

Guthrie “Knot” Planning Study - KYTC Item No. 3-8630.00

Kentucky Transportation Cabinet



Final Report
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Stantec Inc.

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EXECUTIVE SUMMARY

Directly west of Guthrie, Kentucky is a triangular area known as Tiny Town where US 41, US 79, KY 181, KY 294, and KY 2128 come together. This junction of roadways results in a less than efficient “knot” of intersections with multiple safety concerns. The study area’s location along two rail lines and two major US highways (US 41 and US 79), as well as its proximity to I-24, provides it with strong potential for growth. The major investment in the Hemlock Semiconductor Plant on US 79 (just to the south of the Tennessee state line) will have a potential employment of 5,000 employees and is anticipated to attract satellite industries which will utilize its products. Further residential and commercial development is likely to follow and the demand for travel through the Tiny Town junction is expected to increase.

The purpose of the Guthrie “Knot” Planning Study was to explore the scope of and justification for needed transportation improvements in the Tiny Town area. The study focused on investigating the current deficiencies in and around the junction and estimating the likely traffic impacts from future development.

Short term projects, focusing on existing safety and capacity issues, were investigated as well as longer term projects to meet the future transportation needs of the area. The purpose of these conceptual projects is to improve the safety and efficiency of travel through the intersections of KY 181 with US 79, KY 294, and US 41 and the intersections of US 79 with US 41 and with KY 2128 in the Guthrie area. Such projects will also provide better connections for travelers along this existing transportation network to the emerging industrial development.

The Guthrie “Knot” Planning Study resulted in the development of a number of conceptual improvements which were presented to stakeholders and the public. Ultimately, one short-term improvement and one long-term improvement were recommended. The study recommendations, shown in **Figure ES-1**, include access management changes at the US 41 intersection with US 79 and the realignment of KY 181. These improvements are summarized below.

- **Short-Term Improvement: Access management at US 79 and US 41 intersection.**
This is a very large, skewed intersection with four-way stop control and the convenience store located on the south side of the intersection has uncontrolled access along the south and east roadway approaches. The potential short-term improvement includes maintaining the intersection in its current location but constructing a curbed island along most of the convenience store’s frontage to define two access points – one on US 41 east of the intersection and one on US 79 south.
- **Long-Term Improvement: Realignment of KY 181.**
This concept provides a western connector around Tiny Town by redirecting existing KY 181 from north of the US 41 intersection to the west along a semicircular route to US 79 west of the existing KY 181 intersection. The realignment of KY 181 should intersect US 79 at a location to eliminate or at least minimize any right-of-way acquisition or construction within the state of Tennessee. Existing KY 181 would be removed from the existing KY 294 intersection north to the proposed realignment north of US 41. A minor widening of KY 294 west of the realigned KY 181 could be included with this option.

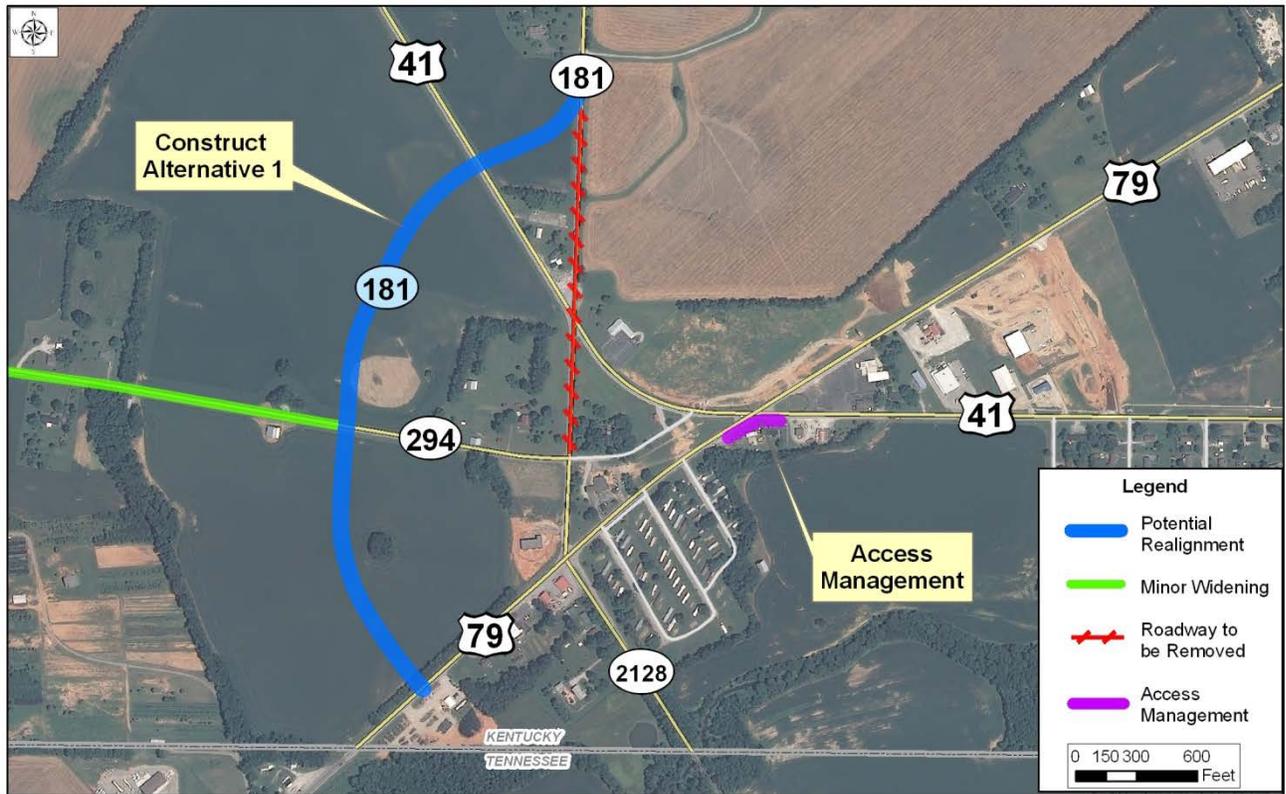


Figure ES-1: Recommended Short-Term and Long-Term Improvements

1 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated the Guthrie “Knot” Planning Study to seek improvement strategies for current and anticipated future transportation deficiencies within a portion of southern Todd County. The project study area, shown in **Figure 1**, is located west of the city of Guthrie and immediately north of the Tennessee state line. The area, commonly referred to as “Tiny Town”, is located at the confluence of US 41, US 79, KY 181, KY 294, and KY 2128. These roads form a large triangle with skewed intersections located at each vertex of the triangle, creating a “knot” of intersecting roadways.



Figure 1: Guthrie “Knot” Study Area

Although there are some existing safety concerns with the skewed intersections within the study area, there has been no significant need for a comprehensive transportation study. A primary motivation for this planning study is the construction of the Hemlock Semiconductor facility, located just off US 79 less than four miles south of the study area in Tennessee. Hemlock produces polycrystalline silicon used in the electronics industry, particularly the production of solar power equipment, and other “satellite” industries are likely to locate nearby to take advantage of both the raw materials used by Hemlock and the products created by Hemlock. This has been the experience of the other Hemlock facility located in Michigan. The Tennessee plant is scheduled to be in operation in 2012 and once fully operational, it could employ as many as 4,000 to 5,000 employees.



With its proximity to the Hemlock facility and the City of Clarksville, Tennessee and I-24 to the south, and with its direct access to two US routes, the Guthrie area is likely to attract some of the satellite industries. The Todd County Industrial Foundation is marketing parcels located west of the study area (located on KY 294) for likely industrial development related to Hemlock. Tennessee already has improved the roadway which becomes KY 294 across the state line, and Kentucky will need to follow suit should development occur. Patriot Park, located on US 79 east of the study area, is another industrial site that is currently being marketed for development, and another large area of nearly 800 acres located off US 79 east of Guthrie is also available for industrial development.

Considering the potential economic development impacts combined with current concerns related to traffic operations and safety, the purpose of the Guthrie “Knot” Planning Study was to explore the scope and justification for needed transportation improvements in the Tiny Town area. The study has focused on investigating the current deficiencies in and around the junction and estimating the likely traffic impacts from future development. Short term improvements, focusing on existing safety and capacity issues, have been investigated as well as longer term improvements to meet the future transportation needs of the area.

1.1 Project Purpose and Need

The Purpose and Need Statement for the study, and for project recommendations which may result from the study, is as follows:

Directly west of Guthrie, Kentucky is a triangular area known as Tiny Town where US 41, US 79, KY 181, KY 294, and KY 2128 come together. This junction of roadways results in a less than efficient “knot” of intersections with multiple existing safety concerns. The study area’s location along two rail lines and two major US highways (US 41 and US 79) and its proximity to I-24 provides it with strong potential for growth. The major investment in the Hemlock Semiconductor Plant on US 79 just to the south of the Tennessee state line will have a potential employment of 5,000 employees and is anticipated to attract satellite industries which will utilize its products. Further residential and commercial development is likely to follow and the demand for travel through the Tiny Town junction is expected to increase.

