PLAINFIELD

2019 Town of Plainfield Thoroughfare Plan

APRIL 2019

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ACKNOWLEDGMENTS

Plan Commission

Bruce Smith, President
Steve Bahr, Vice President
Robin Brandgard
Bill Kirchoff
Kent McPhail
Scott Slavens
Rich Philip

Town Council

Robin G. Brandgard
Bill Kirchoff
Dan Bridget
Kent McPhail
Lance Angle

Steering Committee

Bill Kirchoff
Don McGillem
Eric Berg
Scott Singleton
Steve Bahr
Tim Belcher

PREPARED BY:

HWC ENGINEERING

HWC Engineering
135 N. Pennsylvania Street, Suite 2800
Indianapolis, IN 46204
(317) 347-3663

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KEY TERMS

There are several technical terms used throughout this plan that are specific to transportation planning. Some of these key terms are listed below. A more complete listing can be found in the appendix.

Annual Average Daily Traffic (AADT): The total traffic volume passing a point or segment of a highway facility in both directions for one year divided by the number of days in a year.

Capacity: The maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic and control conditions. Usually expressed as vehicles per hour or persons per hour.

Functional Classification: The classification of roadways based on two key characteristics: roadway mobility (traffic volume) and roadway accessibility (entry and exit onto the roadway). Functional classifications are defined by the Federal Highway Administration (FHWA).

Land Use: The classification of geographic areas of land according to their primary use. Examples can include agricultural, residential, commercial, industrial, open space and recreation. Land use classifications are defined in the municipality Comprehensive Plan.

Level of Service: Qualitative measure describing operational conditions within a traffic stream, generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, safety, comfort and convenience.

Multi-Modal: Utilizing multiple forms of transportation, including transit, vehicular, cycling and pedestrian.

Right of Way: Publicly owned land reserved for public infrastructure purposes such as roadways, railroads, utilities, greenways, etc.

FHWA: The acronym for the Federal Highway Administration, which is the agency within the U.S. Department of Transportation that supports state and local governments in the design, construction and maintenance of the nation's highway system (Federal Aid Highway Program) and various federally and tribally owned lands.

Indianapolis MPO: The Indianapolis Metropolitan Planning Organization which is responsible for conducting a continuing, cooperative and comprehensive transportation planning process within the Indianapolis region.

INDOT: The acronym for the Indiana Department of Transportation.

Shared-Use Trail: Infrastructure that supports multiple modes of transportation and recreation. This may include walking, biking, running, skating or people in wheelchairs. Shared-use trails may be located in public right-of-way along roadways connecting key destinations throughout the municipality.

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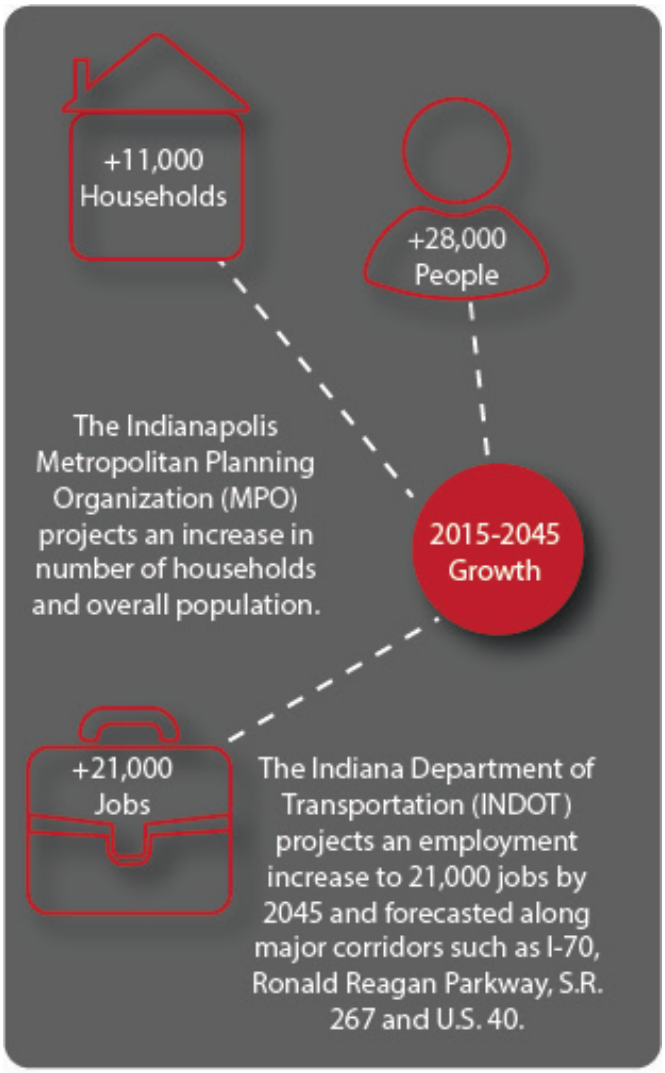
01 EXECUTIVE SUMMARY

GROWING IN PLAINFIELD

The Town of Plainfield has experienced significant growth and development in recent years. Whether it is ongoing suburban residential development, the continued expansion of one of the Indianapolis region's premier industrial destinations or the planned redevelopment of its downtown core, things are growing in Plainfield. Based on regional growth projections, however, past growth is just the beginning.



This growth provides tremendous opportunity for the community, but it does not come without challenges. One specific challenge is the need to maintain and improve the local transportation network to ensure that it addresses current needs as well as the community's needs in the future. For Plainfield to continue to capitalize on this momentum, it must plan for the future to ensure the transportation network within the town is ready for what is to come. This thoroughfare plan helps prepare Plainfield by:

1. Comprehensively engaging the citizens of Plainfield to understand their desires and concerns regarding the current and future transportation system of the town.
2. Reviewing and updating right-of-way standards to ensure sufficient right-of-way is dedicated along local roads as part of new development.
3. Modeling and analyzing local and regional roadway networks based on future growth, to identify potential areas of congestion and delay.
4. Identifying potential short-term and long-term improvements to increase safety and efficiency of the local transportation network.
5. Identify potential policies to help achieve the community's goals related to transportation matters.

> "The world cannot be understood without numbers. And it cannot be understood with numbers alone." Hans Rosling

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TRAFFIC MODELING

One of the differentiating factors between this thoroughfare plan and many other thoroughfare plans is the use of a travel demand model built specifically for Plainfield. This model provides insight into traffic impacts and capacity needs for the town as it undergoes large-scale household and employment growth. The model allows for both local and regional impacts to be evaluated helping the town seek regional, state and federal funding opportunities for transportation projects.

Though many scenarios were tested, four scenarios are presented within this plan for consideration. These scenarios include:

The travel demand model allows for evaluation of multiple future scenarios, considering such aspects as:

1. Impact of differing concentrations of population within the study area.
2. Impact of different concentrations of employment sites within the study area.
3. Impact of proposed transportation network improvements on the local transportation network.

Scenario	Description
CC	Current Conditions Base Model Year 2017
NB	Future No Build: Represents the future year 2045 traffic, if no changes were made to the transportation network and projected future growth occurs.
PS1	Preferred Scenario 1: Include all recommended future improvement projects including connecting local corridors to complete the network and improvements to Ronald Reagan Parkway, Hadley Road, a new Stanley Road Extension between Center Street and Moon Road and key intersection improvements.
PS2	Preferred Scenario 2: Identical to PS1, but includes the proposed I-70 interchange, a new regional connector road between U.S. 40 and I-70 as well as connections to the new regional connector.

ECONOMIC ANALYSIS

To support that the findings of the modeling effort are the proper alternatives for the town, an economic impact evaluation was completed. This analysis allows the town to understand the broader impacts of the proposed transportation improvements recommended within this plan.

The main conclusion that can be drawn from the economic impact analysis is that the recommended package of transportation improvements (Preferred Scenario 2 - PS2) will be economically beneficial to the town and the region. Typically, any roadway improvement scenario where the Benefit Cost (B/C) ratio is higher than 2.0 is considered to be an outstanding public investment. The recommended scenario has significant overall economic benefit, local employment impact and scored a B/C ratio of 6.46.

Beyond the assessment of the economic benefit of the transportation projects themselves, an assessment of projected development fiscal benefits was also completed. Based on the development that is projected to be supported by the proposed thoroughfare improvements, it appears that there is the potential for significant local real property assessed value growth.

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KEY FINDINGS

Beyond the economic benefits of the proposed projects, the modeling effort also identified some key findings from the analysis, including:

» Future traffic projections along the Ronald Reagan Parkway justify expanding the roadway to a 6-lane capacity in the future.

» Because of the expected growth, and the importance of their role in moving local traffic, Hadley Road and Perry Road, have had their functional classes upgraded compared to other sections of the Perimeter Parkway.

» Based on a high-level analysis, the proposed new interchange access on I-70 is expected to invite enough traffic and new development to justify the investment. However, the value of the interchange is not just local. The regional benefits of the interchange are significant and thus the proposed interchange, and its regional connection between I-70 and U.S. 40, should be closely coordinated with other benefiting municipal groups as well as Hendricks County and Morgan County.

» Initially Moon Road appeared to be the logical location for the new interchange, however, based on some environmental development constraints, it appears that a location closer to C.R. 525 may be a better location. Further analysis will be necessary to determine the precise location of the best alternative.

» Plainfield suffers from a lack of east/west connectivity in the community. A new interchange isn't expected to 'solve' anticipated congestion issues on Hadley Road, regardless of its placement. The new interchange would serve a minor role in congestion management. Other future improvements have been included in the preferred scenario to improve long-term relief.

» Additional projects such as the extension of Stanley Road to Moon Road and the extension of C.R. 750 S across the interstate were also modeled and have strong potential benefits to east/west connectivity in the town. While these projects do offer potential to provide alternatives for east/west traffic, they clearly have unique challenges to overcome considering the existing built environment. Further analysis would be required of these alternatives if they were to be pursued in the future.

» Intersection improvements will play a large role in the town managing traffic congestion now and into the future. Some of these improvements will provide relatively cost effective ways to manage congestion in the short to mid-term. These intersection improvements, however, will not eliminate the need for roadway capacity improvements in the future.

Downtown Plainfield Streetscape
Source: HWC Engineering

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KEY RECOMMENDATIONS

The Transportation Plan Recommendations section contains a robust list of short, medium and long-term improvements and policy recommendations based on traffic modeling, community input, steering committee feedback and review of current and previous planning efforts. These short-term priority projects include, but are not limited to:

1. Hadley Road improvements and related intersection improvements.
2. Moon Road widening and related intersection improvements.
3. Intersection improvements along S.R. 267 at C.R. 750 S, Hadley Road, Reeves Road and Stafford Road.
4. Klondike Road extension and improvements.
5. New interchange on I-70.
6. Smith Road widening and improvement.
7. Carr Road widening and improvement.
8. Stout Heritage Parkway widening from Perry Boulevard to Ronald Reagan Parkway.

Details of these projects can be found in the Recommendations chapter of this document.

There are several policies which should be considered priority strategies due to their impact on the town and their ability to lay the groundwork for other identified recommendations. Not all of these priority strategies are short-term. Some may be long-term, but require action in the short-term to ensure success. The priority policies/strategies include:

- Require traffic impact studies according to the thresholds and standards of the Indiana Department of Transportation Applicant's Guide to Traffic Impact Studies. These should utilize town's TransCAD model tool as either the base analysis tool or as verification of alternative analysis.
- Complete the corridor study for the potential new interchange along I-70 as well as the alignment and defined purpose of the proposed west side U.S. 40/I-70 Connector Corridor.
- Work with INDOT to update their on-system Functional Class Map as it relates to the Town of Plainfield to help secure future project funding.
- Work with the Indianapolis MPO to update their 2045 Long Range Transportation Plan to reflect key projects identified within this plan for potential future funding.
- Update and review town design standards to align with recommendations in this plan.

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FUTURE THOROUGHFARE MAP

The Future Thoroughfare Plan Map (Exhibit Z) lays out the envisioned future roadway network for the town. The Thoroughfare Map utilizes the same terms as the existing INDOT Functional Classification Map (arterials and collectors) to ensure continuity for future funding. This map is used to apply future right-of-way standards for the town. This map is also used to amend the State of Indiana's on-system functional classification map for the town as well as inform future discussions with the Indianapolis MPO regarding adjustments to their LRTP (Long Range Transportation Plan) regarding town and regional projects.

Effort has been made to coordinate other jurisdictional thoroughfare plans and designations as part of the development of Plainfield's plan. However, if the Plainfield Thoroughfare Plan classifications differ from adopted thoroughfare classifications in other jurisdictions, Plainfield's standards should apply within the town's jurisdiction.

The roadway alignments and proposed road segments illustrated on the Future Thoroughfare Plan Map are conceptual representations and do not indicate actual alignments. Detailed surveys and studies will be required for any new right-of-way dedication or new road construction.

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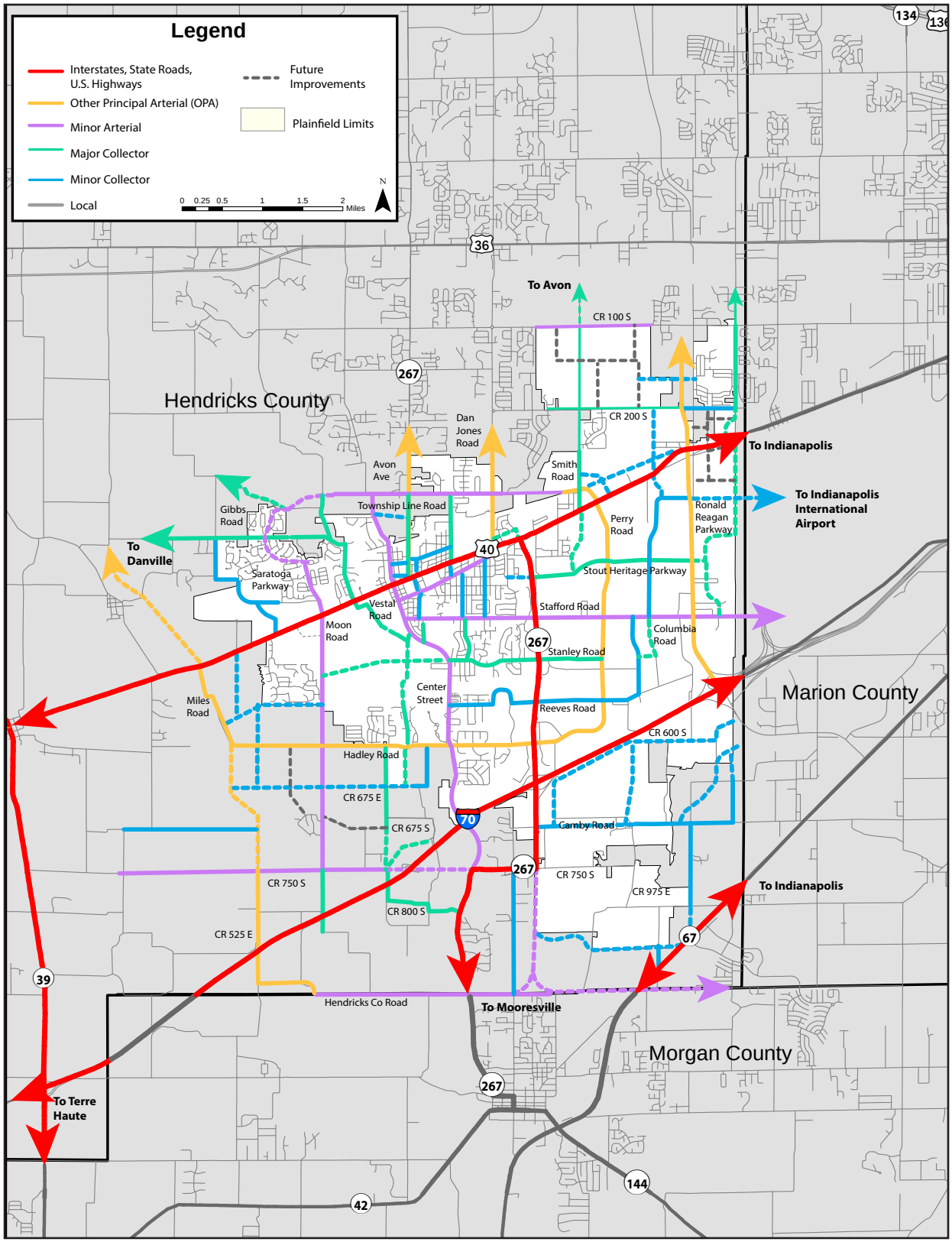
EXHIBIT Z: FUTURE THOROUGHFARE PLAN MAP



*This map is conceptual only and for the purpose of assisting the analysis of this plan. They are subject to change as actual development occurs in the future in currently undeveloped areas.

Source: HWC Engineering

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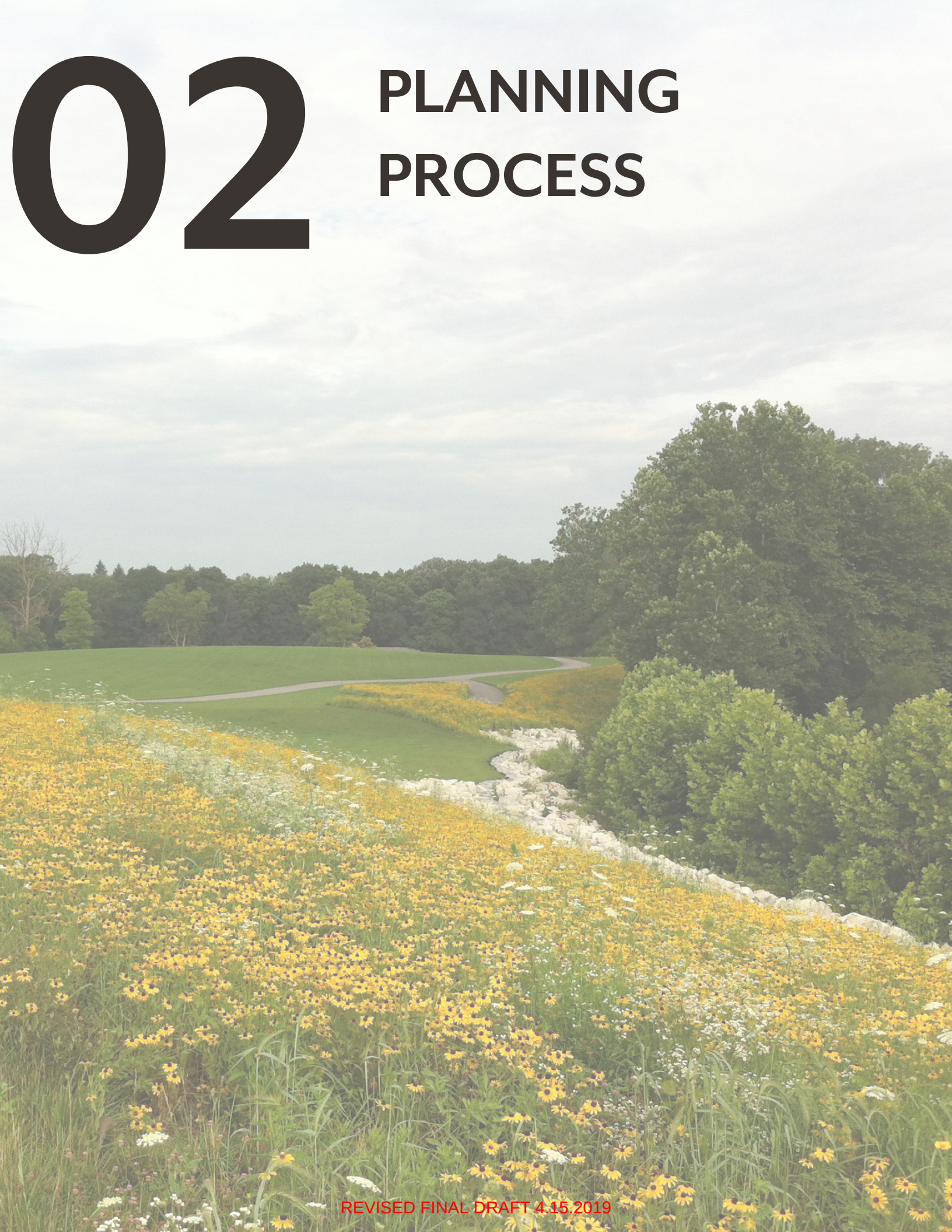
02 PLANNING PROCESS



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PURPOSE OF THIS PLAN

Thoroughfare Plans are long-range planning tools that help public officials, town staff, residents and developers guide and prioritize transportation projects supporting the future needs of the community. This Plainfield Thoroughfare Plan update has been completed based on public input, stakeholder feedback, professional analysis and specific traffic modeling tools. Attention has been given to efforts to ensure safety and efficiency for the community's transportation network. Key improvements identified throughout this plan will be initiated as they are needed and as federal, state and local funding permits.

It is important to note that this plan is not a traffic study and is intended to address the future long-range needs and concerns of the overall transportation network. It considers the transportation network that serves Plainfield and which is also influenced by the region and neighboring communities.

THIS PLAN WAS DEVELOPED BASED ON THREE MAJOR GOALS:

GOAL #1: To provide the highest level of transportation efficiency and safety along key east/west and north/south corridors.

GOAL #2: To provide and improve regional connectivity to accommodate anticipated growth within and beyond Plainfield.

GOAL #3: To plan local transportation improvements that support the overall quality of place and economic growth of Plainfield.

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PROJECT STUDY AREA

The project study area includes the corporate limits of the Town of Plainfield as well as areas outside of Plainfield that influence the local transportation network. Because traffic does not stop at the town limits, it was important that the traffic model include analysis of the transportation system outside of Plainfield. This included parts of incorporated and unincorporated Hendricks and Morgan Counties. This is illustrated as the study area in the illustration below. Including the two different areas of analysis allows for both local and regional impacts to be assessed. The Plainfield Transportation Model was developed using the town's Geographic Information System (GIS) road-centerline layer. This data covers all the roadways within the study area, including the modeling area.

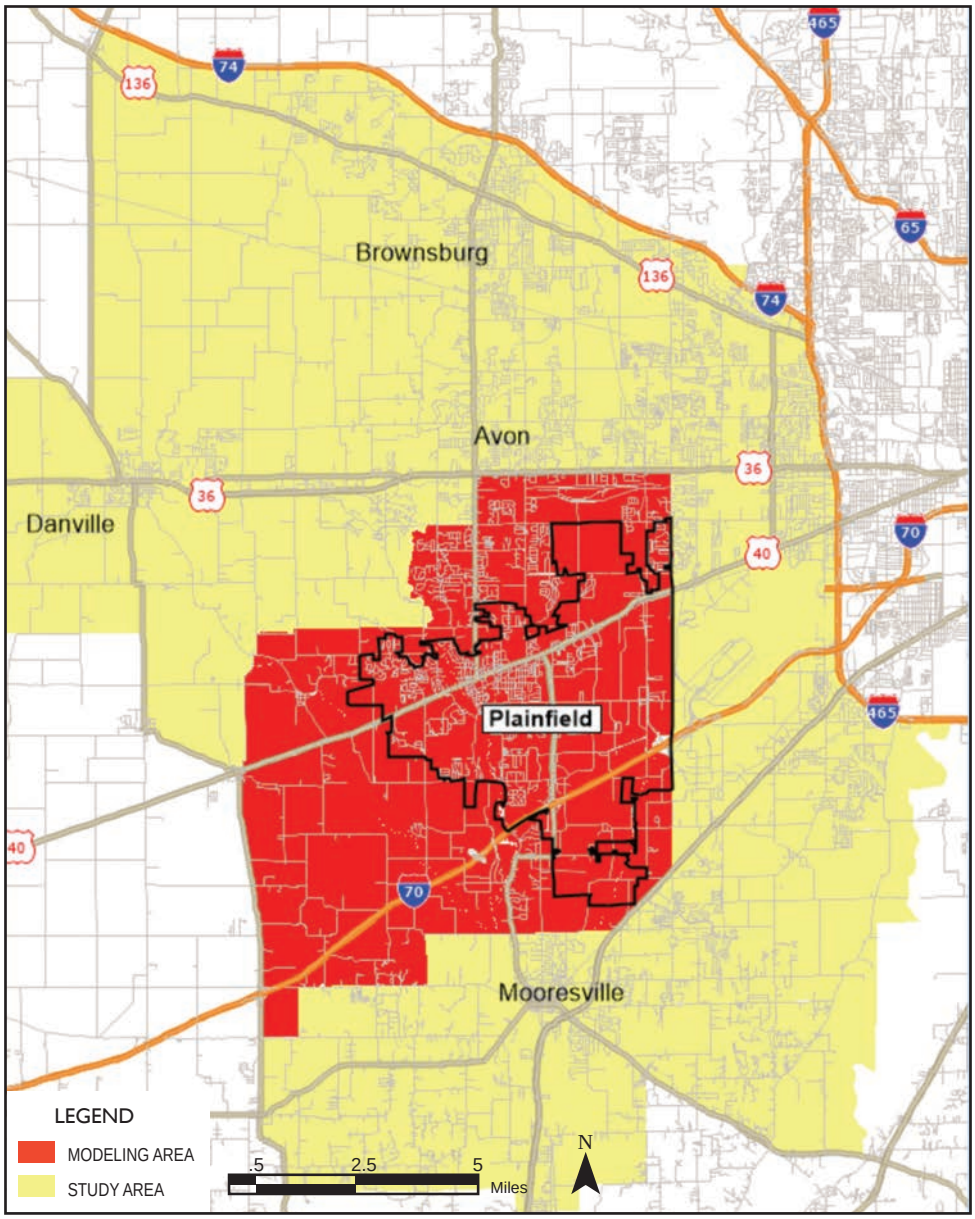

Illustration of the project study area.
Source: Convergence Planning

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STEERING COMMITTEE

A steering committee was created to develop, review and confirm the elements of this planning process. The committee was comprised of six members representing a mix of plan commissioners, town leaders and town staff.

The steering committee met seven times throughout this twelve-month planning process. This committee was essential in reviewing the public input and helping refine the concerns, issues and goals related to Plainfield's transportation network. The committee also reviewed the modeling data and scenario analysis to help refine the Plan's recommendations.

PUBLIC ENGAGEMENT

To better understand the Town of Plainfield's current and expected future transportation needs, a public engagement effort was initiated early on in this planning process, including the following efforts:

PUBLIC INPUT WORKSHOPS

Two public input workshops were held to encourage people to share their thoughts, concerns and desires for the future of Plainfield. The first public input event was held at the Plainfield Public Recreation Center on June 27, 2018. The second took place at the Plainfield Farmer's Market on July 11, 2018. Over 250 individuals provided feedback on the future of Plainfield's transportation networks at these events. A full report of the public input workshops can be found in the Appendix of this document.

Public Input Meeting held at the Guilford Township Community Center.
Source: HWC Engineering

Public Input Workshop at the Farmer's Market.
Source: HWC Engineering

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STAKEHOLDER & FOCUS GROUPS

Increased growth has impacted Plainfield's transportation network. This growth is expected to continue as the town continues to attract businesses, industry and residents. It was important that a variety of stakeholders and focus groups were involved in the planning process to help provide local context to understanding growth impacts on the community.

Stakeholder and focus group meetings were held over several days and included conversations with the Indianapolis International Airport, adjacent community representatives, county representatives, major local employers, local developers and real estate professionals, public safety officials and other community groups. The Indianapolis Metropolitan Planning Organization and Indiana Department of Transportation were also included in stakeholder discussions.

ONLINE SURVEY & MAPPING

An online survey was established to collect input from those unable to attend the public input workshop events. This online survey generated 834 responses to in-depth questions related to Plainfield's current and future transportation networks. A full survey summary can be found in the Appendix.

A project website was also created to identify key transportation issues, concerns and ideas. The website used online mapping tools to give respondents the ability to locate missing sidewalk segments, needed intersection improvements and overall road and street concerns. The online mapping results are shown in Exhibit A (page 27).

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PUBLIC INPUT SUMMARY

The public identified several items that were important to them to support the future transportation network of Plainfield. These included:

Top transportation concerns:

- » **Increased traffic and congestion on U.S. 40, Hadley Road, S.R. 267 and Center Street**
- » **Increasing freight and truck traffic**
- » **Aging infrastructure, including sidewalks and drainage.**

Top public priorities for future transportation improvements:

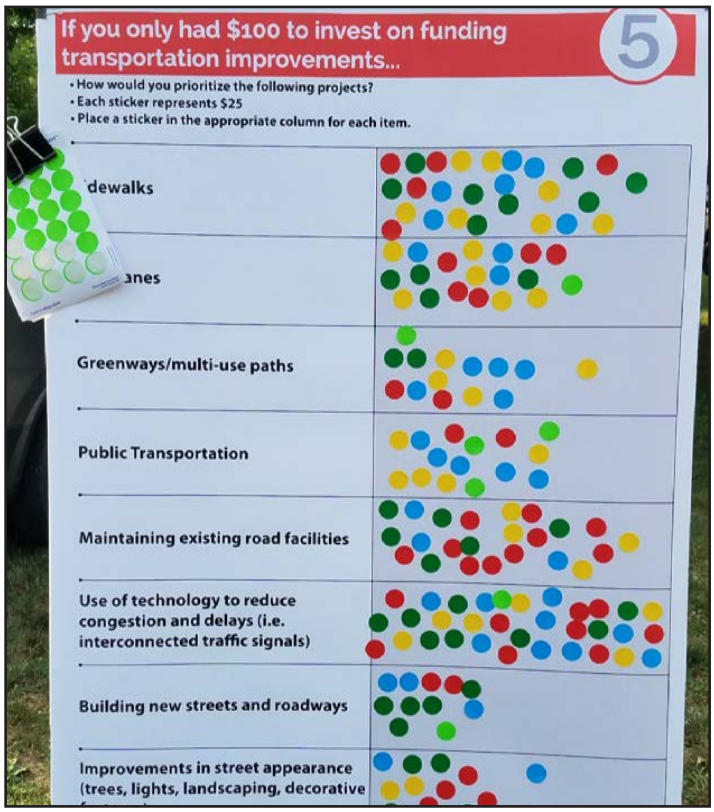
- » **Reduce congestion**
- » **Improve pedestrian safety**
- » **Increase local connectivity**
- » **Increase vehicular capacity of roads**
- » **Support economic development**

The top areas where the public indicated that local resources should be allocated for transportation improvements:

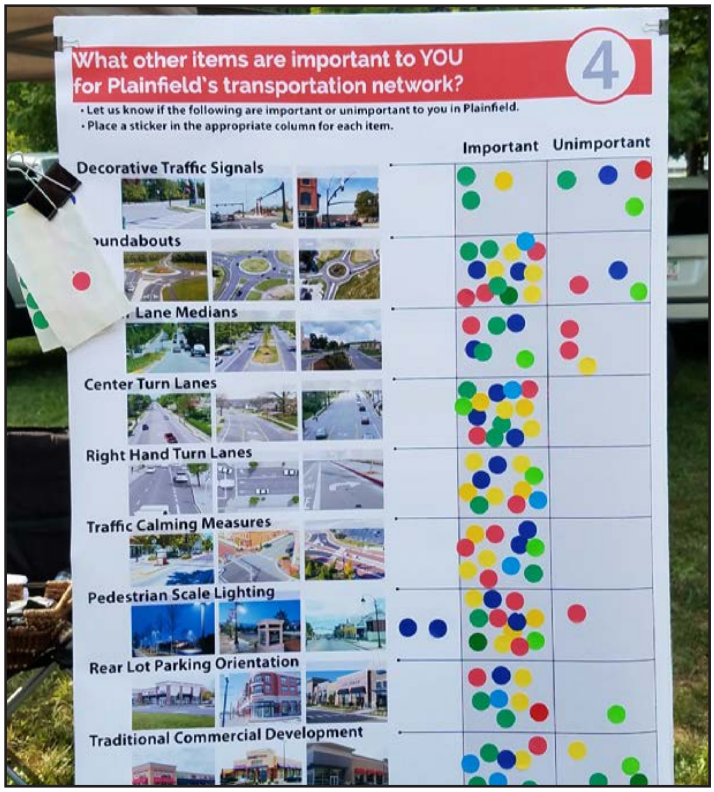
- » **Maintenance of existing streets**
- » **Safety improvements on existing roadways**
- » **More convenient access to I-70**
- » **New streets and expanded capacities**
- » **Off street sidewalks and paths**
- » **Better use of technology to reduce traffic delays**

Top road design elements:

- » **Roundabouts**
- » **Center turn lanes**
- » **Recreation trails (off-street trails and bike access**
- » **Aesthetic elements (decorative traffic signals, lighting, trees, plantings)**



Input collected from residents at the Farmers Market showed clear support for investing in congestions solutions, sidewalks, new technologies and maintain the town's existing facilities.



Residents at the Farmers Market also indicated a desire to utilize tools such as roundabouts, center turn lanes and traffic calming measures to improve roads within the town.

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PUBLIC INPUT SUMMARY CONT.

The public indicated they are generally pleased with the town's proactive implementation of road improvements. However, a few recurring comments and concerns did surface, including congestion on key corridors like U.S. 40, S.R. 267 and Hadley Road.

The public also noted the need to continue to improve overall traffic circulation. Specific public recommendations to accomplish this included:

- **Providing additional access to I-70**
- **Improving east/west connectivity**
- **Improving key intersections to increase overall traffic efficiency during peak travel times**

People also identified the following key intersections for future improvements:

- **U.S. 40 and Center Street**
- **Hadley Road and S.R. 267**
- **S.R. 267 and Township Line Road**
- **Hadley and Moon Road**

A significant public concern was the need to improve local transportation networks to better accommodate truck traffic and freight movement.

The public also indicated a strong desire for improved walkability and pedestrian accommodation throughout the community. While there is already trail infrastructure within the town, additional bicycle and pedestrian route improvements are desired to help make residents and visitors less dependent on cars for their travel needs.

SURVEY SAYS...

87% of people think increased traffic, congestion and delays are a challenge for Plainfield in the next 25 years.

40% of people wish the road and streets were improved for commuter traffic.

RESPONDENTS...

- Think travel time is the biggest factor why they use a personal car; accessibility is second in importance.
- People wish there were more public transportation options.
- Want to see additional trail connections.

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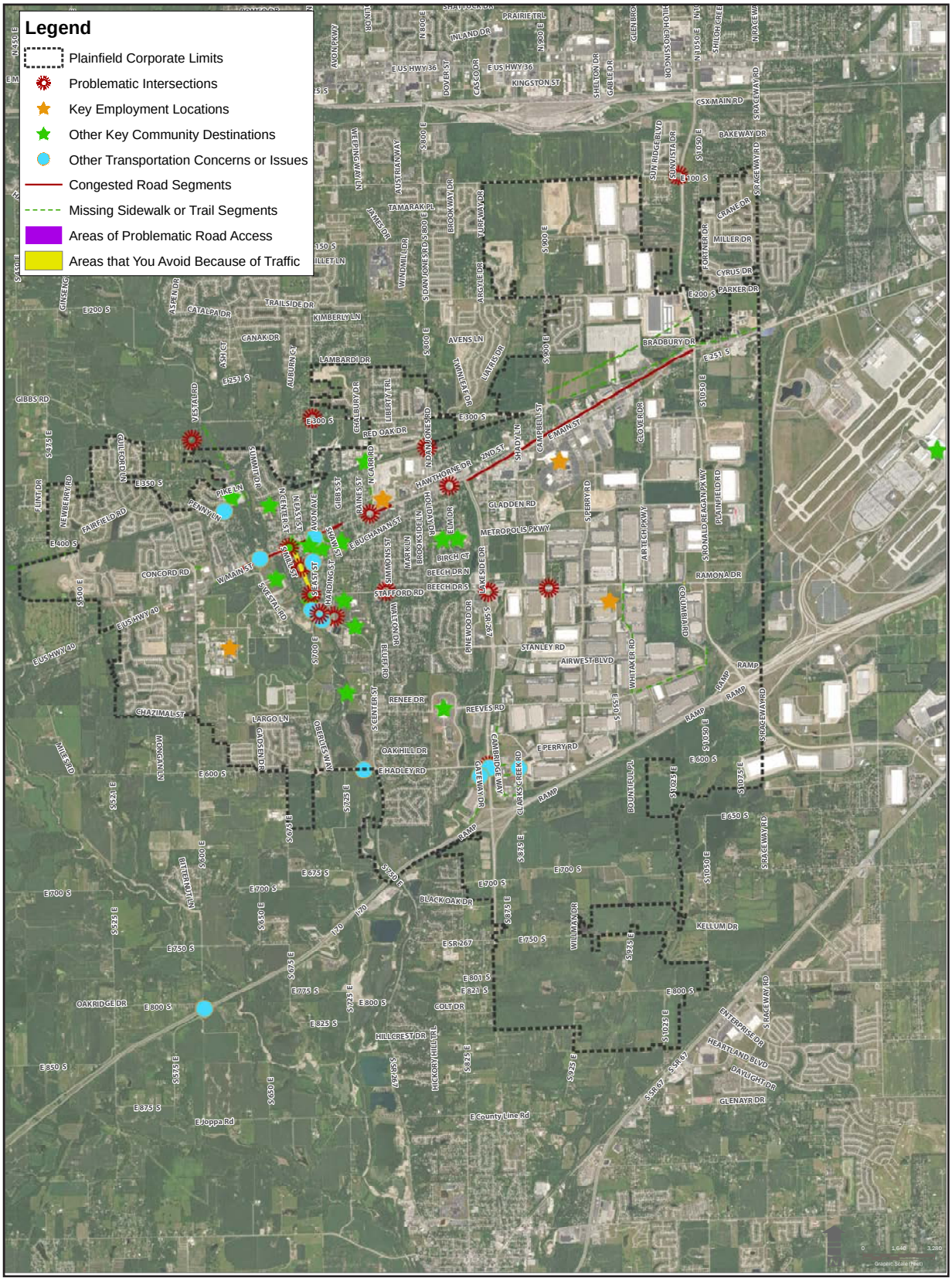
EXHIBIT A: MAP SOCIAL RESULTS



Results from the Online Map Social public input exercise.
Source: HWC Engineering

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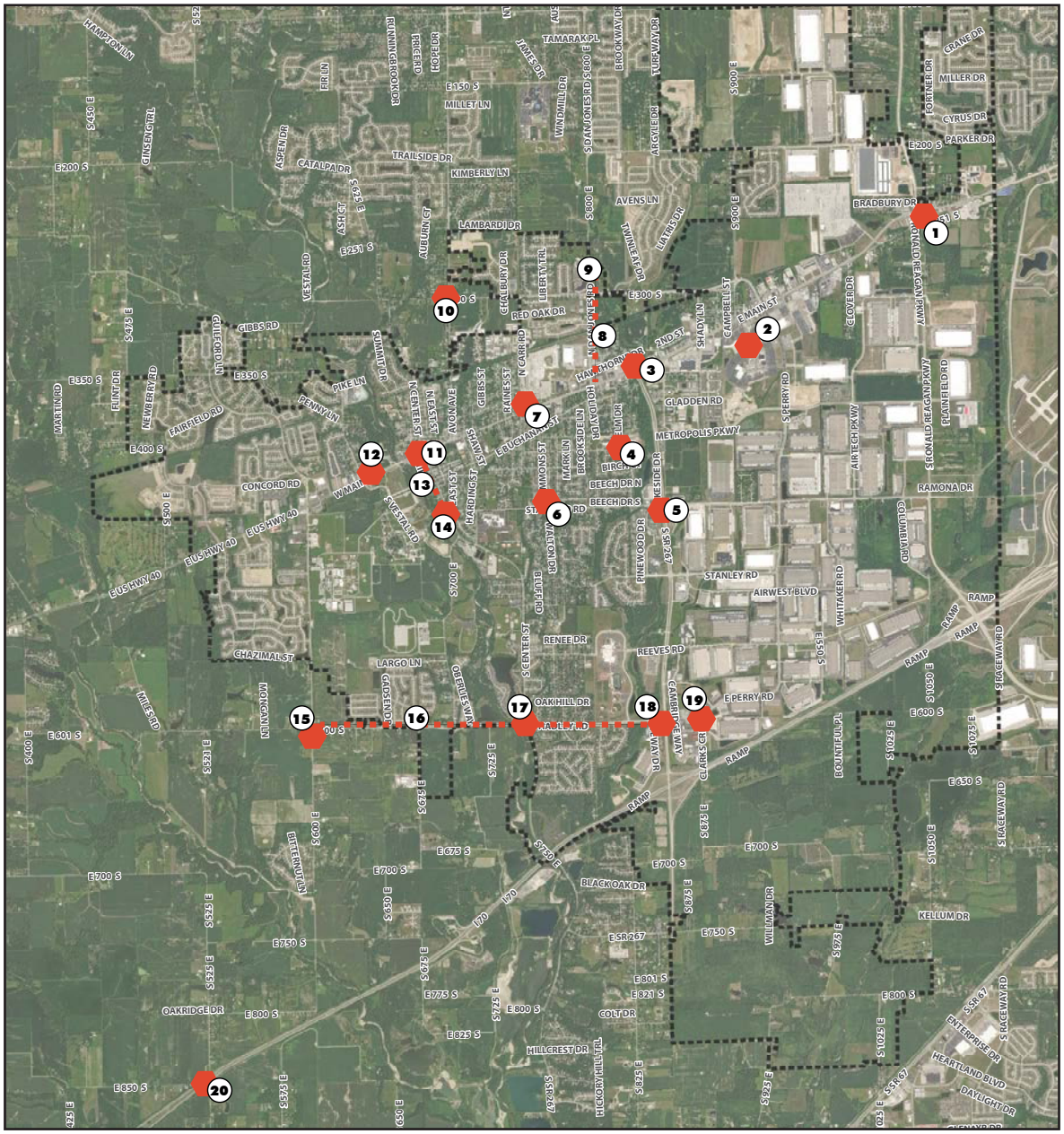
COMBINED CAPACITY PROJECTS

Exhibit B is a compilation of information gathered during the public input process, feedback from the steering committee and a review of previous planning efforts. This map, and the accompanying table, identify the areas, road segments and intersections that have been noted for further planning analysis. This map and list include projects that have been previously studied as well as new projects for consideration.

