



## Study Background and Purpose

The US 51 Study in Bardwell, Kentucky is a planning and feasibility study to assess the need for potential improvements to US 51 in the vicinity of Bardwell in Carlisle County, Kentucky. The Kentucky Transportation Cabinet (KYTC) initiated the study in 2002 as part of the implementation of the KYTC Six-Year Highway Plan. This project was programmed in the highway plan in response to a 1995 US 51 Wickliffe to Fulton corridor study. The 1995 study concluded that widening US 51 from Wickliffe to Fulton was not warranted. However, it identified the portion of US 51 through the town of Bardwell as a potential future traffic congestion area.

This current study therefore examined traffic and highway conditions on US 51 in Bardwell to confirm whether there are current or projected future deficiencies and to evaluate the extent of those deficiencies. A range of improvement alternatives were developed to address each identified deficiency. The alternatives were then compared and evaluated based on transportation, community, economic, environmental, and construction benefits and impacts/costs. The result of the study was a recommended set of highway improvements for future implementation.

At the outset of the project, KYTC informed the project team, local officials, and members of the public that the study would examine a wide range of possible improvements from doing nothing, to in-town improvements, to bypass alternatives. The Cabinet also made it clear that there was not a predetermined solution or outcome to the study.

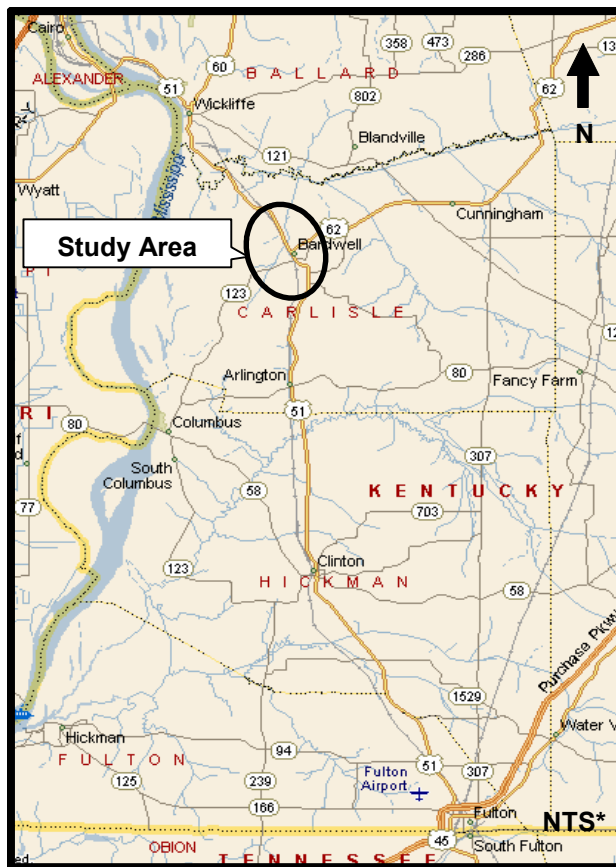
## Study Location and Limits

US 51 is a north-south highway in Western Kentucky, connecting Cairo, Illinois to Fulton, Kentucky near the Tennessee border. Bardwell, Kentucky is located along US 51 in Carlisle County. This study is limited to the portion of US 51 in the vicinity of Bardwell and extends from KY 1203 in the north to half a mile beyond KY 1377 in the south for a distance of approximately six miles. Figure 1 illustrates the study location.

## No-Build Conditions Analysis

US 51 is an undivided two-lane highway. Average daily traffic volumes (ADT) peak at approximately 5,600 ADT in town, with 2,600 ADT north of town and 2,800 ADT south of town. Truck traffic percentages are approximately 15% south of town, 22% north of town, and 9% in town. Based on the traffic volumes, the current traffic levels of service (LOS) are acceptable (LOS B or C) indicating little vehicle delay and good

Figure 1: Study Location



\*NTS = Not to Scale

traffic flow conditions from a capacity standpoint.