The purpose of the potential project or multiple projects identified in this study is to improve the safety and efficiency of travel through the intersections of KY 181 with US 79, KY 294, and US 41 and the intersections of US 79 with US 41 and with KY 2128 in the Guthrie area and to provide better connections for travelers along this existing transportation network to the emerging industrial development.

The primary goals for the study include the following:

- Discuss the project needs with public officials, resource agencies, the general public and other groups which have an interest in the project;
- Define project goals, needs, and issues;
- Identify any known environmental issues, including potential environmental justice issues; and
- Identify and evaluate short-and long-term projects, including access management, spot improvements, alternate corridors and design criteria.



1.2 Public Outreach

Public involvement plays a critical role in the success of any planning study. The KYTC seeks to build partnerships among stakeholders in order to better understand the relationships among problems and to bring more resources and expertise together to develop solutions. The purpose of the public outreach component of the Guthrie “Knot” Planning Study was to bring people together to express their ideas, to clarify areas of agreement and disagreement, and ideally to develop consensus on potential transportation improvement projects.

The public involvement component of this study was used to do the following:

- Gauge the interest of the affected community regarding the desire for transportation improvements;
- Inform and educate the public on the study;
- Identify the needs of the study area;
- Identify the project issues and goals; and
- Identify potential new or improved corridor locations.

Public involvement during the study included meetings with stakeholders and the general public. Invitations to serve on the stakeholders committee were sent to a diverse group of 69 individuals representing property owners, local officials, emergency responders, and other interested parties.

A stakeholders meeting was held early in the study process to introduce the study team members, begin to discuss study goals, and solicit input on transportation issues and needs. A group exercise was undertaken at the meeting to provide attendees an opportunity to work with each other to identify existing transportation issues and potential improvements. The committee was divided into small groups and provided maps on which they were asked to depict where improvements are needed within the study area. More discussion of this exercise and the results is found in the Development of Alternatives section of this report.

A Public Meeting for the Guthrie “Knot” planning study was held on Thursday, September 29, 2011 at the Guthrie Senior Citizens Center. (A second meeting with local officials was held the same day as the public information meeting and the purpose of the meeting was to discuss the information that would be presented at the public meeting later that evening). The purpose of the public meeting was to inform the public of the planning study, discuss various environmental and technical issues concerning the project area, and to solicit input on potential improvement projects. The meeting was held in an open house format with a brief overview presentation provided. KYTC and consultant staffs were available to answer questions and discuss issues. Seventy-five members of the public attended the meeting. A table was set up where attendees signed in and were given a meeting handout and questionnaire. The following project exhibits were on display:

- Study Area with Existing and Future Traffic Volumes
- Crash History
- Long-Term Improvements Options
- Short-Term Improvement Options

Meeting summaries for all meetings held throughout the Guthrie “Knot” Planning Study are found in **Appendix A**.

2 EXISTING CONDITIONS

Conditions of the study area's existing transportation network are examined in the following section. The information compiled includes traffic data, roadway geometrics, crash history, and environmental concerns within the study area. Data for this section were collected from the KYTC's Highway Information System (HIS) database, the Kentucky State Police Crash Database, and from field reviews.

2.1 Roadway Characteristics

Figure 2 shows the functional classification of the roadways within the study area.



Figure 2: Functional Class for Study Area Roadways

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

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

- Provide a basis for evaluating present and future needs.
- Provide a basis for allocation of limited financial resources.

US 79 is functionally classified as a Rural Principal Arterial, US 41 and KY 181 are Rural Minor Arterials, and KY 294 is a Rural Minor Collector. KY 2128 is classified as a Local route.

Lane widths for the roadways within the study area are shown in **Figure 3**.



Figure 3: Lane Widths on Study Area Roadways

Current KYTC design guidelines call for a minimum of 11-foot wide lanes on arterials and collector roadways. US 79 has 11-foot wide lanes and both US 41 and KY 181 have 10-foot wide lanes. KY 294 and KY 2128 both have 9-foot wide lanes. Shoulder widths on all facilities range from one to four feet.

Figure 4 shows the speed limits in the study area, as well as the approximate location of the posted speed limit signs.



Figure 4: Speed Limits on Study Area Roadways

Within and approaching the triangle, both US 41 and US 79 are signed at 35 miles per hour (MPH). KY 181 is not posted within the study area (the nearest sign is located on northbound KY 181 north of US 41) and is therefore 55 MPH. There are no speed limit signs within the study area along either KY 294 or KY 2128. East of the study area, there is a 45 MPH zone on US 41 beginning near Patriot Park.

Existing average daily traffic (ADT) volumes were obtained for all State-maintained roadways within the study area using the KYTC HIS database. Figure 5 shows the ADTs. US 79 carries the highest volume of traffic at 6,300 vehicles per day (VPD).

The volume-to-service flow (VSF) is a measure of congestion along a roadway, comparing the roadway’s demand to its capability. Areas of concern are where the VSF values approach or exceed 1.0, in which limited capacity leads to congestion. As illustrated on Figure 5, all roadways are performing adequately, with a volume to capacity (V/C) ratio of 0.8 or below.



Figure 5: Average Daily Traffic (ADT) Volumes

2.2 Crash History

Crash data were collected along existing roadways within the study area for a five-year period (2006 – 2010). The locations of these crashes are shown on **Figure 6**. A total of 71 crashes were reported with 11 injury crashes (16 percent of total crashes) and no fatalities. The injury crashes were not concentrated at specific locations and were generally distributed throughout the study area. A closer review of the data found that most of the crashes were intersection crashes. Rear-end or angle crashes accounted for 39 percent of all crashes in the study area. There was also a significant percentage of backing crashes (19 crashes, 27 percent of total crashes), which would typically occur in parking lots.

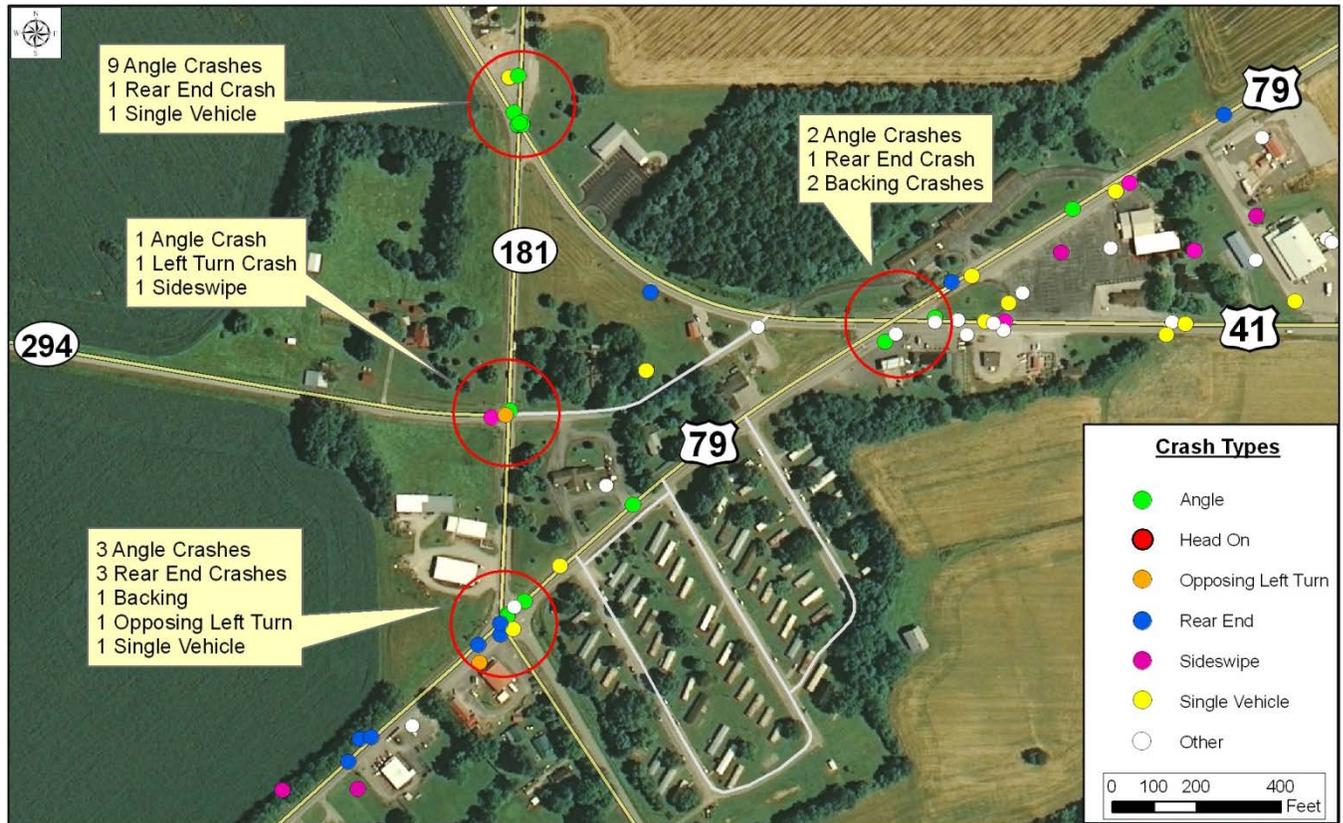


Figure 6: Crash History (2006 – 2010)

Critical Rate Factors (CRFs) were also determined as part of this analysis. The CRF value is calculated by dividing the actual crash rate along a particular roadway segment by the critical rate, which is the maximum accident rate for which it can be said that crashes are occurring randomly based on roadway characteristics and traffic. A CRF less than 1.0 indicates that crashes occur at random, and greater than 1.0 suggests that conditions may exist that contribute to non-random occurrences. **Figure 7** shows the CRF values for study area roadways between 2008 and 2010. Only KY 181 between US 41 and US 79 has a CRF greater than 1.0; the CRF on this segment is 1.9. More detailed crash analysis information is found in **Appendix B**.