EXHIBIT B: COMBINED CAPACITY PROJECTS MAP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STANLEY RD
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GLADDEN RD
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COMBINED CAPACITY PROJECTS LIST

	Segment	Public Input Description
1	Ronald Reagan Pkwy. & U.S. 40	Intersection Improvement/Long Light
2	Perry Rd./Shops at Perry Crossing	Congestion
3	S.R. 267/Quaker Blvd & U.S. 40	Intersection Improvement/Long Light
4	Elm Dr. onto U.S. 40	Congestion on Oliver Ave.
5	Stafford Rd. & S.R. 267/Quaker Blvd.	Intersection Improvement
6	Stafford Rd. & Simmons St.	Intersection Improvement/Congestion
7	Carr Rd. & U.S. 40	Intersection Improvement/Long Light/Congestion
8	Dan Jones Rd.	Pedestrian Connection
9	Dan Jones Rd. & Township Line Rd.	Intersection Improvement
10	Township Line Rd.	Speed Limit/Trail Connectivity to Main St.
11	Center St. & Main St./U.S. 40	Congestion/Accidents
12	Vestal Rd. & Main St./U.S. 40	Intersection Improvement/Long Light
13	Center St. from Main to Stafford Rd.	Congestion
14	Stafford Rd. & Center St.	Intersection Improvement/Congestion
15	Moon Rd. & Hadley Rd.	Intersection Improvement/Congestion
16	Hadley Rd. from Moon Rd. to S.R. 267	Widening/Upgrade leftover section
17	Center St. & Hadley Rd.	Intersection Improvement
18	S.R. 267 & Hadley Rd.	Tall Grasses/Intersection Improvement
19	Perry Rd. & Clarks Creek shopping area	Intersection Improvements/Congestion
20	I-70 & U.S. 40 route	Additional Western Connection
21	Joppa Rd./Co Line Rd.	South of I-74 connection to S.R. 267 to Morgan Co.
22	South S.R. 267 extension	New Road connection to Co Line Rd./Morgan Co.
23	700 E. to Bountiful Rd.	Upgrades to 700 E. and Bountiful Rd.
24	South of I-74 frontage road	New Road connection from S.R. 267 to 600 S.
25	Airtech Pkwy. extension	Whitaker Rd. to Airtech Pkwy. connection
26	Metropolis Pkwy.	Upgrades to Metropolis Pkwy. extension
27	Plainfield Rd. extension	New Road connection from Plainfield Rd. to Raceway Rd.
28	Airtech Pkwy. extension	New Road connection from Raceway Rd. to Airtech Pkwy.
29	200 S. connector	New Road connection from Ronald Reagan to Raceway Rd.
30	Clover Dr. extension	Connection from 200 S. to Airtech Pkwy.
31	Allpoints Pkwy. connection	Connection from Smith Rd./Perry Rd. to Ronald Regan Pkwy.
32	Smith Rd./Perry Rd.	Upgrades and road extension to Metropolis Pkwy.
33	Co Line Rd. and Gibbs Rd.	Upgrades and extension to Gibbs Rd.
34	350 S.	Upgrades to C.R. 350 S. from Saratoga Pkwy. to town limits
35	Saratoga Pkwy	Potential widening/Upgrades from U.S. 40 to Gibbs Rd.
36	Moon Rd.	Upgrade Moon Rd.
37	Miles Rd. extension/regional connector	New road connection from Miles Rd. to I-70 interchange
38	C.R. 750 S.	Upgrades to C.R. 750 S.

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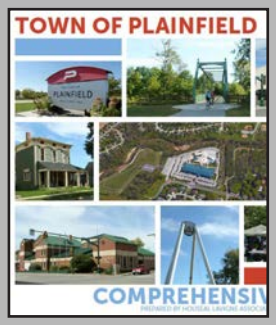
PREVIOUS PLANS

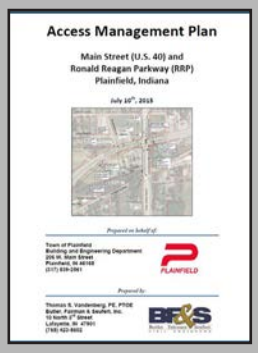
This plan was also created and influenced by previous planning efforts completed by Plainfield, adjacent communities, regional planning organizations and Hendrick's County. The goals and objectives of these plans have guided the development of projects and priorities for this thoroughfare plan update.

The plans and studies below influenced the development of the Plainfield Thoroughfare Plan update. These plans and studies have helped influence Plainfield's current thoroughfare infrastructure.

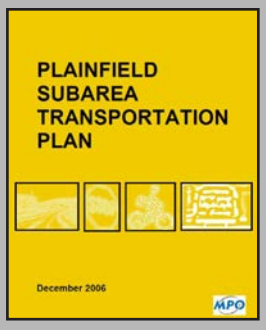


2016 Plainfield Comprehensive Plan

2011 Plainfield Sidewalks and Trail Master Plan



2015 U.S. 40 & RRP Access Management Plan



2006 Plainfield Subarea Transportation Plan

2006 Hendricks County Comprehensive Plan

2045 Indianapolis MPO Long Range Transportation Plan

2018-2021 INDOT STIP

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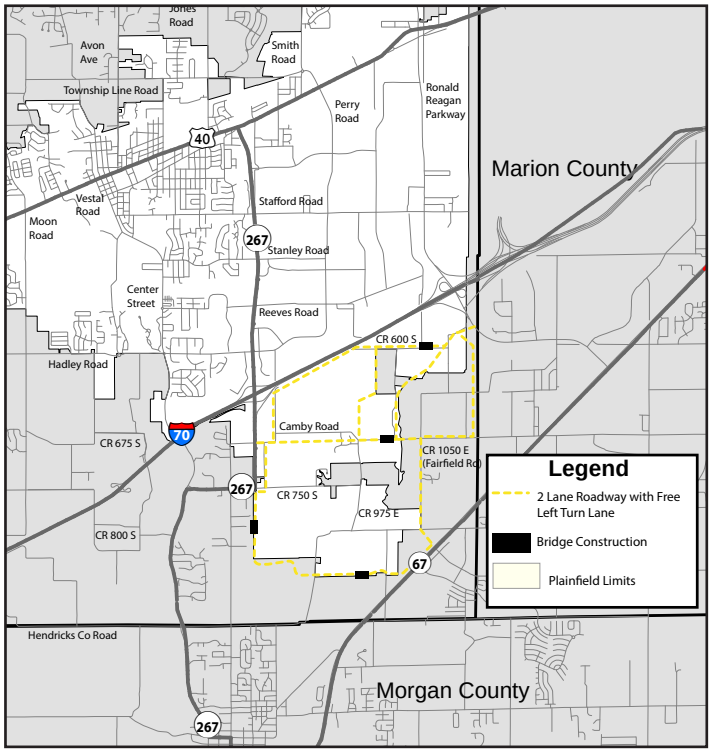
INFLUENCING PLANNING EFFORTS

2006 Subarea South of I-70 Transportation Plan

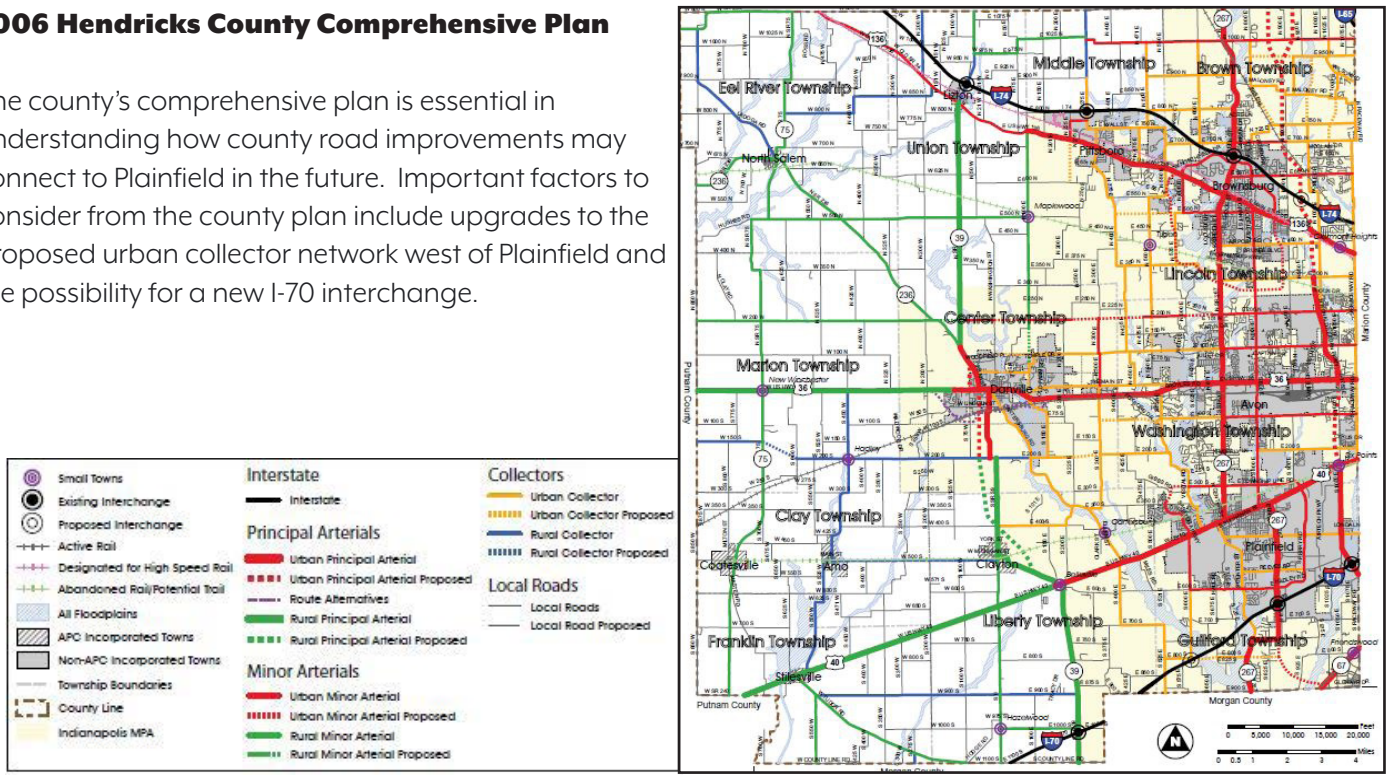
This plan identified key network connections to the southeast side of Plainfield. The key corridors, illustrated on the right, include upgrades to a two-lane road with a left turn lane. Camby Rd., C.R. 750 S. and south of S.R. 267 are other roadway corridors recommended for upgrades. The C.R. 600 S. upgrade was identified as important for greater connection to Marion County and increased economic development impact.



Source: Town of Plainfield

2006 Hendricks County Comprehensive Plan

The county's comprehensive plan is essential in understanding how county road improvements may connect to Plainfield in the future. Important factors to consider from the county plan include upgrades to the proposed urban collector network west of Plainfield and the possibility for a new I-70 interchange.



Source: Hendricks County, IN

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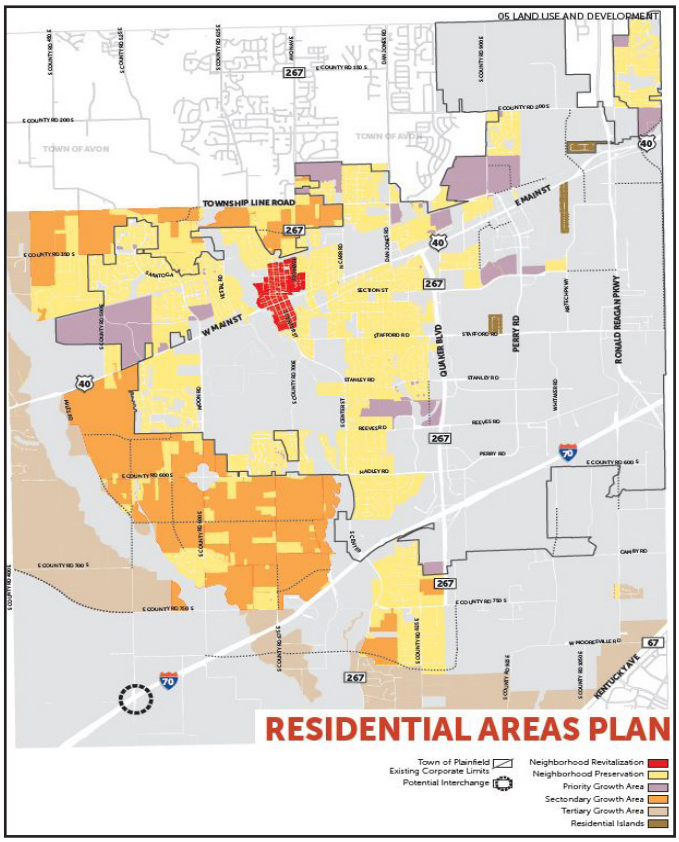
2016 Town of Plainfield Comprehensive Plan

The 2016 Plainfield Comprehensive Plan has identified areas where future growth is anticipated and encouraged. The Residential Areas Plan Map illustrates the primary and secondary areas identified for residential growth. The majority of this anticipated growth is located on the west side of Plainfield. Modeling scenarios used in this plan reference these anticipated growth areas when establishing future transportation needs.

Additionally, the transportation networks within the 2016 Comprehensive Plan reflect the future transportation networks in the 1997 Comprehensive Plan. One major corridor that remains a future priority is the Perimeter Parkway. The Perimeter Parkway corridor loops around Plainfield to provide an arterial connection aside from U.S. 40, I-70, S.R. 267 and the Ronald Reagan Parkway.



Source: Town of Plainfield

TRANSPORTATION AND MOBILITY

The 2016 Plainfield Comprehensive Plan's Transportation and Mobility section identifies two key corridors that have influenced this Thoroughfare Plan: the Perimeter Parkway and future I-70 interchange. These two future corridor projects will likely increase transportation flow throughout and into Plainfield.

Source: Town of Plainfield

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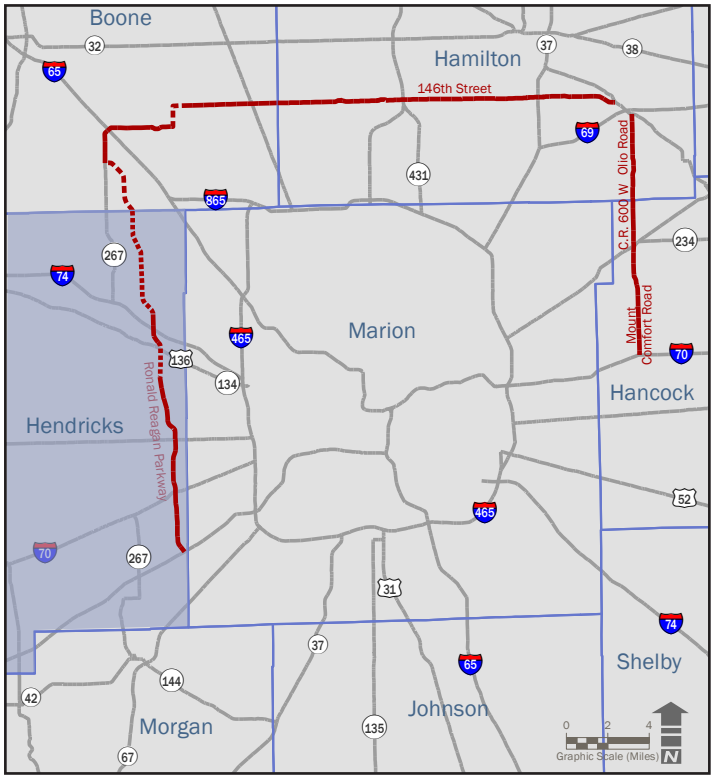
INFLUENCING CORRIDORS

Ronald Reagan Parkway

The Ronald Reagan Parkway that runs through Plainfield is expected to eventually connect S.R. 67 to I-65. Subsequent improvements to the 146th Street corridor in Boone County would eventually improve the connection to I-69 in Hamilton County. This state funded corridor has provided new economic development opportunities and provided incentive for additional private investment in nearby communities.



Regional Context Map highlighting the original alignment of the Ronald Reagan Parkway and the regional corridors formed by Hendricks, Boone, Hamilton and Hancock Counties.

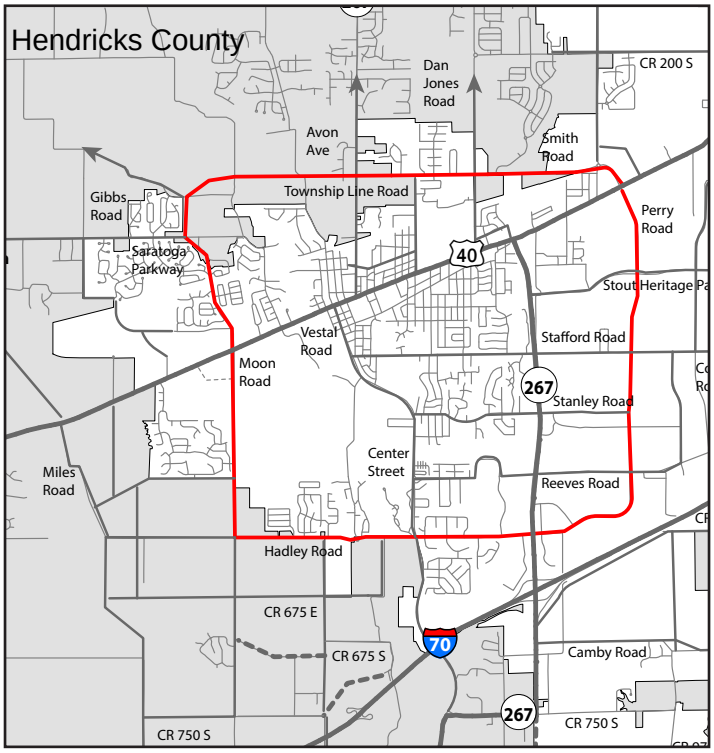
Source: HWC Engineering

Plainfield Perimeter Parkway

The perimeter parkway is an ongoing effort to create an internal loop of major roadways within Plainfield. Identified in the Town's 1993 Transportation Plan, it consists of a series of roadway improvements to east/west and north/south corridors within the community. Key components of the parkway include :

- **Township Line Road**
- **Moon Road**
- **Hadley Road**
- **Perry Road**

Upgrades to these roadways will be required to realize the full benefits from the Perimeter Parkway vision. Once completed, this project is expected to reduce congestion on surrounding roadways and provide better traffic flow to adjacent development areas.



Source: HWC Engineering

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Potential I-70 Interchange

Plainfield's 2004 Comprehensive Plan first identified a new interchange at I-70 and Moon Road as a potential solution for increasing traffic levels that were expected to occur on both Hadley and Moon Roads as the town expanded and developed new residential neighborhoods to the west. The proposed interchange was included in Hendricks County's 2006 Comprehensive Plan as part of its Transportation Plan.

In 2016, the Plainfield Comprehensive Plan again identified the benefits a new interchange with I-70 would have but considered an alternative location at the intersection of I-70 with C.R. 525 E. It was suspected that this location may provide more opportunity and support of future economic development due to more favorable site conditions associated with the surrounding terrain.

A key goal of this Thoroughfare Plan update is to model the traffic and economic benefits of both scenarios and provide a recommendation on what the intersection location means for the town. While this plan outlines the potential impact of the interchange, additional study will be required to identify the best location for a new interchange as well as the best corridor alignment with which to connect the interchange to U.S. 40. Conversations with INDOT and the Indianapolis MPO should continue as further study is completed to help ensure that the projects become a priority for future regional infrastructure planning.

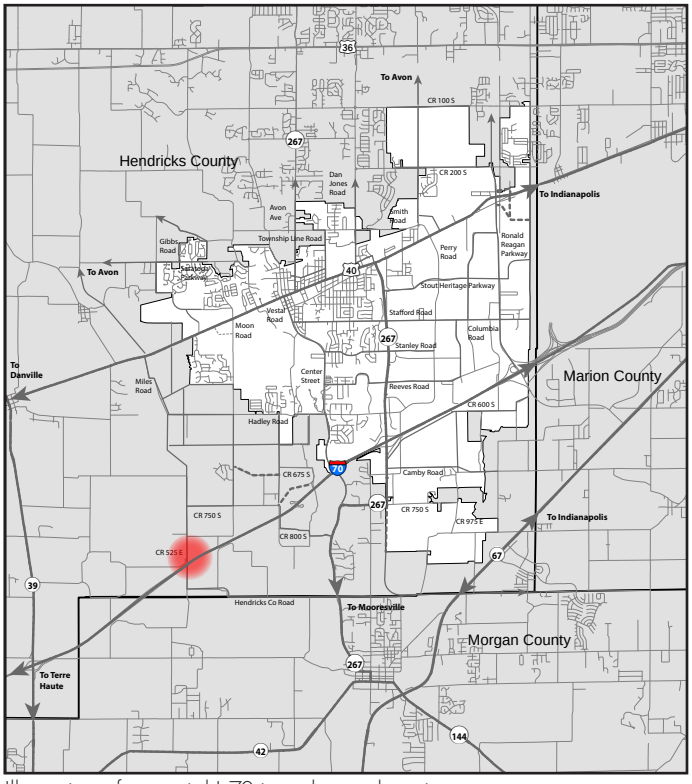

Illustration of potential I-70 interchange location.

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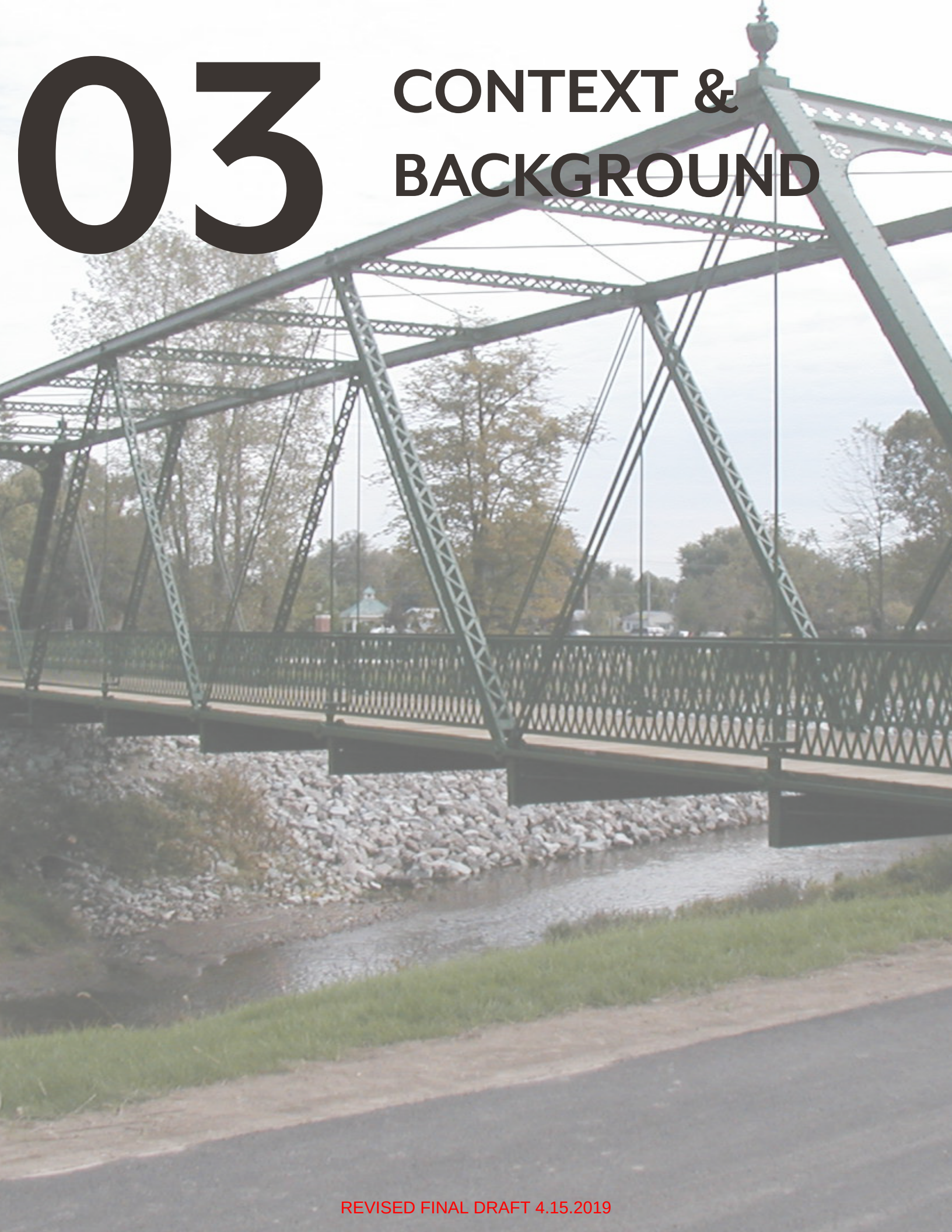
03 CONTEXT & BACKGROUND



LOCATION IS KEY

The Town of Plainfield is located within Hendricks County and is located in the southwest corner of the state capitol of Indianapolis. Total land area in Plainfield is just over 22 square miles and includes a historic downtown core, major industries, quality schools, and easy access to the City of Indianapolis and Indianapolis International Airport along U.S. 40 and I-70. Plainfield is primarily within Guilford Township but portions of the town are within Liberty and Washington townships.

Plainfield's location has been a major factor in its recent economic success. The U.S. 40 and I-70 travel corridors traversing the town provide convenient access to major regional travel routes.

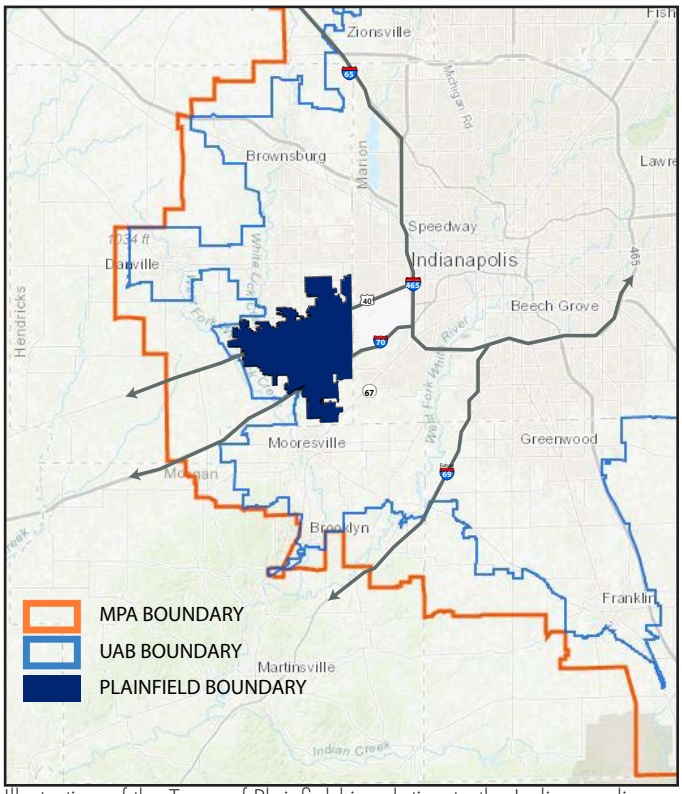


Illustration of the Town of Plainfield in relation to the Indianapolis MPO UAB and MPA boundaries.
Source: INDY MPO

REGIONAL LOCATION

Because traffic does not stop at jurisdictional boundaries, it is important to understand the influence that areas outside of Plainfield have on the town itself. Plainfield is included in the Indianapolis Metropolitan Planning Organization's (MPO) Metropolitan Planning Area (MPA) and Urbanized Area Boundary (UAB). This provides an opportunity for regional funding opportunities for transportation needs and upgrades on projects that particularly exhibit regional connectivity.

The Town of Avon is located to the north of Plainfield. Avon is currently updating its thoroughfare plan and has shared its future thoroughfare desires with Plainfield. Some of these future improvements may impact Plainfield's transportation network.

Morgan County and Hendricks County are also underway on thoroughfare plan updates. As Plainfield considers regional connectivity to corridors such as I-70, I-69, S.R. 39 and S.R. 144, it will be important to coordinate transportation efforts with these other planning processes. This will help ensure the greatest overall transportation functionality and economic benefit to the region.

With Indianapolis International Airport to the east of the town, conversations with airport officials were conducted to understand their concerns and any future expansion projects that could affect Plainfield. Overall, the internal roadway system the airport has in place aids in managing some of the congestion on U.S. 40 and I-70. One connection the airport and Plainfield are interested in is the improvement of Stafford Road and Airtech Parkway to the Airport's internal loop road. These connections are a direct way into the airport's internal transportation system and would aid in accessibility for Hendricks County residents and the businesses that utilize the airport's services.

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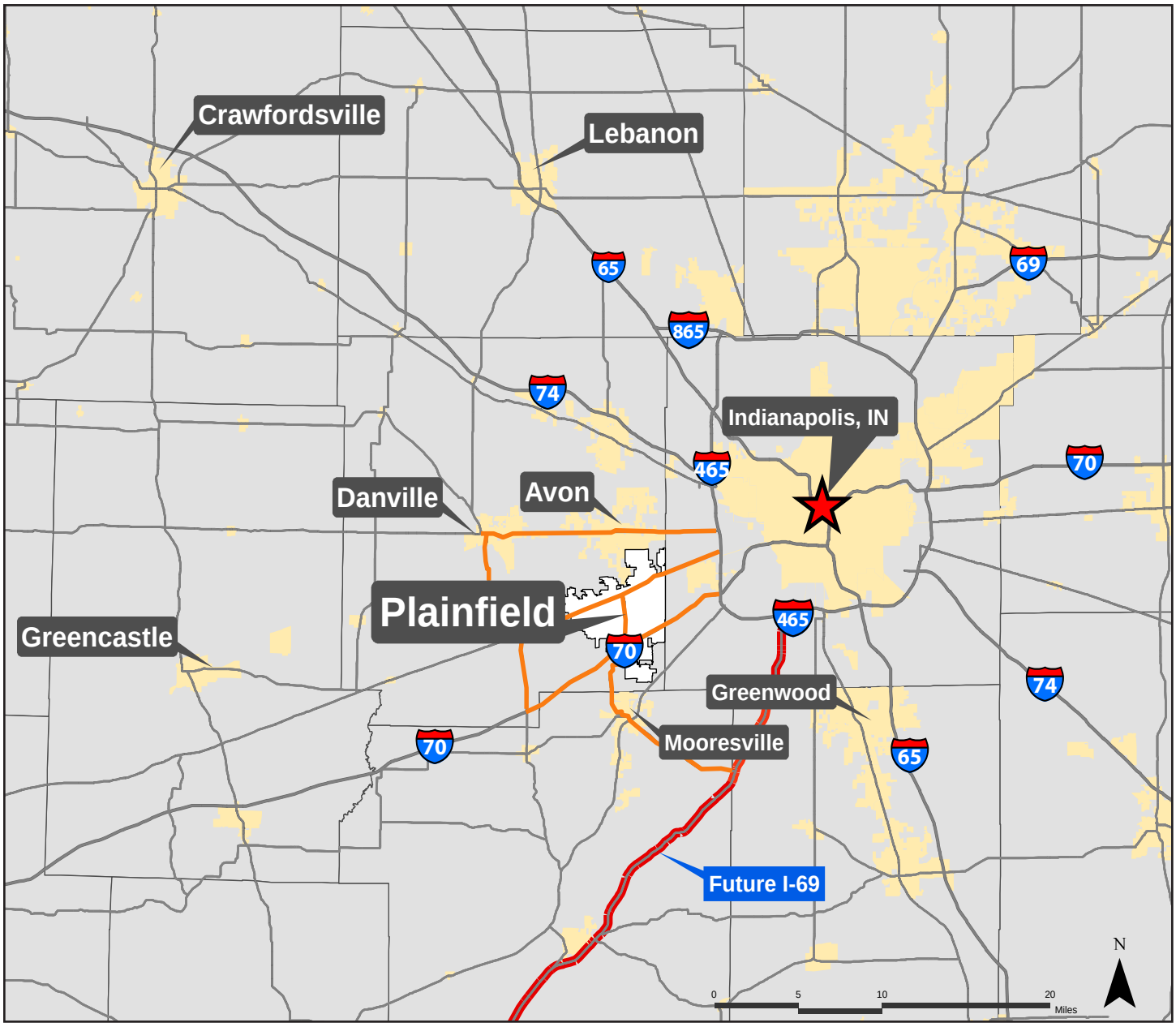
EXHIBIT C: REGIONAL LOCATION MAP



Plainfield's regional relation to adjacent communities and major corridors, including the future I-69 corridor.
Source: HWC Engineering

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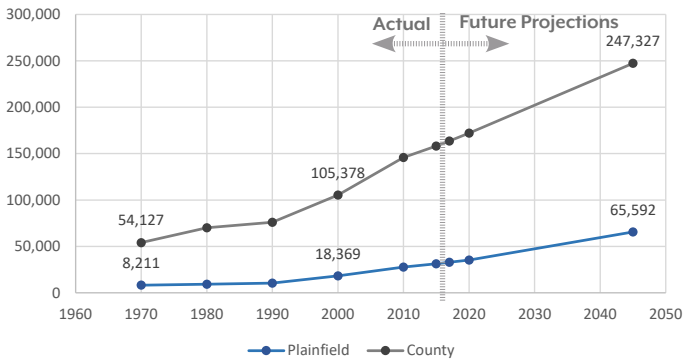
DEMOGRAPHIC, ECONOMIC & POPULATION TRENDS

POPULATION GROWTH

Plainfield's population has increased over the past decade. This is a trend that is anticipated to continue in the future. To allow for more accurate future growth projections, data from both the Indianapolis MPO and INDOT have been utilized in this plan. This helps deepen the understanding for both local and regional future growth expectations.

The MPO population forecasts were used for Hendricks County and the Woods and Poole INDOT projections were used for areas within Plainfield.

Population Growth 1970-2045



Source: INDOT

The chart above illustrates historic and projected population data for both Plainfield and Hendricks County. In 2017, Plainfield's population represented 29.5% of Hendricks county's total population and this is expected to increase to 33.6% by 2045. This projected growth necessitates proper planning to accommodated the town's future utility and transportation infrastructure needs. Plainfield's future growth projections have been derived from the Woods and Poole Economics forecasts which factor in a number of future changes including the completion of I-69, Indianapolis Metropolitan growth and overall market expectations. Plainfield is expected to experience future population and employment growth due to its regional transportation access, available land and quality of place factors.

Historical Permit Data

HOUSING

	PERMIT TOTALS		CUMULATIVE TOTAL UNITS
1990	41	1990	75
1995	134	1995	1,298
2000	421	2000	2,444
2005	363	2005	4,616
2010	63	2010	5,413
2015	167	2015	6,672
2017	254	2017	7,800
2018	280	2018	8,268

INDUSTRIAL

	CUMULATIVE TOTAL SQUARE FOOTAGE
1995	687,939
2000	10,888,534
2005	22,143,593
2010	26,917,485
2015	35,076,562
2017	39,966,145
2018	43,090,554

Industry has continued to grow within the 5 industrial parks: Metro Air, Airtech, Allpoints, Airwest and Gateway.

Source: Plainfield, Indiana

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COMMUTING

On The Map is an online tool provided by the U.S. Census Bureau that illustrates commuting data for geographic areas. According to On The Map, 25,039 people commute into Plainfield for work. The majority of those commuting into the town are commuting from Avon and Indianapolis. Over 70% of those commuting into Plainfield travel up to 24 miles per day for work and primarily drive alone.

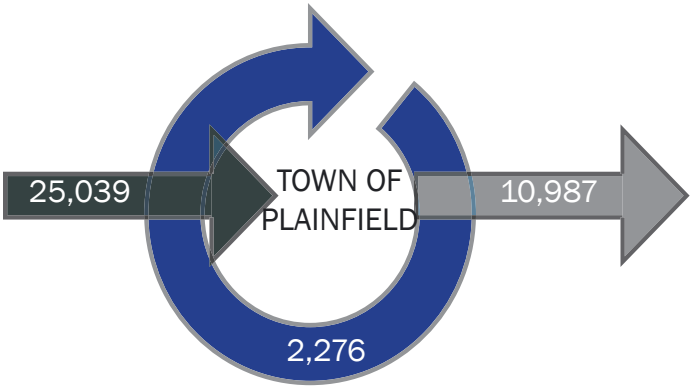
In 2015, nearly 11,000 of Plainfield's residents left town for work, while a fraction of the population, only 2,276, lived and worked within Plainfield. Of those who commuted out of the town's boundaries, most were commuting to the east and south, towards Indianapolis and Johnson County.

In 2010, those who lived elsewhere but commuted into Plainfield constituted 64% of the overall commuting traffic. This percentage increased to 70%, or an additional 8,596 individuals, in 2015.