Traffic growth on US 51 in Bardwell has been modest over the last 15 years with an average growth rate of 0.6% per year at the ten study area count stations. In fact, traffic volumes are lower now on US 51 than they were in the late 1970s due to the construction of I-55 in Missouri. However, for purposes of this study a 1.5% growth rate was applied to evaluate how traffic conditions would change if the traffic growth rate were higher than it has been historically. Using the 1.5% growth rate, traffic volumes increase to a high of approximately 8,500 ADT in 2030, with volumes of around 4,000 ADT north and south of town. Using these traffic volumes and assuming no highway improvements, the side street approaches to two intersections in town are projected to be below the threshold of LOS C in 2030. This is associated with the left turn movements from the minor streets onto US 51.

There are several geometric issues with the current highway. While the average lane width is 11 feet, there are sections with limited shoulders of well less than 3 feet. There are no curb and gutter sections in the town. There is one sharp curve south of town with limited sight distance. There is also one steep hill south of town. Intersection corner radii are too small for trucks at two key intersections. There is one unwarranted traffic signal. There are no left turn lanes to or from US 51 (though this does not create a capacity problem at present). There are utility poles and trees in close proximity to the traveled way. Many sidewalks on US 51 are in disrepair, and there are discontinuities in the sidewalk system.

A review of recent crash data showed that US 51 through Bardwell has a high crash rate compared to the statewide average. Specifically, US 51 from East Court Street to US 62 had a critical crash rate 1.67 times higher than the critical crash rate threshold. In addition, there were two crash clusters observed in the study area, one of which exceeds the statewide average. This location between Jennings Street and KY 123 had a crash rate 1.17 times higher than the critical spot crash rate. These high crash locations indicate the possible need for improvements to the existing highway.

### **Project Issues and Goals**

Based on the technical analyses, as well as extensive public involvement, the Project Team identified a number of important issues for consideration in examining US 51 in Bardwell. A list of these issues is provided below:

- Vehicular Safety and Highway Design
- Pedestrian Safety
- Truck Traffic
- Traffic Flows
- Economic Development and Regional Access
- Environmental Issues
- Community Character and Beautification / Amenities
- Utilities and Drainage
- Historic Preservation and Property Impacts
- Low-Income and Senior Populations
- Bicycle / Pedestrian Facilities and Streetscape Improvements

The goals for projects to be evaluated in the US 51 study directly relate to the key issues discussed above. These goals were developed with extensive input from the

local community as well as the project team and technical analysis. The key project goals include:

1. Mitigate the negative impacts of heavy truck traffic on US 51, while maintaining an efficient through route for trucks and other vehicles;
2. Preserve downtown business and community character;
3. Maintain appropriate traffic controls and traffic flow conditions;
4. Avoid, minimize, and/or mitigate property takings as well as other community and environmental impacts (This was put forward specifically by many local citizens and has been included even though it is understood to be part of the normal KYTC planning and design process);
5. Improve highway geometry and drainage;
6. Enhance vehicle and pedestrian safety on US 51 in the study area; and
7. Enhance the visual aspects of the community infrastructure and provide improved recreation (bicycle/pedestrian) facilities in keeping with the local economic development goals.

