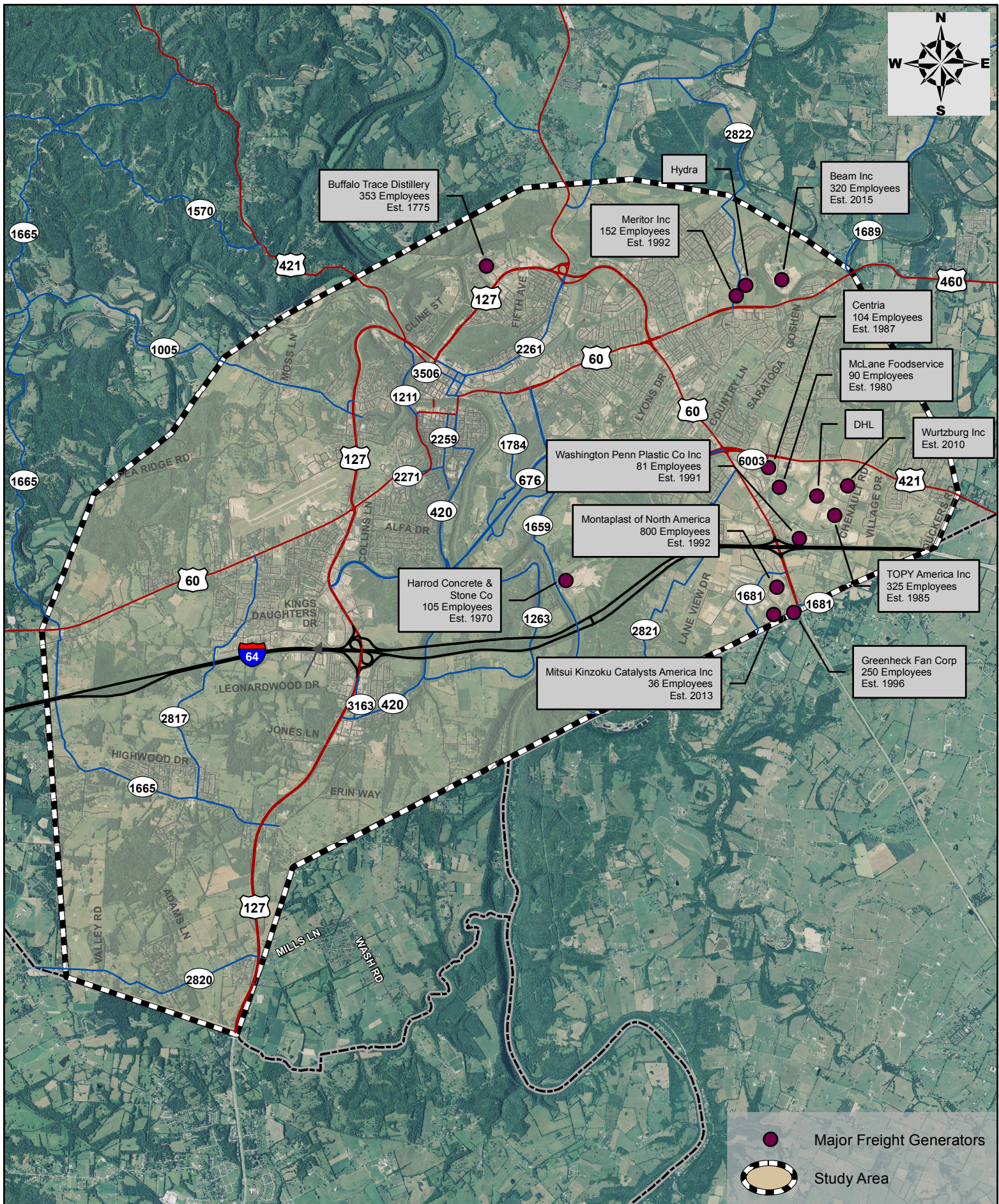


Figure 17: Major Freight Generators

Community Features

Numerous community resources are located within the study area.

Parks and Public Recreation

Frankfort maintains a network of parks and public greenspaces:

- Capitol View
- Cove Spring
- Dolly Graham
- East Frankfort
- Juniper Hill
- Lakeview
- Leslie Morris at Fort Hill
- River View
- Todd Park in Bellepoint

In addition, several public boat ramps and marinas provide recreational access to major waterways. Large conservation easements are located east, west, and north of town, associated with a Cante Farm, Cove Springs Park, and Julian Farm, respectively.

Public parks are further protected by Section 4(f) of the US Department of Transportation Act, which protects public parks, recreation areas, wildlife refuges, and historic sites from conversion to a transportation use. Parks/recreation areas that received grants through the Land and Water Conservation Fund Act (LWCFA) are also protected by Section 6(f) regulations. Overall, 14 LWCFA grants have been awarded in Franklin County, several falling within the limits of the study area (**Appendix D**). If any proposed improvements involve additional right-of-way from within a park or recreation area, Section 4(f) and Section 6(f) requirements should be considered during future project development phases.

Schools and Universities

Two school districts serve the study area, in addition to private schools: Franklin County and Frankfort Independent school systems. Combined, Franklin County has three high schools, two middle schools, and seven elementary schools, plus five private schools covering wider age ranges.

Frankfort is home to Kentucky State University, an 800-acre facility with 135 full-time faculty and some 2,200 students. Associate, bachelor, and master degree programs are offered in a host of disciplines.



Kentucky State University, main campus

Historic Districts and Properties

Numerous historic districts and properties are located within the study area. The greatest concentration of sites is within downtown Frankfort. Districts listed on the National Register of Historic Places (NRHP) include:

- South Frankfort Neighborhood Historic District
- Frankfort Barracks District
- Central Frankfort Historic District
- Old Statehouse Historic District
- Frankfort Commercial Historic District

- Frankfort Cemetery and Chapel
- George T Stagg Distillery (now Buffalo Trace)

Further, 37 properties within the city are individually listed on the NRHP:

- | | |
|--|--|
| • Andrew Trumbo Log House (Green Point Farm) | • Gov. Charles S. Morehead House |
| • Arrowhead | • Jackson Hall at Kentucky State University |
| • Baltimore Petit Truss Bridge (West Broadway) | • Kentucky Governor's Mansion |
| • Beeches | • Kentucky State Arsenal |
| • Blanton–Crutcher Farm | • Kentucky State Capitol |
| • Brown–Henry House | • Knight–Taylor–Hockensmith House |
| • Charles Patterson House | • Liberty Hall |
| • Col. R. T. P. Allen House | • Old Governor's Mansion |
| • Colored Soldiers Monument | • Old Statehouse |
| • Confederate Monument | • Old Stone Tavern |
| • E. E. Hume Hall at Kentucky State University | • Old Taylor Distillery |
| • Frankfort Cemetery and Chapel | • Old U.S. Courthouse and Post Office |
| • Frankfort Greenhouses | • Point Breeze |
| • Frankfort Storage Building (Armory) | • Rev. Jesse R. Zeigler House (Frank Lloyd Wright House) |
| • George F. Berry House | • Robert Todd Summer Home |
| • Giltner–Holt House | • Scotland |
| • Glen Willis | • Singing Bridge |
| • Gooch House | • Stewart Home School |
| | • Valley Farm Ruins |

If any proposed improvements involve additional right-of-way from within a listed historic site or an additional site meeting the criteria to qualify for NRHP eligibility, Section 4(f) requirements should be considered during future project development phases. Consultation with the Kentucky Heritage Council would also be required.

Churches and Cemeteries

More than a dozen churches and other places of worship are located throughout Frankfort, as shown in **Figure 15**. Three large cemeteries serve the town: Frankfort Cemetery, Green Hill Cemetery, and Sunset Memorial Gardens. The former two are accessed from US 60 (East Main Street) while the latter lies just beyond the study area limits off US 60 (Versailles Road). Additional unmarked burial grounds may exist, particularly as small family plots in more rural areas.

Other Services and Attractions

Six fire stations are within the study area; law enforcement is provided by the Frankfort Police Department and Franklin County Sheriff's Office, both located within Frankfort. Medical services are provided by the Frankfort Regional Medical Center, located off Kings Daughters and Leonardwood drives on the west side of town. Numerous other medical offices, clinics, and support services supplement the hospital in providing care.

Tourism for the area is managed by the Frankfort/Franklin County Tourist and Convention Commission. Key attractions include historic sites, distilleries/wineries/breweries, riverfront and outdoor venues, galleries, and shopping. Other community features around town include the Old and New Capitol Buildings, Capital City Airport, Boone National Guard Center, Salato Wildlife Education

Center, the Thomas D. Clark Center for Kentucky History, the Vietnam Veterans Memorial, and more.

Demographic Trends

Included as **Appendix E**, an assessment of demographic trends was completed by Bluegrass Area Development District (BGADD) to identify potential sensitive population concentrations. This socioeconomic study reviewed current Census estimates to identify geographies where populations of low-income, minority, elderly, disabled, or limited English proficiency persons could represent an environmental justice potential. Summarized in **Figure 18** and **Table 5**, the analysis concluded that potential environmental justice populations exceed county averages for 35 of 39 block groups within the study area. Additional analysis may be required as part of future project development phases, especially if improvements require additional right-of-way or residential relocations.

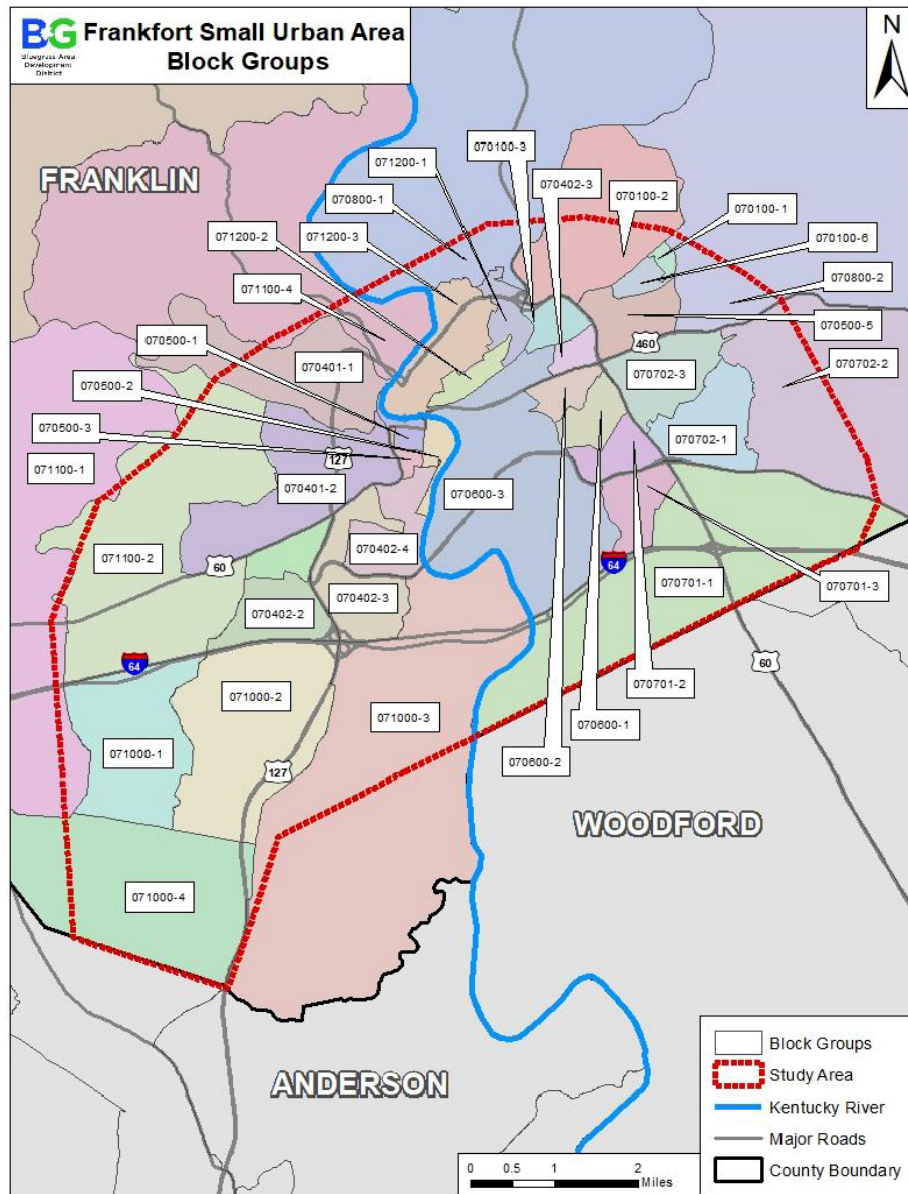


Figure 18: Census Tract and Block Group Boundaries

Table 5: Census Block Groups Exceeding County Average for Reference Populations

		Total Pop	Minority	Poverty	65 and Over	Disability	LEP*
United States		318,558,162	38.0%	11.0%	14.5%	12.5%	7.9%
Kentucky		4,411,989	14.6%	18.8%	14.8%	15.6%	2.0%
Franklin County		49,982	16.2%	14.8%	17.0%	20.8%	1.6%
Tract	Block Group						
050300	2	1,276					
070100	1	1,021		X			
	2	1,429	X		X		XX
	3	1,578	X	X			XX
	4	672		X		X	XX
	5	738			X		
	6	611			X	X	X
070401	1	1,743					
	2	954			X	X	
070402	1	1,050	X		X		
	2	2,004	X	X	X	X	XX
	3	1,051		X		X	
	4	1,305			X	X	
070500	1	514		X	X	X	
	2	1,122	X	X			X
	3	448	X	X			
070600	1	1,265		X			
	2	1,520	X	X		X	
	3	2,237	X	X			X
070701	1	2,147	X			X	X
	2	769			X	X	
	3	1,014	X				
070702	1	1,145			X		
	2	1,244			X		
	3	2,725	X		X	X	
070800	1	1,644		X		X	
	2	1,954					
071000	1	1,430	X		X	X	X
	2	1,217			X		
	3	1,742					
	4	1,032				X	
071100	1	1,816			X	X	X
	2	1,517			X		
	4	937			X	X	
071200	1	781		X	X	X	
	2	1,217	X	X		X	
	3	1,742		X			
950100	1	2,840					
	2	2,416		X			

* LEP = Limited English Proficiency; X exceeds county average, XX exceeds 5%

Hazardous Materials Considerations

Due to the large size of the study area, a detailed government database search was not conducted. Instead, readily available records from the US Environmental Protection Agency (USEPA) were compiled to illustrate the range of monitored sites within the study area. Shown in **Figure 19**, records range from short-term construction permits to large-scale industrial pollutant handlers/generators.

