Corbin Bypass (KY 3041) Extension Study

Knox and Laurel Counties
Kentucky
KYTC Item #11-190.00

Prepared for:
Kentucky Transportation Cabinet

Prepared by:

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Executive Summary

The Corbin Bypass (KY 3041) Extension Study was initiated by the Kentucky Transportation Cabinet (KYTC) to evaluate a new connection between the existing Corbin Bypass and I-75. The project is listed in Kentucky's FY 2014 - FY 2020 Highway Plan, hereinafter referred to as the "Highway Plan" and is currently funded through the planning phase. Future design, right-of-way, utility, and construction phases for this project are not included in the Highway Plan.

Purpose and Need

The purpose of the Corbin Bypass Extension Project is to improve local and regional mobility and to provide a safer, more efficient connection between I-75 and much of southeastern Kentucky, including southern Laurel County, Knox County, and Bell County.

Extending the Corbin Bypass and constructing a new interchange with I-75 will reduce congestion on existing routes accessing the interstate, reduce truck volumes on roadways not intended to serve such traffic, and better connect developing areas to regionally important routes such as the existing Corbin Bypass, US 25E, US 25, and I-75.

Existing Conditions

The project study area, shown in **Figure ES-1**, includes an area just north of Corbin, Kentucky bounded by the Laurel Ridge Landfill to the north, US 25E to the south, I-75 to the west and the existing Corbin Bypass to the east. In the central portion of the study area there are a lot of stream crossings, wetland areas, and significant floodplains. Major waterways include portions of the Laurel River, Robinson Creek, Horse Creek, and Sydney Fork.

There are two constraints to constructing a new I-75 interchange; the weigh station located 0.8 miles north of the study area and the I-75 interchange at Exit 29 two miles south of the study area. *A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011*, commonly referred to as the "Green Book," lists the minimum interchange spacing as 1 mile in urban areas and 3 miles in rural areas, based on crossroad-to crossroad-spacing. Because I-75 is designated as a rural interstate through the study area, the study focused on potential new interchange locations at least 3 miles north of exit 29.

A number of industries and businesses are located directly on the existing Corbin Bypass. Many more in the area, like those located in the Southeast Kentucky Regional Industrial Park, are strategically located to take advantage of interstate accessibility. There are currently four well-spaced I-75 interchanges within the vicinity of the study area. Two interchanges are near London, Kentucky and the remaining two are near Corbin, Kentucky. Each of the routes providing access directly to the interstate experiences recurring congestion and have a high crash rate (based on crashes reported from 2010 to 2012), particularly in the vicinity of the interchange. US 25E (Exit 29) provides the most direct connection from the study area to I-75, and carries 20,000 - 25,000 vehicles per day (vpd) with 11 percent trucks. US 25 and US 25E have the greatest amount of traffic inside the study area outside of I-75 and operate at a LOS of D/E.

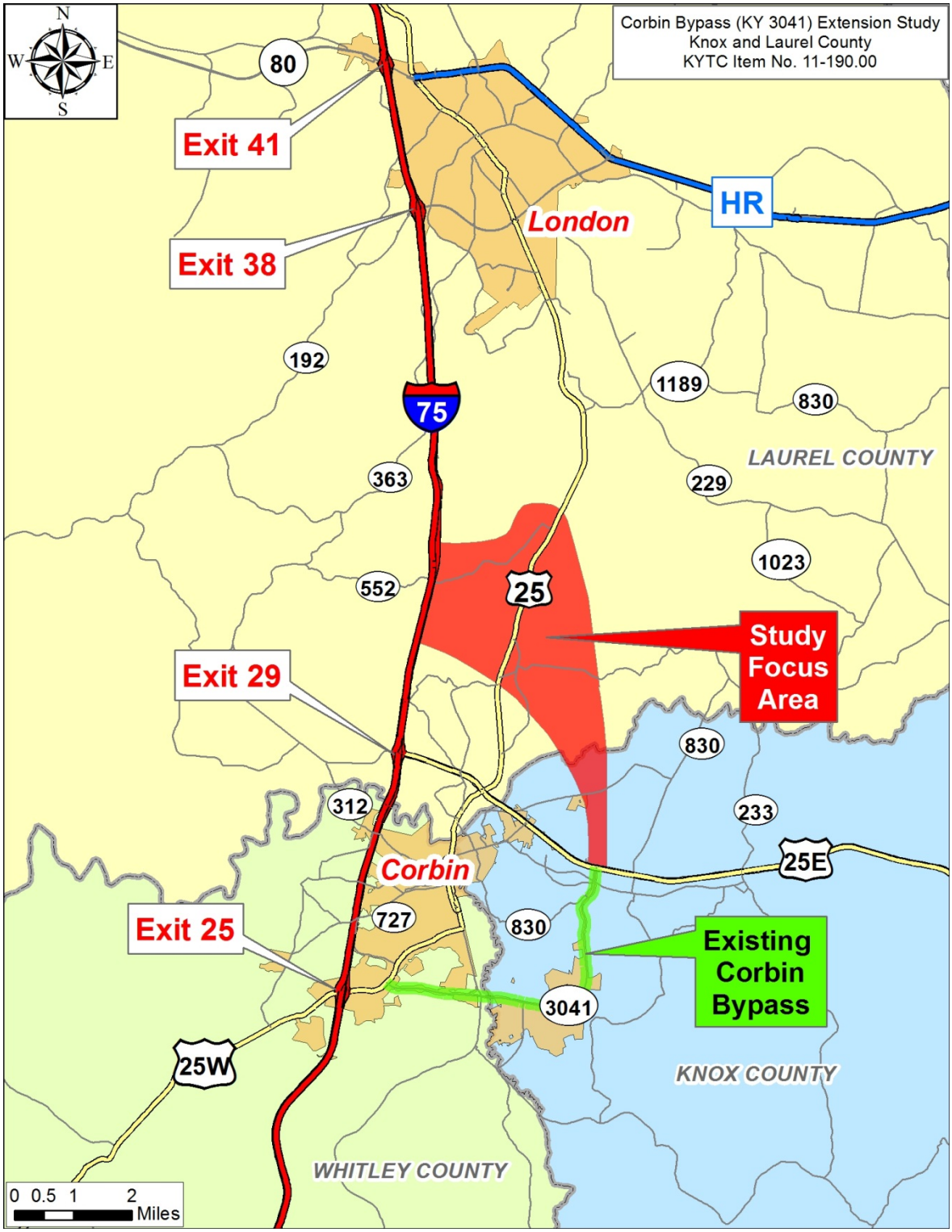

Figure ES-1 – Study Area

An examination of the crash history from 2010 through 2012 revealed most segments of 25E between the Corbin Bypass and I-75 have a Critical Crash Rate Factor (CRF) greater than 1.0, suggesting that conditions exist that contribute to a non-random occurrence of crashes. Additionally, most of the major intersections along US 25E are considered high crash spots.

Alternative interstate access to and from the north is provided via US 25 to KY 192 in London. Other routes provide indirect and inefficient access to the interstate but are used by truck drivers to avoid congestion along the primary routes. An example is KY 229, which carries up to 9,200 vpd and approximately five percent trucks. Such routes, with relatively narrow lanes and little to no usable shoulder, are not intended to carry such high volumes of truck traffic.

Alternatives Considered

Initially, five alternatives were considered: the no-build and four build alternatives with 1,000-foot-wide corridors. One of the concepts is a direct connection from US 25 to a new interchange with I-75. The remaining concepts begin at the existing Corbin Bypass, travel northwest and create a new interchange with I-75.

Throughout the study, the project team met with local officials, stakeholders, and the public to discuss alternatives and understand local perspectives on improvement concepts. Following comments from the first round of public involvement and given the surrounding residential areas, the project team believed that certain corridors were too close and would require too many home relocations. The four initial conceptual alternatives were then modified to minimize impacts. All four revised alternatives were 500-foot-wide corridors and were evaluated in two ways. First were the Full-Build Alternatives (extension of the existing Corbin Bypass from its current terminus at US 25E to a new interchange on I-75). Second were the Partial-Build Alternatives (connection between US 25 and a new I-75 interchange).

The traffic forecast examined three design-year growth scenarios: 2040 No-Build, 2040 Partial-Build and 2040 Full-Build to estimate the future demand for travel. The 2040 No-Build volumes show a 20 percent increase in traffic on US 25E. Extending the Bypass shifts traffic away from US 25E and US 25 (10 percent for the Partial-Build Alternatives and 30 percent for the Full-Build Alternatives).

The traffic impacts related to Corbin's proposed quarter horse racing track, Thunder Gap, were not considered as part of this study because the site is new and was unknown to the project team during the study. Thus, Thunder Gap was not included in the traffic forecast or decision making process. The proposed racing facility is located off the existing Corbin Bypass and will consist of a 1,723-foot straightaway horse track, grand stand seating, an entertainment facility, two 50-stall horse barns, 1,500 parking spaces, and seven commercial lots set aside for business and hotel development. Future project development phases will need to consider this new facility.

Recommendations

In light of the input received and the detailed screening process, the project team recommends the Partial-Build Alternatives for consideration in future project development phases. The Full-Build Alternatives divert 30 percent of through traffic away from US 25 and US 25E, which was a major public concern. The proposed future improvements along US 25E and US 25 would provide a better connection to the Partial-Build Alternatives. The Partial-Build Alternatives would provide a connection between an improved US 25 and I-75.

The Partial-Build Alternatives are recommended as the preferred alternative for the following reasons:

- Satisfies the project Purpose and Need:
    - Improves local and regional mobility by constructing a new interchange with I-75, which will reduce congestion on existing routes accessing the interstate and better connect developing areas to regionally important routes such as the existing Corbin Bypass, US 25E, US 25, and I-75.
    - Provides a safer, more efficient connection between I-75 and much of southeastern Kentucky, including southern Laurel County, Knox County, and Bell County, by providing an alternative interstate access to and from the north via US 25 and KY 192 in London.
- Serves a Laurel County population that is projected to increase from 58,850 in 2010 to 72,750 by 2040, an increase of nearly 24 percent.
- Minimizes the impacts to the human and natural environment by reducing the length of the project as much as 5.6 miles when compared to the Full-Build Alternatives.
- Minimizes the construction cost of the project by as much as $24 million when compared to the Full-Build Alternatives.
- Takes advantage of the proposed future improvements along US 25 and US 25E.
- The Partial-Build Alternatives best satisfy resource agency, local official, and public concerns.

A summary of the recommended Partial-Build Alternatives, including length, potential relocations, design cost, right-of-way cost, utility cost, and construction cost, is shown in **Table ES-1**. **Figure ES-2** depicts the recommended alternatives.

Alternative	Description of Alternative	Partial Alternatives (US 25 to I-75)						
		Length (Miles)	Potential Relocations	Design Cost ($Millions)	Right-of-Way Cost ($Millions)	Utility Cost ($Millions)	Construction Cost ($Millions)	Total Cost ($Millions)
Alternative 1 (Magenta)	New connector from US 25 to I-75, starting at US 25 near KY 2392 and providing a new interchange on I-75 at KY 552.	1.7	8 - 10	$2.7	$1.9	$2.6	$27.0	$34.1
Alternative 2 (Orange)	New connector from US 25 to I-75, starting at US 25 near old US 25 (north of Lily School Road) and providing a new interchange on I-75 at KY 552.	1.8	10 - 12	$2.4	$2.2	$2.7	$24.0	$31.3
Alternative 3 (Yellow)	New connector from US 25 to I-75, starting at US 25 near old US 25 (north of Lily School Road) and providing a new interchange on I-75 at KY 552.	1.9	10 - 12	$2.1	$2.2	$2.9	$21.0	$28.2
Alternative 4 (Blue)	New connector from US 25 to I-75, starting at US 255 north of Hunter Hills Elementary providing a new interchange on I-75 approximately 2.25 miles north of US 25E.	1.8	8 - 10	$2.5	$1.9	$2.7	$25.0	$32.1

Table ES-1- Summary of Recommended Alternatives

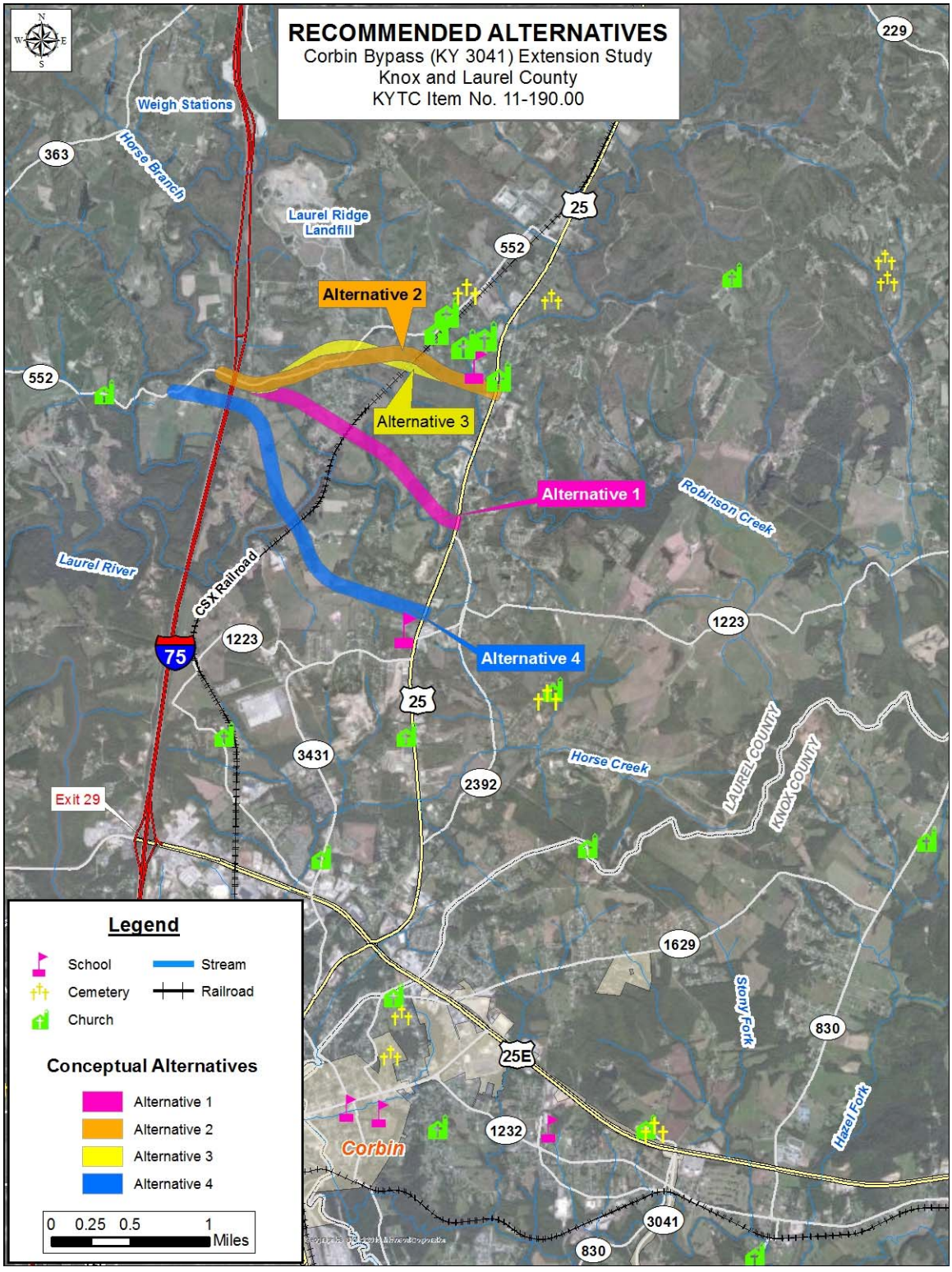

Figure ES-2 - Recommended Alternatives

1.0 INTRODUCTION

The Corbin Bypass (KY 3041) Extension Study was initiated by the Kentucky Transportation Cabinet (KYTC) to evaluate a new connection between the existing Corbin Bypass and I-75. KY 3041 currently extends around the City of Corbin from the south at US 25W and to the east of Corbin at US 25E. KY 3041 is a partial by-pass providing a two-lane route of approximately 3.9 miles around the southeast quadrant of the City of Corbin. The new connection would provide access to I-75 and facilitate freight distribution and alleviate congestion on existing interstate access routes. The purpose of this study is to gather critical information necessary to develop and evaluate alternatives that provide a more efficient connection between I-75 and northern Knox County/ southern Laurel County, north of Corbin, Kentucky.

The proposed Corbin Bypass extension is listed in Kentucky's FY 2014 - FY 2020 Highway Plan, hereinafter referred to as the Highway Plan. The project is currently funded through the planning phase with $500,000 in State Priority Project (SPP) funds. Future design, right-of-way, utility, and construction phases for this project are not included in the Highway Plan.

1.1 STUDY AREA

The project study area, shown in pink in **Figure 1**, includes an area just north of Corbin, Kentucky and bounded by the Laurel Ridge Landfill to the north, US 25E to the south, I-75 to the west and the existing Corbin Bypass (KY 3041) to the east. In the central portion of the study area there are a lot of stream crossings, wetland areas, and significant floodplains. Major waterways include portions of the Laurel River, Robinson Creek, Horse Creek, and Sydney Fork. It is envisioned that any new route in this area will be built largely on fill with overflow structures within floodplain areas and structures (bridges and/or box culverts) at each blueline stream crossing.

There has been significant growth along the US 25E corridor between its junctions with I-75 and the existing Corbin Bypass. The Corbin Bypass extension would serve both residential and industrial communities. The extension of the Corbin Bypass would provide an additional link, particularly for freight, from Corbin to I-75. There are two constraints to constructing a new I-75 interchange: the weigh stations located approximately 0.8 miles north of the study area shown in **Figure 2** and the I-75 interchange at exit 29 two miles south of the study area shown in **Figure 3**. I-75 is classified as a rural interstate through the study area. *A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011,* commonly referred to as the "Green Book," lists the minimum interchange spacing as one mile in urban areas and three miles in rural areas, based on crossroad-to-crossroad spacing. Therefore, the study focused on potential new interchange locations at least three miles north of exit 29. To mitigate the effects of closely-spaced interchange ramps, designers can employ auxiliary lanes along the interstate mainline.