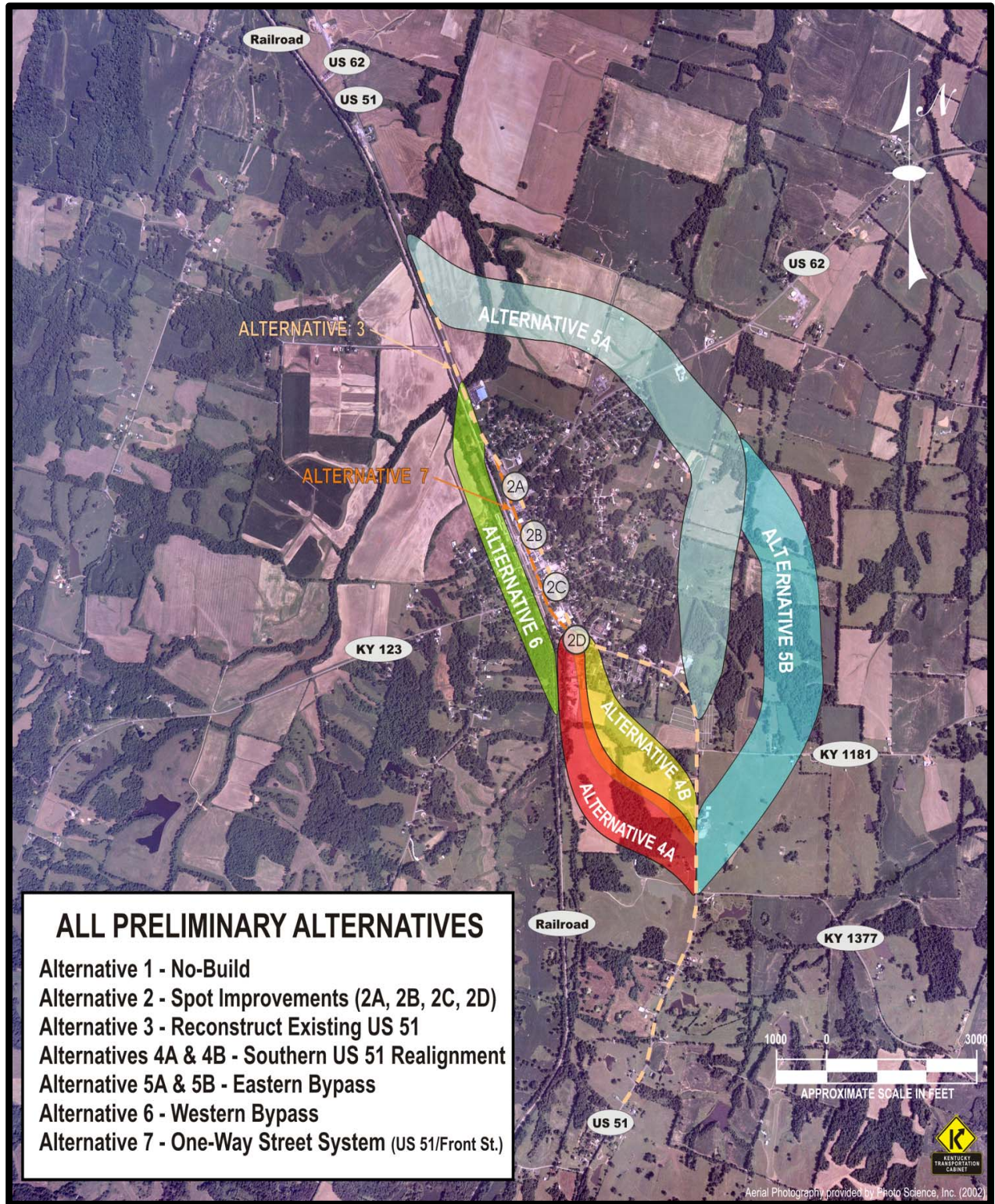
### **Alternatives Development**

In response to roadway deficiencies identified in the No-Build Conditions analysis and the project issues and goals listed in the previous section, nine alternatives were developed. The alternatives were based on both technical analysis and public input. They are shown on Figure 2 and include:

- Alternative 1 – No-Build
- Alternative 2 – Spot Improvements
  - 2A – US 51 / US 62 / Front Street Intersection
  - 2B – US 51 / Jennings Street Intersection
  - 2C – US 51 / KY 123 (Elsey Avenue) Intersection
  - 2D Curve – US 51 at Curve by Methodist Church
  - 2D Hill – US 51 at Hill by the Lions Club Building
- Alternative 3 – Reconstruct US 51 as Two-Lane Roadway with Turn Lanes
- Alternative 4A – US 51 Realignment West of the Methodist Church
- Alternative 4B – US 51 Realignment East of the Methodist Church
- Alternative 5A – US 51 Bypass from the Curve near the Fire Station
- Alternative 5B – US 51 Bypass from South of the Bardwell Cemetery
- Alternative 6 – US 51 Western Bypass
- Alternative 7 – One-Way Street System (US 51 and Front Street)