Figure 7: Critical Crash Rate Factors (CRF), (2008 – 2010)

2.3 Environmental Resources and Issues

Environmental resources and issues of concern identified in the project study area include those related to both the natural and human environment, and included the following: streams, floodplains, wetlands, ponds, water supplies, threatened, endangered and special concern species and habitat, woodland and terrestrial areas, parks, social and economic resources, historic and archaeological resources, hazardous materials concerns, agriculture, mining, environmental justices, and additional concerns. A brief summary of the environmental resources and issues requiring additional consideration in the project study area is presented below, with additional resource and issue information provided in the project *Environmental Overview*, included in **Appendix C**.

Figure 8 presents a summary of the significant natural environment features located within the study area. Natural environment resources identified within the study area and issues that will require being addressed if impacts occur are discussed on the following pages.

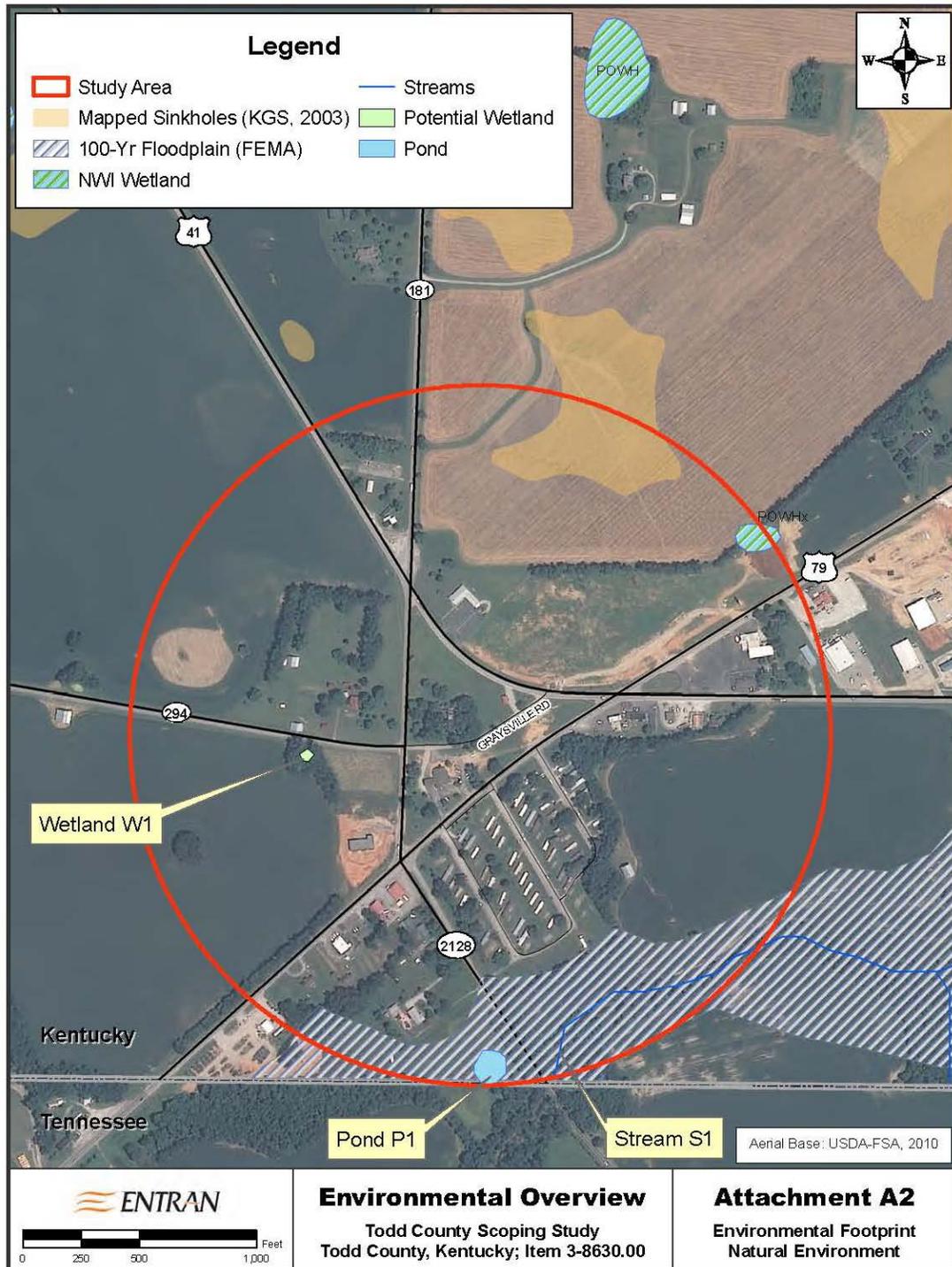


Figure 8: Significant Natural Environment Features



Surface Streams

One stream, one potential wetland and one pond are located in the study area. A comprehensive stream and wetland survey and impact assessment will be needed for the project. Unavoidable impacts to streams and/or wetlands will require coordination with the U.S. Army Corps of Engineers (USACE) and KDOW and a determination of Section 404/401 permitting and mitigation requirements.

100-Year Floodplain

Review and coordination with local floodplain coordinator for the City of Guthrie and the Kentucky Division of Water, Surface Water Permits Branch, Floodplain Management Section will be required.

Groundwater Resources

The study area is located within a karst landscape characterized by numerous sinkholes, underground conduits, or caves. Construction disturbance or release of pollutants within the study area could cause contamination of groundwater. Sinkholes are mapped and several low lying areas were observed within the study area into which surface drainage appeared to flow but having no discernible outflow, indicating potential locations of these underground conduits. Construction activities, especially in regards to vehicle fueling and maintenance and surface runoff from precipitation events, will be required to be directed away from all sinkhole and low lying areas, and steps should be taken to avoid introducing contaminants into the groundwater system.

Threatened, Endangered and Special Concern Species

There are no known records of any federal-listed species within the study area boundaries based on review of database records, although six species are known to have the potential to occur in Todd County. Indiana bat and littlewing pearlymussel potential habitat occurs in the study area, along with potential habitat for four state endangered and four state threatened species, and a nearby record of one state endangered species. Additional habitat assessment and coordination with the USFWS Ecological Services Kentucky Field Office, Kentucky Department of Fish and Wildlife Resources and the Kentucky State Nature Preserves Commission will be required.

Section 4(f) and Section 6(f) Facilities

Based on the June 2011 on-site reconnaissance and review of information from Kentucky State Nature Preserves (KSNPC), the National Park Service (NPS), and other available mapping, no state or federal managed areas, parks, forests or preserves (Section 4(f) resources) occur in the study area. No facilities in the study area were identified as having received a Land and Water Conservation Fund (LWCF) grant (Section 6(f) resources). Section 4(f) resources relative to archaeological sites and cultural and historic properties are discussed in the following section.

A summary of the significant human environment features in the study area is shown in **Figure 9**.

