Chapter II
Project Alternatives

This chapter discusses the reasonable improvement alternatives under consideration for the proposed action, including other alternatives, considered initially, but eliminated from detailed analysis. The final recommendation of the preferred alternative was based on the overall assessment of social, economic and environmental consequences, engineering performance and the alternative's ability to satisfy the Purpose and Need, in conjunction with the public and resource agency involvement process.

The alternatives evaluated during the second tier environmental decision-making process were divided into four distinct stages. The intent of the four-stage evaluation process was to expand upon the work already completed in the first tier study, provide a broad coverage of all viable alternatives for evaluation, as well as provide a framework for screening alternatives. The four-stage process employed during this study included:

- **First Tier Alternatives** – The first tier study provided the overall framework for the evaluation completed in the second tier by addressing corridor-wide issues and strategies.
- **Universe of Alternatives** – The initial phase of the second tier study evaluated the universe of potential alternatives for SIU 6, including numerous interchange options at the U.S. 54 interchange in Kingdom City and numerous alignment options through Mineola Hill.
- **Reasonable Alternatives** – The second phase of the second tier study further refined the evaluation in Kingdom City and Mineola Hill.
- **Recommended Preferred Alternative** – The final phase of the second tier study provided a recommendation for the SIU 6 preferred alternative.

A. No-Build Alternative

The No-Build Alternative represents the existing roadway system plus any committed or reasonably anticipated transportation improvements in the SIU 6 study area. The No-Build Alternative would include standard maintenance but would not include any capacity expansion along either mainline I-70 or at any of the interchanges or overpasses. The only identified committed improvement within the SIU 6 study area is the replacement of the Route N Bridge over the Loutre River. The bridge is located on the western edge of Mineola.

Under the No-Build scenario, on-going maintenance and bridge replacements would be needed to continue the operation of the existing system, including replacement and/or repair of substandard bridges, improving existing pavement condition, and making spot safety improvements. In addition, traveler safety is expected to continue to decline and traffic congestion is expected to increase resulting in increased traveler costs.

The No-Build Alternative would not meet the improvement needs of I-70 as identified in the purpose and need. Although it would not meet the improvement needs for the highway, the

No-Build Alternative does provide a basis of comparison for evaluating the impacts and benefits of the proposed action.

B. First Tier Strategies

The goals of the First Tier Environmental Impact Statement were to define the general location and scope of the best improvement strategy to meet the future transportation needs of the I-70 Study Corridor. The physical and operational characteristics and the overall benefits and costs of each strategy were defined in sufficient detail in order to support the decision-making process. Sufficient detail and definition of the preferred strategy and its characteristics were developed to allow for the defensible identification of the next steps within the tiered process, and the limits and scope of the Second Tier Studies.

1. Strategies Evaluated

The First Tier Study followed a process designed to develop strategies that best addressed the identified future needs of the I-70 facility and travelers. Arriving at a recommended preferred strategy involved several increasingly detailed steps of developing, assessing and selecting strategies. Per National Environmental Policy Act (NEPA) regulations, in addition to highway improvements, the study team considered all "reasonable strategies" such as alternative modes of transportation and transportation system management. A No-Build strategy was also included among the initial strategies. Under the No-Build strategy, the existing I-70 would be preserved by completing rehabilitation and performing ongoing maintenance without adding new lanes or capacity. The remaining six strategies included:

- Transportation system management/Transportation demand management;
- Widening of existing I-70;
- Building a new, parallel four-lane facility;
- Building a new, parallel four-lane toll facility;
- Constructing HOV lanes along the existing alignment; and
- High speed passenger rail service between Kansas City and St. Louis.

While coordinating with the public and local, state and federal resource agencies, the study team identified three of these strategies that could meet the corridor's needs. These reasonable strategies were:

- Widening of existing I-70;
- Building a new, parallel four-lane facility; and
- Building a new, parallel four-lane toll facility.

Any strategy that would not adequately address the problems and issues identified for the corridor was eliminated from consideration.

2. Preferred First Tier Strategy

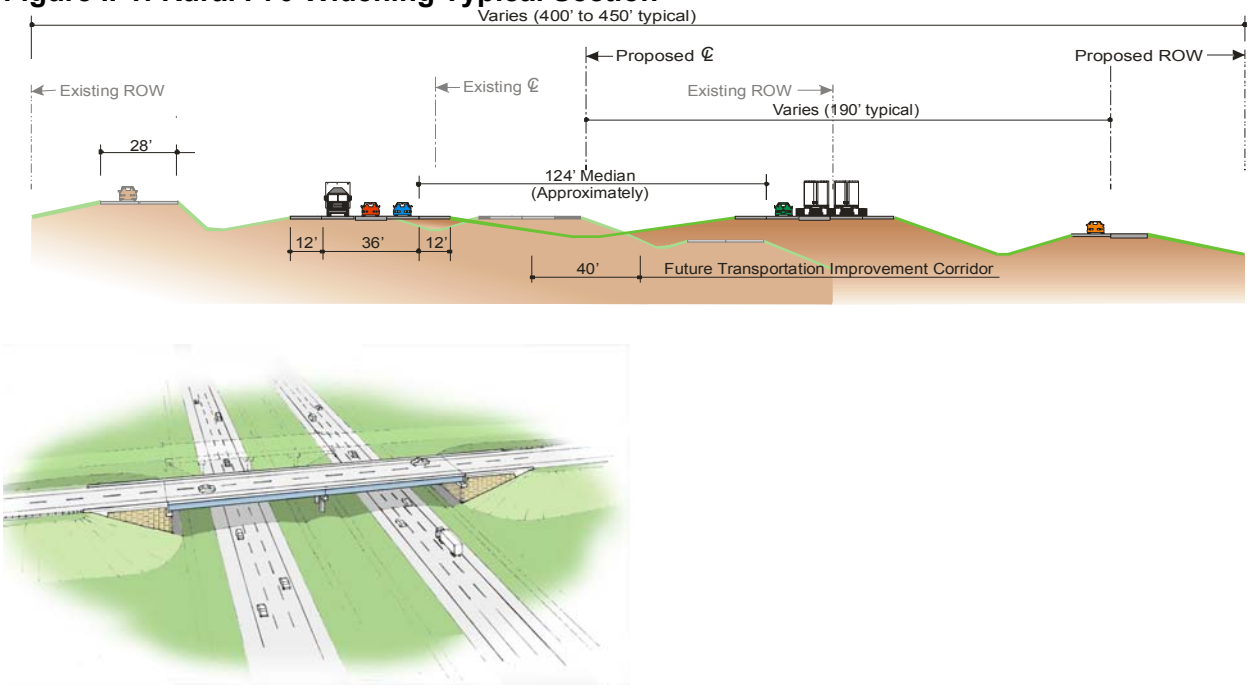
In recommending a preferred strategy, the study team first had to more fully develop and assess the engineering and traffic characteristic of each of the recommended reasonable strategies. The study team included engineering, traffic, environmental and socio-economic considerations in the evaluation factors. Each strategy's impact on these evaluation factors and its ability to address the identified purpose and need for improvement was considered in identifying a

recommended preferred strategy. Based on the evaluation of reasonable strategies, the study team recommended Strategy No. 3 (Widen Existing I-70) as the recommended preferred strategy. This strategy was recommended for the following reasons:

- Meets the long-term travel and safety needs for the corridor;
- Responds to public concerns;
- Replaces existing I-70 pavement;
- Lower annual maintenance;
- Reinvests in existing system;
- Could be built in usable increments;
- Incorporates management type improvements such as Intelligent Transportation Systems (ITS); and
- Improved incident management.

The features of the recommended preferred strategy, a rebuilt and reconstructed I-70 on its current alignment, are depicted in **Figure II-1**. A modernized I-70 would include an expanded right-of-way with six lanes of travel in rural areas and eight to ten lanes of travel in urban areas. The improvements would also include improved interchanges, environmental enhancements and the option of frontage roads on either the north or south side of I-70, as necessary. **Appendix A** provides more detail on the first tier process and recommendations.

Figure II-1: Rural I-70 Widening Typical Section



Source: First Tier Environmental Impact Statement, 2001

3. Recommendations for SIU 6

The First Tier Study recommended dividing the study corridor into seven Sections of Independent Utility, or SIUs. The rationale for dividing the corridor into seven sections was that it would allow for a more realistic, detailed and manageable study of the various portions of the corridor. Each of the seven SIUs could also be studied, designed and implemented independently from the other sections in the corridor. SIU 6 is located in central Missouri, with

termini at mile post 147, at the I-70/U.S. 54 interchange in Kingdom City to mile post 174, located near but not including the I-70/Route 19 interchange near Montgomery City.

The First Tier Study received a Record of Decision in December of 2001. With the approval of the First Tier Study selected alternative, the Second Tier Study could commence. The Second Tier Study, of which this report is a part, would guide the recommended preferred strategy through the SIU 6 Corridor.

4. Design Criteria

MoDOT, in coordination with FHWA, has established overall program-level design criteria (**Exhibit II-1**), rural I-70 typical section and guidance for the second tier preliminary engineering studies of the I-70 improvements. These guidelines were established based on MoDOT's Policy Procedure and Design Manual and AASHTO's Policy on Geometric Design of Highways and Streets. However, recognizing that the investments in I-70 would be long term, more stringent and conservative design criteria have been defined in anticipation of future corridor needs and ever-evolving design parameters. A more stringent design criteria has been established as a desired goal to allow design flexibility within the corridor such that future design evolutions could be reasonably "absorbed" within the project. Furthermore, a more stringent design criteria provides a more liberal estimate of the impacts of the project for the purposes of the environmental planning process and documentation.

As an example, the minimum vertical clearance at bridges is greater than what would be required per currently adopted standards. This would allow the improvements to accept future changes in vertical clearance requirements. For all such instances, MoDOT would assess the program's overall design criteria during subsequent design development to ensure the program strikes the right balance between meeting the needs of tomorrow and the additional costs and impacts of the more stringent design. MoDOT is committed to adhering, at a minimum, to the appropriate currently adopted criteria and design standards. The goal would be to provide a consistent criteria throughout the corridor. However, MoDOT recognizes that constraints in some areas, such as the urban areas, may affect the ability to reasonably accomplish the more stringent criteria. If necessary, the rural areas may provide a more stringent design criteria while the urban areas, due to tighter constraints, may hold to the minimum design standards.

Access Management guidelines put in place for I-70 are based on the guidelines established by MoDOT in their *Access Management Manual*, endorsed by the Commission in June, 2003. MoDOT Access Management guidelines for interchanges require a minimum spacing of about 1,320 feet (402.3 m) between ramp termini and the first private driveway on the left-hand side, median opening, or intersection with a public road. It is also suggested that there be 750 feet (228.6 m) of clearance between the ramp termini and the first right turn in or out of a driveway or a public road. Access Management guidelines also suggest that in rural areas, a minimum five-mile (8 km) spacing should be provided between interchanges along I-70 in order to maintain a smooth traffic flow and to allow for safe and efficient weaving of traffic that is entering and exiting the highway.

Further discussion of the typical sections, maintenance of traffic plans and access management plans can be found in **Appendix A**. More detailed discussion of the design criteria can also be found in the *Median Area Study, Design Criteria and Estimating Guide*, available upon request.

C. Universe of Alternative Strategies

The first stage of the second tier alternatives evaluation was to provide a recommendation on which side, either north or south, of I-70 the proposed improvements should be constructed. The study team evaluated each alternative based on the recommended maintenance of traffic plan developed in the first tier study, as well as natural, social and economic impacts. Because of the complexities identified in Kingdom City and through Mineola Hill, additional analysis was also completed in these areas. A detailed analysis of this initial screening process can be found in the *Draft Initial Screening Report: SIU 6* that is available upon request.

To simplify the alternatives evaluation process, the SIU 6 study corridor was divided into two distinct study areas:

- **Western Study Area (Kingdom City)** – The western study area extends from the western SIU 6 terminal at mile marker 147, through the U.S. 54 Interchange in Kingdom City, to mile marker 163 just east of the Route D Interchange at Williamsburg.
- **Eastern Study Area (Mineola Hill)** – The eastern study area extends from mile marker 163 just east of the Route D Interchange at Williamsburg to the eastern SIU 6 terminal at mile marker 174. The eastern study area contains the environmentally sensitive Mineola Hill region.