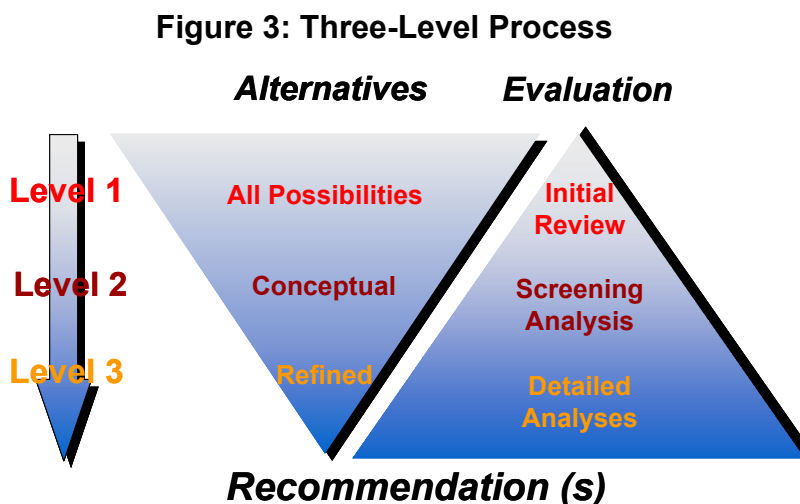


Figure 2: All Preliminary Alternatives



## Alternatives Evaluation

The evaluation process used in this study is a three-step process (see Figure 3). The goal is to successively refine the list of alternatives from all possible alternatives, to a short list of promising alternatives, and then finally to the recommended alternative(s). The evaluation begins at Level 1 with a qualitative analysis applied to all possible alternatives. Alternatives advanced to Level 2 are subjected to a more detailed analysis that combines both qualitative and quantitative evaluation criteria. The final level, Level 3, uses the most detailed information about each of the remaining alternatives to select the recommended alternative or set of alternatives.



The Level 1 evaluation began with nine initial alternatives. Of these, six were recommended for more detailed analysis and three were set aside from further consideration (5B, 6, and 7).

The two eastern bypasses were compared in Level 1. Alternative 5B was judged to have more significant costs and impacts compared to Alternative 5A, with little or no additional benefit. It rated fair to poor in all five evaluation categories. Therefore, Alternative 5B was not recommended for further study. The western bypass, Alternative 6, was also set aside due to construction cost and right-of-way issues, railroad issues, low public support, and potential environmental and community impacts. A one-way street system, Alternative 7, was also dropped in Level 1 because it was unwarranted, could have negative traffic and community impacts, and might present safety problems. It was also deemed to be out of character with the rural, small town nature of the community.

In Level 2, four of the remaining alternatives were recommended for more detailed analysis and two were removed from further consideration (4A and 5A). This evaluation level included specific quantitative analysis elements.

The two US 51 realignment alternatives (4A and 4B) were compared in Level 2, and it was determined that Alternative 4B had the same benefits as Alternative 4A but a lower cost and fewer environmental impacts. This was primarily due to a shorter length and avoidance of streams and the floodplain. Therefore, Alternative 4B was advanced to Level 3, and Alternative 4A was set aside.



Alternative 5A was re-examined in Level 2. This included traffic forecasts and an initial cost estimate. The analysis led to dismissing the alternative from further consideration. The reasons for this decision included:

- Low traffic volumes of 1,400-1,900 vehicles per day in the design year of 2030;
- Does not address identified high crash rate and geometric deficiencies in town;
- Low public and political support;
- Possible impacts to wetlands, streams, floodplains, and a potential archeological site; and
- High construction cost estimate.