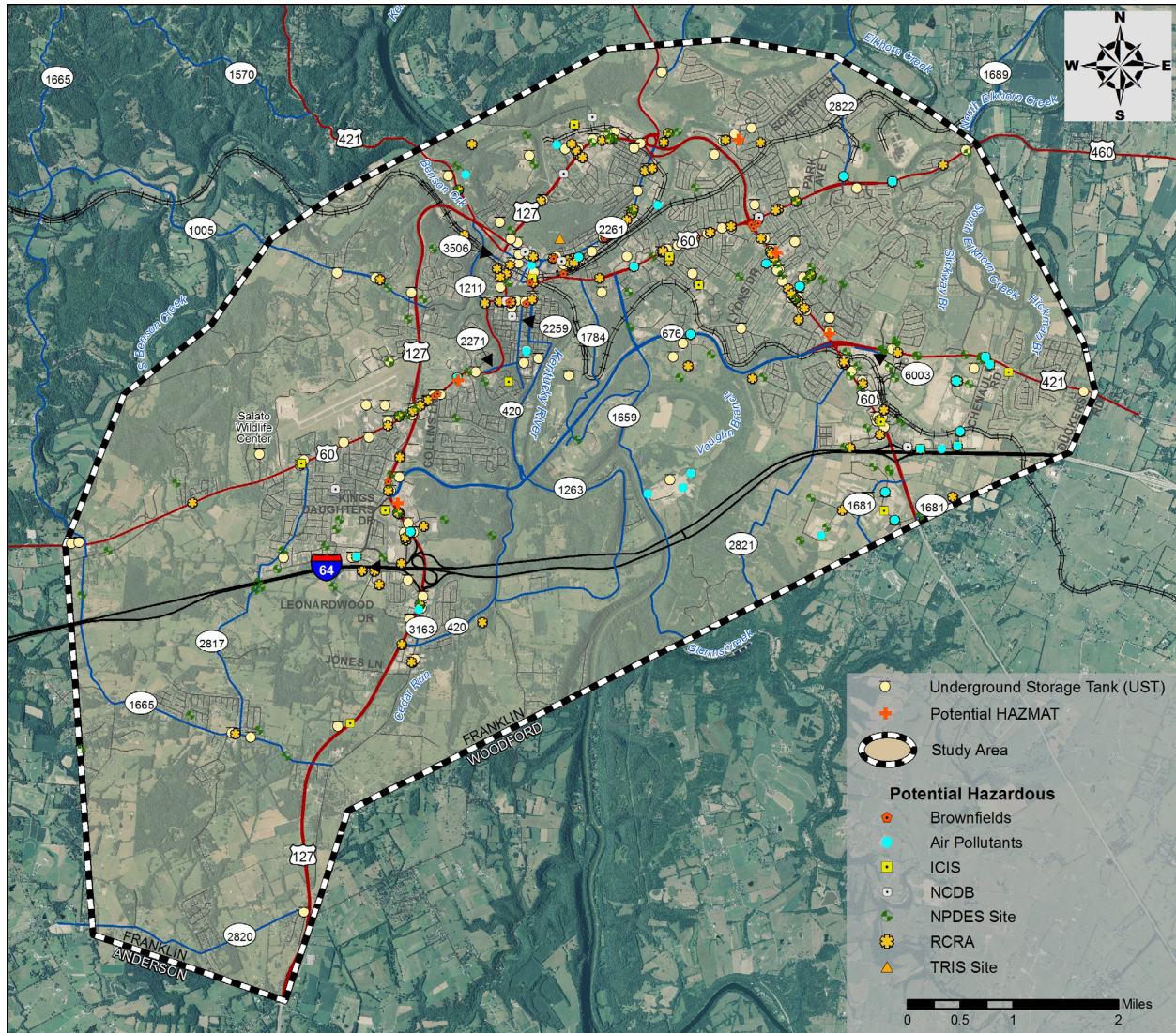


Figure 19: Potential Hazardous Materials/UST Concerns

Air Quality and Noise Considerations

Generally, air quality issues are not a major concern for Frankfort or Franklin County. The region is in attainment for all criteria pollutants monitored by the USEPA. It is not located within a Metropolitan Planning Organization (MPO) border; therefore, any federally funded transportation projects should be included in the statewide transportation improvement program (STIP) to ensure air quality conformity requirements are satisfied.

Federally funded transportation projects can also require consideration of noise impacts. Noise sensitive receptors in the vicinity of improvements include residential areas, parks, cemeteries, hospitals, churches, schools, etc. Some commercial properties with exterior uses are also considered noise sensitive. Specific traffic noise impact analyses may be required as part of future

project development activities if projects are identified that add capacity or shift traffic closer to sensitive receptors.

4. INITIAL COORDINATION EFFORTS

Two types of meetings were held during the course of the study: project team meetings and local officials/stakeholders (LO/S) meetings. The project team was composed of the KYTC District 5 and Central Office staff from various disciplines, along with BGADD and the consultant.

Involvement of local officials and other stakeholders was an important component of this SUA study. The intent of this effort was to gather input from a variety of local perspectives, identifying areas of concern and developing potential solutions. The LO/S engagement component of the SUA study was used to:

- Inform the study effort and its goals
- Gauge interest in transportation improvement projects
- Identify needs within the study area
- Identify project issues and goals
- Identify and prioritize potential improvement concepts

Summaries of all meetings held are in **Appendix F**.

4.1 Initial Scoping with Project Sponsors

An initial meeting between the project team and local planners who requested the study occurred April 19, 2018. The purpose of the meeting was to obtain feedback on planned projects and previous study recommendations in the study area, high crash locations, and environmental features; and to gather additional data on existing conditions. Early in the process, the following issues were identified as local concerns to be considered as the study unfolds:

- Demolition of the Capital Plaza tower and civic center complex in March 2018, pictured at right, shifted over 800 jobs away from the downtown core. A replacement office building under construction and anticipated for completion in late 2019 will shift some 1,500 jobs back downtown.
- Recent development along Sower Boulevard included two large government office buildings constructed within the last five years along with several smaller private businesses.
- Expansion of the Farmdale sanitation district along US 127 south of town is anticipated to increase residential development potential along this corridor over the next 20 years.
- Improved accessibility to several large tracts with development potential is desirable: a farm south of I-64 and east of US 60 and two farms roughly bounded by KY 676, KY 420, I-64, and existing commercial development lining US 127.
- The two main distilleries in town—Jim Beam and Buffalo Trace—have major expansion projects ongoing.



Tower Demolition in March 2018

The team reviewed previous improvement concepts around town, from PIFs or previous planning studies. While recommendations in the 2000 Frankfort SUA are largely outdated, improvements to KY 2261 (Holmes Street), US 60 (East Main Street), and US 60 (Versailles Road) remain local priorities. A downtown redevelopment study is ongoing concurrent with this study that may identify additional downtown transportation improvements for inclusion in the SUA prioritization process.

4.2 Project Team Meeting No. 1

The first project team meeting was held at KYTC Central Office on May 15, 2018. The purpose of the meeting was to review existing conditions data including high crash locations, 2018 traffic, and environmental features. Much of the discussion focused on current status of various projects, studies, and PIFs.

The 2018 existing levels of service (LOS) on roadway segments in the study area are acceptable, with a few exceptions discussed in **Section 2.4**. All current v/c calculations were 0.61 or less, signifying no major congestion issues based on daily volumes. Attendees noted US 60 (Versailles Road) traffic backs up during the peak hours with strong directional trends. The team also reviewed the freight survey intended to provide detail about truck movements and industrial trends to feed into the traffic model.

4.3 Local Officials and Stakeholders Meeting No. 1

The first LO/S meeting was held at KYTC Central Office on May 15, 2018, following the initial project team meeting. The purpose of the meeting was to present existing conditions data and gather input on potential problem areas and possible solutions. Representatives included city and county governments, emergency services, Capital Development Corporation, BGADD, and major employers (Buffalo Trace Distillery and TOPY America, Inc.), along with the project team.

A presentation of existing conditions provided background information on previous studies and previously identified projects, development trends, roadway characteristics, traffic operations, safety analyses, and the environmental setting. Afterward, attendees were separated into two groups and asked to identify locations on an oversized map of the study area with safety, congestion, or other areas of concern to be considered for improvements.

Groups identified the following locations:

- US 127: Buffalo Trace truck traffic is increasing due to facility expansion; turn lanes and additional storage will be needed at the main entrance. Along the Lawrenceburg Road portion, signal timing/programming is needed for traffic leaving town.
- US 60: Louisville Road / Bridgeport Road intersections should be signalized and US 60 near the Salato Wildlife Education Center needs to be widened. Truck traffic is a problem on Louisville Hill. Signal timing at Martin Luther King Jr Boulevard should be refined to account for pedestrians. The Versailles Road two-way left turn lane (TWLTL) leads to vehicle conflicts. The Versailles Road commercial strip needs a backage road. Extended turn lanes to I-64 ramps at Versailles Road are needed.
- US 421: Turning is difficult along Leestown Road near Chenault Road due to truck traffic and speeds. Sometimes trucks pull out in front of mainline traffic. The four-lane section should be



Workgroup during LO/S Meeting

extended. Weaving issues exist for left turns from the US 60 (Versailles Road) ramp onto Leestown Road.

- US 460: Extend the shoulder, lower the speed limit, and add a shared use path to Switzer Road. The area is heavily residential.
- KY 676 (East-West Connector) / Collins Lane intersection has speed and safety issues.
- KY 1665 (Evergreen Road) is too narrow for firetrucks to pass; no shoulders plus poor sight distance are issues of concern. Finding a gap to turn right onto US 127 is challenging.
- KY 1681 (Duncan Road): High speed vehicles using the US 60 slip ramp make turning right difficult. Traffic backs up during shift changes. The route should be transferred from the rural secondary system.
- KY 2261 (Holmes Street): Recommend incorporating master plan vision that includes a couplet system between West Main and Holmes streets following an existing roadway.
- KY 2817 (Cardwell Lane): At least two crashes occurred in the past year plus there are flooding issues near US 60. The route is narrow, curvy, and has horizontal sight distance issues.
- Access to Kings Daughters Hospital is difficult.
- Demolition of Broadway Bridge is funded in current highway plan but locals would like to keep it as a pedestrian bridge.

4.4 Freight Survey

A freight survey was prepared and sent to local industry representatives early in the study process. Attendees at the first LO/S meeting were encouraged to complete a survey or promote it to any local freight entities they represent. The intent was to gather information about existing and anticipated future freight flows to refine assumptions for the traffic forecast. Three surveys were returned, providing minimal regional insight to adjust the traffic model. One survey included a supplemental list of transportation needs and potential improvements (see **Appendix G**).

5. 2040 TRAFFIC FORECAST AND NO-BUILD OPERATIONS

Future year growth for all study area roadway segments was determined using the KYTC Statewide Travel Demand Model. The background model assumptions were modified to reflect large-scale changes in households and employment. Specifically, background socioeconomic assumptions were changed to reflect the closure of the Capital Plaza tower, the new government offices along Sower Boulevard, the new state office building under construction downtown, and additional residential growth expected to occur along the US 127 corridor approaching Anderson County.

A 2040 No-Build scenario was run to project future traffic volumes, which were adjusted as appropriate to reflect existing count data and eliminate any negative growth projections. Detailed information about this effort is contained in the *Traffic Forecast Report* (see **Appendix A**). Overall, growth ranged from 0% to over 300% for low-volume KY 1659 (Glenns Creek Road), averaging an area-wide 4.6% increase over the 22-year forecast period. Over half the analysis segments exhibited no growth, corresponding to the relatively flat-line county population projections anticipated by the Kentucky State Data Center through 2040. Only three analysis segments changed LOS based on projected growth; each remains at LOS C or better.

Intersection capacity analyses were performed for the nine intersections counted. Intersection delay in the 2040 No-Build scenario changed by no more than 1.0 second at each location, indicating the capacity concerns identified in **Section 2.4** also apply to the 2040 No-Build scenario.

6. CONCEPT DEVELOPMENT

Based on a review of existing geometric deficiencies, existing and future traffic operations, crash concentrations, anticipated development trends, field reconnaissance, and input from community leaders, a series of concepts to improve safety and congestion were developed. The terms “improvement” and “concept” are used interchangeably throughout the text.

Each concept can be categorized as one of three groups:

- Long-term projects are relatively high cost projects, often requiring additional right-of-way that will entail substantial investment to acquire. Most require additional project development activities and would need to be funded through traditional funding sources in KYTC’s biennial highway plan.
- Short-term projects are relatively lower cost projects that may be implemented in the near future. Many require little-to-no new right-of-way; several may be completed as maintenance actions.
- Local projects are improvements located beyond the state-maintained highway system. These would likely need to be funded by the City of Frankfort, Franklin County, or a private developer.

6.1 Interim Coordination Meetings

An initial set of improvement concepts was developed and shared with both the project team and the project sponsors in September and October 2018, respectively. Meeting summaries are in **Appendix F**. Initial concepts were refined as needed based on this input.

6.2 Initial Improvement Concepts

Shown in **Figure 20**, the following initial improvement concepts were developed.

Long-Term

- Site A: Separate planning study with detailed traffic analysis for US 60 (East Main Street) road diet
- Sites B–F: Access management and pedestrian safety improvements along segments of US 60 (Versailles Road)
- Site G: Reconfigure I-64 interchange with US 60 (Versailles Road)
- Site H: KY 2261 (Holmes Street) corridor improvements
- Site I: Spot improvements along KY 2817 (Cardwell Lane)
- Site J: Reconstruct KY 1005 (Devils Hollow Road) from Pea Ridge Road to US 127 (Wilkinson Boulevard)

Short-Term

- Site K: Extend southbound turn lane along US 127 (Lawrenceburg Road) over I-64
- Site L: Intersection improvements at US 127 (Lawrenceburg Road) / US 60 (Louisville Road)
- Site M: Signal improvements at US 60 (Louisville Road) intersections with KY 2817 (Cardwell Lane, M1) and Meadowview Lane (M2)
- Site N: Extend eastbound off-ramp from KY 676 (East-West Connector) to US 60 (Versailles Road)
- Site O: Intersection improvements at KY 676 (East-West Connector) / KY 1659 (Martin Luther King Jr Boulevard)
- Site P: Improve signage along KY 420 (Old Lawrenceburg Road) approach to KY 676 (East-West Connector) intersection
- Site Q: Intersection improvements at KY 3166 (Burlington Lane) / KY 3163 (Anderson Road)

- Site R: Intersection improvements at US 421 (Wilkinson Boulevard) / Schenkel Lane

An improvement along US 421 Wilkinson Boulevard to serve increasing truck traffic at the Buffalo Trace Distillery was considered but eliminated based on subsequent input from distillery staff.

Local

- Site S: New connection from Sower Boulevard to KY 1659 (Glenns Creek Road)
- Site T: Spot improvements along CS-1569 (Leonardwood Drive)
- Site U: New connection from Forest Hill Drive to Eastwood Shopping Center
- Site V: Extend Sunset Drive for secondary connection to Brighton Park Shopping Center
- Site W: Realign US 60 (Versailles Road) / KY 2821 (Hanly Lane) intersection with extension to Locust Drive

Other proposed connections from the 2014 *US 60 Versailles Road Traffic Study* were discussed but not advanced for future consideration.

6.3 2040 Build Scenario Traffic

The following subsections highlight 2040 Build traffic analyses for initial improvement concepts. Many recommended improvement concepts were smaller in scale or focused on improving safety, leading to minor impacts on routine traffic operations.