1. Western Study Area (Kingdom City)

The SIU 6 Study Team recommended expanding I-70 north through the western study area as a continuation of the SIU 5 Study Team recommendation to expand north of existing through SIU 5 to avoid impacting Tucker Prairie. Continuation of the northern expansion through the first section of SIU 6 was also recommeded to avoid the Missouri Girls Town facility and a potentially historic farmstead located in the southwest quadrant of the Calwood interchange. Earlier studies recommended crossing over from expanding on the north side to expanding on the south side of I-70 just west of the Williamsburg interchange. Expansion would have continued on the south side to just before the Loutre River Valley at Mineola Hill. The SIU 6 Study Team recommended reversing that recommendation and expanding the highway in the vicinity of Williamsburg to the north to avoid affecting the existing gas station located in the southwest quadrant of that interchange and to eliminate the cost and additional traffic delay typical of a crossover.

The western study area included three existing interchanges (Kingdom City, Calwood and Williamsburg) and two overpasses that do not have direct access to I-70. The interchanges at Calwood and Williamsburg were analyzed to determine forecast capacity constraints and it was determined that the standard diamond interchange configurations at the three interchanges would be able to adequately handle the 2030 projected traffic volumes. Therefore, additional interchange concepts were not developed for those two interchanges. A number of options were considered for improving the Kingdom City interchange due to the potential impact on the Kingdom City business community and the projected traffic volumes. The study team considered various interchange alternatives and locations for interchange improvements.

a. Fully-Directional Interchange

Several combinations of a fully-directional interchange were proposed prior to and during the second tier that would have shifted the existing location of the interchange approximately two miles to the east of its existing location and would require the relocation of U.S. 54 east of its

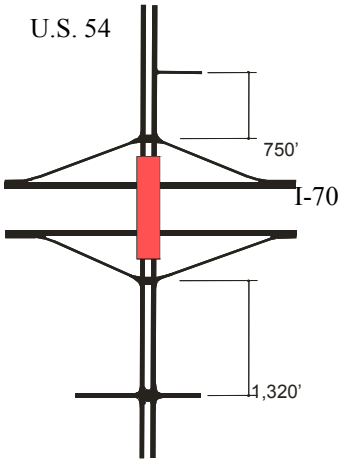
present alignment. This alternative would have eliminated the need for any at-grade signalized intersections and would have provided the most efficient traffic flow of any of the alternatives examined. However, the alternatives examined would have had a substantial negative impact on the visibility and accessibility of the existing business community in Kingdom City. This alternative was eliminated from consideration after it was determined that U.S. 54 would not be reclassified as a freeway facility in the foreseeable future and that traffic flow could be accommodated with other alternatives that did not require the relocation of the existing interchange.

b. Standard Diamond Interchange

Several variations of the standard diamond interchange were evaluated based on the standard template developed for the Improve I-70 Study.

On-Existing Location

The first on-existing alternative examined was to replace the existing diamond interchange in its present location. The standard diamond would conform to the design criteria established for a diamond interchange for the Improve I-70 Study, including an 800-foot spacing between ramp termini, elongated ramps and additional spacing between the ramps and the outer roads according to the established access management guidelines. This would require the closure of the existing outer road intersections on both the north and south side of this intersection replacing them with new intersections located farther away from the interchange.



During the initial screening process it was found that a standard diamond interchange would not be sufficient to accommodate future year (2030) traffic, especially with the above-average number of large trucks currently using and expected to utilize this interchange.

The study team considered an interchange modification that included the future construction of directional ramps located south and east of Kingdom City. The ramps would serve through traffic traveling from westbound I-70 to southbound U.S. 54 and from northbound U.S. 54 to eastbound I-70. These directional ramps would handle the primary traffic movement coming to and from St. Louis and the Jefferson City/Lake of the Ozarks Area. The directional ramps would be constructed if and when warranted based on traffic conditions. If needed, implementation of these directional ramps would be sufficient to handle the projected increase in traffic through the design year.

Near North of Existing

Based on guidance provided by the Kingdom City Highway Coalition (KCHC), the study team considered an alternative that would shift the mainline of I-70 slightly to the north. The Highway Coalition held that if businesses located north of the interchange would face changes in access, there should be an alternative that relocates the interchange to the north of its existing location. This alternative would relocate an improved standard diamond interchange just north of its existing location and provide the directional ramps previously discussed. This alternative would directly impact the Missouri Tourist Center, the Missouri Fire Fighters Memorial, the Southwestern Bell Repeater Station, two service stations and a restaurant, allowing them to be taken through MoDOT's right of way process. Even though there were direct impacts to the

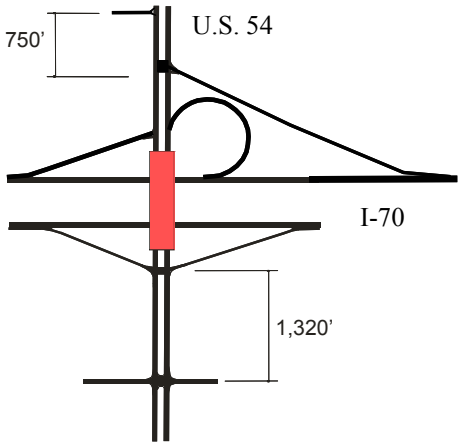
identified businesses, this alternative was carried forward for further evaluation. This alternative was carried forward because it would provide the option of maintaining the existing outer road intersection on the south side of the interchange in its present location and would maintain those business's visibility and accessibility.

Far North of Existing (Old U.S. 40)

This alternative would relocate mainline I-70 north of the existing businesses in the approximate location of the old U.S. 40 roadbed. Shifting I-70 farther to the north would avoid direct impacts to the existing businesses and provide sufficient space to construct the interchange. This alternative was eliminated from consideration because it impaired the visibility of the businesses located on the south side of existing I-70, could not be constructed without substantially altering the accessibility of the businesses located north of existing I-70, and was in close proximity to the existing railroad and railroad overpass hindering the constructibility of the interchange.

c. Partial Cloverleaf Interchange

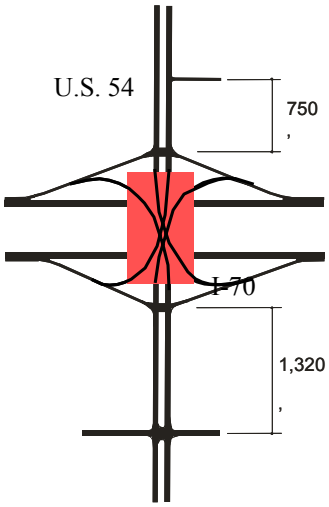
Two partial cloverleaf alternatives were investigated for the Kingdom City interchange. The first alternative placed the cloverleaf, or loop ramp, in the northeast quadrant of the existing interchange. Doing so would improve the overall operating efficiency by eliminating the need for a left-hand turn across traffic for the northbound U.S. 54 to westbound I-70 movement. This alternative was eliminated from further consideration because of direct impacts to an existing service station and restaurant, a concern about the turning ability of large trucks through the loop, and the fact that this alternative would not improve the overall operational efficiency of the primary traffic movement (south to/from the east).



The second partial cloverleaf alternative placed the loop ramp in the northwest quadrant of the existing interchange, thereby serving the predominant traffic movement. This alternative was eliminated from further consideration because of the direct impacts to the Missouri Fire Fighters Memorial, the Missouri Tourism Center, a service station and a historic Southwestern Bell repeater station, and because it would be difficult for large trucks to negotiate the loop ramp.

d. Single-Point Urban Interchange

The Single-Point Urban Interchange (SPUI) would replace the typical two-intersection configuration of a standard diamond interchange with a single intersection at the middle of the interchange. Generally, this configuration is constructed in urban areas with high traffic volumes and limited land availability. This interchange configuration typically improves the overall traffic operations above what could normally be handled with a standard diamond interchange by eliminating one of the intersections and by providing improved turning radii for heavy trucks. The study team's detailed traffic evaluation indicated that a Kingdom City SPUI would improve the overall travel efficiency of the interchange above what would be expected from a standard diamond. However, it would not provide a long-term solution (beyond 2030)



to the expected traffic problem. Therefore, the directional ramp configuration was evaluated in conjunction with the SPUI. The study team considered the following three single-point interchange configurations:

- **Existing I-70 Alignment**– This alternative could be constructed without directly impacting the existing businesses in the Kingdom City interchange and was carried forward for more detailed evaluation.
- **Near North Alignment** – The near north alignment was carried forward for further analysis because of the ability to maintain the existing intersection serving the businesses south of I-70.
- **Far North Alignment (Old U.S. 40)** – For the same reasons as the standard diamond, this interchange configuration was eliminated from further consideration because of the visibility and accessibility of the existing Kingdom City businesses and the proximity of the existing rail line and rail overpass.

2. Eastern Study Area (Mineola Hill)

Because of the proximity of numerous environmental constraints, such as the Graham Farmstead, the Graham Cave State Park and Graham Rock, earlier studies did not make a recommendation for expansion through Mineola Hill. The SIU 6 Study Team evaluated numerous options through this section, including several off-alignment alternatives. The SIU 6 Study Team recommended a southern expansion of mainline I-70 east of any Mineola Hill alternatives to avoid the Danville area and the historic Baker Plantation. Coordination with the SIU 7 Study Team indicated that a southern expansion would be acceptable at the eastern terminal as that study is recommending a southern expansion as well through the Route 19 interchange. The interchange at Danville was also analyzed to determine forecast capacity constraints and it was determined that the standard diamond interchange configuration at the interchange would be able to adequately handle the 2030 projected traffic volumes. Therefore, additional interchange concepts were not developed for this interchange.

The First Tier Study investigated several alternatives through the Mineola Hill area to try and determine a workable solution that avoided direct impacts to the known environmental resources in the area (Graham Farmstead, Graham Cave State Park and Graham Rock). Two northern relocation alignments and several on-existing alignments were analyzed (**Exhibit II-2**). The conclusion of the first tier study identified several alternatives that would avoid direct impacts to the identified environmental resources and recommended carrying those alternatives into the second tier study process. Building on the work completed in the first tier, the SIU 6 Study Team identified and evaluated a series of alternatives through the Mineola Hill area.

a. On-Existing Alignment Alternatives

Numerous on-existing alignment options through Mineola Hill were developed and evaluated during the Second Tier Study process.

I-70 Rural Typical Section

The typical roadway section being considered throughout the rural sections of I-70 was the first alternative investigated along existing I-70. This alternative included the implementation and maintenance of traffic plan which would require construction of new lanes of traffic either to the north or south of the existing I-70 mainline. This alternative was eliminated from consideration because an expansion to the south would take the Graham Farmstead, identified as eligible for the National Register of Historic Places (NRHP). An alternative that expanded to the north

would require a substantial portion of the Graham Cave State Park, including the majority of the parking lot and associated recreation facilities.

The conclusion of this evaluation revealed that the proposed maintenance of traffic plan being utilized in the majority of the rural sections of I-70 could not be implemented through Mineola Hill without undue impact to the known cultural resources. Therefore, the study team investigated several different strategies for construction that maintained two lanes of traffic in each direction. A discussion of that plan has been provided later in this Chapter.

Adjacent Frontage Road Typical Sections

The next step in the on-existing evaluation was to deviate from the standard I-70 typical section to determine whether the recommended six-lane (with capacity for eight-lane) facility with adjacent frontage roads (see recommendations outlined in the *Improve I-70: Frontage Road Master Plan* available upon request) on both the north and south side of I-70 could be constructed. Two concepts were investigated for the frontage road system. The first utilized the standard spacing between the mainline I-70 and the frontage roads. This alternative could not be constructed without substantial impact to either the Park or the Farmstead. The second alternative utilized a Jersey barrier to physically separate the frontage road from the mainline traffic. It was determined that, because of old U.S. 40 running through the town of Mineola, that both a north and a south frontage road would not be necessary. Therefore, this alternative was revised to include only one frontage road along existing I-70 (**Exhibit II-3**). This alternative was carried forward because it provided efficiencies in how traffic was maintained during construction.

