SCIENCE HILL

Railroad Crossing Study

KYTC Item No. 8-9010.00
Pulaski County, KY

June 2019

In Partnership With

KENTUCKY TRANSPORTATION CABINET

QK4 Engineering Planning

Groundbreaking by Design.

FINAL

Table of Contents

Figures

Tables

Appendices

List of Acronyms

AADTT	Annual Average Daily Truck Traffic
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
BG	Block Group
BPMP	Bicycle/Pedestrian Master Plan
CCRF	Critical Crash Rate Factor
CHAF	Continuous Highway Analysis Framework
CT	Census Tract
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
HCM	Highway Capacity Manual
HIS	Highway Information System
IPaC	Information for Planning and Consultation
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KGS	Kentucky Geological Survey
KSNPC	Kentucky State Nature Preserves Commission
KSS	Kentucky Speleological Society
KTC	Kentucky Transportation Center
KYTC	Kentucky Transportation Cabinet
LCADD	Lake Cumberland Area Development District
LEP	Limited English Proficiency
LPTDM	Laurel-Pulaski Travel Demand Model
LO/S	Local Officials/Stakeholders
LOS	Level of Service
LWCF	Land and Water Conservation Fund
MP	Mile point
MSAT	Mobile Source Air Toxics
NEPA	National Environmental Policy Act
NHS	National Highway System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PACE	Purchase of Agricultural Conservation Easements
PDO	Property Damage Only
PIF	Project Identification Form
RRS	Railroad Separation Protection Program
RTEC	Rural Transit Enterprises Coordinated, Inc.
STAA	Surface Transportation Assistance Act
STIP	Statewide Transportation Improvement Program
T/E	Threatened/Endangered
TWLTL	Two-way Left-Turn Lane
USFWS	US Fish and Wildlife Service
v/c	Volume-to-capacity ratio
vpd	Vehicles per day

EXECUTIVE SUMMARY

The Kentucky Transportation Cabinet (KYTC) initiated the Science Hill Railroad Crossing Study to evaluate alternatives to improve safety and reliability in Science Hill. Dual Norfolk Southern railroad tracks form a barrier between the eastern and western portions of town. Seven at-grade crossings are located within the study area, as shown in **Figure ES-1**. The northern four crossings carry the majority of local traffic whereas the southern three each serve a few private residences. The nearest grade-separated crossing is the US 27 overpass, near the southern limits of the study area.

The study identified the need for a project to improve cross-railroad mobility, reliability, and safety for motorists—especially emergency responders—in Science Hill. The need for an improvement project is based on high volumes of daily through trains, trains stopping on tracks, lengthy detours when at-grade crossings are blocked, and inherent safety risks for at-grade crossings. Efficient response times for fire, police, and ambulances are critical for community safety. These are compromised by the current disruptions in accessibility caused by existing train traffic.

Planners analyzed existing roadway conditions, present and future traffic volumes, crash trends, etc. to understand the context of the study area.

- Analyses showed that generally, the existing highway network provides adequate capacity for current and future traffic volumes; all studied segments and intersections operate at Level of Service (LOS) D or better.

- Five years of crash data showed 174 crashes reported throughout the study area, including two fatalities and 35 injury collisions. Half of the reported crashes were along US 27; all three high crash spots identified occur at US 27 intersections.

- KY 635 near Hall Street (CS-4017) is locally known as “Mill Hill”—an 11% grade leading to curves in front of the mill—and was identified by local law enforcement personnel and other stakeholders as a local safety concern.

Science Hill has a population of 693 and is located 8 miles north of Somerset in Pulaski County. The area is a typical small town in southern Kentucky, a mix of residential, business and agricultural land uses, with an abundance of farmland in the southern portion. Small streams, wetlands, and forested parcels providing potential bat habitat comprise the natural environment. There is a high to very high potential to encounter karst features though only bowl depressions were noted during field visits. The community is home to potentially historic resources along Stanford and Main streets, several churches, a park, and other civic services concentrated in the northern portion of the study area.

The project team (i.e., KYTC Central Office Division of Planning, District 8 staff, Lake Cumberland Area Development District, and the consultant) examined a wide range of initial improvement concepts to address the purpose and need. Rolling terrain combined with the design requirement of a 23-foot minimum vertical clearance over the rail tracks drove engineering considerations. Several design concepts require steep grades and/or reconstruction of large sections of KY 1247 to maintain connections. Nine initial alternatives fit into one of three geographic areas within the study area: North, Middle, or South. These were shared with local officials and stakeholders to obtain community input regarding strengths and weaknesses associated with each alternative. While opinions differed concerning which alternative was most desirable, attendees agreed that a project was needed and a grade-separated crossing with a connection to KY 1247 would serve local needs just as well as a larger connection to US 27.

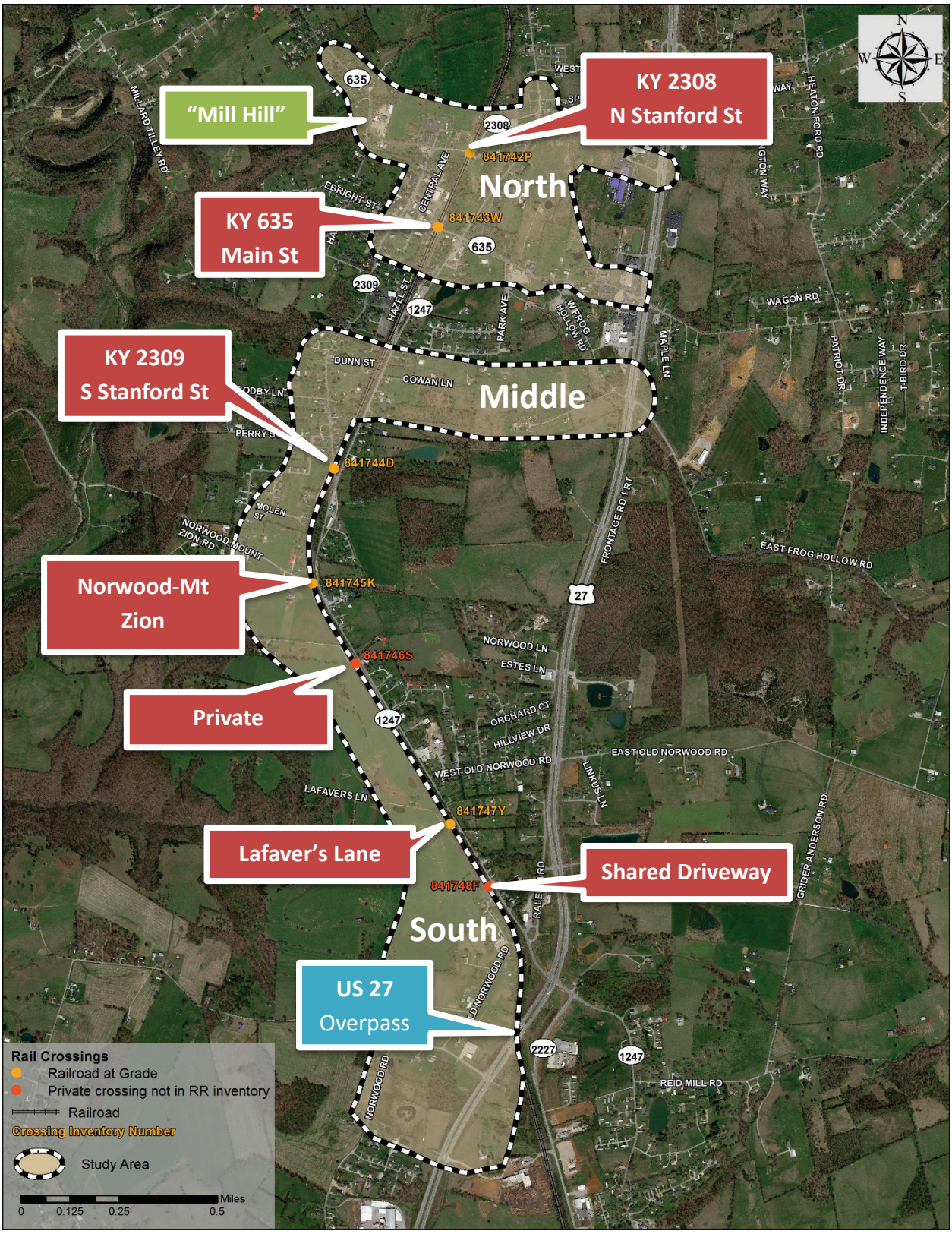


Figure ES-1: Study Area with Local Rail Crossings

Based on costs, impacts, input from local officials and stakeholders, and more, the project team eliminated some of the initial alternatives and identified four to present to the public (**Figure ES-2**). One or more alternatives from each geographic group was advanced, representing the best solution(s) within that group. Each alternative was renamed with a corresponding color for simplicity and ease of identification. A Molen Street Connector was considered alongside north and middle concepts.

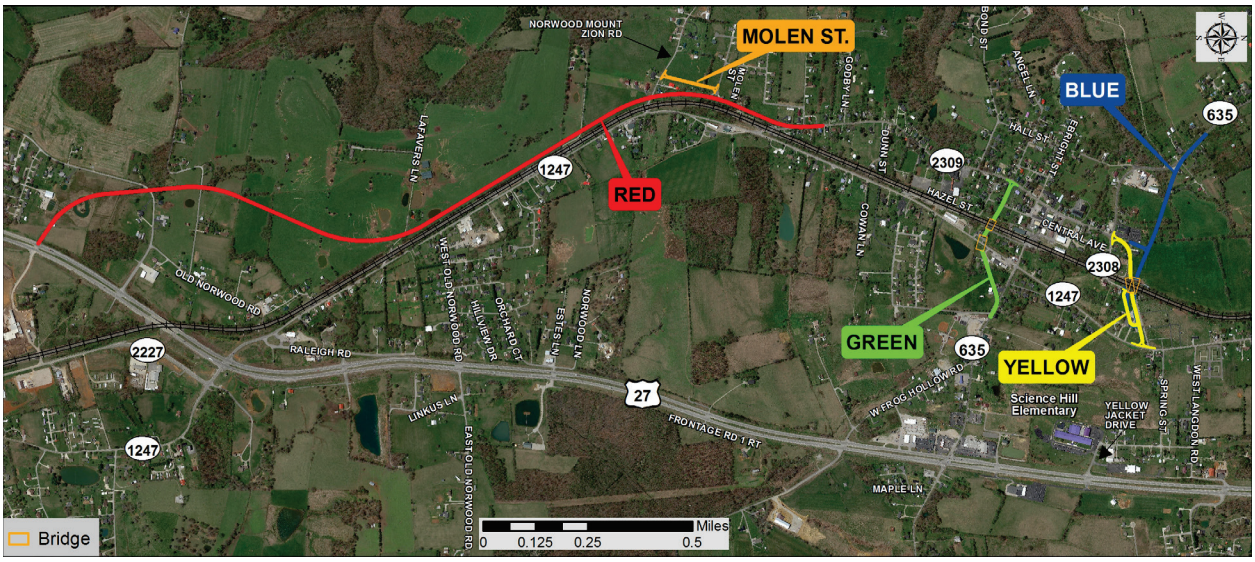


Figure ES-2: Alternatives Presented for Public Consideration

The **Red Alternative**, which provides a new southern connection to US 27, offers a 55 mph connection with no new bridge structures to maintain. It creates a 2-mile long roadway west of the tracks and closes five of the seven local at-grade crossings. The longest alternative considered, it results in the most impacted parcels and the greatest number of potential residential relocations. The estimated cost for this alternative is $12.3 million. It has the highest cost estimate and exceeds the budget established in the current FY 2018—FY 2024 Highway Plan. Operationally, the Red Alternative results in the greatest mileage savings and decrease in vehicle hours of travel overall as the majority of trips are headed to/from the south. With facilities off KY 635 (Main Street) in the North section of the study area, fire and police representatives expressed concern that the increased travel time compromises their response times in emergency situations as they must travel three miles south of town then north along US 27 to react to local calls when the remaining crossings are blocked. Most local school buses would also have to be rerouted when a train is blocking the remaining at-grade options, resulting in increased travel times/distances. For these reasons, neither the Red Alternative nor a similar southern concept were recommended to advance for further consideration.

The **Green Alternative**, located in the middle of the study area, is 0.36 miles long. It closes the KY 635 (Main Street) at-grade crossing, bridges the railroad tracks and KY 1247, and connects to KY 635 just west of Science Hill Ball Park. Estimated costs for this alternative total $9.3 million for all phases. This alternative results in the steepest grades (8.4% max). It relocates more properties (three businesses and eight homes) than the northern options but does not impact churches. It is the lowest rated choice based on public surveys. Operationally, the Green Alternative results in negligible mileage savings and increases vehicle hours of travel compared

to today because trip lengths to the south and east increase. For these reasons, neither the Green Alternative nor a similar middle concept were recommended to advance.

Two northern concepts were advanced for detailed study: the Blue and Yellow Alternatives. Each crosses the railroad tracks while they are in a cut section, reducing the maximum grade requirement to achieve the required 23-foot clearance. Each would close the KY 2308 (North Stanford Street) crossing. Half of the public surveys received preferred a northern concept, making the Blue or Yellow alternative most preferred over southern (Red) and middle (Green) options. Local officials, particularly fire and police representiatives, preferred the northern concepts as they provided the closest connection to their facilities, resulting in the most efficient response times. The most prevalent concern for either of the northern alternatives is impacts to nearby churches.

- The **Yellow Alternative** is 0.30 miles long and is the shortest and least expensive (estimated cost of $6.2 million) of the alternatives considered. It impacts a portion of the Northside Baptist Church parking lot and requires the relocation of the Science Hill Christian Church building and parsonage. Four other homes also likely require relocation.

- The **Blue Alternative** is located slightly north of the Yellow and also reconstructs KY 635 on a new alignment to avoid Mill Hill for a total length of 0.56 miles; estimated costs total $8.5 million for all phases. The Blue Alternative impacts a portion of the Northside Baptist Church parking lot, likely relocates the Northside Baptist Church parsonage, and relocates the Science Hill Christian Church building and parsonage. Five other homes also likely require relocation.

The project team held an open house public meeting on January 29, 2019, to gather public input on the options presented. In total, 80 members of the public signed in at the meeting. A survey was distributed to attendees and made available online for the public at large. Throughout the 15-day comment period, 180 responses were received. Overall, the majority of respondents (88%) felt an improved connection was needed; access/reliability were cited as the primary needs. When asked about alternative preferences, 50% preferred a Northern route (Yellow or Blue), 19% preferred Southern (Red), 13% preferred Middle (Green), and the remainder did not have a preference.

Based on the study process described herein, the Blue and Yellow alternatives are recommended to advance for preliminary design efforts and evaluation. The northern alternatives provide the most cost effective solutions, minimize overall impacts, and are preferred by both local officials and the public.

The Molen Street Connector is a low cost additional connection between Molen Street and Norwood-Mount Zion Road that can be combined with any north or middle concept. It provides homes along Norwood-Mount Zion Road with access to a new bridge over the railroad without looping back through the existing detour. It should also advance for consideration in preliminary design.

1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated the Science Hill Railroad Crossing Study to evaluate alternatives to improve safety and reliability for travelers—especially emergency responders—in the city of Science Hill in south-central Kentucky. Dual Norfolk Southern railroad tracks form a barrier between the eastern and western portions of town; according to the Federal Railroad Administration (FRA), 60 trains travel through this area during a 24-hour period at speeds between 40 and 50 mph. Emergency service access can be blocked by these trains. Train counts conducted as part of the study showed an average 3.1 minutes of closure per train with a maximum of seven minutes; however, local officials noted 20-30 minute delays at times. Observed train lengths ranged from 80-130 cars each. Discussions with Norfolk Southern revealed crew changes in Burnside—approximately 13 miles south of Science Hill—may attribute to some of the extended delays. Detours around blocked tracks can take between 11 and 23 minutes. In addition, occupied crossings impede school bus traffic from reaching Science Hill Elementary School.

Seven at-grade crossings are in the study area with no grade-separated crossings available within the community. **Figure 1** shows the study area setting within Pulaski County. **Figure 2** shows the study area limits, which can be geographically lumped into north, middle, and south sections.

This planning study provides analyses, costs, and alternatives updated from the initial effort identified in the 1985 *KY 635 Southern Railway Crossing at Science Hill Advanced Planning Project Report.* The current study identifies costs and impacts associated with alternatives that provide a means to navigate through Science Hill unobstructed by the railroad. The project is funded by Federal Railroad Separation Protection Program (RRS) funds, requiring at least one at-grade crossing be eliminated.

This study is the only project within the study area, identified as IP20040027 in KYTC's Continuous Highway Analysis Framework (CHAF) database. The CHAF shows an escalated project cost estimate of $13.7 million.

1.1 Study Area

Science Hill has a population of 693[1] and is located eight miles north of the heart of Somerset **(Figure 1)**. The highest average daily traffic (ADT) volumes in the study area include 14,620 vehicles per day (vpd) on US 27 and 3,700 vpd on KY 635 through town. The study area encompasses three general areas—North, Middle, and South **(Figure 2)**:

- North—A section along KY 635 (Main Street) through downtown Science Hill, from the mill east to US 27.
- Middle—A section between KY 2309 (South Stanford Street) east to US 27, near the southern boundary of Science Hill.
- South—A section from the KY 2309 (South Stanford Street) / KY 1247 intersection, stretching south to US 27 near Norwood Road.

[1] 2010 U.S. Census

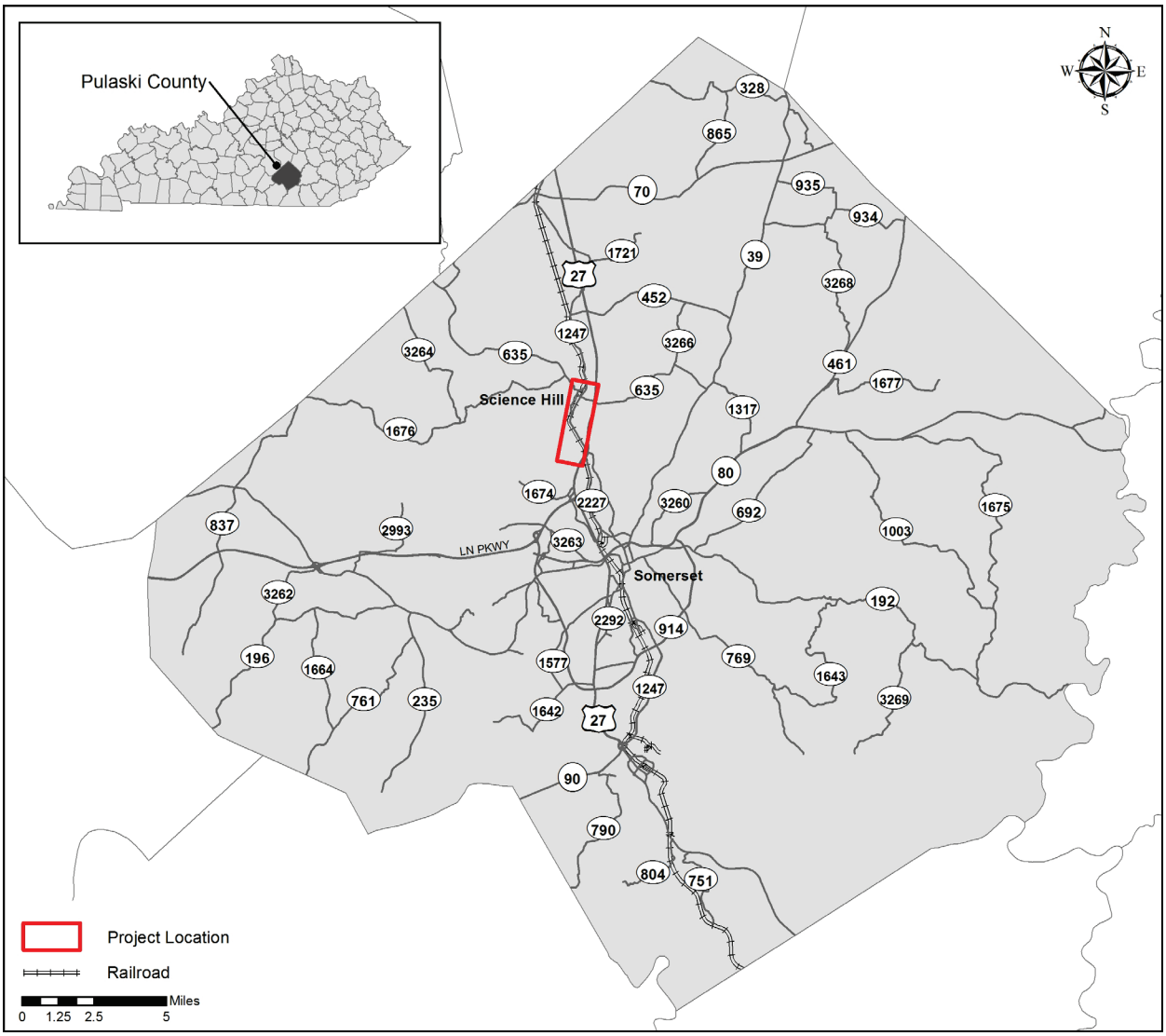


Figure 1: Project Location

Land use in the study area is a mix of residential, business and agricultural, with an abundance of farmland in the southern section. Although rural in nature, Science Hill is encompassed within the Federal Adjusted Urban Area boundary of Somerset. Two tracks of the Norfolk Southern Railroad essentially parallel KY 1247 through the study area with seven at-grade crossings.

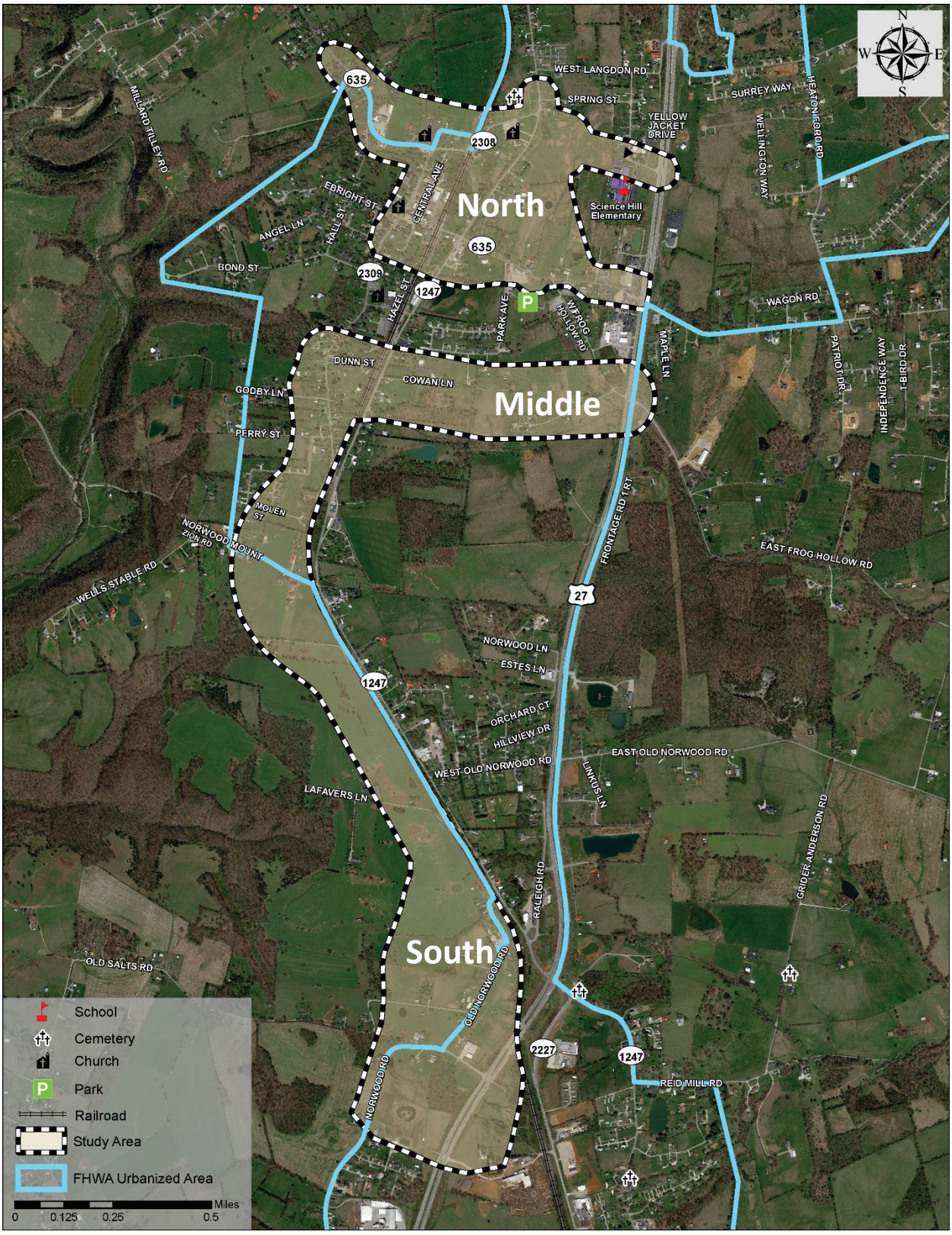


Figure 2: Study Area

1.2 Project History

The need for a grade-separated crossing in Science Hill was first identified in a 1985 *Advance Planning Project Report* completed by KYTC. Alternative 1 (**Figure 3**) was preferred at the time mainly due to its low cost while Alternative 4 was desired should additional funding become available. Since, Science Hill Elementary School was constructed where Alternative 4 from the 1985 planning study connects to US 27.

