SR 32 Corridor Study

FROM OAK RIDGE ROAD TO MOONTOWN ROAD
WESTFIELD, INDIANA

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City of Westfield

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May 21, 2011

AMERICAN STRUCTUREPOINT INC.

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EXECUTIVE SUMMARY

Study Purpose

Indiana SR 32 is a major east-west corridor through Hamilton County and central Indiana. Within the city of Westfield, SR 32 is literally the "Main Street" providing essential connectivity between transportation routes and major destinations. During the past decade, Westfield has experienced rapid development and population growth, which has put significant strain on the SR 32 corridor. With the proposed interchange of US 31 and SR 32 located just west of the downtown area, it is critical the SR 32 corridor is improved to adequately serve the regional and local traffic.

Through the Grand Junction Task Group, the city of Westfield and its business community have been engaged in revitalizing their downtown. Their vision for the downtown area is a vibrant, walkable, mixed-use district where people can live, work, and shop. Most of the redevelopment effort is anticipated to be concentrated along the SR 32 corridor. As an integral part of the downtown district, the SR 32 corridor will have direct impacts on the success of this vision.

The purpose of this study was to identify and evaluate transportation improvement alternatives for the SR 32 corridor as a regional thoroughfare, while also supporting the downtown redevelopment efforts. The preferred alternative has been selected based on a comprehensive evaluation of traffic operations, safety, community impact, right-of-way acquisition, and construction cost. The study also provides recommendations on design features such as typical cross-section, horizontal alignment, intersection treatment, and pedestrian accommodation. It will serve as a resource of information to guide the City through future phases of implementing these improvements.

Study Scope

To successfully complete the study, a detailed project scope was developed. The scope included:

- Holding a kickoff meeting between the City of Westfield, Indianapolis MPO, and American Structurepoint
- Reviewing previous studies, plans, available existing traffic data, and other related project information
- Identifying improvement components and develop three alternatives for further analysis
- Developing a schematic layout for the three alternatives
- Presenting the three alternatives to stakeholders, gather input, and evaluate the three alternatives
- Scoring the alternatives based on various factors and develop a preferred alternative
- Making recommendations for next steps

Study Area

The study area includes the SR 32 corridor from Oak Ridge Road to Moontown Road/Gray Road. For purposes of clarity, the corridor has been divided into three segments: west segment from Oak Ridge Road to US 31, downtown segment from US 31 to East Street, and east segment from East Street to Moontown Road. While the study will cover all three segments, special emphasis is given to the downtown segment due to the redevelopment efforts.

Stakeholder Coordination

Stakeholder coordination has been considered a critical component of this study. Key stakeholders include City of Westfield staff, the Grand Junction Task Force, and Indiana Department of Transportation staff. In addition to regular study progress meetings, two public meetings were planned in conjunction with the Grand Junction Task Group, two US 31 Hamilton County stakeholder coordination meetings were participated in, and a presentation was given to the Westfield Chamber of Commerce. Feedback from these meetings has been incorporated into this report.

Identification of Need

The city of Westfield is one of several fast-growing communities in Hamilton County. According to the US Census, the population of Washington Township (which includes the city of Westfield) has grown 85.1 percent from 18,712 in the year 2000, to 34,640 in the year 2009. This growth rate is higher than the average growth rate (58.7 percent) in Hamilton County during the same period. Based on the projection by Indiana Business Research Center, the population growth in Hamilton County will continue, and the county's total population is expected to grow by 46.6 percent by year 2030. A similar growth trend can also be expected for Westfield.

This explosion in the growth of population has placed the existing transportation infrastructure in Westfield under considerable strain to be able to serve the growing demand. SR 32 is the primary east-west corridor for Westfield, and the primary east-west state route connecting Muncie, Anderson, Noblesville, Westfield, Lebanon, and Crawfordsville to each other and major north-south freeways. The existing SR 32 cross-section through downtown Westfield is inadequate to handle current traffic volumes, much less the anticipated traffic after US 31 is upgraded and the Grand Junction redevelopment takes place.

Alternative Development

One of the study objectives was to develop and evaluate three different alternative layouts for the SR 32 corridor within the study area. The following elements were considered when developing feasible alternatives:

- Number of mainline travel lanes: Alternatives including four, five, and six travel lanes were studied.
- Type of intersection control at the major intersections: Alternatives included a mixture of two-way stop control, traffic signals, and roundabouts.

- Access Management: Alternatives included the use of a two-way, left-turn lane; restrictions of certain turning movements; and the use of a raised median.
- Pedestrian and Bicycle Accommodation: Alternatives included wide sidewalk through the downtown segment and sidewalks on both sides for the east and west segments. Because the proposed Midland Trace Trail will run almost parallel to SR 32 within the study area, the options of bike lanes and multi-purpose path were eliminated.
- Parking Options: Alternatives with and without on-street parking were considered.

Due to the different characteristics of the three segments of SR 32 through Westfield, the improvement alternatives were developed separately for the three segments. These alternatives have been summarized in **Table 1**. A schematic layout and typical section for each alternative are shown in **Appendix C**.

- For the west segment, the section west of US 31 was recently widened to a five-lane roadway as part of an INDOT project. The proposed US 31 and SR 32 interchange is currently being designed, and construction is scheduled to begin in the year 2014. No further improvements were identified as a part of this study.
- For the downtown segment, three improvement alternatives were identified. These alternatives consist of a reasonable combination of the improvements on the five components discussed above.
- For the east segment, only one improvement alternative was identified. This alternative is most compatible with the existing land uses and roadway conditions while continuing to accommodate the long term growth potential on SR 32.

Evaluation of Improvement Alternatives

In this study, the three alternatives for the downtown segment were evaluated based on five criteria: traffic operations, safety, community impact, right-of-way acquisition, and construction cost.

- Traffic Operations: Alternatives were scored based upon traffic operations at the intersections within the study area using the planning-level traffic forecast for the year 2035. For each alternative, all the intersections will be operating at LOS D or better in the year 2035 peak hour. The complete software output from the Synchro and RODEL software can be found in **Appendix A**.
- Safety: Roundabout intersection control is safer for both pedestrians and motorists, reducing injury crashes by up to 80 percent, if properly designed. Raised medians are safer than a two-way left-turn lane, and on-street parking contributes to a lower safety rating.
- Community Impact: Alternatives were scored according to how well they support the vision of the Grand Junction Master Plan, the opportunity for a gateway feature, pedestrian friendliness, and provision of on-street parking.
- Right-of-Way Acquisition
- Construction Cost

The following table shows the results of the comparison of each of the alternatives:

Alternative	Traffic Operations	Safety	Community Impact	Right-of-Way Acquisition (Acres)	Construction Cost (Downtown & East)
No Build	★	★	★	--	**--**
Alt. 1	★★★	★★★★	★★★	10.6	$15,793,100
Alt. 2	★★	★★	★★	10.2	$15,860,250
Alt. 3	★★★★	★★★	★★★★	12.2	$16,486,500
Preferred Alt.	★★★★	★★★	★★★★	**11.7**	**$16,411,800**

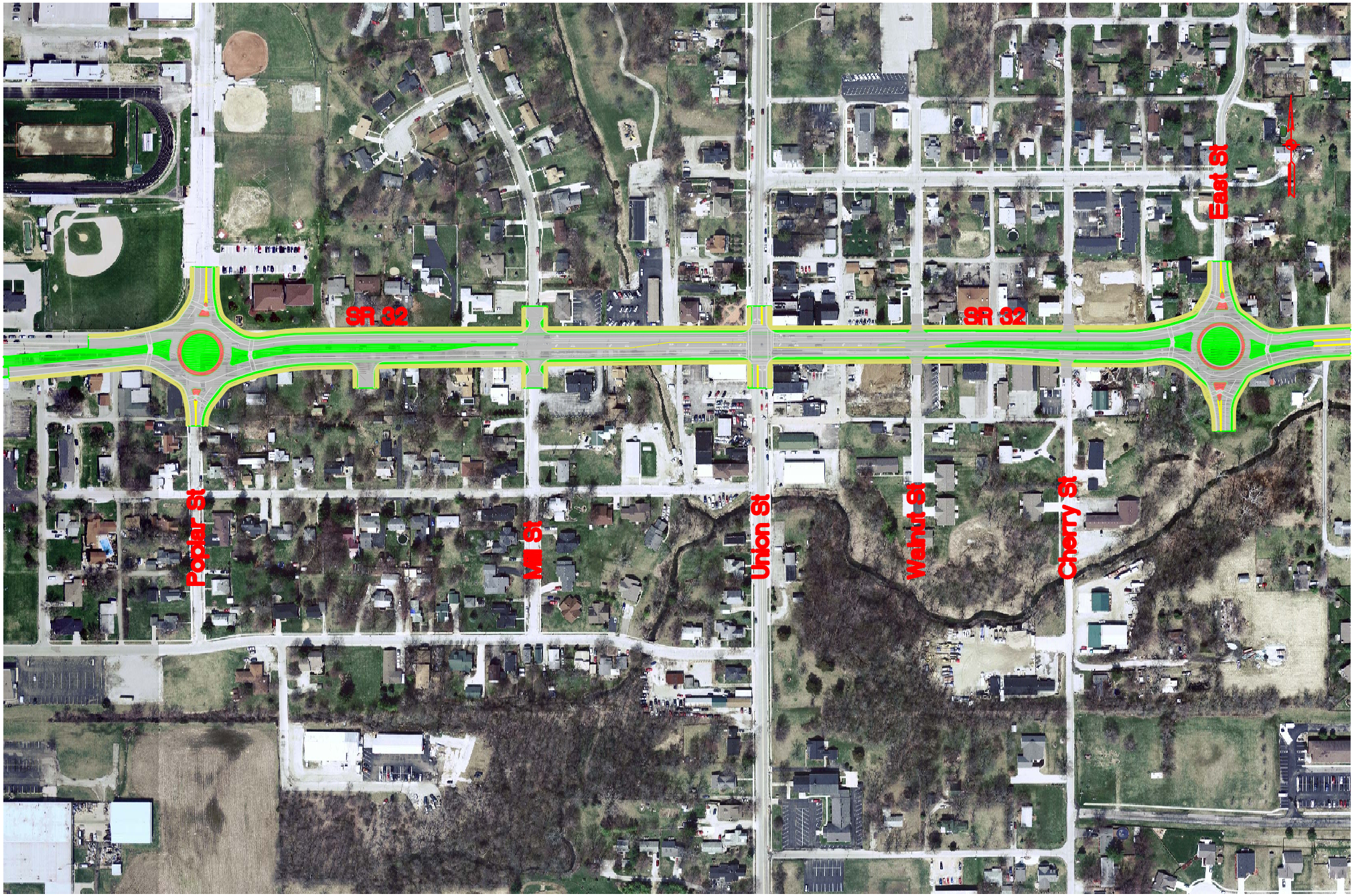
Findings and Recommendations

The following is a summary of the study's findings and recommendations.