No Adjacent Frontage Roads

The final alternative evaluated on-existing was to completely eliminate a frontage road on the north side of I-70 (**Exhibit II-3**) and rely on the existing highway through the town of Mineola as the only frontage road. This alternative was also carried forward for further evaluation.

b. Near North Alignment Alternatives

Several off-alignment alternatives were investigated to provide the necessary avoidance alternative assuming the study team couldn't avoid impacting the sensitive resources along the existing facility. The first avoidance alternative was a Near North relocation alternative that skirted just north of the Graham Cave State Park and tied back in to the existing highway near the Danville interchange. This alternative would include the typical rural roadway section identified for SIU 6.

This alternative was eliminated because of the displacement of numerous residential properties on both sides of the Loutre River and the close proximity to the northern side of Graham Cave State Park. The resource agencies, including the MDNR Division of State Parks, were concerned that this alternative would merely shift the high noise levels on the south side of the park to the north where there were several park resources, including the majority of the park camp sites.

c. Far North Alignment Alternatives

The Far North Corridor was positioned far enough north of Graham Cave State Park to reduce/eliminate the proximity problems associated with the Near North alternatives. Several variations of the Far North alternative were investigated:

Split Alignment

The first alternative investigated in the Far North Corridor was to actually split the westbound and eastbound lanes of I-70. The westbound lanes would follow the Far North Corridor, while the eastbound lanes would stay along the existing alignment. This alternative would minimize the footprint needed in the Far North Corridor, while also utilizing the existing alignment without taking additional right-of-way from the Park or Farmstead. This alternative was eliminated from consideration primarily because the improvement would result in the isolation of Graham Cave State Park in the median of I-70 and would create additional habitat fragmentation without improving the existing corridor.

Far North Relocation

This alternative would relocate mainline I-70 north of Graham Cave State Park in both directions. The relocated interstate would be constructed according to the design criteria established for the rural portions of I-70. Several options for frontage roads were investigated, including parallel frontage roads adjacent to the new relocation, as well as utilizing the existing I-70 Corridor for the southern frontage road. This alternative was carried forward because of its ability to avoid the direct impacts to the cultural resources along the existing corridor (Graham Cave State Park, Graham Farmstead and Graham Rock) and the potential reduction in noise levels in the Park.

D. Reasonable Build Alternatives

The study team recommended carrying forward four alternatives for the Kingdom City area and two for Mineola Hill. Each of these preliminary alternatives were refined and developed as Reasonable Alternatives. In some cases, particularly with the Mineola Hill alternatives, the study team prepared variations of each alternative based on profile grade, frontage roads and environmental and cultural resource constraints.

1. Western Study Area (Kingdom City)

In general, the four recommended alternatives for Kingdom City were selected because of their ability to maintain accessibility and visibility to the existing Kingdom City business community, minimize the environmental impacts and to sufficiently improve travel efficiencies. More detailed environmental and engineering investigations were completed on these four reasonable strategies to determine which ones would be carried forward into the final evaluation process. The four recommended alternatives included:

- Standard Diamond Interchange on Existing;
- Single Point Interchange on Existing;
- Standard Diamond Interchange in North of Existing Corridor; and
- Single Point Interchange in North of Existing Corridor.

The primary finding during this stage of analysis was the determination that the existing Southwestern Bell Repeater Station located in the northwest quadrant of the Kingdom City interchange was potentially eligible for inclusion on the National Register of Historic Places. This determination, along with the direct impacts to the Missouri Firefighters Memorial, the Missouri Tourism Center, two service stations and a restaurant, led to the conclusion that the Standard Diamond and SPUI alternatives located just north of existing I-70 should be removed from consideration.

2. Eastern Study Area (Mineola Hill)

The initial screening and evaluation of Mineola Hill alternatives assessed how well the various alternatives avoided impacting the known cultural resources. During the Reasonable Strategies evaluation, the study team coordinated with the Improve I-70 Study Management Group and the Study Management Group's Mineola Hill Subcommittee to conduct a more refined environmental analysis. The two alternative strategies evaluated during this phase of study included the On-Existing Alignment and the Far North Alignment.

There were two proposed frontage road systems for the On-Existing Alignment. One option utilized an adjacent frontage separated by a Jersey barrier with the old highway roadbed through Mineola as the other frontage road. The second option eliminated a northern frontage road and utilized the old highway roadbed as the only frontage road. The option with a Jersey barrier separated adjacent frontage road was eliminated from consideration after more detailed maintenance of traffic plans were developed. Four-lanes of traffic could be maintained during construction of the recommended preferred alternative without having to also construct a new parallel frontage road.

E. Preferred Alternative Recommendation

The final stage of analysis included a detailed evaluation of the finalist alternatives leading to a recommended preferred alternative throughout the entire length of SIU 6. The decision for a recommended preferred alternative was based on the analysis of environmental consequences, which is detailed in **Chapter 3 – Affected Environment/Consequences**. The results of this evaluation are summarized in the evaluation matrices (**Exhibit II-4)**. In addition, the final alignments are provided over the aerial mosaics along with the known environmental resources in proximity to the improvements in **Appendix C**. The recommended preferred alternative will be offered at a public hearing and through circulation of the draft Environmental Assessment. A selected alternative will be chosen only after conducting the public hearing and with approval of the final environmental document and finding of no significant impact (FONSI).

1. Western Study Area (Kingdom City)

a. Elimination of SPUI

The final evaluation of alternatives through the Kingdom City portion of the study area led to the elimination of the Single Point interchange (**Exhibit II-5**) from further consideration. This alternative was eliminated for the following reasons: constructability; maintenance of traffic; and, traffic operations.

Constructability Issues

The primary concern with the construction of the SPUI interchange has to do with the overall size of the proposed bridge. Because of the larger median proposed for the I-70 Corridor, the overall size of the bridge would be considerably larger than those constructed for other comparable single point interchanges. The larger sized bridge, while constructible, creates concerns related to durability, flexibility and cost. In addition, the approaches to the bridge (the ramps) would require additional structure to cross over mainline I-70 as well as the enlarged median. The environmental, social and economic impacts of the SPUI interchange were very similar to those associated with the improved diamond interchange and were not the

determining factor for eliminating the SPUI interchange as an alternative. An improved diamond interchange would be simpler to construct, cost less and require less bridge and ramp structure.

Maintenance of Traffic

The maintenance of traffic plan for the standard diamond interchange would provide for the opportunity to maintain four-lanes of traffic in each direction on both I-70 and U.S. 54 during construction. The SPUI interchange would require the closure of two lanes of traffic on U.S. 54 during the initial phases of construction. The diamond option would allow the construction of a companion bridge next to the existing bridges. The SPUI would require the demolition of one of the bridges prior to the construction of any part of the new bridge.

Traffic Operations

Traffic would generally operate more efficiently through a SPUI than through a standard diamond. However, two issues present in Kingdom City could potentially skew the overall efficiency of this interchange. The first relates to the overall size of the actual intersection and the other has to do with the balance of traffic going in the various directions:

- **Intersection size** – The overall ability of a SPUI to function correctly relates to the overall distance vehicles must drive to get clear of the intersection. If that distance is increased above what is normally necessary for a single point intersection then the operations could be affected. In Kingdom City, the tradeoff was between bringing the ramps closer to the center of the interchange (requiring more structure), or increasing the clear zone through the intersection. The large volumes of trucks operating in the Kingdom City Interchange would further complicate operations.
- **Traffic balancing** – SPUIs traditionally work best when the traffic is fairly evenly distributed. In Kingdom City the predominant movements are from I-70 westbound to U.S. 54 southbound and from U.S. 54 northbound to I-70 eastbound. This results in a heavy left-turn movement from the east to the south. The study team's projected increase in business and other economic development to the north of I-70 would serve to balance those movements. If this development did not occur or if development in the south were to continue to outpace the north, it would affect interchange operations.

The final traffic analysis revealed that a Kingdom City SPUI could prolong the operational life of the existing interchange but would not eliminate the need for the directional ramps in the southeast quadrant. The SPUI interchange would only delay the need for construction of the directional ramps by five to ten years. The benefit of a five to ten year delay in right of way acquisition needed for construction of the directional ramps did not outweigh the issues and costs associated with constructing the SPUI interchange.

b. Recommended Improvement

The SIU 6 Study Team chose improving the diamond interchange at its existing location and other I-70 improvements as the recommended preferred alternative for the western (Kingdom City) portion of the SIU 6 study area (**Exhibit II-6**). The decision was based on the evaluation of the potential social and natural environmental impacts, engineering performance and the alternative's ability to satisfy the Purpose and Need, along with the public and resource agency involvement process. The recommended improvements included the following:

- From the western terminal at mile marker 147 to the start of the Loutre River valley, mile marker 163, the recommended improvement strategy would provide three

continuous lanes in each direction with all construction activities taking place on the north side of the existing I-70 alignment.

- The two existing interchanges at Calwood and Williamsburg would be replaced with standard diamond interchanges based on the design criteria established for standard diamond interchanges being utilized throughout the I-70 Corridor.
- The two overpasses located between Kingdom City and Calwood and between Williamsburg and the Loutre River valley would also be replaced with no provision for direct access.
- The existing interchange at Kingdom City would be replaced with a standard diamond interchange on its present location. The existing south outer road intersection would be relocated south of the existing Best Western Hotel and the existing access road to the Missouri Tourism Center and service stations would be relocated north to the approximate location of the Old Highway 40 intersection. Outer roads would be constructed from those new intersections to reconnect to the existing outer road system already in place. Directional ramps would be constructed south and east of the interchange and Kingdom City if future traffic volumes warrant.

c. Features of the Recommended Improvements for the Western Study Area

Directional Ramps

Changes in development patterns, changes in the actual timing of the development, changes in traffic patterns statewide along with many other possibilities could change the need for the directional ramps. The Missouri Department of Transportation understands that construction of the directional ramps as a component of the recommended preferred alternative is a concern to the Kingdom City community and that the recommended preferred alternative for the interchange alone would operate at acceptable levels of service for many years before the directional ramps would be necessary based on this study. Therefore, the Missouri Department of Transportation agreed that it would not construct the directional ramps until such time that traffic volumes degrade the operation of the interchange to an unacceptable level and not until such time as a re-evaluation of the need has been completed.

The established threshold for the need was a level of service operating condition of D or worse at one or more interchange components. Interchange components were considered to be ramps, ramp terminal and the cross-road in the area of influence from the interchange. It was anticipated, as discussed in this document, that the operations of this interchange would initially be compromised by the left turn movement at the northern ramp terminal, the vehicles going from the east to the south. Calculations indicated that 500 vehicles per hour in this movement would cause the level of service to be D or worse. MoDOT would monitor the operation of this interchange on a regular basis and would share the findings with the Kingdom City community. Should operational characteristics of the interchange begin to show signs of failure, MoDOT would work with the Kingdom City community as the re-evaluation and verification of the fulfillment of the total, long-term solution at this location was undertaken.

Outer Roads

The location of outer roads on both the north and south side of I-70 in the Kingdom City area has been a topic of conversation with the Kingdom City Highway Coalition (KCHC) from the beginning. The study team presented various frontage road alternatives but has always maintained that the details of the frontage road locations would be finalized during later design stages of the project. The environmental document would show the proposed locations of the new intersections on the north and south side, as well as connecting roads necessary to

reconnect back to the existing outer road system. This document would not commit MoDOT to building any additional outer roads but instead illustrates where roads are proposed to be included as development occurs in the interchange.

d. Ability to Address the Needs of Kingdom City Business Community

Throughout the SIU 6 decision-making process the study team sought to develop alternatives that balanced the improvement needs of the highway with the concerns of the Kingdom City community. Working with the KCHC, the study team identified the following principal concerns, including: location of the interchange; accessibility to existing businesses; visibility of existing businesses; potential customer-related traffic volumes; preservation of the firefighter's memorial and tourist center complex; and construction related traffic disruptions.

