



US 31 SOUTH

# LEVEL 2 SCREENING REPORT

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Prepared By



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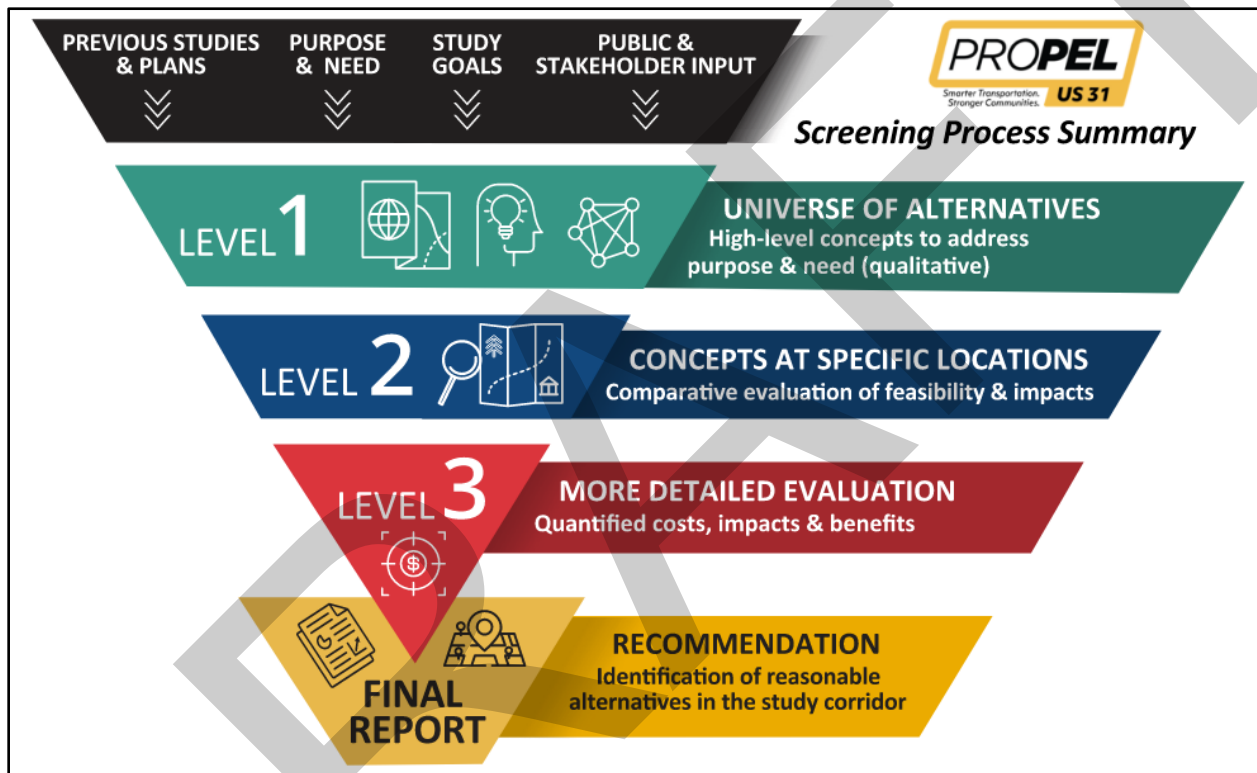
- Appendix A: Decision Trees
- Appendix B: Preliminary Capacity Analysis Results
- Appendix C: Design Criteria and Preferences

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# EXECUTIVE SUMMARY

ProPEL is an Indiana Department of Transportation (INDOT) initiative for transportation planning that uses collaborative Planning and Environment Linkages (PEL) studies to consider environmental, community, and economic goals. The ProPEL US 30/31 studies are utilizing a three-level screening process, depicted in **Figure ES-1**, to identify reasonable alternatives that address the identified transportation needs and goals of the study area. The Level 2 screening evaluates concepts advancing from the Level 1 screening at the primary intersections within the study area.

Figure ES-1 ProPEL US 31 South Alternatives Development and Screening Process



This *ProPEL US 31 South Level 2 Screening Report*, which details the Level 2 screening methodology and results, has been prepared for the ProPEL US 31 South study and is based on existing conditions, projected future conditions, current plans and past studies, public comments, stakeholder input as well as social, economic, and environmental constraints. The ProPEL US 31 South study area includes US 31 from 276<sup>th</sup> Street in Hamilton County north to the State Route (SR) 931 south junction in Tipton County, and from the SR 931 north junction in Howard County north to County Road (CR) West 300 North in Miami County. The US 31 Kokomo bypass is excluded from the ProPEL US 31 South study.

This Level 2 screening report provides a comparative evaluation of reasonability and impacts for transportation improvement concepts and identifies alternatives to further evaluate in Level 3.

# LEVEL 2 SCREENING

## OVERVIEW

The purpose of the Level 2 screening analysis is to qualitatively evaluate location-specific improvements identified in the Universe of Alternatives (Level 1) Report for reasonability and potential impacts. As part of the Universe of Alternatives (Level 1) screening, fifty-five (55) transportation improvement concepts, including the No-Build concept, were considered for the ProPEL US 31 South study area. These concepts were qualitatively evaluated against the study area purpose and need, as well as practicality. Of the 55 concepts, five (5) Primary Concepts, nine (9) Complimentary Concepts, and thirteen (13) Design Elements were identified to move forward in the study. More information on the concepts that moved forward is available in the Universe of Alternatives Report online at ProPELUS31.com.

In Level 2, the fourteen (14) potential solutions that were identified as Primary and Complimentary Concepts are being qualitatively evaluated at the primary intersections in the study area. Primary intersections are locations where US 31 intersects with a roadway that is designated as a Major Collector or higher, or they are roadways within the study areas that were identified during outreach as important to the surrounding community, such as being an access point for a school. These primary intersections largely control roadway operations in the study area. Therefore, alternatives selected at the primary intersections influence what can be constructed upstream or downstream of the primary intersection and set the foundation for improvements between them. Thus, the Level 2 screening will identify the building blocks for the Level 3 screening.

While the Level 2 screening focuses on alternatives at the primary intersections, the Level 3 screening will develop and analyze improvement packages for sections of the study area. These sections, which will be called planning segments, will include improvements at the primary intersections, the secondary intersections, as well as the roadway sections between them. Each of the primary intersection improvement alternatives advancing from the Level 2 screening will be included in at least one of the improvement packages considered in the Level 3 screening. The Level 3 screening include both qualitative and quantitative factors to enable an assessment of costs, benefits, and impacts. The Design Elements will again be evaluated as part of the Level 3 screening.

A four-step evaluation process was applied to each of the 18 primary intersections within the ProPEL US 31 South study area. This process is summarized as follows:

### STEP 1 – DECISION TREE

A decision tree assessment tool was developed to identify the scale of improvement needed at each primary intersection based on safety and operational data, as well as input from both the public and stakeholders. More information is provided in **Section 3.1.1**.

### STEP 2 – OPERATIONAL ANALYSIS

Various concepts or intersection types were evaluated at each primary intersection. Concepts that are expected to produce poor operating conditions were eliminated from further consideration. More information is provided in **Section 3.1.2**.

### STEP 3 – EVALUATION MATRIX

A matrix was prepared for each primary intersection to assess the following attributes for all concepts advancing from Step 2:

- Ability to meet purpose and need.
- Social, economic, and environmental impacts.
- Relative cost.

Multiple concepts were eliminated in this step due to high impacts and/or low benefits. **Section 3.1.3** provides details of the evaluation process and results.

#### STEP 4 – CONCEPTUAL FOOTPRINT COMPARISON

Concepts advancing from Step 3 were developed into intersection alternatives by preparing conceptual designs to establish a high-level estimation of the improvement limits (i.e., a footprint). These footprints were then used to assess impacts and screen out alternatives with high impacts. Avoidance and minimization of adverse impacts to the human and natural environment were incorporated to the extent feasible in a planning study. Further details on this process are provided in **Section 3.1.4**.

### LEVEL 2 SCREENING RESULTS

The Level 2 screening has identified a wide range of alternatives to improve operations and safety at the 18 primary intersections. The alternatives passing the Level 2 screening are listed in **Table ES-1**.

Table ES-1 ProPEL US 31 South Level 2 Screening Results

Alternatives	No Build	Primary Concepts					Complementary Concepts									
		Access Modifications	Unsignalized Intersection Improvements		Grade Separation		Auxiliary Lanes	Signal Timing Updates	Add/Lengthen Turn Lanes	Acceleration / Deceleration Lanes	Signalized Intersection Improvements		Ramp Terminal Improvements	Roadway Lighting	Warning System	Freight Priority System
			RCI	Signalization	Overpass	Interchange					Green-T Intersection	Quadrant Roadway				
US 31 & CR 200 N	x	x	x			x			x	x				x	x	
US 31 & CR 100 N	x	x	x			x			x	x		x		x	x	
US 31 & US 24	x															
US 31 & Blair Pike Rd	x	x	x						x	x				x	x	
US 31 & Logansport Rd	x		x		x	x				x				x	x	
US 31 & Airport Rd	x	x							x	x					x	
US 31 & Business 31	x					x				x	x			x	x	x
US 31 & CR 400 S	x		x		x				x	x				x	x	
US 31 & CR 500 S	x	x	x		x				x	x				x	x	
US 31 & SR 218 N	x		x	x		x				x	x			x	x	x
US 31 & SR 218 S	x	x	x							x	x			x	x	
US 31 & CR 800 S	x	x	x			x				x				x	x	
US 31 & SR 18	x		x	x		x			x	x		x		x	x	x
US 31 & CR 550 N	x	x	x			x			x	x				x	x	
US 31 & Division Rd	x		x	x		x				x		x		x	x	x
US 31 & SR 28	x											x				
US 31 & 296 <sup>th</sup> St	x	x	x			x			x	x				x	x	
US 31 & 276 <sup>th</sup> St	x	New interchange constructed as part of a separate project														

# 1 INTRODUCTION

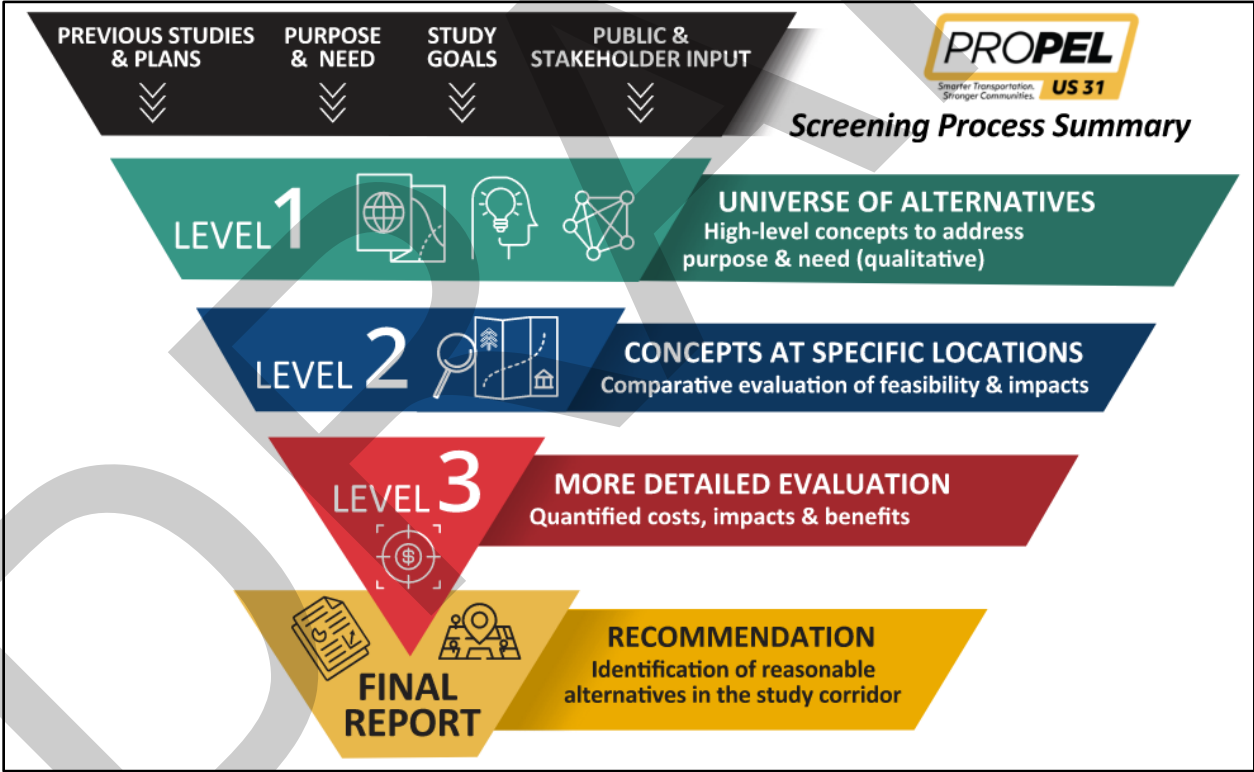
## 1.1 PURPOSE OF THIS REPORT

This report documents the Level 2 screening of concepts that advanced from the Level 1 (Universe of Alternatives) screening process. These concepts address the transportation needs identified in the *ProPEL US 31 South Purpose and Need Report* (<https://propelus31.com/31doctrinary/>) and are practical.

The Level 2 screening represents the second step in a three level alternatives development and screening process, as depicted in **Figure 1-1**. The concepts advanced from the Level 1 screening process were evaluated at specific locations in the Level 2 screening process to assess reasonability and potential impacts. Public and stakeholder input received to date was considered as part of the Level 2 screening. The ability of each concept to meet the study’s purpose and needs is also analyzed in the Level 2 screening.

As part of the Level 2 screening process, location-specific concepts will be identified and evaluated qualitatively based on study needs, costs, and social, economic, and environmental impacts. The results of this process will be made available for public comment and any feedback received will be considered before advancing to the Level 3 screening process.

Figure 1-1: ProPEL US 31 South Alternatives Development and Screening Process



A stated goal of this PEL study is to identify the reasonable range of alternatives for the study area. Given the needs identified within the study area, a reasonable alternative could consist of improvements at a single intersection; it could also consist of improvements at multiple intersections and/or the roadway sections in between them. Depending on multiple factors, including statewide priorities and funding availability, improvements considered as part of this PEL study could be combined in different ways to address the identified transportation needs and support the goals of the study area.



The Level 2 screening process focuses on the primary intersections within the study area and identifies the location-specific concepts that are reasonable at each of these intersections. Primary intersections are those locations where US 31 intersects with a roadway with classification of *Major Collector* or higher. Note CR 400 S in Miami County was added to the Level 2 analysis as it is the primary access point for Pipe Creek Elementary School.

The Level 2 screening for the ProPEL US 31 South study was developed utilizing information from the following reports, which are available at the study website (<https://propelus31.com/31doclibrary/>):

- *ProPEL US 31 South Existing Transportation Conditions Report (April 11, 2023)*
- *ProPEL US 31 South Final Environmental Constraints Report (Date TBD)*
- *ProPEL US 31 South Final Purpose and Need Report (December 1, 2023)*
- *ProPEL US 31 South Resource Agency, Stakeholder & Public Involvement (RASPI) Summary Reports*
  - *RASPI #1 (September 27, 2023)*
  - *RASPI #2 (December 6, 2023)*
- *ProPEL US 31 South Universe of Alternatives (Level 1) Screening Technical Memorandum (November 13, 2023)*

Additional inputs to this screening process include previous studies, current plans, and input received from both the public and study stakeholders.

The following information is provided in this report:

- A summary of the study area purpose and need statement along with study goals.
- A summary of the Level 1 Screening and the concepts advanced.
- The methodology applied in the Level 2 screening process.
- Details of how alternatives were identified, developed, and evaluated at primary intersections during the Level 2 screening.
- An overview of the next steps in this PEL study.

## 1.2 STUDY INTERSECTIONS

The ProPEL US 31 South study area contains 54 intersections with crossroads. These intersections were designated as “primary” or “secondary” intersections based on the functional classification of the crossroad<sup>1</sup>. Below is further description of these designations:

- **Primary Intersections** – Intersections where the crossroad has a classification of *Principal Arterial*, *Minor Arterial*, or *Major Collector*, which are the highest non-interstate classifications of roadways<sup>2</sup>. US 31 within the study area is classified as a *Principal Arterial (other)*. The US 31 and CR 400 S intersection does not meet these criteria but was added as a primary intersection due to it being the primary access to Pipe Creek Elementary School. These intersections may be stop controlled, signalized, or have existing interchanges. The primary intersections largely control the operations of US 31 within the study area. Primary intersections within the US 31 South study area are listed in Table 1-1.

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<sup>1</sup> Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide.

<sup>2</sup> <https://www.fhwa.dot.gov/planning/processes/statewide/related/hwy-functional-classification-2023.pdf>

Table 1-1: Primary Intersections in US 31 South Study Area

Primary Intersections		
In Miami County	In Tipton County	In Hamilton County
US 31 & CR 200 N	US 31 and CR 550 N	US 31 and 296 <sup>th</sup> Street
US 31 & CR 100 N	US 31 and Division Road	US 31 and 276 <sup>th</sup> Street
US 31 & US 24	US 31 and SR 28	-
US 31 & Blair Pike Road	-	-
US 31 & Logansport	-	-
US 31 and Airport Road	-	-
US 31 and Business 31	-	-
US 31 and CR 400 S	-	-
US 31 and CR 500 S	-	-
US 31 and SR 218 N	-	-
US 31 and SR 218 S	-	-
US 31 and CR 500 S	-	-
US 31 and SR 18	-	-

**Secondary Intersections** – Intersections where the crossroad has a classification of *Minor Collector* or *Local Road*, which are the lowest classifications of roadways<sup>3</sup>. These intersections are typically two-way stop controlled and have minor influence on the operations of US 31 within the study area.

Secondary intersections were considered in the Level 2 screening process only when directly impacted by alternatives at adjacent primary intersections. All secondary intersections will be addressed in the Level 3 screening. An overview of how these intersections will be addressed is provided in **Section 6**.

### 1.3 PURPOSE AND NEED

The needs, purpose, and goals identified in the *ProPEL US 31 South Purpose and Need Report* are summarized below.

#### 1.3.1 TRANSPORTATION NEEDS

The following transportation needs have been identified for the ProPEL US 31 South study area:

- Safety concerns due to high crash frequencies and/or high crash severities within the study area
- Operational issues at unsignalized intersections across the study area
- Lack of consistency with INDOT’s Access Management Guidelines
- Mobility requirements across the US 31 corridor (east-west)
- Safe, high-quality mobility for long-distance passenger and freight trips through the study area

<sup>3</sup> <https://www.fhwa.dot.gov/planning/processes/statewide/related/hwy-functional-classification-2023.pdf>

### 1.3.2 PURPOSE

As defined by, and to address the needs identified above, the purpose of the ProPEL US 31 South study is to:

- Improve safety along US 31 by reducing the frequency and severity of crashes within the study area.
- Improve traffic operations by reducing delay at unsignalized intersections.
- Improve access control through implementation of INDOT's Access Management Guidelines.
- Support east-west mobility for schools, emergency services, and agricultural services.
- Enhance the efficiency and reliability of US 31 as a regional and statewide corridor.

For more detail, see the *ProPEL US 31 South Final Purpose and Need Report* available on the study website (<https://propelus31.com/31doclibrary/>).

### 1.3.3 GOALS

The following goals have been identified for the ProPEL US 31 South study area:

- **Economic Development** – Provide transportation infrastructure to support local economies and economic development goals.
- **Equity In Transportation** – Provide equitable access and mobility for underserved communities.
- **Multimodal Access & Connections** – Accommodate non-motorized, transit, and active modes of travel in and across the study area.
- **Emerging Technologies** – Support emerging technologies and related infrastructure, including alternative fuel, and autonomous or connected vehicles.
- **Fiscal & Environmental Practicality** – Identify fiscally responsible improvements and avoid/minimize impacts to the human and natural environment.

## 2 CONCEPTS EVALUATED

### 2.1 SUMMARY OF LEVEL 1 SCREENING

The Level 1 screening process considered 55 transportation improvement concepts, including the No-Build concept, for the ProPEL US 31 South study area. These concepts were qualitatively evaluated against the study area purpose and need and evaluated for practicality.

The Level 1 screening process identified 14 concepts which meet one or more of the study area needs and are considered practical. Five of these concepts met a majority of the transportation needs. These concepts were designated as Primary Concepts and were evaluated as stand-alone alternatives in the Level 2 screening process. Nine of these concepts addressed some of the transportation needs but cannot function as a stand-alone alternative. These concepts were designated as Complementary Concepts. Complementary Concepts were evaluated in the Level 2 screening process as location-specific application(s) as part of a Primary Concept.

The Level 1 screening process also identified 13 concepts that did not meet any of the study area needs but were considered practical as they provide some benefit to the study area. These concepts have been designated as Design Elements and will be incorporated, where applicable, into concepts developed in the Level 3 screening processes.

The No-Build Alternative meets one transportation need of the study area, but it will not address the safety issues identified throughout the study area. The No-Build Alternative will be advanced throughout the PEL study and throughout any ensuing NEPA analyses to serve as a baseline for comparison to build alternatives.

**Table 2-1** lists the practical concepts advanced from the Level 1 screening process.

*Table 2-1: Level 1 Screening: Practical Concepts*

Primary Concepts (5)	Complementary Concepts (9)	Design Elements (13)
<ul style="list-style-type: none"> <li>• Access Management</li> <li>• Freeway (Free Flow Facility with Full Control of Access)</li> <li>• Unsignalized Intersection Improvements</li> <li>• Cross Road Overpass/Underpasses</li> <li>• Convert to Interchange</li> </ul>	<ul style="list-style-type: none"> <li>• Auxiliary Lanes</li> <li>• Signal Timing Updates/Coordination</li> <li>• Add/Lengthen Turn Lanes</li> <li>• Add/Extend Acceleration Lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Intersection Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority System</li> </ul>	<ul style="list-style-type: none"> <li>• Median Safety Improvements</li> <li>• Realign Skewed Intersections</li> <li>• Intersection Sight Distance Improvements</li> <li>• Traffic Control Visibility Upgrades</li> <li>• Pavement Marking Improvements</li> <li>• Roadway Signage Improvements</li> <li>• Accommodate Wildlife Crossing</li> <li>• Geometric Improvements</li> <li>• Roadway Drainage Improvements</li> <li>• Gateway/Corridor Treatment</li> <li>• Speed Management</li> <li>• Alternative Fuel/Electric Vehicle Considerations</li> <li>• Bicycle/Pedestrian Facilities</li> </ul>

## 2.2 PRIMARY CONCEPTS

Five primary concepts were carried forward from the Level 1 screening for further evaluation in the Level 2 screening. These concepts will define how the study area operates, such as whether it provides for free flow along US 31 or requires intermittent stops. The following sub-sections further define the primary concepts.

### 2.2.1 ACCESS MANAGEMENT

Access management includes various modifications that can be implemented at primary and secondary intersections, as well as on the roadway sections between intersections, to improve safety and operations by eliminating conflict points and restricting access, whereas improvements listed later in this chapter are intended to maintain access while improving safety and operations. Access management will be considered in the Level 2 screening mostly with respect to changes to locations immediately upstream or downstream, if warranted, by improvements analyzed at primary intersections.

Access management improvements considered in the Level 2 screening include the following:

A **right-in/right-out (RIRO)** intersection configuration, shown in **Figure 2-1**, can be applied to a crossroad or a driveway. This configuration allows only right turns to/from the crossroad (green and red arrows) or driveway. The major roadway (blue arrows) is not required to stop at this intersection type. Crossing and left turn movements to and from the crossroad are not permitted thus eliminating the likelihood of high severity collisions associated with these movements.

**Closure of an intersection** occurs when all connections between US 31 and a crossroad are severed. Closures typically include construction of cul-de-sacs on the crossroad.

Figure 2-1: Access Management, Right-In/Right-Out (RIRO) Schematic Diagram

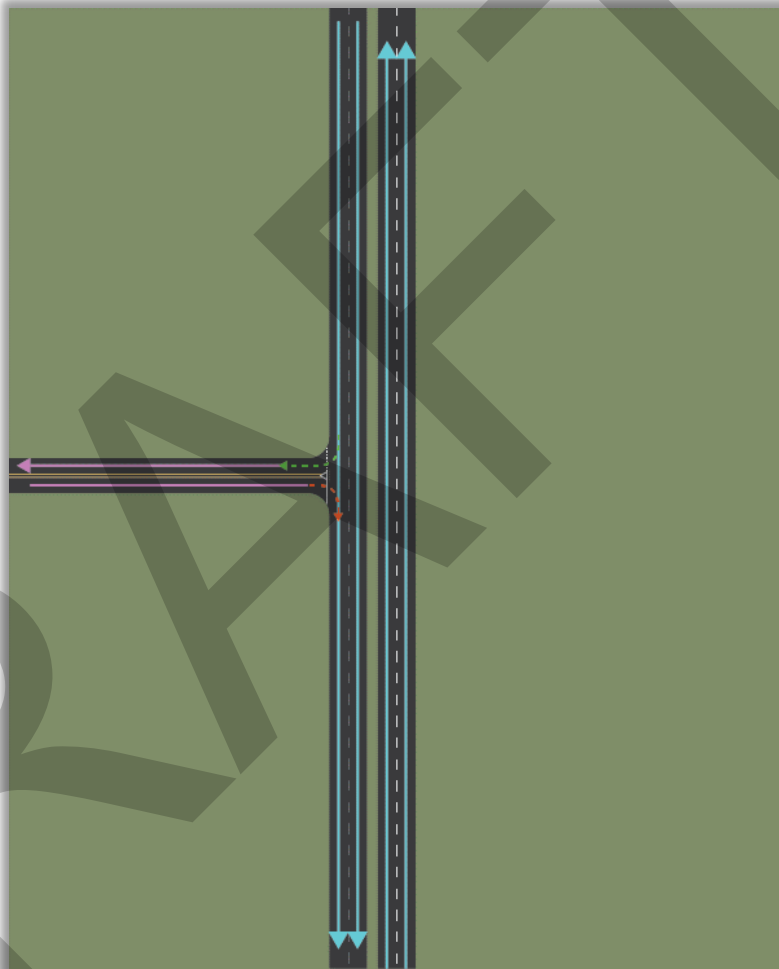
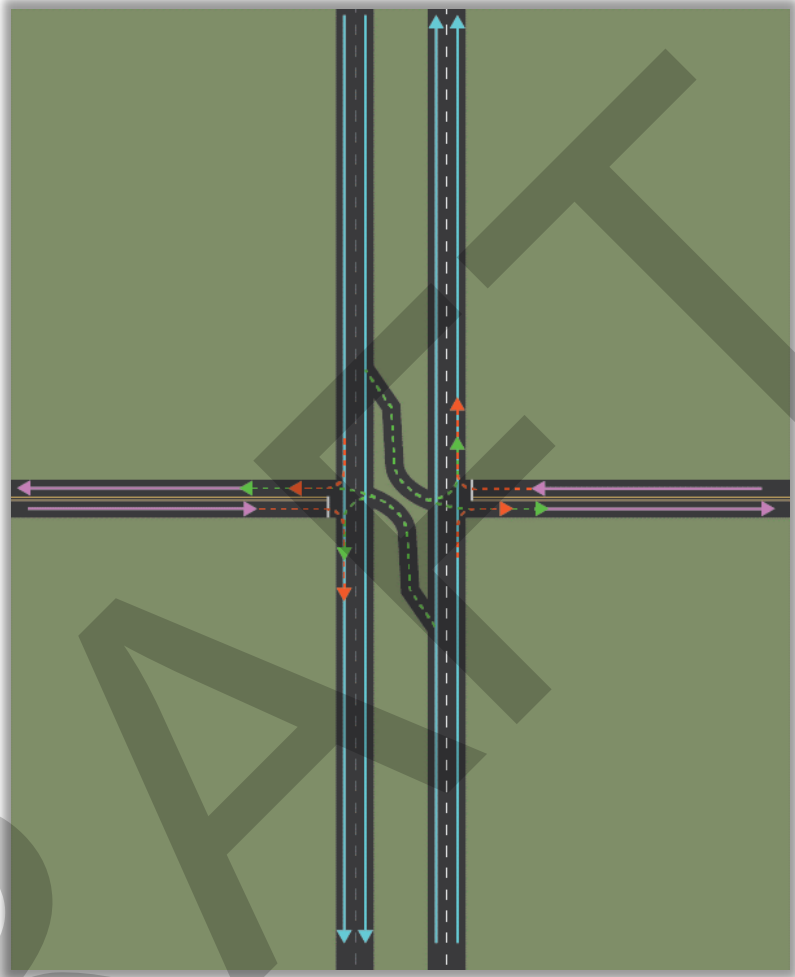


Figure 2-2: Access Management, Directional Median Schematic Diagram

**Directional median openings**, as shown in **Figure 2-2**, where through movements on the crossroad (purple arrows) and left turn movements from the crossroad (not shown) are prohibited. The major roadway (blue arrows) is not required to stop at this intersection type.





### 2.2.2 UNSIGNALIZED INTERSECTION IMPROVEMENTS

The *INDOT Intersection Decision Guide*<sup>4</sup> identifies multiple unsignalized at-grade intersection types that may improve operations, safety, and/or mobility at primary intersections. These include the following:

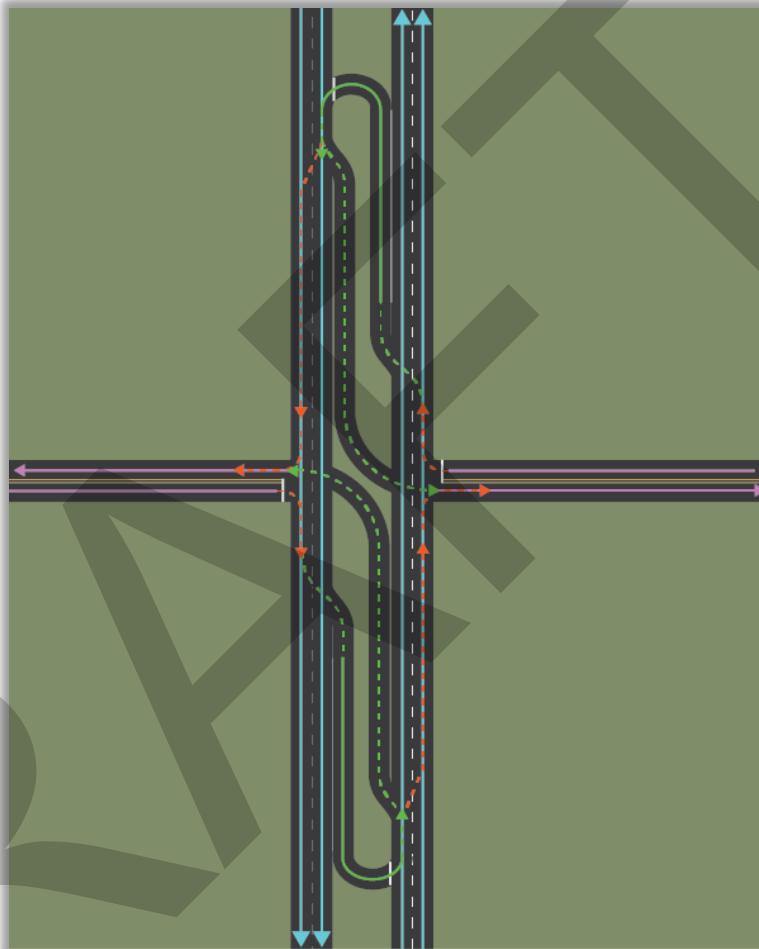
A **Reduced Conflict Intersection (RCI)**, shown in **Figure 2-3**, is an intersection type where left turn and through movements from the crossroad are facilitated by turning right (red arrows) onto the major road (blue arrows), making a U-turn movement (green arrows) provided along the major roadway and proceeding past or turning right onto the crossroad. Left turn movements from the major roadway (green arrows) are typically permitted at the crossroad (green dashed arrows).

This intersection type is commonly used to improve safety by rerouting left turn and through movements from the crossroad as crashes associated with these movements are typically severe. Additionally, this intersection type provides or maintains free flow conditions on the major roadway. Depending on traffic volumes, the U-turn and right turn movements may require signalization. When an RCI is signalized, it is called a Restricted Crossing U-Turn (RCUT) intersection.

A **signalized intersection** is an intersection where a traffic signal assigns the right-of-way to all movements, which can improve the efficiency of the intersection. The decision to signalize an intersection is based on the outcome of a needs study which determines if a traffic signal is expected to improve conditions. These needs studies are conducted based on national guidelines<sup>5</sup> established by the Federal Highway Administration (FHWA). No figure is provided for this intersection concept.

Other unsignalized intersection types not considered for the US 31 South Study area include offset T-Intersections and roundabouts. More information on these intersection types can be found in the *INDOT Intersection Decision Guide*<sup>6</sup>. Additional information on why these intersection types were eliminated from consideration in the Level 2 screening can be found in Section 3.2.2.

Figure 2-3: Reduced Conflict Intersection Schematic Diagram



<sup>4</sup> [https://www.in.gov/indot/files/ROP\\_IntersectionDecisionGuide.pdf](https://www.in.gov/indot/files/ROP_IntersectionDecisionGuide.pdf)

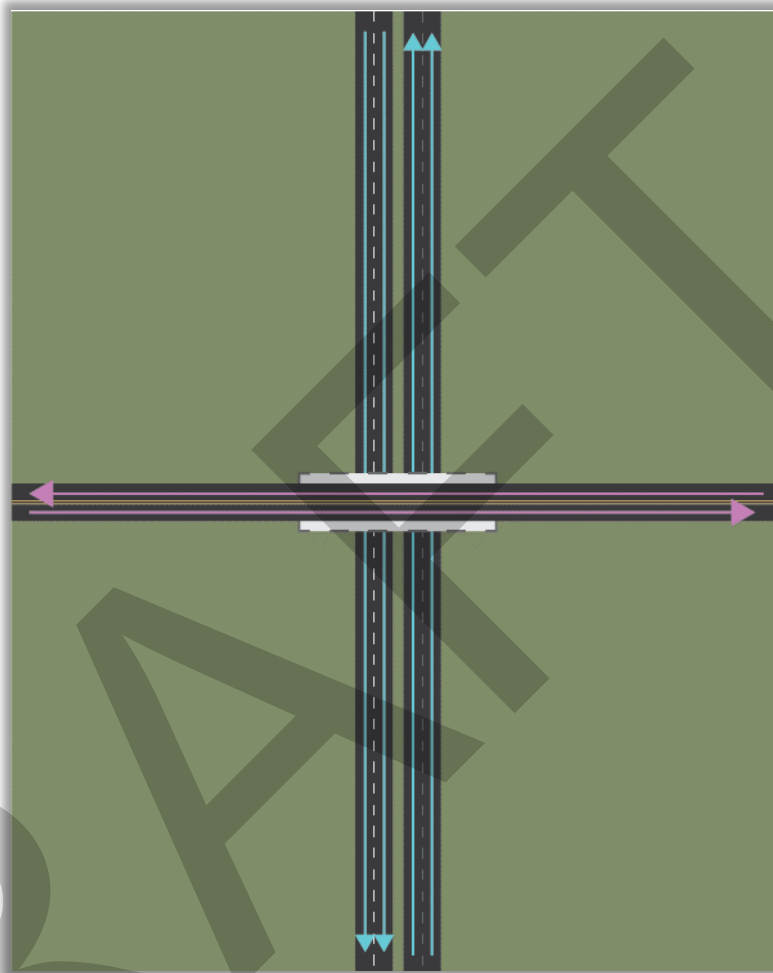
<sup>5</sup> <https://mutcd.fhwa.dot.gov/hdm/2009r1r2r3/part4/part4c.htm>

<sup>6</sup> [https://www.in.gov/indot/files/ROP\\_IntersectionDecisionGuide.pdf](https://www.in.gov/indot/files/ROP_IntersectionDecisionGuide.pdf)

### 2.2.3 CROSS ROAD OVERPASS / UNDERPASS

**Overpasses and underpasses** allow for free flow conditions by grade separating the major roadway (blue arrows) from the crossroad (purple arrows), which allows both roadways to be free flowing. The decision whether the major roadway or the crossroad should be carried over the other is made by examining impacts of each option. Both options sever all connections between the major roadway and the crossroad. A schematic of a crossroad overpass is provided in **Figure 2-4**.

Figure 2-4: Overpass Schematic Diagram



### 2.2.4 INTERCHANGES

An **interchange** is a junction where the major roadway and the crossroad are grade separated to provide free flow conditions on the major roadway. Access to/from the major roadway is provided via a series of entrance and exit ramps. All interchanges fall into one of two categories:

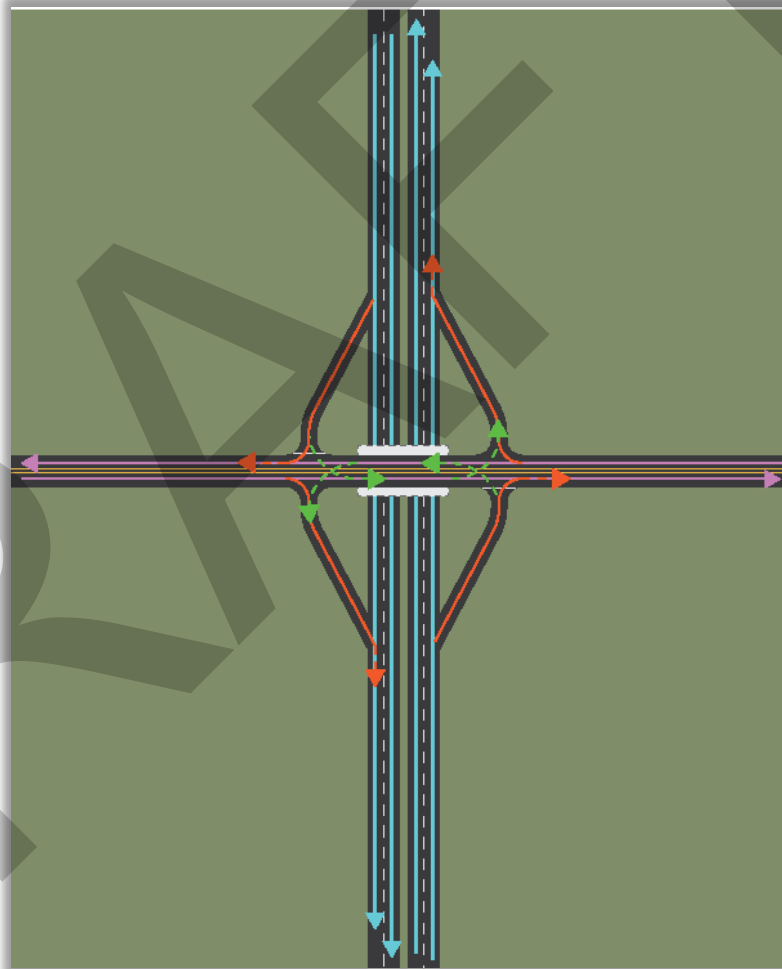
- **System interchanges** provide connections between multiple controlled access highways and provide for free-flowing movements between roadways. The US 31 & US 24 interchange is an example of a system interchange.
- **Service interchanges** connect access-controlled highways to roadways of a lower classification and commonly do not provide for free-flowing movements between roadways. The US 31 & SR 28 interchange is an example of a service interchange.

Interchange types typically require higher amounts of right-of-way and have higher construction costs than previously described improvements. Location specific solutions may be developed that achieve the safety, operational, and mobility benefits comparable to the benefits of an interchange at reduced costs and/or fewer impacts.

Should interchanges be identified as potential solutions, they will be service interchanges as none of the crossroads in the study area are controlled access facilities – except US 24 where an interchange is already provided. While multiple concepts exist for service interchanges, one concept had to be chosen to provide a high-level estimation of the improvement limits (i.e., a footprint). A diamond interchange was selected as the starting point as it is the simplest interchange type, and it is expected to accommodate the 2045 traffic forecasts for the study area. Using the diamond interchange as a starting point for interchanges in this PEL study does not preclude other interchange alternatives from consideration during subsequent studies or project development. In some cases, alternative/innovative interchange configurations will be considered to provide equivalent access, mobility and safety benefits while minimizing costs and adverse impacts.

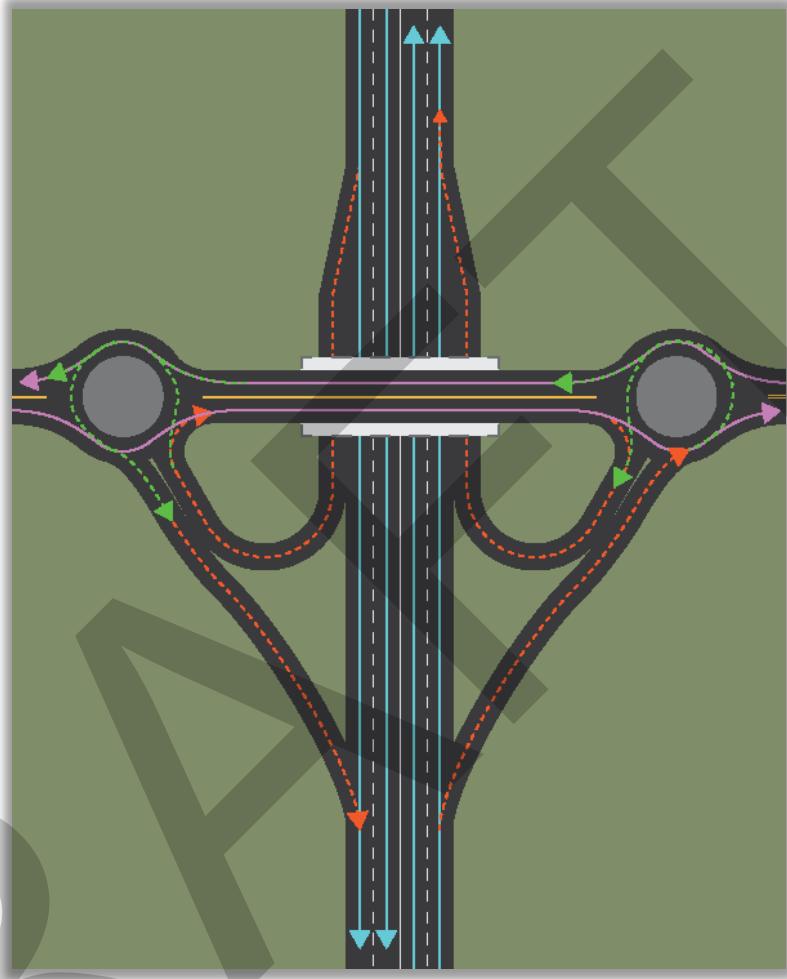
Diamond interchanges, as depicted in **Figure 2-5**, are typically the starting point in an interchange selection process. Diamond interchanges provide for free-flowing traffic on the mainline (blue arrows). Traffic moves to/from the mainline through a series of ramps (red and green arrows). Traffic on the crossroad (purple arrows) may be free-flowing or signal controlled, depending on traffic volumes on the ramps.

*Figure 2-5: Diamond Interchange Schematic Diagram*



**Folded Diamond Interchanges**, depicted in **Figure 2-6**, are applicable when a barrier, such as a railroad, river or other constraint prevents implementation of a diamond interchange without excessive costs to avoid the barrier. Like diamond interchanges, folded diamond interchanges provide for free-flowing traffic on the mainline (blue arrows). Ramps are provided on only one side of the crossroad (purple arrows) to avoid the constraint or barrier. Ramps (red and green arrows) are provided to connect the mainline to the crossroad. Ramp terminal intersections of this interchange type are typically roundabouts, which discourage wrong-way driving.

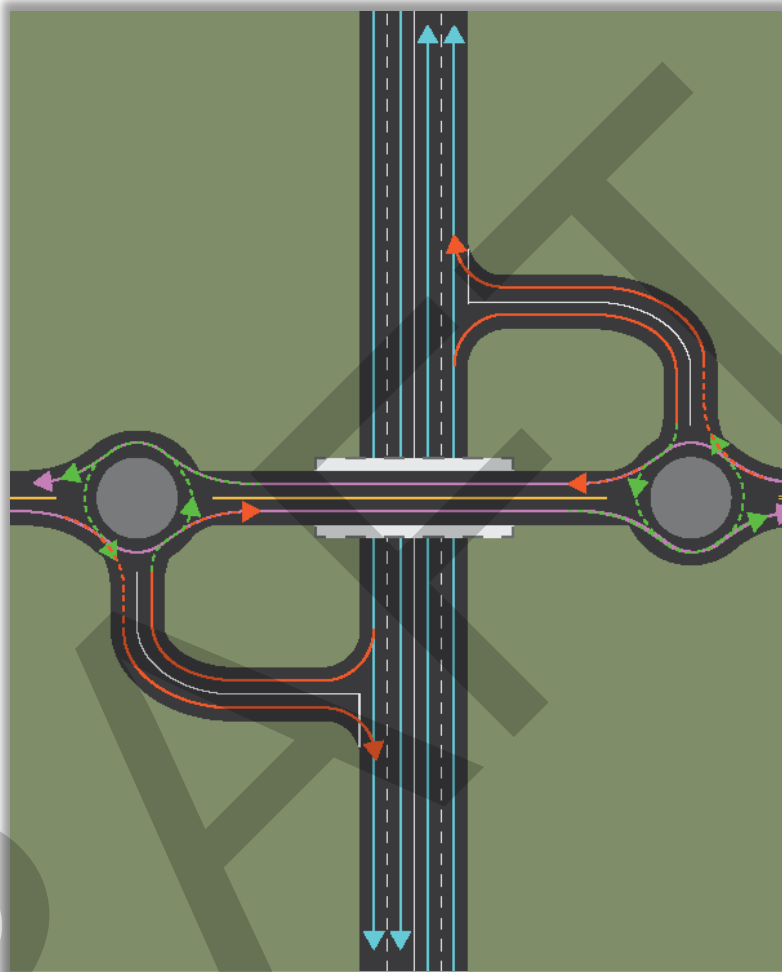
Figure 2-6: Folded Diamond Interchange Schematic Diagram



Site specific factors may require alternative/innovative interchange or grade separated intersection configurations to address the need for access, to preserve mobility on US 31, while working within identified constraints associated with engineering, environmental, and/or costs.

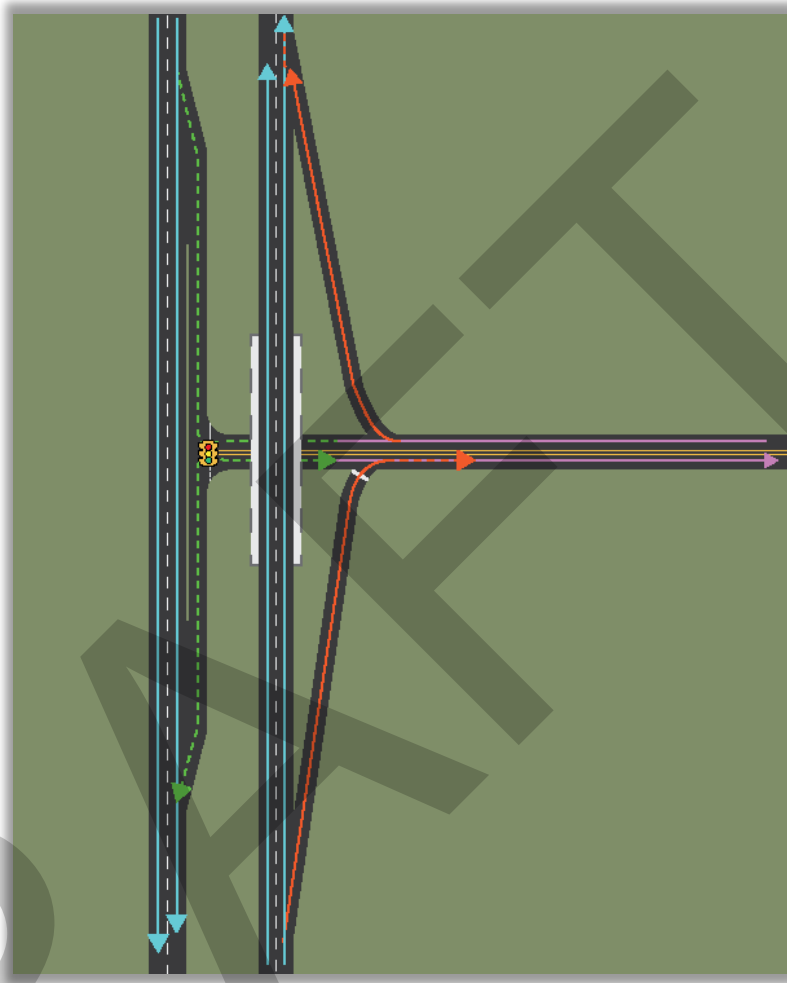
A variation of the folded diamond interchange, known as a quadrant interchange, replaces the merge and diverge conditions at the ends of the ramps with right-in/right-out configurations. This often results in a lower cost solution than a traditional interchange and can provide operational and safety conditions similar to those of a folded diamond interchange. This interchange type is depicted in **Figure 2-7**.

Figure 2-7: Quadrant Interchange Schematic Diagram



Another variation of a low-cost interchange considered in this study is the Green-T interchange, as depicted in **Figure 2-8**. This interchange type is best suited for three-legged intersections where free-flowing conditions must be provided for both directions of the mainline (blue arrows). The Green-T interchange achieves this by grade separating the crossroad (purple arrows) and one direction of the mainline. Left turns to/from the crossroad (green arrows) pass under one direction of the mainline merge or diverge from the opposite direction of the mainline.

Figure 2-8: Green-T Interchange Schematic Diagram





### 2.2.5 FREE FLOW FACILITIES (FULL AND PARTIAL CONTROL OF ACCESS)

A free-flow facility is a road that has no traffic signals, stop signs, or yield signs. There are varying types of free-flow facilities, ranging from freeways—which have full control of access—to free-flow facilities that have no or partial control of access. **2.2.5a Freeway (Free-Flow Facility with Full Access Control)**

A freeway is one example of a free-flow facility. A freeway concept was advanced from the Universe of Alternatives (Level 1) screening for further study. A freeway also includes full control of access, which means that access to/from the facility is restricted to select crossroads at interchanges. The US 31 bypass around Kokomo is a freeway with full control of access.

