Alternative Analysis Technical Report

ArDOT Job No. CA0602

I-30 (From I-530/I-440 to I-40) and
I-40 (From Hwy. 365/MacArthur Dr. to Hwy. 67)

Pulaski County, Arkansas

March 2018

U.S. Department of Transportation
Federal Highway Administration

ARDOT
ARKANSAS DEPARTMENT OF TRANSPORTATION

CONNECTING ARKANSAS PROGRAM
CAP

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1.0 **PROJECT DESCRIPTION**

Approved by Arkansas voters, the Arkansas Department of Transportation (ArDOT) is implementing an accelerated State Highway Construction and Improvement Program named the Connecting Arkansas Program (CAP).

A major component of the CAP is to implement a project to improve a portion of Interstate 30 (I-30) from Interstate 530 (I-530) and Interstate 440 (I-440) to Interstate 40 (I-40), including the Arkansas River Bridge, and a portion of I-40 from Highway (Hwy.) 365 (MacArthur Drive [Dr.]) to Hwy. 67. This project is CA0602: I-530 - Hwy. 67 (Widening & Reconst.) (I-30 & I-40), commonly known as 30 Crossing project. **Figure 1** illustrates the proposed 7.3-mile project limits.

1.1 Existing Facility

I-30 is one of the critical links of the Central Arkansas Freeway System. It connects communities within the Central Arkansas Region and serves local, regional and national travelers with varied destinations and trip purposes.

The I-30 corridor generally consists of three main lanes in each direction with parallel one-way discontinuous frontage roads on each side of the interstate. In the northern portion of the project limits, the I-40 corridor consists of three to four main lanes in each direction with parallel one-way frontage roads on each side of the interstate between the I-30/I-40 interchange and North Hills Boulevard (Blvd.). Within the 7.3-mile corridor, four system interchanges are located:

- I-30 with I-530 and I-440
- I-30 with I-630
- I-30 with I-40
- I-40 with Highways 67/167

Interchanges and grade separations in the project area are listed in **Table 1** from south to north on I-30, and west to east on I-40. The Union Pacific Railroad (UPRR) crosses the study area at two locations.

The I-30 Bridge over the Arkansas River (herein referred to as the Arkansas River Bridge) connects Little Rock with North Little Rock. This portion of the Arkansas River is also known as the McClellan-Kerr Arkansas River Navigation System (MKARNS) and provides a transportation channel from Oklahoma to the Mississippi River. The MKARNS provided a conduit for approximately 11.5 million tons of barge traffic in 2016. The Arkansas River Bridge is located at Mile 118.5 on the MKARNS, between the David D. Terry lock and Murray lock. These locks can accommodate a single barge as large as 108 feet wide by 585 feet long. The existing horizontal clearance in the navigational channel at the Arkansas River Bridge is 174.5 feet, and the vertical clearance above the navigational pool (Pool 6) is 65.6 feet.

FIGURE 1: PROJECT LIMITS

Table 1: Interchanges and Grade Separations in the Project Area

Interchange	Type	Pedestrian Crossing
I-30/I-440/I-530	System to System Fully Directional	No
I-30/UPRR	Overpass	No
I-30/East Roosevelt Road	Partial Diamond	Yes
I-30/East 21st Street	Underpass	Yes
I-30/East 17th Street	Overpass	Yes
I-30/I-630	System to System Fully Directional	No
I-30/East 9th Street	Underpass	Yes
I-30/ East 6th Street	Partial Diamond	Yes
I-30/East 4th Street	Overpass	Yes
I-30/East 3rd Street	Overpass	Yes
I-30/ East 2nd Street	Modified trumpet	Yes
I-30/East Markham Street	Overpass	Yes
I-30/East Riverfront Drive	Overpass	Yes
I-30/East Washington Avenue	Overpass	Yes
I-30/East Broadway Street	Partial Diamond	Yes
I-30/Bishop Lindsey Avenue	Partial Diamond	Yes
I-30/9th Street	Overpass	Yes
I-30/UPRR	Overpass	No
I-30/13th Street	Overpass	Yes
I-30/Curtis Sykes Drive	Diamond	Yes
I-30/19th Street	Overpass	Yes
I-30/I-40	System to System Fully Directional	No
I-40/J.F.K. Boulevard	Partial Cloverleaf	Yes
I-40/Pike Avenue/MacArthur Drive (HWY 365)/UPRR	Overpass and Partial Diamond	Yes
I-40/North Hills Boulevard	Partial Cloverleaf	No
I-40/Hwy 67/167	System to System Fully Directional	No

Source: Project Schematics, April 2016

There is one bus route run by a public transit system (Rock Region Metro, formerly Central Arkansas Transit Authority, or CATA) that uses the corridor, with five trips per day. Pedestrian facilities are well developed in the project area, with the two closest bridges to the Arkansas River Bridge being pedestrian-only bridges. There is also a network of bicycle facilities, including the Arkansas River Trail, which crosses the corridor along both sides of the Arkansas River. North Hills Blvd. does not have sidewalks included in the overpass over I-40 and is the only local street that does not allow pedestrians to cross I-30 or I-40 within the project area.

2.0 PURPOSE AND NEED AND STUDY GOALS

The following sections provide a description of the purpose and need for the project (**Table 2**) and a summary of the project goals that were established through public involvement during the PEL Study. For more information, refer to *Purpose and Need Report, of the PEL Study*.

Table 2: Purpose and Need

Needs (Problems)	Purpose (Solutions)
Traffic congestion	To improve mobility on I-30 and I-40 by providing comprehensive solutions that improve travel speed and travel time to downtown North Little Rock and Little Rock and accommodate the expected increase in traffic demand. I-30 provides essential access to other major statewide transportation corridors, serves local and regional travelers and connects residential, commercial and employment centers.
Roadway Safety	To improve travel safety within and across the I-30 corridor by eliminating and/or improving inadequate design features.
Structural and Functional Roadway Deficiencies	To improve I-30 roadway conditions and functional ratings.
Navigational Safety	To improve navigational safety on the Arkansas River Bridge by eliminating and/or improving inadequate design features.
Structural and Functional Bridge Deficiencies	To improve conditions and functional ratings of bridges within the project study area, including the structurally deficient Arkansas River Bridge, North Locust Street Bridge over UPRR, EB and WB I-30 over UPRR on the south side of the Arkansas River, and WB I-30 over UPRR on the north side of the Arkansas River.; Functionally obsolete bridges will be repaired or replaced as funding allows.

Source: PEL Study, 2014, and ArDOT Structure Inventory and Appraisal (SI&A) Form, 2017

2.1 Study Goals

During the PEL Study process, the public and participating agencies were given the opportunity to provide input on the goals of the project, as documented in *Appendix C of the PEL Study, Outreach*. These are listed below:

- Improve opportunity for east-west connectivity;
- Enhance mobility;
- Improve local vehicle access to and from downtown Little Rock/North Little Rock;
- Connect bicycle/pedestrian friendly facilities across I-30/I-40;
- Accommodate existing transit and future transit;
- Improve system reliability;
- Minimize roadway disruptions during construction;
- Minimize river navigation disruptions during/after construction;
- Follow through on commitment to voters to improve I-30 as part of the CAP;
- Maximize cost efficiency;
- Optimize opportunities for economic development;
- Avoid and/or minimize impacts to the human and natural environment, including
- historic and archeological resources;
- Sustain public support for the I-30 Corridor improvements; and
- Improve safety.

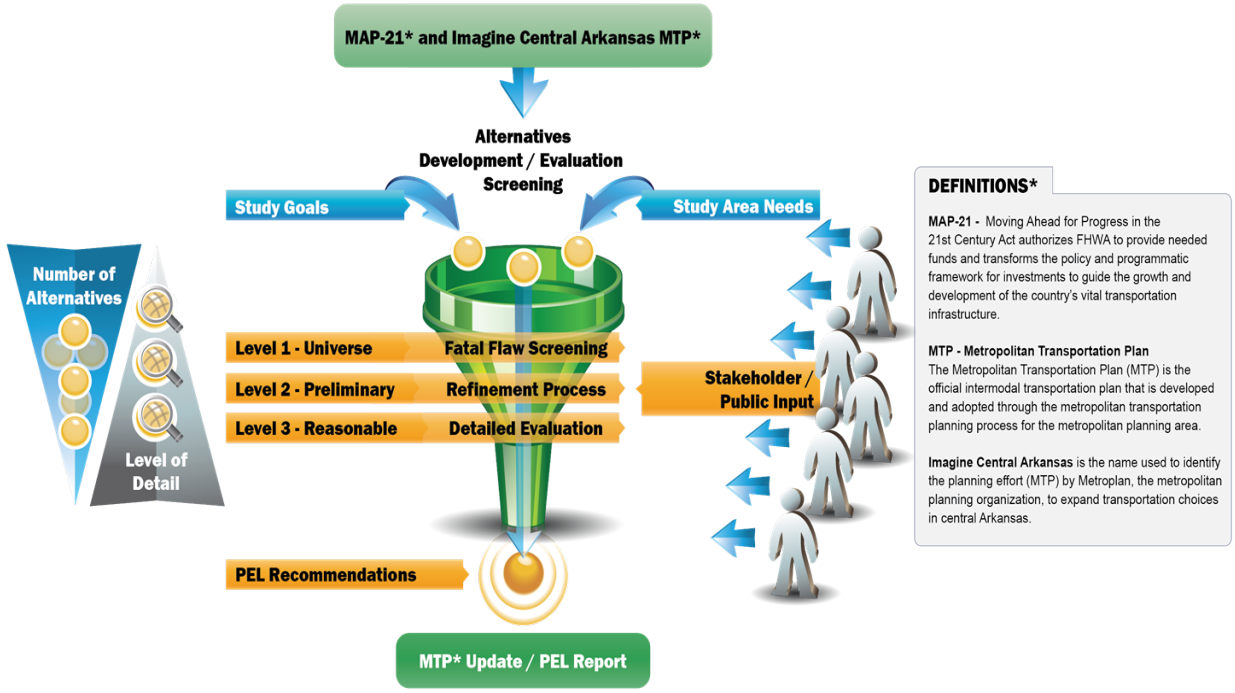
These study goals were included in the alternative evaluation process. Alternatives were scored based on how well they met the project purpose and need and study goals.

3.0 ALTERNATIVE SELECTION PROCESS DURING THE PEL STUDY

This National Environmental Policy Act (NEPA) study is a continuation of the I-30 Planning and Environmental Linkages Study, hereafter referred to as the PEL Study, begun in April 2014 by ArDOT. The PEL Study identified the purpose and need for improvements to I-30 and evaluated possible viable alternatives that could be carried forward into this NEPA study. The identified method of delivery of the project is Design-Build.

Alternatives were developed in the PEL Study process in accordance with the *Alternatives Analysis White Paper (September 2010)* produced by FHWA. Various alternatives were developed to address the project purpose and need and study goals described in **Section 2.0**. Each alternative was screened based on effectiveness in meeting the project purpose and need, feasibility and cost, environmental impacts, and public input. The methodology for screening alternatives was thoroughly detailed. For a complete description of the PEL Study alternative evaluation process, refer to the *PEL Study Alternatives Development and Evaluation, Appendix D*. A graphic depiction of the screening process is shown in **Figure 2**.

FIGURE 2: PEL STUDY ALTERNATIVE SCREENING PROCESS



3.1 PEL Study Screening Process

The PEL Study involved the evaluation of a broad range of 43 potential modes and strategies, as well as the No Action Alternative. These alternatives were developed by the study team, drawing upon previous planning efforts, with help from the Technical Working Group (TWG), stakeholders and the public. The TWG is composed of representatives of 37 agencies with an interest in the project. The Universe of Alternatives included Highway Build Alternatives (**Figure 3**), Arkansas River Bridge Alternatives (**Figure 4**), Other Mode Alternatives (**Figure 5**), Congestion Management Alternatives (**Figure 6**), and Non-Recurring Congestion Management Alternatives (**Figure 7**).

FIGURE 3: HIGHWAY BUILD ALTERNATIVES

FIGURE 4: I-30 ARKANSAS RIVER BRIDGE ALTERNATIVES

FIGURE 5: OTHER MODE ALTERNATIVES

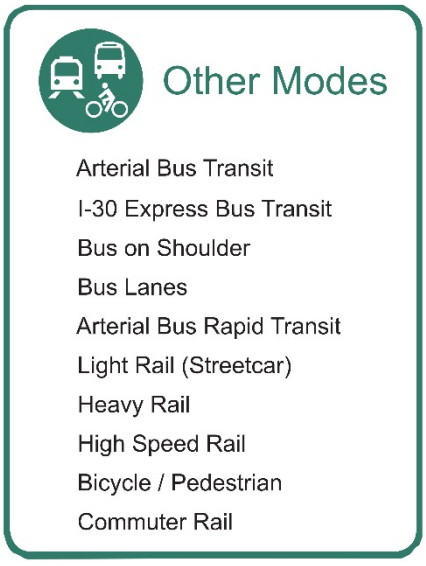


FIGURE 6: CONGESTION MANAGEMENT ALTERNATIVES

FIGURE 7: NON-RECURRING CONGESTION MANAGEMENT ALTERNATIVES

Alternatives that were deemed to either not meet the purpose and need of the project, or to be impractical, based on either environmental impacts or costs that are so high as to make the alternative infeasible, were considered to have a "fatal flaw" and were screened out. Action Alternatives that were considered to have the potential to have a positive impact on the facility were carried into NEPA as Primary Alternatives. Action Alternatives that could enhance the effectiveness of the primary alternatives were carried into NEPA as Complementary Alternatives.

3.2 Alternatives Screened Out During the PEL Study

- The Elevated Lanes (Roadway) Alternative was eliminated because of high cost.
- The Dedicated Truck Lanes/Ramps Alternative was eliminated because it would have minimal effect due to the minimal amount of truck traffic.
- The I-30 Arkansas River Bridge Elevated Lanes Alternative was eliminated because of high cost.
- The Heavy Rail and High Speed Rail Alternatives were eliminated because of high cost.
- The Rehabilitation of the Arkansas River Bridge Alternative was eliminated because the Bridge is in very poor condition, rehabilitation would be very costly, and navigational issues would not be addressed.
- The Light Rail and Commuter Rail Alternatives were eliminated because they are not in Metroplan's Long Range Metropolitan Transportation Plan (LRMTP) and there is no dedicated funding source.
- The Managed Lanes Alternative was screened out because of cost, safety concerns, and environmental justice concerns.

- The Reversible Lanes Alternative was screened out because of cost and safety concerns.
- The Hard Shoulder Running Alternative was screened out because of potential conflicts with emergency safety and conflicts with the recommended Bus on Shoulder alternative).
- The Land Use Policy Alternative was screened out because the region's adopted land use policies are already considered in the traffic forecasts for the project.

Bypass routes were evaluated during the PEL Study but were also screened out. In general, bypass routes do not meet the purpose and need of the project because they do not address operational and safety issues along I-30 and I-40, structural and functional roadway issues along I-30 and I-40, and structural and navigational issues with the I-30 Arkansas River Bridge. Construction of a bypass route would divert funds away from improvements to I-30, which would prevent the roadway safety issues, roadway and bridge structural and functional deficiencies, and bridge navigational issues, from being addressed by the project. Bypass routes were evaluated to see if they could provide traffic congestion relief to the I-30 corridor.

A new parallel route to I-30, the Pike Avenue extension (**Figure 8**), was included in the Central Arkansas Regional Transportation Study (CARTS) Areawide Freeway Study, Phase 1, Arkansas River Crossing Study, in 2003. The Pike Avenue extension was conceived as originating at either I-630 or 7th Street, and terminating at the Pike Avenue roundabout in North Little Rock. The existing Pike Avenue would then provide a connection to I-40. The intent of the Pike Avenue extension was primarily to connect the Capitol area of Little Rock directly to Pike Avenue in North Little Rock. The connection to I-630 would create operational issues, as it is located within 1000 feet of the existing Woodrow Street interchange. Terminating the bypass at 7th Street would solve that problem, but this would not be an efficient connection to I-630. In addition, there is a highly contaminated hazardous waste site just south of the Pike Avenue roundabout that would be impacted. Because of the costs and environmental impacts of this potential bypass route, and the fact that it would not provide an efficient connection between I-630 and I-40, it was not considered to be a reasonable alternative to improving I-30.

The Chester Street extension (**Figure 9**) was suggested by the public during the PEL Study as a possible alternative to the Pike Avenue extension. The intent would be to widen and improve South Chester Street along its current alignment from its interchange with I-630 to LaHarpe Boulevard, then extend North Chester Street across the Arkansas River and tie into Riverfront Drive just east of the UPRR overpass in North Little Rock. Its primary benefit would be in providing an additional connection between Little Rock and North Little Rock; it would not provide an efficient connection between I-630 and I-40. This project would require the acquisition of land from approximately nine businesses in Little Rock and would divide the downtown Little Rock commercial district between West 8th Street and West Markham Street. An analysis of the Chester Street bypass route was done during the PEL Study (*PEL Study Report Attachment F, Traffic and Safety*), using Metroplan's Travel Demand model. The analysis showed that the bypass route would only remove 3.5% of the traffic from I-30. Therefore, the Chester Street bypass route would not meet the traffic congestion component of the project purpose and need.

FIGURE 8: PIKE AVENUE EXTENSION BYPASS ROUTE

FIGURE 9: CHESTER STREET BYPASS ROUTE

3.3 Action Alternatives Carried Forward as Complementary Alternatives

Complementary alternatives were evaluated individually or as a group to determine if mobility could be improved by their implementation. Complementary alternatives identified in Level 2A of the PEL Study were:

- Highway Build – Main Lane Pavement Rehabilitation, Auxiliary Lanes, Frontage Road Improvements, Intersection Improvements, Ramp Consolidation/Elimination, Roadway Shoulder Improvements, Horizontal/Vertical Curve Improvements, Bottleneck Removal
- Other Modes – Arterial Bus Transit, I-30 Express Bus Transit, Bus on Shoulder, Arterial Bus Lanes, Arterial Bus Rapid Transit, Bicycle/Pedestrian
- Congestion Management – Information Systems/Advanced Traveler Information, Ramp Metering, Travel Demand Management (TDM), Transportation System Management (TSM), Wayfinding/signage, Arterial Improvements
- Non-Recurring Congestion – Crash Investigation Sites, Roadside/Motorist Assist Enhancements, Improvements to Detour Routes, Variable Speed Limits (Speed Harmonization), Queue Warning

The transit alternatives were considered as complementary rather than as a solution that could meet the congestion relief component of the project purpose and need on their own. A transit study conducted during the PEL Study indicated that transit would not divert sufficient trips from auto to transit on I-30 in 2040 to improve driving conditions. In addition, transit alternatives would not address roadway and bridge deficiencies or navigational safety, all of which are components of the project purpose and need. ArDOT supports these transit alternatives, but their implementation is the responsibility of regional transit agencies.

3.4 Action Alternatives Carried Forward as Primary Alternatives

The Primary Alternatives evaluated in the PEL Study as having the potential to be effective were assembled into Basic Scenarios for evaluation. Basic Scenarios included some variation of addition of main lanes, main lane widening and C/D roads, the complementary alternatives, and the replacement of the Arkansas River Bridge, including elimination of the pier which obstructs the navigational channel. Although it was recognized that interchange improvements would become a part of the Basic Scenarios, they were not evaluated in the PEL Study. The Basic Scenarios were:

- 6-Lane Scenario: No-Main Lane Widening
- 8-Lane Scenarios:
    - three main lanes and one main lane widening in each direction (8-lane General Purpose)
    - three main lanes and one C/D lane widening in the downtown area in each direction (8-lane Downtown C/D)
- 10-Lane Scenarios:
    - three main lanes and two main lane widening in each direction (10-lane General Purpose)

- three main lanes and two C/D lanes in the downtown area in each direction (10-lane Downtown C/D)
- 12-Lane Scenario: three main lanes and three main lane widening in each direction (12-lane General Purpose).

The Basic Scenarios were scored qualitatively based on mobility, safety, cost and environmental impacts. Fourteen mobility measures, seven safety measures, four cost measures, and thirteen environmental measures were considered. The evaluation resulted in the 6-Lane, the 8-lane General Purpose, and the 12-lane General Purpose Scenarios being screened out in Level 2B of the PEL Study. The 6-lane and the 8-lane General Purpose Scenarios did not address mobility or safety sufficiently when compared to the other alternatives. While the 12-Lane General Purpose Scenario did meet the mobility and safety goals, the cost and environmental impacts were high compared to the other alternatives. East and west alignment options scored the same, due to insignificant differences in environmental impacts.

The alternatives carried forward from Level 2B and evaluated in Level 3 were:

- No Action
- 8-Lane Downtown C/D
- 10-Lane General Purpose
- 10-Lane Downtown C/D

The three Action alternatives were enhanced by the addition of the complementary alternatives to create comprehensive transportation solutions. In addition, modifications to improve mobility and address safety concerns were made to all three Action alternatives. These enhancements consisted of:

- elimination of the weaving movement from I-30 northbound, to I-40 eastbound, to Hwy 67 northbound by addition of a right exit and flyover ramp on I-40 eastbound,
- elimination of the weaving movement from Hwy 67 southbound to I-40 westbound to I-30 southbound by addition of a right exit and flyover ramp to I-40 westbound,
- expansion of the northbound I-30 to westbound I-40 ramp to two lanes,
- completion of the southbound frontage road (North Cypress Street) between 7th Street and 13th Street, over the UPRR,
- elimination of the 15th Street interchange to relieve congestion caused by weaving between closely spaced interchanges,
- addition of a slip ramp from the northbound I-30 frontage road near Curtis Sykes to I-30 northbound,
- replacement of the Highway 10 (Cantrell Road) Interchange with a diverging diamond interchange,
- elimination of the southbound I-30 exit ramps at 6th and 9th streets,
- expansion of the I-530 to I-30 northbound section to two lanes, and
- improvements to the Broadway, I-630, and Roosevelt Road interchanges.

3.5 PEL Study Recommendations

The mobility and safety advantages of the 10-lane Downtown C/D Alternative, along with the enhanced connectivity between Little Rock and North Little Rock, led to its recommendation in the PEL Study. The recommendation was presented to the public at Public Meeting 4. FHWA concurred with the PEL Study Recommendations in August 2015 (**Attachment A**), concurred with allowing the project to proceed into NEPA, and allowed the decisions made during the PEL Study to inform the NEPA process.

During the transition from the PEL Study to NEPA, several improvements were made to the 10-lane Downtown C/D to benefit cost and mobility. These were:

- The C/D system's northern limits were moved from Curtis Sykes Avenue south to Broadway Street to increase the weaving distance between the end of the C/D system and the north terminal.
- The Arkansas River Bridge location of the 10-lane Downtown C/D Alternative was initially expected to be built as closely as possible to the centerline of the existing Bridge, requiring phased construction. The design team discovered that phase construction would have a higher cost and significant constructability issues. Consequently, east and west Arkansas River Bridge alignments were evaluated.

In addition, commitments were made to study the following design refinements:

- Improvements to the 2nd Street/Cumberland Street intersection to improve safety
- Improvements to the Highway 10 (Cantrell Road)/Cumberland Street intersection
- A corridor improvement alternative with two main lanes and three C/D lanes in each direction
- Widening and lengthening 6th Street and 9th Street overpasses to enhance east-west connectivity and bicycle and pedestrian mobility

These commitments are documented in *Appendix H of the PEL Study, PEL to NEPA Transition Report.*

4.0 NEPA ALTERNATIVES

One NEPA Action Alternative for improvement of the I-30/I-40 corridor through the study limits was developed based on the PEL Study Recommendations, the 10-lane Downtown C/D Alternative, which was eventually renamed the 6-lane with C/D Alternative, in order to more accurately describe the improvements. A second NEPA Action Alternative for improvement of the I-30/I-40 corridor through the study limits was developed in response to comments from Metroplan following Public Meeting 4: the 8-lane General Purpose Alternative (four main lanes in each direction). In the Class of Action recommendation on August 19, 2015, FHWA requested that this alternative be evaluated in the NEPA phase (**Attachment B**). As discussed in Section 3.4, this alternative had been screened out during the PEL Study because it was viewed as not addressing mobility and safety adequately. Under both corridor Action Alternatives, two alternatives for the Highway 10 Interchange were evaluated, for a total of four NEPA Action Alternatives. In addition, the No Action Alternative was evaluated.

During the NEPA phase, additional Action Alternatives, including the East Bypass, Boulevard Alternative, and 4-Lane with C/D Alternative, as well as various options for the Highway 10 Interchange, and a tunnel to carry traffic under LaHarpe Boulevard/President Clinton Avenue (East Markham Street) area, were considered.

4.1 No Action Alternative

The No Action Alternative represents the case in which the proposed project is not constructed, but could include future projects identified through the long range planning process for maintaining a state of good repair as funding becomes available. The No Action Alternative would not make any immediate improvements to the existing roadway or any bridges throughout the corridor, including the Arkansas River Bridge. With increasing population and traffic demand and no improvements to the project area, congestion will increase and ultimately decrease safety and mobility. This alternative would not improve the existing geometric deficiencies, traffic capacity limitations, safety insufficiencies, or deteriorating roadway and bridges. The No Action Alternative does not meet the purpose and need outlined for the project.