The number of potential alternatives was decreased to four by Level 3. The alternatives that remained are shown on Figure 4 and included the no-build option (Alternative 1), spot improvements (Alternative 2), reconstruction of the existing alignment of US 51 (Alternative 3) and realignment of US 51 near the Methodist Church (Alternative 4B).

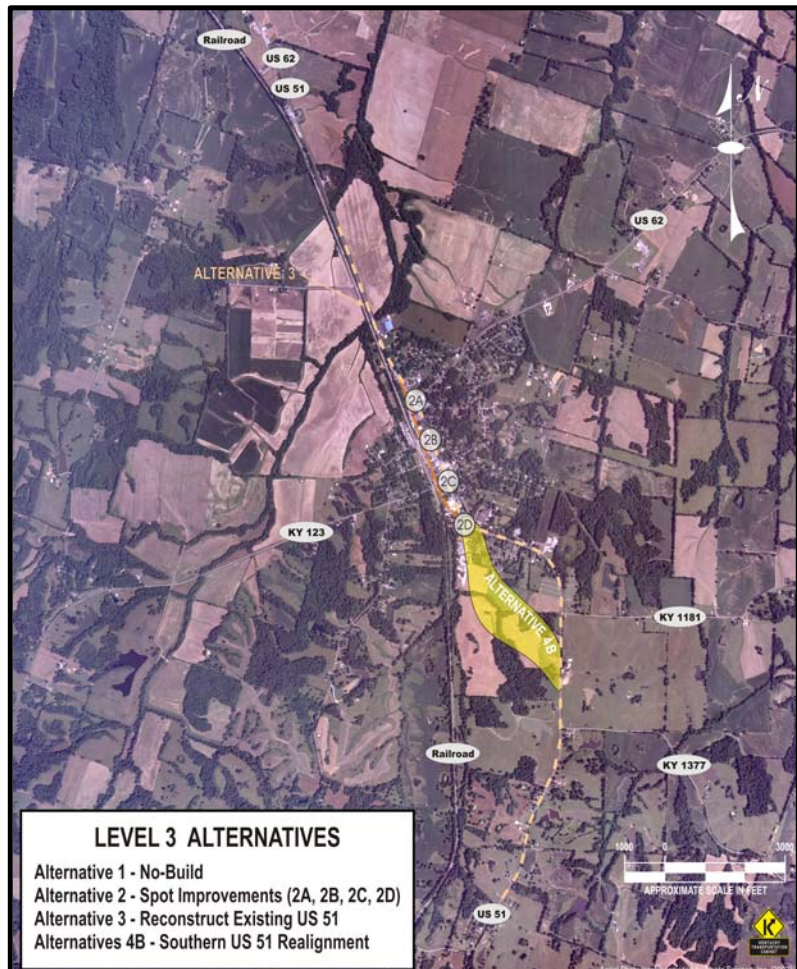
For the four alternatives advanced to Level 3 (Alternatives 1, 2, 3, and 4B), the following section includes the evaluation discussion as well as the recommended alternative.

### Recommendation

The final recommendation for improvements to US 51 through Bardwell is Alternative 3 which includes Alternatives 2A, 2B, 2C, and 2D. The Alternative 3 improvements could be constructed in three phases with Phase 1 consisting of Alternatives 2A, 2B, 2C, and reconstruction of US 51 through town. Phase 2 consists of Alternative 2D Curve and Hill, and Phase 3 includes roadway improvements to US 51 south of Bardwell. Alternative 4B was not recommended based on the estimated construction cost, modest project benefits, potential community and property impacts including the acquisition of prime farmland, and limited local support.

Alternative 2A was selected based on a recognized need for traffic flow improvements, access management, and increased turning radii for trucks at the

Figure 4: Level 3 Alternatives



intersection of US 51 and US 62. It also had considerable community support. Alternative 2B was selected since the current signal is not warranted and the removal will eliminate unnecessary stops through town. Again, it had strong community support. Alternative 2C was selected because the current corners of the intersection of US 51 and KY 123 are deficient with regard to truck turning movements. The proposed increases in radii will allow for greater turning safety and ease, and can be accomplished at a low cost. The installation of a signal in the future will address future traffic flow issues. Alternative 2D, both the curve and the hill, was selected as a recommended alternative to improve the safety of the section of US 51 in the vicinity of the curve by the Methodist Church. This section of US 51 was identified as a problem area through the analysis of crash data on US 51. The analysis revealed a high crash location through Bardwell to East Court Street just past the church.