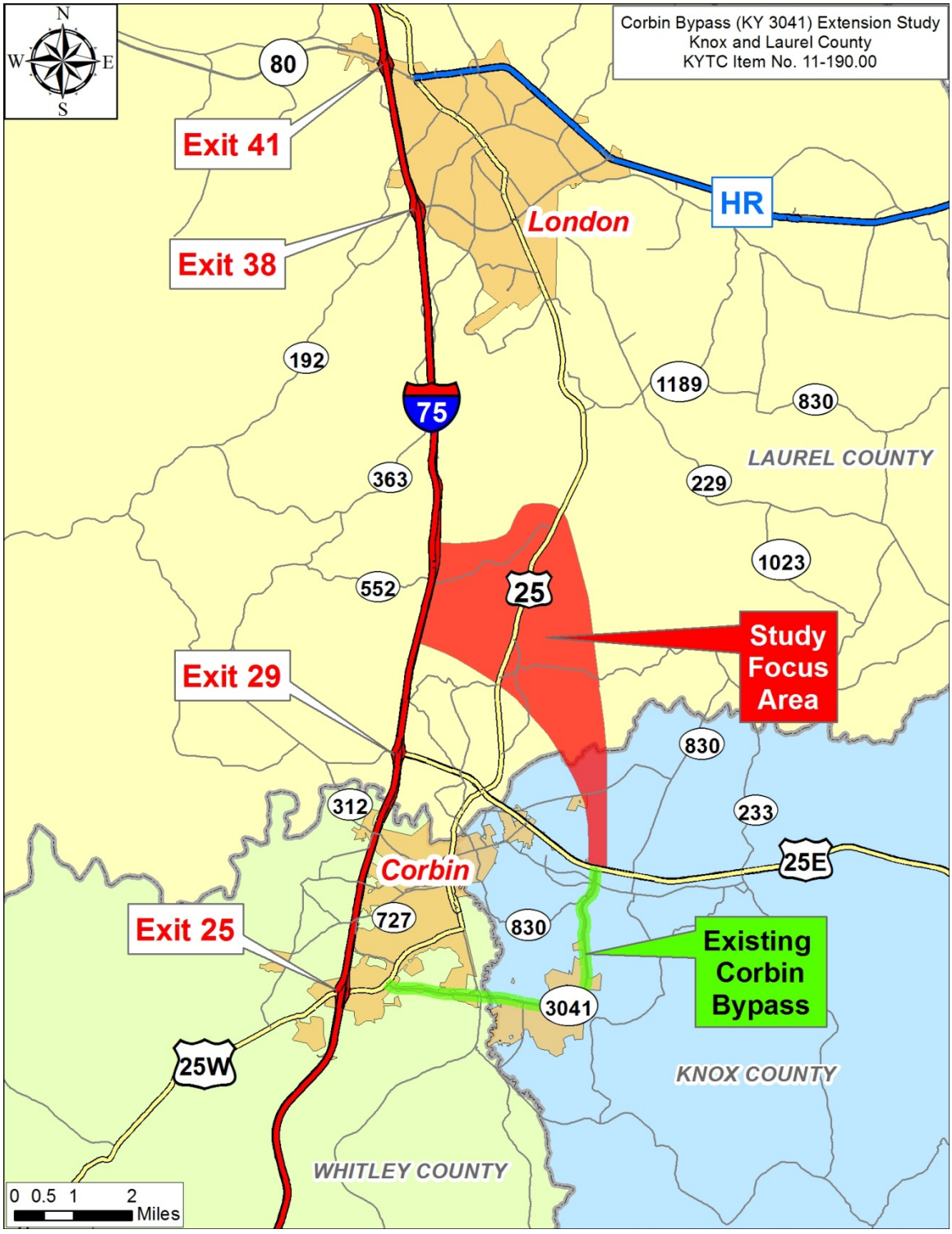

Figure 1 – Study Area

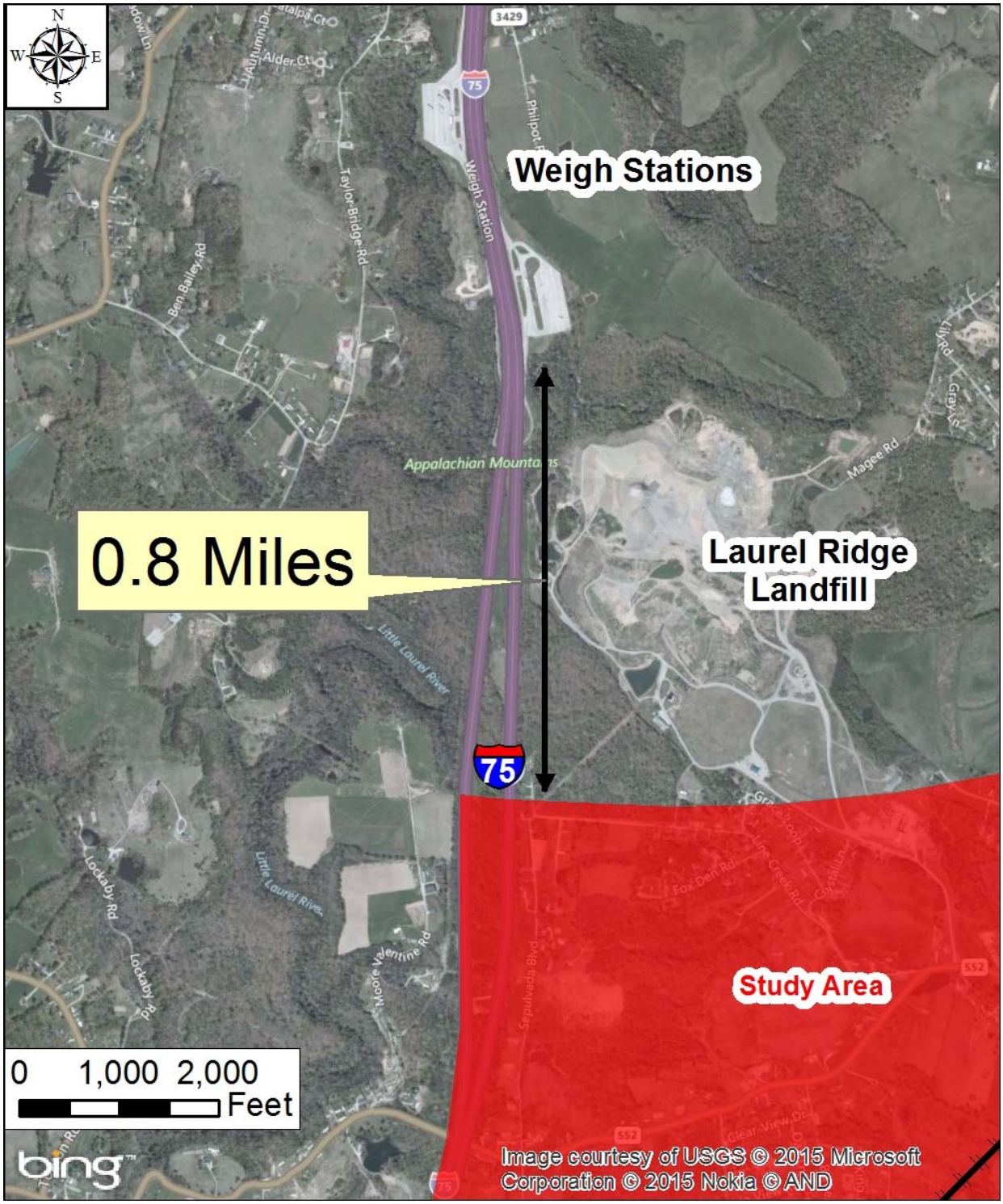

Figure 2 – I-75 Constraint #1: Weigh Stations

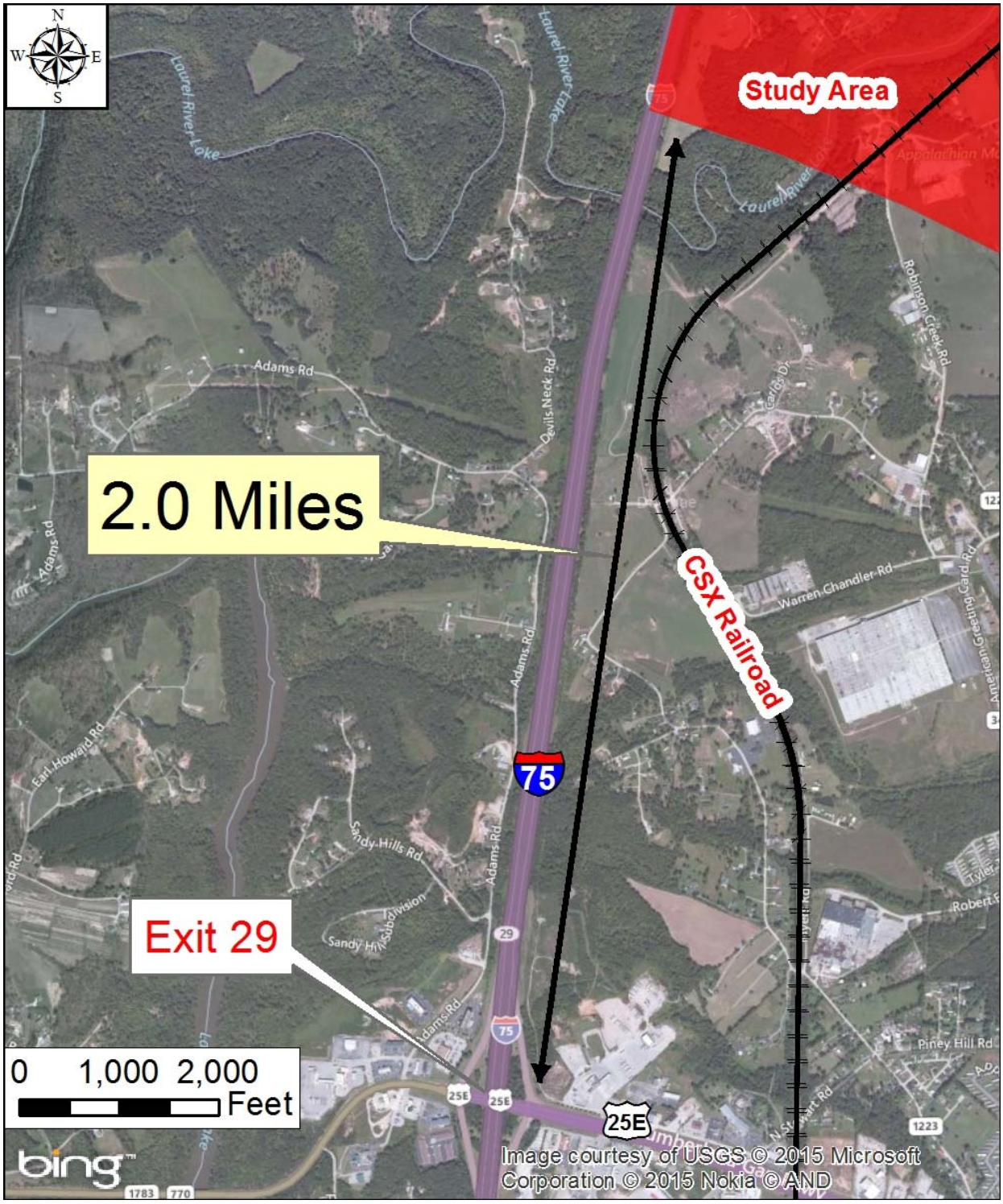

Figure 3 – I-75 Constraint #2: Proximity to Exit 29 at US 25E

2.0 EXISTING CONDITIONS

Conditions of the study area's existing transportation network are examined in the following section. The information compiled includes roadway facilities and geometrics, crash history, and traffic volumes within the study area. Data for this section were collected from the KYTC's Highway Information System (HIS) database, aerial photography, as-built plans, and field reviews.

2.1 ROADWAY SYSTEM

Functional classification is the grouping of roads, streets and highways into integrated systems ranked by the level of mobility for through movements and access to adjoining land. This grouping acknowledges that roads serve multiple functions and it provides a basis for comparing roads. Functional classification can be used for, but is not limited to, the following purposes:

- Provide a framework for highways serving mobility and connecting regions and cities within a state.
- Provide a basis for assigning jurisdictional responsibility according to the roadway's importance.
- Provide a basis for development of minimum design standards according to function.
- Provide a basis for evaluating present and future needs.
- Provide a basis for allocation of limited financial resources.

Figure 4 shows the functional classification of roadways within the study area.

There are three major roadways adjacent to the study area. I-75, which is just west of the study area, is a rural interstate north of exit 29 and an urban interstate south of exit 29 and is the primary regional corridor that provides north-south regional connectivity for both commerce and the traveling public. There are currently four I-75 interchanges within the vicinity of the study area, as follows:

- Exit 25: US 25W in Corbin
- Exit 29: US 25E in north Corbin
- Exit 38: KY 192 in London
- Exit 41: KY 80 in London

These interchanges provide large truck access to and from the existing industrial areas where many warehouse distribution centers reside. US 25E is a principal arterial on the National Truck Network and is the primary east-west connector just north of Corbin, connecting the northern termini of the existing Corbin Bypass and I-75 at exit 25. US 25 is a north-south minor arterial connecting Corbin, Knox County, and Laurel County just east of I-75. This route also carries a higher percentage of truck traffic. Available truck percentages are shown on **Figure 5**.

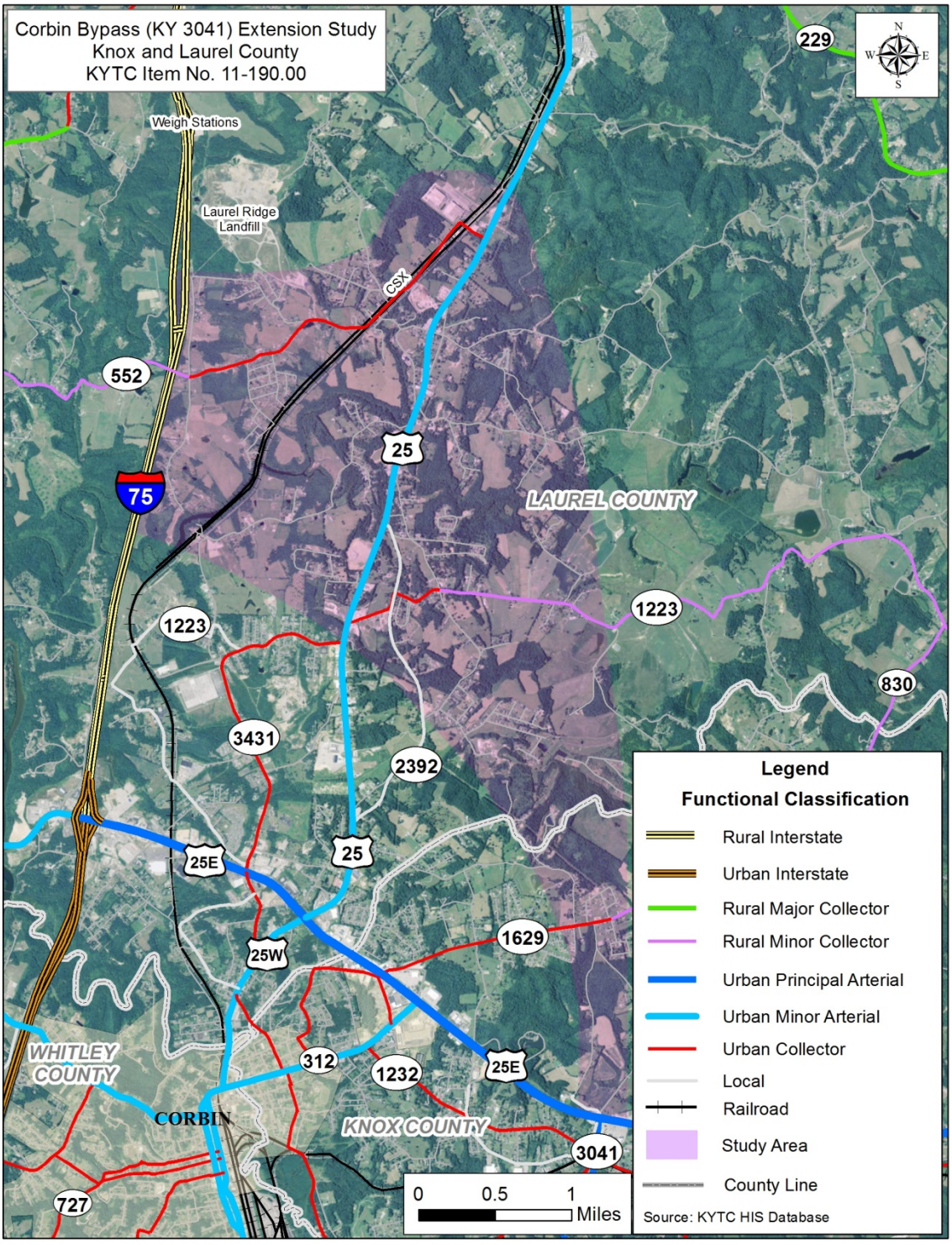

Figure 4 – Functional Classification

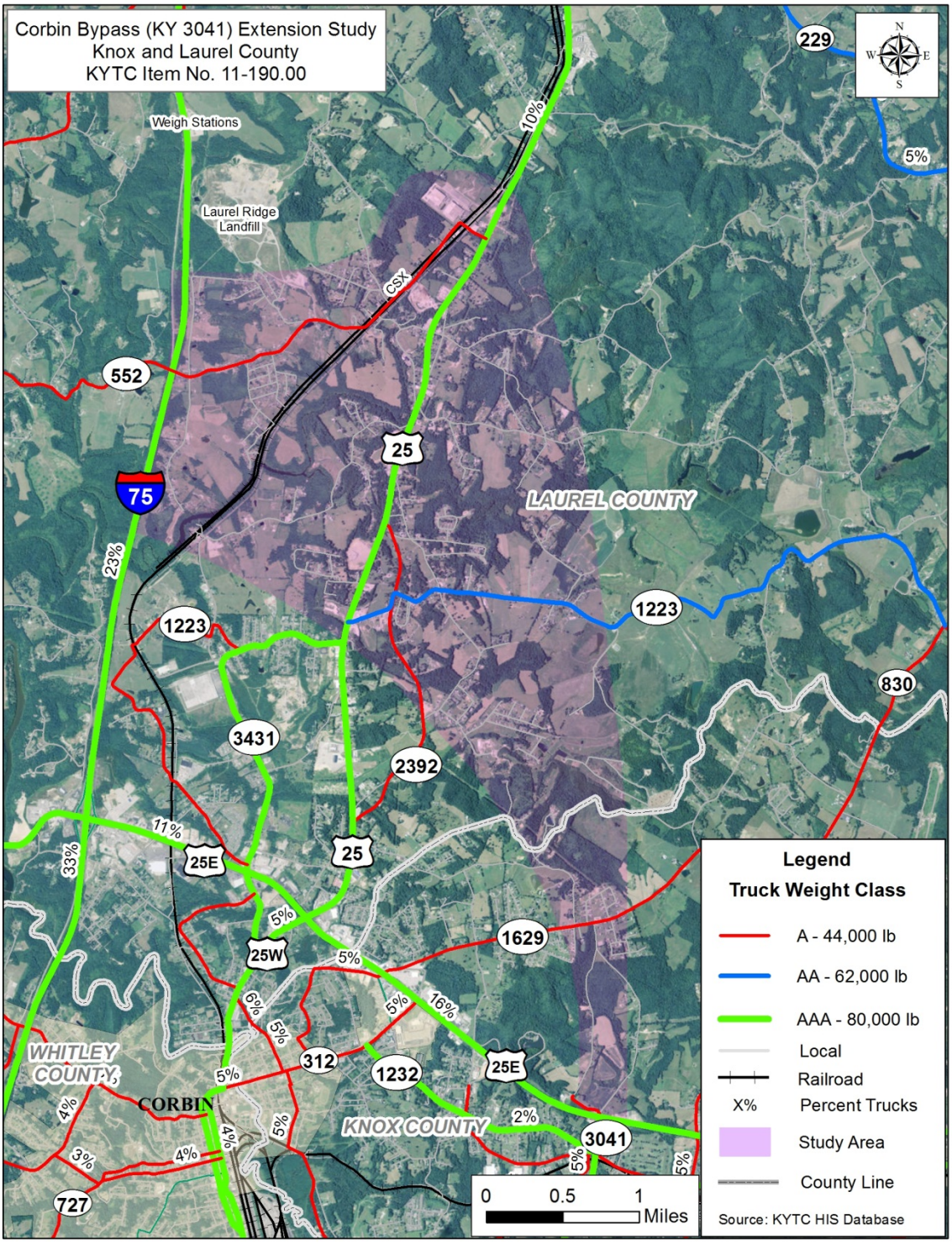

Figure 5 – Truck Percentages and Weight Class

In compliance with the Kentucky Revised Statute (KRS) 189.222, Kentucky requires weight limits on state maintained highways. The weight limits range from "C" to "AAA" based on gross pound vehicle weight. These designated truck weight limits are shown on **Figure 5**. I-75, KY 3431, KY 1232, Corbin Bypass (KY 3041), US 25 and, US 25E are in weight class "AAA" which has the highest weight allowed, 80,000 pounds. I-75, Corbin Bypass and US 25E are also part of the Kentucky State Designated National Truck Network on which vehicles with increased dimensions (STAA vehicles) may operate. Additionally, US 25, US 25E, and US 25W are part of Kentucky's Coal Haul Highway System.