Statewide Model Runs

The majority of improvement concepts were too small-scale to adjust traffic flows within the statewide model. Sites J and S were input into the model and run as build scenarios to approximate future build conditions.

- Site J, KY 1005 (Devils Hollow Road) reconstruction as a three-lane cross-section with improved horizontal and vertical alignments shows daily traffic volumes would increase by 7% versus 2040 No-Build, still within the operational capacity of the route.
- Site S, a new highway connection from Sower Boulevard to KY 1659 (Glenns Creek Road), would redistribute around half the traffic currently using the Sower Boulevard / KY 676 (East-West Connector) intersection, currently operating at LOS E. Removing this traffic improves operations at the existing intersection to LOS D overall during the PM peak, with northbound left and right turning movements at LOS D and F, respectively.

US 60 (Versailles Road) Corridor (Sites B-G)

Future build operations for the US 60 (Versailles Road) corridor (Sites B–F) are included from the 2014 *US 60 Traffic Study*. Prior analysis shows corridor segments operating at LOS A–B in 2014, with three intersections at LOS E–F during the PM peak hour. By 2040, segment LOS A–B drops to LOS B–C and the intersections remain at LOS E–F. Incorporating access management principles shows a minor impact on operations, improving LOS at one intersection from F to D.

Three build options were examined at the I-64 / US 60 (Versailles Road) interchange (Site G), summarized in **Figure 21**: reconstruction as a diverging diamond interchange (Option G1), or widening US 60 between adjacent signals to provide increased left turn storage space (Options G2 and G3). Under Option G1, the diverging diamond configuration would switch the eastbound and westbound US 60 lanes between ramps, and convert all movements to I-64 to free flow turns for safer and more efficient operations.

While no detailed engineering has been undertaken, Site G in Frankfort was compared with the recently constructed KY 4 (New Circle Road) / US 68 (Harrodsburg Road) diverging diamond interchange in Lexington. Analysis shows Frankfort has more spacing between adjacent intersections and lower traffic volumes, as illustrated in **Figure 22**, suggesting it is a feasible candidate for the diverging diamond configuration.

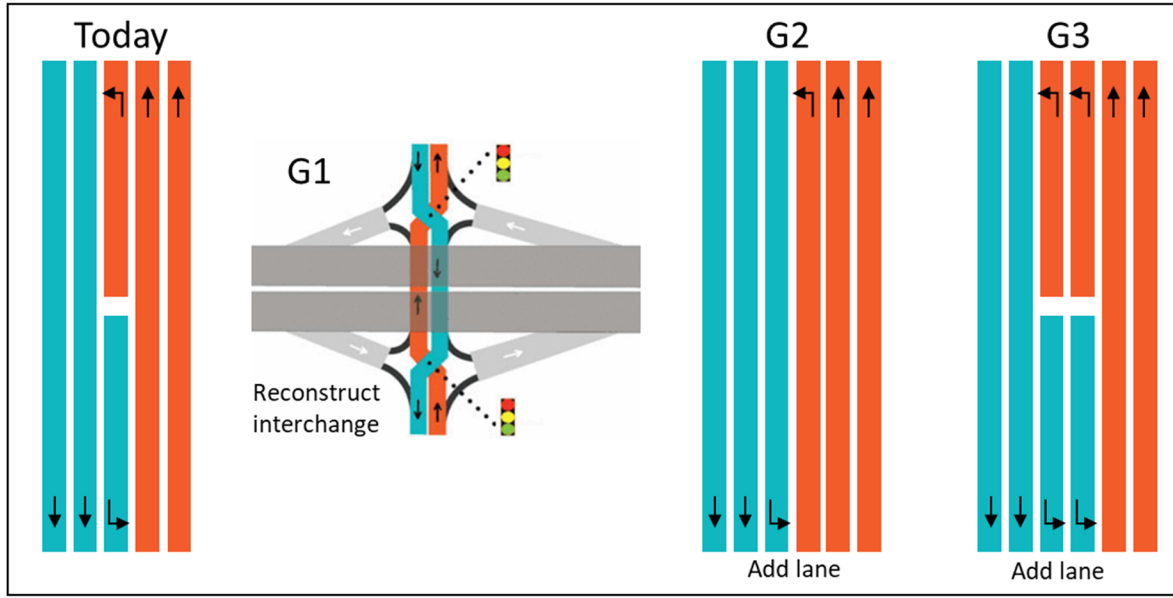


Figure 21: Proposed Improvement Options at Site G

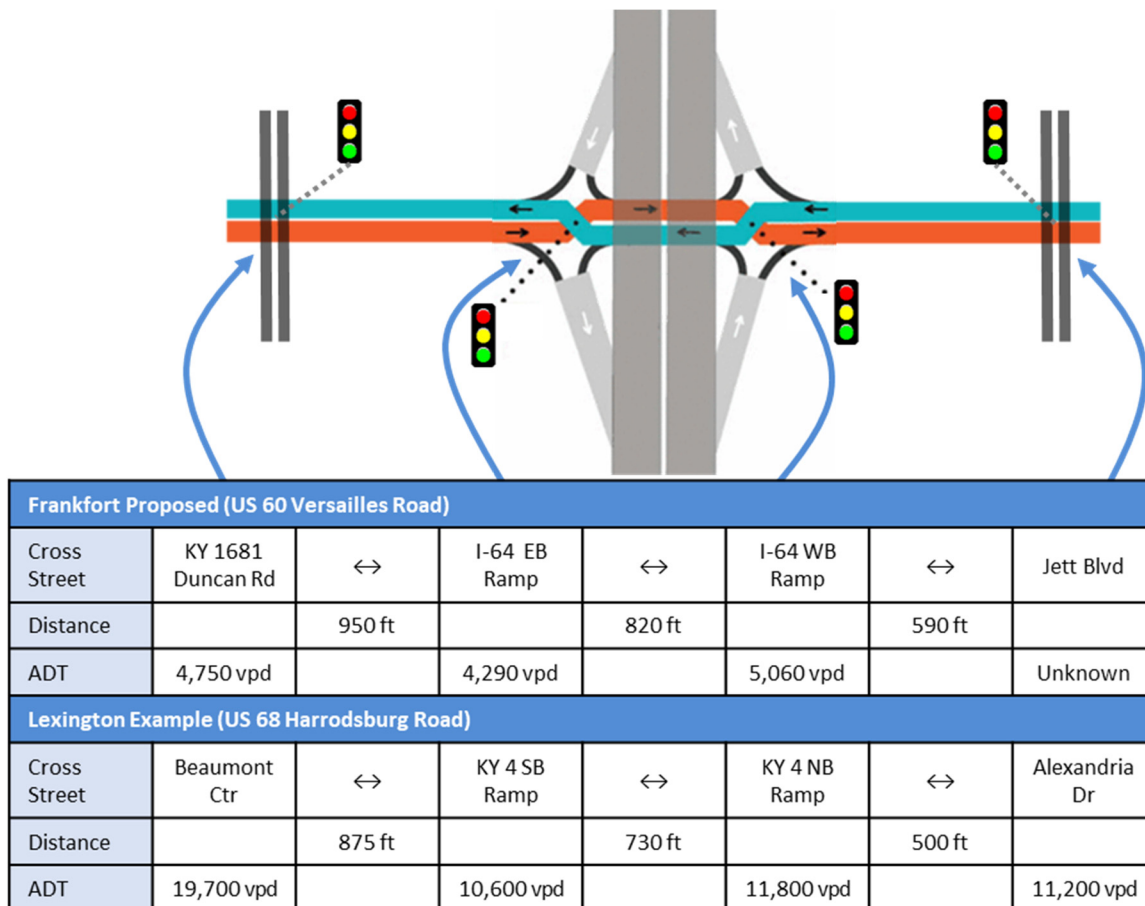


Figure 22: Comparison of Site G with Existing Lexington Diverging Diamond Interchange

Existing interchange traffic volumes were input into FHWA's *Capacity Analysis for Planning of Junctions* tool to estimate operations for Option G1. The tool shows the interchange would operate at a 0.8 v/c overall. HCM methodologies were applied for Options G2 and G3, summarized in **Table 6**. Under either scenario, the additional storage space improves operations over the existing layout; however, queues would still spill back during peak hours, with the left turn movement to the westbound ramp operating at LOS E in each case.

Table 6: Comparison of Site G Operations during AM (PM) Peak Hours

Scenario	Intersection LOS	US 60 Left to Ramp LOS	US 60 Left to Ramp Queue Storage Ratio ¹
2040 No Build			
US 60 / WB Ramps	C (D)	E (E)	3.3 (3.4)
US 60 / EB Ramps	C (C)	D (D)	1.8 (2.8)
2040 Build G2: Single Lefts			
US 60 / WB Ramps	C (D)	E (E)	1.4 (1.4)
US 60 / EB Ramps	C (C)	D (D)	0.8 (1.3)
2040 Build G3: Dual Lefts			
US 60 / WB Ramps	C (C)	E (E)	1.7 (1.6)
US 60 / EB Ramps	C (B)	B (A)	0.4 (0.3)

¹ Queue Storage Ratio represents how far turning vehicles are likely to spill back beyond the available storage space; for example, 1.2 means vehicles are likely to queue up 20% farther beyond the turn lane length.

Leonardwood Drive

With its high crash frequencies, 8,100 vpd traffic volume, and array of closely spaced driveway intersections, Leonardwood Drive (Site T) merits detailed, corridor-specific traffic analysis to develop improvements. As a city street, this level of analysis was beyond the scope of the SUA study.

6.4 Downtown Frankfort Master Plan

The *Downtown Frankfort Master Plan* concluded in late Fall 2018, outlining a long-term vision to redefine and guide reinvestment in the downtown area. Complementing land use changes, the plan emphasizes new connections to the river and to nearby destinations such as the university, government complex, and distillery. It notes "the difficulty of getting to [downtown], the difficulty of accessing the necessary foot and vehicle traffic, and the difficulty in easily moving from one part of downtown to another greatly impede growth."

Transportation elements in the plan include the following:

- Integrate the former civic center complex into the downtown street grid
- Provide streetscaping improvements along Broadway
- Convert one-way streets to two-way streets
- Improve bicycle and pedestrian connections, to include preservation of the Broadway bridge

Because no specific projects to improve vehicle safety or reduce congestion were identified, no projects were carried forward into the SUA prioritization process.

7. FINAL COORDINATION MEETINGS

After the development of improvement concepts, a final round of meetings were held to gather feedback on potential projects and prioritization. Meeting summaries are in **Appendix F**.

7.1 Local Officials and Stakeholders Meeting No. 2

A second LO/S meeting was held January 14, 2019, attended by representatives from city and county governments, local businesses, emergency services, the county school board, economic development advocates, the airport, the university, and others. During the meeting, attendees were provided with a map and handouts presenting the 23 improvement concepts (see **Figure 20**) for ranking. Each potential project was discussed and individuals were asked to score their priorities by category. That is, long-term improvements included 10 projects for a total of 10 points (one point for each project). Each attendee was asked to divide the 10 possible points between at least two projects, awarding the most points for the highest priority projects. Each scoring sheet had follow-up questions on particular sites.

For long-term projects, LO/S ranked the I-64 / US 60 interchange (Site G) as their highest priority, followed by KY 2817 (Cardwell Lane, Site I) and US 60 (East Main Street, Site A). Scoring results are summarized in **Figure 23**.

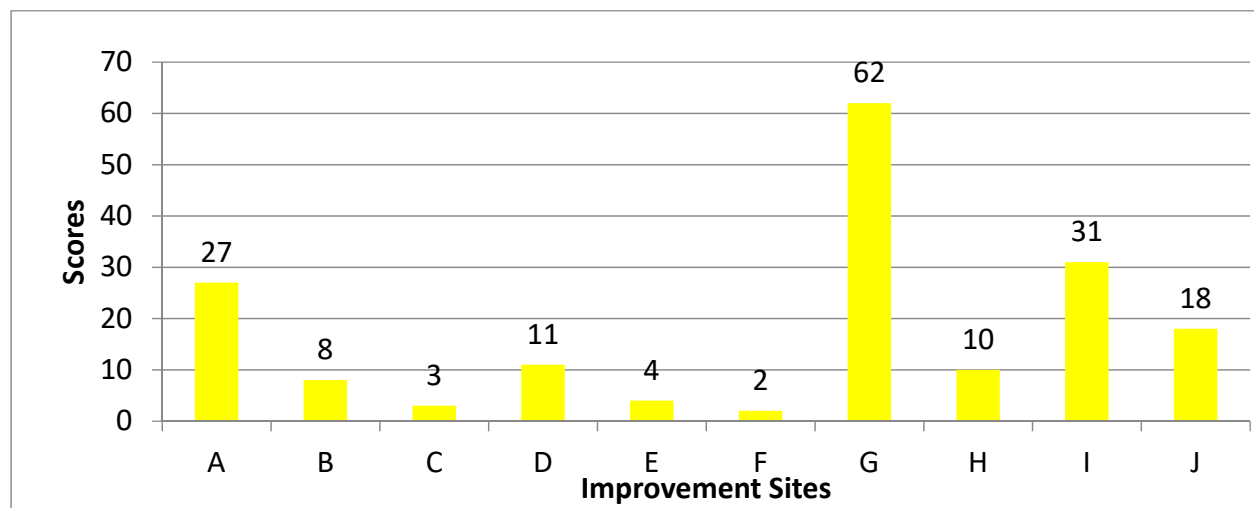


Figure 23: LO/S Scoring Results for Long-Term Improvements

Preferences between the three options at Site G were divided: seven votes for Option G1 (reconstruction as diverging diamond interchange), six votes for Option G2 (side-by-side left turn lanes stretching between signals), and four votes for Option G3 (dual left turn lanes).

Attendees were also asked to prioritize individual spot improvements along KY 2817 (Cardwell Lane, Site I), assigning “1” as their highest priority through “4” as their lowest. Spot improvements included improving three horizontal curves and flattening a steep hill to improve sight distance, as shown in **Figure 24**. Within Site I, Spot I3 was the highest priority with a 1.9 average score, followed by Spot I1 with 2.6 average points, and a tie between Spots I2 and I4 as the lowest, both averaging 2.9.