Finally, the recommendation includes the reconstruction of US 51 through town. This will improve safety and traffic flow generally in the area with wider lanes and other improvements. The reconstruction will also improve drainage through town through the installation of a better drainage system. The installation of curb and gutter will improve safety by limiting access to US 51 from the development located through town. The construction of sidewalks will improve accessibility for pedestrians through town, and should improve the aesthetics of the roadway. South of town, improvements are to be made to the curves and hills to improve roadway safety.

### **Comparison of Recommendation to Project Goals**

In summary, Alternative 3 (including the Alternative 2 improvements) was selected for implementation because overall, it best addresses the following key project goals.

➤ **Enhance vehicle and pedestrian safety on US 51 in the study area.**

The proposed Alternative 2 and 3 projects directly address the safety issues in town by upgrading key intersections and bringing the road up to current design standards. For example, Alternative 2A will improve safety at the US 51 / US 62 intersection, Alternative 2D will improve a deficient curve, and the lane widening and addition of curbs and sidewalks will make the highway safer for vehicles, pedestrians, and bicycles. Overall, improving the existing highway is a very solid and direct means of addressing this goal.

➤ **Mitigate the negative impacts of heavy truck traffic on US 51, while maintaining an efficient through route for trucks and other vehicles.**

Alternatives 2 and 3 mitigate the effect of the truck traffic without removing it from the highway. They also make the route more efficient for through truck traffic. In particular, the Alternative 2A spot improvement may significantly benefit truck movements between US 62 and US 51. The improvements to the hill and curve, the other radii improvements at KY 123, and even the removal of the signal at Jennings Street may all benefit truck traffic while enhancing safety.



➤ **Maintain appropriate traffic controls and traffic flow conditions.**

Alternatives 2 and 3 modify the existing highway to provide appropriate traffic controls and to provide adequate (LOS C or better) traffic flow conditions. Current traffic controls in at least two locations (2A and 2B) should be altered and this is accomplished with Alternatives 2 and 3.

➤ **Preserve downtown business and community character.**

Alternative 3 preserves downtown business by maintaining the existing infrastructure in support of existing businesses. It does not shift traffic away from the main corridor through town, but maintains visibility for existing businesses. It may also have a positive impact on community character. A majority of the community appears to favor these alternatives as being in their best interests.

➤ **Improve highway geometry and drainage.**

Alternative 3 addresses this goal very well since it involves reconstructing US 51 to meet current design standards. Drainage could be improved at the same time through the addition of curb and gutter with storm sewers and possibly detention facilities as necessary.

➤ **Avoid, minimize, and/or mitigate property takings on US 51 as well as other community and environmental impacts.**

This goal was put forward specifically by many local citizens and has been included even though it is understood to be part of the normal KYTC planning and design process. All alternatives were developed in accordance with this goal. However, compared to many of the other alternatives, Alternative 3 meets this goal very well since the proposed improvements require the least amount of new right-of-way and have the fewest expected environmental impacts. Because this alternative involves reconstruction through town, there is the potential for some property impacts along US 51. However, the proposed improvements were developed to work within the existing right-of-way to the extent possible.

➤ **Enhance the visual aspects of the community infrastructure and provide improved recreation (bicycle/pedestrian) facilities in keeping with the local economic development goals.**

Alternative 3 offers significant advantages for improving the visual nature of the town as well as upgrading bicycle and pedestrian facilities through the developed area where they are most likely to be used. The enhancements can be used by the local community to try and achieve their economic development goals which local officials indicate are focused on recreation, senior citizens, and young families.