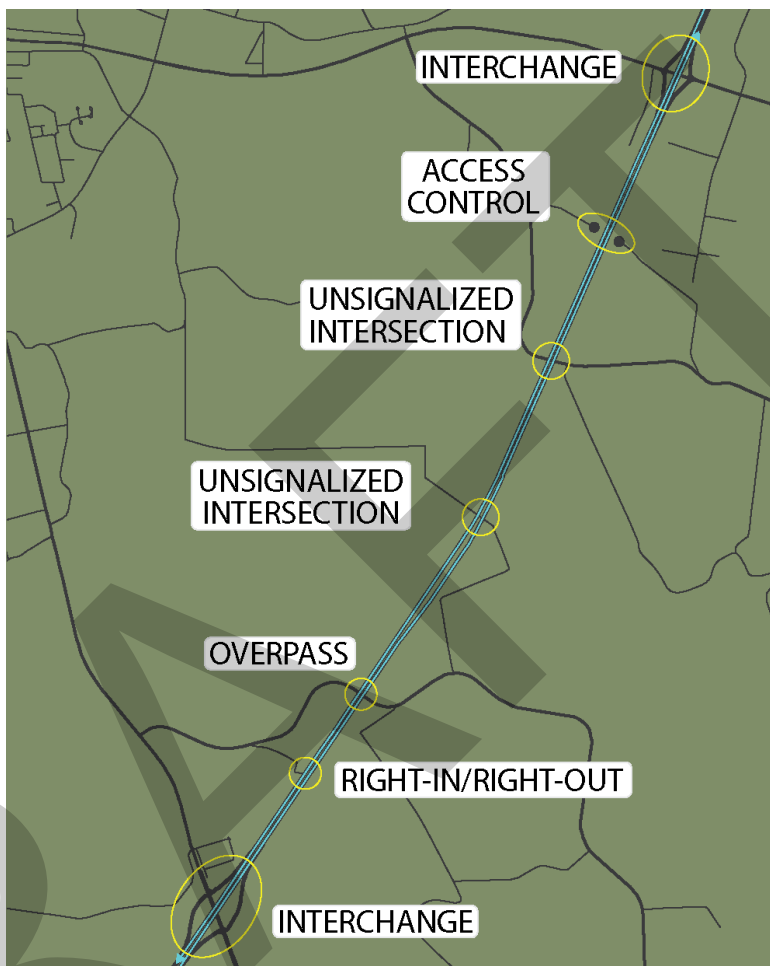
#### 2.2.5b Free-Flow Facility with Partial Control of Access (Expressway and/or Unsignalized Arterial)

A free-flow facility can also have partial access control, which means that access to/from the facility may be provided via at-grade intersections, interchanges, and/or major commercial driveways. The number of driveway connections (residential and commercial) may be reduced in number and/or limited to right-in/right-out movements. The number of median openings may also be reduced. An example of a free flow facility with partial control of access is depicted in **Figure 2-9**. US 31 within the ProPEL US 31 North study area (the study area just north of the US 31 South corridor) is a free-flow facility with partial control of access; however, several areas do not meet INDOT’s access management guidelines.

Note: A common theme of the public comments received to date is that maintaining local access to/from US 31 (i.e., alternatives with less control of access) is important and should be considered as part of the PEL study. As a result, the Level 2 alternatives screening will focus on Primary Intersection improvements. The options for potential facility types in the US 31 South study area will be evaluated in the Level 3 alternatives screening.

Because it is possible to have varying facility types within the study area, the ProPEL US 31 South study area may be divided into smaller pieces or focus areas as part of the Level 3 screening. This approach will enable maximum flexibility to combine improvements in different ways to address the identified transportation needs, support study area goals, as well as to reflect community-specific context regarding fit and function.

Figure 2-9: Example Free Flow Facility with Partial Access Control



## 2.3 COMPLEMENTARY CONCEPTS

The complementary concepts described below were considered in the development of alternatives for the primary intersections.

### 2.3.1 AUXILIARY LANES

Auxiliary lanes were considered between adjacent intersections or interchanges. Auxiliary lanes are necessary when additional capacity is needed.

### 2.3.2 SIGNAL TIMING UPDATES/COORDINATION

Updates to signal timings and/or signal coordination timings were considered at all signalized intersections.

### 2.3.3 ADD/LENGTHEN TURN LANES

Adding or lengthening turn lanes was considered at all intersections and median openings.

### 2.3.4 ADD/EXTEND ACCELERATION/DECELERATION LANES

Acceleration and deceleration lanes were considered anywhere low and high-speed traffic merge. Left and right turn lanes along US 31 should be sufficient in length to include deceleration distance, which allows motorists to safely exit the mainline lanes at-speed before decelerating for a turning movement. Existing turn lanes were evaluated to determine if existing turn lane lengths are sufficient to include the necessary deceleration distances, or if lengthening of turn lanes is necessary. Acceleration lanes were considered at all locations where non-signal-controlled movements must merge with high-speed traffic.

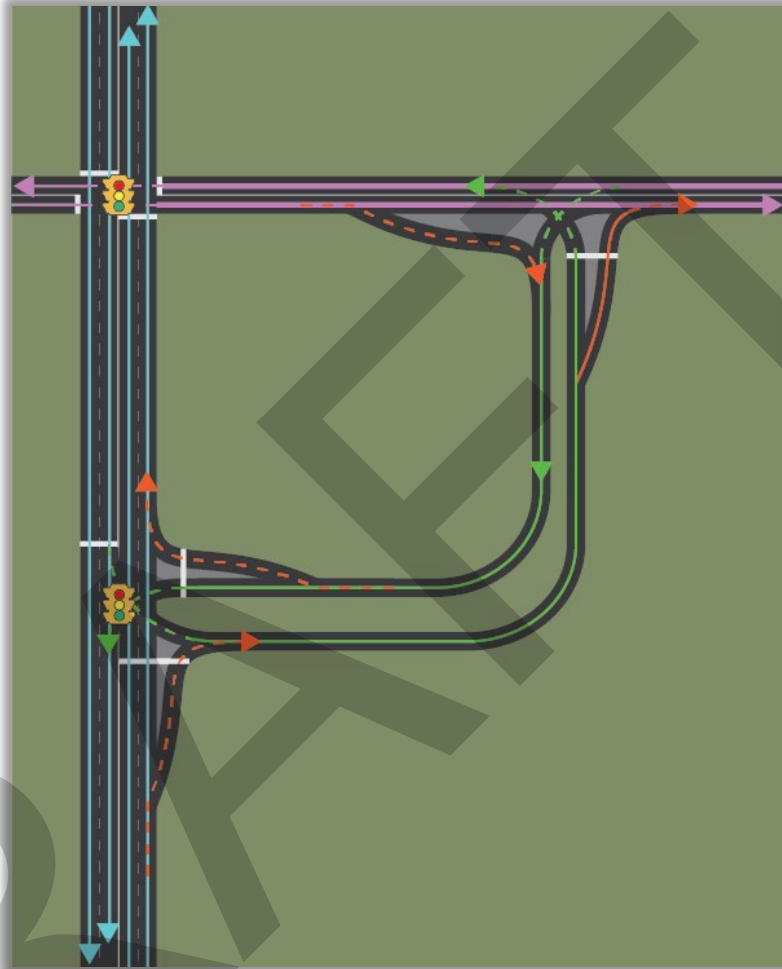
### 2.3.5 SIGNALIZED INTERSECTION IMPROVEMENTS

The *INDOT Intersection Design Guide*<sup>7</sup> identified multiple signalized at-grade intersection types that may improve operations, safety, and/or mobility at primary intersections. These include the following:

A **Quadrant Roadway Intersection**, as shown in **Figure 2-10**, is one in which a new roadway (green arrows) is constructed in one quadrant and all turn movements (dashed red and green arrows) are displaced to this new roadway. The main or original intersection then serves only through movements for both the major roadway (blue arrows) and crossroad (purple arrows). The intersections at the ends of the quadrant roadway may be signalized or unsignalized, depending on traffic volumes.

Quadrant roadways improve operations by eliminating signal phases and improve safety by reducing conflict points at the primary intersection.

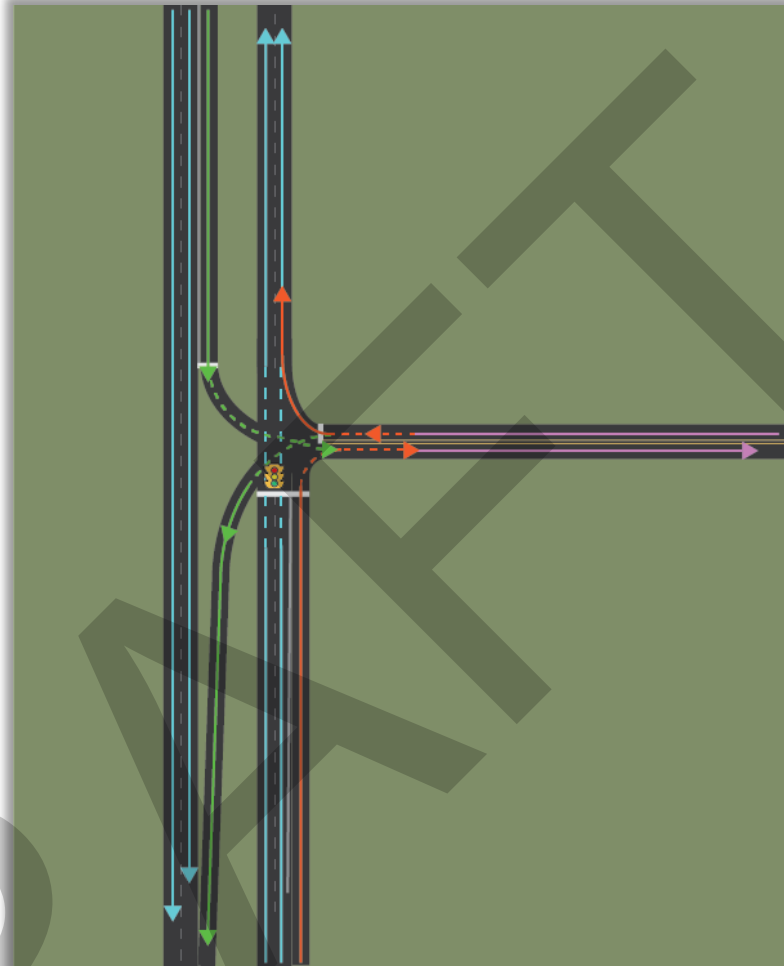
Figure 2-10: Quadrant Roadway Schematic Diagram



<sup>7</sup> [https://www.in.gov/indot/files/ROP\\_IntersectionDecisionGuide.pdf](https://www.in.gov/indot/files/ROP_IntersectionDecisionGuide.pdf)

A **Green-T Intersection**, as depicted in **Figure 2-11**, is an at-grade three-legged intersection where the left turns (green arrows) to/ from the crossroad (purple arrows) are barrier separated from the major roadway (blue arrows) with acceleration and deceleration lanes provided for these movements. This concept provides for free flow movements on one or both directions of the major roadway and improves safety by reducing conflict points. Depending on traffic volumes, the left turn movements may require signalization, as shown in **Figure 2-11**, or grade separation.

Figure 2-11: Green-T Intersection Schematic Diagram (At-Grade)



Other unsignalized intersection types not considered for the US 31 South study area include boulevard left turn intersections, jughandle intersections, and displaced left turn intersections (see Section 3.2.2). More information on these intersection types can be found in the *INDOT Intersection Decision Guide*<sup>8</sup>.

### 2.3.1 ROADWAY LIGHTING

Roadway lighting will be included at all interchanges, signalized intersections, Reduced Conflict Intersections, and all unconventional intersections per INDOT lighting guidelines.

### 2.3.1 FREIGHT PRIORITY SYSTEM

Freight priority systems are included at all signalized intersections to reduce stops for freight traveling the US 31 corridor.

### 2.3.2 RAMP TERMINAL INTERSECTION IMPROVEMENTS

Improvements at ramp terminals, which are the intersections where interchange ramps intersect the crossroad, are included at all existing interchanges where issues are known at ramp terminals.

### 2.3.3 WARNING SYSTEMS

Warning systems are considered at all intersections that are signalized or two-way stop controlled. Warning systems are expected to reduce the likelihood of right angle and left turning crash types, which often result in severe injuries. Unsignalized intersections would utilize the Intersection Conflict Warning System (ICWS) which uses vehicle

<sup>8</sup> [https://www.in.gov/indot/files/ROP\\_IntersectionDecisionGuide.pdf](https://www.in.gov/indot/files/ROP_IntersectionDecisionGuide.pdf)

detectors under the pavement with fixed and variable messages in signing along with flashing lights to notify drivers on both roads whether there is an approaching or waiting vehicle. Signalized intersections would utilize an Advance Warning For End of Green System (AWEGS), or similar, to alert motorists on the mainline of a stop condition that lies ahead at the signalized intersection.

## 2.4 DESIGN ELEMENTS

The Level 1 screening identified multiple concepts that did not meet any of the study area needs but are considered practical and provide some benefit to the study area. These concepts were identified as Design Elements. Design Elements will not be individually advanced or evaluated in the screening process; however, they will be considered, where applicable, as part of alternatives considered in this PEL study. Each of the design elements is listed in **Table 2-2**, along with an explanation of whether and how each design element will be further considered as part of this PEL study. Although some design elements may not be further evaluated as part of this PEL study, they are recommended for consideration as part any future projects that result from the study.

Table 2-2: Consideration of Design Elements

Design Element	Evaluate Further in this PEL Study?	Explanation
Median Safety Improvements	No	Median safety improvements at non-primary intersections require a level of design and analysis that is beyond the scope of this PEL study.
Realign Skewed Intersections	Yes	Realignment of roadways will be considered at all study intersections where substantial skew is present. This consideration will occur during the Level 2 and Level 3 screenings.
Intersection Sight Distance Improvements	Yes	All concepts for study area intersections will include reasonable means to improve intersection sight distance where issues are identified. This consideration will occur during the Level 3 screenings.
Traffic Control Visibility Upgrades	Yes	Improvements to the visibility of traffic control devices will be considered in all alternatives where visibility issues are identified. This consideration will occur during the Level 3 screenings.
Pavement Marking Improvements	No	Pavement markings are subject to change based on the final alternatives selected. Improvements will be addressed in the preliminary design phase of any project that follows this PEL study.
Roadway Signage Improvements	No	Roadway signage is subject to change based on the final alternatives selected. Improvements will be addressed in the preliminary design phase of any project that follows this PEL study.
Accommodate Wildlife Crossing	No	Wildlife crossing patterns are influenced by development and could substantially change in the time between completion of this PEL study and construction of projects. The need for wildlife crossings should be evaluated in project development subsequent to this PEL study.

Table 2-2: Consideration of Design Elements (cont.)

Design Element	Evaluate Further in this PEL Study	Explanation
Geometric Improvements	Yes	Geometric improvements that impact the character of the roadway or result in substantial realignment or new alignments of roadways will be incorporated into the concepts developed in this PEL Study. These largely consist of substantial changes to horizontal or vertical alignments. This consideration will occur during the Level 2 and Level 3 screenings.
Roadway Drainage Improvement	No	Topographic survey data is required to evaluate drainage issues and develop solutions. No such survey data is available for this PEL study. As such, roadway drainage improvements should be evaluated in project development subsequent to this PEL study.
Gateway & Aesthetic Treatment	No	Gateway and corridor treatments are aesthetic improvements that would not address the study area purpose and need; however, they are considered in direct response to public input. Possible locations for such improvements will be identified in the Level 3 screening process; however, details of the specific treatments would be addressed in the preliminary design phase of any future projects along the study area.
Speed Management	Yes	Techniques to manage speed that require changes to geometry or intersection types will be considered in the development concepts in the Level 3 screenings. Other speed management techniques are assumed to require policy changes and cannot be evaluated in this PEL study.
Alternative Fuel/ Electric Vehicle Considerations	Yes	Provisions to support alternative fuel/electric vehicles are being implemented by INDOT through specific programs. The INDOT National Electric Vehicle Infrastructure (NEVI) Plan includes charging stations at the US 31 interchanges with US 28 and US 24. No changes in access are being considered at US 28. The concepts under consideration near US 24 in Level 2 would support this initiative. Further and more detailed consideration will occur in Level 3.
Bicycle/Pedestrian Facilities	Yes	Bicycle and pedestrian facilities will be considered in the Level 3 screening process at locations where the need for non-motorized facilities have been identified.

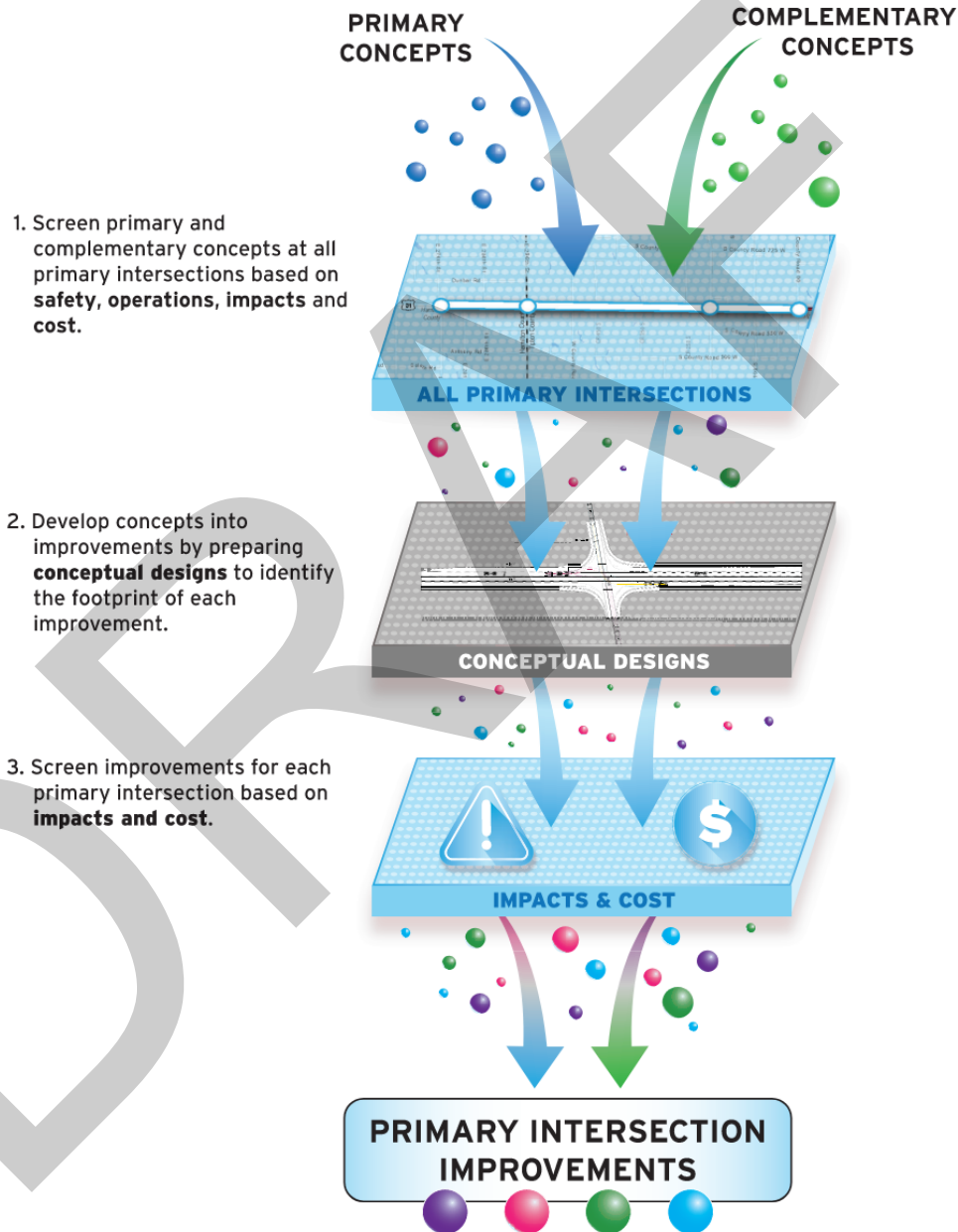


# 3 LEVEL 2 SCREENING PROCESS

Each of the primary and complementary concepts described in **Section 2** were evaluated in the Level 2 screening process to identify alternatives for each primary intersection. The Level 2 screening process, which is depicted in **Figure 3-1**, is described in detail in the following sub-sections.

Figure 3-1: Level 2 Screening Process

## LEVEL 2 SCREENING



### 3.1.1 STEP 1 – DECISION TREE

The first step in the screening process was to answer a series of questions about each primary intersection that were intended to identify the scale of improvement needed at each study intersection. These questions are as follows:

- Are there safety and/or operational issues (i.e., purpose & need elements) that need to be addressed?
- Are access restrictions appropriate (necessary)?
- Are at-grade solutions available to address documented issues and/or public and stakeholder input?
- Is grade separation necessary?

To standardize the process and document answers, the questions were arranged in the form of a decision tree, a sample of which is provided in **Figure 3-2**. Data contained in the *ProPEL US 31 South Existing Conditions Report* was used to navigate the decision tree for each intersection and to identify primary and complementary concepts that should be further evaluated at each primary study intersection.

A key element of the decision tree is that all four questions are answered for each primary intersection. This results in multiple concepts being identified as possible solutions at each intersection – even those where no transportation needs were identified. This is necessary to support the Level 3 screening, where the primary intersection improvements passing the Level 2 screening will be combined with secondary intersection improvements and access management improvements. When this occurs, some primary intersections with no identified transportation needs may require modification or improvement to work within that overall context of the corridor. Therefore, the Level 2 analysis was used to identify the reasonable range of potential improvements for all primary intersections – even those where no transportation needs were identified. For example, improvements may be considered at an existing signalized intersection with no safety or operational issues, as the signalized intersection would not be appropriate for a free flow facility. This is to ensure compatibility of alternatives along the study corridor as part of the Level 3 screening.

The following factors were considered as part of completing the decision tree for each primary intersection:

- Complementary concepts were considered for improving safety and/or operations at locations where safety and/or operational issues exist. These complementary concepts are listed in **Figure 3-2**.
- When no safety or operational issues exist, retaining the existing intersection configuration was considered, along with the potential for access modifications or grade separation, as discussed below.
- Access restrictions were retained as a potential solution for further evaluation at a primary intersection, and the possibility to limit access was considered in conjunction with potential solutions at adjacent primary intersections. This was done such that the impacts of restricting access, and the subsequent redistribution of traffic volumes, could be considered qualitatively, and the reasonability of restricting access could be determined. This consideration will be revisited in Level 3.
- When at-grade intersections were retained as a potential solution for further evaluation, the eighteen intersection types listed on **Figure 3-2** were advanced for further evaluation in Step 2. These intersection types are listed in the *INDOT Intersection Design Guide* as potential solutions that should be considered at all locations. These at-grade intersection types are considered to be the first step in addressing purpose and need as at-grade intersection types are generally lower cost and lower impact than grade separated concepts.
- An overpass or underpass, which is also called a grade separation, was retained as a potential solution for further evaluation when the intersection was found to be important for east-west traffic flow, but access to/from US 31 was not as important.
- An interchange was retained as a potential solution for further evaluation at some intersections based on traffic volumes, the proximity of existing and/or planned developments, consideration of overall network connectivity and access, and/or input from both the public and stakeholders.

- No specific traffic volume criteria or warrants exist for justification of an interchange; however, an interchange was considered as a potential solution when traffic volumes warrant signalization of the intersection, as documented in the *ProPEL US 31 South Existing Conditions Report*.
- The proximity and extent of existing and/or planned development to any given intersection was a factor in recommending potential interchange locations. Intersections with substantive development in proximity are considered more appropriate locations for interchanges. On the other hand, more developed areas could result in more impacts than desirable to place an interchange.
- The role of the crossroad within the overall transportation network was also a consideration when recommending potential interchange locations.
- Public and/or stakeholder input suggested the need for interchanges at various locations. Additionally, each county’s comprehensive plan lists locations where interchanges are desired. This input was used to identify locations where interchanges could be a potential solution.

The outcomes of the decision trees are provided in **Appendix A**.

### 3.1.2 STEP 2 – OPERATIONAL ANALYSIS

The Decision Tree of Step 1 identifies various at-grade concepts that should be evaluated as potential solutions at each primary intersection. Each of these at-grade intersection types are described in **Section 2**.

Preliminary capacity analysis of these intersection types was conducted using the Federal Highway Administration (FHWA) Cap-X tool, which provides the ability to evaluate the operations of multiple intersection types and compare based on volume to capacity ratios. Design year no-build traffic volumes and lane configurations for each intersection were input into the analysis tool, which then provides ranking of intersection types based on volume to capacity ratios. The design year no-build traffic volumes were obtained from the *ProPEL 31 South Existing Conditions Report*.

The preliminary capacity analysis results indicate that only a select few intersection types should be discarded due to poor volume to capacity ratios, which indicate unacceptable operating conditions. All intersection types that were identified as yielding acceptable volume to capacity ratios in the 2045 planning horizon were given further consideration except for those listed below:

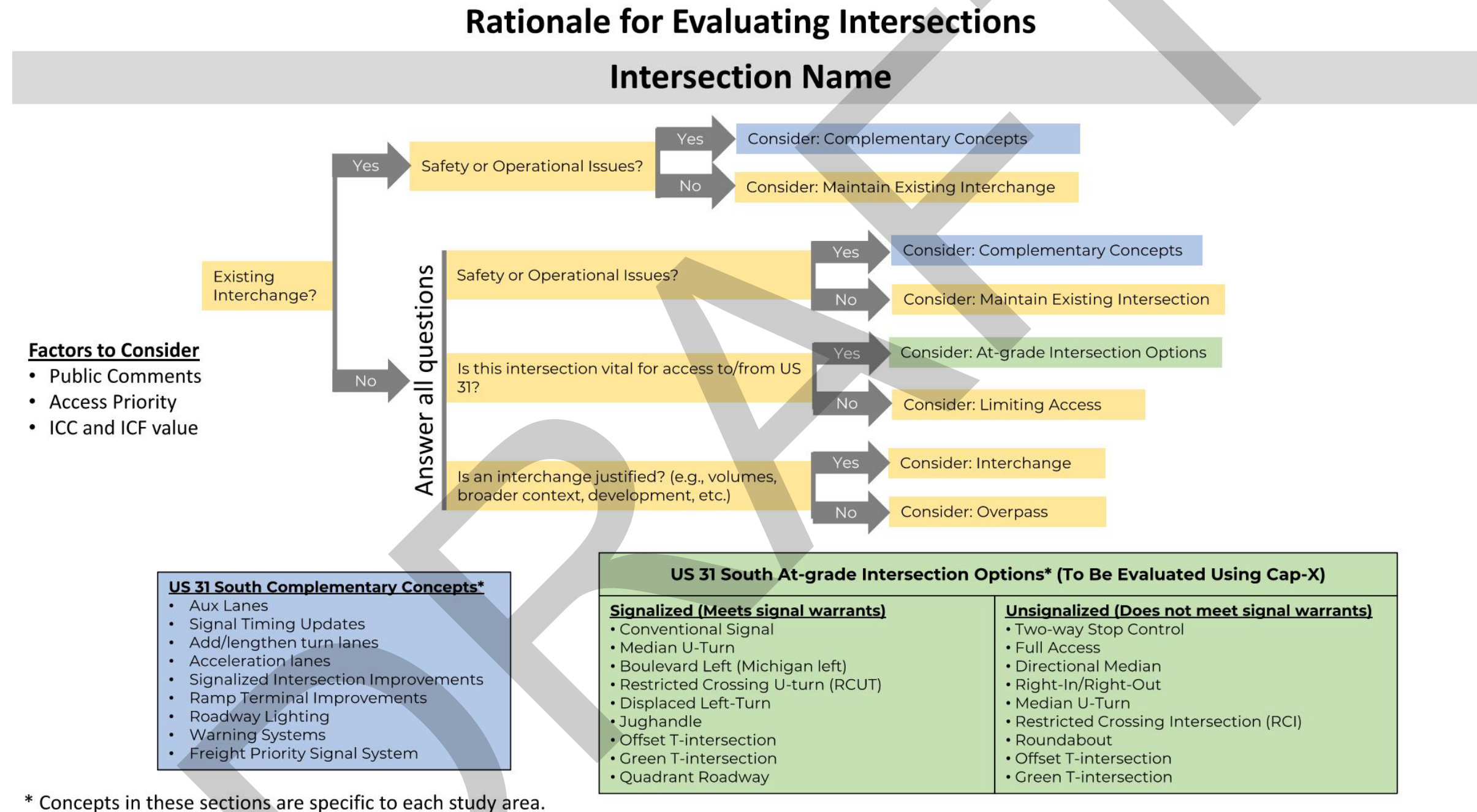
- **Offset T Intersections** are not being considered for primary intersections evaluated in the Level 2 screening as no locations to implement this concept were identified. This concept may be applied to various secondary intersections in the Level 3 screening.
- **Roundabouts**, despite being applicable to high-speed roadways, roundabouts are not being considered for the ProPEL US 31 South study. The US 31 South study area is located between lengthy stretches of free-flowing portions of US 31 where speeds commonly exceed the posted speed limit. Introducing a roundabout in this corridor, and the associated potential for a stop situation along US 31, would likely violate driver expectations, and may result in safety issues.
- **Boulevard left turn intersections** are not being considered for the ProPEL US 31 South study area as the study area does not have high volume intersections that operate poorly.
- **Jughandle intersections** are not being considered for the ProPEL US 31 South study area as left turning volumes on US 31 in the study area can be accommodated by conventional intersection types. Additionally, a jughandle intersection would add a signalized intersection to US 31. This is undesirable as adding a traffic signal is expected to increase travel time along US 31 and may not improve safety.
- **Displaced Left Turn Intersections** are not being considered for the ProPEL US 31 South study area as traffic volumes in the study area for left turn and opposing through volumes are not expected to cause operational issues in the design year. Additionally, converting any intersection to a displaced left turn intersection would

add two traffic signals along US 31. While the timings of these signals would be coordinated, the addition of a traffic signal to US 31 is undesirable for the reasons explained above.

The results of the preliminary capacity analyses, provided in **Appendix B**, were used to evaluate all concepts quantitatively based on their ability to yield acceptable operating conditions.

DRAFT

Figure 3-2: Sample Decision Tree



### 3.1.3 STEP 3 – EVALUATION MATRIX

Concepts advancing to Step 3 of the screening process were evaluated qualitatively based on:

- Ability to meet purpose and need;
- Social, economic, and environmental impacts; and
- Relative cost

This assessment is documented in an evaluation matrix prepared for each study primary intersection. The goal of Step 3 is to identify those concepts with high impacts and few benefits that should be discarded before reaching Step 4 of the screening process. The methodology used in this step is explained below.

#### 3.1.3.1 Ability to Meet Purpose & Need

The concepts advancing from Step 3 must satisfy the purpose and need for the study. The ability of each concept to address purpose and need at each primary intersection was determined by answering the questions listed in **Table 3-1**.

Table 3-1: Needs Assessment

Needs	Performance Measure	Does the concept...
Safety	Apply safety countermeasures to reduce crash rates and/or severity.	Reduce the risk of crashes occurring, OR Address documented safety issues?
Traffic Operations	Reduce delay at the unsignalized intersections where traffic volumes are substantial.	Reduce delays on crossroads at unsignalized intersections, where crossroad traffic volumes are substantial?
Access Control	Prioritize and consolidate access points on US 31.	Bring the study area closer to compliance with INDOT’s Access Management Guidelines?
Cross Corridor Mobility at Important Crossing Locations	Maintain or improve safety, access, and mobility across the corridor for school buses, emergency services, and agricultural equipment by preserving the most important crossing locations <sup>9</sup> .	Maintain or improve the ability to cross US 31?
Regional and Statewide Mobility	Improve operations along US 31 to enhance passenger and/or freight mobility.	Reduce travel time along US 31?

#### 3.1.3.2 Social, Economic and Environmental Impacts

The concepts developed for the US 31 South study area have a wide range of impacts on various social, economic, and environmental factors, which are listed in **Table 3-2**. These impacts were assessed qualitatively for each concept to determine the relative impacts and better inform the decision-making process. The assessment of impacts was based on imagery analysis, Google maps (<http://maps.google.com>), and desktop GIS analysis.

<sup>9</sup> Important crossing locations were defined through conversations with stakeholders and are documented in the *ProPEL US 31 South Purpose and Need Report*.



Table 3-2: Social, Economic, and Environmental Impacts

Needs	Resources	Does the concept have...
Natural Resources	<ul style="list-style-type: none"> <li>Wetlands</li> <li>Streams</li> <li>Floodplains</li> <li>Forests</li> <li>Lakes</li> <li>Protected Species Habitat</li> <li>INDOT Mitigation Sites</li> </ul>	Potential for adverse impacts to natural resources?
Cultural Resources	<ul style="list-style-type: none"> <li>Above-Ground Resources</li> <li>Archaeological Resources</li> <li>Potential Section 4(f) Resources</li> </ul>	Potential for adverse impacts to cultural resources?
Community Impacts	<ul style="list-style-type: none"> <li>Access to/from US 31 corridor</li> <li>Communities with Environmental Justice Concerns</li> <li>Underserved Communities</li> </ul>	Potential for adverse impacts to communities with environmental justice (EJ) concerns and/or Underserved Communities?
ROW/ Displacements	<ul style="list-style-type: none"> <li>Right-of-way / Relocations</li> <li>Businesses</li> <li>Farmland</li> </ul>	Potential for right-of-way and/or displacement impacts?

3.1.3.3 Relative Cost

Approximate costs for all concepts evaluated in the Level 2 screening process were estimated from historical cost information or from high-level construction cost estimates when no historical cost information was available. These per intersection costs, provided in **Table 3-3**, were used to determine the relative cost of these concepts. Relative costs of improving each primary intersection were estimated on a low/medium/high basis as follows:

- Low Cost: <\$5M
- Medium Cost: \$5M to \$15M
- High Cost: >\$15M

Table 3-3: Estimated Cost of Level 2 Concepts (Per Intersection)

Improvement	Relative Cost
Do Nothing	Low
Access Modifications	Low
Unsignalized Intersection Improvements	
Reduced Conflict Intersection	Low
Signalized Intersection (New)	Low
Grade Separate	Medium
Convert to Interchange	High
Auxiliary Lane (1/2-mile length)	Low

Table 3-3: Estimated Cost of Level 2 Concepts (cont.)

Improvement	Relative Cost
Signal Timing Updates	Low
Add/Lengthen Turn Lanes (Per Lane)	Low
Add/Extend Acceleration/Deceleration Lanes (Per Lane)	Low
Signalized Intersection Improvements	-
Quadrant Roadway	Medium
Green-T Intersection	Low
Ramp Terminal Intersection Improvements	Low
Roadway Lighting	Low
Warning Systems	Low
Freight Priority System	Low

**3.1.3.4 Rating and Comparison of Concepts**

The assessments of each concept’s safety and operational benefits, social, economic, and environmental impacts, and relative cost were assigned ratings as provided in **Table 3-4**. The ability to meet safety and operations needs was rated on a Yes/No scale, as these metrics are clear cut. The ability to address the mobility needs was based on a three-tiered rating system, as the mobility components are more complex than traffic operations and safety. The magnitude of environmental impacts was generally assessed on a low/medium/high scale, with impacts being assessed based on environmental constraints and the potential footprints of each concept. The relative cost of each concept was also assessed on a low/medium/high scale, with ratings assigned based on historical costs.



Table 3-4: Evaluation Criteria

	Criteria	Performance Measure	Ratings and Definitions
Purpose and Need	Safety	Applies safety countermeasures to reduce crash rates and/or severity?	Yes = The concept applies safety countermeasures to address identified issues.
			No = The concept does not apply safety countermeasures that address identified issues, or no safety issues have been identified.
	Traffic operations	Reduce delay at unsignalized intersections?	Yes = The concept reduces delay at unsignalized intersections.
			No = The concept does not reduce delay at unsignalized intersections.
			N/A = Not applicable.
	Access Management	Prioritizes and consolidates access points on US 31?	Yes = The concept prioritizes and consolidates access points on US 31.
			No = The concept does not prioritize and consolidate access points on US 31.
	Cross-Corridor Mobility	Maintains or improves safety, access, and mobility across the corridor for school bus routes, emergency services, and agricultural equipment by preserving the most important crossings?	Improves = The concept would improve safety, access, and mobility across the corridor and/or would preserve an important crossing and/or access point.
			Maintains = The concept would maintain safety, access, and mobility across the corridor and/or would preserve a important crossing and/or access point.
			Neutral = The concept would improve safety but may impact access and mobility by requiring additional travel time or distance.
			Worsens = The concept would worsen access and/or mobility across the corridor and/or would not preserve an important crossing and/or access point.
	Regional and Statewide Mobility	Maintains or improves operations along US 31?	Maintains = The concept would maintain operations along US 31.
			Improves = The concept would improve operations along US 31.
			Worsens = The concept would require some speed reduction to safely navigate the improvements.
N/A = Not applicable.			

Table 3-4: Evaluation Criteria (cont.)

	Criteria	Performance Measure	Ratings and Definitions	
Environmental Impacts	Natural Resources	Potential for adverse impacts to natural resources?	Low = The concept has the potential to result in no or relatively minor adverse impacts to documented natural resources, including wetlands, streams, floodplains, lakes, forests, protected species and mitigation sites.	
			Medium = The concept has the potential to result in relatively moderate adverse impacts to documented natural resources, including wetlands, streams, floodplains, lakes, forests, protected species and mitigation sites.	
			High = The concept has the potential to result in relatively high adverse impacts to documented natural resources, including wetlands, streams, floodplains, lakes, forests, protected species and mitigation sites.	
	Cultural Resources	Potential for adverse impacts to cultural resources?	No = No documented above-ground and/or archaeological resources and/or cemeteries are present	
			Yes = Documented above-ground and/or archaeological resources and/or cemeteries are present	
	Underserved Populations	Potential for adverse impacts to communities with environmental justice (EJ) concerns and/or other Underserved Communities?	No = The concept does not have the potential to result in adverse impacts to communities with EJ concerns and/or other Underserved Communities.	
			Yes = The concept has the potential to result in adverse impacts to communities with EJ concerns and/or other Underserved Communities.	
	Right-of-Way/ Displacements	Potential for right-of-way and/or displacement impacts?	Low = The concept has the potential for no or relatively minor right-of-way acquisition acreage and no potential displacements.	
			Medium = The concept has the potential for relatively moderate right-of-way acquisition acreage and few, if any, potential displacements.	
			High = The concept has potential for relatively substantive right-of-way acquisition acreage and potential displacements.	
	Cost	Cost	Relative costs	Low = The concept would include relatively minor costs to implement.
				Medium = The concept would include relatively moderate costs to implement.
High = The concept would include relatively high costs to implement.				

The ratings were compiled into an evaluation matrix, as depicted in **Figure 3-3**, where a decision on whether to carry the concept forward could be made based on the ratings.

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Figure 3-3: Sample Evaluation Matrix

US 31 & Crossroad	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build												
<b>Primary Concepts</b>												
Access Modifications												
Unsignalized Intersection Improvements												
Reduced Conflict Intersection												
Signalization												
Overpass												
Interchange												
<b>Complementary Concepts</b>												
Auxiliary Lanes												
Signal Timing Updates												
Add/Lengthen Turn Lanes												
Acceleration / Deceleration Lanes												
Signalized Intersection Improvements												
Green-T Intersection												
Quadrant Roadway												
Ramp Terminal Improvements												
Roadway Lighting												
Warning System												
Freight Priority System												

### 3.1.3.5 Advancement from Step 3

The decision to advance a concept to Step 4 of the screening process or discard it from further consideration was based on the outcome of the needs, environmental impacts, and relative cost evaluation. Concepts that did not significantly address transportation needs were discarded from further consideration. Concepts that significantly satisfied transportation needs with reasonable impacts and costs were identified for advancement unless extenuating factors indicated the concept should be discarded. These factors are listed in the evaluation matrix for documentation purposes. Concepts that significantly satisfy the transportation needs but may have high environmental impacts were advanced, as the ability to minimize and/or mitigate impacts could not be determined until conceptual designs were prepared.

### 3.1.3.6 Study Area Goals

As part of the Level 2 screening, goals were also considered; however, the relative ability of each specific intersection improvement concept to address broader study area goals was difficult to assess given these improvements are at isolated locations. A more robust assessment of study area goals will occur in the Level 3 screening. In the interim, the relative ability to support each of the five stated goals was considered as part of the Level 2 screening criteria, as shown in **Table 3-5**.

Table 3-5: Study Area Goals

Study Area Goal	How Measured?	Where Considered in Level 2 Screening Criteria?		
		Relative Ability to Meet Purpose and Need	Relative Environmental Impacts	Relative Cost
Economic Development	Support the existing economy and/or planned economic development through improved safety, mobility and/or access.	X		
Equity in Transportation	Improve safety, mobility, or access for underserved communities.	X	X	
Multi-Modal Access and Connections	Include sidewalk, trails, or other non-motorized methods of travel and transit.	Level 3 will include additional concept development, including identification of where bicycle/pedestrian infrastructure may be included. None of the Level 2 concepts preclude the incorporation of bicycle/pedestrian infrastructure.		
Emerging Technologies	Has the potential to interact with connected vehicles and/or support alternative fuel initiatives.	The INDOT National Electric Vehicle Infrastructure (NEVI) Plan includes charging stations at the US 31 interchanges with US 28 and US 24. No changes in access are being considered at US 28. The concepts under consideration near US 24 in Level 2 would support this initiative. Further and more detailed consideration will occur in Level 3.		
Fiscal & Environmental Practicality	Expected to have minimal negative environmental impacts (though there are positive impacts in some cases) and are expected to have good returns on the investments.	X	X	X

### 3.1.4 STEP 4 - CONCEPTUAL FOOTPRINT COMPARISON

Concepts advancing from Step 3 were developed into intersection alternatives by preparing conceptual designs based on current design standards and assumptions, which are provided in **Appendix C**. The conceptual designs were used to establish a high-level estimation of the improvement limits (i.e., a footprint). The figures of intersection alternatives provided in this document show only the approximate footprint of each alternative and do not provide design detail. No design detail is provided as the safety and operational analysis of the Level 3 screening is expected to result in refinement of these concepts. In many instances, the footprints were used to answer the questions below, which resulted in a screening of alternatives.

- Overpass versus underpass – Which is more appropriate for the given location?
- Roadway relocations – To what extent must a roadway be realigned to minimize impacts?

During the conceptual design process, efforts were made to avoid and minimize adverse impacts to the human and natural environment to the extent feasible for a planning study. When avoidance was infeasible, minimization measures (e.g., retaining walls) were incorporated, where possible, to avoid impacts to environmentally sensitive areas (e.g., historic properties, churches, cemeteries, wetlands, and water resources).

Conceptual designs were developed using existing aerial photography and LiDAR data provided by the State of Indiana. This information was used in the *OpenRoads ConceptStation* software to produce conceptual designs for each of the primary intersections. The *OpenRoads ConceptStation* platform was selected for use as it provided an efficient means to visualize concepts and associated impacts at a planning level, and because it provides the ability to interface with Geographic Information Systems (GIS), which improves both the quality of data utilized in the conceptual design and the ability to produce graphics.

After development of conceptual designs and footprints, all alternatives for a given intersection were compared, and only those with reasonable impacts were identified for advancement to the Level 3 screening process.

# 4 DEVELOPMENT OF ALTERNATIVES

## 4.1 US 31 & CR 200 N IN MIAMI COUNTY

### 4.1.1 OVERVIEW

The two-way stop-controlled intersection of US 31 and CR 200 N is expected to operate acceptably in the planning horizon of 2045 in its existing configuration. The crash history at this intersection indicates:

- 38% of crashes were ran off road type crashes.
- 15% of crashes were side swipe type crashes between vehicles traveling in the same direction.

This intersection serves as the primary access point for the Miami County Fairgrounds, the Peru Municipal Airport, the Silo Music Center, and the local INDOT Peru Maintenance Unit. The Miami County Comprehensive Plan does not call for improvements at this intersection. Zero public comments have been received to date about this intersection.

### 4.1.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- A religious facility, Calvary Temple Assembly of God, is located in the northeast corner of the intersection.
- An unnamed tributary (UNT) to Eel River, which is also an IDEM 303(d) listed stream, crosses US 31 approximately 0.25 mile north of the intersection.
- Three mapped National Wetlands Inventory (NWI) wetlands are near the intersection.
- Three lakes are near the intersection.
- A hazardous material concern site, consisting of a leaking underground storage tank (LUST) site, associated with the INDOT Peru Maintenance Unit, is mapped within the intersection. However, the INDOT-Wabash Subdistrict is located 0.09 mile to the east of the center of the intersection.
- Potentially underserved communities are near the intersection.
  - The intersection is located within an area with limited internet access and limited English proficiency populations.
  - A limited vehicle access population is present south of the intersection.

### 4.1.3 SCREENING OF ALTERNATIVES

#### 4.1.3.1 Step 1 – Decision Tree

East-west traffic volumes are low at this location, so access modifications may improve conditions with only a minor impact on mobility. Although traffic volumes do not warrant signalization, an interchange may be appropriate here given the importance of this intersection as a primary access point to existing and proposed developments. An overpass at this location is not recommended based on the need to maintain access to/from US 31 and the relatively low east-west through volumes.

#### 4.1.3.2 Step 2 – Operational Analysis

All at-grade intersection concepts and the interchange concept are feasible for this location, as preliminary capacity analysis indicates that all at-grade concepts will operate acceptably in the design year.

#### 4.1.3.3 Step 3 – Evaluation Matrix

The evaluation of alternatives advancing to Step 3 in the screening process is summarized in **Table 4-1**. The following alternatives have been advanced to Step 4.

- Access Modifications – Limiting access at this location by restricting to right-in/right-out access will reduce conflict points and delay and may be a means to improve operations and reduce any future safety concerns. Mobility to/from various developments east of US 31 will be limited if access is restricted; however, maintaining mobility by providing access at an adjacent intersection may be feasible.
- Reduced Conflict Intersection – This concept will improve safety, will maintain free flow conditions along US 31, and will maintain the current level of mobility. This concept is expected to require little or no additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive concept advancing to Step 4 that maintains the current level of mobility.
- Interchange – This concept improves operations along US 31 by separating the US 31 through movements from the CR 200 N crossing and turning movements. This would improve east-west mobility, intersection safety and would improve access to the Miami County Fairgrounds, Peru Municipal Airport, a future concert venue and INDOT Maintenance Unit. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts with possible adverse impacts to the existing church. It may be possible to avoid/minimize impacts during development of conceptual designs. The interchange may also have negative impacts on both the religious facility and underserved community populations.

Primary concepts eliminated from further consideration are as follows:

- Signalization – Turning movement volumes at this intersection do not warrant signalization. Signalizing the intersection adds delay to US 31 and may cause rear-end crashes.
- Green-T Intersection – This concept is not applicable to a four-legged intersection.
- Quadrant Roadway – This concept adds a traffic signal to US 31, resulting in the same drawbacks as the signalization concept.
- Overpass – This location has been identified as a priority access point and severing access here is not recommended.

Complementary concepts to be considered as part of primary concepts include:

- Add/Lengthen Turn Lanes – The addition of a southbound right turn lane should improve operations and may provide a safety benefit.
- Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for safer transitions to/from US 31.
- Roadway lighting – Required per INDOT guidelines for a reduced conflict intersection and an interchange to provide safety and comfortability for drivers at night.
- Warning system – Applicable to the reduced conflict intersection concept to improve safety by alerting motorists of approaching and/or crossing vehicles.



Table 4-1: US 31 & CR 200 N - Qualitative Comparison of Concepts

US 31 & CR 200N (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	No	Low	Yes	Restrict to right-in/right-out to reduce conflict points if access to southbound US 31 can be provided elsewhere.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Expected to improve safety by reducing conflict points. Maintains free flow conditions for US 31. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not warrant signalization. Adds delay to US 31.
Overpass	Yes	Yes	No	Worsens	Improves	Low	Low	Medium	No	Medium	No	Not appropriate at this intersection due to relatively low crossing volumes and need to maintain access to/from US 31.
Interchange	Yes	Yes	No	Improves	Improves	High	Medium	Medium	Yes	High	Yes	Important access point per stakeholders. May result in adverse impacts to the church. Opportunity to avoid and/or minimize impacts during concept development.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	Southbound right turn may provide operational & safety benefits by separating turning traffic from through traffic.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	May improve safety and operations for traffic entering/exiting US 31. Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	No	Medium	No	Induces delay along US 31 by adding a new traffic signal. Requires ROW for quadrant roadway.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection and interchange concepts per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles. Consider pairing with the Reduced Conflict Intersection concept.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

#### 4.1.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to Step 4 of the screening process are described below.

##### **Access Modifications**

Access modifications at this intersection include limiting movements at this intersection to right-in/right-out and adding acceleration and deceleration lanes to US 31. Side street left turn movements at this intersection would be displaced to adjacent intersections. Mainline left turn movements may be provided at the intersection or displaced to adjacent intersections, depending on intersection operations. This alternative can be constructed within the existing right-of-way. No conceptual design has been prepared for this alternative because of its lack of impacts to resources. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Reduced Conflict Intersection**

The US 31 and CR 200 N intersection is converted to a reduced conflict intersection, with U-turn movements provided north and south of CR 200 N. This alternative reroutes the through and left turn movements from CR 200 N to the U-turn movements. The approximate limits of this alternative are depicted in **Figure 4-1**.

This alternative is expected to be constructed within the existing right-of-way and to have little to no impact on both natural and cultural resources. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange On Existing Alignments**

An interchange that elevates CR 200 N over US 31 minimizes the length of bridge needed at this interchange but requires extensive grading along CR 200 N, which severs connections to existing driveways near the interchange. An interchange with US 31 over CR 200 N allows existing driveways along CR 200 N to remain if outside of the limited access right-of-way. Therefore, US 31 over CR 200 N is the preferred configuration of an interchange at this location.

Both options would require acquisition of Calvary Church, located in the northeast quadrant, and homes on the west side of the interchange. The alternative's improvement limits are illustrated in **Figure 4-2**. Despite these impacts, this alternative will be carried forward to the Level 3 screening as it is likely to be the best option for providing an interchange at this intersection.