Existing Interchange Location

A key concern and the reason that the Kingdom City business owners decided to form an organized coalition, was to ensure that the location of the U.S. 54 interchange remained at its existing location. The initial interchange studies showed a relocated interchange, approximately 1.8 miles (2.9 km) east of the existing location, to satisfy the perceived need to make U.S. 54 a freeway facility. Since that time, it has been determined that U.S. 54 would not be constructed to freeway standards which provided the opportunity to investigate other more traditional interchange options. From a statewide perspective, relocating and building a fully directional interchange east of Kingdom City could be considered the best option because it would accommodate U.S. 54 traffic and would be a key component to designate the Kingdom City to Jefferson City section of U.S. 54 as an Interstate. However, the need of the directly affected community also had to be considered. The study team concluded that the recommended preferred alternative effectively balanced the statewide needs of travel efficiency with the local economic development needs of Kingdom City.

Accessibility/Visibility of Existing Businesses

A second concern among Kingdom City business owners was to maintain accessibility and visibility of their businesses. Several alternatives were investigated that shifted the location either north or south, as well as east and west, that would have hindered both accessibility and visibility. The recommended preferred alternative would maintain the interchange at its existing location and maintain accessibility, though with a somewhat different configuration, and visibility.

Traffic Volumes (Customers)

The KCHC sought to minimize the reduction in the total number of vehicles (i.e., patrons) that might no longer drive through Kingdom City if the interchange was relocated or reconfigured. The study team estimated that if the proposed directional ramps in the southeast quadrant of the interchange were constructed, it would shift approximately 25 percent of the total number of trips entering the interchange to the directional ramps. While this did represent a fairly substantial reduction in hourly and daily trips, the overall number of vehicles that would pass through Kingdom City would be considerably higher than currently exists. For example, traffic counts conducted in 2002 indicated that during the peak hour approximately 2,000 vehicles passed through the existing diamond interchange at U.S. 54. If no improvements were made to the interchange, that number would grow to approximately 4,000 vehicles by the year 2020 and to 5,300 vehicles by the year 2030. If the recommended preferred alternative was implemented and the directional ramps were not constructed until the early 2020s, then the study team estimated that approximately 1,000 vehicles per hour would be diverted to the directional ramp. Over 3,000 vehicles would continue to utilize the improved interchange. While the traffic

volumes would be less than what would be there without the directional ramp, the total number of vehicles in the year 2020 would still be approximately 50 percent more than currently pass through the U.S. 54 interchange. In addition, the configuration of the directional ramps could be modified to promote and encourage easier access from the ramps to the businesses in Kingdom City.

Firefighter's Memorial/Tourist Center

The Kingdom City community dedicated tremendous resources to attract the Fire Fighters Association of Missouri memorial, proposed museum and the Mid-Missouri Tourist Center. The KCHC was concerned that all three resources would be lost if the interchange was relocated. The study team evaluated several alternatives, some of which included the relocation of those resources. However, the two final alternatives avoided direct impacts to those resources. Therefore, the recommended preferred alternative would not directly impact the memorial, the tourist center or the plans for the proposed museum.

Traffic Disruption During Construction

A final concern of the KCHC was that interchange improvements would cause short-term traffic disruptions and a loss of business. Any alternative that replaced an existing interchange in-place would have some short-term impact to traffic movement and accessibility to existing businesses. However, the study team determined that the construction-related impacts associated with the proposed improved diamond interchange would be substantially less than those associated with a SPUI. The biggest short-term difference between alternatives was that only one lane of traffic in each direction would be available during the initial construction of a single-point structure, resulting in a 6- to12-month disruption, while construction staging of an improved diamond interchange would allow all existing lanes to be open on U.S. 54.

e. Route JJ to Auxvasse Creek

Compared to a majority of the existing I-70 corridor in SIU 6, the interstate median between Route JJ and Auxvasse Creek (**Appendix C – Figure 8**) widens substantially through a curve for approximately 4,000 feet. This sudden change in median width at this location makes it difficult to utilize the proposed standard roadway section and maintenance of traffic scheme without a substantial increase in the amount of right of way required for construction. To offset the need for additional right of way, the study team recommends that the typical rural roadway section be constructed with a modified maintenance of traffic plan that would require temporary pavement and unique staging of traffic.

To facilitate the maintenance of traffic during construction, it has been proposed that a four-stage process be implemented (**Exhibit II-7**). Stage I operations would include the maintenance of traffic on the existing eastbound and westbound lanes while the proposed westbound lanes are constructed. A section of the proposed westbound alignment would be shifted slightly where it overlaps the existing westbound alignment. Temporary pavement would be constructed as part of the Stage I activities to facilitate the maintenance of traffic in Stages II and III. Stage II operations would maintain traffic on the proposed and existing westbound alignments with the use of the temporary pavement while the eastbound lanes are constructed. The shifted portion of westbound I-70 would be constructed during Stage III operations while traffic is maintained on the newly constructed eastbound and westbound lanes which are connected by the temporary pavement.

2. Eastern Study Area (Mineola Hill)

a. Elimination of Far North Alternative

The final evaluation of alternatives through the Mineola Hill portion of the study area led to the elimination of the Far North alignment alternative from further consideration. This alternative was eliminated for the following reasons: cultural resources, environmental and engineering impacts. A more detailed discussion of this evaluation has been provided in **Appendix F.**

Cultural Resources

The Far North Corridor was originally established as an avoidance alternative if improvements could not be made along existing I-70 that avoided direct impacts to the Graham Cave State Park and the historic Graham farmstead. After it was determined that improvements could be made along existing I-70 without directly impacting those cultural resources the need for an off-alignment corridor was reduced.

Environmental Impacts

The majority of the Far North alignment would pass through previously undisturbed natural habitat, including an additional crossing of the Loutre River. The additional impacts to the riparian and upland woodland resources, the additional floodplain and wetland impacts, along with additional prime farmland far outweighed the environmental impacts associated with improvements along a previously defined corridor, namely existing I-70.

Engineering Impacts

The Far North alignment would require a substantial amount of additional excavation above what would be required along the existing corridor, resulting in a substantial increase in construction costs for this alternative. Preliminary cost calculations estimated an additional $75 million would be required for the construction of this alternative.

b. Recommended Preferred Alternative

For the eastern (Mineola Hill) portion of the study area, the study team recommended making improvements to the existing highway alignment. The study team based the recommendation on the evaluation of the potential social and natural environmental impacts, along with the public and resource agency involvement process. The study team recommended that the following improvements to I-70 be the preferred alternative strategy for the eastern (Mineola Hill) portion of the SIU 6 study area.

From just east of the Williamsburg interchange, near mile marker 163, through the Loutre River valley, to the Danville interchange the recommended improvement strategy is to provide three continuous lanes in each direction. Unlike other sections of I-70, construction would not take place on either the north or south sides of existing I-70 but instead would be replaced on its existing location. From the Danville interchange to the eastern terminal just west of the Route 19 interchange the additional capacity to mainline I-70 would be constructed south of the existing facility.

The existing interchange at Danville would be replaced with a standard diamond interchange based on the design criteria established for standard diamond interchanges being utilized throughout the I-70 Corridor.

The recommended preferred alternative through the Mineola Hill area (Loutre River valley) would be a six-lane section with a seventh lane in the eastbound direction between the Loutre

River and the top of the hill to provide a truck passing lane and to aid in the maintenance of traffic. Should an eighth lane be necessary in the distant future, no additional impacts to or use of park land are anticipated, as the study team evaluated potential impacts to Graham Cave State Park as part of the Second Tier Study. Extensive use of retaining walls would be required on both the north and south sides of mainline I-70 to prevent encroachment into the Graham Cave State Park and the historic Graham Farmstead. A maximum vertical grade of four percent from the Loutre River to the Graham Rock would be required instead of the recommended three percent grade being used on other sections of I-70. A maximum side slope grade of 2:1 with the required guard rail would be constructed instead of the standard 6:1 side slope grades. The final recommendation through this section was to utilize the existing highway, State Routes J and N in Montgomery County, south of I-70 through the town of Mineola as the only continuous frontage road through this section.

c. Issues Regarding the Recommended Improvements

Vertical Grade Issues

The proposed design criteria for the I-70 Corridor recommended construction of a vertical grade (hill) not to exceed three percent, while the standard FHWA criteria sets a maximum vertical grade for interstate highways at four percent. Extensive engineering analysis was completed through Mineola Hill to determine what should be the appropriate vertical grade. The recommended three percent grade was determined to be infeasible because it would require an extensive amount of rock cut east of the Graham Rock, would require the existing bridge across the Loutre River valley to be raised by almost 20 feet and could not be constructed without impacting the Graham Cave State Park or the historic Graham farmstead. Variations of the three percent grade were then evaluated and, in coordination with FHWA, a decision to carry a four percent grade between the Loutre River and Graham Rock and then a three percent grade from the rock to the top of the hill was determined to be the most appropriate course of action.

Side Slope Issues

The typical section for the I-70 Corridor recommends a side slope, or clear zone, not to exceed 6:1 slopes. It was determined that standard side slopes could not be constructed through this area without substantial impacts to either Graham Cave State Park or the historic Graham Farmstead. Instead, the recommendation was to carry steeper 2:1 side slopes which would then require the construction of guard rails.

Safety Issues

A key issue through Mineola Hill was traffic safety. The Purpose and Need identified this portion of I-70 as a high accident area because of the existing five and six percent grades and the proximity of the rest areas to these steep vertical grades. Several improvements were incorporated into all the alternatives examined through Mineola, including the removal of the rest areas, the additional fifth and sixth through lanes, retaining walls and guard rails. The study team also recommended adding a seventh lane in the eastbound direction to provide a truck climbing lane. The only real difference from an accident perspective between the Final Alternatives for Mineola Hill was the respective vertical grades being proposed. A detailed safety analysis revealed no real difference in traffic safety between any of the final alternatives. Improving the grade would result in a traffic crash reduction of approximately 14 percent, with additional crash savings associated with removal of the rest areas and the inclusion of additional through/truck-only lanes.

Outer Roads

The First Tier Study identified the goal for continuous frontage roads on both the north and south of I-70. As part of the Second Tier Studies, the GEC and MoDOT developed the *Improve I-70 Frontage Road Master Plan*. The master plan provided an inventory of existing frontage roads, defined an overall conceptual plan for providing continuous frontage roads and established the criteria and study approach for outer roads.

Numerous frontage road options were investigated through the Mineola Hill area, including various options of incorporating frontage roads adjacent to mainline I-70. It was determined that adjacent frontage roads could not be constructed without directly impacting the Graham Cave State Park or the historic Graham farmstead. It was also determined that maintenance of traffic could be resolved without the need for the additional frontage road lanes. Therefore, it was determined that a northern frontage road through Mineola Hill was impractical and that the existing highway, State Routes J and N, through the town of Mineola could serve as the southern frontage road.

Maintenance of Traffic

Several maintenance of traffic plans were evaluated in an effort to meet the goal of maintaining four lanes of traffic during construction. The standard maintenance of traffic plan being implemented on other sections of I-70 was determined to be impractical because of the need to stay out of the Graham Cave State Park and the Graham farmstead. Instead, a maintenance of traffic plan (**Exhibit II-8**) was developed that would shift two lanes of traffic to the westbound lanes, with some temporary construction, that would require head-to-head traffic operations separated by a Jersey barrier. The construction of the eastbound lanes would include the fourth truck climbing lane that would be sufficiently wide to handle the head-to-head traffic required while construction of the westbound lanes is completed. Temporary expansion of the westbound Loutre River Bridge would also be required during the first phase of construction.