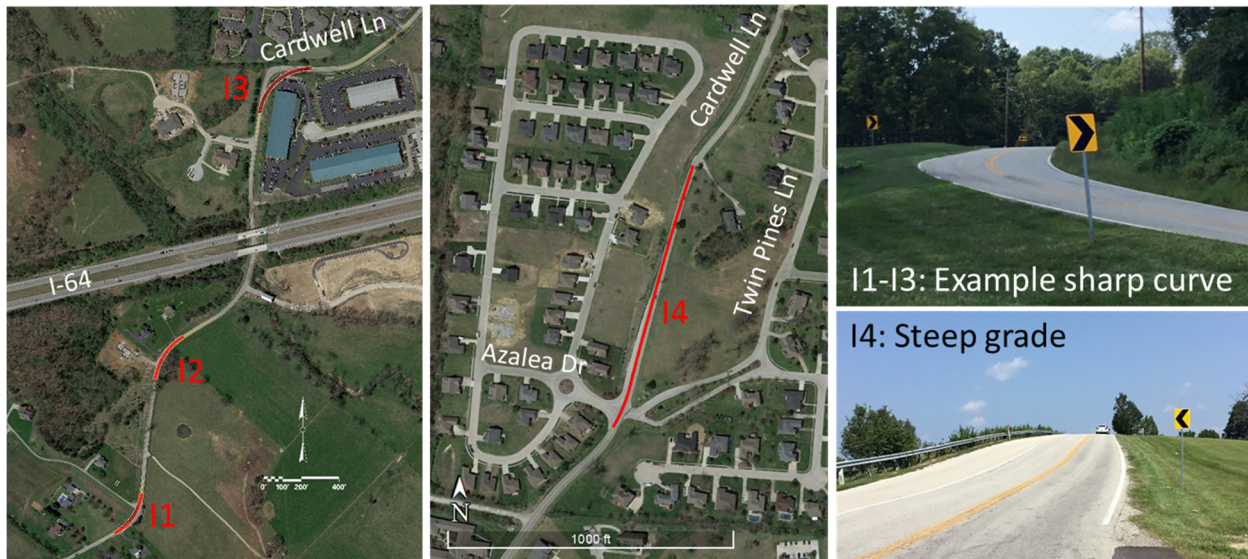


Figure 24: Spot Improvements within Site I

For short-term projects, LO/S ranked Site N—the eastbound off-ramp from KY 676 (East-West Connector) to US 60 (Versailles Road)—as their highest priority, followed by the US 127 (Lawrenceburg Road) / US 60 (Louisville Road) intersection (Site L). Scoring results are summarized in **Figure 25**.

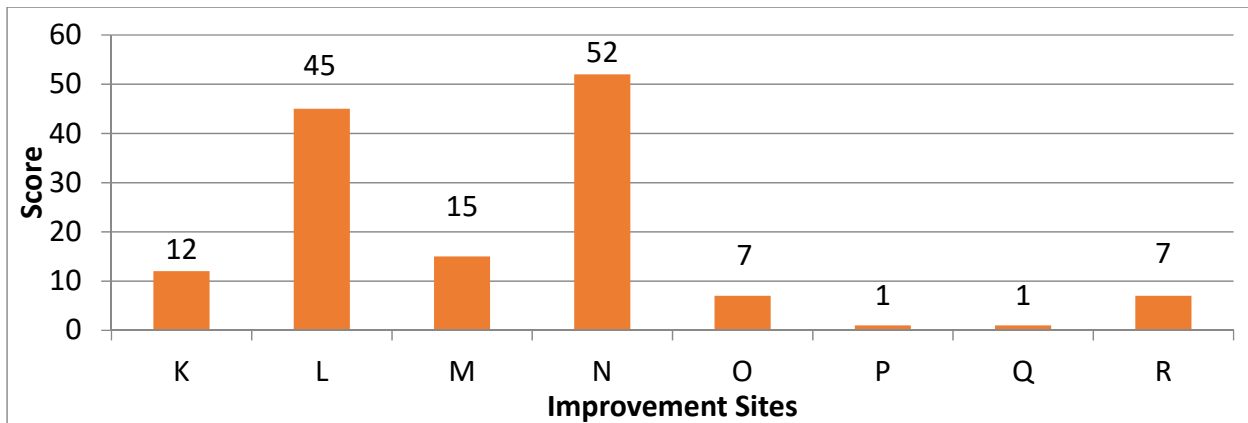


Figure 25: LO/S Scoring Results for Short-Term Improvements

During the meeting, it was suggested Sites P (KY 420 Old Lawrenceburg Road signage) and Q (Burlington Lane / Anderson Road intersection) be handled as maintenance actions rather than prioritized alongside other potential projects.

Attendees were also asked to prioritize between two standalone spot improvements at the US 127 (Lawrenceburg Road) / US 60 (Louisville Road) intersection (Site L). Spot L-1 (extend northbound US 127 right turn lane) was almost unanimously the highest priority compared to Spot L-2 (add coordinated signalhead for eastbound US 60 right turn lane).

For local projects, LO/S identified Leonardwood Drive (Site T) as their highest priority, followed closely by extending Sunset Drive for a secondary connection to Brighton Park Shopping Center (Site V). Scoring results are summarized in **Figure 26**. Individual spot improvements within the Leonardwood Drive corridor (Site T) received extremely close priority scores, ranging from an average 2.8 through 3.1.

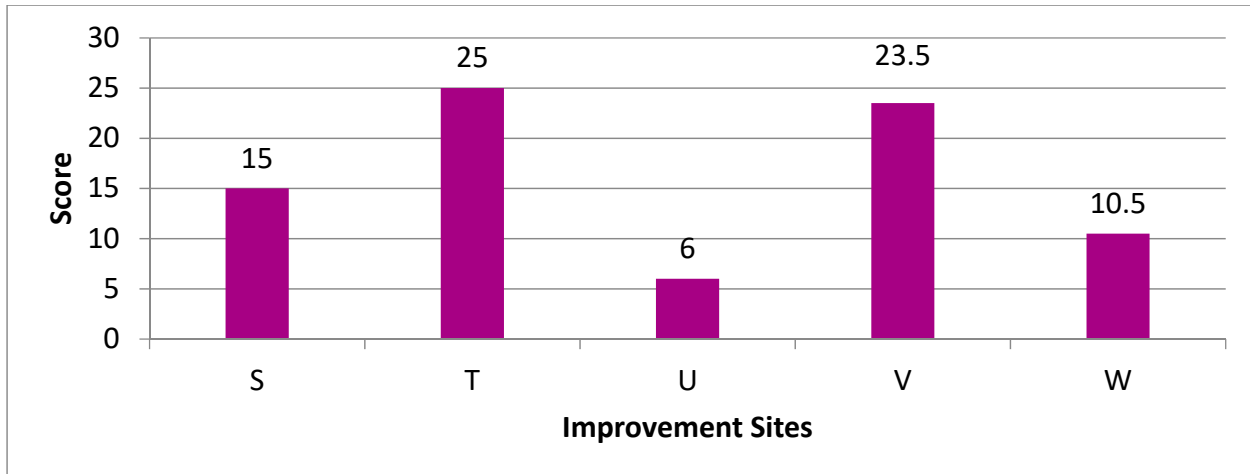


Figure 26: LO/S Scoring Results for Local Improvements

7.2 Project Team Meeting No. 3

Immediately following the LO/S meeting on January 14, 2019, the project team convened to review their input and finalize prioritization. Detailed project sheets for each recommended site are presented in the next chapter; key discussion items from the meeting are summarized below.

- The US 60 (East Main Street) study (Site A) should be scheduled so the project development phase can be completed prior to the next pavement rehabilitation cycle (in seven to ten years).
- At the I-64 / US 60 interchange, reconstruction as a diverging diamond (Option G1) should remain a long-term improvement but Options G2 or G3 to modify left turn lanes on US 60 should be considered a short-term, high priority improvement.
- While KY 2817 (Cardwell Lane, Site I) was rated high, it would remain a narrow route with substandard vertical and horizontal alignment elements even if all four spot improvements are constructed. It is unlikely to score well regionally, due to low traffic volumes and crash trends.
- Extension of the southbound US 127 left turn lane to eastbound I-64 (Site K) is not currently feasible: US 127 has dual structures over I-64 with a center-jointed median between. These structures will likely be replaced when this section of I-64 is widened. Consider Site K at that time.
- The project team agreed to address signage along KY 420 (Site P) as a maintenance action.
- Converting Burlington Lane / Anderson Road to a two-way stop (Site Q) was not recommended to advance. It would address left turn traffic spilling back onto US 127, but elimination of the four-way stop raises safety concerns due to heavy trucks from the businesses, gas station, and KYTC maintenance facility using this intersection.
- Five spot improvement options at Leonardwood Drive (Site T) received extremely close scores from LO/S, suggesting the corridor should be considered as a whole, rather than through piecemeal spot improvements. A “quick win” to remove/replace shrubbery would likely provide an immediate benefit.

8. RECOMMENDATIONS

The Frankfort SUA Study resulted in a range of conceptual improvements recommended for future implementation. These focus on areas with existing safety concerns, recurring congestion issues,

and other geometric deficiencies identified by the project team and through LO/S input. The following subsections summarize results of the prioritization process, which incorporates traffic operations, safety considerations, project team input, qualitative cost/benefits, and other factors beyond LO/S scores. It should be noted that Site Q was not recommended to advance and is not discussed in this chapter.

Cost estimates were developed for each concept based on planning-level quantities for pavement, structures, earthwork, etc. KYTC District 5 staff provided right-of-way and utility estimates. For projects already identified in a PIF/CHAF or other planning effort, previous cost estimates were adjusted to current year dollars using KYTC's 2017 construction cost index, inflated to 2018 and rounded. Cost estimates are summarized in **Table 7** and in the individual project sheets that follow.

Six improvement concepts identified as high priorities for implementation are shown in **Figure 27**.

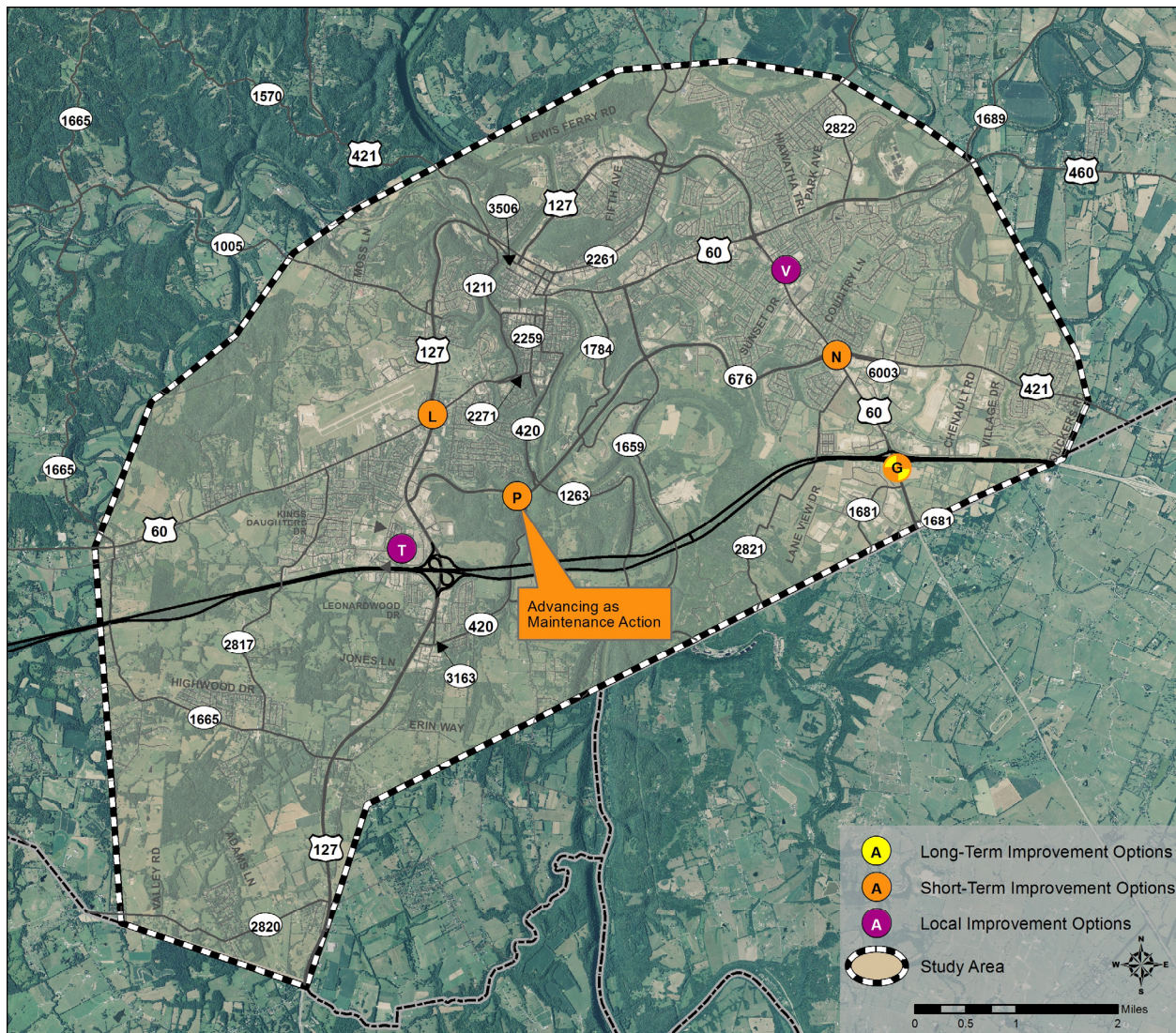


Figure 27: High Priority Improvement Recommendations

Twelve improvement concepts identified as medium priorities for implementation are shown in **Figure 28**. Plan sheets from the 2014 *US 60 Versailles Road Traffic Study* corresponding to Sites B–F are in **Appendix H**.

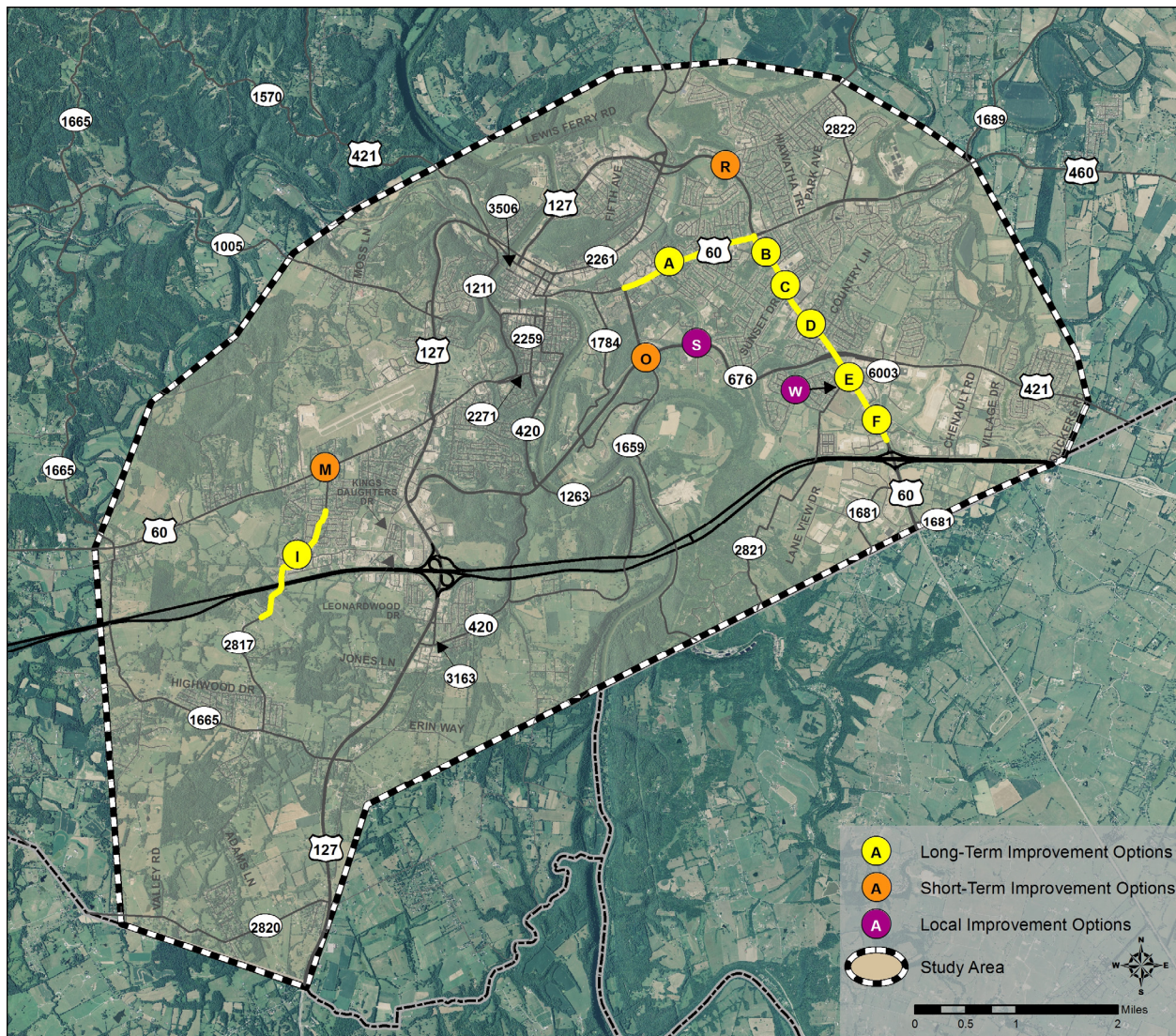


Figure 28: Medium Priority Improvement Recommendations

Four improvement concepts identified as low priorities for implementation are shown in **Figure 29**.