2.2 ROADWAY GEOMETRIC CHARACTERISTICS

As part of the study effort, designers conducted a review of existing geometrics along study area roadways and compared those geometrics to the common geometric practices for Rural Collector Roads, as listed in Exhibit 700-02 and Rural Arterial Roads, listed in Exhibit 700-03, of the 2006 KYTC Highway Design Manual[1]. Roadway characteristic data discussed in this chapter come from the KYTC Highway Information System (HIS) database.

The current estimated lane widths along study area roadways are shown on **Figure 6**. Current KYTC design guidelines recommend a minimum of 11-foot-wide lanes on arterials and collector roadways with an average daily traffic (ADT) between 1,500 and 2,000 vehicles per day (vpd) and a minimum of 12-foot-wide lanes on arterial and collector roadways with an ADT greater than 2,000 vpd. Even though 12-foot-wide lanes are recommended on arterial and collector roadways with an ADT greater than 2,000 vpd, 11-foot lanes are considered acceptable. With the exception of I-75, US 25E, US 25, segments of KY 3431, KY 1629, KY 1232, and Corbin Bypass (KY 3041), which have 11-foot lanes or greater, all other Kentucky state-maintained roadways in the study area have less than 11-foot lanes which is considered undesirable.

Estimated shoulder widths are shown on **Figure 7**. Most of the shoulders along the arterial and collector routes are between one and four feet wide, which is less than the recommended minimum of six feet for roadways with an ADT between 1,500 and 2,000 and eight feet for roadways with an ADT greater than 2,000 vpd. The exceptions are segments of I-75 near the US 25E interchange, US 25E east of US 25, the Corbin Bypass, and US 25 between US 25E and KY 3431. These sections have shoulders that are at least ten feet wide.

The horizontal alignment analysis is shown on **Figure 8.** US 25E and Corbin Bypass have some horizontal curves that are less than the standard and could produce hazardous conditions if driven above the speed limit. Along KY 1232, west of the intersection with the Corbin Bypass and south of US 25E, there are infrequent horizontal curves that require a reduced speed. There were no roadways with horizontal curves that severely affect speed.

[1] http://transportation.ky.gov/Highway-Design/Highway%20Design%20Manual/Geometric%20Design%20Guidelines.pdf

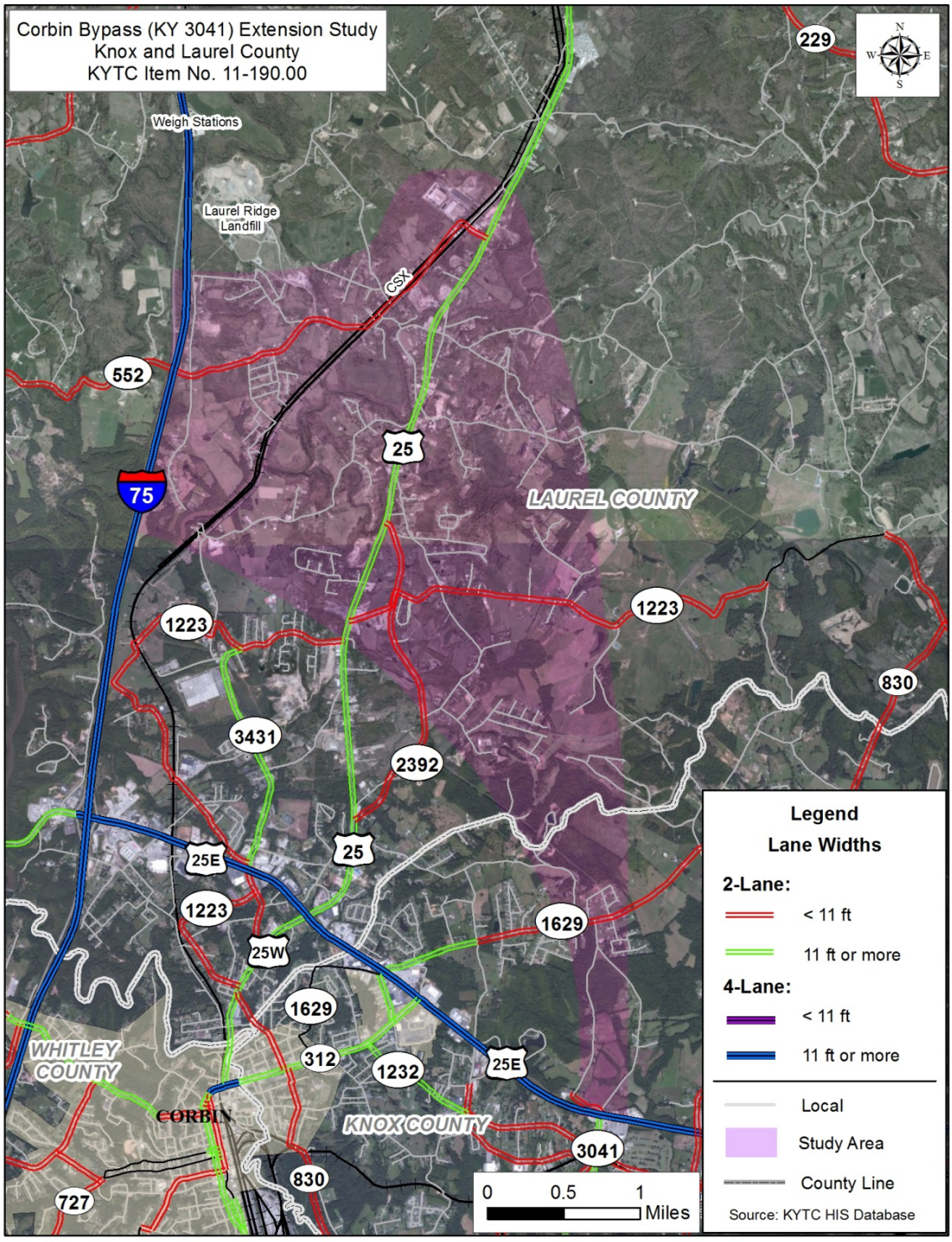

Figure 6 – Lane Widths

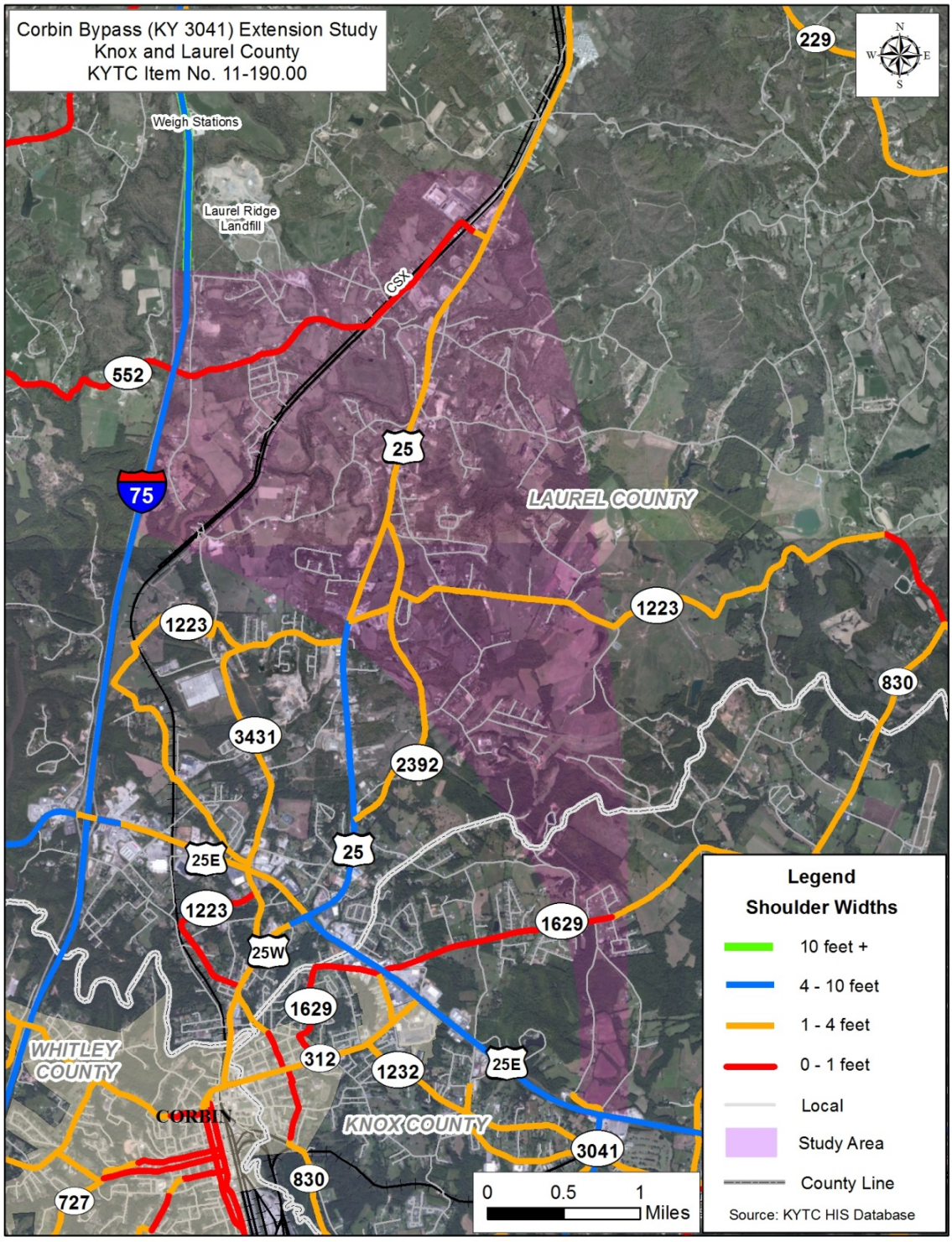

Figure 7 – Shoulder Widths

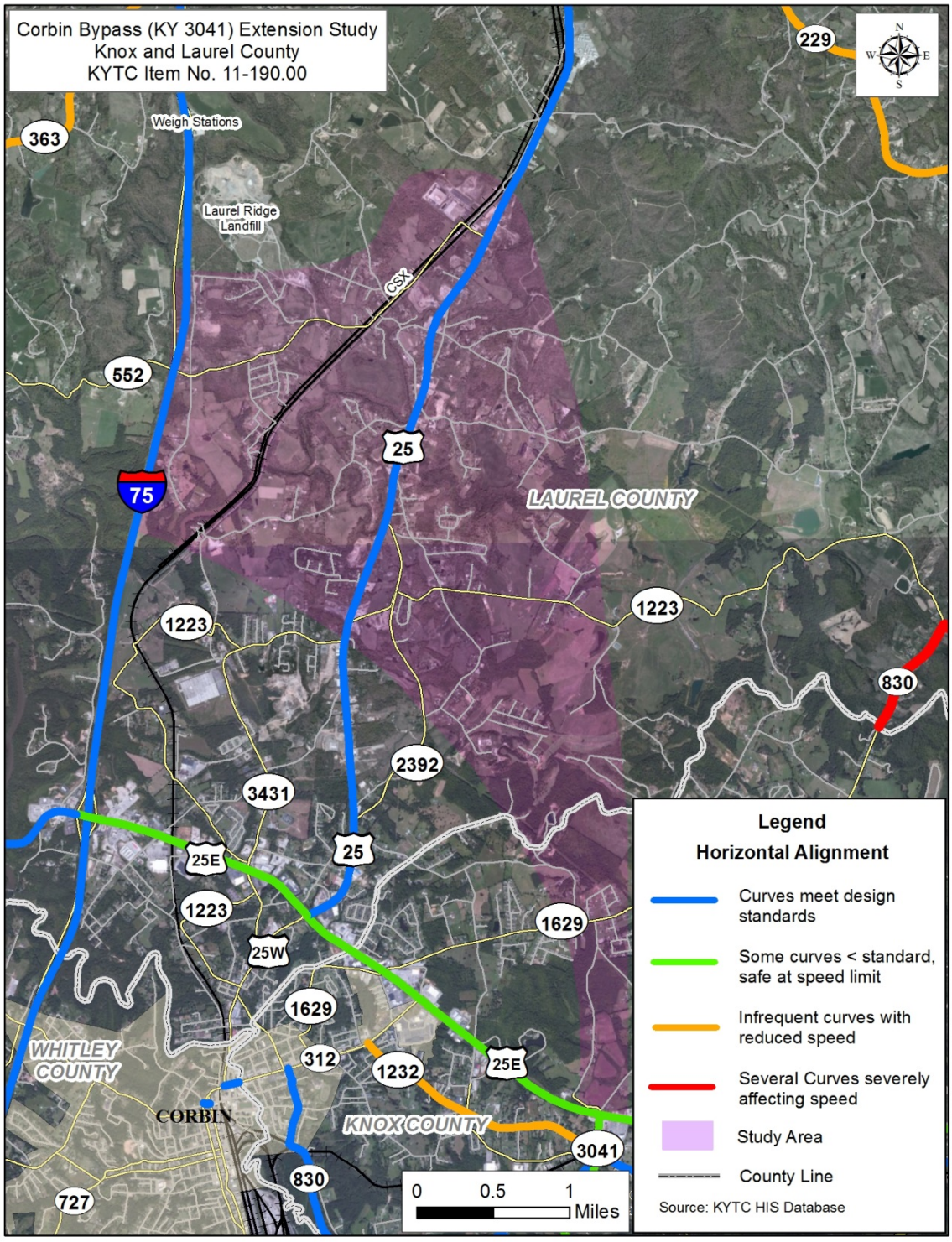

Figure 8 – Horizontal Alignment

Vertical alignment analysis is shown on **Figure 9**. I-75 from the US 25E interchange to the north has vertical grades that meet the design standards for the terrain that is present. The majority of US 25, US 25E, and the Corbin Bypass have some vertical grades that do not meet current design standards and where sight distance is less than desirable.

2.3 EXISTING TRAFFIC VOLUMES

Average daily traffic (ADT) volumes and Level of Service (LOS) values are shown on **Figure 10**. Level of service is a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience[2]. At the facility level, Level of Service (LOS) can be computed using methods that involve detailed data and operational parameter input. There are six levels of service, having letter grades A through F. 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. Typically, a minimum LOS D is considered acceptable in urban areas and LOS C is considered acceptable in rural areas. Roadway classifications (rural vs. urban) are shown on **Figure 4**.

US 25 and US 25E have the greatest amount of traffic outside of I-75 and operate at a LOS of D/E. I-75 operates at LOS C/D. ADT volumes on I-75, US 25E and US 25 in the study area range from 12,700 to 39,400 vehicles per day (vpd). The intersection of US 25E with US 25/US 25W, shown on **Figure 11** and referred to locally as "Malfunction Junction", is a bottleneck within the study area due to the tremendous volume of traffic passing through it each day. Improvements have been proposed to address the congestion issues at this location, including consideration of a grade separated interchange to facilitate traffic movement.

Levels of service for different facility types are based on service measures deemed most appropriate for describing operations. For interstates, freeways and multilane highways, LOS is based on density (expressed in passenger car equivalents per mile). For arterial streets, LOS determinations are based on the percent of free-flow speed. This measure includes delay at signalized intersections. For two-lane highways, levels of service are determined based on two parameters – average travel speed and percent time following in a platoon.

To evaluate the adequacy of roadway segments, traffic volumes were compared to the roadway's theoretical capacity. A volume-to-capacity ratio (V/C) represents the number of vehicles using the road in a specific time period compared to the number of vehicles the roadway was designed to be able to handle during that period. The target V/C ratio is 0.9 for rural areas and 1.0 for urban areas. A V/C greater than this indicates the road is congested, i.e. operating above its intended capacity. **Figure 12** presents the V/C for each segment along the corridor based on a theoretical daily capacity.

[2] *Highway Capacity Manual*, Transportation Research Board, National Research Council, Washington, D.C., 2010.