3. Ability to Meet Purpose and Need

The study team concluded that the recommended preferred alternative for SIU 6 clearly satisfied the identified purpose and need for the project, while minimizing any adverse social or environmental impacts. The conclusion was based on the overall evaluation conducted during the Second Tier Study process. The recommended preferred alternative addresses the purpose and need for SIU 6 as follows:

- **Roadway Capacity** – The additional lanes and geometric improvements on I-70 provides for an adequate future year level of service for all mainline segments of interstate. The standard diamond interchanges being proposed at the three interchanges in Calwood, Williamsburg and Danville would maintain an acceptable level of service. The level of service at the two Kingdom City ramp terminals and the relocated north and south outer road intersections could operate at an acceptable level up to and until a point when the proposed directional ramp in the southeast quadrant was necessary.
- **Traffic Safety** – The identified safety deficiencies, primarily in the Kingdom City area, would be improved with the construction of the improved standard diamond interchange and the relocation of the north and south outer road intersections. Mainline geometric improvements, including additional lanes on mainline I-70 and the wider median section, would also improve traveler safety throughout this section of SIU 6, including the Mineola Hill area.

- **Roadway Design Features** – The recommended preferred alternative would eliminate any of the existing substandard roadway or interchange sections. With one exception, the roadway and bridge construction in this section of I-70 would meet the design criteria established for I-70. The exception is the Mineola Hill segment, which would not meet the recommended I-70 criteria, but would meet existing FHWA standards.
- **System Preservation** – The existing I-70 facility, including the Kingdom City interchange, would be improved in its present location, thereby preserving the existing facility.
- **National Security** – The additional lanes, along with the potential inclusion of continuous frontage roads, would provide for improved ability to respond to regional and national emergencies and would provide needed redundancies.

4. Corridor Enhancements

The First Tier Study documented the commitments of MoDOT and the FHWA to provide corridor-wide impact coordination, impact mitigation and considerations of corridor enhancements. The document provided agencies and communities the assurance that an enhancement master plan would be developed, and that corridor-based considerations would be fulfilled and appropriate special considerations would be provided for each of the Second Tier Studies.

For the Second Tier Studies, a Corridor Enhancement Subcommittee was formed. The Corridor Enhancement Subcommittee, one of three subcommittees for the Second Tier Studies, was a consortium of the project team and local, state and federal agency technical staff. This subcommittee developed *The I-70 Corridor Enhancement Plan* that proposed aesthetic enhancements for the overall I-70 Corridor. The goals of the enhancement plan included creating an approximately 200-mile I-70 transportation corridor that would:

- Complement the existing natural environment;
- Maintain sensitivity to the existing context of the corridor;
- Provide a sense of consistency along the entire route;
- Showcase Missouri natural resources through enhancements that would also highlight Missouri's history, cultural resources and economy; and
- Establish baseline enhancements for the entire corridor and identify opportunities for additional enhancements by local communities and other partnering agencies.

Included in the conceptual plan was: a program for aesthetic enhancements for the existing natural features in the corridor; visual design treatments to build elements that reduce their sense of scale; an overall design theme for enhancements to complement the visual context of the corridor (context sensitive solutions); corridor landscape enhancements for both the mainline and interchanges; and riparian habitat enhancement and wildlife corridors treatment.

Appropriate baseline enhancement features would be incorporated into the major reconstruction efforts along the I-70 Corridor, dependent upon the availability of adequate funding. This baseline enhancement concept includes bridge enhancement, landscaping using native grasses and flowers and habitat enhancement at major stream and river crossings. Additional "beyond-baseline" enhancements would be dependent upon the participation and funding by local communities and resource agencies.

The recommendations proposed for the entire I-70 Corridor would be appropriate for inclusion in specific sections of SIU 6. In addition, it has been proposed that MoDOT continue work with the Study Management Group Mineola Hill Subcommittee to investigate enhancement opportunities

through the Mineola Hill area. Potential enhancement opportunities discussed at previous meetings included potential noise reduction strategies, aesthetic easments for billboard construction, or joint use projects with Graham Cave State Park.

5. Rest Areas

In December of 2000, the MoDOT Rest Area Task Force completed the Missouri Rest Area Plan, a long-range, comprehensive plan for the rest area system throughout the state. This plan provided recommendations on establishing rest area priorities, allocating resources to address those priorities and criteria for location and design features of the rest area. For the Second Tier Studies, the GEC and MoDOT completed the *Improve I-70 Rest Area Study* in August, 2003. The focus of this Rest Area Study was on implementing the recommendations of the Rest Area Task Force for the I-70 Study Corridor. This included identification of general site locations for the new rest areas/welcome centers, design concepts, features and other issues, such as funding, to be considered.

Currently along I-70, there are rest areas located near Concordia, Boonville, Mineola and Wright City. These rest areas include a facility on each side of the interstate to provide service to both directions of traffic. The Rest Area Task Force recommended that new rest area facilities should be built between mile markers 179 and 199 to replace the Wright City and Mineola rest areas and near the junction of I-70 and Route 65 to replace the Concordia and Boonville facilities. This Rest Area Study used the criteria of service to truck traffic, proximity to urban areas, system functionality (spacing) and availability of utilities to identify future rest area locations. Using these criteria, the Rest Area Study recommended that rest areas be placed in the western part of the state between Exit 24 and Exit 41, the central part of Missouri between Exit 103 and Exit 115, and the Eastern part of the state between Exit 179 and Exit 199. The inbound rest areas on each end of the state would also serve as Welcome Centers.

For SIU 6, the GEC recommended removing the existing rest area at Mineola and relocate/consolidate it outside of the termini of SIU 6. For purposes of this study, the accomodation for a new rest area within SIU 6 would not be necessary.

6. Intelligent Transportation System

The implementation of Intelligent Transportation Systems (ITS) along the I-70 Corridor would improve the operating efficiency of the corridor under both the No-Build and Build Alternatives. The movement of people and goods along the corridor would be safer, faster and more reliable. ITS improves safety by identifying hazards and providing information on those hazards to drivers and system operators. Efficiently identifying and managing incidents in the I-70 Corridor would reduce the occurrences of congestion, which reduces average travel time and improves travel time reliability. Implementing ITS systems along I-70 would maximize the return on the investment being made on the critical I-70 Corridor.

MoDOT recommended ITS deployments along the I-70 Corridor included:

- Commercial Vehicle Operations (CVO)
- Parking Management
- Road Weather Information System (RWIS)
- Incident Detection and Management
- Traffic and Travel Information and
- Work Zone Management

The capital cost for implementing ITS in SIU 6 was $3,800,000. The estimated annual operation and maintenance cost for ITS was $380,000. These costs did not include the cost for developing and operating an I-70 Corridor traffic operations center.

7. Frontage Roads

The First Tier EIS stated the long-term goal of providing continuous frontage roads for the purposes of incident management – frontage roads could provide an alternative route should an incident occur on I-70. MoDOT is currently in the process of developing a statewide incident management plan, including a plan for I-70 across the state, to respond quickly and efficiently to incidents. Providing continuous frontage roads along the corridor, on at least one side or the other, would provide redundancy within the system and would fully complement and further amplify the benefits of incident management. In the event of an incident, traffic can be efficiently rerouted to the adjacent frontage road system, as necessary, to maintain traffic flow in the corridor.

Though continuous frontage roads are a long-term goal and are included as part of the proposed action for environmental planning purposes, continuous frontage roads are not a high priority. Including continuous frontage roads as part of the proposed action provides a long-term master plan for the corridor, but MoDOT is not committed to build continuous frontage roads in the near term. MoDOT is committed, however, to construct frontage roads for the purposes of maintaining existing local service connections and maintaining existing access to adjacent properties. Each frontage road would be assessed on an individual basis as to whether or not any existing discontinuities would be addressed as part of the initial construction. Improvement of existing discontinuities would depend on the availability of construction funding and relative priorities.

In SIU 6, there are four areas where frontage roads adjacent to I-70 are not part of the improvement plan in the long term. In these areas, existing roadways would be utilized as the continuous frontage roads.

- **Kingdom City** - The first such example of this is around the Kingdom City interchange where the frontage road follows Old US 40 north of the interchange. Old US 40 tracks approximately a half mile north of I-70 in this area. The frontage road would be located away from I-70 from the western terminus of SIU 6 to approximately one mile east of the Kingdom City interchange, where Old US 40 begins to run adjacent to I-70.
- **Calwood Interchange** - Approximately a half mile east of the Calwood Interchange, south of I-70, the frontage road would follow Jade Road southeast until it intersects with County Road 142. It would then follow County Road 142 until it intersects with County Road 161 approximately a quarter mile south of I-70. At this point, County Road 161 runs north towards I-70 until turning east and running adjacent to the interstate, approximately four miles west of the Williamsburg interchange.
- **Williamsburg Interchange** - Another area in SIU 6 where there is not a continuous frontage road adjacent to I-70 occurs near the Williamsburg interchange. On the north side of I-70, the frontage road follows Route D/Old US 40 from approximately two miles west of Williamsburg, at the Route D overpass, to County Road 1030 until it meets up with I-70 approximately two miles east of Williamsburg.
- **Mineola Hill** - In the Mineola Hill area, there are spots on both the north and south sides of I-70 that do not contain continuous frontage roads. North of I-70 the frontage road ends approximately one mile west of the Loutre River Bridge and does not pick up again until Route TT approaches I-70 just east of Graham Cave State

Park. South of I-70, the frontage road follows Route N and runs southeasterly away from I-70 until it reaches the town of Mineola. Here the frontage road would follow Route J traveling north out of Mineola. The frontage road again follows I-70 continuously beginning at approximately one mile west of the Danville interchange.

In addition, there are two areas where continuous frontage roads would not be constructed in the near term. These areas generally are in areas where no existing frontage road exists and where the improvements to I-70 would occur on the opposite side of the I-70 corridor. The areas are illustrated with a grey outline in the exhibits in **Appendix C** and include:

- **Auxvasse Creek** – Frontage roads on either the north or the south of I-70 between the overpass at Route JJ and the interchange at Route A/Z, through the Auxvasse Creek valley, currently do not exist and construction of frontage roads through this area would depend on available funding.
- **Williamsburg –** On the south side of I-70 between the overpass at Route D and the Williamsburg interchange (also Route D) there is currently no frontage road system. This section would also only be constructed based on available funding.

For the purposes of this environmental document, since it is reasonably anticipated that full build-out of the frontage road system would occur at some point in the future, continuous frontage roads have been considered in the impact assessments as direct impacts. As such, the analysis of the improvement alternatives has fully considered the implications of the future continuous frontage system on the layout and configuration of the initial I-70 improvements (i.e., proposed action). Recommendations for the improvements have been based on the anticipated full build-out of the corridor. Construction cost estimates do not include future frontage roads.

8. Construction Cost Estimates

Based on current MoDOT bid tabulations and MoDOT guidance, construction cost estimates were prepared for the No-Build Alternative and each Build Alternative carried forward into the final screening of alternatives. Construction quantities were developed for the following primary categories, including right-of-way acquisition, utility relocations, grading and drainage, pavement and base, interchanges and bridges. A 15 percent contingency was used to account for unforeseen circumstances and for items not tabulated individually. Program management and administration has also been added to represent the internal cost to MoDOT for managing the construction of the new facility. **Table II-1** provides the preliminary construction cost estimate for the recommended preferred alternative for SIU 6. It should be noted that these cost estimates are based on 2005 dollars and are subject to change due to inflation.

The construction cost estimates are based on the exhibits included in this environmental document, which show differently the frontage roads to be constructed initially and those anticipated sometime in the future. For the purposes of this environmental document, the construction cost estimates include only the initial frontage road construction (those necessary, in general, to maintain existing access and local street connections). The cost estimates also assume that impacts to billboards would be paid for based on the actual cost to replace the billboards in kind. In some cases, existing billboards don't conform to MoDOT policy, and there may be additional cost implications in order to bring them into compliance. These potential costs are subjective based on each individual occurrence and therefore have not been included in the estimate.

Widening of I-70 will typically result in the need to acquire and remove existing billboards located where new right of way is required. Under current state and federal law, some of the billboards that are removed may be able to be replaced on other land adjacent to the new right

of way limits. Minimum spacing and other requirements are likely to prevent other billboards from being replaced. The cost estimates assume that a greater cost will have to be paid for billboards that cannot be replaced, than for those which are able to be set back and replaced at their approximate original milepost location. These estimated costs are roughly approximate, due to uncertainties in the variables of time, potential changes in billboard laws and valuation, plus the unique circumstances that affect the value of each current billboard.