4.1.1 Advantages

Following are the advantages of the No Action Alternative:

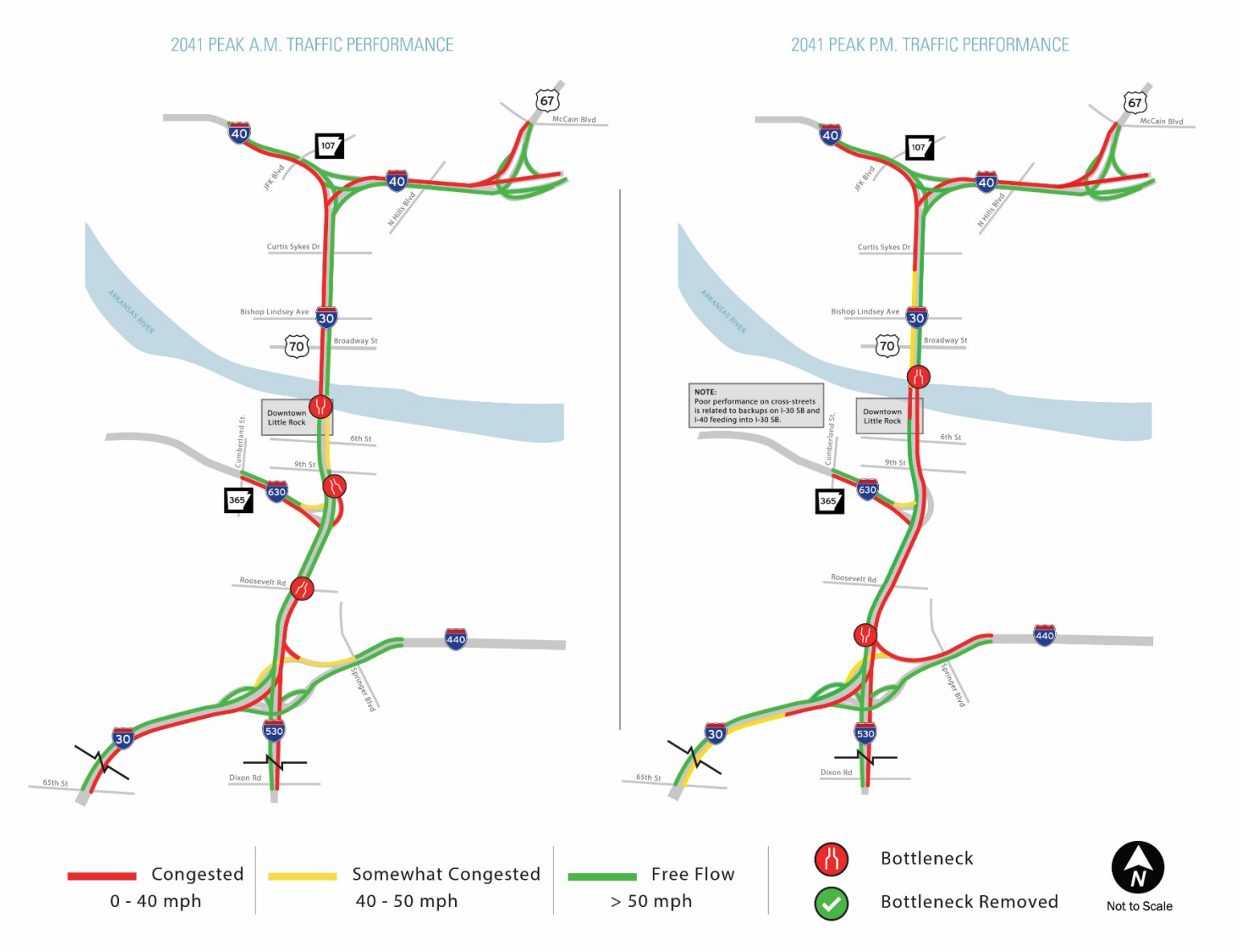
- No right-of-way (ROW) acquisition would be necessary.
- No wetland, habitat, and floodplain impacts would occur and no mitigation would be required.
- No impact to historic structures
- No disturbance to I-30, I-440, I-40, and Hwy 67 during the construction phase.

4.1.2 Disadvantages

With the No Action Alternative the project purpose and need would not be fulfilled for the following reasons:

- Mobility on I-30 and I-40 would become increasingly worse, decreasing travel speed and time (**Figures 10 and 11**). Congestion in the downtown/River Market areas of Little Rock would increase, causing socio-economic impacts.
- Travel safety across the I-30 corridor would decrease with increase of traffic.
- Structural and functional roadway deficiencies would not be addressed.
- Navigational safety would not be addressed.
- The structurally deficient and functionally deficient bridges within the corridor would not be addressed.
- East-west connectivity, including bicycle and pedestrian connectivity, would not be improved.
- Future transit opportunities would not be accommodated.
- The No Action Alternative is not consistent with area wide transportation plans.
- The No Action Alternative is not consistent with the CAP (as stated above, the CAP included a commitment to voters to improve I-30).
- Maintenance and improvement costs required to maintain the corridor in a state of good repair would be deferred to multiple other projects, resulting in increased cost and lengthy construction time.

FIGURE 10: NO ACTION ALTERNATIVE FUTURE AM AND PM TRAFFIC



4.2 Action Alternatives Considered and Rejected

4.2.1 Corridor Action Alternatives

The following alternatives were evaluated during the NEPA process to address corridor-wide needs, but were rejected for the reasons detailed below.

4.2.1.1 East Bypass

The east bypass (**Figure 11**) was suggested by the public during the NEPA Study as a possible bypass route for I-30. The intent would be to construct a new roadway between the I-30/I-630 interchange, and the I-40/Hwy 67 interchange. While no traffic analysis has been done on this route, it does have the potential to provide an efficient connection between the two interchanges. Bypasses were evaluated during the PEL Study, as discussed above in Section 3.1, and screened out, because they do not address the purpose and need for the project: operational and safety issues along I-30 and I-40, structural and functional roadway issues along I-30 and I-40, and structural and navigational issues with the I-30 Arkansas River Bridge. Bypasses were evaluated as possible ways to relieve traffic congestion on the I-30 corridor.

The primary engineering issue with this concept is the high cost of constructing a new roadway along the new alignment. This alternative would also involve a new bridge at a new location over the Arkansas River, which would present navigational concerns that would have to be addressed in order to obtain USCG approval. Finally, the corridor crosses the UPRR at a new location, which would require an easement from UPRR and be very expensive.

The primary environmental impacts from this alternative would be the impacts to environmentally sensitive areas. It would require the acquisition of businesses along 15th Street and divide two residential neighborhoods, one lying west of the Airport between East 8th and East 12th Streets, and along South Buckeye Street between East Lincoln Avenue and East Broadway Street. The communities that are impacted in Little Rock have a high minority population, while the impacted communities in North Little Rock have both large minority and low income populations. Finally, the roadway would also have significant wetland and floodplain impacts in Dark Hollow.

Because of the environmental issues with this alternative, and the fact that it would not meet the project purpose and need, it was not evaluated further.

FIGURE 11: EAST BYPASS

4.2.1.2 Boulevard Alternative

The Boulevard Action Alternative was evaluated in response to public comment following Public Meeting 5, held on October 22, 2015. Because this alternative had not been through the PEL Study screening process, it was decided to evaluate it using the same process as the other Action Alternatives, using the Level 1 PEL Study screening. The Boulevard Alternative would convert I-30 from I-630 to 13th Street in North Little Rock to an at-grade roadway with three through lanes in each direction. In addition, there would be a fourth lane to the outside that would be used as a through lane during peak periods, and used for on-street parking the remainder of the day. The I-30/I-630 interchange would be reconstructed as a roundabout. The results of the Level 1 screening are shown in **Attachment C**.

The Boulevard Alternative was screened out in Level 1 as it does not address the purpose and need for the project. Specifically, according to the Metroplan analysis, the alternative would result in increased congestion, reduced speeds and increased travel time in the project area. The alternative would result in an increase in vehicular collisions due to the increase in conflict points and signalized intersections and an increase in bicycle and pedestrian crashes. Finally, the alternative is not practicable as it would result in the removal of the interstate designation from I-30, triggering the need for additional studies to evaluate the impacts of the removal of the roadway from the interstate system.

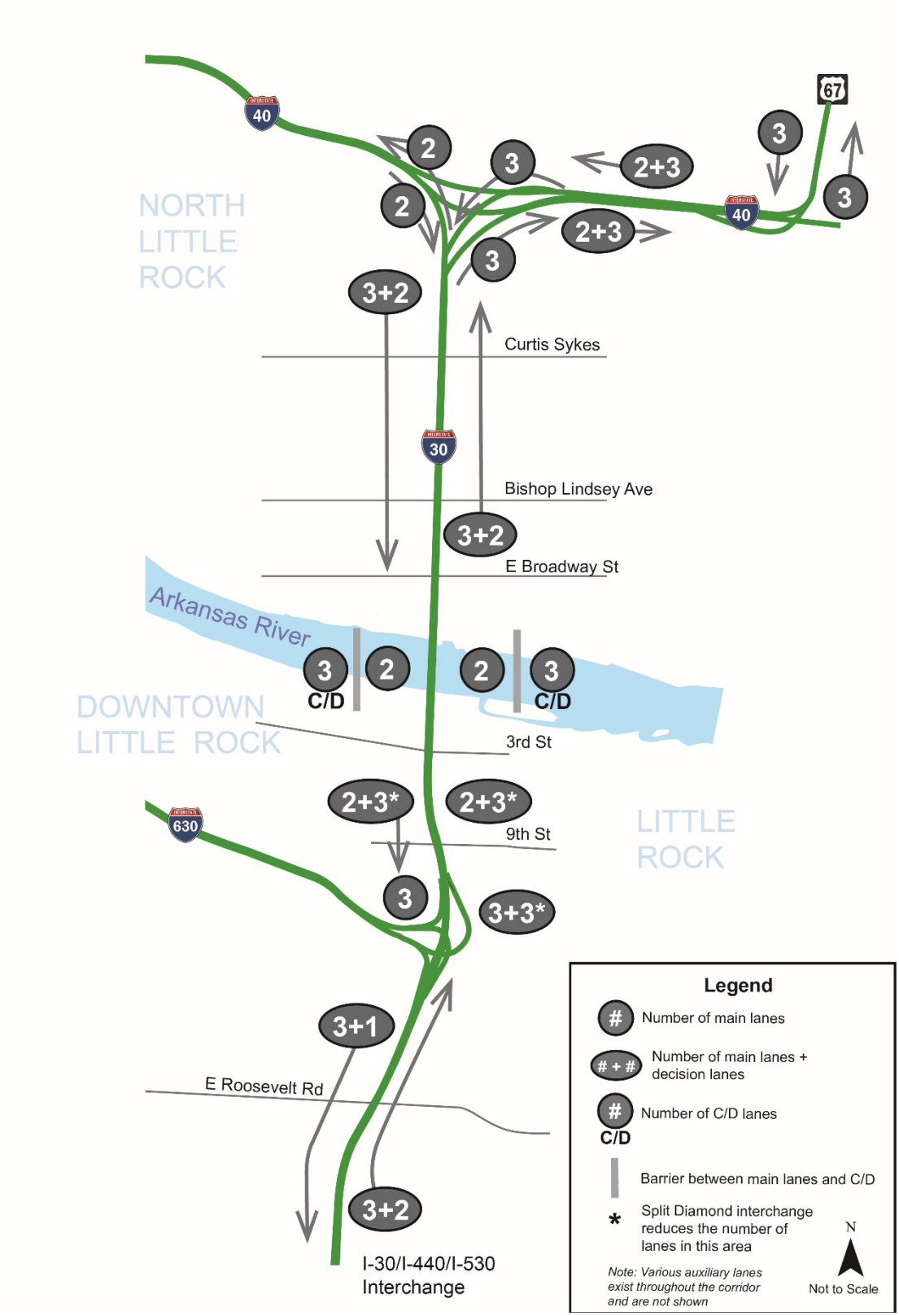
4.2.1.3 4-Lane with C/D Alternative

The commitment to evaluate the 4-Lane with C/D Alternative (**Figure 12**) was made during the transition from the PEL Study to NEPA. This corridor improvement alternative is a variation on the 10-Lane Downtown C/D Alternative (renamed the 6-Lane with C/D Alternative, as discussed in Section 4.0) in which four through lanes (two in each direction) and six C/D lanes (three in each direction) are provided through the downtown area. This alternative was developed because Metroplan's traffic modeling indicated a relatively low volume of through traffic from the southerly project limit to the I-30/I-40 interchange.

It has been determined that four through lanes will not provide sufficient capacity for the design year volume (see *Traffic Report*, *Appendix B of Environmental Assessment*). VISSIM modeling confirmed that this alternative does not provide sufficient capacity for the through movement and that speeds in the southbound direction from the Hwy. 67/McCain Boulevard Interchange to south of the Arkansas River during the AM peak are extremely slow in the design year. To solve that capacity issue, an additional lane in each direction would be needed, which would make the alternative similar to the 6-Lane with C/D Action Alternative.

There are also safety concerns resulting from dropping one of the main lanes in the approach to the downtown area (see *Safety Report, Appendix B of Environmental Assessment*). This alternative was not evaluated further as it does not meet the congestion relief or safety components of the purpose and need.

FIGURE 12: 4-LANE WITH C/D ALTERNATIVE



4.2.2 Highway 10 Interchange Options

The current Highway 10 (Cantrell Road) interchange provides direct access to the downtown business district of Little Rock. Its location, coupled with the Arkansas River Bridge and the I-30/I-630 interchange, creates a unique level of complexity. The PEL Study had assumed a diverging diamond interchange at Highway 10; however, it was recognized during the transition from the PEL Study to the NEPA phase that a thorough evaluation of options for the Highway 10 Interchange, and the intersections with Cumberland Street and 2nd Street, needed to occur.

Five interchange options were initially developed, evaluated and compared (**See Section 4.2.2.6**): the diverging diamond (PEL Study Recommendation), standard diamond, single point urban, roundabout diamond, and one-way pair. The analysis included cost, access, LOS, compliance with design criteria, vehicular east-west connectivity, visual east-west connectivity, and whether or not the interchange interfered with the portion of the River Rail Street Car line on 3rd Street.

4.2.2.1 Diverging Diamond Interchange

This PEL Study Recommendation scored low in all categories considered, except cost, resulting in an overall score that was the second lowest of the five options considered. It did not require the relocation of the portion of the River Rail Street Car (**Figure 13)** on 3rd Street.

4.2.2.2 Standard Diamond Interchange

This option scored second highest of the five options. This option had the highest cost of the five options. The very large footprint of the option resulted in ROW being needed to be acquired to the northwest, northeast, and southeast of the interchange, and the Arkansas River Bridge to be considerably wider than the other interchange options, resulting in a cost that far exceeded the other options. In addition, the portion of the River Rail Street Car on 3rd Street would be affected (**Figure 14**).

FIGURE 13: DIVERGING DIAMOND HIGHWAY 10 INTERCHANGE OPTION

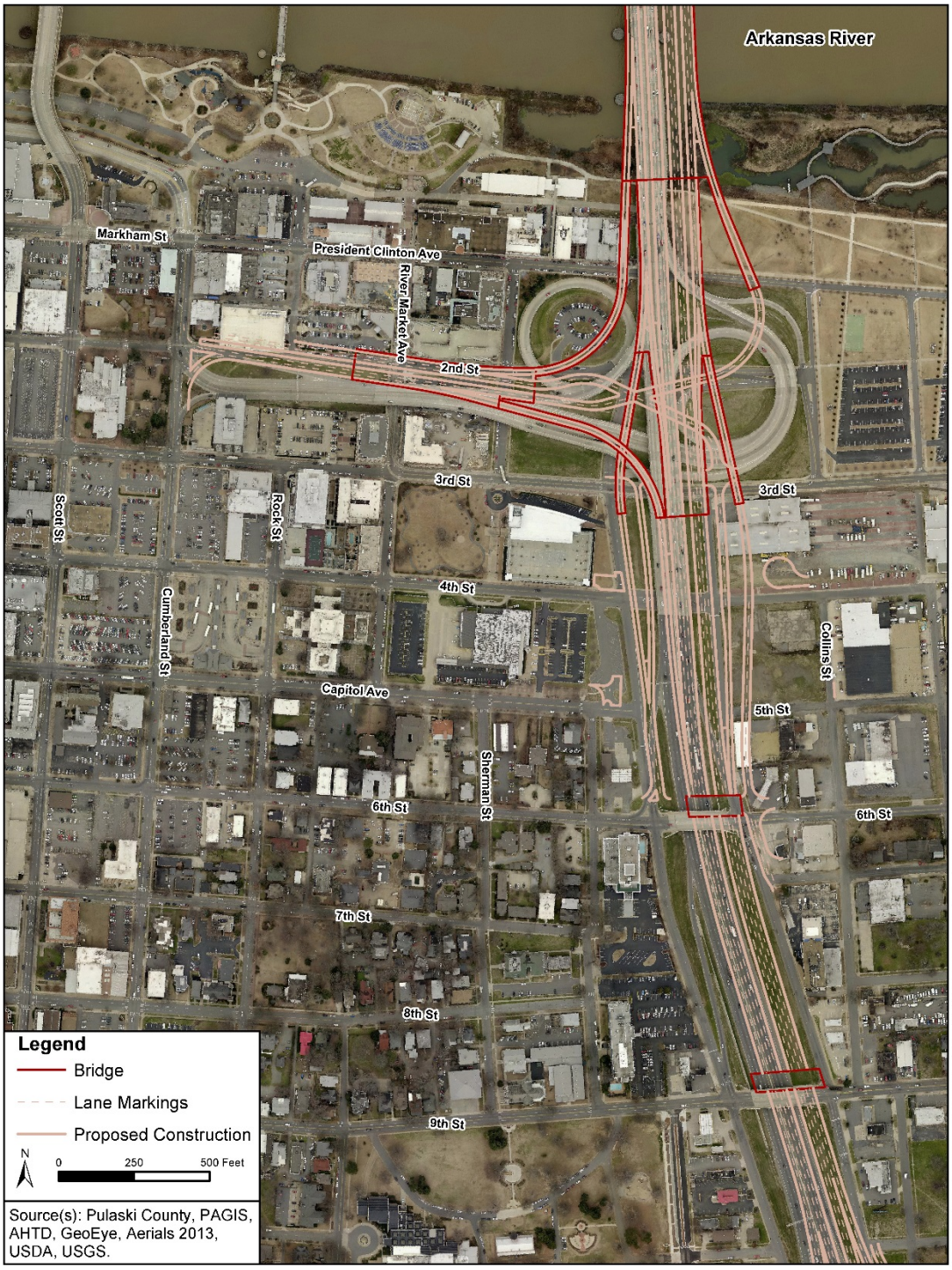
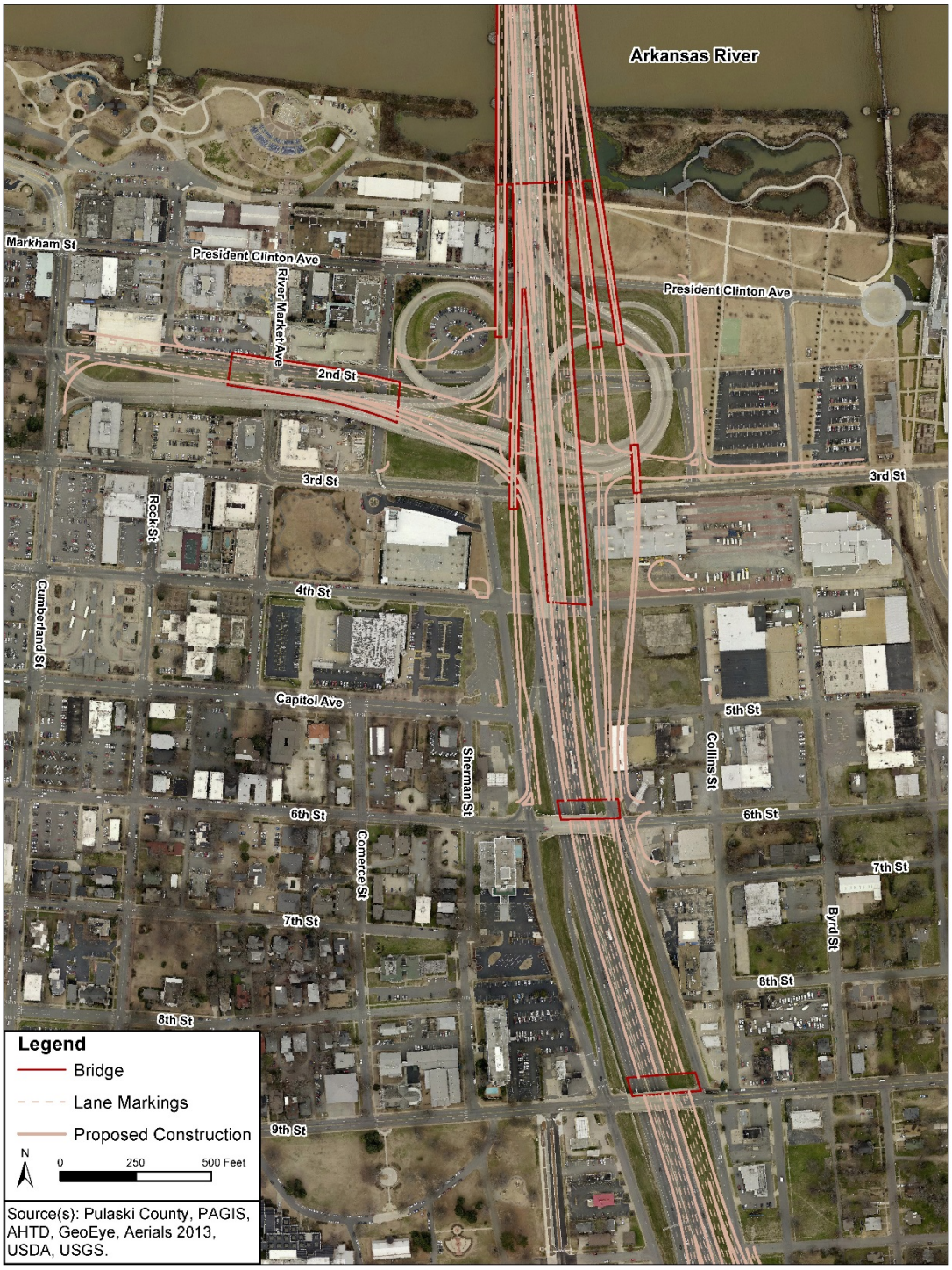


FIGURE 14: STANDARD DIAMOND HIGHWAY 10 INTERCHANGE OPTION



4.2.2.3 At-Grade Single Point Urban Interchange (SPUI).

This option scored highest of the five options. It had the second highest cost, because additional ROW would need to be acquired along the northwest, northeast, southeast, and southwest edges of the interchange (**Figure 15**). It did require the relocation of the portion of the River Rail Street Car on 3rd Street and cut off vehicular access to 4th Street.

4.2.2.4 Roundabout Diamond Interchange

This option scored third highest of the five options considered. It had the lowest LOS of the five options, and required the relocation of the portion of the River Rail Street Car on 3rd Street, but otherwise scored high in all categories (**Figure 16**).

4.2.2.5 One-Way Pair Interchange

This option scored lowest of the five options. Although the cost was among the lowest, and the portion of the River Rail Street Car on 3rd Street was not affected, it scored the lowest in all other categories (**Figure 17**). East-west connectivity would be impacted, and the ramp from 4th Street to I-30 southbound would exceed the criteria for maximum grade.