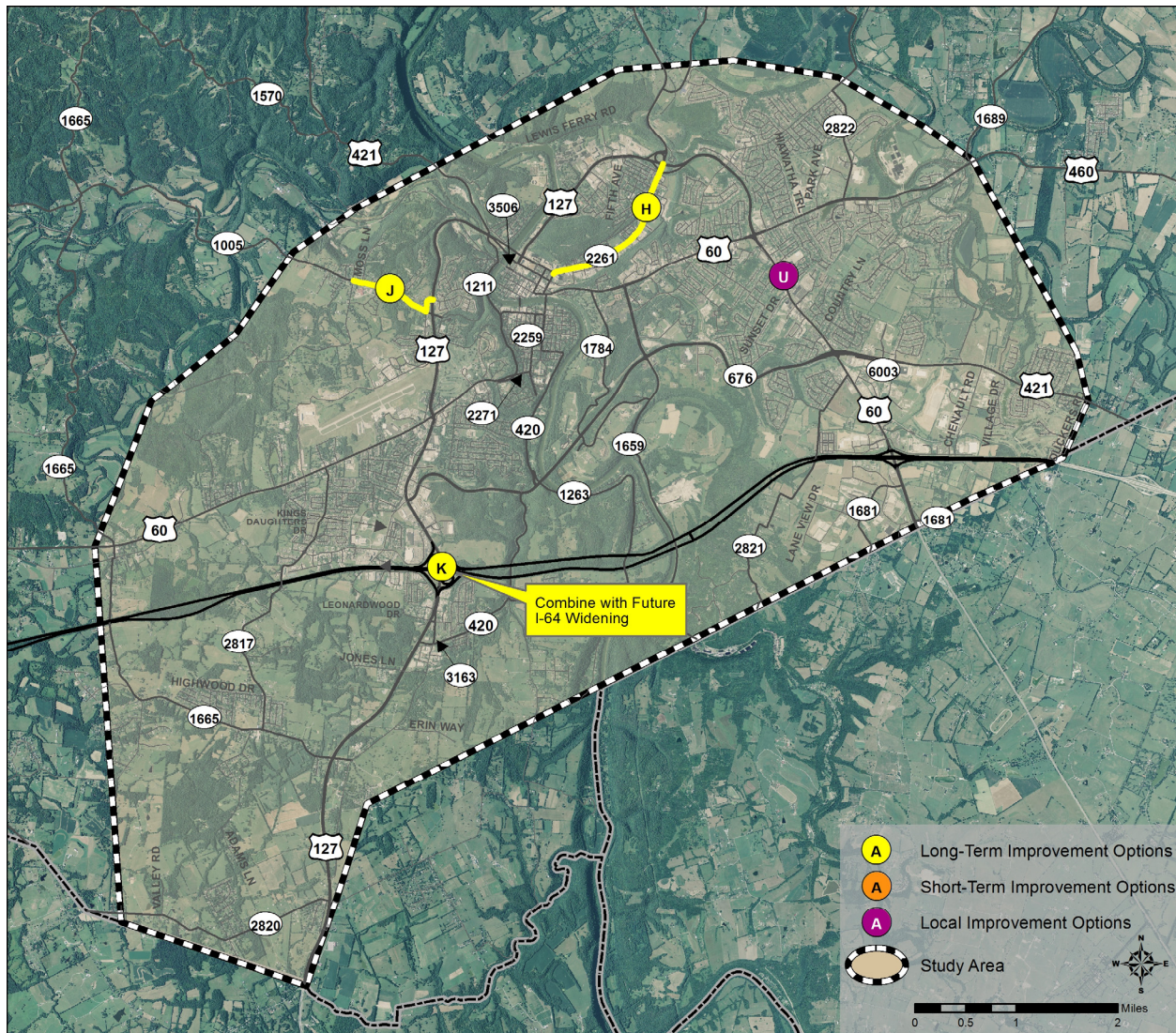


Figure 29: Low Priority Improvement Recommendations

Project sheets with detailed information for each individual site follow. Note: Cost for project phases Design, Right-of-Way, Utilities, and Construction are identified on each project sheet as "D," "R," "U," and "C," respectively.

Table 7: Improvement Concept Recommendations and Cost Estimates

Site	Route	Begin MP	End MP	Description	Priority	Rounded Cost Estimates (2018 \$\$)				
						Design	Right-of-Way	Utilities	Construction	Project Total
A	US 60 East Main Street	KY 1659 Martin Luther King Jr Boulevard (MP 9.338)	US 421 Wilkinson Boulevard (MP 10.667)	Study feasibility of road diet, to incorporate access management principles	Medium	x	x	x	x	\$250,000- \$500,000 (Planning)
B	US 60 Versailles Road	US 460 East Main Street (MP 10.667)	CS-1154 Lyons Drive (MP 11.163)	Access Management plus Pedestrian Improvements	Medium	\$150,000	\$470,000	\$79,000	\$1,900,000	\$2,600,000
C	US 60 Versailles Road	CS-1154 Lyons Drive (MP 11.163)	Brighton Park (MP 11.500)	Access Management plus Pedestrian Improvements	Medium	\$96,000	\$150,000	\$30,000	\$1,300,000	\$1,600,000
D	US 60 Versailles Road	Brighton Park (MP 11.500)	KY 676 East-West Connector (MP 12.119)	Access Management	Medium	\$170,000	\$690,000	\$68,000	\$2,300,000	\$3,200,000
E	US 60 Versailles Road	KY 676 East-West Connector (MP 12.119)	Capitol Center Drive (Approx. MP 12.725)	Access Management	Medium	\$140,000	\$262,000	\$55,000	\$2,000,000	\$2,500,000
F	US 60 Versailles Road	Capitol Center Drive (Approx. MP 12.725)	Jett Boulevard (MP 13.130)	Access Management	Medium	\$96,000	\$175,000	\$36,000	\$1,400,000	\$1,700,000
G	US 60 Versailles Road	Jett Boulevard (MP 13.130)	KY 1681 Duncan Road (MP 13.599)	G1 – Reconstruct as Diverging Diamond Interchange	High	\$600,000	\$100,000	\$900,000	\$6,000,000	\$7,600,000
G				G2 – Extend US 60 left turn lanes (side-by-side vs end-to-end)		\$50,000	\$0	\$750,000	\$550,000	\$1,400,000
G				G3 – Dual US 60 left turn lanes		\$84,000	\$0	\$750,000	\$840,000	\$1,700,000
H	KY 2261 Holmes Street	KY 420 Mero Street (MP 0.162)	US 421 Wilkinson Boulevard (MP 1.832)	Corridor improvements, scope to be determined based on further study by city	Low	\$500,000 – \$1,300,000	\$0 – \$4,900,000	\$0 – \$3,600,000	\$5,000,000 – \$8,200,000	\$5,500,000 – \$18,000,000
I	KY 2817 Cardwell Lane	South of I-64 (Approx. MP 1.3)	Heritage Subdivision (Approx. MP 2.6)	I1 – Realign curve MP 1.4	Medium	\$6,000	\$100,000	\$450,000	\$60,000	\$620,000
				I2 – Realign curve MP 1.6		\$4,000	\$50,000	\$105,000	\$40,000	\$200,000
				I3 – Realign curve MP 1.9		\$20,000	\$50,000	\$105,000	\$200,000	\$380,000
				I4 – Flatten hill		\$120,000	\$300,000	\$100,000	\$1,200,000	\$1,700,000
J	KY 1005 Devils Hollow Road	Pea Ridge Road (MP 6.508)	US 127 Wilkinson Boulevard (MP 7.450)	Widen to three lanes and correct substandard geometry	Low	\$1,200,000	\$2,000,000	\$1,400,000	\$7,200,000	\$12,000,000
K	US 127 Lawrenceburg Road	I-64 Ramps (Approx. MP 4.400-4.500)		Extend SB left turn lane	Low	\$37,000	\$0	\$0	\$370,000	\$410,000
L	US 127 Lawrenceburg Road at US 60 Louisville Road	US 127 Approx. MP 6.050-6.100		L1 – Extend NB right turn lane on US 127	High	\$10,000	\$30,000	\$75,000	\$97,000	\$210,000
		US 60 Approx. MP 6.300-6.305		L2 – Coordinated signalhead for EB right on US 60		\$21,000	\$100,000	\$260,000	\$230,000	\$610,000
M	US 60 Louisville Road at KY 2817 Cardwell Lane	US 60 Approx. MP 5.170-5.174		M1 – Signal improvements	Medium	\$1,000	\$0	\$0	\$14,000	\$15,000
	US 60 Louisville Road at Meadowview Lane	US 60 Approx. MP 5.618-5.622		M2 – Signal improvements		\$1,000	\$0	\$0	\$14,000	\$15,000
N	KY 676 East-West Connector at US 60 Versailles Road	KY 676 Ramp Approx. MP 0.000-0.300		Extend EB ramp to US 60, stripe for two lanes and coordinate signalhead for EB right turns	High	\$160,000	\$150,000	\$100,000	\$1,600,000	\$2,000,000

Site	Route	Begin MP	End MP	Description	Priority	Rounded Cost Estimates (2018 \$s)				
						Design	Right-of-Way	Utilities	Construction	Project Total
O	KY 1659 Martin Luther King Jr Boulevard at KY 676 East-West Connector	KY 1659 Approx. MP 3.356-3.500		Improve signage; extend SB left turn storage; retime signal	Medium	\$19,000	\$0	\$0	\$190,000	\$210,000
P	KY 420 Old Lawrenceburg Road at KY 676 East-West Connector	KY 420 Approx. MP 2.100-2.145		Improve Signage	High	\$0	\$0	\$0	\$1,100	\$1,100
R	US 421 Wilkinson Boulevard at Schenkel Lane	US 421 Approx. MP 3.860-4.150		Install advance warning signage on US 421; High Visibility backplates	Medium	\$7,200	\$0	\$0	\$72,000	\$79,000
S	New Route	Sower Boulevard	N/A	Construct new route between Sower Blvd and KY 1659 Glenns Creek Rd	Medium	\$250,000	\$500,000	\$450,000	\$2,500,000	\$3,700,000
T	CS-1569 Leonardwood Drive	CS-1419 Kings Daughters Drive (MP 0.000)	US 127 Lawrenceburg Road (MP 0.801)	T1 – Relocate shrubbery, entire length	High	\$0	\$0	\$0	\$85,000	\$85,000
				T2 – Extend outbound right turn lane to US 127		\$11,000	\$30,000	\$460,000	\$110,000	\$610,000
				T3 – Extend second inbound lane from US 127		\$11,000	\$30,000	\$460,000	\$110,000	\$610,000
				T4 – Intersection improvement at northern Walmart entrance		\$8,000	\$75,000	\$70,000	\$80,000	\$230,000
				T5 – Intersection improvement at middle Walmart entrance		\$6,000	\$50,000	\$40,000	\$64,000	\$160,000
U	New Route	Forest Hill Drive	N/A	Construct new route between Eastwood Shopping Center and Forest Hill	Low	\$16,000	\$421,000	\$0	\$150,000	\$590,000
V	Sunset Drive Extension	US 60	N/A	Extend Sunset Drive (McDonalds) to Brighton Park Shopping Center (Kroger East)	High	\$18,000	\$520,000	\$70,000	\$160,000	\$770,000
W	KY 2821 Hanly Lane Extension	Bob Allen Chrysler (Approx. MP 2.81)	N/A	Realign Hanly Lane and extend to Locust Drive	Medium	\$55,000	\$610,000	\$58,000	\$520,000	\$1,200,000

Notes: Sites categorized by Long-Term (yellow), Short-Term (orange), and local (purple) as shown in left column. Throughout, N/A indicates Not Applicable.

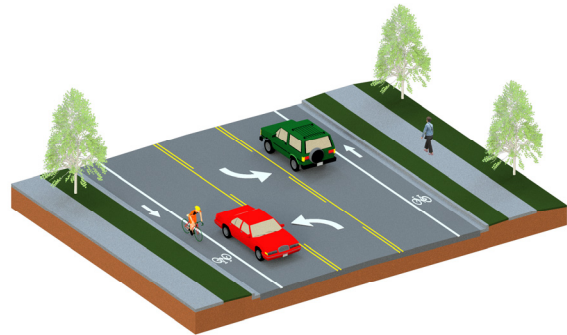
A Long-Term	LOCATION	PROJECT PRIORITY
	US 60 East Main Street KY 1659 MLK Jr Blvd to US 421 Wilkinson Blvd (MP 9.338-10.667)	Medium
	Description Feasibility Study to Implement Road Diet incorporating Access Management Principles	Cost Estimate: D N/A R N/A U N/A C N/A Total \$250k-500k (Planning)

Identified Needs:

- Four-lane highway with numerous cross streets and driveways.
- 2018 ADT: 15,710 to 21,300 vpd; segments operating at LOS B-C.
- 2040 ADT: 15,710 to 21,600 vpd; segments operating at LOS B-C.
- 157 crashes (0 fatal, 20 injury) in three years; 2 high CCRF segments and 3 high CCRF spots.
- High turn volumes with no left turn storage leads to turbulent flow with concentrations of rear ends and same direction sideswipes.
- Concept has been discussed for some time but no in-depth feasibility study has been completed.