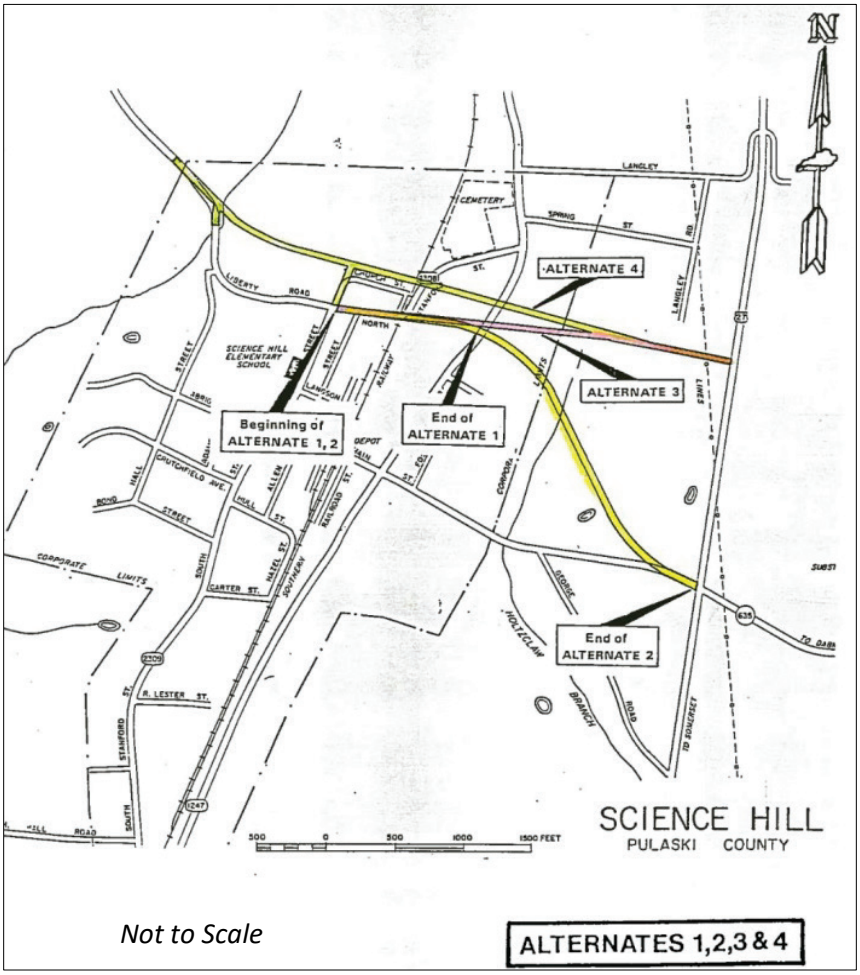


Figure 3: 1985 Advance Planning Project Report Alternatives

A 2001 Project Identification Form (PIF) was developed with a total cost estimate of $10 million. During prior prioritization efforts, this project consistently ranked as a high priority by local transportation and public officials.

Kentucky's FY 2018—FY 2024 Highway Plan identifies funding for the following project phases:

- Right-of-Way in Fiscal Year 2020, $1.8 million
- Utilities in Fiscal Year 2020, $1.3 million
- Construction in Fiscal Year 2022, $6.5 million

As the project is funded by RRS source funds, at least one at-grade crossing must be eliminated.

2.0 EXISTING CONDITIONS

Study area roadway characteristics—highway systems, geometric characteristics, structures, traffic conditions, and crash history—are identified in the following sections. Applicable features were obtained and have been summarized from the KYTC Highway Information System (HIS) database, existing plans, and field reviews.

2.1 Highway Systems

Major highway systems are defined in **Table 1** and shown in **Figure 4** and **Table 2** for the primary state-mainted routes covered by the study: KY 635, US 27 and KY 1247.

Table 1: Highway Systems

Route	System Description
State Primary Road System (SPRS)	Six categories of state-maintained roads under the State System range from highest to lowest classification order: Interstates, Parkways, Other State Primary roads, State Secondary, Rural Secondary, and Supplemental roads.
Federal Functional Classification	Categories assigned to each state-maintained road based on two primary functions it provides—mobility and access and also urban or rural location. Other factors can help determine the proper category—such as trip length, speed limit, volume, and vehicle mix.
Truck Route Network	Includes roads designated for use by commercial trucks with increased dimensions (102 inches wide; 13 feet, six inches high; semi-trailers up to 53 feet long; and trailers up to 28 feet long, not to exceed two trailers per truck).
National Highway System (NHS)	Includes Interstate Highways and other significant Principal Arterials important to the nation's economy, defense, and mobility.
Kentucky Freight Highway System	A four-tiered roadway network representing critical freight corridors. • Tier 1 – National Regional Significance, annual average daily truck traffic (AADTT) ≥ 7,000. • Tier 2 – Statewide Significance; AADTT of 4,000 to 7,000. • Tier 3 – Statewide Regional Significance, AADTT of 500 to 4,000. • Tier 4 – Local Access Significance.
Truck Weight Class	Kentucky Revised Statutes require weight limits on state-maintained highway system. Occasional exceptions are granted. Weight classification limits in maximum gross vehicle weights are: • AAA–80,000 pounds • AA–62,000 pounds • A–44,000 pounds

Table 2: Route Systems

Description					Systems						
Route Name	Beginning MP	Beginning Feature	Ending MP	Ending Feature	Area Type	Federal Funtional Class	State Primary Road System	National Highway System	Freight Network	Truck Route Network	Truck Weight Class
KY 635	6.699	Near Cooper Drive	7.174	CS 4017 (Hall Street)	Rural Area (pop. < 5K)	Major Collector	State Secondary	No	No	No	A
US 27	20.300	0.3 Mile South of Norwood Road	23.500	Just North of Yellow Jacket Way	Small Urban Area (pop. 5K to 50K)	Principal Arterial Other	State Primary (Other)	Yes	Kentucky Tier 3	Yes	AAA
KY 1247	11.742	US 27	14.375	West Langdon Road	Small Urban Area (pop. 5K to 50K)	Major Collector	Rural Secondary	No	Kentucky Tier 3	No	A

Note: HIS data accessed May 2018

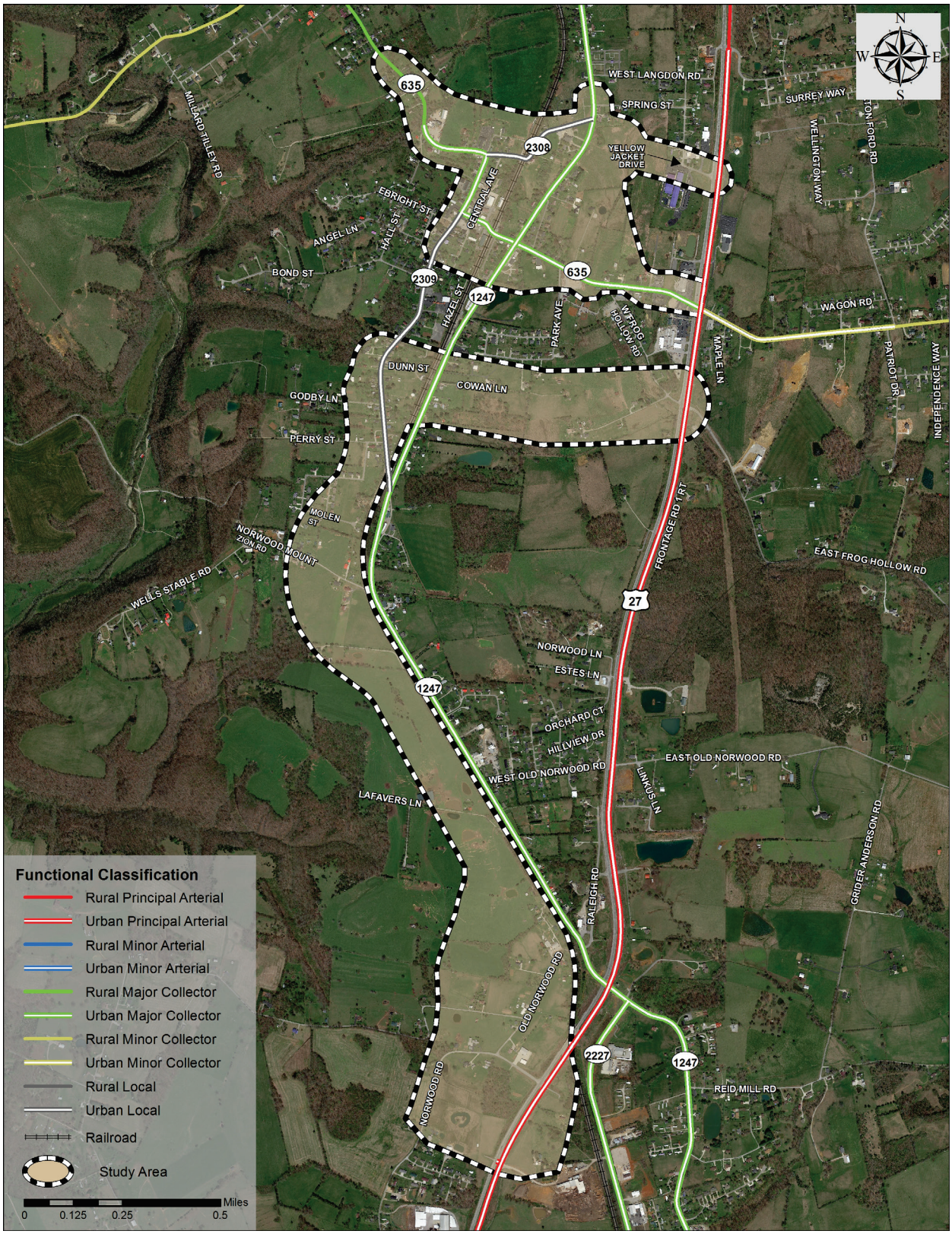


Figure 4: Functional Classification

2.2 Existing Norfolk Southern Railroad Crossings

Science Hill is divided in half by dual tracks of the Norfolk Southern Railroad with seven at-grade crossings **(Figure 6)**. According to the FRA Crossing Inventory Forms and 24-hour video counts collected for the study, approximately 60 trains (each having between 80-130 cars), travel through Science Hill, sometimes blocking at-grade crossings up to seven minutes. When trains block local at-grade crossings—such as those shown in **Figure 5**—available detours range in length from seven to 21 miles **(Figure 7)**. Besides longer travel times, these routes present unique challenges as well. For example, the yellow detour route shown leads under a narrow railroad bridge on Smith Vaught Road **(Figure 8)**, a 33-foot long arched opening 12.3 feet high by 15.3 feet wide, making it unsafe for two vehicles to pass. Distances and travel times for select detours are shown in **Table 3**.

Figure 5: Photos of Select Science Hill At-Grade Rail Crossings

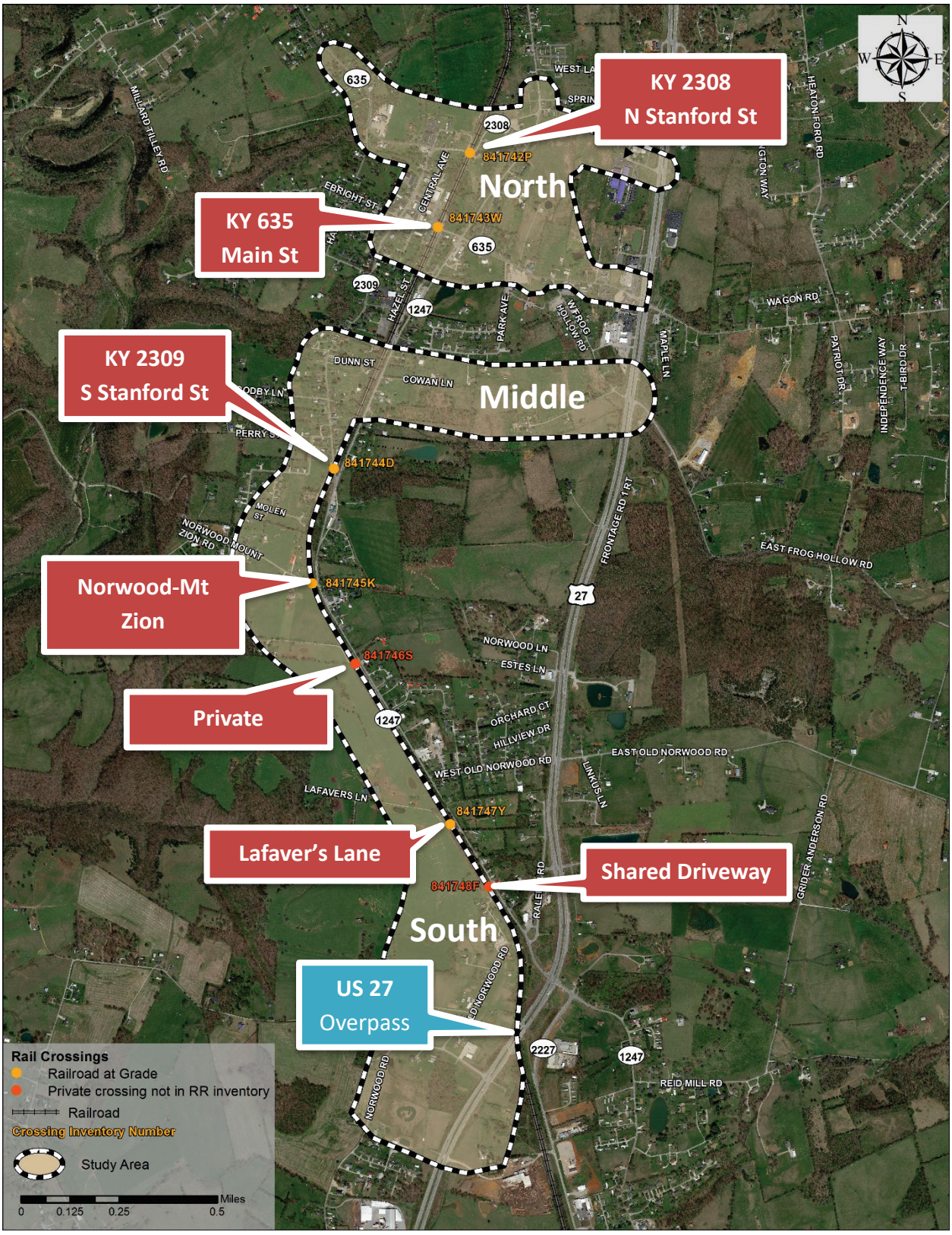


Figure 6: Norfolk Southern Railroad Crossings

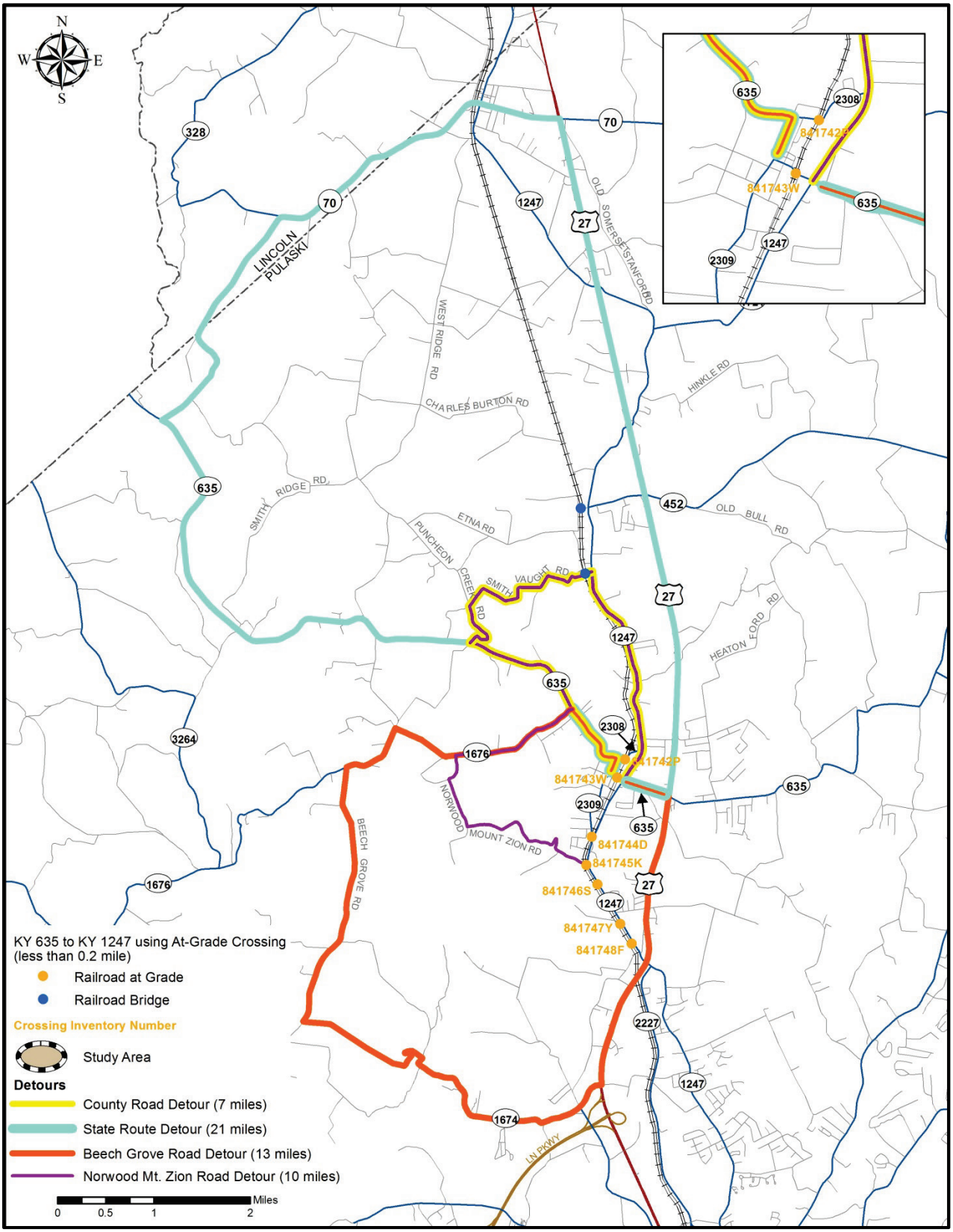


Figure 7: Railroad Crossing Detours

Figure 8: Smith Vaught Road Railroad Overpass (Yellow Route)

Table 3: Railroad Crossing Detour Lengths and Travel Times

Route	Length	Travel Time
Yellow	7 mi	13 min
Teal (State Routes)	21 mi	23 min
Orange	13 mi	21 min
Purple	10 mi	11 min

Several local and statewide media sources have reported on the recurring delays caused by railroad crossings. According to the *Lexington Herald-Leader*,[2] there have been complaints in Pulaski County about trains blocking street crossings in the small cities of Burnside, Science Hill and Ferguson. “Ambulances have been unable to respond to emergency calls; people have missed medical appointments; kids have been late to school; and even people have lost jobs

[2] Estep, Bill. ‘*It’s a public-safety issue.’ Streets blocked by trains lead to tickets, lawsuit.* Lexington Herald-Leader. 2018 May 22. Accessed online 2018 Jul 31.

because of trains blocking streets. It's a public safety issue." The article states the problem worsened when Norfolk Southern opened a depot several years ago in Burnside. Norfolk Southern stated they switch crews and perform necessary tests on air brakes at this location.

Other articles mention a train was stopped in Science Hill because of replacement of a track switch just ahead of the train.[3] When tracks have been blocked, school buses have been delayed traveling to and from school[4] and people have been unable to reach doctor's office appointments, businesses, and church services.

2.3 Roadway Geometrics

As part of the study effort, existing roadway geometrics were compared to common geometric design practices in the *Highway Design Manual*.[5] Roadway characteristic data discussed in this section was taken from the KYTC HIS database where appropriate or existing highway plans. The terrain is classified as rolling. All three major roadways are classified as urban except for KY 635 from Hall Street (CS-4017) west to the northwestern edge of the study area, which is classified as rural.

Summarized in **Figure 9,** HIS data reveals several sharp horizontal curves at low-speed rail crossings and at "Mill Hill" as discussed below. HIS data does not show any vertical grades that exceed design guidelines; however, limited data is available in the area.

2.3.1 KY 635

KY 635 is a rural two-lane roadway west of Hall Street with a 45 mph posted speed. East of Hall Street (MP 7.174), KY 635 is classified as urban with the posted speed transitioning from 35 to 25 mph through Science Hill proper, changing back to 35 mph east to US 27. The majority of KY 635 has nine foot lanes and shoulders between two and three feet in uncurbed sections (one foot is paved). Access control is by permit and the ADT is 3,700 vpd.

Neither the rural nor urban driving lanes along KY 635 meet current design guidelines. KYTC's current design guidelines recommend 12-foot-wide lanes on rural collector roads with an ADT greater than 2,000 vpd. The urban section of KY 635 does not meet minimum criteria of 10-foot-wide lanes.

Minimum rural recommended shoulder widths are eight feet for roadways with an ADT greater than 2,000 vpd. The rural segment of KY 635 does not meet the minimum recommended shoulder width guideline. Urban collector roadway shoulder widths can vary.

KY 635 near Hall Street (CS-4017) is locally known as "Mill Hill".This section of KY 635 has an 11 percent grade combined with a sharp (337-foot radius) horizontal curve in front of the mill. **Figure 10** shows the as built plan sheet while **Figure 11** shows views of the section.

---

[3] Slavey, Carla. *Stopped trains halting traffic in Science Hill.* Somerset Commonwealth Journal. 2017 Aug 30. Accessed online 2018 Jul 31.
[4] Neal, Jeff. *Science Hill residents growing frustrated with blocked crossings.* Somerset Commonwealth Journal. 2011 Oct 29. Accessed online 2018 Jul 31.
[5] 2017 KYTC Highway Design Manual, Exhibit 700-03.