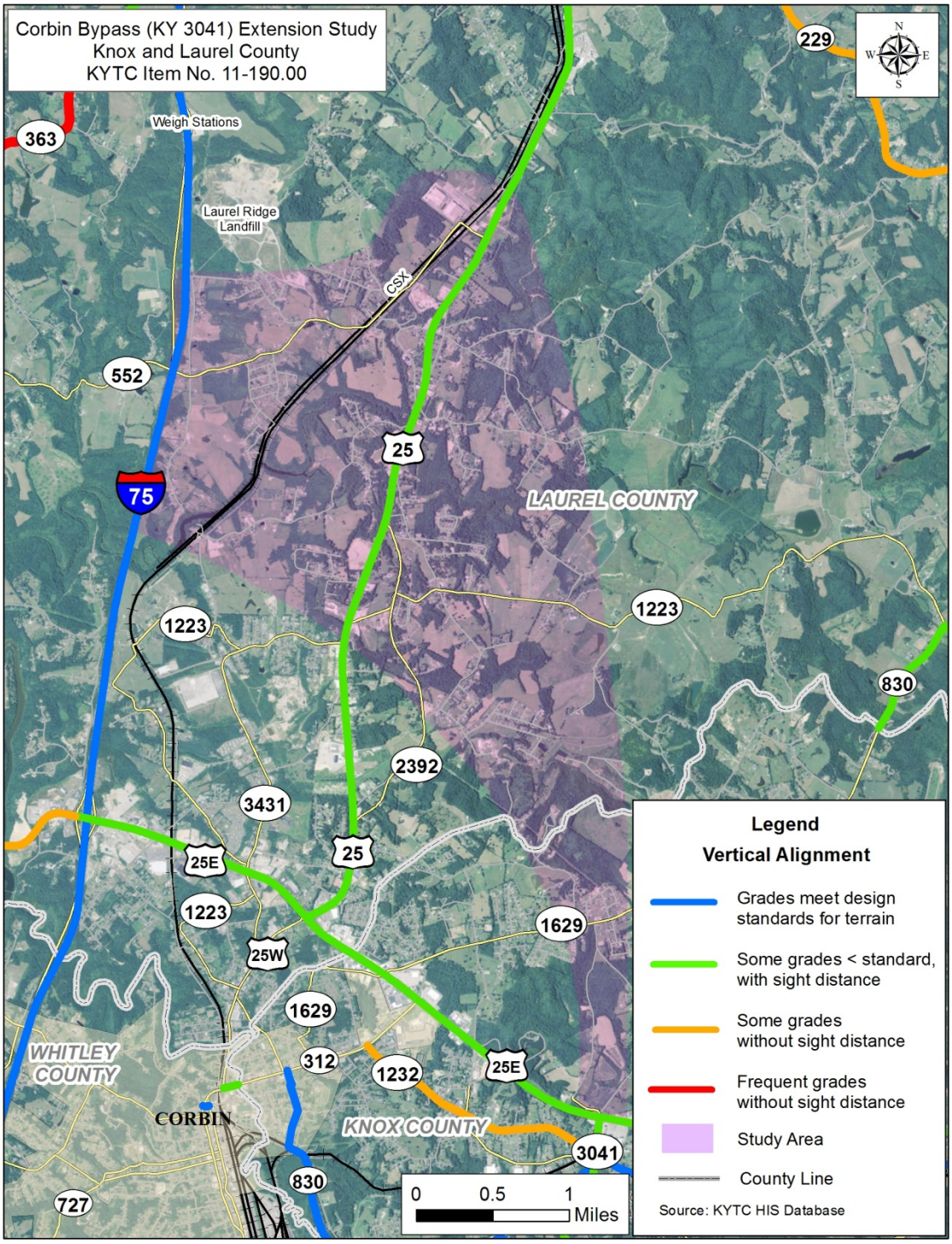

Figure 9 – Vertical Alignment

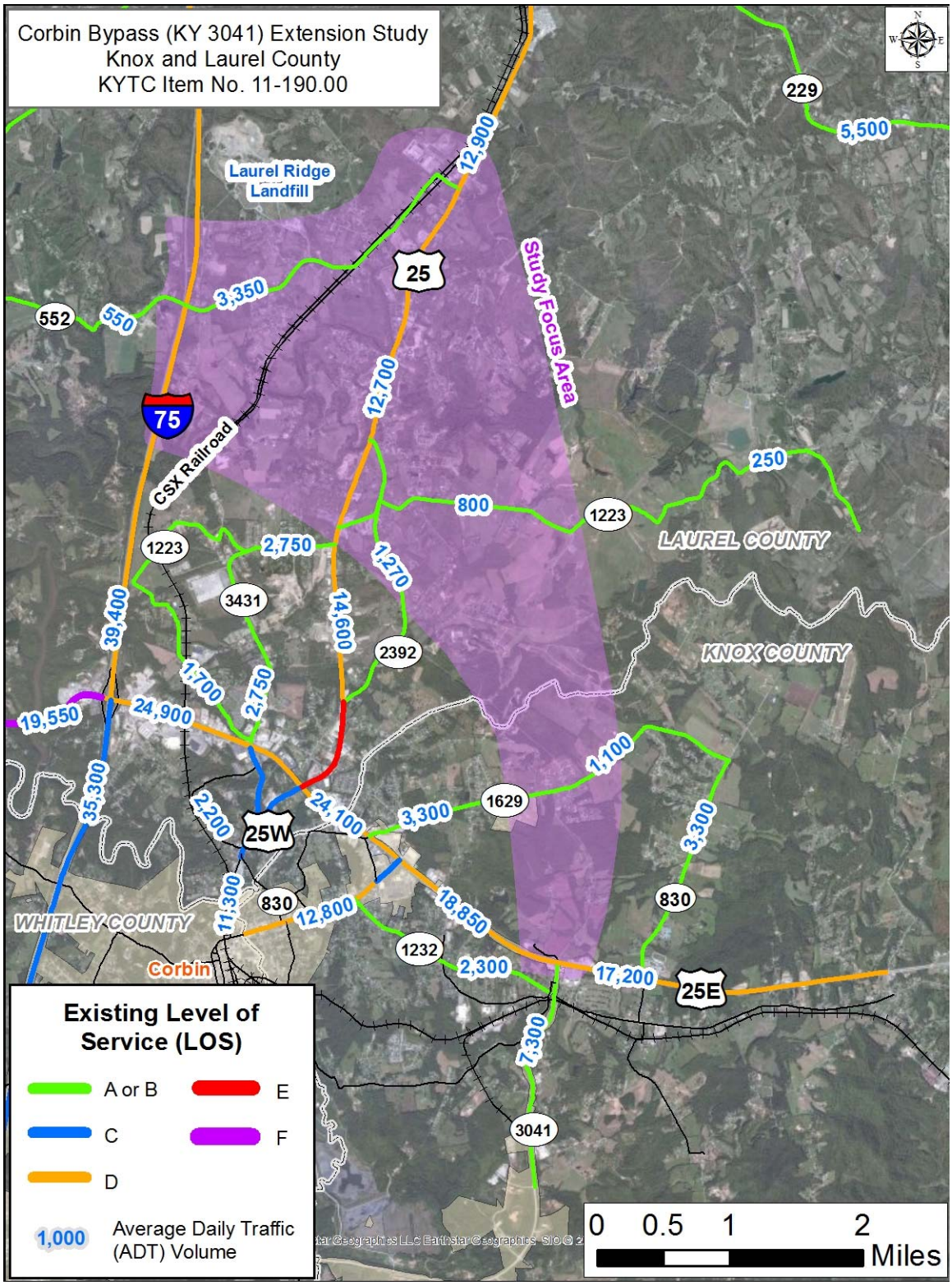

Figure 10 – Current Average Daily Traffic (ADT) Volumes and Level of Service (LOS)

Figure 11 – US 25E at US 25/US 25W
(Looking westbound along US 25E)

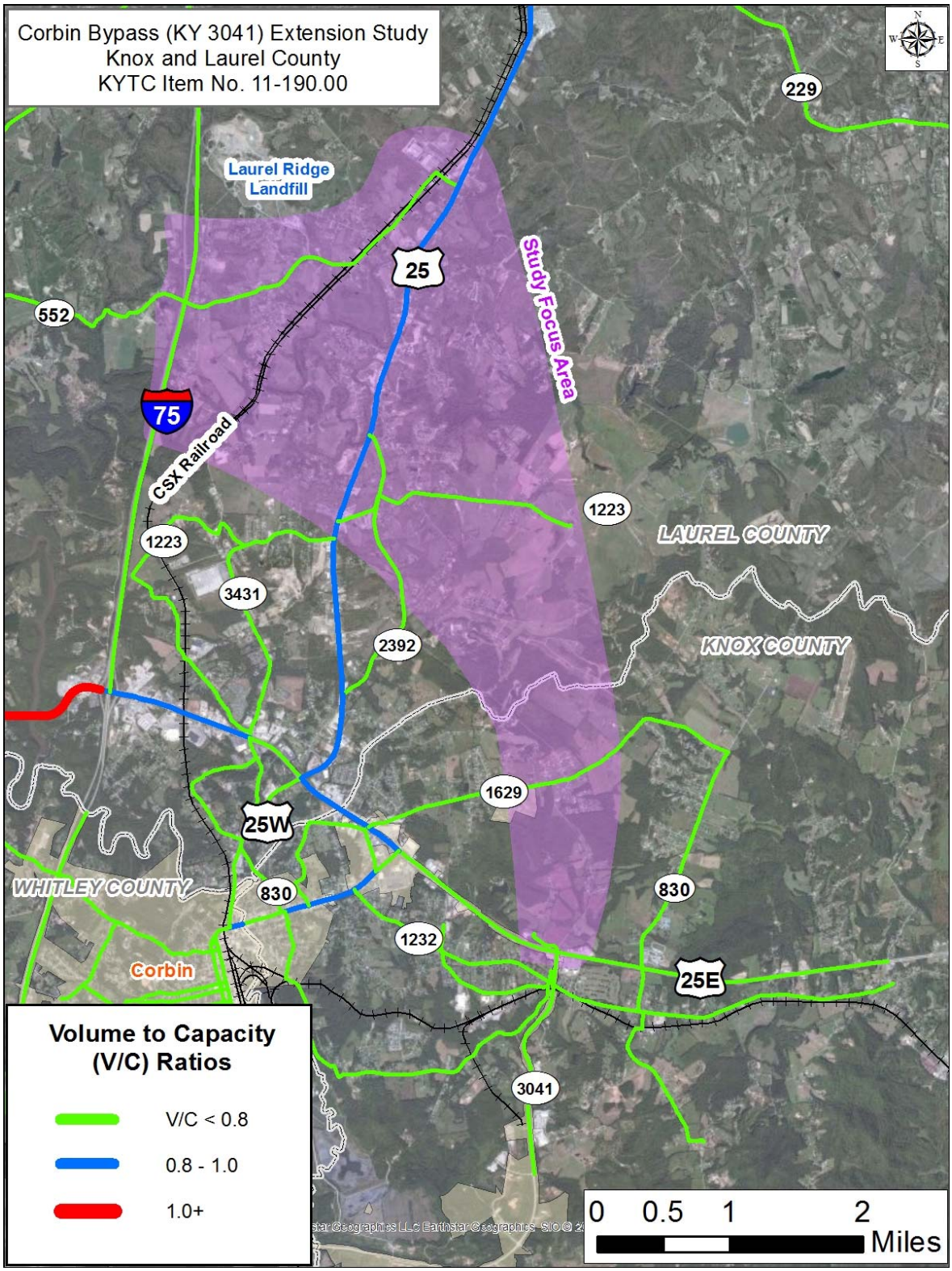

Figure 12 – Volume to Capacity (V/C) Ratios

2.4 CRASH HISTORY

Historical crash data was collected along existing roadways within the study area for a three-year period between 2010 and 2012. The crash records and locations are included in **Appendix A**. Crashes were geospatially referenced and compared to statewide data to identify locations experiencing above average crash rates. The methodology is defined in the Kentucky Transportation Center (KTC) research report *Analysis of Traffic Crash Data in Kentucky (2009-2013)*[3]. As defined in the methodology report, segments vary in length and are divided along roadways where geometry or traffic volumes change. For each segment, analysts looked at the number of crashes, traffic volume, rural/urban, number of lanes, and segment length to determine the critical rate factor (CRF). The CRF is one measure of the safety of a road, expressed as a ratio of the crash rate at the location compared to the average crash rate for roadways of the same functional classification throughout the state. If the CRF is 1.00 or greater, it is assumed that crashes may be occurring due to circumstances that cannot be attributed to random occurrence. Analysts also conducted a spot analysis along the study routes. Spots were defined by observing 0.1-mile sections where crashes were concentrated. Crashes were again geospatially referenced and compared to statewide data to identify locations experiencing above average crash rates. The CRF was again used as a measure of the safety of a particular spot.

The results of the crash analysis are shown on **Figure 13** and **Table 1**. Most segments of 25E between the Corbin Bypass and I-75 have a CRF greater than 1.0. Additionally, most of the major intersections along US 25E are considered high crash spots. The US 25E intersection with the existing Corbin Bypass has the highest CRF for any spot in the study area, with a CRF value of 2.8.

[3] http://www.ktc.uky.edu/files/2014/09/KTC_14_07_KSP2_13_1F_.pdf

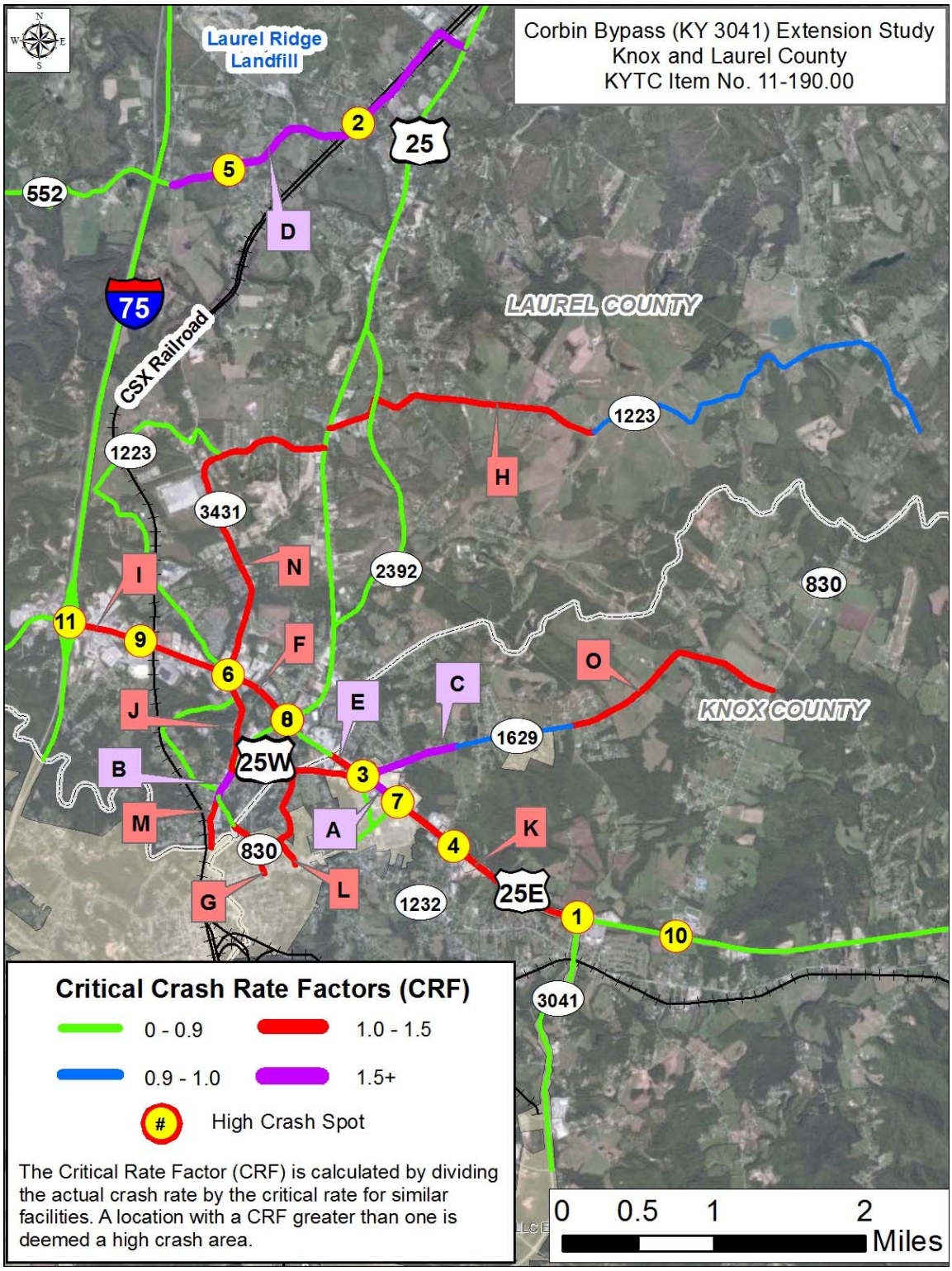

Figure 13 – Critical Crash Rates (CRF) and High Crash Spots

Type	Figure 13 ID's	County	Route	Location	Begin Milepoint	End Milepoint	Critical Crash Rate Factor (CRF)
HIGH CRF SPOTS	1	Knox	US 25E	KY 3041 (Corbin Bypass)	24.121	24.321	2.8
	2	Laurel	KY 552	Carter Lane / Underpass Road	7.000	7.200	2.1
	3	Knox	US 25E	KY 1629	25.842	26.042	2.0
	4	Knox	US 25E	Lynn Camp School Road	25.081	25.281	1.9
	5	Laurel	KY 552	Tackett Road	6.045	6.245	1.8
	6	Laurel	US 25E	KY 3431 (Cherry Avenue)	0.755	0.955	1.8
	7	Knox	US 25E	KY 312 (Master Street)	25.550	25.750	1.7
	8	Laurel	US 25E	US 25 / US 25W	0.244	0.444	1.6
	9	Laurel	US 25E	Stewart Road	1.376	1.576	1.5
	10	Knox	US 25E	KY 830 (Calvary Church Road)	23.476	23.676	1.2
	11	Laurel	US 25E	I-75 Interchange	1.824	2.024	1.1
HIGH CRF SEGMENTS	A	Knox	US 25E	KY 312 to KY 1629	25.650	25.942	2.8
	B	Laurel	US 25W	KY 830 to KY 3431	0.362	0.545	1.8
	C	Knox	KY 1629	US 25E to Norvell Road	1.159	1.822	1.7
	D	Laurel	KY 552	Old Whitley Road to US 25	5.751	8.165	1.6
	E	Knox	US 25E	KY 1629 to Laurel County line	25.942	26.197	1.5
	F	Laurel	US 25E	US 25 to KY 3431	0.344	0.855	1.4
	G	Knox	KY 830	Laurel County line to KY 312	0.000	0.376	1.4
	H	Laurel	KY 1223	US 25 to Campbell Road	3.984	5.879	1.4
	I	Laurel	US 25E	KY 3431 to I-75	0.855	2.024	1.2
	J	Laurel	KY 3431	US 25W to US 25E	0.000	0.650	1.2
	K	Knox	US 25E	KY 3041 to KY 312	24.221	25.650	1.2
	L	Knox	KY 1629	KY 312 to US 25E	0.000	1.159	1.2
	M	Laurel	US 25W	KY 312 to KY 830	0.000	0.362	1.1
	N	Laurel	KY 3431	US 25E to US 25	0.650	2.959	1.1
	O	Knox	KY 1629	Watch Road to KY 830	2.602	4.151	1.0

Table 1 – Critical Crash Rates (CRF) and High Crash Spots

3.0 ENVIRONMENTAL OVERVIEW

An environmental overview was performed to determine the potential impacts of the proposed project. The complete document is included in **Appendix B**. The following sections discuss both natural and human environmental resources present within the study area. This information was assembled from readily available data sources and correspondence with resource agencies; additional, detailed investigations should be undertaken as part of any future project development phases.