Within SIU 7, we estimate that construction of a build alternative would require the removal of approximately 115 to 126 existing billboards, depending on the alignment of the build alternative selected. A substantial number of these large billboards would be able to be set back and rebuilt at their same approximate milepost location under current law.

Under the No-Build Alternative, the existing billboard structures would not be affected.

Table II-1: Construction Cost Estimates

Segment	Mainline Length (miles)	Construction Costs in 2005 dollars ($mil)		
		Construction	Right of Way	Total
No-Build	27	$88.1	$0.0	$88.1
Western Study Area (Kingdom City)				
Standard Diamond (Recommended)	16	$262.9	$20.0	$282.9
SPUI Interchange	16	$275.5	$20.0	$295.5
Eastern Study Area (Mineola Hill)				
On-Existing (Recommended)	11	$146.1	$18.1	$164.2
Far North	11	$229.4	$10.5	$239.9
Total for SIU 6 (Recommended)	27	$409.0	$38.1	$447.1

Source: Wilbur Smith Associates, 2004

9. Traffic Circulation

The SIU 6 Study Team assessed current and forecast operations and capacity on I-70 and all interchanges in SIU 6 in conjunction with the analysis of natural, social and economic impacts. **Chapter 3 – Affected Environment/Consequences** details the analysis of environmental consequences. The study team assessed current and forecast operations and capacity by utilizing the Highway Capacity Manual "Level of Service" scale. The Highway Capacity Manual and the "Level of Service" (LOS) scale were developed by the Transportation Research Board to characterize how motorists and passengers perceive operational conditions within a traffic stream. The descriptions of individual levels of service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions and comfort and convenience. Please see page I-5 to view detailed definitions for the six levels of service.

a. Mainline I-70

In order to forecast future traffic volumes in SIU 6, the study team adapted the existing Missouri statewide model to replicate existing travel characteristics. The future travel characteristics were then projected to the design year 2030 using anticipated future population growth and development. The volumes presented in **Table II-2** represent the existing and forecast traffic volumes on four SIU 6 mainline I-70 roadway segments.

Table II-2: Average Daily Traffic (ADT) on Mainline I-70

	Kingdom City to Calwood	Calwood to Williamsburg	Williamsburg to Danville	Danville to Route 19
2000				
ADT	29,893	29,892	29,892	32,585
Truck ADT	8,071	7,772	7,772	8,798
% Trucks	27%	26%	26%	27%
2020 Build				
ADT	59,130	59,990	60,000	58,930
Truck ADT	17,150	17,395	17,400	17,090
% Trucks	29%	29%	29%	29%
2030 Build				
ADT	70,090	71,110	71,120	69,850
Truck ADT	20,325	20,620	20,625	20,255
% Trucks	29%	29%	29%	29%

Source: Wilbur Smith Associates, 2004

Table II-3 describes the existing and forecast LOS for each mainline segment of I-70. The MoDOT standard for level of service in rural areas of Missouri is a LOS of C or better. Under the No-Build scenario, the increase in traffic degrades the LOS to D by the year 2020 and by 2030 all mainline segments of SIU 6 would fail to meet MoDOT standards for capacity. Under the Build scenario, which consists of three lanes of travel in each direction, the LOS improves to a level of C across the board in 2020 and remains at a LOS of C in 2030.

Table II-3: Mainline I-70 Level of Service (LOS) Analysis

		Kingdom City to Calwood	Calwood to Williamsburg	Williamsburg to Danville	Danville to Route 19
Peak Period Traffic[1]					
2000		2,390	2,390	2,390	2,605
2020		4,680	4,765	4,765	4,680
2030		5,520	5,620	5,625	5,525
Peak Period LOS					
2000	Existing	B	B	B	B
2020	Build	C	C	C	C
2030	Build	C	C	C	C

Source: Wilbur Smith Associates, 2004
[1]Peak hour volumes are two-way peak hour volumes.

b. Kingdom City Interchange

In July of 2002, turning movement counts were taken at each at-grade intersection in the Kingdom City interchange. Design year, 2030, forecast traffic was developed based on normal traffic growth, known future development and potential unknown development estimates. The year 2030 operations analysis identified LOS problems in each of the area intersections. **Table II-4** displays the LOS for each intersection near the Kingdom City interchange for two 2030 build scenarios for the recommended preferred alternative.

Table II-4: Kingdom City Interchange LOS – 2030

	Level of Service (LOS)	
Intersection	**Build (without directional ramps)**	**Build (with directional ramps)**
U.S. 54 and Old Highway 40	B	B
U.S. 54 and Fire Fighter Memorial Access	--	--
U.S. 54 and I-70 Westbound on/off Ramps	E	C
U.S. 54 and I-70 Eastbound on/off Ramps	D	D
U.S. 54 and South Outer Road	D	C

Source: Wilbur Smith Associates, 2004

c. Calwood, Danville, Williamsburg Interchanges

The three remaining interchanges (Calwood, Williamsburg and Danville) within SIU 6 were analyzed to determine forecast capacity constraints. It was determined that under the No Build scenario, the existing diamond interchange configurations at the three interchanges would be able to adequately handle 2030 projected traffic volumes. All movements at the interchanges have very low volume-to-capacity ratios, meaning that very little of the facility's capacity is being utilized. There remains plenty of capacity for additional vehicles before the interchanges become overburdened and begin to fail. **Table II-5** displays the average interchange level of service for each respective interchange.

Table II-5: Calwood, Williamsburg and Danville Interchange Level of Service (LOS) – 2030

	Level of Service (LOS)
Intersection	**Build**
Calwood	A
Williamsburg	A
Danville	B

Source: Wilbur Smith Associates, 2004

10. Traffic Safety

Improvements to the I-70 roadway associated with the recommended preferred alternative would reduce the total number of crashes, as well as the severity of those crashes. Specific I-70 Corridor-wide improvements would include:

- An additional travel lane in each direction that would result in a reduction in the density of traffic per lane.
- Wider medians, which would allow for drivers to safely recover control when they leave the roadway.
- Geometric design elements such as grooved shoulders, wide outside shoulders, increased clear zones, improved guard rail design, improved cut and fill slopes, increased horizontal curve radii, improved vertical alignment, and increased minimum clearance.

Additionally, within SIU 6, several specific improvements would be incorporated into the overall final design of I-70. Those specific SIU 6 elements would include:

- Improving the diamond interchange configuration at Kingdom City to include longer ramps and merge zones, and improving access management along U.S. 54.
- Removing the existing rest areas in the Mineola Hill area, thereby eliminating dangerous merge/weave zones on steep grades.

- The addition of a truck-only climbing lane in the Mineola Hill area, which would reduce speed differential conflicts between automobiles and heavy trucks on steep grades.

The SIU 6 Study Team estimated the likely crash reduction based on typical crash reductions associated with the various improvements proposed for I-70. It was estimated that the proposed improvements would result in a 13 percent reduction in property-damage-only (PDO) accidents, a 15 percent reduction in injury accidents and a 34 percent reduction in fatal crashes. **Table II-6** displays the estimated total annual reduction in traffic crashes, by type, per HMVMT for each of the four sub-sections of SIU 6.

Table II-6: Build Alternative Crash Reductions – Year 2030 (per HMVMT)

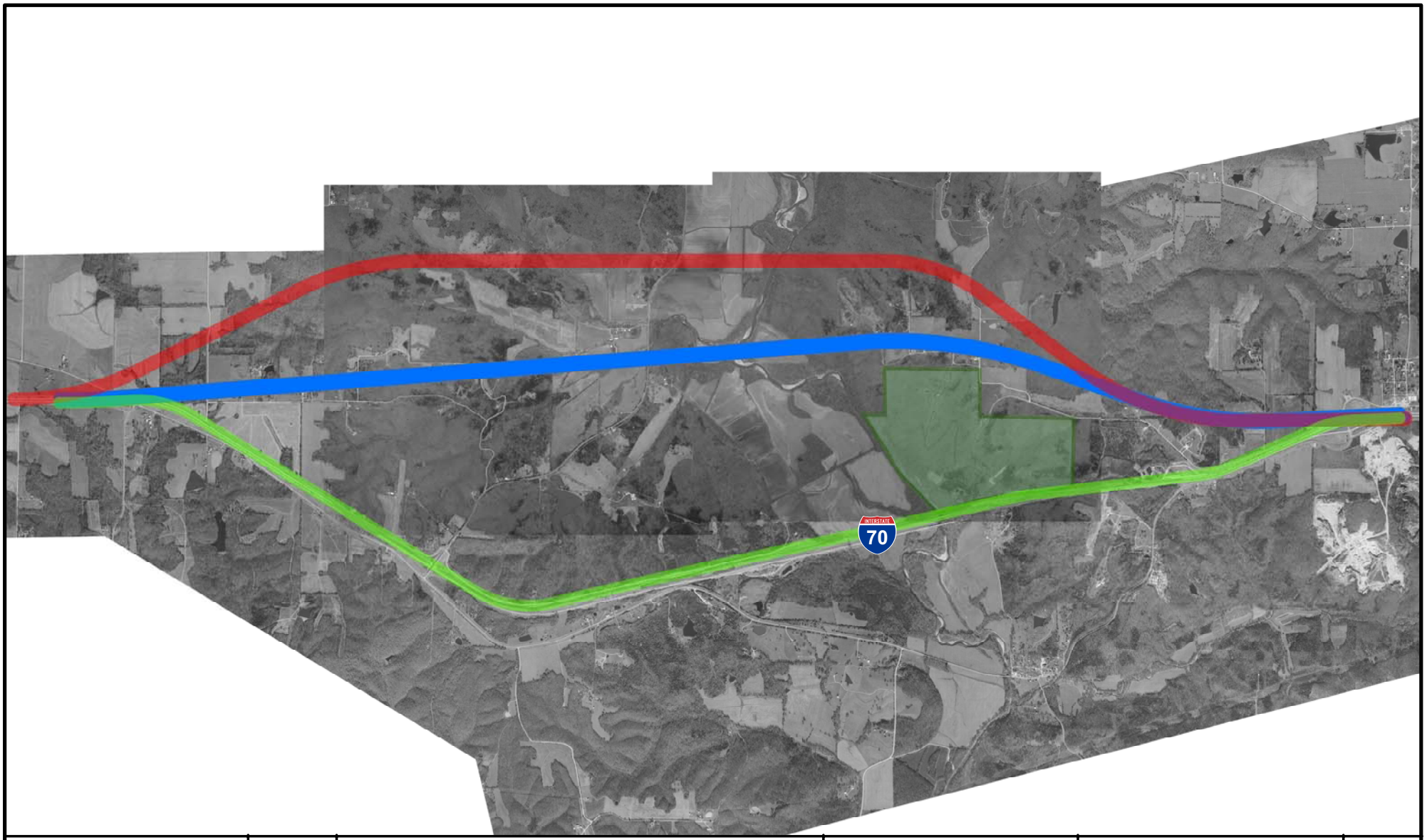
SIU 6 Segment	PDO	Injury	Fatal	Total
U.S. 54 to State Rt. A/Z	15	6	1	22
State Rt. A/Z to State Rt. D	8	4	0	12
State Rt. D to State Rt. J	18	15	2	35
State Rt. J to State Rt. 19	6	4	1	11
SIU 6	47	29	4	80

Source: Wilbur Smith Associates, 2004

By improving the existing roadway with safety enhancements, the entire SIU 6 Corridor would see a reduction of approximately 80 crashes (four of them fatal crashes) per year when compared to a roadway carrying the same amount of traffic, but without the safety enhancements.