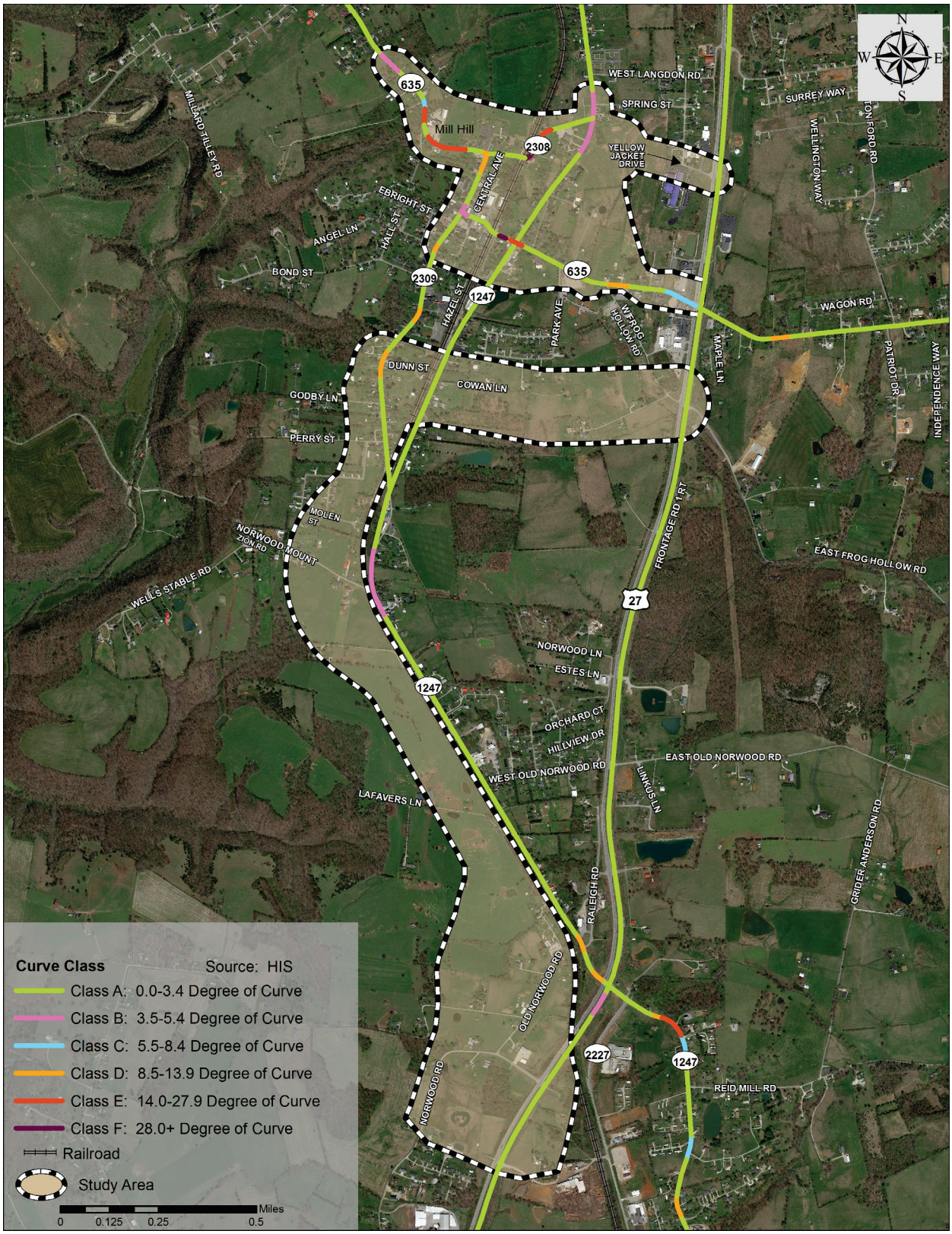


Figure 9: Degree of Curve

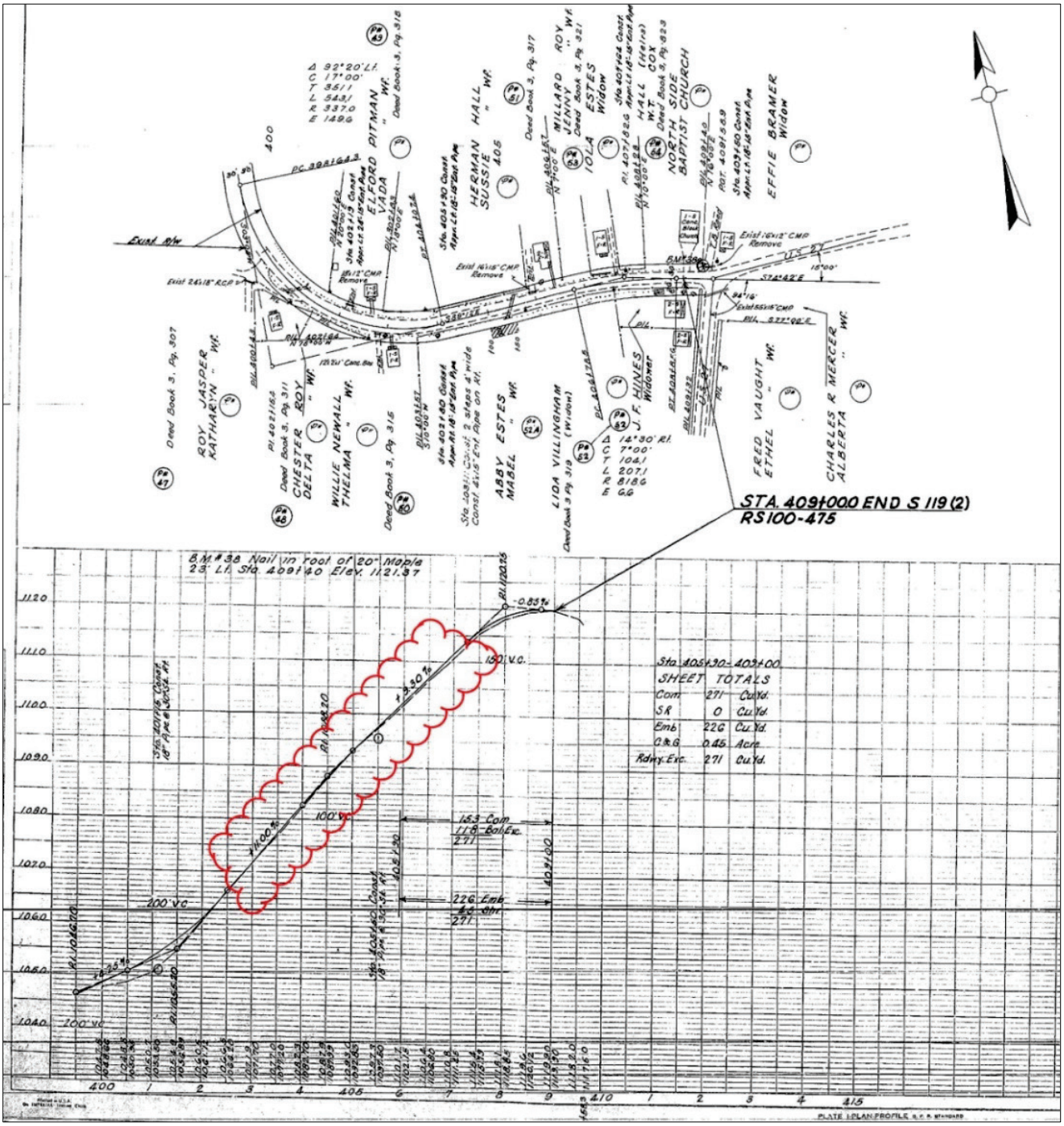


Figure 10: Mill Hill Curve and Steep Grade from 1953 As-Built Plans

Figure 11: Mill Hill Aerial View (top); Steep Grade (bottom left); sharp curves (bottom right)

2.3.2 US 27

In the study area, US 27 is a four-lane divided highway with a posted speed limit of 55 mph with 12-foot lanes and a 40-foot grass depressed (sunken) median including inside shoulders. US 27 is a partially controlled access roadway except between approximately Frog Hollow Road and Valley Plaza where access is by permit. Outside shoulders are 11 feet in width. Inside shoulders are 6 feet wide (four feet of which are paved). Spacing between access points varies from 600 to 1,200 feet. The 2018 ADT volumes range from 13,800 to 14,600 vpd. Existing US 27 geometry meets current design guidelines.

A representative view of existing conditions is shown in **Figure 12**.

Figure 12: View South along US 27 toward KY 635 intersection

2.3.3 KY 1247

KY 1247 forms the primary north-south connection through Science Hill east of the railroad tracks. It has two 12-foot lanes with eight-foot shoulders (three-foot paved) approaching the US 27 intersection but two 10-foot lanes with four-foot shoulders (one foot paved) for the remainder of the study area. The posted speed limit is 45 mph; access control is by permit. The average ADT is 3,940 vpd in between its intersection with US 27 and KY 635. North of KY 635, the ADT reduces to 1,740 vpd. Data obtained indicates the existing geometry meets current design guidelines. However, field observation suggests KY 1247 at US 27 may have an intersection sight distance issue as shown in **Figure 13**. Further study of this intersection may be warranted.

Figure 13: Potential Intersection Sight Distance Issue along US 27 from northbound KY 1247

2.3.4 KY 2308

KY 2308, known as North Stanford Street, is a local road with two nine-foot lanes and three-foot shoulders (one foot paved) and a posted speed limit of 35 mph. The roadway truck weight class is "A" (44,000 pounds). The 2018 ADT volume is 700 vpd. KYTC Design guidelines recommend 10-foot lanes for local roads with five foot shoulders in rural areas. Therefore, KY 2308 does not meet minimum guidelines.

2.3.5 KY 2309

KY 2309, known as South Stanford Street, is a local road with two nine-foot lanes and three-foot shoulders (one foot paved) and a posted speed limit of 35 mph. It forms the main north-south connection through Science Hill west of the tracks. The roadway truck weight class is "A" (44,000 pounds). The 2018 ADT volume is 2,500 vpd. KYTC Design guidelines recommend 10-foot lanes for local roads with five-foot shoulders in rural areas. Therefore, KY 2309 does not meet minimum typical section guidelines.

2.4 Bicycle and Pedestrian Review

Downtown, sidewalks exist on both sides of KY 635 between Langdon Street and Stanford Street. Sidewalks exist on the south side of KY 2308 between KY 635 and Central Avenue. Pedestrian accommodations on KY 2309 exist on the east side for a short segment north of Orchard Street (MP 0.488 – MP 0.534) in front of the Science Hill Church of the Nazarene. A western sidewalk begins just south of Bond Street (MP 0.534). The eastern sidewalk begins again at Chloe Street (MP 0.628) and both sidewalks are almost continuous north to KY 2308 (MP 0.765), with the exception of a short segment on the east missing between Vaught and Langdon streets. Study area roadways do not have dedicated bicycle facilities.

The City of Somerset has a *2016 Bicycle and Pedestrian Master Plan* (BPMP); however, this plan does not address the city of Science Hill. Since Science Hill is within the urban boundaries of Somerset, goals of the plan could be similar.

The goals of the Somerset 2016 BPMP for pedestrian facilities are to:

- Identify major collector and arterial streets to become complete streets;
- Retrofit and maintain existing sidewalks to Americans with Disabilities Act (ADA) standards;
- Provide sidewalks where appropriate on both sides of urban streets;
- Provide a minimum sidewalk width of five feet, where feasible;
- Provide sidewalks to surrounding neighborhoods and schools in order to create a network throughout the city of pedestrian access;
- Provide access for children, non-drivers and senior citizens to points of interest within the community.

The Somerset BPMP plan of action implementation includes the following:

- Phase 1 Bicycle: Signage and pavement markings for bicycle routes. This phase is a low cost and effective way to promote awareness, educate the public, and provide accommodations.
- Phase 1 Pedestrian: Improve roadway intersection and existing sidewalks to meet ADA standards. This will also serve as a starter ADA transition plan.
- Phase 2 Bicycle: Add bike lanes where appropriate and possible.
- Phase 2 Pedestrian: Plan, design, and construct new sidewalks near schools when and where possible.
- Phase 3: Additional bike lane, trail and shared use-paths.

The Science Hill local government does not have proposed plans for bicycle or pedestrian travel or improvements within the project area. Strava Heat Maps[6] shows bicycle activity along many of the routes in Science Hill (**Figure 14**, colored lines). However, pedestrian activity is mainly in the northern part of the study area (**Figure 14**, colored lines).

Figure 14: Strava Heat Maps for Bicyclists (left) and Pedestrians (right) in Science Hill

[6] Strava is a data service locating where people ride and run. Strava users track rides and runs with a smartphone or with a GPS device. The heatmap shows "heat" made by public activities over the last two years and is updated monthly; darker colors indicate more users. Areas with very little activity may not show any "heat." https://labs.strava.com/heatmap

2.5 Transit

Rural Transit Enterprises Coordinated, Inc. (RTEC) was organized for the sole purpose of coordinating and operating public transportation, providing service to 15 counties in the region. RTEC operates lift-equipped vehicles for wheelchair users and provides community transportation services. RTEC has been operating for 29 years in public transit for residents of southeast Kentucky including Intercity Employment Transportation, Medical and General Public services. Pulaski County is within the RTEC service area; however, there are no regularly scheduled routes within the study area.

2.6 Structures

Dual three-span bridges are located in the southern portion of the study area, each carrying one direction of US 27 traffic over the Norfolk Southern tracks: Bridge No. 100B00119L at MP 20.702 and No. 100B00119R at MP 20.704. Both bridges are 239 feet long and were constructed in 2008.

In accordance with National Bridge Inspection Standards, bridges are inspected every two years to evaluate their conditions and other elements. The deck, superstructure, and substructure of each bridge is assigned a rating on a ten point scale. If the lowest rating is four or less, the structure is considered to be in poor condition. If all ratings are seven or greater, the structure is considered to be in good condition. Any other combination results in a fair rating. **Table 4** shows structure details of the dual three-span bridges.

Table 4: Structures

Bridge No.	100B00119L	100B00119R
Route	US 27	US 27
MP	20.702	20.704
Features Intersected	Norfolk Southern Railroad	Norfolk Southern Railroad
Description	0.132 mile south of KY 1247 junction	0.132 mile south of KY 1247 junction
Year Built	2008	2008
Description	3-span prestressed concrete continuous Stringer/Multi-beam or Girder	3-span prestressed concrete continuous Stringer/Multi-beam or Girder
Condition	Good	Good
Length (feet)	239.0	239.0
Last Inspection Date	7/27/2018	7/27/2018
Approach Roadway (feet)	42.0	42.0
Skew (degrees)	55	55
Posting	No Restrictions	No Restrictions

Source: KYTC Division of Maintenance Bridge Inspection Reports, July 2016

2.7 Crash History

Kentucky State Police traffic collision data for the five-year period between January 1, 2013, and December 31, 2017 were collected and analyzed **(Appendix A)**. During the review period, 174 crashes were reported including two fatalities and 35 injury collisions. Half of reported crashes were along US 27.

Figure 15 illustrates a crash breakdown between study area routes.

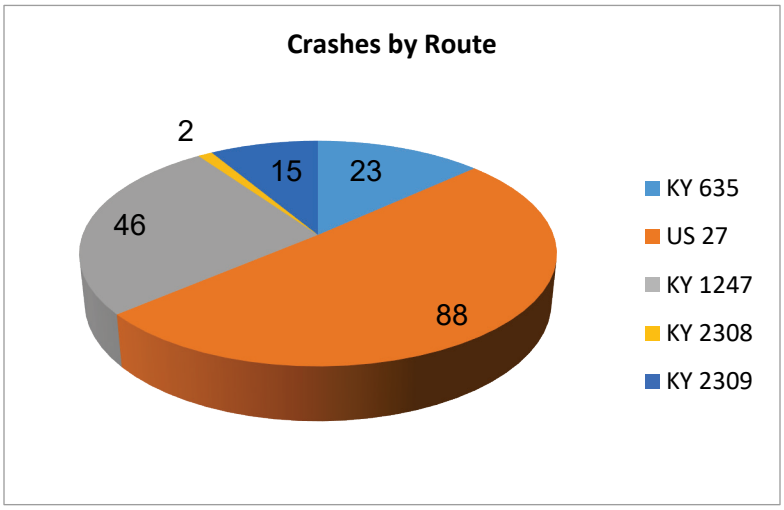


Figure 15: Crashes by Route

2.7.1 Crash History by Crash Type

Crashes by severity—fatality, injury, and property damage only (PDO) are shown on **Figure 16**. **Figure 17** maps crashes by severity during the five-year period.

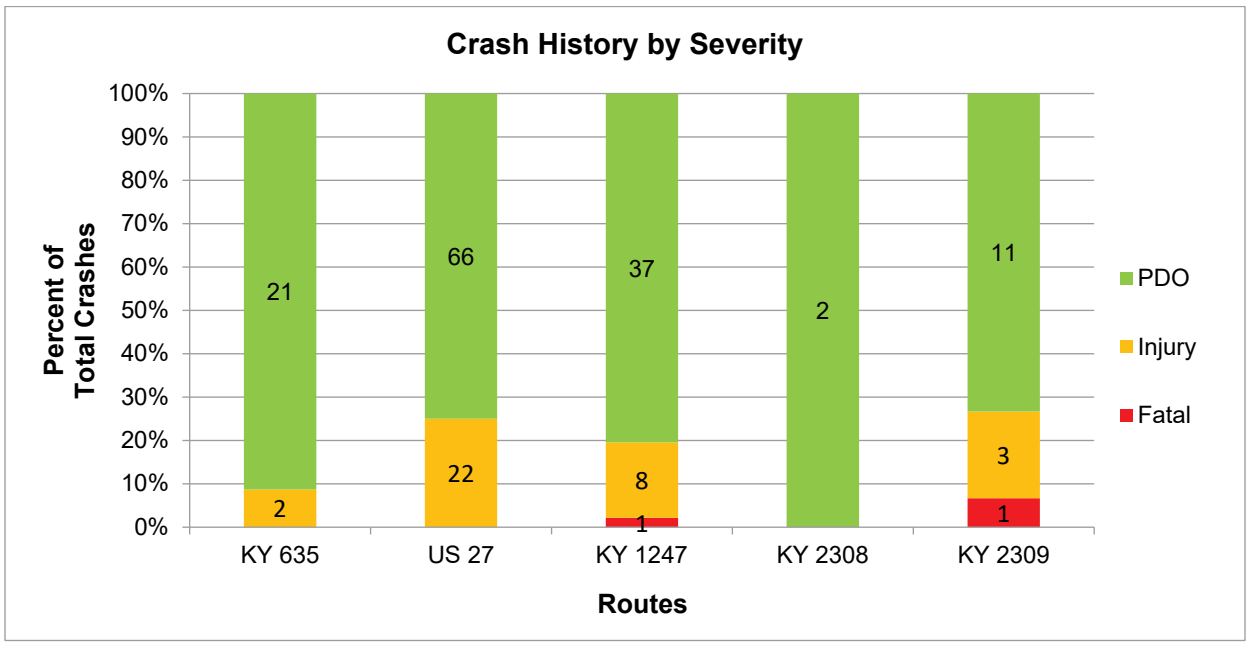


Figure 16: Crash History by Severity

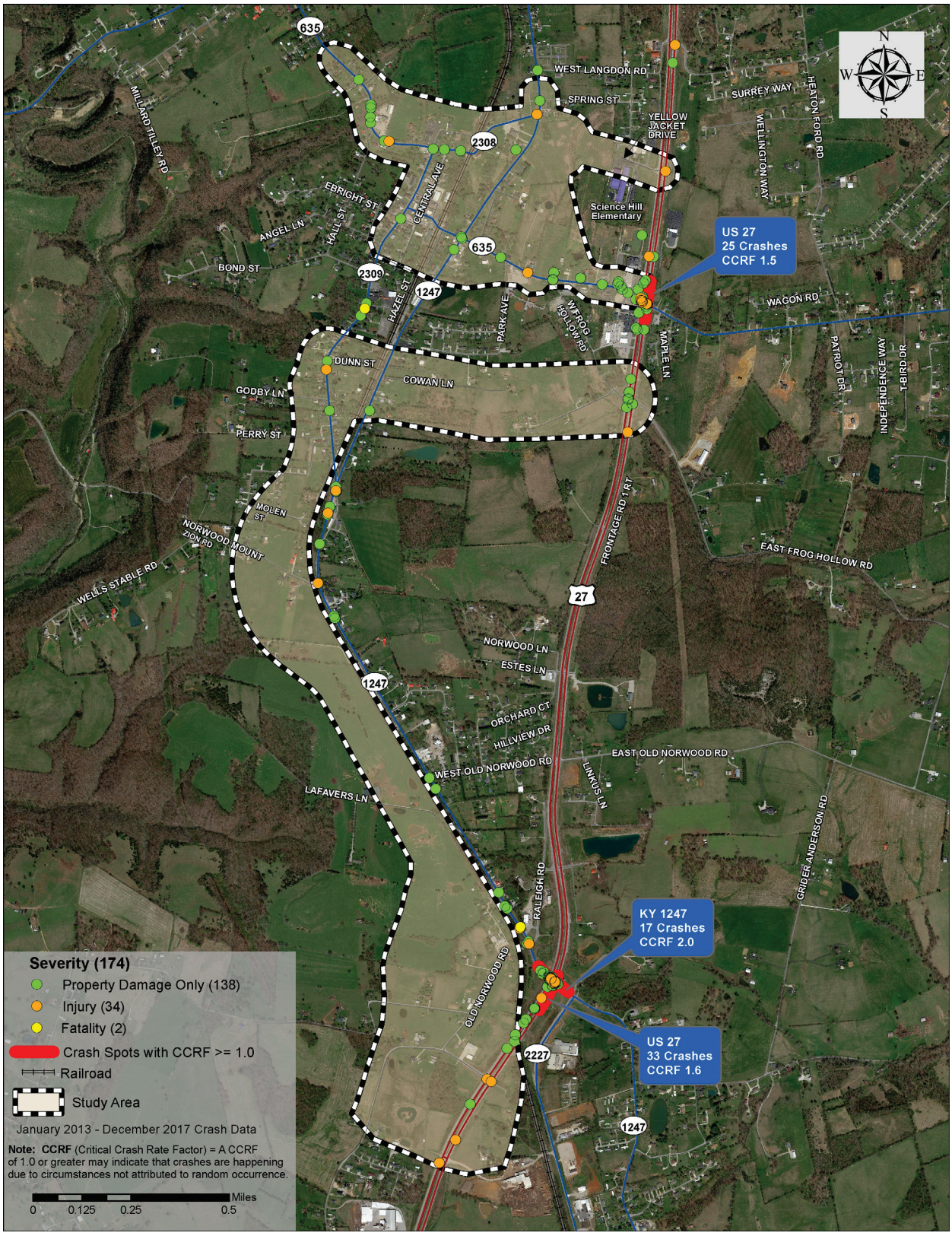


Figure 17: Crash History by Severity with High Crash Spots

Two fatal crashes occurred during this period.The following describes each fatal crash.

1) KY 2309 (South Stanford Street), MP 0.477: A southbound vehicle on Stanford Street attempted to navigate a curve in dry, daylight roadway conditions, went into the opposing traffic lane and struck a northbound vehicle head on. Alcohol involvement was indicated on the police report.

2) KY 1247, MP 11.911: A single northbound vehicle skidded out of control and left the roadway striking an embankment and several utility poles. Travel speed was cited as a human factor on the police report.

2.7.2 Crash History by Manner of Collision

A breakdown of crashes by the manner of collision is shown on **Figure 18**. Of 174 total crashes, the predominant manners of collision reported were rear ends (37%), angle (29%), and single vehicle (20%). Crash locations by manner of collision are shown geographically on **Figure 19**.

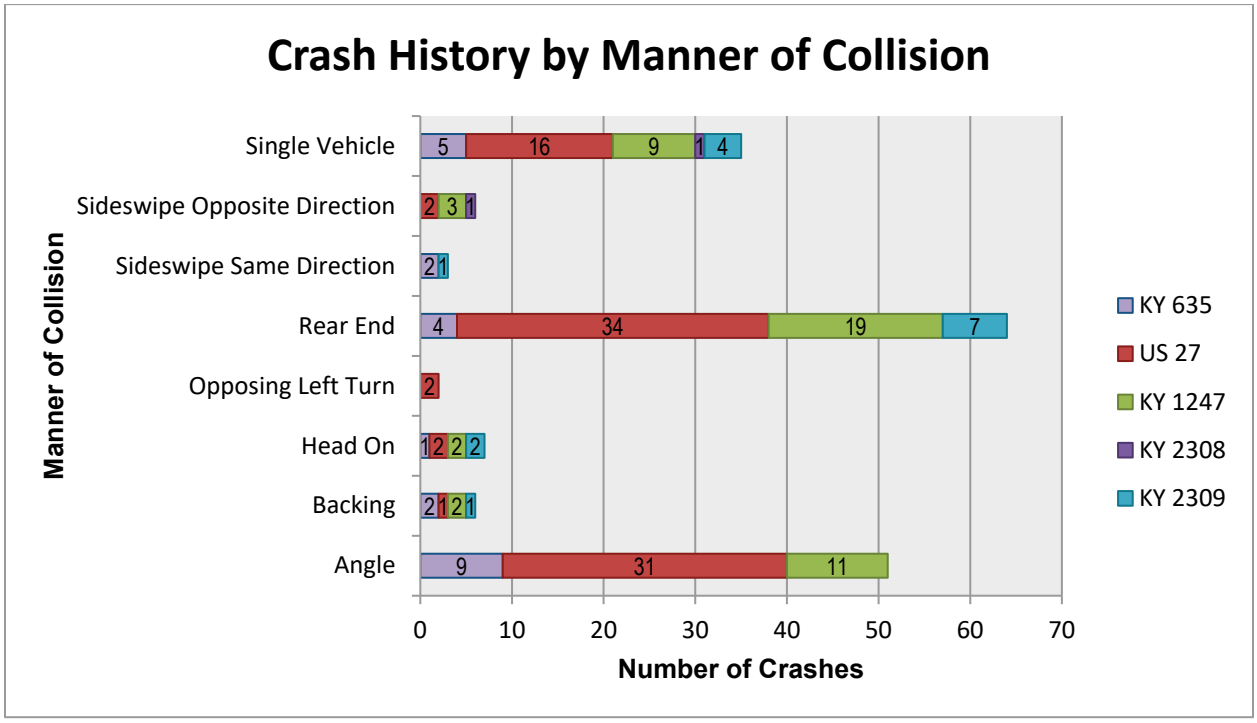


Figure 18: Crash History by Manner of Collision

In the study area, one crash involving a pedestrian was reported. It occurred on KY 1247 at MP 14.152 on a curve and grade in wet and dark conditions. According to the police report, the pedestrian was not wearing reflective clothing.