3.1 NATURAL ENVIRONMENT

Natural environment resources include streams; floodplains; wetlands; ponds; water supplies; threatened, endangered and special concern species and habitat; woodland and terrestrial areas; and parks located within the study area. Natural environment resources present in the study area are shown on **Figure 14**.

3.1.1 Surface Streams

Forty-three (43) streams are mapped in the study area. The largest of these is Laurel River, which traverses the northern portion of the study area, followed by Robinson Creek, then Horse Creek.

Review of the 2010 Kentucky Division of Water (KDOW) 305(b) and 303(d) integrated water quality report indicates that segments of the Laurel River are listed as Not Supporting Aquatic Life and Fully Supporting for Primary Contact Recreation. The Laurel River from river mile 25.2 to 30.1 is listed as impaired water. Information from the Kentucky Division of Water indicates there are no Special Use Waters (cold water aquatic habitat, exceptional water, reference reach water, and outstanding state resource water) within the study area. Comprehensive wetland surveys and impact assessments, including evaluation of avoidance and minimization measures, will need to be conducted during subsequent project phases.

3.1.2 Floodplains

Based on review of Flood Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), 100-year floodplains occur at several locations in the northeast and central portions of the study area. Floodplains are associated with Laurel River, Robinson Creek, and Horse Creek. No floodways are located within the study area. Coordination for transportation projects in mapped 100-year floodplain areas will be required with the Laurel County Floodplain Administrator and the Kentucky Division of Water (KYDOW), Surface Water Permits Branch, Floodplain Management Section to determine limitations on construction activities in these areas, as well as local and state permit requirements.

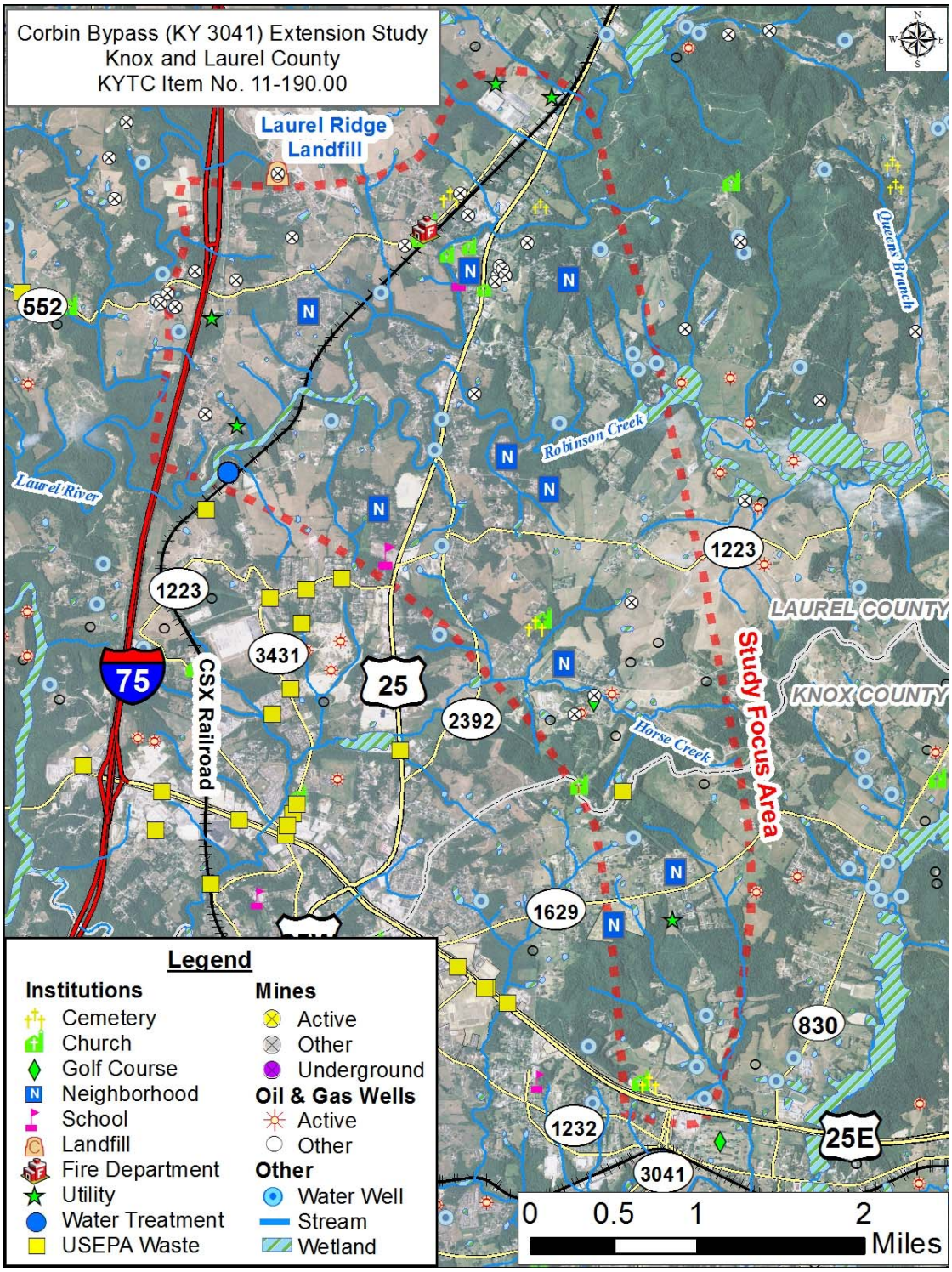

Figure 14 – Natural Resources

3.1.3 Wetlands and Streams

A review of National Wetlands Inventory (NWI) data indicates that eighty-one (81) NWI-mapped wetlands are located throughout the study area. The majority of the NWI mapped features, seventy-eight (78), are identified as ponds, typically small farm ponds, landscape and recreational ponds or storm water retention ponds readily observable in the landscape. Two larger features are mapped as forested wetlands along Robinson Creek. The Laurel River pool is mapped as a riverine wetland at the downstream of the study area. A limited potential for extensive wetland locations was observed during field reconnaissance of the study area beyond the aerial photography due to the topographic relief, resulting in a high likelihood that additional unmapped wetlands are present. The unmapped wetlands would be contained to adjacent areas of Robinson Creek and Laurel River or occur at random locations of smaller size. Comprehensive wetland surveys and impact assessments, including evaluation of avoidance and minimization measures, will need to be conducted during subsequent project phases. Efforts will be made to avoid or minimize stream and wetland impacts.

3.1.4 Ponds

There are seventy-eight (78) identified ponds, older than ten years, as part of the NWI data that contains either diked or excavated ponds within the study area. Locations of new development are not included in this data since they are less than ten years old.

3.1.5 Groundwater Resources

Groundwater, spring, and water well information from the Kentucky Geologic Survey (KGS) and KDOW was reviewed for the study area. Review of Kentucky Geologic Survey data indicate there are 26 water wells registered in the study area. Of these, 8 (31 percent) are monitoring wells below underground storage tank regulatory authority, 14 (54 percent) are domestic use wells, and 4 (15 percent) are unknown. One spring is mapped within the study area and an unnamed feature is located in Laurel County as a tributary to Robinson Creek and south of KY 553. Based on available groundwater and bedrock geology data, the presence of springs is not considered to be common or widespread throughout the study area.

3.1.6 Public Water Supplies

Water supply is served by two water utilities, Corbin Utilities Commission and Laurel County Water District #2. Corbin Utilities Commission is the main supplier of treated drinking water while the Laurel County Water District #2 serves rural areas. The study area includes portions of two Source Water Assessment and Protection (SWAP) areas, one for each of the water companies. Coordination with the Cumberland Valley Area Development District (CVADD) and the local water utilities to identify requirements of the SWAP Programs, limitations on construction project and local permit requirements, will need to be conducted during subsequent transportation projects. Construction activities may require a Groundwater Protection Plan.

3.1.7 Public Parks – Section 4(f) and Section 6(f) Facilities

Based on review of secondary source information and available aerial mapping, no parks (Section 4(f) resources) are located in the study area. In addition, no state or federal managed areas, parks, forests or preserves occur within the study area. No facilities in the study area were identified as having received Land and Water Conservation Fund (LWCF) grants (Section 6(f) resources). An athletic facility that is privately owned was observed during field reconnaissance of the study area. Further coordination with the owners will determine if impacts would be made by any subsequent projects.

3.1.8 Air Quality and Environment

Counties and the surrounding areas are not listed for any criteria pollutants. The Kentucky Transportation Cabinet (KYTC), Division of Planning's Air Quality Modal Program does list Knox and Laurel County as an Air Quality Maintenance Area for 8-Hour Ozone as of July 2012 (KYTC, 2013b).

A review of the FHWA air quality checklist indicates the following conditions currently exist for criteria pollutants in regards to subsequent transportation projects in the study area:

- Carbon Monoxide (CO): Current average daily traffic (ADT) on roads in and around the study area include 14,100 vehicles per day on US 25 at Lily, 17,300 vehicles per day on US 25E at KY 3041, and 44,300 on I-75 at KY 552. Subsequent projects most likely will not meet the criteria requiring a CO project level analysis (a signalized intersection with an ADT greater than 80,000) and most likely will not produce a project violation of the CO standards.
- Lead: There is no air quality concern regarding Lead (Pb) for the study area, as all areas in Kentucky are in attainment.
- Nitrogen Dioxide (NO2): There is no air quality concern regarding Nitrogen Dioxide (NO2) for the study area, as all areas in Kentucky are in attainment.
- 8-Hour Ozone (O3): The study area is located in an Ozone attainment area and this pollutant is not a project-level concern.
- Sulfur Dioxide (SO2): There is no air quality concern regarding Sulfur Dioxide (SO2) for the study area, as all areas in Kentucky are in attainment.
- Particular Matter (PM2.5): The study area is located in PM2.5 attainment area and this pollutant is not a project-level concern, and the conformity procedures of 23 CFR 770 do not apply.
- Mobile Source Air Toxics (MSATs): A new bypass route in the study area would most likely require a Qualitative Analysis and an Uncertainty Assessment for MSATs, as it would not fall under a Categorical Exclusion or a Conformity Regulation Exempt Project under existing regulations.

Kentucky Division for Air Quality Regulation 401 KAR 63:010 Fugitive Emissions states that no person shall cause, suffer, or allow any material to be handled, processed, transported, or stored without taking reasonable precaution to prevent particulate matter from becoming airborne. Regulation 401 KAR 63:005 states that open burning is prohibited. The Division would like to offer the following suggestions on how this project can help us stay in compliance with the National Ambient Air Quality Standards. More importantly, these strategies are beneficial to the health of citizens of Kentucky.

- Utilize alternatively fueled equipment.
- Utilize other emission controls that are applicable to your equipment.
- Reduce idling time on equipment.

3.1.9 Noise and Sensitive Surroundings

To determine if highway noise levels are compatible with various land uses, the Federal Highway Administration (FHWA) has developed noise abatement criteria (NAC) and procedures to be used in the planning and design of highways. These abatement criteria and procedures are in accordance with Title 23 Code of Federal Regulations (CFR), Part 772, U.S. Department of Transportation, FHWA, Procedures for Noise Abatement of Highway Traffic Noise and Construction Noise. Noise –sensitive receptors are present throughout the study area. Exterior Residential areas are Category B. Both interior and exteriors for active sports areas, cemeteries, and places of worship, Section 4(f) sites, and schools are Category C & D. A receptor is defined as a discrete or representative location of a noise sensitive area(s), for any of the land uses listed. Receptors are impacted if noise levels increase over the NAC as defined by FHWA and KYTC. **Appendix B** discusses this further.

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area. For the areas where impacts are identified, methods of noise abatement will be evaluated to determine the feasibility and reasonableness of their implementation. The evaluation is based on many factors, some of which include constructability, cost, height of wall, amount of land use, and whether changes in existing land use are expected.

This project is a Type I project as designated in FHWA Regulation 23 CFR Part 772 and, in any future project development phases, a detailed noise analysis should follow the FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise and the Kentucky Transportation Cabinet Noise Analysis and Abatement Policy (July 13, 2011).

3.2 HUMAN ENVIRONMENT

Human environment is defined as what we live in and around and what we have built. Through review of secondary source information and field reconnaissance, potentially sensitive resources

that affect the human environment were identified in the study area, are discussed in the following sections, and shown in **Figure 14**.

3.2.1 Social and Economic Resources

- Cemeteries – Based on a review of USGS topographic maps and field survey, there were four cemeteries located in the study area as shown in **Table 2**.

Name of Cemetery	Location
Cumberland Memorial Gardens	Lily, Kentucky
Horse Creek Church Cemetery	Laurel County
Lynn Camp Cemetery	Knox County
Unnamed family cemetery	Lily, Kentucky

Table 2 – Cemeteries

- Churches/Houses of Worship – Based on review by field reconnaissance, there were seven houses of worship located in the study area shown in **Table 3**.

House of Worship	Location
Horse Creek Church	Laurel County
Lily Missionary Baptist Church	Lily, Kentucky
Lily Church of Christ	Lily, Kentucky
Lily Holiness Church	Lily, Kentucky
Lynn Camp Church	Knox County
Oak Ridge Church	Laurel County
Redemption Tabernacle	Lily, Kentucky

Table 3 – Houses of Worship

- Schools, Institutions and Learning Centers – Two schools, institutions, or learning centers are mapped within the study area – Cornerstone Christian School and Hunter Hills Elementary School.

- Federal Facilities – No federal facilities or federal government owned lands are mapped in the study area or were observed during the field reconnaissance.

- Fire Departments and Emergency Services – There is only one fire department located in the study area, and no emergency operations centers. Fire and emergency services are provided by the Lily Fire Station #1, located on KY 552 in proximity to the northern portion of the study area.

- Law Enforcement – No law enforcement facilities are mapped within the study area or were observed during the field reconnaissance.

- Industrial Parks – No industrial parks are mapped within the study area. Industrial facilities located within the study area include Aisin Automotive Castings, R.C. Miller Oil distributors, and several additional facilities located along US 25 in the northern portion of the study area.

- Golf Courses – One golf course is located in the central part of the study area – Sweet Hollow Golf Course in Laurel County.

- Farmland – The top crop item per acre in both counties is a plant material consisting of mainly plant leaves and stems, otherwise known as forage. Prime farmland soils cover 52 percent of the study area, mostly in Laurel County. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food. Most of these areas have been developed in residential and commercial land uses along US 25. Aerial photography indicated agricultural lands are more prevalent between I-75 and US 25, south of Lily, along SR 1223, north of Knox County border and north of US 25E. Continued coordination with the local Natural Resources Conservation Service (NRCS) office will be necessary to complete the Farmland Conversion Impact Rating assessments and evaluating potential impacts. Efforts will be made to minimize prime farmland impacts that could be listed on the National Register Historic Properties.

- Potential Relocations – There are 8 to 12 potential relocations for the Partial-Build alternatives and 24 to 38 potential relocations for the Full-Build alternatives. Every effort will be made to avoid home and business relocations. In Phase I design, alignments will be shifted, where feasible, to avoid relocations.

3.2.2 Environmental Justice

Environmental Justice is to avoid, minimize or mitigate human health or environmental effects, ensure the full and fair participation by all affected communities and to prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority population and low-income populations.

The US DOT order defines minority as:

1. Black
2. Hispanic
3. Asian American
4. American Indian and Alaskan Native

Socioeconomic issues pertaining to minority, elderly, disability and low income (persons living in poverty) populations in the project study area were evaluated and documented by the Cumberland Valley Area Development District (CVADD) in a November 2013 report entitled *KY-3041 Corbin By-Pass Extension Study: Knox & Laurel County- Environmental Justice Report*. A copy of the report is found in **Appendix C**. This report concluded that, based on evaluation of data obtained from the U.S. Census Bureau, there is a concentration of Environmental Justice

(EJ) and socioeconomic sensitive populations over the age of 65 in Corbin that is above the state and national averages. Census Tracts (CT) 9710.01 and 9710.02 in Laurel County are considered to be in Distressed Areas with respect to poverty and additional measures will be taken so this area will not be disproportionately affected. Environmental Justice issues will be addressed further in accordance with KYTC Policy in Phase 1 Design.

3.2.3 Historic Properties

Information concerning archaeological and cultural historic resources in the vicinity of the project study area was provided by Cultural Resource Analysts, Inc. (CRA). CRA conducted a records review of the study area to identify previous archaeological and cultural historic resource survey areas and previously recorded archaeological or cultural historic sites. Additional information concerning cultural resources that could be expected and a context for cultural resources recovered from the study area was also provided.

The National Register of Historic Places (NRHP) did not list any archaeological or cultural historic sites situated within the study area. The full records review report is provided in **Appendix B**. No previously recorded cultural historic sites are located within the study area as well. However, CRA is currently completing a cultural historic baseline survey along US 25 through the study area. The US 25 review within the study area has identified 93 cultural historic sites, with one of those sites being recommended eligible for listing in the NRHP. Historic maps of the study area indicate that a large number of properties over 50 years in age are located throughout the remainder of the study area. CRA recommends that a cultural historic baseline survey be conducted of the study area that will be impacted by subsequent transportation projects not included within the current US 25 review area.

3.2.4 Archaeology

One prehistoric archaeological site has been documented within the study area, located near the confluence of Robinson Creek and Laurel River. Only a small portion of the study area has been previously surveyed for archaeological resources. Further study will be required, once a potential roadway alignment nears finalization.

CRA recommends that an archaeological survey be conducted for all portions of the study area that will be impacted by subsequent transportation projects and that have not been previously surveyed. In addition, if the one recorded archaeological site cannot be avoided by a subsequent transportation project, an archeological evaluation will be required to assess its eligibility for inclusion in the NRHP.

3.2.5 UST and Hazardous Waste Sites

Properties with hazardous material concerns were identified through review of readily available state and federal database records. Federal and state regulatory database records research was provided in part by Environmental Data Resources, Inc. (EDR, 2013), in addition to a review of the Kentucky Statewide Underground (UST) Database Report (KDWM, 2011b), Kentucky Solid

Waste Facilities GIS information (KDWM, 2011a), and USEPA Envirofacts Data Warehouse information (2012a).