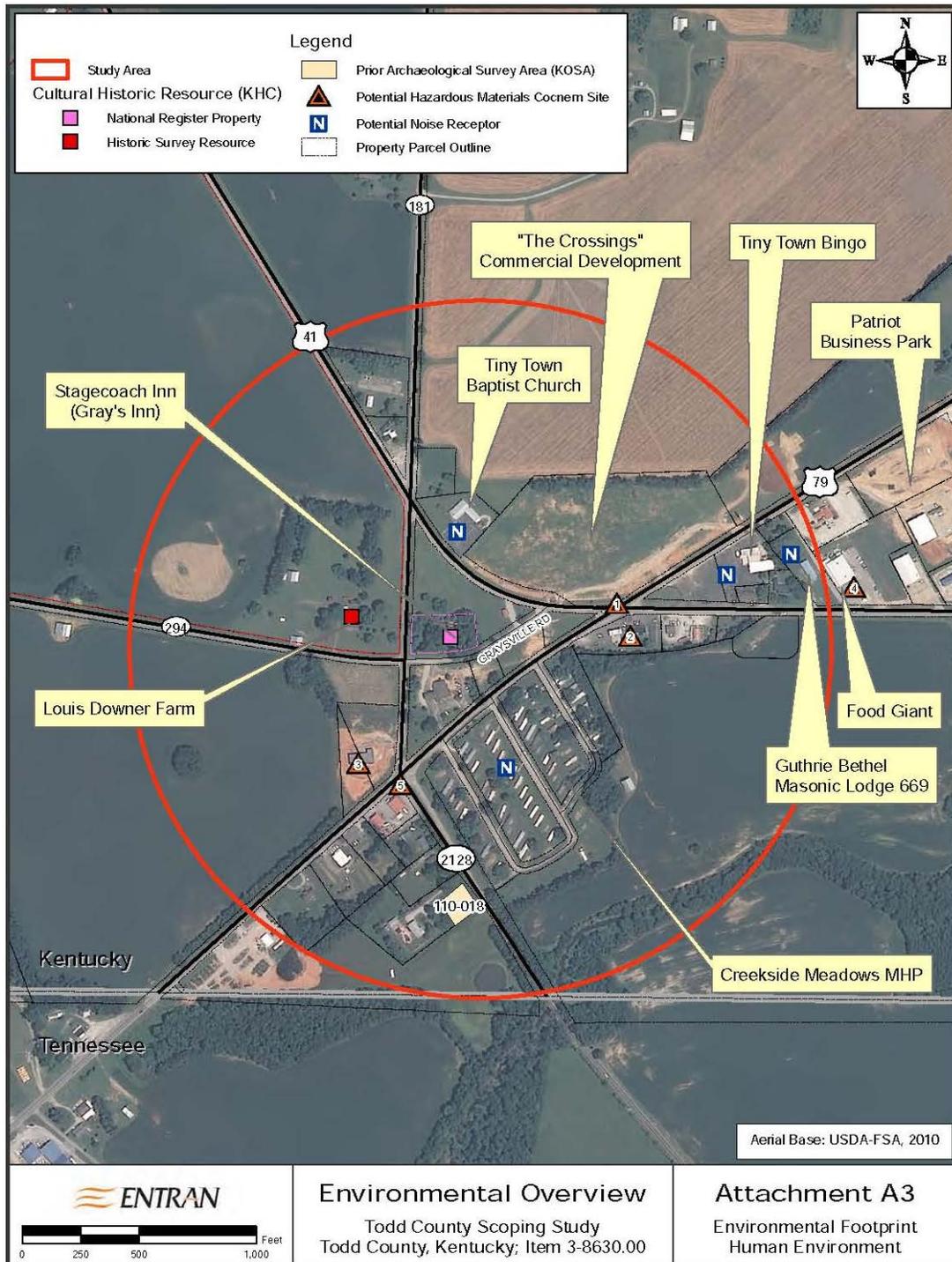


Figure 9: Significant Human Environment Features

Human environment resources identified within the study area and issues which will require being addressed are discussed below.

Historic and Archaeological Resources - Section 106 and Section 4(f) Resources

One National Register of Historic Places (NRHP) site and one Kentucky Historic Survey Resource site are located in the study area. **Figure 10** shows The Stagecoach Inn (also known as Gray’s Inn), located in the center of the study area, at the northeast corner of Graysville Road and KY 181, facing Graysville Road. The building is on the NRHP, is currently a privately-owned residence, and the property includes a Kentucky Historical Society “Stage Coach Inn” marker and a National Park Service “Trail of Tears National Historic Trail” sign.



Figure 10: Stagecoach Inn

The Louis Downer Farm, shown in **Figure 11**, is a Historic Survey Resource, with NRHP status undetermined, and is located at the northwest corner of KY 181 and KY 294. The property includes a privately-owned residential structure and several small outbuildings in excellent condition. A cultural historic survey performed by a KYTC pre-qualified consultant will be required to determine the presence (and NRHP eligibility) or absence of additional cultural historic resources in the study area.



Figure 11: Louis Downer Farm

Review of information from the Kentucky Office of State Archaeology (KOSA) data request response indicates one prior archaeological survey has been performed which lies within the project study, which was provided the identification number 110-018. The prior archaeological survey was conducted for a cell tower site along KY 2128 south of the project center and did not identify any archaeological resources. The KOSA estimated that less than 10 percent of the project study area has been surveyed for archaeological resources. A Phase I archaeological site investigation will be required to determine the presence or absence of significant archaeological sites throughout the extent of the study area.

Hazardous Materials Concerns

There are two active underground storage tank (UST) facilities, one inactive UST facility, one inactive UST and Resource Conservation and Recovery Act (RCRA) facility, and one inactive USEPA Permit Compliance System (PCS) facility located within the study area. A Phase I survey for hazardous materials concerns including UST’s and potentially contaminated soils will be required at four facilities.

Agriculture

Review of 2007 Agricultural Census data from the United States Department of Agriculture (USDA) indicates that Todd County is ranked 7th out of 120 Kentucky counties in agricultural production value, with the typical agricultural practices of corn (48,390 acres) and soybean (42,795 acres) (USDA, 2007), with poultry and eggs



having the largest value in sales. Review of soil data information of the project study area (Haagen, 1987) indicated that prime farmland soils cover 90% of the study area. Hay and row crop fields are present throughout the study area, and estimated to account for approximately 46% of the total land area. Coordination with the local NRCS office which is regulated by the Farmland Protection Policy Act (FPPA), will be necessary.

Noise-sensitive Receptors

Four locations within or adjacent to the study area include a mobile home park, a church and two community meeting facilities that may be sensitive to increased noise impacts. A project specific traffic noise impact analysis may need to be conducted to identify and mitigate traffic noise impacts.

2.4 Environmental Justice

Issues pertaining to minority, elderly, disability and low income (persons living in poverty) populations in the project study area were evaluated and documented in an April 2011 report entitled *KY 181/US 79/US 41/KY 294 Intersection Study - Environmental Justice Review*. The report concluded that Environmental Justice (EJ) populations above the state and county averages occur in several Census Block Groups in the study area, particularly within the Block Group that comprises the majority of the City of Guthrie. The study determined that there would be no impact to the EJ populations if project recommendations were confined to existing roadway rights-of-way. However, if proposed improvements take a new route off one of the existing right-of-ways in one or more areas, then additional examination of these areas proposed in the new route(s) should be explored further for EJ impacts as the project further develops. Additional information concerning Environmental Justice issues in the project study area is provided in the project *Environmental Justice Review* in **Appendix D**.



3 DEVELOPMENT OF ALTERNATIVES

In order to determine the need for and purpose of potential transportation improvement projects, it is necessary to estimate future conditions within the study area. This chapter summarizes the anticipated future conditions and how alternatives were developed to address anticipated needs.

3.1 Committed Projects

Only two transportation projects are programmed for implementation in Todd County within the coming years. These projects are summarized in **Figure 12**. KYTC Item #3-8401.00 is a current design project to provide spot improvements along KY 181 from the Todd County courthouse in Elkton north to US 68/80. Item #3-8630.00 is the Guthrie “Knot” Planning Study.

3.2 Population Projections

According to projections provided by the Kentucky State Data Center, Todd County’s population is holding relatively steady. Recent population projections, released in September 2011, are shown in **Figure 13**.