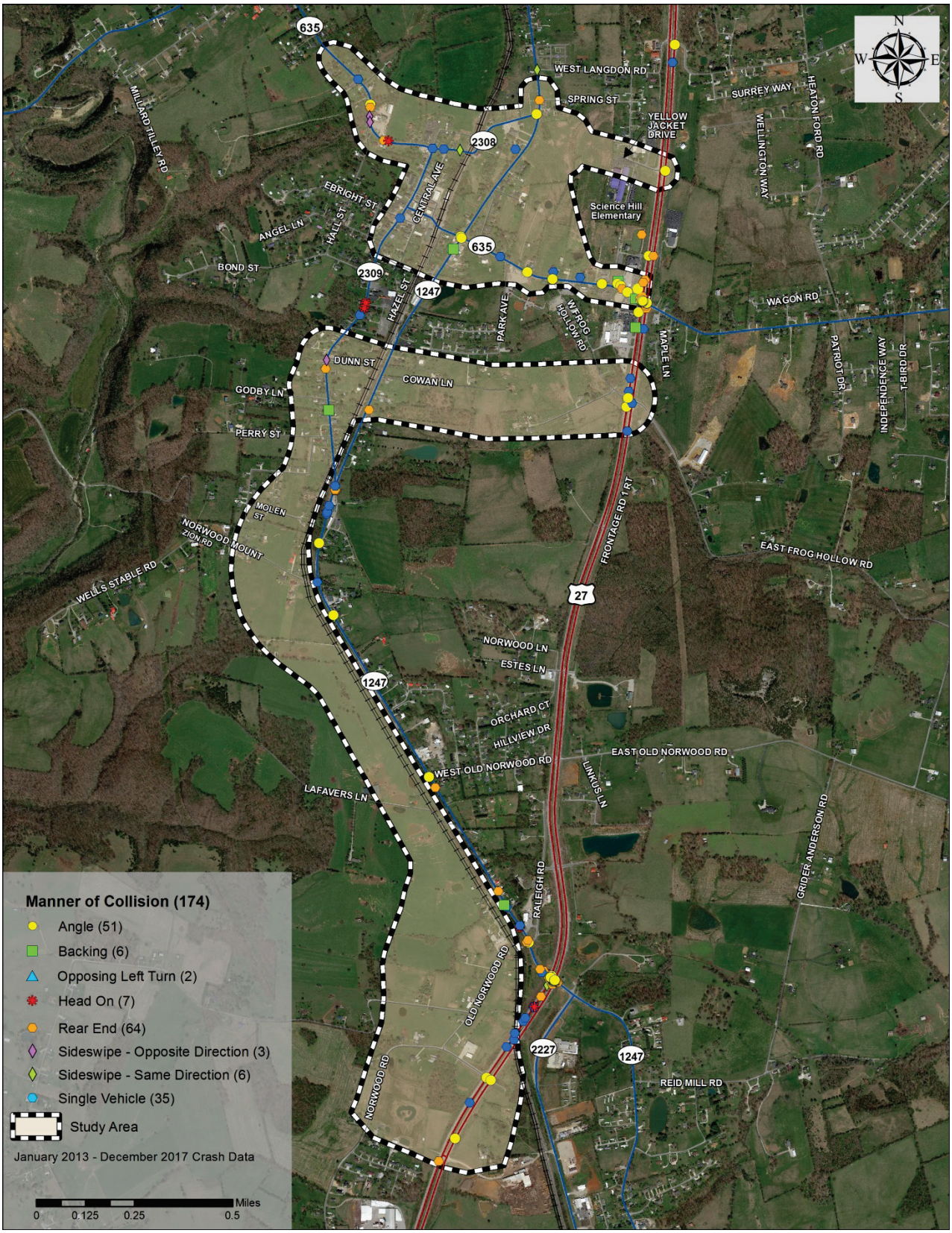


Figure 19: Crash History by Manner of Collision

2.7.3 0.1-Mile High Crash Spots

Using the Kentucky Transportation Center's methodology[7], three 0.1-mile high crash spots **(Figure 17)** were identified with critical crash rate factors (CCRF) greater than 1.0 during the five-year study period, as listed in **Table 5**. The CCRF 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. A CCRF of 1.0 or greater indicates crashes may be occurring due to circumstances that cannot be attributed to random occurrence.

Table 5: High Crash Spots

High Crash Spot		Mile points		Crashes				
		Begin	End	Fatal	Injury	PDO	Total	CCRF
1	US 27 at KY 1247	20.8	20.9	0	7	26	33	**1.6**
2	US 27 at KY 635	22.6	22.7	0	6	19	25	**1.5**
3	KY 1247 at US 27	11.7	11.8	0	1	16	17	**2.0**

- At Spot 1, 15 (45%) were rear-end collisions with 10 northbound. Another 13 (39%) were angle/turning crashes, each due to red light running. Twenty-five (76%) crashes occurred on a clear day.
- At Spot 2, 14 (56%) collisions were rear-end while nine (36%) were angle/turning crashes. Nine (36%) crashes were either due to red light running or failure to yield to oncoming traffic. Several recent crashes have occurred at this location since the onset of this study.
- At Spot 3, 13 (82%) collisions were rear-ends, including eight (47%) westbound. One crash involved an emergency vehicle.

2.7.4 Railroad Crossing Crashes

FRA records show 19 collisions at rail crossings within the study area since 1975; two involved fatalities. One of those 19 crashes occurred at the Lafaver's Lane crossing **(Figure 6)** on March 14, 2018. The driver stopped on the crossing and was uninjured. Other collisions noted in the records were beyond the five-year crash analysis period for the study.

[7] *Analysis of Traffic Crash Data in Kentucky (2012-2016)*

3.0 TRAFFIC ANALYSIS – EXISTING (2018) AND FUTURE (2040)

Qk4 prepared the *Traffic Forecast and Model Amendment Report* for this study. The report is in **Appendix B.**

3.1 2018 Traffic Counts and Speed Data

Traffic data was collected at locations shown in **Table 6** and **Figure 20**: 24-hour counts at four railroad crossings and 12-hour turning movement counts at five intersections. All counts used Miovision video-capture technology. Data showed 35 trains blocked the tracks in the 24-hour period for an average of three minutes each, with three crossings taking over five minutes to clear the tracks. The longest time of blockage was seven minutes. Trains were observed to have between 80-130 cars each and each car is usually about 50 feet in length.

Table 6: Traffic Count Locations

Railroad Crossings		Intersections	
1	Norwood/Mt. Zion Road	5	US 27/Norwood Road
2	KY 2309	6	US 27/KY 1247
3	KY 635	7	US 27/W Frog Hollow Road
4	KY 2308	8	US 27/KY 635
		9	US 27/Yellow Jacket Drive

3.2 Speed Data Collection and Travel Demand Model Adjustments

Speed data was collected during field reviews along railroad detour routes shown in **Figure 7** and for select other routes in the study area. Data was collected with a datalogger (provided by KYTC) during non-peak times, travelling a comfortable, normal speed and without train interruption. This information was used to update speeds in the Laurel-Pulaski Travel Demand Model (LPTDM). In the LPTDM, speeds were also lowered by three to four mph at the rail crossings to adjust the 24-hour model simulation for train blockage of nearly two hours cumulatively on a typical day.

3.3 2040 Design Year Growth Factors

A growth analysis using KYTC historical traffic data and 2018 intersection counts at locations shown in **Table 6** provides a base year 2018 ADT for study area routes. Using the count history, older traffic counts were projected to year 2018 based on historical growth rates for each route. An existing model scenario was completed and compared to current traffic counts to determine appropriate adjustment ratios to be applied to future year (2040) model runs. Any 2040 model output was adjusted with the same ratio to determine future year 2040 daily volumes. The 2040 adjusted volumes were used as the 2040 No-Build ADTs for the intersections and roadway segments. Truck volumes were assumed to grow at the same rate as cars.

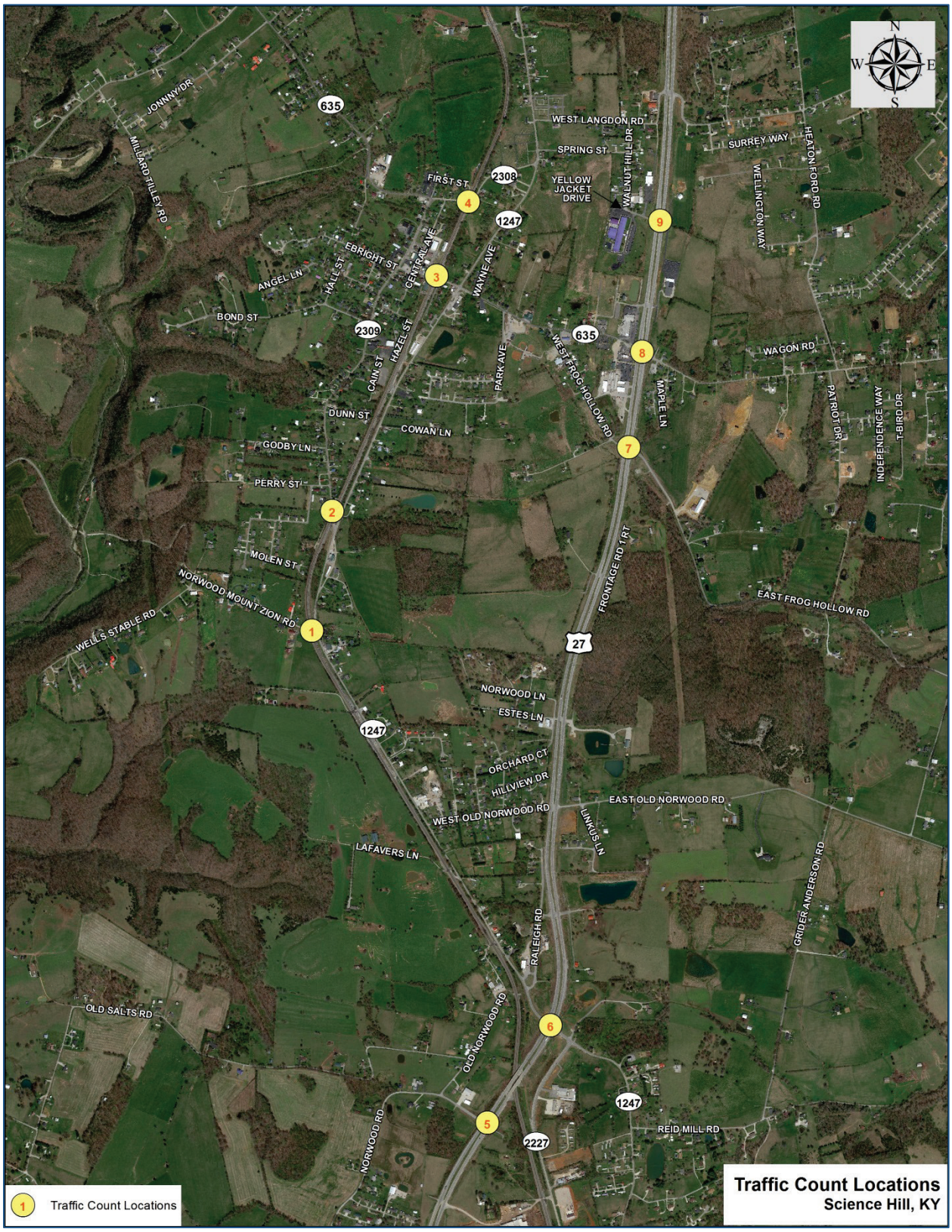


Figure 20: Traffic Count Locations

3.4 2018 Existing Traffic Operations

To evaluate congestion, 2018 traffic volumes ("v") were compared to area roadways' theoretical capacity ("c"). A v/c ratio greater than 0.9 in rural areas indicates congestion in the analysis year. The 2018 v/c ratios show no segments with a v/c ratio greater than 0.25.

Level of service (LOS) is a qualitative performance measure used to evaluate a roadway or intersection congestion. Levels of service are described according to a letter rating system ranging from LOS "A" (free flow, minimal or no delays—best conditions) to LOS "F" (severe congestion, long delays—worst conditions). LOS C or better is desirable in rural areas. At intersections, LOS is measured for non-free-flow movements: for individual stop-controlled approaches at non-signalized intersections and for each movement and approach at signalized intersections, combined for an overall intersection-level result.

Using *Highway Capacity Manual (HCM) 6th Edition* classifications and methodologies, US 27 was analyzed as a multi-lane highway. The remaining routes were analyzed as Class III two-lane highways. Class III highways serve moderately developed areas and often have reduced speed limits reflecting higher activity level. LOS criteria are measured by average travel speed and percent time spent following.

The 2018 intersection and segment traffic analysis indicates study area routes and the five US 27 intersections operate at a generally acceptable LOS D or better. Segment ADT and LOS for the existing scenario are shown in **Figure 21**.

Each of the five studied intersections operates at LOS C or better overall in the existing scenario. Only one movement exceeds LOS C during either peak hour: the westbound KY 1247 approach at the US 27 intersection (LOS D during the AM peak hour).

3.5 No-Build Year 2040 ADT and LOS

The projected 2040 No-Build traffic volumes and operations analysis compared to existing traffic operations exhibit minimal changes despite modest volume increases, i.e., less than 0.5% growth per year on average. Segment LOS does not change between scenarios; intersection LOS remain at either LOS B or C during both peak hours aside from eastbound Frog Hollow Road approaching US 27 (expected to worsen to LOS E during the AM peak and LOS D during the PM peak). **Table 7** summarizes ADT and LOS between scenarios.

Table 7: Summary of 2018 & 2040 No Build Traffic Operations

Location		2018 Scenario		2040 No Build Scenario	
Segment	**MP Limits**	**ADT**	**LOS**	**ADT**	**LOS**
KY 635	MP 6.699-8.201	3,700-3,700	C-D	4,300-5,200	C-D
US 27	MP 19.177-22.642	13,800-14,600	A	15,500-16,200	A
KY 1247	MP 11.646-14.830	1,700-3,900	B-C	1,800-4,400	B-C
KY 2308	MP 0.000-0.311	700	B	820	B
KY 2309	MP 0.000-0.765	2,500	C	2,700	C
Intersection		**AM LOS**	**PM LOS**	**AM LOS**	**PM LOS**
US 27/Yellow Jacket Way		B (eastbound)	B (eastbound)	B (eastbound)	B (eastbound)
US 27/KY 635		B (overall)	B (overall)	B (overall)	B (overall)
US 27/Frog Hollow Road		C (eastbound) C (westbound)	C (eastbound) C (westbound)	E (eastbound) C (westbound)	D (eastbound) C (westbound)
US 27/KY 1247		C (overall)*	C (overall)	C (overall)*	C (overall)*
US 27/Norwood Connector		C (eastbound)	B (eastbound)	C (eastbound)*	B (eastbound)

** One or more individual movements operate at LOS D*

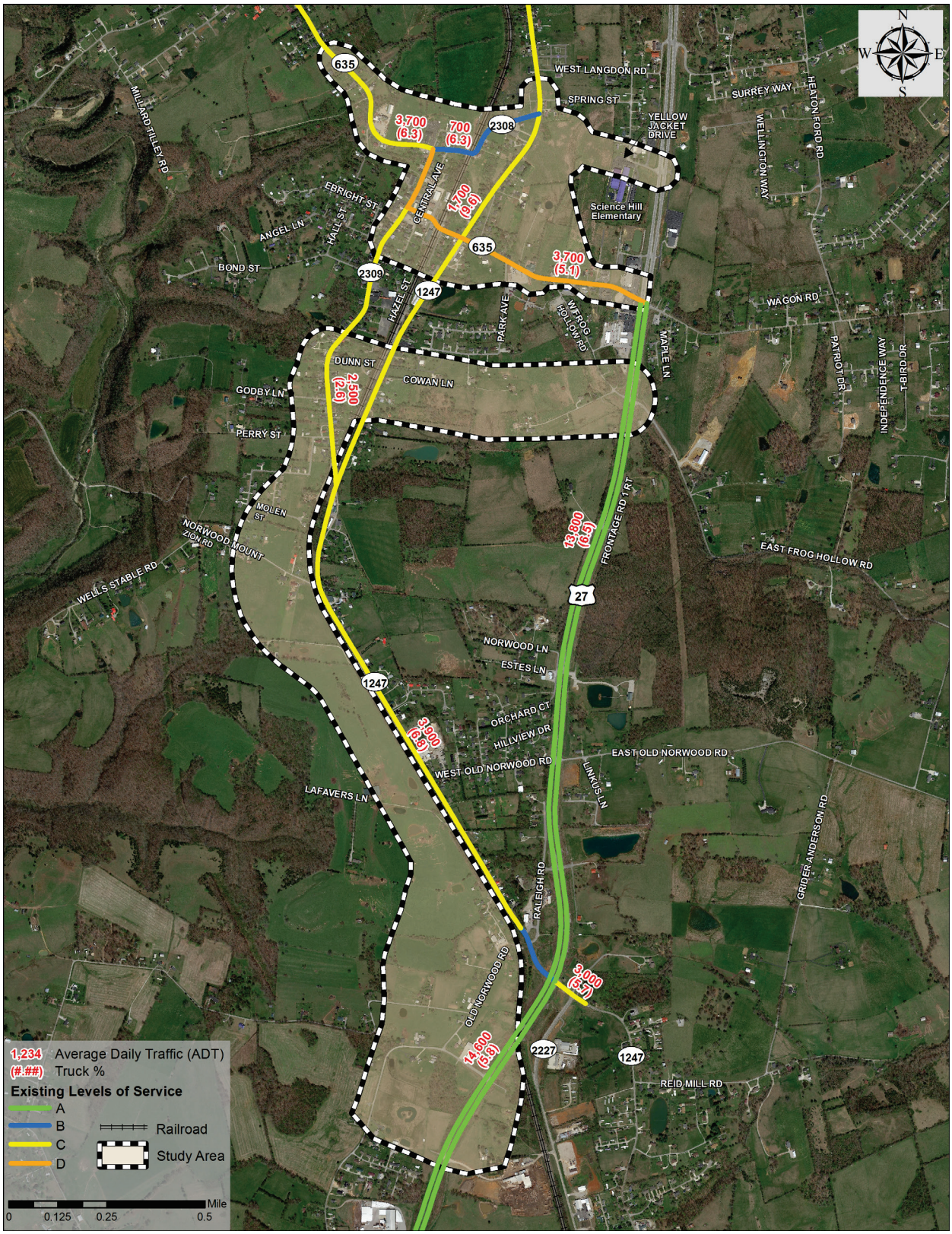


Figure 21: 2018 Average Daily Traffic and Traffic Operations

4.0 ENVIRONMENTAL OVERVIEW

An environmental overview was conducted to identify human and natural environmental resources in the study area. These resources were identified through literature searches, readily available GIS information, and windshield surveys. If projects advanced from this study receive federal funds, National Environmental Policy Act (NEPA) documentation will be required to address resources, impacts, and any appropriate commitments to minimize and mitigate impacts.

4.1 Natural Environment

The study area encompasses approximately 193 acres. Streams, wetlands, ponds, floodplains, geological features, and ecological resources—including habitat for threatened and endangered species—comprise the natural resources summarized in the following sections. The study area consists of primarily rural residential uses with young woods habitat, mature woods habitat, and agricultural/pasture areas.

4.1.1 Water Resources

According to the Kentucky Division of Water (KDOW) online Kentucky Watershed Viewer, none of the following exist in the study area: public water supply sources, wellhead protection areas, source water assessment and protection programs, or KDOW priority watersheds. Kentucky Hydrologic Units (14 digit) include Holtzclaw Branch, Big Clifty Creek, and Pitman Creek. Several drainage basins cover the area:

- Hyatts Fork and Fletcher Branch for the northern portion;
- Holtzclaw and Smith Branch for the southeast;
- Hines Branch and Big Clifty Creek to the west.

Biologists conducted a review of available mapping and identified water resources in the study area. Those resources are illustrated on **Figure 22**. A field assessment was performed during May 2018 to identify the approximate location and extent of waters and wetlands. The locations and extent of jurisdictional features have not been formally delineated or verified by the US Army Corps of Engineers, which holds final authority over determinations.

Table 8 summarizes streams, wetlands, and open waters identified within the study area. The National Wetlands Inventory (NWI) mapping differed significantly from the field reconnaissance.

Table 8: Water Resources

Resource	NWI Features	Surveyed Features	Size	Status
Potential wetlands	1 appears filled	23	11.08 ac	Jurisdictional
Potential streams - Intermittent	0	11	6,546 LF/0.55 ac	Jurisdictional
Potential streams - Ephemeral	0	6	1,084 LF/0.04 ac	Jurisdictional
Potential streams - Perennial	2	2	1,926 LF/0.23 ac	Jurisdictional
Open Water Ponds	7	17	3.93 ac	Jurisdictional

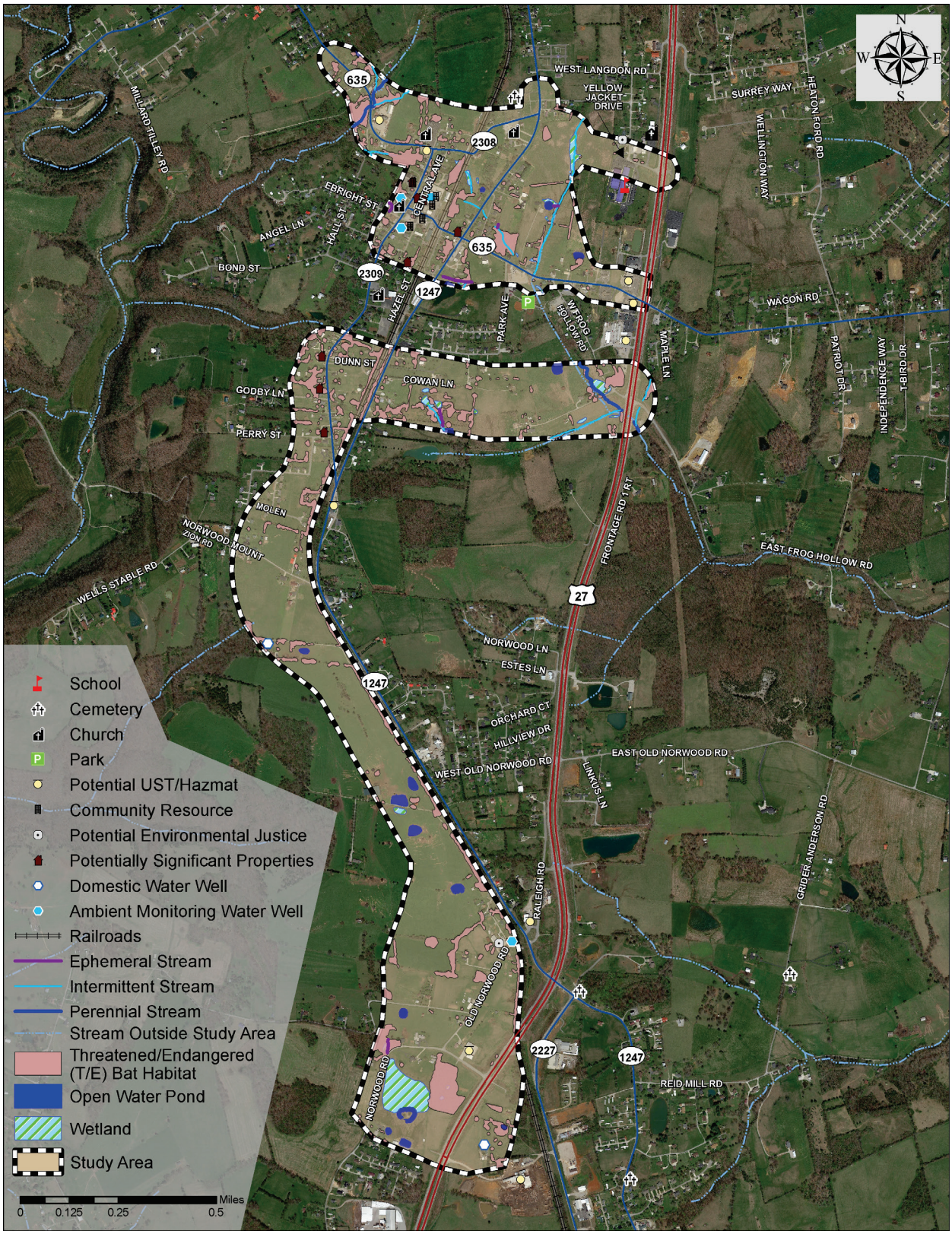


Figure 22: Environmental Overview

No areas within the 100-year floodplain were identified. In addition, no Wild and Scenic Rivers, Outstanding National Resource Waters, or Exceptional and Reference Reach Waters of Kentucky are in the study area.

Permits from the US Army Corps and Kentucky Division of Water may be required for implementation, depending on the alternative selected.

- If the project impacts less than 500 feet of stream or 0.5 acres of wetland, it is permittable under Nationwide Permit 14 under Section 404 of the Clean Water Act.
- If impacts to each intermittent or perennial stream are greater than 300 feet, the overall project impacts greater than 500 feet of intermittent and perennial stream within each hydrologic unit, or the project results in impacts greater than 0.5 acre of wetland, an Individual Water Quality Certification under Section 401 of the Clean Water Act is required along with an Individual Permit under Section 404.

Best Management Practices are recommended during construction for stream crossings and erosion control measures.