The records of most concern that were identified during this review included: one SHWS (State Hazardous Waste Sites, Superfund equivalent), three US MINES (mining permits), three EDR US Hist Auto Stat (historical auto station records), one HIST LF (historical landfill) site, one RCRA INFO (USEPARCRA listed) site, and 14 UST (Underground Storage Tank) sites.

Correspondence from the Kentucky Division of Waste Management indicates that the closest landfill, Laurel Ridge, is north of the project area. There are no hazardous waste locations in the study area. Any potential impacts will be handled per all local, state, and federal laws and in accordance with KYTC policy. All solid wastes generated by any future construction activities must be disposed of at a permitted facility.

3.3 THREATENED AND ENDANGERED SPECIES

Information concerning federal and state endangered, threatened and special concern species and unique habitats in the project vicinity was obtained from the United States Fish and Wildlife Service (USFWS), the USFWS Ecological Services Kentucky Field Office, the Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Kentucky State Nature Preserves Commission (KSNPC).

3.3.1 Federal-Listed Species

Twelve federal-listed species, including five mussel species, have the potential to occur within the study area based on review of database information, including seven federal-endangered, two federal-threatened, and three federal candidate species. Of these, seven species have the potential habitat within the study area. The Kentucky State Nature Preserves Commission recommends site specific habitat surveys during subsequent project phases. Impacts to these areas should be avoided to the extent practical. See **Appendix B** for additional detail.

3.3.2 State-Listed Species

State-listed species having the potential to occur in the study area were identified through Kentucky State Nature Preserves Commission (KSNPC) records and the Kentucky Department of Fish and Wildlife Resources (KDFWR) Quad List State Threatened, and Special Concern Species. Twenty-five species were identified that could potentially occur in and within 5 miles of the study area based on historic recorded occurrences, including five state-endangered species, three state-threatened species, and seven state-special concern species.

KSNPC reported certain habitats within the study area that should be reviewed. These habitats include the Bottomland hardwood forests and the Cumberland Plateau gravel/cobble bar. The KSNPC recommends site specific habitat surveys during subsequent project phases. Impacts to these areas should be avoided to the extent practical. See **Appendix B** for additional detail.

3.4 GEOTECHNICAL CONSIDERATIONS

The KYTC Division of Structural Engineering, Geotechnical Branch provided a Geotechnical Overview for the study area, a copy of which is found in **Appendix D**. The review noted the study area is located in the Eastern Kentucky Coal Field Physiographic Region, which is in turn a part of the Cumberland Plateau. This area has forested hills and V-shaped valleys which produce the highest elevations. Available mapping indicates the area is underlain by bedrock; however, no faults are noted on the mapping.

Foundations for bridges in the study area are generally deep steel or concrete friction piles. Smaller structures such as retaining walls and box culverts are commonly constructed on shallow foundations. Native soils in the area are generally suitable for embankment construction, accommodating embankments to a height of 60 feet with 2:1 sideslopes if proper compaction methods are used. However, in no case should soil cuts be steeper than 2:1. California Bearing Ratio (CBR) values used in pavement design are generally low for subgrades in the area, ranging from two to four. Chemical modification of subgrade or the use of rock roadbed is sometimes recommended in the area.

3.5 RESOURCE AGENCY COORDINATION

The KYTC Division of Planning sent letters to several agencies asking for input and comments on the Corbin Bypass Extension Study to address any concerns early in the project development process. Responses were received from 19 agencies and their comments are included in **Appendix E**. A summary of the responses, in the order they were received are as follows:

- Kentucky State Nature Preserves Commission – Several threatened species have been found within the study area. A pre-construction survey is recommended.
- Kentucky Cabinet for Economic Development – The project could have a positive impact by attracting new development to the area.
- Federal Aviation Administration – No impacts are anticipated.
- Kentucky Department of Fish and Wildlife Resources – The study area contains Gray bat habitat areas as well as mussel, fish, lamprey, mammal, reptile, amphibian, and bird Conservation Areas. Impacts to these areas should be avoided to the extent practical. The proposed project has potential to impact wetland habitats. Impacts to streams should be minimized with certain design specifications.
- Kentucky Association for Economic Development – No significant impact to its properties or mission.
- Department of Military Affairs – No significant impact to its properties or mission.

- Scenic Kentucky – Concerns regarding the possibility of new billboards and desire that the new corridor be designated billboard free.

- Education and Workforce Development Cabinet, Department of Education – No impacts are anticipated, but additional consultation with the Laurel and Knox County school districts and Corbin Independent School is recommended.

- United States Coast Guard – The proposed project does not involve waterways over which the Coast Guard exercises jurisdiction for bridge administration purposes.

- Kentucky Department for Environmental Protection:

    - Division of Waste Management – The closest landfill, Laurel Ridge, is near the project area to the north. There are not any hazardous waste locations near the site, per USEPA Envirofacts Data Warehouse (USEPA, 2012a) and the EDR (2013) regulatory database.
    - Division of Water – Water and sewer lines are present in the study area and should be considered during design and construction. Additionally, local utilities should be contacted. The Division should be prepared to have a review by Individual Water Quality Certification (WQC) if the stream and wetland impacts are not kept to a minimum.
    - Division of Air Quality – The Division offered suggestions on how this project can help maintain compliance with the National Ambient Air Quality Standards, including the use of alternatively fueled equipment, emission controls, and reduced idling time.

- United States Fish and Wildlife Service – It is recommended that project plans be developed to avoid impacting wetland areas and/or streams. The United States Army Corps of Engineers (USACE) was contacted to assist in determining if wetlands or other jurisdictional waters are present or if a permit is required. Federal-listed species may be present within the project area.

- Kentucky Commission on Human Rights – The Commission would like to be kept abreast of any contracts and subcontracts awarded to Disadvantaged Business Enterprises (DBE's) during planning and implementation phases of the project.

- Natural Resources Conservation Service (NRCS) – The planning study considered impacts of the proposed highway on prime farmland and state and locally important farmland.

- Tourism, Arts and Heritage Cabinet – The Cabinet consulted Tourism and the Department of Fish and Wildlife Resources. The Kentucky Transportations Cabinet must ensure compliance with relevant state and federal regulations regarding cultural resources. These may include any or all of the following: the Advisory Council on Historic Preservations' Rules and Regulations for the Protection of Historic and Cultural Properties (36 CFR, Part 800) pursuant to the National Historic Preservations Act of 1966; the National

Environmental Policy Act of 1969; Executive Order 11593; the Kentucky Antiquities Act; the Kentucky Cave Protection Act; and graves protection legislation.

- Kentucky Transportation Cabinet, Department of Environmental Analysis – There may be prehistoric sites or rock shelters in the nearby area. The recommendation is to investigate the Laurel River crossings prior to selection of a final alternate and to minimize tank system impacts.

- Knox County Emergency Management – Some residents will be affected by the property acquisition.

- Corbin City Government – We are of the opinion that this will be extremely detrimental to the City of Corbin and are opposed to this extension. This redundant road will run parallel 3 miles east of KY 25 which is also planned for improvement. The proposed project will lower the property values of the subdivision and outskirts of property associated with this project. It will have a devastating economic impact on current and future jobs and businesses located at our largest shopping center, The Trademart Shopping Center, in that corridor. It will divert traffic from their business and any traffic traveling south on I-75 will be able to exit at the new exit and never pass Exit 29. The new exit may be important to a major company, Aisin that employs many area people. The best value in helping Aisin would be to run the connector road from KY 25 near that short distance to I-75. This will help Aisin in their expansion plans and save millions of dollars.

- United States Department of Agriculture – No significant impacts were noted to its resources or facilities.

- Department of the Army – The proposed project may impact waters of the United States. If so, try to avoid impacting waters during the design phase. If discharge of dredged or fill material will occur, a DA permit will be required.

4.0 PURPOSE AND NEED

As a result of the existing conditions analysis, project team input and resource agency coordination, a purpose and need statement for this study was developed to be used during future project development efforts, including design and environmental activities. The purpose and need statement establishes why KYTC is proposing to advance a transportation improvement and drives the process for improvements, alternative consideration, analysis, and selection.

> *The purpose of the KY 3041 (Corbin Bypass) Extension Project is to improve local and regional mobility and to provide a safer, more efficient connection between I-75 and much of southeastern Kentucky, including southern Laurel County, Knox County, and Bell County.*

Extending the Corbin Bypass and constructing a new interchange with I-75 will reduce congestion on existing routes accessing the interstate, reduce truck volumes on roadways not intended to serve such traffic, and better connect developing areas to regionally important routes such as the existing Corbin Bypass, US 25E, US 25 and I-75.

The regional roadway network serves as a doorway to Appalachia, connecting the mountains with I-75 and serving a high amount of truck traffic as a result. The existing Corbin Bypass is a two-lane road with paved shoulders and truck passing lanes. Trucks comprise 6 to 12 percent of the 8,000 to 9,000 vehicles per day (vpd) on the existing Corbin Bypass. The area through which potential alternatives will pass is predominantly agricultural and rural residential.

There are a number of industries and businesses located directly on the existing Corbin Bypass. Many more in the area, like those located in the Southeast Kentucky Regional Industrial Park, are strategically located to take advantage of interstate accessibility. There are currently four I-75 interchanges within the vicinity of the study area, as follows:

- Exit 25: US 25W in Corbin
- Exit 29: US 25E in north Corbin
- Exit 38: KY 192 in London
- Exit 41: KY 80 in London

Each route providing access directly to the interstate experiences recurring congestion and has a high crash rate (based on crashes reported from 2010 to 2012), particularly in the vicinity of the interchange. US 25E (Exit 29) provides the most direct connection from the study area to I-75, and US 25E carries 20,000 to 25,000 vpd with 11 percent trucks. Alternative interstate access to and from the north is provided via US 25 to KY 192 in London. Other routes provide indirect and inefficient access to the interstate but are used by truck drivers to avoid congestion along the primary routes. An example is KY 229, which carries up to 9,200 vpd that includes approximately 5 percent trucks. Such routes, with relatively narrow lanes and little to no usable shoulder are not intended to carry such high volumes of truck traffic.

Of the three counties within the study area (Knox, Laurel, and Whitley), only Laurel County is anticipated to experience population growth in the coming years. The Kentucky State Data Center (KSDC) projects Laurel County's populations will increase from 58,850 in 2010 to 72,750 by 2040, an increase of nearly 24 percent.

5.0 INITIAL DEVELOPMENT OF CONCEPTUAL ALTERNATIVES

Initially, five alternatives were considered: the no-build and four build alternatives. **Figure 15** shows the four build concepts in more detail. One of the concepts is a direct connection from US 25 to a new interchange with I-75. The remaining concepts begin at the existing Corbin Bypass (KY 3041), travel northwest and create a new interchange with I-75. Because the project is early in the planning process, each conceptual alternative has a 1,000-foot-wide corridor within which a new roadway could be constructed. Multiple constraints were revealed while defining the concepts shown in **Figure 15**, including the following:

- The central portion of the study area is characterized by stream crossings, wetland areas, and significant floodplain encroachment. It is envisioned that any new route in this area will be built largely on fill with overflow structures within floodplain areas and structures (bridges and/or box culverts) at each blueline stream crossing.

- The proposed I-75 interchange at KY 552 would require some access modifications to accommodate the new connector road and access to Moore Valentine Road to the east and Old Whitley Road to the west.

- The two proposed I-75 interchanges to the south would be less than three miles from the existing US 25E interchange, Exit 29. The *2005 AASHTO A Policy on Design Standards for Interstate Systems* lists the minimum interchange spacing as 3 miles in rural areas, based on crossroad-to-crossroad spacing.

- The heavy truck presence due to I-75 and the large number of regional businesses that rely on a good connection to I-75 will need to be accounted for.

5.1 TYPICAL SECTIONS

The project team considered several possible typical sections, including a two-lane roadway and another option with truck climbing lanes. The first option was a two-lane section (one lane per direction) with outside shoulders and the second includes three lanes, one lane per direction with a truck climbing lane, as shown below in **Figure 16.**

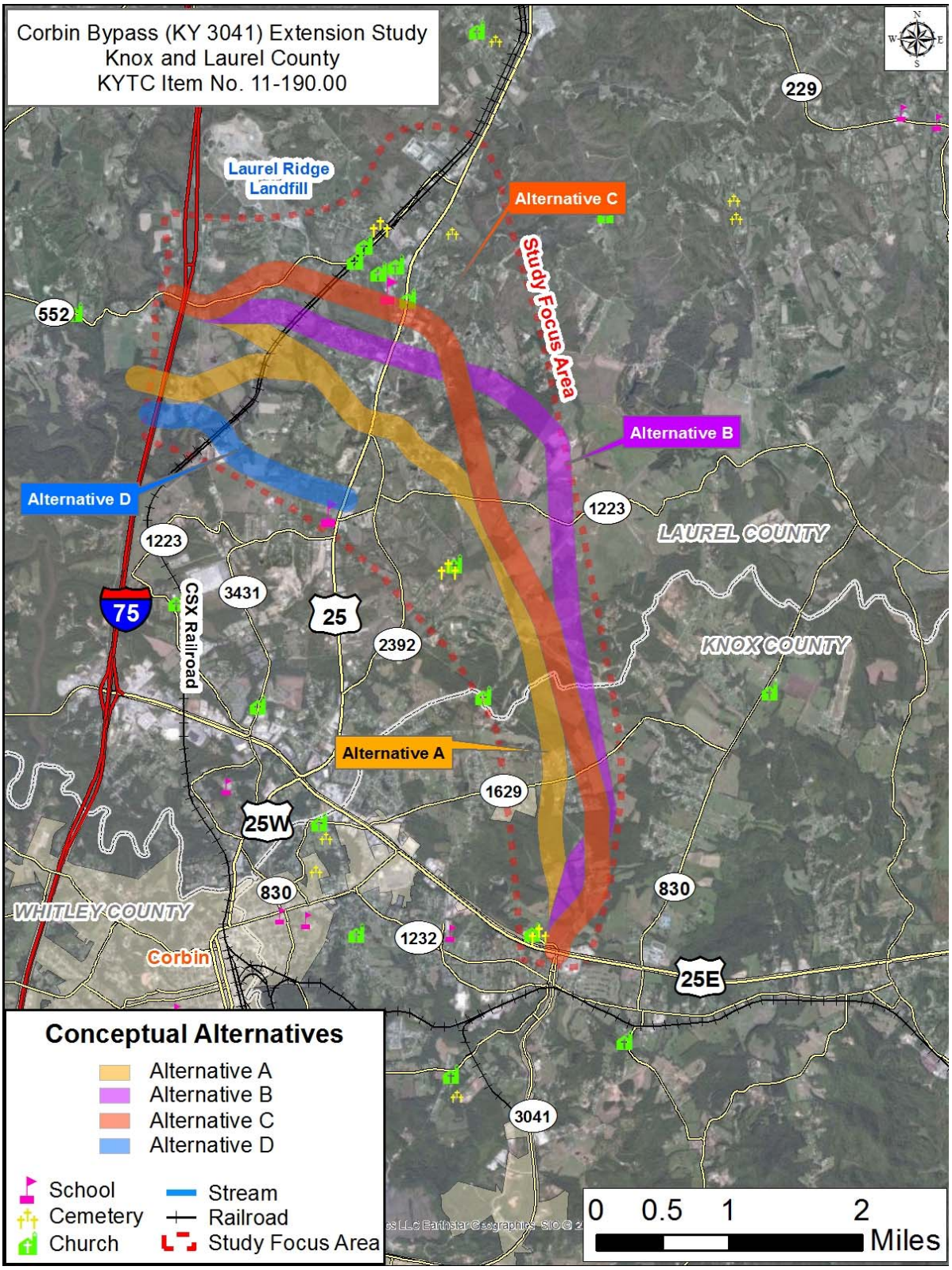

Figure 15 – Initial Conceptual Alternatives

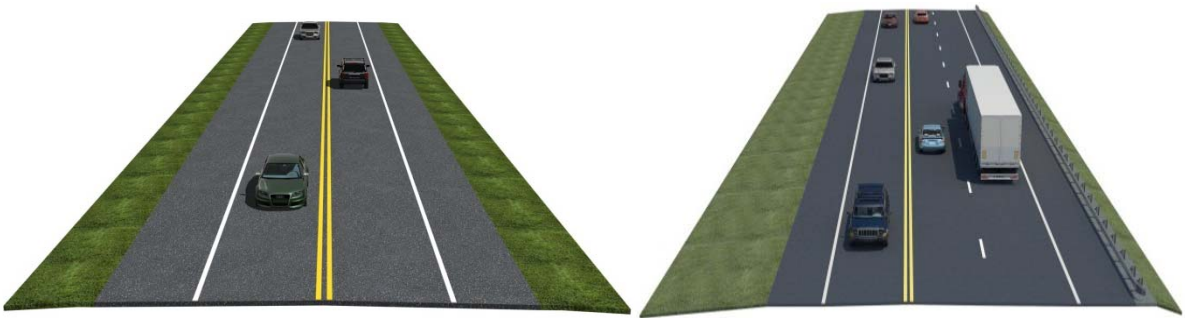

Figure 16 – Typical Sections

5.2 TRAFFIC FORECASTS

The Laurel-Pulaski Travel Demand Model was updated as part of this study. The model expansion area includes portions of northwestern Knox County and northern Whitley County. The tool was utilized to develop traffic forecasts for the proposed roadway based on likely development trends within the study area. The forecasting task examined three design-year growth scenarios: 2040 No-Build, 2040 Partial-Build (direct connection from US 25 to I-75), and 2040 Full-Build (direct connection from existing Corbin Bypass to I-75) to estimate the future demand for travel.

5.2.1 Laurel-Pulaski Travel Demand Model

KYTC's Laurel-Pulaski Travel Demand Model ("the model") was updated to provide forecasts of for project alternatives for this study. The model is a conventional three-step (*Trip Generation, Trip Distribution, and Trip Assignment*) model developed within the TransCAD modeling software package, using KYTC's preferred standard interface and file model structure. The model was originally developed by Stantec for KYTC in 2010 and calibrated and validated to a 2005 base year and provides forecasts for future years 2020, 2030, and 2040.

Before developing forecasts, Stantec modified and updated the model in several ways. Stantec expanded the model area to include the adjacent portions of western Knox County and northeast Whitley County that are within and affect the project study area. Stantec updated the entire model's socioeconomic data to the 2010 base year, incorporating household data from the 2010 Census, and the most recent employment data collected by the Kentucky Education Cabinet, Office of Employment and Training, and vehicular ownership data collected by KYTC. The 2040 forecast year was also updated to reflect these new data and new population forecasts from the Kentucky State Data Center.