FIGURE 15: AT-GRADE SINGLE POINT HIGHWAY 10 INTERCHANGE OPTION

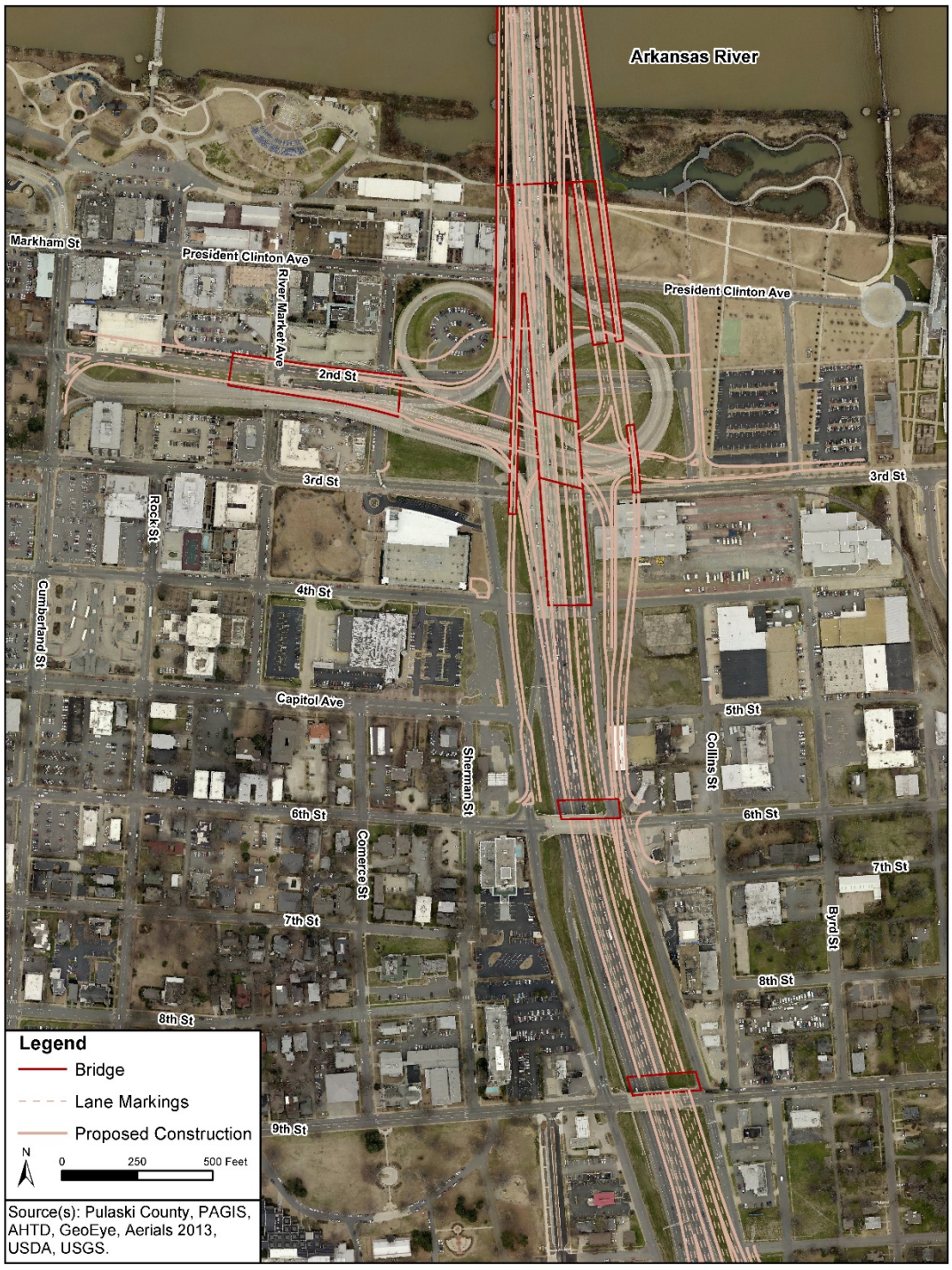


FIGURE 16: ROUNDABOUT DIAMOND HIGHWAY 10 INTERCHANGE OPTION

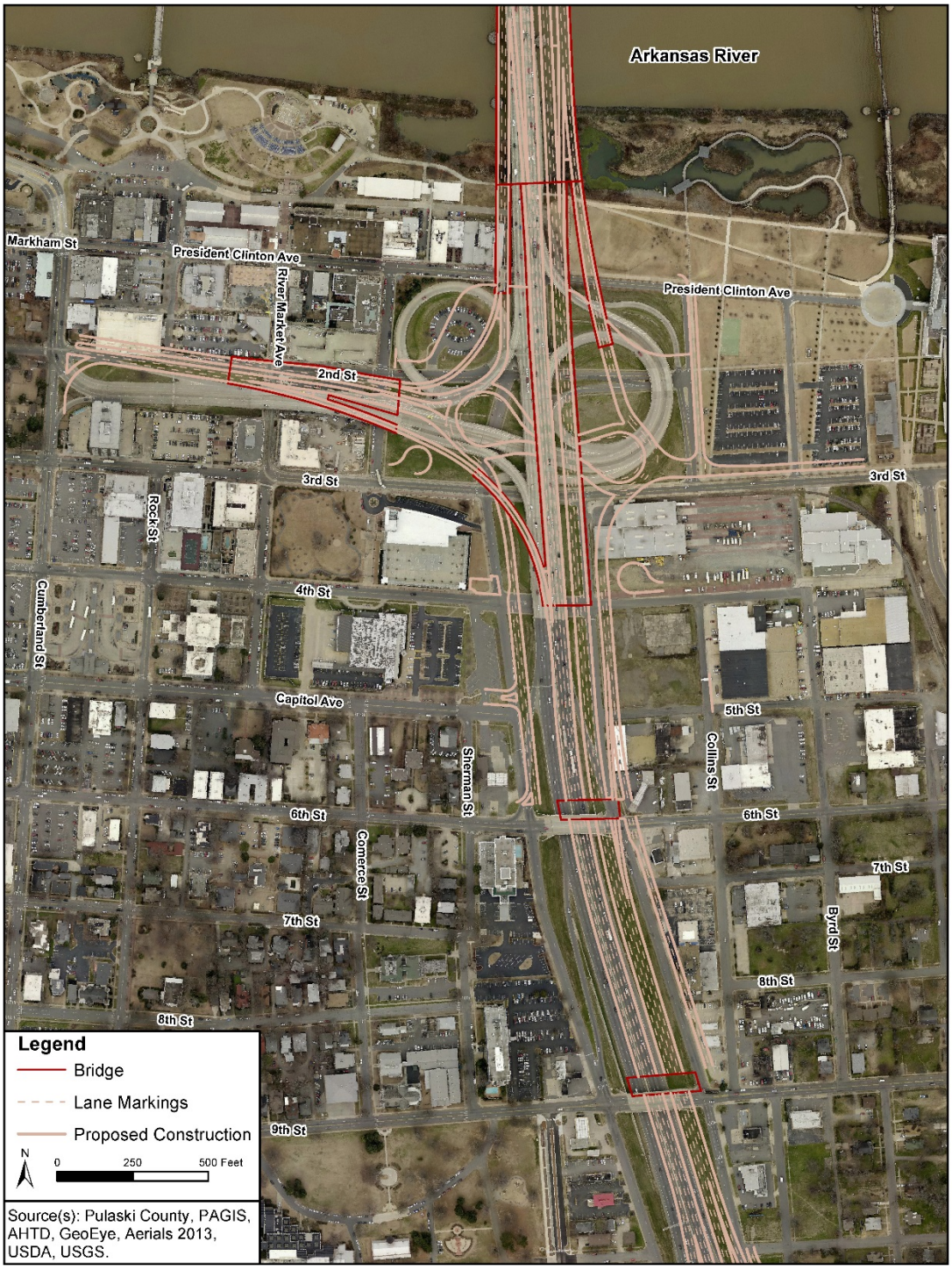
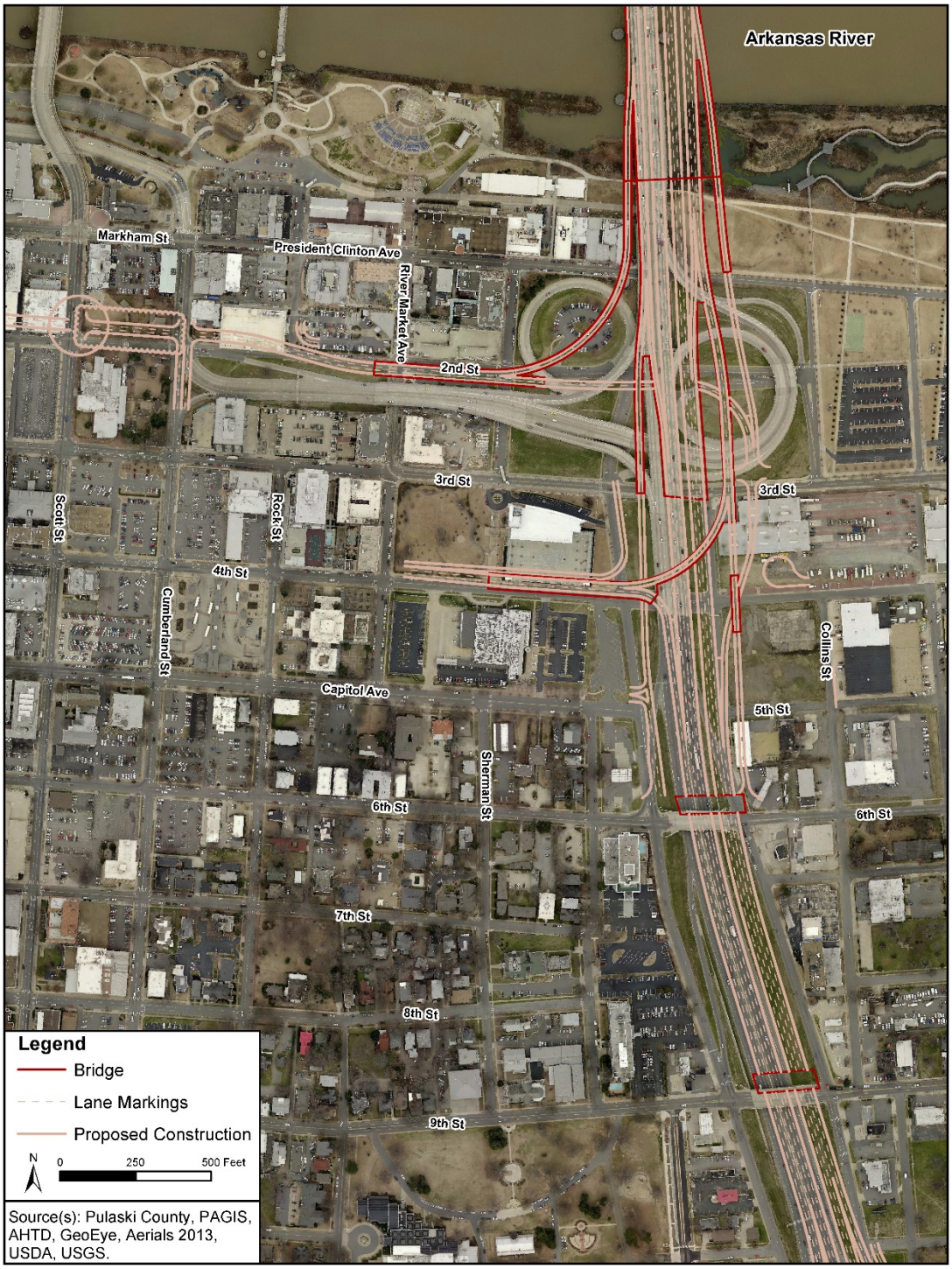


FIGURE 17: ONE-WAY PAIR HIGHWAY 10 INTERCHANGE OPTION



4.2.2.6 Preliminary Interchange Options Analysis

Based on this analysis, the single point urban (SPUI) scored highest, with the highest score representing the most desirable alternative (**Table 3**).

Table 3: Highway 10 Interchange Options Comparison

	Diverging Diamond	Diamond	At-Grade SPUI	One-Way Pair	Roundabout Diamond
Cost	$82.1 M	$101.2 M	$91.1 M	$82.3 M	$88.1 M
I-30 Access to River Market	+	+	++	+	++
I-30 Access to President Clinton Library/Heifer International	- -	+	++	-	+
Access to I-30	-	++	++	-	++
++LOS	0	0	++	-	- -
Geometrics	-	++	++	- -	++
Vehicular East-West Connectivity	-	++	++	- -	++
Visual East-West Connectivity	-	++	++	-	+
Bicycle and Pedestrian East-West Connectivity	-	- -	- -	-	- -
River Rail Streetcar Impact	++	- -	- -	-	- -
Total	-4	6	10	-6	4

++ Substantial positive effects (+2)
+ Some positive effects (+1)
0 Neutral effects (0)
- Some negative effects (-1)
-- Substantial negative effects (-2)
Source: Project team, July 2016

All five options were shown to the public at Public Meeting 5. The public expressed dissatisfaction with all of the interchange options; therefore, none were evaluated further.

4.2.2.7 Tunnel Option: LaHarpe Boulevard/President Clinton Intersection

The Tunnel Option was evaluated to respond to City of Little Rock concerns with pedestrian safety issues with the section of LaHarpe Boulevard/Cumberland Street between President Clinton Avenue/East Markham Street and East 2nd Street, which is an area with heavy pedestrian traffic. The goal was to remove traffic from LaHarpe Boulevard street level from 2nd Street to north of President Clinton Avenue., allowing that area to become a pedestrian mall. The proposed tunnel would carry a two-lane bidirectional roadway and would maintain all existing traffic movements (**Figure 18**). The proposed tunnel alignment would be within the ROW except at the north end near the Chamber of Commerce building, where the possibility exists that a taking from Julius Breckling Riverfront Park would be required. Existing road levels at the East 2nd Street intersection are a vertical constraint for the tunnel as the road descends into the tunnel from the south. The tunnel structure would need adequate clearance below the road surface to enable near surface utilities to pass above the tunnel structure. The tunnel configuration is governed by regulatory agency requirements as well as the space required for traffic operations and equipment. The US Department of Transportation FHWA Technical Manual for Design and Construction of Road Tunnels (2009) was considered in addition to the project design criteria.

In addition to the high cost, other issues with the tunnel were gradients that exceeded recommended standards, low design speed (25 mph), need for pumped drainage, utility conflicts, possible contamination, and challenging geotechnical issues. These issues led to the tunnel option being screened out from further evaluation. A tunnel option feasibility study memo (**Attachment D**) was prepared to document the analysis and decision.

FIGURE 18: TUNNEL OPTION

4.3 Action Alternatives

4.3.1 Elements Common to All Action Alternatives

4.3.1.1 Bridge Improvements

All structurally deficient bridges within the project limits, including the I-30 Bridges over UPRR in Little Rock and North Little Rock, the North Locust Street Bridge, and the I-30 Arkansas River Bridge, would be replaced or rehabilitated. Functionally obsolete bridges within the project limits would be replaced or rehabilitated as funding allows.

In a January 29, 2014 letter from ArDOT, USCG requested that the proposed I-30 Arkansas River Bridge meet a minimum horizontal clearance of 320 feet and a vertical clearance of 63.0 feet, in order to be consistent with other bridges on the Arkansas River. In an August 21, 2014, letter to ArDOT, the Arkansas Waterways Commission requested that the proposed I-30 Arkansas River Bridge meet the minimum horizontal clearance of the Junction Bridge (332 feet), and the vertical clearance of the proposed Broadway Bridge (62.4 feet). These letters are included in **Attachment E**. The proposed design of the I-30 Arkansas River Bridge provides a navigational channel meeting the minimum requirements: a horizontal clearance of 320 feet and vertical clearance of 63.0 above normal pool.

The existing navigational channel through the I-30 Arkansas River Bridge does not align with the navigational opening through the adjacent Junction and Clinton Bridges. The USCG letter also requested that the channel opening be shifted north.

The USCG letter also specified that the existing left descending navigational channel of the Arkansas River should remain clear at all times during construction. East and west alignment alternatives were evaluated for the proposed bridge. The recommended alignment is slightly to the east of the current alignment in order to minimize impacts. The maintenance of traffic scheme involves construction of a portion of the new structure to the east of the existing bridge, shifting all traffic onto the new structure, and construction of the remaining structure to the west.

4.3.1.2 Interchange and Ramp Improvements

Improvements to interchanges and ramps are common to all Action Alternatives, excluding the area from I-630 to the Arkansas River that is affected by the Split Diamond and SPUI interchange alternatives, which are discussed **below in Sections 4.3.3.1 and 4.3.3.2**. There will be 15 ramp modifications outside this area: twelve ramps are being improved, four replaced, and one removed. These improvements were intended to bring the corridor into compliance with design criteria, shown in **Attachment F**.

4.3.1.3 Complimentary Alternatives

The following complimentary alternatives identified during the PEL Study were included under all Action Alternatives:

- Main Lane Pavement Rehabilitation,
- Auxiliary Lanes,
- Frontage Road Improvements,
- Roadway Shoulder Improvements,
- Horizontal/Vertical Curve Improvements,

- Intersection Improvements
- Bus on Shoulder,
- Bicycle/Pedestrian Accommodations,
- Ramp Metering,
- Transportation System Management (TSM),
- Wayfinding/signage, Arterial Improvements,

4.3.2 Corridor Action Alternatives

Two action alternatives are under consideration to address corridor-wide needs: the 8-lane General Purpose and 6-Lane with C/D Alternatives.

4.3.2.1 8-Lane General Purpose Alternative

This corridor improvement alternative would generally consist of reconstructing the existing six-lane (three in each direction) roadway and adding one through lane, for total of eight lanes (**Figure 19**). This alternative would not have Collector Distributor (C/D) lanes.

From the beginning of the project at the I-30/I-530/I-440 interchange to the I-30/I-630 interchange, this alternative would have three through lanes and one decision lane in each direction, replacing the existing six-lane (three in each direction) section. Decision lanes are lanes that are added and dropped from the freeway as it moves through a series of interchanges.

From the I-30/I-630 interchange to Broadway Street in North Little Rock, the configuration would vary depending on which Highway 10 Interchange Alternative (Split Diamond or SPUI) is selected. This section includes the I-30 Arkansas River Bridge and would include four through lanes and one auxiliary lane in each direction.

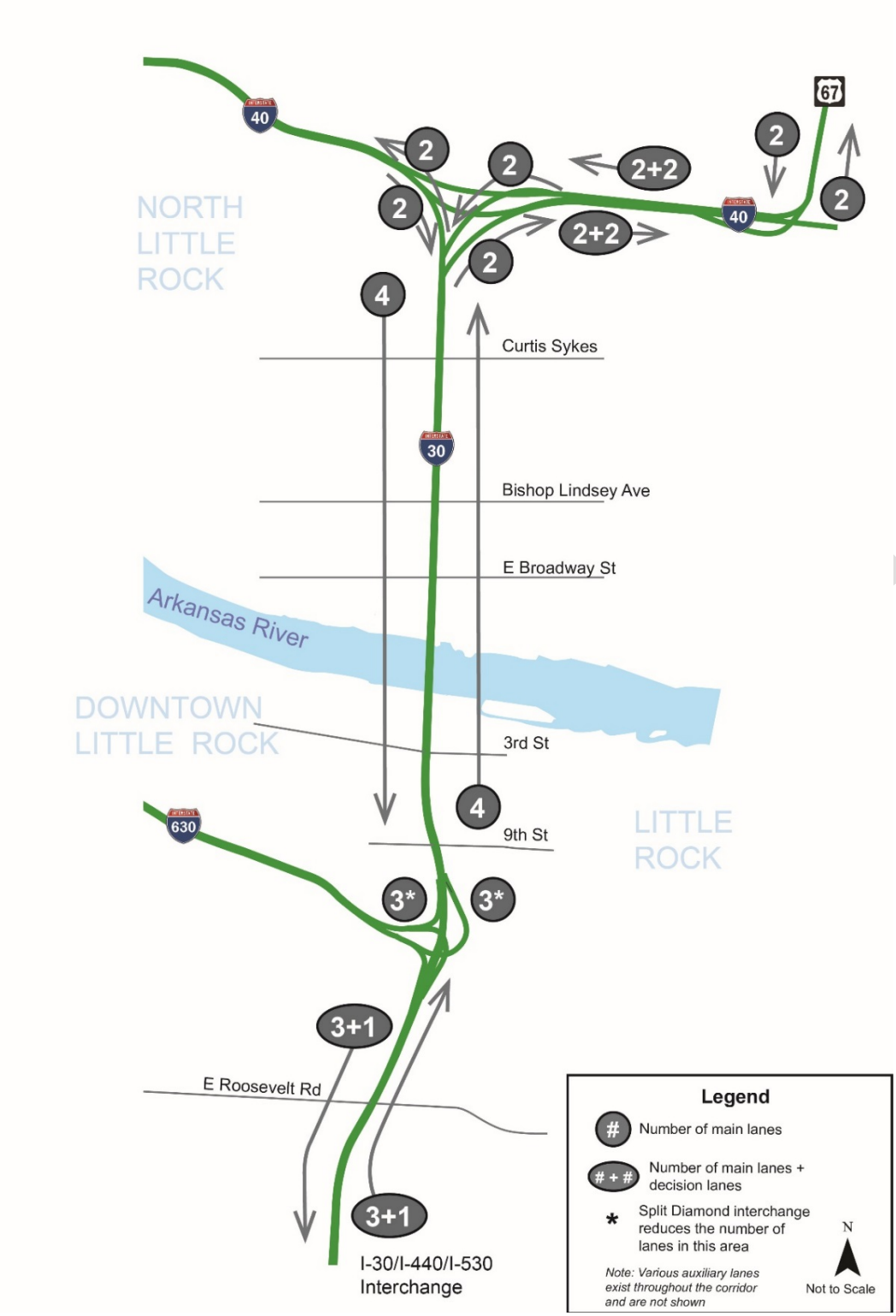
From Broadway Street to the I-40 interchange, this alternative would have four lanes in each direction, replacing the existing six-lane, three in each direction, section. One of these northbound lanes would become a decision lane, with vehicles allowed to go either east or west on I-40. Within this segment, Cypress Street west of I-30 would be extended from 9th Street to 13th Street, including a bridge over the UPRR, allowing it to become a one-way southbound frontage road. The existing structurally deficient North Locust Street Bridge over the UPRR would be replaced, and North Locust Street would serve as the one-way northbound frontage road.

The improvements to I-40 from the I-30 interchange to the Hwy. 67 interchange would consist of reconstructing the existing eight-lane section, to provide two decision lanes and two through lanes in each direction. Within these limits, the I-40 eastbound to Hwy. 67 northbound ramp and the I-40 westbound to I-30 southbound ramp would be reconstructed to right exit ramps but would remain two lanes.

The improvements to I-40 westbound from the I-30 interchange to MacArthur Drive (Hwy. 365) consist of reconstructing the existing three through lanes and increasing the length of the ramps.

VISSIM modeling showed that the 8-Lane General Purpose Alternative as envisioned in the PEL Study (detailed above) resulted in heavy congestion in the northbound direction

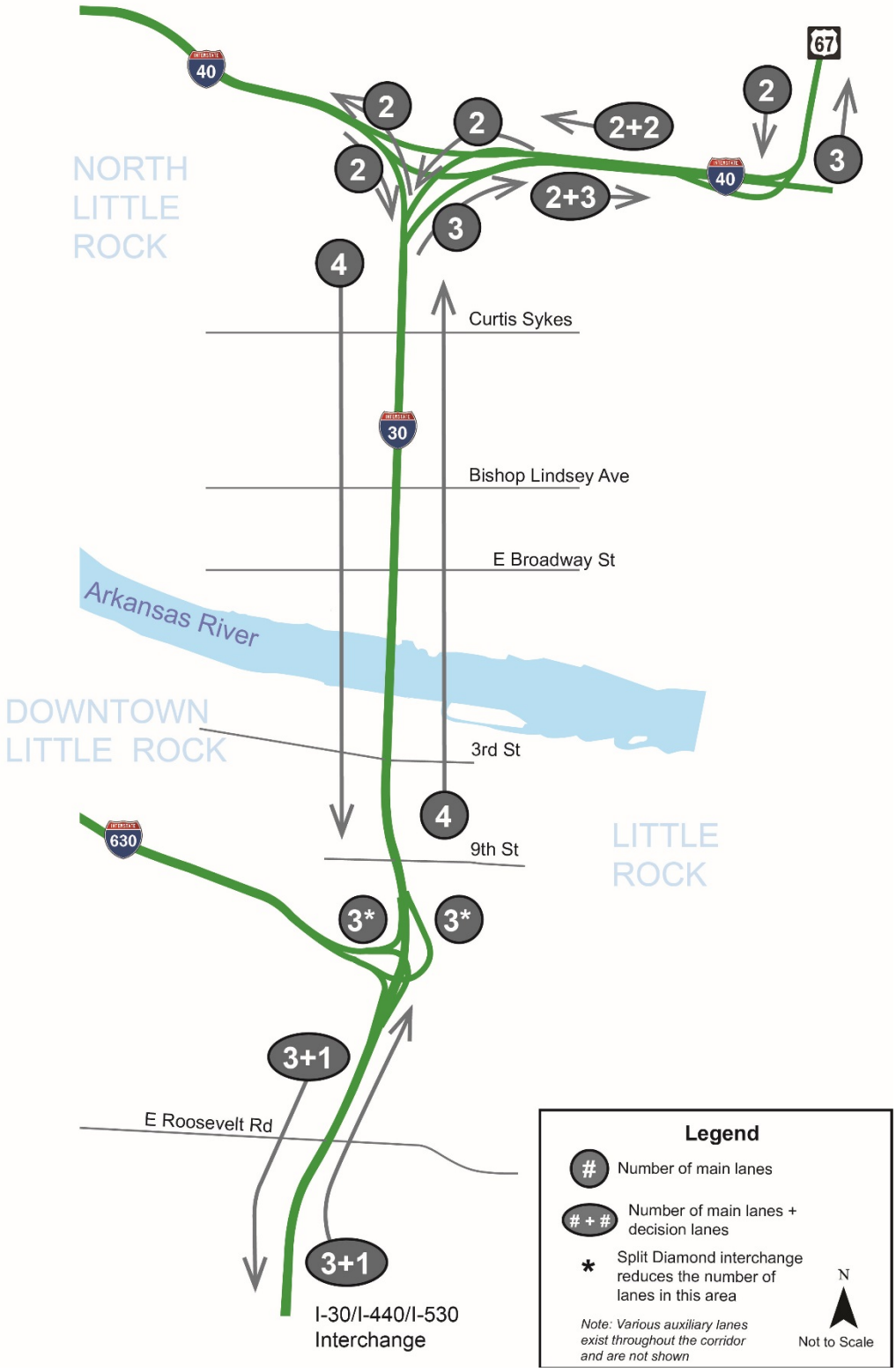
FIGURE 19: 8-LANE GENERAL PURPOSE PEL ACTION ALTERNATIVE



on I-30 in the PM peak. A modification was developed to evaluate a possible solution to the I-30 northbound congestion issue. The modification (**Figure 20**) incorporates the improvements of the 6-Lane with C/D alternative on I-40 eastbound by adding an additional lane to I-40 from I-30 to Hwy 67, as well as widening both the I-30 northbound to I-40 eastbound ramp and the I-40 eastbound to Hwy 67 northbound ramp from two to three lanes. VISSIM modeling showed that the modification resulted in a significant improvement to the mobility in the PM peak. Consequently, this modification will be incorporated into the 8-Lane General Purpose Alternative.

A modification was also investigated to provide a possible solution to the AM Peak bottleneck at the Hwy 67 southbound to I-40 westbound ramp. This investigation revealed that major modifications would be required in both the westbound direction on I-40 and southbound direction on I-30, resulting in an alternative very similar to the 6-Lane with C/D Alternative. Consequently, this modification will not be considered in the evaluation of the 8-Lane General Purpose Alternative.

FIGURE 20: 8-LANE GENERAL PURPOSE ACTION ALTERNATIVE - MODIFIED



4.3.2.2 6-Lane with C/D Alternative

This corridor improvement alternative would generally consist of reconstructing the existing six-lane (three in each direction) roadway while adding two decision lanes in each direction that ultimately feed into a C/D system located at the Arkansas River Bridge (**Figure 21**).

From the beginning of the project at the I-30/I-530/I-440 interchange to the I-30/I-630 interchange, this alternative would have three through lanes and two decision lanes, for a total five, in the northbound direction, and three through lanes and one decision lane, for a total of four, in the southbound direction. This would replace the existing six-lane (three in each direction) section. I-630 westbound to the Cumberland Street exit would be widened from four to five lanes.

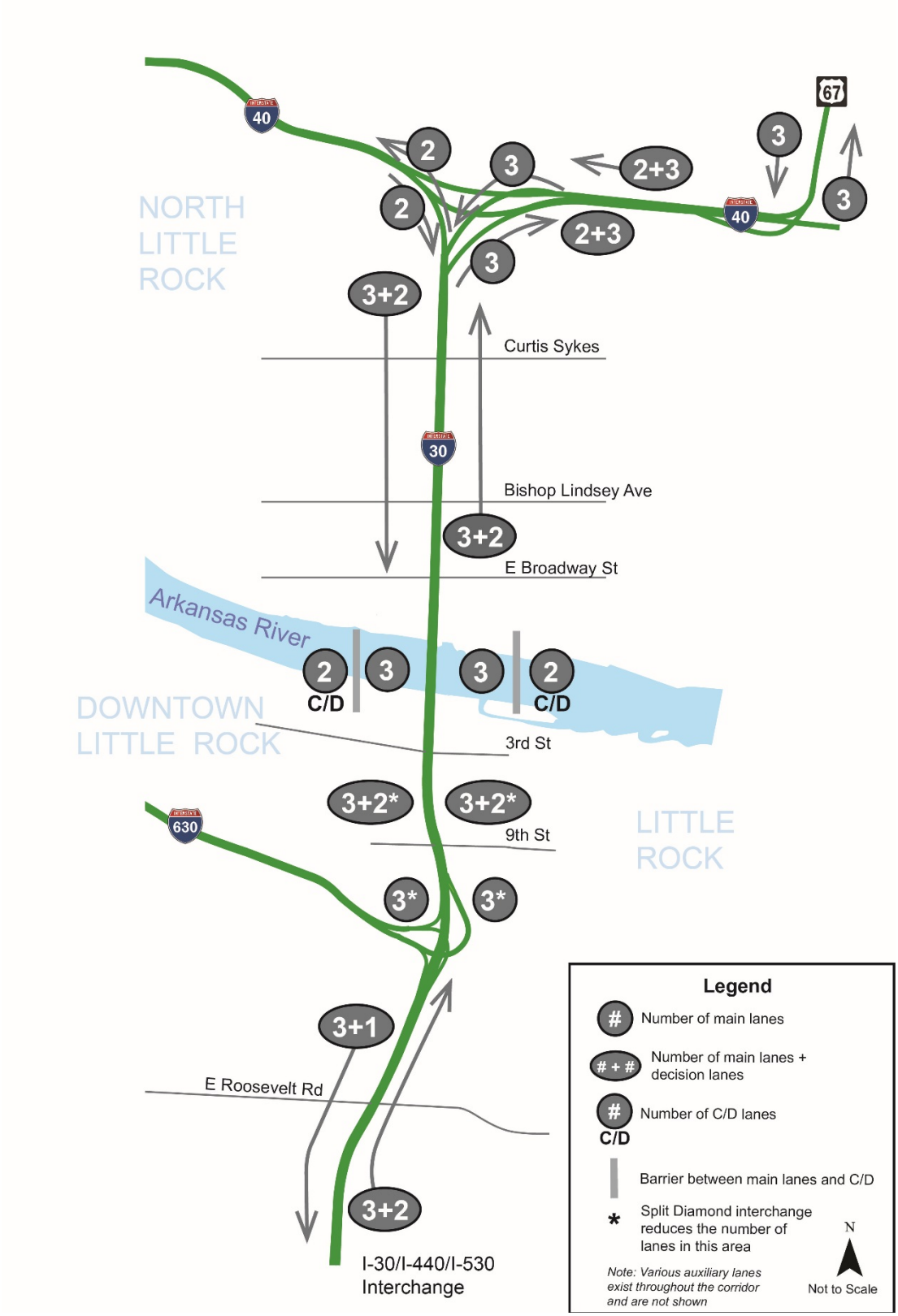
From the I-30/I630 interchange to Broadway Street in North Little Rock, the configuration would vary depending on which Highway 10 interchange alternative (Split Diamond or SPUI) is selected. This section includes the I-30 Arkansas River Bridge and would consist of three through lanes, two C/D lanes, and an auxiliary lane in each direction.