4.1.2 Threatened and Endangered Species

Regarding habitat for the listed species, analysts reviewed occurrence records maintained by the U.S. Fish and Wildlife Service Kentucky Field Office (USFWS KFO), Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Kentucky State Nature Preserves Commission (KSNPC). **Table 9** lists federally-listed species potentially occurring in the study area as identified in the USFWS Information for Planning and Conservation (IPaC) portal.

Table 9: Threatened (T) and Endangered (E) Species

	Scientific Name	Common Name	Federal Status	Habitat Present
Flowering Plants	Platanthera intergrilabia	White Fringeless Orchid	T	No
	Spiraea virginiana	Virginia spiraea	T	No
Mussels	*Alamindonta atropurpurea*	Cumberland Elktoe	E	No
	Epioblasma brevidens	Cumberlandian Combshell	E	No
	Epioblasma florentina walkeri	Tan Riffleshell	E	No
	Epioblasma triquetra	Snuffbox Mussel	E	No
	Pegias fabula	Littlewing Pearlymussel	E	No
	Ptychobranchus subtentum	Fluted Kidneyshell	E	No
	Villosa trabalis	Cumberland Bean	E	No
Mammals	*Corynorhinus townsendii*	Virginia big-eared bat	E	No
	Myotis grisescens	gray bat	E	Yes Foraging
	Myotis septentrionalis	northern long-eared bat	T	Yes
	Myotis sodalis	Indiana bat	E	Yes Potential Summer Habitat

The May 2018 field assessment identified potential threatened and endangered species habitat. IPaC identified no critical habitats in the vicinity.

- No roosting habitat or winter hibernacula were identified for cave-dwelling bats. Mapping reviews did not identify any underground or surface mines within the study area. Although some areas with very high karst potenial exist, no caves, rockshelters, or other underground features were observed. However, the Kentucky Speleological Survey (KSS) indicated three known caves are located within three miles of the study area: Andes Cave, Gridler Cave 1, and Gridler Cave 2. Andes Cave is noted as being located immediately west of the south study area (approximately 1,200 feet), but unverified. Sinkholes were noted, but none were suitable for bat use.

- The mature woods habitat in the study area was identified as suitable summer roosting, foraging, and commuting habitat for Indiana and northern long-eared bats. This habitat totals approximately 64.0 acres.

- The study area is located in potential habitat for Indiana bat and in a known quadrangle with hibernaculum buffers for northern long-eared bat.

- Perennial streams within the study area are considered foraging and commuting habitat for gray bat.

The locations and extent of Threatened and Endangered (T/E) species habitat **(Figure 22)** were approximated and have not been formally delineated or verified by the appropriate resource agency. No suitable habitat is present in the study area for the seven mussel species or the two plants.

It appears that impacts to the Indiana and northern long-eared bat may be addressed following guidance provided in the *Revised Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (2016) and a contribution to the Imperiled Bat Conservation Fund. Additionally, the 4(d) Rule may be used to address impacts to the northern long-eared bat if it is determined by the USFWS the project is not located within 0.25-mile of known hibernacula. Impacts to the perennial stream could adversely impact foraging habitat for gray bat. Adverse effects to other federally-listed threatened/endangered species are not anticipated as a result of the proposed alterantives considered.

Agency correspondence and the *Terrestrial and Aquatic Assessment* with detailed mapping are located in **Appendix C**.

4.1.3 Preliminary Geotechnical Overview

The *Geotechnical Overview* is found in **Appendix D**. The study area is in the western Pennyrile or Mississippian Plateau physiographic region. Topographic mapping shows relief ranging from 1,180 feet above mean sea level in the southwestern study area to a low of approximately 1,020 feet in the northwest. Limestone is the dominant rock type with some claystone, siltstone and shale. No known fault lines exist in the study area. The topography can be described as karst landscape, with red clay soils, numerous sinkholes and depressions, gently rolling to rolling hills and small streams and creeks.

A summary of the 2002 and 2007 geotechnical reports from US 27 improvements through the study area noted the following:

- Soil cut slopes ranged from 2H:1V to 3H:1V. All embankments were constructed at 2H:1V, however this embankment geometry may be too steep, as evidenced by the embankment failure observed during the field review.

- Local ponds were drained and soft/saturated material was removed prior to stabilizing the areas with stone and placing engineered fill. Ponds were noted in the field which may require similar effort to stabilize and fill.

- Non-durable shale was encountered and cannot be placed in the subgrade.

- Sinkholes were noted in the report and were recommended to be filled or capped in accordance to Section 215 of Kentucky Department of Highways *Standard Specifications for Road and Bridge Construction*. The project was designed for a soil subgrade utilizing

a California Bearing Ratio (CBR) value of 2. Lime modification was suggested as a soil stabilization method.

Given the above information, geologists recommended more specific cut and fill slopes absent drilling. The recommendations are in **Appendix D**.

Karst terrain in the study area will likely be the most detrimental factor to any new construction. Summarized in **Figure 24**, each of the study area geologic formations exhibit significant potential for karst impacts during construction, as indicated on karst potential mapping. Soft, silty soils also may be encountered in low lying areas, especially in surface depressions. The northern part of the study area is developed which can mask the existence of karst features. Sinkholes were not observed in the field, however several locations exhibited the bowl-shaped topography. Also, during the field review, much of the southern area was covered in row crops and partially wooded, which made it difficult to identify individual sinkholes.

While new construction will not likely be at any greater risk to ground subsidence or other impact from karst than existing roadways and structures within the study area, a site specific geotechnical investigation will provide critical information with regard to karst potential, problematic soils and other pertinent information for design.

Several water wells, monitoring wells, and oil wells are in the vicinity of the project, shown in **Figure 22**. A few surface depressions and springs were observed during the field reconnaissance within the study area. Adequate drainage will be of primary concern to minimize environmental impacts by surface runoff into the underlying karst network. Proper management of surface water will also lessen the occurrence of sinkhole dropouts during construction. Specific mitigation measures are identified in the full overview.

Wet areas could require stabilization for embankment construction. Likewise, subgrade soils under existing pavements could be very wet and might require stabilization if pavements are removed. An addendum to past roadway reports in the area recommended granular embankment wrapped in Type IV Geotextile Fabric to stabilize low-lying areas prior to embankment construction.

Landslide inventory from the Kentucky Geological Survey (KGS) shows no previously reported landslides in the study area. There is an existing slope failure near the intersection of US 27 and Norwood Road Connector (**Figure 23**). If this area is improved, it may be necessary to repair this slope failure. Due to overgrowth, it is impossible to accurately classify the failure type but a shallow rotational failure is suspected.

Figure 23: Slope Failure at US 27/Norwood Road Connector Intersection

Any open sinkholes or cavities identified within construction limits not utilized for drainage purposes should be filled and/ or capped.

Any new sizable structures or widening of existing structures are likely to be designed for nonyielding foundations utilizing H-piles or drilled shafts. Culverts may require either a yielding or nonyielding foundation based on similar projects in the area. Yielding foundations may require stabilization if soft soils are encountered as indicated in previous structure reports for the area.

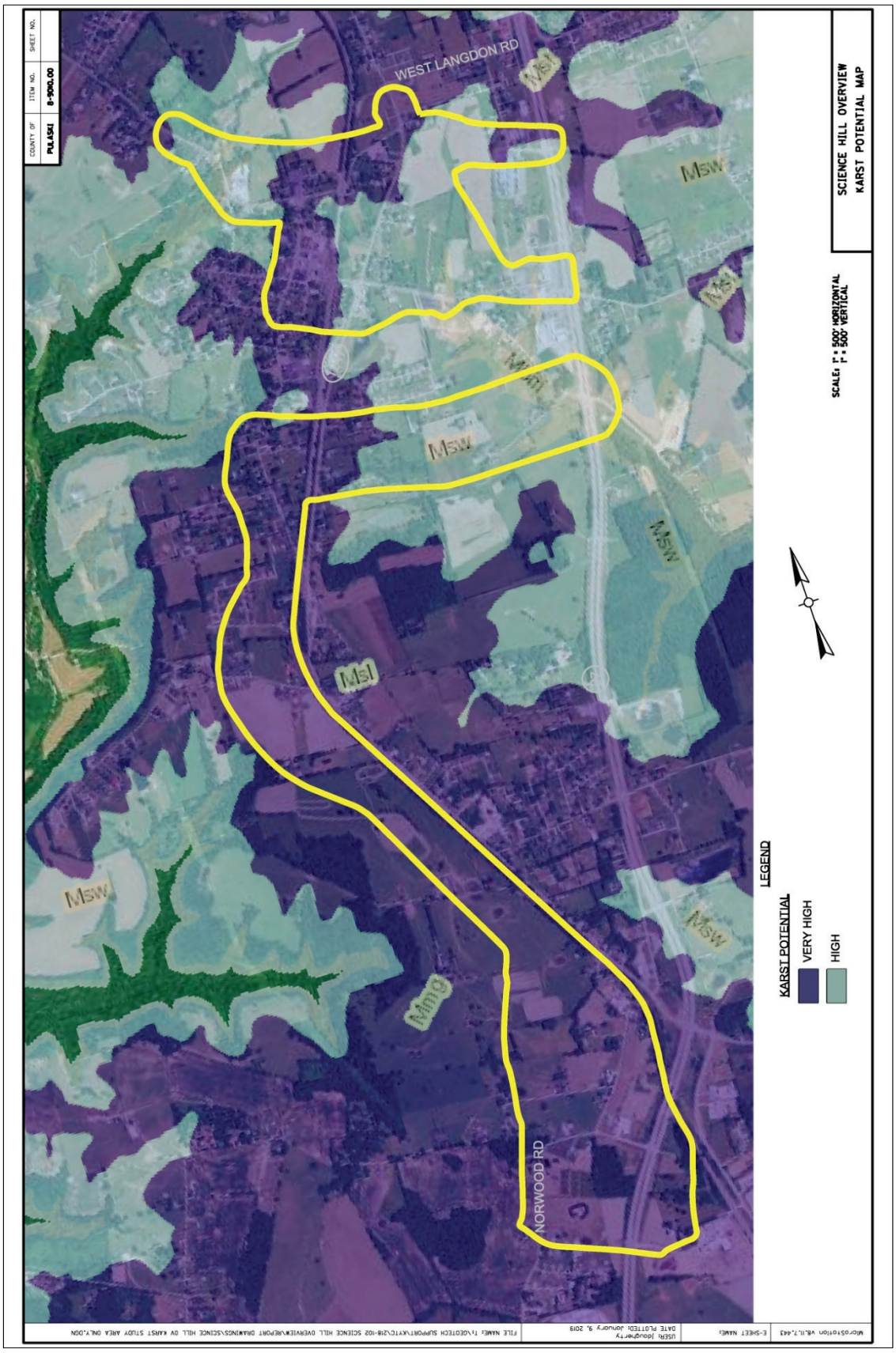


Figure 24: Karst Potential

4.1.4 Farmlands

According to the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) web soil survey[8], much of the study area is considered prime farmland (**Figure 25**). Approximately 36% of the study area is prime farmland and 40% is of statewide importance.

The Kentucky Division of Conservation administers the Agricultural District Program, the goals of which are to protect Kentucky's best agricultural land for food and fiber production, and to prevent its conversion to nonagricultural usage. Land enrolled in the program cannot be annexed or condemned without mitigation, is taxed at the agricultural rate, and is eligible for deferred assessment costs when water lines are extended. No established agricultural districts are within the study area.

Kentucky's Farmland Preservation Program authorizes purchase of agricultural conservation easements through the Purchase of Agricultural Conservation Easements (PACE) program to ensure lands currently in agricultural use will remain available for agriculture and not be converted to other uses. The Kentucky Department of Agriculture data shows no PACE program properties in Pulaski County.[9]

The farmland classification report is in **Appendix E**.

4.2 Human Environment

The human environment is often defined as the "built" environment or can be described as what humans have built. Built-environment resources that may affect or be affected by improvements recommended in this corridor study are discussed in the following sections.

4.2.1 Land Use

The study area is a mix of residential, business and agricultural, with an abundance of farmland in the southern section of the study area. The northern section is more developed and includes businesses, residences, schools, churches, city streets, and various support facilities. Although rural in nature, Science Hill is encompassed within the Federal Adjusted Urban Area boundary of Somerset. Two tracks of the Norfolk Southern railroad essentially parallel KY 1247 through the study area with seven at-grade crossings.

[8] https://websoilsurvey.scegov.usda.gov/App/HomePage.htm
[9] http://www.kyagr.com/marketing/documents/PACE_Map.pdf

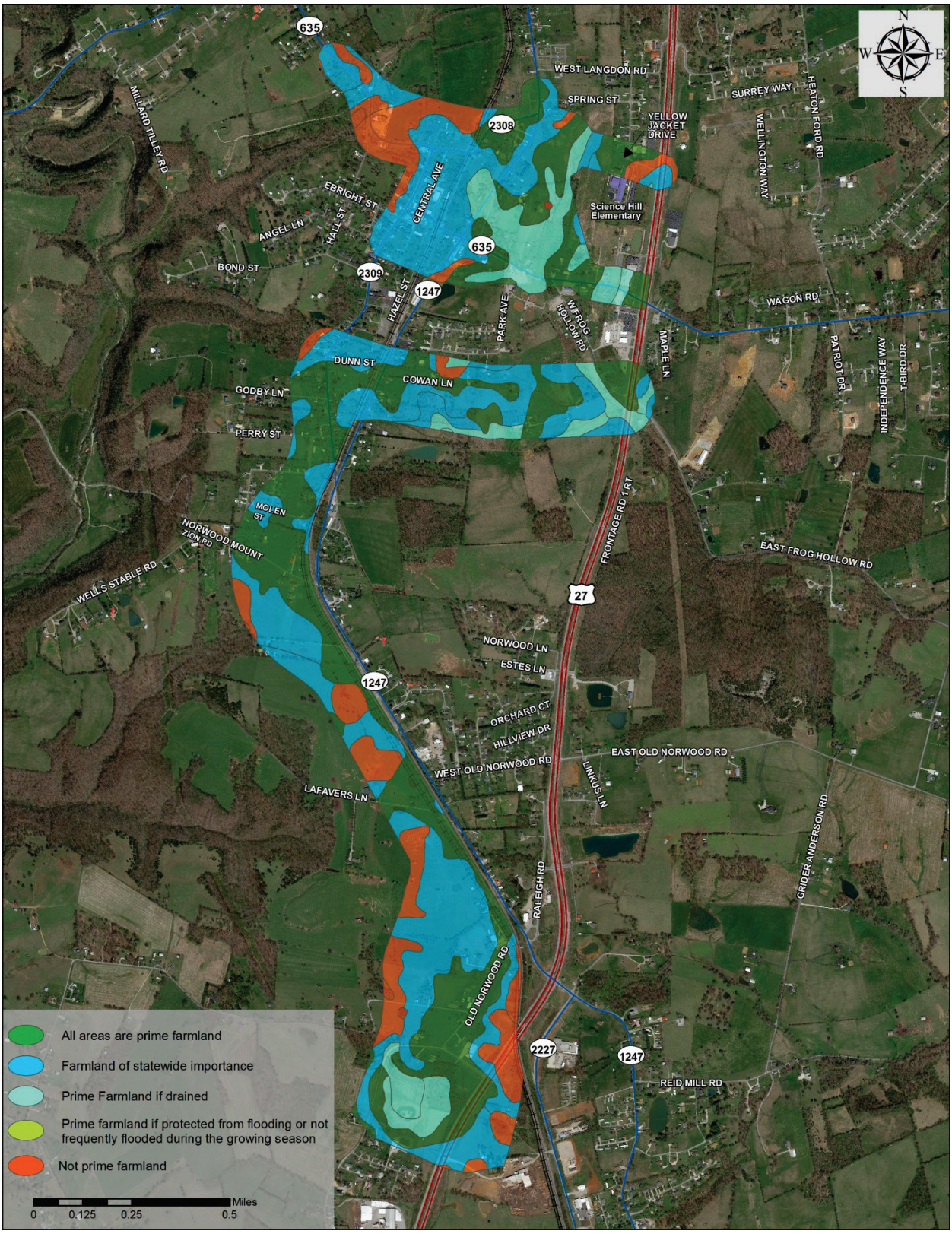


Figure 25: Farmland Classification

4.2.1.1 Community Resources

Churches

Shown in **Figure 26**, three churches lie within the study area: Science Hill United Methodist Church, Northside Baptist Church, and Science Hill Christian Church. There are other churches within the community but beyond the study boundaries. Input received throughout the public involvement process suggest churches prominently characterize the community's identify.

Figure 26: Churches within Study Area

Cemeteries

One known large cemetery, Science Hill Cemetery, is located north of KY 2308 between the railroad and KY 1247. It covers over 6 acres, located just north of Science Hill Christian Church.

Schools

One school—Science Hill Elementary School—is located in the northern study area on Yellow Jacket Way. Students range from kindergarden through eighth grade, with an enrollment around 450 students.

Other Resources

Science Hill Ball Park is on KY 635 (Main Street) between Park Avenue and West Frog Hollow Road. The park includes four baseball fields, two basketball courts, soccer field, playground, and picnic shelter. Along with wildlife refuges and historic resources, public parks are protected under Section 4(f) of the US Department of Transportation Act of 1966, which protects these resources from transportation use unless strict criteria are met, including an assessment of avoidance options. Further, recreational resources developed using Land and Water Conservation Fund

(LWCF) grants are protected under Section 6(f) of the Land and Water Conservation Act. Eighteen grants were identified in Pulaski County (**Appendix H**); two grants were specific to the city of Science Hill for the Science Hill Ball Park. Future research is required to determine exact Section 6(f) involvement if the park is impacted.

A Science Hill branch library is at the corner of Main Street and Central Avenue.

The police department and post office are along Central Avenue and the fire department is on East Langdon Road.

No known landfills are in the study area. A historic dump is located along Ware Road, about half a mile to the north of the study area.

4.2.1.2 Utilities Infrastructure

Science Hill Water Works provides the primary drinking water supply for the study area, purchasing from Somerset Utilities. Water lines run alongside most streets in the community; Kentucky Infrastructure Authority (KIA) records[10] show replacement/extension projects planned along KY 1247 to KY 2309 and along US 27. One 75,000-gallon water tower stands along KY 635 (Main Street) between the library and the railroad tracks; a second tank holds 300,000 gallons and stands between KY 2309 Stanford Street and the railroad, south of Dunn Street.

KGS also publishes a database for known water wells, shown on **Figure 22**.

- One domestic well is along KY 635 in the north and one well is near the southernmost tip of the study area.
- Two ambient monitoring wells are west of the railroad in the northern portion of the study area and a third is near the southern study area limits.

According to KIA data, the study area has existing sewer lines throughout much of the community. The main wastewater treatment plant is located west of the study area along East Bright Street. KIA mapping[11] shows several proposed wastewater expansions planned throughout the northern, middle and southern portions of the study area.

Overhead utilities for electric, telephone, and cable also run throughout the study area. Eastern Kentucky Power maintains transmission lines which cross through the study area at its northernmost and southernmost limits.

4.2.2 Socioeconomic Review

The *Science Hill Railroad Crossing Socioeconomic Study* (**Appendix F**) was prepared by the Lake Cumberland Area Development District (LCADD). This report relies on the U.S. Census Bureau's 2016 American Community Survey's five-year estimates and data tables for demographic data about the study area's geographic units: Census Tract (CT) 930200 and Block Groups (BG) 1, 2 and 3 within it plus CT 93401 and BG 2 within it. It includes documentation of potential environmental justice populations, i.e., racial minorities and persons below poverty level.

Statistics are provided for minority, elderly (age 65 and over), low-income, disabled, and Limited English Proficiency (LEP) populations. Data is intended to identify populations that may have

[10] http://kygeonet.ky.gov/kia/dw/index.html
[11] http://kygeonet.ky.gov/kia/cw/index.html

specific concerns/needs that may require additional analysis if projects are advanced to future phases from this study.

Table 10 highlights where Pulaski County exceeds Kentucky average rates and where each BG surpasses Pulaski County average rates.

Table 10: Select Populations in Study Area Census Tracts and Block Groups

		Total Pop	Minority	Poverty	Over 65	Disability	LEP
United States		318,558,162	24%	15.1%	14.5%	12.5%	8.5%
Kentucky		4,411,989	10.6%	18.8%	14.8%	17.2%	2.1%
Pulaski County		63,772	2.8%	25.0%	17.7%	21.7%	0.6%
Census Tract	**Block Group**						
930200	1	1,811	0.9%	15.5%	17.7%	26.0%	0.5%
930200	2	1,981	0.7%	30.9%	16.2%	30.7%	0.0%
930200	3	1,583	1.3%	33.8%	14.4%	31.7%	0.2%
930401	2	1,252	7.0%	30.1%	14.9%	27.8%	0.0%

In summary, the southernmost section of the study area has a concentration of minorities. Elevated concentrations of low-income and disabled populations cover nearly the entire study area. Persons over age 65 are in the northern portion of the corridor. Based on Census distributions, LEP is not a concern as over 99.5% of the population speaks English. As illustrated in **Figure 27,** each BG covers a much larger area than contained within the study area limits; the figure highlights each BG that exceeds Pulaski County average rates (darker colors). Larger maps are located in **Appendix F.**

During future phases of project development, a more detailed analysis may be required for NEPA documentation, per *Environmental Justice Executive Order 12898*, to assess the potential for adverse and disproportionate impacts to low-income and minority populations.

4.2.3 Noise

Due to the size of the study area, the environmental overview examined general concerns for noise. Noise-sensitive receptors, as identified per the FHWA's Noise Abatement Criteria and the KYTC's *Noise Analysis and Abatement Policy* (July 2015)[12], are present throughout the study area, including specified activity categories (land uses) for:

- Category B—Residential areas.
- Category C/D—Active sports areas, cemeteries, hospitals, parks, picnic areas, places of worship, playgrounds, Section 4(f) sites, schools, exterior and interior areas respectively.
- Category E—Hotels, motels, offices, restaurants/bars, etc. with exterior uses.

Based on the recommendations developed for this study, specific traffic noise impact analyses may need to be conducted to satisfy NEPA requirements. Due to the proximity of the active rail line, barriers are unlikely to reduce noise levels to satsify policy thresholds.

[12] https://transportation.ky.gov/EnvironmentalAnalysis

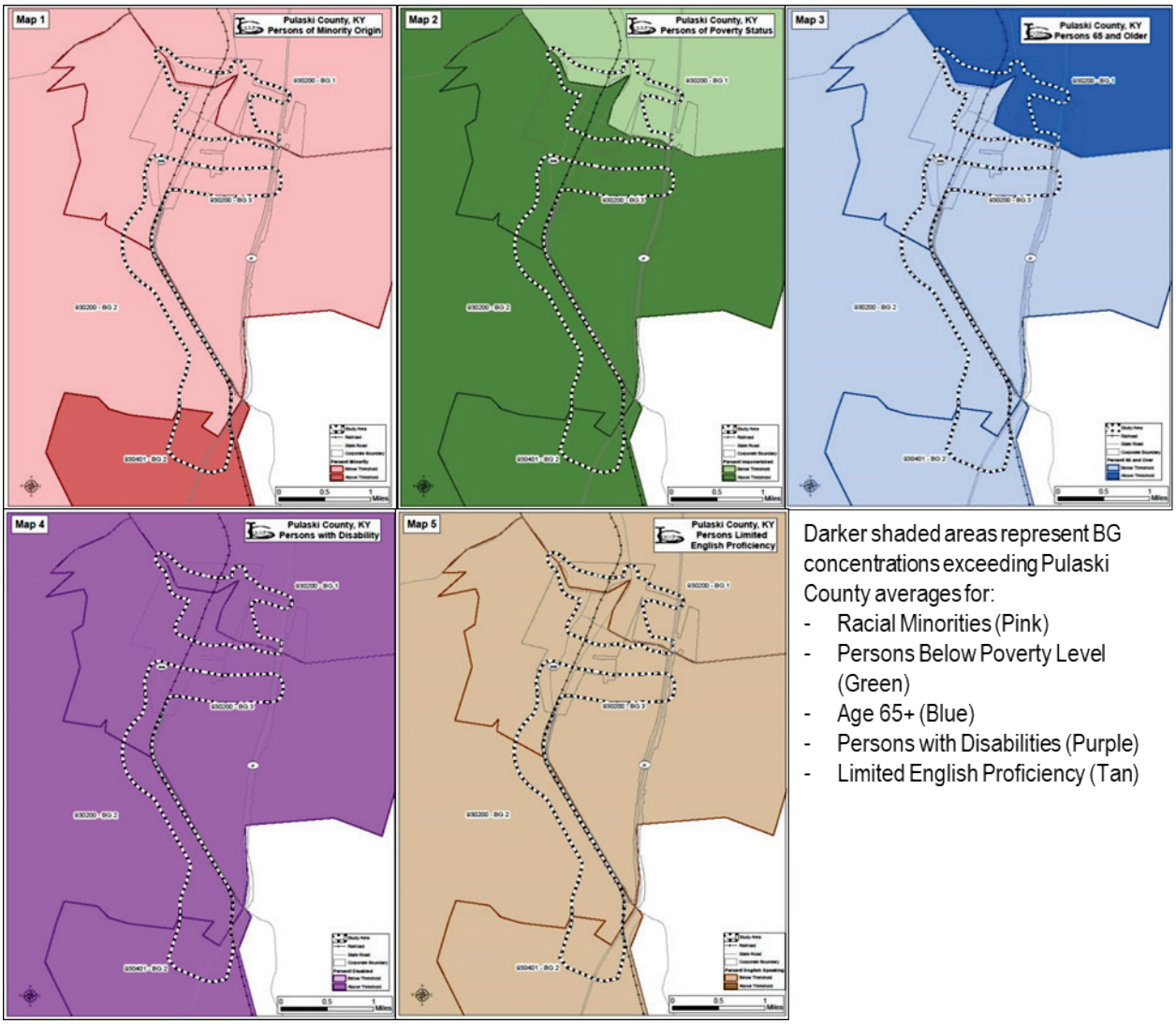


Figure 27: Maps of BG Concentrations for Select Demographics

4.2.4 Air Quality

Pulaski County is in attainment for all National Ambient Air Quality Standards for six major air quality pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and particulate matter.[13]

Traffic delays and vehicle idling can lead to increased emissions, especially in terms of carbon monoxide and Mobile Source Air Toxics (MSAT). U.S. Environmental Protection Agency (EPA) regulations for vehicle engines and fuels will cause overall MSAT emissions to decline substantially over the next several decades. This will both reduce the background level of MSAT as well as the possibility of MSAT emissions created within the project study area.