PLAINFIELD COMMUTING TRENDS 2010 AND 2015		
	2010	**2015**
Employed in Plainfield but live elsewhere	16,443	25,039
Live in Plainfield but work elsewhere	9,379	10,987

Source: Onthemap.census.gov

PLAINFIELD COMMUTING TRENDS



Source: Onthemap.census.gov

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EXHIBIT D: COUNTY WIDE MAJOR EMPLOYERS WITHIN PLAINFIELD

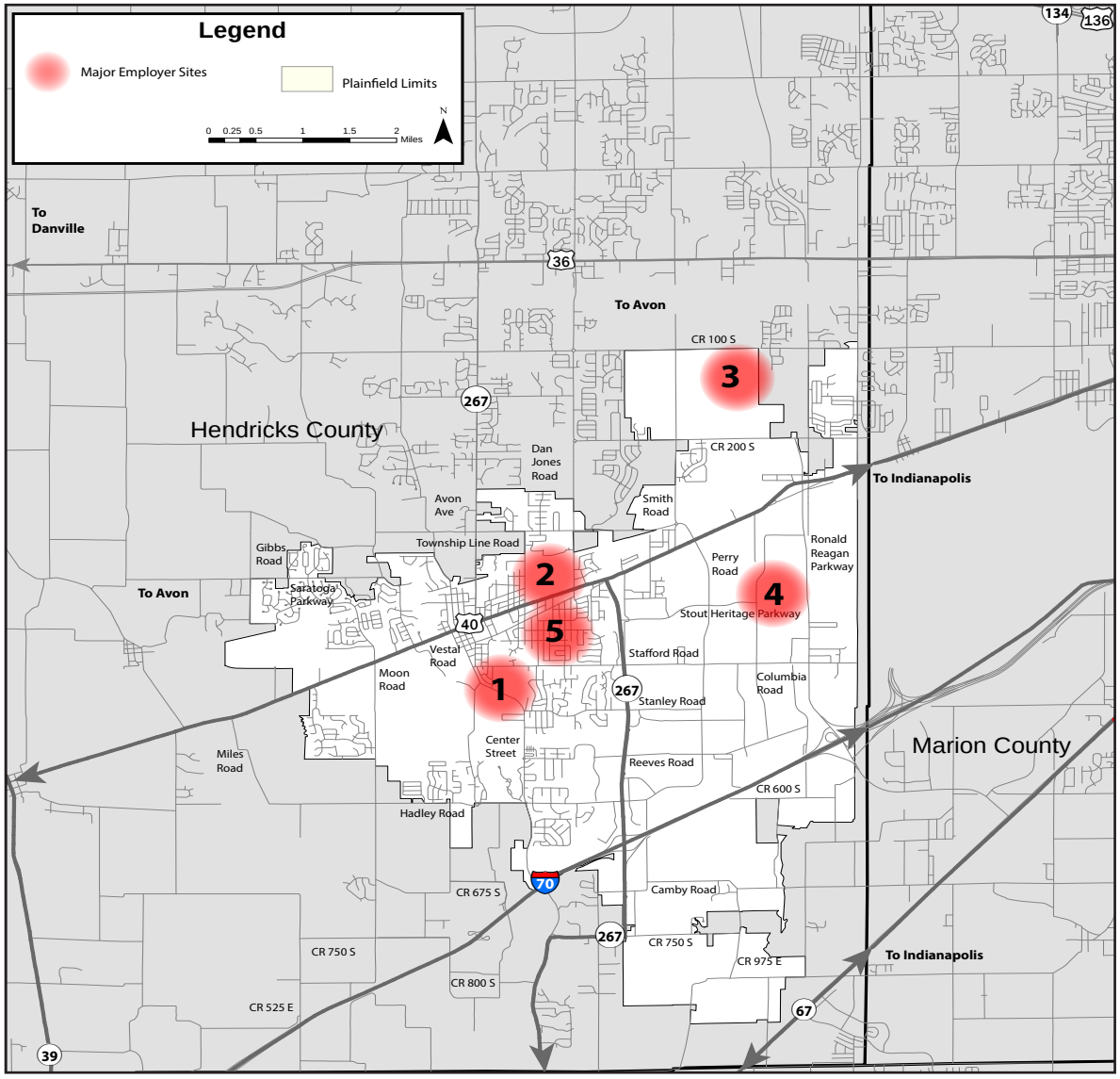

Illustration of key county-wide major employers located in the Town of Plainfield.
Source: HWC Engineering/ Data Source: Hoosierdata.in.gov

EMPLOYMENT

The total local labor force within Plainfield was approximately 15,100 in 2016. In January 2016, the local unemployment rate for Plainfield was 4.1%. By May 2018, the unemployment rate had fallen to 3.0%, which was slightly lower than the state unemployment rate of 3.2%. The list below shows the top county-wide employers located in Plainfield, as indicated on the Hoosier Data web portal.

1. Plainfield School Districts
2. Duke Energy
3. Walmart Distribution
4. Ingram Micro Mobility
5. Mr. Electric

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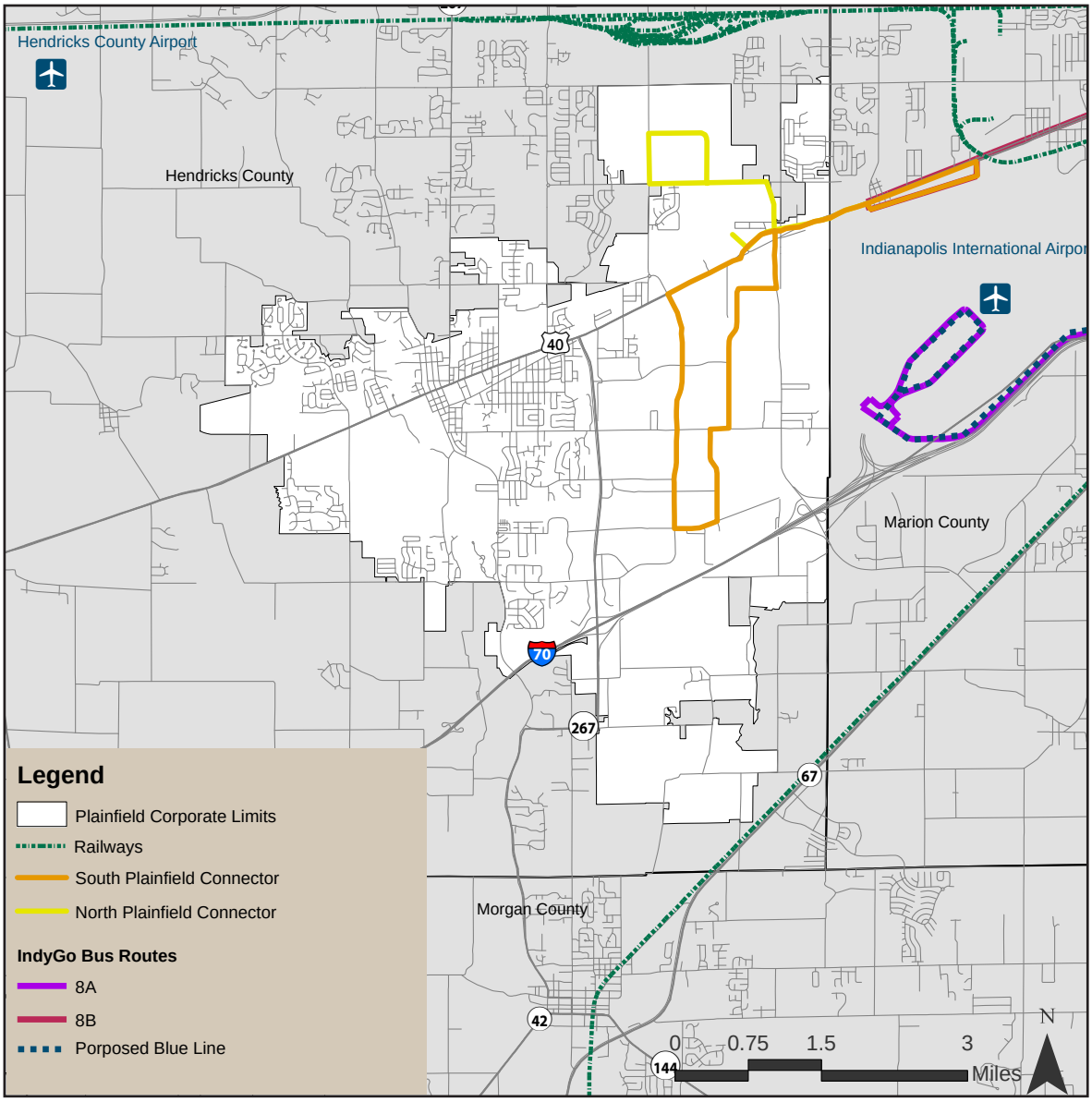
EXHIBIT E: RAIL, AIR & PUBLIC TRANSIT



Plainfield's location in relation to key rail, airport and public transportation destinations.
Source: HWC Engineering

OTHER MODES OF TRANSPORTATION

CSX rail service currently runs north of Plainfield along U.S. 36 in Avon, as well as along S.R. 67 in Morgan County. These rail lines accommodate rail freight to Chicago, St. Louis, Louisville and Cincinnati.

The Plainfield Connector is a public bus system with service routes primarily in the eastern part of Plainfield, including service to Indianapolis International Airport (see Exhibit E). The connector also runs through the industrial portions of Plainfield along the Ronald Reagan Parkway and U.S. 40 to the airport. This provides transit service for employees of the many large businesses located in this portion of the community.

The public input process identified a need for additional public transportation services within Plainfield. The Blue Line, a bus rapid transit (BRT) line, will provide additional transit service along U.S. 40 to the airport and into Indianapolis. New local connections to this regional transit service will enhance its utility within Plainfield as service becomes operational within the next few years.

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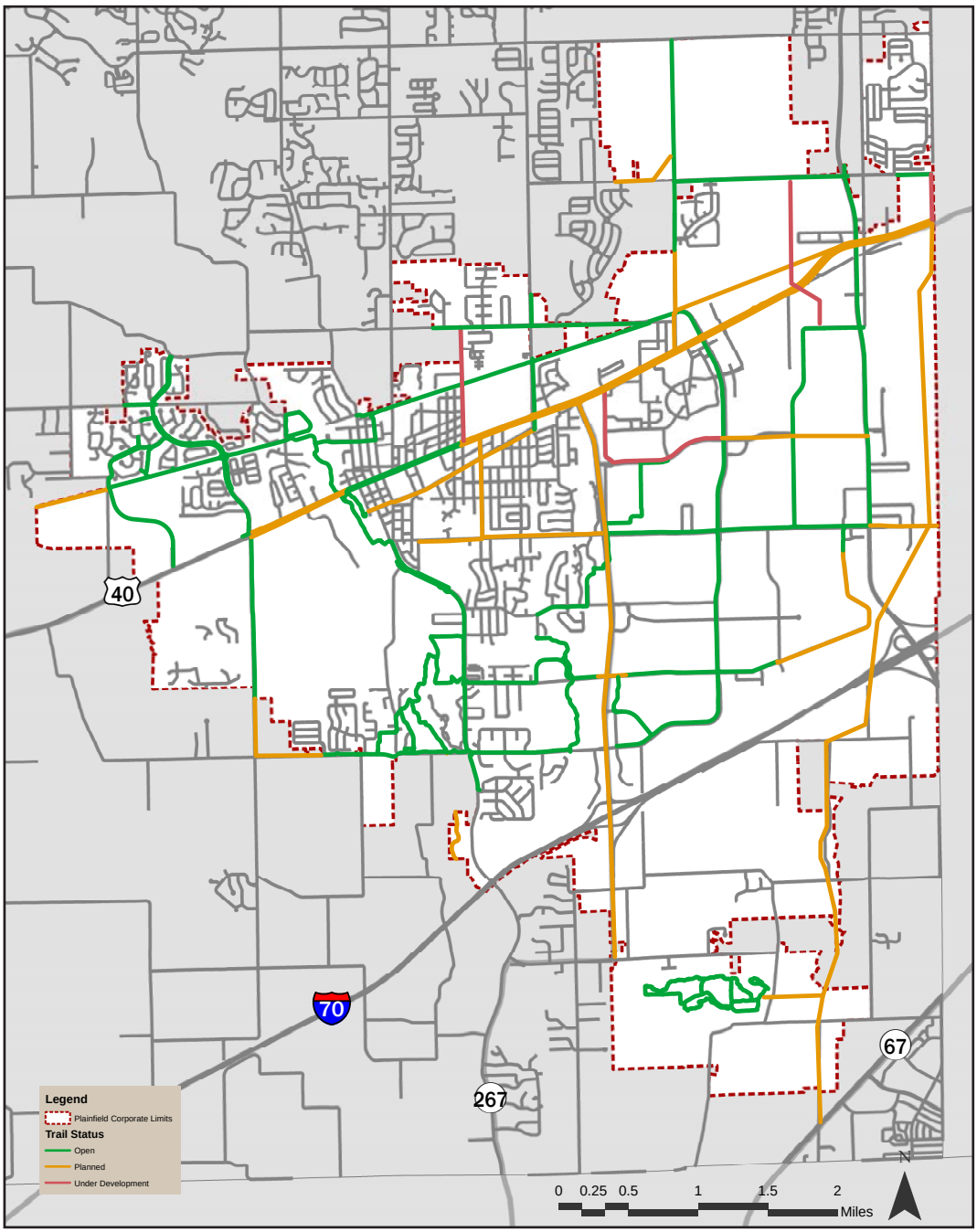
EXHIBIT F: SIDEWALKS & TRAILS



Plainfield's sidewalk and trail system continues to grow with planned and under development networks.
Source: HWC Engineering

TRAILS AND SIDEWALKS

Plainfield has sidewalks along many of its current streets but some of these are aging and in need of repair. The recently updated Trails Master Plan has identified many of the ares in most need of repair and the town will work to make these repairs as new trail networks are developed in areas shown in Exhibit F. Plainfield residents appear to be in support of new trails, as determined by public feedback responses. As Plainfield completes projects identified in its Trails Master Plan, residents can expect to be able to enjoy greater shared-use access to important locations such as neighborhoods, parks, shopping and schools.

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EXHIBIT G: HYDROLOGY AND FLOODPLAINS

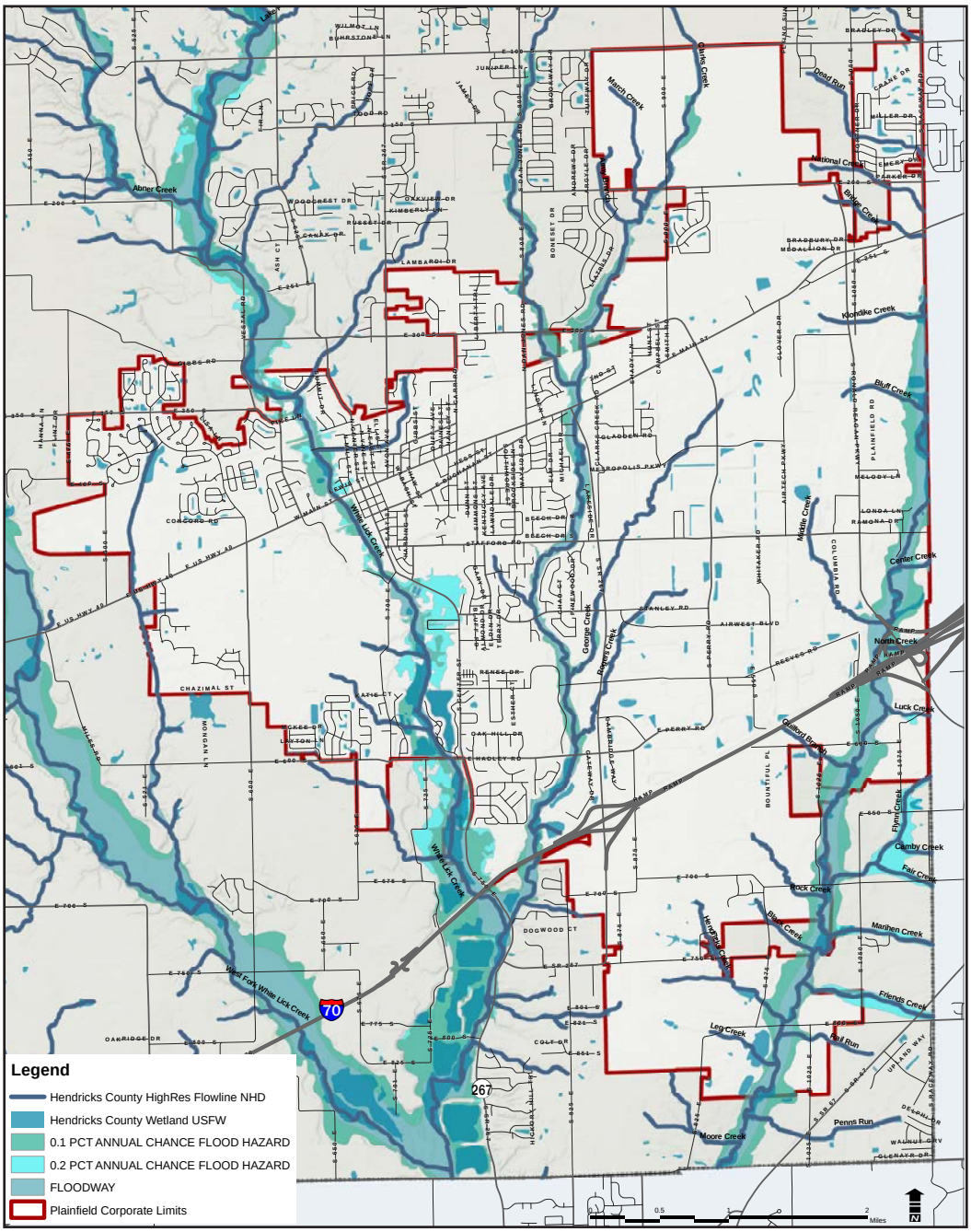

Illustration of future flood challenges and natural waterways that run through the Town of Plainfield.
Source: HWC Engineering

HYDROLOGICAL CHALLENGES

Hydrological features such as flood ways, floodplains, and wetlands are important factors to consider when making transportation investment decisions. Exhibit G illustrates the location of the most significant hydrological features within Plainfield, which include the Western and Eastern Forks of the White River and White Lick Creek. While Plainfield does not prohibit development within the floodplain, it is closely regulated and discouraged for major development that may impact the waterways. Currently, Plainfield has used these flood areas as parks and open space opportunities, such as Hummel Park along the White Lick Creek.

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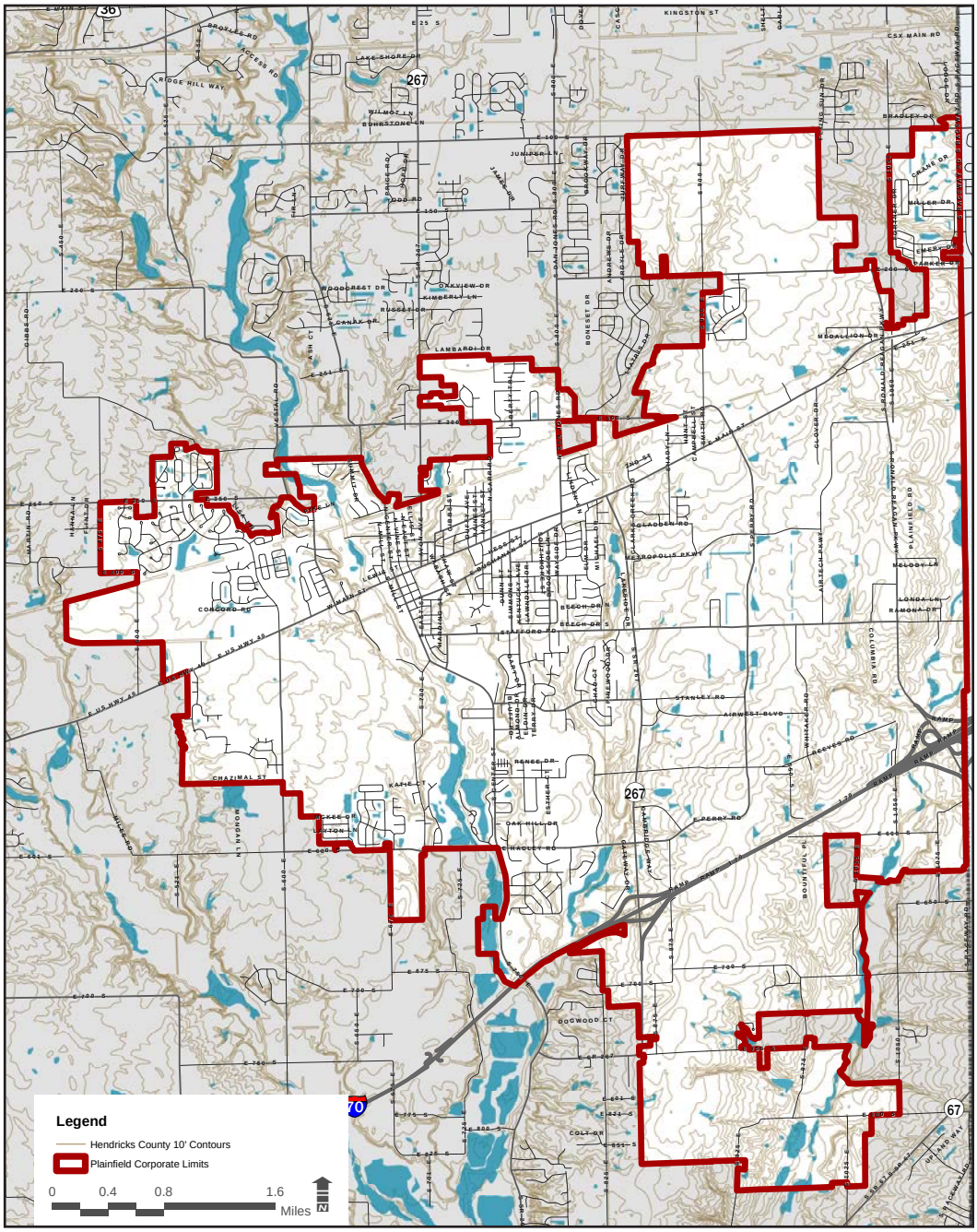
EXHIBIT H: TOPOGRAPHY



Topographical challenges within Plainfield can determine where and how development and infrastructure improvements are located.
Source: HWC Engineering

TOPOGRAPHICAL CHALLENGES

Topography and steep slopes within Plainfield primarily occur along hydrological features such as White Lick Creek. Exhibit H illustrates the ten foot contour intervals for areas within and surrounding Plainfield. Areas on the map where the lines appear to be closest together represent the locations where slopes are steepest and where future construction challenges should be expected. The presence of steep slopes doesn't preclude building but, because of the additional costs associated with proper construction techniques, these areas are typically reserved for residential or preservation type uses.

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EXISTING CONDITIONS ANALYSIS

Since Plainfield's population is expected to increase through 2045, the town needs to begin paying particular attention to providing key transportation improvements to identified growth areas. These improvements should include provisions for expansion of the traditional roadway network, alternative modes of transportation and increasing public transit options. As regional transportation options are extended to Plainfield within the next decade, additional local bus services will undoubtedly follow. This will help increase public transportation choices for Plainfield residents but will also create new challenges in planning and improving local roadway network capacity and efficiency.

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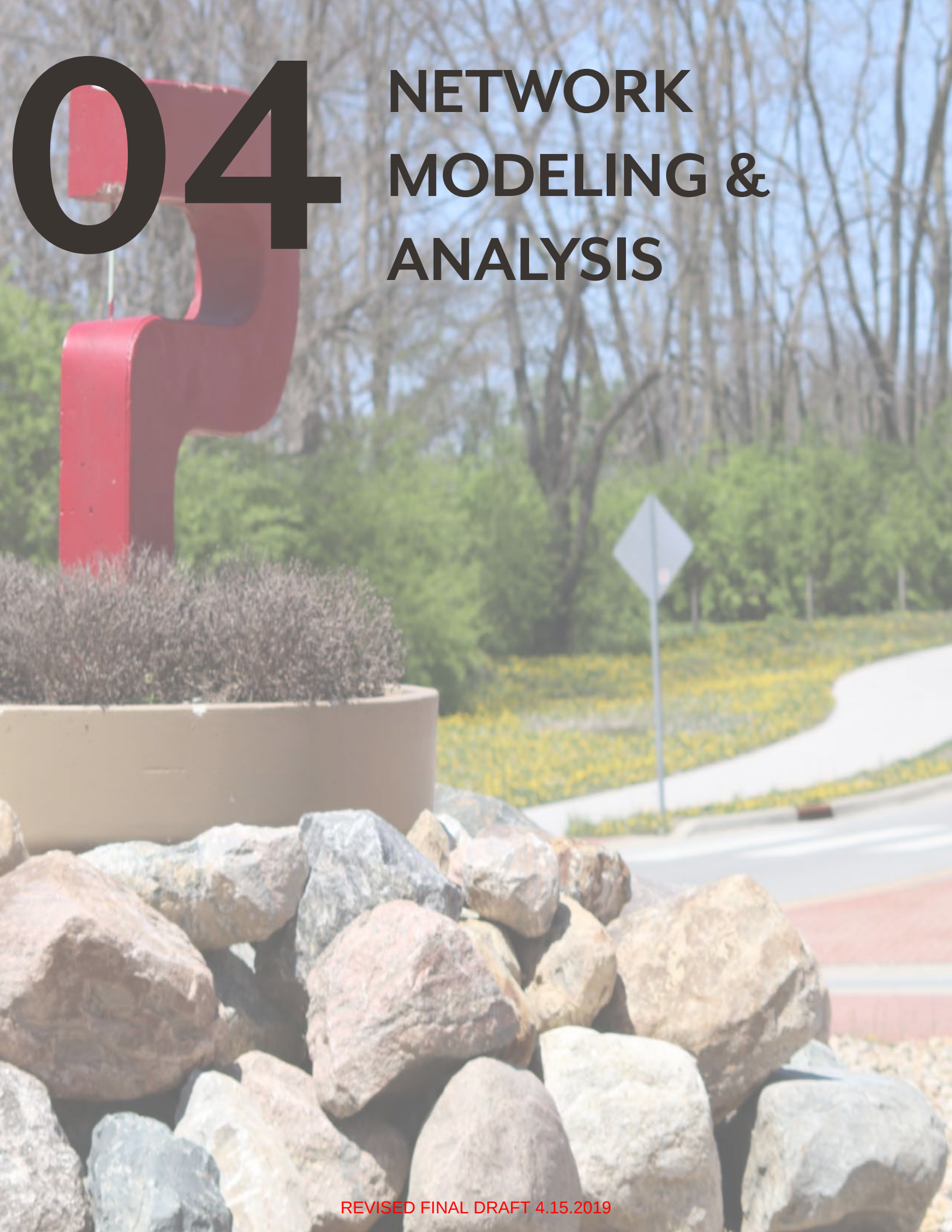
04 NETWORK MODELING & ANALYSIS



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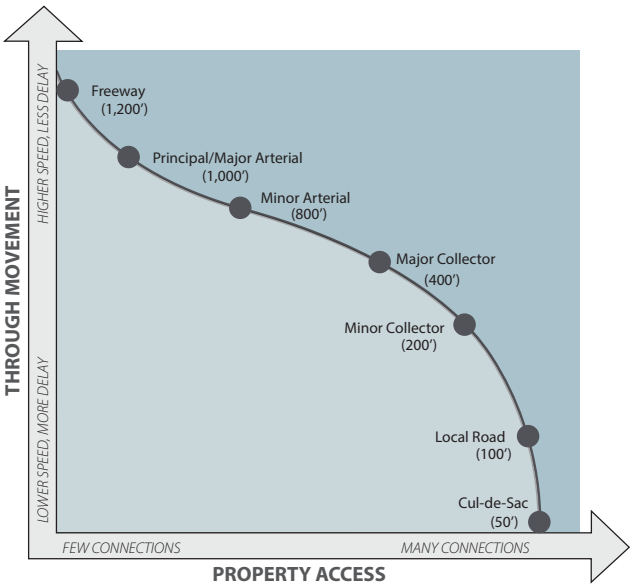
EXISTING ROAD NETWORK

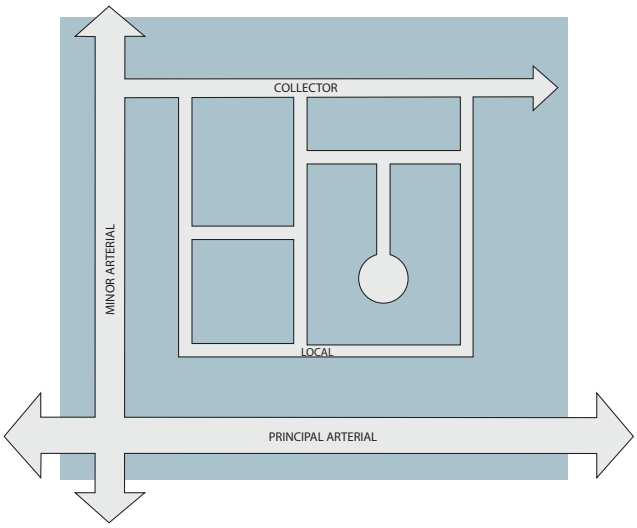
Gaining an understanding of current roadway network challenges is essential to providing accurate and timely recommendations for future improvements.

Exhibit I contains Plainfield's existing functional classification map as it exists on the State of Indiana's on system network. This map depicts the existing roadway network based on predicted future roadway volume classifications outlined by FHWA. Functional classifications take into consideration, among other things, existing and future land uses, population growth, employment and future roadway capacity needs.



Roadway classifications occur along diverging axis of through movement (mobility) and property access

U.S. 40 is classified as a major arterial roadway



Roadway classifications establish a hierarchy, which serve to create a functioning and efficient roadway network

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EXHIBIT I: EXISTING FUNCTIONAL CLASSIFICATION MAP

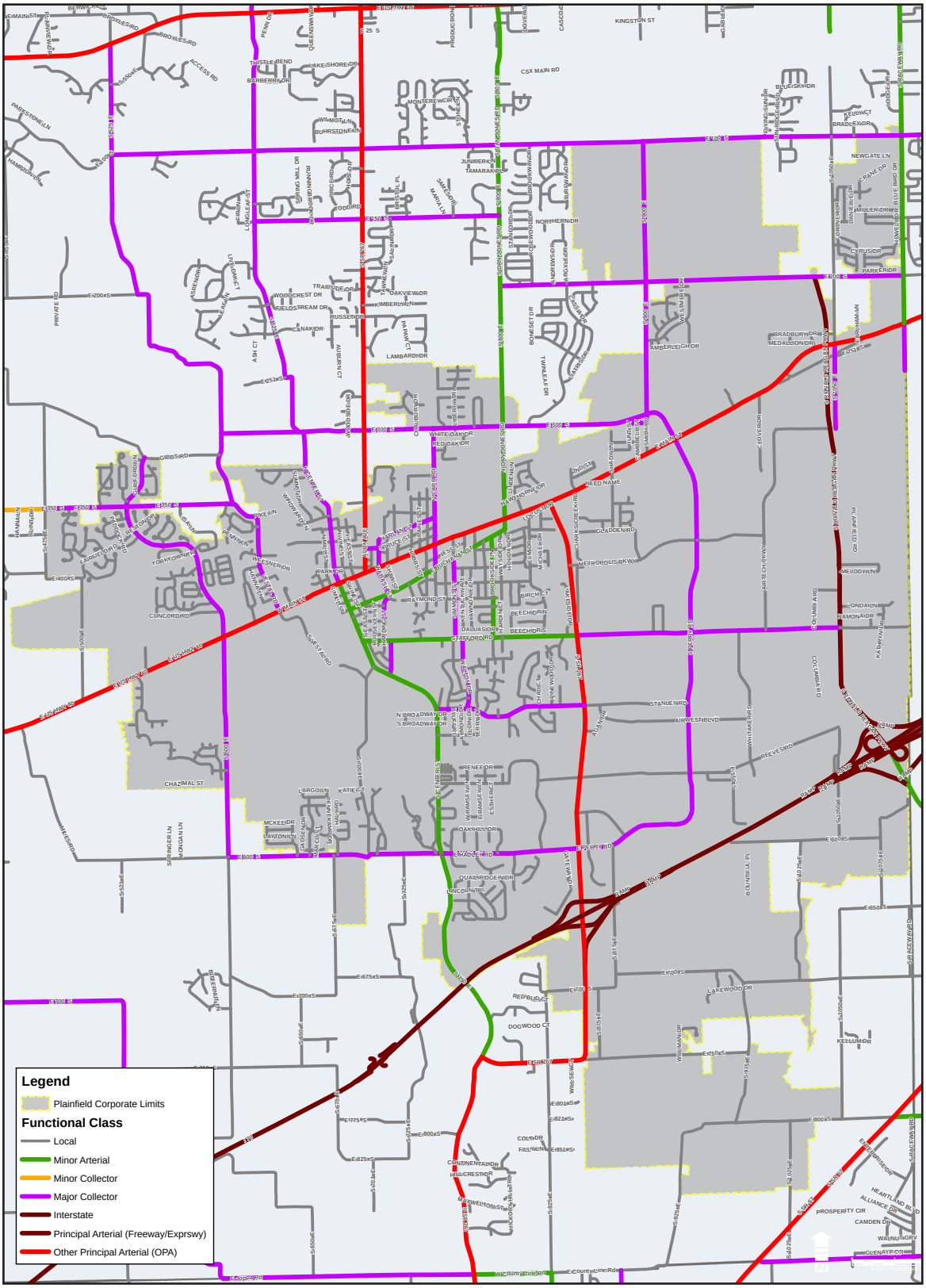

Illustration of the Town of Plainfield's current functional classification system.
Source: HWC Engineering

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EXISTING FUNCTIONAL CLASSIFICATIONS

The Federal Highway Administration (FHWA) defines functional classification designations based on the priority of mobility for through-traffic versus access to adjacent land. In other words, streets are designed along opposing continuum to either connect to destinations or to carry through-traffic. Other important factors related to functional classification include access control, speed limit, traffic volume, spacing of routes, number of travel lanes and regional significance.

Interstates, such as I-70, are the highest classification of roadway. They prioritize vehicular mobility and have extremely limited access. Interstates are high speed and high volume and have statewide or national significance. They are planned and maintained by state authorities with federal oversight.

Other Freeways & Expressways look very similar to interstates, but without the interstate designation. These have regional or statewide significance.

Major (Primary) Arterials carry high volumes of regional traffic. They serve major cities from multiple directions and provide connectivity between cities in rural areas. Arterials provide direct access to adjacent land, but may limit the number of intersections and driveways to give generally higher priority to through-traffic. Major Arterials are generally spaced at two to three mile intervals in suburban areas and farther apart in rural areas.

Minor (Secondary) Arterials are similar to Major Arterials, but are spaced more frequently and serve trips of moderate length. Spacing of minor arterials is one to three miles in suburban areas and further apart in rural areas. Minor Arterials connect most cities and larger towns and provide connectivity between Major Arterials.

Major Collectors gather traffic from the local roads and connect them to the arterial network. They provide a balance between access to land and corridor mobility. Major Collectors provide connectivity to traffic generators not already on the arterial system, such as schools, parks and major employers.

Minor Collectors are similar to major collectors, but are used for shorter trips. They provide traffic circulation in lower-density developed areas and connect rural areas to higher classified roadways.

Local Roads make up the largest percentage of roadways within the town. Their primary function is to provide access to parcels. Trips are short, speeds are lower and cut-through traffic may be discouraged. All remaining roads that are not arterials or collectors are considered local roads. In most cases, local roads are not part of the system of roads eligible for federal funding.

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EXISTING RIGHT-OF-WAY STANDARDS

The table below indicates Plainfield's current right-of-way standards for each road classification. Each of these classifications is assigned an anticipated number of travel lanes as well as a minimum standard right-of-way width.

Many of the main thoroughfares in Plainfield are state roads and not within the town's jurisdiction. These roadways include U.S. 40, I-70 and S.R. 267.

Existing Minimum Right-Of-Way Requirements

	No. of Lanes	Minimum Right-of-Way		
		All Uses	Commercial/Industrial	Residential
Divided Arterial	4	100'	-	-
Major (Primary) Arterial	2-4	80'	-	-
Minor (Secondary) Arterial	2-4	70'	-	-
Major Collector	2	-	70'	70'
Minor (Local) Collector	2	-	-	60'
Local Road (Commercial)	2	-	50'	50'
Local Road (Industrial)	2	-	60'	-

Note: Sidewalks are required on all street sections. Curb and gutter required on all street sections

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NETWORK MODELING & MODEL ANALYSIS

OVERVIEW

This section documents the development of the TransCAD travel demand model for the Town of Plainfield, and an evaluation of traffic conditions under various transportation and land use scenarios. The project study area (see Exhibit J) includes the Town of Plainfield, surrounding adjacent areas in Hendricks and Morgan Counties, and includes the I-70, U.S. 40, and S.R. 267 corridors.

The travel demand analysis provides insights into traffic impacts and capacity needs for the Town of Plainfield as it undergoes household and employment growth. The traffic analysis forecasts specific land development patterns, and then uses a travel demand model built specifically for this project to generate and distribute trips and assign estimated vehicle flows to the various road network scenarios. This information is then used to compute performance measures.

Any summary statistics cited within the Network Modeling and Analysis section pertain to the study area highlighted in pink in Exhibit J. The travel model covers a wider area than the project's study area and also includes the entire area bounded by S.R. 39, I-465, I-74, and White River within the modeled area. The design of the modeled area was based on analysis conducted with the 2009 Central Indiana Household Travel Survey and it covers more than 90% of the trip destinations reported from Town of Plainfield households captured in the survey.

In utilizing this broader analysis area, the traffic model is able to assess both local and regional traffic impacts. This allows for a broader understanding of the impacts that certain projects will have and will assist the town as it seeks outside funding opportunities for selected projects.

Modeling analysis for the Thoroughfare Plan covered multiple alternatives to be tested for 30 year traffic forecasts, including:

- **Base Year 2015**
- **No Build Future 2045**
- **Two Preferred Future Roadway Scenarios (described in detail later)**

TRAFFIC ANALYSIS ZONES (TAZ)

A centroid's location and level of detail is directly affected by the TAZ structure. For this planning effort, a very detailed sub-block level TAZ was developed according to the land parcel and/or Census Block boundaries. This includes a total of 1128 internal zones and 52 external connectors.

This approach contributes to a better simulation of traffic loading/parking choice in such a compact urban area. Centroid connectors were coded to represent traffic loading and parking options for each zone.

External trip patterns and modeled growth rates for external trips were derived from INDOT traffic counts and the Indiana Statewide Travel Demand Model (ISTDM).

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EXHIBIT J: BASE MODEL TAZ NETWORK

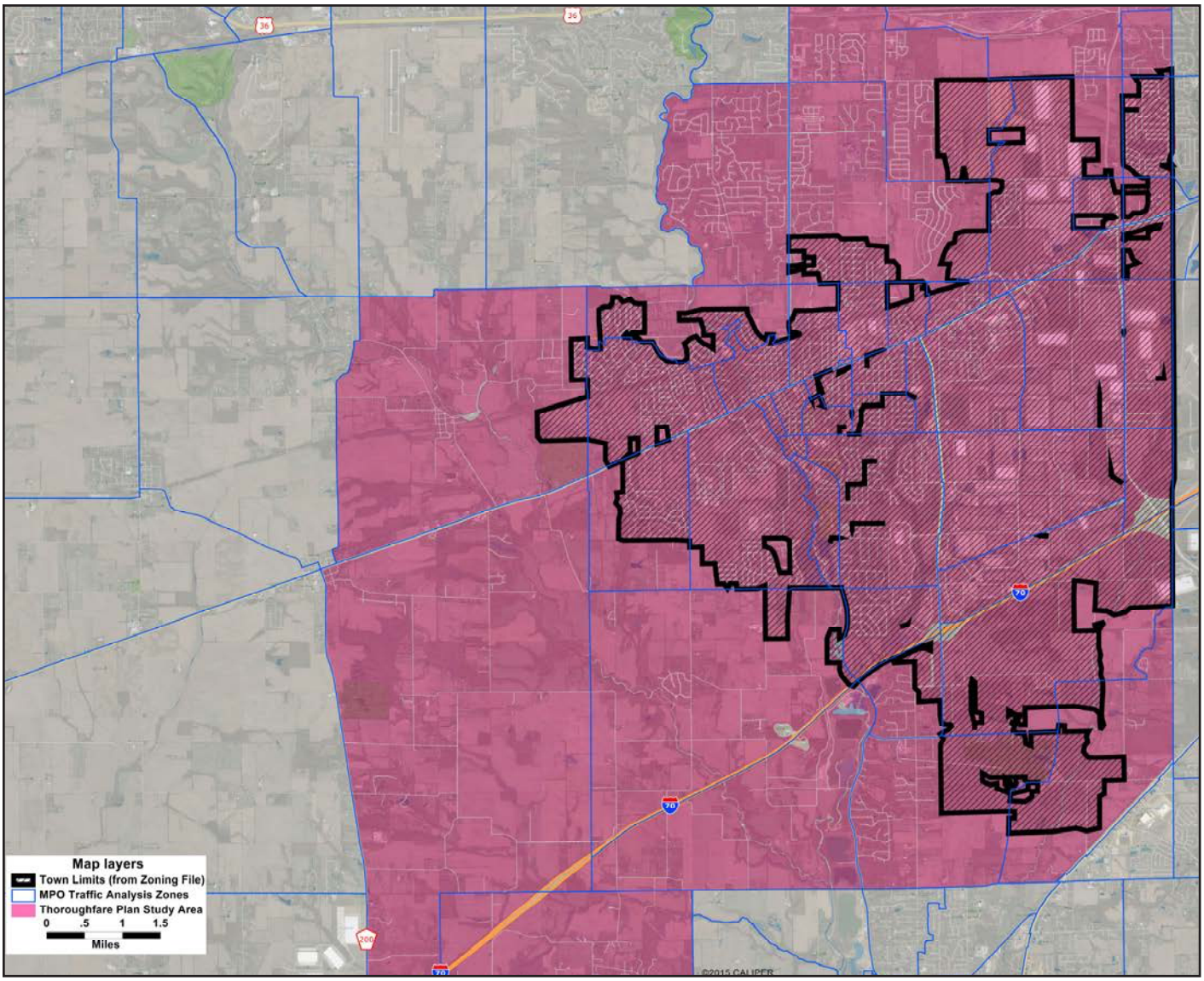

Illustration indicating the study area of the modeling process.
Source: Convergence Planning

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BASIC MODEL COMPONENTS

The Plainfield travel model includes a technical memorandum and scenario analysis, validations and assumptions utilizing a TransCAD (Version 8.0) travel demand model developed and facilitated by Convergence Planning. The Plainfield travel model is a conventional travel demand model that is similar in structure and methodology to other current area-wide models used for traffic forecasting. It relies upon the Indianapolis Metropolitan Planning Organization's (MPO) model and Indiana Statewide Travel Demand Model (ISTDM) for data sources on household and commercial travel behavior. It uses aggregate land use/socioeconomic data and road network data to estimate facility-specific roadway traffic volumes and performance.