From Broadway Street to the I-40 interchange, this alternative would have three through lanes and two decision lanes, for a total five in each direction, replacing the existing six-lane, three in each direction, section. Within this segment, Cypress Street would be extended from 9th Street to 13th Street, including a bridge over the UPRR, allowing it to become a one-way southbound frontage road. The existing structurally deficient North Locust Street Bridge over the UPRR railroad would be replaced, and North Locust Street would serve as the one-way northbound frontage road.

The improvements to I-40 from the I-30 interchange to the Hwy. 67 interchange would consist of two through lanes and three decision lanes, for a total five in each direction, replacing the existing eight-lane, four in each direction, section. Within these limits, the I-30 northbound to I-40 eastbound and the Hwy. 67 southbound to I-40 westbound ramps would be widened from two to three lanes. The I-40 eastbound to Hwy. 67 northbound ramp and the I-40 westbound to I-30 southbound ramp would be reconstructed to right exit ramps and widened from two to three lanes.

The improvements to I-40 westbound from the I-30 interchange to MacArthur Drive (Hwy. 365) consist of increasing the length of the ramps.

FIGURE 21: 6-LANE WITH C/D ACTION ALTERNATIVE



4.3.3 Highway 10 Interchange Alternatives

In response to comments from the public and the City of Little Rock, the At-Grade SPUI Interchange (**Section 4.2.2.3**) was modified in order to eliminate conflict with the River Rail Trolley, and a new option, the Split Diamond Interchange (SDI), was developed in order to improve east-west connectivity in the downtown area. The modification to the At-Grade SPUI consisted of a realignment on the east side of I-30 to the intersection with Mahlon Martin Street, instead of 3rd Street, and an increase in ramp elevations to allow 4th Street to remain open to vehicular traffic. The At-Grade SPUI and SDI options were run through the same interchange comparison process as the preliminary options and scored identically (**Table 4**). Consequently, the two Highway 10 Interchange options, the SPUI and SDI, were advanced as NEPA Alternatives. Either interchange alternative can be used with each of the Corridor Action Alternatives.

Table 4: Comparison of SPUI and Split Diamond Interchange Options

	SPUI	Split Diamond
Cost	$87.4 M	$77.8 M
I-30 Access to River Market	++	+
I-30 Access to President Clinton Library/Heifer International	++	+
Access to I-30	++	++
++LOS	++	++
Geometrics	++	++
Vehicular East-West Connectivity	++	++
Visual East-West Connectivity	+	++
Bicycle and Pedestrian East-West Connectivity	+	++
River Rail Streetcar Impact	++	++
Total	16	16

++ Substantial positive effects (+2)
+ Some positive effects (+1)
0 Neutral effects (0)
- Some negative effects (-1)
-- Substantial negative effects (-2)
Source: Project Team, July 2016

4.3.3.1 SPUI Highway 10 Interchange Alternative

The SPUI Alternative is a refinement of the initial Single Point Urban Interchange concept that was developed in order to avoid impacts to the portion of the River Rail Street Car on 3rd Street and loss of vehicular access to 4th Street. With the SPUI Alternative, I-30 would continue to be elevated over 2nd Street, while all entrance and exit ramps for Highway 10 would intersect at a central signalized location under the I-30 Bridge (**Figures 23 and 24**). This signalized location would be modestly elevated on embankment in order to provide clearance over 3rd and 4th Streets for entrance and exit ramps. Traffic would access the SPUI from Little Rock by a six-lane elevated roadway beginning at-grade at the Cumberland/La Harpe/2nd Street intersection on the west side and at Mahlon Martin Street on the east side. In addition, traffic would be able to enter I-30 northbound from 6th Street by using a ramp that would bridge over 4th, 3rd, and 2nd Streets, and exit I-30 southbound by an additional ramp that would intersect with Capitol Avenue. An additional traffic signal would be needed at the intersection of East 3rd Street and Mahlon Martin Street.

In this interchange alternative, traffic would continue to enter and exit downtown Little Rock in a similar manner as the existing interchange. The only change to the local street systems would be that Cumberland Street between East 2nd Street and East 3rd Street would be closed to traffic and the Hwy. 10 ramp from I-30 would connect to Cumberland Street in the northbound direction only; movements onto East 2nd Street in the westbound direction would be prohibited. This would provide the opportunity for a decrease in traffic at this intersection. The Hwy. 10 interchange would also continue to utilize the ROW of the current interchange for transportation purposes.

Figures 22-27 show the horizontal extent of the SPUI Alternative improvements by using sectional views at two locations, between 4th Street and Capitol Avenue, and between 2nd Street and President Clinton Avenue. These sectional views are shown for the 6-Lane with C/D Alternative, which represents a worst case condition with respect to the width of the improvements. The width of the improvements for the 8-Lane General Purpose Alternative would be very similar but slightly less wide.

FIGURE 22: SPUI INTERCHANGE ALTERNATIVE WITH 8-LANE GENERAL PURPOSE CORRIDOR ALTERNATIVE

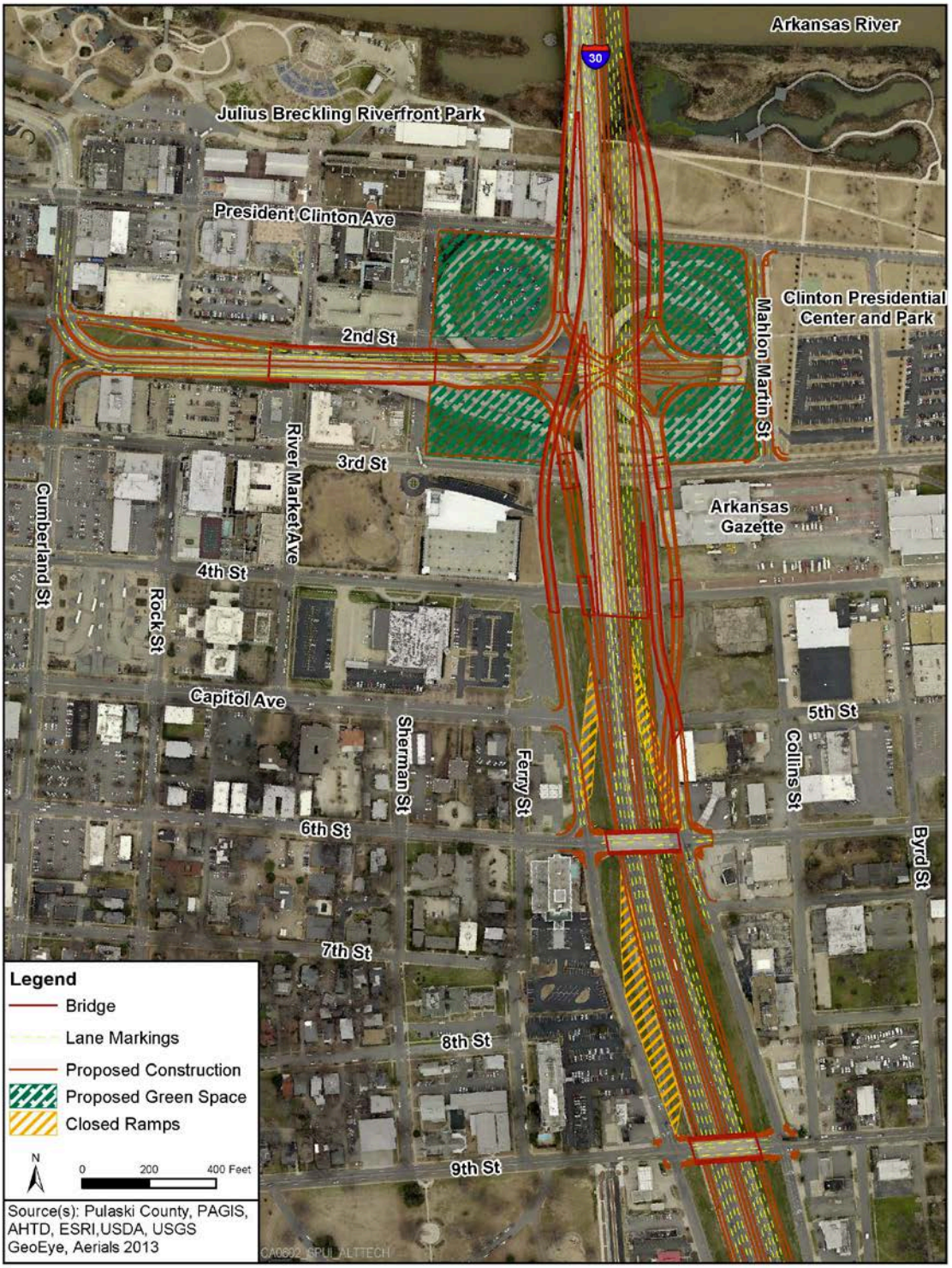


FIGURE 23: SINGLE POINT URBAN INTERCHANGE (SPUI) ALTERNATIVE WITH 6-LANE WITH C/D CORRIDOR ALTERNATIVE

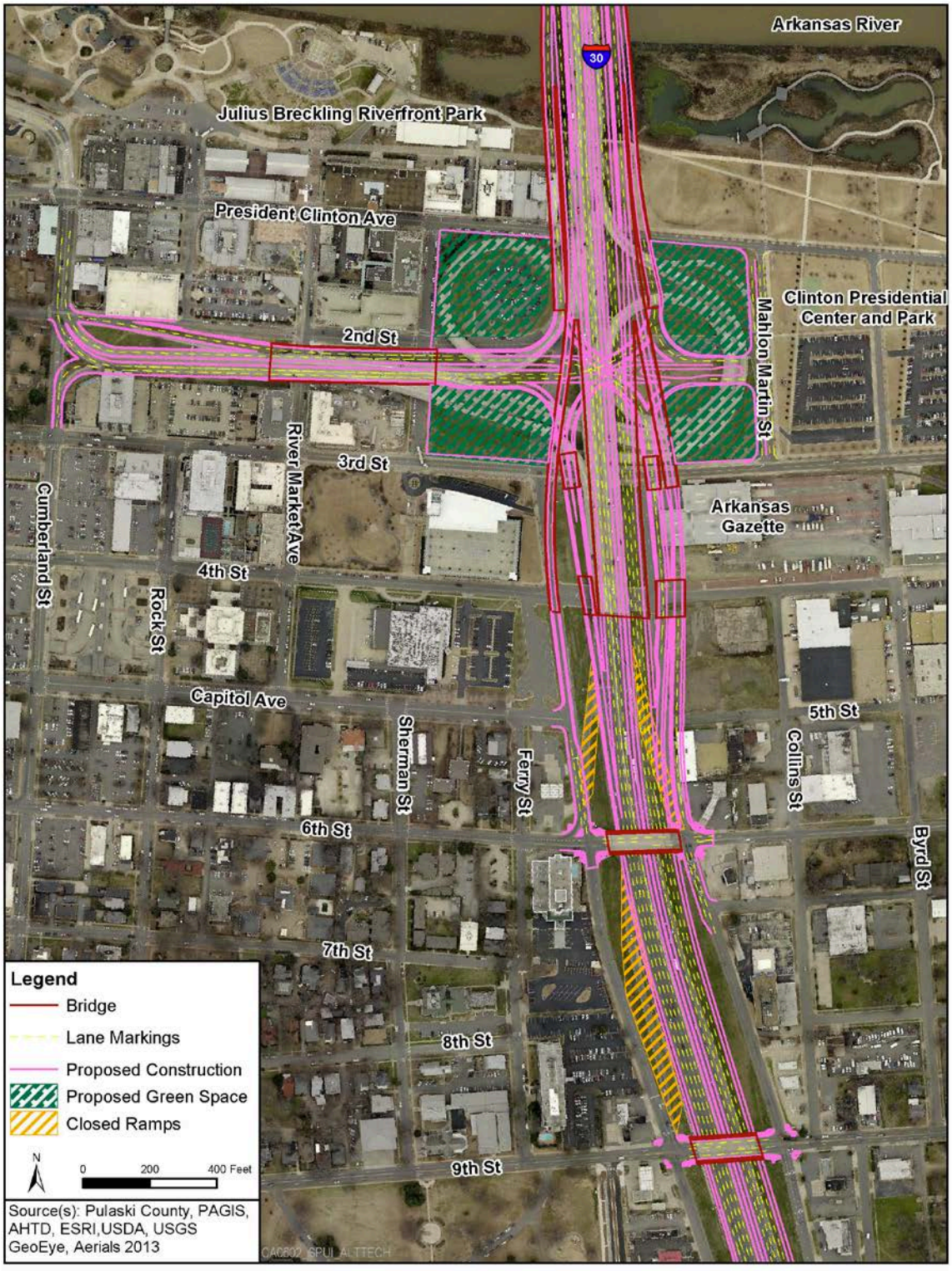


FIGURE 24: SPUI INTERCHANGE ALTERNATIVE TYPICAL SECTION A LOCATION

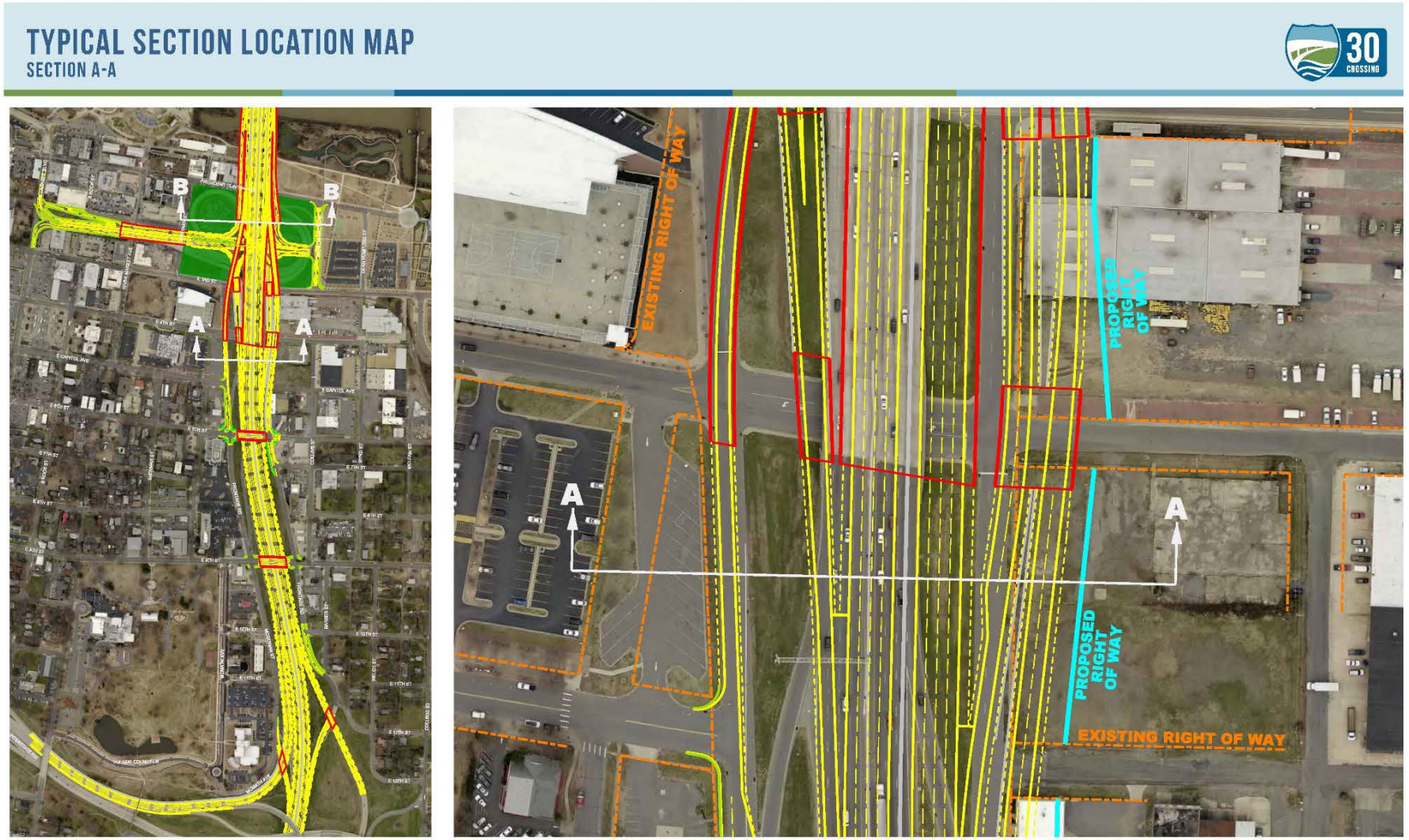


FIGURE 25: SPUI INTERCHANGE ALTERNATIVE TYPICAL SECTION A

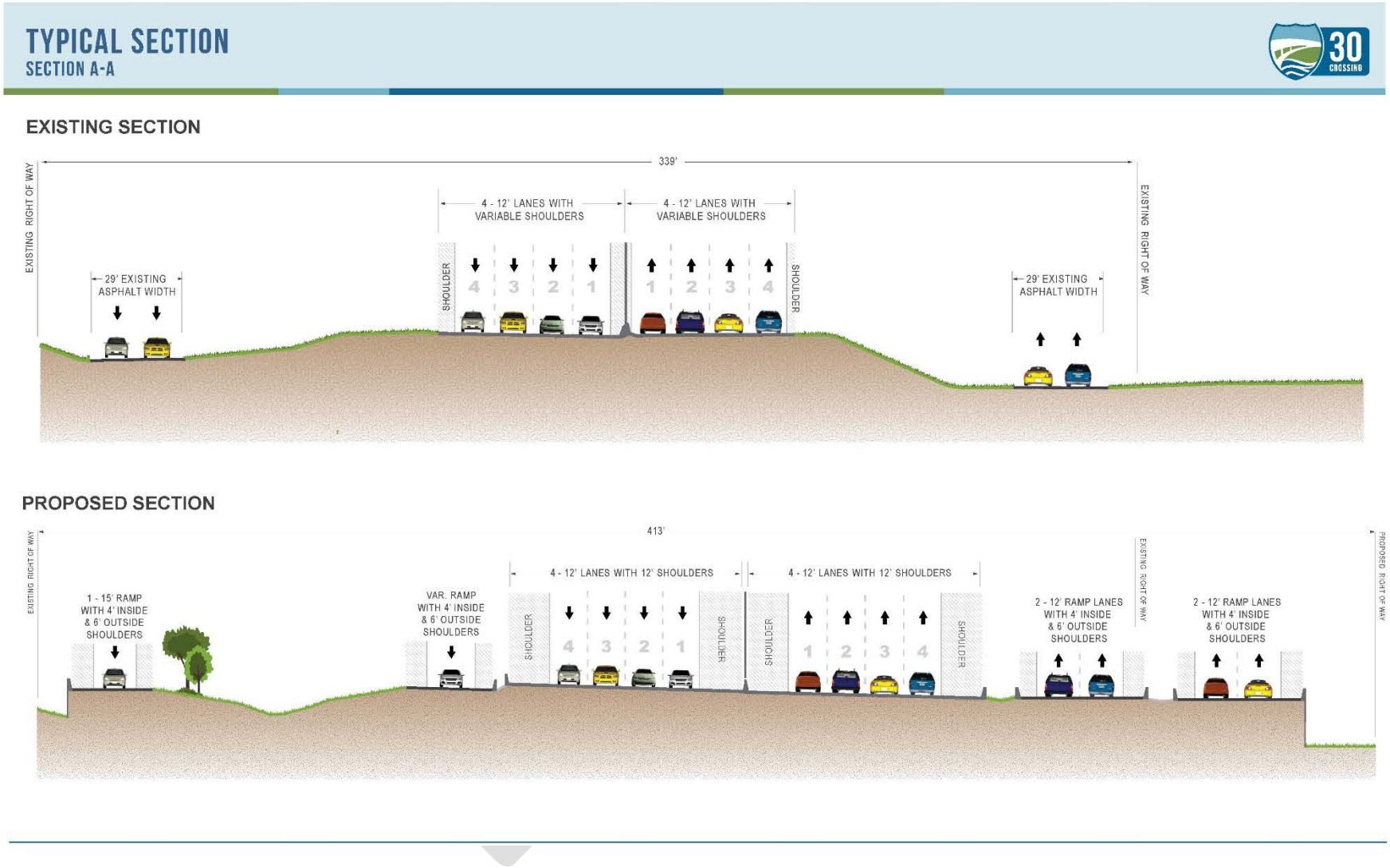


FIGURE 26: SPUI INTERCHANGE ALTERNATIVE TYPICAL SECTION B LOCATION

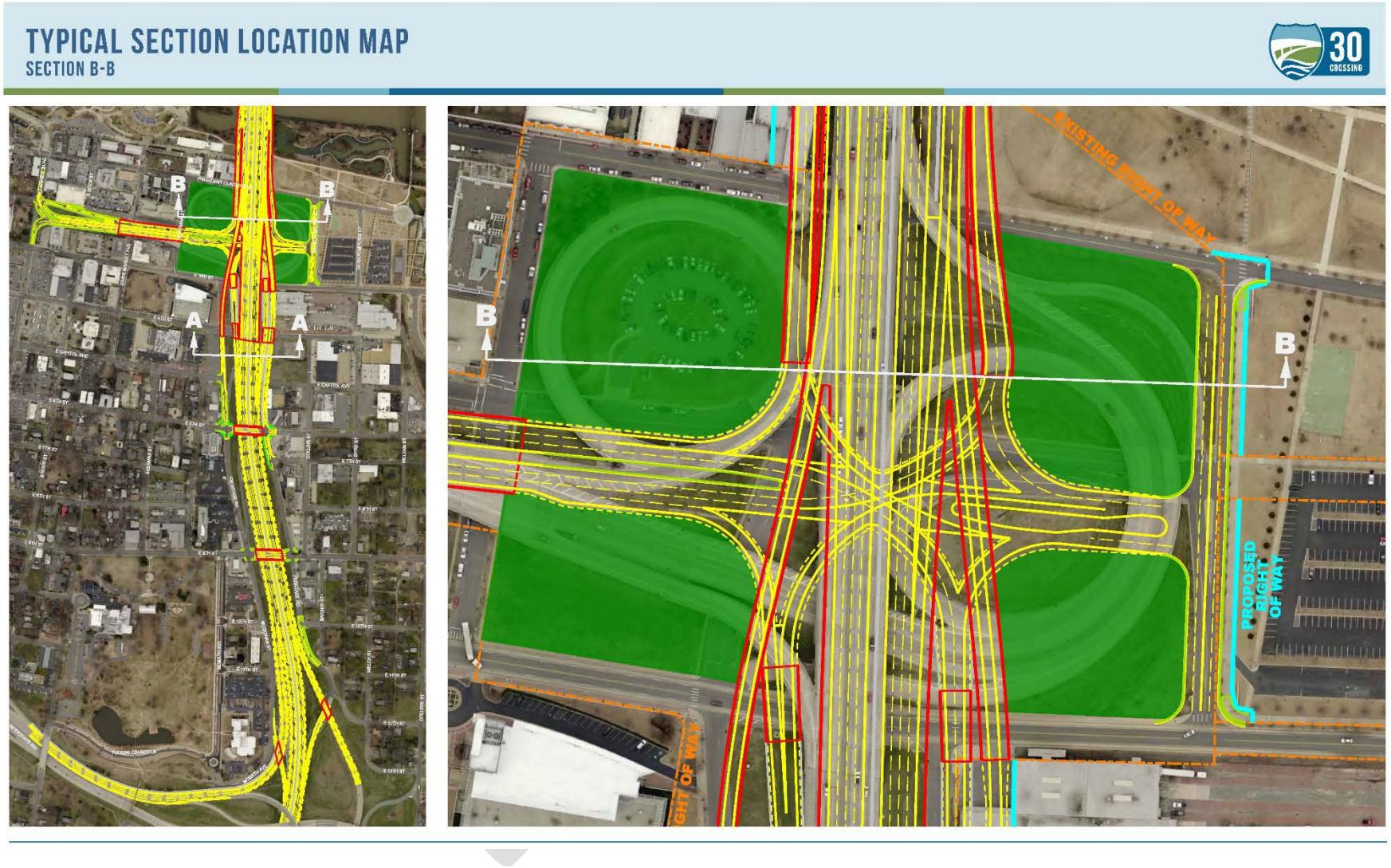
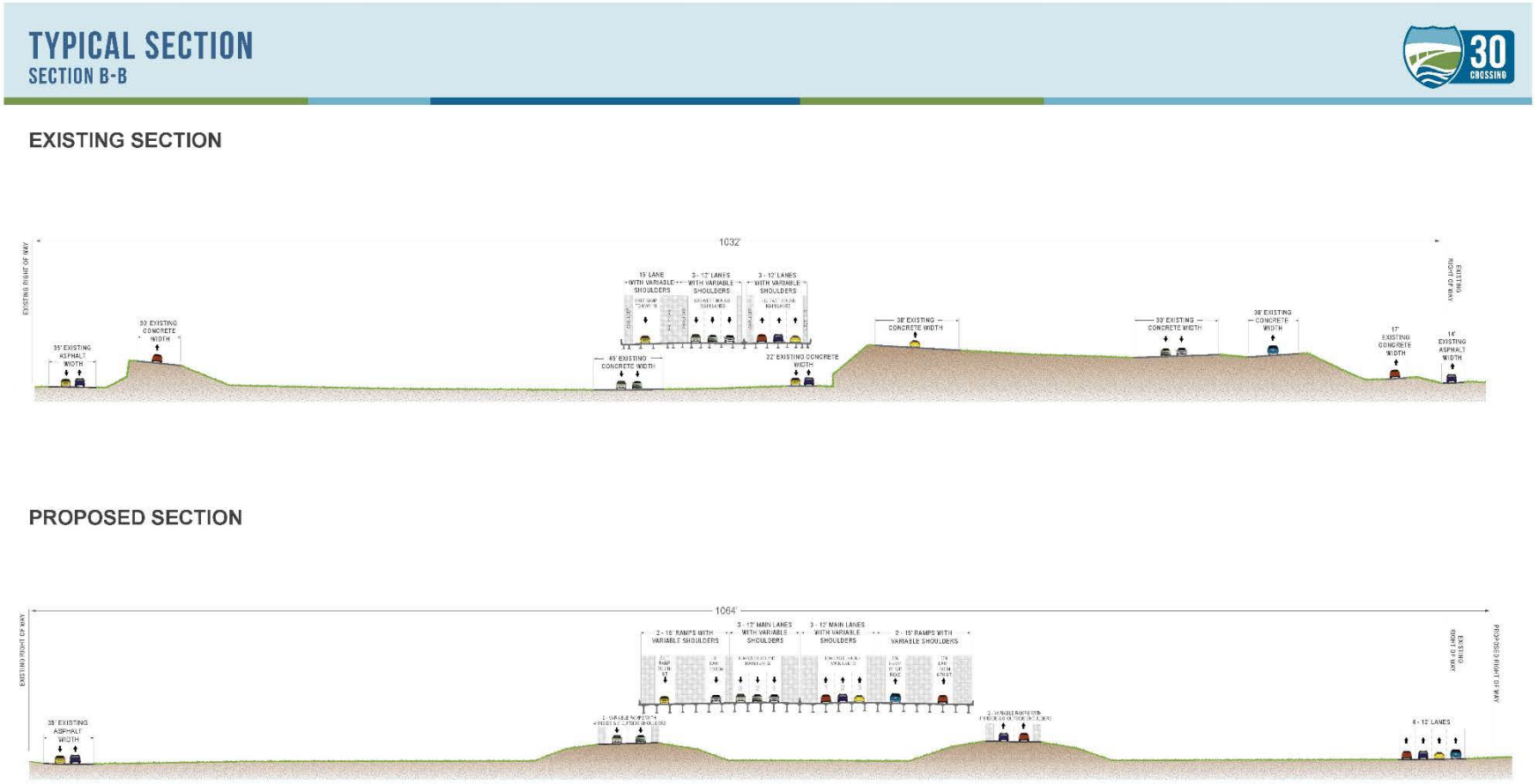