[13] https://www3.epa.gov/airquality/greenbook/ancl.html

4.2.5 Potential Hazardous Materials

Potential hazardous materials sites were inventoried based on the EPA Viewer Search[14] and a windshield survey to identify potential contaminated sites: e.g., gas stations, automotive businesses, etc.

Table 11 and **Figure 28** summarize these sites. Five sites were noted within the study area limits with four others immediately adjacent.

Table 11: Potential UST/Hazmat Sites

Site	Description
Science Hill Milling Company 986 W Highway 635	Historic feed mill with numerous on-site storage silos and related equipment. Noted in field visit; not listed in EPA records.
Former Gas Station W Highway 635/First Street	Likely to contain underground storage tanks (USTs) or former leaks/spills. Noted in field visit; not listed in EPA records.
Dollar General Store #4454 5775 N Highway 27	Listed in RCRAInfo* database as unpermitted facility.
BP Gas Station 5705 N Highway 27	Noted in field visit; listed in RCRAInfo database.
Automotive Garage 5615 N Highway 27	Likely to contain oil storage/spills or other chemicals. Noted in field; not listed in EPA records. Falls beyond study area limits.
Former Gas Station Science Hill Food Mart 5858 KY 1247	Likely to contain USTs or former leaks/spills. Noted in field; not listed in EPA records. Falls beyond study area limits.
Shell Gas Station 55 Raleigh Road	Likely to contain USTs. Noted in field; not listed in EPA records. Falls beyond study area limits
Automotive Garage Danny's Hot Rod Super Center 55 Norwood Road	Likely to contain oil storage/spills or other chemicals. Noted in field; not listed in EPA records.
KY Hardwood Lumber Mill Ridge Road	Industrial lumber processing/sales site, likely to contain chemicals or former leaks/spills. Noted in field; not listed in EPA records.

** RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976.*

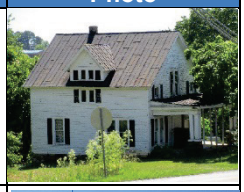
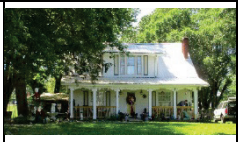
[14] https://geopub.epa.gov

Figure 28: Potential Hazardous Material Concerns

4.2.6 Historic Architectural Resources (Section 106)

To identify potential resources protected by the National Historic Preservation Act, historians conducted archival research and a field survey. They identified no architectural resources listed in the National Register of Historic Places (NRHP) within the study area: 13 resources had undetermined statuses according to Kentucky Heritage Council's database. Eight newly identified resources were deemed potentially eligible (**Table 12**) for the NRHP. The full report is in **Appendix G**.

Table 12: Potentially NRHP Eligible Resources

Site/Survey #	Description	Address/Location	Criterion	Condition	Photo
CRA 1	Front-gable house	Northwest corner of KY 635 and KY 1247, Science Hill	C	Good; retains historic materials and integrity	
CRA 2	Former gas station	Stanford Street (KY 635) between Dick and Langdon Streets, Science Hill	A, C	Good; retains historic materials and integrity	
PU 115	Science Hill School	Stanford Street (KY 635), north of Langdon Street, Science Hill	A, C	Good; retains historic materials and integrity	
PU 116	Carl Dick's General Store	Southeast corner of Langdon Street and Central Avenue, Science Hill	A, C	Good; retains historic materials, form, and highly decorative elements; modern side addition slightly diminishes integrity	
CRA 3	T-plan house	Northeast corner of Chloe Street and Central Avenue, Science Hill	C	Poor; historic form intact, but deteriorated condition diminishes integrity of historic materials and workmanship	
CRA 4	Front-gable house	Northwest corner of Stanford and Perry Streets	C	Good; retains majority of historic materials and integrity	
CRA 5	Side-gable house	West side of Stanford Street, north of Godby Lane	C	Good; retains historic materials and integrity	
CRA 6	Side-gable house	West side of Stanford Street, north of Dunn Street	C	Good; retains majority of historic materials and integrity	

Criterion A: Potential Local significance in the areas of transportation, education and commerce
Criterion C: Potential architectural significance

Portions of the Science Hill Mill date to 1928; the owner received a Kentucky Landmark certificate that proclaims the site is “deemed worthy of preservation.” While the mill is locally valued, it does not meet eligibility criteria for the NRHP.

4.2.7 Archaeological Resources

Archival research was conducted to identify prior archaeological surveys completed in the study area, or areas likely to contain archaeology sites. The soils mapped within the study area were also reviewed in order to define areas that may contain intact cultural deposits. Illustrated in **Figure 29**, a rating model was conducted to identify high, medium, and low probability areas for containing archaeological deposits. This model is presented for planning use only. It is not to be used as a model for archaeological site predictability; it does not include an analysis for identifying rockshelters or caves.

The review indicated four sites fall within or adjacent to the study area. A review of historic maps indicates the study area has high potential to contain archaeological remains in the communities of Science Hill and Norwood as well as a possibility for more scattered occurrences throughout the rural landscape. Alluvial soils along Holtzclaw Branch suggest a moderate potential for encountering prehistoric archaeological deposits that may be significant.

Due to the relatively high potential for the presence of archaeological sites in the study area, an intensive archaeological survey is recommended prior to any development. Survey should include pedestrian survey, shovel testing, and bucket augering.

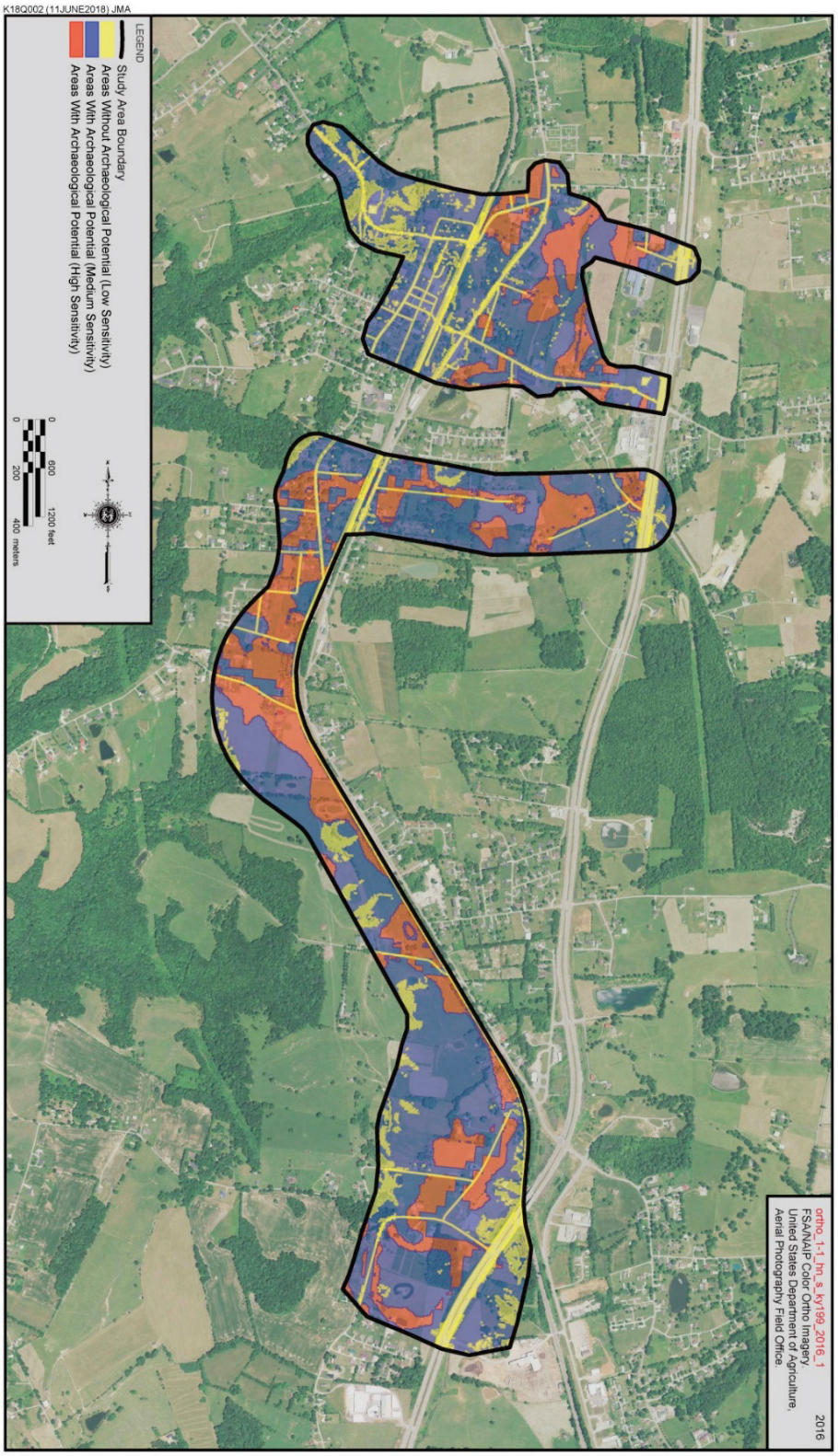


Figure 29: Modeled Potential to Encounter Archaeological Deposits

5.0 PURPOSE AND NEED STATEMENT

As a result of the existing conditions analysis, traffic analysis, project team and local official/stakeholder input, and resource agency coordination, a draft purpose and need statement was crafted for future project development efforts, including design and environmental activities. The draft purpose and need statement establishes why the KYTC proposes to advance a transportation improvement and drives the decision-making process for alternatives' consideration, analysis, and selection.

Purpose: The purpose of this project is to improve cross-railroad mobility, reliability, and safety for motorists—especially emergency responders—in Science Hill, as the railroad tracks form a barrier between the eastern and western portions of town.

The **Need** for an improvement project is based on the following:

There are seven at-grade crossings of the dual-track Norfolk Southern Railroad in the study area (**Figure 6**); the northern four crossings carry the majority of local traffic whereas the southern three serve a few residences each. The nearest grade-separated crossing is the US 27 overpass, near the southern limits of the study area. It is located 2.25 miles south of the KY 2308 (North Stanford Street) crossing.

High Volumes of Daily Trains. According to 2017 FRA data, approximately 60 trains per 24-hour period travel along the Norfolk-Southern tracks through Science Hill. At an average speed of 40-50 mph, it takes slightly over a minute for each mile-long train to clear the at-grade crossing, plus roughly 45 total seconds of additional delay as the gates are lowered then raised.

However, video counts completed during 2018 showed clearing individual train crossings generally takes much longer. Graphed in **Figure 30**, 36 trains were recorded during the count period, with crossings blocked from 1.5 to over 7.0 minutes, averaging 3.1 minutes. No trains stopped during the 24-hour count.

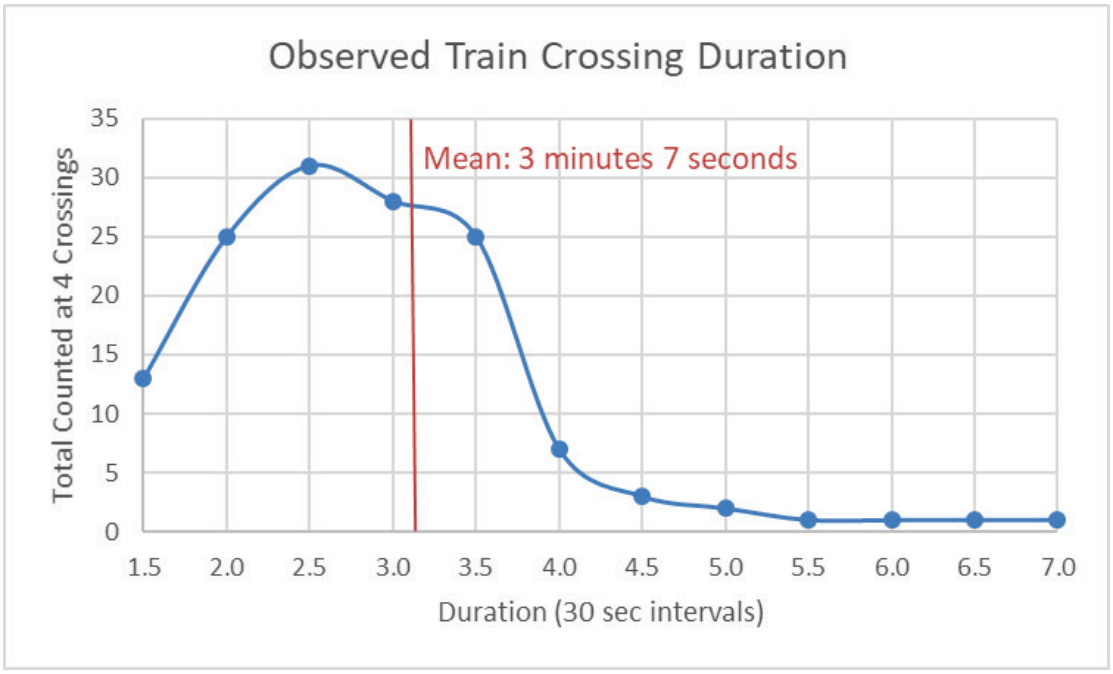


Figure 30: Period Train Crossings Blocked During 24-Hour Counts at Four Local Crossings

Trains Stopping on Tracks. In addition to the high volume of trains passing through Science Hill daily, trains also stop on the tracks, blocking one or more of the seven local at-grade crossings. The frequency and duration of stopped trains is difficult to quantify.

- Conversations with local officials and stakeholders, discussed in **Section 7.3**, indicate trains regularly stop for 30 minutes or more. Per their input, stopped trains can block the crossings for an hour or more a few times per year.

- A public meeting survey completed during January 2019 asked community members how often and for what average duration their route has been blocked by a stopped train. Over 147 responses were received, noting durations ranging from two minutes to over nine hours. The majority of open-ended responses identified average delays between 15 and 30 minutes. Numerous respondents noted that they would opt to take one of the detour routes (**Figure 7**) instead of waiting if they got to a crossing and found it blocked.

- Local law enforcement officers historically have kept sporadic records on train blockages but began to keep more detailed records in 2018. The project team requested available data in early 2019; 29 records from April 2014 through December 2018 were received. Files show Science Hill at-grade crossing(s) blocked from 8.0 minutes to over 7.5 hours. Omitting records beyond the study area limits or where the blockage was caused by factors beyond a stopped train, closure durations average 1.5 hours. In most instances, local law enforcement officers contacted Norfolk Southern soon after complaints were called in; primary reasons given for stoppages included mechanical issues or crew switches at Burnside.

Lengthy Detours. As shown in **Figure 7**, circuitous detours exist but lead to substantial increases in travel times and distances. These delays affect all motorists—commuters, emergency responders, school buses, etc.

Efficient response times for fire, police, and ambulances are critical for community safety. The fire and police departments are located on the west side of the tracks while the north-south connection to medical aid relies on US 27, east of the tracks.

Inherent Safety Risks. The presence of at-grade crossings increases the inherent risk of collisions. FRA predictive crash data[15] suggests a 3% chance per year that a collision between a train and highway vehicle will occur at the KY 635 and KY 2309 crossings, a 2% chance at the Lafaver's Lane and KY 2308 crossings, and a 0.8% chance at the Norwood-Mount Zion Road crossing. The proximity of the Science Hill Elementary School, which runs 10-12 of their buses across the tracks each weekday, is another consideration.

[15] https://safetydata.fra.dot.gov/webaps/

6.0 INITIAL BUILD ALTERNATIVES CONCEPT DEVELOPMENT

The project team examined a wide range of initial concepts to cross the railroad without being impeded by train traffic. Rolling terrain combined with the design requirement for a 23-foot minimum vertical clearance over the rail tracks drove engineering considerations; several concepts evaluated require steep grades and/or reconstruction of large sections of KY 1247 to maintain connections.

Design speeds and proposed templates defined in the scope of work are shown in **Table 13**; initial typical sections are shown in **Figure 31.** Both rural and urban typical sections were originally modeled; however, because of only a two foot difference in width, there was minimal difference between impacts. For consistency, a rural typical section was used for all cost estimates. The reasons for design speed variations are due to limitations from horizontal curvature to make desired connections and sight distance limitations due to vertical curvature at the railroad crossing.

Table 13: Preliminary Alternative Design Criteria

INITIAL ALTERNATIVE	LENGTH (miles)	DESIGN SPEED (mph)	PROPOSED TEMPLATE
1	1.24	35	Rural
2	0.19	35	Rural; Urban
3	2.45	55	Rural
3a	2.45	55	Rural
4	0.34	30	Rural
5	0.3	30	Rural; Urban
6	0.45	30	Rural; Urban
7	1.12	30	Rural
8	0.72	35	Rural
9	0.58	30	Rural; Urban
Molen Street—Norwood/Mt Zion Connector	0.15	30	Rural

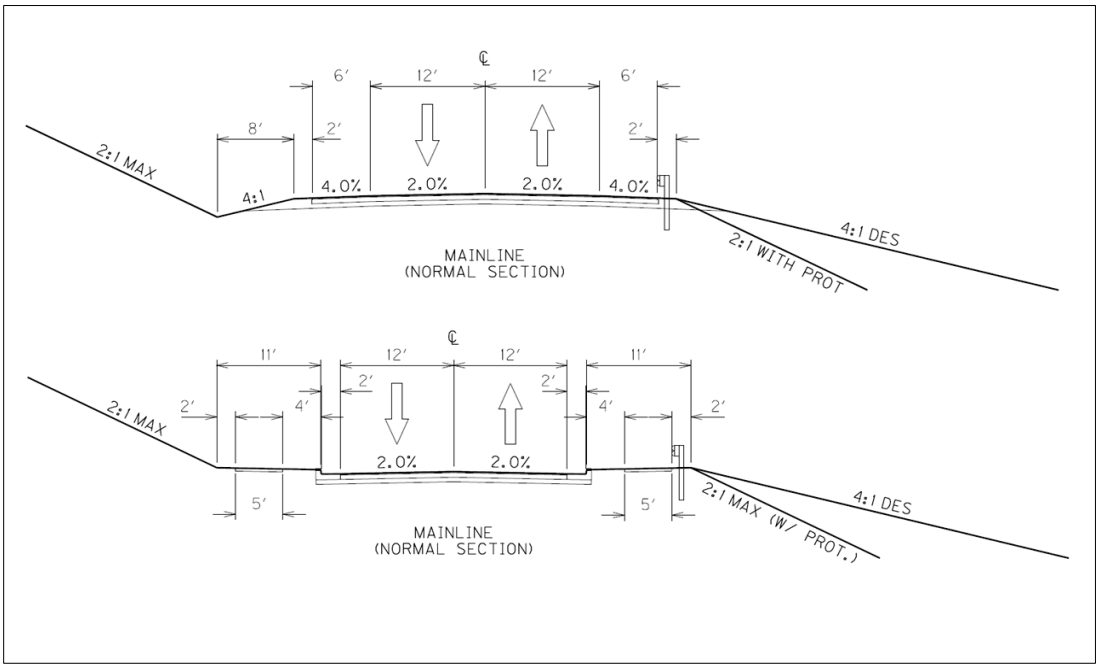


Figure 31: Typical Sections for Rural (top) and Urban (bottom) Areas

Some segments of each numbered alternative would be interchangeable; for example, any alternative showing a connection to Yellow Jacket Way could be modified to connect to KY 635 instead. Initial alternatives are summarized below and depicted in **Figure 33 (page 51)**. Initial alternatives fit into one of three geographic areas: North, Middle, or South.

- South: Alternatives 3 and 3a
- Middle: Alternatives 6 and 7
- North: Alternatives 1, 2, 5, 4+5, 8, and 9

A discussion of impacts is presented alongside each alternative, with impacts summarized in **Table 14 (page 53)**.

6.1 South Concepts

The two southern concepts effectively parallel KY 1247 but on the west side of the tracks. Heading south on KY 2309 (Stanford Street), motorists would continue south instead of crossing the tracks, and would end at US 27. The existing US 27 overpass provides the crossing for the railroad tracks. Either would allow five of the seven local crossings to be closed, resulting in an estimated 2040 Build ADT of 3,000 vpd on the new roadway. Sections of Alternatives 3 and 3a are interchangeable.

- **Alternative 3** is 1.85 miles long, its southern terminus at US 27 / Norwood Road Connector. It would have a 55 mph design speed and maximum 2.5% grade. Alternative 3 would relocate 10-12 homes and has a preliminary construction cost estimate ranging from $5.9 to $7.6 million.
- **Alternative 3a** is similar to Alternative 3 but connects to US 27 about 1,200 further feet south to provide better sight distance at the US 27 intersection. Alternative 3a is 2.15 miles long with a 55 mph design speed with a maximum 2.5% grade. It would have one residential relocation, substantially fewer than Alternative 3. The preliminary construction cost estimates range from $7.1 to $8.8 million.

6.2 Middle Concepts

Alternative 6 starts at KY 2309 (Stanford Street) near the intersection with Crutchfield Street, is 0.36 miles long, and has a 30 mph design speed. It spans the railroad south of KY 635 (Main Street) with a maximum 8.4% grade, bridges KY 1247 (providing no direct access from the new route), and ends at KY 635 (Main Street) near Park Avenue. This alternative relocates an estimated nine residences plus one business. The preliminary construction cost estimate is $5.4 million. With the KY 635 (Main Street) at-grade crossing closed, the projected ADT is 3,650 vpd on this new roadway.

Alternative 7 starts on KY 2309 (Stanford Street) near the water tower, bridges over the railroad tracks and KY 1247 with a maximum 8.25% grade, and ends at US 27 at Frog Hollow Road, an intersection with US 27 that provides good sight distance. It is 1.06 miles long with a 30 mph design speed and 8.3% maximum grade. This alternative relocates two residences. The preliminary construction cost estimate is $5.6 million. With the KY 2308 (North Stanford Street) at-grade crossing closed, the ADT is projected to be 600 vpd because most motorists will continue to use the KY 635 (Main Street) at-grade crossing.

Molen Street Connector is a connection between Molen Street and Norwood-Mount Zion Road that could be combined with any of the North or Middle concepts. It provides a way for homes along Norwood-Mount Zion Road to access the new bridge over the railroad without looping back through the detour. Construction costs are estimated at about $300,000. The link is 0.14 miles long with a 30 mph design speed and has a maximum 5.6% grade. This connector has no relocations.

6.3 North Concepts

Alternative 1 realigns KY 635 to avoid Mill Hill, crosses the railroad tracks near the cemetery with a maximum 9.0% grade, reconstructs a section of KY 1247, and ends at US 27 / Yellow Jacket Drive. It is 1.19 miles long with a 35 mph design speed and 9.0% maximum grade. This alternative relocates eight homes and Science Hill Christian Church. Northside Baptist Church and Science Hill Elementary each lose some parking; Science Hill Mill loses two buildings. The preliminary construction cost estimate is $6.4 million. With the North Stanford Street at-grade crossing closed, the projected ADT is 4,500 vpd. Alternative 1 had the most anticipated stream impacts with over 450 linear feet.