- *West segment*: Beside the improvements that have been recently constructed on SR 32 and the proposed interchange at US 31 and SR 32 that is currently under design, no further improvements have been identified in this study.
- *Downtown segment*: The preferred alternative for the downtown segment scores highest in traffic operations and community impact and scores behind Alternative 1 in safety. The reason for the lower scoring in safety is due to left-turns being allowed from SR 32 to Union Street. They were restricted in Alternative 1. There are also two additional full access locations at Mill Street and Walnut Street.
- *East segment*: Only one alternative was proposed for this segment. A five-lane cross section is the most compatible with the existing land uses and roadway conditions while accommodating the long term growth potential on SR 32.

Exhibit I shows a schematic drawing of the preferred alternative for the downtown segment. **Exhibits II** and **III** show the downtown segment preferred alternative typical sections, with and without a raised median, respectively. **Exhibit IV** shows a schematic drawing of the east segment.

Stakeholder coordination between City of Westfield staff, the Grand Junction Task Force, and INDOT was important to forming a consensus as to the preferred alternative for the downtown segment of Main Street (SR 32). It is reasonable to expect some aspects of the proposed preferred alternative may be altered with further study or during the design phase. This report is a planning document that is meant to aid in future decisions that are made for the SR 32 corridor in Westfield and is not the final authority on every design aspect of the corridor.

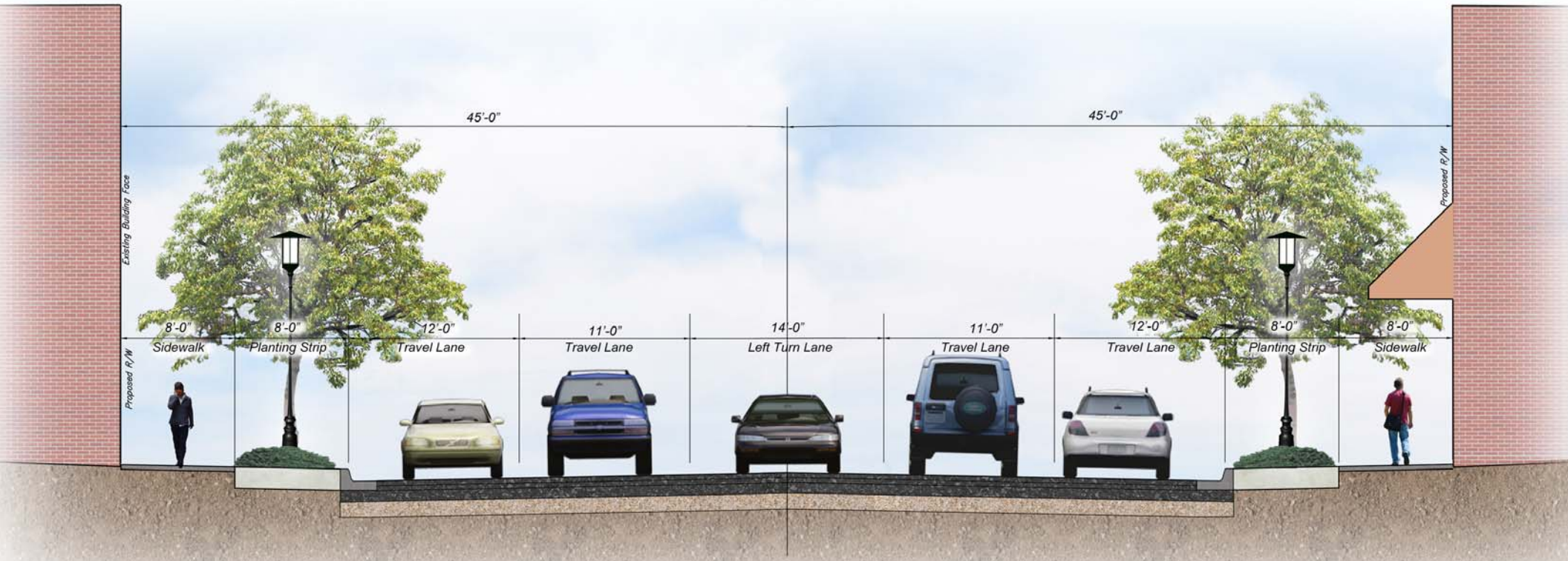


SR 32 Corridor Analysis - Preferred Alternative (Scale 1" = 320')

EXHIBIT I

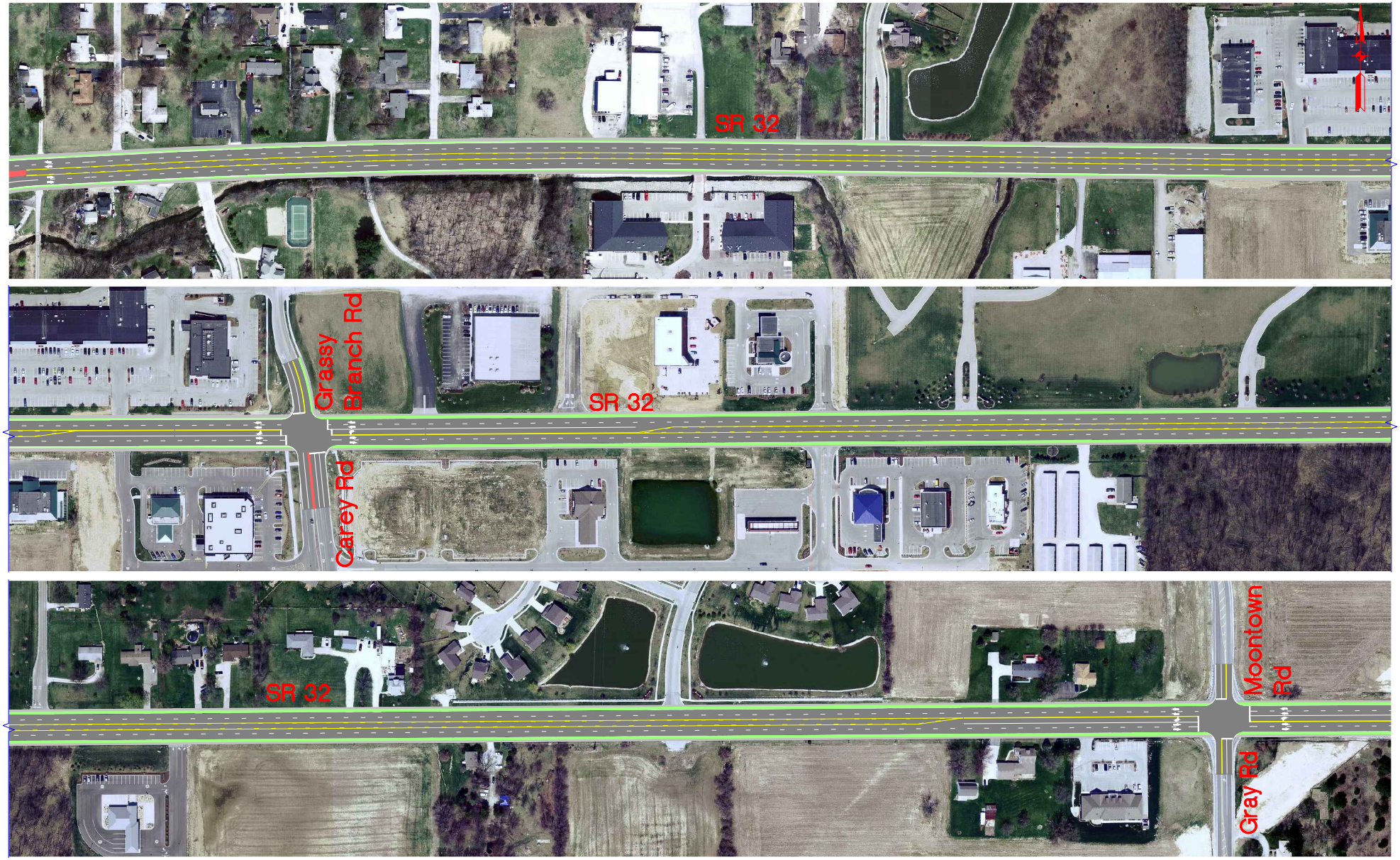
Typical Section: 5-Lane Section with Raised Median
Downtown Preferred Alternative

EXHIBIT II



Typical Section: 5-Lane Section without Raised Median
Downtown Preferred Alternative

EXHIBIT III



SR 32 Corridor Analysis – East Segment (Scale 1" = 320')

EXHIBIT IV

1.0 INTRODUCTION

1.1 Study Purpose

Indiana SR 32 is a major east-west corridor through Hamilton County and central Indiana. Within the city of Westfield, SR 32 is literally the "Main Street" providing essential connectivity between transportation routes and major destinations. During the past decade, Westfield has experienced rapid development and population growth, which has put significant strain on the SR 32 corridor. With the proposed interchange of US 31 and SR 32 located just west of the downtown area, it is critical the SR 32 corridor is improved to adequately serve the regional and local traffic.