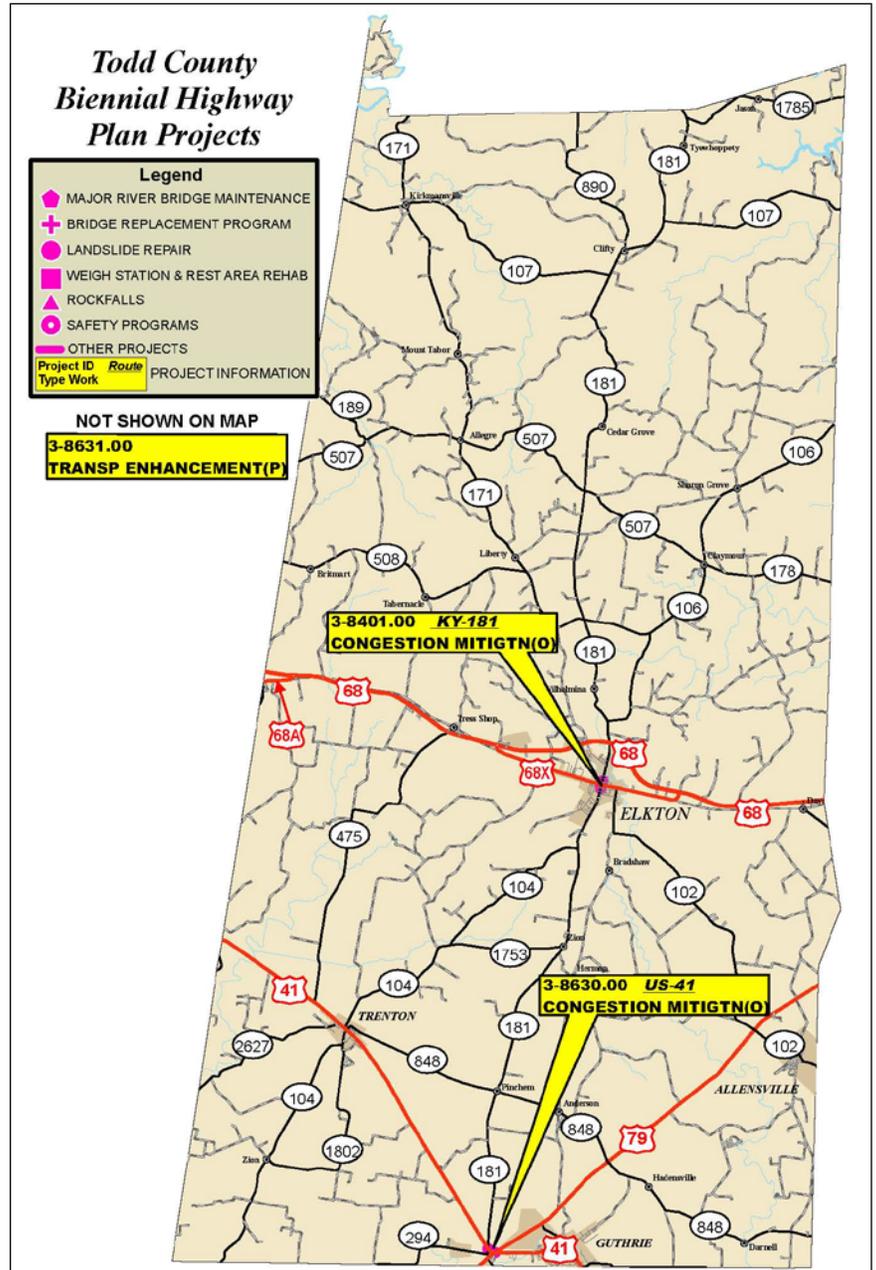


Figure 12: Committed Projects in Todd County
Source: KY Transportation Cabinet

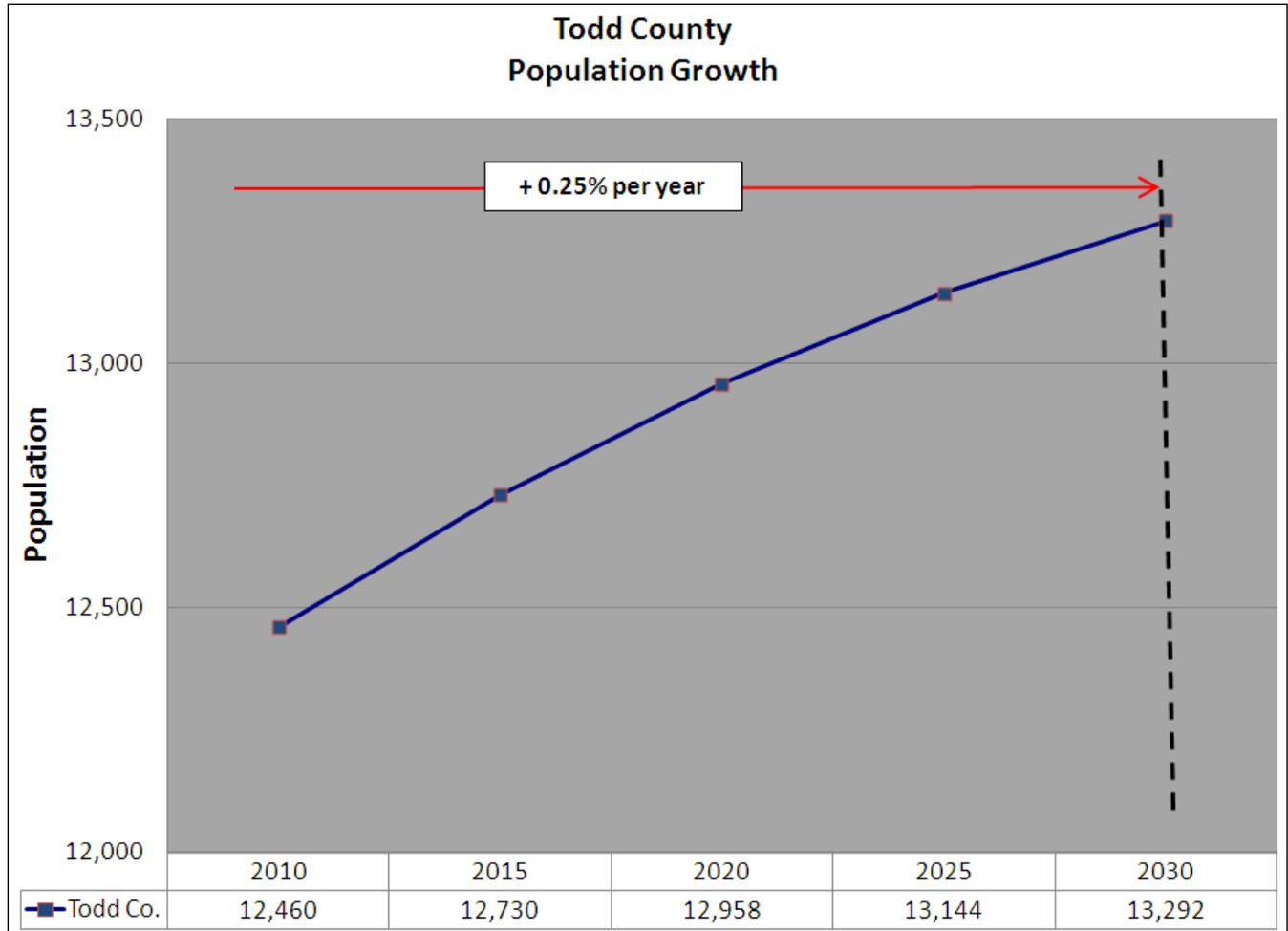


Figure 13: Todd County Population Projections
(Source: Kentucky State Data Center, September 2011)

Based on a comparison of the 2010 Census data, Todd County appears to be growing in population by about 0.25 percent per year. That is lower than the statewide average growth rate of 0.6 percent per year. The estimated population in Todd County in July 2010 was 12,460 and is expected to increase to 13,292 by the year 2030.

Table 1 includes a summary of the 2000 Census and subsequent population estimate for the incorporated cities in Todd County through 2009. Guthrie’s population decreased by 0.1 percent per year over that time period while the remainder of the county grew by about 0.4 percent per year.



Table 1: Todd County and Incorporated Cities Population Estimates

County / Incorporated Place	2000 Census (April 1)	2009 Estimate (July 1)	Population Change	Annual Growth 2000 - 2009
Todd County	11,971	12,253	282	0.3%
Allensville	n/a	n/a		
Elkton	1,986	1,989	3	0.0%
Guthrie	1,469	1,457	-12	-0.1%
Trenton	419	430	11	0.3%
Balance of Todd County	8,097	8,377	291	0.4%

(Source: Kentucky State Data Center, June 2010)

3.3 Traffic Forecasts

Development of traffic forecasts is a necessary step in determining the need for transportation improvements. However, in the case of this study, traffic forecasts are difficult to estimate because no one knows the impact Hemlock will have on growth in the area. Therefore, it was decided that the study would consider a range of forecasts including low, medium, and high growth scenarios.

The low growth scenario is based on output from the Kentucky Statewide Travel Demand Model (KYSTM), the only travel demand model available for Todd County. The KYSTM is a conventional three-step daily travel demand model that is run in the TransCAD software package. The model contains all major state, federal, and county facilities in Kentucky and the adjacent areas of surrounding states. The model also has a truck component. The model is calibrated to a 2003 base year and has future year socioeconomic data to run a 2030 forecast. The KYSTM was run to establish a baseline traffic assignment, and was found to be relatively consistent with the population growth from the Census with traffic on most study area roadways growing by 0.4 to 0.5 percent per year.

The medium growth scenario is based on the lower of the historical growth rate for each roadway or the functional class average growth rate for Todd County based on KYTC's latest available data. The historical growth rate for a minor arterial in Todd County is 3.45 percent per year, and the average growth rates for each of the study area roadways is between 1.5 percent and 4.1 percent per year. High Growth is based on the higher of the historical growth rate or the functional class average growth rate for Todd County. The resulting traffic forecasts are summarized in **Table 2**.



Table 2: 2030 Traffic Forecasts

Route / Segment	Last Available Count			Assumed Annual Growth Rate			2030 Forecasts		
	2008	2009	2010	Low Growth	Med Growth	High Growth	Low Growth	Med Growth	High Growth
US 41 - East of US 79		4,030		0.4%	2.0%	3.45%	4,400	6,100	8,300
US 41 - West of US 79			1,610	0.4%	1.3%	3.45%	1,800	2,100	3,200
US 79 - South of US 41		6,290		0.5%	1.5%	3.45%	7,000	8,600	12,900
US 79 - North of US 41		3,420		0.5%	2.1%	3.45%	3,900	5,300	7,000
KY 181 - US 79 to US 41		1,860		0.3%	1.5%	3.45%	2,000	2,600	3,800
KY 181 - North of US 41	1,900			0.5%	1.5%	3.45%	2,200	2,700	4,100
KY 294		907		0.1%	0.6%	4.07%	1,000	1,100	2,100

The medium growth scenario includes annual growth rates ranging from 0.6 to 2.1 percent and the high growth scenario ranges from 3.45 to 4.1 percent per year. It was agreed that the high growth scenario should be used for purposes of this study. Even at the assumed high growth rates, no roadway segment within the study area would be anticipated to require widening to four lanes before 2030. The highest anticipated volume in 2030, 12,900 vehicles per day (VPD), is along US 79 south of US 41. **Appendix E** includes peak hour turning movement counts collected by the KYTC and 2030 forecasted design hour volumes (DHV's) developed based on the high growth rate scenario.