##### **Interchange Shifted to the South**

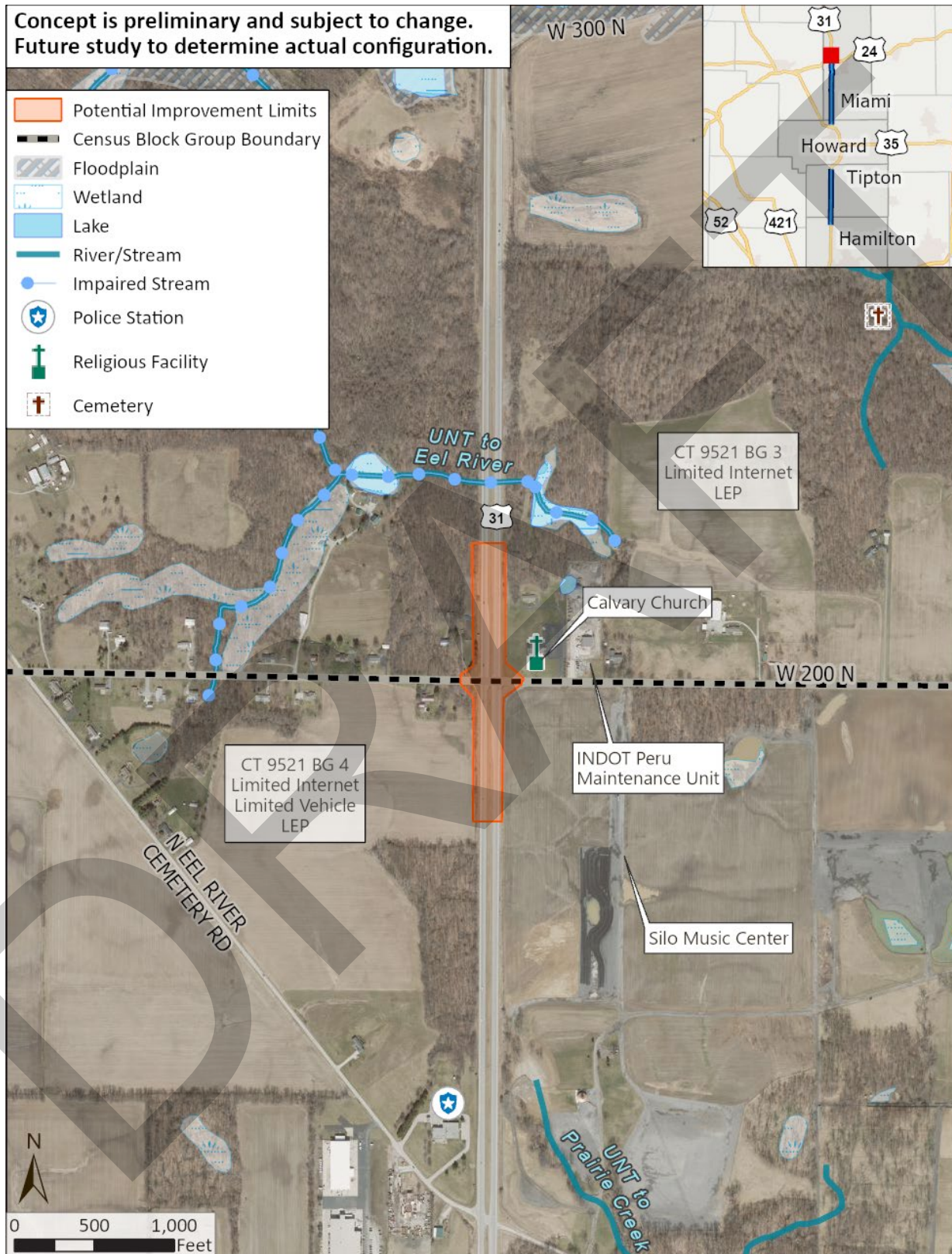
Avoidance of Calvary Church requires locating the interchange north or south of the existing intersection. Shifting to the north is not desirable due to the body of water that lies northeast of the intersection. Shifting the interchange to the south avoids impacting the church but would limit access to both the church and the adjacent INDOT Peru Maintenance Unit as CR 200 N is realigned to the south. Substantial right-of-way acquisition is necessary to realign CR 200 N, which would significantly impact the concert venue that is currently being constructed in the southeast quadrant of the intersection. This alternative will not be advanced for further evaluation in the Level 3 screening as it requires substantial right-of-way acquisition and has severe impacts on the two adjacent land uses. No conceptual design was prepared for this alternative.

#### 4.1.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative - Carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Interchange on Existing Alignments
- Add/Lengthen Turn Lanes – Incorporate in all alternatives.
- Acceleration / Deceleration Lanes – Incorporate in all alternatives for safer transitions to/from US 31.
- Warning System - Incorporate with the Reduced Conflict Intersection alternative.

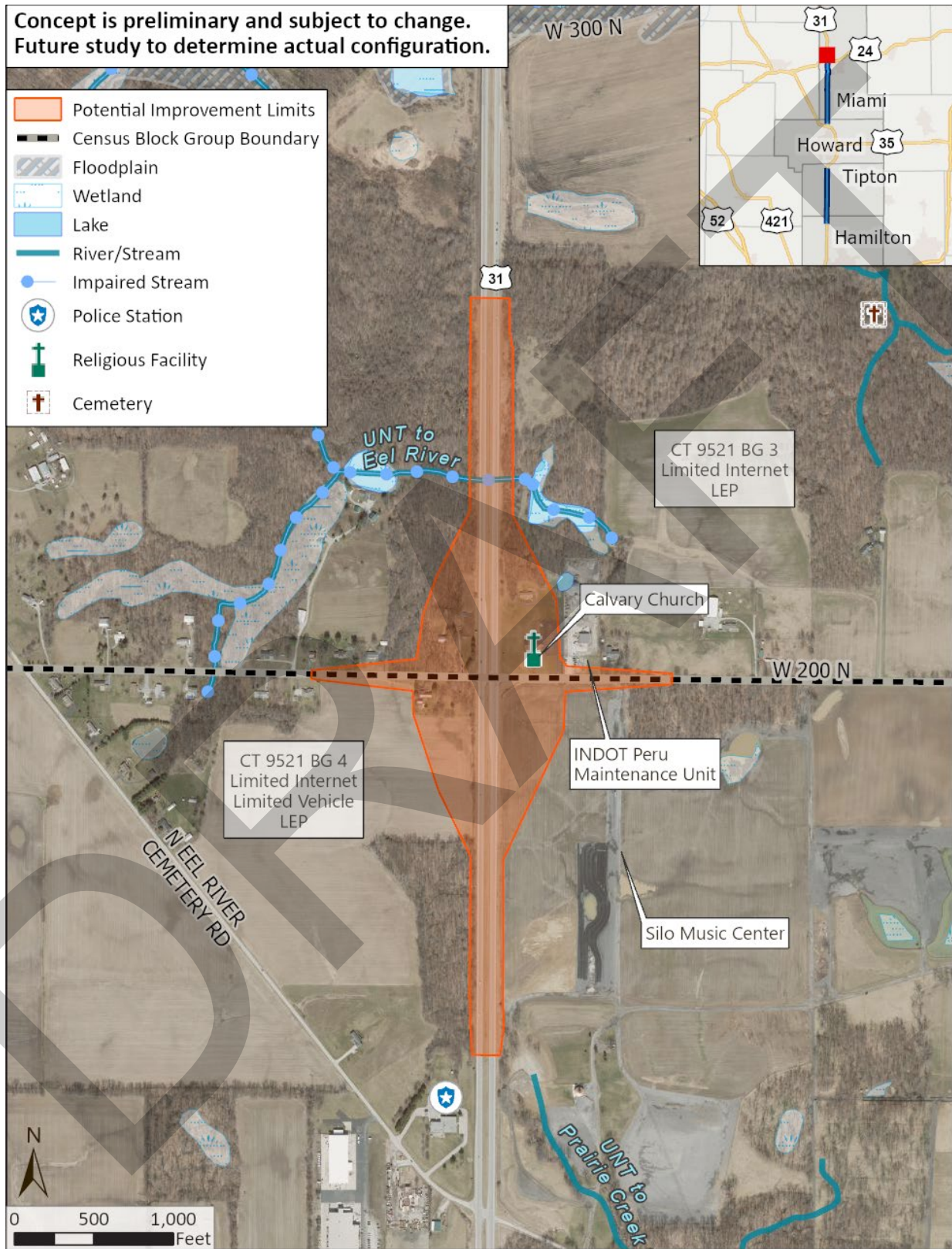
Figure 4-1: US 31 & CR 200 N – Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-2: US 31 & CR 200 N - Interchange Alternative



## 4.2 US 31 & CR 100 N IN MIAMI COUNTY

### 4.2.1 OVERVIEW

The signalized intersection of US 31 and CR 100 N is expected to meet INDOT level of service standards in the design year. The crash history at this intersection indicates:

- 41% of crashes were rear-end type crashes.
- 16% of crashes were right-angle crashes.

A previous INDOT study of this intersection concluded a Reduced Conflict Intersection was the ideal improvement for this location. The Miami County Comprehensive Plan identifies this intersection for closure and intends to provide access to the adjacent parcels by recommending an interchange at the US 31 and Eel River Cemetery Road intersection, which is located less than 0.5 mile north of CR 100 N. Public comments received to date about this intersection are as follows:

- Interchange needed at this location.
- Access to the adjacent businesses is important for sustainability.
- Remove the traffic signal at this intersection to promote free flow conditions.

### 4.2.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Multiple businesses are directly adjacent to the intersection, including JJ’s Travel Plaza, Co-Tronics, Simplot Grower Solutions, Miami County REC, and Broadway Broadband. Additionally, X Factor Whitetails hunting ranch and the White Tail Woods Event Center are located east of the intersection along CR 100 N.
- Chinook RV is 0.35-mile northwest of the intersection, and the Indiana State Police outpost is 0.5 mile north of the intersection along the west side of US 31.
- Two UNTs to Prairie Creek are located in proximity to the intersection. One UNT to Prairie Creek crosses under US 31 under CR 100 N north of the intersection and crosses under CR 100 N approximately 0.13 mile west of the intersection. The second UNT to Prairie Creek flows under CR 100 N 0.35 miles east of the intersection.
- Two mapped NWI wetlands are near the intersection.
- One lake is near the intersection.
- Hazardous material concerns are near the intersection, including:
  - An underground storage tank (UST) and Leaking UST (LUST) site are in the northeast quadrant of the intersection.
  - An RCRA generator site lies in the southeast quadrant of the intersection.
- The intersection is within several potentially underserved communities, including:
  - Limited English proficiency populations.
  - Limited vehicle access populations.
  - Limited internet access populations.

### 4.2.3 SCREENING OF ALTERNATIVES

#### 4.2.3.1 Step 1 – Decision Tree

This intersection is important for access to and from US 31, which eliminates the overpass concept. Based on INDOT interchange design guidelines, this intersection lies too close to the US 31 and US 24 interchange and, therefore, should be limited in access or eliminated. This spacing eliminates the possibility to upgrade the intersection to an interchange and limits improvement options.

#### 4.2.3.2 Step 2 – Operational Analysis

All at-grade concepts are expected to operate acceptably in the design year based on the operations analysis.

#### 4.2.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-2**. From this table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Access Modifications – Restricting access at this location by converting both side street approaches to a right-in/right-out configuration or closing both approaches is practical given proximity to the US 24 interchange. Both types of modifications will improve operations of the US 31 and US 24 interchange, will both improve safety, and will allow for free flow conditions at this intersection. Access to various developments east of US 31 should be maintained.
  - Reduced Conflict Intersection – This concept will improve safety, will provide free flow conditions along US 31, and will maintain the current level of mobility. This concept is expected to require little or no additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage that maintains the current level of mobility.
- Complementary concepts:
  - Signalized Intersection Improvements, Quadrant Roadway – This concept retains a traffic signal on US 31 but is expected to improve operations and safety by reducing the number of signal phases necessary, thus reducing red time and the chance for rear-end collisions.
  - Roadway lighting – Required per INDOT guidelines for a Reduced Conflict Intersection and a quadrant roadway to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection and Quadrant Roadway concepts to improve safety by alerting motorists of approaching and/or crossing vehicles.
  - Freight Priority System – Applicable to all concepts that include traffic signals, allowing for the extension of a green light to accommodate an approaching truck.

The following primary and complementary concepts were eliminated from further consideration:

- Primary Concepts:
  - Overpass – This concept was eliminated as east-west traffic volumes do not justify an overpass.
  - Interchange – This concept was eliminated due to the proximity of the US 31 and US 24 interchange.
- Complementary concepts
  - Signalized Intersection Improvements, Green-T Intersection – This concept is not applicable to a four-legged intersection.

Table 4-2: US 31 & CR 100 N - Qualitative Comparison of Concepts

US 31 & CR 100N (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward to Step 4?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	N/A	Yes	Worsens	Improves	Low	Low	Low	No	Low	Yes	Restrict to right-in/right-out and/or close due to proximity to US 24 interchange.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	N/A	No	Improves	Improves	Low	Low	Low	No	Low	Yes	Expected to improve safety by reducing conflict points. Provides free flow conditions for US 31. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Existing signalized intersection. Carry forward as No-Build Alternative or relocate intersection to the north.
Overpass	Yes	N/A	No	Worsens	Improves	Low	Low	High	No	Medium	No	Not appropriate at this intersection due to relatively low crossing volumes and need to maintain access to/from US 31.
Interchange	Yes	N/A	No	Improves	Improves	Low	Low	High	No	High	No	Intersection is too close to US 24 to be an interchange and would create potential operational and safety issues.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	Yes	N/A	No	Maintains	Maintains	Low	Low	Yes	No	Low	No	Timing updates will not address crash history of this intersection.
Add/Lengthen Turn Lanes	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Existing turn lanes are sufficient in length.
Acceleration / Deceleration Lanes	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	No	Existing intersection has acceleration lanes.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	N/A	No	Maintains	Improves	Low	Low	Medium	No	Medium	Yes	Moves signal farther from US 24. Expected to improve delay & safety.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at interchange ramp terminal intersections.
Roadway Lighting	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection and quadrant roadway concepts per INDOT Guidelines.
Warning System	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists to a potential stop condition ahead at the traffic signal. Consider pairing with the Reduced Conflict Intersection and quadrant roadway concepts.
Freight Priority System	No	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	Yes	May reduce delays for trucks by extending green time. Does not address crash history. Consider pairing with signalized concepts.



#### 4.2.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to Step 4 of the screening process are described below.

##### Access Modifications

Access modifications at this intersection include limiting movements at this intersection or closure of the intersection. Both options are reasonable because of the proximity of this intersection to the US 31 and US 24 interchange. Both types of access modifications will displace traffic to adjacent intersections along US 31 and along US 24. This concept can be constructed within the existing right-of-way. No conceptual design has been prepared for this concept because of the lack of impacts to resources resulting from this concept. This concept will be advanced for further evaluation in the Level 3 screening process.

##### Reduced Conflict Intersection

This concept facilitates through and left turn movements from CR 100 N via U-turn movements located along US 31. The proximity of the US 24 interchange prevents the southbound U-turn movement from being located 800 feet south of CR 100 N, as is preferred. Instead, the southbound U-turn movement is located 1,650 feet south of CR 100 N, between the US 31 southbound exit ramp to US 24 and the US 24 westbound to US 31 southbound ramp. An auxiliary lane from the loon, or turnout, to the CR 100 N intersection serves as an acceleration lane along northbound US 31. The improvement limits of this concept are depicted in **Figure 4-3**. This concept will be advanced for further evaluation in the Level 3 screening process.

##### Quadrant Roadway

The quadrant roadway concept includes a new intersection on US 31 approximately 750 feet north of CR 100 N and a new intersection on CR 100 N approximately 950' west of US 31, with a new roadway in the northwest quadrant of the intersection to connect these intersections, as illustrated in **Figure 4-4**. This concept retains all existing access drives to CR 100 N and requires right-of-way for only the quadrant roadway itself. This concept will be advanced for further evaluation in the Level 3 screening process.

##### Relocated Intersection

The existing intersection violates current interchange design criteria by being located too close to the US 31 and US 24 interchange. Moving the intersection north creates more space between it and the interchange, which should improve operations and safety for both the intersection and the interchange. In this concept, the existing intersection at CR 100 N is closed and the signal is shifted approximately 0.25 mile north with an access road connecting it to CR 100 N to the west and Eel River Cemetery Road to the east. This concept includes realignment of Eel River Cemetery Road west of US 31 to connect to the new access road. This eliminates the US 31 and Eel River Cemetery Road intersection, which provides both safety and operational benefits. The limits of this concept are shown in shown in **Figure 4-5**. This concept will be advanced for further evaluation in the Level 3 screening process.

#### 4.2.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Quadrant Roadway
- Relocated Intersection
- Roadway Lighting - Provide with the Reduced Conflict Intersection and Quadrant Roadway alternatives.
- Warning System - Consider with the Reduced Conflict Intersection or Quadrant Roadway alternatives.
- Freight Priority System - Consider for all intersection types that include signalization.



Figure 4-3: US 31 & CR 100 N – Reduced Conflict Intersection Alternative





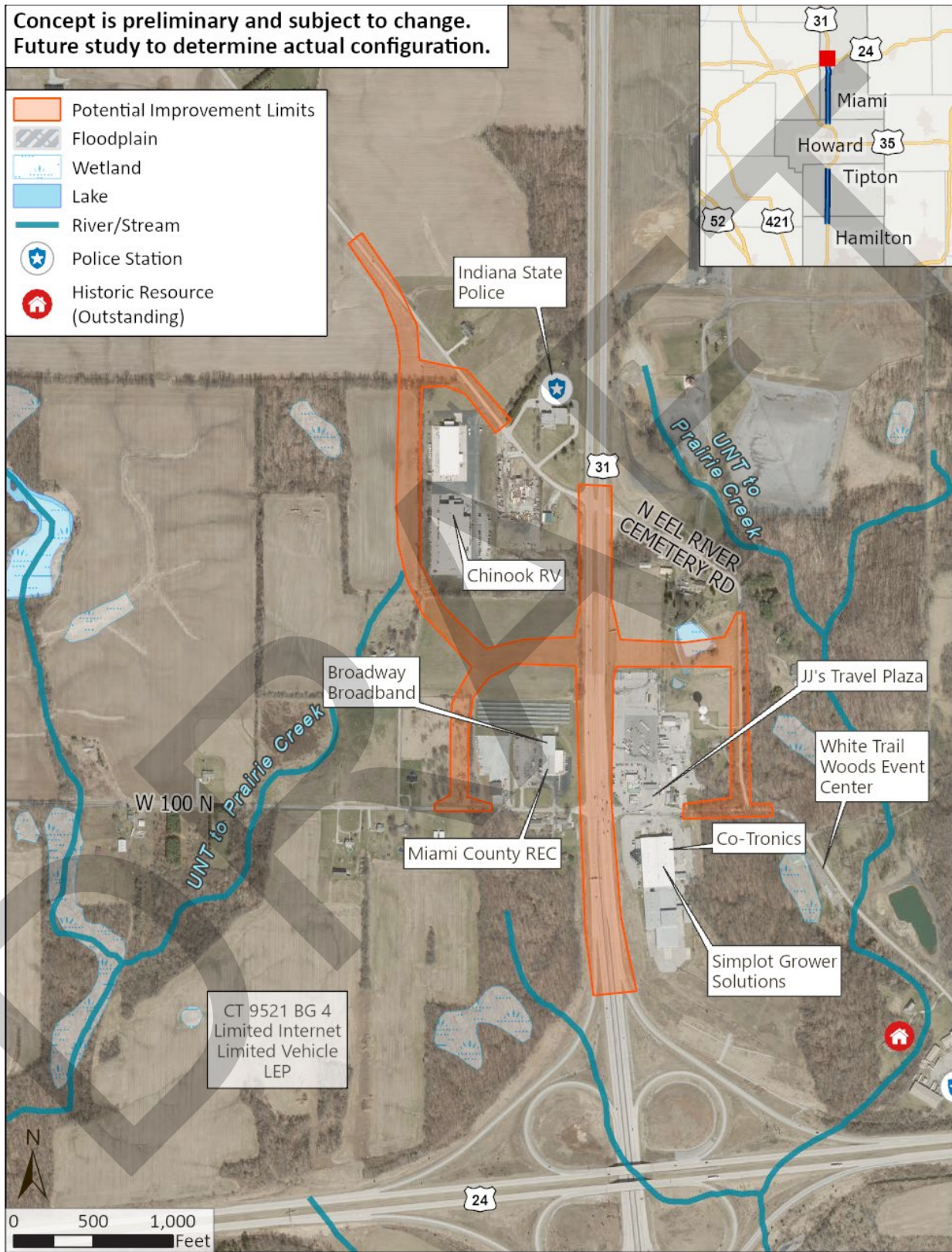
Figure 4-4: US 31 & CR 100 N - Quadrant Roadway Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-5: US 31 & CR 100 N - Relocated Intersection Alternative



## 4.3 US 31 & US 24 IN MIAMI COUNTY

### 4.3.1 OVERVIEW

This existing interchange is expected to operate acceptably through the design year of this study. The crash history at this intersection indicates:

- 24% of crashes were ran off the road type crashes.
- 16% of crashes were side swipe crashes between vehicles traveling in the same direction.

The Miami County Comprehensive Plan does not identify a need for improvements at this interchange. The lone public comment received to date about this interchange requests a bike and pedestrian connection point between US 31 and the Northern Suffolk Railroad at a location north of US 24.

### 4.3.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- A business, Rent-a-Trailer, is located in proximity to the intersection, approximately 0.40 mile to the northeast of the intersection.
- A UNT to Prairie Ditch crosses into the northwest quadrant of the clover. Additionally, there are multiple UNTs near the intersection. Prairie Ditch flows under US 31 approximately 0.55 mile south of the intersection.
- The floodplain associated with Prairie Ditch is located 0.40 mile south of the intersection.
- Five mapped NWI wetlands are near the intersection.
- Two lakes are located near the intersection east and west of US 31 south of US 24.
- A floodplain is located approximately 0.20 mile southeast of the center of the intersection.
- An INDOT Mitigation Site, US 24 Sperry Mitigation Site, is located approximately 0.30 mile southwest of the center of the intersection.
- An outstanding above-ground resource, a farm, is located approximately 0.34-mile northeast of the intersection. This historic site would require further evaluation to determine National Register of Historic Places (NHRP) eligibility.
- A National Pollutant Discharge Elimination System (NPDES) is mapped at the intersection. However, the permit is listed as terminated.
- The intersection is located within potentially underserved communities, including:
  - Limited English proficiency populations.
  - Limited vehicle access populations.
  - Limited internet access populations.

### 4.3.3 SCREENING OF ALTERNATIVES

No concepts have been developed for this interchange as no safety, operational, or access issues need to be addressed.

## 4.4 US 31 & BLAIR PIKE ROAD IN MIAMI COUNTY

### 4.4.1 OVERVIEW

This two-way stop-controlled intersection is expected to operate acceptably through the design year of this study. The crash history at this intersection indicates:

- 37% of crashes were rear-end type crashes.
- 21% of crashes were ran off the road type crashes.
- 21% crashes were side swipe type crashes between vehicles traveling in the same direction.

The Miami County Comprehensive Plan does not recommend changes to this intersection. Public comments received to date about this intersection are summarized as follows:

- The trips to/from Dukes Memorial Hospital frequently use Blair Pike Road and this intersection.

### 4.4.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Prairie Ditch crosses US 31, 90 feet north of the intersection, and Blair Pike Road, 215 feet west of the intersection.
- Two INDOT Mitigation Sites, US 24 Wolfe Mitigation Site and US 24 Sperry Mitigation Site, are located on the west side of US 31 north of Blair Pike Road.
- A pipeline is located 0.08 mile south of the intersection.
- The intersection is within a floodplain.
- The intersection is within potentially underserved communities, including:
  - Limited English proficiency populations.
  - Limited internet access populations.
  - Limited vehicle access populations.

### 4.4.3 SCREENING OF ALTERNATIVES

#### 4.4.3.1 Step 1 – Decision Tree

The lack of safety or operational issues with this intersection suggest that at-grade options, as well as access modifications, are most appropriate for this intersection. Grade separation and interchange concepts were ruled out for this location due to relatively low traffic volumes, and the 3,000 feet of separation from the US 24 interchange is too close to allow for an interchange at this intersection.

#### 4.4.3.2 Step 2 – Operational Analysis

All at-grade intersection types will yield acceptable operations.

#### 4.4.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-3**. From this table, the following alternatives are to be advanced to Step 4.

- Primary Concepts:
  - Access Modifications – Limiting access at this location may be a means to improve operations and safety.
  - Reduced Conflict Intersection – This concept will improve safety, will maintain free flow conditions along US 31, and will maintain the current level of mobility. This concept is expected to require little or no additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage that maintains the current level of mobility.

- Complementary concepts:
  - Add/Lengthen Turn Lanes – The addition of left and right turn lanes along US 31 should improve operations and will provide a safety benefit.
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for a Reduced Conflict Intersection to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection concept to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary concepts were eliminated from further consideration:

- Signalization – Turning movement volumes at this intersection do not warrant signalization. Signalizing the intersection adds delay to US 31 and may cause rear-end crashes.
- Green-T Intersection – This concept is not applicable to a four-legged intersection.
- Quadrant Roadway – This concept adds a traffic signal to US 31, resulting in the same drawbacks as the signalization concept.
- Overpass – East-west traffic volumes do not justify this concept.
- Interchange – Traffic volumes do not justify signalization and therefore do not justify an interchange. Additionally, there are no safety or operational issues to address.



Table 4-3: US 31 & Blair Pike Road - Qualitative Comparison of Concepts

US 31 & Blair Pike Rd	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	No	Low	Yes	Restrict to right-in/right-out or close due to low volumes.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Expected to improve safety by reducing conflict points. Maintains free flow conditions for US 31. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	Yes	Yes	No	Worsens	Improves	Medium	Low	Low	No	Medium	No	Would sever access to/from US 31. Not appropriate at this intersection due to relatively low traffic volumes.
Interchange	Yes	Yes	No	Improves	Improves	High	Low	Low	No	High	No	Relatively low traffic volumes, as well as potential impact concerns with adjacent mitigation sites. Additionally, intersection is too close to US 24 to be an interchange per INDOT's guidelines.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	No turn lanes are present along US 31.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	No acceleration /deceleration lanes are present along US 31. Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Medium	Low	Low	No	Medium	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection concept per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles. Consider pairing with the Reduced Conflict Intersection concept.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

#### 4.4.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to Step 4 of the screening process are described below.

##### **Access Modifications**

The implementation of a right-in/right-out alternative allows for free flow conditions along US 31 but restricts access across it, requiring drivers to make a right turn from Blair Pike Road. Closure of the intersection is also a type of access control that would be appropriate for this location based on the low traffic volumes served by this intersection. However, both concepts would hinder emergency response times to the nearby hospital, forcing them to reroute to US 24. Bridge widening and minimal right-of-way acquisition may be required along US 31 to incorporate acceleration and deceleration lanes along US 31. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Reduced Conflict Intersection**

Implementing a reduced conflict intersection at the intersection of US 31 and Blair Pike Road only allows for the addition of one loon located south of the main intersection. Free flow conditions remain for US 31, with Blair Pike Road traffic being required to turn right and continue to the loon to the south or use the US 24 interchange to the north. There are minimal right-of-way needs with a small amount of grading to occur outside of the existing US 31 limits, as shown in **Figure 4-6**. This alternative will be advanced for further evaluation in the Level 3 screening process.

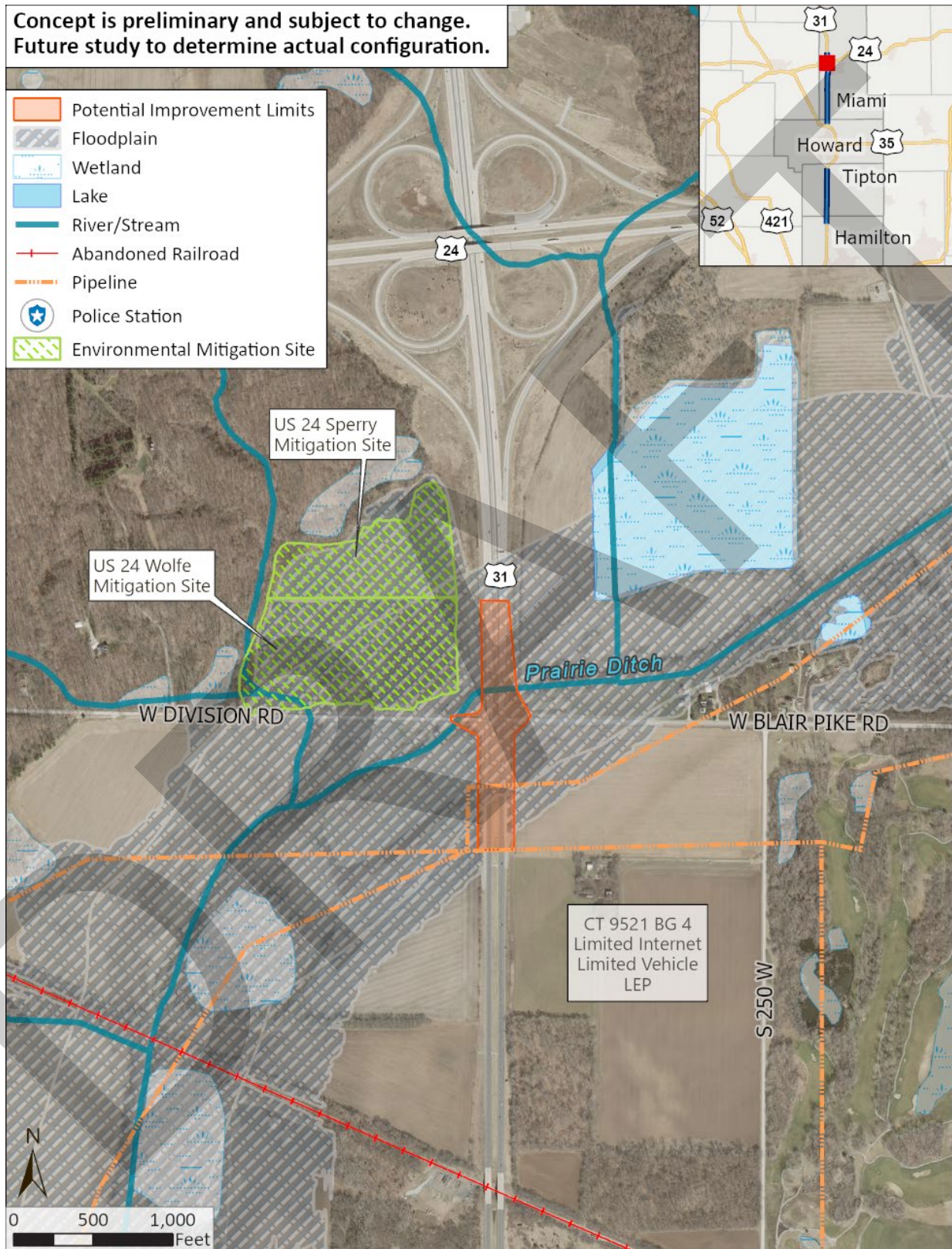
#### 4.4.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Add/Lengthen Turn Lanes – Incorporate in all alternatives.
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide with the Reduced Conflict Intersection alternative.
- Warning System - Consider with the Reduced Conflict Intersection alternative.



Figure 4-6: US 31 & Blair Pike Road – Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

## 4.5 US 31 & LOGANSPOUR ROAD IN MIAMI COUNTY

### 4.5.1 OVERVIEW

This two-way stop-controlled intersection is expected to operate acceptably through the design year of this study. The crash history at this intersection indicates:

- 35% of crashes were rear-end type crashes.
- 29% of crashes were ran off the road type crashes.
- 18% of crashes were side swipe crashes between vehicles traveling in the same direction.

The current configuration of the intersection does not allow for an eastbound left turn movement onto northbound US 31.

The Miami County Comprehensive Plan does not recommend changes to this intersection. Public comments received to date about this intersection are summarized as follows:

- The intersection should remain open to provide access to the existing fuel terminal.
- Fuel tanker trucks use this intersection.
- The intersection should allow an eastbound left turn onto northbound US 31.
- There is a campground planned for this area.

### 4.5.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- One business, Doane Keyes Associates, is located northeast of the Logansport Road and US 31 connection road.
- The Wabash River, which is also an IDEM 303(d) listed stream, is located 0.15 mile south of the intersection.
- A floodplain associated with the Wabash River is located 0.07 mile south of the intersection.
- Two mapped NWI wetlands are near the intersection.
- The Norfolk Southern Railroad runs parallel to Logansport Road along the north side of the intersection.
- A historic canal route is located 0.12 mile south of the intersection.
- The intersection is located within potentially underserved communities, including:
  - Limited English proficiency populations.
  - Limited internet access populations.
  - Limited vehicle access populations.

### 4.5.3 SCREENING OF ALTERNATIVES

#### 4.5.3.1 Step 1 – Decision Tree

At-grade intersection concepts may increase accessibility. Although traffic volumes do not warrant signalization, an interchange was also considered as an appropriate alternative given that this access point provides a direct link between US 31 and the City of Peru via Business 24. Restricting access is not considered to be a reasonable concept.

#### 4.5.3.2 Step 2 – Operational Analysis

All at-grade intersection concepts and the interchange concept are feasible for this location, as preliminary capacity analysis indicates that all at-grade concepts will operate acceptably in the design year.

#### 4.5.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-4**. From this table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Reduced Conflict Intersection – This concept maintains free flow conditions along US 31 and could improve mobility by allowing an eastbound left turn movement via a southbound U-turn, south of Logansport Road. This concept is expected to require little or no additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage that maintains the current level of mobility.
  - Green-T Intersection (At-Grade) – This concept improves mobility at this intersection by allowing the eastbound left turn movement and is expected to have low impacts to natural and cultural resources.
  - Overpass – This intersection already includes grade separation.
  - Interchange – Adding a quadrant roadway to the east side of US 31 and providing acceleration/ deceleration lanes along US 31 effectively creates an interchange. This concept requires acquisition of the development in the southeast quadrant of the intersection.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for the Reduced Conflict Intersection, Green-T intersection, and interchange concepts to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection and Green-T intersection concepts being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Limiting access at this location is not recommended due to the importance of this intersection for truck traffic and as an access point to the City of Peru.
- Signalization – Turning movement volumes at this intersection do not warrant signalization. Signalizing the intersection adds delay to US 31 and may cause rear-end crashes.
- Quadrant Roadway – This concept adds a traffic signal to US 31, resulting in the same drawbacks as the signalization concept.



Table 4-4: US 31 & Logansport Road - Qualitative Comparison of Concepts

US 31 & Logansport Rd (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	No	Low	No	Important access point per public input.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Expected to improve safety by reducing conflict points. Maintains free flow conditions for US 31. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	The existing intersection is essentially a quadrant roadway with an overpass. Carry forward as No-Build alternative.
Interchange	Yes	Yes	No	Improves	Improves	Medium	Low	High	No	High	Yes	Interchange provides for additional movements. Potential impacts to White River due to possible bridge widening.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Turn lanes are present along US 31.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	No acceleration/ deceleration lanes are present along US 31. Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	Yes	Yes	No	Improves	Maintains	Medium	Low	Low	N/A	Medium	Yes	Provides for all movements and reduces conflict points. Potential impacts to White River due to possible bridge widening.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Low	No	Medium	No	The existing intersection is essentially a quadrant roadway with an overpass. Carry forward as No-Build alternative.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection, Green-T, and interchange concepts per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles. Consider pairing with the Reduced Conflict Intersection and Green-T concepts.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

#### 4.5.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to Step 4 of the screening process are described below.

##### **Reduced Conflict Intersection**

A Reduced Conflict Intersection at the location of US 31 and Logansport Road retains free flow conditions along US 31. This alternative can be accomplished by adding a southbound U-turn Lane and requires no additional right-of-way. No natural or cultural impacts are expected from this alternative. The improvement limits of this alternative are depicted in **Figure 4-7**. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Green-T Intersection**

Implementing a Green-T style intersection at the intersection of Logansport Road requires minimal changes to the existing intersection. Northbound and southbound US 31 remain free flow with channelized left turns for northbound and eastbound traffic. The possibility of adding a signal to this intersection allows for protected left turns but removes the free flow condition for US 31 southbound. Acceleration lanes are implemented for those entering northbound or southbound US 31 from Logansport Road. The improvement limits of this alternative are shown in **Figure 4-8**. The northbound acceleration lane would require widening of the US 31 bridge over the railroad.

Additional right-of-way is not required, but both bridges to the north and south of the intersection need widening to accommodate the acceleration/deceleration lanes. Minimal grading is required at the main intersection. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange**

A folded diamond interchange to the south of Logansport Road allows for free flow conditions for both northbound and southbound travel while maintaining the existing Logansport Road overpass with the addition of one travel lane for each direction. Widening is needed for the Wabash River bridge and for the lane transitions south to Sease Drive, south of the bridge. Access to Sease Drive is modified due to the length of the lane transitions. The improvement limits of this alternative are shown in **Figure 4-9**.

Extensive right-of-way is required to implement this interchange alternative due to grading as well as the exit and entrance ramps. There would be a total acquisition of Doane Keyes Associates immediately to the east of US 31 on Logansport Road. Despite these impacts, this alternative will be advanced for further evaluation in the Level 3 screening process, as based on public input, this intersection is important for movement of commodities.

#### 4.5.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Green-T Intersection (At-Grade)
- Quadrant Roadway Intersection
- Interchange
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide with the Reduced Conflict Intersection and interchange alternatives.
- Warning System - Consider with the Reduced Conflict Intersection and Green-T intersection alternatives.

Figure 4-7: US 31 & Logansport Road – Reduced Conflict Intersection Alternative

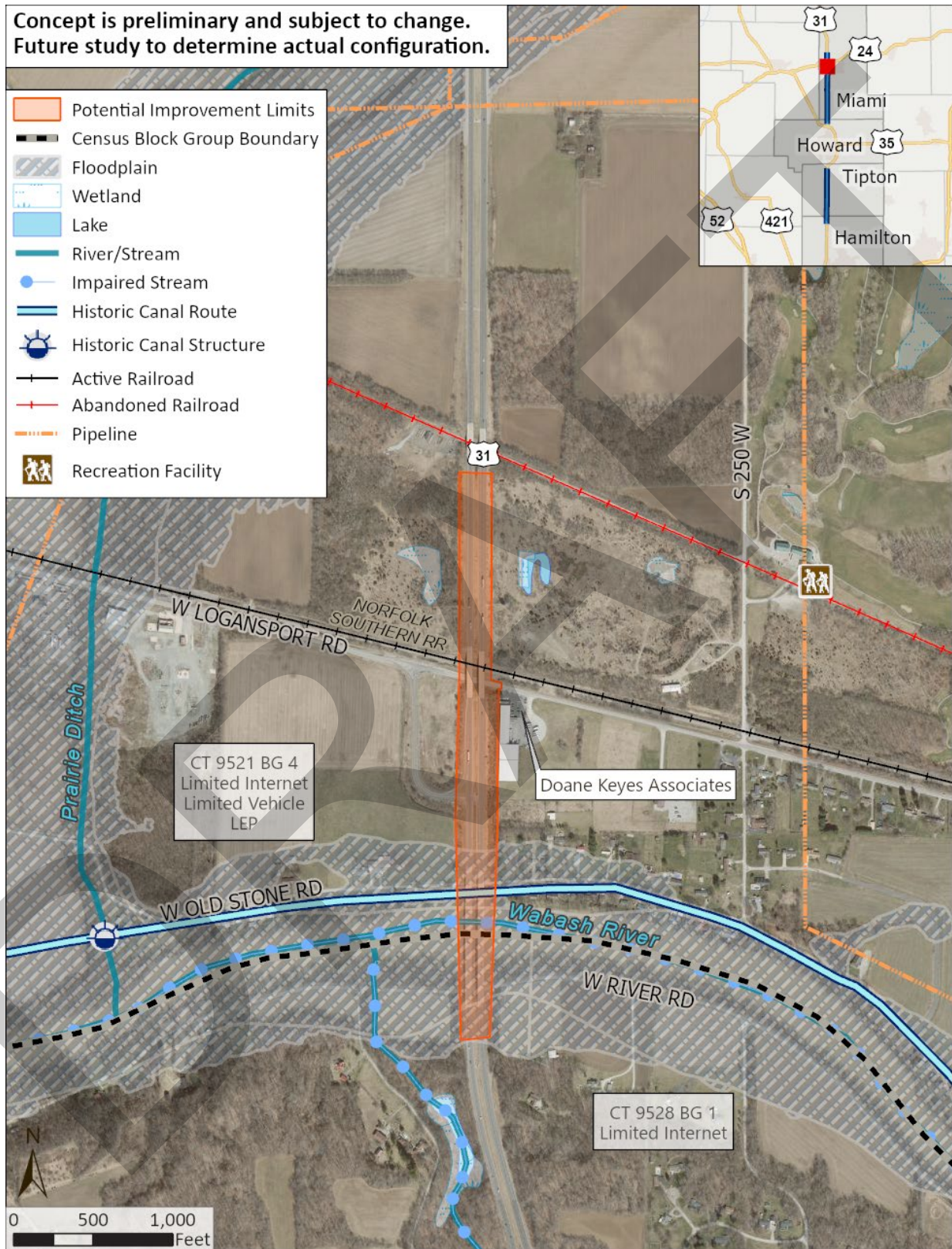
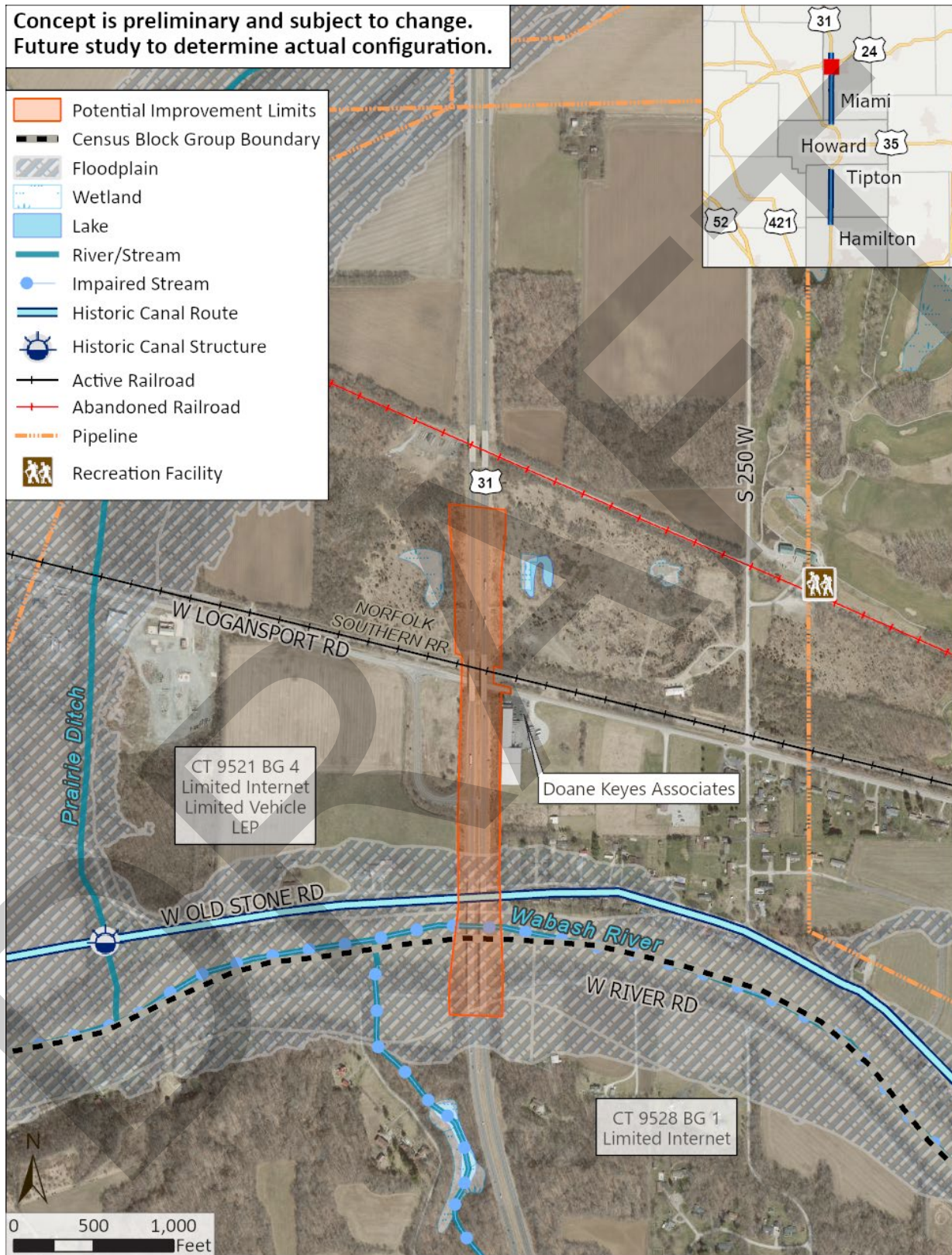




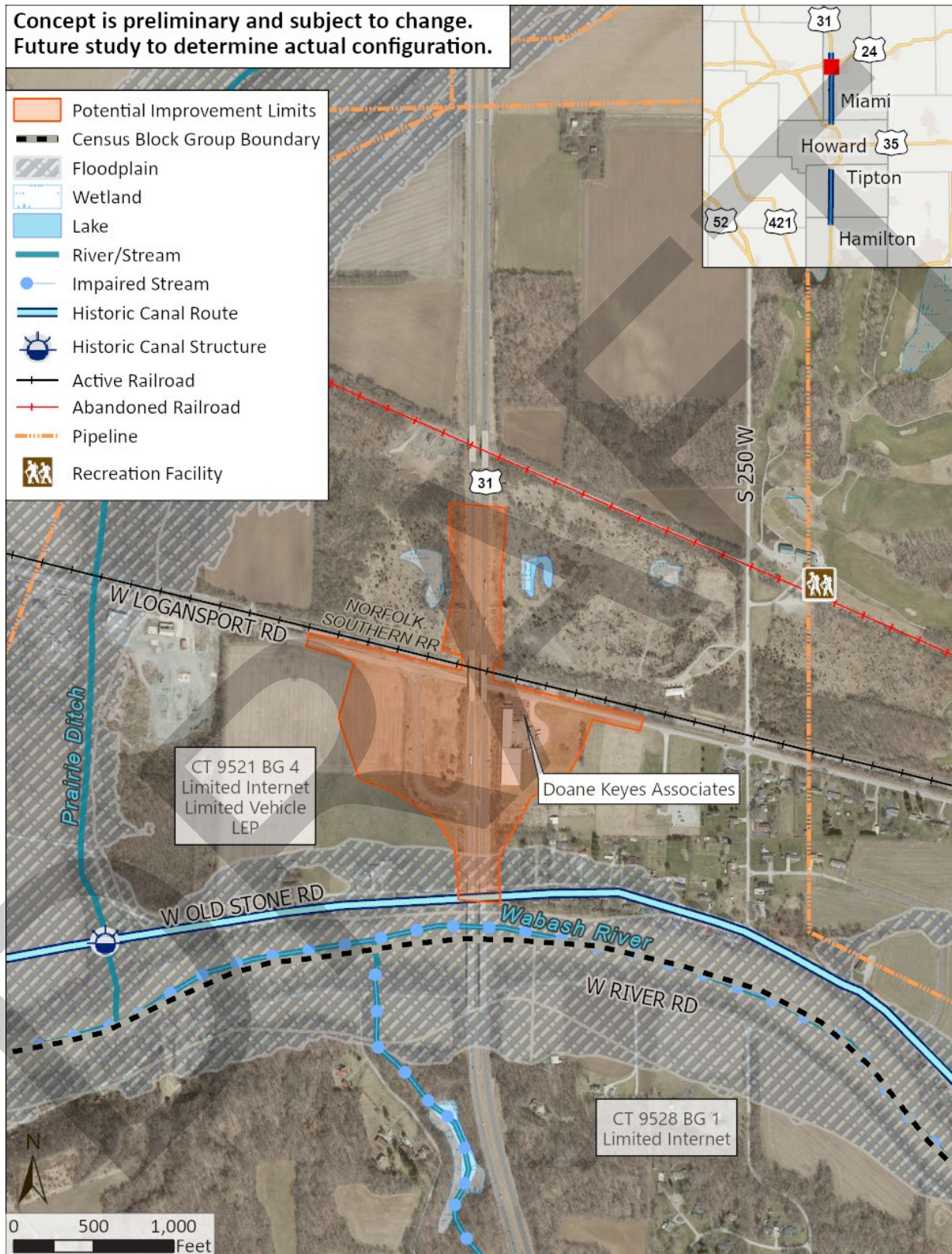
Figure 4-8: US 31 & Logansport Road - Green-T Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-9: US 31 & Logansport Road - Interchange Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



## 4.6 US 31 & AIRPORT ROAD IN MIAMI COUNTY

### 4.6.1 OVERVIEW

The two-way stop-controlled intersection of US 31 and Airport Road is expected to operate acceptably in the design year in its current configuration. The prevailing crash types at this intersection are:

- 21% of crashes were right angle type crashes.
- 14% of crashes were rear-end type crashes.

The Miami County Comprehensive Plan identifies this intersection for closure. One public comment regarding the need for a turn lane was received about this intersection.

### 4.6.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- One religious facility, Summit Theological Seminary, is in the northeast corner of the intersection.
- A pipeline runs under Airport Road approximately 0.05 mile west of the intersection and under US 31 directly north of the intersection.
- The intersection is located within a potentially underserved community (limited internet access populations).

### 4.6.3 SCREENING OF ALTERNATIVES

This intersection is considered to work as a system with the US 31 and Business 31 intersection to provide mobility in the area. For this reason, concepts for the US 31 and Airport Road intersection were developed to complement concepts for the US 31 and Business 31 intersection. US 31 and Airport Road concepts are discussed and evaluated in the US 31 and Business 31 section of this report. The qualitative evaluation of Airport Road concepts is summarized in **Table 4-5**.

Screening of alternatives for this intersection are discussed and depicted in Section 4.7.

Table 4-5: US 31 & Airport Road - Qualitative Comparison of Concepts

US 31 & Airport Rd (Miami County)	Purpose and Need (Mobility and Safety)				Environmental Impacts			Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures	Reduces delay at unsignalized intersections?	Maintains or improves safety, access, and mobility across the corridor by preserving the most important crossings and access points	Maintains or improves operations along US 31	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?			
No Build	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>										
Access Modifications	Yes	No	Worsens	Improves	Low	Low	Low	Low	Yes	Restrict to right-in/right-out or close. Provide access via US 31 & Business 31.
Unsignalized Intersection Improvements										
Reduced Conflict Intersection	Yes	Yes	Improves	Maintains	Low	Low	Low	Low	No	Provide access via US 31 & Business 31. Low volume road does not justify this improvement. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	Maintains	Worsens	Low	Low	Low	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	Yes	Yes	Worsens	Improves	Low	Low	Medium	Medium	No	Traffic volumes do not justify this improvement.
Interchange	Yes	Yes	Improves	Improves	Low	Low	High	High	No	Traffic volumes do not justify this improvement.
<b>Complementary Concepts</b>										
Auxiliary Lanes	No	No	Maintains	Maintains	Low	Low	Low	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	Maintains	Improves	Low	Low	Low	Low	Yes	Left turn lanes are present along US 31.
Acceleration / Deceleration Lanes	Yes	Yes	Improves	Improves	Low	Low	Low	Low	Yes	May provide safety benefits.
Signalized Intersection Improvements										
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A. Not a T-intersection.
Quadrant Roadway	Yes	NO	Neutral	Worsens	Low	Low	Medium	Medium	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	Improves	Maintains	Low	Low	Low	Low	No	Not necessary for access modifications.
Warning System	Yes	No	Improves	Maintains	Low	Low	Low	Low	Yes	May improve safety. Consider pairing with at-grade primary concepts per INDOT Guidelines.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

## 4.7 US 31 & BUSINESS 31 IN MIAMI COUNTY

### 4.7.1 OVERVIEW

The signalized intersection of US 31 and Business 31/Broadway Street operates acceptably in the existing conditions and is expected to operate acceptably through the design year. The crash history at this intersection indicates:

- 50% of crashes were rear-end type crashes.
- 23% of crashes were right-angle crashes.
- 22% of crashes resulted in fatalities or incapacitating injuries.