Alternative 2 starts on KY 635 east of the mill, crosses the railroad tracks just south of the KY 2308 (North Stanford Street) crossing, shifts/raises KY 1247 between KY 635 and KY 2308, and ends at KY 1247. It has a milder grade (7.6%) than Alternative 1, is 0.57 miles long, and has a 35 mph design speed. This alternative relocates four homes plus one business. The preliminary construction cost estimates range from $7.1 to $7.3 million. With the KY 2308 (North Stanford Street) at-grade crossing closed, the projected ADT of the new connection is 4,250 vpd.

Alternative 5 generally follows First Street from the KY 635 intersection, crosses the railroad tracks with a maximum 6.5% grade near the cemetery, and ends at a 4-way stop intersection with KY 1247. Because the tracks are in a cut at this location (**Figure 32**), the grades are less steep than other northern concepts. **Alternative 4** extends Alternative 5 to US 27 at Yellow Jacket Way.

Figure 32: Railroad in a Cut Section

Combined, Alternative 4+5 is 0.7 miles long with a 35 mph design speed and 6.5% maximum grade. Alternative 4+5 relocates six to eight homes and Science Hill Elementary School loses some of its parking. The preliminary construction cost estimates range from $2.6 to $4.1 million, depending on the limits. With the KY 2308 North Stanford Street at-grade crossing closed, the projected ADTof the new roadway is 4,050 vpd.

Alternative 8 begins at the KY 635 / First Street intersection, crosses the railroad tracks at the KY 2308 (North Stanford Street) crossing, bridges over KY 1247, and ends at KY 635 opposite Frog Hollow Road. It is 0.55 miles long with a 35 mph design speed. The maximum grade is 7.5%. This alternative relocates seven homes. The preliminary construction cost estimate is $6.8 million. With the KY 2308 (North Stanford Street) at-grade crossing closed, the projected ADT is 4,110 vpd. Alternative 8 had the second most anticipated stream impacts at 400 linear feet.

Alternative 9 begins at the KY 635 / First Street intersection, crosses the railroad tracks at the KY 2308 (North Stanford Street) crossing, bridges KY 1247 but provides a connection to access it, and ends at US 27 at Yellow Jacket Way. It is 0.77 miles long with a 35 mph design speed. The maximum grade is 7.9%. This alternative relocates eight residences plus one business. Science Hill Elementary School and Science Hill Christian Church would each lose some parking. The preliminary construction cost estimate is $7.6 million. With the KY 2308 (North Stanford Street) at-grade crossing closed, the projected ADT is 4,500 vpd.

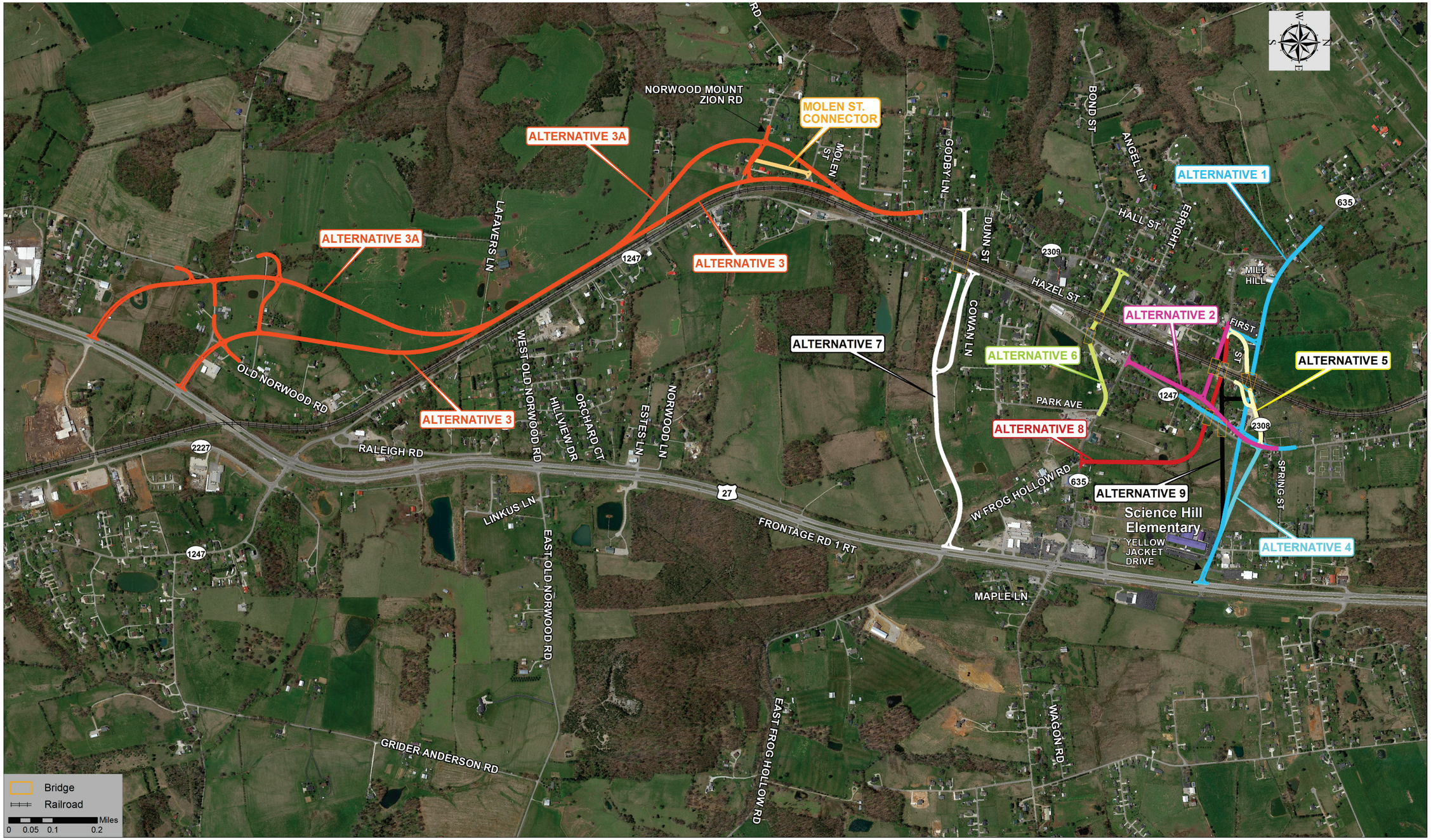


Figure 33: Initial Alternatives

This page intentionally left blank.

Table 14: Initial Alternatives Evaluation Matrix

		SOUTH ALTERNATIVES					MIDDLE ALTERNATIVES		NORTH ALTERNATIVES					
		ALTERNATIVE 3		ALTERNATIVE 3A		MOLEN STREET CONNECTOR	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 5	ALTERNATIVE 4+5	ALTERNATIVE 8	ALTERNATIVE 9
		NORTH	SOUTH	NORTH	SOUTH									
APPROACH WORK								TIE TO KY 1247	KY 1247	KY 1247	TIE TO STANFORD ST.	TIE TO STANFORD ST.		TIE TO KY 1247
LENGTH (MILES)		1.02	0.83	1.11	1.04	0.14	0.36	1.06	1.19	0.57	0.35	0.70	0.55	0.77
GEOMETRICS	BRIDGES	None	None	None	None	None	RAILROAD; KY 1247	RAILROAD	RAILROAD & STANFORD ST (1 BRIDGE)	RAILROAD	RAILROAD	RAILROAD	RAILROAD; KY 1247	RAILROAD; KY 1247
	DESIGN SPEED (MPH)	55	55	55	55	30	30	30	35	35	30	30	35	35
	MAX GRADES	2.5%	2.5%	2.5%	2.5%	5.6%	8.4%	8.25%	9.00%	7.60%	5.80%	6.50%	7.50%	7.90%
	COMMENTS	LEFT EXISTING CROSSING AT STANFORD STREET	LEFT EXISTING CROSSING AT STANFORD STREET	LEFT EXISTING CROSSING AT STANFORD STREET	LEFT EXISTING CROSSING AT STANFORD STREET	COMBINES WITH ANY MIDDLE OR NORTH ALTERNATIVE	NO DIRECT ACCESS TO KY 1247	INDIRECT TIE TO KY 1247	KY 635 AND KY 1247 TIE INTO THE MAINLINE WHERE THE MAINLINE GRADE IS 9% KY 635 DOES NOT MEET MINIMUM INTERSECTION SIGHT DISTNCE OF 412' LIKELY CAN BE REMEDIED BY FLATTENING VERTICAL CURVE ACROSS BRIDGE DURING DESIGN	380 FT OF RETAINING WALL		KY 1247 INTERSECTION (IN CURVE) WILL LIKELY NEED TO BE A 4-WAY STOP AND ABOUT 300 FEET OF KY 1247 RECONFIGURED VERTICALLY.	COULD NOT MEET 45 MPH DESIGN SPEED SIGHT DISTANCE OVER RAILROAD	COULD NOT MEET 45 MPH DESIGN SPEED SIGHT DISTANCE OVER RAILROAD
TRAFFIC DIVERSION ADT		3,000 vpd	3,000 vpd	3,000 vpd	3,000 vpd	N/A	3,650 vpd	600 vpd (Most use Main St)	4,500 vpd	4,250 vpd	4,050 vpd	4,050 vpd	4,110 vpd	4,500 vpd
ENVIRONMENTAL*	INTERMITTENT STREAMS (LINEAR FEET)	0	0	0	0	0	0	0	467	171-175	0	172	350	146
	EPHEMERAL STREAMS (LINEAR FEET)	0	0	0	189	0	105	0	0	0	0	0	50	0
	PERENNIAL STREAMS (LINEAR FEET)	0	0	0	0	0	0	233	232	0	0	0	0	0
	WETLANDS (ACRES)	0.0	0.0	0.0	3.0	0.0	0.2	1.4	0.3	0.1	0.0	0.2	0.1	0.3
	POND	0.2	0.4	0.2	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
	BAT HABITAT (acres)	3.0	1.0	2.0	1.8	0.1	0.5	2.0	1.4	0.4	0.2	0.3	0.4	0.4
	SCHOOL IMPACTS	None	None	None	None	None	None	None	Parking Lot	None	None	Parking Lot	None	Parking Lot
	CHURCH IMPACTS	None	None	None	None	None	None	None	Northside parsonage & parking; SH Christian church building & house	None	Northside parsonage; SH Christian Church house & parking	Northside parsonage; SH Christian Church house & parking	None	SH Christian Church parking
RIGHT OF WAY	PARCEL ACRES	17	14	20	26	1.5	6.5	17	15	11-12	4	8	10	12
	ESTIMATED RESIDENTIAL RELOCATIONS	9-11	1	5-7	1	0	9	2	8	4	6	8	7	8
	ESTIMATED COMMERCIAL RELOCATIONS	0	0	0	0	0	1	0	Mill (Partial Relo)	1	0	0	0	1
RR CROSSINGS CLOSED (#)		5 (Keep N Stanford St & Main St)	5 (Keep N Stanford St & Main St)	5 (Keep N Stanford St & Main St)	5 (Keep N Stanford St & Main St)	0	1 (Close Main St)	1 (Close N Stanford St)	1 (Close N Stanford St)	1 (Close N Stanford St)	1 (Close N Stanford St)	1 (Close N Stanford St)	1 (Close N Stanford St)	1 (Close N Stanford St)
PHASE COSTS	DESIGN	$300,000	$300,000	$400,000	$500,000	$30,000	$500,000	$600,000	$600,000	$700,000	$300,000	$400,000	$700,000	$800,000
	R/W													
	UTILITIES													
	CONSTR.	$2,800,000	$3,100,000	$4,000,000	$4,800,000	$300,000	$5,400,000	$5,600,000	$6,400,000	$7,300,000	$3,100,000	$4,100,000	$6,800,000	$7,600,000
	TOTAL	$3,100,000	$3,400,000	$4,400,000	$5,300,000	$330,000	$5,900,000	$6,200,000	$7,000,000	$8,000,000	$3,400,000	$4,500,000	$7,500,000	$8,400,000

This page intentionally left blank.

6.4 2040 Traffic Analysis Of Build Alternatives

The North, Middle, and South concepts were input into the Laurel-Pulaski Travel Demand Model (LPTDM) to simulate future build traffic patterns. Summarized in **Table 15**, up to 4,500 vpd would use any new connector, well within the capacity of a two-lane highway.

- The northern concepts (Alts. 1, 2, 5, 4+5, 8, 9) show the highest traffic volumes using a new connection. They would pull the most volume away from KY 635 (Main Street), a potential concern for local business owners dependent on pass-by traffic.
- Results for the middle concepts (Alts. 6, 7) vary. Alternative 6 would close the KY 635 (Main Street) crossing, diverting those trips and a portion of trips crossing at KY 2309 to the new route. Alternative 7 would carry substantially less traffic than any other alternative because, within the model network, it results in a slightly longer trip than does the existing KY 635 crossing.
- The southern concepts (Alts. 3, 3A) close most of the existing crossings, dividing cross-rail trips between the remaining KY 635 (Main Street) at-grade crossing and US 27 overpass.

Table 15: Comparison of 24-Hour Traffic Volumes using Key Local Railroad Crossings

Scenario	KY 2308 N Stanford St	KY 635 Main St	KY 2309 S Stanford St	Norwood-Mt Zion Rd	New RR Bridge
2040 No-Build	670	3,000	2,800	500	N/A
2040 Build: North	Closed	140-500	1,900-2,000	520	4,100-4,500
2040 Build: Middle Alternative 6	690	Closed	2,200	520	3,700
2040 Build: Middle Alternative 7	Closed	4,000	1,900	520	600
2040 Build: South	Closed	4,100	Closed	Closed	3,000*

**Model shows 3,000 vpd would use a new south link, which relies on the existing US 27 crossing*

Operationally, the majority of study area routes operate at LOS C or better in the future No-Build scenario. None of the Build scenarios would increase traffic volumes on the LOS D segment of KY 635 (MP 7.371—8.201) over the segment volumes analyzed in HCS under the No-Build. Therefore, no operational concerns are anticipated with any build alternative as Build traffic volumes remain nearly identical to the No-Build scenario, well wtihin capacity of existing routes.

7.0 INITIAL PROJECT TEAM MEETINGS AND PUBLIC INVOLVEMENT

Over the course of the study, the project team held three project team meetings, two Local Officials/Stakeholders (LO/S) meetings, one meeting with Science Hill Elementary School officials, and one public meeting to coordinate key issues, gather input, and present alternatives. This section describes early project team and LO/S meetings, which helped refine the initial alternatives prior to engaging the public. Project team and LO/S meeting minutes are presented in **Appendices I** and **J**, respectively.

7.1 Science Hill School Officials Meeting

Following preliminary alternatives development, an early meeting with Science Hill Elementary School officials was held on September 25, 2018. Members of the project team wanted to obtain school officials' input regarding whether a tie to Yellow Jacket Drive (such as Alternatives 1, 4, or 9) would have a positive or negative effect on school operations.

Discussions identified that preliminary alternatives tying to Yellow Jacket Drive would result in increased traffic in proximity to the school and therefore could negatively impact:

- Overflow parking—the school uses Science Hill First Baptist Church's parking lot across Yellow Jacket Drive for overflow parking during events.
- Student pickup—cars line up along Walnut Hill Drive, immediately north of the school, to pick up students after school dismisses.
- Student drop off—increased traffic could result in safety concerns for pedestrians and children being dropped off along Yellow Jacket Drive.
- Volume and type of traffic by the school—a new connection at Yellow Jacket Drive would increase traffic, likely including heavy truck traffic.

Buses would have direct access to the other side of the railroad directly from Yellow Jacket Drive.

School officials advised that, based on this initial evaluation, a tie to Yellow Jacket Drive would not likely be in the school's best interest. However, they understood all preliminary concepts would be presented for LO/S consideration. School officials felt this approach provided value and the opportunity for differing opinions to be raised for discussion. Meeting minutes can be found in **Appendix J**.

7.2 First Project Team Meeting

The first project team meeting was held October 16, 2018, at KYTC's District 8 office in Somerset. The meeting objective was to discuss the existing conditions and environmental features, present and revise the draft purpose and need statement, and discuss preliminary improvement alternatives in advance of the LO/S meeting. Comments were as follows:

- The team should identify representative road grades around town (e.g. Mill Hill) and how those grades relate to the proposed overpasses.
- LO/S will be interested to know how traffic will change at each existing crossing under different scenarios, i.e., what traffic will remain in front of Main Street businesses with each alternative.

- The traffic forecast represents approximately two hours of delay over a 24-hour period—not a stopped train blocking the local crossings for an unusually long time.
- An extension of Alternative 5 to address Mill Hill may be favored locally.

7.3 First Local Officials/Stakeholders Meeting

The first LO/S meeting was held October 25, 2018, at the Science Hill Elementary School. The project team met with public and county officials, including the State Representative, Mayor of Science Hill, the Pulaski County Judge-Executive, members of the City Commission; representatives from public safety, police, fire and emergency management; school officials; LCADD; and other stakeholders in the study area. The meeting objective was to provide information about the existing conditions, define the project's purpose, and gather local perspectives regarding the range of initial alternatives.

Along with a presentation of existing conditions, the project team provided large maps showing sensitive resources and alternatives. Meeting participants were asked to identify and locate future development and existing conditions or environmental resources not designated. Comments regarding improvement alternatives were discussed.

A group exercise encouraged participants to communicate the primary transportation needs facing Science Hill today. Each small group recorded their responses, which were categorized as follows:

- Improve access across the railroad tracks
- Improve access and safety for school buses
- Improve efficient access and safety for emergency responders
- Improve access and reliability for commuters, including those from nearby counties
- Help church attendance—if crossings are blocked, people are late or opt not to attend
- Help with economic development
- Bypass Mill Hill to improve safety
- Minimize impacts to homes and businesses

To supplement train counts/delay information already gathered, project team members asked attendees about the frequency and duration of train delays in the study area. Responses are noted below.

- Crossings are blocked longer than observed during the 24-hour count—closer to 30 minutes or more. Although rare, trains can block the crossings for an hour or more, perhaps three or four times per year.
- Trains stop in Burnside (approximately 13 miles south of Science Hill) to switch crews, which can slow/stop upstream trains.

- Documentation may exist regarding the length of train delays. City/County law enforcement dispatchers have been trying to keep better records that may provide useful data.

A group discussion followed, identifying strengths and weaknesses for each geographic group of alternatives. **Table 16** summarizes comments received, both during the meeting and from one-on-one discussions with attendees afterwards.

Table 16: LO/S Comments on North, Middle, and South Concepts

Concept	Strengths	Weaknesses
North	- Closest to the fire department to provide quick access across the tracks - Bypasses Mill Hill (safety) - Can be easily tied down to KY 1247 - Lowest project costs	- Impacts to school: safety concerns to cross busier road; traffic backs up as 250 kids are driven to school; less parking - Impacts to churches - Adverse travel, as most residents are trying to get south - Would not help with train noise - Potential impacts to mill (currently expanding its operation) - Impacts to farms
Middle	- Impacts fewer homes - Connection to KY 1247	- Steeper grades - Concern about semi-truck traffic using KY 1247 T-intersection
South	- Decreases railroad noise - Improved safety for kids on buses - Quicker access to Somerset businesses	- Adverse travel to local destinations: school buses, EMS - Impacts to downtown (takes away pass-through traffic from businesses) - Changes school bus routes with closed at-grade crossings

While opinions differed concerning which alternative was most desirable, attendees agreed that a project was needed. Generally, attendees agreed a grade-separated crossing with a connection to KY 1247 would satisfy the project purpose as well as a longer connection to US 27. Several people favored Alternative 5 as a low cost, relatively low impact option.

7.4 Second Project Team Meeting

The second project team meeting was held November 26, 2018, at the KYTC District 8 office. The meeting objective was to refine the range of alternatives to present to the public. Revised alternatives, a comparison matrix, and stakeholder input were presented to the team for discussion.

Prior to the meeting, two alternatives were revised to improve performance versus the initial concepts presented. Alternative 1 was shifted north to avoid impacts to the mill and reduce costs by reconstructing less of KY 1247. Alternative 5 was shifted away from the cemetery, preserving its existing internal circulation patterns.

After discussing the merits of each alternative, the project team agreed to present the following alternatives to the public in January 2019. One or more from each geographic group was advanced, representing the best solution within that group. For simplicity, each alternative was renamed by color. A Molen Street connector was considered along with the other color alternatives. The range of alternatives are shown in **Figure 34.**

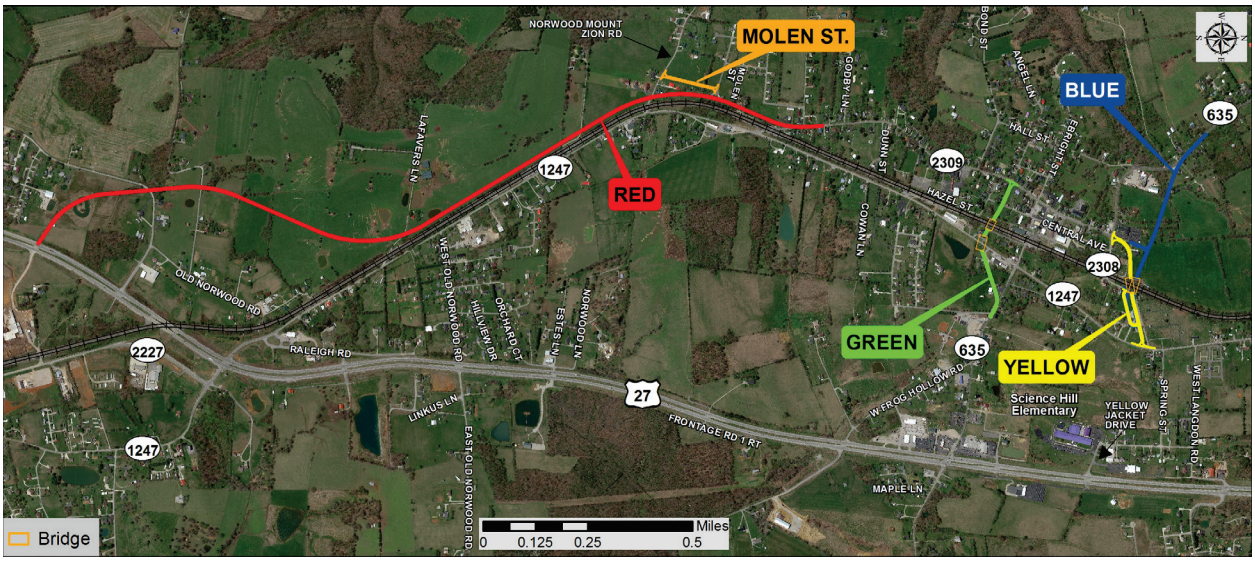


Figure 34: Alternatives Presented to the Public for Consideration

Red (Figure 35): In the South, segments of Alternatives 3 and 3a were combined to optimize performance. The team agreed to advance the southern section of Alternative 3a because it intersects US 27 at a location with better sight distance. The northern section of Alternative 3 was advanced because it splits fewer farms, has fewer affected parcels, and has lower construction costs. The actual alignment would be optimized during future design stages if advanced.

Green (Figure 36): As it provides better functionality, including a good connection for emergency services, and does not route additional traffic onto narrow Frog Hollow Road, Alternative 6 was advanced over Alternative 7 within the Middle group.

The **Molen St Connector** combines with Northern or Middle concepts to provide a connector for Norwood-Mt Zion properties when their crossing is blocked. This option was also selected to be presented to the public. **(Figure 37).**

Two Northern concepts were advanced, both of which take advantage of the railroad cut section to minimize grades and costs. Neither impacts the school or requires reconstruction of KY 1247. **Blue (Figure 38)**, a revised version of Alternative 1, was favored as it improves Mill Hill, a local safety concern. **Yellow (Figure 39)**, a revised Alternative 5, is shorter and less expensive.