It was important that the model utilize similar analysis tools and data sources as those utilized by the MPO and INDOT. This will allow for better communication of the conclusions of this analysis and should help streamline future funding applications and requests.

ROADWAY NETWORK ELEMENTS

The Plainfield base model roadway network is based on an INDOT road inventory road-centerline GIS layer which covers all roadways in the study area. Detailed roadway information is used in the modeling process. The collected information includes:

- **Number of lanes**
- **Posted speed**
- **Observed speeds**
- **Travel direction**
- **Functional classification**
- **Intersection types**
- **Traffic counts**

Delays due to traffic signals and other traffic controls use the same methods as in the ISTDM model (see the Travel Demand Model Technical Memorandum located in the Appendix of this document for the assumptions used). Exhibit K shows the Plainfield base model network and traffic analysis zones (TAZ) structure.

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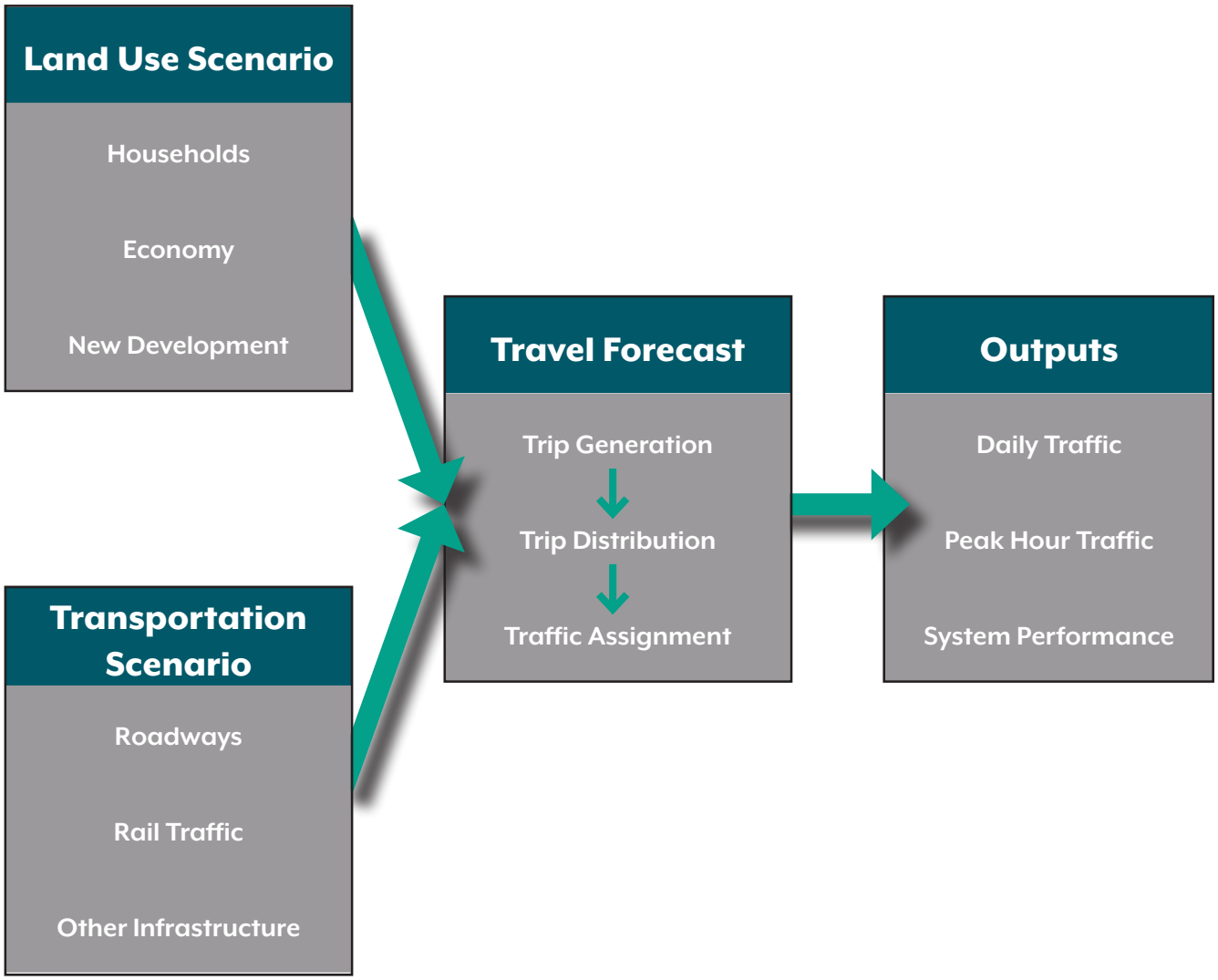
Land Use Scenario
Households
Economy
New Development
Transportation Scenario
Roadways
Rail Traffic
Other Infrastructure
Travel Forecast
Trip Generation
Trip Distribution
Traffic Assignment
Outputs
Daily Traffic
Peak Hour Traffic
System Performance

MODEL VALIDATION

An extensive traffic count database was used to validate the model. Count locations are shown in Exhibit K. The count dataset corresponds to 2016-2018 era counts, and the model was initially developed to represent conditions up to year 2017. The overall model validation was 24.63% RMSE (Root Mean Square Error), which is very good. Additional model validation information is contained in the Model Development Technical Memorandum (MDTM). The MDTM and associated traffic count data can be found in the Appendix of this document.

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EXHIBIT K: MODEL LINKS WITH TRAFFIC DATA FOR MODEL VARIATION

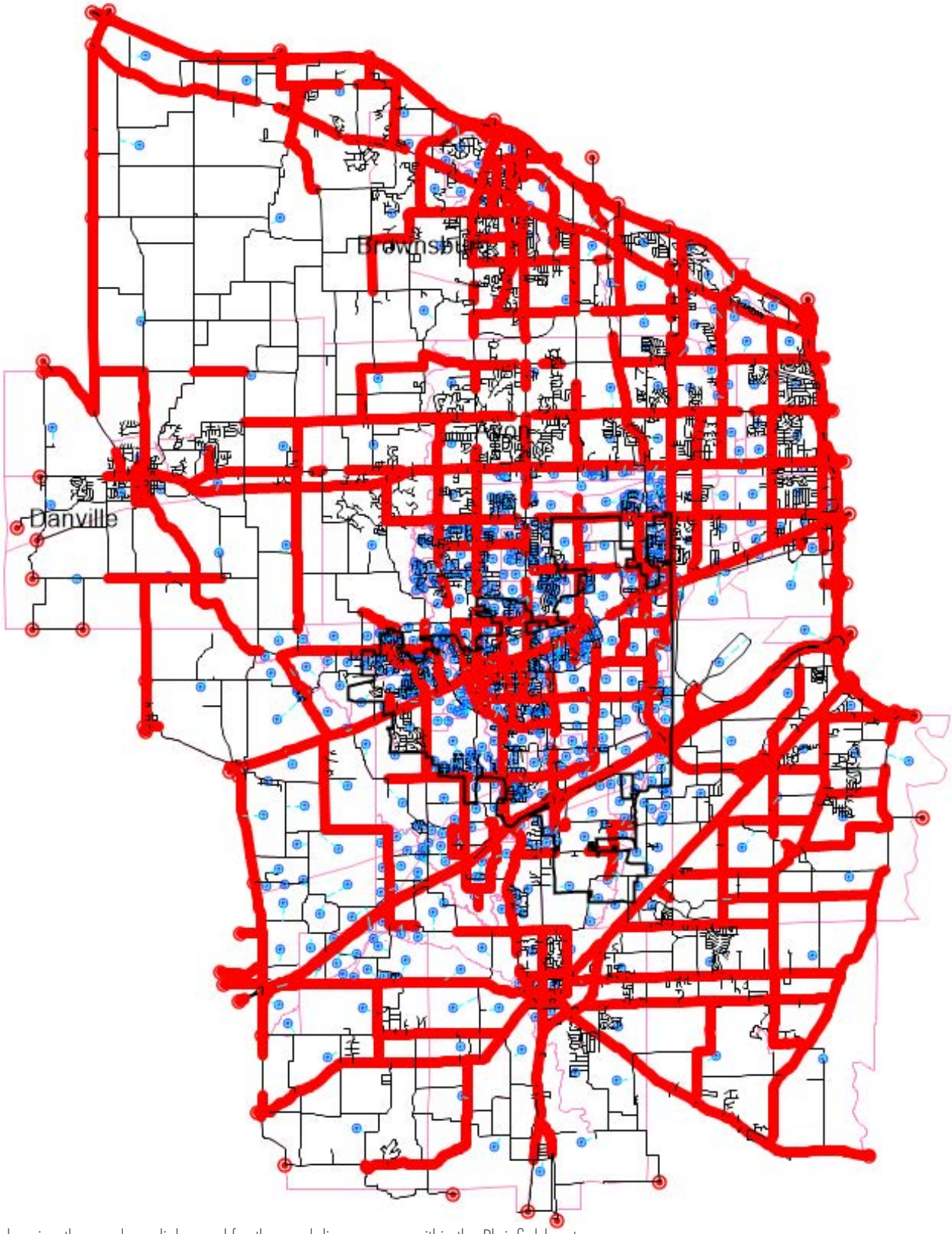

Illustration showing the roadway links used for the modeling process within the Plainfield system.
Source: Convergence Planning

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SOCIO-ECONOMIC GROWTH FORECASTS

The Plainfield travel demand model takes socio-economic data (allocated to each TAZ) and processes this information in the Trip Generation step. The Census Block level base year employment data was obtained from the 2016 Longitudinal Employer-Household Dynamics (LEHD) data via U.S. Census Bureau. Household and population statistics at the Census Block level were also obtained.

SOCIO-ECONOMIC DATA AND FORECASTS USED AS INPUTS TO THE ANALYSIS (MPO PROJECTIONS)					
PLAINFIELD STUDY AREA					
	Population Plainfield Area TAZs	Population Hendricks County	Share of County Population	Average HH Size	Plainfield TAZs-Households
YEAR					
1970	8,211	54,127	15.2%	3.33	2,465
1980	9,191	70,002	13.1%	3.08	2,984
1990	10,433	76,107	13.7%	2.90	3,596
2000	18,396	105,378	17.5%	2.79	6,595
2010	27,631	145,863	18.9%	2.78	9,949
2015	31,370	158,192	19.8%	2.73	11,486
2017	32,865	163,620	20.1%	2.70	12,186
2025	42,121	191,522	22.0%	2.72	15,463
2035	51,378	219,425	23.4%	2.64	19,441
2045	60,634	247,327	24.5%	2.59	23,419

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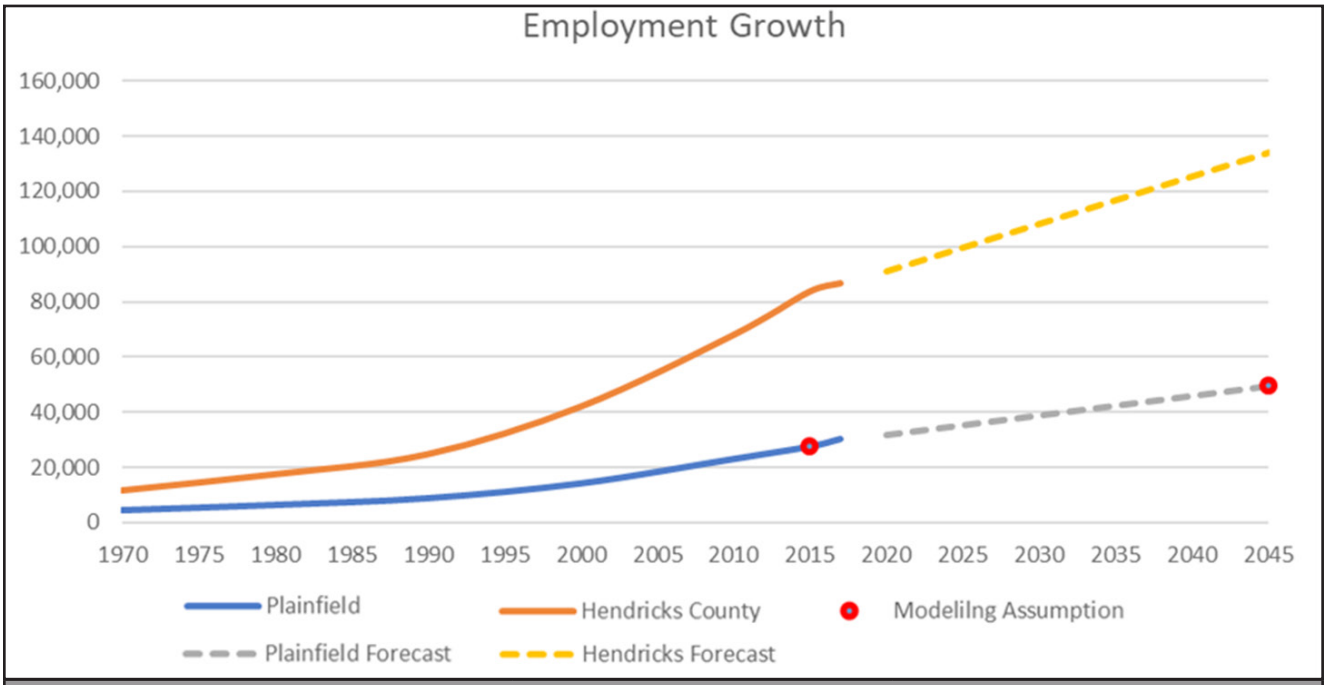
Forecasts were based on the Indianapolis MPO 2045 TAZ forecasts and Woods and Poole Economics forecasts. The net growth was allocated to individual traffic zones and added to the base data to form a land use forecast. The growth forecasts for the project's study area are summarized below.



PROJECTED JOB AND HOUSEHOLD GROWTH FOR PLAINFIELD STUDY AREA (2015-2045)		
PLAINFIELD STUDY AREA		
	NEW JOBS 2015-2045	NEW HOUSEHOLDS 2015-2045
COUNTY-WIDE WOODS & POOLE	50,362	-
PLAINFIELD STUDY AREA	21,607	11,933
EXISTING PLAINFIELD EMPLOYERS	5,725	-
NEW DEVELOPMENT	15,882	-

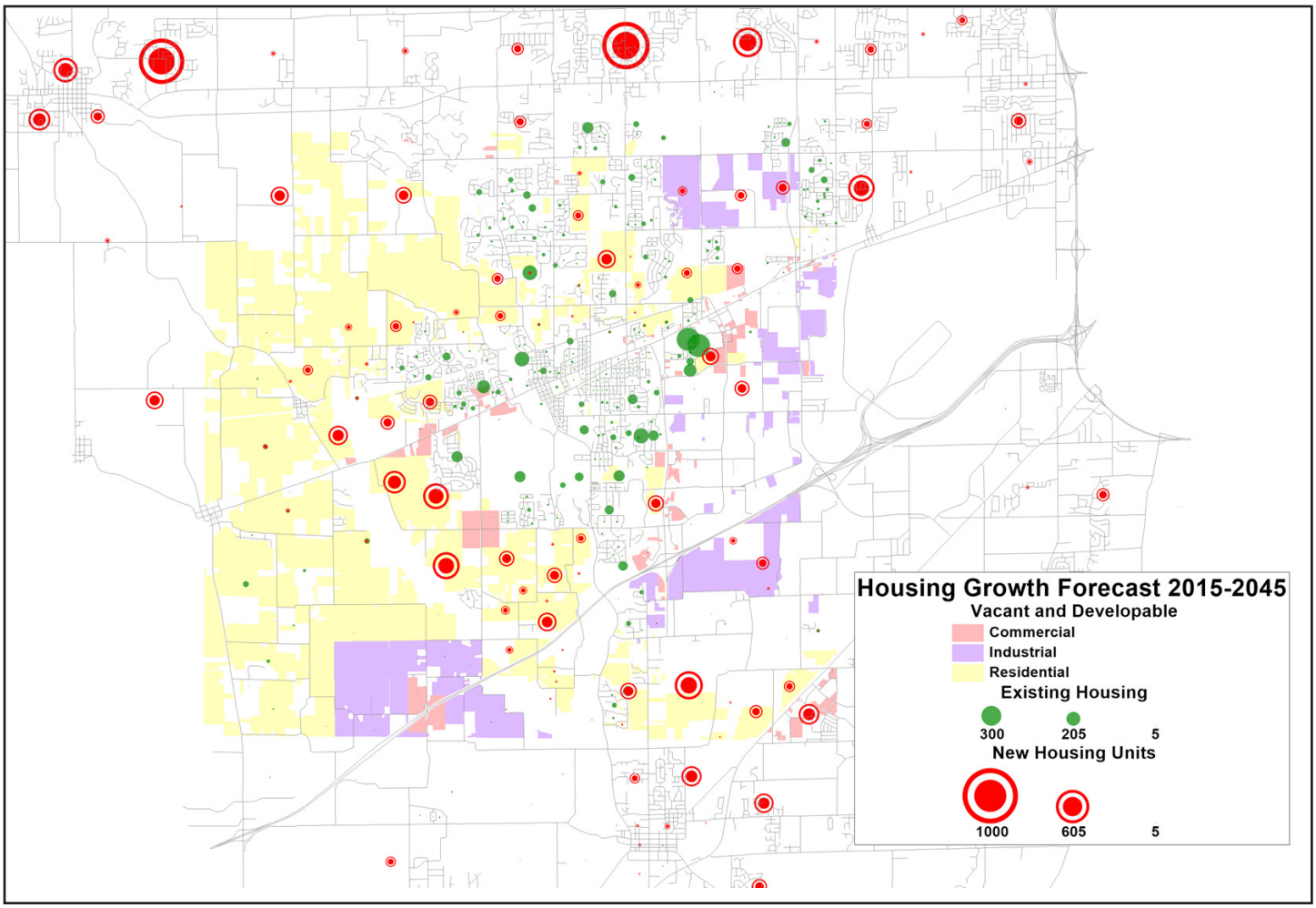
Source: Convergence Planning

GROWTH ALLOCATION PROCESS

The control totals derived from the Indy MPO 2045 Forecast were allocated to the Plainfield Study Area model's 1,128 internal traffic zones using a technical growth allocation process. For the zones within the Plainfield Study Area model, but outside the project's study area, the MPO zones and assumptions were used directly. For zones that are internal to the project's study area, a set of growth allocation models were calibrated and applied to predict the likely areas to attract the MPO forecasted growth for the following categories:.

- **Housing**
- **Retail Employment**
- **Service Employment**
- **Basic Employment (mostly industrial/light industrial)**

EXHIBIT L: 2015-2045 PROJECTED HOUSING GROWTH



Projected future housing growth heat map of areas within the study area that does not include a future I-70 interchange.
Source: Convergence Planning

The number of anticipated households in Plainfield Study Area projected by the Indianapolis MPO for 2045 is an approximate 11,000 unit increase over the number of households in 2015 (the base year for this analysis). At Plainfield's average household size of 2.57 people (as of the 2010 Census), this represents a potential increase in the study area's population of approximately 28,000 people. This number is nearly double the estimated 2017 population of the town based on current Census projections.

As indicated in Exhibit L, the majority of future housing growth is expected west and south of currently developed Plainfield. There is also significant residential growth anticipated north of Plainfield within the Town of Avon and Town of Danville. With much of the area currently within the corporate limits of Plainfield already developed, some of the anticipated growth will occur as a result redevelopment, infill and increased density in areas like downtown Plainfield. This concept is supported by recent planning documents including the town's Comprehensive Plan, its Downtown Plan and its recent Housing Study. The majority of future residential growth, however, will likely be in areas that are currently outside the current corporate limits of the community.

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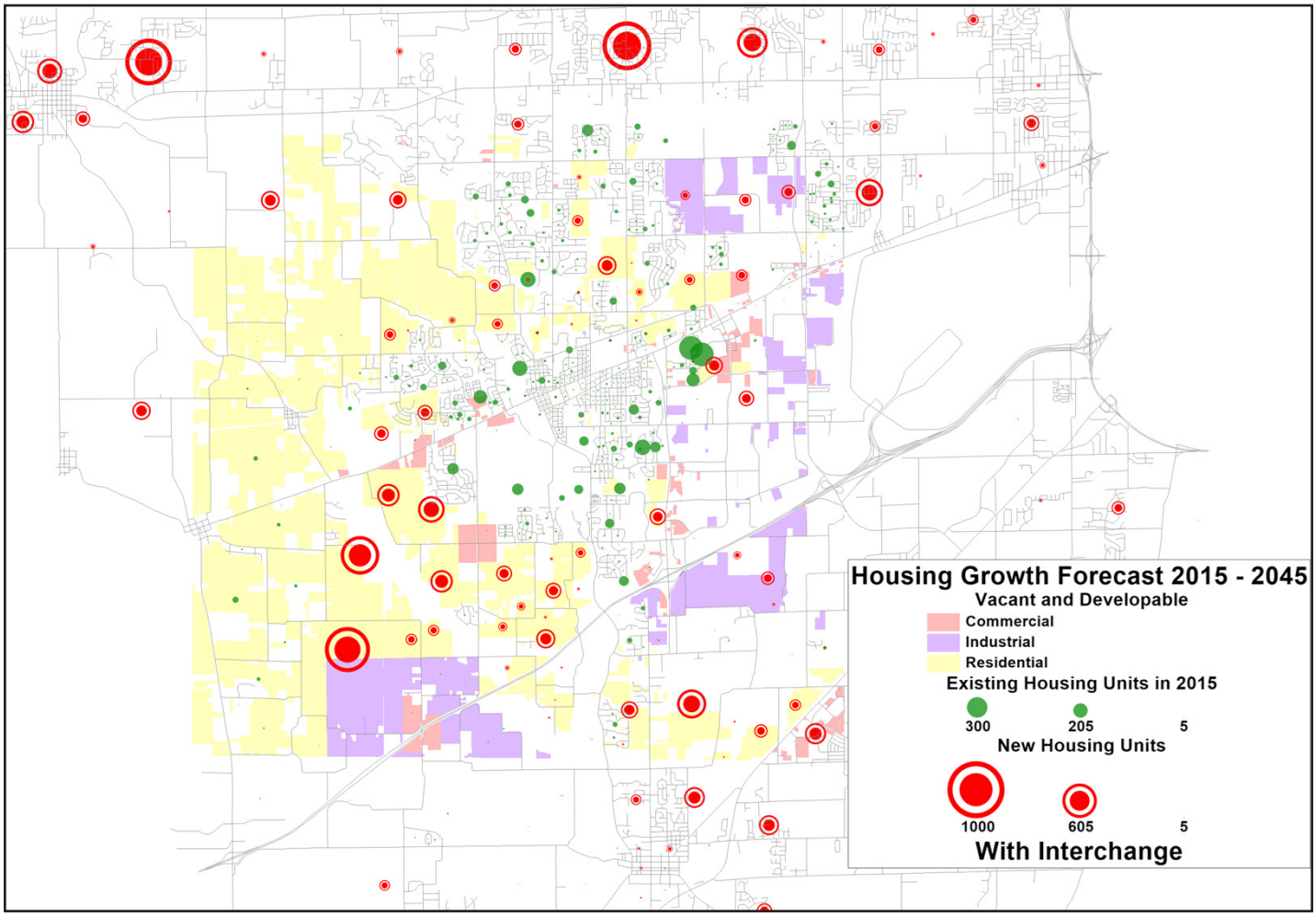
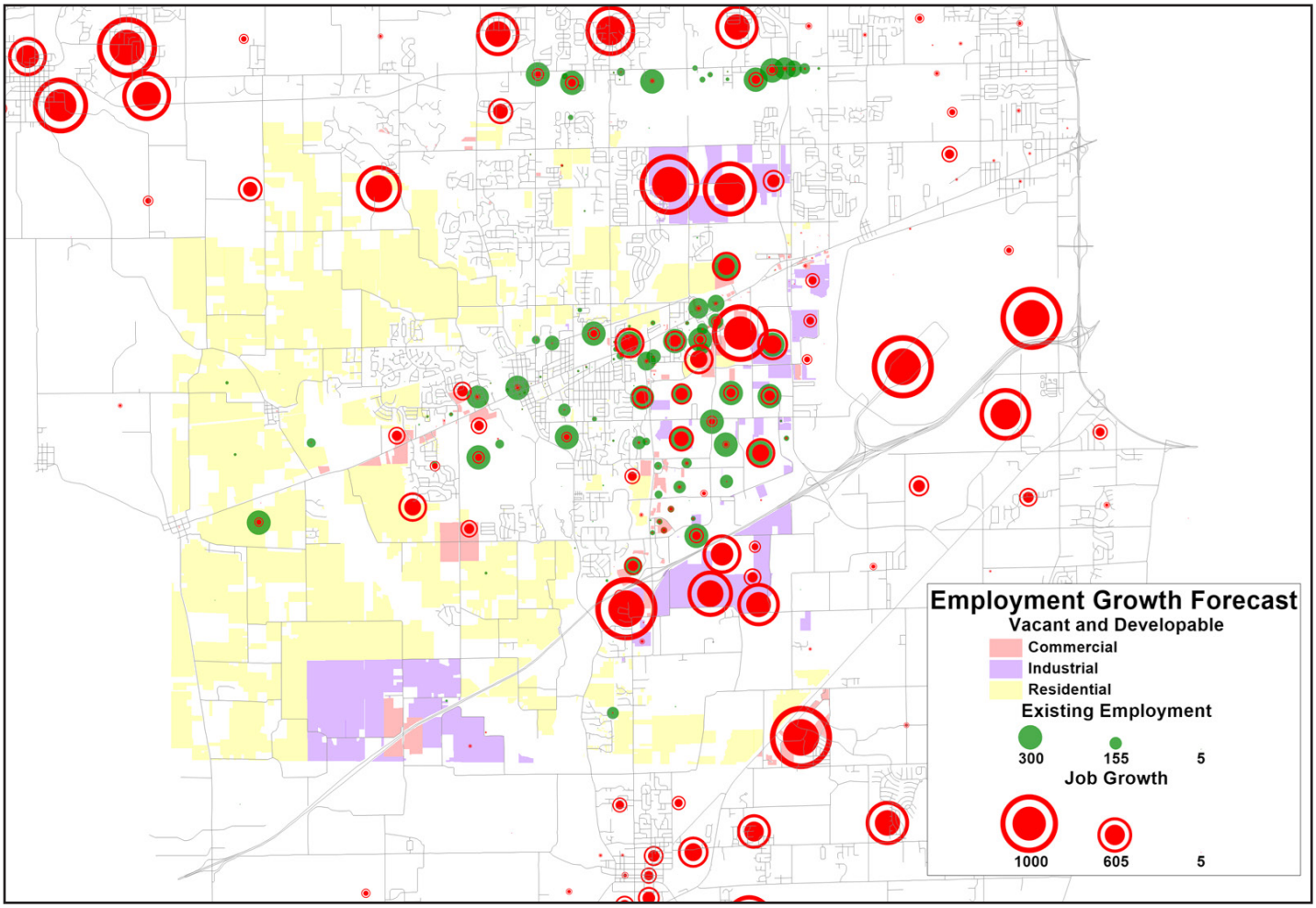
EXHIBIT M: 2015-2045 PROJECTED HOUSING GROWTH
WITH CONCEPTUAL INTERCHANGE



Projected future housing growth heat map of areas within the study area that includes a future I-70 interchange.
Source: Convergence Planning

When a new I-70 interchange is added to the residential growth allocation (see Exhibit M), there is a shift of potential residential growth in proximity to the north side of the potential new interchange. It does not radically alter projected growth from any one area, but rather draws marginally from all areas to create the potential for significant additional residential development southwest of Plainfield and north of the potential interchange. The potential impact of the new interchange will need to be taken into consideration as the traffic model scenarios are created.

EXHIBIT N: 2015-2045 PROJECTED EMPLOYMENT GROWTH



Projected future employment growth heat map of areas within the study area that does not include a future I-70 interchange.
Source: Convergence Planning

Exhibit N indicates the projected employment growth anticipated by INDOT's Woods and Poole Economic analysis between 2015-2045. It is projected that employment will increase by approximately 21,000 jobs during this period in the Plainfield Study Area, including unincorporated areas around the town and in neighboring communities such as Danville and Avon. These projections illustrate growth in areas based on their location, available land and traditional development growth. The majority of the employment is concentrated along the existing major corridors such as; I-70, the Ronald Reagan Parkway, U.S. 40 and S.R. 267. Over 7,500 jobs of the anticipated employment growth is expected from new development and job creation within the industrial land use, which is over 70% higher than the jobs going to existing industrial land.

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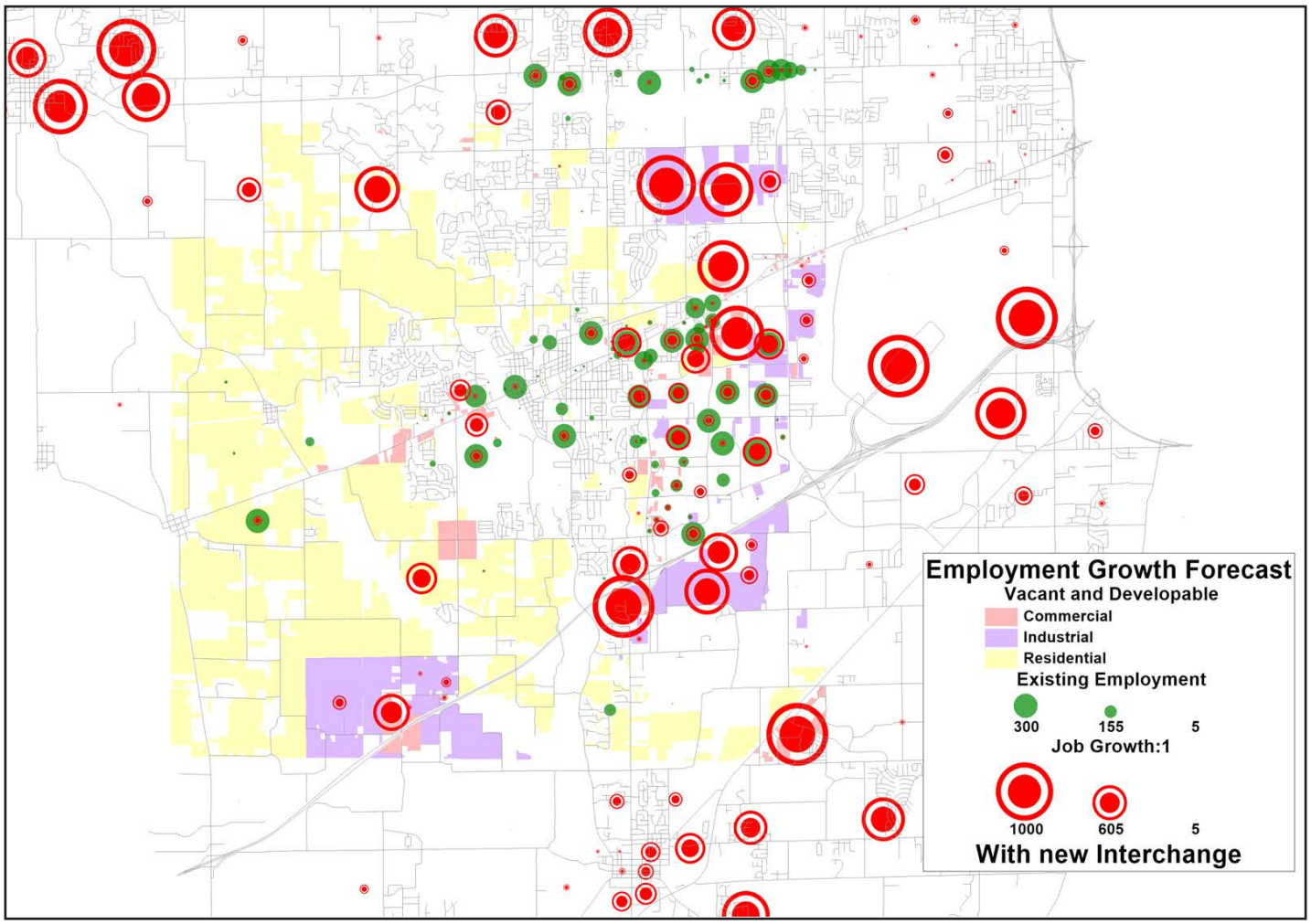
EXHIBIT O: 2015-2045 PROJECTED EMPLOYMENT GROWTH **WITH CONCEPTUAL INTERCHANGE**



Projected future housing growth heat map of areas within the study area that includes a future I-70 interchange.
Source: Convergence Planning

Exhibit O indicates that, with the addition of the new interchange to the employment allocation model, there is a shift of both commercial and industrial jobs toward the new interchange. Like the residential growth model, this is not a significant shift from any one area, but rather a marginal shift from many areas toward the interchange. As mentioned previously, there are many factors that weigh into the relative allocation of future development decisions. In this particular case, however, the model may underestimate the potential impact direct access to the interstate might have on future site selection decisions. Given the regional nature of this model, there may be a greater reallocation of employment to the proposed interchange from areas outside of the Town of Plainfield if the geographic area of the model were limited only to the town itself. This is especially true for potential future industrial projects.

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Comparison with 2019 Plainfield Housing Analysis and Strategies

In 2018, the Town of Plainfield engaged Greenstreet Ltd. to conduct a housing analysis to better understand how changes in consumer preferences, household makeup, and employment may affect housing needs at the local level. Because both housing and employment growth affect elements of the Thoroughfare Plan, it is important to understand how the findings of the 2018 housing study intersect and contrast with the methodology involved in developing transportation models used to generate Thoroughfare Plan scenarios. Both studies share similar source data, however, the extent and scope of the use of that data may differ between the two plans.

A quick review of the data outcomes of both studies indicates that, while each study is using similar sources, the final growth numbers projected are different. The Housing Study projections for residential and job growth appear to be about half of those projected for the Thoroughfare Plan. This is not to say that one is right and the other is wrong. The differences in projections are likely due to several factors in analysis methodology. These factors are discussed below.

Two significant scope differences involve time frames and areas studied. This Thoroughfare Plan forecasts scenarios through the year 2045, whereas the Housing Study extends only to 2038. Regarding geographical area, this plan analyzes the road network within the Town of Plainfield along with areas outside of the current town boundaries that influence the local transportation network; specifically, Hendricks County and parts of Morgan County. This allows for both regional and local transportation impacts to be taken into consideration and projection numbers include areas both inside and outside the current town. The Housing Study appears to focus on the area that is currently within the town itself and is therefore not as broad in geographic scope as the Thoroughfare Plan.

There are perhaps other contrasts in the methodology used to forecast housing and employment between the two analysis. For example, it appears that some of this discrepancy may be due to land use attribution within the modeling process developed for this plan versus land use categorization by the Assessor's office. Certain parcels of land, especially smaller plots and common areas such as drainage ponds, are categorized as vacant, agricultural, or otherwise available for development. When preparing data for this plan, those parcels were removed in order to create a realistic development scenario.

Additionally, the Thoroughfare Plan takes into account potential adjusted development patterns as a result of future infrastructure projects. One such project is the potential of a future interchange along I-70. These projects have a significant impact on projected growth potential and were not likely not specifically factored into the results of the Housing Study. Both studies provide valuable data to inform future town decisions. Understanding the methodologies of each, however, will allow the studies to be evaluated within their proper context.

Existing housing in Plainfield
Source: HWC Engineering

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NETWORK LEVEL OF SERVICE

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream, generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, safety, comfort, and convenience. Levels range from A–F, with A being the best and F being the worst. Most design or planning efforts typically use service flow rates at LOS C or D, to ensure an acceptable operating service for facility users. While this is not the only factor that will be used to evaluate the relative impacts of scenarios in this analysis, it is a key component of the overall evaluation process.

The following descriptions of each classification are paraphrased from the Highway Capacity Manual:

LOS DEFINITIONS	
LEVEL	DESCRIPTION
A	Free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes.
B	Reasonably free flow. LOS A speeds are maintained, maneuverability within the traffic stream is slightly restricted.
C	Stable flow. Ability to maneuver through lanes is noticeably restricted and lane changes require more driver awareness. Target LOS for some urban and most rural highways
D	Approaching unstable flow. Speeds slightly decrease as traffic volume slightly increases. Freedom to maneuver within the traffic stream is much more limited and driver comfort levels decrease. Common goal for urban streets during peak hours
E	Unstable flow, operating at capacity. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to maneuver in the traffic stream. Factors such as merging ramp traffic or lane changes will affect traffic upstream.
F	Forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity.

NETWORK MODELING SCENARIOS

Building Scenarios

Numerous project scenarios and sensitivity test runs were conducted in order to identify current/future capacity needs and the potential future improvements necessary to meet those future needs. In all, 16 separate scenario evaluations were completed to test separate collections of road projects to better understand their future impacts and benefits. From this analysis, a set of recommended projects was assembled as a "Preferred Scenario" based on their overall positive impacts on anticipated future traffic concerns. This section describes the current condition, what happens in the event no future projects are completed, the recommended base projects to support current and future traffic demands and what impact the future additional I-70 interchange might have on the area. Exhibit P breaks down what projects are included within each Preferred Scenario.

BREAKDOWN OF SCENARIO ELEMENTS

Scenario	Description
CC	Current Conditions Base Model Year 2017
NB	Represents the year 2045 traffic, but without any new roadway capacity projects except for an assumed interchange connection at I-65 for the final leg of the Ronald Reagan Pkwy.
PS1	Include all recommended future improvement projects including connecting local corridors to complete the network and improvements to Ronald Reagan Parkway, Hadley Road and a new Stanley Road Extension between Center Street and Moon Road.
PS2	Identical to Scenario 1, but includes the proposed I-70 interchange, a new regional connector road between U.S. 40 and I-70 as well as connections to the new regional connector.