Design Consideration	Unit	Interstate Rural & Bypass	Ramp	Frontage Road
Functional Classification and Roadway Section	---	Interstate	---	Collector D-69C
Design Year	---	2030		
Traffic Service Volume	---	All (Over 15,000 ADT)	One Lane <1500 VPH	All
Number of Lanes	#	6	1	2
Design Speed	MPH	75	Gore = 50	Desirable = 50 Minimum = 35
Lane Width	Feet	12	18	Desirable = 12
Median Width	Feet	124	NA	NA
Outside Shoulder Width	Feet	12	8	8 Paved
Inside Shoulder Width	Feet	12	4	NA
Safety Clear Zone	Feet	32	See Note 1	See Note 1
Slopes (H:V) Foreslopes in Clear Zone		6:01	6:01	4:01
Foreslopes out of Clear Zone		4:01	4:01	3:01
Backslope		3:01	3:01	3:01
Maximum Horizontal Curve	Degree	1-30	6 at Gore / 7-30' Max on Ramp	Desired = 6-00 Minimum = 13-30
Vertical Clearance Over railroad	Feet	23'-6"	23'-6"	23'-6"
Over I-70	Feet	19'0"	19'0"	N.A.
Over Crossroad	Feet	16'-6"	16'-6"	15'-6"
Grade	%	3	5	7
Crest Vertical Curve	K-Value	312	84	Desired = 84
Sag Vertical Curve	K-Value	206	96	Desired = 96 Minimum = 49
Passing Site Distance	Feet	N.A.	---	Desired = 1835 Minimum = 1280
Superelevation	Feet/Foot	0.08	0.08	0.04
Pavement Cross Slope	%	2	2	2
Ditch Depth	Feet	4	2	2

Source: GEC, *Median Area Study, Design Criteria and Estimating Guide,* October 2002
Notes: 1. Refer to AASHTO, Roadside Design Guide



MoDOT

IMPROVE i70

SECTION
6
Kingdom City
to
Montgomery City

Legend

- Far North Alternative
- Near North Alternative
- Existing Alternative
- Graham Cave State Park

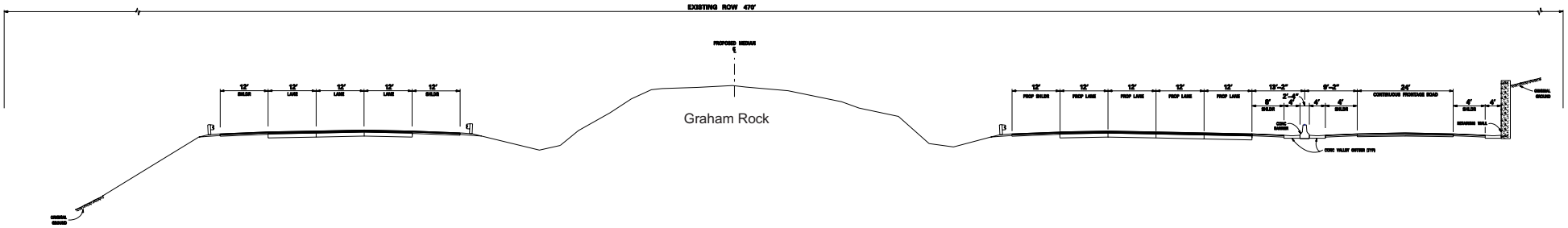
1 inch equals 2,500 feet

Aerial: November 2000

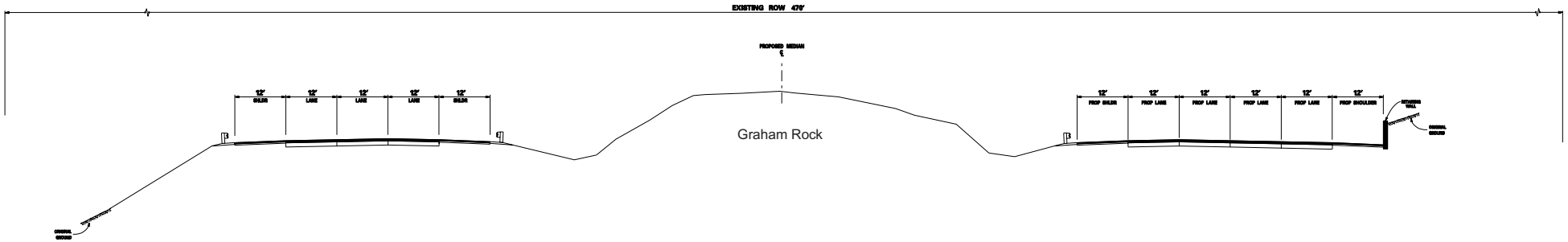
Mineola Hill
Preliminary Alternatives

EXHIBIT
II - 2

Mineola Hill Alignment - Adjacent Frontage Road



Recommended Mineola Hill Alignment - No Adjacent Frontage Road



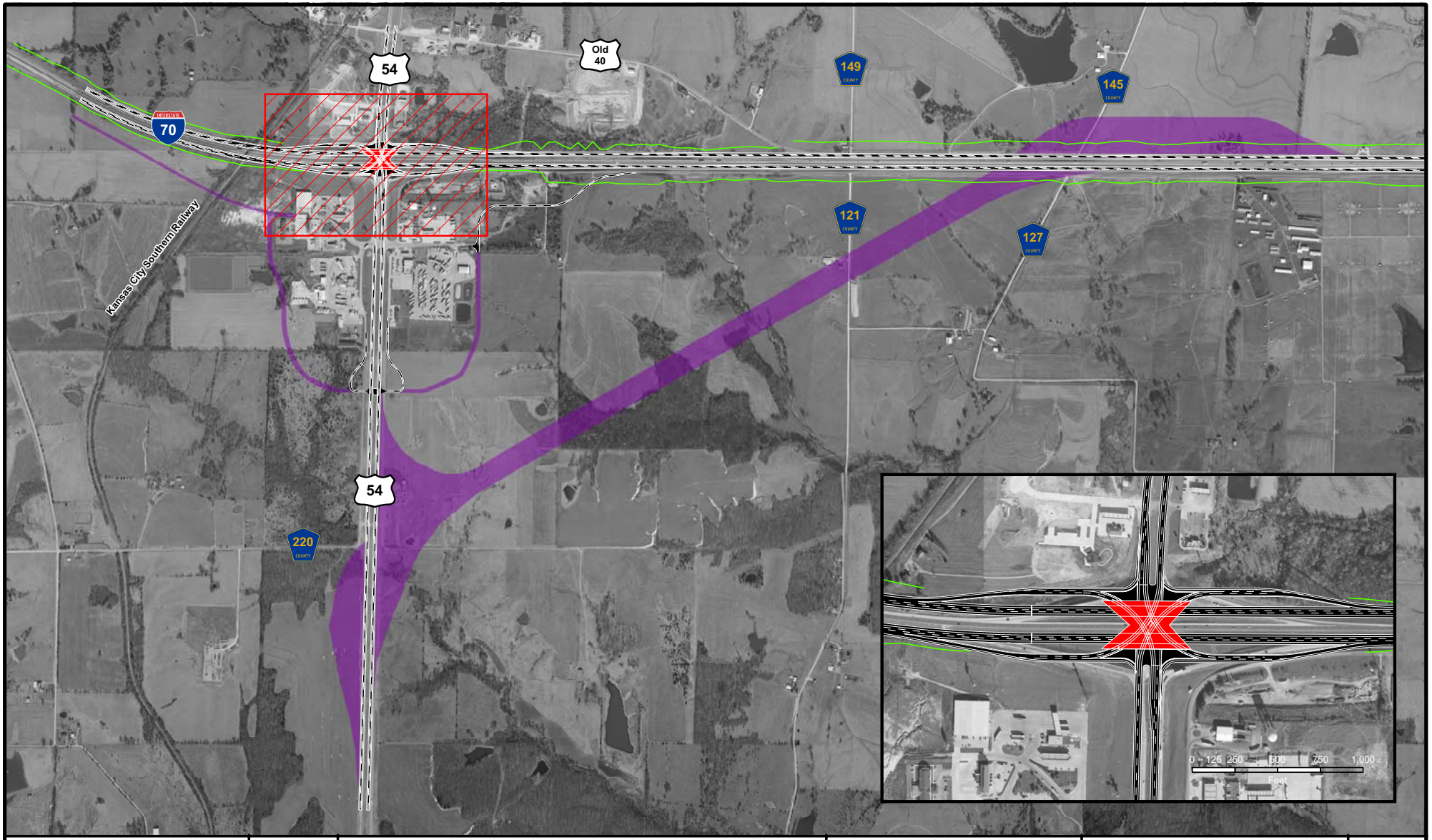
MoDOT / IMPROVE I70	SECTION 6 *Kingdom City to Montgomery City*		**Mineola Hill Alignments Typical View**	EXHIBIT **II-3**

Western Study Area (Kingdom City)

Criteria	Single Point (SPUI)	Standard Diamond
Engineering Issues		
Does the alternative meet federal and state highway design criteria?	Yes	Yes
Is the alternative constructable?	Yes	Yes
Can four-lanes of traffic be maintained on I-70 during construction?	Yes	Yes
Can Four-Lanes of traffic on Route 54 be maintained during construction?	No	Yes
What is the total increase in State roadway mileage (lane-miles)?	44 miles	44 miles
What are the anticipated construction costs?	$295.5 million	$282.9 million
How much could be saved by delaying construction of the directional movement?	$19.6 million	$19.6 million
Traffic/Safety Issues		
Does this alternative improve accident rates at the US 54 interchange?	Yes	Yes
Does this alternative affect incident management and emergency services?	No	No
Does the alternative improve traffic operations, allowing vehicles to move more freely?	Yes	Yes
Does the alternative improve travel efficiency, reducing the hours and miles traveled daily?	Yes	Yes
Does the alternative address long-term capacity needs?	Yes	Yes
Environmental Issues		
How much farmland is impacted?	280 acres	280 acres
How much parkland is impacted?	0 acres	0 acres
How much wooded forests are impacted?	65 acres	65 acres
Does the alternative impact threatened and endangered species?	No	No
Does the alternative impact water resources, stream crossings or floodplains?	25 acres	25 acres
How many weltand areas are impacted?	5 acres	5 acres
Are any natural areas, habitats or CRP property impacted?	No	No
Are there any visually sensitive resources impacted?	No	No
Are any historic structures impacted?	No	No
Are any prehistoric archaeological sites impacted by the alternative?	No	No
Are there any secondary or cumulative impacts associated with the alternatives?	Yes	Yes
Are any hazardous waste sites in the path of the alternative?	Yes	Yes
Social Issues		
How many existing residences would be directly impacted (structures)?	11	11
How many non-business landowners would be partially impacted (land only)?	102	102
Will this alternative increase the level of noise experienced nearby?	Yes	Yes
Is this alternative compatible with the community's land use plans?	Yes	Yes
Will the alternative impact the Firefighter Memorial and Tourist Center?	No	No
Will the alternative impact the new Kingdom City sewage treatment plant?	No	No
Are minority or low-income communities disproportionately impacted by the alternative?	No	No
Economic Issues		
How many businesses (full taking) would be directly impacted?	3	3
Will the alternative impact business operations during construction?	Yes	Yes
Will the alternative maintain the existing intersection on the south side of the interstate?	No	No
Will the alternative create out-of-distance travel to businesses after construction?	Yes	Yes
Will the alternative maintain the visibility of existing businesses?	Yes	Yes
Does the alternative impact all the businesses equitably?	Yes	Yes

Eastern Study Area (Mineola Hill)