Through the Grand Junction Task Group, the city of Westfield and its business community have been engaged in revitalizing their downtown. Their vision for the downtown area is a vibrant, walkable, mixed-use district where people can live, work, and shop. Most of the redevelopment effort is anticipated to be concentrated along the SR 32 corridor. As an integral part of the downtown district, the SR 32 corridor will have direct impacts on the success of this vision.

The purpose of this study was to identify and evaluate transportation improvement alternatives for the SR 32 corridor as a regional thoroughfare, while also supporting the downtown redevelopment efforts. The preferred alternative has been selected based on a comprehensive evaluation of traffic operations, safety, community impact, right-of-way acquisition, and construction cost. The study also provides recommendations on design features such as typical cross-section, horizontal alignment, intersection treatment, and pedestrian accommodation. It will serve as a resource of information to guide the City through future phases of implementing these improvements.

1.2 Study Scope

To successfully complete the study, a detailed project scope was developed. The scope included:

- Holding a kickoff meeting between the City of Westfield, Indianapolis MPO, and American Structurepoint
- Reviewing previous studies, plans, available existing traffic data, and other related project information
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The study area, shown in **Figure 1**, includes the SR 32 corridor from Oak Ridge Road to Moontown Road/Gray Road. For purposes of clarity, the corridor was divided into three segments: west segment from Oak Ridge Road to US 31, downtown segment from US 31 to East Street, and east segment from East Street to Moontown Road. While the study covers all three segments, special emphasis was placed on the downtown segment due to the redevelopment efforts and significant right-of-way challenges along this segment.

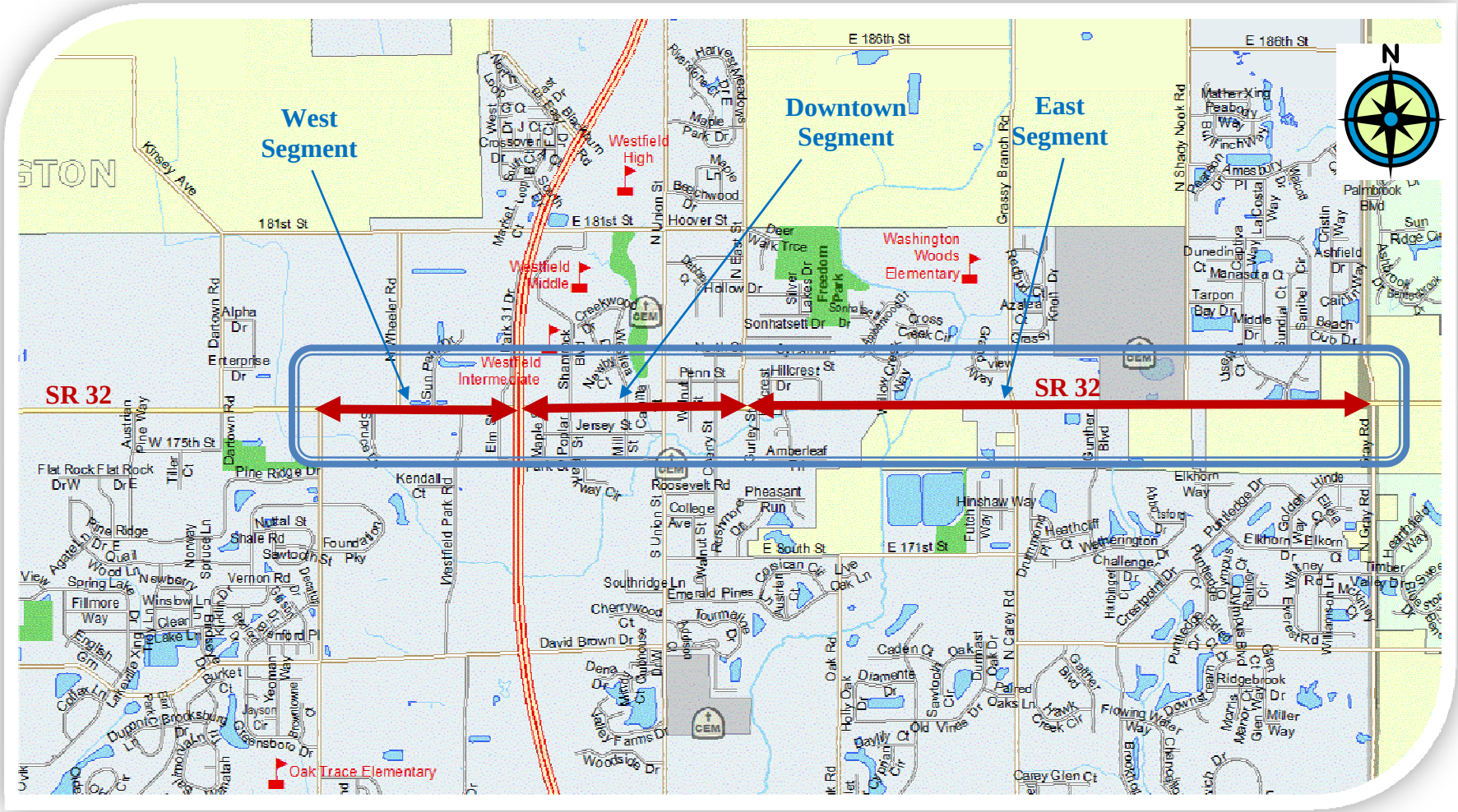

Figure 1 – Study Area

1.3 Stakeholder Coordination

Stakeholder coordination has been considered a critical component of this study. Key stakeholders include City of Westfield staff, the Grand Junction Task Force, and Indiana Department of Transportation staff. In addition to regular study progress meetings, two public meetings were planned in conjunction with the Grand Junction Task Group, two US 31 Hamilton County stakeholder coordination meetings were participated in, and a presentation was given to the Westfield Chamber of Commerce. Feedback from these meetings has been incorporated into this report.

2.0 EXISTING CONDITIONS

This section describes the existing conditions within the study area, focusing on population growth, land use, and the transportation system.

2.1 Population Growth

The city of Westfield is one of several fast-growing communities in Hamilton County. For consistency of comparison, Washington Township, which includes the city of Westfield, and other unincorporated land in Hamilton County, is evaluated. The township boundary was used because the boundaries have not changed over the past ten years, whereas the city limits have changed. According to the US Census, Washington Township's total population has grown 85.1 percent from 18,712 in year 2000 to 34,640 in year 2009, as shown in **Figure 2**. This growth rate is higher than the average growth rate (58.7 percent) in Hamilton County during the same period.

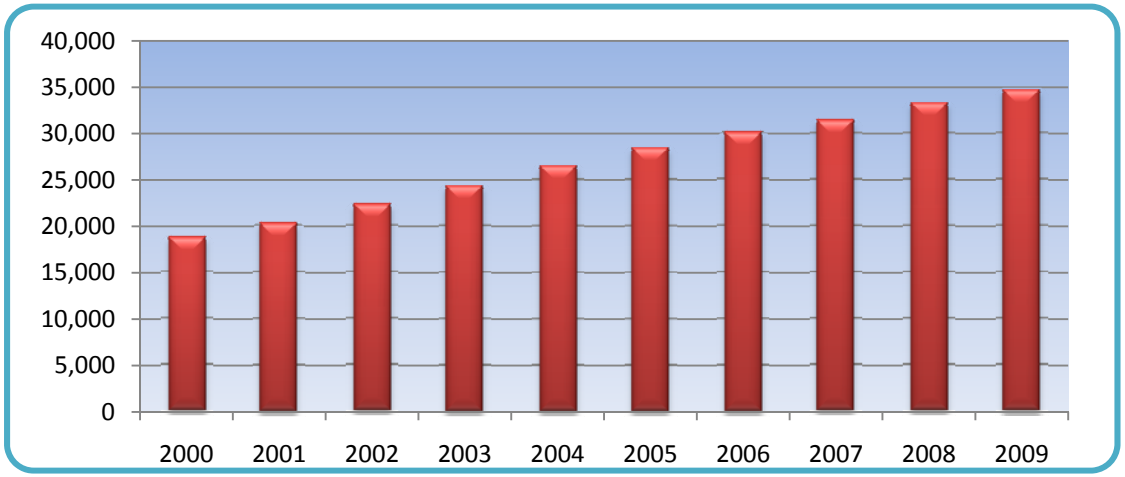

Figure 2 – Washington Township Population Growth from 2000 to 2009

2.2 Land Use

Figure 3 shows the existing land use map for Westfield. The existing land uses along SR 32 have different compositions for each of the three segments:

West Segment: The land uses are a mix of industrial, commercial, residential, and agricultural. The majority of Westfield's industrial land uses are located here. This is also the area where the proposed Westfield Sports Complex will be located.

Downtown Segment: The predominant land uses are residential and commercial. The Westfield Intermediate School and Middle School are located along Shamrock Boulevard, north of SR 32. In general, the commercial buildings are close to the street and utilize the on-street parking spaces to varying degrees.

East Segment: Similar to the downtown segment, the predominant land uses are residential and commercial. However, the commercial buildings are located further away from the street and provide sufficient off-street parking spaces.