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EXHIBIT P: NETWORK MODELING SCENARIOS

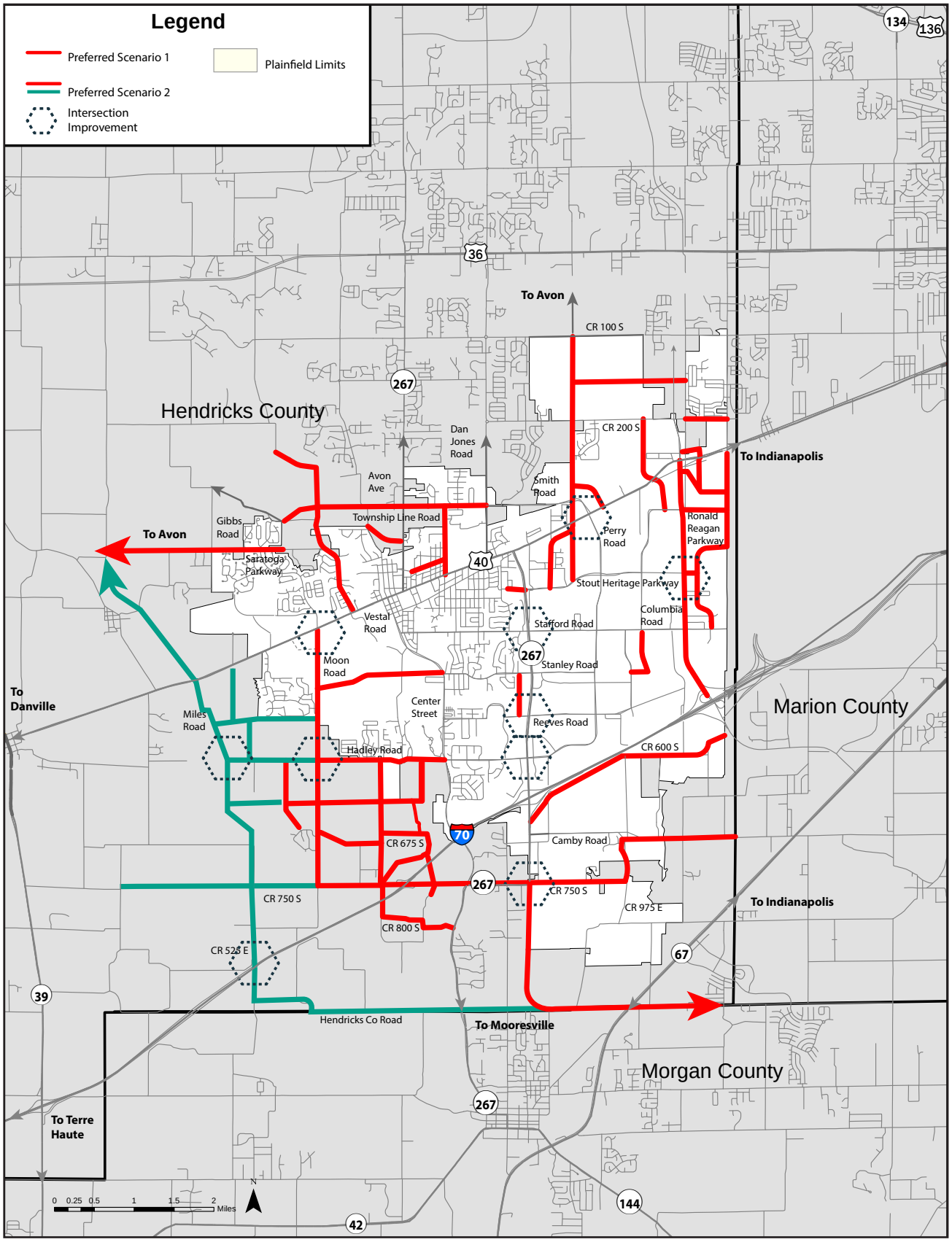

Illustration of recommended Preferred Scenarios and their associated roadway improvement segments.
Source: Convergence Planning

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Preferred Scenarios Modeled Projects List			
Project	**Project Description**	**Scenario 1**	**Scenario 2**
Hadley Rd (Sugar Grove Road to Byscand Blvd.)	Improve existing roadway to 3-lane section	X	X
Carr Road, US-40, and Township Line Rd	Carr Rd reconstruction: widen to 3-lane section	X	X
Smith Rd (Phase 2: 25%)	Improve from Township Line Rd to Main St.	X	X
Smith Rd (Phase 1: 75%)	Improve from CR 200 S to Township Line Rd	X	X
Stout Heritage PKWY Widening	Planned to widened to accommodate Canyon Club	X	X
Widen Stout Heritage to 4 Lanes	Widen from Ronald Regan PKWY to Airtech PKWY	X	X
New I-70 Interchange	New Interchange located at 525 E		X
Airtech-Whitaker Connection	2-lane local industrial roadway	X	X
Klondike Rd - South	3-lane section road connecting U.S. 40 to Airtech	X	X
Klondike Rd - North	3-lane section road connecting U.S. 40 to Bradford Rd.	X	X
Hadley Rd. Widening	5-lane section from Moon Road to Hunters Ridge	X	X
Moon Rd. Upgrade	5-lane section from Hadley to Belvista	X	X
Moon Rd. Upgrade	5-lane section from Belvista to US 40	X	X
Moon/Hadley Intersection	Intersection improvements	X	X
Moon/US 40 Intersection	Intersection improvements	X	X
SR 267/750 S Intersection	Intersection improvements	X	X
US40/Perry Rd Intersection	Intersection improvements	X	X
Stout Heritiage/Reagan Intersection	Intersection improvements	X	X
SR267/Hadley Intersection	Intersection improvements	X	X
SR 267/Reeves Intersection	Intersection improvements	X	X
SR 267/Stafford Rd Intersection	Intersection improvements	X	X

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Project	Project Description	Scenario 1	Scenario 2
Stout Heritage PKWY - Elm Extension	Open access to SR-267 via Metropolis/Elm	X	X
Hadley Road Extension	From Regional Connector to Moon Rd	X	X
CR 675 E Reconstruction	MOU with Westport Homes to improve / widen roads	X	X
NE Warehouse District, Project 2	Connects AllPoints Rd to Ronald Regan PKWY between	X	X
Southfield Dr	Connect Stanley to Reeves	X	X
Bradford Rd from Raceway to CR 1050 E	Reconstruct County Road Section to Town Standards	X	X
Wabash St, Realignment	--	X	X
Raceway Rd Extension	From Stout Hertiage to US40	X	X
Raceway Rd Extension	From Stafford to Stout Heritage	X	X
Airtech Extension	From Reagan to Raceway Extension	X	X
Smith Rd	Upgrade from 200S to 100S	X	X
Allpoints Pkwy	Upgrade from Smith Rd to Allpoints	X	X
Road Extension	Extend from US40 to Metropolis	X	X
Allpoints Pkwy Extension	Connect from Reagan to 6points	X	X
Plainfield Commons Extension	New Road from US40 to Smith Rd	X	X
Upgrade 575 E	From new I-70 Interchange to 750 S		X
Reagan Parkway	Added Lanes	X	X
200 S Extension	From Reagan Pkwy to Raceway Rd	X	X
251 S Extension	From Reagan Pkwy to Raceway Rd	X	X
Earlhan Ln Connector	From 251S to 200S	X	X
Upgrade Moon Rd.	From 650 S to Hadley Rd.	X	X
New Int. and Regional Connector	New I-70 Int. and new alignment connector to US 40		X
Joppa Rd	Upgrade and add lanes		X
New Road 825 E	Connect Mooresville to SR267 Interchange	X	X
New Road - South I-70 Frontage Rd	Connect SR 267 to Ameriplex	X	X
Stanley Rd Extension	New road between Center and Moon	X	X
Lincoln St Extension to Avon Ave	New connection	X	X
Quaker Blvd. Extension	New road from US 40 to Township Line Rd	X	X
Upgrade 350S	From Saratoga to 300 E	X	X
Regional Connector Segment #2	From US 40 to Cartersburg Rd		X
Extension of 521 E	Extend 521 E south to 650 S	X	X
Extension of 521 E	Extend 521 E north from Hadley Rd to Chazmal		X

Project	Project Description	Scenario 1	Scenario 2
Extension of Chazmal	From existing cul de sac westward to new Regional Connector		X
Upgrade 725 E	From 650S to Hadley Rd	X	X
New Road 650 S	From 675 E to Center	X	X
New Road 565 E	New N-S road from Mockernut Ct to Hadley Rd	X	X
Upgrade 700S	Upgrade between Moon and 675E	X	X
Upgrade 750 S	improve between 600 E and 675 E	X	X
New Road 675 E	From 750 S to 700 S	X	X
New Road 750 S	Extend 750 S from 375 E to 525 E		X
Upgrade 675 S	From 675 E to 725 E	X	X
Upgrade 725 E	From I-70 to 675 S	X	X
Upgrade 675 S	From 675 E to 725 E	X	X
Upgrade 675 S	From 700S to 650 S	X	X
Upgrade Center St.	From SR267 to Hadley Rd	X	X
Moon Rd Upgrade	From 750 S to 650 S	X	X
New Road 650 S	From Moon Rd to 675 E	X	X
New Road 650 S	From Regional Connector to Moon Rd		X
Upgrade 750 S	Improve 750 S to 4 lane minor arterial		X
South Connector Option #1	From 675 E at I-70 to SR 267		X
Extend 750 S across I-70	New Road replacing rest area	X	X
Camby Rod upgrade	Upgrade from SR 267 to Marion Co	X	X

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CC CURRENT CONDITIONS (2017 BASE YEAR)

Exhibit Q illustrates the peak hour LOS for the 2017 base year used in this modeling process. This is a representation of the current conditions within the study area. Areas that are currently experiencing high levels of congestion are located at intersections along U.S. 40, along S.R. 267 and the ramps off I-70 to S.R. 267. Other areas including Perry Road, Avon Avenue and Dan Jones Road.

The importance of analyzing the current LOS is to understand where current pinch points, congestion and areas that will need improvement regardless of anticipated future growth. This map is also a strong reflection of the feedback that was received during the public engagement process regarding locations of existing traffic concerns within the town.

Snapshot: CURRENT CONDITIONS (2017)	
Daily Vehicle Trips	
Total	843,789
Daily Vehicle Miles Traveled (VMT)	
Total	2,305,913
Average Trip Length	2.73
Daily Vehicle Hours Traveled (VHT)	
Total	138,098
Average Trip Duration (min)	9.82
Daily Vehicle Delay Hours	
Total	78,220
Average Delay Per Vehicle (min)	5.56
Average Speed (mph)	16.70
Deficient Lane Miles	12.07

Base Year 2017 Scenario
This scenario evaluates the system under base year conditions.

- **Current peak hour capacity problems are seen on U.S. 40, S.R. 267 at I-70, and at several local intersections; mainly at Hadley Rd. and S.R. 267 along with Stafford Rd. at Ronald Reagan Pkwy.**
- **About half of all travel time on the Plainfield area network (includes INDOT roadways) is due to delays, especially at major intersections.**
- **The Base Year scenario was developed to calibrate the model to replicate existing traffic flows and to correctly capture locations where congestion is experienced today.**

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EXHIBIT Q: CURRENT CONDITIONS 2017 LOS

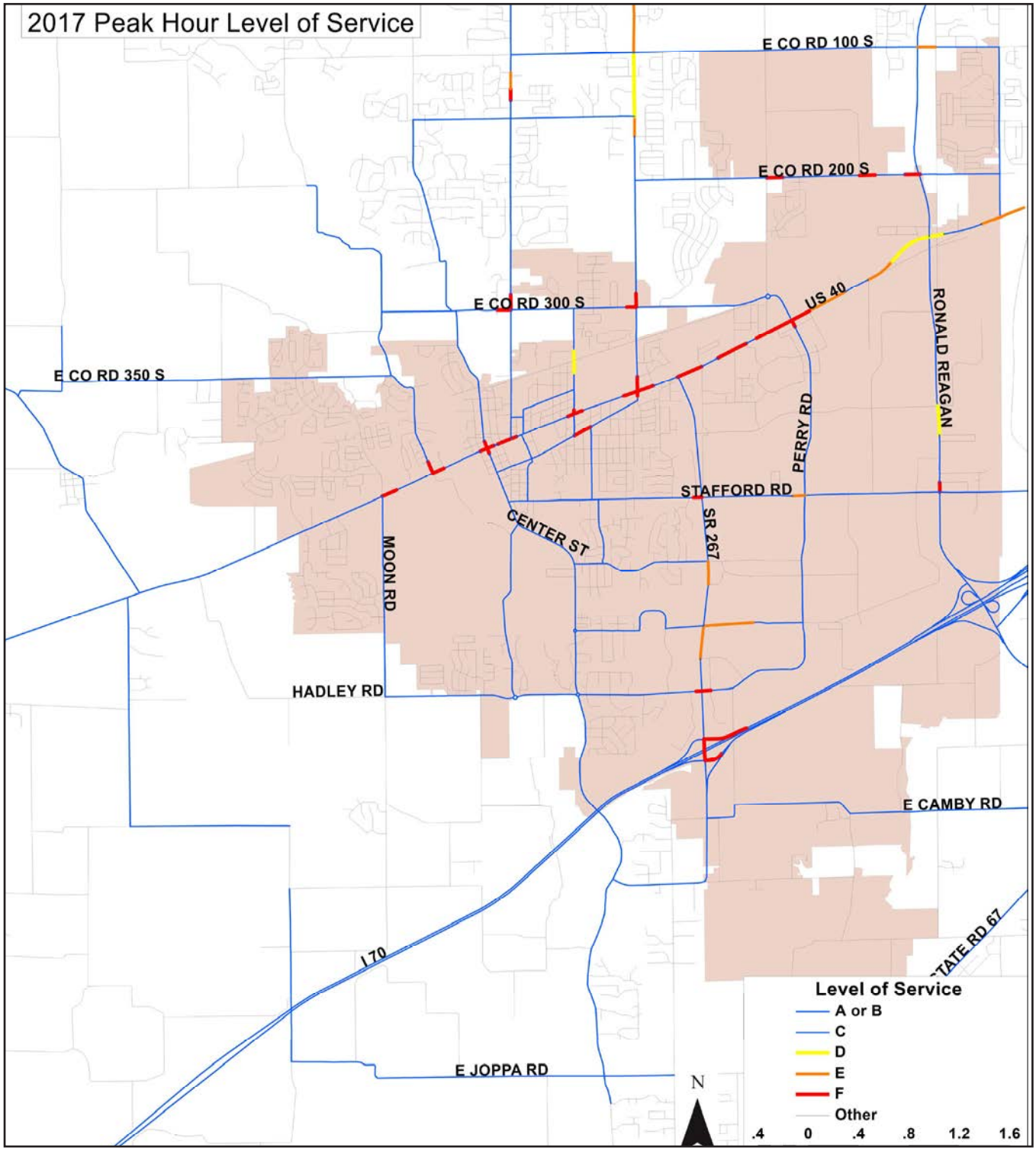

Illustration of the Town of Plainfield's current Peak Hour Level of Service (LOS) on its existing transportation network.
Source: Convergence Planning

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NB FUTURE 2045 NO BUILD SCENARIO

FUTURE 2045 NO BUILD/BASE MODEL PEAK LEVEL OF SERVICE

This scenario evaluates the system conditions as if no new roadway improvements are made before 2045, but development/growth occurs as projected by the economic growth forecast.

- **Land use change within the immediate Plainfield area is significant with 92% more households and 62% more jobs. This is a faster pace than the surrounding areas. All of the new development (immediate area and surrounding area) generates 1.1 million total vehicle trips within the study area by 2045.**

- **Vehicle trips passing through the study area increase by 49%, and the amount of vehicle delay is 32% more than experienced on the roadways today. Because the development is dispersed, the existing road infrastructure can absorb some of the increase, but many roadways will be over capacity during peak hours.**

- **The No Build scenario is used as the baseline comparison with all other scenarios.**

See Appendix for complete ADT analysis.

Snapshot: 2045 No Build/Base Model	
Daily Vehicle Trips	
Total	1,029,765
Daily Vehicle Miles Traveled (VMT)	
Total	3,457,375
Average Trip Length	3.70
Daily Vehicle Hours Traveled (VHT)	
Total	203,133
Average Trip Duration (min)	13.04
Daily Vehicle Delay Hours	
Total	114,564
Average Delay Per Vehicle (min)	7.35
Average Speed (mph)	17.02
Deficient Lane Miles	39.02

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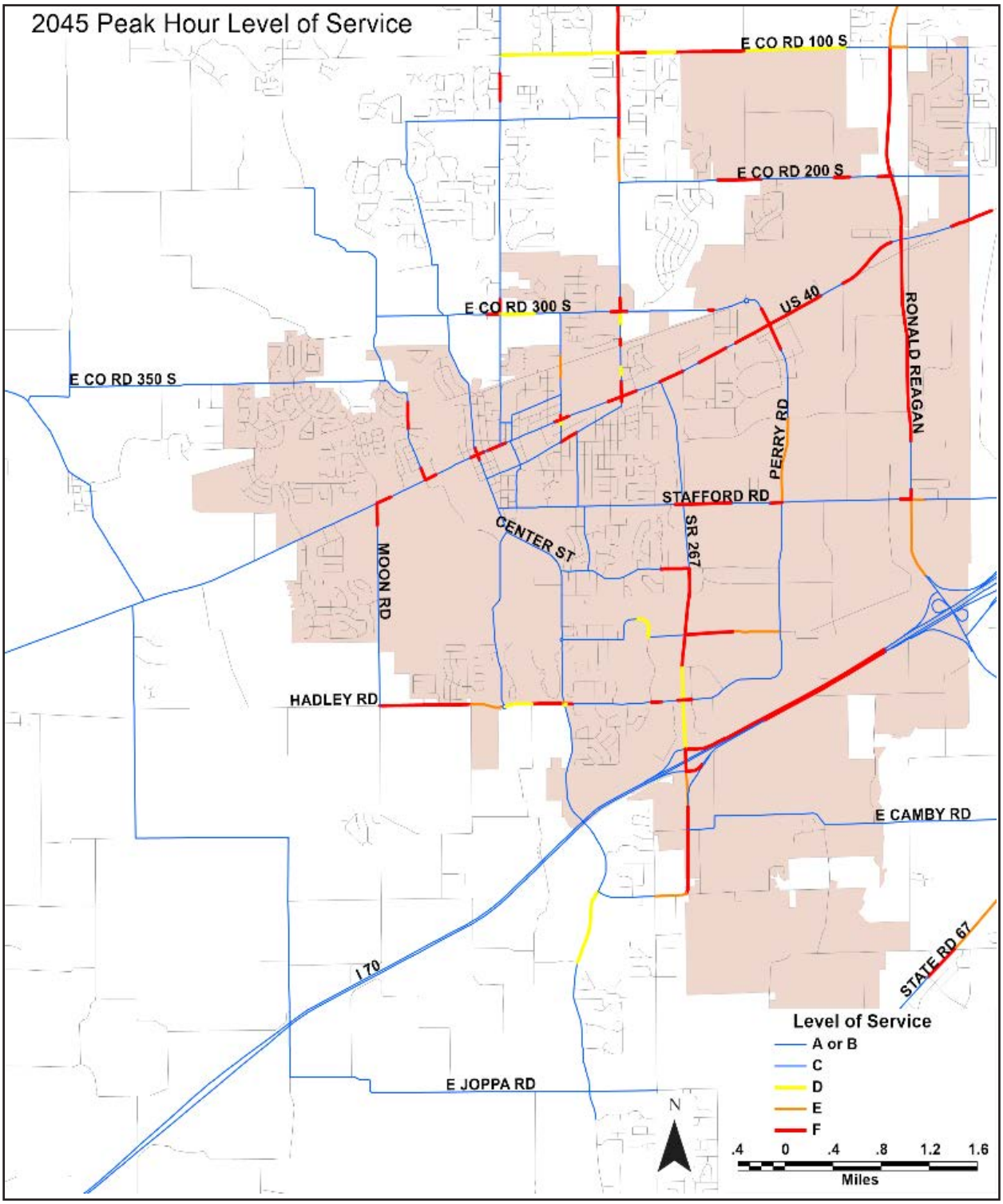
EXHIBIT S: FUTURE 2045 NO BUILD SCENARIO



Level of Service (LOS) illustration of future impacts the base model improvements to the current Plainfield transportation system.
Source: Convergence Planning

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PS1 PREFERRED SCENARIO 1 (WITHOUT INTERCHANGE)

Modeling Preferred Scenario 1

The detailed project list for the preferred scenario is listed in the appendix of this report. This scenario uses the land use forecast based on a no-interchange scenario. Major roadway capacity increases include:

- **Major intersection improvements at Perry/U.S.40, Hadley/S.R.267, Moon Road/U.S. 40, Moon Road/Hadley, S.R. 267/Camby Road, Stout Heritage/Ronald Reagan, S.R. 267/Reeves Road, and S.R. 267/Stafford Rd. The model has included roundabout improvements at these locations but alternate improvements may be utilized.**
- **Adding lanes on Hadley and Moon Roads, plus the introduction of a grid network in the southwest portion of the Town's anticipated growth area.**
- **Added lanes on the Ronald Reagan Parkway, increasing the corridor to 6 lanes between I-70 and E. 200 S.**
- **Added lanes and improvements on E. 300 S along with a new alignment connector to Saratoga. Completing the final portions of the Perimeter Parkway.**
- **A new crossing of I-70 along the 750 S. alignment and improvements such that there is a continuous E-W corridor along to S.R. 67. The new corridor transitions to Camby Rd in the East.**

Scenario Impacts:

- **Vehicle trips in 2045 within the study area remain the same when compared to No Build, however, Vehicle Miles Traveled increase 3.7% over the No Build Scenario. The VMT increase is caused by the shortest travel time path sometimes being a longer distance due to new roadway links or added capacity on some links.**
- **Total vehicle hours decrease by 12.2%, and vehicle delays decrease by 29.2% compared to the No Build scenario, all despite the extra vehicle miles.**
- **Build vs. No Build flow improvements result in flow improvements on Hadley and at the existing S.R. 267 interchange.**
- **Economic benefits – This scenario has a benefit cost ratio of 7.41 and is projected to create an additional 755 long term jobs.**

Snapshot: 2045 Preferred Scenario 1- w/out Int.	
Daily Vehicle Trips	
Total	1,029,765
Daily Vehicle Miles Traveled (VMT)	
Total	3,584,523
Average Trip Length	3.48
Daily Vehicle Hours Traveled (VHT)	
Total	178,353
Average Trip Duration (min)	10.39
Daily Vehicle Delay Hours	
Total	88,744
Average Delay Per Vehicle (min)	5.17
Average Speed (mph)	20.10
Deficient Lane Miles	29.57

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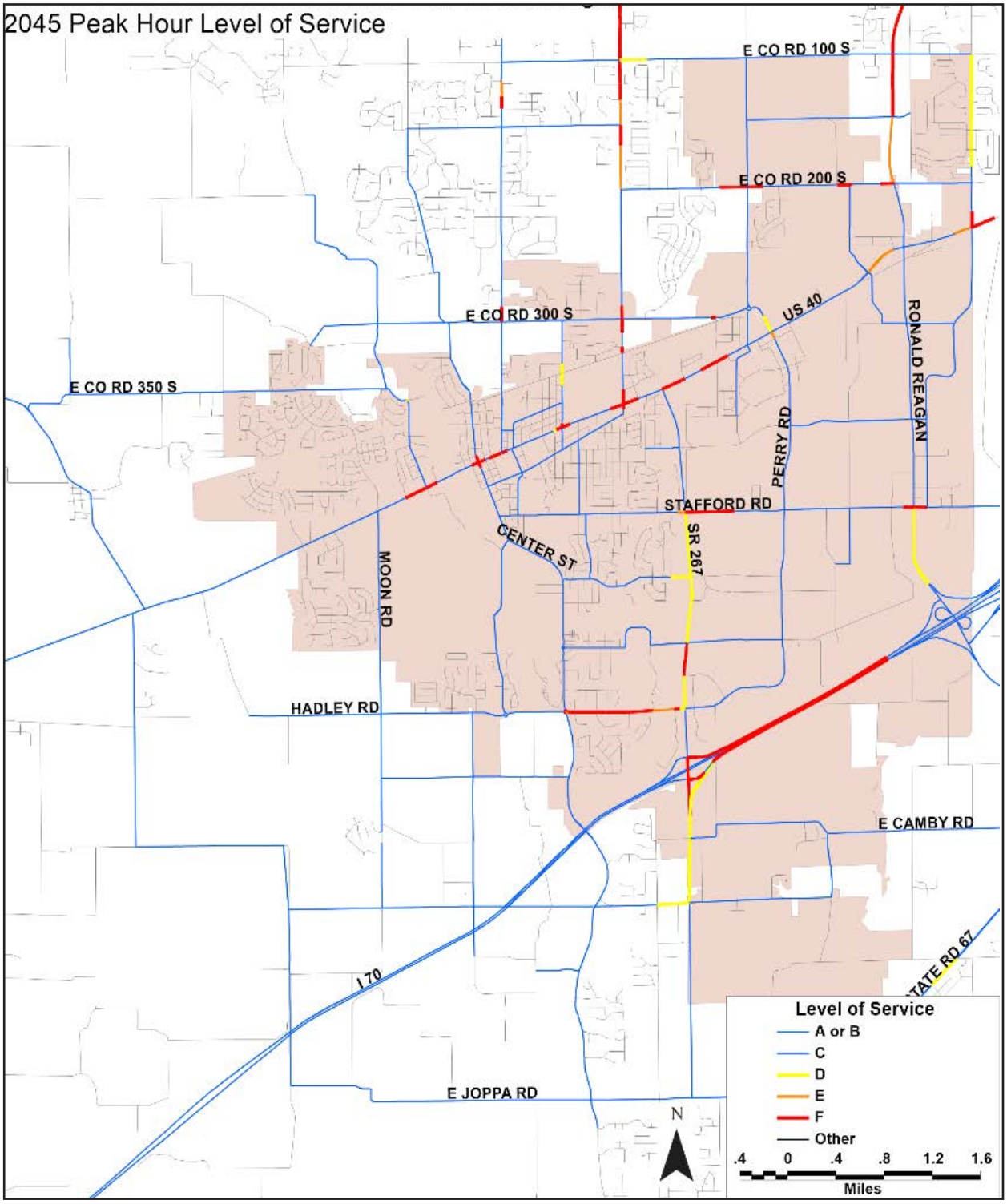
EXHIBIT T: PREFERRED SCENARIO 1- 2045 LOS



Level of Service (LOS) illustration of impacts Scenario 1 model improvements will have to the Plainfield transportation system.
Source: Convergence Planning

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PS2 PREFERRED SCENARIO 2- (WITH INTERCHANGE)

Modeling Preferred Scenario with I-70 Interchange

This scenario includes all projects contained in the previous scenario and adds a new interchange on I-70 near County Road 525 E. Also included are a major new multi-lane divided, high speed, regional connector between the new I-70 interchange and C.R. 350 S. (north of U.S. 40) as well as several road improvements connecting existing county roads to the regional connector corridor (see Exhibit P).

- **The addition of the new interchange and regional connector affects land development assumptions, attracting more development to the Plainfield area, which in turn increases study area vehicle trips by 1.7%.**
- **Vehicle miles of travel within the study area increase by 15% compared to No Build, which is caused by the shortest travel time path sometimes being a longer distance due to new roadway links or added capacity on some links.**
- **Total vehicle hours decrease by 5%, and vehicle delays decrease by 27% compared to the No Build scenario, all despite the extra vehicle trips and vehicle miles.**
- **Build vs. No Build flow improvements provide flow improvements on Hadley and at the existing S.R.267 interchange. Traffic modeling shows that I-70 will experience an increase in traffic, and will exceed capacity between S.R. 267 and the Ronald Reagan Parkway/Ameriplex interchanges during peak conditions.**
- **The regional connector corridor attracts a significant amount of new traffic from Danville and Avon that would have normally used U.S. 36. Improvement to U.S. 36 beyond our study area could also be significant and planned improvements are included in the model.**
- **Economic benefits – The full Preferred Scenario, when including the new interchange and connector corridor, has a benefit cost ratio of 6.46 and is projected to create an additional 972 long term jobs.**

Snapshot: 2045 Preferred Scenario 2 -w/ Int.	
Daily Vehicle Trips	
Total	1,047,511
Daily Vehicle Miles Traveled (VMT)	
Total	3,990,845
Average Trip Length	3.88
Daily Vehicle Hours Traveled (VHT)	
Total	192,296
Average Trip Duration	11.20
Daily Vehicle Delay Hours	
Total	91,910
Average Delay Per Vehicle (min)	5.36
Average Speed (mph)	20.75
Deficient Lane Miles	41.94

Scenario 2 Conditions Include:

- **New I-70 crossing along C.R. 750 S., plus;**
- **Associated road improvements to East/West corridor along to S.R. 267, plus;**
- **New corridor transitions to Camby Rd. east of S.R. 267.**

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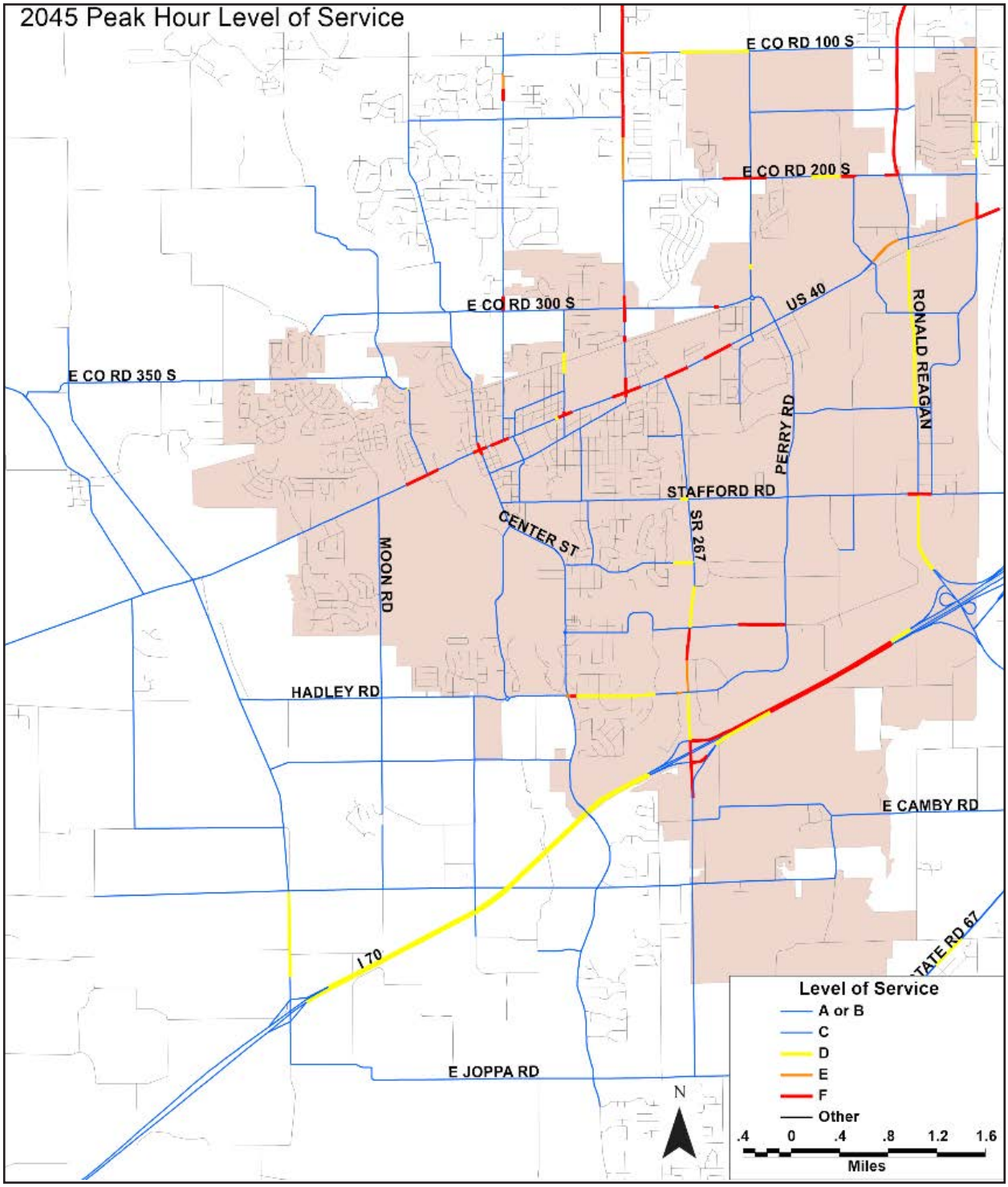
EXHIBIT U: Preferred SCENARIO 2- 2045 LOS



Level of Service (LOS) illustration of impacts Scenario 2 model improvements will have to the Plainfield transportation system.
Source: Convergence Planning

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EXHIBIT V1: SCENARIO COMPARISONS

Comparison of Modeled Scenarios				
Year	2017	2045	2045	2045
Network	Existing	No Build	Preferred Scenario 1	Preferred Scenario 2 (with interchange)
Daily Vehicle Trips	843,789	934,611	1,029,765	1,047,511
Daily VMT				
Interstate	477,512	728,501	683,519	797,802
Principal Arterial	871,512	1,185,093	1,353,587	1,517,643
Minor Arterial	345,339	636,440	842,179	746,809
Collector	50,029	96,755	71,924	107,252
Local	561,615	810,587	633,314	820,340
Total	*2,305,913*	*3,457,375*	*3,584,523*	*3,990,845*
Daily Vehicle Delay Hours				
Interstate	185.2	1,261.8	1,485.3	1,828.3
Principal Arterial	33,285	46,128.2	38,760.0	40,962.9
Minor Arterial	9,504	21,467.3	11,145.7	10,459.1
Collector	1,383.8	2,727.8	1,399.4	1,617.3
Local	33,862	42,687.5	35,954.1	37,042.0
Total	*78,219.9*	*114,563.7*	*88,744.5*	*91,909.7*

Scenario Comparison Tables

Exhibit V1 and V2 identify ways each modeled scenario compares to another in terms of daily number of miles traveled, expected daily delays, deficient lane miles and the LOS of the miles traveled in Plainfield.

Daily Vehicle Trips
A measure of travel demand; in the model, it is determined by calculating the number of vehicles traveling between traffic zones. For modeling purposes, the town and surrounding areas were divided into 1180 traffic zones. A measure of travel demand.

Daily VMT
Average daily traffic (ADT) volume multiplied by the distance of a segment in miles. Cumulative over all levels of service. A measure of travel demand

Daily VHT
Travel time of a segment multiplied by the number of vehicles (cumulative over all levels of service). A measure of travel demand.

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EXHIBIT V2: SCENARIO COMPARISONS

Comparison of Modeled Scenarios *(continued)*				
Year	2017	2045	2045	2045
Network	Current	No Build	Preferred Scenario 1	Preferred Scenario 2 (with interchange)
Daily VMT at LOS				
A or B	1,608,949	1,399,577	2,069,843	2,069,521
C	306,643	654,741	312,316	294,489
D	105,916	171,021	192,075	446,087
E	77,585	175,457	324,936	455,698
F	207,020	1,056,579	685,354	725,049
Deficient Lane Miles				
Interstate	0.51	3.5	4.13	11.32
Principal Arterial	8.02	21.04	20.27	24.50
Collector	2.74	13.03	5.05	5.50
Local	0.79	1.45	0.11	0.62
Total	*12.07*	*39.02*	*29.57*	*41.94*

Daily Vehicle Delay Hours

Average number of hours per day that a vehicle traveling on a segment experiences delays multiplied by the number of vehicles traveling along the segment over the course of a day. A delay is defined as the amount of additional time that a vehicle spends on a road segment in less-than-free-flow (i.e., LOS A) conditions.

Daily VMT at LOS

Miles traveled per vehicle per day at the level of service specified within the model.

Deficient Lane Miles

Number of lanes with a LOS (as defined by INDOT) of E or below in urban areas, or D or below in rural areas multiplied by the number of miles within the segment that the deficient LOS occurs.

Accidents

Number of incidents resulting in property damage, injury, or death in a given year under the scenario specified.

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Modeled Scenarios Comparison Summary

During the Thoroughfare Plan development process, numerous project scenarios and sensitivity test runs were conducted in order to identify current/future capacity needs based on overall metro area economic growth assumptions and likely land use growth locations within the immediate Plainfield area. Beyond the performance evaluation analysis completed in this chapter, economic impacts of the proposed improvements are also evaluated using components of Indiana's MCIBAS system (discussed in more detail in Chapter 5). This summary describes the outcomes from the final set of land use and preferred network improvement scenarios that support the development of the final recommended project list and prioritization.

In general, each of the chosen scenarios have positive impacts. Under each scenario, overall time savings and vehicle operating cost savings are improved. Additionally, all scenarios support and enhance long-term job growth within the area. While each of the project-mix scenarios helps solve existing and new traffic issues created by new development, the town will need to carefully coordinate the addition of roadway capacity with new land development. The scenario that includes a new interchange on I-70 along with connecting roadways (Preferred Scenario 2) is best at serving the long-term land development forecasts under the current Comprehensive Plan policies.

The "no interchange" scenario (Preferred Scenario 1) is desirable for serving short-term growth. It should be noted that some flow improvements are evident on Hadley Road when comparing against the No Build scenario. This finding is significant because it shows that implementation would serve to mitigate some of the existing issues in the level of service currently present on this corridor. Addressing this situation in the short-term could potentially facilitate a smoother land use development process in this area going forward.

Adding the proposed new interchange on I-70 around 525 E. facilitates new development and growth for the town. Under this scenario, a new multi-lane divided, high speed regional connector is added between the new I-70 interchange and C.R. 350 S. (north of U.S. 40) including several road improvements connecting existing county roads to the regional connector corridor. Vehicle trips are increased by 1.7% under this scenario; however, it would bring about decreases in vehicle hours (5–7%) and in vehicle delays (23–27%).

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For the long-term, the full build-out of the preferred project list which includes the new interchange and regional connector corridor (Preferred Scenario 2) presents the most beneficial overall outcome for the town. Inclusion of all projects mentioned brings about even more flow improvements on Hadley Road, along the S.R. 267 corridor and at the existing S.R. 267 interchange. Although the final scenario has a slightly lower benefit cost ratio, it will generate an additional 28% job growth over the "no interchange" option. This project should be looked at as a long-term alternative for the town.

A general recommendation emerging from the modeling process is for the town to consider managing additional development in certain areas. One specific area would be that which would feed additional traffic onto Hadley Road. This could include a variety of measures including, but not limited to, promoting more compact growth, discouraging "leap frog" development or asking developers to assist in future improvements to Hadley Road as part of their development projects. The long-term solution is for Plainfield to develop a grid roadway network system within the areas where new development is expected such that alternatives to Hadley Road and the S.R. 267 interchange are in place to support future growth.

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05 ECONOMIC IMPACT

ECONOMIC BENEFIT-COST ANALYSIS

Chapter 4 focused on the performance metrics of the different project scenarios that led to the identification of the recommended Preferred Scenario 2. This recommendation was based on the overall long-term physical performance of that alternative in helping manage projected future traffic concerns. An alternative method of evaluating the recommended scenario is to look at its performance from a benefit-cost perspective. A benefit-cost analysis examines the effect of a transportation policy, program, project, activity or event on the economy of a given area.

For the Plainfield Thoroughfare Plan, an economic impact analysis for the roadway project bundles identified in Chapter 4 has been performed. Benefit-cost analysis differs from economic impact analysis in that it also accounts for non-economic benefits for system users (such as the effects on personal travel time savings, safety and improvements in the quality of life). For Plainfield, INDOT's Major Corridor Benefit Analysis System (MCIBAS) has been adapted to provide both an economic impact and benefit-cost analysis resource that can be used to inform decision makers during this planning process. A growing number of transportation agencies are making use of economic analysis in the decision-making process, including INDOT.

The hope is that Plainfield can use this information at each stage in the transportation planning and decision-making process to:

» Provide vital information for public policy discussions

» Outline vision, performance measures,performance targets and other strategic planning

» Identify project needs, selection, and prioritization through the MPO's planning process

» Compete for funding from INDOT, the Indianapolis MPO and other competitive grant programs grants

» Support project-level analysis for determining the most feasible and effective alternatives for implementation

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INDIANA'S MCIBAS MODELING DETAILS

Under INDOT's MCIBAS system, user benefits that accrue over the useful life of a project are used to offset cost estimates of infrastructure improvements. Descriptions of long-term benefits, cost-effectiveness, and business attraction potential provide model users the ability to evaluate project concepts as a focused set of investments supporting transportation and the Indiana economy. The methodology used in this analysis uses various components of the Major Corridor Investment Benefit Analysis System (MCIBAS). These include a travel demand model (developed for this project), NET_BC (INDOT tool used to compute the user benefits and benefit-cost), and REMI (an economic model). In short, this evaluation of the economic benefit uses INDOT's own methodologies and tools to help justify the importance of proposed local and regional projects. A description of how the system works is below:

» Travel demand model outputs, indicating miles of travel and hours of travel by autos and trucks and trip purpose are used to monetize travel time, operating, accident and vehicle emissions costs.

» Costs (time, operating, accident and emissions) grow as more traffic is generated from new land development. This represents a growing stream of "roadway user" costs into the future.

» The impact of the traffic growth depends on the roadway network capacity added for each scenario. So, scenarios with more roadway capacity will result in less congestion (fewer vehicle hours per vehicle miles traveled) and potentially lower costs for the users.

» The stream of costs for each scenario is compared against the stream of costs for the no-build scenario. The difference between the cost streams represent a "user benefit" when the cost of a build scenario is less than the cost of no-build. The cost streams use a 25 year window.

» User benefits (time, operating, accident and emissions) are split into three categories based on mode: truck, business automobile, and non-business automobile. MCIBAS is especially sensitive to impacts on trucking, since these are direct business costs.

» The user benefits for commercial trip purposes (truck and business auto) are assigned to specific economic sectors based on each industry classification's sensitivity to transportation costs (manufacturing is more sensitive to transportation costs than medical services) and passed into the Indiana REMI model.

» The REMI model is a sophisticated input-output model that considers the industry structure of a particular region, as well as transactions between industries. Changes that affect industry sectors that are highly interconnected to the rest of the economy will often have a greater economic impact than those for industries that are not closely linked to the regional economy. The REMI model output reveals changes in gross regional product, real personal income, and employment for a given network scenario. These are the long-term economic impacts of each of the network scenarios. It should be noted that the economic impacts are regional, so a set of projects in Plainfield may benefit the wider region and entire impact will not be solely within Plainfield.

» Construction jobs created directly by the roadway projects are not included in the analysis because they have a very short-term impact.