FIGURE 27: SPUI INTERCHANGE ALTERNATIVE TYPICAL SECTION B



4.3.3.2 Split Diamond Highway 10 Interchange Alternative

The Split Diamond Interchange (SDI) Alternative eliminates the existing partial cloverleaf interchange at Highway 10 (Cantrell Road). With this alternative, the only southbound I-30 off-ramp between I-630 and the Arkansas River would be at East 4th Street and the only northbound I-30 off-ramp in the same area would be at East 9th Street. Frontage roads would be used to distribute traffic onto the downtown road network. This alternative would provide direct access to I-630 westbound from the southbound frontage road and direct access to the northbound frontage road from I-630 eastbound. Modifications to some city streets would be required:

- East 4th Street between Cumberland Street and the northbound frontage road would be converted from two-way to one-way eastbound, requiring the removal of some on-street parking to accommodate three lanes of eastbound traffic.
- A Texas U-turn would be added to allow traffic on the southbound I-30 off-ramp to exit onto 3rd Street.
- Mahlon Martin Street would be converted from a one-way to a two-way roadway.
- East 2nd Street between Sherman Street and Mahlon Martin Street may be closed to traffic.
- A new road would be constructed between East 3rd and East 4th Streets east of I-30. The southbound lane of this road would connect directly to the northbound frontage road as well as to East 4th Street.
- On the north side of Capitol Avenue between the southbound frontage road and Cumberland Street, 32 parking spaces would be removed to add an additional westbound lane. Capitol Avenue would remain a two-way roadway, with one lane in the eastbound direction, and two in the westbound direction.
- East 6th Street between the southbound frontage road and Sherman Street is currently a two-way roadway with two lanes in the westbound direction and one lane in the eastbound direction. This section of East 6th street will be changed to a one-way section with two westbound lanes and 11 parallel parking spaces and a bike lane on the north side. East 6th Street between Sherman Street and Cumberland Street is currently a one-way roadway with two lanes in the westbound direction and two-hour parallel parking on both sides of the street. This section will continue to be a one-way roadway with two lanes in the westbound direction; however, East 6th Street's current width of 34 feet does not meet the city code requirement of 40 feet of roadway width in order to have two lanes of traffic and parallel parking on both sides. In order to meet City code, the two-hour parallel parking on the south side of East 6th street will be removed (27 parking spaces). The two-hour parallel parking on the north side will be retained and a bike lane will be added to coincide with the City's bike plan.
- Cumberland Street between East 4th Street and East 6th Street would be restriped to provide two lanes in the northbound direction and one lane in the southbound direction.
- Traffic signals may be required at the intersections of East 4th Street and the southbound and northbound frontage roads, East 4th Street and Rock Street, Capitol Avenue and Rock Street, East 4th Street and River Market Avenue, and East 3rd Street and the Texas U-turn.

The Split Diamond Interchange Alternative would remove the existing exit ramp that provides direct access to the complex intersection of Hwy. 10, 2nd Street and Cumberland Street, which provides an opportunity for a decrease in traffic at this intersection. The traffic currently using the existing Highway 10 (Cantrell Road) interchange would shift primarily to East 4th Street, Capitol Avenue, and East 6th Streets, resulting in an increase in the traffic volumes on these city streets. The removal of the existing interchange would open up the space currently occupied by the interchange, providing opportunity for improved multi-modal east-west movement under I-30 at this location.

Through coordination with stakeholders, it was determined that the potential increase in traffic on Capitol Avenue and East 6th Street within the MacArthur Park Historic District as a result of the Split Diamond Alternative is not desirable in this historic residential neighborhood. Consequently, the Split Diamond Interchange Alternative was modified as shown in **Figures 28 and 29.** The changes from the original Split Diamond Alternative consist of the following:

- East 2nd Street would remain open to traffic and would be widened and improved between Cumberland Street and Mahlon Martin Street to provide two lanes eastbound and two lanes westbound. Six on-street parking spaces along East 2nd Street and twelve along Ferry Street would be removed.
- The new road constructed between East 3rd and East 4th Streets would be shifted east to line up with Mahlon Martin Street.
- No changes to the existing conditions on East 6th Street or East 3rd Street are proposed
- Capitol Avenue would remain one lane in each direction. No parking removal would be required.
- Cumberland Street between East 2nd Street and East 3rd Street would be slightly widened to provide two lanes in both the northbound and southbound directions. No change would occur to Cumberland Street between East 4th and East 6th Streets.
- Traffic signals may be required at the intersections of River Market Avenue with East 2nd Street, East 3rd Street, and East 4th Street; East 2nd Street and Sherman Street; East 3rd Street and the Texas U-turn, East 4th Street and Rock Street; and Mahlon Martin Street with East 2nd Street and East 3rd Street.

As a result of these modifications, future traffic levels on Capitol Avenue and 6th Street with the Split Diamond Alternative would be close to the No-Action Alternative levels, thereby avoiding potential traffic impacts to the MacArthur Park Historic District. Consequently, this modification will be incorporated into the Split Diamond Interchange Alternative. **Figures 30-37** show what the horizontal extent of the Split Diamond Alternative improvements would be by using sectional views at three locations, between I-630 and East 9th Street, in the vicinity of East 7th Street, and between East 4nd Street and Capitol Avenue. These sectional views are shown for the 6-Lane with C/D Alternative, which represents a worst case condition with respect to the width of the improvements. The width of the improvements for the 8-Lane General Purpose Alternative would be very similar but slightly less wide.

FIGURE 28: SPLIT DIAMOND INTERCHANGE ALTERNATIVE WITH 8-LANE GENERAL PURPOSE CORRIDOR ALTERNATIVE

FIGURE 29: SPLIT DIAMOND INTERCHANGE ALTERNATIVE WITH 6-LANE WITH C/D CORRIDOR ALTERNATIVE

FIGURE 30: SPLIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION A

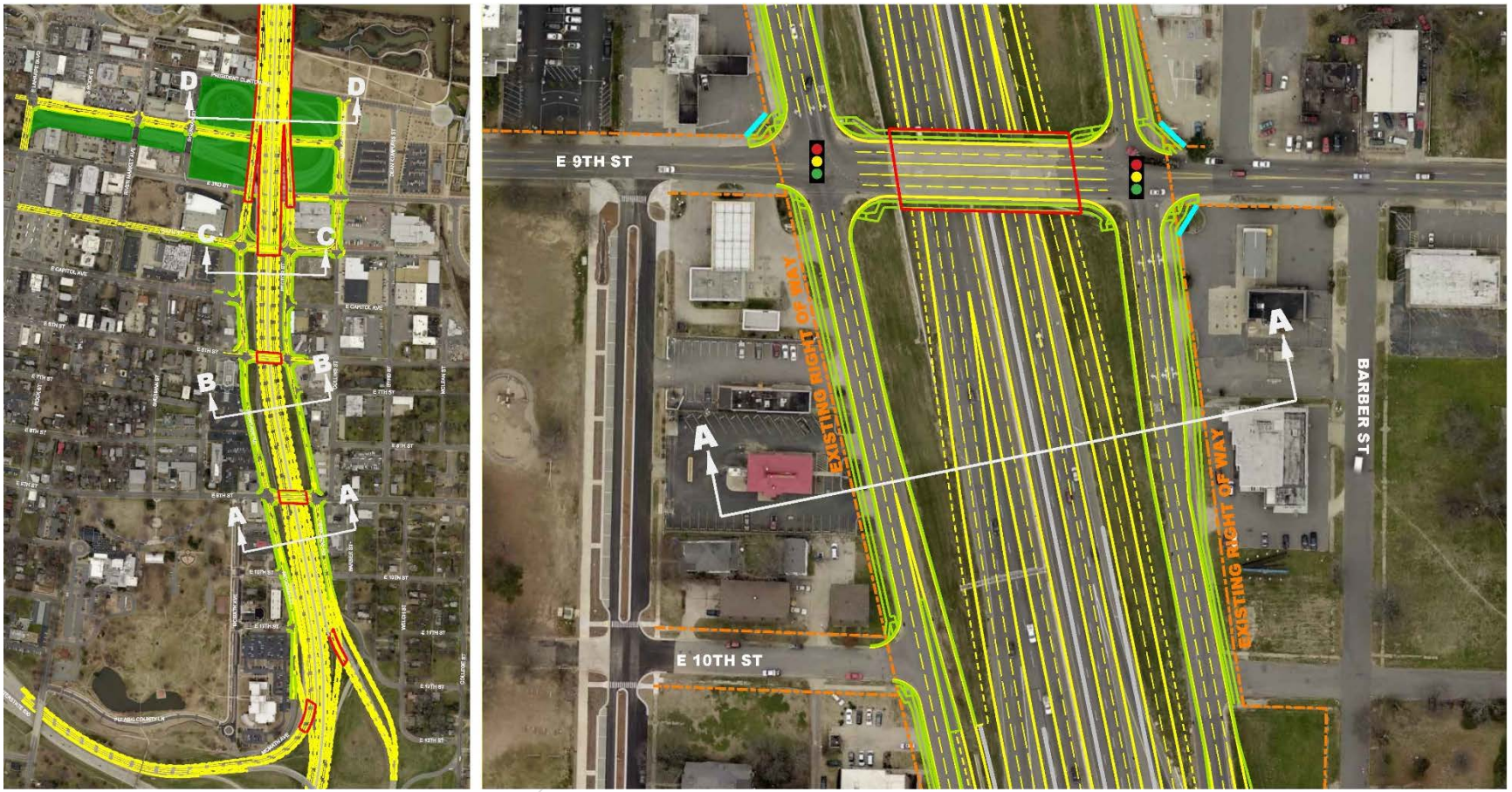


FIGURE 31: SPLIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION A TYPICAL SECTION

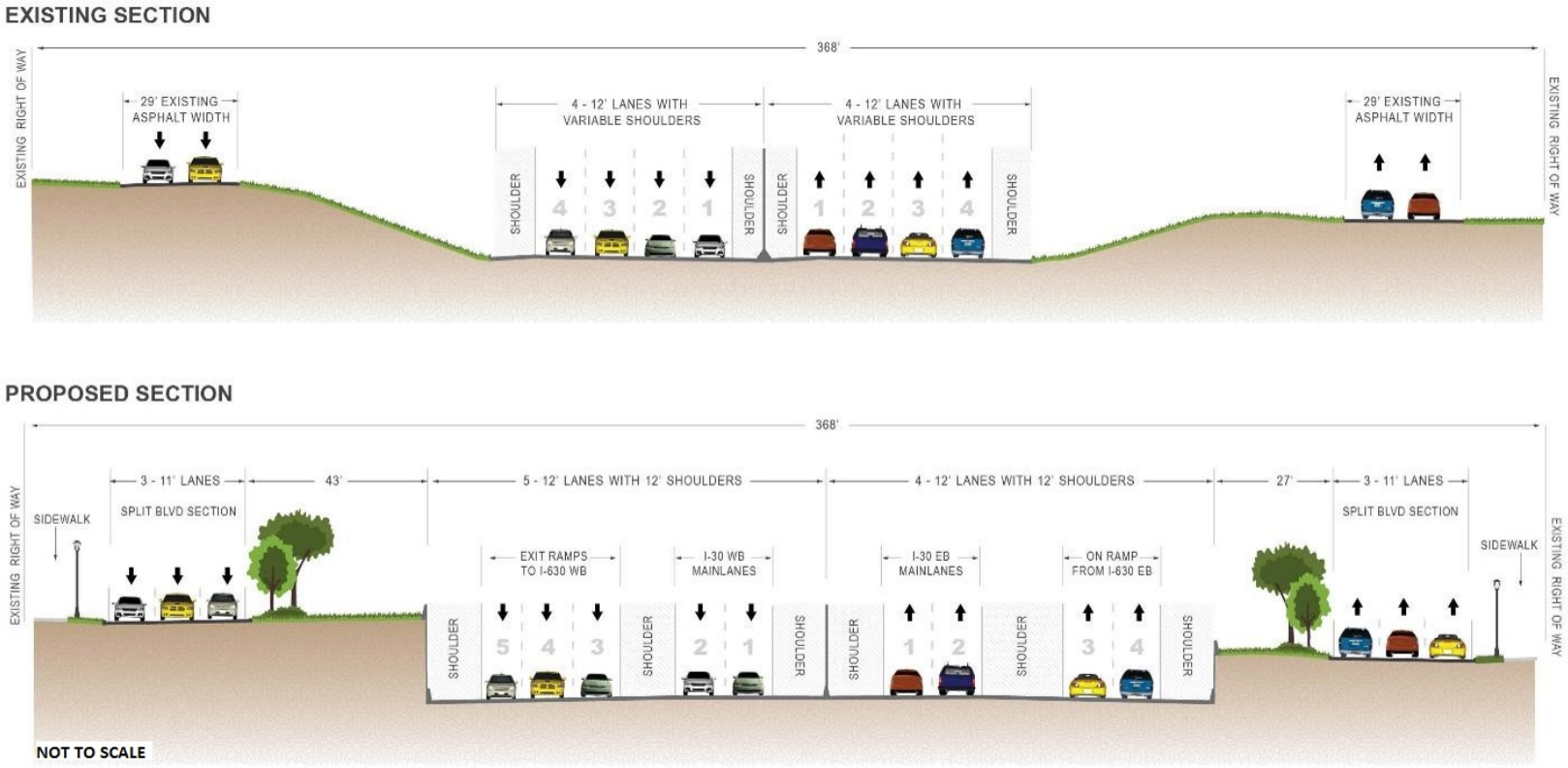


FIGURE 32: SPLIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION B

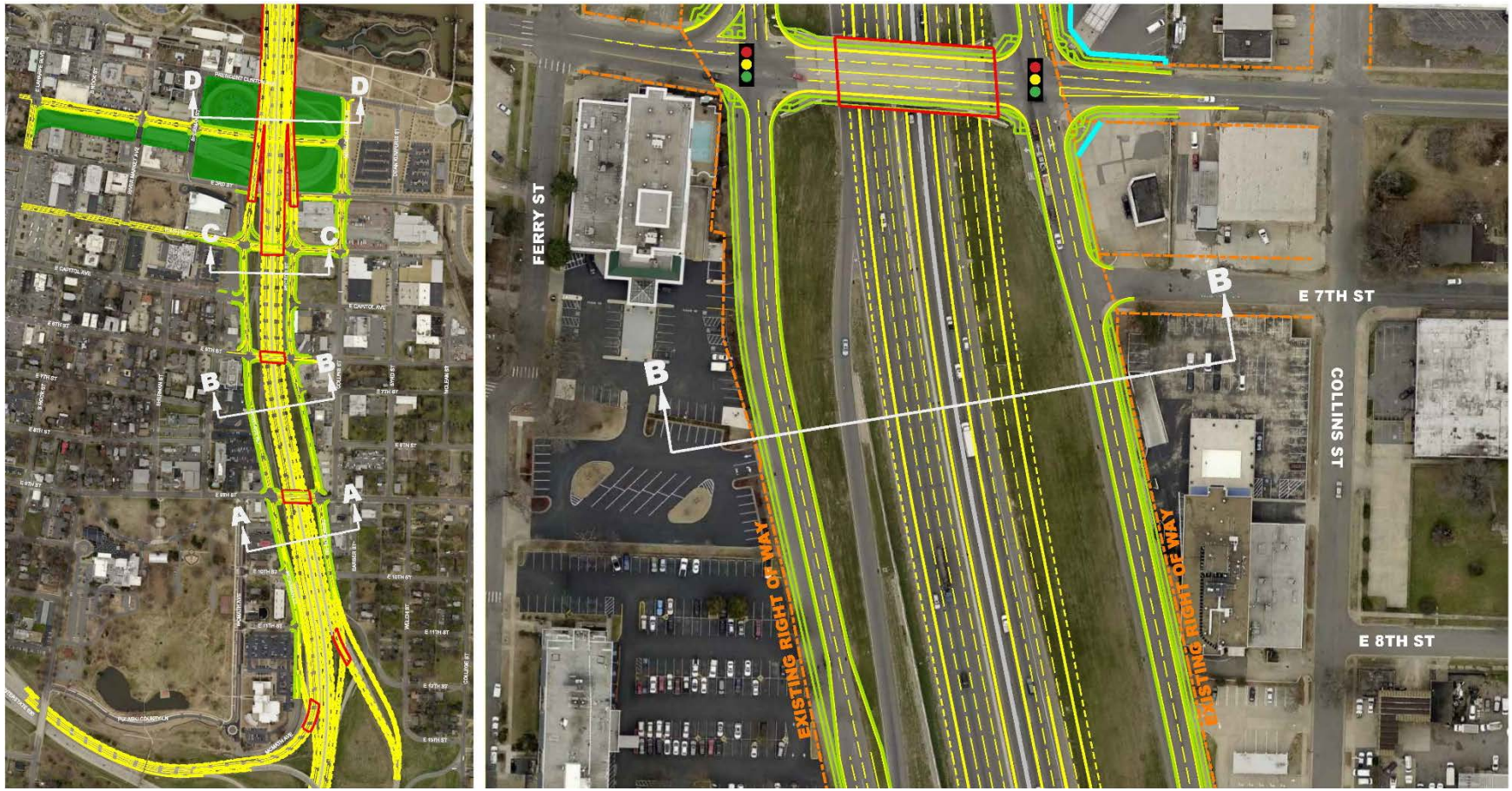


FIGURE 33: SPLIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION B TYPICAL SECTION