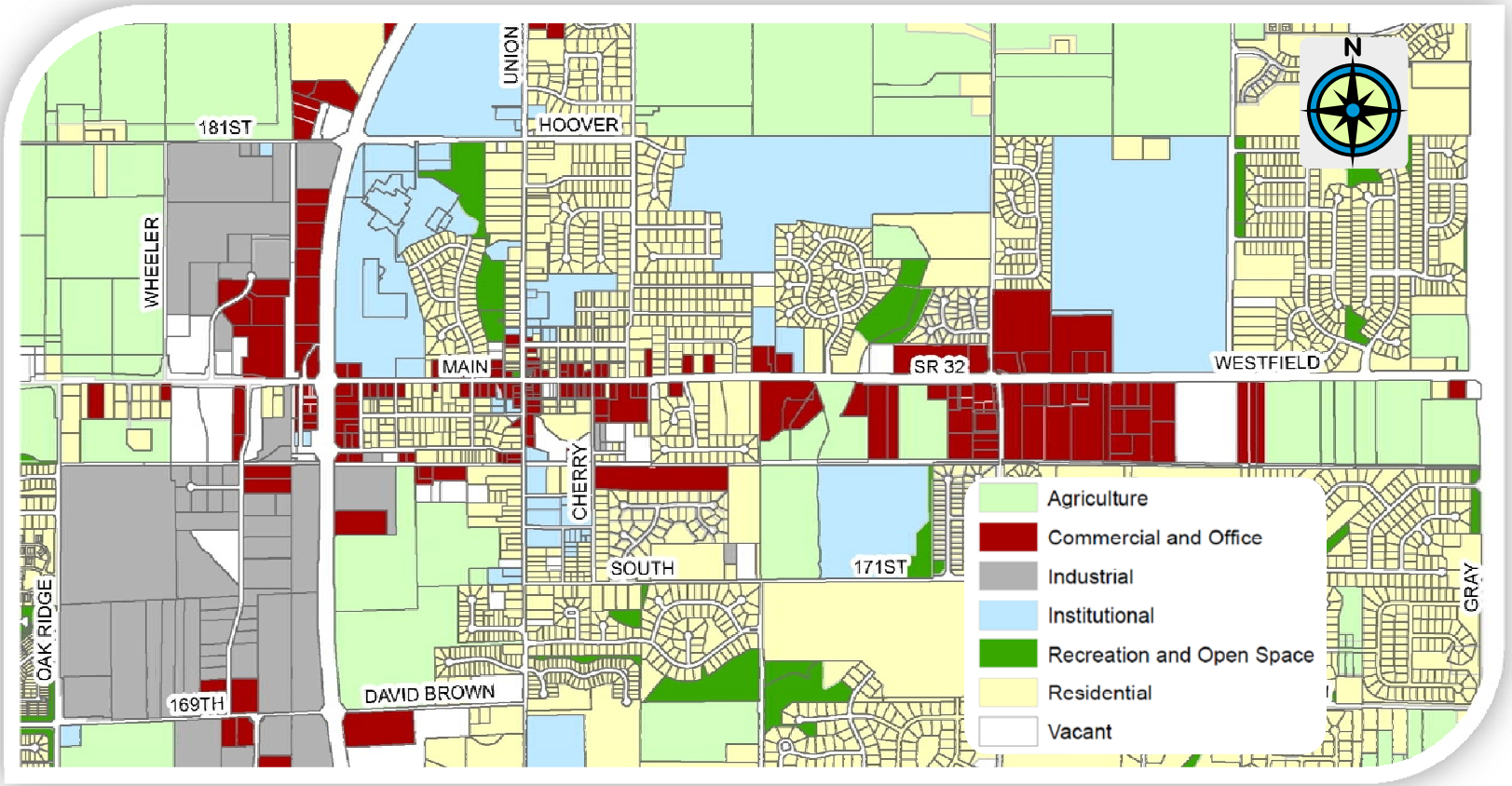

Figure 3 – Existing Land Uses

2.3 Transportation System

2.3.1 Street Network

State Road 32 (Main Street): State Road 32 is an undivided, east-west principal arterial that is part of the National Truck Network. The posted speed limit along SR 32 varies from 30 mph to 50 mph within the study area.

- The west segment was recently widened to a five-lane roadway with additional turn lanes at intersections.
- The downtown segment has one through lane in each direction and on-street parking on both sides, but no additional turn lanes at intersections. **Figure 4** is a picture looking east on SR 32 toward Union Street in the downtown segment.
- The east segment has one travel lane in each direction and additional turn lanes at intersections.

Figure 4 – Looking East along SR 32 (Downtown)

US 31: US 31 is a four-lane, divided, north-south principal arterial within the study area. It is classified as a Statewide Mobility Corridor, and is on the National Highway System (NHS). The speed limit is posted as 55 mph.

Oak Ridge Road: Oak Ridge Road is a two-lane, north-south urban collector within the study area. The speed limit is posted as 30 mph.

Shamrock Boulevard/Poplar Street: Shamrock Boulevard and Poplar Street are two-lane, north-south local roads within the study area. The speed limit is posted as 30 mph.

Westlea Drive/Mill Street: Westlea Drive and Mill Street are two-lane, north-south local roads within the study area. The speed limit is posted as 30 mph.

Union Street: Union Street is a two-lane, north-south urban collector within the study area. It is the primary north-south street in downtown Westfield. The speed limit is posted as 30 mph.

Walnut Street: Walnut Street is a two-lane, north-south local road within the study area. The speed limit is posted as 30 mph.

Cherry Street: Cherry Street is a two-lane, north-south local road within the study area. The speed limit is posted as 30 mph.

East Street: East Street is a two-lane, north-south urban collector within the study area. The speed limit is posted as 30 mph.

Carey Road/Grassy Branch Road: Carey Road and Grassy Branch Road are two-lane, north-south urban collectors within the study area. The speed limit is posted as 30 mph.

Moontown Road/Gray Road: Moontown Road and Gary Road are two-lane, north-south urban collectors within the study area. The speed limit is posted as 40 mph.

2.3.2 Key Intersections

SR 32 and Oakridge Road: This is a "tee" intersection and is currently signalized. Dedicated turn lanes are present on all three legs.

SR 32 and US 31: This is a four-leg intersection and is currently signalized. Dedicated turn lanes are present on all four legs.

SR 32 and Shamrock Boulevard/Poplar Street: This is a four-leg intersection and is currently controlled by two-way stop signs with SR 32 being preferential.

SR 32 and Westlea Drive/Mill Street: This is a four-leg intersection and is currently controlled by two-way stop signs with SR 32 being preferential.

SR 32 and Union Street: This is a four-leg intersection and is currently signalized. No dedicated turn lane is present on any approach. **Figure 5** is an aerial image of this intersection, which illustrates how close the existing buildings are on three corners of the intersection. The forth corner is Hadley Park.

Figure 5 – Existing SR 32 and Union Street Intersection

SR 32 and Walnut Street: This is a four-leg intersection and is currently controlled by two-way stop signs with SR 32 being preferential. No dedicated turn lane is present on any approach.

SR 32 and Cherry Street: This is a four-leg intersection and is currently controlled by two-way stop signs with SR 32 being preferential. No dedicated turn lane is present on any approach.

SR 32 and East Street: This is a "tee" intersection and is currently controlled by a stop sign with SR 32 being preferential. No dedicated turn lane is present on any approach.

SR 32 and Grassy Branch Road/Carey Road: This is a four-leg intersection and is currently signalized. Dedicated turn lanes are present for all four legs.

SR 32 and Moontown Road/Gray Road: This is a four-leg intersection and is currently signalized. Dedicated turn lanes are present for all four legs.

2.3.3 Traffic Data

The existing traffic data was obtained from INDOT. The existing AADT along SR 32 ranges from 22,000 vpd to 17,000 vpd within the study area. The traffic patterns on SR 32 during a typical weekday east of US 31 are shown in **Figure 6**. It is noted that traffic volumes immediately east of Union Street are higher than those shown in this figure. The intent of this figure is to show the daily peaks on SR 32.

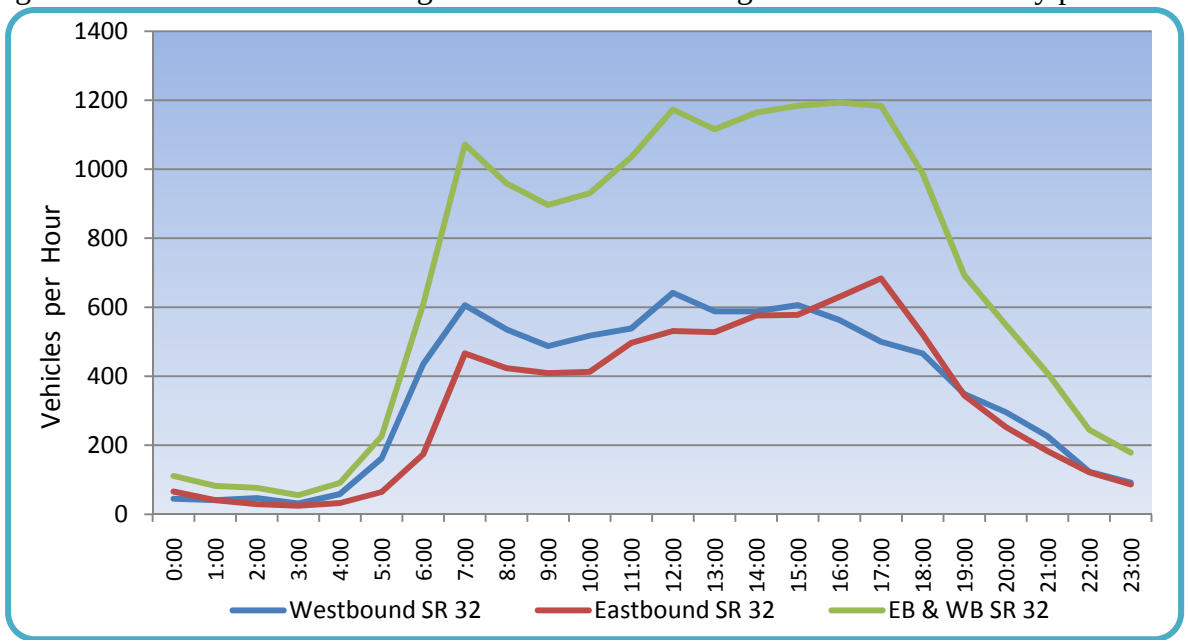

Figure 6 – Typical Weekday Traffic Pattern for SR 32

2.3.4 Parking

There are approximately 70 on-street parking spaces in the downtown segment of SR 32. These parking spaces are intended to provide convenience to the visitors of the commercial land uses along SR 32. There is no on-street parking on the west and east segments of SR 32.