» In the final step of MCIBAS, the economic impact, combined with direct user benefits, is compared against the project costs for a given scenario, providing a benefit-cost ratio and a net present value.

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BENEFIT-COSTS RESULTS SUMMARY

MCIBAS output results for the roadway scenarios tested as part of the Thoroughfare Plan are shown in the accompanying table. Selected economic analysis results are also summarized within each scenario result summary that was outlined within the Network Modeling and Analysis Chapter. The benefit-cost ratios are highly dependent on the estimated project costs and the timing of the expenditures. For this analysis, only rough project costs were estimated and it is likely that these will change when a more detailed cost estimate is generated as projects go under design. Costs and benefits are both discounted to 2015 (using a 7% discount rate recommended in FHWA guidance), so benefits occurring in distant years will be significantly discounted.

The main conclusion that can be drawn from the analysis is that the roadway scenarios or combinations of scenarios are all viable (B/C ratio greater than 1) and economically beneficial to the region. Typically any roadway improvement scenario where the B/C ratio is higher than 2.0 is considered to be an outstanding public investment. All scenarios considered for the Thoroughfare Plan exceed this threshold. Scenario 1 emerges with the highest benefit-cost ratio, but Scenario 2 has the most overall economic benefit and jobs impact. It should be noted that the scenarios are mostly cumulative and this can be seen in the overall scenario project costs. The net present value of the project costs is used, first because benefits are also expressed in these terms, but also because it assumed that the construction costs of the various projects will be incurred over the life of the analysis (dollars diminish in present value with each year into the future). Details can be found in the table below.

MODEL SCENARIOS BENEFIT-COST ANALYSIS SUMMARY		
	NETWORK SCENARIOS	
	PS1 (without Int.)	PS2 (with Int.)
COSTS		
Estimated Scenario Project Costs ($ 2018)	$248.00	$320.00
NPV Estimated Scenario Project Costs ($ 2018)	$231.78	$299.07
BENEFITS		
Time Savings	$930.53	$1,076.93
Operating Cost Savings	$23.00	$37.98
Accident Cost Savings	$80.44	$74.53
Emissions Cost Savings	$21.49	$24.80
Economic Impact	$662.87	$718.75
Total Benefit	$1,718.33	$1,932.99
BENEFIT-COST		
Ratio (benefit/cost)	7.41	6.46
Net Present value (benefit minus cost)	$1,486.56	$1,633.92
REGIONAL EMPLOYMENT IMPACT		
Average Annual Job Gain over no-build scenario	755	972

NOTE: ALL BENEFITS AND COSTS ARE EXPRESSED AS THE NET PRESENT VALUE (MILLIONS 2015 $)

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Key Benefit-Cost Summary Definitions

The table on the previous page identifies ways each modeled scenario compares to one another in terms of overall economic benefit. Below is a description of the areas of assessment.

Time Savings
The difference in Vehicle Hours Traveled (VHT) between the no-build alternative versus a modeled scenario, multiplied by the value of the traveler's time, as determined by the type of travel undertaken (e.g., commuter, freight, casual, etc.).

Operating Cost Savings
The difference in Vehicle Miles Traveled (VMT) between the no-build alternative versus a modeled scenario, multiplied by factors that contribute to vehicle operating costs, such as fuel and vehicle maintenance expenses.

Accident Cost Savings
The monetary savings difference between the number of accidents predicted to occur under the no-build alternative versus a modeled scenario.

Emissions Cost Savings
The reduced cost of health care for members of the study area population resulting from improved air quality that can be directly attributed to lower vehicle emissions.

Economic Impact
The present-day dollar value in benefits to the local economy, such as increased company profits, additional jobs created, or increased consumer spending. Calculated by using the REMI model, which inputs business cost savings and generates outputs such as gross regional product (the total value of all goods and services produced in the State of Indiana), changes to personal income as calculated by the State of Indiana, and new job creation.

Assumptions
All projects in a given scenario are completed and open for travel by 2025. Calculated benefits for each project begin in 2025. Each project carries a 20-year lifespan from the date it opens (i.e., 2025–45).

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LOCAL ECONOMIC IMPACT

Economic Development Areas

With proper transportation improvements in place to attract residential and non-residential development, it is likely that areas will see continued or increased development activity. The town has been segmented into six areas for analysis (see Exhibit W). These development areas all differ in character and surrounding environments and each has independent and unique development opportunities.

A Development Area A

Area A is located north of U.S. 40 along the eastern boundary of Plainfield and includes portions of the Town of Avon. This development area has existing industry and businesses such as Adesa Auto Auction and industrial distribution centers that are mixed with single-family residential subdivisions. This area is significant because of existing development opportunities as well as its proximity to Marion County, U.S. 40 and the Ronald Reagan Pkwy.

B Development Area B

The Ronald Reagan Pkwy's influence within this area will continue to attract industry and major employers. Developable land is becoming limited in the area of Plainfield by the influx of growth and development. Plainfield has invested in providing proper infrastructure to attract and accommodate industry and taken advantage of easy highway and interstate access within this area.

C Development Area C

Area C provides some industrial development opportunities south of I-70 but is constrained by the existence of natural bat habitats. It is possible that industrial and office campus growth from Marion County expands west into Plainfield along the I-70 corridor towards S.R. 267. Additionally, there is opportunity for mixed-use and potential residential development in this area.

D Development Area D

Area D is likely the primary area for future suburban residential development in Plainfield. Hadley Road acts as the major east/west corridor, connecting residential subdivisions to the S.R. 267 and I-70 interchange. It is essential that future road infrastructure is installed to accommodate the anticipated future residential growth.

E Development Area E

Area E has been identified as the potential location of a future I-70 and regional connector route. New interchange improvements in this area will allow industrial and commercial development to occur over time. A detailed interchange/corridor study should be completed to determine specific future alignments.

F Development Area F

The conceptual regional connector roadway, as indicated in the transportation scenarios and future thoroughfare plan, will have major development impacts within this area. The nature of the future road will influence the types, amounts and timing of future development in this area.

G Development Area G

This area incorporates a majority of Plainfield's existing development. Schools, retail, commercial, parks and residential development are located here. While some infill growth may occur in the downtown and around the mall, most of the projected future growth of Plainfield will likely be outside of this area.

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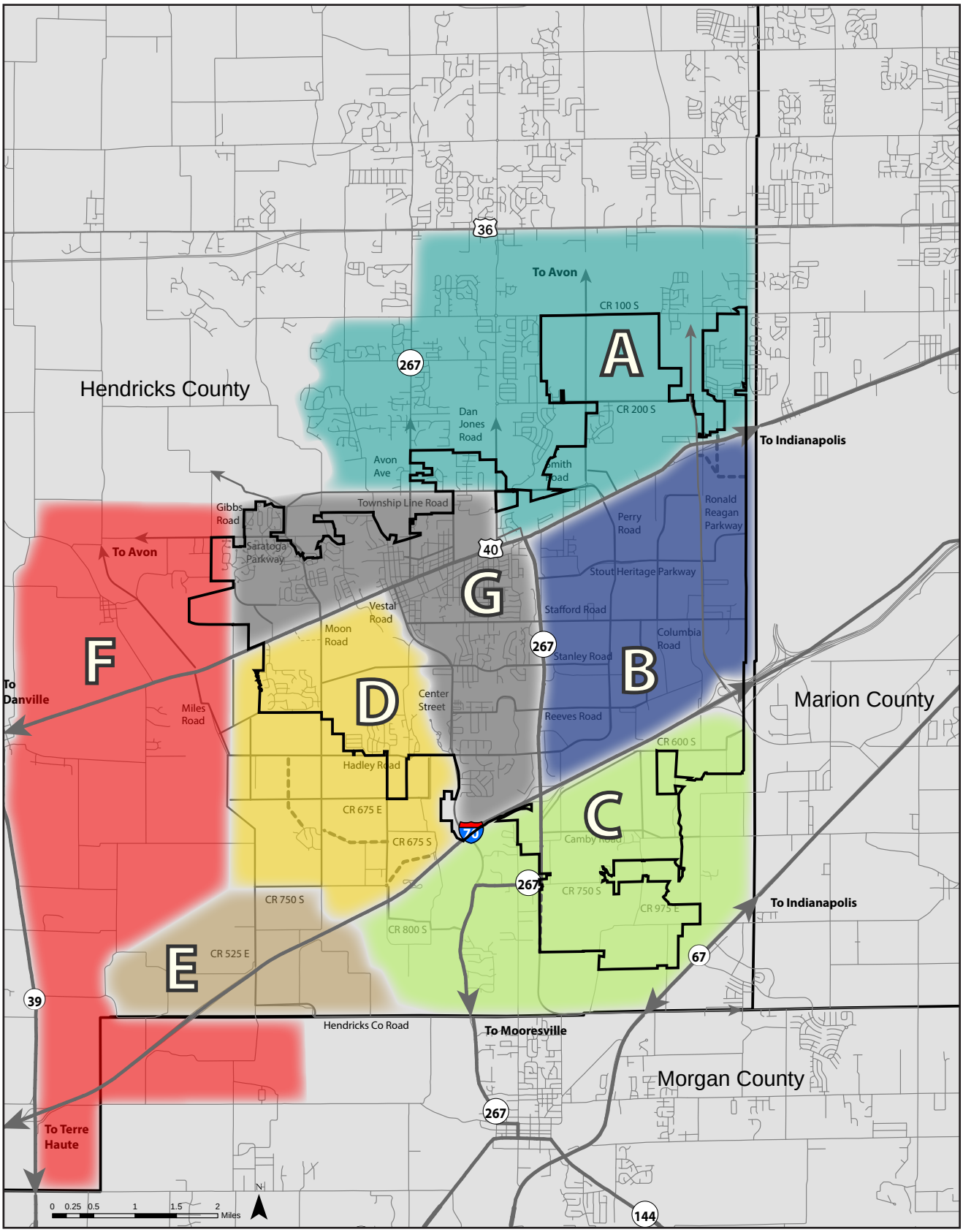
EXHIBIT W: KEY DEVELOPMENT AREAS MAP



*This map is conceptual only and for the purpose o assisting the analysis of this plan. They are subject to change as actual development occurs in the future in currently undeveloped areas.

Source: HWC Engineering

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Land Available for Future Development

As part of the modeling analysis of this plan, future growth projection data was collected for a variety of land uses. These land uses included:

- Residential
- Industrial and Warehousing
- Retail, Hotel and Restaurant
- Service

The table below indicates the amount of developable property in each of the defined Development Areas for each land use. It should be noted that these areas, and their corresponding acreages, cover the area within the study area of this plan. This area stretches beyond the current corporate limits of the town. This is also a much larger area than was analyzed as part of the town's 2019 Housing Study.

Projected Future 2045 Employment and Residential Unit Growth

The table to the right illustrates the projected growth of each of the analyzed land use categories. This chart also identifies the influence the proposed new I-70 interchange might have on the development potential within each area. For each Development Area, projected housing unit and population growth numbers have been identified for 2045 and compared to actual 2015 numbers.

In addition, employment numbers for each of these land uses have been distributed for current year analysis (2015) and future year (2045), both with and without the proposed interchange on I-70. An additional 489 residential units, 565 industrial jobs and 1,087 retail, hotel and restaurant jobs are projected for Plainfield by adding the new I-70 interchange. While these numbers may seem small from a local perspective, the presence of the new interchange will also likely have an impact on the speed of development of the area and will likely have significant positive regional impacts for Hendricks County and Morgan County.

VACANT AND DEVELOPABLE LAND (ACRES)

GROWTH AREA	RESIDENTIAL	INDUSTRIAL	RETAIL-HOTEL-RESTAURANT	SERVICE
A	1,045	861	135	135
B	50	483	255	255
C	1,588	1,841	14	14
D	2,030	-	213	213
E	283	1,941	198	198
F	10,708	145	138	138
G	650	2	121	121
TOTAL	16,353	5,273	1,075	1,075

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The growth model utilized as part of this Thoroughfare Plan indicates a strong development preference for the area around the proposed interchange. This is evident in some of the development pattern shifts identified in the tables below. This means that the interchange increases the likelihood of development within and around Plainfield, especially for non-residential development. While the direct benefit of the interchange is significant, its indirect benefit to the town and the region may actually be greater.

ESTIMATED RESIDENTIAL 2045 GROWTH PROJECTIONS (UNITS AND POPULATION)									
USE	A	B	C	D	E	F	G	TOTAL	
2015									
POPULATION	16,412	3,354	1,863	2,912	357	2,573	17,702	45,173	
UNITS	6,386	1,305	725	1,133	139	1,001	6,888	17,577	
2045 (WITHOUT INTERCHANGE)									
POPULATION	22,269	4,873	7,206	9,756	357	7,743	20,928	73,132	
UNITS	8,665	1,896	2,804	3,796	139	3,013	8,143	28,456	
2045 (WITH INTERCHANGE)									DIFFERENCE
POPULATION	22,284	4,873	7,039	10,393	357	8,514	20,928	74,389	+1,257
UNITS	8,671	1,896	2,739	4,044	139	3,313	8,143	28,945	+489

ESTIMATED NON-RESIDENTIAL 2045 GROWTH PROJECTIONS (EMPLOYMENT)									
USE	A	B	C	D	E	F	G	TOTAL	
2015									
INDUSTRIAL	1,990	7,339	139	59	29	139	1,322	11,017	
RETAIL-HOTEL-RESTAURANT	3,483	5,144	-	118	-	58	637	9,440	
SERVICE	2,859	1,625	54	936	2	595	3,507	9,578	
2045 (WITHOUT INTERCHANGE)									
INDUSTRIAL	4,692	9,978	3,622	66	127	159	1,674	20,318	
RETAIL-HOTEL-RESTAURANT	5,157	9,206	710	1,360	-	77	1,996	18,506	
SERVICE	3,687	2,096	70	1,205	3	767	4,520	12,348	
2045 (WITH INTERCHANGE)									DIFFERENCE
INDUSTRIAL	4,692	9,978	2,886	66	1,448	159	1,674	20,903	+585
RETAIL-HOTEL-RESTAURANT	5,552	9,530	700	1,077	641	77	2,016	19,593	+1,087
SERVICE	3,687	2,096	70	1,205	3	767	4,520	12,348	-

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Future Growth Factors

Many factors will influence the town's ability to achieve this projected growth. These factors include, but are not limited to:

- Local economic development efforts
- Macro-economic conditions
- Local market demands
- Local development polices
- Annexation restrictions/limitations
- Regional competition
- Consumer Preferences
- Technology Advancements
- Telecommuting Patterns

These factors are variable for the economic climate of Plainfield. Over the long-term, they tend to even out allowing for delivery of the long-term projections utilized in this analysis. The long-term nature of these projections make it challenging to accurately project growth on an annual basis.

It is important, however, to try to understand the local impacts of this potential growth in both the short-term and the long-term. What follows are a series of tables that look at potential 10-year non-residential growth for each of the Development Areas. These numbers are based on a presumed linear growth pattern of development over the overall 30 year time period.

With the employment numbers calibrated for a projected 10-year increment, it is possible to translate projected employment growth into development expectations. To accomplish this, a combination of logarithmic equations and average rate multipliers identified in The Institute of Traffic Engineers Trip Generation Manual and by the U.S. Department of Energy were utilized. These sources relate employment numbers to the relative square footage of the building needed to support those jobs. The associated tables identify potential square footage growth over a 10-year period and the potential associated growth in real property assessed valuation resulting from that projected employment growth.

ESTIMATED 10-YEAR EMPLOYMENT GROWTH PROJECTIONS (2015-2025)

GROWTH AREA	INDUSTRIAL-WAREHOUSE		RETAIL-HOTEL-RESTAURANT		SERVICE	
		WITH INTERCHANGE		WITH INTERCHANGE		WITH INTERCHANGE
A	901	901	558	690	276	276
B	880	880	1354	1462	157	157
C	1161	916	237	233	5	5
D	2	2	414	320	90	90
E	33	473	0	214	0	0
F	7	7	6	6	57	57
G	117	117	453	460	338	338
TOTAL	3100	3295	3022	3384	923	923

ALL TABLES AND NUMBERS ARE ESTIMATES ONLY BASED ON PROJECTED DEVELOPMENT TRENDS OVER THE NEXT 10 YEARS. ACTUAL DEVELOPMENT MAY VARY SIGNIFICANTLY FROM THESE ESTIMATES BASED ON A VARIETY OF FACTORS INCLUDING, BUT NOT LIMITED TO, CHANGES IN MARKET CONDITIONS, DEVELOPMENT FACTORS IN OTHER GEOGRAPHIC LOCATIONS THAT IMPACT THE REA OF STUDY, THE LEVEL OF AGGRESSIVENESS OF DEVELOPMENT INCENTIVES INCLUDING THE EXPANSION AND PROVISION OF PUBLIC UTILITIES, FINANCIAL INCENTIVE PACKAGES, ETC. THESE TABLES ARE ILLUSTRATIVE ONLY AND ARE TO BE UTILIZED TO BETTER UNDERSTAND THE POTENTIAL IMPACTS OF PROJECTED GROWTH. THESE NUMBERS SHOULD NOT BE USED EXCLUSIVELY IN PREPARING PLANS FOR FUTURE PROJECT FINANCING.

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ESTIMATED 10-YEAR NON-RESIDENTIAL BUILDING SQUARE FOOTAGE GROWTH PROJECTIONS (2015-2025)		
GROWTH AREA	INDUSTRIAL-WAREHOUSE SF	
	WITHOUT INTERCHANGE	WITH INTERCHANGE
A	675,500	675,500
B	659,750	659,750
C	870,750	686,750
D	1,750	1,750
E	24,500	354,750
F	5,000	5,000
G	88,000	88,000
TOTAL	2,325,250	2,471,500
RETAIL-HOTEL-RESTAURANT SF		
A	167,400	206,900
B	406,200	438,600
C	71,000	70,000
D	124,200	95,900
E	0	64,100
F	1,900	1,900
G	135,900	137,900
TOTAL	768,800	1,015,300
SERVICE SF		
A	69,000	69,000
B	39,250	39,250
C	1,333	1,333
D	22,417	22,417
E	83	83
F	14,333	14,333
G	84,417	84,417
TOTAL	230,833	230,833
INDUSTRIAL-RETAIL-SERVICE TOTAL SF		
A	911,900	951,400
B	1,105,200	1,137,600
C	943,083	758,083
D	148,367	120,067
E	24,583	418,933
F	21,233	21,233
G	308,317	310,317
TOTAL	3,462,683	3,717,633

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ESTIMATED 10-YEAR REAL PROPERTY ASSESSED VALUE GROWTH (2015-2025)		
GROWTH AREA	INDUSTRIAL-WAREHOUSE	
	WITHOUT INTERCHANGE	WITH INTERCHANGE
	AV	AV
A	$27,020,000	$27,020,000
B	$26,390,000	$26,390,000
C	$34,830,000	$27,470,000
D	$70,000	$70,000
E	$980,000	$14,190,000
F	$200,000	$200,000
G	$3,520,000	$3,520,000
TOTAL	$93,010,000	$98,860,000
RETAIL		
	AV	AV
A	$14,229,000	$16,552,000
B	$34,527,000	$35,088,000
C	$6,035,000	$5,600,000
D	$10,557,000	$7,672,000
E	$0	$5,128,000
F	$161,500	$152,000
G	$11,551,500	$11,032,000
TOTAL	$65,348,000	$81,224,000
SERVICE		
	AV	AV
A	$4,140,000	$4,140,000
B	$2,355,000	$2,355,000
C	$80,000	$80,000
D	$1,345,000	$1,345,000
E	$5,000	$5,000
F	$860,000	$860,000
G	$5,065,000	$5,065,000
TOTAL	$13,850,000	$13,850,000

ALL TABLES AND NUMBERS ARE ESTIMATES ONLY BASED ON PROJECTED DEVELOPMENT TRENDS OVER THE NEXT 10 YEARS. ACTUAL DEVELOPMENT MAY VARY SIGNIFICANTLY FROM THESE ESTIMATES BASED ON A VARIETY OF FACTORS INCLUDING, BUT NOT LIMITED TO, CHANGES IN MARKET CONDITIONS, DEVELOPMENT FACTORS IN OTHER GEOGRAPHIC LOCATIONS THAT IMPACT THE REA OF STUDY, THE LEVEL OF AGGRESSIVENESS OF DEVELOPMENT INCENTIVES INCLUDING THE EXPANSION AND PROVISION OF PUBLIC UTILITIES, FINANCIAL INCENTIVE PACKAGES, ETC. THESE TABLES ARE ILLUSTRATIVE ONLY AND ARE TO BE UTILIZED TO BETTER UNDERSTAND THE POTENTIAL IMPACTS OF PROJECTED GROWTH. THESE NUMBERS SHOULD NOT BE USED EXCLUSIVELY IN PREPARING PLANS FOR FUTURE PROJECT FINANCING. THESE PROJECTIONS DO NOT FACTOR IN VARIABLES SUCH AS DEPRECIATION RATES, VARIABLE RATE ADJUSTMENTS, POTENTIAL

TAX ABATEMENTS AND OTHER FACTORS RATE MAY IMPACT THE RATE USED FOR THE PURPOSE OF THIS ASSESSMENT EVALUATION.

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LOCAL ECONOMIC IMPACT SUMMARY

Without adequate infrastructure improvements, it is unlikely that any of the growth projections in this study will be realized. If traffic and congestion become overwhelming, developers will find alternative locations in which to invest. That said, the future development potential for the Town of Plainfield is strong. This potential is further enhanced by the prospects of additional access to I-70 and the regional connector corridor proposed to go along with it.

The tables in this section for projected non-residential buildings are only projections, actual building construction may differ greatly in the future. These tables are designed only to understand the potential magnitude of construction as it relates to the projected 10-year employment growth.

The majority of future non-residential growth is anticipated to continue the trend of industrial/ distribution development. There remains, however, significant retail and service potential as well. Based on the rough assessments of this analysis, it appears that there is the potential for significant local real property assessed value growth as a result of potential non-residential development.

This will be important as there are significant improvements proposed to address the future needs of the community. The investment in these improvements will be significant. The intent of this planning effort is to support securing outside funding for several of the projects proposed in this plan. Even with outside funding, however, a significant amount of local funds will need to be dedicated toward the necessary future transportation improvements within the town. Based on these projections, it appears there is the potential for local revenue to be available in the future to support the needed infrastructure development.

This study has looked only at non-residential growth potential in real property assessment as a result of projected growth. There will also likely be significant local revenues from sources such as personal property investments and local sales and income tax benefits. The 2019 Housing Study also projects the potential for significant additional property tax revenues from residential growth in the community. That study indicates that the annual "Net Fiscal Impact" to the town for residential development may range from around $2,300/acre to $17,300/acre depending on the density of development. The projected residential growth potential within the study area is significant. Combine this with the town's desire to, within more urban areas, promote a range of development densities, and the result may be significant local revenues from residential development as well moving forward.

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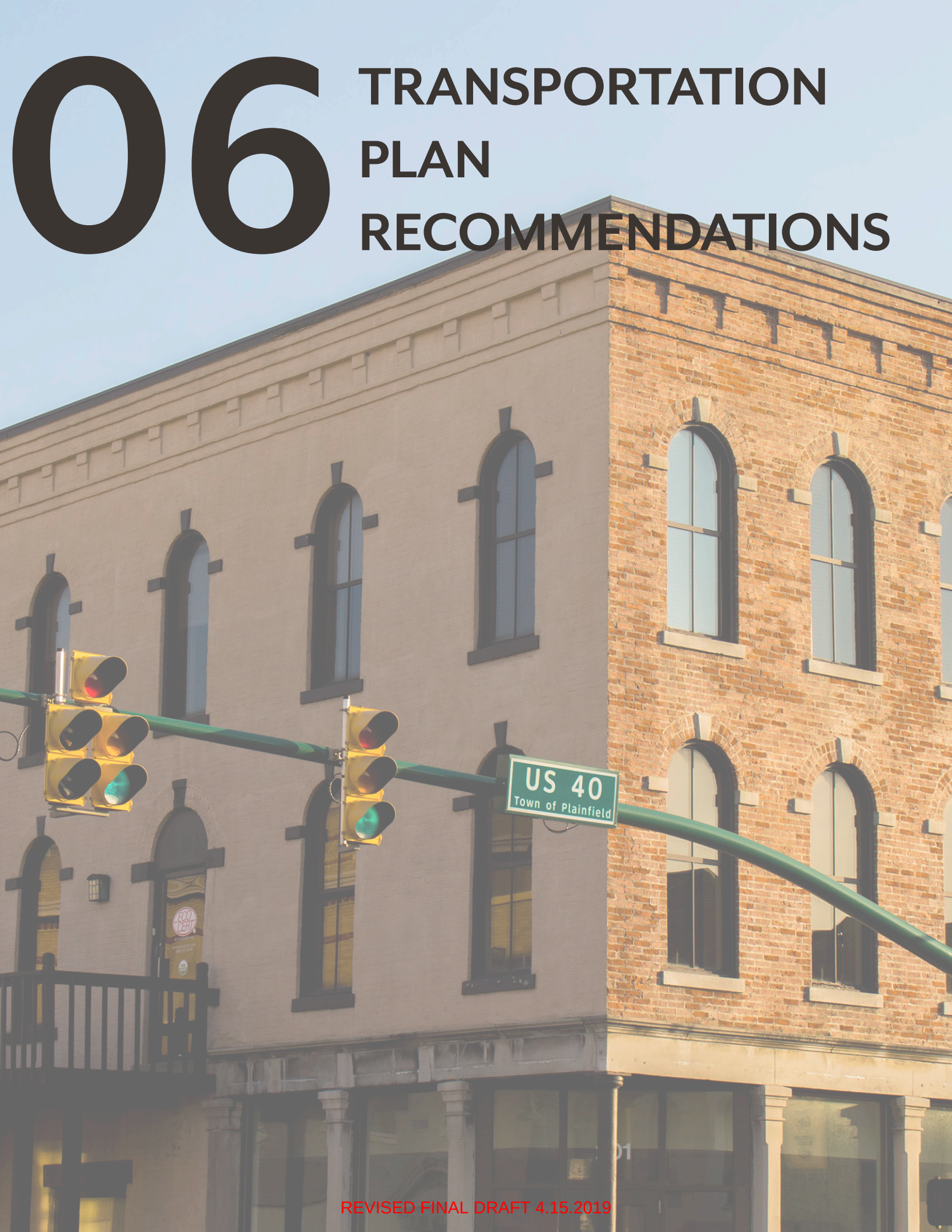
06 TRANSPORTATION PLAN RECOMMENDATIONS



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TRANSPORTATION PLAN RECOMMENDATIONS

The standards and classifications presented within the transportation plan recommendations are applied when a private property owner seeks to alter their property (through such actions as development, subdivision or rezoning petitions) or when a public entity seeks to make an improvement within the public right-of-way. The recommendations consist of several separate but interrelated sections including:

- Thoroughfare classifications
- Right-of-way standards
- Context zones
- Conceptual flexible design standards and sections
- Priority improvement considerations
- Priority policy considerations

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THOROUGHFARE PLAN MAP

Town of Plainfield's Thoroughfare Plan Map lays out the proposed future roadway network for the town. One of the primary purposes of the Future Thoroughfare Plan Map is to set expectations for right-of-way requirements and street design standards for the main thoroughfares through Plainfield.

All classified roadways in the Future Thoroughfare Plan Map will be required to provide a minimum right-of-way dedication and meet certain other standards, such as lane widths, curb/gutter and sidewalk standards based on the corresponding classification. Additional right-of-way is also generally necessary at intersections that include at least one Collector level or higher roadway. Constraints may exist which make it impossible to meet the requirements and standards outlined within this plan. In those instances, a case-by-case review will need to be completed, utilizing this Thoroughfare Plan and other city documents as a guide for prioritizing components and functions of main thoroughfares.

Exhibit X is the town's current Thoroughfare Plan Map (called the Transportation and Mobility Map within the town's Comprehensive Plan). Based on the modeling analysis, several of the roads on this map have been recommended for classification changes to better serve the future needs of the community. In addition to the capacity changes, it should be noted that the current map does not use a naming system which is consistent with the FHWA or INDOT's classification system. Both of these matters are addressed within the Proposed Thoroughfare Plan Map (Exhibit Z).

The current Thoroughfare Plan Map (Transportation and Mobility Map) is referenced by the town's zoning ordinance and is, therefore, part of the legal documents which define right-of-ways and assign design standards for transportation projects within the town. It is recommended that this plan be adopted by the town as an amendment to the town's Comprehensive Plan and that local ordinances be adjusted to reflect the standards and classifications identified within this plan.

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EXHIBIT X: EXISTING THOROUGHFARE MAP

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CHANGES TO THE THOROUGHFARE PLAN MAP

Exhibit Y, and its associated tables, identifies where changes from the existing Thoroughfare Plan (Transportation and Mobility Map) are proposed to implement recommendations of the modeling work and create naming consistency with FHWA and INDOT. Some of the changes are in name only, while others represent an upgrade or downgrade in classification from the existing standard. Some new roadway segments have been added which were not previously reflected in the existing Thoroughfare Plan map.

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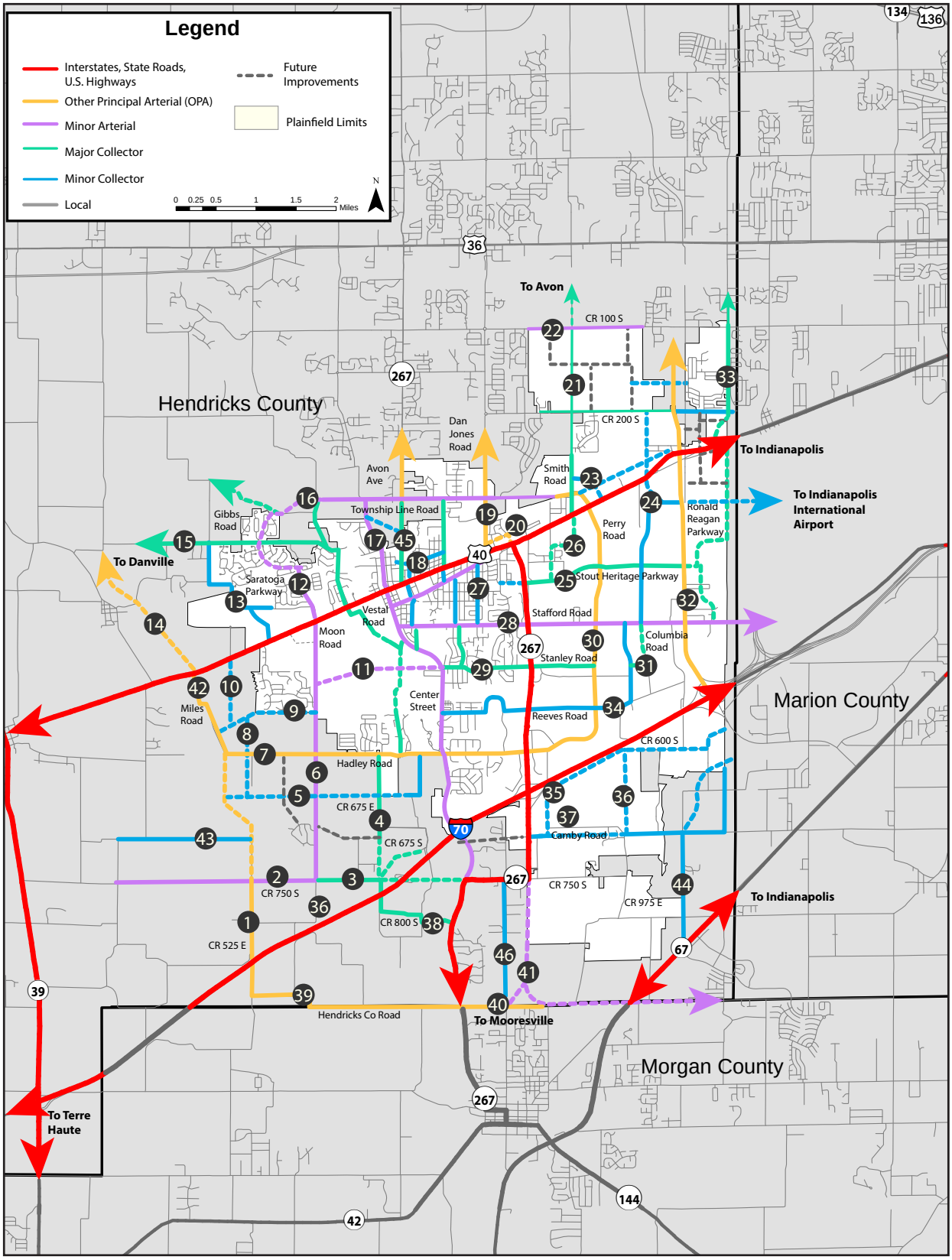
EXHIBIT Y: PROPOSED CHANGES TO THE EXISTING THOROUGHFARE PLAN MAP



Source: HWC Engineering

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PROPOSED CHANGES TO THE THOROUGHFARE PLAN MAP LIST

	Segment	Previous Classification	Proposed Classification
1	C.R. 525 E from I-70 to Miles Rd.	N/A-Local	Principal Arterial
2	C.R. 750 S. from C.R. 525 E. to Moon Rd.	N/A-Local	Minor Arterial
3	C.R. 750 S. from Moon Rd. to C.R. 675 E.	Collector	Major Collector
4	C.R. 675 E. from Hadley Rd. to C.R. 800 S.	N/A-Local	Major Collector
5	New Rd. from C.R. 525 E. connector to C.R. 725 E.	N/A-Local	Minor Collector
6	Moon Road from U.S. 40 to C.R. 750 S.	Secondary Arterial	Minor Arterial
7	Hadley Road from C.R. 525 E. connector to S.R. 267	Secondary Arterial	Principal Arterial
8	New Road Connection from #5 to #9	N/A-Local	Minor Collector
9	New Road Connection from Miles Road to Moon Road	N/A-Local	Minor Collector
10	New Road Connection from U.S. 40 to #9	N/A-Local	Minor Collector
11	Stanley Road Extension to Moon Road	N/A-Local	Minor Arterial
12	Saratoga Parkway from C.R. 350 E. to U.S. 40	Secondary Arterial	Minor Arterial
13	C.R. 500 E. from C.R. 350 S./Hanna Rd. to Vandalia Blvd.	Collector	Minor Collector
14	Airtech Parkway from Stafford Road to Raceway Road	Collector	Minor Collector
15	C.R. 350 .S/Hanna Rd. from C.R. 475 E. into Hendricks Co	Collector	Major Collector
16	Township Line Rd. from U.S. 40 to Gibbs Rd.	Secondary Arterial	Minor Arterial
17	N Center St. from U.S. 40 to Township Line Rd.	Secondary Arterial	Minor Arterial
18	Harlan St. from Carr Rd. to Avon Ave.	Collector	Minor Collector
19	Dan Jones Rd. from U.S. 40 to Town Limits	Primary Arterial	Principal Arterial
20	New Rd. Connection from S.R. 267 to Dan Jones Rd.	N/A-Local	Principal Arterial
21	Smith Rd. from U.S. 40 to C.R. 100 S.	N/A-Local	Major Collector
22	C.R. 100 S.	N/A-Local	Minor Arterial

NOTE: N/A-Local Roadways not illustrated on Mobility Plan but constructed under local standards.

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PROPOSED CHANGES TO THE THOROUGHFARE PLAN MAP CONT.

23	Williams Trace from U.S. 40 to Township Line Rd.	N/A-Local	Minor Collector
24	Aitech Pkwy.	Collector	Minor Collector
25	Stout Heritage Pkwy. (Metropolis Pkwy.) from S.R. 267 to Ronald Reagan Pkwy.	Collector	Major Collector
26	Smith Rd. Extension from U.S. 40 to Stout Heritage Pkwy.	Collector	Major Collector
27	Brookside Lane From Stafford Rd to U.S. 40	Collector	Major Collector
28	Stafford Rd. from S.R. 267 to Haueisen Rd.	Secondary Arterial	Minor Arterial
29	Stanley Rd. from S.R. 267 to Perry Rd.	Collector	Major Collector
30	Perry Rd. from U.S. 40 to S.R. 267	Secondary Arterial	Principal Arterial
31	Stanley Rd. Extension from Perry Rd. to Airtech Pkwy.	N/A-Local	Major Collector
32	Ronald Reagan Pkwy.	Primary Arterial	Principal Arterial
33	Raceway Rd north of Bradford Road	Collector	Major Collector
34	Reeves Rd.	Secondary Arterial	Minor Collector
35	New Rd. Connection from S.R. 267 to Marion Co	N/A-Local	Minor Collector
36	Bountiful Place Rd.	N/A-Local	Minor Collector
37	Camby Rd. from S.R. 267 to Marion Co	N/A-Local	Minor Collector
38	C.R. 800 S. from C.R. 675 E. to S.R. 267	N/A-Local	Major Collector
39	New Rd. Connection from S.R. 267 to Hendricks Co Rd./ Joppa Rd.	Collector	Minor Arterial
40	Hendricks Co Rd./Joppa Rd. from C.R. 525 E. to S.R. 267	Collector	Minor Arterial
41	S.R. 267 Extension from S.R. 267 to Hendricks Co Rd.	N/A-Local	Minor Arterial
42	Miles Rd. from U.S. 40 to Hadley Rd.	Collector	Principal Arterial
43	C.R. 700 S. from Regional Connector to C.R.400 E.	N/A-Local	Minor Collector
44	C.R. 1050 E. from Camby Rd. to S.R. 67	N/A-Local	Minor Collector
45	Avon Avenue from Township Line Road to U.S. 40	Secondary Arterial	Major Collector
46	Indiana Street from Hendricks Co Road to S.R. 267	N/A-Local	Minor Collector

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FUTURE THOROUGHFARE PLAN MAP

Exhibit Z is the proposed future Thoroughfare Plan map which reflects all of the changes recommended previously. State routes, such as U.S. 40 and S.R. 267 were not classified on the thoroughfare map as these roads, and their right-of-way, are state jurisdiction today. Effort has been made to coordinate other jurisdictional thoroughfare plans and designations as part of the development of Plainfield's plan. However, if the Plainfield Thoroughfare Plan classifications differ from adopted thoroughfare classifications in other jurisdictions, Plainfield's standards should apply within the town's jurisdiction.

This map will be used to amend the State of Indiana's on-system functional classification map for the town. The Future Thoroughfare Plan Map utilizes the same terms as the existing INDOT Functional Classification Map (arterials and collectors) in order to ensure continuity for future funding opportunities. The state's Future Functional Classification Map is supposed to represent a shorter implementation time period (five to ten years generally). The Future Thoroughfare Plan Map is purposefully more long-term allowing for the town to plan for changes to its transportation network through the year 2045. In addition to the on-system functional class map, this plan should also inform future discussions with the Indianapolis MPO regarding adjustments to their LRTP (Long Range Transportation Plan) regarding town and regional projects.

The roadway alignments and proposed road segments illustrated on the Future Thoroughfare Plan Map are conceptual representations and do not indicate actual alignments. Detailed surveys and studies will be required for any new right-of-way dedication or new road construction.