The 2015 Miami County Comprehensive Plan calls for an interchange at this location and identifies this interchange as a “critical need” for the county. “Critical need” intersections are defined as intersections that “require attention due to safety and connectivity significance and overall corridor improvement.”

INDOT had initiated a project to replace this intersection with an interchange. This project was suspended due to the initiation of this PEL study.

Public comments received to date for this intersection are summarized as follows:

- Excessive speeds frequently cause rear-end crashes at this intersection.
- The traffic signal should be eliminated.
- Provide access at this intersection to parcels on the west side of US 31.
- This is an important access point for the City of Peru.

### 4.7.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Multiple businesses are located near the intersection. Knights Inn, a self-storage facility, and the Best Western Circus City Inn are located east of US 31 north and south of Business 31. Additionally, Maximum Power Sports is located 0.24 mile south of the intersection.
- Two mobile home communities are in close proximity to the intersection. Woodland Hills Mobile Home Park is located 0.19 mile southwest of the intersection along the west side of US 31, and an additional mobile home park lies 0.35 mile south of the intersection along the east side of US 31, south of CR 300 S.
- Rife Creek crosses US 31 0.11 mile north of the intersection and crosses Business 31 0.21 mile east of the intersection. Additionally, a UNT to Rife Creek flows parallel to US 31 0.06 mile west of US 31.
- Hazardous material concerns are near the intersection, including a LUST and institutional control site, located 0.13 mile east of the intersection along the north side of Business 31. Further investigation into the LUST incident and institutional control site will be required.
- Potentially underserved communities are in proximity to the intersection, including:
  - Environmental Justice populations (minority).
  - Limited English proficiency populations.
  - Limited internet access populations.
- Institutional controls apply to parcels in proximity to this intersection. Institutional controls allow properties with chemicals remaining in environmental media at concentrations that exceed unconditional remediation objectives to be safely reused or developed so long as the land use restrictions and obligations are maintained to protect human health.

### 4.7.3 SCREENING OF ALTERNATIVES

#### 4.7.3.1 Step 1 – Decision Tree

The initial screening indicates that access modifications are not appropriate here and that at-grade intersections may yield acceptable operations. Preliminary capacity analysis results indicate an at-grade Green-T intersection may operate acceptably. The initial screening also indicates an interchange may be appropriate here given traffic volumes, crash history, and the importance of this intersection as a primary access point to the City of Peru.

#### 4.7.3.2 Step 2 – Operational Analysis

The at-grade Green-T intersection, signalized intersection and grade separation concepts are expected to yield acceptable operations in the design year.

#### 4.7.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-6**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Green-T Intersection – This concept will improve operations and will address at least some of the crash history.
  - Signalization – The existing traffic signal operates acceptably but has safety concerns.
  - Interchange – This concept improves operations along US 31 by eliminating a traffic signal, addresses the crash history, and can improve mobility. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. The interchange may also have negative impacts on underserved populations.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Signalized Intersection Improvements – Innovative intersection concepts, such as a Green-T intersection, may provide safety and operational benefits at this location.
  - Roadway lighting – Required per INDOT guidelines for a Green-T intersection and an interchange to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Green-T intersection concept to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Limiting access at this location is not recommended due to the importance of this intersection to the City of Peru and due to the volume of traffic that would be displaced.
- Reduced Conflict Intersection – The preliminary capacity analysis results indicate this concept cannot accommodate the high volume of westbound left turning traffic projected for this intersection.
- Quadrant Roadway – This concept is not applicable at a T-intersection.
- Overpass – This location has been identified as a priority access point and severing access here is not recommended.

Table 4-6: US 31 & Business 31 - Qualitative Comparison of Concepts

US 31 & Business 31 (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	N/A	Yes	Worsens	Improves	Low	Low	Low	Yes	Low	No	Restricting access at this intersection is not recommended as Business 31 is the primary corridor into Peru from US 31, as well as concerns for communities with EJ concerns.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	No	Westbound left turn volumes are too high for a Reduced Conflict Intersection.
Signalization	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing signalized intersection. No-Build will consider keeping as-is.
Overpass	Yes	N/A	No	Worsens	Improves	Low	Low	Medium	No	Medium	No	Would eliminate Priority Access point to/from US 31.
Interchange	Yes	N/A	Yes	Improves	Improves	Medium	Low	High	Yes	High	Yes	Opportunity to add fourth leg to interchange to improve connectivity and mobility across US 31. May impact access to mobile home community. Evaluate opportunities to avoid and/or minimize impacts during concept development. A Green-T interchange may have fewer impacts and lower cost than four-legged interchange.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	N/A	No	Maintains	Maintains	Low	Low	Low	Yes	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Signal timing updates will not address documented history of rear-end and right-angle crashes.
Add/Lengthen Turn Lanes	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	No documented issues with existing turn lanes on US 31.
Acceleration / Deceleration Lanes	Yes	N/A	No	Improves	Improves	Low	Low	Low	Yes	Low	Yes	Incorporate into Primary Concepts. Evaluate opportunities to avoid and/or minimize impacts to communities with EJ concerns during concept development.
<b>Signalized Intersection Improvements</b>												
Green T Intersection	Yes	N/A	No	Improves	Improves	Low	Low	Low	No	Low	Yes	Addresses crash history by channelizing vehicles turning left from Business 31. Improves operations by allowing free flow for SB US 31.
Quadrant Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A for a T-intersection.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by improved visibility at night. Consider pairing with at-grade primary concepts per INDOT Guidelines.
Warning System	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists to a potential stop condition ahead at the traffic signal. Consider pairing with the Green-T concept.
Freight Priority System	No	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	Yes	May reduce delays for trucks by extending green time. Does not address documented history of rear-end and right-angle crashes. Consider pairing with signalized concepts.

#### 4.7.3.4 Step 4 – Conceptual Footprint Comparison

The alternative advancing to Step 4 of the screening process are described below.

##### **Green-T Intersection**

This alternative provides for free-flowing traffic on southbound US 31 by barrier separating the southbound lanes and the left turn movement from Business 31. A traffic signal is retained to control the northbound lanes of US 31 and movements to/from Business 31. Acceleration lanes are provided along US 31 northbound and southbound to allow traffic from Business 31 to merge with US 31 traffic at the posted speed limit of US 31. This alternative requires closure of the median opening at Plothow Road to prevent conflicts with the southbound acceleration lane from Business 31. Plothow Road is restricted to right-in/right-out access only. This alternative does not require modifications to the US 31 and Airport Road intersection. This alternative will be advanced for further evaluation in the Level 3 screening process. The improvement limits for this alternative are depicted in **Figure 4-10**.

##### **Green-T Interchange**

In this alternative, the northbound lanes of US 31 are grade separated from all other movements, providing free flow conditions for northbound traffic on US 31. Southbound traffic on US 31 is not required to stop for traffic merging from Business 31, as an acceleration lane in the median is provided for westbound to southbound traffic. This acceleration lane merges into southbound US 31 prior to reaching the intersection of US 31 and CR 300 S/ Maugens Road. This eliminates the need for any modifications to the US 31 and CR 300 S/Maugens Road intersection; however, the US 31 and Plothow Road intersection must be restricted to right-in/right-out access. Modifications are needed at the US 31 and Airport Road intersection to maintain safety and access. The east leg of this intersection and the southbound left turn movement should be closed to prevent low speed traffic entering or crossing high speed traffic on the northbound lanes. All impacted movements should be detoured to the US 31 and Business 31 intersection. The northbound to westbound movement will remain open to provide access to parcels west of US 31. The west leg of the US 31 and Airport Road intersection should be reconfigured as a right-in/right-out to prevent eastbound traffic merging with northbound traffic. The eastbound to northbound movement can be accomplished by performing a U-turn at the US 31 and Business 31 intersection. The improvement limits for this alternative are depicted in **Figure 4-11**.

Exit/entrance ramps are provided along northbound US 31 to connect to Business 31. These ramps intersect Business 31 at near right angles in order to maintain access to the hotels located in the northeast and southeast quadrants. Southbound to eastbound traffic occurs under the overpass. The traffic control method to be used at intersections of this alternative will be determined in the Level 3 screening.

This alternative requires minimal right-of-way acquisition and is expected to have minimal environmental impacts, as it is largely constructed in the existing right-of-way. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – US 31 over Business 31**

Converting the intersection into a more traditional interchange provides the opportunity to connect to Plothow Road by adding a fourth leg to the intersection. Elevating Business 31 over US 31 minimizes the length of bridge needed at this interchange but requires extensive grading along both Business 31 and Plothow Road, which negatively impacts access to these roadways. This grading requires acquisition of several parcels in the northwest quadrant of the US 31 and Business 31 interchange. Elevating Business 31 over US 31 is not recommended due to these impacts.

Elevating US 31 over Business 31, with improvement limits shown in **Figure 4-12**, results in no impacts to existing driveway connections along CR 300 W and allows for relocation of existing commercial driveways along Business 31 to a location farther east of the interchange.

The entrance and exit ramps to/from the north tie into US 31 near Airport Road. The proximity of these ramps requires that Airport Road be disconnected from US 31 on both east and west sides. The interchange ramps to/from

the south require closure of the US 31 intersections with Plothow Road and CR 300 S/Maugens Road. Access to US 31 for parcels west of US 31 can be provided by extending Plothow Road to the south. Access to US 31 for the parcels east of US 31 will be eliminated, with trips being rerouted to utilize the interchange at US 31 and Business 31. The residences located east of US 31 between Maugens Road and Business 31 can remain if a frontage road providing access to Maugens Road is constructed. This alternative will be advanced for further evaluation in the Level 3 screening process.

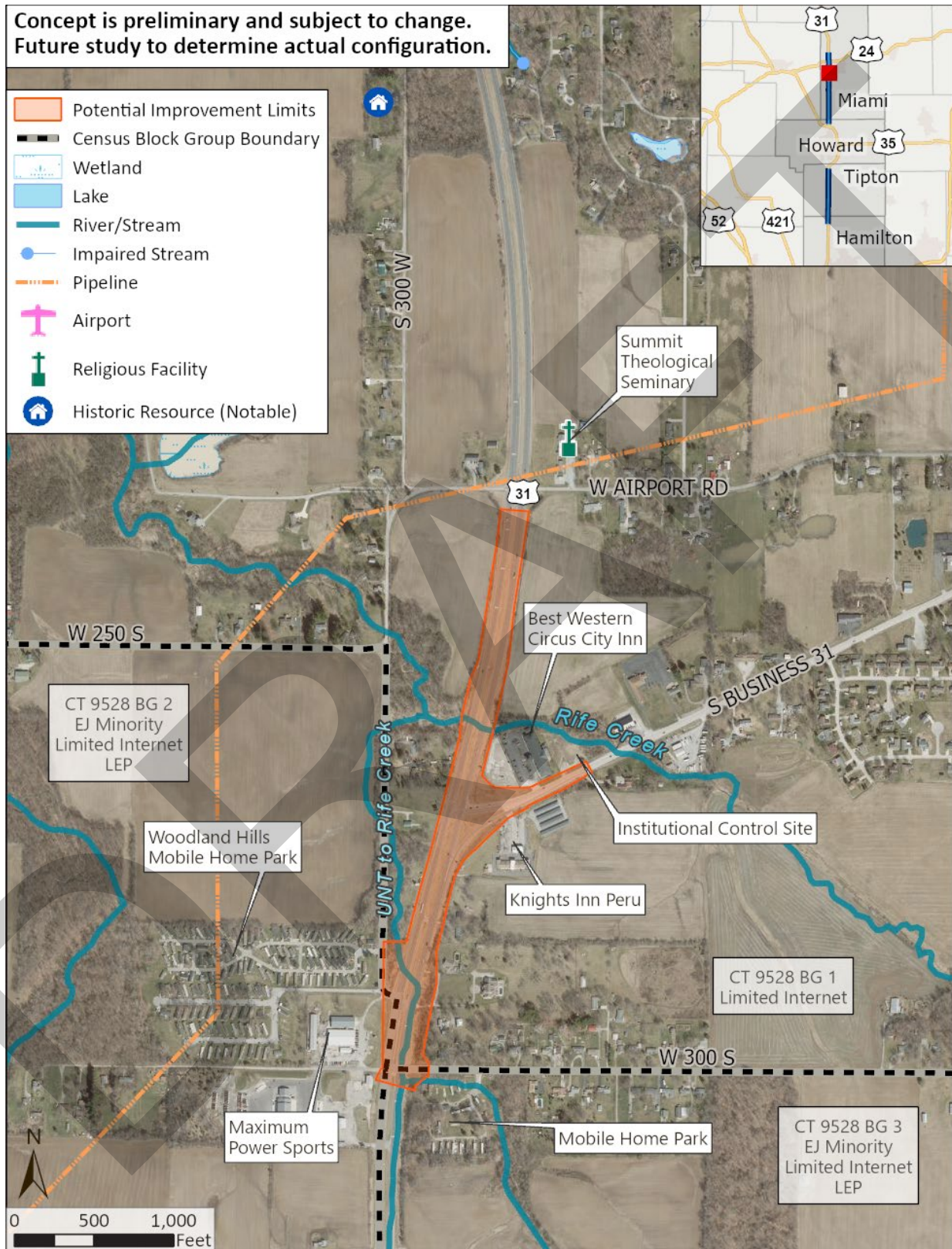
#### 4.7.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Green-T Intersection (At-Grade)
- Green-T Interchange
- Interchange
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting – Provide with the Green-T intersection and Interchange alternatives.
- Warning System - Consider with the at-grade Green-T intersection alternative. Also consider as an immediate improvement to address right angle and rear end crashes. This alternative is recommended for further consideration outside of this PEL study as a potential short-term improvement.
- Freight Priority - Consider with all alternatives that include signalization.



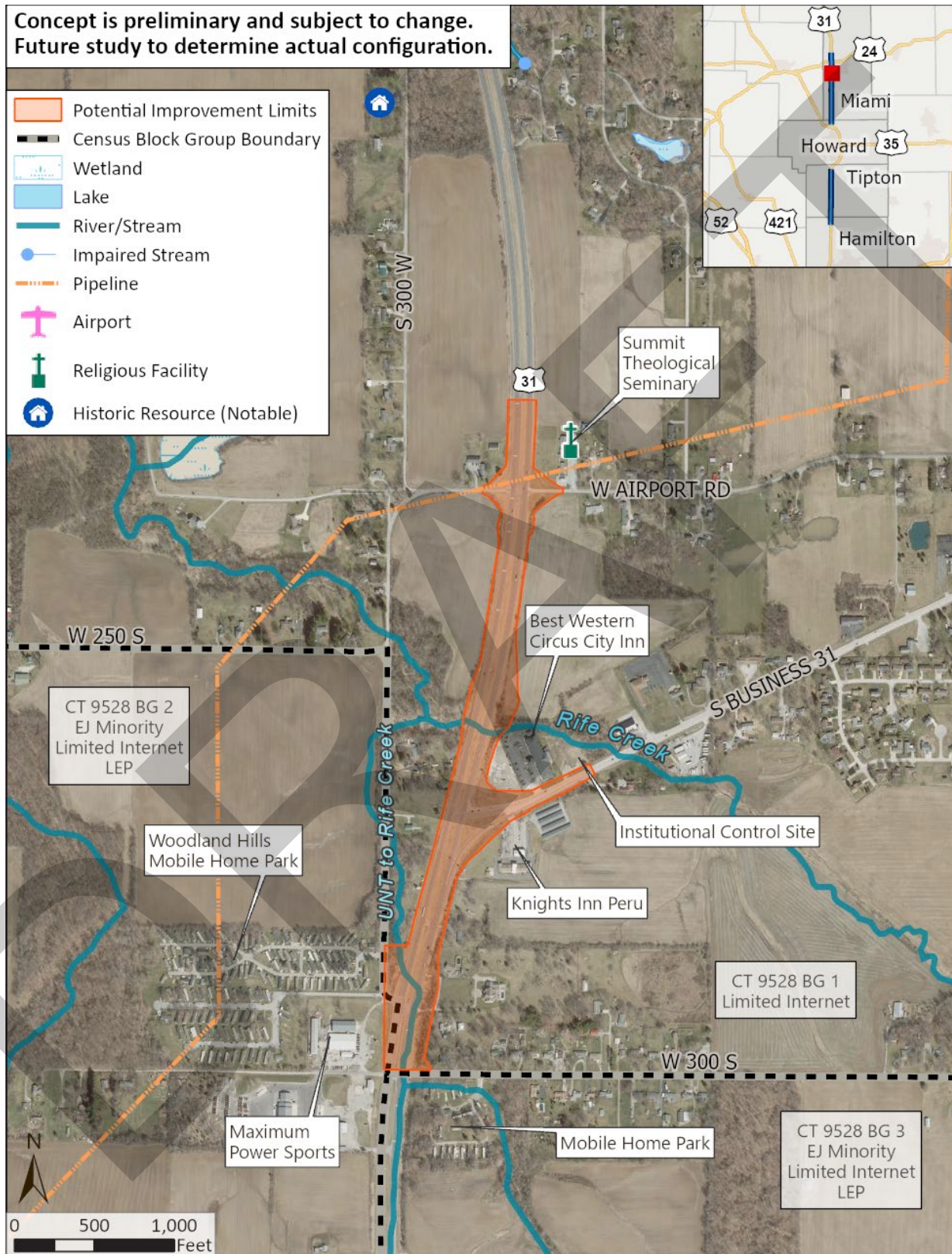
Figure 4-10: US 31 & Business 31 - Green-T Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



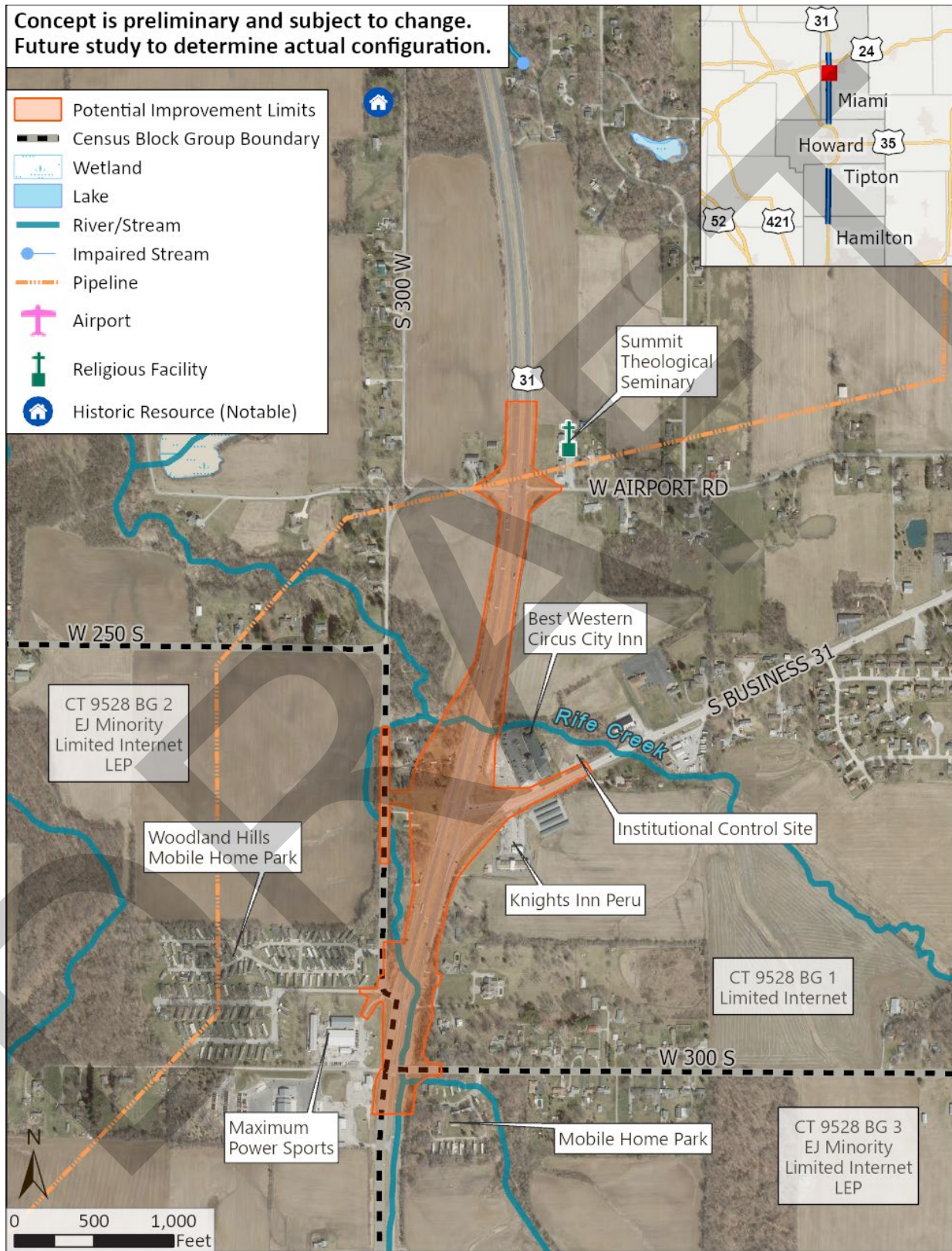
Figure 4-11: US 31 & Business 31 – Green-T Interchange Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-12: US 31 & Business 31 - Interchange Alternative, US 31 over Business 31



## 4.8 US 31 & CR 400 S IN MIAMI COUNTY

### 4.8.1 OVERVIEW

This intersection was added as a primary intersection after the Level 1 screening due to its proximity to Pipe Creek Elementary School.

The east and west approaches of this two-way stop-controlled intersection are expected to operate acceptably in the design year of this study. The crash history at this intersection indicates:

- 44% of crashes were sideswipe type crashes involving vehicles traveling in the same direction.
- 22% of crashes were ran off the road type crashes.

The 2015 Miami County Comprehensive Plan calls for an overpass at this location and an upgrade to CR 400 S to include trail connections between the Town of Nead and the Nickel Plate Trail. Public comments received to date for this location are summarized as follows:

- It is difficult to turn into/out of CR 400S.
- Turn lanes on US 31 are not long enough to accommodate buses slowing down.
- CR 400 S is an important crossing for agriculture.

### 4.8.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Pipe Creek Elementary School is located in the northwest quadrant of the intersection.
- UNT to Rife Creek is located 0.32 mile east of the intersection under CR 400 S.
- A mapped NWI wetland is located 0.09-mile northwest of the intersection.
- The intersection is within potential underserved communities, including:
  - Environmental Justice populations (minority).
  - Limited English proficiency populations.
  - Limited internet access populations.

### 4.8.3 SCREENING OF ALTERNATIVES

#### 4.8.3.1 Step 1 – Decision Tree

The lack of safety or operational issues with this intersection suggest that at-grade options are most appropriate for this intersection; however, an overpass was also considered as an appropriate alternative to provide continued access to Pipe Creek Elementary School for any alternatives that would restrict access between CR 400 S and US 31. An interchange is not considered for this location due to low traffic volumes.

#### 4.8.3.2 Step 2 – Operational Analysis

Multiple at-grade intersection types will yield acceptable operations through the design year, including the existing condition of a two-way stop-controlled intersection.

#### 4.8.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-8**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Reduced Conflict Intersection – This concept will improve safety, will maintain free flow conditions along US 31, and will maintain the current level of mobility. This concept is expected to require little or no

additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage that maintains the current level of mobility.

- Overpass – This location has been identified by the County’s comprehensive plan as a preferred location for an overpass. Access across US 31 is important at this location to maintain community access to Pipe Creek Elementary School. The overpass concept would not be implemented as a standalone project but could be implemented as part of a corridor-wide treatment that restricts access to US 31.
- Complementary concepts:
  - Add/Lengthen Turn Lanes – The existing right-turn lanes are short and appear to be sub-standard in length.
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for a Reduced Conflict Intersection to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection concept to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Restricting access at this intersection will have adverse impacts on the community and Pipe Creek Elementary School.
- Signalization – Turning movement volumes at this intersection do not warrant signalization and signalizing the intersection would add delay to US 31 and may cause rear-end crashes.
- Green-T Intersection – This concept is not applicable to a four-legged intersection.
- Quadrant Roadway – This concept adds a traffic signal to US 31, resulting in the same drawbacks as the signalization concept.
- Interchange – Traffic volumes do not justify signalization and therefore do not justify an interchange. Additionally, there are no safety or operational issues to address.

Table 4-7: US 31 & CR 400 S - Qualitative Comparison of Concepts

US 31 & CR 400S (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	No	Low	No	Important access point for Pipe Creek Elementary School.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provides safety benefits by reducing conflict points. Relatively low cost and impact. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	Yes	Yes	No	Worsens	Improves	Low	Low	Medium	No	Medium	Yes	Provides continued access to Pipe Creek Elementary School for local communities.
Interchange	Yes	Yes	Yes	Improves	Improves	Low	Low	High	No	High	No	Traffic volumes do not justify this improvement.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	Existing right-turn lanes are substandard in length.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	May provide safety benefits.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	No	Medium	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Ramp Terminal Improvements	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection concept.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles.
Freight Priority System	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.



#### 4.8.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to the conceptual design stage are described below. Complementary concepts have been incorporated into these concepts where applicable.

##### **Reduced Conflict Intersection**

Converting the intersection of US 31 and CR 400 S into a Reduced Conflict Intersection allows for free flow conditions along US 31 with the elimination of cross street through traffic. Drivers from CR 400 S are required to make a right turn at the intersection of US 31 and travel downstream to make a U-turn and continue through the intersection or make another right to continue along CR 400 S. Left turns from US 31 are possible at the intersection. The improvement limits for this alternative are shown in **Figure 4-13**.

Impacts are expected to be limited to the existing US 31 right-of-way. Grading in the median and outside shoulders is anticipated, as well as the addition of pavement. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Overpass – CR 400 S Over US 31**

In this concept, the intersection of US 31 and CR 400 S is grade separated with CR 400 S going over US 31 with access between the two roadways eliminated. This alternative provides free flow conditions for both roads. Raising the grade of CR 400 S eliminates access to CR 400 S for multiple residences and businesses located along this roadway and would limit access to Pipe Creek Elementary School.

Extensive right-of-way is required for grading along CR 400 S. This alternative will not be advanced for further evaluation in the Level 3 screening process due to these impacts.

##### **Overpass – US 31 Over CR 400 S**

Grade separating US 31 over CR 400 S mitigates impacts to residences along CR 400 S. Raising the grade of US 31 impacts the adjacent median openings north and south of CR 400 S, although access to the neighboring parcels could likely be maintained. This concept, with improvement limits depicted in **Figure 4-14**, may require retaining walls to keep earthwork within the existing US 31 right-of-way. This alternative will be advanced for further evaluation in the Level 3 screening process as it has less impacts on residences than the alternative that carries CR 400 S over US 31.

#### 4.8.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Reduced Conflict Intersection
- Overpass
- Add/Lengthen Turn Lanes should be considered.
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide with the Reduced Conflict Intersection alternative.
- Warning System - Consider with the Reduced Conflict Intersection alternative.

Figure 4-13: US 31 & CR 400 S – Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-14: US 31 & CR 400 S – Overpass Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

## 4.9 US 31 & CR 500 S IN MIAMI COUNTY

### 4.9.1 OVERVIEW

The east and west approaches of this two-way stop-controlled intersection are expected to operate at unacceptable levels in the design year of this study. The crash history at this intersection indicates:

- 31% of crashes were right-angle type crashes.
- 16% of crashes were from when a driver ran off the road.
- 16% of crashes were collisions with an animal.
- 22% of crashes resulted in fatalities or incapacitating injuries.

The 2015 Miami County Comprehensive Plan calls for an overpass at this location and for SR 218 N to be realigned to connect to CR 500 S in order to create an east-west route that traverses the county. Public comments received to date for this location are summarized as follows:

- An interchange may be appropriate here.
- This intersection provides access to the Miami State Recreation Area and Mississinewa Lake.
- There are numerous residences along CR 500 S that depend on access to US 31 at this intersection.

### 4.9.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- A mobile home community is near the intersection, with the only access to it located 143 feet west of the intersection off of CR 500 S.
- A UNT to Pipe Creek, which is also an IDEM 303(d) listed stream, crosses US 31 0.08 mile south of the intersection.
- A pipeline crosses US 31 0.05 mile south of the intersection.
- A floodplain is located 0.30 mile southwest of the intersection.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental justice populations (minority).
  - Limited English proficiency populations.
  - Limited internet access populations.

### 4.9.3 SCREENING OF ALTERNATIVES

#### 4.9.3.1 Step 1 – Decision Tree

Complementary concepts and/or at-grade intersection concepts may address safety concerns at this intersection. An overpass was also considered as an appropriate alternative given that CR 500 S is one of the few east-west routes that are continuous across this portion of Miami County. Additionally, an overpass at this location was included in the Miami County Comprehensive Plan.

#### 4.9.3.2 Step 2 – Operational Analysis

Multiple at-grade intersection types will yield acceptable operations through the design year, apart from the existing condition of a two-way stop-controlled intersection.

#### 4.9.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-8**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Access Modifications – Limiting access at this location may be a means to improve operations and safety.

- Reduced Conflict Intersection – This alternative will improve safety, will maintain free flow conditions along US 31, and will maintain the current level of mobility. This alternative is expected to require little or no additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive alternative advancing to the conceptual design stage that maintains the current level of mobility.
- Overpass – This location has been identified by the County’s comprehensive plan as a preferred location for an overpass. CR 500 S is one of only a few east-west roadways that span Miami County; and therefore, it is logical to include an overpass at US 31.
- Interchange – This intersection meets signal warrants and justifies installation of a traffic signal. As such, this location also justifies an interchange.
- Complementary concepts:
  - Add/Lengthen Turn Lanes – The existing turn lanes are short and appear to be sub-standard in length.
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for a Reduced Conflict Intersection to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary concepts were eliminated from further consideration:

- Signalization – Turning movement volumes at this intersection do warrant signalization; however, signaling the intersection would add delay to US 31 and may cause rear-end crashes.
- Green-T Intersection – This concept is not applicable to a four-legged intersection.
- Quadrant Roadway – This concept adds a traffic signal to US 31, resulting in the same drawbacks as the signalization concept.

Table 4-8: US 31 & CR 500 S - Qualitative Comparison of Concepts

US 31 & CR 500S (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	Yes	Low	Yes	Restrict to right-in/right-out. Evaluate providing access at adjacent intersection(s) to address access concerns for communities with EJ concerns.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Neutral	Maintains	Low	Low	Low	No	No	Yes	Provides for all movements and improves safety by reducing conflict points.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes meet signal warrants. Signal adds delay to US 31.
Overpass	Yes	Yes	No	Worsens	Improves	Medium	Low	Medium	Yes	Medium	Yes	Improves access across US 31 on a roadway that spans the county. Communities with EJ concerns on both sides of US 31. Evaluate opportunity to avoid/minimize impacts during concept development.
Interchange	Yes	Yes	Yes	Improves	Improves	Medium	Low	High	Yes	High	Yes	Traffic volumes make interchange a potentially feasible alternative.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	Yes	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	No	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	Existing turn lanes are substandard in length.
Acceleration / Deceleration Lanes	Yes	Yes	NO	Improves	Improves	Low	Low	Low	Yes	Low	Yes	No acceleration/ deceleration lanes are present along US 31. Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	Yes	Medium	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection concept.
Warning System	Yes	No	NO	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.



#### 4.9.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to the conceptual design stage are described below. Complementary concepts have been incorporated into these concepts where applicable.

##### Access Modifications

The implementation of a right-in/right-out alternative allows for free flow conditions along US 31 but restricts access across it, requiring drivers to make a right turn from CR 500 S. A right-in/right-out design includes right-of-way impacts to all quadrants due to grading, but there are no changes to property access. This design minimizes widening and reuses as much of the original construction footprint as possible. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### Reduced Conflict Intersection

Converting the intersection of US 31 and CR 500 S into a Reduced Conflict Intersection allows for free flow conditions along US 31 with the elimination of cross street through traffic. Drivers from CR 500 S are required to make a right turn at the intersection of US 31 and travel downstream to make a U-turn and continue through the intersection or make another right to continue along CR 500 S. Left turns from US 31 are possible at the intersection. Access to the mobile home community is maintained by connecting it to the median opening south of the main intersection. Moving the southern U-turn movement farther south provides access to existing properties. The improvement limits for this alternative are shown in **Figure 4-15**. Impacts are expected to be limited to the existing US 31 right-of-way. Grading in the median and outside shoulders is anticipated, as well as the addition of pavement. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### Overpass – CR 500 S Over US 31

In this concept, the intersection of US 31 and CR 500 S is grade separated with CR 500 going over US 31 with access between the two roadways eliminated. This alternative provides free flow conditions for both roads. Raising the grade of CR 500 S eliminates access to CR 500 S for multiple residences located along this roadway. Maintaining access to the mobile home community in the southwest quadrant requires construction of an access road along the west side of US 31. Extensive right-of-way is required for the access road and for grading along CR 500 S. This alternative will not be advanced for further evaluation in the Level 3 screening process due to these impacts.

##### Overpass – US 31 Over CR 500 S

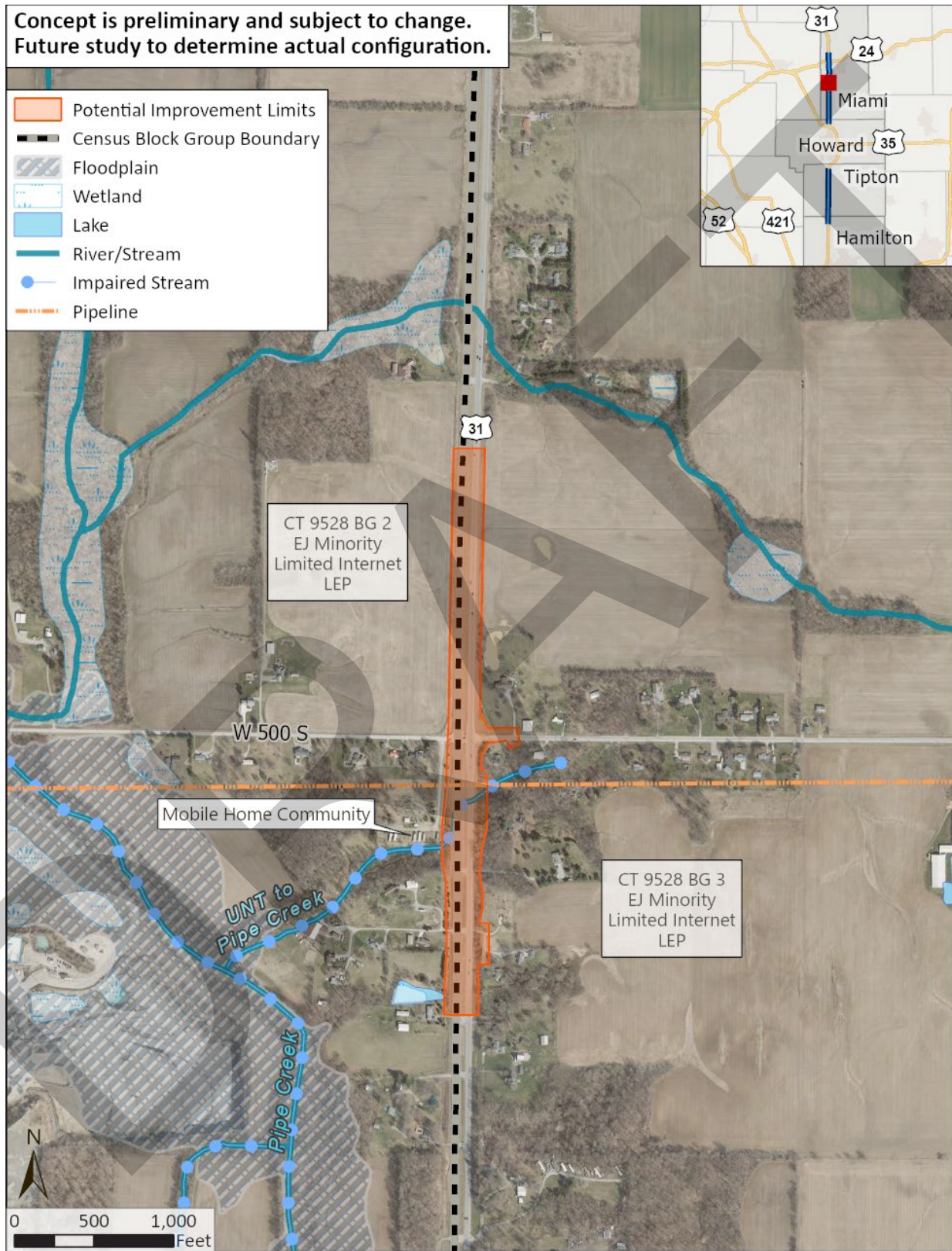
Grade separating US 31 over CR 500 S mitigates impacts to residences along CR 500 S. Raising the grade of US 31 impacts the two median openings to the south of CR 500 S, although access to the neighboring parcels could likely be maintained. This concept, with improvement limits depicted in **Figure 4-16**, may require retaining walls to keep earthwork within the existing US 31 right-of-way. This alternative will be advanced for further evaluation in the Level 3 screening process as it has less impacts on residences than the alternative that carries CR 500 S over US 31.

#### 4.9.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Overpass
- Interchange
- Add/Lengthen Turn Lanes – Incorporate in all at-grade alternatives.
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting – Provide with the Reduced Conflict Intersection and Interchange alternatives.
- Warning System – May improve safety by alerting motorists of approaching and/or crossing vehicles.

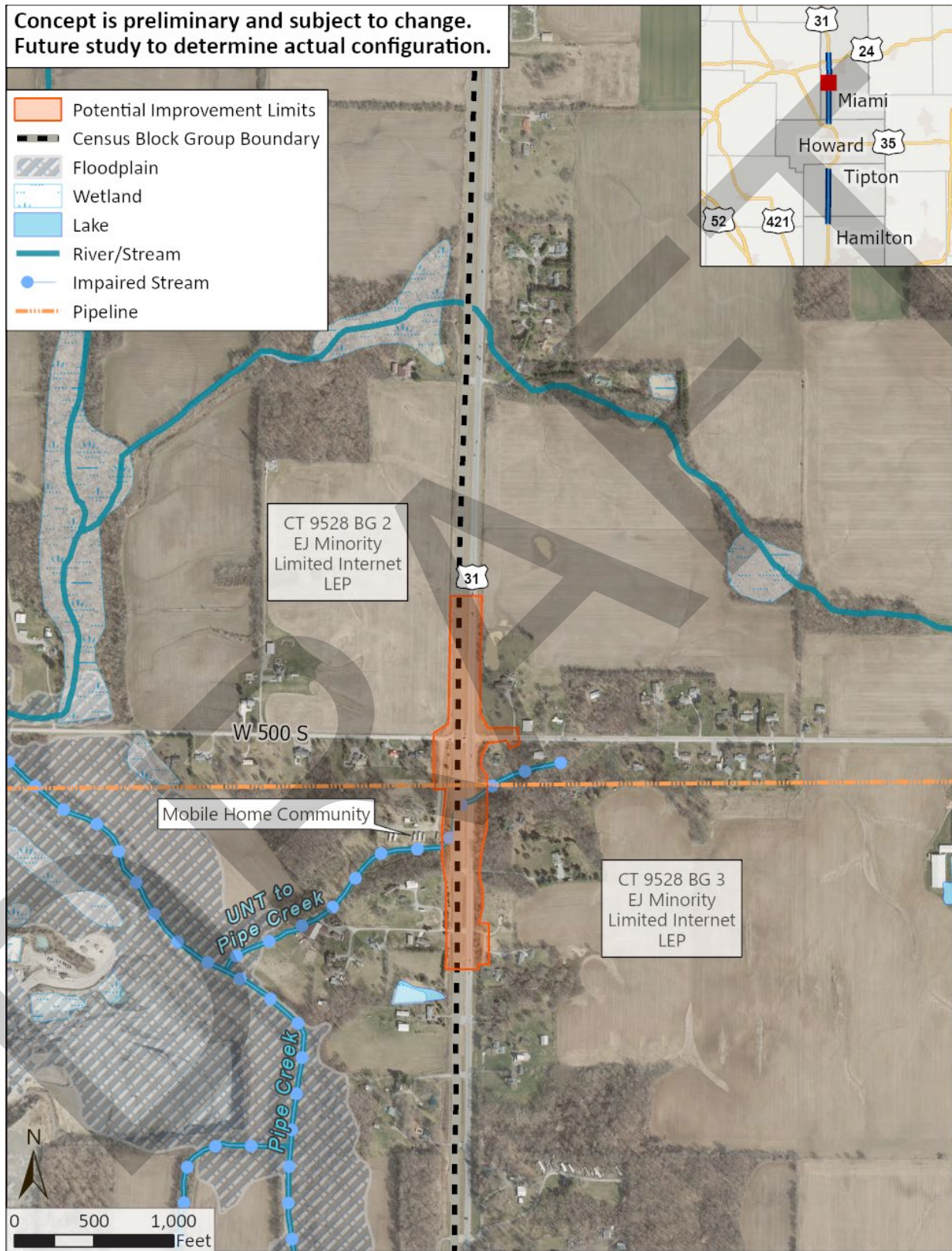
Figure 4-15: US 31 & CR 500 S - Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-16: US 31 & CR 500 S - Overpass Alternative, US 31 over CR 500 S



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

## 4.10 US 31 & SR 218 N IN MIAMI COUNTY

### 4.10.1 OVERVIEW

The signalized intersection of US 31 and SR 218 N operates acceptably in the existing conditions and is expected to operate acceptably through the design year. The crash history at this intersection indicates:

- 69% of crashes were rear-end type crashes.
- 9% of crashes were right-angle crashes.
- 16% of crashes resulted in fatalities or incapacitating injuries.

The 2015 Miami County Comprehensive Plan calls for an interchange at this location and identifies this interchange as a “critical need” for the county. “Critical need” intersections are defined as intersections that “require attention due to safety and connectivity significance and overall corridor improvement.” This intersection is also the primary access point for Grissom Air Force Base. A previous INDOT study of the corridor had recommended a reduced conflict intersection, but other factors elevated consideration of an interchange at this location. Public comments received to date about this intersection focus on elimination of the traffic signal. Other comments are summarized as follows:

- Provide canoe access to the creek.
- Northbound frequently runs red lights.
- Consider an interchange here.
- Reconfigure access.
- Vehicular speeds along US 31 typically exceed the speed limit.

Additionally, school districts and emergency service providers in the study area have identified this intersection as an important access point that for both school buses and first responders.

### 4.10.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Two mobile home communities are near the intersection. Cedar Creek Mobile Home Park is 0.25 mile north of the intersection along the east side of US 31, and Brookside Estates Mobile Home Park is 0.5 mile west of the intersection along the south side of SR 218 N.
- Pipe Creek crosses US 31 0.10 mile north of the intersection. Additionally, a UNT to Pipe Creek runs parallel to US 31 along the west side from approximately 0.17 mile south of SR 218 N to approximately 0.12 mile north of SR 218 N.
- Five mapped NWI wetlands are near the intersection.
- There is a sensitive environmental area located near the intersection that will require further investigation.
- Maiben landfill is south of the intersection along the east side of US 31. This landfill is on the northeast corner of the Nickel Plate Trail, previously Conrail Railroad, and US 31.
- A Section 4(f) property, Nickel Plate Trail Managed Land, is located 0.47 mile south of the intersection, east of US 31.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental justice populations (minority) are present in the northeast and northwest quadrants of the intersection.
  - Underserved populations are present at the intersection:
    - Limited English proficiency populations.
    - Limited internet access populations.
    - Limited vehicle access population is located on the southside of the intersection.
  - Justice40 Disadvantaged populations are north of the intersection along both sides of US 31.

### 4.10.3 SCREENING OF ALTERNATIVES

#### 4.10.3.1 Step 1 – Decision Tree

The initial screening of this location indicated that an interchange may be applicable given the crash history, the significance of this intersection to Grissom Airforce Base, and input from both the public and stakeholders. An overpass at this location is not logical, given the need to provide access between US 31 and SR 218 N.

#### 4.10.3.2 Step 2 – Operational Analysis

The preliminary capacity analysis results indicated that a variety of intersection types could produce acceptable operating conditions in the design year.

#### 4.10.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-9**. The following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Reduced Conflict Intersection – This concept replaces the traffic signal with a U-turn movement to facilitate the eastbound to northbound movement. This concept will address the crash history, will provide for free flow conditions along US 31, and maintains mobility to/from the west. This concept is expected to require little or no additional right-of-way and have low impacts to underserved populations and to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage.
  - Green-T Intersection – This concept improves operations along northbound US 31, addresses crash history, and will improve mobility to/from the west. This concept is expected to have low impacts to underserved populations and to both natural and cultural resources.
  - Interchange – This concept improves operations along US 31 by eliminating a traffic signal, addresses the crash history, and can improve east-west mobility and eliminate an access point if CR 600 S is realigned to connect with the interchange. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. The interchange may also have medium to high impacts on natural resources, cultural resources, and underserved populations. A Green-T interchange is expected to have fewer impacts and a lower cost than a traditional diamond interchange.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Signalized intersection improvements – Implementing an innovative intersection type, such as the Green-T intersection is expected to maintain operations and improve safety.
  - Roadway lighting – Required per INDOT guidelines for all advancing primary concepts listed above to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to Reduced Conflict Intersection and Green-T concepts being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.
  - Freight Priority System – Applicable to all primary concepts that retain a traffic signal.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Restricting access at this intersection will have adverse impacts on the community and Grissom Air Force Base.
- Quadrant Roadway – The quadrant roadway concept is not well suited for T-intersections.
- Overpass – This location has been identified as a priority access point and severing access here is not recommended.



Table 4-9: US 31 & SR 218 N - Qualitative Comparison of Concepts

US 31 & SR 218 N (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	N/A	Yes	Worsens	Improves	Low	Low	Low	Yes	Low	No	Important access point for Grissom AFB & City of Walton.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	Yes	Anticipate signalization required due to traffic volumes.
Signalization	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	Yes	Existing signalized intersection. Carry forward as No-Build Alternative.
Overpass	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A	No	N/A for a T-intersection.
Interchange	Yes	N/A	No	Improves	Improves	High	Medium	Medium	Yes	High	Yes	Truck route, major access point. Previously NRHP eligible building demolished. May impact access to mobile home community. Evaluate opportunities to avoid/minimize impacts during concept development. Green-T interchange may have fewer impacts and lower cost than four-legged interchange.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	N/A	No	Maintains	Maintains	Medium	Low	Low	Yes	High	No	Additional capacity along US 31 is not needed. Requires widening of bridge over Pipe Creek.
Signal Timing Updates	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Signal timing updates will not address documented history of rear-end and right-angle crashes.
Add/Lengthen Turn Lanes	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Turn lanes are present along US 31.
Acceleration / Deceleration Lanes	Yes	N/A	No	Improves	Maintains	Low	Low	Low	Yes	Low	Yes	Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	Yes	N/A	No	Improves	Improves	Low	Low	Low	No	Low	Yes	Addresses crash history by channelizing vehicles turning left from SR 218 N. Improves operations by allowing free flow for NB US 31.
Quadrant Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A for a T-intersection.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection, Green-T, and interchange concepts per INDOT Guidelines.
Warning System	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists to a potential stop condition at the traffic signal.
Freight Priority System	No	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	Yes	May reduce delays for trucks by extending green time. Does not address documented history of rear-end and right-angle crashes. Consider pairing with signalized concepts.

#### 4.10.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to Step 4 of the screening process are described below.

##### **Reduced Conflict Intersection**

The reduced conflict intersection alternative at this location provides for northbound left turns to occur at the intersection, with eastbound left turns using the U-turn movement provided south of the intersection. The improvement limits of this alternative are depicted in **Figure 4-17**. This alternative is expected to be constructed within the existing right-of-way and requires no changes to existing driveways.

##### **Green-T Intersection**

This alternative provides for free-flowing traffic on northbound US 31 by barrier separating the northbound lanes and the left turn movement from SR 218 N. A traffic signal is retained to control the southbound lanes of US 31 and movements to/from SR 218 N. Acceleration lanes are provided along US 31 northbound and southbound to allow traffic from SR 218 N to merge with US 31 traffic at the posted speed limit of US 31.

##### **Green-T Interchange**

The southbound lanes of US 31 could be grade separated over SR 218 N to allow for free-flowing traffic along US 31 southbound. Entrance and exit ramps are provided to connect the southbound lanes of US 31 to SR 218 N. The northbound lanes of US 31 remain at-grade and are physically separated from traffic entering/exiting to SR 218 N. The traffic control method for the crossing movements of northbound traffic exiting to SR 218 N and northbound traffic entering from SR 218 N will be determined in the Level 3 screening.

The grade separated alternative raises the profile of southbound US 31 and requires replacement of the southbound US 31 bridge over Pipe Creek. Additionally, this alternative landlocks the parcel located along the east side of the intersection as no future connection to this parcel can be constructed without reconstructing the entire intersection. Access to the parcel in the southwest quadrant will need to be moved west of the proposed turn lanes. Access to the parcel in the northwest quadrant will be maintained, but the eastern driveway will be eliminated. Right-of-way acquisition is required along SR 218 N for the turn lanes to/from US 31. The improvement limits of this alternative are depicted in **Figure 4-18**. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange with US 31 over SR 218**

This alternative creates a four-legged interchange by aligning SR 218 N and CR 600 S, with US 31 elevated over the crossroads. The connection of SR 218 N to CR 600 S provides a new opportunity to cross the US 31 corridor. This alternative raises the profile of US 31 such that US 31 crosses over SR 218 and CR 600 S. The raised profile requires replacement of US 31 bridges over Pipe Creek. The realignment of CR 600 S to create the fourth leg of the interchange requires a new bridge over Pipe Creek.

The interchange is located 500 feet south of the existing intersection to avoid impacts to both Pipe Creek Mill Road and the Cedar Creek Mobile Home Park. The driveway connection of the Cedar Creek Mobile Home Park to US 31 must be removed due to it falling within the acceleration lane of the proposed northbound entrance ramp. Access to US 31 for this community is provided at the proposed interchange, with Pipe Creek Mill Road and CR 295 W serving as the route linking the interchange to the community. Access to the parcel in the southwest quadrant will need to be moved west of the interchange. Access to the parcel in the northwest quadrant is maintained, but the eastern driveway is eliminated. Right-of-way acquisition is required in all four quadrants of the intersection, along the realigned section of SR 218 N, and along the new alignment linking the interchange to CR 600 S. No conceptual design is provided for this concept. This alternative will not be carried forward for further consideration because of the magnitude of impacts associated with raising US 31 over SR 218 N.