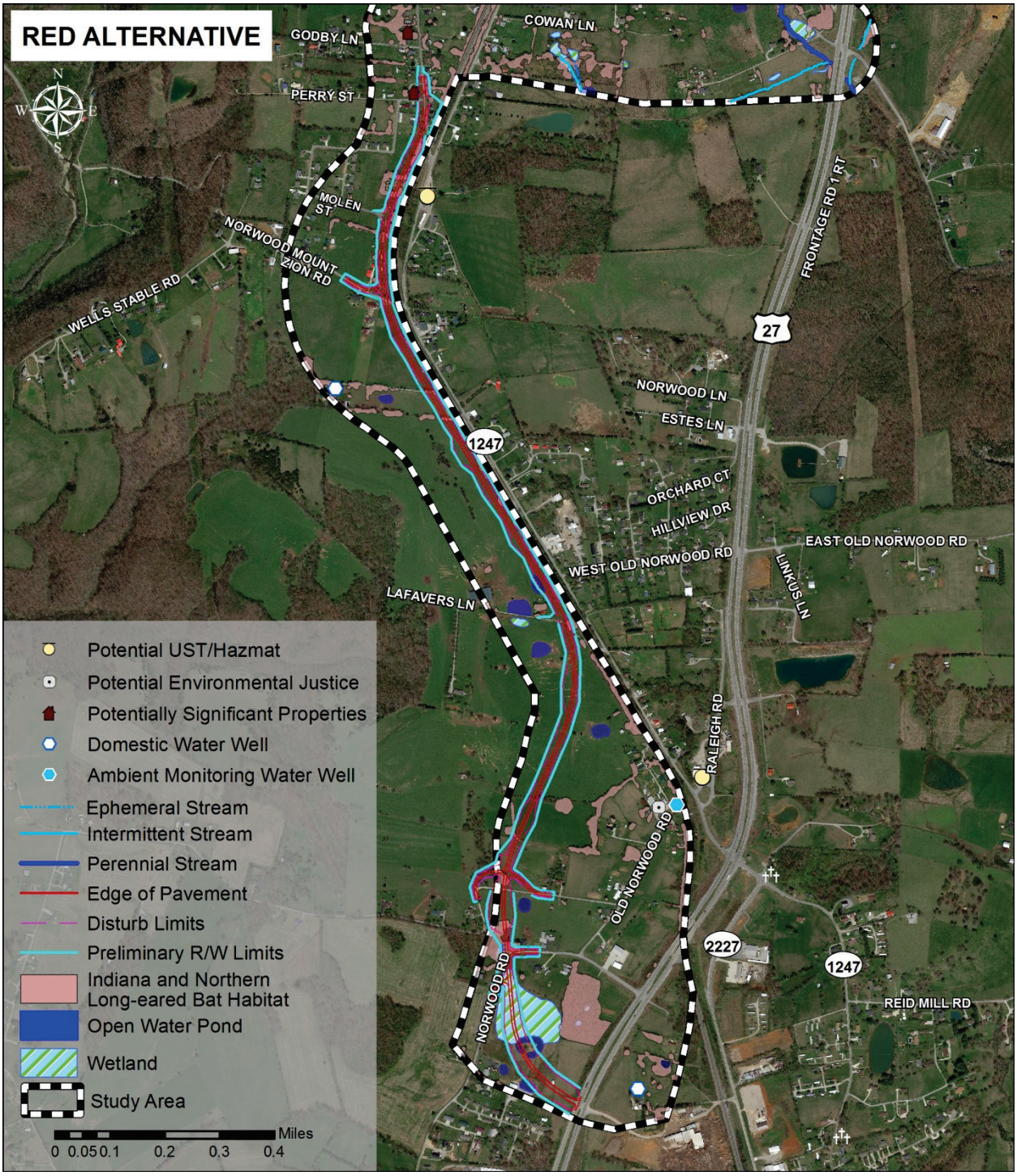


Figure 35: Red Alternative and Potential Impacts

Figure 36: Green Alternative and Potential Impacts

Figure 37: Molen Street Connector and Potential Impacts

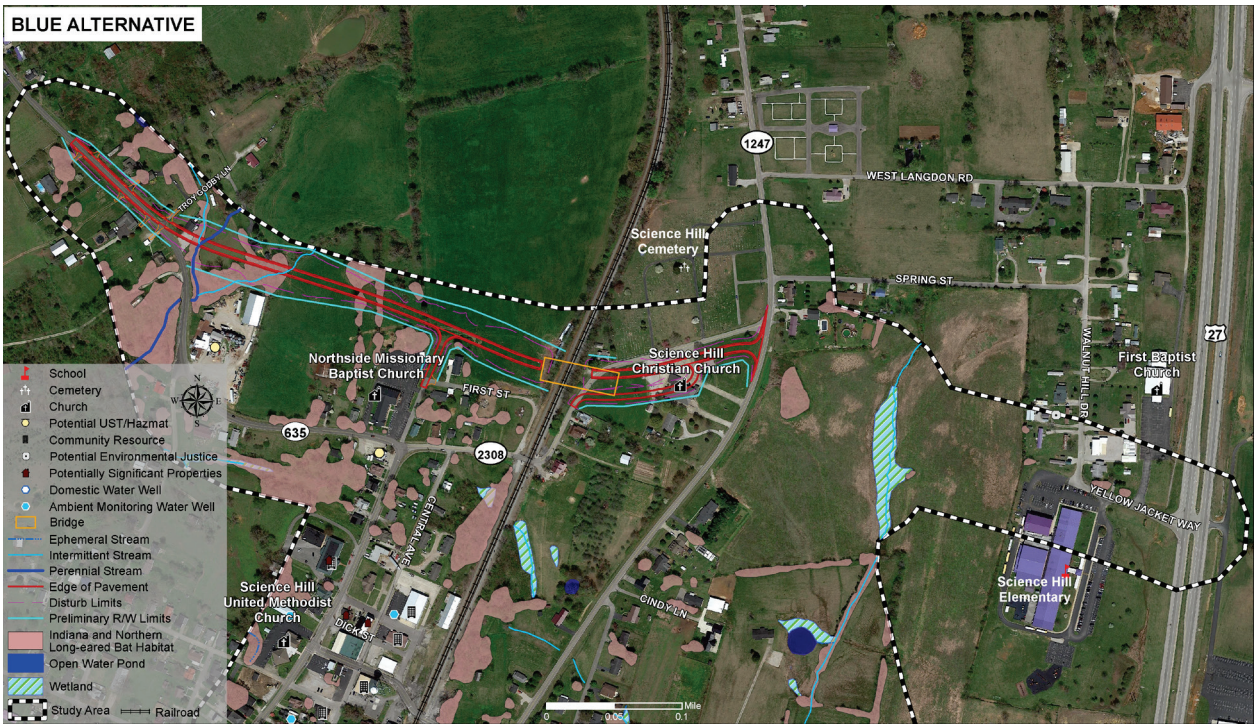


Figure 38: Blue Alternative and Potential Impacts

Figure 39: Yellow Alternative and Potential Impacts

7.5 Potential Impacts

Potential impacts were estimated within the proposed rights-of-way for each alternative. A comparative impact matrix **(Table 18)** was used to facilitate discussion in project team and LO/S meetings discussed in **Chapter 9.0**. The matrix features environmental, historical, right-of-way impacts; construction costs; and traffic diversion.

7.6 Cost Estimates

Phased cost estimates for improvement alternatives are shown in **Table 17.** Conceptual design models generated quantities of high-cost construction items including earthwork, pavement, and structures. Construction costs were tabulated using the KYTC District 8 average unit bid prices. The KYTC District 8 provided right-of-way and utility cost estimates based on preliminary right-of-way limits.

Project costs range from $6.2 to $12.3 million.

Table 17: Alternative Phase Cost Estimates

	South Concept	Can Be Used With Middle or North Concepts	Middle Concept	North Concepts	
Project Phase	**Red**	**Molen St Connector**	**Green**	**Blue**	**Yellow**
Design	$800,000	$30,000	$500,000	$500,000	$300,000
Right-of-Way	$3,050,000	$150,000	$3,050,000	$2,900,000	$2,500,000
Utility	$845,000	$100,000	$320,000	$430,000	$265,000
Construction	$7,600,000	$300,000	$5,400,000	$4,700,000	$3,100,000
Total	**$12,295,000**	**$580,000**	**$9,270,000**	**$8,530,000**	**$6,165,000**

Table 18: Alternative Comparison Matrix

		NO BUILD	SOUTH CONCEPT	CAN BE USED WITH MIDDLE OR NORTH CONCEPTS	MIDDLE CONCEPT	NORTH CONCEPTS	
		No construction would take place only routine maintenance	RED	MOLEN STREET CONNECTOR	GREEN	BLUE	YELLOW
GENERAL INFORMATION	LENGTH (MILES)	0	2.06	0.14	0.36	0.56	0.30
	RR CROSSINGS CLOSED (#)	0	5 (Keep KY 2308 N Stanford St & KY 635 Main St)	0	1 (Close KY 635 Main St)	1 (Close KY 2308 N Stanford St)	1 (Close KY 2308 N Stanford St)
	TRAFFIC DIVERSION AVERAGE DAILY TRAFFIC	0	3,000 vpd	N/A	3,650 vpd	3,600-4,100 vpd	4,050 vpd
GEOMETRICS	BRIDGES	0	None	None	Railroad; KY 1247	Railroad	Railroad
	DESIGN SPEED (MPH)	0	55	30	30	35	30
	MAX GRADES	0	2.5%	5.6%	8.4%	6.25%	6.0%
ENVIRONMENTAL*	STREAM IMPACTS (LINEAR FEET)	0	189	0	105	677	0
	POTENTIAL CHURCH IMPACTS (NOT INCLUDED IN RIGHT OF WAY RESIDENTIAL OR COMMERCIAL RELOCATIONS)	0	None	None	None	Northside Baptist Church parking and parsonage; Science Hill Christian Church building & parsonage	Northside Baptist Church parking; Science Hill Christian Church building & parsonage
	POTENTIALLY HISTORIC RESOURCES	0	1	0	1	0	0
RIGHT OF WAY	ESTIMATED RESIDENTIAL RELOCATIONS	0	11	0	8	5	4
	ESTIMATED COMMERCIAL RELOCATIONS	NO BUILD	0	0	3	0	0
COST	CONSTRUCTION COST ESTIMATE	No construction would take place only routine maintenance	$7,600,000	$300,000	$5,400,000	$4,700,000	$3,100,000

8.0 RESOURCE AGENCY COORDINATION

Resource agency coordination was conducted to help identify potential environmental resources, development plans, or other potential issues. The KYTC Division of Planning mailed applicable resource agencies a packet of project-related information including purpose and need, four build alternatives and associated environmental impacts, study area environmental overview exhibit, crash history exhibits, and Preliminary Comparison of Impacts and Costs for Build Alternatives. Responses are summarized in **Table 19** and provided in full in **Appendix K**.

Table 19: Resource Agency Comments Summary

Representing	Summary of Comments
U.S. Coast Guard (USCG)	➲ No USCG bridge permit or exemption will be required.
U.S. Environmental Protection Agency (USEPA)	➲ According to the EPA's EJSCREEN tool, statistically significant low-income and less educated populations reside in the project vicinity. The EPA recommends identifying nearby low-income residents and determining if they will be disproportionately and adversely impacted by the project. We also advocate complying with Executive Order 13166, *Improving Access to Services for Persons with Limited English Proficiency.* ➲ The project is located in the Upper Cumberland/Lake Cumberland watershed and crosses two waterways in this watershed: an unnamed tributary to Big Clifty Creek and Holtzclaw Branch, a tributary to Pitman Creek. The EPA could not determine if the project will involve the disturbance of one or more acres of contiguous land. If it does, a NPDES Stormwater Construction General Permit may be necessary. KYTC should consider implementing temporary and permanent best management practices to minimize surface water impacts during construction and throughout the project's operational life. ➲ The project should avoid and minimize placement of dredged or fill material in jurisdictional waters of the U.S., which include the unnamed tributary to Big Clifty Creek and Holtzclaw Branch.
Appalachian Regional Commission (ARC)	➲ No active or proposed projects are located in the vicinity; ARC is not aware of any significant issues or concerns. ➲ If improving safety is truly a key aspect of the project purpose, alternatives should be expanded to address existing high crash locations.
U.S. Department of Agriculture; Natural Resources Conservation Service (NRCS)	➲ Based on the information provided, NRCS does not anticipate the proposed actions will affect prime farmland soils, soils of statewide importance, watershed structures, or wetland/grassland easements. ➲ The area contains prime/statewide important farmlands. Form NRCS-CPA-1006 should be submitted to the local NRCS office if federal funding is used.
KY Airport Zoning Commission (KAZC)	➲ Construction equipment or permanent structures greater than 200 feet above ground level require a permit from the KAZC.
KY Tourism, Arts and Heritage Cabinet	**KY Heritage Council:** ➲ No comments on draft purpose and need statement or mitigation strategies. **Department of Parks:** ➲ No comments. **KY Department of Fish and Wildlife Resources (KDFWR):** ➲ Six federally listed species and 16 state-listed species are known to occur within close proximity of the project area. ➲ No caves or other unique natural areas are known to occur within close proximity to project site. ➲ KDFWR listed eight recommendations for mitigating/minimizing stream impacts. ➲ To minimize impacts to the aquatic environment, the KDFWR recommends erosion control measures be developed and implemented prior to construction to reduce siltation into waterways and/or karst features.
KY Division of Forestry (KDOF)	➲ The KDOF found no forest resources that would be affected by the project.
Kentuckians for Better Transportation	➲ No comments.

KY Energy and Environment Cabinet	Division of Conservation: ➲ There are no agricultural districts or PACE easements in/near the study area.
	Division of Water: ➲ Best management practices should be utilized to reduce runoff from project construction activities into nearby waters. ➲ The project may require an Individual Water Quality certification. It will not require a Permit to Construct Across or Along a Stream. ➲ The proposed work is endorsed by the Groundwater Section; however, it is located in an area with a high potential for karst development where groundwater is susceptible to direct contamination from surface activities. A Groundwater Protection Plan is recommended. ➲ The Yellow Alternative has no impacts to surface waters and would be preferred.
	Division of Waste Management: ➲ UST records indicate active underground storage tank sites at two locations: Science Hill Food Mart (5858 N KY 1247) and Warren Service Station (835 W KY 635). If any USTs are discovered in the area, they should be reported. ➲ Seven Superfund sites are identified in the project impact area. Six records have been closed/restored; the Southern States Cooperative is noted as Contained/Managed. ➲ The Science Hill wastewater treatment plan is an active solid waste site in the vicinity. The Science Hill Landfill is a historic record along Ware Road, which was used as a dump site 30-40 years ago. ➲ There are no hazardous waste issues or open dumps within or near the project impact area. ➲ Any solid wastes encountered by the project must be disposed of at a permitted facility. If asbestos, lead paint, and/or other contaminants are encountered, contact the Division of Waste Management.
	Division for Air Quality: ➲ Measures to prevent particulate matter from becoming airborne are recommended. ➲ Open burning shall be prohibited except as noted in 401 KR 63:005. ➲ Air quality control strategies suggested for implementation include utilizing alternatively fueled equipment, emission controls, and reduced idling for equipment. ➲ The Division also suggests investigation into local government regulations.
	Office of Kentucky Nature Preserves: ➲ Karst and cave resources and associated fauna occur near or within your project area and could be impacted by the proposed project.
Norfolk Southern Railroad	➲ Norfolk Southern is in favor of any project that improves safety of railroad crossings. Generally speaking, solutions that consolidate underutilized crossings or those with increased safety concerns.
Greg Speck, Pulaski Sheriff	➲ The Pulaski 911 center receives many complaints of trains blocking roadways in the Science Hill area and in the Burnside area. One business owner in Science Hill has told me he may be forced to close his business due to customers not being able to enter and leave due to the trains blocking Ware Road. This problem is extremely disruptive and potentially dangerous

Color Key: *Federal* *State* *Study Area*

9.0 FINAL MEETINGS

This section describes final project team, LO/S, and public involvement that occurred. Individual meeting minutes are in **Appendices I, J,** and **L**, respectively.

9.1 Second LO/S Meeting

The project team met with local officials and stakeholders the afternoon of January 29, 2019, at the Science Hill Christian Church. The meeting purpose was to present four remaining build alternatives with impacts and costs and to gather feedback. Attendees were distributed a survey and a handout summarizing the purpose and need of the project and locations of alternatives with a comparison matrix. A KYTC representative explained that the current Highway Plan contains construction funding in fiscal year 2022; design can begin as soon as the planning phase is complete. The meeting began with a presentation of improvement alternatives and impacts. Comments/questions from meeting attendees included:

- Suggestions to shift the Blue Alternative north or south were intended to avoid/minimize church impacts. The team wanted to avoid impacts to the large cemetery north of Science Hill Christian Church (SHCC). Alternatives north of the cemetery lose the benefit of crossing the railroad tracks in a cut section, plus KY 1247 and the tracks run closer together. This combination makes a safe connection impractical without reconstructing a significant section of KY 1247. Further south, the elevation differential between the rail crossing and KY 1247 results in grades too steep to safely tie to KY 1247. For this connection to be made, a large section of KY 1247 must be reconstructed and substantially elevated, resulting in additional impacts. A similar approach was evaluated previously with Alternative 2.
- One of the primary community concerns with North concepts is displacing SHCC. A church representative explained that their leadership met and agreed that if church impacts were unavoidable, they would prefer to be relocated rather than be left with reduced parking, no parsonage, and without space for future expansion.
- Northside Baptist Church faces a similar challenge with the Blue Alternative: this alternative eliminates opportunities for future expansion.
- The Green Alternative has fewer impacts on churches but impacts more homes and businesses.
- The Molen Street Connector was generally viewed as a good option to help improve access.
- Representatives from the local fire and police departments generally disliked the Red Alternative due to the adverse travel time to respond to local emergencies. They favored fixing recurrent safety issues along Mill Hill in the Blue Alternative.

9.2 Public Meeting

The project team held an open house public meeting the evening of January 29, 2019. The meeting was held at Science Hill Christian Church at 1170 Stanford Street in Science Hill. The purpose of the meeting was to present build alternatives and to gather public input on the options presented.

In advance of the meeting, the KYTC notified the public by:

- Placing advertisements in Somerset's Commonwealth Journal and the Casey County News.
- Posting the meeting notice, project information, and a link to an electronic survey on District 8's website.
- Mailing a postcard to the five postal routes in/around Science Hill, representing approximately 2,400 residents.
- Posting a notice on social media platforms via District 8's Facebook account.

In total, 80 members of the public and 12 project team members signed in at the public meeting. Project team members greeted attendees at the door and offered each a study area map that included a statement of the project's purpose, brief descriptions of alternatives, link to the online survey, and contact information. The survey was also provided in hard-copy format.

Throughout the 15-day comment period, 180 survey responses were received. Overall, the majority of respondents (88%) felt an improved connection was needed; access/reliability were cited as the primary needs. When asked about alternative preferences, 50% preferred a Northern route, 19% preferred Southern, 13% preferred Middle, and the remainder did not have a preference. Of the Northern options, 41% preferred Blue and 23% preferred Yellow with the remainder not having a preference. Results are summarized graphically in **Figure 40**.

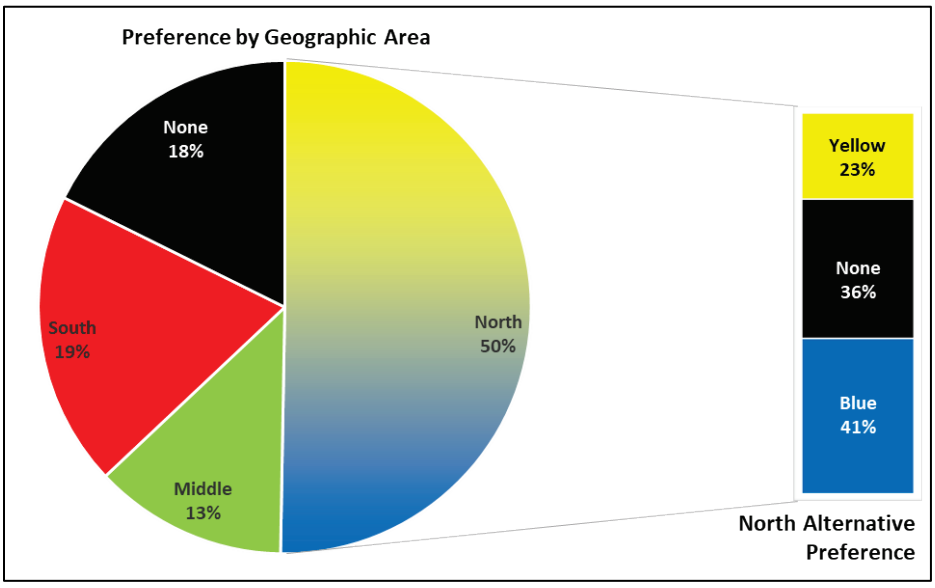


Figure 40: Public Concept/Alternative Preferences

Adding a Molen Street connection was generally preferred; the need to fix Mill Hill was a recurring theme. Whether to consider sidewalks was fairly evenly divided (46% like, 19% dislike, 35% no response). Other comment themes stressed the importance of implementing the project, improving emergency response times, and avoiding church impacts.

9.3 Final Project Team Meeting

The project team met a third time the morning of March 25, 2019, at KYTC District 8 to discuss stakeholder input, review resource agency comments, finalize improvement alternatives, and refine the project's draft Purpose and Need statement.

One of the agency letters received suggested eliminating safety from the project purpose and need as the proposed alternatives do not address high crash locations, which occur primarily along US 27. While correcting existing crash concentrations is not explicitly part of the improvements, safety is still a core metric.

The project team reviewed input received from public surveys, local officials, SHCC, resource agencies, and other stakeholders. Recommendations for build alternatives to advance for preliminary design are presented in the following chapter.

10.0 STUDY CONCLUSIONS

This KY 635 Railroad Crossing Alternatives Study describes the process used to evaluate and compare environmental, right-of-way, utility, traffic impacts, and costs of four build alternatives. The purpose of the project is to improve cross-railroad mobility, reliability, and safety for motorists—especially emergency responders—in Science Hill, as the railroad tracks form a barrier between the eastern and western portions of town.

The FY 2018—FY 2024 Highway Plan identifes $9.6 million in funding for the following project phases: right-of-way (2020), $1.8 million; utilities (2020), $1.3 million; and construction (2022), $6.5 million.

Four Build Alternatives were advanced for detailed study as part of the planning effort.

The **Red Alternative**, which provides a new southern connection to US 27, offers a 55 mph connection with no new bridge structures to maintain. It creates a 2-mile long roadway west of the tracks and closes five of the seven local at-grade crossings. The longest alternative considered, it results in the most impacted parcels and the greatest number of potential residential relocations. The estimated cost for this alternative is $12.3 million. It has the highest cost estimate and exceeds the budget established in the current FY 2018—FY 2024 Highway Plan. Operationally, the Red Alternative results in the greatest mileage savings and decrease in vehicle hours of travel overall as the majority of trips are headed to/from the south. With facilities off KY 635 (Main Street) in the North section of the study area, fire and police representatives expressed concern that the increased travel time compromises their response times in emergency situations as they must travel three miles south of town then north along US 27 to react to local calls when the remaining crossings are blocked. Most local school buses would also have to be rerouted when a train is blocking the remaining at-grade options, resulting in increased travel times/distances. For these reasons, neither the Red Alternative nor a similar southern concept were recommended to advance for further consideration.

The **Green Alternative**, located in the middle of the study area, is 0.36 miles long. It closes the KY 635 (Main Street) at-grade crossing, bridges the railroad tracks and KY 1247, and connects to KY 635 just west of Science Hill Ball Park. Estimated costs for this alternative total $9.3 million for all phases. This alternative results in the steepest grades (8.4% max). It relocates more properties (three businesses and eight homes) than the northern options but does not impact churches. It is the lowest rated choice based on public surveys. Operationally, the Green Alternative results in negligible mileage savings and increases vehicle hours of travel compared to today because trip lengths to the south and east increase. For these reasons, neither the Green Alternative nor a similar middle concept were recommended to advance.

Two northern concepts were advanced for detailed study: the Blue and Yellow Alternatives. Each crosses the railroad tracks while they are in a cut section, reducing the maximum grade requirement to achieve the required 23-foot clearance. Each would close the KY 2308 (North Stanford Street) crossing. Half of the public surveys received preferred a northern concept, making the Blue or Yellow alternative most preferred over southern (Red) and middle (Green) options. Local officials, particularly fire and police representiatives, preferred the northern concepts as they provided the closest connection to their facilities, resulting in the most efficient response times. The most prevalent concern for either of the northern alternatives is impacts to nearby churches.

- The **Yellow Alternative** is 0.30 miles long and is the shortest and least expensive (estimated cost of $6.2 million) of the alternatives considered. It impacts a portion of the

Northside Baptist Church parking lot and requires the relocation of the Science Hill Christian Church building and parsonage. Four other homes also likely require relocation.

- The **Blue Alternative** is located slightly north of the Yellow and also reconstructs KY 635 on a new alignment to avoid Mill Hill for a total length of 0.56 miles; estimated costs total $8.5 million for all phases. The Blue Alternative impacts a portion of the Northside Baptist Church parking lot, likely relocates the Northside Baptist Church parsonage, and relocates the Science Hill Christian Church building and parsonage. Five other homes also likely require relocation.

As a result of the study, the Blue and Yellow alternatives are recommended to advance for preliminary design efforts and evaluation. The Northern alternatives provide the most cost effective solutions, minimize overall impacts, and were preferred by both local officials and the public.

A low cost, low impact add-on, the Molen Street Connector, is a connection between Molen Street and Norwood-Mount Zion Road that, as noted previously, could be combined with any North concept. It would provide homes along Norwood-Mount Zion Road with access to a new bridge over the railroad. This improvement should also advance for consideration in preliminary design.

11.0 CONTACTS / ADDITIONAL INFORMATION

Any written requests for additional information regarding the study should be sent to:

Mr. Joseph Gossage, PE
Department of Highways, District 8
1660 South US 27
Somerset, Kentucky 42502
Phone: (606) 677-4017