Criteria	On-Existing	Far North
Engineering Issues		
Does the alternative meet federal and state highway design criteria?	Yes	Yes
Is the alternative constructable?	Yes	Yes
Can four-lanes of traffic be maintained on I-70 during construction?	Yes	Yes
Are there frontage roads on both sides of the facility?	No	Yes
What is the total increase in State roadway mileage (lane-miles)?	22 miles	54 miles
What are the anticipated construction costs?	$164.2 million	$239.9 million
Traffic/Safety Issues		
Does this alternative affect incident management and emergency services?	No	No
Does the alternative improve traffic operations, allowing vehicles to move more freely?	Yes	Yes
Does the alternative improve travel efficiency, reducing the hours and miles traveled daily?	Yes	Yes
Does the alternative address long-term capacity needs?	Yes	Yes
Environmental Issues		
How much farmland is impacted?	105 acres	220 acres
How much parkland is impacted?	0 acres	0 acres
How much wooded forests are impacted?	50 acres	275 acres
Does the alternative impact threatened and endangered species?	No	No
Does the alternative impact water resources, stream crossings or floodplains?	<5 acres	45 acres
How many acres of weltands areas are impacted?	5 acres	15 acres
Are there any visually sensitive resources impacted?	Yes	Yes
Are any historic structures impacted?	No	No
Is the Graham Family Farm directly impacted?	No	No
Is Graham Cave State Park directly impacted?	No	No
Is Slave Rock directly impacted?	No	No
Are any prehistoric archaeological sites impacted by the alternative?	No	No
Are there any secondary or cumulative impacts associated with the alternatives?	Yes	Yes
Are any hazardous waste sites in the path of the alternative?	No	No
Social and Economic Issues		
How many existing residences would be directly impacted (structures)?	6	6
How many non-business landowners would be partially impacted (land only)?	71	57
Will this alternative increase the level of noise experienced nearby?	Yes	Yes
Are minority or low-income communities disproportionately impacted by the alternative?	No	No
How many businesses (full taking) would be directly impacted?	2	1



MoDOT

IMPROVE i70

SECTION
6
Kingdom City to Montgomery City

Legend

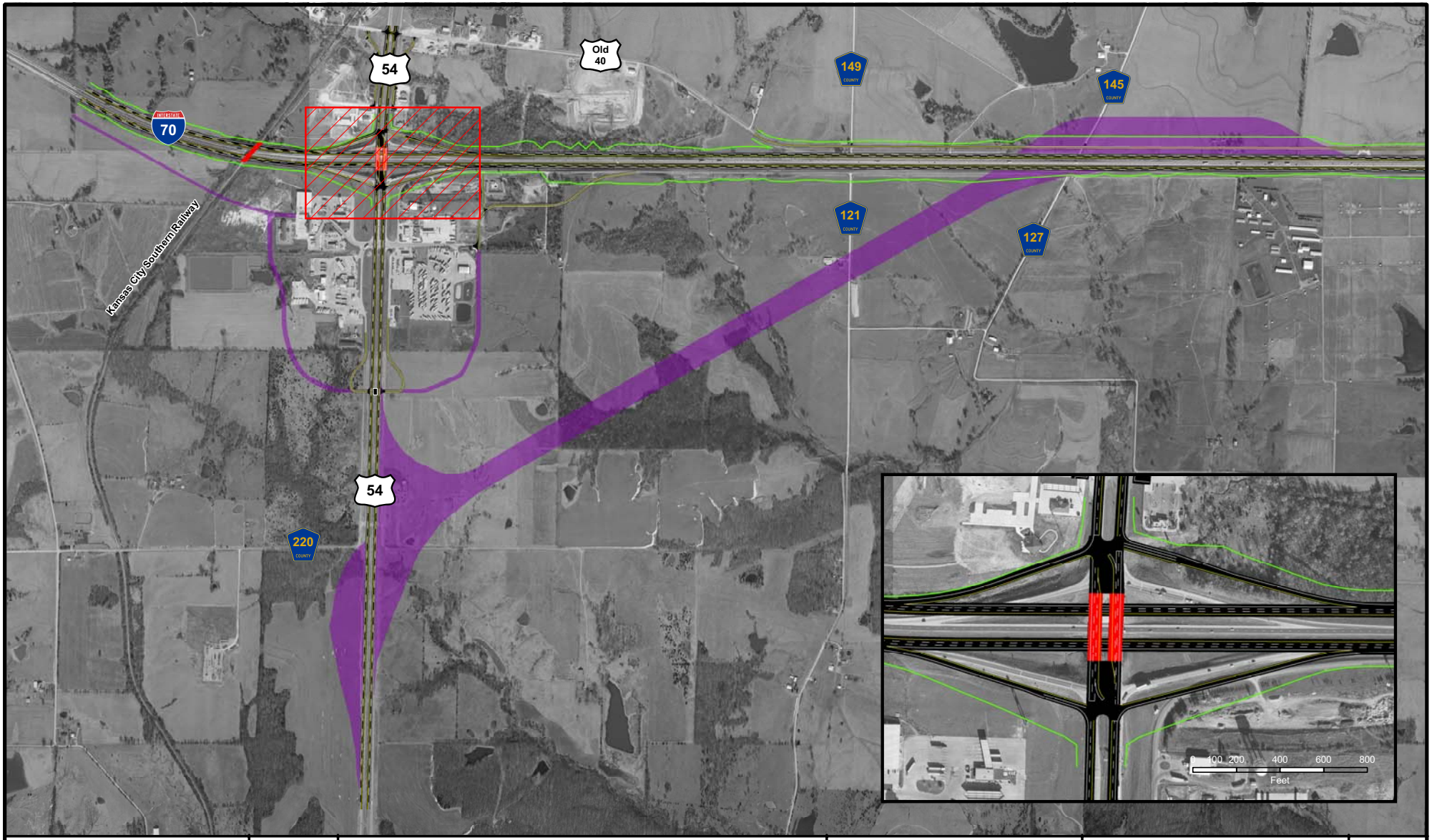
- Alternative
- Limits of Construction (Approx)
- Bridge
- Future Construction

1 inch equals 1,200 feet

Aerial: November 2000

Single Point Interchange (SPUI)

EXHIBIT
II - 5



MoDOT

IMPROVE i70

SECTION 6
Kingdom City to Montgomery City

Legend

- Alternative
- Limits of Construction (Approx)
- Bridge
- Future Construction

1 inch equals 1,200 feet

Aerial: November 2000

Standard Diamond Interchange

EXHIBIT
II - 6

MoDOT

IMPROVE i70

SECTION
6
Kingdom City
to
Montgomery City

Legend

Stage 1 Construction: Maintain traffic on existing eastbound and westbound lanes. Construct proposed westbound lanes, gapping out section that overlaps existing Interstate 70.

Stage 2 Construction: Maintain eastbound traffic on existing westbound lanes, utilizing temporary pavement shown in yellow. Maintain westbound traffic on newly constructed lanes utilizing temporary pavement shown in orange. Construct proposed eastbound lanes.

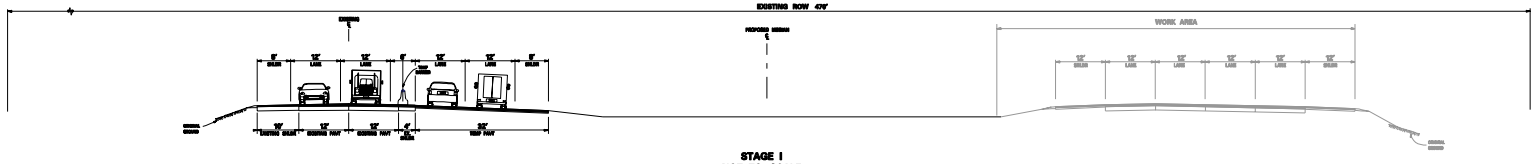
Stage 3 Construction: Maintain eastbound traffic on newly constructed eastbound lanes. Maintain westbound traffic on new westbound lanes utilizing temp pavement shown in orange. Construct gapped out sections of proposed westbound lanes.

1 inch equals 400 feet

Aerial: November 2000

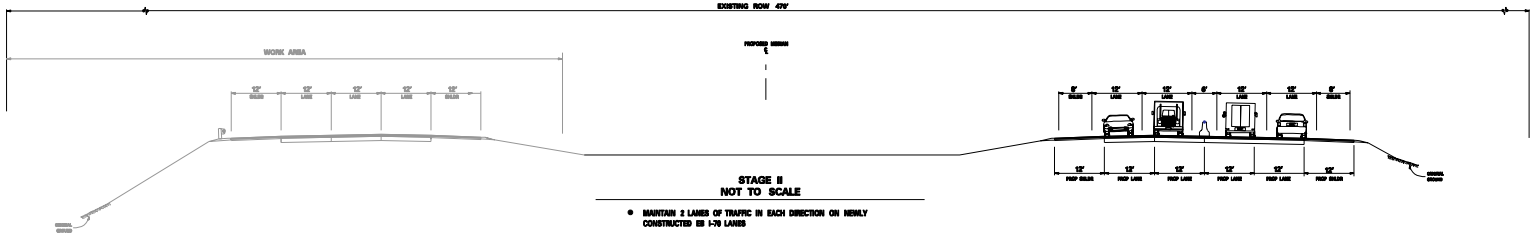
Route JJ to Auxvasse Creek Maintenance of Traffic Plan

EXHIBIT
II - 7



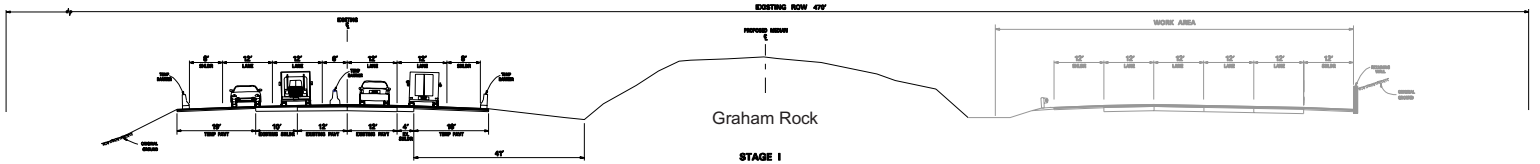
STAGE I
NOT TO SCALE

- MAINTAIN 2 LANES OF TRAFFIC IN EACH DIRECTION ON EXISTING WB I-70 UTILIZING TEMPORARY PAVEMENT
- TEMPORARY BRIDGE WIDENING WILL BE NECESSARY ON WB I-70 MAINLINE OVER THE LOUTRE RIVER IN ORDER TO MAINTAIN 2 LANES OF TRAFFIC IN EACH DIRECTION
- CONSTRUCT 4-LANE EB I-70 CROSS-SECTION



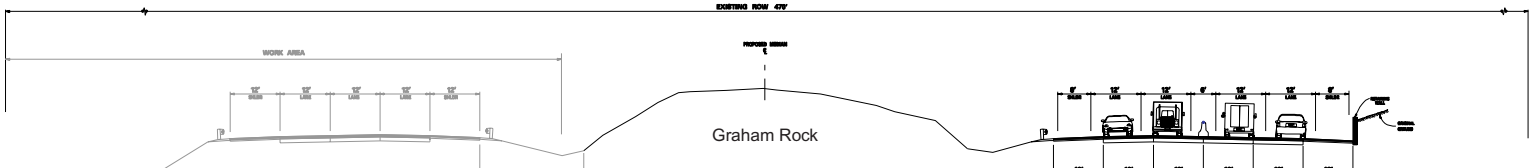
STAGE II
NOT TO SCALE

- MAINTAIN 2 LANES OF TRAFFIC IN EACH DIRECTION ON NEWLY CONSTRUCTED EB I-70 LANES
- CONSTRUCT 3-LANE WB I-70 CROSS-SECTION
- NEW EB I-70 MAINLINE BRIDGE OVER LOUTRE RIVER WILL ACCOMODATE 2-LANES OF TRAFFIC IN EACH DIRECTION WITH 5' SHOULDERS



STAGE I
NOT TO SCALE

- MAINTAIN 2 LANES OF TRAFFIC IN EACH DIRECTION ON EXISTING WB I-70 UTILIZING TEMPORARY PAVEMENT
- TEMPORARY BRIDGE WIDENING WILL BE NECESSARY ON WB I-70 MAINLINE OVER THE LOUTRE RIVER IN ORDER TO MAINTAIN 2 LANES OF TRAFFIC IN EACH DIRECTION
- CONSTRUCT 4-LANE EB I-70 CROSS-SECTION



STAGE II
NOT TO SCALE

- MAINTAIN 2 LANES OF TRAFFIC IN EACH DIRECTION ON NEWLY CONSTRUCTED EB I-70 LANES
- CONSTRUCT 3-LANE WB I-70 CROSS-SECTION

MoDOT / IMPROVE I-70	SECTION 6 *Kingdom City to Montgomery City*		**Mineola Hill Preferred Alternative Maintenance of Traffic Plan**	EXHIBIT **II-8**