Proposed Improvement: Based on ADT, East Main Street is at the upper threshold for a road diet; the concept is worth an in-depth study, including microsimulation, to understand operational impacts. The study should also examine measures to incorporate access management principles. Depending on the directional split during peak hours, the study should also consider a reversible lane configuration.

The addition of bike lanes was rated a medium priority in the 2017 *Joint Bike/Ped Master Plan*. Narrow sidewalks exist on both sides of the street. Environmentally, the corridor includes numerous hazardous materials/UST sites and provides access to potential environmental justice populations.



Example typical section for road diet (top). Representative views along US 60 (East Main Street), facing east (bottom left) and west (bottom right).

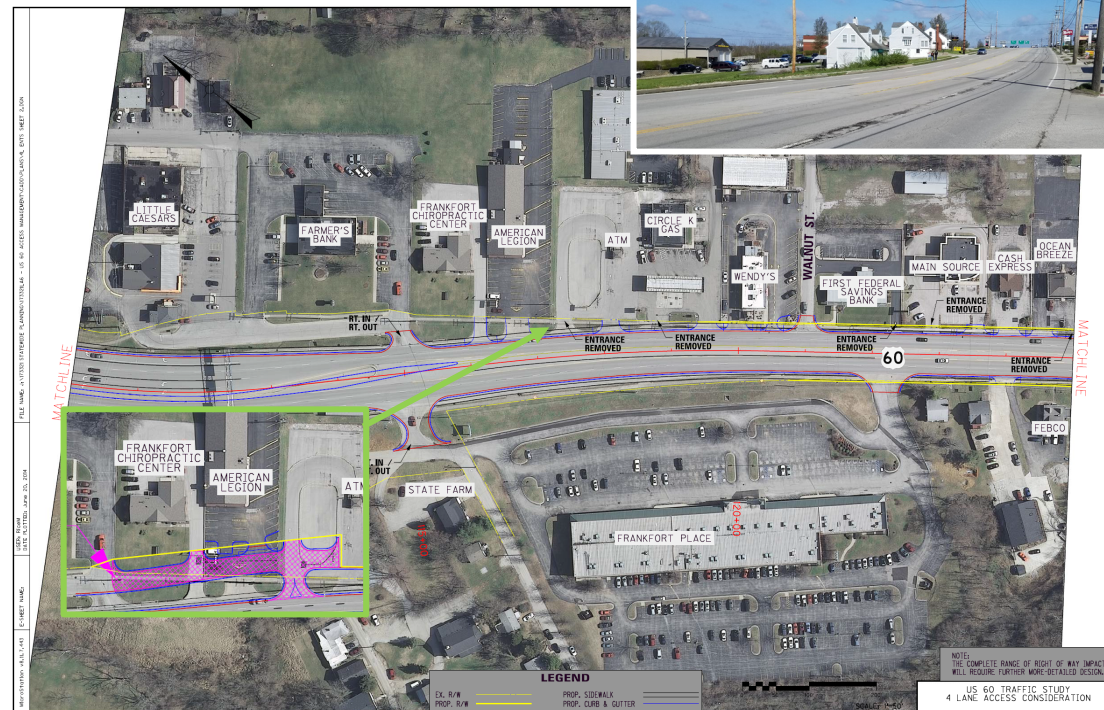
B Long-Term	LOCATION	PROJECT PRIORITY
	US 60 Versailles Road US 460 East Main St to CS-1154 Lyons Dr (MP 10.667-11.163)	Medium
	Description Incorporate Access Management Principles and Pedestrian Safety Measures	Cost Estimate: D \$150k R \$470k U \$79k C \$1.9M Total \$2.6M <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Five-lane highway with numerous cross streets and driveways.
- 2018 ADT: 31,210 vpd; segments operating at LOS C.
- 2040 ADT: 31,210 vpd; segments operating at LOS C (no change).
- 77 crashes (1 fatal, 5 injury) in three years; 2 high CCRF spots.
- Stop-and-go traffic during peak hour commuter flows with high turn volumes.
- Several pedestrian strikes reported along corridor: few pedestrian crossings available.

Proposed Improvement: The improvement incorporates access management principles, as shown in the 2014 *US 60 Traffic Study*. Option 1 (extend frontage road) is also included. A 2015 *Pedestrian Safety Audit* recommended high visibility signal backplates, upgraded crosswalks, improved pedestrian signals, and two pedestrian refuge islands in this section.

Environmentally, the corridor includes numerous hazardous materials/UST sites and provides access to potential environmental justice populations.



View west along US 60 Versailles Road (top). Representative plan view from 2014 study (bottom), incorporating Option 1.

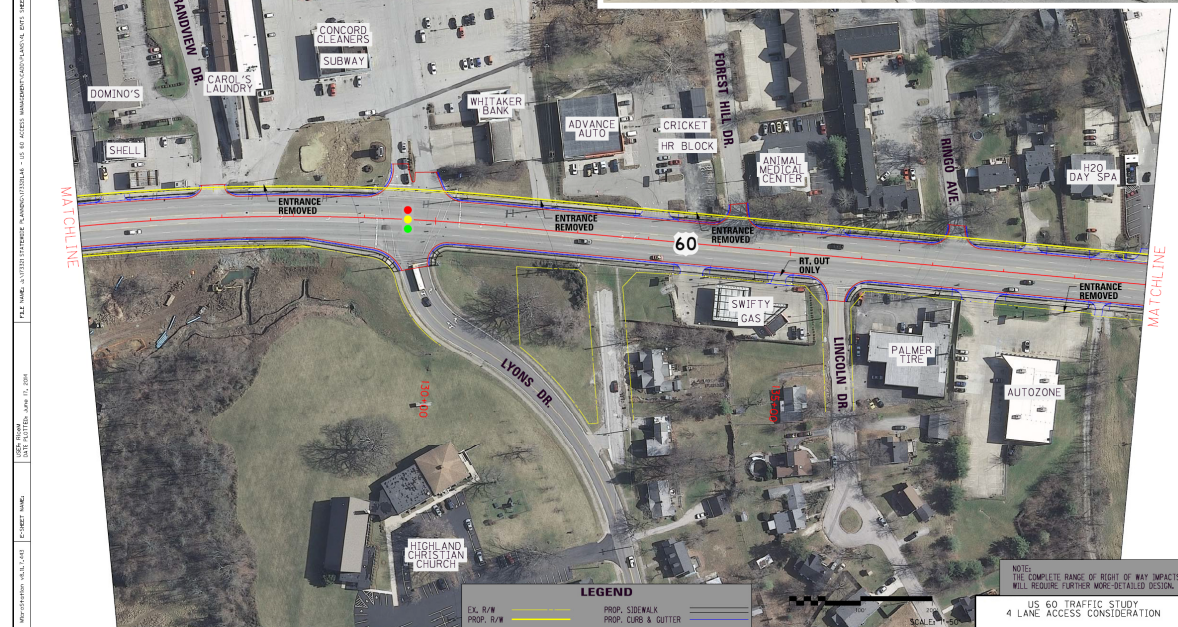
C Long-Term	LOCATION	PROJECT PRIORITY
	US 60 Versailles Road CS-1154 Lyons Dr to Brighton Park Blvd (MP 11.163-11.500)	Medium Cost Estimate: D \$96k R \$150k U \$30k C \$1.3M Total \$1.6M <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Five-lane highway with numerous cross streets and driveways.
- 2018 ADT: 28,800 vpd; segments operating at LOS C.
- 2040 ADT: 29,600 vpd; segments operating at LOS C.
- 130 crashes (1 fatal, 18 injury) in three years; 4 high CCRF spots.
- Stop-and-go traffic during peak hour commuter flows with high turn volumes.
- Several pedestrian strikes reported along corridor: few pedestrian crossings available.

Proposed Improvement: The improvement incorporates access management principles, as shown in the 2014 *US 60 Traffic Study*. A 2015 *Pedestrian Safety Audit* recommended high visibility signal backplates, upgraded crosswalks, improved pedestrian signals, and a pedestrian refuge island in this section.

Environmentally, the corridor includes numerous hazardous materials/UST sites.



View north along US 60 Versailles Rd (top). Representative plan view from 2014 study (bottom).

D Long-Term	LOCATION US 60 Versailles Road Brighton Park to KY 676 East-West Connector (MP 11.500-12.119)	PROJECT PRIORITY Medium
	Description Incorporate Access Management Principles	Cost Estimate: D \$170k R \$690k U \$68k C \$2.3M Total \$3.2M <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Five-lane highway with numerous cross streets and driveways.
- 2018 ADT: 28,800 vpd; segments operating at LOS C.
- 2040 ADT: 29,600 vpd; segments operating at LOS C.
- 113 crashes (1 fatal, 13 injury) in three years; 2 high CCRF spots.
- Stop-and-go traffic during peak hour commuter flows with high turn volumes.

Proposed Improvement: The improvement incorporates access management principles, as shown in the 2014 *US 60 Traffic Study*. Options 5 (consolidation of Teachers Retirement driveways) and 6 (construct backage lane to Country Lane) are also included. Environmentally, the corridor includes numerous hazardous materials/UST sites.



E Long-Term	LOCATION	PROJECT PRIORITY
	US 60 Versailles Road KY 676 East-West Connector to Capitol Ctr Dr (MP 12.119 – approx. 12.725)	Medium
	Description Incorporate Access Management Principles	Cost Estimate: D \$140k R \$260k U \$55k C \$2.0M Total \$2.5M <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Five lane highway with numerous cross streets and driveways.
- 2018 ADT: 30,680 vpd; segments operating at LOS C.
- 2040 ADT: 31,400 vpd; segments operating at LOS C.
- 74 crashes (0 fatal, 7 injury) in three years; one high CCRF spot.
- Stop-and-go traffic during peak hour commuter flows with high turn volumes.

Proposed Improvement: The improvement incorporates access management principles, as shown in the 2014 *US 60 Traffic Study*. Environmentally, the corridor includes numerous hazardous materials/UST sites.



View north along US 60 (top). Representative plan view from 2014 study (bottom).

F Long-Term	LOCATION	PROJECT PRIORITY
	US 60 Versailles Road Capitol Center Dr to Jett Blvd (Approx. MP 12.725 – MP 13.130)	Medium Cost Estimate: D \$96k R \$175k U \$36k C \$1.4M Total \$1.7M <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Five-lane highway with numerous cross streets and driveways.
- 2018 ADT: 30,680 vpd; segments operating at LOS C.
- 2040 ADT: 31,400 vpd; segments operating at LOS C.
- 44 crashes (0 fatal, 2 injury) in three years; one high CCRF spot.
- Stop-and-go traffic during peak hour commuter flows with high turn volumes.

Proposed Improvement: The improvement incorporates access management principles, as shown in the 2014 *US 60 Traffic Study*. Environmentally, the corridor includes numerous hazardous materials/UST sites, and a conservation easement lies just to the south.



Representative plan view from 2014 study.

G Long-Term	LOCATION US 60 Versailles Road Jett Blvd to KY 1681 Duncan Rd (MP 13.130-13.599)	PROJECT PRIORITY High
	Description Reconstruct Interchange as Diverging Diamond (Option G1)	Cost Estimate (G1): D \$600k R \$100k U \$900k C \$6.0M Total \$7.6M <i>Costs based on similar projects.</i>

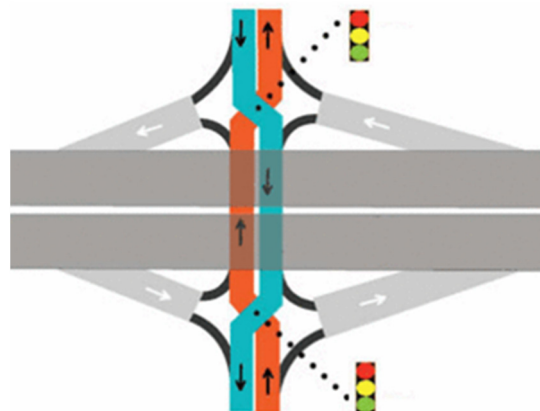
Identified Needs:





- Stop-and-go commuter traffic during peak hour, with high left turn volumes accessing I-64, leads to queue spillbacks that disrupt through movements at adjacent signalized intersections.
- 2018 ADT: 28,090-30,680 vpd; segments operating at LOS B-C.
- 2040 ADT: 28,090-31,400 vpd; segments operating at LOS B-C.
- 129 crashes (0 fatal, 21 injury) in three years: 2 high CCRF segments and 4 high CCRF spots.

Proposed Improvement: Long-term Option G1 reconstructs the interchange as a Diverging Diamond, similar to the New Circle Road / Harrodsburg Road interchange in Lexington. This requires coordination with FHWA. Preliminary analysis suggests the interchange would operate at LOS C overall.



View north along US 60 at I-64 interchange during PM peak hour (top left); queueing for left turns to ramp (top right); sketch of diverging diamond layout (bottom).



G Short-Term	LOCATION US 60 Versailles Road Jett Blvd to KY 1681 Duncan Rd (MP 13.130-13.599)	PROJECT PRIORITY High
	Description Improve Interchange with I-64 G2: Extend left turn lanes G3: Dual left turn lanes	Cost Estimate (G2 G3): D \$50k \$84k R \$0 \$0 U \$750k \$750k C \$550k \$840k Total \$1.4M \$1.7M <i>Costs based on per mile.</i>
Identified Needs: <ul style="list-style-type: none"> Stop-and-go commuter traffic during peak hour, with high left turn volumes accessing I-64, leads to queue spillbacks that disrupt through movements at adjacent signalized intersections. 2018 ADT: 28,090-30,680 vpd; segments operating at LOS B-C. 2040 ADT: 28,090-31,400 vpd; segments operating at LOS B-C. 129 crashes (0 fatal, 21 injury) in three years: 2 high CCRF segments and 4 high CCRF spots. <p>Proposed Improvement: Two short-term improvements were considered. Option G2 adds a lane along US 60 between the ramp terminals to effectively double the length of the left turn lanes, to run side-by-side instead of end-to-end. Option G3 creates dual left turn lanes to both on-ramps to improve signal timing options. Options G2 and G3 improve operations but neither fully covers peak queue lengths.</p>		
<div>  <p>View north along US 60 at I-64 interchange during PM peak hour (top left); queueing for left turns to ramp (top right); sketches of each option (bottom).</p> <div> <div> <p>Today</p>  </div> <div> <p>G2</p>  <p>Add lane</p> </div> <div> <p>G3</p>  <p>Add lane</p> </div> </div> </div>		

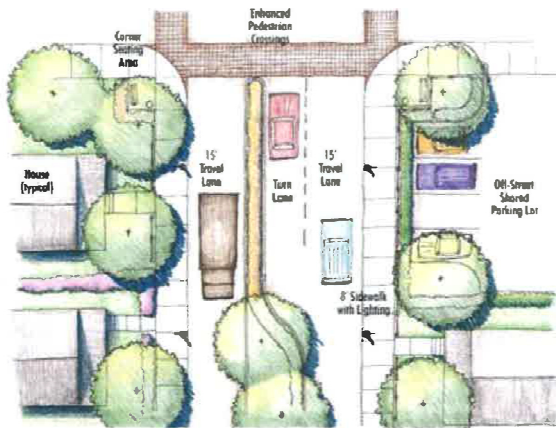
H Long-Term	LOCATION	PROJECT PRIORITY
	KY 2261 Holmes Street KY 420 Mero St to US 421 Wilkinson Blvd (MP 0.162-1.832)	Low Cost Estimate: D \$500k - \$1.3M R \$0 - \$4.9M U \$0 - \$3.6M C \$5.0 - \$8.2M Total \$5.5 - \$18.0M <i>Max costs provided by design consultant.</i>

Identified Needs:

- Two-lane highway with numerous cross streets and driveways; also serves as backdoor connection to downtown.
- 2018 ADT: 6,180 vpd; segments operating at LOS A-C.
- 2040 ADT: 6,180 vpd; segments operating at LOS A-C (no change).
- 51 crashes (0 fatal, 7 injury) in three years, no high CCRF spots.