A number of transportation alternatives were developed and evaluated over the course of the study. These include both short-term projects that could potentially be implemented in the near term with minimal cost and long-range corridor alternatives that would require significant resources to implement. The following sections discuss how improvement concepts were developed and received by the public.

3.4 Stakeholder Input

One of the primary goals of the public involvement component of the study was to solicit input on the location of existing transportation deficiencies and needed improvements. To that end, the first meeting with local officials was used as an opportunity to ask focused questions. First, they were asked to point out specific trouble spots or issues that should be considered in the study. Second, they were asked to identify possible transportation improvements that should be considered. The attendees were divided into five groups, and their recommendations are summarized below.

Group 1

- Proposed improvements
 - Access control at convenience store near US 79 and US 41
 - Consider increasing turning radius from eastbound US 41 to southbound US 79 (investigate availability of using state property near the intersection)
 - Better “guide” signs at all intersections



- Widen KY 294 to Tennessee state line (minor widening discussed included two 11-foot wide lanes with 8-foot wide shoulder that is partially paved)
- Build loop away from knot to west to connect to KY 181 or US 79

Group 2

- Transportation issues
 - Drainage issues
- Proposed improvements
 - New connection from KY 294 to US 79; improve KY 294 to Hemlock
 - Consider a four-way stop at US 41 and KY 181 with a flashing beacon
 - Eliminate “through” traffic on Graysville Road
 - Increase turning radius at US 79 and US 41
 - Provide better access control at convenience store

Group 3

- Proposed improvements
 - Bypass to west (KY 294)
 - Additional signage at US 41 and KY 181
 - Consider making US 41 between KY 181 and US 79 a “local only” route
 - Left turn lane on northbound US 79 at KY 181
 - Sidewalk connection along US 41 to east

Group 4

- Transportation issues
 - Signs are too small at US 79 and KY 181; some advance warning signage is needed to direct traffic to turn onto KY 181
 - Congestion is an issue on Graysville Road
 - Crashes at Patriot Park entrance on US 41
 - Consider impact on downtown Guthrie, particularly associated with truck traffic toward Springfield
 - KY 346 (Ewing St.) serves as a cut-through
- Proposed improvements
 - Consider a traffic signal at US 41 and US 79
 - Western bypass with connection to Patriot Park to the east on US 79
 - Speed limit reduction on US 79 from Tennessee state line to north of Patriot Park
 - Speed limit reduction on US 41 north of the knot

Group 5

- Transportation issues
 - New school(s) proposed in north Montgomery County, TN
 - Huge subdivision planned off Port Royal Road (KY 2128)
 - 1,000 acre industrial park on KY 294
 - 800 acres of industrial property on US 79 north of KY 2128
 - TDOT has recently discussed widening US 79 to four lanes south of the Kentucky state line
 - Caution about constriction to any creeks as they currently control flooding in and around Guthrie
- Proposed Improvements
 - Bypass from KY 2128 to the west then north around to Patriot Park on US 41
 - Consider closing Graysville Road (minimize impacts to the Stagecoach Inn)

- Add directional signage to Hemlock and other industrial parks
- Add more pavement to the west at KY 181 and US 41 to help “square up” trucks

3.5 Short-Term Improvement Alternatives

A number of short-term improvements (also referred to as “spot improvements”) were developed based on input from the combined local officials and stakeholders meeting, investigation of crash data, and site reconnaissance. These projects, most of which were developed to improve traffic safety, are shown in **Figure 14** with descriptions of each project to follow.



Figure 14: Preliminary Short-Term Improvement Alternatives

1. Construction of left-turn lanes on US 79 at the KY 181 intersection, shown in **Figure 15**. A number of rear end crashes have occurred at this intersection, and the addition of left-turn lanes on US 79 would be one way to minimize such crashes. This improvement would be difficult without significant right-of-way impacts and removal of parking for businesses south of US 79.



Figure 15: US 79 at KY 181

2. Access management at US 79 and US 41 intersection, shown in **Figure 16**. This is a very large, skewed intersection with four-way stop control and the convenience store located on the south side of the intersection has uncontrolled access along the south and east roadway approaches. The potential short-term improvement includes maintaining the intersection in its current location but constructing a curbed island along most of the convenience store’s frontage to define two access points – one on US 41 east of the intersection and one on US 79 south.



Figure 16: US 79 at US 41

3. Minor reconfiguration of the US 41 and KY 181 intersection, shown in **Figure 17**. This is a very large, skewed intersection with two-way stop control on the KY 181 approaches. Vehicles, particularly trucks, on southbound KY 181 will often veer to the right (almost as if they were attempting to turn right onto westbound US 41) to maximize sight distance before crossing US 41 or turning left towards Guthrie. The preliminary proposed improvement was to construct a curbed island to define a right “turning roadway” onto westbound US 41 and to prevent through and left-turning vehicles from veering to the right.



Figure 17: US 41 at KY 181

During the second meeting with local officials, there was some discussion concerning the viability of this concept. The Study Team believed the issue was limited sight distance to the east (towards Guthrie). It was noted the issue really deals with the sight distance to the west along US 41 as the skew angle on the southbound approach makes it difficult for trucks to see oncoming vehicles to their right. Therefore, this concept could worsen that situation. Additional maintenance activities that could be considered include some shoulder stabilization on the northbound KY 181 approach for right-turning vehicles. There was also some discussion concerning converting this intersection to four-way stop control.

4. Traffic calming on Graysville Road, shown in **Figure 18**. Graysville Road experiences a significant volume of “cut-through” traffic as it provides a more direct east-west connection than either US 41 or US 79 to KY 181 and then KY 294. Three possible options discussed by the Study Team include: 1) do nothing, 2) traffic calming and speed reduction through speed humps, tables, or other such devices, and 3) permanent closure of Graysville Road.



Figure 18: Graysville Road (looking west)

These short-term improvements were presented at the public meeting in September, and a questionnaire was distributed to solicit input. Public meeting attendees were given the option to either fill out their questionnaire at the meeting or return it by mail after the meeting. A total of 21 questionnaires were returned. The results of the questionnaire are summarized in **Figure 19** and as follows:

1. Construction of left-turn lanes on US 79 at KY 181 (76% in favor)
2. Curb construction along US 41 and US 79 near the convenience store (81% in favor)
3. Traffic Calming on Graysville Road (76% in favor)
4. Reconfiguration of the US 41 and KY 181 intersection (67% in favor)

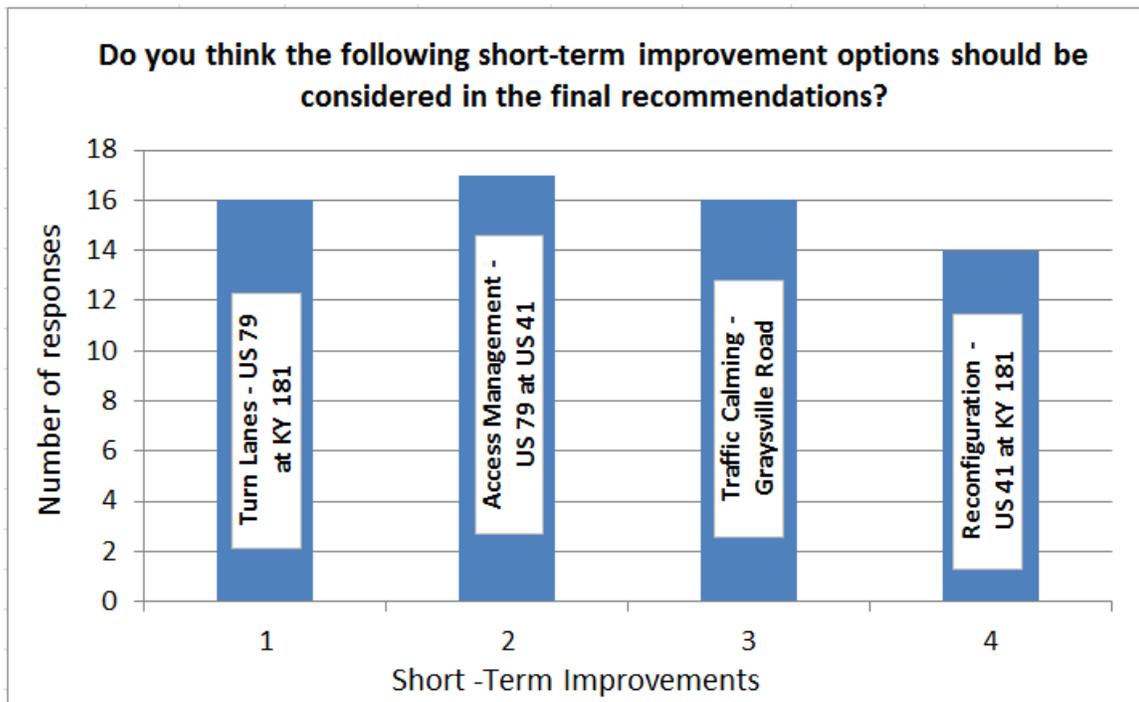


Figure 19: Public Comment Summary – Short-Term Improvements

All short-term improvement options were well received by those that returned questionnaires. Of the 21 responses received, the lowest approval was 67 percent in favor of the reconfiguration of the US 41 intersection with KY 181 with the greatest being 81 percent in favor of making the access management improvements near the US 79 intersection with US 41.