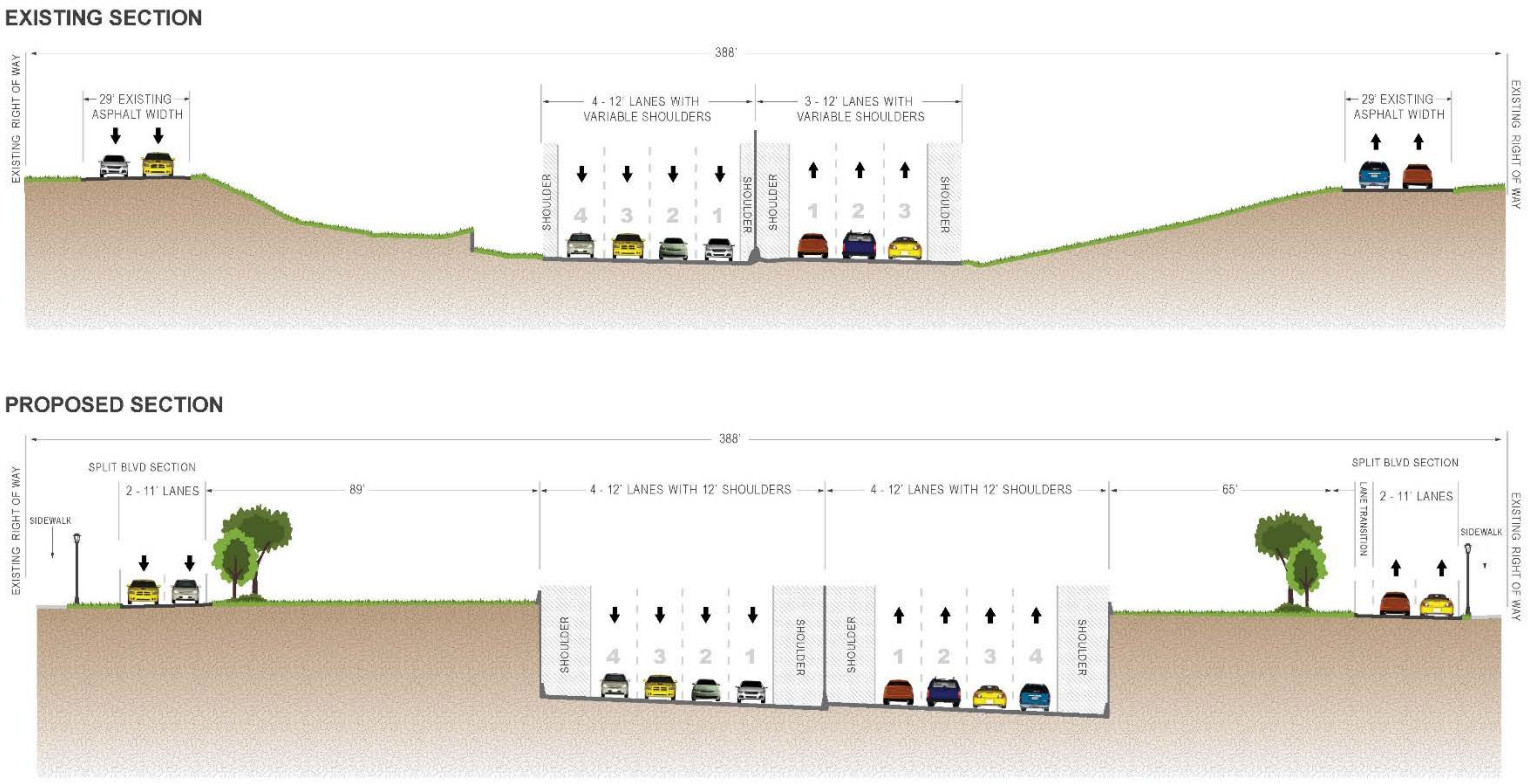


FIGURE 34: SPLIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION C

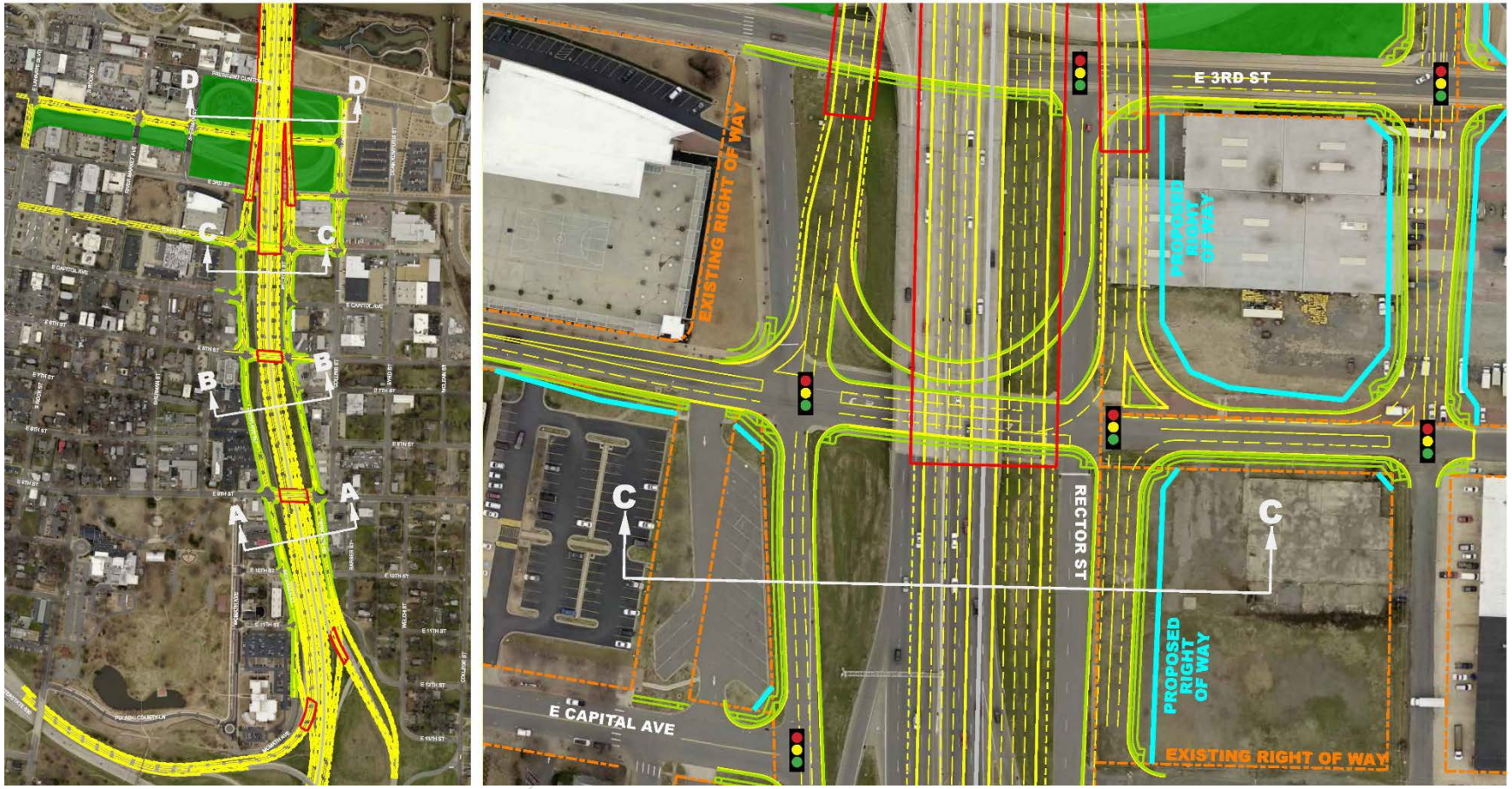


FIGURE 35: SPLIT DIAMOND INTERCHANGE ALTERNATIVE TYPICAL SECTION C

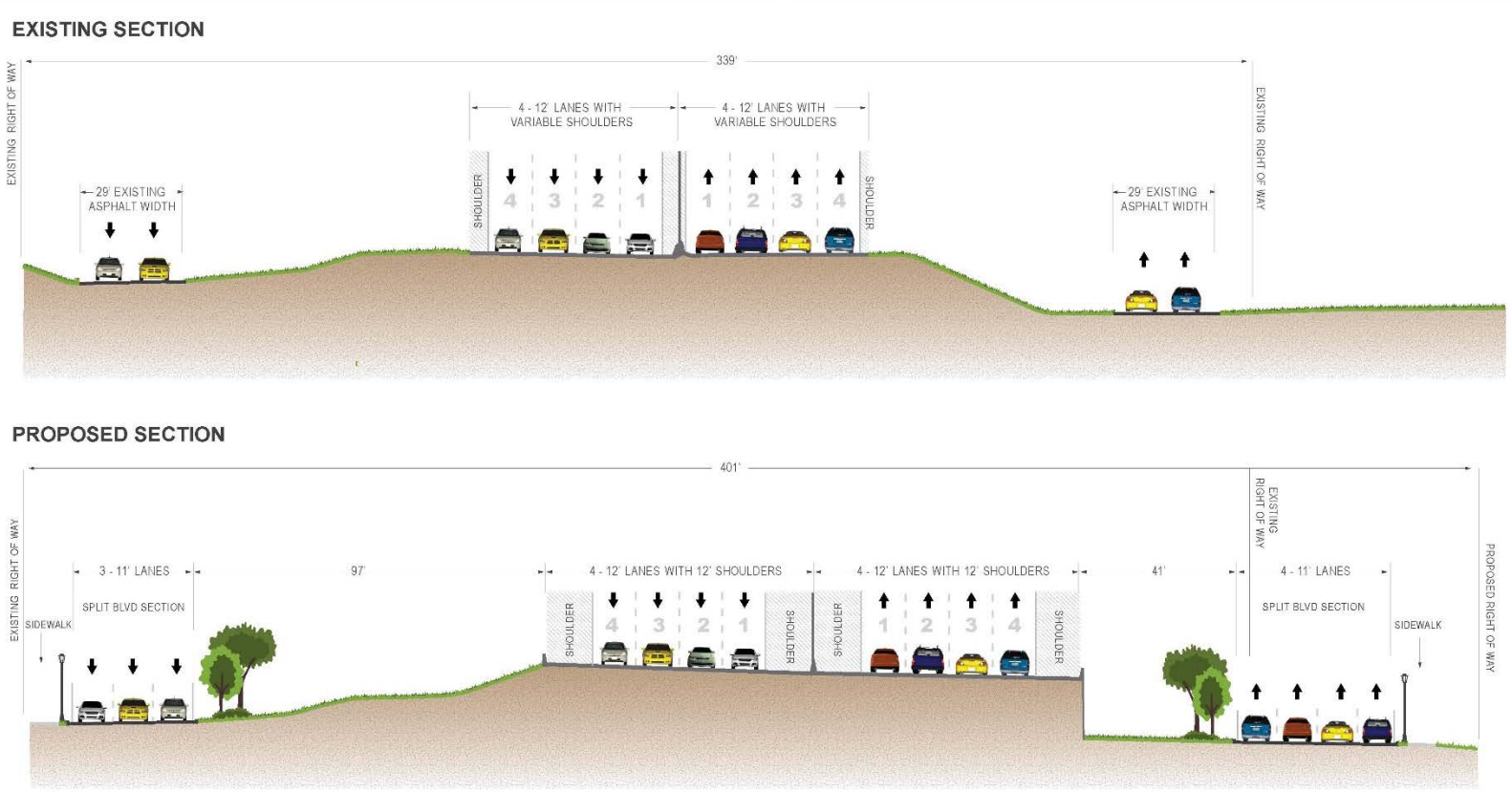
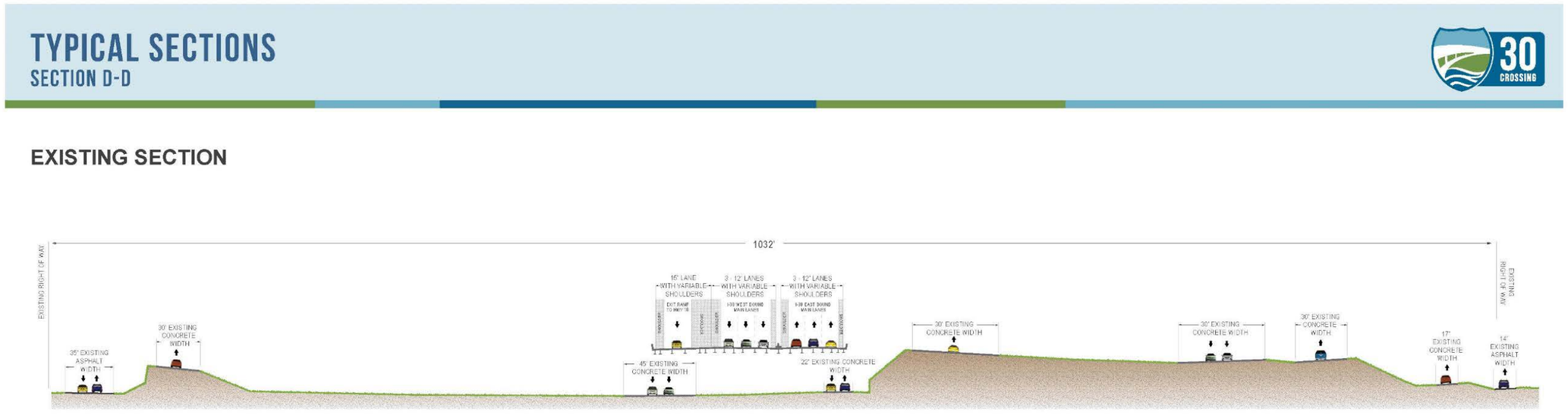


FIGURE 36: SPLIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION D

FIGURE 37: SPIT DIAMOND INTERCHANGE ALTERNATIVE LOCATION D TYPICAL SECTION



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4.3.4 NEPA Action Alternatives

The two corridor improvement alternatives under consideration, both of which include the replacement of the Arkansas River Bridge, are:

- 8-Lane General Purpose (GP) alternative which would provide four main lanes in each direction with no Collector Distributor (C/D) lanes.

- 6-Lane with C/D alternative which would reconstruct the existing six-lane (three in each direction) roadway while adding two decision lanes on each side that ultimately feed into a C/D system located at the Arkansas River Bridge.

Two alternatives for improvement of the Highway 10 (Cantrell Road) are under consideration:

- A Single Point Urban Interchange (SPUI) constructed in the same location as the current interchange.

- A Split Diamond Interchange (SDI) constructed south of the existing interchange at 4th and 9th Streets.

Combing the two main lane configurations with the two Highway 10 interchange alternatives results in the four Action Alternatives under consideration:

- Alternative 1A: 8-Lane General Purpose with SPUI
- Alternative 1B: 8-Lane General Purpose with Split Diamond Interchange
- Alternative 2A: 6-Lane with C/D with SPUI
- Alternative 2B: 6-Lane with C/D with Split Diamond Interchange

Attachment A: PEL Study FHWA Approval Letter

U.S. Department of Transportation
Federal Highway Administration

Arkansas Division

700 West Capitol, Rm. 3130
Little Rock, AR 72201-3298
(501) 324-5625
(501) 324-6423 fax
pete.jilek@dot.gov

July 1, 2015

In Reply Refer To:
HDA-AR

Mr. Scott Bennett
Director
Arkansas State Highway and Transportation Department
10324 Interstate 30
Little Rock, AR 72203-2261

Dear Mr. Bennett:

This letter acknowledges the completion of the Planning and Environmental Linkages (PEL) study undertaken by the Arkansas State Highway and Transportation Department (AHTD) in relation to proposed highway improvements to Interstate 30 between Interstate 530 and U.S. Highway 67 in Pulaski County. The project is included for study and development in AHTD's Connecting Arkansas Program.

We appreciate and commend the efforts the PEL teams have undertaken to conduct this study in a manner consistent with current Federal Highway Administration (FHWA) PEL guidance and authority. The benefits of this streamlining effort will undoubtedly be realized in terms of time and cost savings during the follow-on National Environmental Policy Act (NEPA) study that will be conducted in the coming months.

The completed PEL Questionnaire submitted to FHWA in May 2015 and revised in June 2015, along with other PEL products provides thorough documentation of the activities conducted during the PEL study, as well as a solid foundation for transition into the NEPA study. Some of the strengths exhibited throughout the PEL study include a meaningful and attentive engagement of the public, local public agencies, and resource agencies; development of a sound purpose and need statement and project goals; and the thorough evaluation of a reasonable range of alternatives. This effort will continue as the NEPA study for the project advances, providing a more detailed analysis of the impacts of the alternative recommended by the PEL study.

If you have any questions or would like to discuss, please contact me at 501-324-5625.

Sincerely,

Peter A. Jilek
Acting Division Administrator

1 **Attachment B: FHWA Class of Action Recommendation**

U.S. Department of Transportation
Federal Highway Administration

Arkansas Division

700 W. Capitol Ave
Room 3130
Little Rock, AR 72201-3298
501-324-5625
501-324-6423(Fax)

August 19, 2015

In Reply Refer To:
HDA-AR

Mr. Scott Bennett
Director
Arkansas State Highway and Transportation Department
10324 Interstate 30
Little Rock, Arkansas 72209

Subject: Recommendation for Class of Action Interstate 530-Highway 67
Pulaski County, Job Number CA0602

Dear Mr. ~~Bennett~~ SCOTT,

Thank you for your letter dated July 17, 2015 requesting FHWA's concurrence on the National Environmental Policy Act (NEPA) proposed Class of Action for the referenced project. The Planning and Environmental Linkages (PEL) study that was completed by the Arkansas State Highway and Transportation Department (AHTD) provides an effective fast-tracking starting point for the NEPA phase by incorporating appropriate documentation in the review process.

FHWA concurs with your request for the project to proceed as an Environmental Assessment (EA).

The PEL study recommends only one build alternative (the 10-lane downtown C/D alternative) to be carried forward in the NEPA phase which will be compared with the no-build alternative. Based on concerns received from project partners, I ask that you include the 8-lane general purpose alternative in the EA phase. Therefore, possible impacts of the alternative can be analyzed, compared and documented along with those of the 10-lane downtown C/D alternative and the no-build.

If you have any questions or would like to discuss further please contact me at 501-324-5625.

Sincerely,

Angel Correa
Acting Division Administrator

c: DD & COO
DD & CE
ACE - P, D, A
ENV
TPP
K. Wylie
B. Browning
PM-Admin
RDWY
BR
SIR
SURVEYS
ROW
Job File CA0602

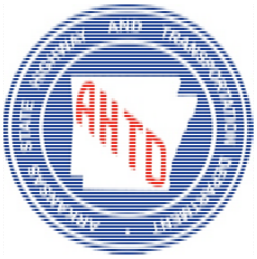
309.48 (New category established for CA0602)

RECEIVED
AUG 20 2015
Program Management Division
AHTD

Attachment C: Level 1 Screening of Boulevard Alternative

Boulevard Alternative Level 1 Screening

I-530-Hwy. 67 (Widening & Reconst.) (I-30 & I-40)
Pulaski County, Arkansas
July 2016



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1.0 BOULEVARD ALTERNATIVE DESCRIPTION

The Boulevard Alternative would convert Interstate 30 between Interstate 630 and 9th Street in North Little Rock to an at-grade roadway with four travel lanes in each direction, a wide landscaped median, and at-grade intersections. In Little Rock, the roadway would intersect with 9th Street, 6th Street, Capitol Avenue, 4th Street, 3rd Street, 2nd Street and Clinton Avenue (Figure 1). In North Little Rock, the roadway would intersect with Broadway Street, Bishop Lindsey Avenue, and 9th Street. There would be no improvements to Interstate 30 outside of these limits, other than transitions from the freeway to the boulevard, and none on Interstate 40. The fourth travel lane would only be available during peak periods; during the remainder of the day, it would be used for parking. The alternative includes the replacement of the existing Interstate 30 Bridge over the Arkansas River, and restructuring the Interstate 30/Interstate 630 interchange to create more green space and park amenities.

Removal of limited access from Interstate 30 would result in its removal from the interstate system. Interstate 440 would become the new Interstate 30, and through traffic would be routed to the interstate loop system around Little Rock and North Little Rock rather than going through the downtown area. By introducing many closely spaced at-grade intersections, the Boulevard Alternative would take away capacity from Interstate 30 and place more travel demand on the local roadway system. Improvements would be needed to other local roadways in the region in order to handle the increased traffic; however, these improvements are not considered part of the alternative.

2.0 LEVEL 1 SCREENING APPROACH

The Boulevard Alternative was evaluated using the Level 1 screening methodology from the Interstate 30 PEL Study. In Level 1, alternatives were assigned a pass or fail rating for each screening criteria. The criteria consisted of elements comprising the purpose and need of the project along with practicality. The purpose and need of the project consists of congestion, roadway safety and structural and functional deficiencies,

FIGURE 1: BOULEVARD LOCATION MAP

navigational safety, and bridge structural and functional deficiencies. An alternative was considered practicable if it: 1) is capable of being implemented (i.e., it can be accomplished within the financial resources that could reasonably be made available and is feasible from the standpoint of technology and logistics); and 2) would not create other unacceptable impacts such as severe operation or safety problems, or serious socio-economic or environmental impacts.

Alternatives that did not meet these criteria were eliminated at Level 1. A pass rating was not required on all criteria in order for an alternative to move to the next level.

3.0 PURPOSE AND NEED

3.1 Traffic Congestion

One of the primary project needs is to alleviate traffic congestion by improving mobility through the study area and providing more efficient access into the downtown areas of Little Rock and North Little Rock. The Boulevard Alternative fails the purpose and need for traffic congestion. Due to closely spaced at-grade intersections, the Boulevard could accommodate only half the traffic currently using Interstate 30 in the downtown area (126,000 vehicles per day in 2014, increasing to 145,000 vehicles per day by 2041). The Boulevard Alternative would result in increased congestion, reduced speeds, and increased travel time in the study area. The resulting congestion would encourage users to seek other routes to their destinations or alter their travel patterns to avoid the downtown area altogether. By introducing multiple at-grade connections to the local roadway network in the downtown area, the Boulevard Alternative would improve access to the downtown areas of Little Rock and North Little Rock; however, congestion on other regional and local roadways would increase as motorists seek alternative routes, and overall mobility in the downtown area would suffer without additional improvements. According to the Metroplan analysis (Figures 2 and 3), the most severely impacted roadways would be Interstate 440, Main Street, Pike Avenue, and the Broadway Bridge. Improvements to these roadways are not identified as part of the Boulevard Alternative.

FIGURE 2: BOULEVARD TRAFFIC EFFECTS LITTLE ROCK

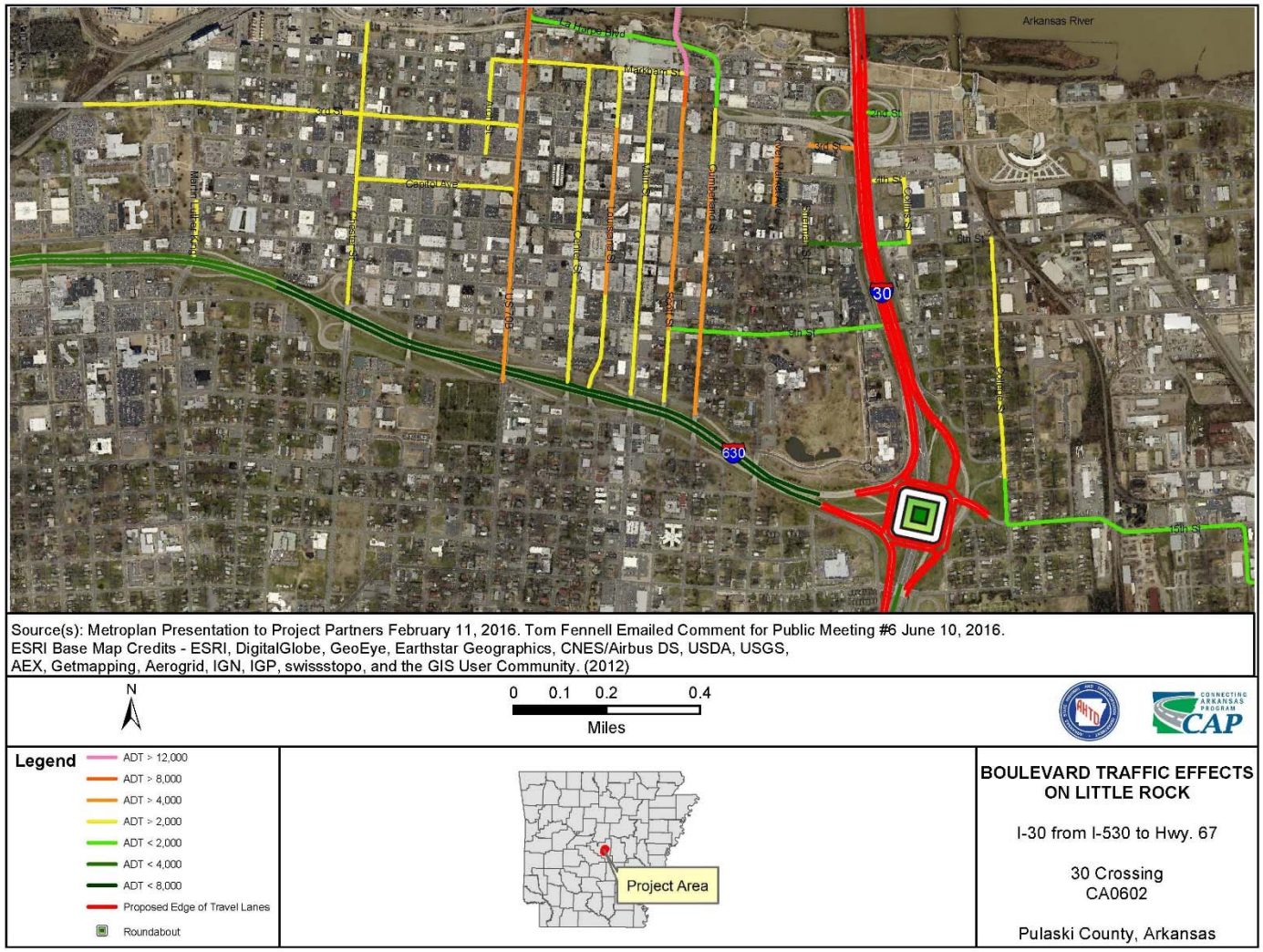
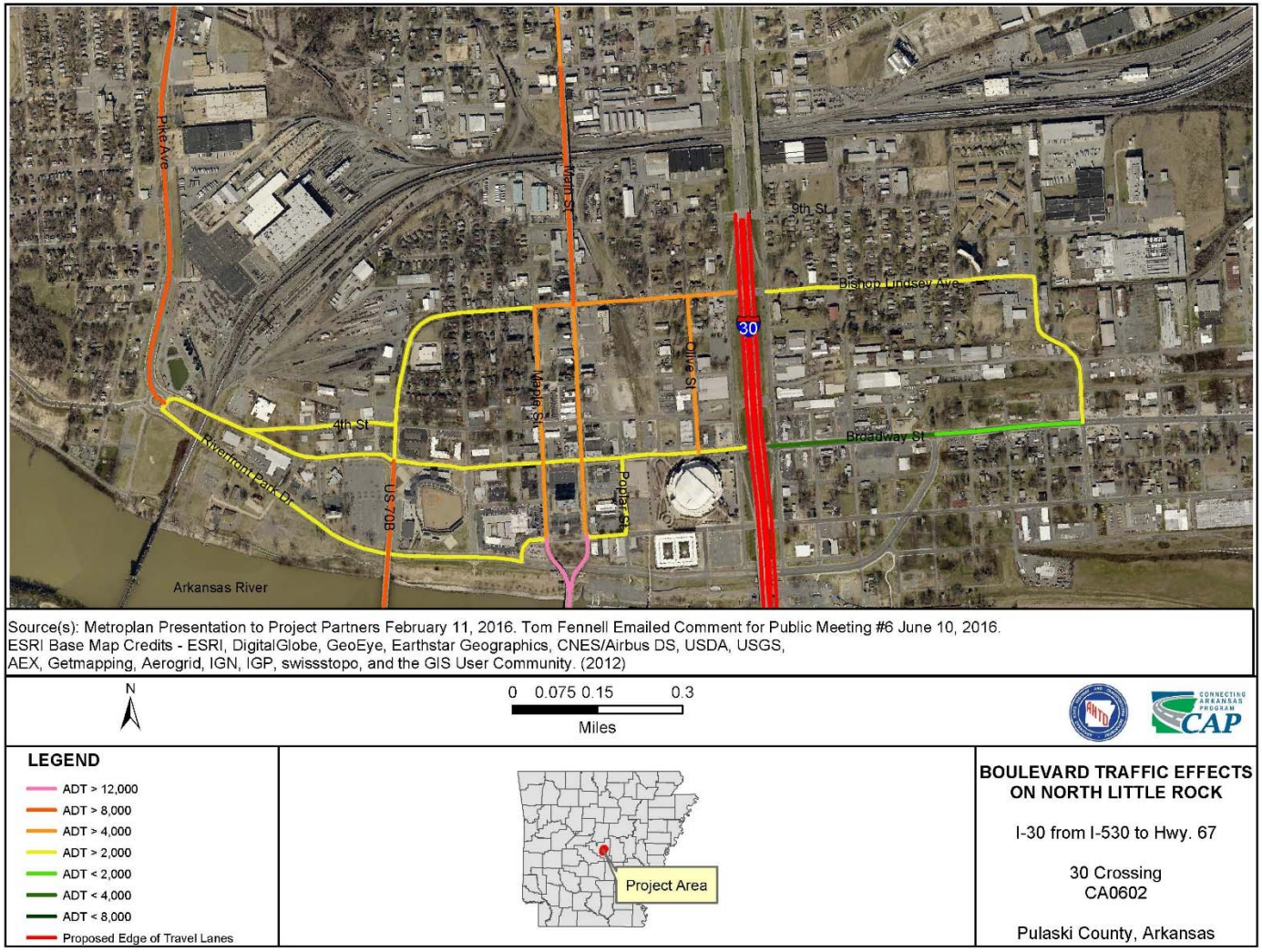


FIGURE 3: BOULEVARD TRAFFIC EFFECTS NORTH LITTLE ROCK



3.2 Roadway Safety

The high traffic volumes in the study area, combined with functional deficiencies of the Interstate 30, contribute to the high crash rates through the corridor. Most of the entrance and exit ramps do not meet the current length requirements, interchanges do not meet spacing requirements, and the weaving areas along the corridor do not provide adequate length for safe lane changes. Shoulder widths are inadequate and horizontal curves do not meet current safety standards for high speed roadways.

The Boulevard Alternative fails the purpose and need for roadway safety. At-grade intersections have much higher crash rates than grade-separated interchanges due to the increase in conflict points, which are locations where opposing traffic movements can occur. In addition, closely-spaced signalized intersections increase the likelihood of rear-end crashes as vehicles are constantly having to stop to allow the side street movements to occur. The transition between the freeway sections of Interstate 30 and the Boulevard section would become bottlenecks as vehicles rapidly decrease speed and change lanes to enter the congested section. This would result in an increase in rear-end collisions. The Boulevard Alternative would result in lower speeds, so the severity of crashes is expected to decrease, but the number of crashes would be expected to increase.

While pedestrians and cyclists are prohibited from using an interstate highway, the Boulevard would be designed to accommodate pedestrians and cyclists. Although it is expected that every effort will be made to make the roadway safe for these users, bringing pedestrians and cyclists in close contact with vehicles is inherently more dangerous than a limited access roadway, which does not allow pedestrian and bicycle use.

The shoulders of interstate highways can be used as a refuge for stalled, incapacitated, and crashed vehicles, and can also be used by emergency vehicles responding to incidents. The Boulevard would have no shoulders. During off-peak hours, the fourth (outside) lane would be used for parking and crashed vehicles would obstruct the third lane. During peak hours, crashed vehicles would obstruct the fourth lane. These obstructions would increase the possibility of secondary crashes and further decrease the Boulevard capacity.

3.3 Structural Roadway Deficiencies

Roadway structural deficiencies are due to the deterioration of concrete and asphalt over the 55 years since the roadway was initially constructed.

The Boulevard Alternative passes the purpose and need for structural roadway deficiencies within its limits. The entire roadway between Interstate 630 and 9th Street in North Little Rock would be reconstructed. Those portions of Interstate 30 outside of the Boulevard limits and Interstate 40 that currently need rehabilitation would need to be rehabilitated under a separate project.

3.4 Functional Roadway Deficiencies

Roadway functional deficiencies include geometric features that do not meet current design standards, such as narrow lanes and shoulders, and inadequate ramp lengths and spacing as defined by the American Association of State Highway and Transportation Officials (AASHTO) and the Arkansas State Highway and Transportation Department (AHTD).

It is assumed that the Boulevard Alternative would pass the project's purpose and need for functional roadway deficiencies within its limits, as it would be designed in accordance with all applicable standards. It is important to note that the Boulevard alternative does not address roadway deficiencies within the study area on Interstate 30 south of Interstate 630 or north of 9th street, as well as on Interstate 40.

3.5 Navigational Safety

The Interstate 30 Bridge over the Arkansas River has a history of being struck by barges due to the location of a pier in the navigational channel. The Arkansas Waterways Commission requested that the bridge provide a horizontal clearance of 332 feet and a vertical clearance of 62.4 feet. The Boulevard Alternative would pass the purpose and need for navigational safety as it includes the replacement of the Arkansas River Bridge and it is assumed the new Arkansas River Bridge would meet all applicable navigational criteria.

3.6 Structural Bridge Deficiencies

The Interstate 30 Bridge over the Arkansas River was rated as Structurally Deficient with a substructure rating of "poor" as a result of an October 2013 inspection by AHTD. The

Boulevard Alternative would pass the purpose and need for structural bridge deficiencies as it includes the replacement of the Arkansas River Bridge and it is assumed the new Arkansas River Bridge would meet all applicable structural design standards.

3.7 Functional Bridge Deficiencies

The existing narrow bridge shoulders do not meet current design standards. The Boulevard Alternative would pass the purpose and need for functional bridge deficiencies as it includes the replacement of the Arkansas River Bridge and it is assumed the new Arkansas River Bridge would meet all applicable design standards.

3.8 Practicality

The funding currently allocated to this project includes federal funds designated for an interstate highway. The Boulevard Alternative would remove this funding source, as well as jeopardize the applicability of the major funding source, the Connecting Arkansas Program (CAP) funds. CAP funds were approved by the voters for improvements to state highways and interstates. As the Boulevard would become a local roadway, CAP funding may not be available. The Boulevard Alternative would be less expensive, due to the reduction in bridges; however, no cost estimates have been done. Any shortfall in funds would have to be made up from other sources, most likely state or local funds. This would result in a delay to the project. The main environmental effects anticipated from the Boulevard Alternative would be socio-economic. Because it has lower capacity, the Boulevard would discourage use by both travelers passing through Little Rock on their way to other destinations, and travelers who currently commute to downtown Little Rock and North Little Rock. These travelers may choose to travel by different routes, which would then become congested, resulting in longer travel times, or may choose the option of avoiding the downtown area altogether in favor of a different destination. It is anticipated that the Boulevard Alternative would result in a substantial amount of traffic bypassing the downtown area.