Proposed Improvement: There has been local interest in large-scale redevelopment along the corridor for many years. A *Redevelopment Master Plan* published in 2007 included concepts for reconfiguration of the roadway and sidewalks along the corridor with use of a complete street concept to accommodate vehicles, pedestrians and bicyclists. The initial recommended roadway section has two 15-foot travel lanes with a 15-foot planted median, turn lanes, and 8-foot multi-use paths on both sides. A range of costs is presented, from minimal pedestrian/streetscaping elements on existing right-of-way to the three-lane reconstruction from the Master Plan. The city submitted a federal grant application in 2018 seeking \$770,000 for additional corridor planning intended to update and refine earlier work.

Environmentally, the corridor includes numerous hazardous materials/UST sites, and provides access to Fort Hill park and environmental justice populations.



Sketch of initial alternative design elements from Master Plan (left). Representative view along Holmes Street (right).

I Long-Term	LOCATION	PROJECT PRIORITY
	KY 2817 Cardwell Lane South of I-64 to Heritage Subdivision (Approx. MP 1.3-2.6)	Medium
	Description Correct four horizontal and vertical curves I1: Realign curve at MP 1.4 I2: Realign curve at MP 1.6 I3: Realign curve at MP 1.9 I4: Cut hill at MP 2.35-2.60	Cost Estimate (total): D \$150k R \$500k U \$760k C \$1.5M Total \$2.9M <i>Costs based on per-mile factors.</i>

Identified Needs:


- Two lane rural highway with narrow lanes and numerous substandard curves, which serves as an unofficial cut-through when US 127 is congested.
- 2018 ADT: 2,540-3,850 vpd; segments operating at LOS C.
- 2040 ADT: 2,540-3,850 vpd; segments operating at LOS C (no change).
- 14 crashes (0 fatal, 1 injury) in three years, no high CCRF spots.

Proposed Improvement: Four individual spot improvements fall within this roadway segment. Realign three horizontal curves near the I-64 overpasses and correct the vertical curve just north of the Heritage subdivision to improve sight distance.

Environmentally, I2 is adjacent to a known sinkhole but few other sensitive resources are identified in the immediate vicinity. I4 requires closing the road over the summer; a detour exists but will impact nearby residents.

Proposed curve improvements to satisfy 35 mph design speed (top right). View of a hill at I4 north from Heritage subdivision entrance (bottom left). View along curve at I2 (bottom right).



J Long-Term	LOCATION KY 1005 Devils Hollow Road Pea Ridge Rd to US 127 Wilkinson Blvd (MP 6.508-7.450)	PROJECT PRIORITY Low
	Description Widen to Three Lanes and Correct Substandard Geometry	Cost Estimate: D \$1.2M R \$2.0M U \$1.4M C \$7.2M Total \$12.0M <i>Costs based on PIF.</i>
Identified Needs: <ul style="list-style-type: none"> Two-lane rural highway with narrow lanes and numerous substandard horizontal and vertical curves, providing access to a relatively new elementary school. 2018 ADT: 3,520 vpd; segments operating at LOS C. 2040 ADT: 3,600 vpd; segments operating at LOS C. 10 crashes (0 fatal, 1 injury) in three years, no high CCRF spots. <p>Proposed Improvement: The project reconstructs about a mile of KY 1005 to satisfy common geometric practices. Environmentally, the route provides access to numerous homes, a church, a former gas station, and a school.</p>		
 <p>Representative views along Devils Hollow Road.</p>		

K Long-Term	LOCATION US 127 Lawrenceburg Road near I-64 Interchange (MP 4.400-4.500)	PROJECT PRIORITY Low
	Description Extend SB left turn lane	Cost Estimate: D \$37k R \$0 U \$0 C \$370k Total \$410k <i>Costs based on planning-level units.</i>

Identified Needs:

- The WB-to-SB ramp merge area ends at roughly the same position where the SB-to-EB left turn lane begins.
- SB left turn traffic to I-64 EB backs up during the PM peak hour, leading to turbulent flow for SB through traffic, complicated by loop ramp merge area.
- 12 SB crashes (0 fatal, 3 injury) between WB-to-SB loop ramp and end of EB-to-SB merge area in three years. No high CCRF spots.
- Minimal growth for 2040 scenario: DHV movements all within ± 20 vehicles per hour.

Proposed Improvement: The improvement removes a portion of the raised median on the bridge to extend the SB turn lane. The separation of the WB-to-SB loop ramp merge area and SB-to-EB turn lane decision points would improve traffic flow and safety.

Due to structural constraints, this project should be considered as part of the future I-64 widening effort.



2018 AM (PM) Design Hour Volumes (above), and PM peak queue for SB left to I-64 EB (left).



L Short-Term	LOCATION	PROJECT PRIORITY
	US 127 Lawrenceburg Road (MP 6.050-6.100) at US 60 Louisville Road (MP 6.300-6.305)	High
	Description L1: Extend NB right turn lane L2: Add signalhead for EB right lane with queue storage on US 60	Cost Estimate (L1 L2): D \$10k \$21k R \$30k \$100k U \$75k \$260k C \$97k \$230k Total \$210k \$610k <i>Costs based on planning-level units.</i>

Identified Needs:

- 69 crashes (0 fatal, 5 injury) within 300 feet of intersection in three years: 2 high CCRF spots.
- Majority of crashes are rear end collisions (66%). 11 crashes involve EB right turn from US 60 to SB US 127, which has channelized movement that creates an awkward angle for drivers to see oncoming SB traffic. No merge area is provided. 4 additional crashes at adjacent Speedway driveway(s), immediately to the south.
- Relatively high ADT volumes, especially for southern approach; segments operating at LOS A-C.

Proposed Improvement: Spot L1 extends the northbound right turn lane. Spot L2 improvements include several components:

- Add a coordinated signalhead for the channelized eastbound right turn lane, along with a turn lane for queue storage along the eastbound approach for this movement.
- Potentially, driveways to Speedway would change as well, to reduce the number of access points but maintain access to the business.

Environmental impacts with hazmat/UST locations and utilities could occur.



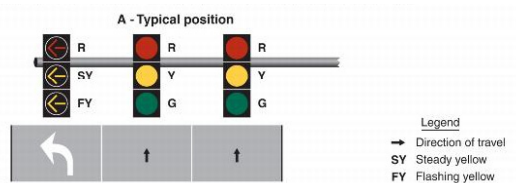
View east towards intersection (left). Existing and future ADT (right).

M Short-Term	LOCATION US 60 Louisville Road (MP 5.170-5.622)	PROJECT PRIORITY Medium
	Description Add signalheads for turn lane, potentially with left turn phase M1: at KY 2817 Cardwell Lane (MP 3.074) M2: at Meadowview Lane	Cost Estimate (total): D \$2k R \$0 U \$0 C \$28k Total \$30k <i>Costs based on planning-level units.</i>

Identified Needs:

- Neither intersection has a dedicated signalhead for the left turn lane.
- M1: 8 crashes (0 fatal, 2 injury) at Cardwell Lane intersection, with 63% representing turning movements to/from minor cross street
- M2: 18 crashes (0 fatal, 5 injury) at Meadowview Lane intersection, with 33% representing turning movements to/from minor cross street

Proposed Improvement: The improvement adds a signalhead for each direction of the US 60 center turn lane at both intersections. Additional count information is needed to determine if a permitted or protected left turn phase is warranted. A spot count in August 2018 showed 90 WB left turns to Cardwell Lane during 30 minutes in the PM peak hour.



View west along US 60 at Cardwell Lane (top); June 2017 collision (bottom left); MUTCD schematic (bottom right).

N Short-Term	LOCATION KY 676 E-W Connector Ramp to US 60 Versailles Road (MP 0.000-0.300)	PROJECT PRIORITY High
	Description Extend and widen KY 676 East-West Connector EB off-ramp to US 60 Add EB right signal	Cost Estimate: D \$160k R \$150k U \$100k C \$1.6M Total \$2.0M <i>Costs based on planning-level units.</i>

Identified Needs:

- High PM peak hour turning volumes utilize EB ramp, which has increased due to the new office complexes along Sower Boulevard.
- Traffic counts show 320 EB left + 600 EB right turns use the ramp in the 2018 PM design hour, which operates at LOS E with lengthy queues. Overall, the intersection operates at LOS D during PM peak.
- Resurfaced in the summer of 2018, the ramp today is striped for a single lane but functions as two lanes during peak commuter hours.
- 35 crashes within 300 feet of ramp terminal, includes at least 9 rear end crashes for the EB right movement from KY 676 to US 60.
- The EB right movement is channelized with a stop sign and no merge area.

Proposed Improvement: The improvement extends the KY 676 EB off-ramp to US 60, to begin the taper just east of the railroad bridge, stripe the ramp for two lanes, and add a coordinated signal for right turns. The addition of a merge area along US 60 to receive right turning vehicles would be costly due to the proximity to the US 60 bridge over the railroad tracks. Therefore, this element is not included in the concept or cost estimate above.



Concept sketch to extend EB ramp to US 60, adding striping to distinguish lanes.

<div style="text-align: center;"> O Short-Term </div>	LOCATION KY 1659 Martin Luther King Jr Boulevard at KY 676 East-West Connector (KY 1659 MP 3.356-3.500)	PROJECT PRIORITY Medium
	Description Add signage for SB right turn Extend SB left turn storage	Cost Estimate: D \$19k R \$0 U \$0 C \$190k Total \$210k <i>Costs based on planning-level units.</i>

Identified Needs:

- SB right turn movement onto KY 676 is channelized with 300+ feet of merge area.
- KY 676 is a high speed, limited access connector route with widely spaced signals.
- One high CCRF spot identified at this location (KY 676 MP 3.1-3.2). Of 24 crashes (0 fatal, 3 injury) within the spot, 14 represent rear ends with 21% associated with the SB right turn movement.
- No signage alerts motorists of upcoming merge.
- All segments operate at LOS A-B; no growth projected by 2040.

Proposed Improvement: The improvement adds warning signage for the SB right turn movement prior to the curve to encourage motorists to continue to turn rather than stop mid-movement. Cut back the raised median on the SB approach to extend the left turn bay approximately 200 feet. During future design stages, consider incorporating positive separation to visually delineate the merge area.



View south at KY 676 intersection with KY 1659, highlighting ADTs and proposed improvements.

P Short-Term Maintenance	LOCATION	PROJECT PRIORITY
	KY 420 Old Lawrenceburg Road at KY 676 East-West Connector (KY 420 MP 2.100-2.145)	High Cost Estimate: D \$0 R \$0 U \$0 C \$1.1k Total \$1.1k <i>Costs based on planning-level units.</i>

Identified Needs:

- Winding, narrow road serves as alternate route to bypass congested US 127.
- Overhanging vegetation and closely spaced signs limit advance warning approaching KY 676 intersection, containing a high CCRF spot (CCRF = 1.24, 80% of crashes are rear end collisions for NB right turns to KY 676).
- 2018 ADT: 5,490 vpd, segment operating at LOS D.
- NB queue backs up ~500 feet during AM peak, screened by curve.

Proposed Improvement: The improvement shifts the “Stop Ahead” sign south of the curve to improve visibility. Overgrown vegetation has been addressed as a “quick win” maintenance action.



Representative views along KY 420 approaching KY 676.

R Short-Term	LOCATION US 421 Wilkinson Boulevard at Schenkel Lane (US 421 MP 3.860-4.150)	PROJECT PRIORITY Medium
	Description Install coordinated advance warning signage for SB traffic and backplates for mainline signals	Cost Estimate: D \$7.2k R \$0 U \$0 C \$72k Total \$79k <i>Costs based on planning-level units.</i>

Identified Needs:

- One high CCRF spot identified at this location: of 21 crashes (0 fatal, 5 injury) within the spot, 12 are rear end collisions.
- SB vehicles travel up a hill and around a curve with a rock cut that limits visibility. An offset signal on the far side signal pole exists to provide advance warning.
- Speed limit is 55 mph on Wilkinson Boulevard; however, free flow speed is higher due to limited access highway with widely spaced signals.
- Schenkel Lane serves as cut-through to US 60 East Main Street/downtown.
- 2018 ADT on Wilkinson Blvd: 19,340-20,010 vpd, segments operating at LOS A-B.
- 2040 ADT on Wilkinson Blvd: 20,010-22,400 vpd, segments operating at LOS A-B.
- Latest KYTC traffic counts on Schenkel Lane show 5,100 vpd to west and 8,500 vpd to east.

Proposed Improvement: The improvement installs high visibility backplates for mainline signals and install advance warning signage coming up the hill on the southbound approach, similar to the US 60 corridor signage in Versailles.



View along US 421 SB up hill to intersection with Schenkel Lane (top left); view north at intersection (top right); Example advance warning signs along US 60 in Versailles to "Prepare to Stop when Flashing" (right).

S Local	LOCATION New Route Sower Blvd to KY 1659 Glenns Creek Rd	PROJECT PRIORITY Medium
	Description Construct new connection between Sower Boulevard and Glenns Creek Road	Cost Estimate: D \$250k R \$500k U \$450k C \$2.5M Total \$3.7M <i>Costs based on planning-level units.</i>

Identified Needs:

- KY 676/Sower Blvd intersection operates at LOS E based on existing timing during the PM peak hour. The NB approach (Sower Boulevard) operates at LOS F with queue spillbacks for the NB left turn movement.
- Year 2040 traffic forecast shows 810 vehicles entering Sower Boulevard during AM peak hour versus 790 vehicles exiting Sower Boulevard during PM peak hour. Distribution shows 52–54% of trips travel to/from the west.
- 13 crashes (0 fatal, 3 injury) within 300 feet of intersection in three years, predominantly single vehicle (38%) and rear end collisions (38%).