Several meeting attendees asked if four-way stop control or traffic signals could be considered at some of the intersections in the triangle. The Study Team evaluated each of these intersections and determined none would satisfy warrants for four-way stop control (other than the US 79 intersection with US 41 that is currently a four-way stop) or the installation of a traffic signal. These evaluations considered not only existing traffic, but also projected turning movements based on the 2030 traffic forecasts. These turning movements and forecasts are provided in **Appendix E**.

3.6 Long-Range Corridor Alternatives

The long-range corridor alternatives for the Guthrie “Knot” Planning Study were developed based on stakeholder outreach and a comprehensive investigation of existing conditions and future industrial development concerns. These alternatives, shown on **Figure 20**, involve realignments of existing routes in an effort to eliminate issues with the existing intersections. Descriptions of each of these concepts are provided below.

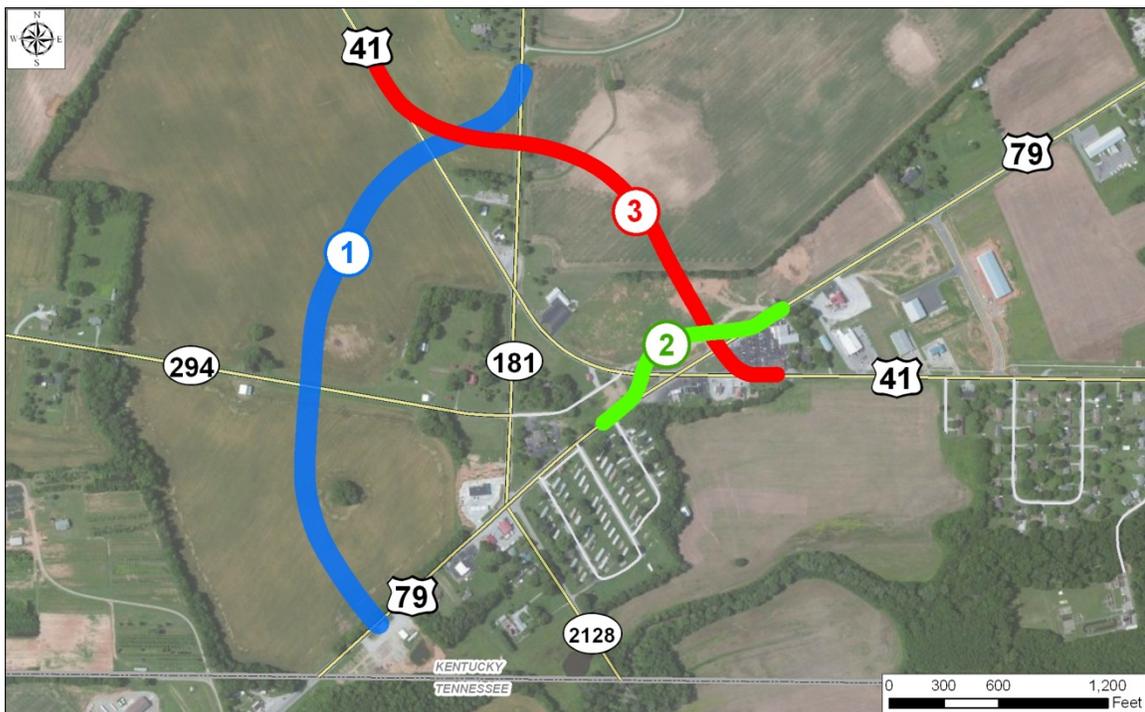


Figure 20: Preliminary Long-Range Improvement Alternatives

1. Realignment of KY 181, shown in **Figure 21**. This concept provides a western connector around Tiny Town by redirecting existing KY 181 from north of the US 41 intersection to the west along a semicircular route to US 79 west of the existing KY 181 intersection. The realignment of KY 181 should intersect US 79 at a location to eliminate or at least minimize any right-of-way acquisition or construction within the state of Tennessee. Existing KY 181 would be removed from the existing KY 294 intersection north to the proposed realignment north of US 41. A minor widening of KY 294 west of the realigned KY 181 could be included with this option.



Figure 21: Conceptual Realignment of KY 181

2. Realignment of US 79, shown in **Figure 22**. This concept realigns US 79 to the west of the existing US 41 intersection to provide a more perpendicular intersection with US 41 and to eliminate the existing access issues with the Minit Mart. This concept would likely require the closure of Graysville Road near US 41 as it would be too close to the proposed US 79 intersection.



Figure 22: Conceptual Realignment of US 79

3. Realignment of US 41, shown in **Figure 23**. This concept realigns US 41 from west of existing KY 181 to east of US 79 through a proposed commercial development. This realignment would eliminate the adverse skew angles at the US 41 intersections with both KY 181 and US 79.

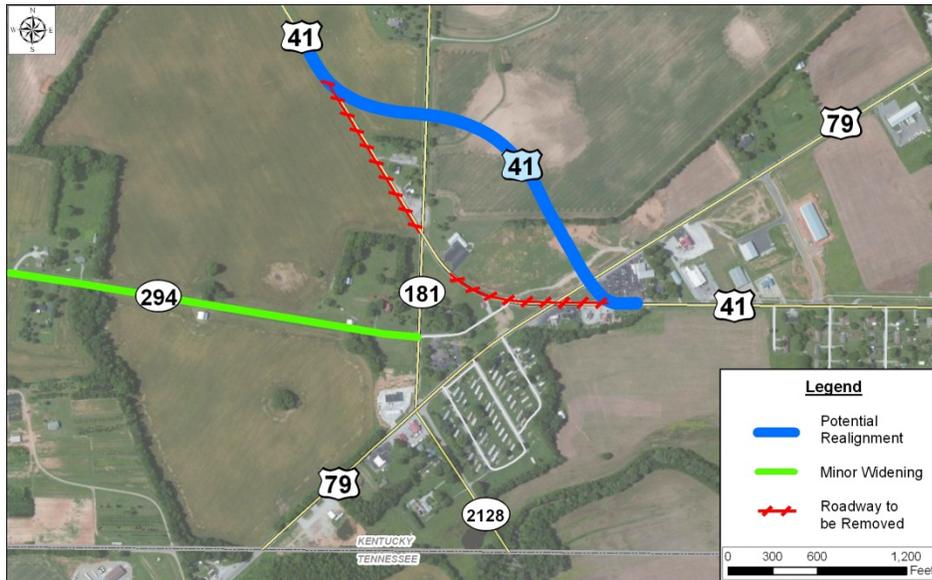


Figure 23: Conceptual Realignment of US 41

4. Realignment of KY 181 and Realignment of US 79, shown in **Figure 24**. This concept realigns both KY 181 (Alternative 1) and US 79 (Alternative 2). This combination would eliminate the adverse skew angles at the US 41 intersections with both KY 181 and US 79.



Figure 24: Combination of Realignment of KY 181 and of US 79

An additional alternative was discussed but not presented to the public. A new Northern Connector, shown in **Figure 25**, would have included a new connector route around the northern half of Tiny Town, from US 79 east of US 41 to US 79 west of KY 181. As shown, it would connect to US 79 east of Tiny Town at the existing entrance to Patriot Park, providing a connection to US 41. Existing KY 181 would be removed from the existing KY 294 intersection north to the proposed connector. One residence would be taken with this concept. The benefits a northern connector would provide are minimal as through traffic on US 79 would continue to travel through the existing skewed intersection at US 41. As the concept would not address many of the intersection issues in the triangle, it was not considered a reasonable alternative.