2.3.5 Pedestrian and Bicyclist Facilities

The west segment and downtown segment have continuous sidewalk on both sides of SR 32 except near the intersection of US 31 and SR 32. On the east segment, no sidewalk is currently present along SR 32. **Figure 7** is a picture of the wide sidewalks directly adjacent to buildings through the downtown segment.

There is currently no dedicated bicycle facility present within the study area.

Figure 7 – Sidewalk North of SR 32 (Downtown)

3.0 FUTURE CONDITIONS

This section describes the future conditions within the study area, focusing on population growth, land use, and transportation system.

3.1 Population Growth

Based on the projection by Indiana Business Research Center, the population growth in Hamilton County will continue, and the county's total population is expected to grow by 46.6 percent by year 2030. A similar growth trend can also be expected for Westfield.

3.2 Land Use

Significant land use changes have been planned in downtown Westfield. According to The Grand Junction Master Plan dated February 2008, Grand Junction is envisioned to be "*an integrated combination of uses and outdoor public spaces that physically express its core brand promise-that the Grand Junction is a place where many kinds of connections are made, including those with family and friends, the larger community, nature, great places to dine, distinctive places to shop, important regional trails and roadways, and Westfield's historic legacy.*" The Master Plan has several key initiatives:

- Grand Junction Plaza in the heart of downtown
- Landmark-quality civic facilities, including a new City Hall and a new Westfield Washington Library
- Extended trail system, including Monon Trail and Midland Trace Trail
- Extended street network
- Enhanced stormwater management facilities
- Signature downtown gateway development at the proposed US 31 and SR 32 interchange

Figure 8 provides an overview of these initiatives from the Grand Junction Master Plan. The numbers in the figure are enumerated in the Grand Junction Master Plan and do not serve any particular function in this corridor study.

3.3 Transportation System

3.3.1 Planned Transportation Improvements

INDOT is currently in the design stage of the US 31 reconstruction project, which will convert US 31 in Hamilton County into a limited-access freeway. A grade-separated interchange has been proposed at US 31 and SR 32 to replace the existing at-grade signalized intersection. Based on the information available on the US 31 Hamilton County project website, the construction is scheduled to start in the year 2014.

Additionally, INDOT was engaged in planning an added travel lane (ATL) project on SR 32. An INDOT report titled *Project Summary for SR 32 from US 31 to SR 38 in Hamilton County* (dated April 2008) recognized the existing congestion on SR 32 and evaluated several widening options. However, in early 2010, INDOT suspended the efforts to further developing this ATL project.

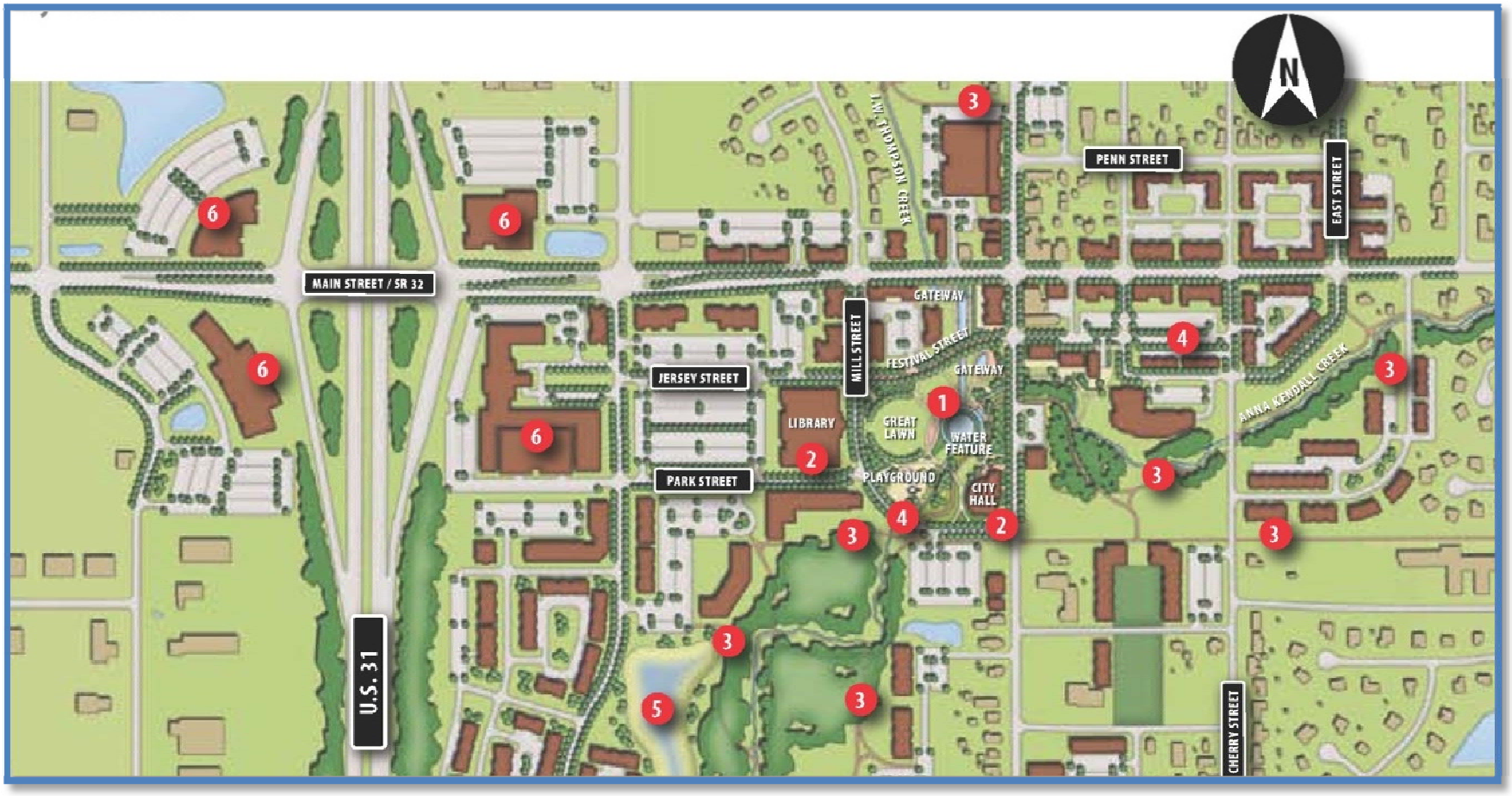

Figure 8 – Overview of the Grand Junction Master Plan

The City of Westfield has been actively involved in planning transportation improvements in response to the continuous growth. The Westfield Thoroughfare Plan was updated in December 2006, and recently amended in July 2010. In addition to developing a functional classification system, the Thoroughfare Plan identified a list of transportation improvements based on existing conditions, future development, and other regional plans. There are a number of transportation improvements that may have impacts on SR 32.

- Union Street Extension: The plan is to extend Union Street south past US 31 and connect it to Western Way at 146th Street. As of April 2011, this improvement is in the planning stage.
- Poplar Street Extension: The plan is to extend Poplar Street southward and connect to 161st Street.
- East Street Extension: The plan is to extend East Street southward and then westward and connect to Mill Street.
- Penn Street Extension: The plan is to extend Penn Street westward and connect to Shamrock Boulevard.
- Westfield Park Drive Realignment: The plan is to realign Westfield Park Drive and connect to SR 32 at Sun Park Drive.
- Oak Road Extension: The plan is to extend Oak Road northward and connect to SR 32 at Willow Creek Way.

Figure 9 shows the updated Westfield Thoroughfare Plan map. It should be noted, most of these transportation improvements may depend on other plans or developments and do not have a fixed schedule at this time. For example, some of the improvements listed above are closely related to the Grand Junction Master Plan or the proposed US 31 reconstruction project.

3.3.2 Traffic Forecast

In order to evaluate the SR 32 improvement alternatives in light of the proposed Thoroughfare Plan improvements, it was necessary to develop a planning-level traffic forecast for the horizon year (year 2035). After reviewing the Westfield Thoroughfare Plan, the Indianapolis MPO regional travel model, and the aforementioned INDOT SR 32 report, it was determined that growth rates used in the INDOT SR 32 report are the most appropriate to be used in this study. Depending on each individual intersection and the time periods, the annual growth rates usually range from 1.4 percent per year to 2.7 percent per year. The projected traffic growth is due to a variety of factors, including regional traffic growth along the SR 32 corridor, land use development and redevelopment efforts (such as those described in the Grand Junction Master Plan), and other transportation improvements.

3.3.3 Pedestrian and Bicyclist Facilities

The future enhancements to pedestrian and bicycle facilities are described in the Westfield Alternative Transportation Plan. Two major enhancements presented in the Alternative Transportation Plan are the Monon Trail extension and the Midland Trace Trail. The Monon Trail, an urban greenway, currently starts at 161st Street in Westfield, goes south through Carmel, and terminates at 10th Street near downtown Indianapolis. The plan is to extend the Monon Trail northward, generally, along the abandoned railway. The Midland Trace Trail, which will be similar to the Monon Trail, will serve as an east-west greenway connecting Noblesville (or potentially Madison County) to the east and Boone County to the west. Due to the proximity of the Midland Trace Trail and the proposed interchange of US 31 and SR 32, the Westfield

Monon-Midland Trace Loop has been proposed to be a collector-distributor for the regional traffic from the Monon Trail and the Midland Trace Trail, while providing local access for other destinations in Westfield.