The capacity to include special generators, such as hospitals and colleges, was added to the model to account for unusually high traffic associated with those facilities, specifically Lake Cumberland Regional Hospital and Somerset Community College in Somerset, Saint Joseph Hospital in London, and the Baptist Regional Medical Center in Corbin. Stantec also incorporated speed and capacity calculators from the 2010 Highway Capacity Manual (2010 HCM) into the model script, replacing the static link speed and capacity values which were

previously calculated external to the model. The expanded updated model is now referred to as the LPKW Model to reflect the addition of parts of Knox and Whitley counties.

Figure 17 presents the model area for the LPKW model. The original model covered all of Laurel and Pulaski counties and consisted of 262 internal Traffic Analysis Zones (TAZ), the basic geographic blocks used to generate and distribute the vehicular trips that travel across the network. The expanded model added 72 zones in Knox and Whitley counties and sub-divided 19 zones within Pulaski and Laurel counties to create a total of 358 internal TAZs. The number of external TAZs, which represent the gateways through which external traffic enter and exit the model area, decreased from 16 to 15 as many of the external gateways around Corbin were absorbed into the model and replaced by fewer farther-spaced rural connections.

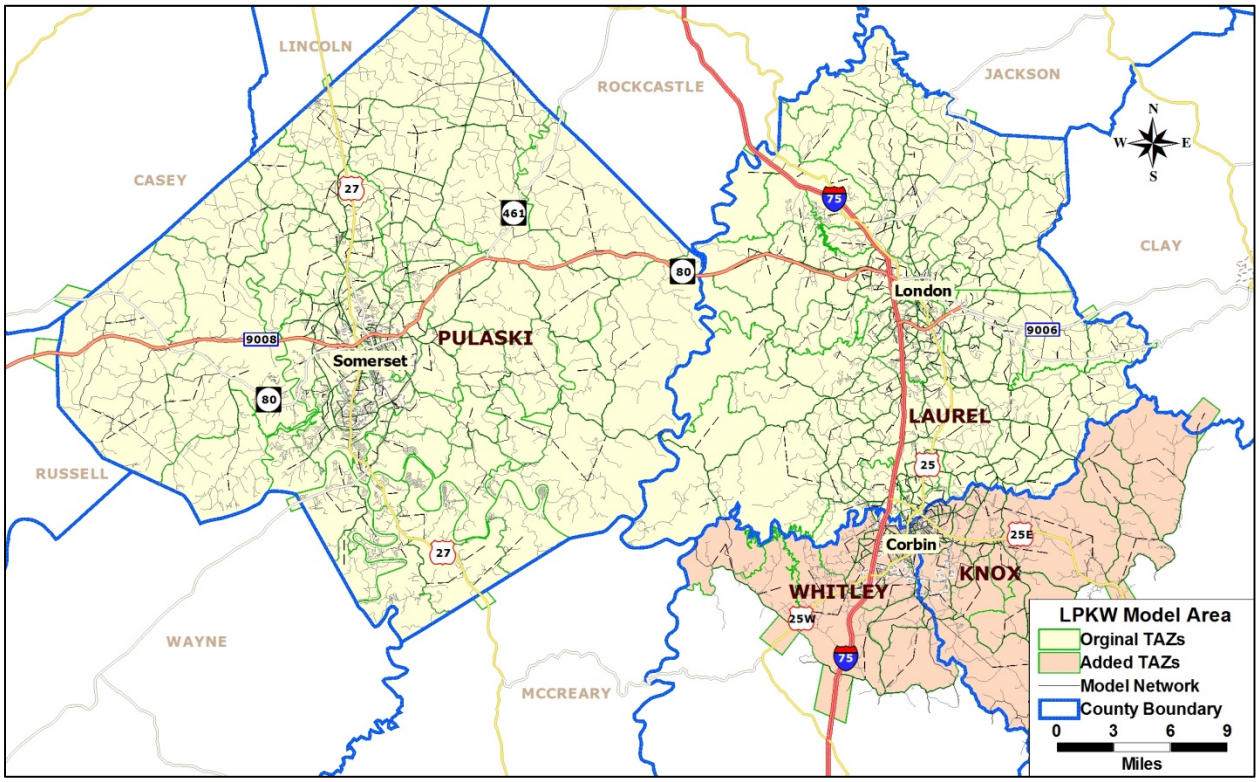

Figure 17 – Laurel-Pulaski Travel Model Area

Table 4 presents a summary of the updated socioeconomic data used as input for the model. Only the data pertaining to the portions of Knox and Whitley counties in the expanded model area are included. According to the KSDC, the population in Knox and Whitley counties is expected to decrease between 2010 and 2040, but it was decided to hold the 2040 population and household levels at their 2010 values in order to ensure a stable and conservative estimate for the project forecasts.

2010	Population	Households	Avg. HH Size	Vehicles	Retail Emp.	Service Emp.	Other Emp.	Total Emp.
Laurel	58,572	23,011	2.55	37,686	7,767	9,442	4,974	22,183
Pulaski	63,045	25,714	2.45	55,066	7,097	6,111	11,695	24,903
Knox (Partial)	13,854	5,434	2.55	5,896	329	1,384	1,067	2,780
Whitley (Partial)	13,132	5,241	2.51	4,923	595	2,699	3,083	6,377
2040								
Laurel	72,754	28,523	2.55	49,063	11,612	15,056	8,853	35,521
Pulaski	84,770	34,414	2.46	74,446	10,027	8,632	16,529	35,188
Knox (Partial)	13,854	5,434	2.55	5,896	420	1,769	1,363	3,552
Whitley (Partial)	13,132	5,241	2.51	4,923	691	3,144	3,592	7,427

Table 4 – Socioeconomic Data

Network updates for the 2010 model were primarily limited to expanding the network within Knox and Whitley counties, and minor changes to the location of existing centroid connectors, which act as the theoretical pathways that connect traffic generated and distributed from the TAZs to the model network. A more accurate depiction of US 25E north of London as a four-lane divided highway was added in Laurel County. Updates in Pulaski County included the new alignments of KY 1247, KY 914 (the Southeastern Bypass), the Cumberland Parkway at KY 914, KY 80, and US 27, all around Somerset.

While the two counties that make up the model are adjacent (Pulaski County to the west, and Laurel County to the east), the Daniel Boone National Forest and the Rockcastle River limit connections between the two counties. Further, the model is set up to balance trip productions and trip attractions separately, so that internally generated trips tend to stay within the west side or east side of the model. Therefore, it was possible to focus model adjustment and calibration efforts on the eastern Laurel-Knox-Whitley side of the model, where the effects of project alternatives would be located, while also ensuring an acceptable level of overall calibration for the entire model network.

The 2010 model's trip assignments were validated to KYTC counts collected between 2008 and 2011. The counts were compared to the total two-way model assignment of all vehicles, except for divided highways, where counts were compared on a directional basis. The two basic metrics for validation were the ratio of assigned volume to observed counts (V/C) and the percent Root Mean Square Error (%RMSE). The target for the V/C ratio is 1.00, demonstrating that the model is producing an overall equivalent amount of traffic on the network. The %RMSE is an overall statistical measure of the accuracy of the assignments at each individual link where counts are observed. The lower the %RMSE value, the more accurate the model is to matching assigned volumes to observed volumes. This measure is generally calculated by volume groups and for all count locations in the study area. Higher volume groups generally should have a smaller %RMSE than lower volume groups, which have less consistent observed volumes from day to day, and by nature are smaller and therefore more difficult to precisely match.

Table 5 presents the validation statistics for the LPKW model. The V/C ratio for Laurel Knox and Whitley counties suggests the model is slightly under-assigning, but the over assignment of very low volume roads suggests that the model may be diverting some traffic from higher volume main roads to more rural roads with less count locations. The %RMSE results for the more significantly higher volume groups are within their respective desirable thresholds. The %RMSE for the smallest volume roads, with less than 1,000 daily trips, is above the desirable range. These low volume roads are typically the most difficult for a model to match counts at a specific location given the small margin of error, and are particularly relevant to planning decisions given their relatively minimal traffic.

COUNT RANGE	Number of Links	COUNT SUM	ASSIGNMENT VOLUME	VOLUME/ COUNT	%RMSE	Desirable
(< 1,000)	114	60,680	92,489	1.52	140.0	55 - 95
(1,000 to 5,000)	197	485,931	477,840	0.98	51.8	45 - 55
(5,000 to 10,000)	126	932,103	904,966	0.97	28.1	35 - 45
(10,000 to 20,000)	82	1,120,862	1,036,493	0.92	20.6	20 - 30
Laurel-Knox-Whitley counties	293	1,544,330	1,467,582	0.95	29.6	<= 35
All Counts	519	2,599,576	2,511,788	0.97	34.8	<= 35

Table 5 – Validation Statistics

5.2.2 2040 Future Network Updates

For the 2040 network, planned projects that either added lanes or new links were added. In Laurel County, US 25 was widened from two to four lanes from Corbin to London, and in London, the US 25 connector to KY 229 was also included. South of Corbin, US 25W was widened from two to four lanes between KY 729 and the interchange with I-75. Projects added in Pulaski County included the extension of the northern portion of Somerset's bypass, from its current termination at US 27 to KY 39, and the widening of KY 914 from two to four lanes on the southwest portion of the bypass. **Figure 18** shows the location of these projects, along with their project item numbers.

5.2.3 2040 Forecasts

The 2040 No-Build volumes show a 20 percent increase in traffic on US 25E. Extending the Bypass shifts through traffic away from US 25E and US 25 (10 percent for the Partial-Build Alternatives and 30 percent for the Full-Build Alternatives). **Figure 19** displays the latest traffic forecast projections for the study area.

The traffic impacts related to Corbin's proposed quarter horse racing track, Thunder Gap, were not considered as part of this study because the site is new and was unknown to the project team during the study. Thus Thunder Gap was not included in the traffic forecast or decision making process. The proposed racing facility is located off the Corbin bypass and will consist of a 1,723-foot straightaway horse track, grand stand seating, an entertainment facility, two 50-stall horse barns, 1,500 parking spaces and seven commercial lots set aside for business and hotel development. Future project development phases will need to consider this new facility.

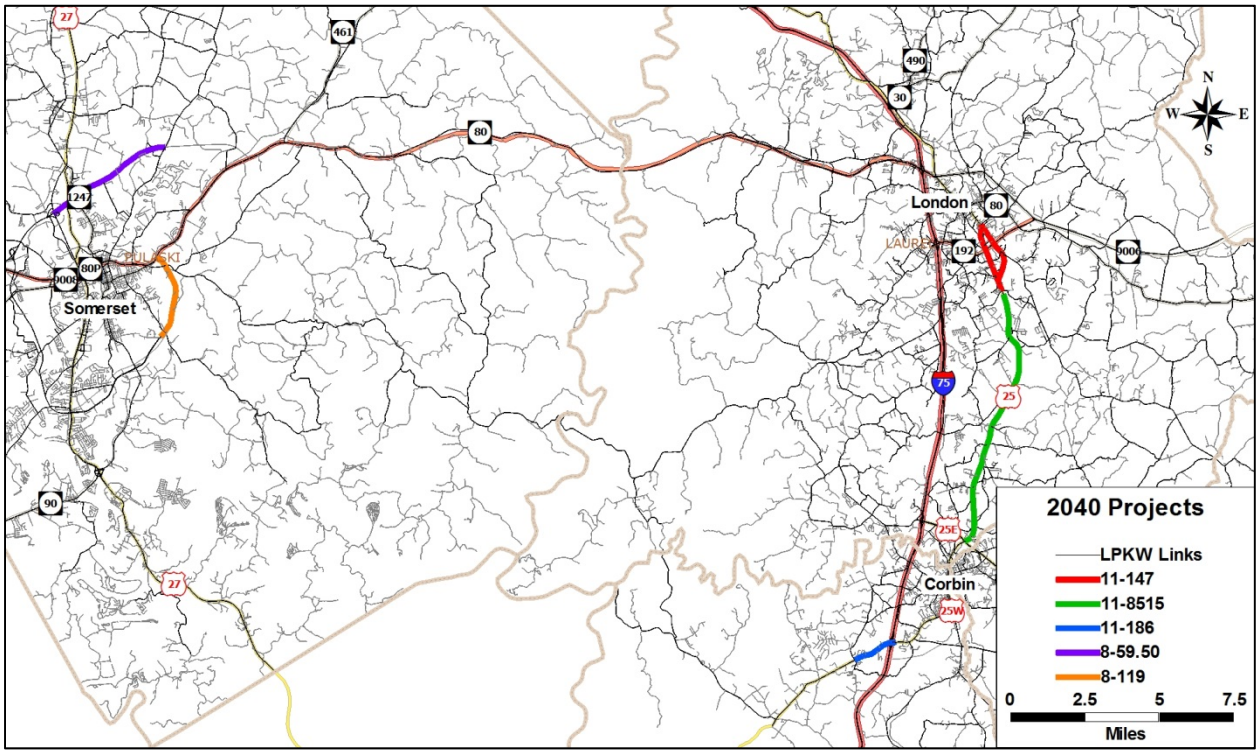

Figure 18 – 2040 Projects

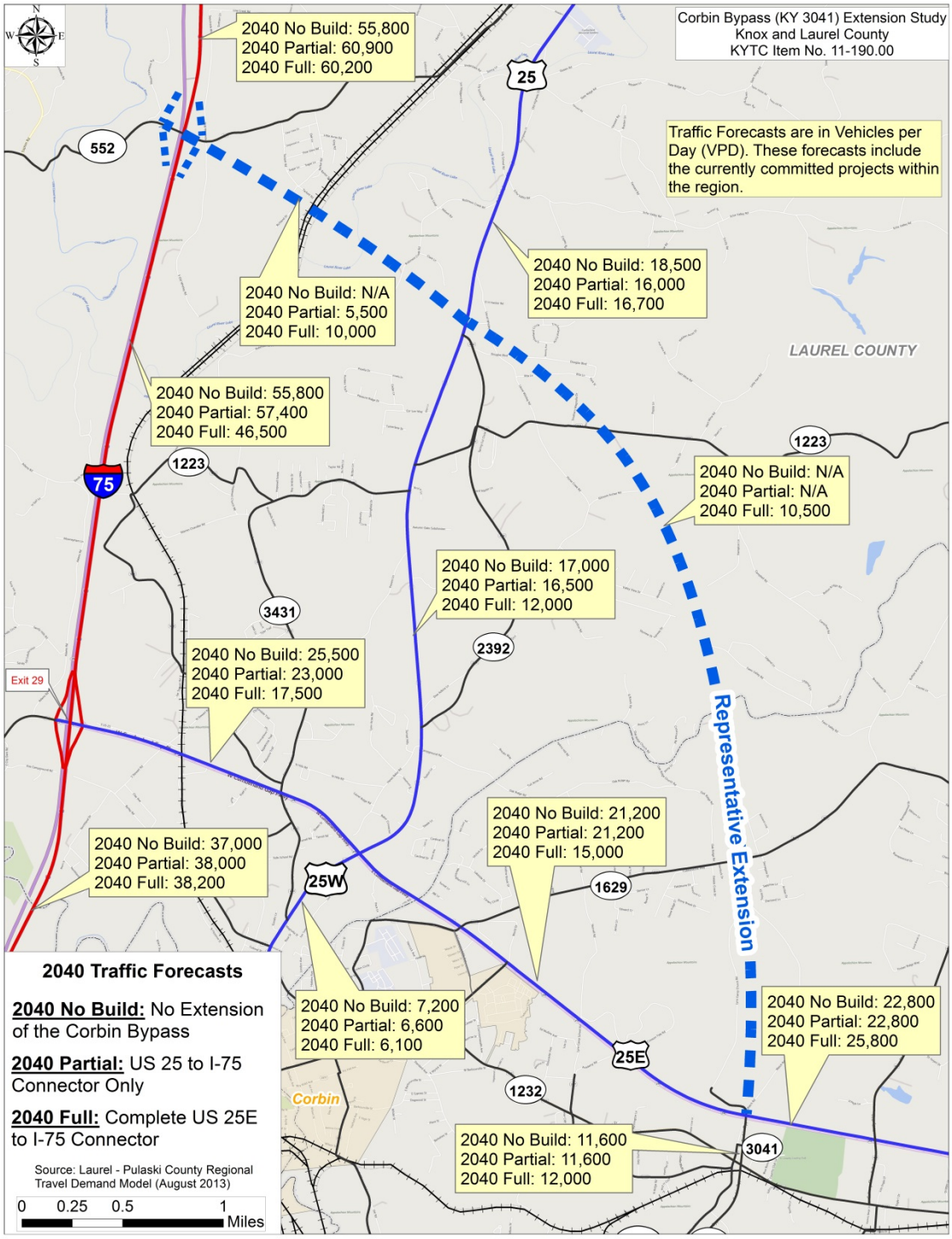

Figure 19 – 2040 Traffic Forecasts

6.0 INITIAL PUBLIC INVOLVEMENT

Over the course of the study, the project team held four in-person project team meetings to coordinate key issues. In addition, public officials, key stakeholders, and the public were given the opportunity to provide input throughout the course of the Corbin Bypass (KY 3041) Extension Study. This chapter describes the first round of public involvement that occurred and describes the comments and input received as a result of those efforts. Public outreach helped guide the Corbin Bypass (KY 3041) Expansion Study, particularly in identifying potential issues and developing alternatives. Summaries of each meeting are presented in **Appendix F**.

6.1 ADVISORY COMMITTEE MEETING (MAY 1, 2013)

An Advisory Committee, consisting of project stakeholders and local officials, was established to solicit feedback at critical stages of the study. **Table 6** includes a list of the stakeholders and local officials invited to participate in the study.

Jessica Blankenship	Cumberland Valley Area Development District
Josh S. Brock	Landowner
Steven H. Brock	Landowner
Dale Gifford	Elmo Greer & Sons, LLC
Charlie Gray	Landowner
Robert Gray	Landowner
Ruth Ann Gray	Landowner
Todd Greer	Elmo Greer & Sons, LLC
Patrick Lyga	Falls Auto Group
Willard McBurney	Mayor, City of Corbin
Saied Nami	Falls Auto Group

Table 6 – Advisory Committee Members

The meeting was held on May 1, 2013 at 1:30 p.m. EDT in the Laurel County Judicial Annex in London. The purpose of this meeting was to introduce the purpose and need of the study, share existing condition information and to solicit input on the conceptual alternatives under consideration at that time.

A group exercise was undertaken to allow the meeting attendees an opportunity to assist the project team by answering three important questions:

1. Are there sensitive resources that should be avoided?
2. Are there “trouble spots” that should be addressed?
3. Where should a new corridor(s) be considered?

Large maps of the study area showing some sensitive resources were provided along with markers, and the advisory committee was asked to answer the questions above by drawing on the maps. The committee's input would assist the project team in developing the conceptual corridors that would be shown at the first public meeting. (It was noted any concepts shown to the public will include corridors 1,000 feet or more in width.) The advisory committee drew four conceptual roadway corridors, two extending the Corbin Bypass to I-75 and two connecting US 25 to I-75.