##### **Interchange with SR 218 N over US 31, connect to CR 600 S**

This interchange alternative keeps US 31 at-grade and carries SR 218 N over US 31 to eliminate the need to replace the US 31 bridges over Pipe Creek and avoid impacts to the Cedar Creek Mobile Home community. The existing

access point to this community is maintained in this concept. The overpass in this alternative is also located south of the existing intersection to minimize cost and impacts associated with CR 600 S crossing Pipe Creek. Access to the parcel in the southwest quadrant is maintained, but the eastern driveway will be eliminated. Right-of-way acquisition is required in all four quadrants of the intersection, along the realigned section of SR 218 N, and along the new alignment linking the interchange to CR 600 S. The limits of this alternative are depicted in **Figure 4-19**. This alternative will be advanced for further evaluation in the Level 3 screening process due to its ability to address existing deficiencies, provide for additional east-west mobility, and provide free flow conditions along US 31.

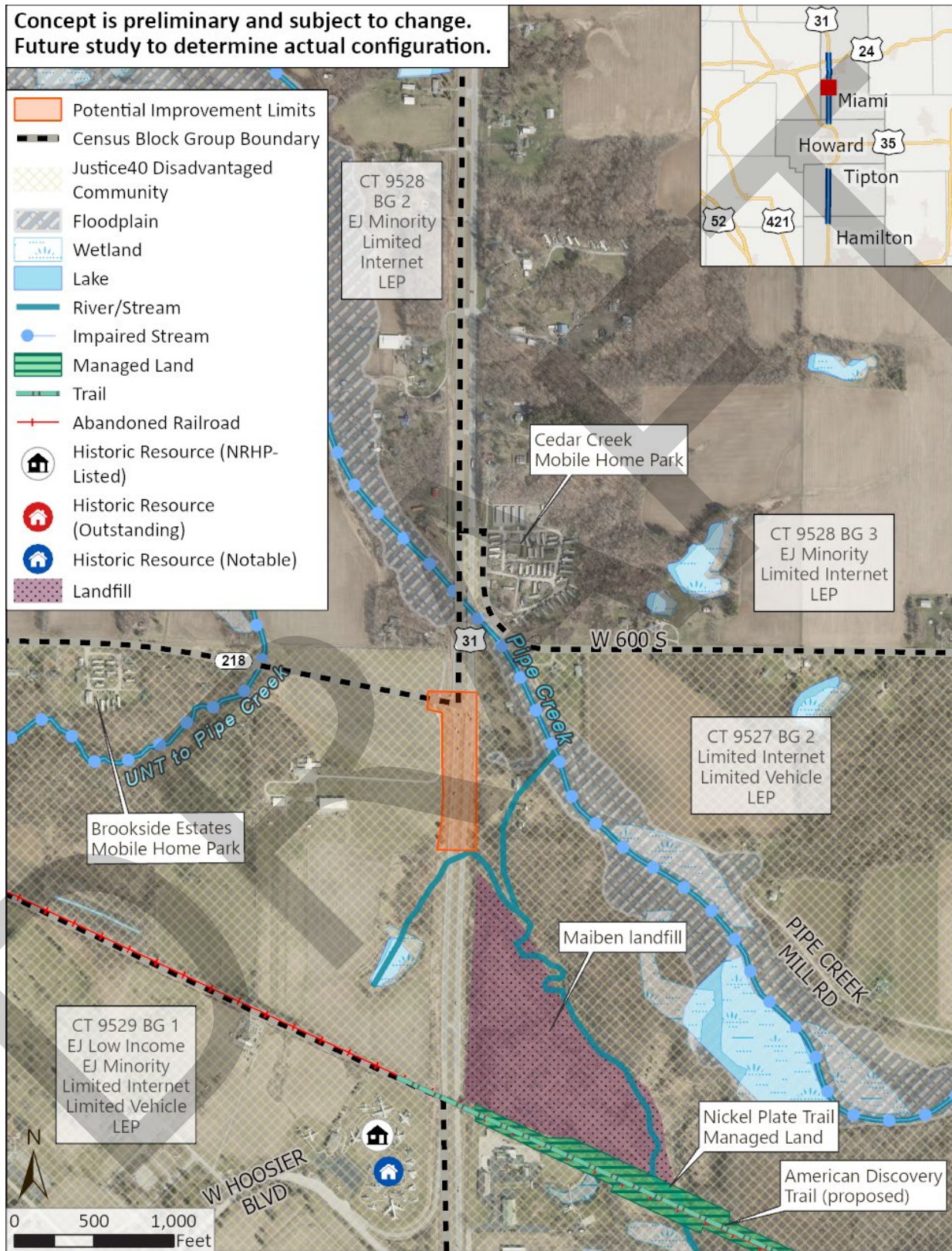
#### 4.10.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Green-T Intersection
- Interchange
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting – Provide with the Reduced Conflict Intersection and Green-T intersection and Interchange alternatives.
- Warning System - An intersection warning system may provide an immediate safety benefit to address right angle crashes, rear end crashes and anecdotal red light running. This alternative is recommended for further consideration outside of this PEL study as a potential short-term improvement.
- Freight Priority System - Consider with Green-T intersection alternative.



Figure 4-17: US 31 & SR 218 N - Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-18: US 31 & SR 218 N - Green-T Interchange Alternative

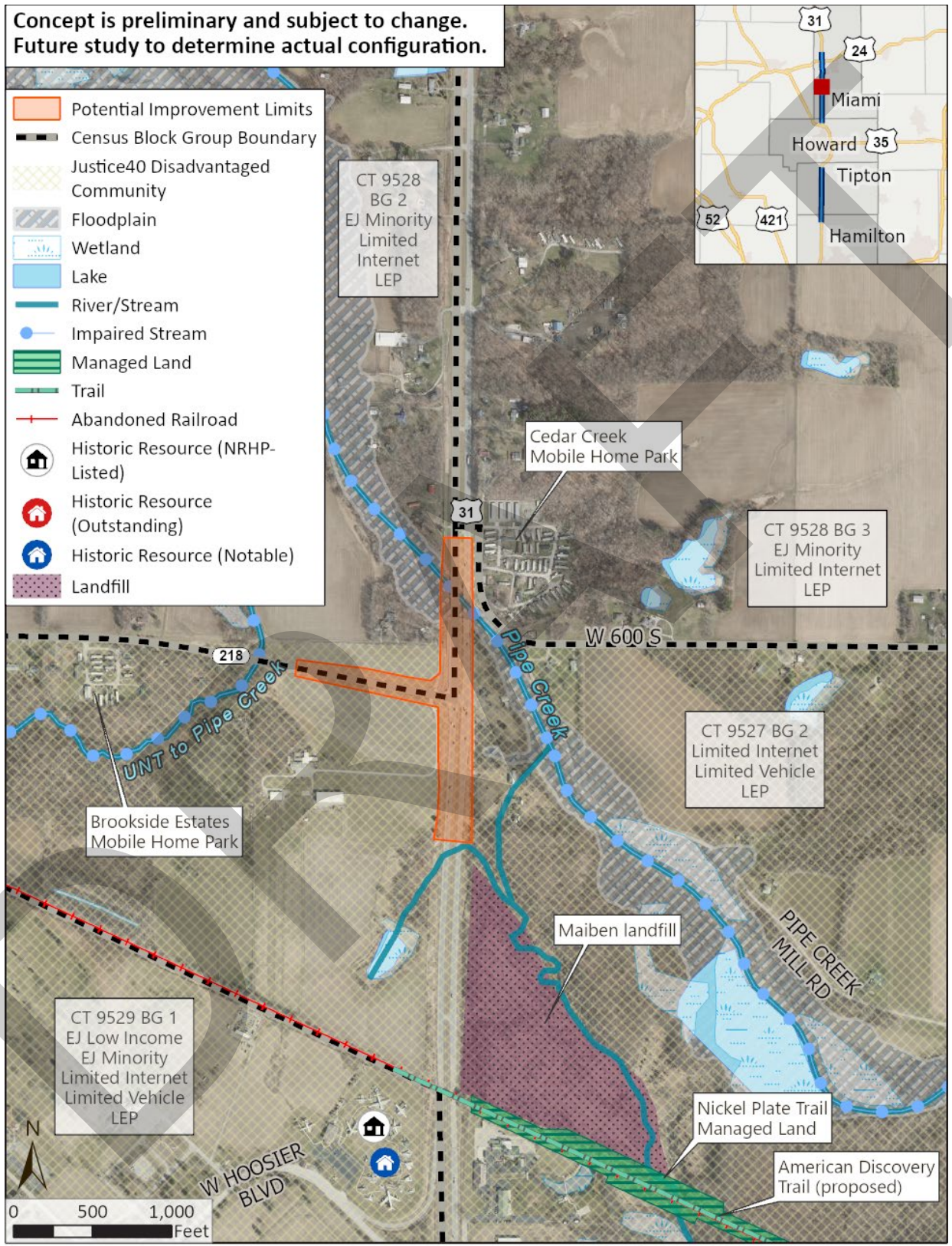
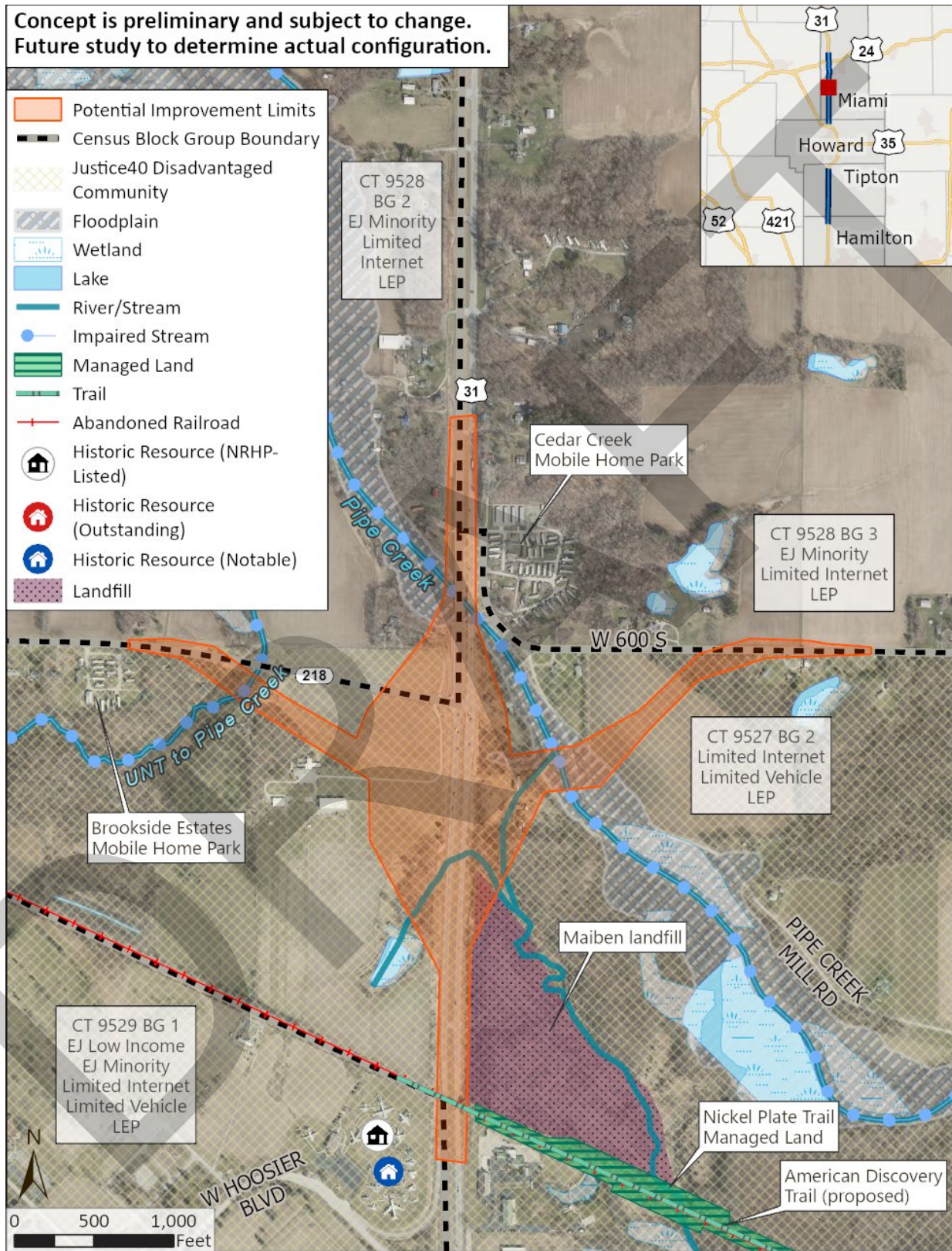




Figure 4-19: US 31 & SR 218 N - Interchange Alternative, SR 218 N over US 31



## 4.11 US 31 & SR 218 S IN MIAMI COUNTY

### 4.11.1 OVERVIEW

This two-way stop-controlled intersection is expected to operate acceptably in the design year in its current configuration. The crash history at this intersection indicates:

- 40% of crashes were right-angle type crashes.
- 14% of crashes were rear-end crashes.
- 26% of crashes resulted in fatalities or incapacitating injuries.

A previous INDOT Study completed in 2020 recommended a Reduced Conflict Intersection at this location to address safety and operational issues.

The 2015 Miami County Comprehensive Plan indicates closure of this intersection with access to the area provided via an interchange at US 31 and CR 800 S. Public comments received to date for this intersection have been focused on safety concerns and east/west mobility across US 31.

### 4.11.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Grissom Air Force Base airport is located directly adjacent to the intersection west of US 31.
- Marathon Gas Station is located in the southeast quadrant of the intersection.
- A UNT to Pipe Creek crosses SR 218 S approximately 0.05 mile east of the intersection.
- A mapped NWI wetland is located within the southeast quadrant of the intersection.
- Springdale Cemetery is located 0.26 mile east of US 31 along the north and south sides of SR 218 S.
- Hazardous material concerns are near the intersection, including:
  - A LUST site and an institutional control site are in the southeast corner of the intersection.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental Justice populations (minority and low-income) are present along the west side of US 31 at the intersection.
  - The intersection is within Justice40 Disadvantaged populations.
  - The intersection is within limited English proficiency, limited internet access, and limited vehicle populations.

### 4.11.3 SCREENING OF ALTERNATIVES

#### 4.11.3.1 Step 1 – Decision Tree

The safety issues of this intersection can be addressed by implementing at-grade intersection concepts or an interchange. Restricting access at this location is also an option if access can be improved at adjacent study intersections. An overpass is not a reasonable alternative here as there is no west leg to the intersection.

#### 4.11.3.2 Step 2 – Operational Analysis

The preliminary capacity analysis results suggest multiple at-grade intersection types will yield acceptable operations through the design year.

#### 4.11.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-10**. From this Table, the following alternatives are to be advanced to Step 4.



- Primary concepts:
  - Access modifications – Restricting access to/from SR 218 S is a viable concept if access can be improved at the adjacent study intersections of US 31 and CR 800 S and/or US 31 and SR 218 N.
  - Reduced Conflict Intersection – This concept provides a U-turn movement to facilitate the westbound to southbound movement. This concept will address the crash history, maintain free flow conditions along US 31, and maintain mobility to/from the west. This concept is expected to require little or no additional right-of-way and have low impacts to underserved populations and to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage.
  - Green-T Intersection – This concept maintains free flow traffic along US 31 and improves safety at the intersection by providing an acceleration lane in the median of US 31 for the westbound to southbound movement. Grade separation cannot be provided here due to proximity of the airport runway. The concept is expected to have medium impacts to natural resources. No right-of-way acquisition is expected for this concept.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for Reduced Conflict Intersection and Green-T intersection concepts to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection and Green-T intersection concepts being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary and complementary concepts were eliminated from further consideration:

- Signalization – Traffic volumes at this intersection do not warrant signalization.
- Quadrant Roadway – The quadrant roadway concept is not well suited for T-intersections.
- Overpass – There is no existing west leg to the intersection to justify this improvement.
- Interchange – Grade separation at this intersection is not feasible due to its proximity to the airport runway.

Table 4-10: US 31 & SR 218 - Qualitative Comparison of Concepts

US 31 & SR 218 S	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	No	No	Yes	Consider limiting access if coupled with improvements at CR 800 S and/or SR 218 N.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	No	Yes	Anticipate traffic volumes will not require signalization. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	No	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A for a T-intersection.
Interchange	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No interchange feasible given proximity to Grissom AFB runway.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	No	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	No	No	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Maintains	Low	Low	Low	No	No	No	Quantity and length of turn lanes is sufficient.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	No	Yes	Existing northbound acceleration lane.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	Yes	Yes	No	Improves	Improves	Medium	Low	Low	No	No	Yes	Addresses crash history by channelizing vehicles turning left from SR 218 S. Improves operations by allowing free flow for SB US 31.
Quadrant Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A for a T-intersection.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	No	Yes	Provide lighting for Reduced Conflict Intersection and Green-T concepts per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	No	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No	N/A. Only applicable at signalized intersections.

#### 4.11.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to Step 4 of the screening process are described below.

##### **Access Modifications**

Restricting access at this intersection maintains free flow conditions along US 31 and addresses the crash history. Access restrictions could be in the form of eliminating left turning movements or eliminating this intersection entirely. This alternative is considered to be feasible if access at the adjacent study intersections is improved. No right-of-way acquisition is needed for this concept, and no environmental impacts are expected.

##### **Reduced Conflict Intersection**

Converting the intersection into a Reduced Conflict Intersection maintains free flow conditions along US 31 and addresses the crash history while maintaining mobility in all directions. Only one U-turn movement is provided, which is to facilitate the westbound to southbound movement. Access to the Marathon Gas Station in the southeast quadrant is retained with this concept. The approximate improvement limits of this alternative are shown in **Figure 4-20**. This alternative does not require additional right-of-way. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Green-T Intersection**

The Green-T intersection alternative allows for northbound and southbound US 31 to be free flowing with acceleration lanes provided along US 31 for both westbound to northbound and westbound to southbound movements. The approximate limits of this alternative are shown in **Figure 4-21**. Access control to/from southbound US 31 will be evaluated in the Level 3 screening. Additional right-of-way is needed along SR 218 S for turn lanes to/from northbound US 31. These turn lanes are expected to impact the Marathon Gas Station in the southeast quadrant. This alternative will be advanced for further evaluation in the Level 3 screening process.

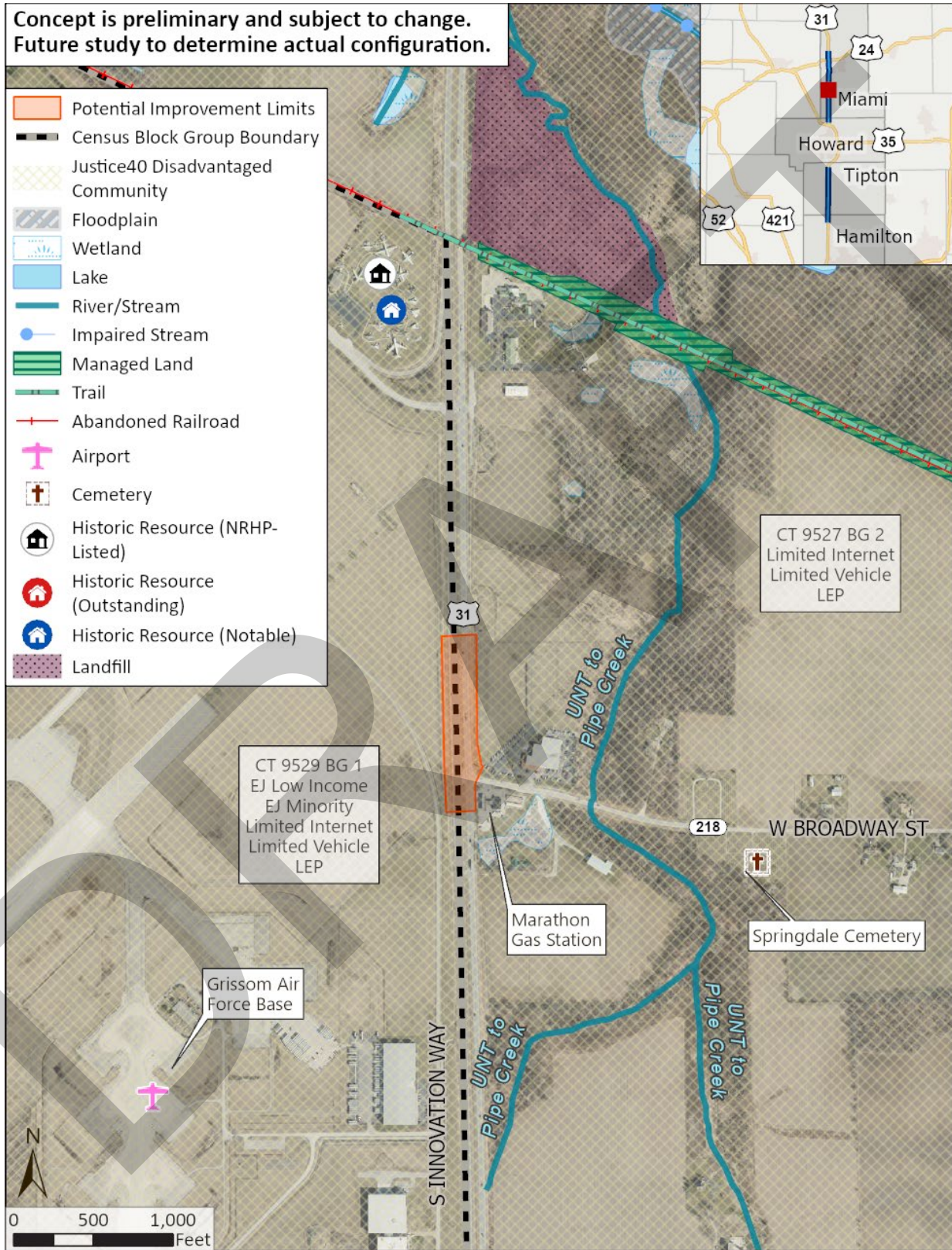
#### 4.11.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Green-T Intersection
- Acceleration / Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide with the Reduced Conflict Intersection and Green-T intersection alternatives.
- Warning System - Consider with the Reduced Conflict Intersection and Green-T intersection alternatives. The intersection warning system may provide an immediate safety benefit to reduce the frequency of right-angle crashes at this location. This alternative is recommended for further consideration outside of this PEL study as a potential short-term improvement.



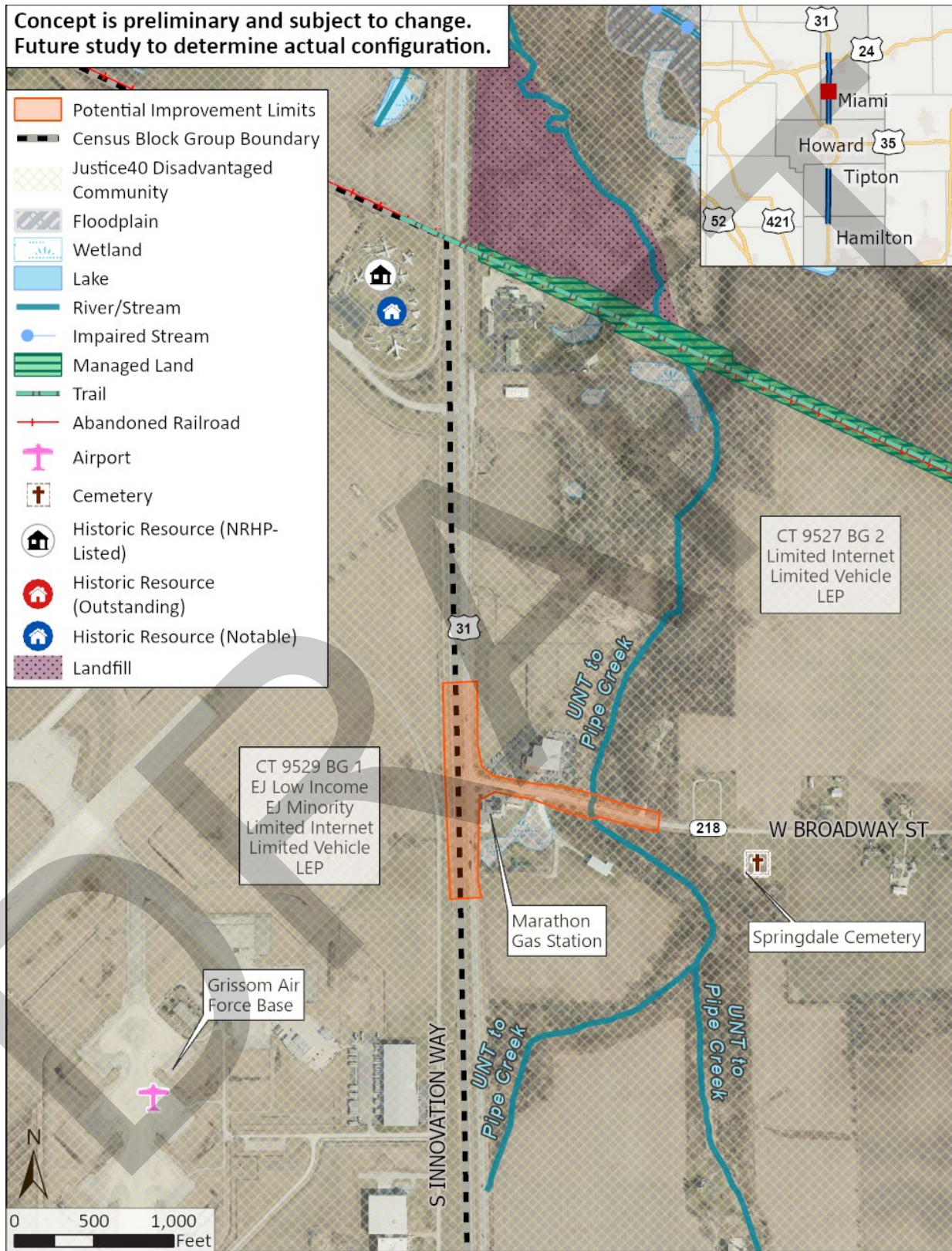
Figure 4-20: US 31 & SR 218 S - Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-21: US 31 & SR 218 S - Green-T Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

## 4.12 US 31 & CR 800 S IN MIAMI COUNTY

### 4.12.1 OVERVIEW

CR 800 S is the primary access point to/from US 31 for the Maconaquah Schools and for the Grissom Aeroplex. The two-way stop-controlled intersection operates acceptably in 2022 but is expected to have unacceptable (LOS F) conditions for the westbound approach in the design year. The crash history at this intersection indicates:

- 26% of crashes were right-angle type crashes.
- 26% of crashes were rear-end type crashes.
- 16% of crashes were sideswipe crashes between vehicles traveling in the same direction.

Numerous school buses traverse the intersection on a typical school day. While no documented crashes between 2017 and 2021 involved school buses, the public has raised concerns regarding the safety of buses entering and exiting the US 31 corridor at this two-way stop-controlled intersection. Additionally, the 2015 Miami County Comprehensive Plan calls for an interchange at this location, which is intended to improve safety and accessibility to the Maconaquah Schools and improve access to the Grissom Aeroplex.

This intersection has received the most public comments to date of all study intersections located north of Kokomo. These comments are summarized as follows:

- This intersection has a high potential for economic development.
- This is the primary access point to/from Maconaquah Schools.
- Substantial volumes of school buses and teenage drivers use this intersection before and after school.

### 4.12.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Miami County Correctional Facility is located to the southwest of the intersection, Los Primos Bar and Grill is located in the southeast corner of the intersection, and Bunker Hill Water Tower is located in the northwest corner of the intersection.
- Two UNTs to Pipe Creek are near the intersection. The first UNT to Pipe Creek is approximately 0.32 mile north of the intersection on the east side of US 31. The second UNT to Pipe Creek crosses CR 800 approximately 0.35 mile east of the intersection.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental Justice populations (minority and low income).
  - Justice40 Disadvantaged populations.
  - Limited internet access populations.
  - Limited vehicle access populations.
  - Limited English proficiency populations.

### 4.12.3 SCREENING OF ALTERNATIVES

#### 4.12.3.1 Step 1 – Decision Tree

At-grade intersection concepts are potential solutions at this location. An interchange is also a potential solution here given an interchange is included in the County’s comprehensive plan. Restricting access at this location, including the overpass concept, is not recommended as this is the primary access point to the Maconaquah Schools and the Grissom Aeroplex.

#### 4.12.3.2 Step 2 – Operational Analysis

Preliminary capacity analysis of at-grade intersection options again indicated that design year traffic volumes can be accommodated with various intersection types, except two-way stop controlled.

#### 4.12.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-11**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Reduced Conflict Intersection – This concept provides U-turn movements to facilitate east-west movements and left turn movements from the side street. This concept is expected to improve operations and safety while maintaining free flow conditions along US 31. This concept is expected to require little or no additional right-of-way and have low impacts to both the community and the environment. This is the least expensive concept advancing to the conceptual design stage.
  - Interchange – This concept improves safety and operations, improve east-west mobility, and is expected to improve traffic flow along US 31. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. The interchange is expected to have medium impacts on the natural resources.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all concepts for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for all Reduced Conflict Intersections to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection and Green-T concepts being advanced.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Restricting access at this intersection will have adverse impacts on the community, Grissom Aeroplex, and Maconaquah Schools.
- Signalization – Adding a traffic signal to US 31 will introduce delay and may result in additional crashes. Traffic volumes at this intersection do not meet signal warrants.
- Quadrant Roadway – This concept adds a traffic signal to US 31, requires right-of-way and is not justified by east-west traffic volumes.
- Overpass – This location has been identified as an important access point and severing access here is not recommended.



Table 4-11: US 31 & CR 800 S - Qualitative Comparison of Concepts

US 31 & CR 800 S (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	Yes	Low	No	Important access point for Maconaquah schools in the community.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provides for all movements and improves safety by reducing conflict points. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	Yes	Yes	No	Worsens	Improves	Low	Low	Medium	No	Medium	No	Important access point for schools in the community. Severing access would be detrimental to the community.
Interchange	Yes	Yes	No	Improves	Improves	Medium	Low	Medium	Yes	High	Yes	Improves safety and access to Maconaquah schools and Grissom Aeroplex.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	No	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Turn lanes are present along US 31.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	Existing northbound acceleration lane.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	No	Medium	No	Retains a traffic signal on US 31. East-west volumes don't justify this concept. Requires ROW acquisition.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection and interchange concepts per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.



#### 4.12.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to the conceptual design stage are described below. Complementary concepts have been incorporated into these concepts where applicable.

##### **Reduced Conflict Intersection**

A Reduced Conflict Intersection at this location may require minor right-of-way acquisition in the northwest and southeast quadrants to provide loons for the U-turn movements. No additional impacts are expected from this alternative as much of the construction occurs within the existing right-of-way, and the commercial property in the southeast quadrant will not have its access restricted. Limits of this alternative are depicted in **Figure 4-22**. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange**

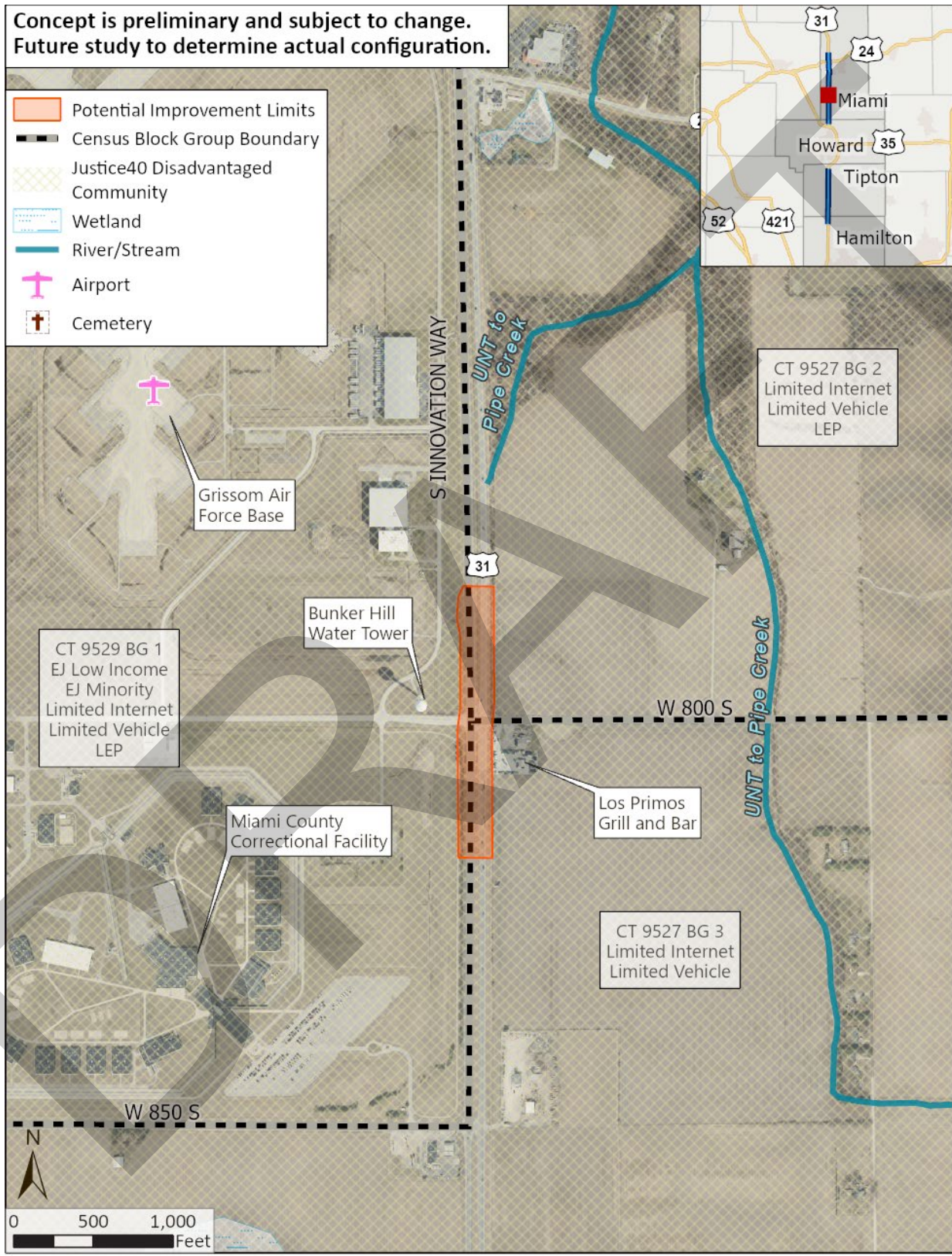
This interchange alternative carries US 31 over CR 800 S. Keeping CR 800 S at grade retains the existing access to the Grissom Aeroplex, which is severed if US 31 is kept at grade. Shifting the alignment of US 31 to the east avoids impacts with the water tower in the northwest quadrant of the roadway and allows the overpass to be built off-alignment. This alternative acquires the Los Primos Grill and Bar located in the southeast quadrant of the intersection. The limits of this alternative are depicted in **Figure 4-23**. This alternative will be advanced for further evaluation in the Level 3 screening process.

#### 4.12.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Interchange
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide with Reduced Conflict Intersection and Interchange alternatives.
- Warning System - May improve safety by alerting motorists of approaching and/or crossing vehicles.

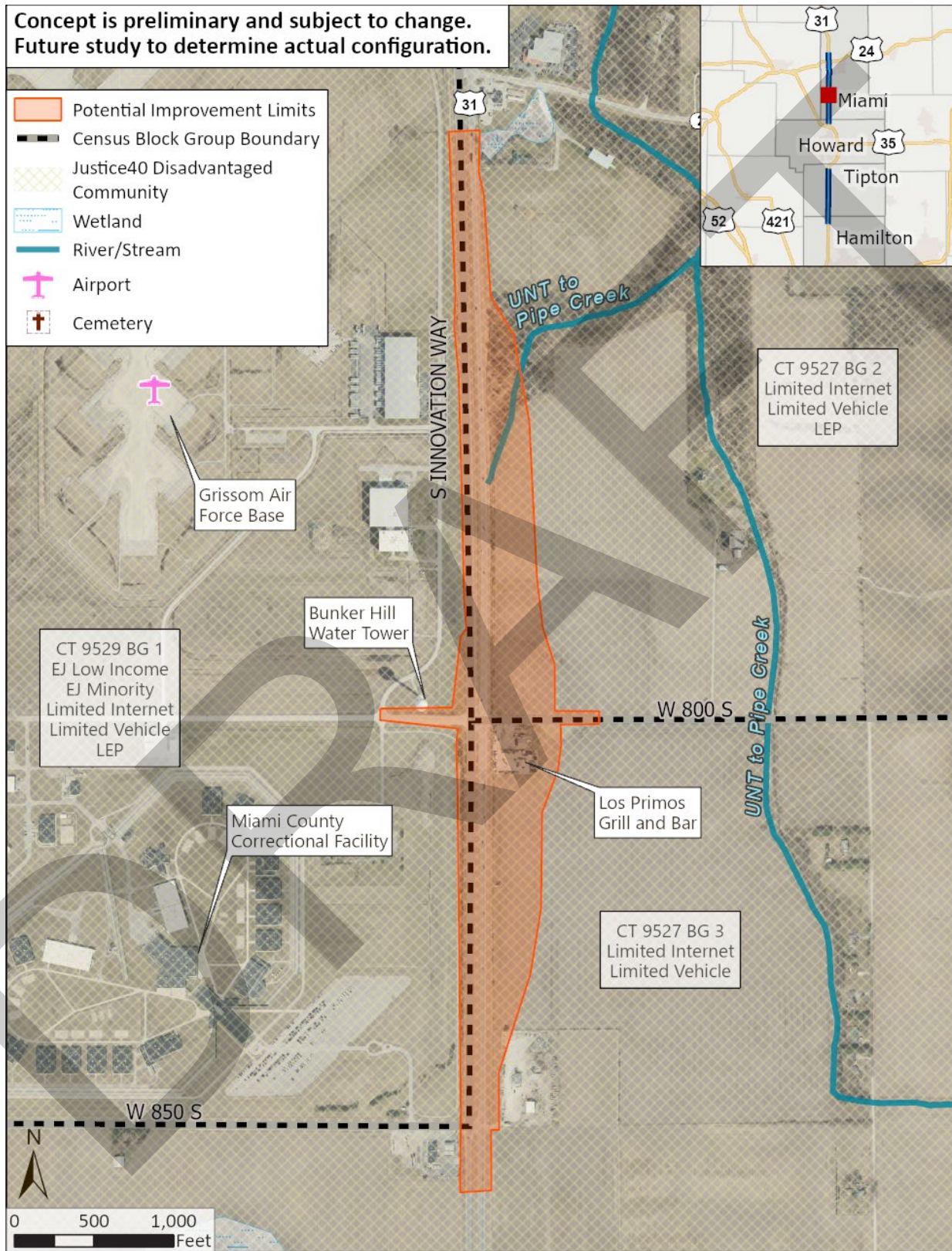
Figure 4-22: US 31 & CR 800 S - Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-23: US 31 & CR 800 S - Interchange Alternative



## 4.13 US 31 & SR 18 IN MIAMI COUNTY

### 4.13.1 OVERVIEW

The signalized intersection of US 31 and SR 18 is expected to operate acceptably in the design year of this study. The crash history at this intersection indicates:

- 57% were rear-end type crashes.
- 14% were right-angle crashes.

The 2015 Miami County Comprehensive Plan calls for an interchange at this location and identifies this interchange as a “critical need” for the county. “Critical need” intersections are defined as intersections that “require attention due to safety and connectivity significance and overall corridor improvement.” A previous INDOT study of this intersection concluded an overpass on a new alignment coupled with right-in/right-out access at the intersection was the ideal improvement for this location.

Public comments received to date for this location are summarized as follows:

- This location should be an interchange if US 31 becomes a freeway.
- The traffic signal should be eliminated.
- Safety is a concern at this intersection.
- The intersection could benefit from left turn lanes on SR 18.
- The traffic signal creates gaps in traffic that allow vehicles to safely enter/exit US 31.
- Left turn phasing/signals are preferred over an interchange.
- SR 18 carries substantial amounts of livestock trucks across US 31.

### 4.13.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Multiple businesses are located at the intersection; Frito-Lay Kokomo, J&J Electric of Indiana Inc., McClure Oil, and Caldwell Monument Company.
- A mobile home community, Maple Lawn Village Manufactured Homes, is near the intersection. The access to Maple Lawn Village is located 0.50 mile south of the intersection along the west side of US 31.
- Russell Ditch crosses US 31 approximately 0.14 mile north of the intersection.
- A property in the southeast corner of the intersection is rated as “Outstanding” and is eligible for the NRHP.
- There is a sensitive environmental area located near the intersection that will require further investigation.
- A pipeline crosses US 31 approximately 0.14 mile south of the intersection. Coordination with Kokomo Gas & Fuel Co. will need to occur.
- Hazardous material concerns are near the intersection, including:
  - A LUST site is located in the northeast corner of the intersection.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental justice (low income) populations.
  - Justice40 Disadvantaged populations.
  - Limited internet access populations.
  - Limited English populations.
  - Limited vehicle populations.



### 4.13.3 SCREENING OF ALTERNATIVES

#### 4.13.3.1 Step 1 – Decision Tree

Concepts to be evaluated at this intersection include at-grade intersections, an interchange, and various complementary concepts.

#### 4.13.3.2 Step 2 – Operational Analysis

The preliminary capacity analysis results suggest multiple at-grade intersection types will yield acceptable operations through the design year, including signalization, which is the existing condition at this intersection.

#### 4.13.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-12**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Reduced Conflict Intersection – This concept replaces the traffic signal with U-turn movement along US 31 to facilitate east-west movements and left turn movements from SR 18. This concept will address the crash history, will provide for free flow conditions along US 31, and maintain east-west mobility. This concept is expected to require little or no additional right-of-way and have low impacts to underserved populations and to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage.
  - Quadrant Roadway – A quadrant roadway retains a traffic signal along US 31 and as such provides less safety benefit than the Reduced Conflict Intersection and interchange options. The quadrant roadway itself will require substantial right-of-way acquisition and may have impacts on cultural resources.
  - Interchange – This concept improves operations along US 31 by eliminating a traffic signal, addresses the crash history, and can improve east-west mobility. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. The interchange may also have impacts on cultural resources.
- Complementary concepts:
  - Add/Lengthen Turn Lanes – Several comments from the public requested turn lanes along SR 18. The length of turn lanes along US 31 is less than desirable.
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Signalized Intersection Improvements – Innovative intersection treatments, such as the quadrant roadway concept, are expected to improve operations and safety.
  - Roadway Lighting – Required per INDOT guidelines for all advancing primary concepts listed above to provide safety and comfortability for drivers at night.
  - Warning System – Applicable to the Reduced Conflict Intersection and quadrant roadway intersection concepts being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.
  - Freight Priority System – Applicable to all primary concepts that retain a traffic signal, allowing for the extension of a green light to accommodate an approaching truck.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Restricting access at this intersection will have adverse impacts on the community and the farming industry.
- Green-T Intersection – This concept is not applicable to four-legged intersections.
- Overpass – This location has been identified as a priority access point and severing access here is not recommended.

Table 4-12: US 31 & SR 18 - Qualitative Comparison of Concepts

US 31 & SR 18 (Miami County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	N/A	Yes	Worsens	Improves	Low	Medium	Low	Yes	Low	No	Communities with EJ concerns and Underserved Communities on both sides of US 31. Also, an important access for EMS. Access to/from US 31 is too important at this location to impose restrictions.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	Yes	May require signalization of turning movements.
Signalization	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Existing signalized intersection. Carry forward as No-Build Alternative.
Overpass	Yes	N/A	No	Worsens	Improves	Low	High	Medium	Yes	Medium	No	Important access point along US 31.
Interchange	Yes	N/A	NO	Improves	Improves	High	High	High	Yes	High	Yes	Truck route, major access point. Evaluate opportunities to avoid and/or minimize impacts during concept development.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Signal timing updates will not address documented history of rear-end and right-angle crashes.
Add/Lengthen Turn Lanes	Yes	N/A	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	Length of turn lanes is substandard.
Acceleration / Deceleration Lanes	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	N/A	No	Maintains	Improves	Low	High	Medium	Yes	Medium	Yes	Retains traffic signal. Evaluate opportunities to avoid and/or minimize impacts, including those to community and NRHP eligible farm in SE quadrant during concept development.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection, quadrant roadway and interchange concepts per INDOT Guidelines.
Warning System	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists to a potential stop condition ahead at the traffic signal.
Freight Priority System	No	N/A	No	Neutral	Improves	Low	Low	Low	No	Low	Yes	May reduce delays for trucks by extending green time. Does not address documented history of rear-end and right-angle crashes. Consider pairing with signalized concepts.

#### 4.13.3.4 Conceptual Footprint Comparison

##### **Reduced Conflict Intersection**

Converting this intersection to a Reduced Conflict Intersection provides free flow traffic along US 31 northbound and southbound. Traffic from SR 18 is required to make a right turn onto US 31 and utilize added median U-turn lanes to turn in the desired direction of travel. The limits of this improvement are illustrated in **Figure 4-24**. This alternative has low environmental impacts, does not require additional right-of-way, and does not restrict access to adjacent parcels. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Quadrant Roadway**

This alternative requires the addition of a signalized intersection along US 31 and substantial right-of-way acquisition for the quadrant roadway itself. The limits of this improvement are illustrated in **Figure 4-25**. The quadrant roadway alternative disturbs only one quadrant of the intersection. There is a historic property within this quadrant, but a strategically placed secondary intersections allows it to go undisturbed as the quadrant roadway wraps around the property. Additional right-of-way is required for grading along US 31 and to mitigate the additional pavement in the southeast quadrant. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – At Existing Intersection**

A diamond interchange design elevates US 31 over SR 18. This alternative requires a total acquisition of parcels in all four quadrants of the intersection, including the historic property in the southeast quadrant. Additionally, multiple properties along SR 18 lose driveway access. This alternative will not be advanced for further evaluation in the Level 3 screening process because of these impacts. No conceptual design has been prepared for this alternative.

##### **Interchange – Shifted South of Existing Intersection**

Shifting the location of the interchange away from the existing intersection avoids impacting existing development and avoids impacting the historic property. This alternative relocates the interchange south of the intersection and realigns SR 18 to connect to it. Access between US 31 and SR 18 at the existing intersection is severed, and connections to the new alignment will be provided on either side of the interchange to provide access to all existing properties. The addition of a culvert and bridge will be needed east of the interchanges to cross Russell Ditch. The limits of this alternative are depicted in **Figure 4-26**. This alternative requires substantial right-of-way acquisition south of SR 18, majority of which is farm fields. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – Shifted North of Existing Intersection**

This alternative is similar to the previous alternative, but with SR 18 realigned to the north. This alternative also avoids impacts to the historic property and to other developments at the intersection. The location of the interchange in this alternative has been chosen to minimize the number of bridges required for crossing Russell Ditch. The limits of this alternative are shown in **Figure 4-27**. This alternative results in the interchange being more than a quarter mile north of the existing intersection, which results in more roadway on a new alignment than in the previous alternative. This alternative will not be advanced for further evaluation in the Level 3 screening process as shifting the interchange south of SR 18 requires less new alignment of SR 18 and is expected to have less impact on surrounding lands.

#### 4.13.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Quadrant Roadway
- Interchange

- Add/Lengthen Turn Lanes – Incorporate in all alternatives.
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide as part of the Reduced Conflict Intersection, Quadrant Roadway Intersection, and Interchange alternatives.
- Warning System - An intersection warning system may provide an immediate safety benefit to address right-angle crashes, rear-end crashes and anecdotal reports of red light running. This alternative is recommended for further consideration outside of this PEL study as a potential short-term improvement.
- Freight Priority System - Considered with all alternatives that include signalization.

DRAFT



Figure 4-24: US 31 & SR 18 - Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-25: US 31 & SR 18 - Quadrant Roadway Alternative





Figure 4-26: US 31 & SR 18 - Interchange Alternative, Shifted South of Existing Intersection





Figure 4-27: US 31 & SR 18 - Interchange Alternative, Shifted North of Existing Intersection





## 4.14 US 31 & CR 550 N IN TIPTON COUNTY

### 4.14.1 OVERVIEW

The eastbound approach of this two-way stop-controlled intersection is expected to operate at unacceptable (LOS E) levels based on INDOT guidelines. The crash history at this intersection indicates:

- 26% of crashes were ran off the road type crashes.
- 21% of crashes were rear-end type crashes.

The Tipton County Comprehensive Plan calls for an overpass at this location. This intersection is the primary access point for the Town of Sharpsville. Public comments received to date for this location are summarized as follows:

- A southbound right turn lane is needed at this intersection.
- Kelly Agricultural Historical Museum and the Spurgeon Round Barn are both cultural centers located at this intersection that need access to/from US 31.
- School buses use this intersection to access to Tri-County schools.
- This intersection is a primary access point for the Town of Sharpsville.

### 4.14.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Kelly West Ditch, which is also an IDEM 303(d) listed stream, is within the intersection, crossing CR 550 N and US 31.
- An “Outstanding” rated, determined NHRP-listed eligible, historic property located at the intersection, in the northwest quadrant.
- Potential underserved communities are in proximity to the intersection, including:
  - Limited internet access populations.
  - Limited vehicle access populations.

### 4.14.3 SCREENING OF ALTERNATIVES

#### 4.14.3.1 Step 1 Decision Tree

This initial screening of concepts indicates that restricting access, at-grade options, and an interchange may best meet the needs of this location. While the county’s comprehensive plan calls for an overpass at this location, an overpass would eliminate mobility between US 31 and the Town of Sharpsville. This is contrary to the public comments received to date and have significant impacts to the Town, and as such was not given further consideration.

#### 4.14.3.2 Step 2 – Operational Analysis

Multiple at-grade intersection types will yield acceptable operations through the design year excluding a Two-Way Stop Control, which is the current traffic control type in use at this location, based on the operations analysis.

#### 4.14.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-13**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Access modifications – Restricting access to/from CR 550 N is a viable concept if access to/from the Town of Sharpsville can be improved at adjacent intersections.
  - Reduced Conflict Intersection – This concept provides U-turn movements to facilitate east-west movements and left turn movements from the side street. This concept will improve safety, maintain free

flow conditions along US 31, and maintains east-west mobility. This concept is expected to require little or no additional right-of-way and have low impacts to underserved populations and to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage.