In addition to these two important regional trails, the Westfield Alternative Transportation Plan has designated several pedestrian corridors and pedestrian districts within the city of Westfield. According to the plan, a pedestrian corridor is defined as a linear distribution of higher density, mixed-use development along a vehicular street, and a pedestrian district is defined as high density, mixed-use development that could support central or multiple transit modes. Within the study area, the downtown segment of SR 32 is located within the area and classified as the downtown pedestrian district, and the east and west segments of SR 32 are both classified as pedestrian corridors. The Westfield Alternative Transportation Plan map is shown in **Figure 10**.

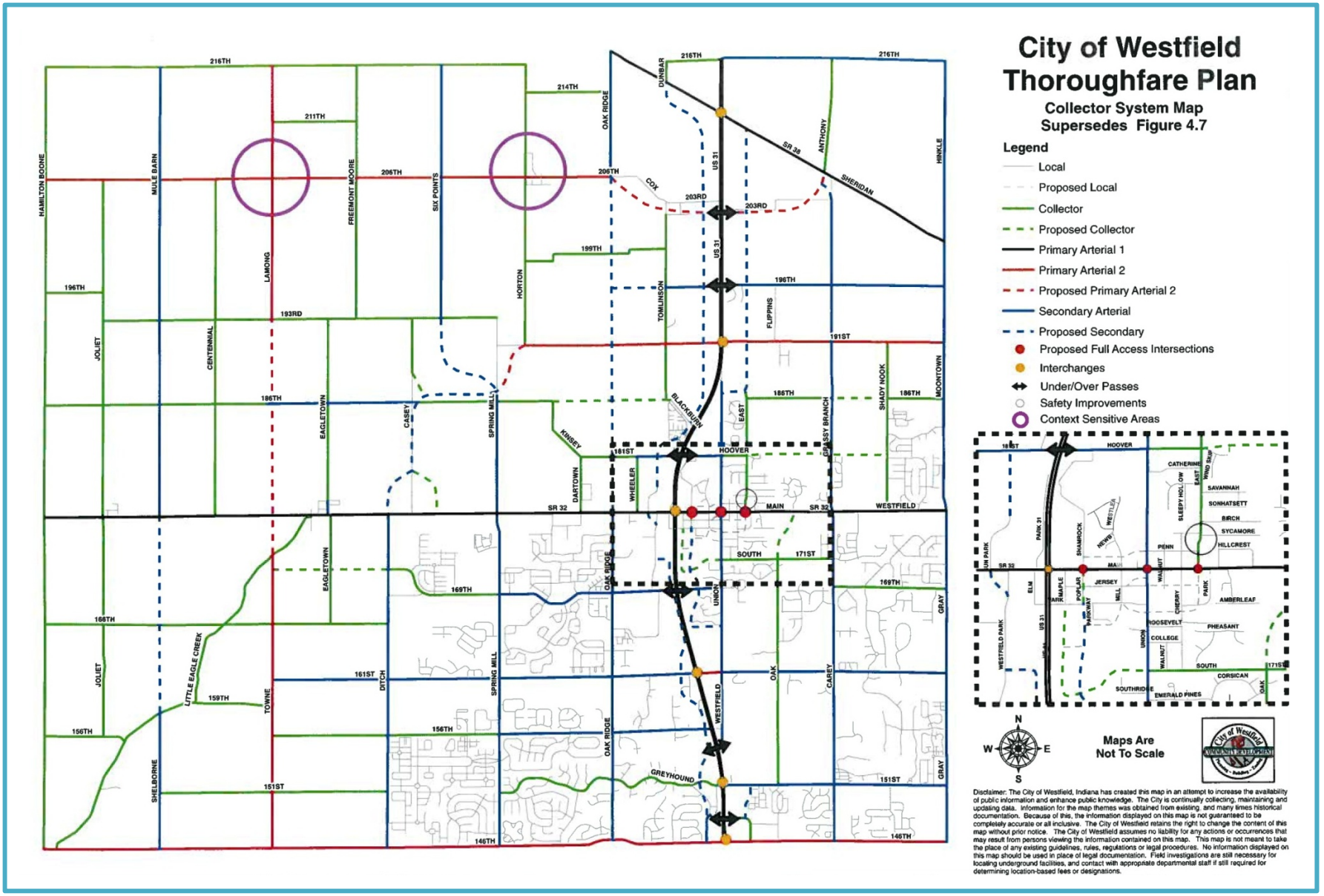

Figure 9 – Westfield Thoroughfare Plan

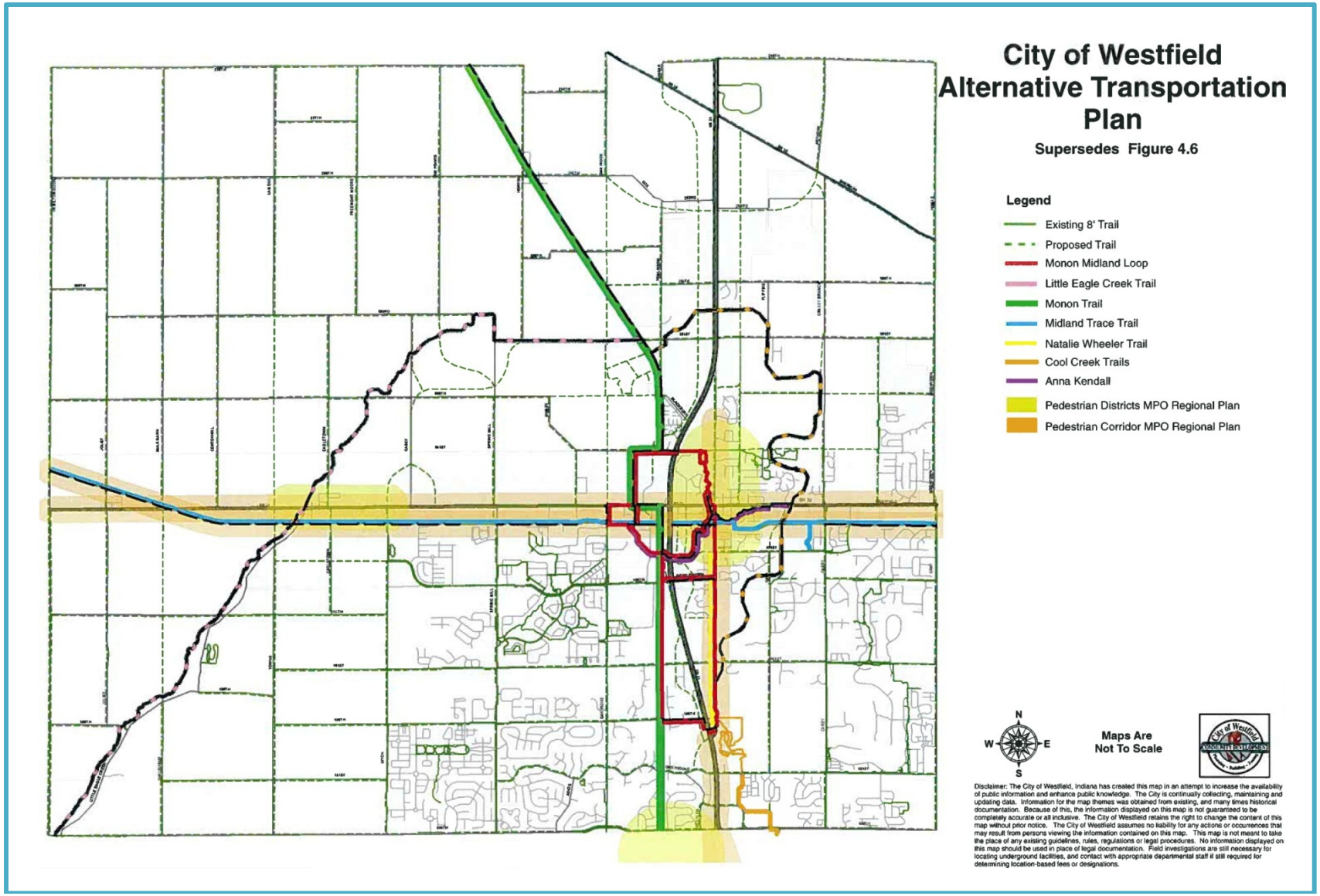

Figure 10 – Westfield Alternative Transportation Plan

4.0 PRELIMINARY IMPROVEMENT ALTERNATIVES

One of the study objectives was to develop and evaluate three different alternative layouts for the SR 32 corridor within the study area. This section of the report outlines how the improvement alternatives were developed and evaluated.

4.1 Alternative Development

For the purpose of this study, the improvement alternatives consist of five main components:

- *Mainline Travel Lanes*: In general, the number of travel lanes for an urban street ranges from two (one lane in each direction) to seven (three lanes in each direction plus a center left-turn lane). The options for two or three travel lanes on SR 32 were eliminated because the traffic forecast for the year 2035 along SR 32 will likely require a minimum of four travel lanes. The option for seven travel lanes was also eliminated due to the relatively high crash rates on existing seven-lane roadway facilities.
- *Intersection Control*: The typical intersection control for an urban street are two-way stop control, all-way stop control, traffic signal, modern roundabout, and grade separation. Except at the intersection of US 31 and SR 32, the option of grade separation was eliminated due to its cost and right-of-way impacts. For other major intersections along SR 32, a traffic signal or a modern roundabout are the only options that will provide adequate capacity. For minor intersections along SR 32, two-way stop-control is considered the best option to minimize the interruption to the SR 32 traffic.
- *Access Management*: Access management is the process that manages access to land developments along a street while simultaneously preserving the flow of traffic on the street in terms of safety, capacity, and speed. Typical access management techniques include strategic driveway locations, median and median openings, auxiliary lanes, and traffic controls.
- *Pedestrian and Bicycle Accommodation*: Typical pedestrian and bicyclist accommodations for an urban street are sidewalks, multi-purpose path, and bike lanes. Because the proposed Midland Trace Trail will run almost parallel to SR 32 within the study area, the options of bike lanes and multi-purpose path were not considered further for SR 32.
- *Parking Options*: An urban street can have on-street parking or off-street parking. The on-street parking can be full time or part time (typically during the off-peak hours). The off-street parking can be in front of buildings (with physical separation from the street) or in the back of the buildings.