Figure 25: Conceptual Northern Connector

The results of the public meeting questionnaire are summarized in **Figure 26** and as follows:

1. Alternative 1 – Realignment of KY 181 (45% in favor)
2. Alternative 2 – Realignment of US 79 (25% in favor)
3. Alternative 3 – Realignment of US 41 (25% in favor)
4. Alternative 4 - Combination of Alternative 1 and Alternative 2 (50% in favor)

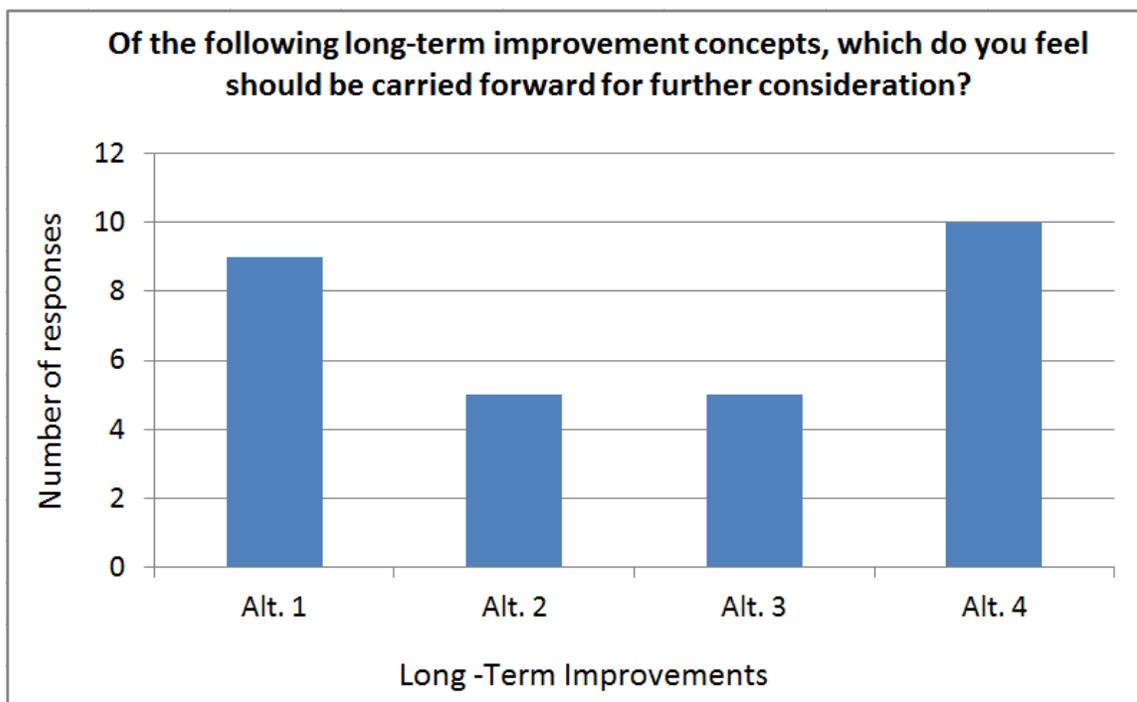


Figure 26: Public Comment Summary – Long-Term Improvements

Nine respondents indicated Alternative 1 should be considered further. This was second only to Alternative 4, a combination of Alternative 1 and Alternative 2, which received 10 responses. It should also be mentioned that all long-term options included provisions to widen KY 294 westward from the Tiny Town “Knot” area.

One additional long-term option was mentioned by several meeting attendees. This alternative would have realigned US 41 south of its current location to provide a more perpendicular intersection with US 79. This alternative was not considered reasonable by the Study Team because a residential development is planned for the area east of US 79 and south of US 41, which would be adversely affected by the alternative.

Table 3 presents a summary of all the alternatives as well as combinations of alternatives in the case of Alternative 4. Preliminary construction cost estimates for these long-term concepts were developed based on KYTC average unit bid prices from 2010 and the construction of a three-lane section (two travel lanes with a continuous center turn lane). Turn lanes were also included on approach roadways. A 20 percent contingency was included, as well as a cost associated with design (10 percent), and a cost of contractor mobilization and demobilization (4.5 percent). The widening of KY 294 includes reconstructing the existing route with an improved two lane section, including two 11-foot wide lanes and 4-foot wide paved shoulders. KYTC District 3 provided right-of-way and utility estimates.



Table 3: Summary of the Long-Range Corridor Alternatives

Project	Description	Length	Approximate cost (\$Millions)	Design	Right-of-Way	Utilities	Construction
1. Realign KY 181	Realign KY 181 from north of US 41 to US 79 west	0.8 Miles	\$3.8	\$250,000	\$250,000	\$670,000	\$2,610,000
2. Realign US 79	Realign US 79 west of the existing US 41 intersection	0.2 Miles	\$2.3	\$110,000	\$300,000	\$830,000	\$1,090,000
3. Realign US 41	Realign US 41 from west of KY 181 to east of US 79 intersection	0.6 Miles	\$2.8	\$185,000	\$225,000	\$450,000	\$1,900,000
4. Realign KY 181 & Realign US 79	Realignment of KY 181 and realignment of US 79	1.0 Miles	\$6.1	\$360,000	\$550,000	\$1,500,000	\$3,700,000
5. Widen KY 294	Widen to two 11' lanes from KY 181 west to Tennessee state line	3.0 Miles	\$9.2	\$610,000	\$550,000	\$1,700,000	\$6,370,000

4 RECOMMENDATIONS

The Guthrie “Knot” Planning Study resulted in the development of a number of short-term and long-term improvement concepts to improve travel efficiency and safety through the study area. The Study Team met in November 2011 to discuss the findings from the public information meeting and to make final study recommendations. Based on the input from the public meeting and discussions with stakeholders, it was decided that one short-term improvement and one long-term improvement would be recommended. **Figure 27** shows the study recommendations, which include the proposed access management changes at the US 41 intersection with US 79 and the realignment of KY 181.

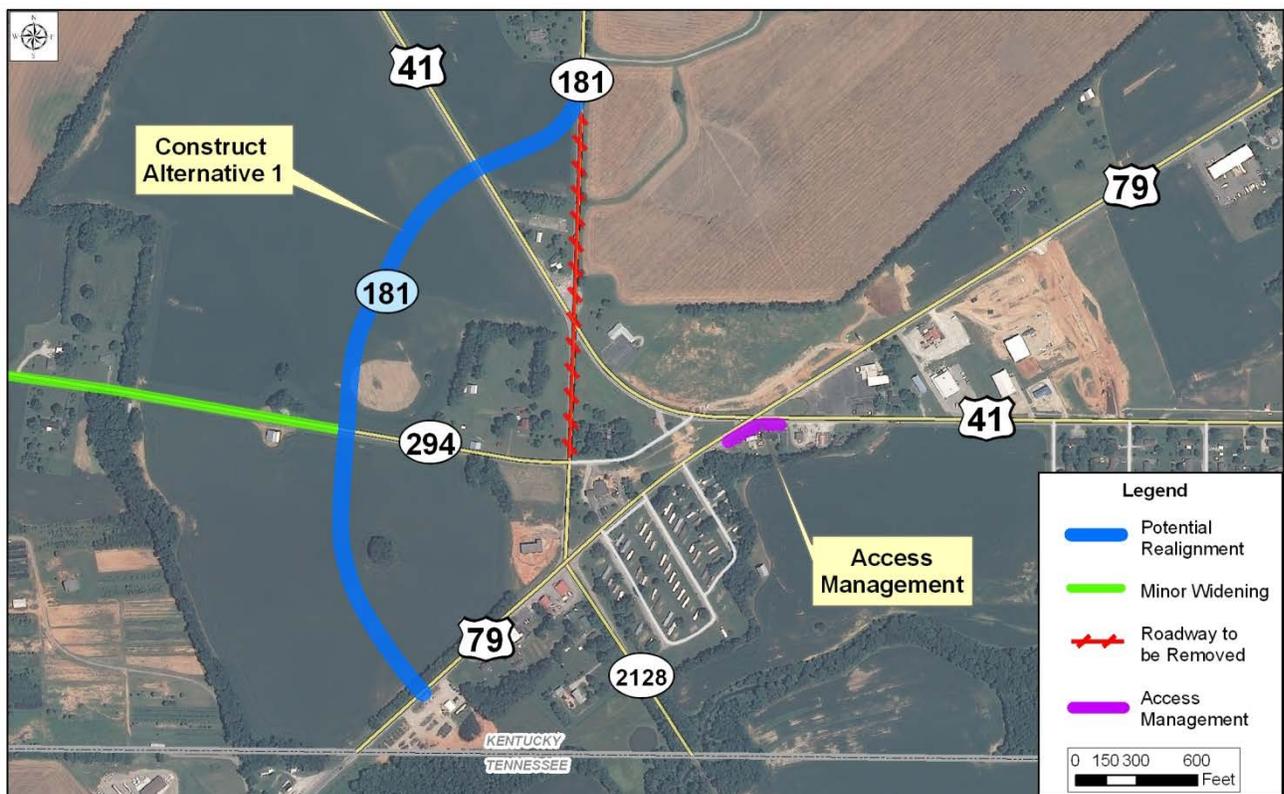


Figure 27: Recommended Short-Term and Long-Term Improvements

The Study Team also discussed the need for additional consideration of traffic calming concepts on Graysville Road. As Graysville Road is a county route (owned and maintained by Todd County), the team did not make any specific recommendations on what improvements should be considered. However, Todd County is strongly encouraged to work with KYTC District 3 to implement traffic calming to reduce traffic volumes and travel speeds on Graysville Road.