Proposed Improvement: A 2013 design memo looked at the existing capacity at the Sower Boulevard/KY 676 intersection, specifically related to the construction of two state office buildings totaling 1,650 employees. The memo determined the additional traffic should not exceed the maximum capacity for the intersection or hinder operations on the bypass. It notes that “if after construction of the two proposed office buildings, it is determined that the existing intersection is not performing as well as anticipated, the development of an additional approach connecting Sower Boulevard to KY 676 may need to be designed to relieve some of the traffic.” It examines two conceptual alternatives to provide a four-lane connector to Sower Boulevard, one connecting to KY 676 East-West Connector and the other to KY 1659 Glenns Creek Road. Construction costs range from \$2.0 million to \$4.4 million, with the higher costs associated with substantial excavation to connect to KY 1659.



Connector concepts from the 2013 design memo.

T Local	LOCATION	PROJECT PRIORITY
	CS-1569 Leonardwood Drive CS-1419 Kings Daughters Dr to US 127 Lawrenceburg Rd (MP 0.000-0.801)	High
	Description Reconstruct corridor with intersection improvements Remove shrubbery	Cost Estimate (total): D \$36k R \$185k U \$1.0M C \$450k Total \$1.7M <i>Costs based on planning-level units.</i>

Identified Needs:

- Over its 0.8-mile length, Leonardwood Drive experienced 57 crashes (0 fatal, 8 injury) in three years: it registers as a high CCRF segment (CCRF 1.20) and spot (CCRF 3.9).
- Majority of crashes reported in concentration of commercial driveways (Fazoli's to Steak-n-Shake). A cluster of crashes also occurs at the US 127 intersection. *Note: MP limits in crash reports do not correspond to lat/long coordinates.* Majority of crashes are related to turns to/from driveways (39%) and rear end collisions (32%).
- Corridor has stop-and-go traffic during afternoon/evening with high turn volumes, operating at LOS E during PM peak; also, landscaping limits visibility.
- Dual left turns from NB US 127 funnel to an immediate merge area after turning.

Proposed Improvement: A series of five spot improvements were initially developed, shown below, that form the basis of the cost estimate. Components are to relocate landscaping (T1), extend lanes approaching US 127 (T2 and T3), and improve intersections (T4 and T5). Local input suggests any improvements should be implemented corridor-wide rather than as piecemeal spot improvements. The removal of shrubbery could advance as a "quick win" solution to improve sight distance.

Additional sidewalks are recommended in the 2017 *Joint Bike/Ped Master Plan*.



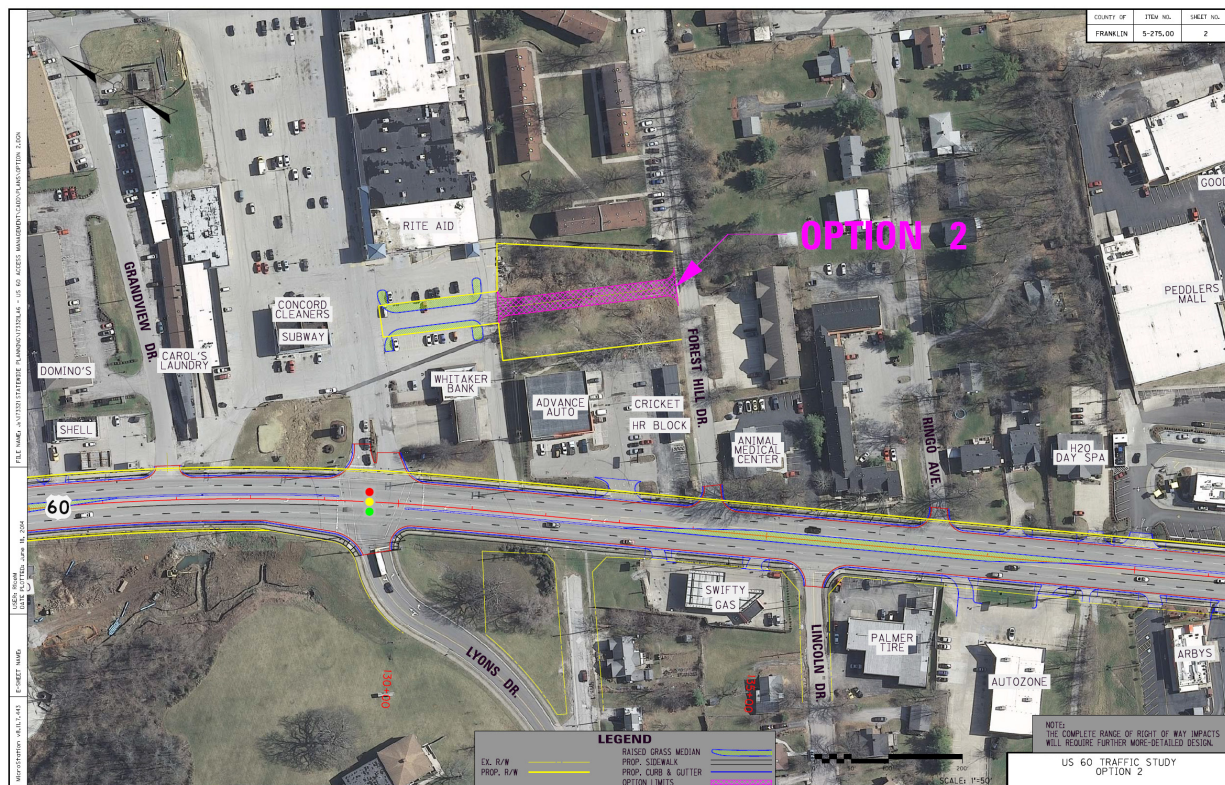
Initial improvement concept (above); view along Leonardwood Drive SB at inbound merge area with landscaping limiting sight distance for turns from cross-streets (right).

U Local	LOCATION	PROJECT PRIORITY
	New Route Forest Hills Dr to Eastwood Shopping Center	Low
	Description Construct new Connection between Eastwood Shopping Center and Forest Hills Drive	Cost Estimate: D \$16k R \$420k U \$0 C \$150k Total \$590k <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Option 2 from 2014 *US 60 Traffic Study* to improve connectivity between developments, rated a medium priority.
- US 60 has stop-and-go traffic during peak hour commuter flows with high turn volumes.
- 27 crashes (1 fatal, 3 injury) within 100 feet of Lyons Drive intersection in three years. Primarily rear end collisions (48%) and those running a red light to collide with turning vehicle (22%).
- 16 crashes (0 fatal, 3 injury) within 100 feet of Forest Hill Drive intersection in three years. Primarily rear end collisions (38%) and motorists pulling out from driveways/cross streets without adequate visibility (38%). Forest Hill provides sole access to apartment complex.

Proposed Improvement: The improvement creates a new connection between Eastwood Shopping Center and Forest Hills Drive.



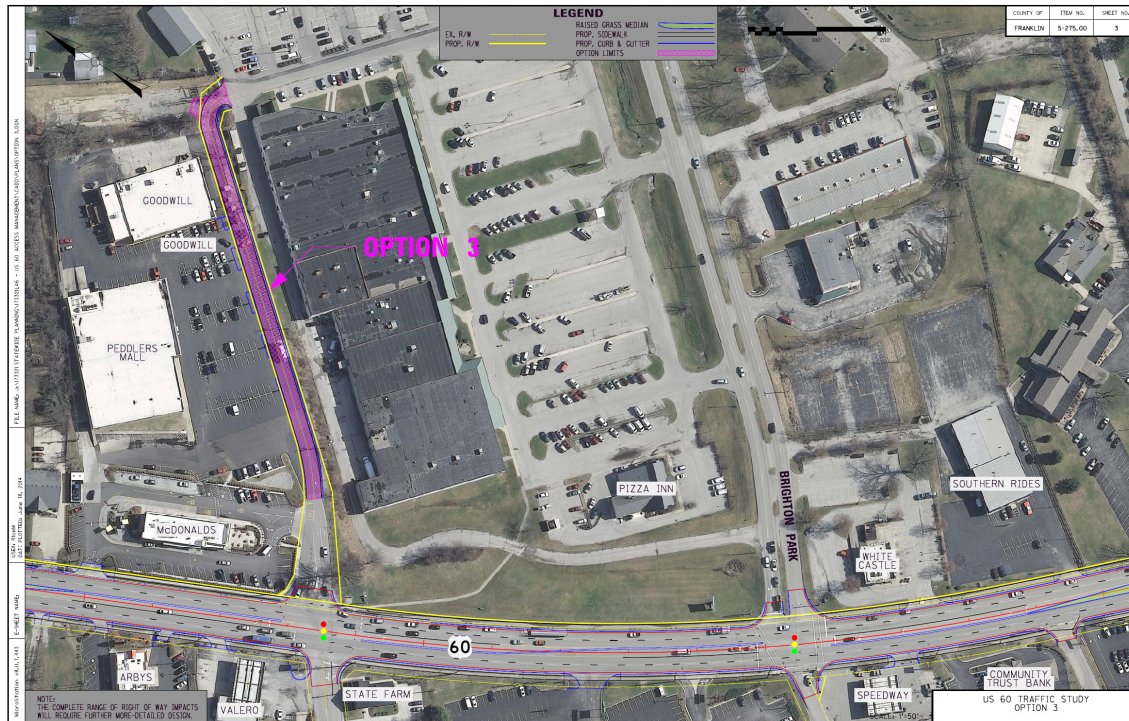
Plan sheet from 2014 study. Note: only purple connector is included in this option, with no change to US 60.

V Local	LOCATION Sunset Drive Extension US 60 to Brighton Park Boulevard	PROJECT PRIORITY High
	Description Construct connection between Brighton Park Shopping Center and Sunset Drive	Cost Estimate: D \$18k R \$520k U \$70k C \$160k Total \$770k <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Option 3 from 2014 *US 60 Traffic Study* to improve connectivity between developments, rated a high priority.
- US 60 exhibits stop-and-go traffic during peak commuter flows with high turn volumes.
- 38 crashes (0 fatal, 8 injury) within 300 feet of Sunset Drive intersection (McDonalds) in three years, primarily rear end collisions (39%) and pulling out from driveways/cross streets (34%).
- 63 crashes (0 fatal, 8 injury) within 300 feet of Brighton Park / Laramie intersection (Krogers) in three years, primarily rear end collisions (44%) and pulling out from cross streets (43%).
- Both developments north of US 60 attract high traffic volumes but have no other entrances. Previous study shows Sunset Drive at LOS C and Brighton Park at LOS F by 2040 PM peak hour.
- Kwikcurb added along US 60 within past few years.
- McDonalds driveway located less than 100 feet from stop bar at US 60 / Sunset Drive.

Proposed Improvement: The improvement is to create a new connection between the Brighton Park Shopping Center and the signalized intersection serving Sunset Drive.



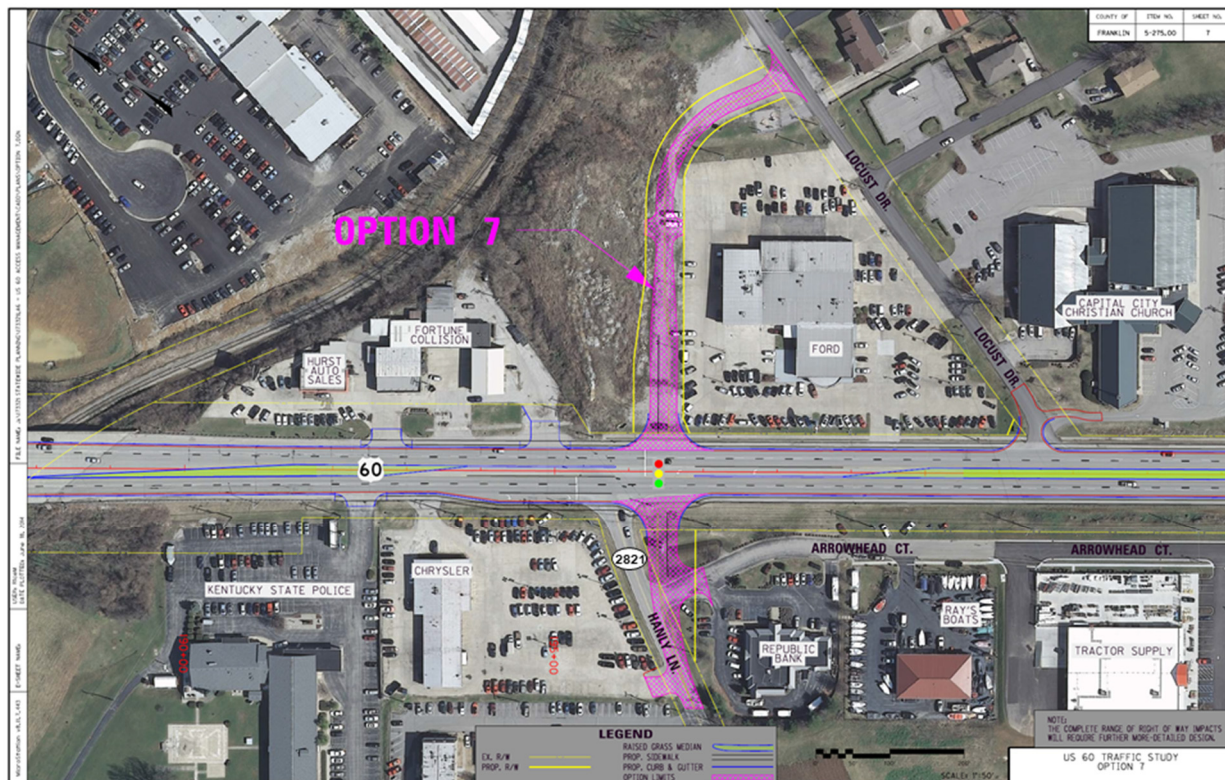
Plan sheet from 2014 study. Note: only purple connector is included in this option, with no changes to US 60.

W Local	LOCATION	PROJECT PRIORITY
	KY 2821 Hanly Ln Extension Bob Allen Chrysler to Locust Dr	Medium
	Description Extend Hanly Lane to Locust Drive, potentially removing current Locust Drive/US 60 intersection	Cost Estimate: D \$55k R \$610k U \$58k C \$520k Total \$1.2M <i>Costs based on 2014 traffic study.</i>

Identified Needs:

- Option 7 from the 2014 *US 60 Traffic Study* to improve connectivity between developments, rated a medium priority.
- US 60 has stop-and-go traffic during peak hour commuter flows with high turn volumes.
- 20 crashes (0 fatal, 3 injury) within 300 feet of KY 2821 (Hanly Lane) intersection in three years, primarily rear end collisions (60%).

Proposed Improvement: The improvement realigns and extends Hanly Lane to create a northern connection to Locust Drive. Several large office buildings along Locust Drive and adjacent Capital Center Drive contribute to high commuter traffic flows; the connection provides access to a signalized intersection for these employees.



Plan sheet from 2014 study. Note: only purple connector is included in this option, with no changes to US 60.

9. ADDITIONAL INFORMATION

The next phase for any project would be Phase 1 Design (Preliminary Engineering and Environmental Analysis). Further funding will be necessary to advance an improvement to the design phase.

Written requests for additional information should be sent to Amanda Spencer, Director, KYTC Division of Planning, 200 Mero Street, Frankfort, KY 40622. Additional information regarding this study can also be obtained from the KYTC District 5 Project Manager, Tom Hall, 8310 Westport Road, Louisville, KY 40242.