- Interchange – This concept improves operations along US 31 by eliminating an at-grade intersection, reduces delay along CR 550 N, improves safety by eliminating conflict points, and improves mobility in all directions. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. The interchange may also have high impacts on both natural and cultural resources.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Add/Lengthen Turn Lanes – No right turn lanes are provided along US 31. These will improve safety and operations but do not address a documented issue. Include in all at-grade intersection concepts.
  - Roadway lighting – Required per INDOT guidelines for the Reduced Conflict Intersection and interchange concepts to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection concept being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following are primary concepts eliminated from further consideration:

- Signalization – Traffic volumes at this intersection do not warrant signalization. Adding a traffic signal along US 31 will add delay along US 31 and may increase crashes at this intersection.
- Green-T Intersection – This concept is not applicable to intersections with four legs.
- Quadrant Roadway – This concept adds a traffic signal to US 31, resulting in the same drawbacks as the signalization concept.
- Overpass – This location has been identified as a priority access point for the Town of Sharpsville. Eliminating all access to/from US 31 at this location is not recommended.

Table 4-13: US 31 & CR 550 N - Qualitative Comparison of Concepts

US 31 & CR 550N (Tipton County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Low	Low	No	Low	Yes	This is the primary access point for the town of Sharpsville.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by reducing conflict points. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	No	Medium	No	Volumes do not warrant. Assumes quadrant roadway in SE quadrant.
Overpass	Yes	Yes	No	Worsens	Improves	Medium	Medium	Medium	No	Medium	No	E/W crossing volumes are relatively low. Important access to/from Sharpsville.
Interchange	Yes	Yes	No	Improves	Improves	Medium	High	High	No	High	Yes	Does not meet interchange spacing guidelines and may create operational issues. However, provides access to/from Sharpsville. Evaluate operations in Level 3. Opportunity to avoid and/or minimize impacts during concept development.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	Left turn lanes are present along US 31.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	No existing acceleration lanes.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	No	Medium	No	Volumes do not warrant. Assumes quadrant roadway in SE quadrant.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a ramp terminal.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection and interchange concepts per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

#### 4.14.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to the conceptual design stage are described below. Complementary concepts have been incorporated into these alternatives where applicable. Multiple options have been explored for the interchange alternative to identify the best configuration for this alternative.

##### **Access Modifications**

The implementation of a right-in/right-out alternative allows for free flow conditions along US 31 but would restrict access across it by closing the median, thus displacing east-west left turns and through movements to downstream intersections. This alternative has no impacts on natural or community resources and does not require right-of-way acquisition. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Reduced Conflict Intersection**

Converting the intersection of US 31 and CR 550 N into a Reduced Conflict Intersection maintains free flow conditions along US 31, maintains mobility in all directions, and improves safety. Drivers from CR 550 N are required to make a right turn at the intersection of US 31, travel downstream to make a U-turn, and then continue through the intersection or make another right to continue along CR 550 N. Left turn movements from US 31 may be provided at the intersection. The limits of this alternative are illustrated in **Figure 4-28**. This alternative will not disturb ground outside of what has previously been disturbed by the construction of US 31. This alternative has no impacts on natural or community resources and does not require right-of-way acquisition. This is the lowest cost alternative that provides mobility in all directions. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – On Current Alignments**

Replacing the at-grade intersection with an interchange improves mobility, improves safety, and reduces east-west delay times. An interchange located on the current alignment of US 31 and CR 550 N requires acquisition of the developments located at this intersection, including the historic property in the northwest quadrant. This alternative is not feasible due to these impacts and will not be evaluated in the Level 3 screening. No figure illustrating this alternative is included in this report.

##### **Interchange – Shifted South and Aligned with CR 525 N**

Shifting the interchange south of CR 550 N provides the opportunity to avoid impacts to developments at the intersection. This interchange can be aligned with CR 525 N, with CR 525 N extended west to provide a direct route between US 31 and the Town of Sharpsville. In this concept, CR 550 N west of US 31 is realigned to connect to the interchange. The limits of this alternative are depicted in **Figure 4-29**.

Acquisition of right-of-way is required for the interchange, realignment of CR 550 N, and for the extension of CR 525 N. This right-of-way acquisition consists largely of farmland and would require no relocations. This alternative is the highest cost alternative considered at this location; however, this alternative will be advanced for further evaluation in the Level 3 screening process due to its ability to provide for free flow, improve safety, and provide access to the Town of Sharpsville.

##### **Interchange – Shifted to the North**

Shifting the location of an interchange to north of CR 550 N is not feasible due to the impacts the alternative has on the residential parcels that are northeast of this intersection. These parcels are depicted in **Figure 4-29**. No design has been prepared for this alternative due to its lack of reasonability. This alternative will not be advanced for further evaluation in the Level 3 screening process.

#### 4.14.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.



- Access Modifications
- Reduced Conflict Intersection
- Interchange
- Acceleration/Deceleration Lanes - Incorporate in all alternatives for better speed transitions to/from US 31.
- Add/Lengthen Turn Lanes - Incorporate in all at-grade alternatives.
- Roadway Lighting - Provide with the Reduced Conflict Intersection alternative.
- Warning System - May improve safety by alerting motorists of approaching and/or crossing vehicles.

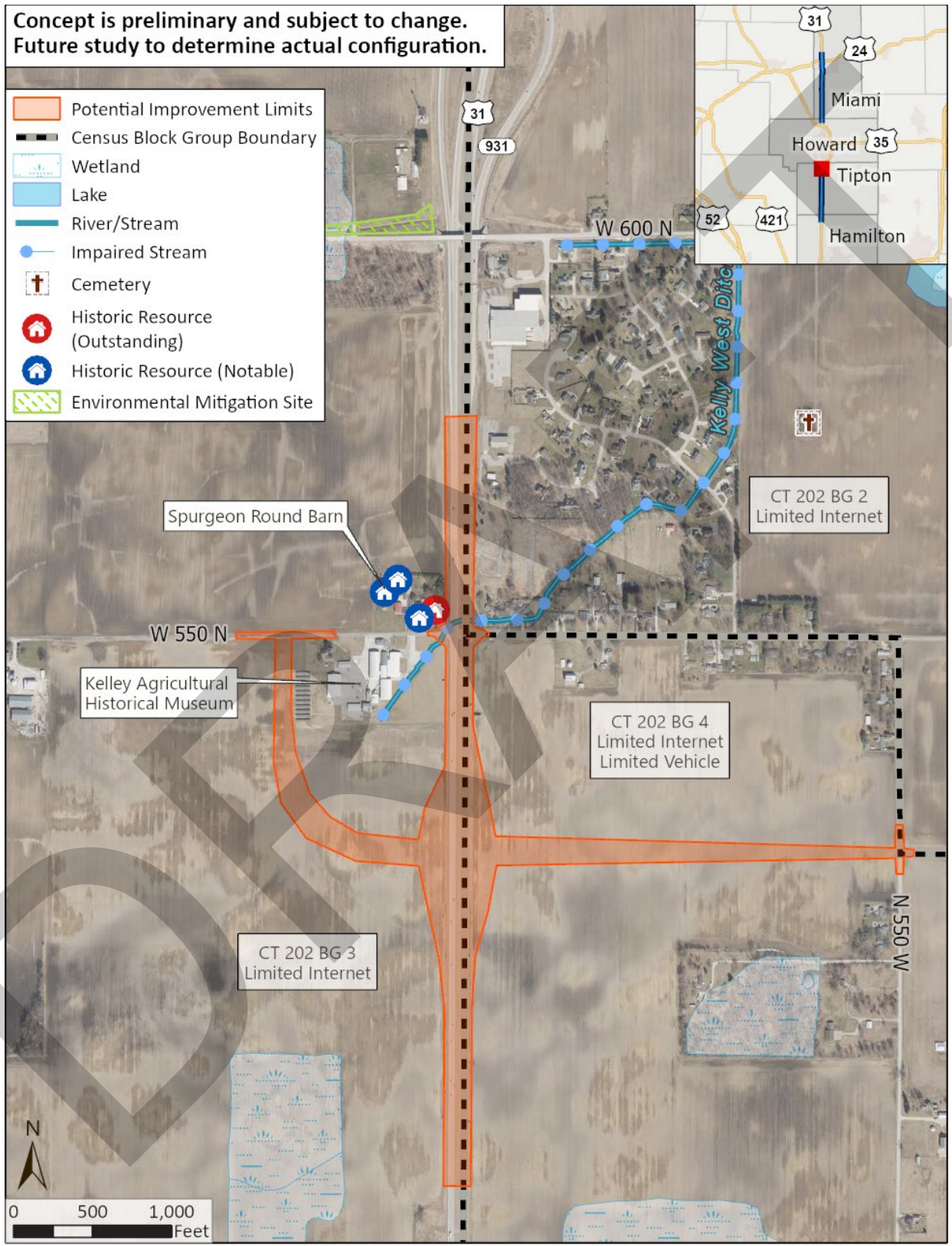
DRAFT

Figure 4-28: US 31 & CR 550 N - Reduced Conflict Intersection Alternative





Figure 4-29: US 31 & CR 550 N - Interchange Alternative, Aligned with CR 525 N



## 4.15 US 31 & DIVISION ROAD IN TIPTON COUNTY

### 4.15.1 OVERVIEW

This signalized intersection is expected to operate acceptably in the design year. The crash history at this intersection indicates:

- 70% rear-end crashes.
- 16% right-angle crashes.
- 20% resulted in fatalities or incapacitating injuries.

A previous INDOT corridor study of US 31 recommended either an interchange or a Reduced Conflict Intersection at this intersection. INDOT previously had planned a Reduced Conflict Intersection at this location but paused the project due to initiation of this PEL study. The Tipton County Comprehensive Plan calls for an interchange at this location.

This intersection received the most public comments to date of any intersection in the US 31 South study area. These comments are summarized as follows:

- An interchange is needed at this location.
- Business access is needed at this intersection.
- There are concerns about future developments at Division Road and their impact on safety and operations.
- The access to US 31 at Division Road should be maintained.
- Traffic counts for this study were conducted during a time when construction activity in the area was causing reduced traffic at the intersection.

Regarding the comments about reduced traffic volumes during construction, a review of the preliminary capacity analysis was conducted for this intersection to determine if increased (i.e., post-construction) traffic volumes would change the Level 2 screening results discussed in this report. Based on that review, it was determined that even with substantially increased volumes, the Level 2 screening conclusions documented in this section remain valid. Updated traffic counts were collected at the US 31 and Division Road intersection after construction of the adjacent railroad overpass was completed. These updated counts, which were generally consistent with the original traffic counts, will be used in the detailed capacity analyses that will be conducted in the Level 3 screening.

### 4.15.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- Potential underserved communities are in proximity to the intersection, including:
  - Environmental justice populations (low-income).
  - Limited English proficiency populations.
  - Limited internet access populations.

### 4.15.3 SCREENING OF ALTERNATIVES

#### 4.15.3.1 Step 1 – Decision Tree

An interchange and at-grade intersections are the concepts that passed the initial screening at this intersection. Complementary concepts that could reduce crash frequency and/or severity were also considered.

#### 4.15.3.2 Step 2 – Operational Analysis

The preliminary capacity analysis results suggest multiple at-grade intersection types will yield acceptable operations through the design year.



#### 4.15.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-14**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Reduced Conflict Intersection – This concept provides U-turn movements to facilitate east-west movements and left turn movements from the side street. This concept will improve safety and maintains east-west mobility. This concept is expected to require little or no additional right-of-way and have low impacts to underserved populations and to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage.
  - Quadrant Road Intersection – This concept is expected to improve operations along US 31 and address at least some of the crash history. The concept will retain a traffic signal on US 31 and therefore cannot address all of the crash history. The concept is expected to have low impacts to both natural and cultural resources. Right-of-way acquisition is needed for the quadrant roadway itself.
  - Interchange – This concept improves operations along US 31 by eliminating a traffic signal, addresses the crash history, and can improve east-west mobility. The interchange is expected to have medium impacts on natural resources and low impacts on both cultural resources and underserved populations. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. Despite this, an interchange is being carried forward to the conceptual design stage because it meets study needs, addresses public concerns, and aligns with the comprehensive plan.
- Complementary concepts:
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Signalized Intersection Improvements – Implementing an innovative intersection type, such as the quadrant roadway intersection, is expected to maintain operations and improve safety.
  - Roadway Lighting – Required per INDOT guidelines for a Reduced Conflict Intersection, a quadrant roadway intersection, and an interchange to provide safety and comfortability for drivers at night.
  - Warning System – Applicable to the Reduced Conflict Intersection and quadrant roadway concepts being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.
  - Freight Priority System – Applicable to all primary concepts that retain a traffic signal, allowing for the extension of a green light to accommodate an approaching truck.

The following primary concepts were eliminated from further consideration:

- Access Modifications – Restricting access at this intersection will have adverse impacts on the community and various industries as Division Road is a designated truck route.
- Green-T Intersection – This concept is not applicable to four-legged intersections.
- Overpass – This location has been identified as a priority access point and severing access here is not recommended.

Table 4-14: US 31 & Division Road - Qualitative Comparison of Concepts

US 31 & Division Rd	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/ displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	N/A	Yes	Worsens	Improves	Low	Low	Low	Yes	Low	No	Access to/from US 31 at this location is important to agriculture, EMS, and trucks to impose restrictions.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	N/A	No	Improves	Improves	Low	Low	Low	No	Low	Yes	May require signalization of turning movements. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts.
Signalization	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Existing signalized intersection. Carry forward as No-Build Alternative.
Overpass	Yes	N/A	No	Worsens	Improves	Low	Low	Medium	Yes	Medium	No	Would eliminate important access point to/from US 31.
Interchange	Yes	N/A	Yes	Improves	Improves	Medium	Low	High	Yes	High	Yes	Opportunity to avoid and/or minimize impacts during concept development. Truck route. Major access point.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	N/A	No	Maintains	Maintains	Low	Low	Low	Yes	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Signal timing updates will not address documented history of rear-end and right-angle crashes.
Add/Lengthen Turn Lanes	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	No operational or safety issues this improvement could address.
Acceleration / Deceleration Lanes	Yes	N/A	No	Improves	Maintains	Low	Low	Low	Yes	Low	Yes	Incorporate into Primary Concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	N/A	No	Maintains	Improves	Low	Low	Medium	Yes	Medium	Yes	Retains a traffic signal.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	N/A	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection, quadrant roadway and interchange concepts per INDOT Guidelines.
Warning System	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists to a potential stop condition ahead at the traffic signal.
Freight Priority System	No	N/A	No	Neutral	Yes	Low	Low	Low	No	Low	Yes	May reduce delays for trucks by extending green time. Does not address documented history of rear-end and right-angle crashes. Consider pairing with signalized concepts.

#### 4.15.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to the conceptual design stage are described below. Complementary concepts have been incorporated into these alternatives where applicable. Multiple options have been explored for the interchange alternative to identify the best configuration for this alternative.

##### **Reduced Conflict Intersection**

Converting the intersection to a Reduced Conflict Intersection will displace east-west through and left turn movements to U-turn lanes provided along US 31. The limits of this alternative are depicted in **Figure 4-30**. Signalization of the Reduced Conflict Intersection may be needed to accommodate projected traffic volumes. The need for signalization will be determined in the Level 3 screening.

This alternative will not disturb ground outside of what has previously been disturbed by the construction of US 31 and can be constructed within the existing right-of-way of US 31. Grading in the median and outside shoulders are anticipated, as well as the addition of pavement. A driveway located at the southern U-turn needs to be eliminated or the spacing of the southern U-turn must be moved farther from the main intersection to avoid undesirable movements from the existing home. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Quadrant Roadway Intersection**

Converting the US 31 and Division Road intersection to a quadrant roadway requires the addition of two signalized intersections, one to the north and one to the east of the existing intersection. Drivers wanting to turn left at the main intersection are required to reroute to the secondary intersections. The improvement limits of this alternative are illustrated in **Figure 4-31**. The quadrant roadway alternative disturbs only the northeast quadrant, with the intersection of Division Road shifted east of Division Drive to avoid traffic conflicts with driveways. Right-of-way acquisition is needed for the quadrant roadway, majority of which is farm fields. Impacts to natural and cultural resources are low for this alternative. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – On Existing Alignments**

An interchange at this location eliminates the traffic signal and provides for free-flowing traffic along US 31. A diamond interchange on current alignments would impact existing residential developments in the northwest and southwest quadrants of the interchange. This interchange impacts all residences along and near Division Drive, as these driveways are located within limited access right-of-way. Providing a frontage road for said residences is not practical given the proximity of the homes to Division Road; therefore, acquisition of these homes is likely. This alternative will not be carried forward for further evaluation due to the residential impacts.

##### **Interchange – Diamond Shifted North**

Shifting the standard diamond interchange design slightly north of Division Road's original alignment allows for Division Drive to remain as-is and be connected to the new alignment via the addition of a short access road. Access to US 31 at the current intersection is terminated. This design would also require ramps in all four quadrants of the intersection, but fewer properties are acquired on the east leg of Division Road with this concept. The improvement limits of this alternative are shown in **Figure 4-32**. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – Quadrant**

The benefits of an interchange can be achieved at a reduced cost by providing grade separation at the intersection and constructing ramps, like quadrant roadways, which have right-in/right-out access to US 31 and acceleration/deceleration lanes along US 31. This concept, with improvement limits shown in **Figure 4-33**, has a smaller footprint and is expected to have a much lower cost than a traditional diamond type interchange. This design requires right-of-way acquisition north of Division Road and parallel to Division Road along the south end. Right-of-way will also be needed along northbound and southbound US 31 to accommodate the addition of acceleration and

deceleration lanes. Limited access right-of-way requirements for this alternative are reduced to allow Division Drive to remain open, eliminating the need to acquire five additional properties that must be acquired if a traditional interchange alternative is implemented. This alternative will be advanced for further evaluation in the Level 3 screening process.

#### 4.15.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Quadrant Roadway
- Interchange
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting - Provide for the Reduced Conflict Intersection, Quadrant Roadway Intersection, and Interchange alternatives.
- Warning System - An intersection warning system may provide an immediate safety benefit to reduce both rear-end and right-angle crashes. This alternative is recommended for further consideration outside of this PEL study as a potential short-term improvement.
- Freight Priority System - Consider for all alternatives that include signalization.



Figure 4-30: US 31 & Division Road – Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

Figure 4-31: US 31 & Division Road - Quadrant Roadway Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-32: US 31 & Division Road - Interchange Alternative, Shifted North



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

Figure 4-33: US 31 & Division Road - Interchange Alternative, Quadrant



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



## 4.16 US 31 & SR 28 IN TIPTON COUNTY

### 4.16.1 OVERVIEW

This interchange is expected to operate acceptably through the design year. The crash history at the western roundabout indicates:

- 36% of crashes were run off the road crashes.
- 22% of crashes were rear-end type crashes.
- 21% of crashes were right-angle crashes.
- 29% of crashes resulted in fatalities or incapacitating injuries.

The Tipton County Comprehensive Plan does not identify any future plans for this interchange.

Public comments received to date are summarized as follows:

- Safety is a concern at this intersection.
- There is a high volume of farm equipment, which is hard to maneuver on roundabouts.
- School buses are too large for roundabouts.

### 4.16.1 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- A floodplain is within the intersection to the west of US 31.
- A lake is approximately 0.14-mile northeast of the intersection.
- Hazardous material concerns are in proximity of the intersection, including,
  - Two LUST sites are located at the intersection.
    - Former Day’s Marathon LUST site is located in the northeast corner of US 31 and SR 28.
    - Former Sherrils Gas LUST site is located on the southeast corner of US 31 and SR 28.
  - A brownfield site is located at the intersection. Formerly Tipton Getrag Tequila is located 0.16-mile northwest of the intersection.
- Tucker Cemetery is approximately 0.15 mile south of the intersection along the west side of US 31.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental justice (low-income) populations.
  - Limited English proficiency populations.
  - Limited internet access populations.

### 4.16.2 SCREENING OF ALTERNATIVES

#### 4.16.2.1 Step 1 – Decision Tree

There are no operational issues identified at this intersection.

#### 4.16.2.2 Step 2 – Operational Analysis

All at-grade concepts are expected to operate acceptably in the design year based on the operations analysis.

#### 4.16.2.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-15**.

#### 4.16.2.4 Step 4 – Conceptual Footprint Comparison

No conceptual design was prepared for this location as only complementary concepts are being explored to address the historic crash data.

Table 4-15: US 31 & SR 28 - Qualitative Comparison of Concepts

US 31 & SR 28 (Tipton County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange.
Unsignalized Intersection Improvements												
Reduced Conflict Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange.
Signalization	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange.
Overpass	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange.
Interchange	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange. Carry forward as the No-Build Alternative.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	N/A	No	Maintains	Maintains	Low	Low	Low	Yes	Low	No	Additional capacity along US 31 is not needed.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	N/A	No	Maintains	Maintains	Low	Low	Low	No	Low	No	Existing turn lanes are sufficient in length.
Acceleration / Deceleration Lanes	Yes	N/A	No	Improves	Maintains	Low	Low	Low	Yes	Low	No	No safety or operational problems with existing acceleration or deceleration lanes.
Signalized Intersection Improvements												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange.
Quadrant Roadway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing interchange.
Ramp Terminal Improvements	Yes	N/A	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	Targeted safety improvements for western roundabout.
Roadway Lighting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Existing lighting at this interchange.
Warning System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Existing interchange.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

## 4.17 US 31 & 296<sup>TH</sup> STREET IN HAMILTON COUNTY

### 4.17.1 OVERVIEW

The eastbound and westbound approaches of this two-way stop-controlled intersection are expected to operate at unacceptable levels in the peak hours of the design year. The crash history at this intersection indicates:

- 30% of crashes were right-angle crashes.
- 36% of crashes were run off the road crashes.

The Hamilton County Comprehensive Plan calls for intersection improvements at this location but does not specify what these improvements should be.

Public comments received to date are summarized as follows:

- Traffic is congested at this intersection.
- An interchange is needed at this location to improve access to the Town of Atlanta.
- An overpass is needed here.
- An overpass is needed here for farm equipment.
- This location is a future National Guard Armory site (Guard site is actually at 276<sup>th</sup> Street).
- A church and cemetery are located in the southeast and southwest quadrants, respectively.

### 4.17.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints at this intersection include:

- East Union Christian Church is in the southeast quadrant of the intersection.
- East Union Cemetery is in the southwest quadrant of the intersection.
- One mapped NWI wetland is near the intersection.
- An NRHP-listed historic property is located 0.14 mile west of the intersection on the north side of 296<sup>th</sup> Street.
- A potential trail, 296<sup>th</sup> Street-Tipton County Line to Madison Co. Line Trail, is planned along the south side of 296<sup>th</sup> Street.
- Potential underserved communities are in proximity to the intersection, including:
  - Environmental Justice populations (low-income).
  - Limited English proficiency populations.
  - Limited internet access populations.
  - Limited vehicle access populations.

### 4.17.3 SCREENING OF ALTERNATIVES

#### 4.17.3.1 Step 1 – Decision Tree

Operational issues at this intersection may be addressed by various at-grade intersection concepts. Complementary concepts may improve safety at this location. An interchange was also considered as an appropriate alternative based on broader context of the area. An overpass is not appropriate as retaining access at this intersection has been identified as being important for surrounding land uses.

#### 4.17.3.2 Step 2 – Operational Analysis

The preliminary results suggest multiple at-grade intersection types will yield acceptable operations through the design year excluding a Two-Way Stop Control, which is the existing condition. Various at-grade concepts, along with complementary concepts and the interchange concept, were evaluated qualitatively to identify options that should be advanced to the conceptual design step in this screening process.

#### 4.17.3.3 Step 3 – Evaluation Matrix

The evaluation of concepts is summarized in **Table 4-16**. From this Table, the following alternatives are to be advanced to Step 4.

- Primary concepts:
  - Access Modifications – This concept would restrict mobility at the intersection to allow fewer movements than are possible today. This would improve safety and may improve operations. This concept would require no additional right-of-way and is expected to have no impacts on natural or community resources.
  - Reduced Conflict Intersection – This concept improves safety, will maintain free flow conditions along US 31, and maintains mobility for all movements. This concept is expected to require little or no additional right-of-way and have low impacts to both natural and cultural resources. This is the least expensive concept advancing to the conceptual design stage that maintains mobility.
  - Interchange – This concept improves operations along US 31 by eliminating merging with low-speed traffic, improves safety by reducing conflict points, and can improve east-west mobility. This concept is expected to have the highest cost and requires the most right-of-way acquisition of all concepts. The interchange may also have severe impacts on cultural resources.
- Complementary concepts:
  - Add/Lengthen Turn Lanes – The addition of right turn lanes along US 31 should improve operations and may improve safety.
  - Acceleration/Deceleration Lanes – Incorporate in all primary concepts to allow for better speed transitions to/from US 31.
  - Roadway lighting – Required per INDOT guidelines for all Reduced Conflict Intersections and interchanges to provide safety and comfortability for drivers at night.
  - Warning system – Applicable to the Reduced Conflict Intersection concept being advanced to improve safety by alerting motorists of approaching and/or crossing vehicles.

The following primary and complementary concepts were eliminated from further consideration:

- Signalization – Traffic volumes at this intersection do not warrant a traffic signal. Signalizing this intersection would induce delay along US 31 and may cause crashes at this intersection.
- Green-T Intersection – This concept is not applicable to four-legged intersections.
- Quadrant Roadway – A quadrant roadway intersection would also add a traffic signal to US 31, which is not warranted and may cause crashes.
- Overpass – Based on traffic volumes, retaining access to US 31 is more important at this location than facilitating east-west traffic flow via an overpass.



Table 4-16: US 31 & 296<sup>th</sup> Street - Qualitative Comparison of Concepts

US 31 & 296th St (Hamilton County)	Purpose and Need (Mobility and Safety)					Environmental Impacts				Relative Cost	Carry Forward?	Notes/Comments
	Applies safety counter-measures?	Reduces delay at unsignalized intersections?	Prioritizes & consolidates access points?	Maintains or improves safety, access, & mobility across the corridor by preserving the most important crossings & access points?	Maintains or improves operations along US 31?	Potential for adverse impacts to natural resources?	Potential for adverse impacts to cultural resources?	Potential ROW/displacement impacts?	Potential for impacts to EJ and/or DACs?			
No Build	No	No	No	Maintains	Maintains	N/A	N/A	N/A	N/A	N/A	Yes	Carry forward as a baseline for comparison to build alternatives.
<b>Primary Concepts</b>												
Access Modifications	Yes	No	Yes	Worsens	Improves	Low	Medium	Low	Yes	Low	Yes	Restrict to right-in/right-out if access can be provided to the south, where interchange under construction at 276t St. Most direct access to town of Atlanta.
<b>Unsignalized Intersection Improvements</b>												
Reduced Conflict Intersection	Yes	Yes	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provides safety benefits by reducing conflict points. May increase travel time for crossroad; however, safety benefits far outweigh travel time impacts. Relatively low cost and impact.
Signalization	No	No	No	Maintains	Worsens	Low	Low	Low	No	Low	No	Traffic volumes do not meet signal warrants. Adds delay to US 31.
Overpass	Yes	Yes	No	Worsens	Improves	Low	High	Medium	Yes	Medium	No	Retaining access to US 31 is more important than east-west flow, which has relatively low traffic volumes.
Interchange	Yes	Yes	Yes	Improves	Improves	Medium	High	High	Yes	High	Yes	Provides more direct connection to Atlanta. Opportunity to avoid and/or minimize impacts during concept development, including cemetery in SW quadrant and NRHP eligible resource in NW quadrant.
<b>Complementary Concepts</b>												
Auxiliary Lanes	No	No	No	Maintains	Maintains	Low	High	Medium	No	Medium	No	Additional capacity along US 31 is not needed. Requires retaining walls to avoid cemetery impacts.
Signal Timing Updates	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.
Add/Lengthen Turn Lanes	Yes	No	No	Maintains	Improves	Low	Low	Low	No	Low	Yes	The addition of right turn lanes on US 31 may improve safety and operations.
Acceleration / Deceleration Lanes	Yes	Yes	No	Improves	Improves	Low	Low	Low	No	Low	Yes	Consider pairing with the primary concepts.
<b>Signalized Intersection Improvements</b>												
Green-T Intersection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Not a T-intersection.
Quadrant Roadway	Yes	No	No	Neutral	Worsens	Low	Low	Medium	No	Medium	No	Traffic volumes do not meet signal warrants. Adds delay to US 31. Assumes quadrant roadway not in NW quadrant.
Ramp Terminal Improvements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at ramp terminal intersections.
Roadway Lighting	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	Provide lighting for Reduced Conflict Intersection and interchange concepts per INDOT Guidelines.
Warning System	Yes	No	No	Improves	Maintains	Low	Low	Low	No	Low	Yes	May improve safety by alerting motorists of approaching and/or crossing vehicles. Consider pairing with No-Build and Reduced Conflict Intersection concepts.
Freight Priority System	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	N/A. Only applicable at signalized intersections.

#### 4.17.3.4 Step 4 – Conceptual Footprint Comparison

The alternatives advancing to the conceptual design stage are described below. Complementary concepts have been incorporated into these concepts where applicable. Multiple options have been explored for the interchange alternative in an effort to identify the best configuration for this concept.

##### **Access Modifications**

The implementation of a right-in/right-out only allow for free flow conditions along US 31 but limit mobility to/from 296<sup>th</sup> Street. A right-in/right-out design includes right-of-way impacts to all quadrants due to grading, but there are no changes to property access. This design minimizes widening and reuses as much of the original construction footprint as possible. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Reduced Conflict Intersection**

Converting the intersection to a Reduced Conflict Intersection retains free flow conditions for US 31, maintains mobility at this intersection for all movements, and improves safety. The limits of this alternative are depicted in **Figure 4-34**. This alternative will not disturb ground outside of what has previously been disturbed by the construction of US 31. Grading in the median and outside shoulders are anticipated, as well as the addition of pavement. This alternative will be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – Diamond in Place**

Implementing a conventional diamond interchange at the intersection of 296<sup>th</sup> Street with a grade separation over US 31 allows for free flow conditions along US 31. This alternative accommodates both public comments regarding access to the Town of Atlanta as well as the elimination of delays from attempting to cross US 31. This alternative is at the existing intersection with the ramp placement requiring the acquisition of properties on all four quadrants, including East Union Christian Church, and impacts Union Cemetery in the southwest. This alternative will not be carried forward for further evaluation due to these impacts. This alternative will not be advanced for further evaluation in the Level 3 screening process.

##### **Interchange – Diamond Shifted North**

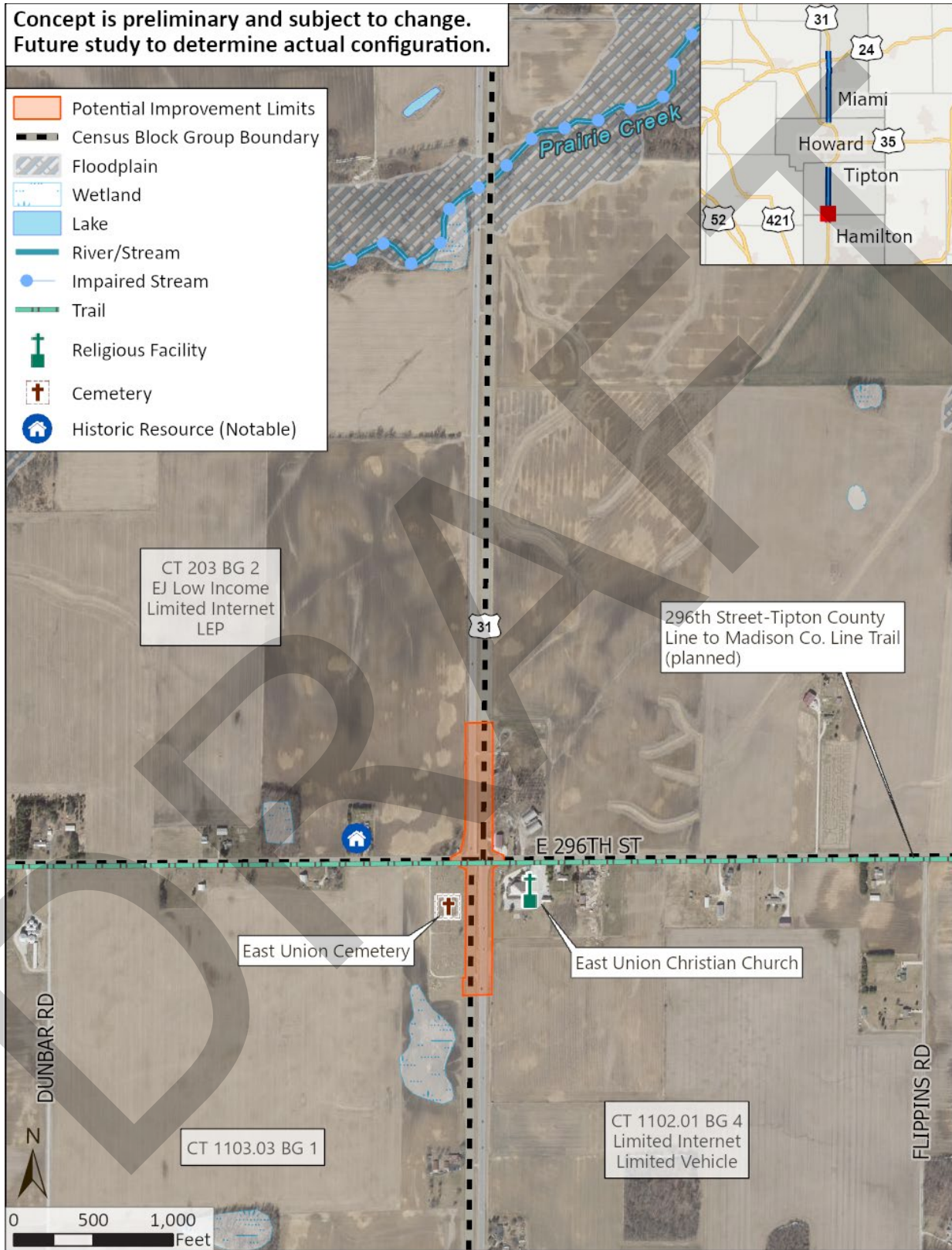
Shifting the interchange to the north of the existing intersection provides the same benefits as the previous alternative but does not impact existing structures and cemetery at the intersection. Right-of-way acquisition is required in this design and impacts multiple properties, with several driveway relocations, but all access will be maintained. This design creates a new alignment for 296<sup>th</sup> Street to connect to the interchange. The limits of this alternative are shown in **Figure 4-35**. The original perpendicular connections of 296<sup>th</sup> Street to US 31 is closed and converted into cul-de-sacs or similar. An access road is added to connect the new and old 296<sup>th</sup> Street. This alternative will be advanced for further evaluation in the Level 3 screening process.

#### 4.17.4 INTERSECTION ALTERNATIVES ADVANCING TO LEVEL 3 SCREENING

The following alternatives will be advanced to the Level 3 screening:

- No-Build Alternative will be carried forward to serve as a baseline for comparison to all build alternatives.
- Access Modifications
- Reduced Conflict Intersection
- Interchange
- Relocated Intersection
- Add/Lengthen Turn Lanes – Incorporate in all at-grade alternatives.
- Acceleration/Deceleration Lanes – Incorporate in all alternatives for better speed transitions to/from US 31.
- Roadway Lighting – Should be provided with the Reduced Conflict Intersection and Interchange alternatives.
- Warning System – May improve safety by alerting motorists of approaching and/or crossing vehicles.

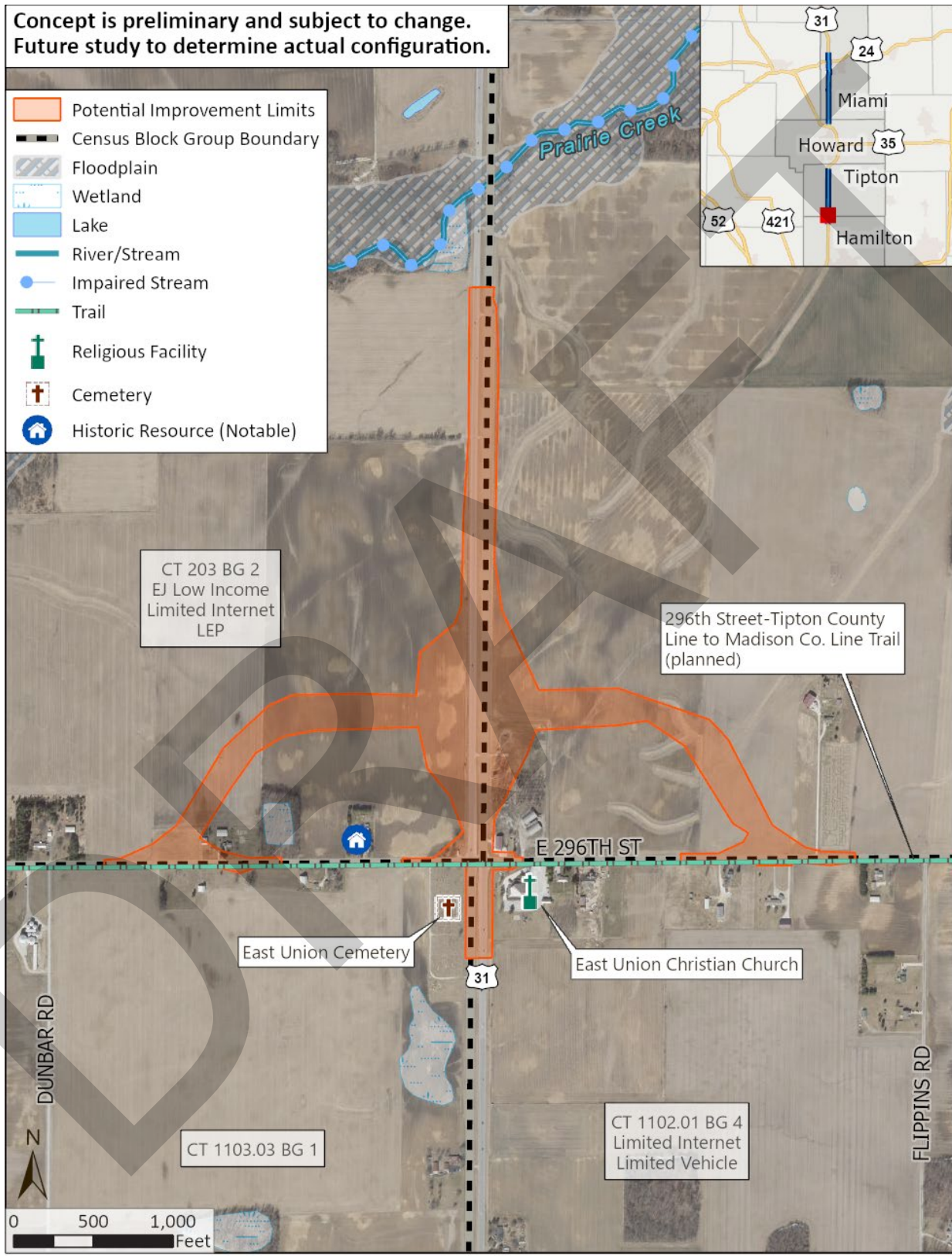
Figure 4-34: US 31 & 296<sup>th</sup> Street – Reduced Conflict Intersection Alternative



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



Figure 4-35: US 31 & 296<sup>th</sup> Street - Interchange Alternative, Diamond Shifted North



Indiana Geographic Information Office, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS



## 4.18 US 31 & 276<sup>TH</sup> STREET IN HAMILTON COUNTY

### 4.18.1 OVERVIEW

As of March 2024, a new interchange was recently opened to traffic at this intersection as part of a separate project.

### 4.18.2 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSTRAINTS

Social, economic, and environmental constraints have not been identified or evaluated for this intersection.

### 4.18.3 SCREENING OF ALTERNATIVES

The newly constructed interchange is expected to improve access, improve operations, and reduce crashes at this intersection. This study provides no further recommendations for this location.

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# 5 LEVEL 2 SCREENING SUMMARY

## 5.1 LEVEL 2 SCREENING SUMMARY

The Level 2 Screening has identified a range of alternatives to improve operations and safety at the 18 primary intersections. These alternatives have been screened qualitatively based on their ability to meet study area needs, relative cost, and social, economic, and environmental impacts. Alternatives not able to substantially meet study area needs and/or with substantial environmental impacts that could not be avoided or minimized were eliminated from further consideration. The alternatives advancing from this evaluation are depicted in **Table 5-1**. The No-Build Alternative will be advanced throughout the PEL study and throughout any ensuing NEPA analyses to serve as a baseline for comparison to build alternatives.

## 5.2 SHORT TERM IMPROVEMENTS

Rear-end crashes and right-angle crashes have been identified as being prevalent at several intersections in the study area. The frequency of these crash types may be reduced through implementation/upgrade of intersection warning systems at these intersections. Warning systems can be used at signalized intersections to warn motorists of a stop condition that lies ahead and can be activated only when the appropriate US 31 phase is active. Warning systems can also be used at unsignalized intersections to warn motorist on US 31 of the presence of a vehicle on the side street and to warn motorist on the side street of traffic approaching on US 31. These locations where the warning system alternative is recommended for further study as a low-cost, short-term improvement are:

- US 31 & CR 100 N in Miami County, where:
  - 41% of crashes are rear-end collisions; and
  - This is the first traffic signal encountered in 63 miles when traveling south from US 20 in South Bend.
- US 31 & Business 31 in Miami County, where:
  - 50% of crashes are rear-end crashes; and
  - 23% of crashes are right-angle crashes.
- US 31 & CR 500 S in Miami County, where 31% crashes at this two-way stop-controlled intersection are right-angle crashes.
- US 31 & SR 218 N in Miami County, where:
  - 9% of crashes are right-angle;
  - 69% of crashes are rear-end crashes; and
  - There are numerous anecdotal reports of red light running.
- US 31 & SR 218 S in Miami County, where 40% of all crashes at this two-way stop-controlled intersection are right-angle crashes.
- US 31 & SR 18 in Miami County, where:
  - 14% of crashes are right-angle crashes;
  - 57% of crashes are rear-end crashes; and
  - There are numerous anecdotal reports of red light running.
- US 31 & Division Rd in Tipton County, where:
  - 70% of crashes are rear-end crashes;
  - 16% of crashes are right-angle crashes;
  - This is the only traffic signal in the 33-mile span of US 31 between Indianapolis and Kokomo; and
  - This is the first traffic signal encountered in 27 miles when traveling north from I-465 in Indianapolis.

Table 5-1: Intersection Alternatives Advancing to Level 3 Screening

Alternatives	No Build	Primary Concepts					Complementary Concepts									
		Access Modifications	Unsignalized Intersection Improvements		Grade Separation		Auxiliary Lanes	Signal Timing Updates	Add/Lengthen Turn Lanes	Acceleration / Deceleration Lanes	Signalized Intersection Improvements		Ramp Terminal Improvements	Roadway Lighting	Warning System	Freight Priority System
			RCI	Signalization	Overpass	Interchange					Green-T Intersection	Quadrant Roadway				
US 31 & CR 200 N	x	x	x			x			x	x			x	x		
US 31 & CR 100 N	x	x	x			x			x	x		x	x			
US 31 & US 24	x															
US 31 & Blair Pike Rd	x	x	x						x	x			x	x		
US 31 & Logansport Rd	x		x		x	x				x			x	x		
US 31 & Airport Rd	x	x							x	x				x		
US 31 & Business 31	x					x				x			x	x	x	
US 31 & CR 400 S	x		x		x				x	x			x	x		
US 31 & CR 500 S	x	x	x		x				x	x			x	x		
US 31 & SR 218 N	x		x	x		x				x	x		x	x	x	
US 31 & SR 218 S	x	x	x							x	x		x	x		
US 31 & CR 800 S	x	x	x			x				x			x	x		
US 31 & SR 18	x		x	x		x			x	x		x	x	x	x	
US 31 & CR 550 N	x	x	x			x			x	x			x	x		
US 31 & Division Rd	x		x	x		x				x		x	x	x	x	
US 31 & SR 28	x											x				
US 31 & 296th St	x	x	x			x			x	x			x	x		
US 31 & 276th St	x															

New interchange constructed as part of a separate project

## 6 NEXT STEPS IN THIS PEL STUDY

### 6.1 PUBLIC COMMENT PERIOD

Comments on the ProPEL US 31 Level 2 Screening Report will be received for a period of 30 days following the publication of this document. The opportunity to comment will be provided via the project website (<https://propelus31.com/31doclibrary/>). Dates, times, and locations of office hours will be announced on the website and through social media channels. Copies of the report will also be available for review throughout the public comment period at the locations listed below:

- Tipton County Public Library, Tipton, IN
- Peru Public Library, Peru, IN
- Kokomo Howard County Public Library, Main Branch, Kokomo, IN
- Kokomo Howard County Public Library, South Branch, Kokomo, IN
- Sharpsville Town Hall, Sharpsville, IN
- Tractor Supply Company, Tipton, IN

### 6.2 LEVEL 3 SCREENING

After consideration of public comments, the Level 3 screening will begin. The goal of this screening process will be to identify a reasonable range of alternatives to advance from this PEL study.

Given the needs identified within the study area, a reasonable alternative could consist of improvements at a single intersection; it could also consist of improvements at multiple intersections and/or the roadway sections in between them. Depending on multiple factors, including statewide priorities and funding availability, improvements considered as part of this PEL study could be combined in different ways to address the identified transportation needs and goals of the study area (i.e., improvement packages).

While the Level 2 screening focused on alternatives at the primary intersections, the Level 3 screening will develop and analyze improvement packages for sections of the study area. These sections will include improvements at the primary intersections, the secondary intersections, as well as the roadway sections between them. Each of the primary intersection improvement alternatives advancing from the Level 2 screening will be included in at least one of the improvement packages considered in the Level 3 screening.

Improvements to the roadway sections will focus on access management strategies. Decisions regarding access management will be made during project development and will be analyzed and documented as part of the NEPA environmental review process. For the purposes of this PEL study, INDOT will develop and evaluate basic access management criteria for roadway sections in the study area to better understand costs, benefits, and impacts of different access management strategies. The criteria for the Level 3 screening will be based on the INDOT access management guidelines and will consider differing levels of access control ranging from existing conditions (i.e., the No-Build) to full control of access. The access management criteria considered in the Level 3 analysis will support a range of facility types that address safety, mobility, and access needs within the study area.

Due to the high number of combinations possible (i.e., several thousand improvement packages), it is not feasible to evaluate every single permutation. Professional judgement will be used to create representative improvement packages for each piece of the study area that will constitute a reasonable range of alternatives.

In forming the improvement packages, the following will be considered:

- **Influence of adjacent intersections:** The influence of recommended improvements at a specific location on the adjacent intersections will be considered. For example, if an interchange alternative is considered at a



primary intersection, consolidation of access to/from US 31 through closure of adjacent secondary intersections will likely be recommended along with it.

- **Interchange spacing guidelines:** INDOT prefers to have a minimum of 3 miles between adjacent interchanges in rural areas; however, this will be examined for the context of each section and location.
- **Access management principles:** Driveway treatments and recommendations on the spacing of median openings will be considered when developing the improvement packages.
- **Improvements at secondary intersections:** There are 34 secondary intersections within the study limits where no detailed evaluation was performed in the Level 2 screening due to the low volumes carried by the intersecting roadways. Access management principles will be evaluated in the Level 3 screening to align the treatments at intersections within the study area with the appropriate access management strategies. The improvements to Secondary Intersections will typically consist of restricting turning movements or closure of the intersection. At locations where an intersection may be considered for closure, a review of mitigation measures to retain access, such as local access roads, may be considered when certain conditions are met. These conditions would be identified as part of the Level 3 screening process, as needed.

The Level 3 screening process will include further analysis and more detail than Level 2. The alternatives that advance from the Level 2 analysis will be further refined based on public comments and to further avoid or minimize impacts, where possible.

Finally, the improvement packages for each piece of the study area will be compared against the performance measures identified in the *US 31 South Purpose and Need Report* to assess an improvement package's ability to both meet study needs and accomplish study goals. Alternatives will also be compared based on relative cost, safety, and operational benefits, as well as social, economic, environmental impacts. The results of this comparison will be used to develop recommendations on reasonable alternatives for further study, which will ultimately be released for public comment.