If this section of Interstate 30 is withdrawn from the Interstate System, NEPA documentation would have to be provided for the action, including an assessment of the socio-economic impacts of causing traffic to bypass the downtown area. Among the documentation that FHWA would require for the proposed action would be the effect on the surrounding Interstate System, socio-economic effects on the community, and, most

importantly, that the action is in agreement with local planning objectives and policies.

4.0 SUMMARY AND CONCLUSIONS

The Boulevard Alternative does not meet the purpose and need of this project for congestion and safety, and is not practicable as it would jeopardize the project funding sources and is not in agreement with local planning policy. The Boulevard Alternative does meet the purpose and need for structural roadway deficiencies, functional roadway deficiencies, navigational safety, structural bridge deficiencies, and functional bridge deficiencies. The screening results are presented in Table 1. This alternative fails the Level 1 screening and will not be carried through to the next screening level.

TABLE 1: LEVEL ONE SCREENING RESULTS

Section Reference	Alternative	Congestion	Safety	Condition	Practicality	Pass, Fail or Complementary	Pass or Justification for Fail Rating
3.1	***No-Action***	O	Fail	Pass	Fail	Fail	Required to be carried forward by NEPA
3.2	***Highway-Build***						
3.2.1	Mainline Widening	++	Pass	Pass	Pass	Primary	Pass
3.2.2	Mainline Pavement Rehabilitation	O	Pass	Pass	Pass	Complementary	Pass
3.2.3	Elevated Lanes	++	Pass	Fail	Fail	Fail	Very high cost, difficult to maintain traffic during construction
3.2.4	Collector/Distributor (C/D) Roads	++	Pass	Fail	Pass	Primary	Pass
3.2.5	Auxiliary Lanes	+	Pass	Fail	Pass	Complementary	Pass
3.2.6	Dedicated Truck Lanes / Ramps	O	Pass	Fail	Fail	Fail	Minimal effect because of low truck percentage on I-30
3.2.7	Frontage Road Improvements	+	Pass	Fail	Pass	Complementary	Pass
3.2.8	Intersection Improvements	+	Pass	Fail	Pass	Complementary	Pass
3.2.9	Interchange Improvements	++	Pass	Pass	Pass	Primary	Pass
3.2.10	Ramp Consolidation / Elimination	+	Pass	Fail	Pass	Complementary	Pass
3.2.11	Roadway Shoulder Improvements	+	Pass	Fail	Pass	Complementary	Pass
3.2.12	Horizontal / Vertical Curve Improvements	+	Pass	Pass	Pass	Complementary	Pass
3.2.13	Bottleneck Removal	+	Pass	Pass	Pass	Complementary	Pass
3.2.14	Bypass Route	+	Pass	Fail	Pass	Complementary	Pass
3.2.15	Boulevard	-	Fail	Pass	Fail	Fail	Increases congestion and does not improve safety; a major portion of the funding would be jeopardized
3.3	***Arkansas River Bridge***						
3.3.1	I-30 Arkansas River Bridge Rehabilitation	++	Pass	Pass	Pass	Primary	Pass
3.3.2	I-30 Arkansas River Bridge Replacement	++	Pass	Pass	Pass	Primary	Pass
3.3.3	I-30 Arkansas River Bridge Elevated Lanes	++	Pass	Fail	Fail	Fail	Very high cost, difficult to maintain traffic during construction
3.4	***Other Modes***						
3.4.1	Arterial Bus Transit	+	Pass	Fail	Pass	Complementary	Pass
3.4.2	I-30 Express Bus Transit	+	Pass	Fail	Pass	Complementary	Pass
3.4.3	Bus on Shoulder	+	Pass	Fail	Pass	Complementary	Pass
3.4.4	Bus Lanes	+	Pass	Fail	Pass	Complementary	Pass
3.4.5	Arterial Bus Rapid Transit	+	Pass	Fail	Pass	Complementary	Pass
3.4.6	Light Rail (Street Car)	+	Pass	Fail	Pass	Complementary	Pass
3.4.7	Heavy Rail	+	Pass	Fail	Fail	Fail	Very high cost per mile
3.4.8	Commuter Rail	+	Pass	Fail	Fail	Fail	High Start-up and Operating Cost
3.4.9	High Speed Rail	+	Pass	Fail	Fail	Fail	Very high cost per mile
3.4.10	Bicycle / Pedestrian	O	Pass	Fail	Pass	Complementary	Pass
3.5	***Congestion Management***						
3.5.1	Information Systems / Advanced Traveler Infor	+	Pass	Fail	Pass	Complementary	Pass
3.5.2	Managed Lanes	+	Pass	Fail	Pass	Complementary	Pass
3.5.3	Reversible Lanes	+	Pass	Fail	Pass	Complementary	Pass
3.5.4	Ramp Metering	+	Pass	Fail	Pass	Complementary	Pass
3.5.5	Hard Shoulder Running	+	Pass	Fail	Pass	Complementary	Pass
3.5.6	Travel Demand Management	+	Pass	Fail	Pass	Complementary	Pass
3.5.7	Transportation System Management (TSM)	+	Pass	Fail	Pass	Complementary	Pass
3.5.8	Wayfinding / Signage	+	Pass	Fail	Pass	Complementary	Pass
3.5.9	Arterial Improvements	+	Pass	Fail	Pass	Complementary	Pass
3.5.10	Land Use Policy	+	Fail	Fail	Pass	Complementary	Pass
3.6	***Non-Recurring Congestion***						
3.6.1	Crash Investigation Sites	+	Pass	Fail	Pass	Complementary	Pass
3.6.2	Roadside / Motorist Assist Enhancements	+	Pass	Fail	Pass	Complementary	Pass
3.6.3	Improvements to Detour Routes	+	Pass	Fail	Pass	Complementary	Pass
3.6.4	Variable Speed Limits (Speed Harmonization)	+	Pass	Fail	Pass	Complementary	Pass
3.6.5	Queue Warning	+	Pass	Fail	Pass	Complementary	Pass

5.0 REFERENCES

Metroplan, Presentation to Project Partners, February 2016.

Summary of Highway Bypass Studies, Dennis Leong and Glen Weisbrod, Economic Development Research Group-Reprint Series, 2000.

Business Impacts of Highway Bypasses, Jonathan C. Comer and G. Allen Finchum, Oklahoma State University, Papers and Proceedings of the Applied Geography Conferences, 2001.

Economic Effects of Highway Relief Routes on Small and Medium-Size Communities: Literature Review and Identification of Issues, Handy, Kubly, Jarrett, and Srinivasan, Center for Transportation Research, Bureau of Engineering Research, the University of Texas at Austin, 2000.

Attachment D: Tunnel Feasibility Memo

TECHNICAL MEMORANDUM

I-30 Little Rock Tunnel Option Feasibility Study – Alignment implications

PREPARED FOR:	Brian Clark
COPY TO:	
PREPARED BY:	Martin Ellis
DATE:	February 4, 2016
PROJECT NUMBER:	CA0602
REVISION NO.:	-

This memo has been prepared to document the key factors affecting the extents of a tunnel solution to the La Harpe Blvd/President Clinton Intersection 141A on the I-30.

The proposed tunnel will be a 2 lane bidirectional tunnel which will underpass President Clinton Ave. and W 2nd Street following the line of Cumberland Avenue/ La Harpe Blvd. Existing road network will be maintained with ramps provided at the tunnel portals to enable all existing traffic movements. Figure 1 shows the location and general layout of the tunnel option considered in this report.

Existing Conditions

The proposed tunnel is located in an urban setting on the south bank of the Arkansas River. The topography is relatively flat but the south approach to the tunnel is descending from a bridge and embankment structure connecting to the I30 intersection.

Plan constraints

The alignment of the proposed tunnel will be within the existing rights of way except at the north side of the Chamber of Commerce building and at the boundary with the riverside park area (further checks are needed to confirm RoW extents).

Property boundaries along Cumberland Ave. between 1st and 2nd street will constrain the width of the tunnel structure and dictate the means of construction. It has been assumed that a minimum of 5ft clearance to the property lines is maintained to allow pedestrian access to properties.

Vertical constraints

The existing bridge structure at River Market Ave has been assumed as a constraining vertical limit and its existing profile has been used as the start for the new alignment. Reconstruction of the bridge has not been considered in this study as it would be a major cost and unlikely to yield much benefit because the bridge structure needs to clear the power cable to the tramway that follows River Market Ave.

Existing road levels at the W 2nd Street junction are a constraint to the vertical position of the tunnel as the road descends into the tunnel from the south. The tunnel structure will need adequate clearance below the road surface to enable near surface utilities to pass above the tunnel structure.

Similarly at the northern end of the tunnel the depth must be sufficient to clear the existing road surface at the President Clinton Ave junction. This clearance point is setback from the junction to allow the La Harpe Blvd side roads to overlap the tunnel before the President Clinton Ave junction.

At the top of the northern ramp the tie in with La Harpe Blvd. is located under the Junction Bridge approach structure and has been assumed to be constrained by the foundations of that structure. It may be possible to extend the tie in point further north to slacken the gradients into the tunnel but this would need further consideration of the bridge foundation structure.

Utilities

In this urban setting numerous utilities will be impacted by the construction of the tunnel. Generally the tunnel's vertical alignment will allow a minimum of 2ft cover to provide space for services between the tunnel and the road surface. Depending on the type of service and method of construction used these affected services can either be diverted or protected in place during the construction of the tunnel.

Several sanitary and storm drains either cross or follow the proposed tunnel alignment below the level of the proposed tunnel. The largest known of these is a 48 inch storm drain following W 2nd street. This utility will need to be diverted. The alternative of lowering the tunnel has been considered but would further steepen the approach gradients beyond 8%.

Several other smaller drains cross either the tunnel or its approach cutting, and diversion of these will be required. (Figure 5 shows potential diversion routes for storm and sanitary drains affected by the tunnel alignment).

A streetcar tram system operates along President Clinton Ave and W 2nd Street and will require careful consideration during construction to minimize disruption and to protect the overhead power cable. Careful sequencing will be needed to minimize any closure periods.

Ground Conditions

Three boreholes were completed along the tunnel alignment and found the bed rock at 10-15ft below ground level, the rock consists of shale and sandstone material. This bedrock is considered to be relatively impermeable except for the top 2-3 ft weathered zone where the sandstone occurs.

Above the bedrock is alluvial deposits consisting of material ranging from silty clays to sandy gravels. Ground water level within the alluvium is likely to vary seasonally but has been identified about 6 feet above bedrock.

One borehole (BH 192) at the northern end of the tunnel encountered some contamination likely from the historic railyard use of the river bank area. Further studies on the contamination and relationship with the groundwater conditions would be needed to confirm the extent of this contamination.

Tunnel Configuration

The tunnel configuration is governed by regulatory agency requirements as well as the space required for traffic operations and equipment. The tunnel configuration is largely determined by required horizontal and vertical clearances and other uses of tunnel space, such as for emergency egress walkway, drainage, signage, communications equipment, and other utilities.

The US Department of Transportation Federal Highway Administration's (FHWA) Technical Manual for Design and Construction of Road Tunnels (2009) has been considered in addition to the project design criteria.

Cross section

The cross section used in this study is based on a 36ft clear width and 18.5ft clear height and is shown in Figure 2.

The clear width of the tunnel is based on a typical arrangement with 12ft lanes, 2ft shoulders and a 4ft walkway. This has been taken as a minimum width and used to confirm that the structure can be constructed along Cumberland Avenue between the existing property lines.

At the ends of the tunnel and through the retained cutting section the horizontal curves result in restricted sight lines and to achieve standard stopping sight distances it will be necessary to widen the structure. The additional width required on the inside wall of the curve is approximately 6 feet to meet the 25mph SSD. At these locations the rook slab may increase in thickness to make the additional span.

The structural thickness of the tunnel walls has been shown as 3ft thick based on a typical pile size, but thicker walls could be used if a temporary support method is used.

The height of the tunnel is based on 16.5ft clearance (which includes 6" for resurfacing), plus 2 feet additional provision for ceiling mounted equipment and signage (nominally 1ft from equipment and 1ft additional tarpaulin clearance). The roof slab thickness has been assumed at 3 ft thick through most of the tunnel but an increased thickness would be provided through the curved sections as noted above..

Alignment

The vertical constraints between the tie in points at the top of the ramps results in maximum gradients used at both ends and a low point near the center of the tunnel. Generally according to (FHWA) Technical Manual for Design and Construction of Road Tunnels (2009) 6% is considered the maximum gradients for tunnels. Whilst this is mostly achieved for this proposed alignment the approach ramp at the south end of the tunnel will exceed that at 7% based on the constraints discussed previously. To achieve clearance at the portals, in addition to the steep grades, limiting vertical curves have been used at the tie in locations and these will result in necessary speed restrictions (25 mph).

The horizontal alignment of the tunnel and its approach ramps is largely dictated by the existing right of way along Cumberland Ave. Figures 3 & 4 show the plan a profile alignment respectively.

The tunnel portals will be on a tight radius where sight lines will be restricted by the tunnel walls or approach retaining walls. For the cross section shown in figure 2 a further 6 ft of shoulder will be needed on the inside of the curves to achieve the 25mph SSD..

The bypass roads at the norther end of the tunnel will not fit in the current assumed right of way and it would be necessary to extend the right of way northward in the river side park area by approximately 15 feet. This would require a small retaining wall against the existing walkway that runs along the south boundary of the park.

Portals and Retaining walls

The location of the tunnel portals is dictated by the surface road layout at the existing junctions. Their location determines the vertical profile gradients. Immediately adjacent to the portal as the road is still descending there may need to be a section above the tunnel with reduced cover to achieve the gradients shown. In this area it may be necessary to divert buried services or provide additional protection where they are close to the road surface.

Retaining walls are provided on each side of the portal approaches. These are required because the side roads that bypass the tunnel and are generally tight against the lanes descending into

the tunnel, except on the northbound southern approach where it may be possible to reduce the amount of retaining wall with landscaped slopes.

Operational considerations

The layout of this tunnel does raise potential safety concerns relating to the steep gradients and tight curves. Although the design speed is set very low there is a potential for much faster traffic with associated risk of incidents. To help manage this risk tunnel signage and communication systems will be required to manage traffic to avoid incidents in the tunnel, or to safely deal with incidents and prevent follow on problems. Signage will be required to divert traffic via surface routes during an incident or during maintenance. Lane control signs should also be provided to warn of breakdown and debris where the sightlines are restricted. CCTV coverage should also be provided and may be used to automate some traffic control responses.

A low point sump and pump station will be required in the tunnel to collect and discharge any runoff and seepage water that enters the tunnel. Separate collection system for some or all of the approach cutting could be provided and gravity drained to the river or existing outfall drains. This would reduce the sump size and pump capacity required in the low point sump.

NFPA 502 indicates that at 500ft long this tunnel does not require alternative means of escape. Walkways are provided with raised curbs to offer some protection from the traffic.

A tunnel ventilation system for control of smoke during a fire incident may not be required for this length of tunnel. This would need to be confirmed based on a more detailed assessment of the traffic conditions. If the tunnel is likely to be congested for significant periods and transport flammable goods, there is a possibility that a ventilation system would be required. If this were necessary jet fans could be installed in the tunnel crown or on the walls. The profile of the tunnel would permit the central section of the tunnel to have an increased headroom to accommodate jet fans mounted to the tunnel ceiling.

If the tunnel is likely to transport unusually flammable goods then some form of fire protection could be considered to protect the structure from damage if there is a cost benefit.

Construction Method

A number of construction methods could be used to construct this tunnel. Further assessment of the constraints will be needed to inform the approach, but it will most likely require a staged approach that will minimize impacts on traffic, trams, utilities and access to properties and businesses. One method that could achieve this is using top down construction where the pile walls are constructed first, followed by the roof slab in sections, and then the main excavation completes the tunnel without disruption to the surface.

The tunnel excavation will pass in close proximity to existing building foundations. Assessment of the potential ground movements will need to be undertaken to confirm the construction does not adversely impact those buildings. The construction method may need to incorporate mitigation measures if a risk of damage is identified.

Cost estimate

The probable construction cost for this tunnel option is estimated to be in the region of $23.7M.

Attachment A to this memo provides a high level breakdown of this estimate.

This estimate is based on the assumption that the tunnel would not require an emergency ventilation system or a fire suppression system due to its relatively short length. Should these additional facilities be required it is estimated that the additional costs would be in the order of $600K

Alternatives

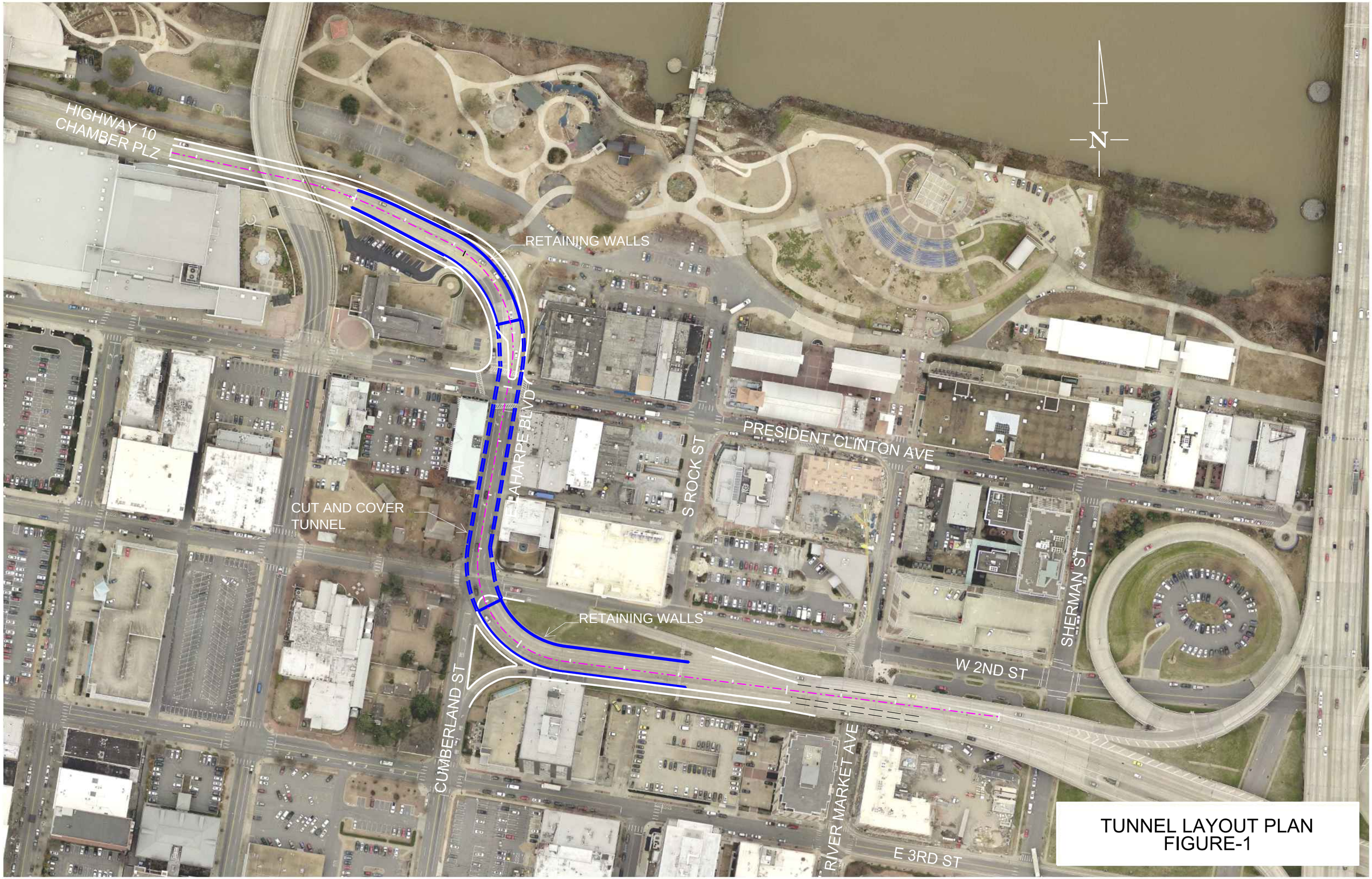
The following alternative could be considered to improve the tunnel alignment:

- Rebuild bridge structure over River Market Avenue,
    - To avoid the main storm drain diversion.
    - To reduce the gradients on the south approach
- Move the northern tie-in location to reduce the gradients from the north.
- Consider a one way tunnel to improve safety and design speed.
-

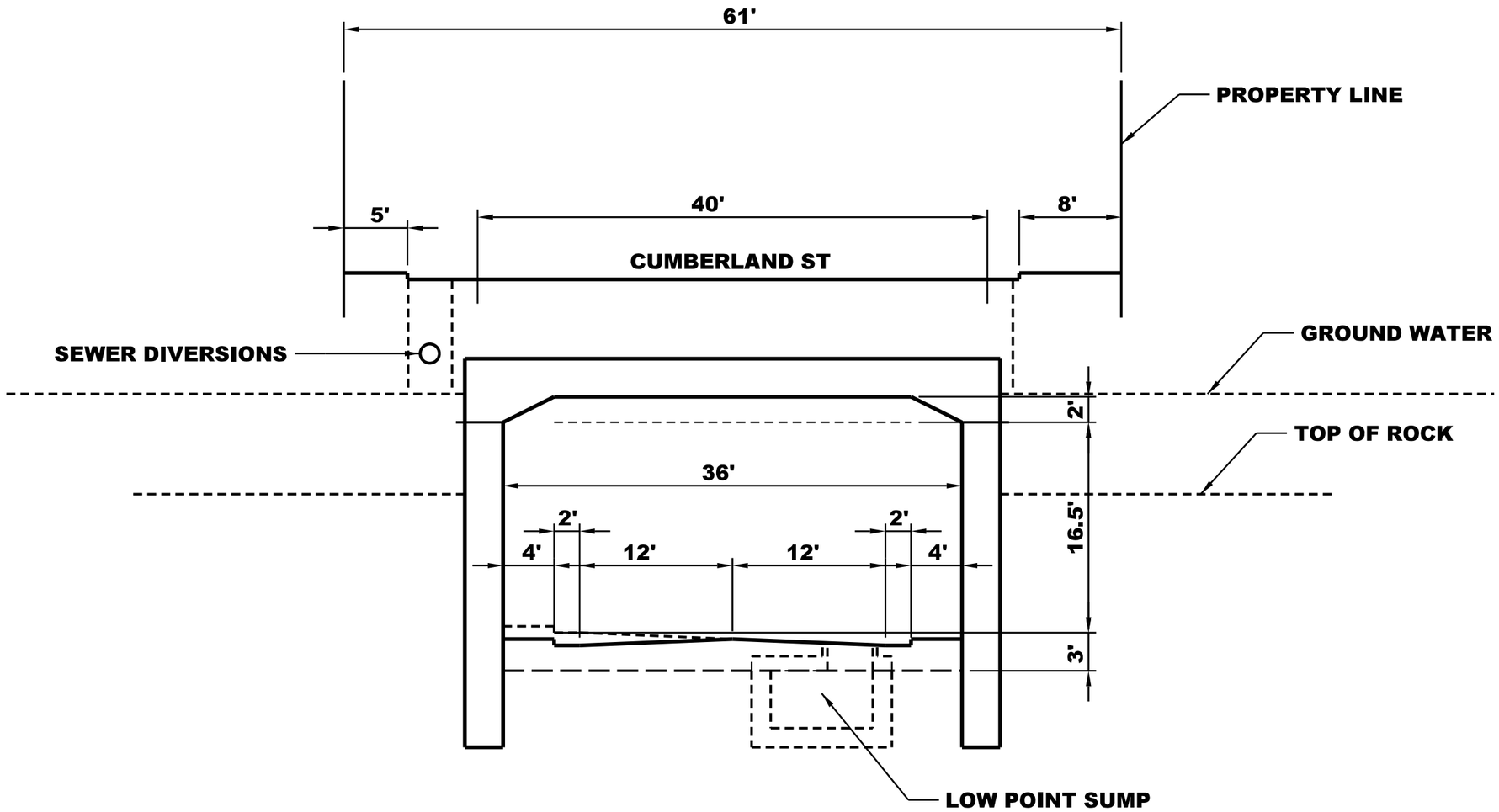
Summary of Findings

This study identified a number of issues that add to the complexity of a tunnel solution for the La Harpe Blvd/President Clinton Intersection and these should be considered in any decision to pursue this option. These issues are summarized below

- Gradients of 7% are more than the recommended maximum of 6% for tunnels.
- Horizontal and vertical curves limit the design speed to 25mph
- Horizontal stopping sight distances will require offset walls through curved sections.
- Low point sumps will require pumped drainage.
- Multiple Storm and Sanitary drain diversion will be required
- Excavated Material may be contaminated
- Excavation method will need to account for soft ground and rock conditions.
- Special construction sequencing will be required to manage traffic, trams and utility diversions.
- Land outside assumed Right of way may need to be acquired.
- Safety case to confirm natural ventilation will need to be proven, but could result in significant additional costs.