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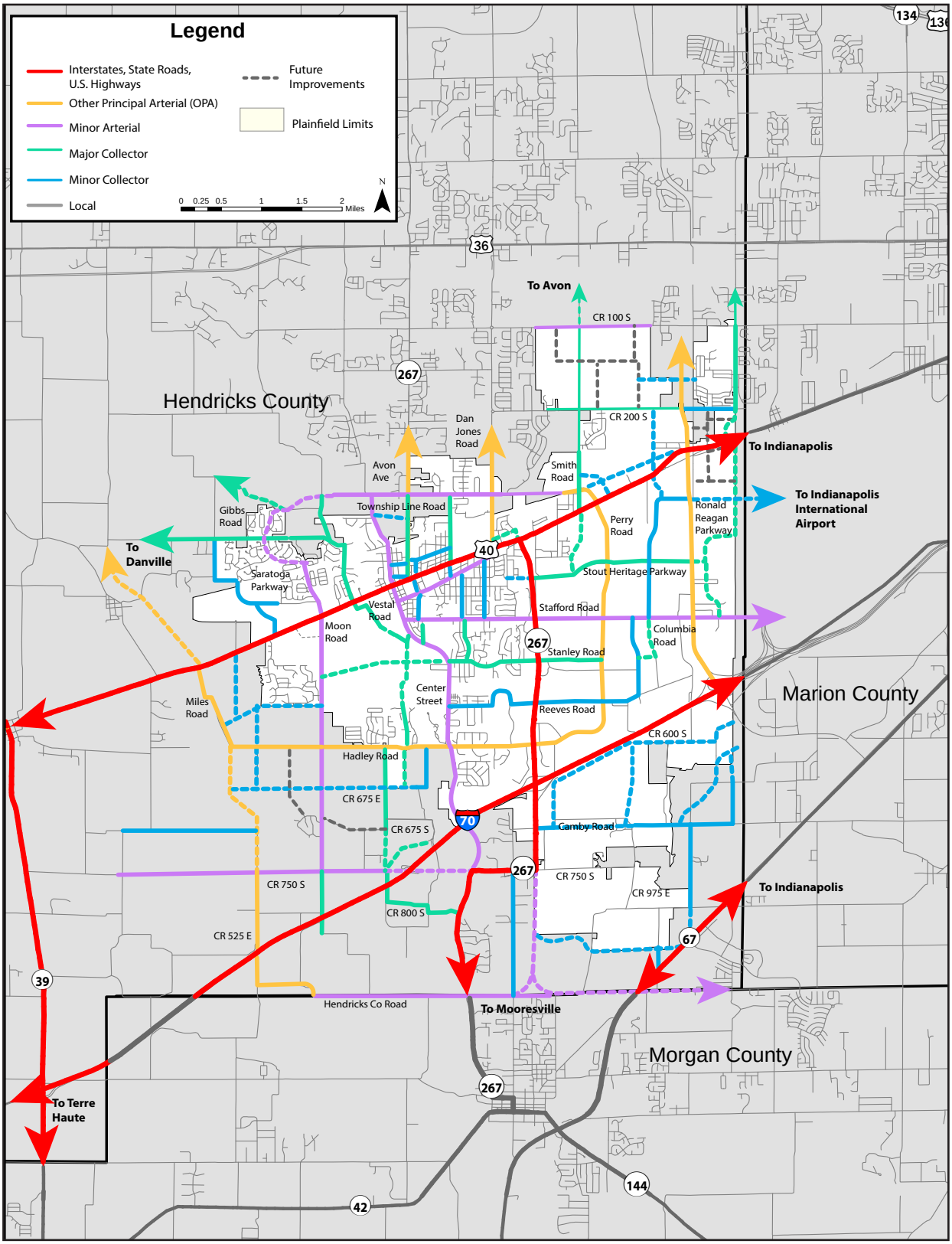
EXHIBIT Z: FUTURE THOROUGHFARE PLAN MAP



*This map is conceptual only and for the purpose of assisting the analysis of this plan. They are subject to change as actual development occurs in the future in currently undeveloped areas.

Source: HWC Engineering

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CONTEXT ZONES

There are two distinct roadway sections that Plainfield's transportation system can be classified within: urban or suburban. To better distinguish between these, a context zone map (see Exhibit AA) was created to identify general areas within Plainfield that will require urban vs. suburban right-of-way standards.

Urban

The urban context zone is located within the downtown core areas of Plainfield where existing development conditions and more narrow roadways generally require narrower right-of way. The mall area along U.S. 40 and Perry Blvd. have been included in this urban classification as infill, redevelopment and higher density development is desired in this area.

Suburban

The suburban context zone describes the remaining areas of Plainfield where single-family residential, school zones, industry and commercial areas are located. This context zone includes areas that can accommodate wider right-of-ways to support additional lanes and turn lanes to address anticipated future traffic needs.

Because the suburban context zone also includes areas of Plainfield and Hendricks County that are currently undeveloped, ensuring the proper right-of-way dedication when development occurs will allow the construction of adequate roadways and amenities, such as trails and sidewalks, in the future. It is much easier, and more cost effective, to acquire the proper right-of-way as development occurs rather than waiting until development constraints such as houses, buildings and utilities are in place.

Minimum Right-Of-Way Requirements

	No. of Lanes	Minimum Right-of-Way	
		Urban	Suburban
Major Arterial	2-4	70'	110'
Minor Arterial	2-4	70'	100'
Major Collector	2	60'	70'
Minor Collector	2	50-60'	60'
Local Road	2	50'	50'

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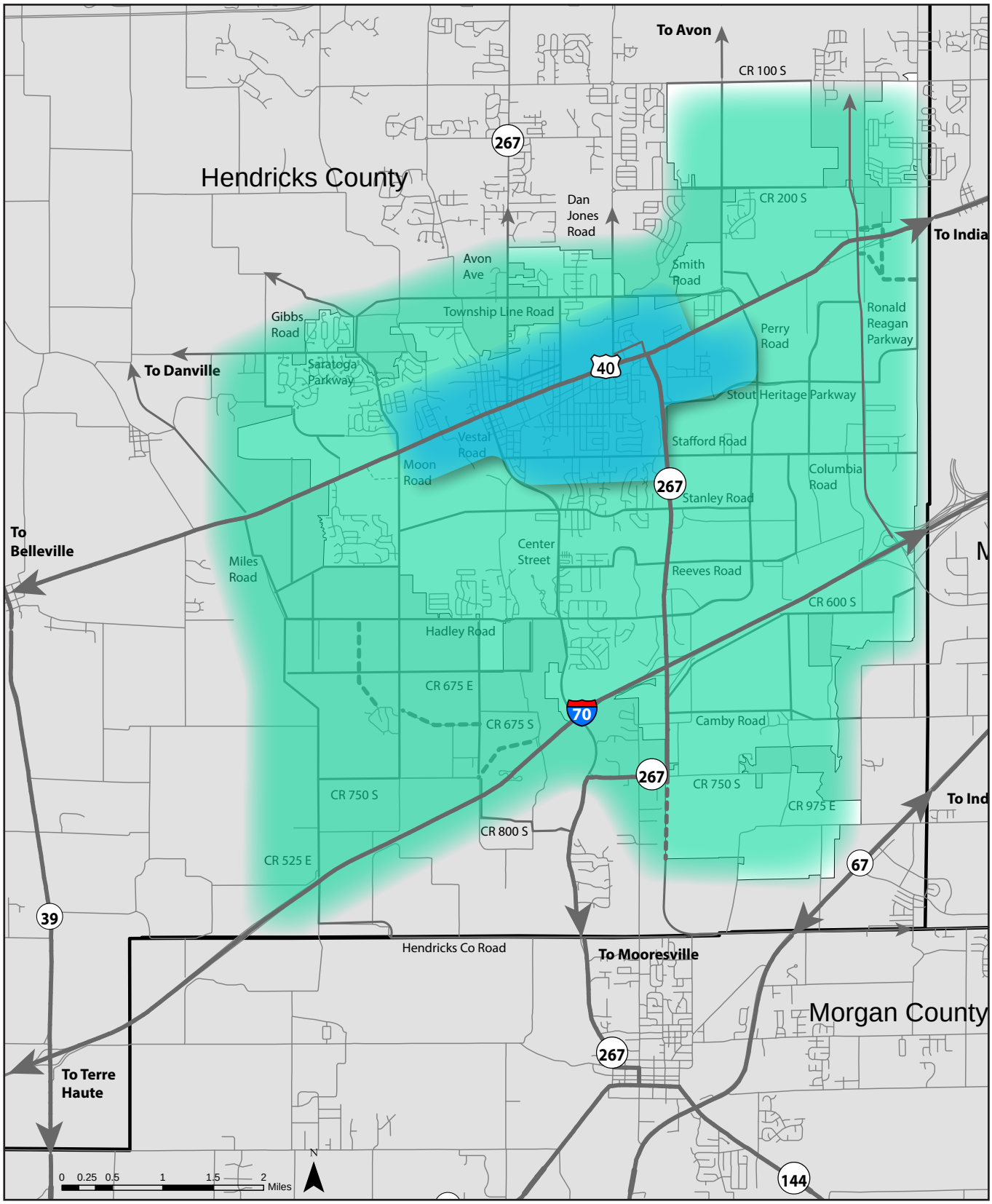
EXHIBIT AA: CONTEXT ZONES



*This map is conceptual only and for the purpose of assisting the analysis of this plan. They are subject to change as actual development occurs in the future in currently undeveloped areas.

Source: HWC Engineering

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FLEXIBLE DESIGN STANDARDS CONCEPT

A worthwhile concept that should be considered in the future is the adoption of flexible design standards for roads within the town. Healthy transportation networks should be programmed to accommodate a healthy mix of vehicular and alternative modes of transportation such as walking and bicycling. Based on public responses, alternative transportation modes are becoming more important to transportation networks.

To allow for proper development of alternative transportation modes, it is important to apply adequate cross section standards within appropriate context zones. It is important to note that this is an introduction to the concept of flexible design standards and any alteration of design standards in the future would require amendment to the town's subdivision control and zoning ordinances as well as amendment to the construction design standards of the town.

The Conceptual Flexible Design Matrix (Exhibit BB) illustrates an example of what flexible design standards might look like in the future for each of the thoroughfare classifications within each context zone. The intent of this Conceptual Flexible Design Matrix is to allow the roadway to be built based on their surrounding context and the needs of the area.

The table is broken into key components and includes items such as:

- Proposed Right-of-way
- Number of travel lanes
- Border section requirements
- Street section requirements
- On-street and off street bike pedestrian alternatives

Proposed right-of-way has generally been broken into two separate use areas: the Street Section and the Border Section. The Street Section includes improvements located between roadway curb lines and the Border Section includes improvements occurring beyond the back of curb.

It is important to note that this concept would require further consideration in the future before any standards were adopted by the town. This section has been provided as a foundation for those future discussions in the event that the town should decide to consider flexible design standards in the future. Future standards, if implemented, may look very different than those indicated within Exhibit BB.

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EXHIBIT BB: CONCEPTUAL FLEXIBLE DESIGN MATRIX

	Major Arterial		Minor Arterial		Major Collector		Minor Collector		Local
	Urban	Suburban	Urban	Suburban	Urban	Suburban	Urban	Suburban	Urban / Suburban
Minimum Right of Way	70'	110'	70'	100'	60'	70'	50'	60'	50'
Border Section									
Sidewalk Width	8' min.	6' min.	6' min.	6' min.	5' min.	5' min.	5' min.	5' min.	5' min.
Shared Use Path Width (opt.)	8' min.	8' min.	8' min.	8' min.	8' min.	8' min.	8' min.	8' min.	8' min.
Street side Buffer Width	5' min.	8' min.	5' min.	8' min.	5' min.	5' min.	5' min.	5' min.	5' min.
Street Section									
Travel Lanes	2-4	2-4	2-4	2-4	2	2	2	2	2
Travel Lane Width	11' min.	12' min.	11' min.	12' min.	10' min.	11' min.	10' min.	10' min.	10' min.
Auxiliary Lanes (opt.)	11' min.	12' min.	11' min.	12' min.	10' min.	11' min.			
On-Street Parking (opt.)					7' min.	8' min.	7' min.	8' min.	8' min.
Medians (opt.)		6'-20'		6'-20'		2'-16'			
Center Turn (opt.)	14' min.	14'-16'	14' min.	14' min.	14'-16'	14'-16'			
Center Turn w/ Medians (opt.)		14'-20'		14'20'		14'-16'			
Curb and Gutter	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical/ Rolled	Vertical/ Rolled	Vertical/ Rolled
Target Speed (MPH)	35	35-45	30	30-40	30	30-40	30	30-35	25
On-Street Bike Facilities (optional)									
Shared									Yes
Bike Lane							5'	5'	4'
Bike Lane (with on-street parking)							6'	6'	5'
Buffered Bike Lane			8'	8'	8'	8'	8'	8'	
Protected Bike Lane	11'	11'	11'	11'	11'	11'			

Note: THIS IS AN EXAMPLE ONLY AND DOES NOT REFLECT A CHANGE IN THE TOWNS DESIGN STANDARDS. IT HAS BEEN PROVIDED TO PROVIDE A FOUNDATION FROM WHICH FUTURE DISCUSSIONS ON THE MATTER CAN TAKE PLACE

Sidewalks and/or shared use paths to be installed on both sides of a street
The horizontal gutter pan cannot be included in the required bike lane width
The horizontal gutter pan can be included in the required width for on-street parking

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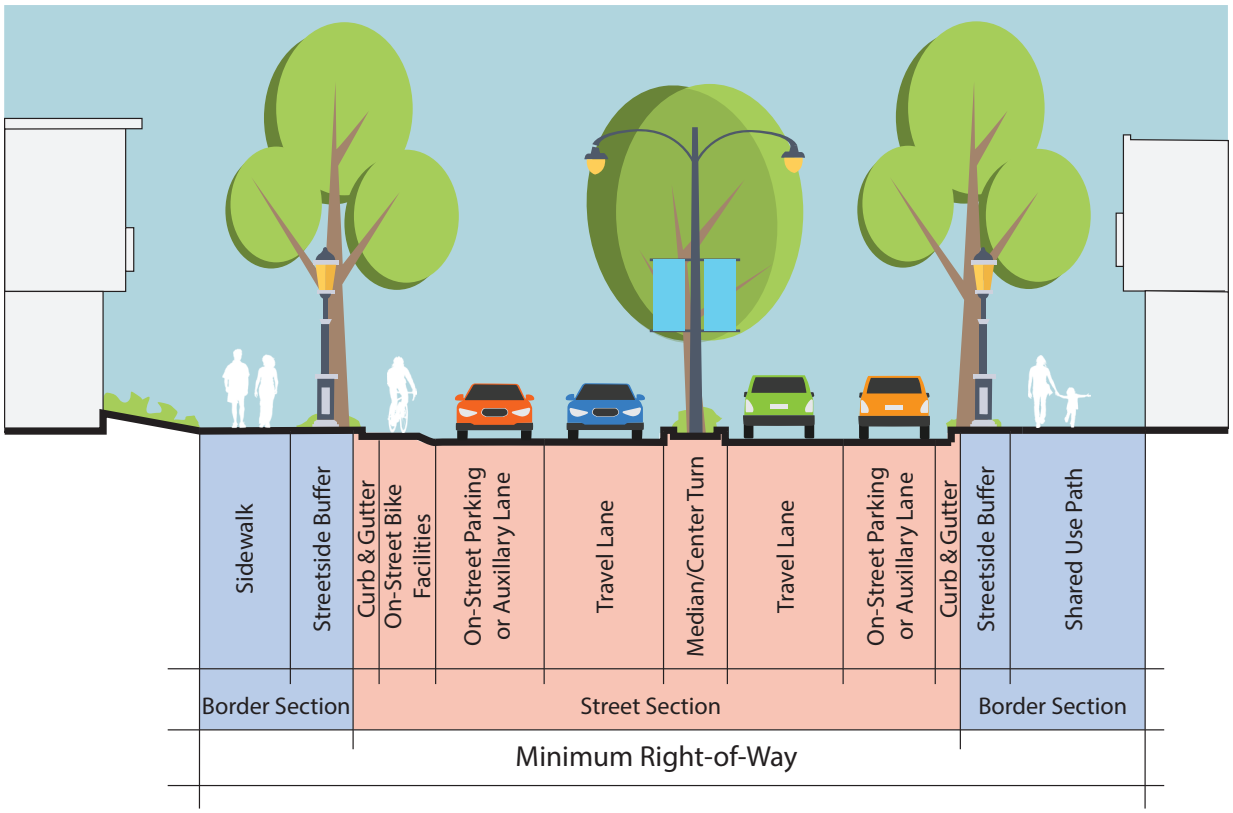
ELEMENTS OF URBAN & SUBURBAN STREET CONTEXT ZONES



*This illustration is conceptual only and subject to changes per the Town Engineer.

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ROADWAY SECTIONS

ILLUSTRATIVE SECTIONS

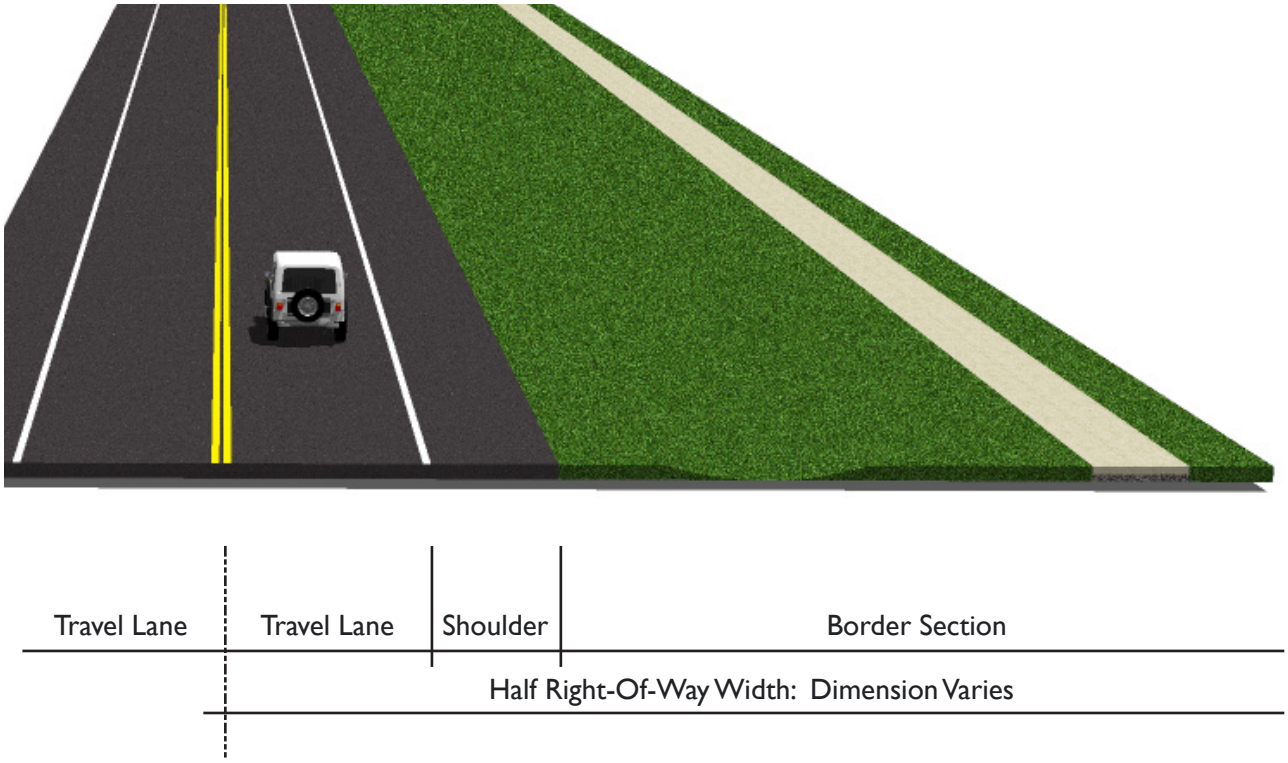
The sections on the following pages correspond to the conceptual flexible design standards identified within Exhibit BB. While the right-of-ways proposed are pursuant to the town's design standards today, the design criteria will need to be considered in the future as part of the larger discussion regarding flexible design standards. Detailed dimensions have not been provided, except for the minimum right-of-way, which is an established standard as part of this plan. The Town of Plainfield's design standards should be referenced to determine the minimum geometric design requirements for roadway construction within the town.

INTERIM SECTIONS

It is recognized that the example sections illustrated on the following pages may not always be feasible due to specific initial development fiscal constraints or the timing of needed improvements.

This section allows for temporary construction of a shoulder and drainage swale in lieu of a curb and gutter and stormwater section. However, this section still preserves the full right-of-way width, to allow for the construction of the full cross section treatment in the future. Pedestrian facilities, such as sidewalks or multi-use paths are still to be constructed in a manner which allows for future conversion of the roadways to the full recommended section.

INTERIM ROADWAY SECTION



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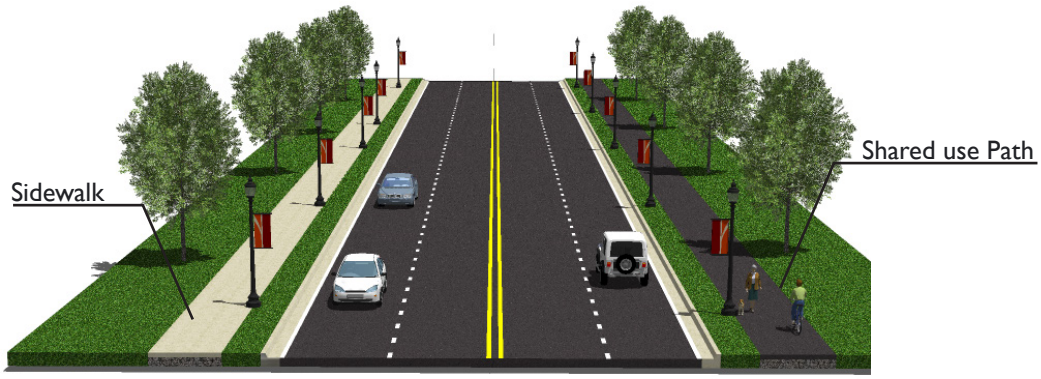
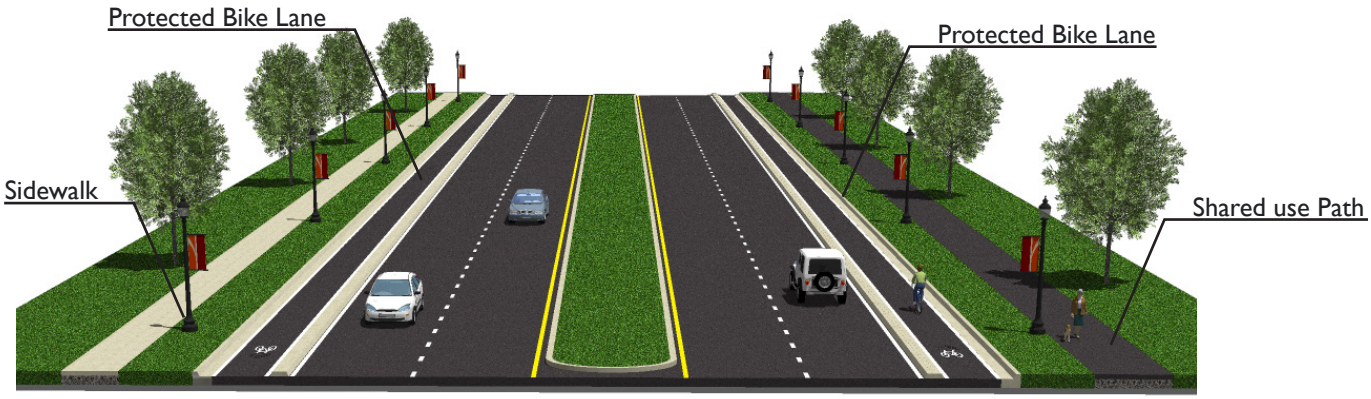
MAJOR ARTERIALS

Urban



Border Section	Street Section	Border Section
Right-Of-Way 70'		

Suburban



Border Section	Street Section	Border Section
Right-Of-Way 110'		

*These illustrations are conceptual only and subject to changes per the Town Engineer.

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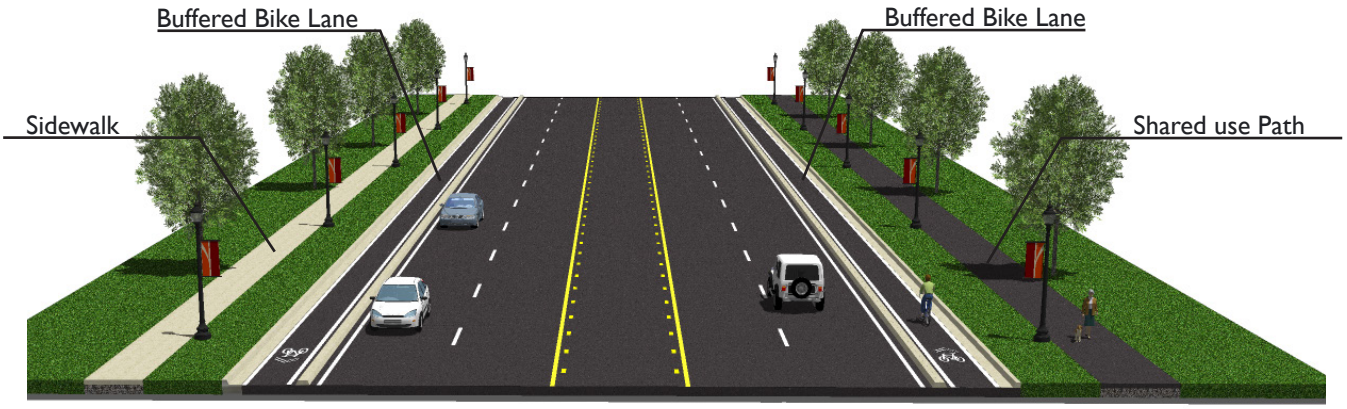
MINOR ARTERIALS

Urban

Border Section	Street Section	Border Section
Right-Of-Way 70'		

Suburban



Border Section	Street Section	Border Section
Right-Of-Way 100'		

*These illustrations are conceptual only and subject to changes per the Town Engineer.

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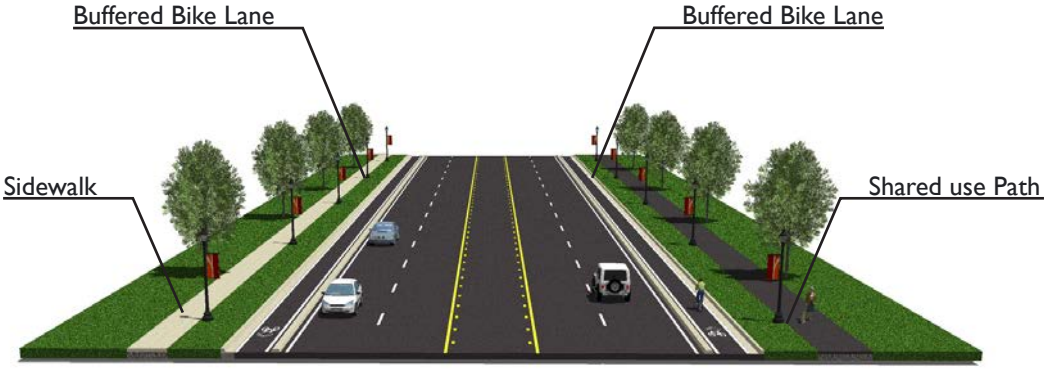
MAJOR COLLECTORS

Urban

Border Section	Street Section	Border Section
Right-Of-Way 60'		

Suburban



Border Section	Street Section	Border Section
Right-Of-Way 70'		

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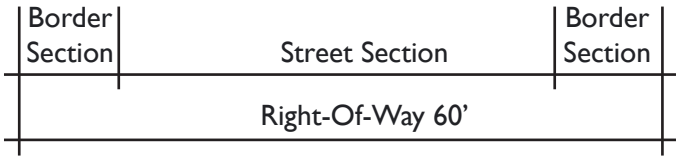
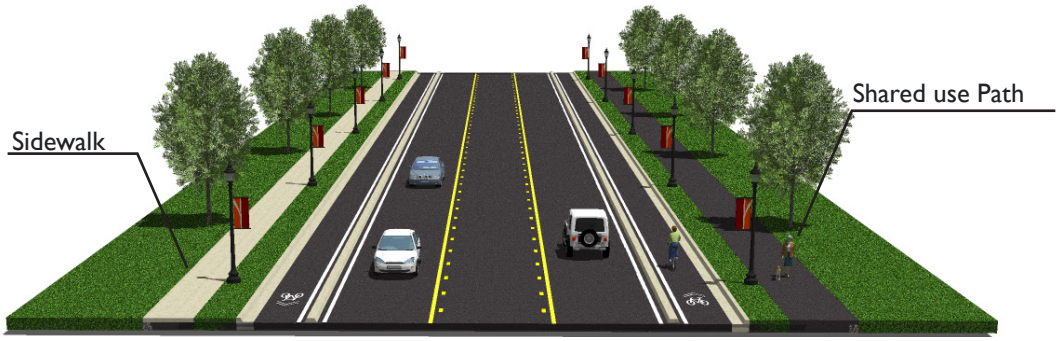
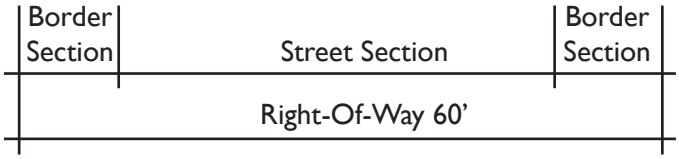
MINOR COLLECTORS

Urban



Suburban





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RECOMMENDED IMPROVEMENTS

POTENTIAL IMPROVEMENTS

Improvements for consideration by the town have been evaluated based on existing conditions, network analysis, input from the working group, input from stakeholders and review of previous plans. The recommended improvements were then organized into three categories: short-term, medium-term, and long-term. Short-term improvements are those proposed within the next one to five years, Medium-term improvements are those likely between five and 10 years, and long-term improvements are those likely beyond 10 years.

It is important to note that the prioritization of these projects will change over time as local needs change, funding opportunities arise and future development patterns become more clear. This prioritization is a snapshot at the time of this plan, but the town should review this plan on an annual basis to ensure it continues to reflect the needs and goals of the community over time.

KEY CONSIDERATIONS

New I-70 Interchange and Regional Connector
Several proposed future improvements were reviewed to help determine their potential impact on the future of the town. One of these projects is a proposed new I-70 interchange located somewhere between the existing interchanges at S.R. 267 and S.R. 39. No single proposed project had a greater overall positive impact on the town, and the region, than the new interchange. Direct benefits from this project include a reduction in projected future congestion on other primary north/south arterials such as S.R. 267, Center St. and the Reagan Pkwy. Another benefit was the significant amount of property made accessible and likely for residential and non-residential development near the interchange.

The value of the interchange is not just in transportation improvements. The proposed new interchange access on I-70 is expected to invite enough traffic and new development to justify the investment in the improvement. The value of the interchange is not just local. The regional benefits of the interchange are significant and thus the proposed interchange, and its regional connection between I-70 and U.S. 40, should be closely coordinated with other benefiting municipal groups as well as Hendricks County and Morgan County.

Several potential interchange locations were evaluated as part of this planning effort. Initially Moon Road appeared to be the logical location for the new interchange given the existing north/south connectivity. Upon a deeper look, however, this location has certain environmental constraints that may limit the economic development potential of the location thus reducing the potential return on investment. The model identified, however, that utilizing the existing Moon Road corridor did not have the impact on future traffic congestion that was anticipated. There was some benefit to local traffic patterns, but the improvement was not significantly better than other interchange locations that were evaluated west of Moon Road.

Given that neither alternative solves the future congestion potential for the town, it would seem that the best alternative is the one that has the greatest positive transportation and economic impact for the region. Given this, it appears that a location west of Moon Road may be the better alternative. Further analysis will be necessary to determine the precise location of the best alternative.

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A new regional connector road was also analyzed to determine the potential impacts of an additional north/south connection between U.S. 40 and I-70 on the west side of Plainfield. The ultimate alignment of this corridor will need to be determined through additional study, but for the purpose of this analysis, a route utilizing the extension from U.S. 40 at Miles Road to C.R. 525 E. and then to the proposed I-70 interchange was used. This represents a new principal arterial roadway that would ease traffic on existing corridors such as S.R. 267, Moon Road, Perry Road and the Ronald Reagan Parkway. The interchange and regional connector together have significant regional impact and provide an effective bypass around Plainfield. This may not have much impact on local traffic in the future, but it will have a significant impact on future regional traffic and will likely help manage traffic congestion on U.S. 40 in the future.

Lack of East/West Arterials

During the scenario analysis, it became clear that Hadley Road is the only local east/west thoroughfare supporting traffic between U.S. 40 and I-70 in the Town of Plainfield. This corridor already experiences congestion, especially around S.R. 267, but it will become even more congested as the town continues to grow to the west. Alternatives were tested to look for other potential east/west corridors within the town. Some components factored into the Preferred Scenario 2 include encouraging a grid road network to be included as the town continues to grow to the southwest, upgrade in the classification of Hadley Road and Perry Road to better accommodate future east west traffic and key intersection improvements. The new interchange would serve a minor role in congestion management but based on the modeling analysis it is not expected to 'solve' anticipated congestion issues on Hadley Road, regardless of its ultimate location.

Additional projects such as the extension of Stanley Road to Moon Road and the extension of C.R. 750 S across the interstate were also modeled and have strong potential benefits to east/west connectivity in the town. While these alternatives do offer significant potential improvement to future east/west connectivity within the town, they clearly have unique challenges to overcome considering the existing built environment. The largest impediment, beyond cost, is perhaps the fact that each would require development within current federal and/or state property. The significant role that each of these projects could play in the future transportation network does not allow their concept to be dismissed out of hand, however. Further analysis would be required to better understand the full cost/benefit of these alternatives if they were to be pursued in the future.

Perimeter Parkway

Creating alternative east/west corridors within the town is critically important to alleviate future projected congestion. One alternative to help this is the completion of the proposed Perimeter Parkway within the town. In the future, the Perimeter Parkway may require further improvement to Hadley Rd. but will offer a reasonable internal circulation network to improve traffic flow both north and south of U.S. 40. Truck and transit flow through the industrial areas have already improved but upon completion of the full-build out, will also potentially divert truck and transit traffic away to areas more suited for local and commuter car traffic.

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Jurisdictional Issues on Major Roads
Many of the most traveled thoroughfares in the Town of Plainfield are not within the town's jurisdiction. U.S. 40, I-70 and S.R. 267 are all within the State of Indiana's jurisdiction. It will be essential to coordinate with INDOT and the Indianapolis MPO for the efficient operation of, and future funding for, improvements for these heavily traveled roadways. Additionally, there are other major corridors that enter and exit the community. It will be important to continually coordinate with Hendricks County, the Town of Avon, Morgan County and the City of Indianapolis when thoroughfares cross jurisdictions.

Trails Network and Local Pedestrian Connectivity
Public comments made it clear that residents desire more sidewalk and trail connectivity within the community. This stems from a desire for more options to travel from place to place within Plainfield that do not require the use of an automobile. Connecting current and future neighborhoods with other neighborhoods, schools, parks, places of employment, shopping and other destinations via trails and sidewalks needs to be part of the overall focus of transportation improvements. It is worth noting that the public did express a preference for off-street pathways versus on-street options, where possible.

Public Transportation
While public transportation exists in Plainfield, it currently only serves the eastern parts of the community. Planned improvements to introduce the IndyGo Blue Line, a rapid transit bus system, within the next few years necessitates study of expanded local connection services. Additional study should be completed regarding expansion of the internal transit system of the town. Future expansion would help provide connectivity to planned IndyGo improvements as well as support additional connectivity to key destinations throughout Plainfield.

Future Expansion of the Reagan Parkway
The Ronald Reagan Parkway has significant influence on both local and regional transportation networks. This impact will only increase as the corridor is extended north to connect with I-65 in Boone County. With the focus on the northward expansion of the corridor, there has been some regional debate about the need and timing of improvements to the section of the Reagan Parkway in Plainfield. The modeling effort as part of this Thoroughfare Plan included the current and future impacts of the Reagan Parkway. The model indicated that future traffic projections along the Ronald Reagan Parkway easily justify expanding the local roadway section to a 6-lane capacity in the future. This finding should be used to influence regional discussions about the prioritization of improvements along the corridor.

Intersection Improvements as Short-Term and Long-Term Solutions
Intersection improvements will play a large role in the town managing traffic congestion now and into the future. Some of these improvements will provide relatively cost-effective ways to manage congestion in the short to mid-term. These intersection improvements, however, will not eliminate the need for roadway capacity improvements in the future. It will be important to monitor the impacts that standalone intersection improvements at key locations have on the overall transportation network. This will help assign proper prioritization to the roadway capacity projects that will be required in the future.

Roundabout improvements at Hadley and Center Streets.
Source: HWC Engineering

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Future Improvement of the I-70/S.R. 267 Interchange

The current interchange at I-70/S.R. 267, and its relative connectivity to the intersection of S.R. 267 and Hadley Road, is a recognized issue for local traffic flow today. While a detailed analysis of the interchange was not included in the scope of this Thoroughfare Plan, a full traffic study is warranted to seek a long-term solution to the transportation network in this area. Several of the improvements suggested in Preferred Scenario 2 work to improve traffic flows around the interchange, but ultimately the interchange itself will require improvements to best manage long-term traffic needs in the town. There are many options that should be considered as part of the traffic study. One option that was discussed as part of the analysis of this plan included converting the interchange to a full cloverleaf style with collector-distributor system separating from mainline. This may help as it would eliminate signals at the ramp junctions and eliminate some traffic weaving.

Another issue is the close proximity of the Hadley Road/S.R. 267 intersection to the interchange and the need for significant movements for changing lanes (example westbound I-70 off to westbound Hadley). One long-term consideration may be to convert the signalized intersection into a single point interchange. This would be similar to type used on Keystone Avenue at 96th Street in Hamilton County. In this scenario, S.R. 267 would bridge over Hadley Road and the intersection would be sited under the bridge. Any long-term fix would involve a significant change to access points immediately east and west of the Hadley Road and S.R. 267 intersection because these are too close to the intersection. These improvements would be a major undertaking and the future traffic study should evaluate many alternatives to identify the best long-term solution for the town.

Future Role of U.S 40

If the new interchange and regional connector are implemented as suggested by this plan, there may be the opportunity to rethink the role and function of U.S. 40 within Plainfield. While the U.S. 40 corridor will always have a local and regional impact, the regional impact may be lessened if the regional connector corridor provides the "bypass" of regional traffic that the modeling work has suggested it might. The town has indicated in its Comprehensive Plan and Downtown Plan a desire to strategically redevelop part of its urban core. This area is significantly influenced by the U.S. 40 corridor. If, in the future, transportation improvements like the regional connector lessened the regional importance of the U.S. 40 corridor within Plainfield, then discussions should be initiated with state and federal agencies about ways to allow the U.S. 40 corridor to better serve the development character and redevelopment desired by the town.

Future of Stout Heritage Parkway

This plan has identified some widening and improvements to certain sections of Stout Heritage Parkway. With that in mind, it is worth considering that one portion of the road may warrant a downgrade in classification. This plan has introduced the concept of context zones and talked of the public's desire to enhance walkability and pedestrian connectivity throughout the community. One area that may deserve further analysis regarding these issues is Stout Heritage Parkway between SR 267 & Perry Road. This may include reclassification of the road to a Minor Collector in the future. This would not be to reduce the overall right-of-way of the road, but to reconsider the use of the right-of way. If the community is successful in opening up Stout Heritage Parkway west of SR 267, then one concept worth consideration is transforming this section into an enhanced multi-modal route that would provide improved connectivity to the retail/mall area to the old parts of town, including downtown. This may actually include a reduction in travel lanes at some point, or at least a reconfiguration of lanes to better support appropriate multi-modal options.

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SHORT-TERM PROJECTS

Exhibit CC identifies the short-term transportation projects for Plainfield. These projects are important to manage both existing and future transportation conditions; including congestion, growth and anticipated land use changes. Many of these priority projects are short-term projects, but some priority projects are considered "big picture" projects that will take time for funding and planning. The longer-term projects, such as the new I-70 interchange and regional connector road, will dramatically alter the future transportation conditions within Plainfield Study Area.

SHORT-TERM CAPACITY PROJECTS LIST & PLANNING COST ESTIMATES				
Number	**Capacity Project**	**Project Description**	**Functional Class**	**Planning Cost Estimate**
1	Hadley Rd (Sugar Grove Road to Byscand Blvd.)	Improve existing roadway to 3-lane section	Principal Arterial	Complete
2*	Carr Road, US-40, and Township Line Rd	Carr Rd reconstruction: widen to 3-lane section	Major Collector	$3,580,000
3	Smith Rd (Phase 2: 25%)	Improve from Township Line Rd to Main St.	Minor Arterial	$970,000
4*	Smith Rd (Phase 1: 75%)	Improve from CR 200 S to Township Line Rd	Major Collector	$3,320,000
5	Stout Heritage Pkwy Widening	Planned to widened to accommodate Echo Park	Major Collector	Complete
6	Widen Stout Heritage to 4 Lanes	Widen from Ronald Regan PKWY to Airtech PKWY	Major Collector	$1,830,000
7	New I-70 Interchange	New Interchange located at 525 E	Interstate	$20,000,000
8	Airtech-Whitaker Connection	2-lane local industrial roadway	Minor Collector	$660,000
9*	Klondike Rd - South	3-lane section road connecting U.S. 40 to Airtech	Minor Collector	$1,610,000
10*	Klondike Rd - North	3-lane section road connecting U.S. 40 to Bradford Rd.	Minor Collector	$2,600,000
11	Hadley Rd. Widening	5-lane section from Moon Road to Hunters Ridge	Principal Arterial	$3,540,000
12	Moon Rd. Upgrade	5-lane section from Hadley to Belvista	Minor Arterial	$3,770,000
13	Moon Rd. Upgrade	5-lane section from Belvista to US 40	Minor Arterial	$3,400,000
14	Moon/Hadley Intersection	Intersection improvements	Intersection	$2,200,000
15	Moon/US 40 Intersection	Intersection improvements	Intersection	$2,600,000
16	SR 267/750 S Intersection	Intersection improvements	Intersection	$2,200,000
17	US40/Perry Rd Intersection	Intersection improvements	Intersection	$2,200,000
18	Stout Heritage/Reagan Intersection	Intersection improvements	Intersection	$2,200,000
19	SR267/Hadley Intersection	Intersection improvements	Intersection	$2,800,000
20	SR 267/Reeves Intersection	Intersection improvements	Intersection	$2,600,000
21	SR 267/Stafford Rd Intersection	Intersection improvements	Intersection	$2,600,000

Probable Cost Estimates are for planning purposes only. Detailed cost estimates will need to be developed once detailed project scope and requirements are established. Intersection improvements assume roundabouts, but may ultimately include alternative development designs. Recommended improvements are not itemized by prioritization. (*) denotes project underway.