# APPENDIX A: DECISION TREES

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# APPENDIX B: PRELIMINARY CAPACITY ANALYSIS RESULTS

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# APPENDIX C: DESIGN ASSUMPTIONS AND PREFERENCES

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# APPENDIX A: DECISION TREES

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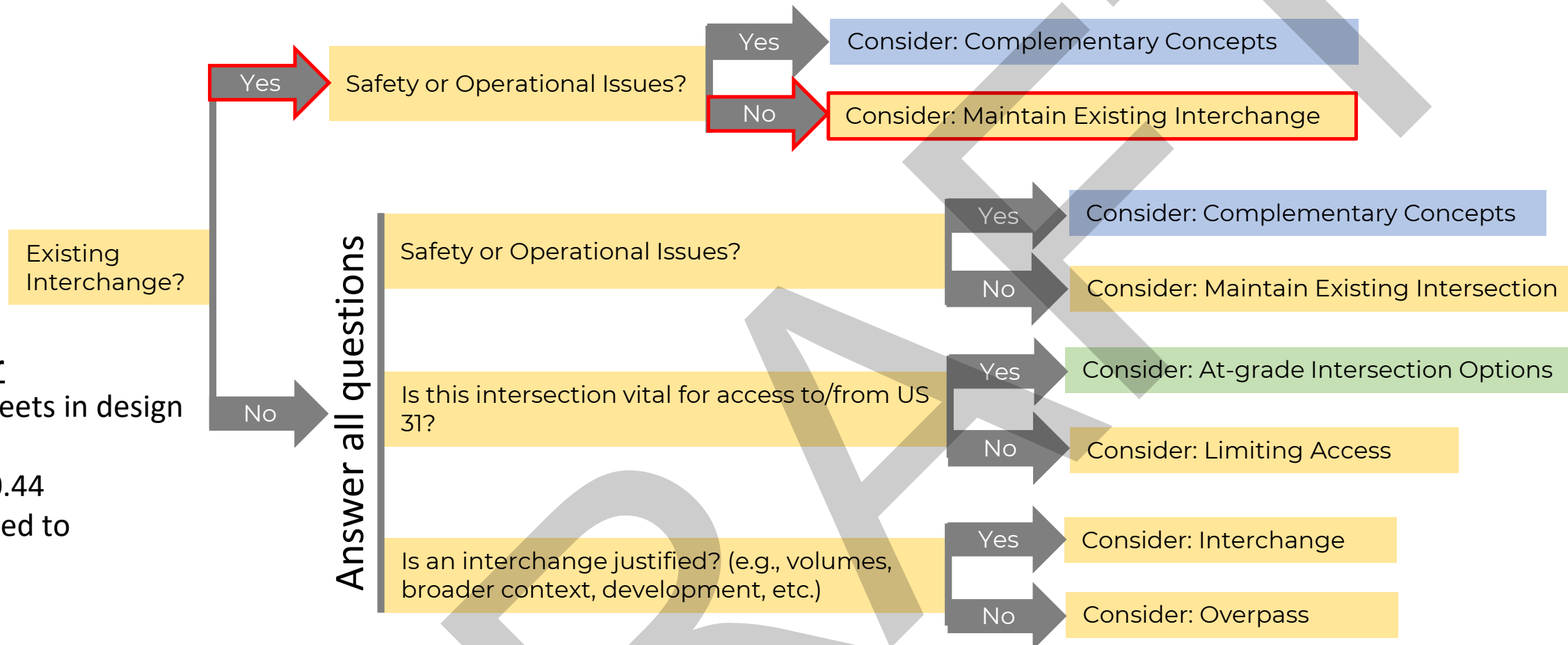
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# Rationale for Evaluating Intersections

## US 31 & 276<sup>th</sup> St

### Factors to Consider

- LOS F for side streets in design year
- ICF=-0.14, ICC=-0.44
- Recently converted to interchange



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

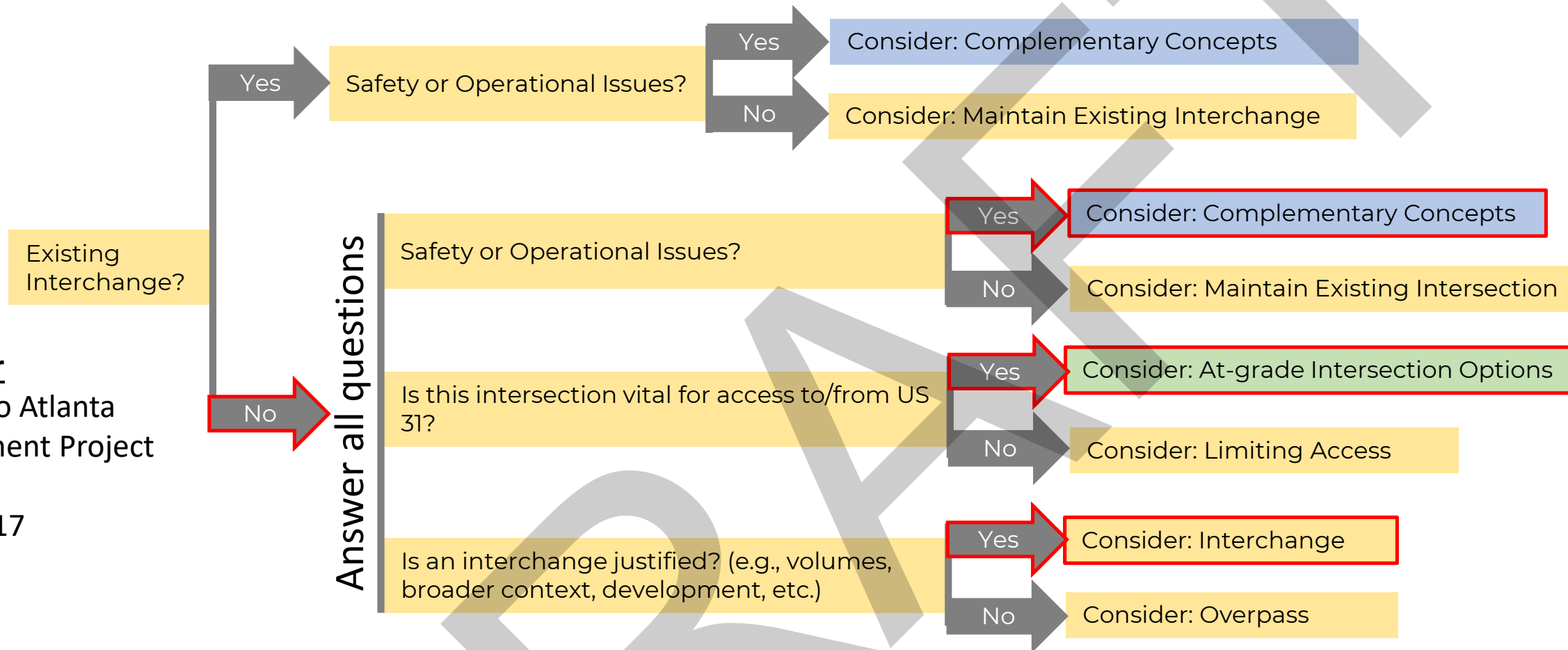
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & 296<sup>th</sup> St

### Factors to Consider

- Primary Access to Atlanta
- Access Management Project on US 31
- ICC=0.79, ICF=0.17



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

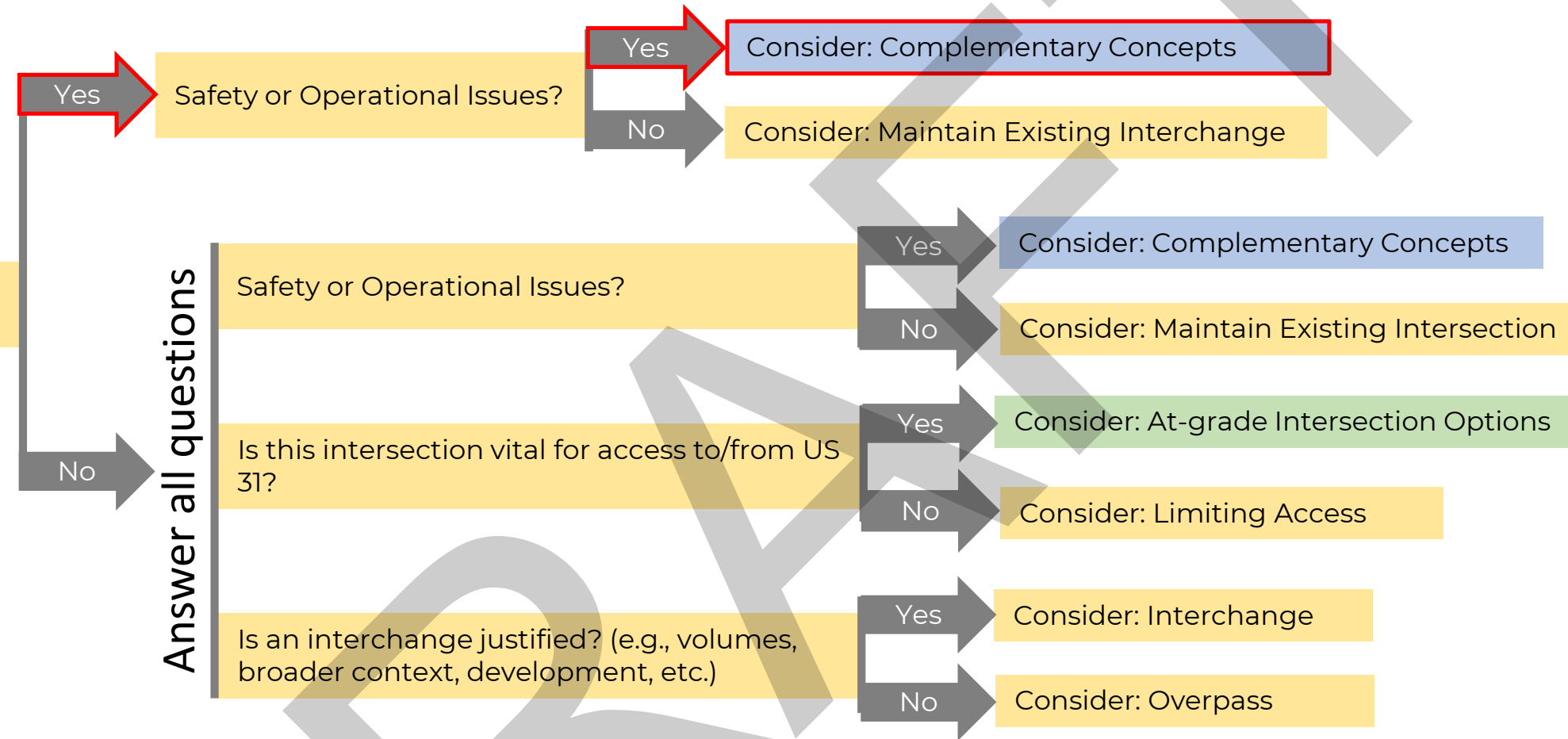
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & SR 28

### Factors to Consider

- Existing Interchange
- No operational issues
- Southbound ramp terminal: ICF=0.90, ICC=1.24
- Northbound ramp terminal: ICF=0.19, ICC=-0.84



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<b>Signalized (Meets signal warrants)</b> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<b>Unsignalized (Does not meet signal warrants)</b> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

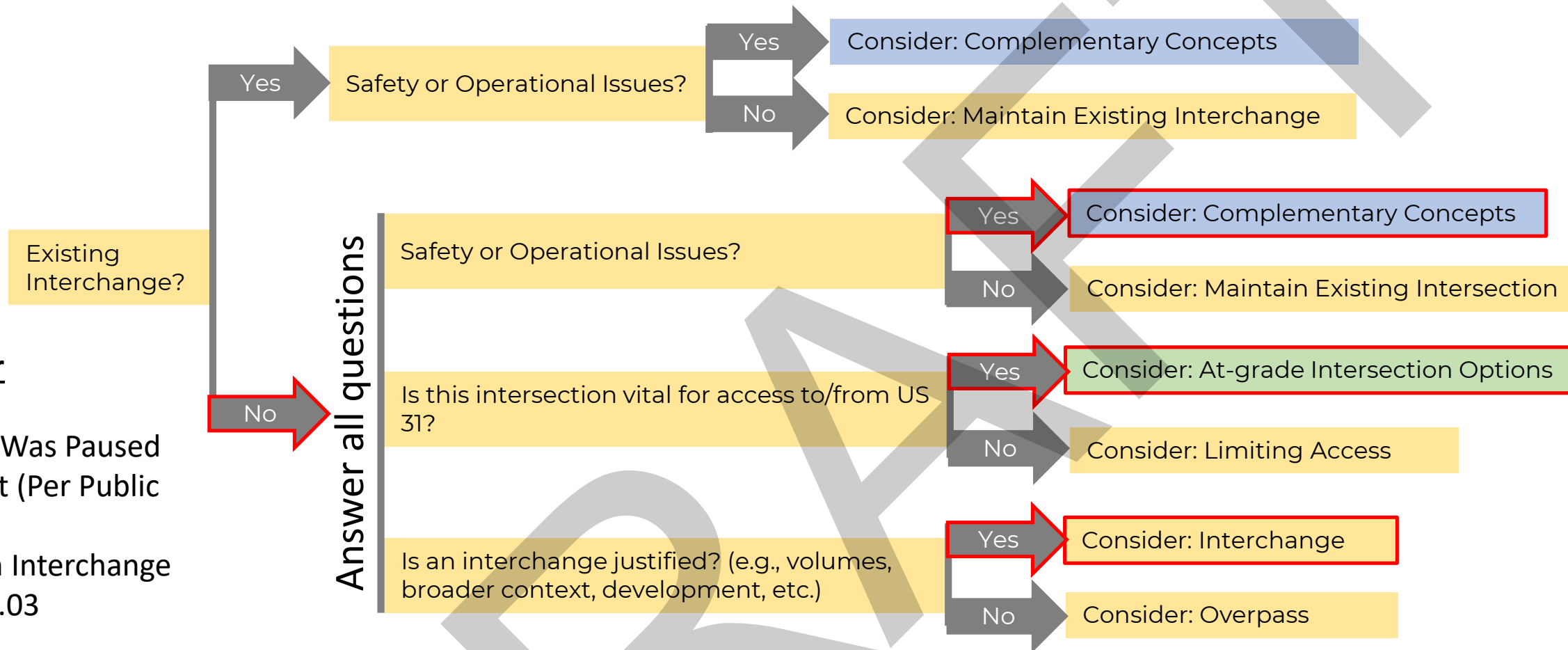


# Rationale for Evaluating Intersections

## US 31 & Division Road

### Factors to Consider

- Truck Route
- RCI Project Here Was Paused
- Vital Access Point (Per Public Comments)
- County Wants an Interchange
- ICC=1.09, ICF = 2.03



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
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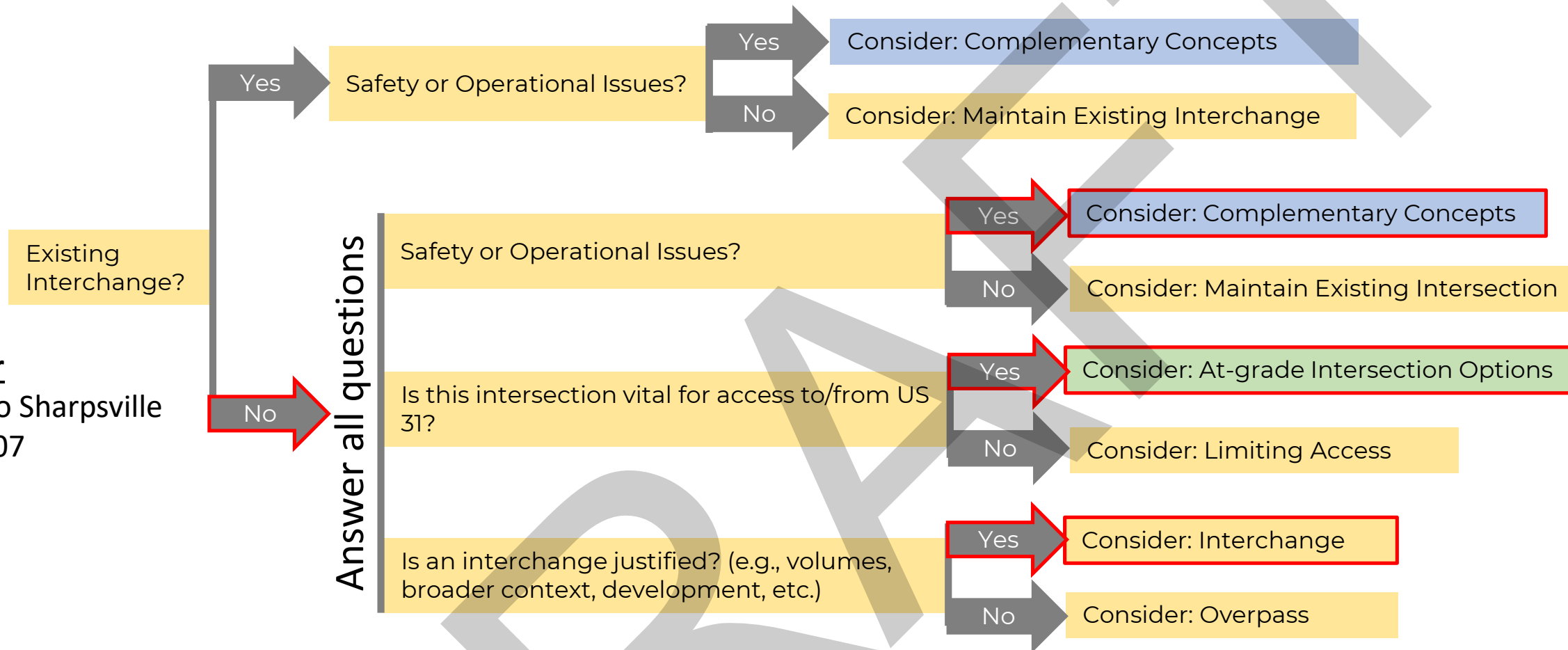
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & CR 550 N

### Factors to Consider

- Primary Access to Sharpsville
- ICC=0.24, ICF=0.07



<b>US 31 South Complementary Concepts*</b>
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

<b>US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)</b>	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

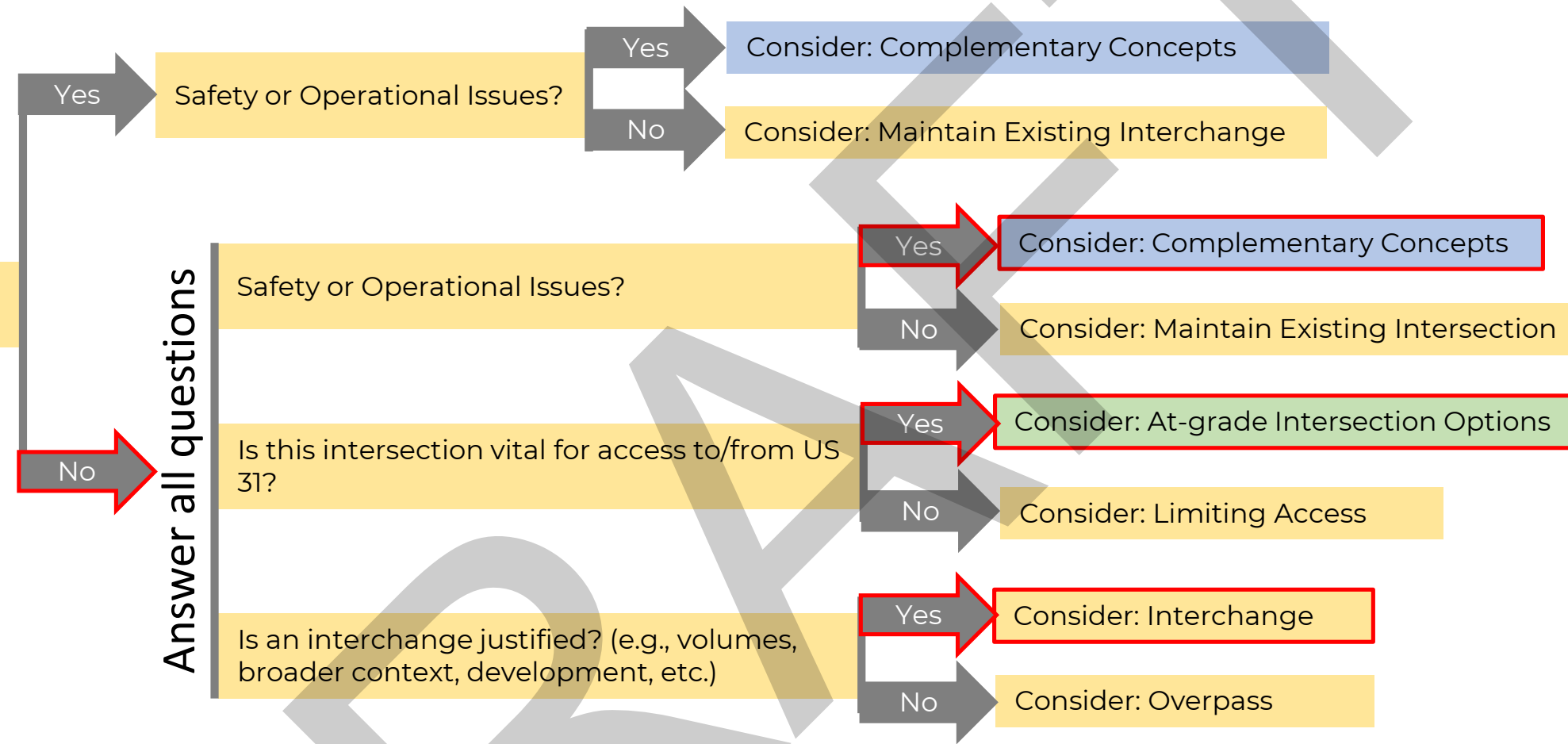
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & SR 18

### Factors to Consider

- Provides Access to Galveston
- High E-W Volumes
- Major E-W Route for Farm Trucks (Per Public)
- Interchange Previously Planned Here
- ICC=1.87, ICF=0.70



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

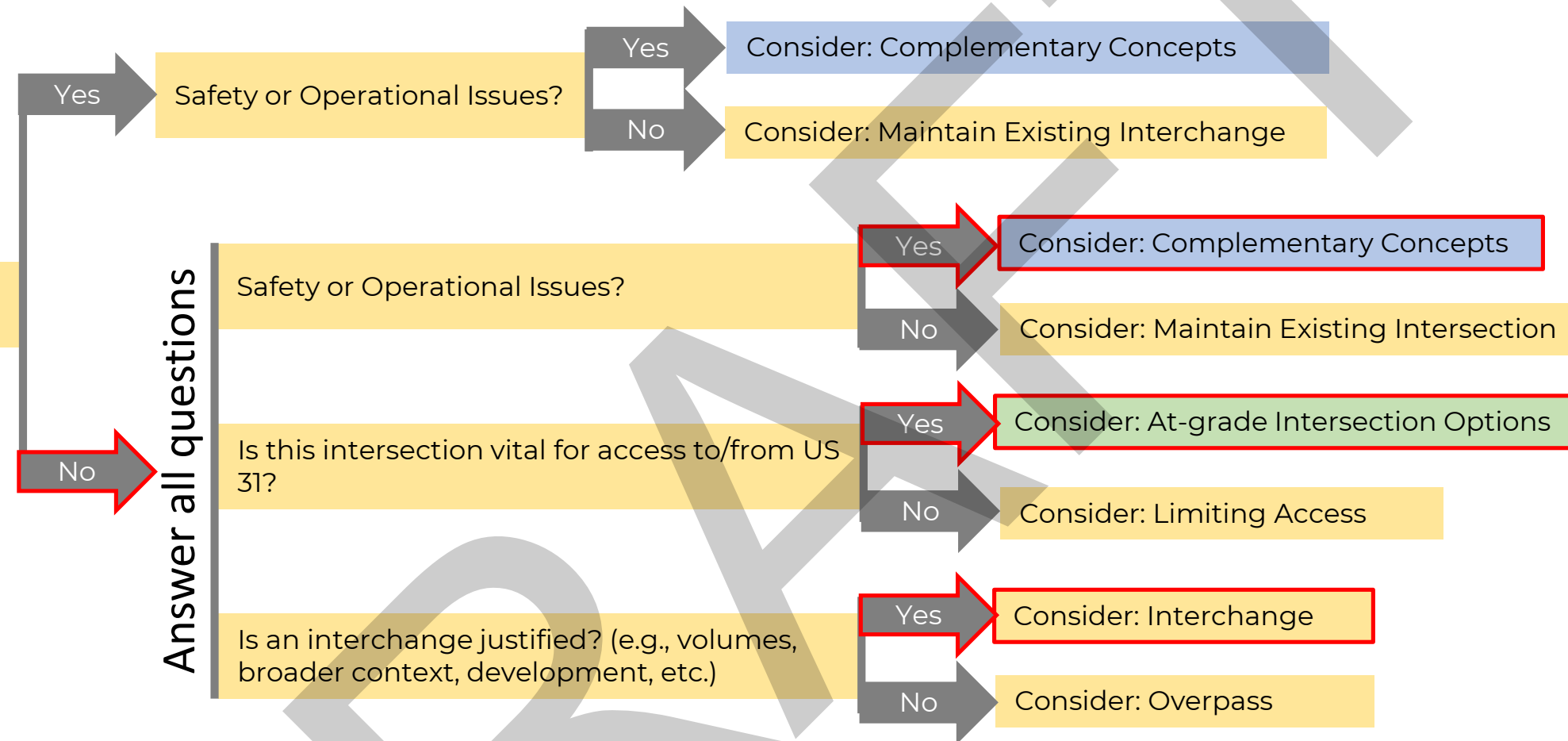
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & CR 800 S

### Factors to Consider

- Provides Access to Maconaquah Schools & Grissom Aeroplex
- County Wants Interchange
- ICC & ICF < 0.5
- Lots of Public Interest



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

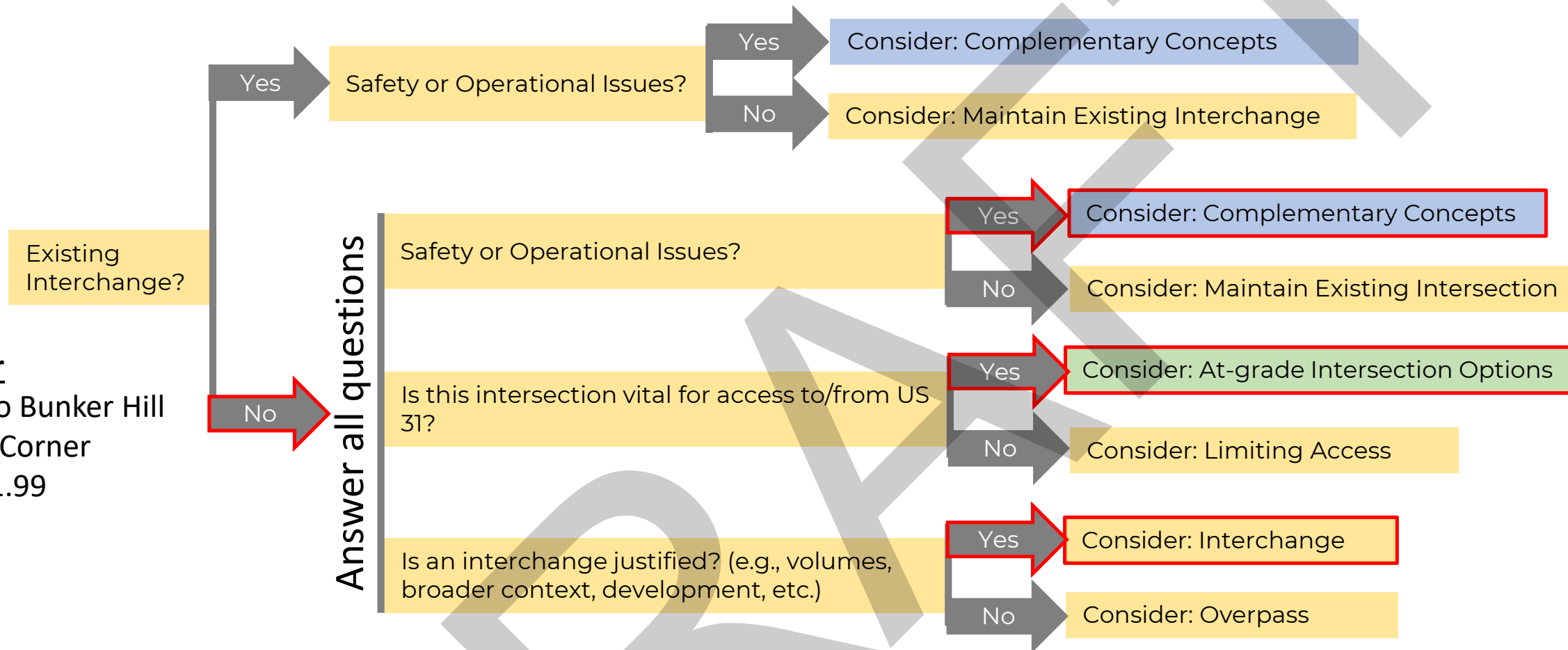


# Rationale for Evaluating Intersections

## US 31 & SR 218 S

### Factors to Consider

- Primary Access to Bunker Hill
- Truck Stop in NE Corner
- ICC=1.57 & ICF=1.99



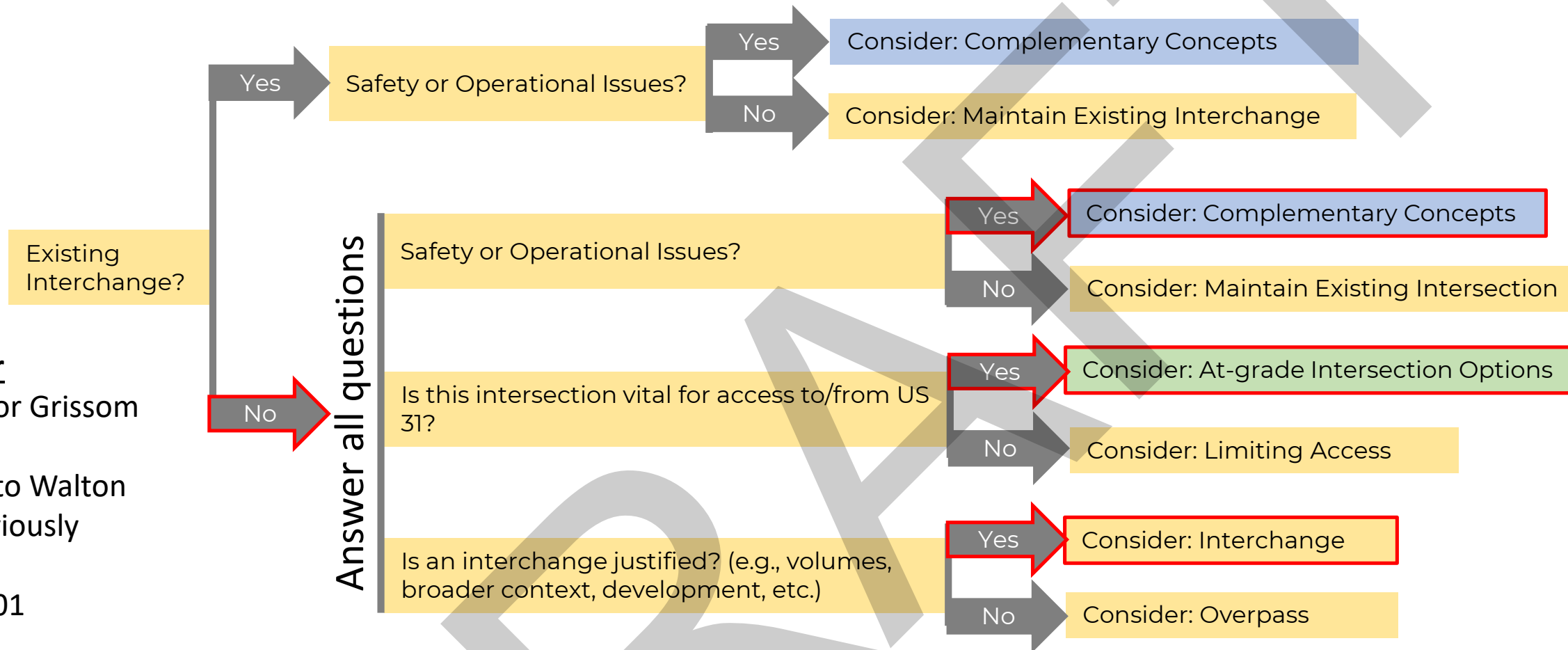
- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & SR 218 N



### Factors to Consider

- Primary Access for Grissom AFB
- Provides Access to Walton
- Interchange Previously Planned Here
- ICC=1.67, ICF=3.01

- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

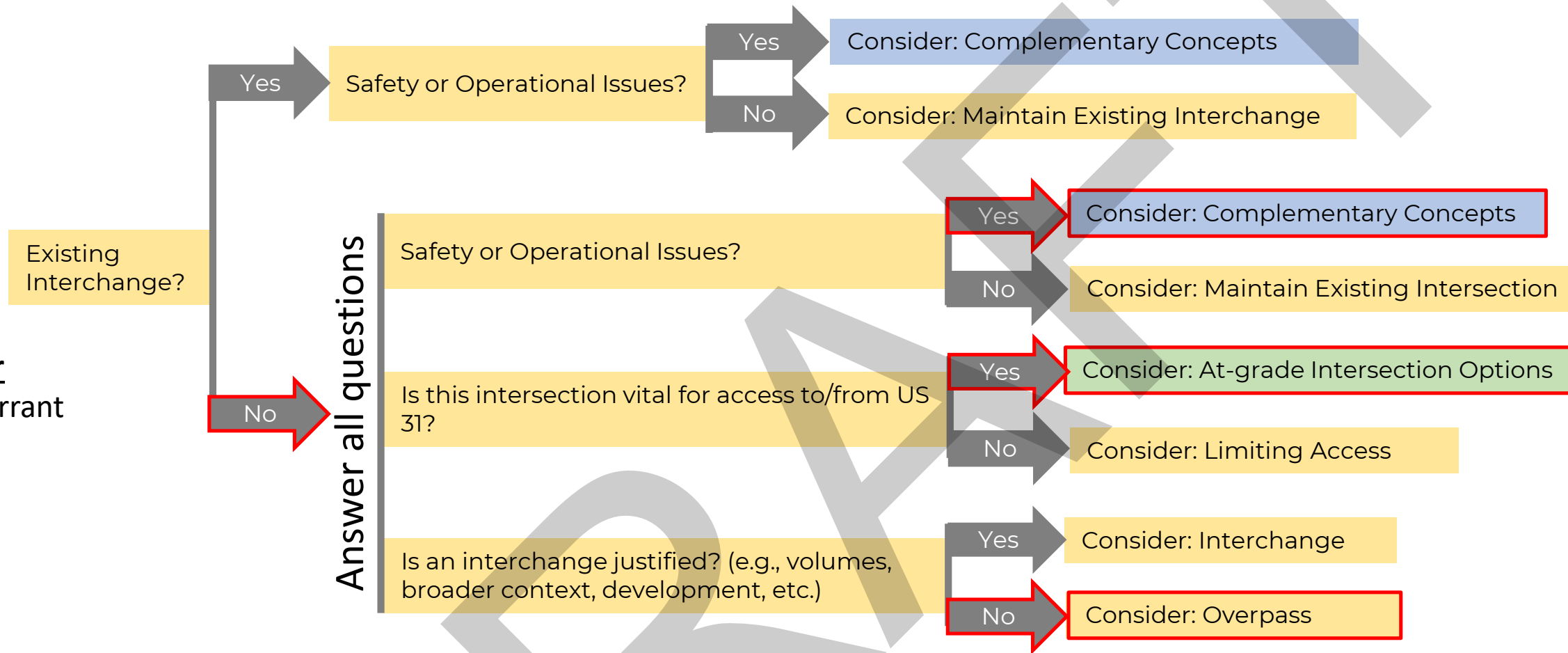
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & CR 500 S

### Factors to Consider

- Meets Signal Warrant
- ICC & ICF = 1.21



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

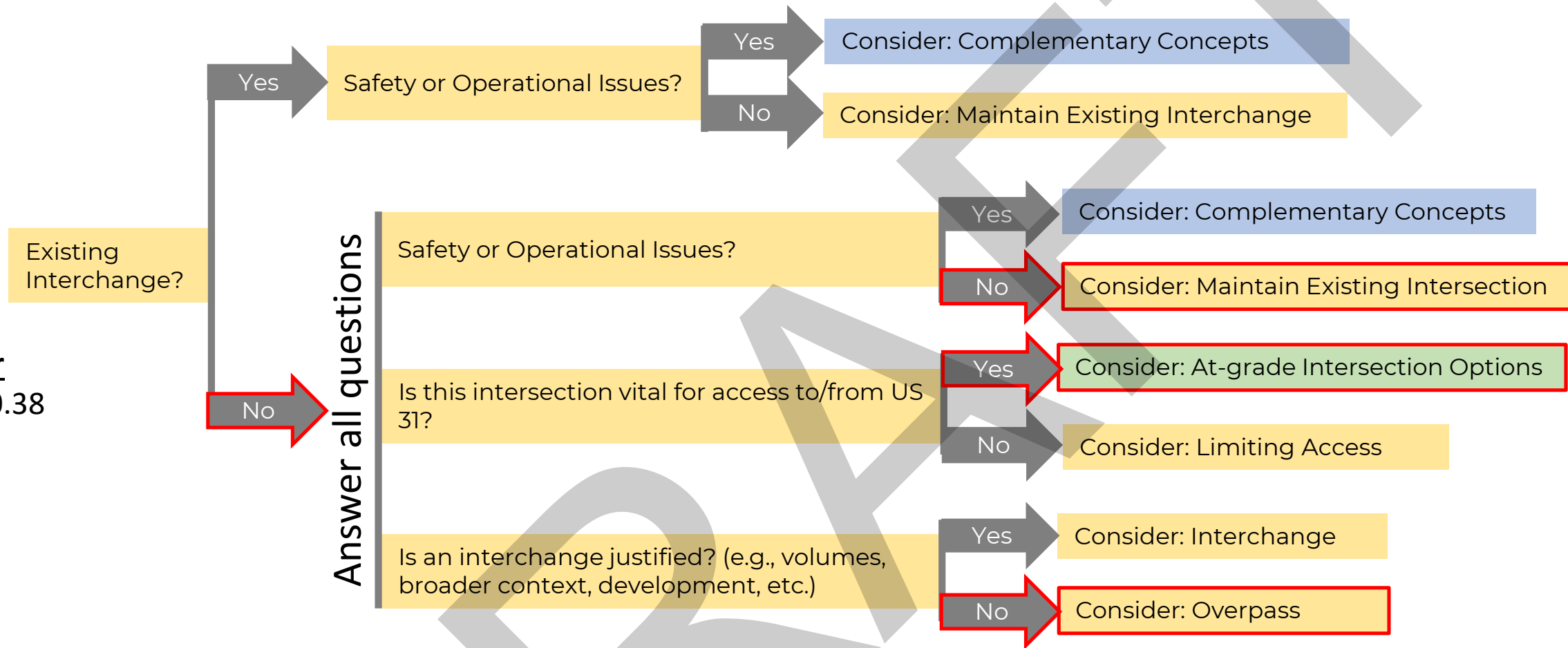
US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & CR 400S

- Factors to Consider**
- ICC=-0.75, ICF=-0.38



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

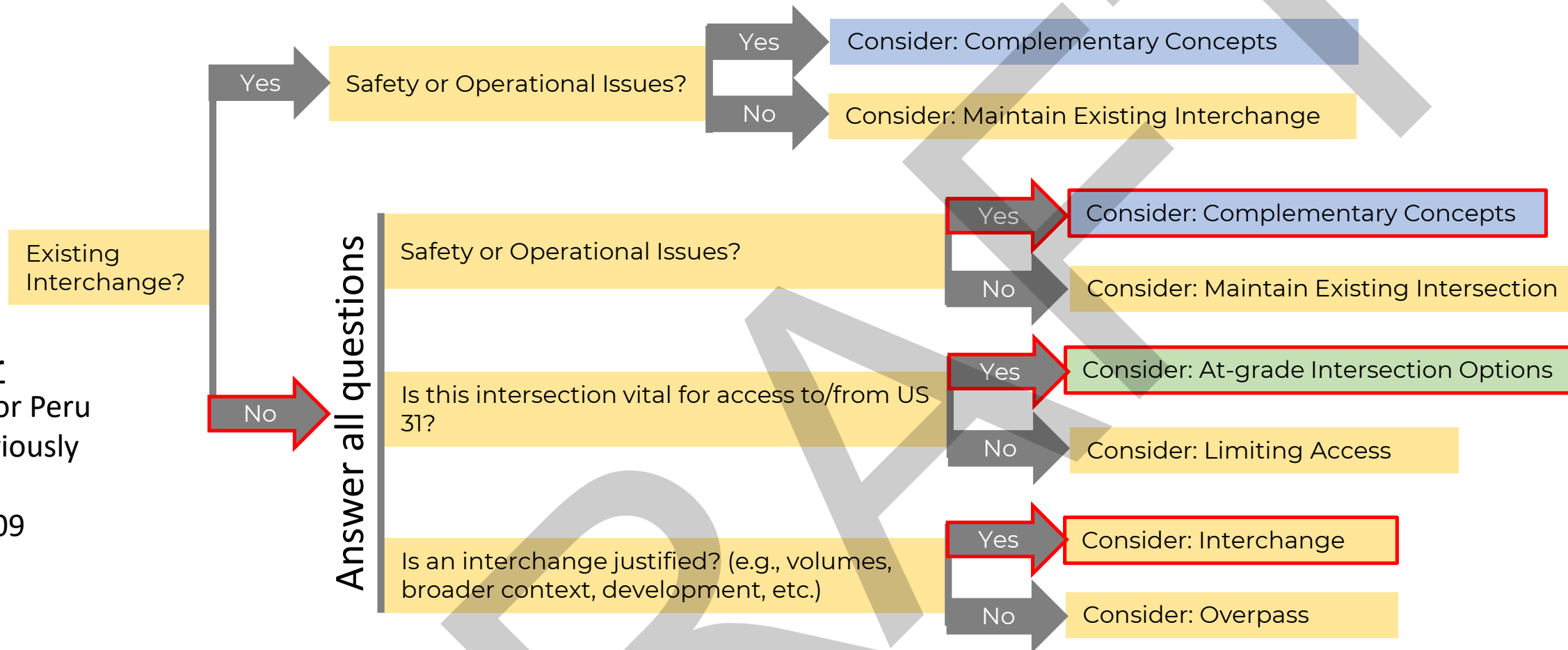


# Rationale for Evaluating Intersections

## US 31 & Business 31

### Factors to Consider

- Primary Access for Peru
- Interchange Previously Planned Here
- ICC=0.09, ICF=2.09



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

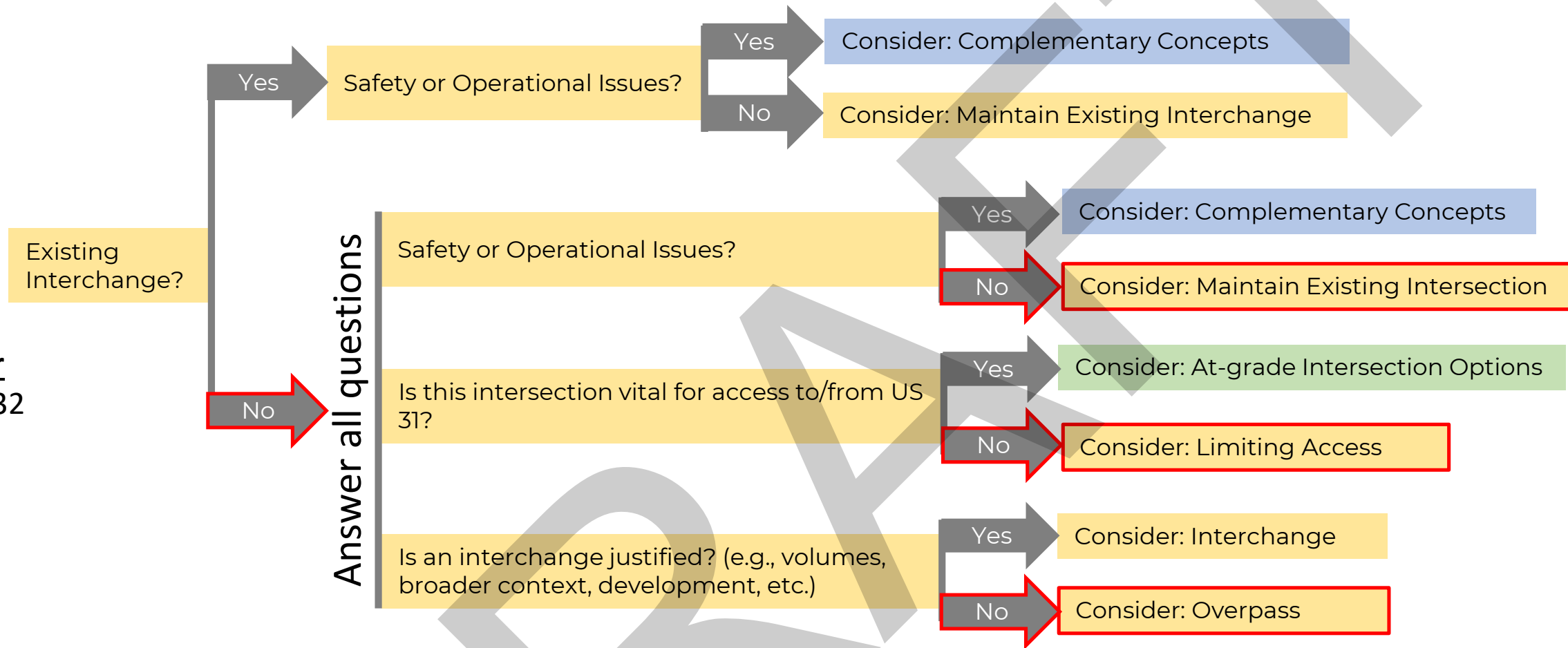
US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & Airport Rd

**Factors to Consider**  
 • ICC=0.46, ICF=0.32



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

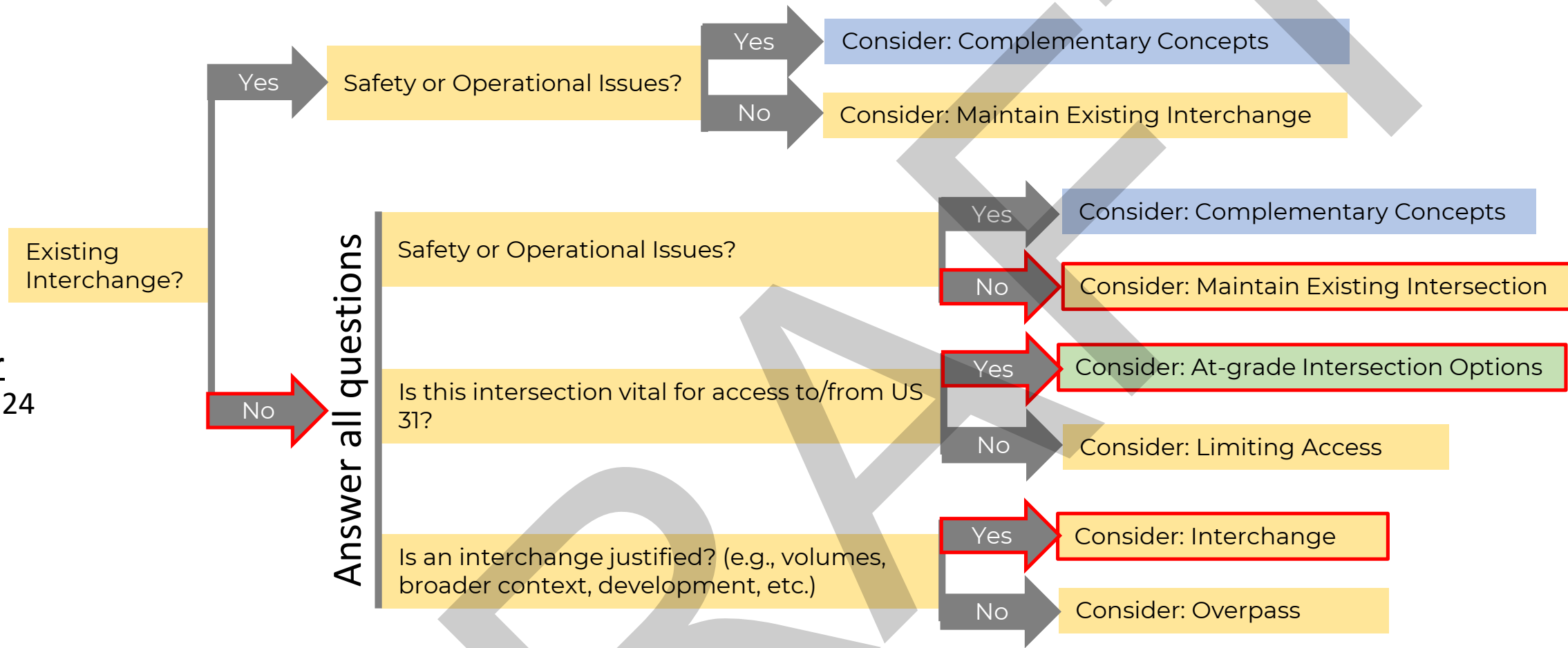
US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & Logansport Rd

**Factors to Consider**  
 • ICC=0.68, ICF=-0.24



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

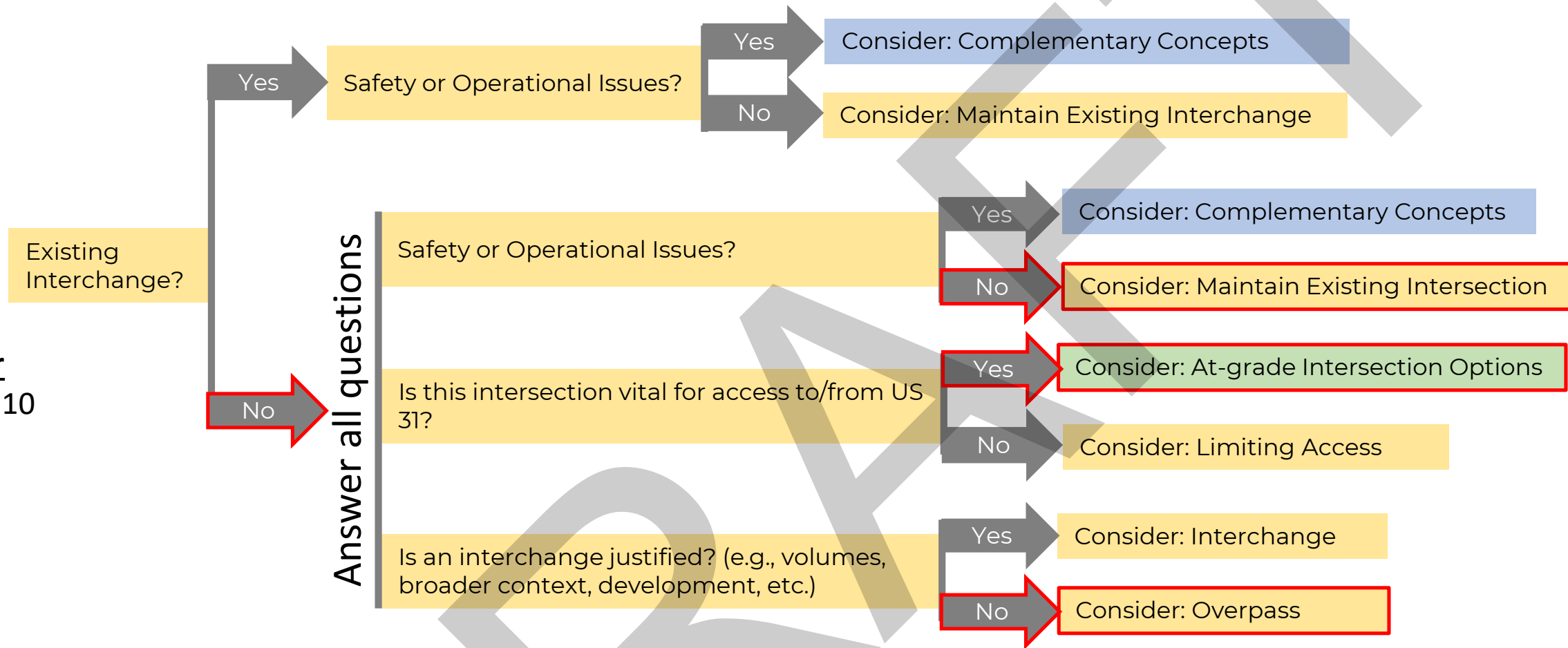
US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & Blair Pike Rd

**Factors to Consider**  
 • ICC=0.19, ICF=-0.10



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.