The initial conceptual alternatives developed by the project team were then presented to the advisory committee. It was noted how similar they were to the lines drawn by the committee during the group exercise. Three concepts extend the existing Corbin Bypass to I-75. A fourth option connects US 25 to I-75.

There was a question asked regarding what types of trips (i.e. local traffic as opposed to regional/"through" traffic) would be served by the proposed roadway and how that might affect the need for extending the Corbin Bypass to I-75 versus simply providing a shorted connection from US 25 to I-75. It was mentioned that proposed improvements along US 25E and US 25 would provide a better connection to a new interstate connector west of US 25, at least partially negating the need for a new roadway between US 25E and US 25. The project team noted the study is evaluating both options and the development of traffic forecasts will help determine the type and intensity of traffic that would use them.

6.2 PUBLIC MEETING #1 (JUNE 13, 2013)

On June 13, 2013, the project team held a public meeting at the Lynn Camp High School in Corbin. The purpose of the meeting was to provide information about the study, discuss the initial conceptual alternatives and to solicit input from the public. The meeting was held in an open house format, with a formal presentation at 5:15 pm to explain the project. Attendees were asked to sign in and were provided a project handout and survey. The project team was available to answer questions and discuss issues. 84 members of the public attended and 50 surveys were submitted.

There were 50 surveys returned, with 31 received at the meeting and 19 submitted via email or regular mail afterwards. Generally speaking, the public was split on the need for the project, but most respondents indicated support for a new interchange on I-75 and a connection to US 25. Of the 50 surveys returned; 19 (38 percent) thought the project was needed, 18 (36 percent) thought the project was not needed, and 13 (26 percent) were undecided. In total, 90 percent of respondents indicated they travel the corridor daily. Of the conceptual alternatives presented, 18 (38 percent) respondents preferred the Full extension of the Corbin Bypass, 16 (33 percent) respondents preferred the Partial connection between US 25 and I-75 and 14 (29 percent) of the respondents preferred the No-Build.

7.0 REVISED CONCEPTUAL ALTERNATIVES

Following comments from the first round of public involvement and given the surrounding residential areas, the project team believed that certain corridors were too close and would require too many home relocations. The four initial conceptual alternatives were modified to minimize impacts. **Figure 20** depicts the revised alternatives. All four concepts were evaluated in two ways. First were the Full-Build Alternatives which extend the existing Corbin Bypass from its current terminus at US 25E to a new interchange on I-75. Second were the Partial-Build Alternatives which provide a direct connection between US 25 and a new I-75 interchange. A summary of each revised conceptual alternative including length, construction cost, and potential relocations for the new connection is shown in **Table 7**.

Table 7 – Summary of Revised Conceptual Alternatives

Alternative	Description of Alternative	Full Extension Alternatives (Corbin Bypass to I-75)			Partial Alternatives (US 25 to I-75)		
		Length (Miles)	Construction Cost ($Millions)	Potential Relocations	Length (Miles)	Construction Cost ($Millions)	Potential Relocations
Alternative 1 (Magenta)	New connector from Corbin Bypass to I-75, crossing US 25 near KY 2392 and providing a new interchange on I-75 at KY 552.	6.3	$44	34 - 38	1.7	$27	8 - 10
Alternative 2 (Orange)	New connector from Corbin Bypass to I-75, turning northwest along Fawn Valley Road after entering Laurel County, crossing US 25 near old US 25 (north of Lily School Road) and providing a new interchange on I-75 at KY 552.	7.3	$40	24 - 26	1.8	$24	10 - 12
Alternative 3 (Yellow)	New connector from Corbin Bypass to I-75, crossing US 25 near old US 25 (north of Lily School Road) and providing a new interchange on I-75 at KY 552.	7.5	$45	26 - 28	1.9	$21	10 - 12
Alternative 4 (Blue)	New connector from Corbin Bypass to I-75, crossing US 25 north of Hunter Hills Elementary providing a new interchange on I-75 approximately 2.25 miles north of US 25E.	6.3	$43	26 - 28	1.8	$25	8 - 10

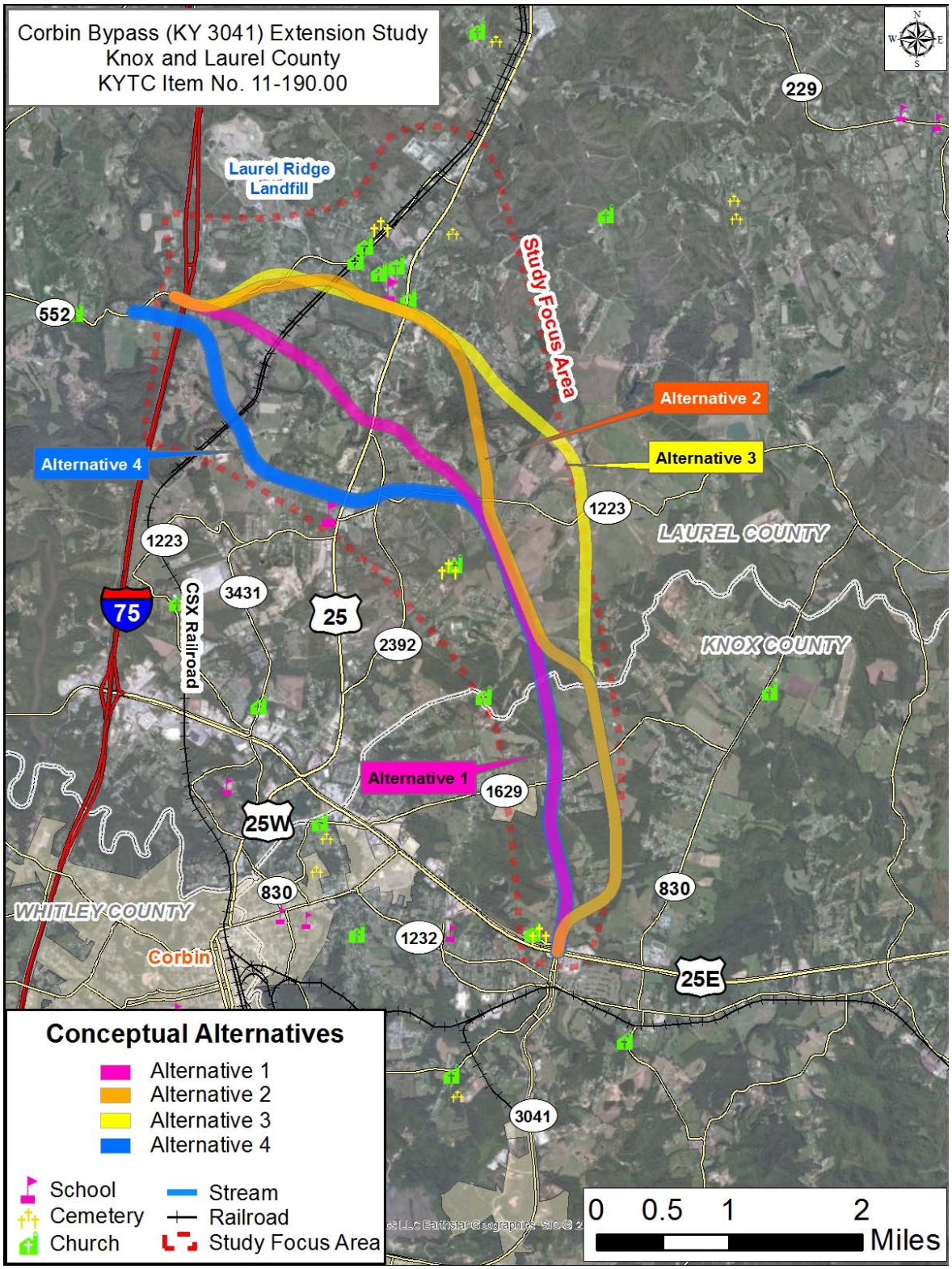

Figure 20 – Revised Conceptual Alternative

8.0 FINAL PUBLIC INVOLVEMENT

As part of the evaluation process a second round of Public Involvement was undertaken with the general public.

8.1 PUBLIC MEETING #2 (AUGUST 29, 2013)

On August 29, 2013, the project team held a second public meeting at the Hunter Hills Elementary School in Corbin. A summary of the meeting is presented in **Appendix F**.

The purpose of the meeting was to provide information about the study, discuss the revised conceptual alternatives and to solicit input from the public. The meeting was held in an open house format, with a formal presentation at 5:15 pm to explain the project. Attendees were asked to sign in and were provided a project handout and survey. The project team was available to answer questions and discuss issues.

168 people attended the meeting. There were 161 surveys returned, with 69 received at the meeting and 92 submitted via email or regular mail after the meeting. Looking at all the surveys received, 78 percent of respondents did not believe the project was needed. Of the 92 participants who submitted surveys after the meeting, 74 percent preferred the No-Build. The responses received at the public meeting were more evenly split. Of the 69 participants who submitted their surveys at the meeting, 25 percent preferred the Full-Build, 30 percent preferred the Partial-Build, 39 percent preferred the No-Build, 3 percent did not know, and 3 percent preferred another idea.

9.0 RECOMMENDATIONS

This section provides the recommendations for the Corbin Bypass (KY 3041) Extension Study.

9.1 FINAL PROJECT TEAM MEETING

The project team met for the final time on November 12, 2014 at the KYTC District 11 Office in Manchester, Kentucky. The purpose of the meeting was to discuss the updated traffic forecast, the input from the second public meeting, and to determine the improvement recommendations. A summary of the final project team meeting is included in **Appendix F**.

The following summary outlines the key discussions from the final project team meeting:

- The 2040 No-Build volumes show a 20 percent increase in traffic on US 25E. Extending the Bypass shifts through traffic away from US 25E and US 25 (10 percent for the Partial-Build Alternatives and 30 percent for the Full-Build Alternatives).
- The project team was concerned that the Full-Build Alternative diverts too much traffic away from US 25 and US 25E.
- The additional I-75 interchange would be beneficial as the area develops.
- The proposed improvements along US 25 are a higher district priority than this project. The proposed improvements along US 25 partially negate the need for the Full-Build Alternatives between US 25E and US 25.

- The project team recommends the Partial-Build Alternatives and a new I-75 interchange for future project development phases.

9.2 RECOMMENDATIONS

In light of the input received and the screening process detailed in this report, the project team recommends the Partial-Build Alternatives for future project development phases. The Full-Build Alternatives divert 30 percent of through traffic away from US 25 and US 25E, which was a major public concern. Proposed improvements along US 25E and US 25 and future improvements to the US 25/US 25W intersection with US 25E ("Malfunction Junction") would provide a better connection to the Partial-Build Alternatives. The Partial-Build Alternatives would provide a connection between an improved US 25 and a new I-75 interchange.

A summary of the recommended Partial-Build Alternatives, including length, potential relocations, design cost, right-of-way cost, utility cost and construction cost is shown in **Table 8**. **Figure 21** depicts the recommended alternatives.

Alternative	Description of Alternative	Partial Alternatives (US 25 to I-75)						
		Length (Miles)	Potential Relocations	Design Cost ($Millions)	Right-of-Way Cost ($Millions)	Utility Cost ($Millions)	Construction Cost ($Millions)	Total Cost ($Millions)
Alternative 1 (Magenta)	New connector from US 25 to I-75, starting at US 25 near KY 2392 and providing a new interchange on I-75 at KY 552.	1.7	8 - 10	$2.7	$1.9	$2.6	$27.0	$34.1
Alternative 2 (Orange)	New connector from US 25 to I-75, starting at US 25 near old US 25 (north of Lily School Road) and providing a new interchange on I-75 at KY 552.	1.8	10 - 12	$2.4	$2.2	$2.7	$24.0	$31.3
Alternative 3 (Yellow)	New connector from US 25 to I-75, starting at US 25 near old US 25 (north of Lily School Road) and providing a new interchange on I-75 at KY 552.	1.9	10 - 12	$2.1	$2.2	$2.9	$21.0	$28.2
Alternative 4 (Blue)	New connector from US 25 to I-75, starting at US 255 north of Hunter Hills Elementary providing a new interchange on I-75 approximately 2.25 miles north of US 25E.	1.8	8 - 10	$2.5	$1.9	$2.7	$25.0	$32.1

Table 8 – Summary of Recommended Alternatives

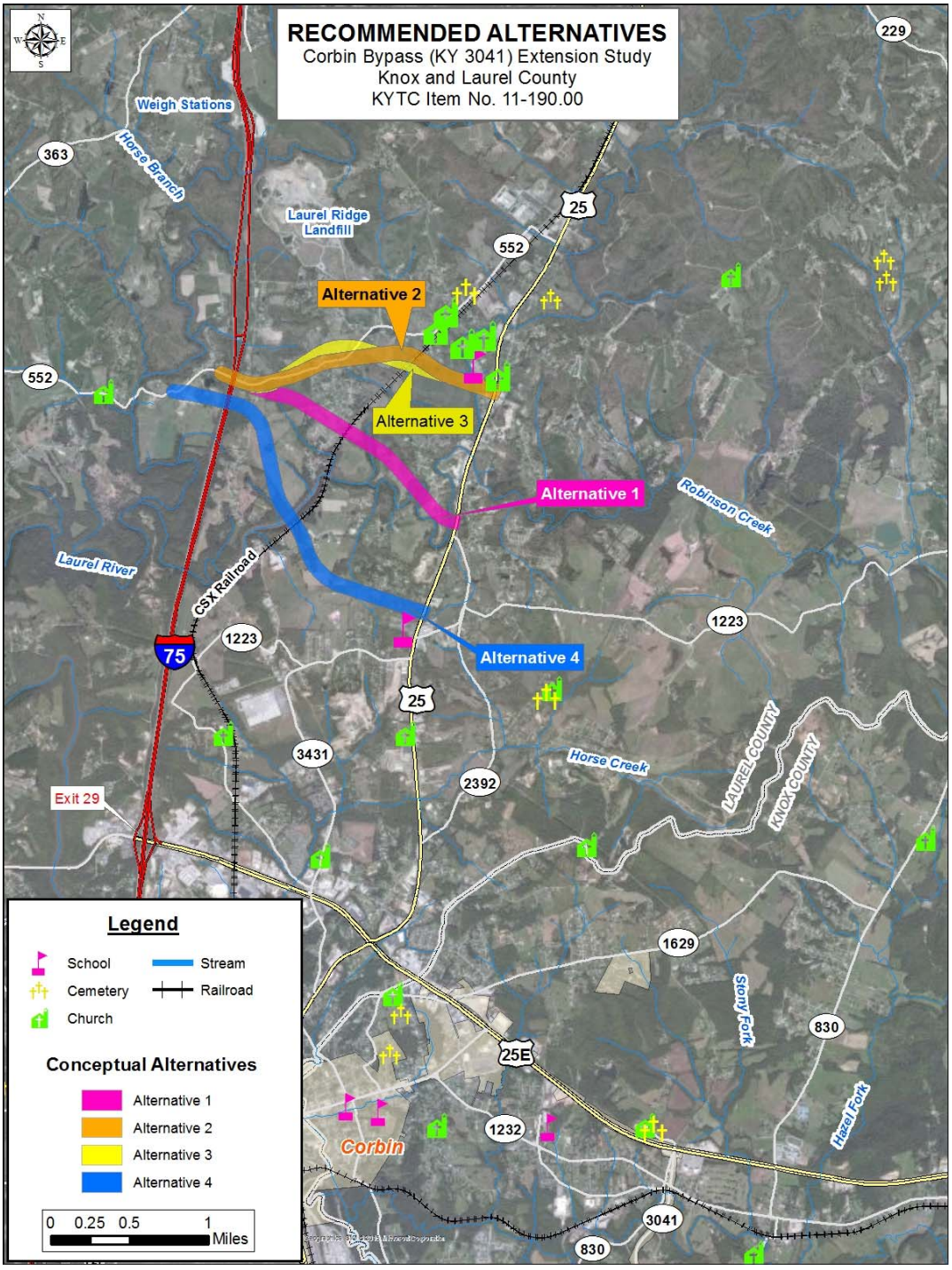

Figure 21 – Recommended Conceptual Alternatives

The Partial-Build Alternatives are recommended as the preferred alternative for the following reasons:

- Satisfies the project Purpose and Need:
    - Improves local and regional mobility by constructing a new interchange with I-75 which will reduce congestion on existing routes accessing the interstate and better connect developing areas to regionally important routes such as the existing Corbin Bypass, US 25E, US 25, and I-75.
    - Provides a safer, more efficient connection between I-75 and much of southeastern Kentucky, including southern Laurel County, Knox County, and Bell County, by providing an alternative interstate access to and from the north via US 25 and KY 192 in London. This will reduce the reliance on other routes that provide indirect, unsafe, and inefficient access to the interstate but are used by truck drivers to avoid congestion along the primary routes. An example is KY 229, which carries up to 9,200 vpd and approximately five percent trucks. Such routes, with relatively narrow lanes and little to no usable shoulder are not intended to carry such high volumes of truck traffic.
- Serves a Laurel County population that is projected to increase from 58,850 in 2010 to 72,750 by 2040, an increase of nearly 24 percent.
- Minimizes the impacts to the human and natural environment by reducing the length of the project by as much as 5.6 miles when compared to the Full-Build Alternatives.
- Minimizes the construction cost of the project by as much as $24 million when compared to the Full-Build Alternatives.
- Takes advantage of the proposed future improvements along US 25 and US 25E.
- Best satisfies resource agency, local official and public concerns.
- Satisfies interchange spacing requirements.

9.3 NEXT STEPS

The next phase would be Phase 1 Design (Preliminary Engineering and Environmental). Future design, right-of-way, utility, and construction phases for this project are not included in the Highway Plan. Following Phase 1 Design and Environmental, Phase 2 Design would need to be completed, followed by the right-of-way, utility, and construction phase.

As part of Phase I Design, traffic impacts related to Corbin's proposed quarter horse racing track, Thunder Gap, will need to be considered. Thunder Gap was not considered as part of this study because the site is new and was unknown to the project team during the study. The racing facility is located off the Corbin bypass and will consist of a 1,723-foot straightaway horse track, grand stand seating, an entertainment facility, two 50-stall horse barns, 1,500 parking spaces, and seven commercial lots set aside for business and hotel development.

Buchanan Boulevard will serve as the main entrance for Thunder Gap, and therefore must undergo major renovations. Allison Boulevard will also have to be reworked and rerouted to fit

the purposes of the project. A traffic light will be added at the intersection of Buchanan and the Corbin bypass. Thunder Gap is anticipated to bring around 2,000 jobs and $10 million in tax revenues over the next five years, with anywhere from 100 to 150 of those jobs being permanent positions.