TUNNEL LAYOUT PLAN
FIGURE-1



TUNNEL CROSS SECTION
FIGURE-2

HIGHWAY 10
CHAMBER PLZ

POB 11+52.44

S77°25'06.11"E

P.I. 14+71.83

15+00

S64°02'56.57"E

P.C. 13+89.79

P.T. 15+53.13

P.C. 16+86.40

P.I. 18+49.36

26°44'14"

P.T. 19+65.34

20+00

OE RIVER OUTLET

PRESIDENT CLINTON AVE

S ROCK ST

E LAHARPE BLVD

S10°13'52.21"W

P.C. 22+95.25

25+00

SHERMAN ST

W 2ND ST

30+00

S82°43'28.28"E

P.I. 24+85.84

CUMBERLAND ST

P.T. 25+88.90

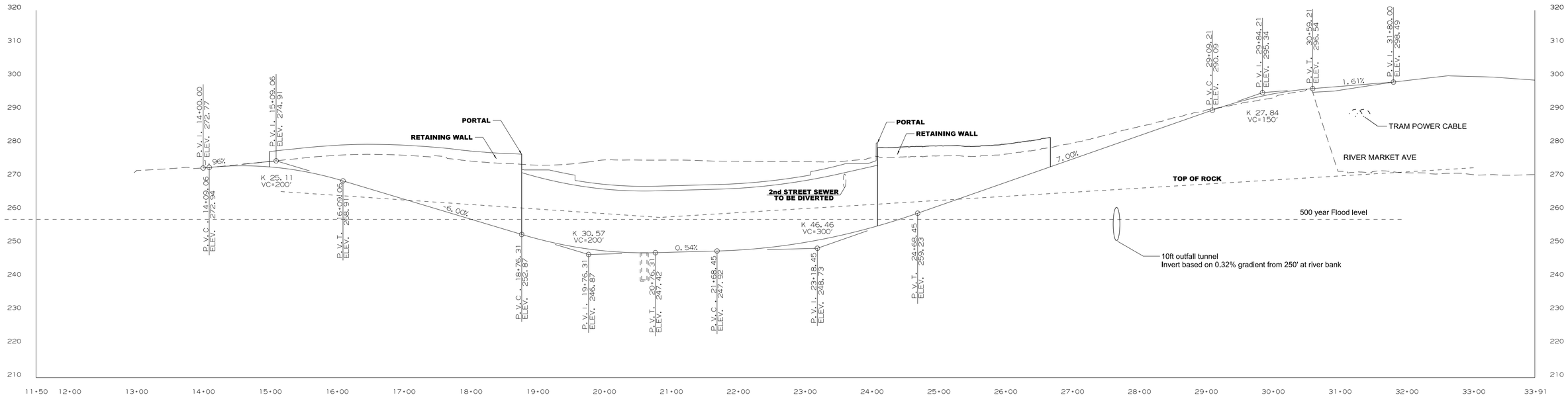
RIVER MARKET AVE

E 3RD ST

POE 33+91.45

N

TUNNEL ALIGNMENT PLAN
FIGURE-3



TUNNEL PROFILE
FIGURE-4

LEGEND:

- EXIST SANITARY SEWER
- EXIST STORM SEWER
- RELOCATED SANITARY SEWER
- RELOCATED STORM SEWER
- ABANDONED SANITARY SEWER
- ABANDONED STORM SEWER

N

HIGHWAY 10
CHAMBER PLZ

APPROX. LOCATION 8'X10' R.C. BOX CULVERT BY PLAN AHTD JOB# 6877

APPROX. LOCATION 10' DRAINAGE TUNNEL BY PLAN AHTD JOB# 6877

E LAHARPE BLVD

S ROCK ST

PRESIDENT CLINTON AVE

SHERMAN ST

W 2ND ST

CUMBERLAND ST

RIVER MARKET AVE

E 3RD ST

TUNNEL DRAIN DIVERSION PLAN
FIGURE-5

OPINION OF PROBABLE CONSTRUCTION COST

I-530-HWY. 67 (WIDENING & RECONST.) (I-30 & I-40) (F)

Description: **Tunnel Option**
La Harpe Blvd/President Clinton Intersection

Made By: MJE
Checked By:

Date: 1/29/16
Date:

TUNNEL COSTS

	Quantity	Cost (per unit)	Total Cost
Cut and Cover Tunnel plan Area (ft^2) =	23,600	$569.49	$13,440,000.00
Dewatering	1%		$134,400.00
Utilities relocation	10%		$1,344,000.00
Building monitoring	1%		$134,400.00
Mob / Demob	10%		$1,344,000.00
Design Fee	5%		$672,000.00
M&E systems	15%		$2,016,000.00
Contaminated ground	5%		$672,000.00
	0%	$0.00	$0.00
		Total =	$19,756,800.00

Total Estimated Bridge Cost = **$19,800,000.00**

ROADWAY COSTS

	Length (ft)	Length (mi)	Cost (per lane-mi)	Total Cost
New Roadway Construction =	1,150	0.2	$2,400,000.00	$522,727.00
	0	0.0		$0.00
			Total =	$522,727.00

Additional Items:

	Length (ft) / Each	Area (ft^2)	Cost (per unit)	Total Cost
Retaining Walls (ft) =	425	28050.0	$60.00	$1,683,000.00
Traffic Signals (each) =	2	-	$180,000.00	$360,000.00
			Total =	$2,043,000.00

Total Of Roadway Items = $2,565,727.00

Total Estimated Roadway Cost = **$2,600,000.00**

TOTAL CONSTRUCTION COSTS

Total Estimated Construction Cost = **$22,400,000.00**

RIGHT-OF-WAY COSTS

	Quantity	Cost (per acre)	Total Cost
Land (acre) =	1.00	$100,000.00	$100,000.00
		Total =	$100,000.00

Total Estimated ROW Cost = **$110,000.00**

TOTAL OPINION OF PROBABLE CONSTRUCTION AND ROW COST (2015): $22,510,000

TOTAL OPINION OF PROBABLE CONSTRUCTION AND ROW COST (2017): $23,700,000

Attachment E: USCG and Arkansas Waterways Commission letters to ArDOT

U.S. Department of Homeland Security

United States Coast Guard

Commander
Eighth Coast Guard District

1222 Spruce Street, Room 2.102D
St. Louis, MO 63103-2832
Staff Symbol: dwb
Phone: (314) 269-2382
Fax: (314) 269-2737
Email: david.a.orzechowski@uscg.mil
www.uscg.mil/d8/westernriversbridges

16593.22/118.5 ARW
January 29, 2014

Mr. Carl J. Fuselier, P.E.
Assistant Division Head
Bridge Division, Arkansas Highway
and Transportation Department
10324 Interstate 30
Little Rock, AR 72209

Subj: I-30 BRIDGE, MILE 118.5, ARKANSAS WATERWAY

Dear Mr. Fuselier:

This is in response to your letter dated December 3, 2013, concerning widening or replacing the subject bridge.

As the existing I-30 Bridge is the most restrictive bridge in Little Rock Harbor in regards to horizontal clearance, from a navigation standpoint the Coast Guard recommends replacing the existing bridge with a new structure that provides a minimum horizontal navigation opening of at least 320.0 feet and a minimum vertical clearance of 63.0 feet above normal pool stage. These clearances are consistent with contemporary bridges permitted and built over the Arkansas Waterway in the past few years. We understand during the construction phase of a new bridge, one half of the existing structure will be retained for diverted vehicular traffic while the new structure is being built. During this phase the current left descending channel shall remain clear at all times. The right descending channel would be blocked by a new pier and associated equipment. In addition, we would like to address placement of the new piers so that the navigation line through the harbor is not adversely affected.

If widening the existing structure is your preferred alternative, a Coast Guard Bridge Permit Amendment will be required. The left descending channel of 169.5 feet is measured between the upstream left descending pier protection cell and the downstream center pier protection cell. This channel is the most preferred by navigation and most restrictive of the two channels, and shall remain unobstructive at all times during the widening sequence. If a containment system is used during the modification, a three foot maximum reduction in the vertical clearance would be allowed. A permanent reduction of two feet of vertical clearance would be acceptable. This bridge is the narrowest of all bridges currently in the Little Rock Harbor and, therefore, any proposed reduction of the existing horizontal clearance in the left descending channel would be unacceptable between the left descending and center pier protection cells unless otherwise approved by this office. Another alternative that could be discussed would be the widening of the bridge on the existing piers (strengthened) along with the removal of the existing center pier and center protection cells.

16593.22/118.5 ARW
January 29, 2014

I appreciate the opportunity to comment on the proposed bridge project and look forward to discussing these alternatives as well as other alternatives that you may bring forth. Should you have any questions, please contact Mr. David Orzechowski at (314) 269-2382.

Sincerely,

ERIC A. WASHBURN
Bridge Administrator, Western Rivers
By direction of the District Commander

C: RALPH - REPLY FOR MY SIG.
LORIE
MIKE
KELI

Arkansas Waterways Commission

Mike Beebe, Governor

Gene Higginbotham, Executive Director

August 21, 2014

Mr. Scott Bennett
Director
Arkansas State Highway and Transportation Department
P.O. Box 2261
Little Rock, Arkansas 72203

RE: Proposed Interstate 30 Bridge, Arkansas River

Dear Mr. Bennett,

On behalf of the Arkansas Waterways Commission, I write to comment on the Proposed Interstate 30 Bridge Expansion (Arkansas Waterway, Mile 118.5, Little Rock, Pulaski County, Arkansas).

The Interstate 30 Bridge carries the highest amount of vehicular traffic across the Arkansas River in Metropolitan Little Rock area. To make this bridge safer for both navigation and the vehicular traffic moving across it, we would recommend the bridge pier that divides the navigation channel be removed and a navigation channel of 332 feet (horizontal width) be established. This horizontal width is the navigation channel width at the Junction Bridge (mile 118.7), which is the closest adjacent bridge. We would also recommend that the deck of the proposed Interstate 30 Bridge be no lower than that of the soon-to-be constructed Broadway Bridge (mile 119.1), which has a proposed vertical clearance of 62.4 feet above pool. Currently the Interstate 30 Bridge does not meet current AASHTO Standards and while the current pier protection system offers optimal protection for frontal collision, there remains a great potential for damage from a vessel collision from the side which is unprotected. Any design plans that would call for reinforcement to the existing pier in the navigation channel would reduce the width of the navigation channel and could possibly lead to more incidents as traffic continues to grow on the McClellan–Kerr Arkansas River Navigation System.

As construction is approved on the Interstate 30 bridge, we would request that the left descending channel remain open at all times. We would also request that any construction done to piers or the deck should be scheduled to minimize the impact to navigation.

Thank you for the opportunity to comment on this issue. If you have any questions regarding my comments, I can be reached at (501) 682-1173.

Sincerely,

Gene Higginbotham

cc: Governor Mike Beebe
Ms. Sandra L. Otto, FHWA Arkansas Division
Mr. Eric Washburn, USCG Eighth Coast Guard District (dwb)

Appendix F: Design Criteria

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	URBAN FREEWAY	
GENERAL INFORMATION		**NOTES**
Functional Classification	Interstate (Urban)	
Design Speed	60 mph	
Design Year	TBD	
Traffic Volume	TBD	
Level of Service	TBD	
Access Control	Fully Controlled	AHTD - Rdwy Dsn Dev Guide, C-1
Design Units	English	
TYPICAL SECTION		
Travel Lanes		
Number of Lanes	6-10 Lanes (3-5 in each direction)	
Lane Width	12' Each	
Cross Slope	NC = 2%	
Max Superelevation	e = 10%	AASHTO Geo Dsn Hw 2004, pg 505, AHTD Std. Drwg. SE-1
Shoulders		
Shoulder Width	10' Outside, 12' Inside	12' outside shldr where barrier wall is located adjacent to pavement
Cross Slope	4%	AASHTO Geo Dsn Hw 2004, pg 316
Max Rollover	8%	AASHTO Geo Dsn Hw 2004, pg 316
Median		
Width	26' with Concrete Barrier	
Slope	2%	
Side Slopes		
Clear Zone Width	30'	AASHTO Roadside Dsn Guide 2011, pg 3-3, (60mph, 6:1, 30-32' - See note 'a')
Slope Inside Clear Zone	6:1	
Slope Outside Clear Zone	3:1	AASHTO Roadside Dsn Guide 2011, pg 3-,4 defines recoverable slopes as 4:1 or flatter.
HORIZONTAL ALIGNMENT		
Max Degree of Curve	5˚15'00"	AASHTO Geo Dsn Hw 2004, Exhibit 3-28, pg 172, Min Radius for 60mph & 10% e (i.e. Rmin = 1090'), AHTD Std. Dwg. SE-1
VERTICAL ALIGNMENT		
Vertical Clearance	16.5' (min) bridge; 17.5' (min) sign truss	AASHTO Geo Dsn Hw 2004, pg 506
Max Grade		
Ascending	4% (3% Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 8-1 pg 506
Descending	4% (3% Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 8-1 pg 506
Min Curvature (K)		
Sag Vertical Curve	136	AASHTO Geo Dsn Hw 2004 Exhibit3-75 pg 277
Crest Vertical Curve	151	AASHTO Geo Dsn Hw 2004 Exhibit3-73 pg 272

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	URBAN FREEWAY (cont'd)	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres SCS Method (TR 55 Methodology) for 200 < DA < 2000 Acres USGS Regression for DA > 2000 Acres	
Cross Drains		
Flood Frequency	50 Year (100 Year Review)	
Pipe Material	Concrete	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	N/A	
Pipe Material	N/A	
Storm Drains		
Flood Frequency	50 Year	
Pipe Material	Concrete	
Pavement Spread	1/2 Outer Lane Width	
Minimum Pipe Size	24"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use concrete ditch paving for slopes > 3%	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit velocity is 50% > channel velocity; when both criteria are met and flow is > 100 cfs, use HEC-14 for energy dissipation device design	

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	COLLECTOR-DISTRIBUTOR ROAD--LIMITED ACCESS	
GENERAL INFORMATION		
Functional Classification	Collector-Distributor	
Design Speed	40 mph (50 mph preferred)	If less due to ROW constraints, include Acceleration and Deceleration Distances of AASHTO Exhibits 10-70 and 10-73. Vertical Alignments and Spacing of existing Underpasses in North Little Rock may require Max Design Speed of 35 mph
Design Year	TBD	
Traffic Volume	TBD	
Level of Service	TBD	
Access Control	Fully Controlled	
Design Units	English	
TYPICAL SECTION		
Travel Lanes		
Number of Lanes	1-2 Lanes	
Lane Width	15' (1 lane), 12' (2 lane)	
Cross Slope	NC = 2%	
Max Superelevation	e = 10%	
Shoulders		
Shoulder Width	6' Outside & 6' Inside (4' with 2' add'l width adjacent to barrier)	
Cross Slope	4% (2% adjacent to barrier wall)	
Max Rollover	8%	AASHTO Geo Dsn Hw 2004, pg 316
Median		
Width	N/A	
Slope	N/A	
Side Slopes		
Clear Zone Width	30'	**AHTD - Rdwy Dsn Plan Dev Guide, B-1 (30')**; AASHTO Roadside Dsn Guide 2011, pg 3-3, (<= 40mph, 6:1, 14-16') - leave as-is
Slope Inside Clear Zone	6:1	AHTD - Rdwy Dsn Dev Guide, B-1
Slope Outside Clear Zone	3:1	AASHTO Roadside Dsn Guide 2011, pg 3-4, defines recoverable slopes as 4:1 or flatter.
HORIZONTAL ALIGNMENT		
Max Degree of Curve	13˚15'00" (8˚15'00" Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-28, pg, 172, Min Radius for 40mph (50 mph preferred) & 10% e - Rmin = 410' 13˚58'28.5" (694' preferred 8˚15'21"), AHTD Std. Drwg SE-1
VERTICAL ALIGNMENT		
Vertical Clearance	16.5' (min) bridge; 17.5' (min) sign truss	AASHTO Geo Dsn Hw 2004, pg 506--Allow 6" additional for future resurfacing
Max Grade		
Ascending	6% (5% Preferred)	AASHTO Geo Dsn Hw 2004, pg 829
Descending	8% (7% Preferred)	AASHTO Geo Dsn Hw 2004, pg 829
Min Curvature (K)		
Sag Vertical Curve	64 (96 Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-75, pg 277

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

Crest Vertical Curve	44 (84 Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-72, pg 272

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	COLLECTOR-DISTRIBUTOR ROAD--LIMITED ACCESS (cont'd)	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres SCS Method (TR 55 Methodology) for 200 < DA < 2000 Acres USGS Regression for DA > 2000 Acres	
Cross Drains		
Flood Frequency	50 Year (100 Year Review)	
Pipe Material	Concrete	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	N/A	
Pipe Material	N/A	
Storm Drains		
Flood Frequency	50 Year	
Pipe Material	Concrete	
Pavement Spread	1/2 Outer Lane Width	
Minimum Pipe Size	24"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use concrete ditch paving for slopes > 3%	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit velocity is 50% > channel velocity; when both criteria are met and flow is > 100 cfs, use HEC-14 for energy dissipation device design	

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	FRONTAGE ROADS--CROSS STREETS--FULL ACCESS	
GENERAL INFORMATION		**NOTES**
Functional Classification	Urban Local Street	
Design Speed	40 mph (preferred) 35 mph (minimum under constraints)	match approaches--coordinate with maintaining authority
Design Year	TBD	
Traffic Volume	TBD	
Level of Service	TBD	
Access Control	Non-restrictive	
Design Units	English	
TYPICAL SECTION		
Travel Lanes		
Number of Lanes	2-4 Lanes (1-2 lanes each direction)	
Lane Width	Variable, TBD	Will correlate with LR and NLR master street plans (inc bike lanes). For 5 lane section, AHTD will permit 4-11' thru lanes & 1-12' turn lane.
Cross Slope	NC = 2%	
Max Superelevation	e = 4%	AASHTO Geo Dsn Hw 2004, pg 145
Shoulders		
Shoulder Width	Variable, TBD	Open shldr sections will match AASHTO guidelines for functional classification, ADT and speed
Cross Slope	4%	
Max Rollover	8%	
Median	Only for 2 way Divided Roadway	
Width	18' Raised Median for Divided Cross Streets--12' lane, 4' raised separator, 1' gutter opposing traffic	AASHTO Geo Dsn Hw 2004, pg 474
Slope	2%	
Side Slopes		
Clear Zone Width	16' (if shoulders) 1.5' (if curb & gutter)	AASHTO Roadside Dsn Guide 2011, pg 3-3, (40mph, 6:1, 14-16')
Slope Inside Clear Zone	6:1 (desired), 4:1 (permitted); 2% w/I limits of sdwk for urban sections (8' grass berm if curb w/no sdwk)	
Slope Outside Clear Zone	3:1	AASHTO Roadside Dsn Guide 2011, pg 3-4, defines recoverable slopes as 4:1 or flatter.
HORIZONTAL ALIGNMENT		
Max Degree of Curve	10˚45'00" (40 mph-R=533') 15˚30'00" (35 mph-R=371')	AASHTO Geo Dsn Hw 2004, Exh 3-25, pg 167
VERTICAL ALIGNMENT		
Vertical Clearance	15.5' unless part of an interchange then 16.5'	bridge memo dated 5-2-95
Max Grade		
Ascending	7% - 10%	AASHTO Geo Dsn Hw 2004, pg 391, 432, 472
Descending	7% - 10%	AASHTO Geo Dsn Hw 2004, pg 391, 432, 472
Min Curvature (K)		

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602	
CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA		
Sag Vertical Curve	64 (40mph) 49 (35 mph)	AASHTO Geo Dsn Hw 2004, Exh 5-2, pg 381
Crest Vertical Curve	44(40 mph) 29 (35 mph)	AASHTO Geo Dsn Hw 2004, Exh 5-2, pg 381

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	FRONTAGE ROADS--CROSS STREETS--FULL ACCESS (ARTERIAL)	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres SCS Method (TR 55 Methodology) for 200 < DA < 2000 Acres USGS Regression for DA > 2000 Acres	
Cross Drains		
Flood Frequency	50 Year	
Pipe Material	Concrete or Asphalt Coated CSP or Aluminum Coated CSP or	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	10 year	
Pipe Material	Refer to Current Specifications Section 606	
Storm Drains		
Flood Frequency	10 Year, with provisions for 100 year for arterials	
Pipe Material	Concrete or Smooth Lined Polymer Coasted CSP	
Pavement Spread	Maintain one lane clear for three lanes and above; 1/2 lane clear for two lanes	
Minimum Pipe Size	18"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use concrete ditch paving for slopes > 3%	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit velocity is 50% > channel velocity; when both criteria are met and flow is > 100 cfs, use HEC-14 for energy dissipation device design	
ROADWAY SECTION	**FRONTAGE ROADS--CROSS STREETS--FULL ACCESS (COLLECTOR)**	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres SCS Method (TR 55 Methodology) for 200 < DA < 2000 Acres USGS Regression for DA > 2000 Acres	
Cross Drains		
Flood Frequency	25 Year	
Pipe Material	Concrete or Asphalt Coated CSP or Aluminum Coated CSP or Polymer Coasted CSP	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	10 year	
Pipe Material	Refer to Current Specifications Section 606	
Storm Drains		
Flood Frequency	10 Year	
Pipe Material	Concrete or Smooth Lined Polymer Coasted CSP	
Pavement Spread	Maintain one lane clear for three lanes and above; 1/2 lane clear for two lanes	

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

Minimum Pipe Size	18"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use concrete ditch paving for slopes > 3%	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit velocity is 50% > channel velocity; when both criteria are met and flow is > 100 cfs, use HEC-14 for energy dissipation device design	

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	FRONTAGE ROADS--CROSS STREETS--FULL ACCESS (LOCAL ROADS)	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres SCS Method (TR 55 Methodology) for 200 < DA < 2000 Acres USGS Regression for DA > 2000 Acres	
Cross Drains		
Flood Frequency	10 Year unless DA > 2 sq mi or ADT > 750, then 25 year	
Pipe Material	Concrete or Asphalt Coated CSP or Aluminum Coated CSP or	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	2 year	
Pipe Material	Refer to Current Specifications Section 606	
Storm Drains		
Flood Frequency	2 Year; except within City of Little Rock, 10 year, with provisions for 25 year	
Pipe Material	Concrete or Smooth Lined Polymer Coasted CSP	
Pavement Spread	Maintain one lane clear for three lanes and above; 1/2 lane clear for two lanes	
Minimum Pipe Size	18"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit	
ROADWAY SECTION	**DIRECTIONAL OR DIAGONAL RAMPS**	
GENERAL INFORMATION		**NOTES**
Functional Classification	Interstate (Urban)	
Design Speed	40 mph (50 mph preferred)	If less due to ROW constraints, include Acceleration and Deceleration Distances of AASHTO Exhibits 10-70 and 10-73
Design Year	TBD	
Traffic Volume	TBD	
Level of Service	TBD	
Access Control	Fully Controlled	
Design Units	English	
TYPICAL SECTION		
Travel Lanes		
Number of Lanes	1-2 Lanes	
Lane Width	15' (1 lane), 12' (2 lane)	
Cross Slope	NC = 2%	
Max Superelevation	e = 10%	

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602	
CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA		
Shoulders		
Shoulder Width	6' Outside & 4' Inside (10' & 6' for 2 lane directional ramp)	
Cross Slope	4%	
Max Rollover	8%	AASHTO Geo Dsn Hw 2004, pg 316
Median		
Width	N/A	
Slope	N/A	
Side Slopes		
Clear Zone Width	30'	**AHTD - Rdwy Dsn Plan Dev Guide, B-1 (30')**; AASHTO Roadside Dsn Guide 2011, pg 3-3, (<= 40mph, 6:1, 14-16') - leave as-is
Slope Inside Clear Zone	6:1 (preferred)	AHTD - Rdwy Dsn Dev Guide, B-1
Slope Outside Clear Zone	3:1	AASHTO Roadside Dsn Guide 2011, pg 3-4, defines recoverable slopes as 4:1 or flatter.
HORIZONTAL ALIGNMENT		
Max Degree of Curve	13˚15'00" (8˚15'00" Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-28 pg 172, AHTD Std. Drwg SE-1
VERTICAL ALIGNMENT		
Vertical Clearance	16.5' (min) bridge; 17.5' (min) sign truss	AASHTO Geo Dsn Hw 2004, pg 506--includes 6" for future resurfacing
Max Grade		
Ascending	6% (5% Preferred)	AASHTO Geo Dsn Hw 2004, pg 829
Descending	8% (7% Preferred)	AASHTO Geo Dsn Hw 2004, pg 829, the manual suggest downgrades should follow the same maximums as updrades, however, assuming appropriate topographic conditions, this 2" increase is allowable.
Min Curvature (K)		
Sag Vertical Curve	64 (96 Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-75 pg 277
Crest Vertical Curve	44 (84 Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-72 pg 272

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	DIRECTIONAL OR DIAGONAL RAMPS (cont'd)	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres	
Cross Drains		
Flood Frequency	50 Year (100 Year Review)	
Pipe Material	Concrete	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	N/A	
Pipe Material	N/A	
Storm Drains		
Flood Frequency	50 Year	
Pipe Material	Concrete	
Pavement Spread	1/2 Outer Lane Width	
Minimum Pipe Size	24"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit	
ROADWAY SECTION	**URBAN LOOP RAMP**	
GENERAL INFORMATION		**NOTES**
Functional Classification	Interstate (Urban)	
Design Speed	30 mph	If less due to ROW constraints, include Acceleration and Deceleration Distances of AASHTO Exhibits 10-70 and 10-73
Design Year	TBD	
Traffic Volume	TBD	
Level of Service	TBD	
Access Control	Fully Controlled	
Design Units	English	
TYPICAL SECTION		
Travel Lanes		
Number of Lanes	1-2 Lanes	
Lane Width	15' (1 lane), 12' (2 lane)	
Cross Slope	NC = 2%	
Max Superelevation	e = 10%	
Shoulders		
Shoulder Width	6' Outside & 4' Inside	
Cross Slope	4%	

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602	
CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA		
Max Rollover	8%	AASHTO Geo Dsn Hw 2004, pg 316
Median		
Width	N/A	
Slope	N/A	
Side Slopes		
Clear Zone Width	30'	**AHTD - Rdwy Dsn Plan Dev Guide, B-1 (30')**; AASHTO Roadside Dsn Guide 2011, pg 3-3, (<= 40mph, 6:1, 14-16') - leave as-is
Slope Inside Clear Zone	6:1 (preferred)	AHTD - Rdwy Dsn Dev Guide, B-1
Slope Outside Clear Zone	3:1	AASHTO Roadside Dsn Guide 2011, pg 3-4, defines recoverable slopes as 4:1 or flatter.
HORIZONTAL ALIGNMENT		
Max Degree of Curve	24˚45'00" (19˚30'00" Preferred)	AASHTO Geo Dsn Hw 2004, Exhibit 3-28, pg 172
VERTICAL ALIGNMENT		
Vertical Clearance	16.5' (min) bridge; 17.5' (min) sign truss	AASHTO Geo Dsn Hw 2004, pg 506--includes 6" for future resurfacing
Max Grade		
Ascending	7%	AASHTO Geo Dsn Hw 2004, pg 829
Descending	9%	AASHTO Geo Dsn Hw 2004, pg 829
Min Curvature (K)		
Sag Vertical Curve	37	AASHTO Geo Dsn Hw 2004, Exhibit 3-75 pg 277
Crest Vertical Curve	19	AASHTO Geo Dsn Hw 2004, Exhibit 3-72 pg 272

PRELIMINARY DESIGN CRITERIA PULASKI COUNTY	I-530-HWY.67 (WIDENING & RECONST.) (I-30 & I-40) (F) AHTD JOB NO. CA0602

CA0602 PRELIMINARY ROADWAY DESIGN CRITERIA

ROADWAY SECTION	URBAN LOOP RAMP (cont'd)	
DRAINAGE		
Calculation of Q	Rational Method for DA < 200 Acres	
Cross Drains		
Flood Frequency	50 Year (100 Year Review)	
Pipe Material	Concrete	
Minimum Freeboard	1.5' Below Top of Subgrade, HW/D <= 1.5	
Side Drains		
Flood Frequency	N/A	
Pipe Material	N/A	
Storm Drains		
Flood Frequency	50 Year	
Pipe Material	Concrete	
Pavement Spread	1/2 Outer Lane Width	
Minimum Pipe Size	24"	
Minimum Cover	1.0' from Top of Structure to Top of Subgrade	
Ditch Lining Check	See Table 6-4 AHTD Drainage Manual for grass channels; use	
Outlet Protection	Standard riprap apron for exit velocity > 12 ft/sec or exit	