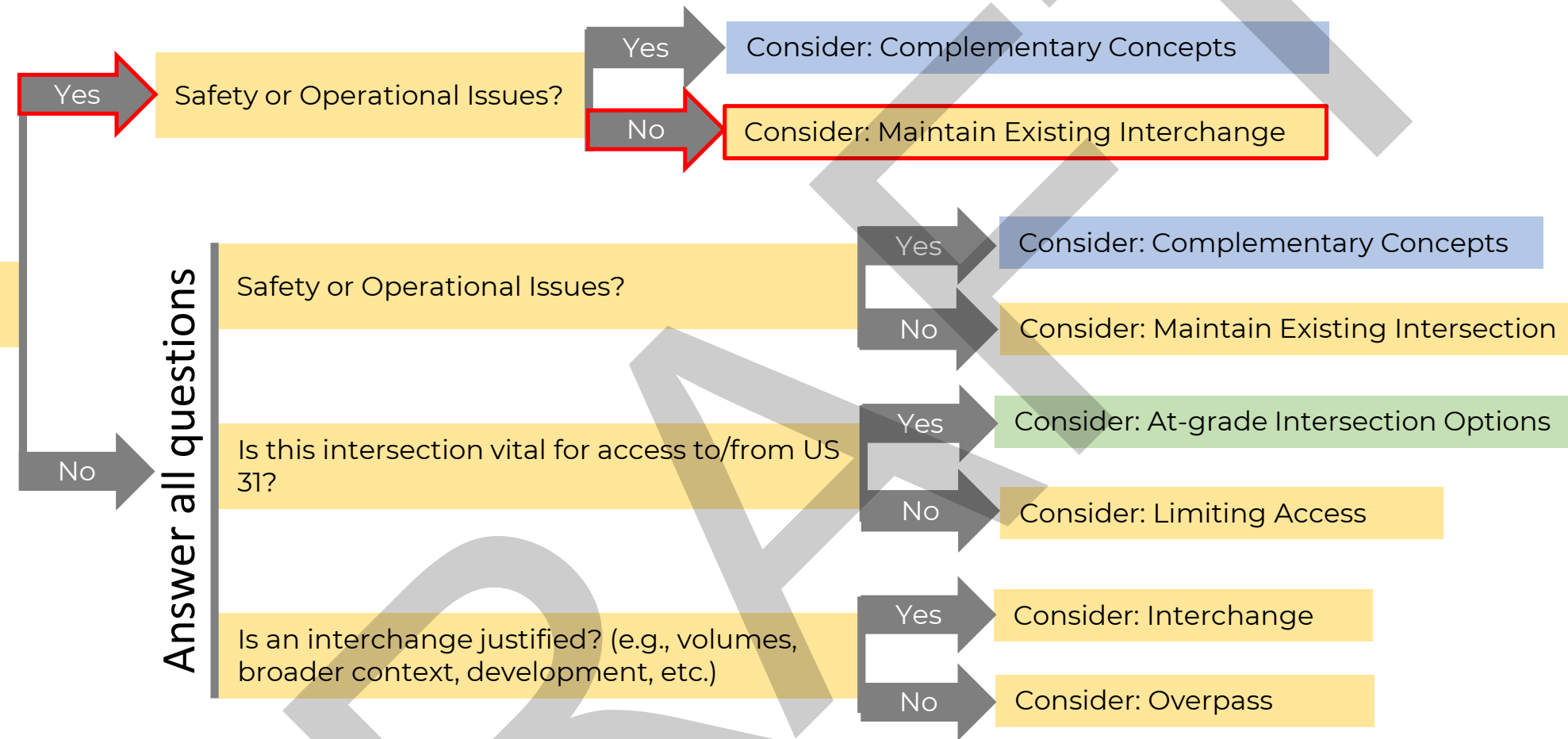


# Rationale for Evaluating Intersections

## US 31 & US 24

### Factors to Consider

- Merge & diverge areas operate at LOS B or better in design year
- ICF=-0.42, ICC=0.41



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

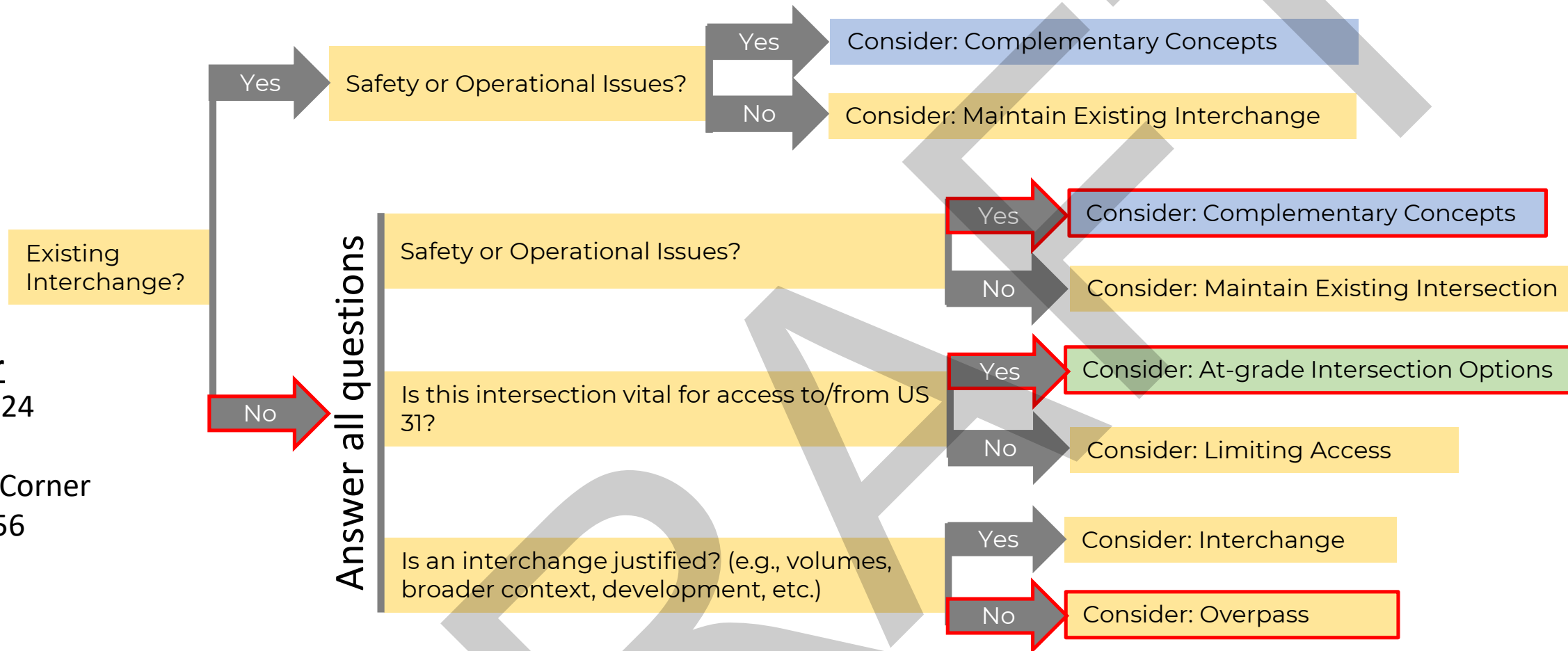
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & CR 100 N

### Factors to Consider

- Very Close to US 24 Interchange
- Truck Stop in NE Corner
- ICC=2.39, ICF=0.56



- US 31 South Complementary Concepts\***
- Aux Lanes
  - Signal Timing Updates
  - Add/lengthen turn lanes
  - Acceleration lanes
  - Signalized Intersection Improvements
  - Ramp Terminal Improvements
  - Roadway Lighting
  - Warning Systems
  - Freight Priority Signal System

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<p><b>Signalized (Meets signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<p><b>Unsignalized (Does not meet signal warrants)</b></p> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

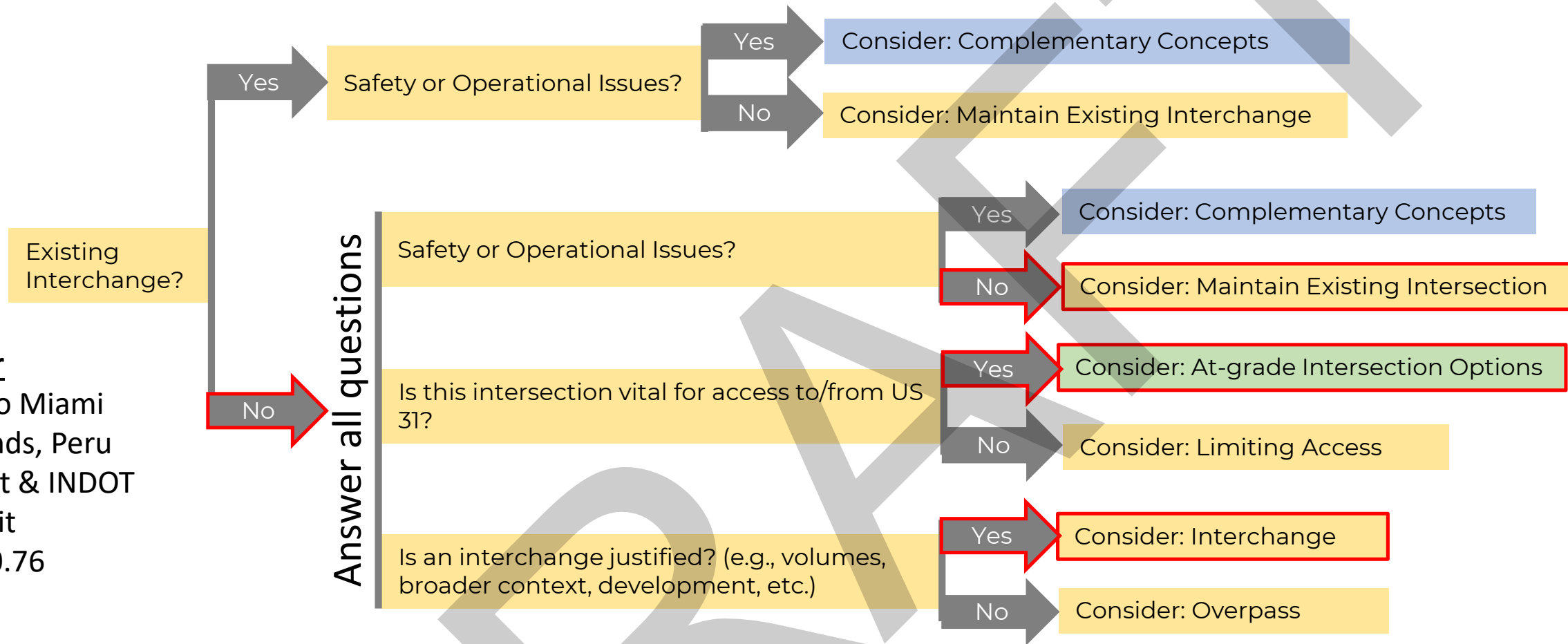
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## US 31 & CR 200 N

### Factors to Consider

- Primary Access to Miami County Fairgrounds, Peru Municipal Airport & INDOT Maintenance Unit
- ICC=-0.19, ICF=-0.76



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<b>Signalized (Meets signal warrants)</b> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left-Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<b>Unsignalized (Does not meet signal warrants)</b> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

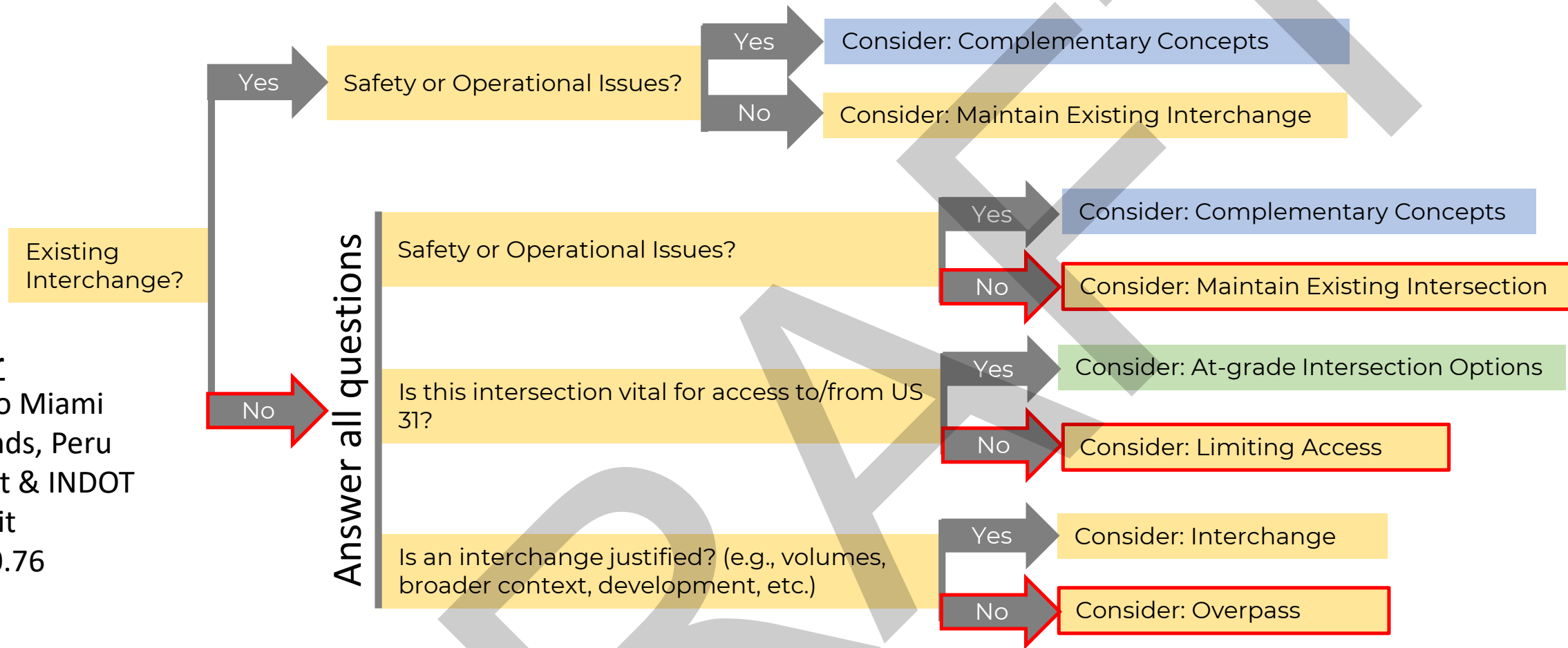
\* Concepts in these sections are specific to each study area.

# Rationale for Evaluating Intersections

## Secondary Intersections

### Factors to Consider

- Primary Access to Miami County Fairgrounds, Peru Municipal Airport & INDOT Maintenance Unit
- ICC=-0.19, ICF=-0.76



US 31 South Complementary Concepts*
<ul style="list-style-type: none"> <li>• Aux Lanes</li> <li>• Signal Timing Updates</li> <li>• Add/lengthen turn lanes</li> <li>• Acceleration lanes</li> <li>• Signalized Intersection Improvements</li> <li>• Ramp Terminal Improvements</li> <li>• Roadway Lighting</li> <li>• Warning Systems</li> <li>• Freight Priority Signal System</li> </ul>

US 31 South At-grade Intersection Options* (To Be Evaluated Using Cap-X)	
<b>Signalized (Meets signal warrants)</b> <ul style="list-style-type: none"> <li>• Conventional Signal</li> <li>• Median U-Turn</li> <li>• Boulevard Left (Michigan left)</li> <li>• Restricted Crossing U-turn (RCUT)</li> <li>• Displaced Left Turn</li> <li>• Jughandle</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> <li>• Quadrant Roadway</li> </ul>	<b>Unsignalized (Does not meet signal warrants)</b> <ul style="list-style-type: none"> <li>• Two-way Stop Control</li> <li>• Full Access</li> <li>• Directional Median</li> <li>• Right-In/Right-Out</li> <li>• Median U-Turn</li> <li>• Restricted Crossing Intersection (RCI)</li> <li>• Roundabout</li> <li>• Offset T-intersection</li> <li>• Green T-intersection</li> </ul>

\* Concepts in these sections are specific to each study area.



# APPENDIX B: PRELIMINARY CAPACITY ANALYSIS RESULTS

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## NOTES ON INTERSECTION CONCEPT NOMENCLATURE

FHWA's CAP-X tool uses slightly different nomenclature for intersection types than INDOT. In CAP-X, a Median U-Turn intersection equates to what INDOT calls a Boulevard Left turn intersection. The Partial Median U-Turn intersection in CAP-X is equivalent to what INDOT refers to as a Boulevard Left Turn intersection with Cross-Street Lefts. The Signalized Restricted Crossing U-turn (RCUT) intersection in CAP-X equates to what INDOT calls and RCUT intersection. The Unsignalized RCUT intersection in CAP-X is what INDOT refers to as a Restricted Crossing Intersection (RCI) with Mainline Lefts.

**Table 1** shows the treatment name used in CAP-X and the equivalent name as used by INDOT. For all intersection types, CAP-X and INDOT use the same name. This report will refer to the intersection types using the names that INDOT uses.

*Table 1 – Intersection Type Equivalency Table*

Intersection Type	
CAP-X	INDOT
Median U-Turn	Boulevard Left Turn
Partial Median U-Turn	Boulevard Left Turn with Cross-Street Lefts
Signalized Restricted Crossing U-Turn (Signalized RCUT)	Restricted Crossing U-Turn (RCUT)
Unsignalized RCUT	Restricted Crossing Intersection (RCI) with Mainline Lefts

## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	296th Street
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	3	6	16	10.00%	0.00%
Westbound	0	82	3	13	1.00%	0.00%
Southbound	0	15	1325	3	16.00%	0.00%
Northbound	0	1	982	20	9.00%	0.00%
Adjustment Factor	0.80	0.95	/	0.85	/	/
Suggested	<b>0.80</b>	<b>0.95</b>	/	<b>0.85</b>	/	/
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.46	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.49	2	Good	Excellent
Quadrant Roadway N-W	0.50	3	Good	Excellent
Traffic Signal	0.52	4	Good	Excellent
Diamond E-W	0.52	4	Good	Fair
Two-Way Stop Control N-S	13.21	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	296th Street
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	5	7	2	0.00%	0.00%
Westbound	0	16	11	20	3.00%	0.00%
Southbound	0	14	1286	3	8.00%	0.00%
Northbound	0	10	1528	94	12.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway N-W	0.50	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.52	2	Good	Excellent
Traffic Signal	0.53	3	Good	Excellent
Diamond E-W	0.54	4	Good	Fair
Unsignalized Restricted Crossing U-Turn N-S	0.61	5	Good	Excellent
Two-Way Stop Control N-S	22.00	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	Division Road
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	14	32	27	9.00%	0.00%
Westbound	0	34	18	46	14.00%	0.00%
Southbound	0	46	1278	14	13.00%	0.00%
Northbound	0	1	1077	15	9.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway N-E	0.44	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.46	2	Good	Excellent
Traffic Signal	0.49	3	Good	Excellent
Diamond E-W	0.49	3	Good	Fair
Unsignalized Restricted Crossing U-Turn N-S	0.74	5	Good	Excellent
Two-Way Stop Control N-S	2.19	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	Division Road
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	18	27	20	4.00%	0.00%
Westbound	0	15	32	80	8.00%	0.00%
Southbound	0	43	1413	18	9.00%	0.00%
Northbound	1	14	1403	36	13.00%	0.00%
Adjustment Factor	0.80	0.95	/	0.85	/	/
Suggested	<b>0.80</b>	<b>0.95</b>	/	<b>0.85</b>	/	/
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions





### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway N-E	0.52	1	Good	Excellent
Diamond E-W	0.53	2	Good	Fair
Signalized Restricted Crossing U-Turn N-S Traffic Signal	0.54	3	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.58	4	Good	Excellent
Two-Way Stop Control N-S	1.55	5	Good	Excellent
--	5.40	6	Fair	Good
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# Capacity Analysis for Planning of Junctions

## Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 550 N
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	2	0	3	0.00%	0.00%
Westbound	0	19	0	14	0.00%	0.00%
Southbound	1	14	1085	6	17.00%	0.00%
Northbound	0	5	993	0	10.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

# Capacity Analysis for Planning of Junctions

## Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.16	1	Good	Excellent
Quadrant Roadway S-E	0.37	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.37	2	Good	Excellent
Traffic Signal	0.39	4	Good	Excellent
Diamond E-W	0.40	5	Good	Fair
Two-Way Stop Control N-S	1.14	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 550 N
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	6	1	0	0.00%	0.00%
Westbound	0	2	1	48	2.00%	0.00%
Southbound	0	28	1244	10	11.00%	0.00%
Northbound	0	7	1354	1	15.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway S-E	0.46	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.47	2	Good	Excellent
Diamond E-W	0.49	3	Good	Fair
Traffic Signal	0.51	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.52	5	Good	Excellent
Two-Way Stop Control N-S	1.52	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	SR 18
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	65	40	27	19.00%	0.00%
Westbound	0	55	35	76	13.00%	0.00%
Southbound	0	28	1028	18	18.00%	0.00%
Northbound	0	16	830	56	12.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway S-E	0.42	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.46	2	Good	Excellent
Diamond E-W	0.47	3	Good	Fair
Traffic Signal	0.49	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	1.15	5	Good	Excellent
Two-Way Stop Control N-S	1.75	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	SR 18
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

### Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	40	65	22	17.00%	0.00%
Westbound	0	43	47	77	19.00%	0.00%
Southbound	0	52	1343	60	10.00%	0.00%
Northbound	0	38	1336	90	15.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway S-E	0.50	1	Good	Excellent
Diamond E-W	0.56	2	Good	Fair
Signalized Restricted Crossing U-Turn N-S	0.57	3	Good	Excellent
Traffic Signal	0.61	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	2.42	5	Good	Excellent
Two-Way Stop Control N-S	16.60	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 800 S
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	9	0	9	36.00%	0.00%
Westbound	0	43	0	67	7.00%	0.00%
Southbound	0	114	1103	22	19.00%	0.00%
Northbound	0	16	823	57	14.00%	0.00%
Adjustment Factor	0.80	0.95	/	0.85	/	/
Suggested	<b>0.80</b>	<b>0.95</b>	/	<b>0.85</b>	/	/
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway N-E	0.41	1	Good	Excellent
Diamond E-W	0.43	2	Good	Fair
Signalized Restricted Crossing U-Turn N-S	0.44	3	Good	Excellent
Traffic Signal	0.45	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.47	5	Good	Excellent
Two-Way Stop Control N-S	5.45	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 800 S
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	23	0	20	16.00%	0.00%
Westbound	0	72	0	82	9.00%	0.00%
Southbound	0	43	1181	10	9.00%	0.00%
Northbound	0	7	1300	60	15.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Diamond E-W	0.50	1	Good	Fair
Quadrant Roadway N-E	0.51	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.53	3	Good	Excellent
Traffic Signal	0.54	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	1.67	5	Good	Excellent
Two-Way Stop Control N-S	15.46	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	SR 218 S / W Broadway St
Date:	2045 AM
Number of Intersection Legs:	3
Which leg is the minor street?:	E

### Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	0	0	0.00%	0.00%
Westbound	0	41	0	64	2.00%	0.00%
Southbound	0	60	1059	0	16.00%	0.00%
Northbound	0	2	734	22	12.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Continuous Green T E	0.30	1	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.34	2	Good	Excellent
Traffic Signal	0.38	3	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.39	4	Good	Excellent
Diamond E-W	0.40	5	Good	Fair
Two-Way Stop Control N-S	1.23	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	SR 218 S / W Broadway St
Date:	2045 PM
Number of Intersection Legs:	3
Which leg is the minor street?:	E

### Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	0	0	0.00%	0.00%
Westbound	0	24	0	53	8.00%	0.00%
Southbound	0	67	945	0	11.00%	0.00%
Northbound	0	1	1135	27	14.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level		Low				
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions





### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Signalized Restricted Crossing U-Turn N-S	0.41	1	Good	Excellent
Traffic Signal	0.43	2	Good	Excellent
Continuous Green T E	0.43	2	Good	Excellent
Diamond E-W	0.43	2	Good	Fair
Unsignalized Restricted Crossing U-Turn N-S	0.57	5	Good	Excellent
Two-Way Stop Control N-S	1.42	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	SR 218 N
Date:	2045 AM
Number of Intersection Legs:	3
Which leg is the minor street?:	W

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	106	0	88	9.00%	0.00%
Westbound	0	0	0	0	0.00%	0.00%
Southbound	0	1	1073	79	20.00%	0.00%
Northbound	0	25	832	0	12.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Continuous Green T W	0.45	1	Good	Excellent
Diamond E-W	0.45	1	Good	Fair
Traffic Signal	0.46	3	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.50	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	1.46	5	Good	Excellent
Two-Way Stop Control N-S	4.06	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	SR 218 N
Date:	2045 PM
Number of Intersection Legs:	3
Which leg is the minor street?:	W

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	178	0	46	8.00%	0.00%
Westbound	0	0	0	0	0.00%	0.00%
Southbound	0	1	1219	148	11.00%	0.00%
Northbound	2	65	1338	0	15.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Diamond E-W	0.52	1	Good	Fair
Continuous Green T W	0.55	2	Good	Excellent
Traffic Signal	0.56	3	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.58	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	1.83	5	Good	Excellent
Two-Way Stop Control N-S	28.21	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 500 S
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	10	9	18	14.00%	0.00%
Westbound	0	59	11	13	5.00%	0.00%
Southbound	0	20	1061	16	19.00%	0.00%
Northbound	0	10	897	27	13.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.39	1	Good	Excellent
Quadrant Roadway N-W	0.40	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.41	3	Good	Excellent
Traffic Signal	0.44	4	Good	Excellent
Two-Way Stop Control N-S	6.40	5	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 500 S
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

### Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	20	18	16	24.00%	0.00%
Westbound	0	65	20	11	1.00%	0.00%
Southbound	1	13	1275	28	11.00%	0.00%
Northbound	0	16	1418	112	16.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway N-W	0.51	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.53	2	Good	Excellent
Traffic Signal	0.56	3	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	1.13	4	Good	Excellent
Two-Way Stop Control N-S	4.08	5	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	US 31 Business Road
Date:	2045 AM
Number of Intersection Legs:	3
Which leg is the minor street?:	E

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	0	0	0.00%	0.00%
Westbound	0	295	0	33	2.00%	0.00%
Southbound	0	7	694	0	20.00%	0.00%
Northbound	0	1	640	163	19.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level		Low				
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Continuous Green T E	0.40	1	Good	Excellent
Traffic Signal	0.42	2	Good	Excellent
Diamond E-W	0.43	3	Good	Fair
Signalized Restricted Crossing U-Turn N-S	0.44	4	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.96	5	Good	Excellent
Two-Way Stop Control N-S	3.22	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	US 31 Business Road
Date:	2045 PM
Number of Intersection Legs:	3
Which leg is the minor street?:	E

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	0	0	0.00%	0.00%
Westbound	0	248	0	20	2.00%	0.00%
Southbound	0	6	800	0	10.00%	0.00%
Northbound	1	0	976	381	20.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Traffic Signal	0.49	1	Good	Excellent
Continuous Green T E	0.49	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.50	3	Good	Excellent
Diamond E-W	0.50	3	Good	Fair
Unsignalized Restricted Crossing U-Turn N-S	1.47	5	Good	Excellent
Two-Way Stop Control N-S	5.53	6	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	Ramp to Logansport Rd
Date:	2045 AM
Number of Intersection Legs:	3
Which leg is the minor street?:	W

### Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	0	49	10.00%	0.00%
Westbound	0	0	0	0	0.00%	0.00%
Southbound	0	1	661	34	21.00%	0.00%
Northbound	1	65	643	0	19.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.17	1	Good	Excellent
Two-Way Stop Control N-S	0.22	2	Fair	Good
Signalized Restricted Crossing U-Turn N-S	0.27	3	Good	Excellent
Traffic Signal	0.28	4	Good	Excellent
Continuous Green T W	0.28	4	Good	Excellent
Diamond E-W	0.28	4	Good	Fair
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	Ramp to Logansport Rd
Date:	2045 PM
Number of Intersection Legs:	3
Which leg is the minor street?:	W

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	0	52	12.00%	0.00%
Westbound	0	0	0	0	0.00%	0.00%
Southbound	0	1	809	26	12.00%	0.00%
Northbound	0	67	964	0	19.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions





### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.22	1	Good	Excellent
Continuous Green T W	0.31	2	Good	Excellent
Two-Way Stop Control N-S	0.32	3	Fair	Good
Traffic Signal	0.33	4	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.34	5	Good	Excellent
Diamond E-W	0.39	6	Good	Fair
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# Capacity Analysis for Planning of Junctions

## Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	Blaire Pike Rd / W Division Rd
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	0	2	5	0.00%	0.00%
Westbound	0	22	3	23	10.00%	0.00%
Southbound	2	20	686	0	22.00%	0.00%
Northbound	0	2	604	36	20.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

# Capacity Analysis for Planning of Junctions

## Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.15	1	Good	Excellent
Quadrant Roadway S-E	0.26	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.26	2	Good	Excellent
Traffic Signal	0.27	4	Good	Excellent
Two-Way Stop Control N-S	0.41	5	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	Blaire Pike Rd / W Division Rd
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	1	3	0	0.00%	0.00%
Westbound	0	27	9	59	1.00%	0.00%
Southbound	0	17	801	0	12.00%	0.00%
Northbound	0	5	942	15	20.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway S-E	0.35	1	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.38	2	Good	Excellent
Traffic Signal	0.39	3	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.48	4	Good	Excellent
Two-Way Stop Control N-S	0.97	5	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 100 N
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	6	2	9	27.00%	0.00%
Westbound	0	93	7	71	30.00%	0.00%
Southbound	0	63	471	3	26.00%	0.00%
Northbound	0	8	436	84	24.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	<b>0.80</b>	<b>0.95</b>		<b>0.85</b>		
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level		Low				
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway S-W	0.27	1	Good	Excellent
Traffic Signal	0.29	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.30	3	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.54	4	Good	Excellent
Two-Way Stop Control N-S	1.60	5	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 100 N
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	3	8	6	0.00%	0.00%
Westbound	0	81	5	86	28.00%	0.00%
Southbound	0	61	508	3	18.00%	0.00%
Northbound	0	17	633	79	18.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level		Low				
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Quadrant Roadway S-W	0.30	1	Good	Excellent
Traffic Signal	0.34	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.35	3	Good	Excellent
Unsignalized Restricted Crossing U-Turn N-S	0.73	4	Good	Excellent
Two-Way Stop Control N-S	2.17	5	Fair	Good
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 200 N
Date:	2045 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

### Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	11	10	2	5.00%	0.00%
Westbound	0	9	9	5	28.00%	0.00%
Southbound	0	6	587	2	29.00%	0.00%
Northbound	0	1	481	22	24.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
Multimodal Activity Level		Low				
Critical Lane Volume Threshold	2-phase signal	Suggested = 1800 (Urban), 1650 (Rural)			1800	
	3-phase signal	Suggested = 1750 (Urban), 1600 (Rural)			1750	
	4-phase signal	Suggested = 1700 (Urban), 1550 (Rural)			1700	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.08	1	Good	Excellent
Two-Way Stop Control N-S	0.21	2	Fair	Good
Quadrant Roadway S-E	0.23	3	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.23	3	Good	Excellent
Traffic Signal	0.24	5	Good	Excellent
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## Capacity Analysis for Planning of Junctions

### Summary Report

Project Name:	US 31 South PEL Studies
Project Number:	2100113
Location:	CR 200 N
Date:	2045 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	3	2	1	17.00%	0.00%
Westbound	0	20	10	6	17.00%	0.00%
Southbound	0	3	661	3	15.00%	0.00%
Northbound	0	1	902	18	20.00%	0.00%
Adjustment Factor	0.80	0.95	/	0.85	/	/
Suggested	<b>0.80</b>	<b>0.95</b>	/	<b>0.85</b>	/	/
Truck to PCE Factor				<b>Suggested = 2.00</b>	2.00	
Multimodal Activity Level			Low			
Critical Lane Volume Threshold	2-phase signal	<b>Suggested = 1800 (Urban), 1650 (Rural)</b>			<b>1800</b>	
	3-phase signal	<b>Suggested = 1750 (Urban), 1600 (Rural)</b>			<b>1750</b>	
	4-phase signal	<b>Suggested = 1700 (Urban), 1550 (Rural)</b>			<b>1700</b>	

## Capacity Analysis for Planning of Junctions

### Summary Report

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
Unsignalized Restricted Crossing U-Turn N-S	0.22	1	Good	Excellent
Quadrant Roadway S-E	0.32	2	Good	Excellent
Signalized Restricted Crossing U-Turn N-S	0.33	3	Good	Excellent
Traffic Signal	0.34	4	Good	Excellent
Two-Way Stop Control N-S	0.62	5	Fair	Good
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# APPENDIX C: DESIGN ASSUMPTIONS AND PREFERENCES

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DRAFT

# MEMORANDUM

Date: 08/15/2023

To: Sandra Flum, Jonathan Wallace, Dan McCoy (INDOT)

CC: Adin McCann and Dan Miller (HNTB)

From: Jen Goins and Ryan Huebschman (HNTB)



## US 31 South Design Criteria and Preferences

The intent of this memorandum is to outline the design criteria and preferences for conceptual design to be used in the US 31 South PEL study. The main design criteria and preferences for US 31 are described below to guide the conceptual design efforts of this study. Several of these topics have been discussed to date in ProPEL US 30/31 Technical Working Group meetings.

Since sections of US 30 and US 31 are being prepared by four different consultants, it is important that these design criteria and preferences are agreed upon prior to beginning conceptual design efforts to facilitate consistency in the approach. While this memo focuses on the US 31 South study area, much of its content is believed to be applicable to the other study areas in the ProPEL US 30/31 studies.

### DESIGN CRITERIA

US 31 design criteria for three separate scenarios from the Indiana Design Manual (IDM) are necessary for this study. The three design criteria utilized were Rural Arterial 3R (IDM Fig 55-3A), Rural Freeway 3R (IDM Fig 54-2A), and Rural Freeway New Construction (IDM Fig 53-1). The design criteria from the IDM are included in Attachment A. The anticipated US 31 proposed roadway typical sections can be found in Attachment B. These each serve different purposes within the study as outlined below.

Table 1 – US 31 Design Criteria for Concepts

Rural Arterial 3R	Rural Freeway (3R or 4R)	Rural Freeway New Construction
<ul style="list-style-type: none"><li>• New Signalized Intersections</li><li>• Upgrades to Existing Traffic Signals</li><li>• Reduced Conflict Intersections</li><li>• Boulevard Left Intersections</li><li>• Roundabouts</li><li>• Adding or Extending Turn Lanes</li><li>• Jughandle Intersections</li><li>• Quadrant Roadways</li><li>• Right-In Right-Out and Two-Way Stop-Controlled Intersections</li></ul>	<ul style="list-style-type: none"><li>• Auxiliary Lanes</li><li>• Adding/Extending Acceleration Lanes</li><li>• Green T or Offset T Intersections</li><li>• Displaced Left Turn Intersections</li><li>• Modifications to Existing Interchange Ramps or Ramp Terminals</li></ul>	<ul style="list-style-type: none"><li>• New Interchange</li><li>• New Overpass/Underpass</li><li>• Freeway</li></ul>

Other existing roadways within the study area should use 4R design criteria for the appropriate functional classification as provided in Chapter 54 of the IDM. New local access roads should use design criteria for rural local roads provided in Chapter 53 of the IDM.

US 31 is designated as a Tier 1 facility per the INDOT Access Classification System. The type and spacing of driveways,

intersections and interchanges are governed by current access management and driveway permitting guidelines along with IDM Chapters 46 and 48. These guidelines are summarized in the Table 2. These guidelines have been expanded to apply to freeways and expressways, which may be considered in this study.

Table 2 Access Management Guidelines

Facility Type	Driveways	Unsignalized Intersections	Signalized Intersections	Interchanges
Arterials	<ul style="list-style-type: none"> <li>Residential: Right-In, Right-Out Only</li> <li>Commercial: Full Access (1 per parcel)</li> <li>495ft (min) spacing for all driveways for posted speed of 55mph</li> </ul>	670 ft (min) spacing	½ mile (min) spacing	<ul style="list-style-type: none"> <li>Rural: 2 miles (min) spacing</li> <li>Urban: 1 mile (min) spacing</li> </ul>
Expressways	No driveways allowed	<ul style="list-style-type: none"> <li>Right-In / Right-Out Access only</li> <li>¼ mile (min) spacing</li> </ul>	½ mile (min) spacing	<ul style="list-style-type: none"> <li>Rural: 2 miles (min) spacing</li> <li>Urban: 1 mile (min) spacing</li> </ul>
Freeways	No driveways allowed	No unsignalized intersections allowed	No signalized intersections allowed	<ul style="list-style-type: none"> <li>Rural: 2 miles (min) spacing</li> <li>Urban: 1 mile (min) spacing</li> </ul>

Additionally, the INDOT Access Management Guide specifies that median openings should exist along a Tier 1A Mobility corridor, such as US 31, where all of the following conditions exist:

- A 400 feet (min) spacing between median openings is provided;
- The median opening will improve safety;
- There is sufficient space for left turn lanes and recovery tapers; and
- The median opening will operate acceptably.

### ANTICIPATED DESIGN EXCEPTIONS

The ProPEL US 31 South study is a planning study. As a result, the US 31 South study team will not prepare or request design exceptions as part of the study; however, the study team will develop design concepts assuming some design exceptions will be requested and received as part of any reasonable alternatives advanced from the PEL study. These assumptions are detailed in this subsection.

The US 31 South study corridor has an existing median width of 50 feet. This meets the design criteria for Rural Arterials (3R) and Rural Freeway (3R or 4R) but does not meet criteria for Rural Freeway New Construction. Should alternatives requiring Rural Freeway New Construction design criteria advance beyond this PEL study, it is assumed the designer would prepare and receive a Level Two design exception for not meeting the required median width of 54.5 feet.

The right-of-way width requirements for the US 31 South corridor ranges from 188 feet (min) for Rural Arterials to 192.5 feet (min), as shown in Attachment B. These widths are based on the design criteria provided in Attachment A and clear zone requirements provided in IDM Figure 49-2A. The need for new ditches, as described in a subsequent discussion on drainage, is not accounted for in these cross sections. Existing right-of-way widths were estimated using parcel lines obtained from property appraiser websites of counties along the study corridor. This information indicates that the

existing right-of-way widths vary from 160 to 370 feet with many locations having existing right-of-way widths of 160 feet to 195 feet. Should alternatives advance beyond this PEL study that require acquisition of right-of-way to satisfy clear zone requirements, it is assumed the designer would utilize guardrail to avoid acquiring right-of-way, if possible.

Substandard superelevation rates were found for horizontal curve south of the Wabash River structures. The existing 4.2% superelevation rate is substandard compared to the required 5.6% superelevation based on the curve radius. The horizontal curves from CR 300 S / Maugans Road to the Wabash River structure are assumed to have been constructed within the same contract and it is likely that these curves will also have substandard superelevation rates. It is assumed the designer would prepare and receive a Level One design exception for these superelevation rates to avoid higher cost pavement treatments.

A substandard vertical clearance has been identified for the abandoned railroad bridge over US 31 that is present near Grissom Air Force Base. The current vertical clearance is 14'-3" while the requirement is 16'-0". Should the PEL study alternatives identify improvements in this area, it is assumed the designer would prepare and receive a Level One design exception to avoid full reconstruction of US 31 through the underpass.

## DESIGN ASSUMPTIONS

### Pavement Treatments

Pavement treatments along US 31 in the study area may vary slightly based on intersection, interchange, and corridor improvements. Table 3 below summarizes the anticipated pavements treatments according to the improvement type. All improvements with full depth widening are assumed to include resurfacing of existing pavement within the limits of the improvement.

Table 3: Pavement Treatments per Improvement Type

Resurfacing Single Lift Mill & Overlay	Full Depth Widening Multi-lift (structural) Mill & Overlay	Full Reconstruction and New Construction Full Depth Replacement
<ul style="list-style-type: none"> <li>• New Signalized Intersections</li> <li>• Upgrades to Existing Traffic Signals</li> </ul>	<ul style="list-style-type: none"> <li>• Adding or Extending Turn Lanes</li> <li>• Auxiliary Lanes</li> <li>• Added/Extending Acceleration Lanes</li> <li>• Reduced Conflict Intersections</li> <li>• Modifications to Existing Interchange Ramps or Ramp Terminals</li> <li>• Green-T or Offset-T Intersections</li> </ul>	<ul style="list-style-type: none"> <li>• Roundabouts</li> <li>• New Interchange</li> <li>• New Overpass/Underpass</li> <li>• New/Modified Local Access Road</li> <li>• Freeway</li> </ul>

### US 31 Cross Sections

In addition to the design criteria in Attachment A and the typical sections of Attachment B, the following assumptions apply to the cross section of US 31:

- All open medians should be depressed and should include cable barrier to prevent cross over crashes.
- Maximum side slope behind guardrail or beyond the clear zone will be 2:1.
- Retaining walls should be used to avoid impacts to environmentally sensitive areas (e.g., historic properties, churches, cemeteries, resources). Retaining walls should not be used to avoid impacts to commercial or residential properties, unless there are concerns associated with underserved populations.



## Crossroads

Design speed for crossing roadways will be the posted speed limit if posted within a ½ mile of US 31. If not posted, a 55 miles per hour (mph) design speed will be used.

## Right of Way Acquisition

Total takes of parcels shall be assumed when the proposed right of way line falls within 10ft of an existing house or when the remaining parcel is considered unusable.

## Drainage

The existing drainage patterns should be maintained along the corridor with the use of a roadside ditch on each side of US 31, along with a median ditch. Existing ditches are assumed to be of sufficient depth for underdrain outlet where required for pavement construction.

If no new additional impervious areas are being added, the existing drainage network is assumed to be sufficient, and no ditch modifications will be needed.

Drainage detention needs will not be analyzed as a part of the study. Runoff from additional impervious area, should be routed, via an 8-foot flat bottom ditch with 2:1 side slopes and a depth of 2 feet. Runoff should be routed to an interchange area utilized for both post construction storm water measures and to mitigate additional run-off from new impervious area, or additional right-of-way must be provided to account for post construction stormwater measures and peak flow mitigation. This applies to both existing roads with additional pavement or new local access roads.

All new or existing infrastructure must have a minimum elevation above the 100-year flood elevation (1% exceedance probability) plus an additional two feet of freeboard throughout the corridor at or near any waterbody.

Existing culverts are assumed to be extended or replaced in-kind in pavement replacement or new pavement areas.

## Bridges

It is anticipated that bridges throughout the project limits will require replacement by the time of construction occurs. The typical section of new bridges shall match that of the adjacent roadway. The length of new bridges should be sized based on the following guidelines:

- Bridge over roadways:
  - Bridges openings should, if possible, satisfy the required clear zone width for the roadway it crosses.
  - Bridges should include slope walls that eliminate the need for guardrail along the underpass roadway.
- Bridges over waterways:
  - For new bridges near an existing bridge:
    - If less than 50 feet from existing bridge, then utilize a 1:1 expansion ratio based on the distance from the existing bridge
    - If more than 50 feet from existing bridge, then utilize a 2:1 expansion ratio based on the distance from the existing bridge
  - For new bridges not near an adjacent bridge:
    - If the new bridge length is greater than the mapped floodway of a stream, utilize the floodway

limits as the bridge length.

- If there is no mapped floodway but a mapped floodplain, utilize the floodplain limits as a bridge length if the calculated value is greater than the floodplain width.
- In almost no case should a proposed bridge be smaller than an existing bridge over the same waterway.

Bridges are assumed to be prestressed precast concrete beams or composite steel plate girders. Structure depths are assumed to be 8 feet for precast concrete structures and 6 feet for steel plate girder structures. Two span structures are assumed to be needed when crossroads span over US 31. Wall pier shall be utilized in the median of US 31 to match existing overpasses along US 31. All new bridges should utilize integral or semi-integral end bents and slope walls for cost estimating purposes. Bridge aesthetics are not anticipated as a part of this study.

### Interchanges

For freeway alternatives, the preferred interchange type for use in this corridor is a diamond interchange, unless other interchange types are required for capacity requirements. The spacing of these terminals shall be 500-750 feet per ITE Freeway and Interchange Design Handbook. This interchange type is assumed to be the starting point for all interchange concepts developed in this PEL study. Refinements to this interchange type should be made, as necessary, to minimize impacts to the surroundings. The amount of design refinement suggested for the Level 2 and Level 3 screening is documented in the ProPEL US 30/US 31 Conceptual Design and Cost Estimating Memorandum.

For non-freeway alternatives, low-cost interchange solutions are preferred over that of diamond interchanges. An example of a low-cost interchange type is the US 35 & Old SR 25 interchange near Logansport, shown in Figure 1, where right-in/right-out freeway ramps connect to the side streets at full-access intersections.

*Figure 1: Low-Cost Interchange Example*



Regardless of interchange type or facility type, the first access point along the crossroad should be located 750 feet or more from the off ramp of the interchange per IDM 48-6.06.

### Roadway Lighting and Intelligent Transportation Systems

Roadway lighting and ITS will not be included in the conceptual design process of this PEL study as it has no significant impact on the cost or footprint of the alternatives being evaluated.

### Intersections at Grade

All intersections should be designed using the Indiana Design Vehicle (WB-65) per IDM Figure 46-1E.

All intersections are intended to provide adequate intersection sight distance per IDM 46-10.

Acceleration & deceleration lanes will be provided for all intersections with right-in/right-out access per IDM 46-3.02(05).

### Reduced Conflict Intersections (RCI)

The US 31 South study corridor, with the existing 50 feet wide median, provides a U-turning radius of 62 feet for U-turns originating in a left turn lane. This width is less than the 82 feet radius required for a WB-65 design vehicle as stated in Indiana Design Manual figure 46-12K. For this reason, all U-turn movements at Reduced Conflict Intersections should provide a 20-foot bulb out for accommodating U-turns. Should median openings be closed, consideration should also be given to providing this bulb out at remaining median openings where U-turn movements are expected.

Acceleration lanes should be provided to aid accelerating upon completion of their U-turn movement. These should be provided due to the high-speed nature of the US 31 South study corridor. These acceleration lanes may also serve dual purpose as right turn lanes at RCIs.

Spacing of U-turn lanes at Reduced Conflict Intersections should be 800 feet (max) based on INDOT's 2022 presentation for Design Considerations for RCI Intersections at the INDOT Highway Design Conference<sup>1</sup>.

Left turn lanes from the mainline to the crossroad should not be provided unless capacity issues are expected at the downstream U-turn movement.

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<sup>1</sup> [https://www.in.gov/indot/engineering/files/04.TR\\_MO-Design-Considerations-for-RCI-Intersections.pdf](https://www.in.gov/indot/engineering/files/04.TR_MO-Design-Considerations-for-RCI-Intersections.pdf)

**Attachment A**  
**Design Criteria**

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# US 31 South Design Criteria

## Attachment A



IDM Design Criteria		Rural Arterial (3R)	Rural Freeway (3R)	Rural Freeway (Reconstruction)
		IDM Figure 55-3A	IDM Figure 54-2A	IDM Figure 53-1
Travel Lane	Lane Width	12 ft.	12 ft.	12 ft.
	Cross Slope	2%	2%	2%
Shoulder	Right Width	Paved: Desirable: 10 ft. / Minimum: 8 ft. Usable: Desirable: 11 ft. / Minimum: 9 ft.	Usable: 11 ft. / Paved: 10 ft.	Usable: 11 ft. / Paved: 10 ft.
	Left Width	Paved: Desirable: 4 ft. / Minimum: 3 ft. Usable: Desirable: 4 ft. / Minimum: 4 ft.	Paved: Minimum: 4 ft. Usable: Minimum: 5 ft.	<u>Paved</u> : Desirable: 8 ft. / Minimum: 4 ft. <u>Usable</u> : Desirable: 9 ft. / Minimum: 5 ft.
	Cross Slope	Paved Width ≤ 4 ft.: 2% Paved Width > 4 ft.: 4% 6% Sealed Aggregate	Paved Width ≤ 4 ft.: 2% Paved Width > 4 ft.: 4%	Paved Width ≤ 4 ft.: 2% Paved Width > 4 ft.: 4%
Auxilliary Lane	Lane Width	Desirable: 12 ft. / Minimum: 11 ft.	12 ft.	12 ft.
	Shoulder Width	Same as Next to Travel Lane (Min. 2 ft.)	Left & Right: Desirable: 12 ft. / Minimum: 6 ft.	Right: 10 ft. (6 ft. Min.) / Left: 4 ft.
Median Width	Depressed	Existing	Existing	Desirable: 100 ft. / Minimum: 54.5 ft.
	Flush, with CMB	Existing	Existing	Desirable: 30.5 ft. / Minimum: 26.5 ft.
Side Slopes (Cut)	Foreslope	2:1 or Flatter	2:1 or Flatter	6:1
	Ditch Width	Existing	Existing	4 ft.
	Backslope	2:1 or Flatter	2:1 or Flatter	4:1
Side Slopes (Fill)		2:1 or Flatter	2:1 or Flatter	6:1 to Clear Zone; 3:1 Max. to Toe
Median Slopes		Desirable: 8:1 / Maximum: 4:1	Desirable: 8:1 / Maximum: 4:1	Desirable: 8:1 / Maximum: 5:1

**Attachment B**  
**Proposed Typical Sections**

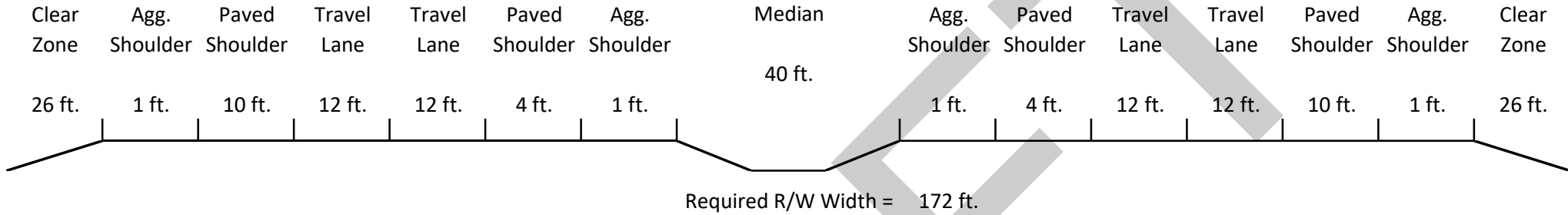
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# US 31 South Typical Sections

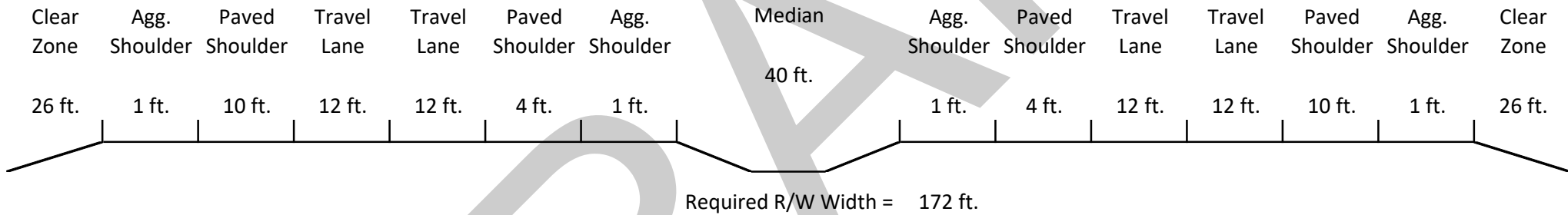
## Attachment B



### Rural Arterial (3R)



### Rural Freeway (3R)



### Rural Freeway (Reconstruction)