Due to the different characteristics of the three segments of SR 32 through Westfield, the improvement alternatives were developed separately for the three segments. These alternatives have been summarized in **Table 1**. A schematic layout and typical section for each alternative are shown in **Appendix C**.

- For the west segment, the section west of US 31 was recently widened to a five-lane roadway as part of an INDOT project. The proposed US 31 and SR 32 interchange is currently being designed, and construction is scheduled to begin in the year 2014. No further improvements were identified as a part of this study.
- For the downtown segment, three improvement alternatives were identified. These alternatives consist of a reasonable combination of the improvements on the five components discussed above.
- For the east segment, only one improvement alternative was identified. This alternative is most compatible with the existing land uses and roadway conditions while continuing to accommodate the long term growth potential on SR 32.

Table 1 – SR 32 Preliminary Improvement Alternatives

SR 32 Mainline Alternative (West Segment)

Alternative	From	To	SR 32 Travel Lanes	Major Intersections	Access Management	Sidewalk	Parking
Existing/ INDOT Design	Oak Ridge Rd	US 31	5	Traffic Signal at Oak Ridge Rd Diamond Interchange at US 31	Raised Median / Center Left-Turn Lane on SR 32	5' minimum on Both Sides	Off-Street Parking

SR 32 Mainline Alternatives (Downtown Segment)

Alternative	From	To	SR 32 Travel Lanes	Major Intersections	Access Management	Sidewalk	Parking
Alt. 1	US 31	East St	4	Roundabout at Shamrock Blvd Traffic Signal at Union St Roundabout at East St	Raised Median on SR 32	12' minimum on Both Sides	Off-Street Parking
Alt. 2			5	Traffic Signal at Shamrock Blvd Traffic Signal at Union St Traffic Signal at East St	Two-way Left-Turn Lane on SR 32	12' minimum on Both Sides	Off-Street Parking
Alt. 3			6	Roundabout at Shamrock Blvd Traffic Signal at Union St Roundabout at East St	Raised Median on SR 32	12' minimum on Both Sides	On-Street Parking

SR 32 Mainline Alternative (East Segment)

Alternative	From	To	SR 32 Travel Lanes	Major Intersections	Access Management	Sidewalk	Parking
Proposed	East St	Moontown Rd/ Gray Rd	5	Traffic Signal at Grassy Branch Rd Traffic Signal at Gunther Blvd Traffic Signal at Moontown Rd	Two-way Left-Turn Lane on SR 32	5' minimum on Both Sides	Off-Street Parking

4.2 Evaluation of Improvement Alternatives

In this study, the three alternatives for the downtown segment were evaluated based on five criteria: traffic operations, safety, community impact, right-of-way acquisition, and construction cost.

4.2.1 Traffic Operations

The standard parameter used to evaluate traffic operation characteristics is referred to as the level of service (LOS). There are six LOS (A through F), which relate to driving conditions from best to worst, respectively. Because intersections are typically the most restrictive points for traffic flow along an urban street, a capacity analysis has been performed on key intersections along SR 32 using the methodology outlined in the Highway Capacity Manual (HCM), 2000.

In order to analyze the traffic operations in the year 2035 at each of the key intersections within the study area, the future traffic patterns based on the Grand Junction plan. A planning-level traffic forecast was performed using INDOT traffic counts included in the Engineer's Scoping report for the SR 32 added travel lane project on SR 32 from US 31 to SR 38. Traffic was forecasted to 2035 and reassigned according to the Grand Junction Master Plan, the US 31 project, the updated Westfield Thoroughfare Plan improvements, and the limitations/opportunities of each particular alternative.

Using the planning-level traffic forecast for the year 2035, the LOS was estimated with Synchro software (version 7.0) and RODEL. The results of the capacity analysis are summarized in **Table 2** through **Table 4**. For each alternative, most of the intersections will be operating at LOS D or better in the year 2035 peak hour. The software output from the Synchro and RODEL software can be found in **Appendix A**.

Table 2 - LOS Summary for SR 32 in Year 2035: Alternative 1

Intersections	Traffic Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
SR 32 & US 31 NB Off Ramp	Traffic Signal	C	24.5	C	22.4
SR 32 & Shamrock Blvd/Poplar Street	Roundabout	A	9.8	A	9.0
SR 32 & Westlea Dr/Mills Street	TWSC*	B	13.1	C	17.0
SR 32 & Union Street	Traffic Signal	C	31.7	D	47.1
SR 32 & Walnut Street	TWSC*	B	14.9	B	13.7
SR 32 & Cherry Street	TWSC*	B	14.7	B	13.6
SR 32 & East Street	Roundabout	B	11.2	E	36.8
SR 32 & Grassy Branch/Carey Road	Traffic Signal	C	21.2	D	42.3
*For TWSC Intersection, the LOS and Delays in the Table are for the Worst Approach					

Table 3 – LOS Summary for SR 32 in Year 2035: Alternative 2

Intersections	Traffic Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
SR 32 & US 31 NB Off Ramp	Traffic Signal	C	22.1	C	20.4
SR 32 & Shamrock Blvd/Poplar Street	Traffic Signal	C	28.1	B	20.0
SR 32 & Westlea Dr/Mill Street	TWSC*	D	31.9	B	13.5
SR 32 & Union Street	Traffic Signal	D	43.8	D	46.1
SR 32 & Walnut Street	TWSC*	B	14.2	E	38.3
SR 32 & Cherry Street	TWSC*	C	18.1	D	34.0
SR 32 & East Street	Traffic Signal	B	14.6	C	21.2
SR 32 & Grassy Branch/Carey Road	Traffic Signal	C	29.6	D	48.5
*For TWSC Intersection, the LOS and Delays in the Table are for the Worst Approach					

Table 4 – LOS Summary for SR 32 in Year 2035: Alternative 3

Intersections	Traffic Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
SR 32 & US 31 NB Off Ramp	Traffic Signal	C	24.5	C	22.4
SR 32 & Shamrock Blvd/Poplar Street	Roundabout	A	9.1	A	7.5
SR 32 & Westlea Dr/Mill Street	TWSC*	B	11.5	B	13.3
SR 32 & Union Street	Traffic Signal	D	48.5	D	43.8
SR 32 & Walnut Street	TWSC*	B	12.2	B	11.7
SR 32 & Cherry Street	TWSC*	B	12.1	B	11.7
SR 32 & East Street	Roundabout	A	6.2	C	15.3
SR 32 & Grassy Branch/Carey Road	Traffic Signal	C	23.3	D	42.4
*For TWSC Intersection, the LOS and Delays in the Table are for the Worst Approach					

Traffic operations along an urban street are also impacted by access management strategies. Two-way left-turn lanes (in Alternative 2) provide direct access to/from the land uses adjacent to the street. Raised medians (in Alternatives 1 and 3), on the other hand, will prohibit certain left-turn movements from SR 32 and from the side streets/driveways. This somewhat limits mobility to/from adjoining parcels, but increases safety of all users and minimizes delay for SR 32 traffic. If raised medians are used, drivers may proceed to a downstream intersection where U-turns are allowed. The U-turn movement is accommodated best with a roundabout intersection. Additionally,

roundabouts (in Alternatives 1 and 3) generally operate more efficiently, thus having less overall delay compared to signalized intersections (in Alternative 2).

4.2.2 Safety

The safety criterion used for ranking alternatives includes both vehicular safety and pedestrian safety. According to the Highway Safety Manual (First Edition) and other national research:

- Roundabouts (in Alternatives 1 and 3) are safer for vehicles and pedestrians than signalized intersections (in Alternative 2). A study performed by the Insurance Institute of Highway Safety indicated roundabouts can reduce injury crashes by up to 80 percent and all crashes by up to 40 percent. Some severe crash types, such as right-angle, left-turn, and head-on crashes, are essentially eliminated in properly designed roundabouts.
- An urban street with two-way left-turn lanes (in Alternative 2) has a higher vehicle crash frequency than with raised medians (in Alternatives 1 and 3). This may be explained by the faster speeds and greater conflict points with the two-way left-turn lanes.
- An urban street with on-street parking (in Alternative 3) has a higher vehicle crash frequency than without on-street parking. Although on-street parking will reduce the vehicle speeds in the adjacent travel lanes, the overall safety impact of on-street parking is negative due to additional friction between vehicles in the parking spaces and traffic on the mainline.

4.2.3 Community Impact

The community impact criterion used for ranking alternatives focuses on how the improvements will impact the community. The Grand Junction Master Plan outlines Westfield's vision in redeveloping its downtown, and all three improvement alternatives in the study were developed to support this vision. Roundabouts (in Alternatives 1 and 3) can be utilized as a gateway feature for downtown Westfield, and provides great landscaping opportunities. Compared to signalized intersections and two-way left-turn lanes, roundabouts and raised medians reduce the vehicle speeds through the downtown area and create an urban street that is friendlier to both vehicles and pedestrians.

Parking is another important aspect for downtown Westfield. Although off-street parking is expected to represent the majority of the parking spaces in the downtown area, on-street parking is an effective solution to encourage visitors to experience the downtown area. For Alterantives 1 and 2, benefits similar to on-street parking can be introduced by utilizing off-street parking placed directly in front of the buildings with physical separation from the street. **Figure 11** and **Figure 12** show an example of the on-street and off-street parking, respectively.

Figure 11 – Example of On-Street Parking on a Multi-Lane Urban Street

Figure 12 – Example of Off-Street Parking in front of Buildings

4.2.4 Right-of-Way Acquisition and Construction Cost

In order to implement the transportation improvements, additional right-of-way will be required. Right-of-way acquisition for each alternative, including the downtown segment and the east segment, was estimated based on the preliminary geometric layout. Among the three alternatives, Alternative 3 requires the most right-of-way (12.2 acres) and Alternative 2 requires the least right-of-way (10.2 acres). The difference is primarily due to the number of travel lanes and roundabouts.

In addition to right-of-way acquisition, it is also necessary compare the construction cost of each alternative. A planning-level construction cost for each alternative, including the downtown and east segments, was estimated. Among the three alternatives, Alternative 3 costs the most (approximately $17.0 million) and Alternative 1 costs the least (approximately $16.2 million). The difference is mostly due to the number of travel lanes. A detailed breakdown of the cost estimate can be found in **Appendix B**.

4.3 Comparison Summary

Based on five evaluation criteria, **Table 5** provides a summary of the comparison between the alternatives. Although No Build is not considered an acceptable alternative in this study, it was included in the table for comparison purposes. Except for the right-of-way acquisition and construction cost, the four alternatives were ranked in relation to one another, with one star being the worst, and four stars being the best.

Table 5 – SR 32 Preliminary Alternative Evaluation Summary

Alternative	Traffic Operations	Safety	Community Impact	Right-of-Way Acquisition (Acres)	Construction Cost (Downtown & East)
No Build	★	★	★	--	--
Alt. 1	★★★	★★★★	★★★	10.6	$15,793,100
Alt. 2	★★	★★	★★	10.2	$15,860,250
Alt. 3	★★★★	★★★	★★★★	12.2	$16,486,500

5.0 PREFERRED ALTERNATIVE

After presenting the three preliminary alternatives to the GJTG at one of their regular monthly meetings, the ensuing discussion and subsequent meetings led to development of the preferred alternative. The three alternatives were presented with the explanation that the individual elements from each of the alternatives, as well as other original ideas, could be combined to produce the preferred alternative. This section of the report explains the decision-making process that led to the preferred alternative. **Exhibits I**, **II**, **III**, and **IV** in the Executive Summary show the preferred alternative.

6.1 Traffic Operations

The four-lane alternative had the disadvantage of not allowing left turns from SR 32 to Union Street. This was unacceptable to the stakeholders involved. On the other hand, the six-lane alternative had too great of an impact on adjacent properties and only provided a marginal improvement in capacity. This led to the selection of the five-lane section as the preferred section. It requires less right-of-way than the six-lane section while providing a similar capacity. An additional benefit of the five-lane section is that in the future, as traffic volumes increase, there is always the option of narrowing the median to allow for a reversible median lane. This would provide three lanes in the heaviest direction and two in the opposite direction.

Additionally, the GJTG preferred the operational benefits of roundabouts to traffic signals at the study intersections of SR 32 with Shamrock/Poplar and SR 32 with East Street. Due to the right-of-way constraints at Union Street, a traffic signal was the preferred control type for this intersection.

Traffic operations are expected to be similar to those of Alternate 2 (all intersections, except the two roundabout intersections) and Alternate 3 (the two roundabout intersections). At the request of INDOT's US 31 consultant, additional roundabout analysis was performed for the roundabout intersections using a confidence level of 85 percent in RODEL. Most capacity analysis software (such as Synchro) has a built-in confidence level of 50 percent. RODEL allows the user to change it. Using a confidence level of 85 percent means that only 15 percent of the time can operations be expected to be worse than the RODEL results. Raising the confidence level is sometimes recommended to give a more conservative estimate of the roundabout capacity. Advocates of raising the confidence level typically do so to better approximate US roundabout capacity, as opposed to UK roundabout capacity, as RODEL was developed in the UK.

6.2 Safety

The safety benefits of roundabouts for both motorists and pedestrians when compared to traffic signals also contributed to roundabouts being preferred at the intersections of SR 32 with Shamrock/Poplar and SR 32 with East Street. The GJTG desired to provide a wide median that would allow both a left turn lane and a median refuge for pedestrians. It would also allow for trees to be planted in the median. A competing need was identified by the GJTG architectural consultant during the discussion regarding the median width. In order to provide an optimal

depth of developable land south of the SR 32, minimum lot depths of 300 feet should be provided from Mill Street to around Walnut Street, which precluded the use of raised medians in this stretch.

6.3 Community Impact

Provision of on-street parking is important to the GJTG and City of Westfield, as it will strengthen the viability of the businesses that will affront SR 32. A four-lane cross-section does not provide enough capacity to allow on-street parking. With five travel lanes, parking could be provided during the off-peak hours. With six travel lanes, parking would be possible even during the peak hours for a number of years. Stakeholders decided a five-lane cross section would be an acceptable compromise. The five-lane section also provides opportunities for aesthetic improvements, adequate capacity for future traffic volumes, and transitions into the proposed roundabout intersections better than a six-lane cross section would.

6.4 Right-of-Way Acquisition and Construction Cost

The preferred alternative provides similar benefits to Alternative 3, the six-lane section, for a slightly lower cost and right-of-way impact.

Table 6 – SR 32 Preferred Alternative Evaluation Summary

Alternative	Traffic Operations	Safety	Community Impact	Right-of-Way Acquisition (Acres)	Construction Cost (Downtown & East)
Preferred Alt.				**11.7**	**$16,411,800**

6.0 ADDITIONAL IMPROVEMENT PREFERENCES

6.1 US 31 and SR 32 Interchange

As part of the US 31 Hamilton County project, the at-grade intersection of US 31 and SR 32 will be replaced by a grade separation. At the time the draft version of the SR 32 Corridor Study was being written, the conceptual SR 32 interchange design was a diamond interchange with SR 32 being raised to go over US 31, and US 31 remaining at its existing elevation. This design meant that the elevation of the intersection of SR 32 and Shamrock/Poplar Streets would be around 15 feet higher than the elevation of the existing intersection.

Raising SR 32 would detract from the visibility of the parcels along SR 32 near the US 31 interchange, and would have a negative effect on the ability to redevelop the SR 32 corridor near US 31. The City of Westfield and the GJTG are requesting that INDOT and its design consultant for US 31 consider the possibility for an interchange design that would allow SR 32 to remain at-grade in the vicinity of US 31. **Figure 13** shows the I-65 and SR 46 Single Point Urban Interchange (SPUI) in Columbus, Indiana. A similar interchange design, with US 31 going over SR 32, would provide opportunities for a landmark-type bridge, and would allow all quadrants of the interchange to be developed.

Figure 13 – Example of a Single Point Urban Interchange

Figure 14 – Existing J.W. Thompson Culvert

6.2 J.W. Thompson Creek

As part of the Grand Junction Master Plan, a pedestrian grade-separation has been planned at the location of the existing culvert conveying J.W. Thompson Creek under SR 32. **Figure 14** shows the current culvert configuration. Field observations reveal a significant difference in elevation from the top of pavement on SR 32 to the flow line in the J.W. Thompson Creek. Elevations from the GIS contours layer reveal approximately ten feet of difference in elevation from the top of pavement to the flow line. It is likely that a pedestrian tunnel could be provided at this location with little or no change in elevation on SR 32. It is recommended that when SR 32 is reconstructed over the J.W. Thompson Creek, this pedestrian tunnel be installed at that time. Otherwise, SR 32 will be disrupted twice – once for the SR 32 construction, and once to build the pedestrian grade separation.

7.0 FINDINGS AND RECOMMENDATIONS

As presented in the previous sections, various transportation improvement alternatives have been identified and evaluated for the SR 32 corridor. The purpose of each of the alternative improvement designs was to help balance the competing needs of SR 32 as both a regional thoroughfare and the "Main Street" in downtown Westfield. The preliminary alternatives were subsequently presented to City of Westfield staff, the Grand Junction Task Group, and INDOT. The preferred improvement alternative was then selected based on input from these stakeholders, and has been presented in this report.

The following is a summary of the study's findings and recommendations.

- *West segment*: Beside the improvements that have been recently constructed on SR 32 and the proposed interchange at US 31 and SR 32 that is currently under design, no further improvements have been identified in this study.
- *Downtown segment*: The preferred alternative for the downtown segment scores highest in traffic operations and community impact, and scores behind Alternative 1 in safety. The reason for the lower scoring in safety is due to left-turns being allowed from SR 32 to Union Street. They were restricted in Alternative 1. There are also two additional full access locations at Mill Street and Walnut Street.
- *East segment*: Only one alternative was proposed for this segment. A five-lane cross-section is the most compatible with the existing land uses and roadway conditions while accommodating the long term growth potential on SR 32.

Stakeholder coordination between City of Westfield staff, the Grand Junction Task Force, and INDOT was important to forming a consensus as to the preferred alternative for the downtown segment of Main Street (SR 32). It is reasonable to expect that some aspects of the proposed preferred alternative may be altered with further study or during the design phase. This report is a planning document that is meant to aid in future decisions that are made for the SR 32 corridor in Westfield, and is not the final authority on every design aspect.

As a result of this study, the City of Westfield is currently in discussions with INDOT to determine if any of the downtown segments can be built as a part of the US 31 Hamilton County project, particularly in light of the cancellation of the previously programmed INDOT project to widen SR 32 from Westfield to Noblesville. Other possible funding sources and schedules for implementing these improvements are also being investigated. With the proposed interchange construction at US 31 and SR 32 beginning in the year 2014, other improvements on SR 32 should take into account this schedule.

Appendices (Provided in Electronic Format)

Appendix A – Synchro Capacity Analysis Output

Appendix B – Construction Cost Opinion Calculations

Appendix C – Schematic Drawings of Alternate SR 32 Configurations