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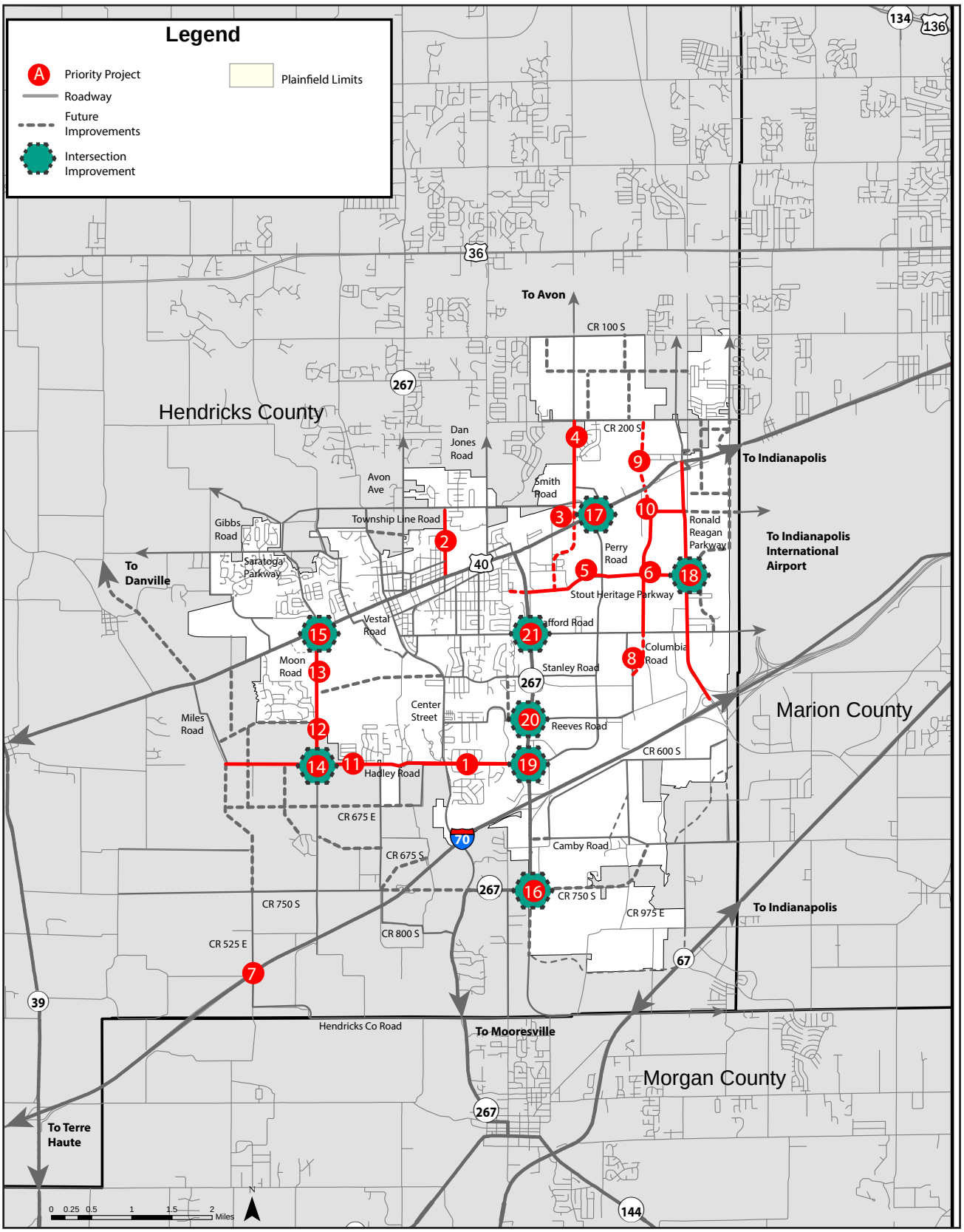
EXHIBIT CC: SHORT-TERM PROJECTS MAP



*This map is conceptual only and for the purpose of assisting the analysis of this plan. They are subject to change as actual development occurs in the future in currently undeveloped areas.

Source: HWC Engineering

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PROPOSED CAPACITY PROJECTS

The proposed projects map was created utilizing the segments of roadways and necessary upgrades identified within the modeling scenarios. These projects include all ongoing, short-term (less than 10 years), mid-term (10 to 20 years) and long-term (20+ years) improvements. These timelines are intended only as a guide and the actual construction of projects will depend on local need and the timing of development within the town.

Exhibit DD only identifies projects that would aid in resolving capacity issues or provide additional capacity in areas where projected growth is anticipated. A complete list of these projects and probable costs can be found in the Appendix of this document.

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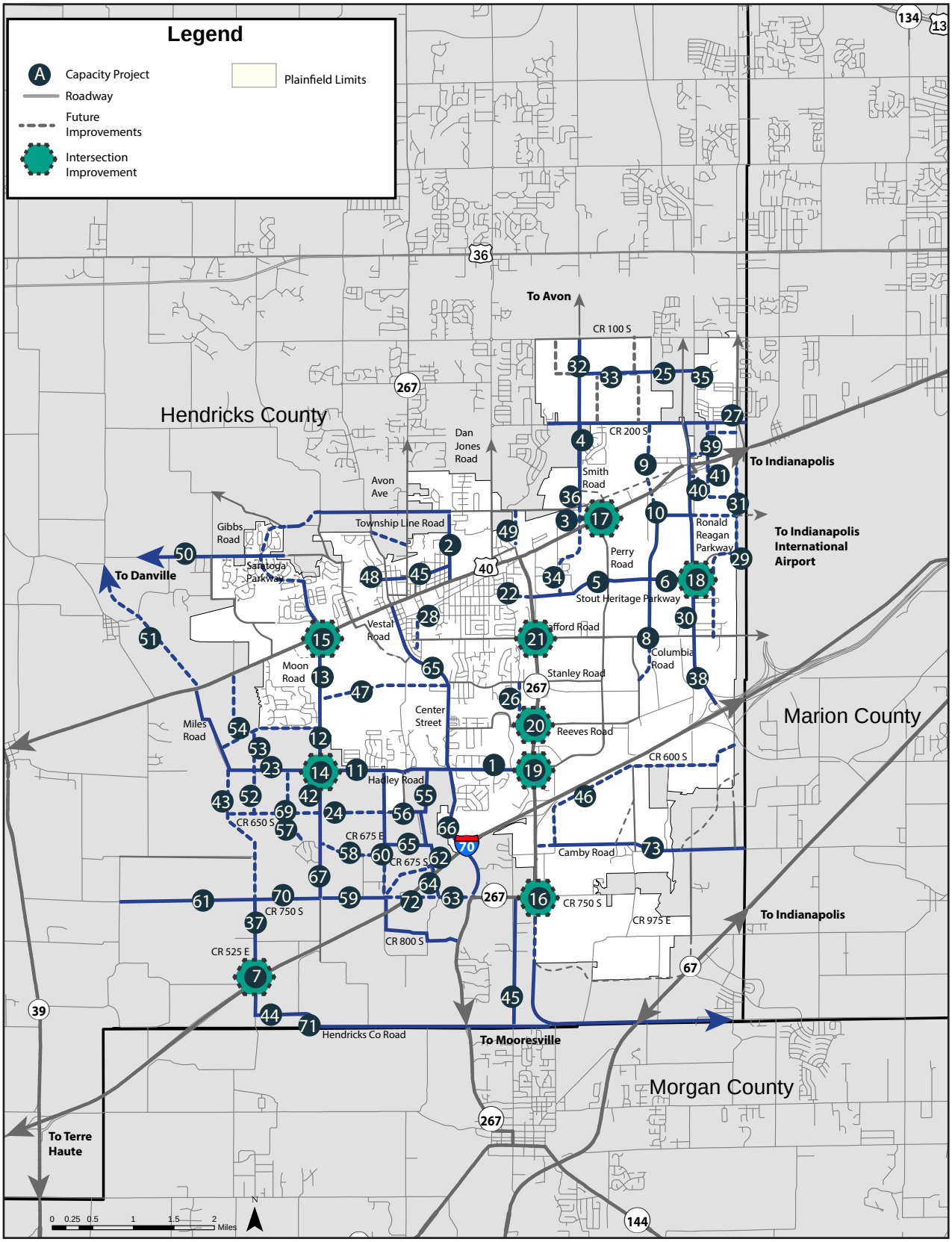
EXHIBIT DD: PROPOSED CAPACITY PROJECTS MAP



*This map is conceptual only and for the purpose of assisting the analysis of this plan. They are subject to change as actual development occurs in the future in currently undeveloped areas.

Source: HWC Engineering

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SHORT-TERM CAPACITY PROJECTS LIST

Number	Capacity Project	Project Description	Functional Class
1	Hadley Rd (Sugar Grove Road to Byscand Blvd.)	Improve existing roadway to 3-lane section	Principal Arterial
2*	Carr Road, US-40, and Township Line Rd	Carr Rd reconstruction: widen to 3-lane section	Major Collector
3	Smith Rd (Phase 2: 25%)	Improve from Township Line Rd to Main St.	Minor Arterial
4*	Smith Rd (Phase 1: 75%)	Improve from CR 200 S to Township Line Rd	Major Collector
5	Stout Heritage Pkwy Widening	Planned to widened to accommodate Echo Park	Major Collector
6	Widen Stout Heritage to 4 Lanes	Widen from Ronald Regan Pkwy to Airtech Pkwy	Major Collector
7	New I-70 Interchange	New Interchange located at 525 E	Interstate
8	Airtech-Whitaker Connection	2-lane local industrial roadway	Minor Collector
9*	Klondike Rd - South	3-lane section road connecting U.S. 40 to Airtech	Minor Collector
10*	Klondike Rd - North	3-lane section road connecting U.S. 40 to Bradford Rd.	Minor Collector
11	Hadley Rd. Widening	5-lane section from Moon Road to Hunters Ridge	Principal Arterial
12	Moon Rd. Upgrade	5-lane section from Hadley to Belvista	Minor Arterial
13	Moon Rd. Upgrade	5-lane section from Belvista to US 40	Minor Arterial
14	Moon/Hadley Intersection	Intersection improvements	Intersection
15	Moon/US 40 Intersection	Intersection improvements	Intersection
16	SR 267/750 S Intersection	Intersection improvements	Intersection
17	US40/Perry Rd Intersection	Intersection improvements	Intersection
18	Stout Heritiage/Reagan Intersection	Intersection improvements	Intersection
19	SR267/Hadley Intersection	Intersection improvements	Intersection
20	SR 267/Reeves Intersection	Intersection improvements	Intersection
21	SR 267/Stafford Rd Intersection	Intersection improvements	Intersection

Recommended improvements are not itemized by prioritization within their time horizon.

(*) denotes project underway.

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MID-TERM CAPACITY PROJECTS LIST

Number	Capacity Project	Project Description	Functional Class
22	Stout Heritage Pkwy - Elm Extension	Open access to SR-267 via Metropolis/Elm	Minor Collector
23	New Road 600 S	From Moon Rd to Regional Connector	Principal Arterial
24	CR 675 E Reconstruction	MOU with Westport Homes to improve / widen roads	Minor Collector
25	NE Warehouse District, Project 2	Connects All Points Rd to Ronald Regan Pkwy	Local
26	Southfield Dr	Connect Stanley to Reeves	Local
27	Bradford Rd from Raceway to CR 1050 E	Reconstruct County Road Section to Town Standards	Minor Collector
28	Wabash St, Realignment	--	Major Collector
29	Raceway Rd Extension	From Stout Heritage to US40	Minor Arterial
30	Raceway Rd Extension	From Stafford to Stout Heritage	Minor Arterial
31	Airtech Extension	From Reagan to Raceway Extension	Minor Arterial
32	Smith Rd	Upgrade from 200S to 100S	Major Collector
33	Allpoints Pkwy	Upgrade from Smith Rd to Allpoints	Major Collector
34	Allpoints	Extend from US40 to Metropolis	Major Collector
35	Allpoints Pkwy Extension	Connect from Reagan to 6points	Minor Collector
36	Plainfield Commons Extension	New Road from US40 to Smith Rd	Local
37	Upgrade 575 E	From new I-70 Interchange to 750 S	Principal Arterial
38	Reagan Parkway	Added Lanes	Principal Arterial
39	200S extension	From Reagan Pkwy to Raceway Rd	Local
40	251S extension	From Reagan Pkwy to Raceway Rd	Local
41	Earlhan Ln Connector	From 251S to 200S	Local
42	Upgrade Moon Rd.	From 650 S to Hadley Rd.	Principal Arterial

Recommended improvements are not itemized by prioritization within their time horizon.

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LONG-TERM CAPACITY PROJECTS LIST

Number	Capacity Project	Project Description	Functional Class
43	New Int. and Regional Connector	New I-70 Int. and new alignment connector to US 40	Principal Arterial
44	Joppa Rd/Hendrick County Rd	Upgrade and add lanes from 575E to S.R. 267	Minor Arterial
45	New Road 850 E	Connect Mooresville to SR267 Interchange	Major Collector
46	New Road - South I-70 Frontage Rd	Connect SR 267 to Ameriplex	Minor Collector
47	Stanley Rd Extension	New road between Center and Moon	Major Collector
48	Lincoln St Extension to Avon Ave	New connection	Local
49	Quaker Blvd. Extension	New road from US 40 to Township Line Rd	Major Arterial
50	Upgrade 350S	From Saratoga to 300 E	Major Collector
51	Regional Connector Segment #2	From US 40 to Cartersburg Rd	Principal Arterial
52	Extension of 521 E	Extend 521E south to 650 S	Local
53	Extension of 521 E	Extend 521E north from Hadley Rd to Chazmal	Local
54	Extension of Chazmal	From existing cul de sac westward to new Regional Connector	Minor Collector
55	Upgrade 725 E	From 650S to Hadley Rd	Minor Collector
56	New Road 650 S	From 675 E to Center	Minor Collector
57	New Road 565 E	New N-S road from Mockernut Ct to Hadley Rd	Local
58	Upgrade 700S	Upgrade between Moon and 675E	Local
59	Upgrade 750 S	Improve between 600 E and 675 E	Major Collector
60	New Road 675 E	From 750 S to 700 S	Minor Collector
61	New Road 750 S	Extend 750 S from 375E to 525E	Minor Arterial
62	Upgrade 675 S	From 675 E to 725 E	Minor Collector
63	Upgrade 725 E	From I-70 to 675S	Minor Collector

Recommended improvements are not itemized by prioritization within their time horizon.

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LONG-TERM CAPACITY PROJECTS LIST			
Number	**Capacity Project**	**Project Description**	**Functional Class**
64	Upgrade 675 E	From 675 E to 725 E	Local
65	Upgrade 675 E	From 700S to 650 S	Minor Collector
66	Upgrade Center St.	From US 40 to Hadley Rd	Minor Arterial
67	Moon Rd Upgrade	From 750 S to 650 S	Minor Arterial
68	575 E	From I-70 to Joppa Rd	Minor Arterial
69	New Road 650 S	From Moon Rd to 675 E	Minor Collector
70	New Road 650 S	From Regional Connector to Moon Rd	Minor Collector
71	Upgrade 750 S	Improve 750 S to 4 lane minor arterial	Minor Arterial
72	South Connector Option #2	From 725 E to SR 267	Major Collector
73	South Connector Option #1	From 675 E at I-70 to SR 267	Major Collector
74	Extend 750 S across I-70	New Road replacing rest area	Minor Arterial
75	Camby Rd	Upgrade from SR267 to SR67	Minor Collector
76	Joppa Rd/Hendricks County Rd	Upgrade from SR267 to SR67	Minor Arterial
77	750 S	Upgrade and new connection into Camby Rd	Major Collector

Recommended improvements are not itemized by prioritization within their time horizon.

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POLICY RECOMMENDATIONS

The following policy recommendations have been developed to support the transportation project recommendations of this plan:

» Require traffic impact studies according to the thresholds and standards of the Indiana Department of Transportation Applicant's Guide to Traffic Impact Studies. These should utilize town's TransCAD model tool as either the base analysis tool or as verification of alternative analysis.

» Complete the corridor study for the potential new interchange along I-70 as well as the alignment and defined purpose of the proposed west side U.S. 40/I-70 connector Corridor.

» Implement a formal access management policy for Primary Arterial corridors within the town.

» Continue the discussion regarding flexible design standards and consider implementation of those standards into a complete streets ordinance.

» Work with INDOT to update their on-system Functional Class Map as it relates to the Town of Plainfield to help secure future project funding.

» Work with the Indianapolis MPO to update their 2045 Long Range Transportation Plan to reflect key projects identified within this plan for potential future funding.

» Continue to work with the City of Indianapolis to encourage the expeditious completion if the IndyGo Blue Line and encourage the expansion of local connector service within the town.

» Ensure that coordination occurs with adjoining jurisdictions for applicable future infrastructure projects. This will allow projects to best leverage resources and maximize the positive local and regional impacts of future projects.

» Review and update the Town's Sidewalk and Trail Master Plan to ensure consistency with the objectives outlined in the Thoroughfare Plan.

» Encourage managed development practices that discourage leapfrog development which require excessive infrastructure improvements at the town's expense.

» As development occurs, require right-of-way dedication pursuant to the standards of the Thoroughfare Plan even if the infrastructure is to be constructed in phases over time.

» Update and review town design standards to align with recommendations in this plan.

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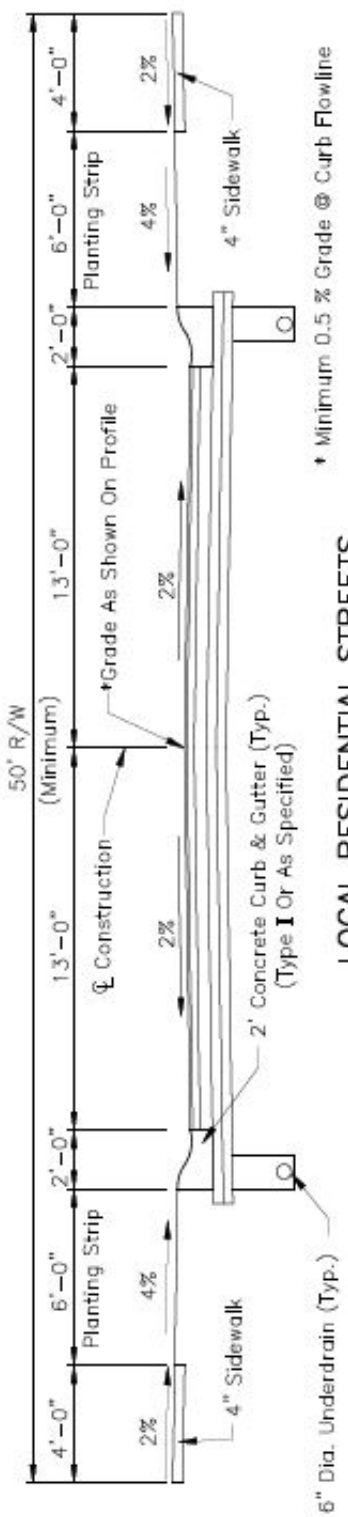
08 APPENDIX

EXISTING STREET STANDARDS



LOCAL RESIDENTIAL STREETS

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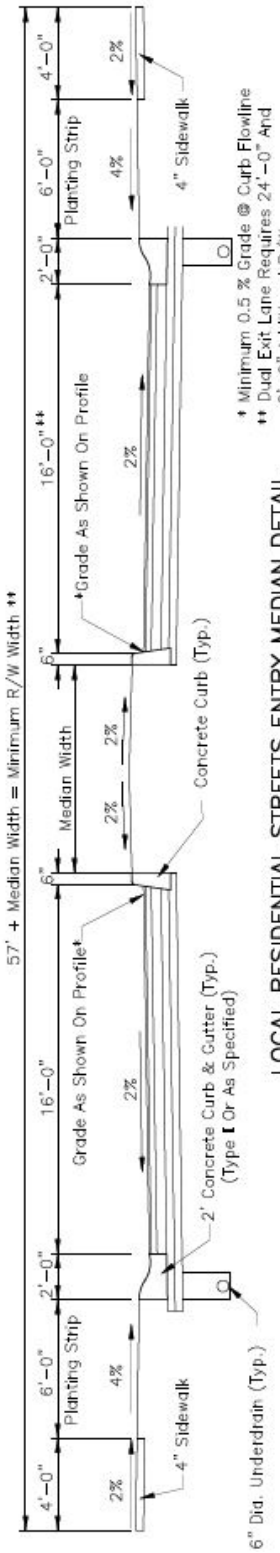

LOCAL RESIDENTIAL STREETS ENTRY MEDIAN DETAIL

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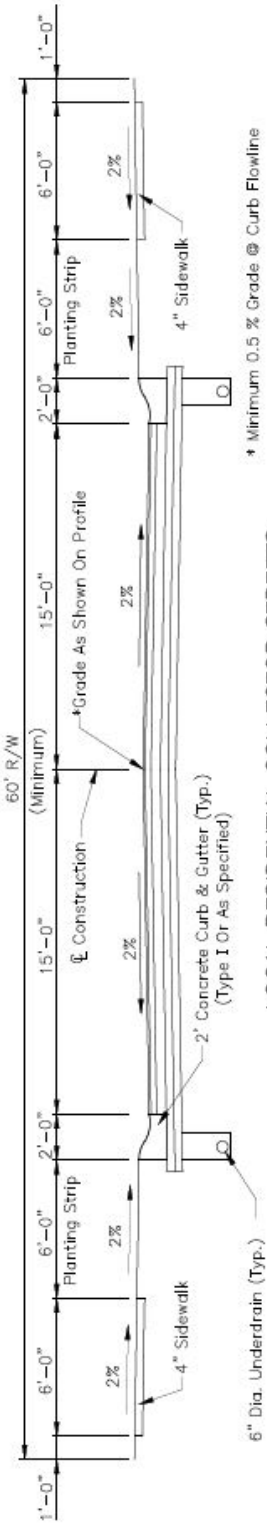

LOCAL RESIDENTIAL COLLECTOR STREETS

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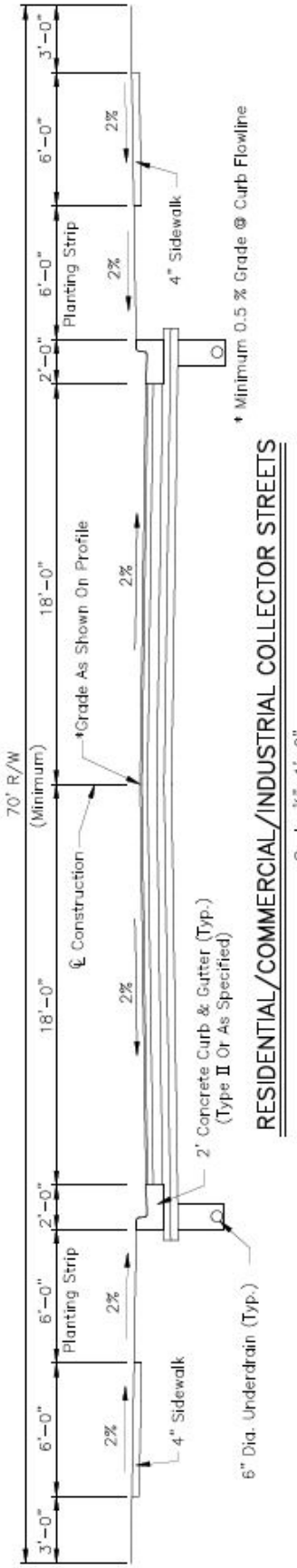
EXISTING STREET STANDARDS CONT.



RESIDENTIAL/COMMERCIAL/INDUSTRIAL COLLECTOR STREETS

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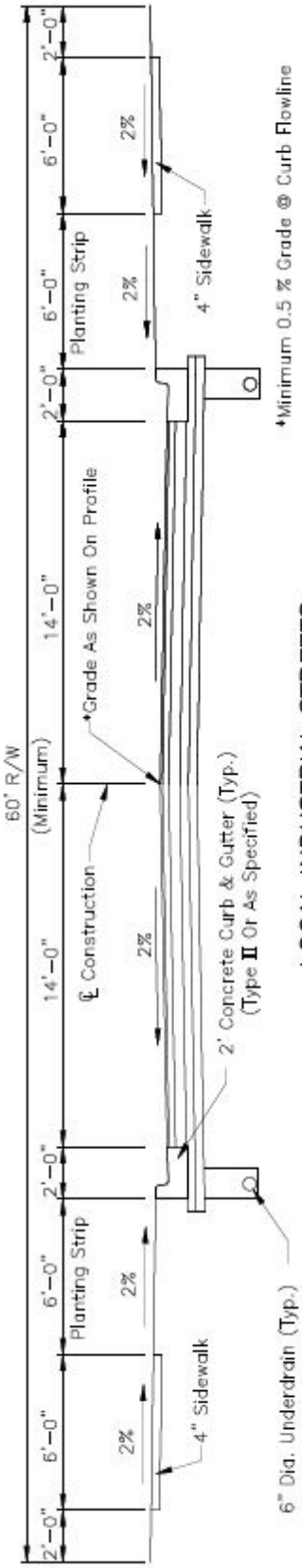

LOCAL INDUSTRIAL STREETS

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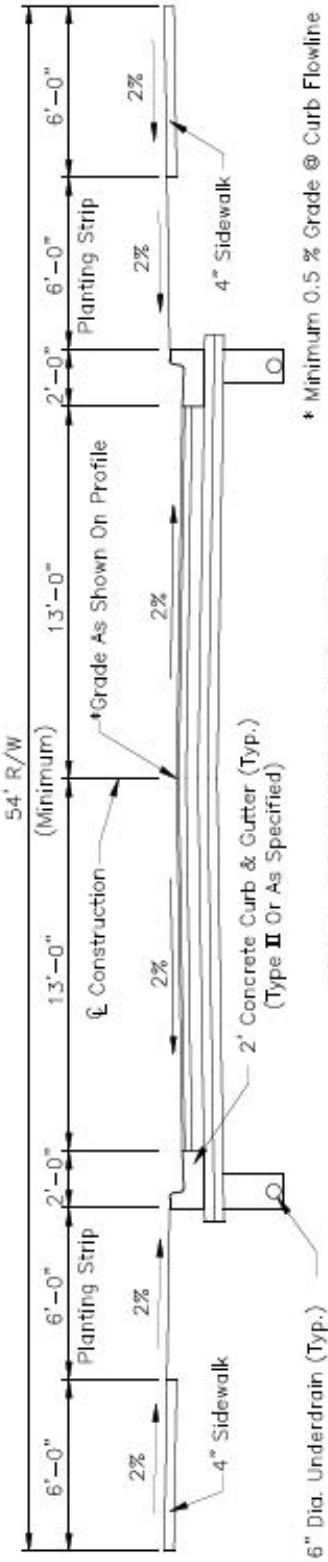

LOCAL COMMERCIAL STREETS

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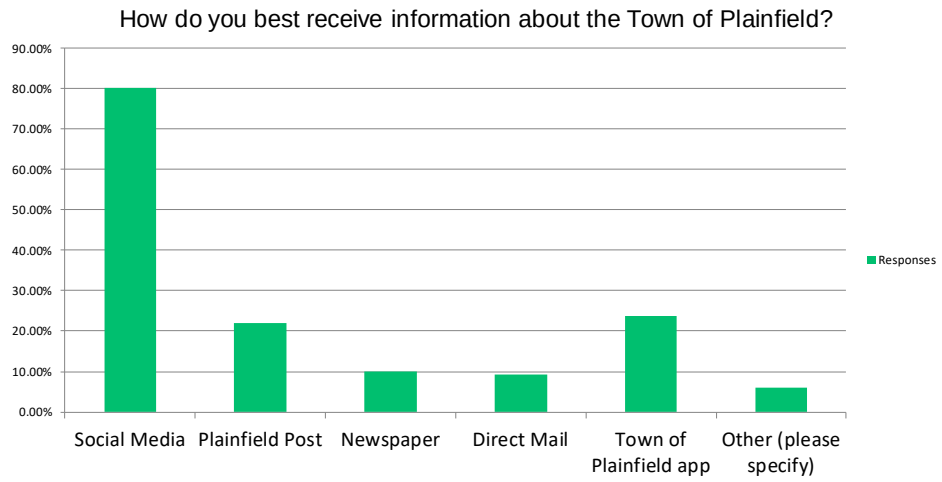
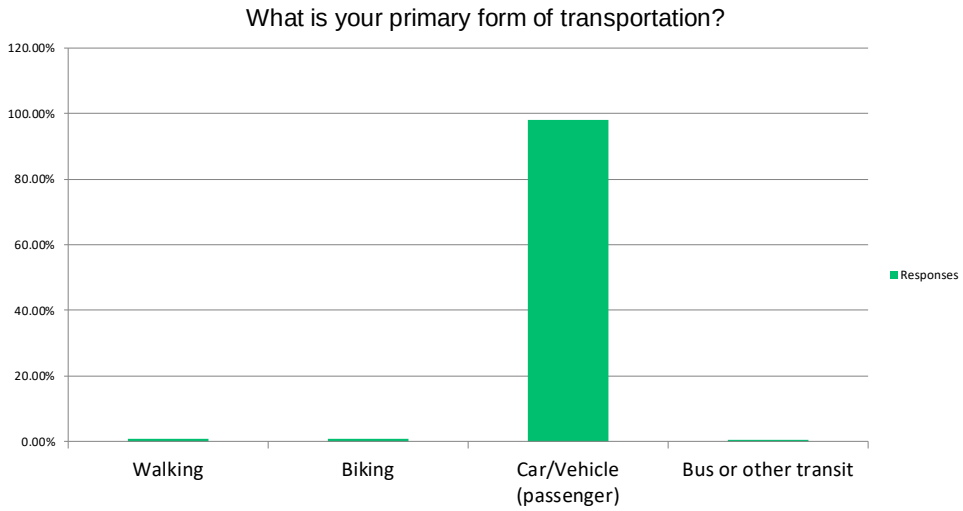
PUBLIC INPUT SUMMARY

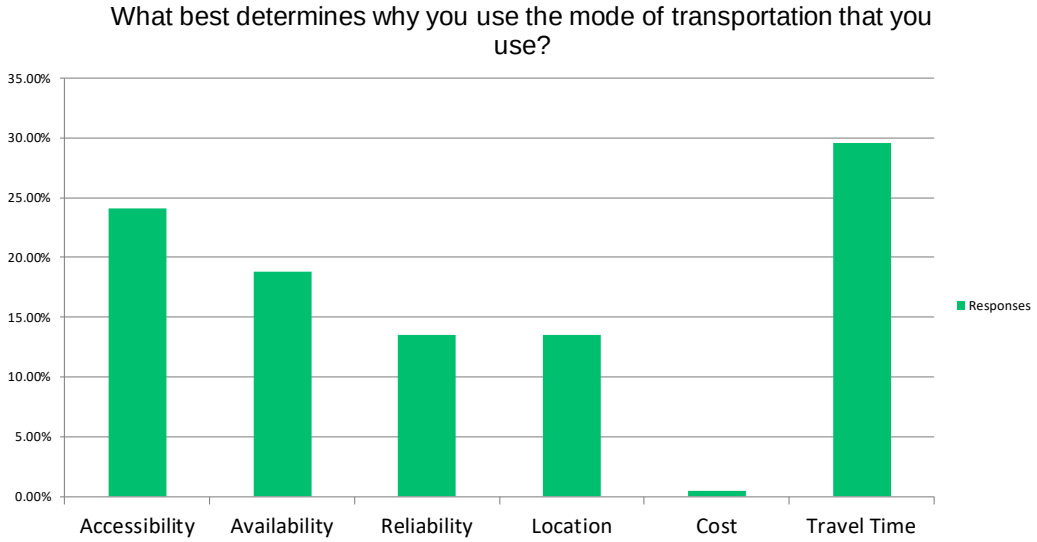
825 TOTAL RESPONSES

711 RESPONDENTS LIVE IN PLAINFIELD

63 RESPONDENTS LIVE IN UNINCORPORATED HENDRICKS COUNTY







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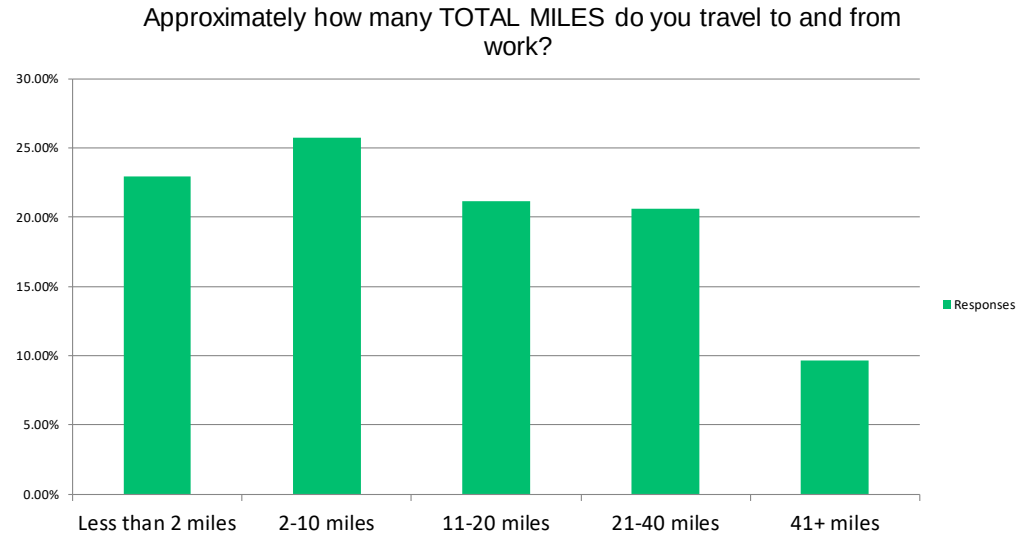
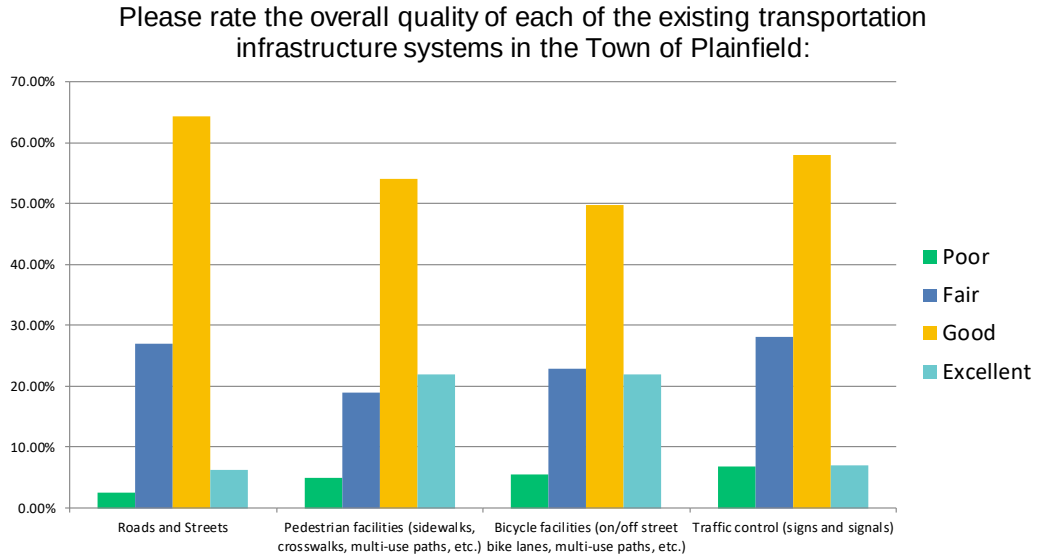
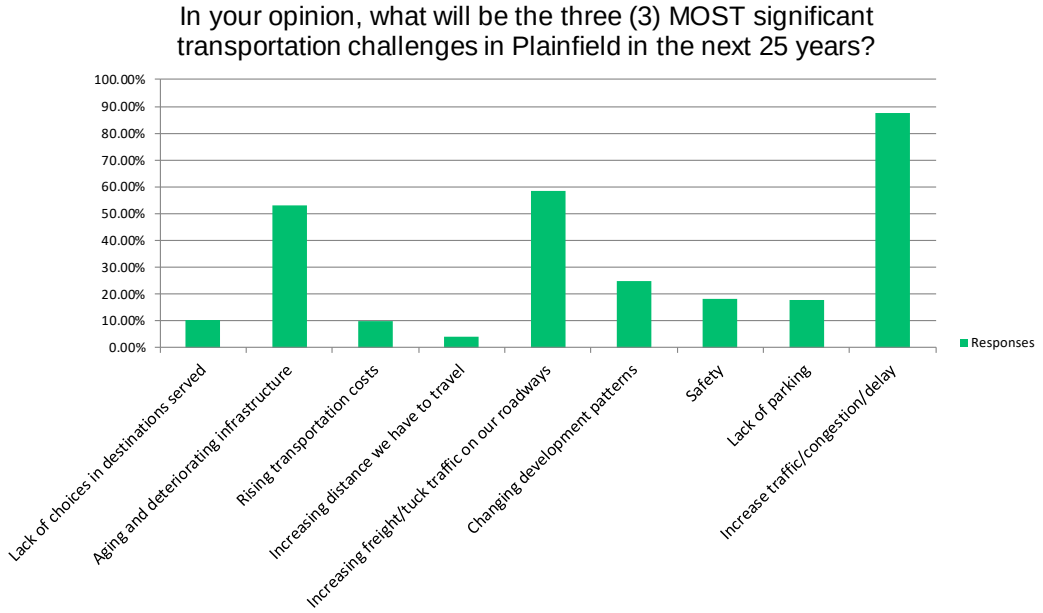
PUBLIC INPUT SUMMARY CONT.







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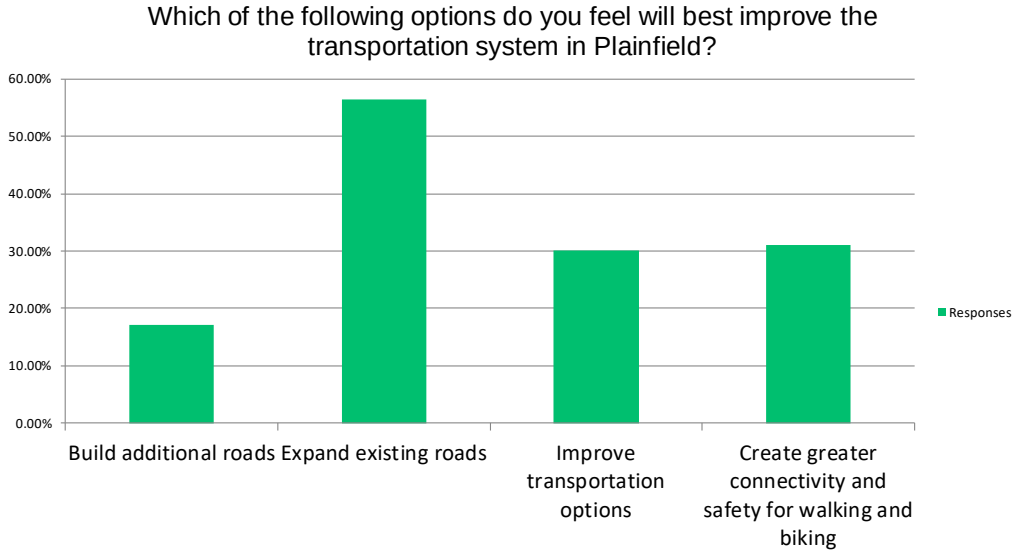
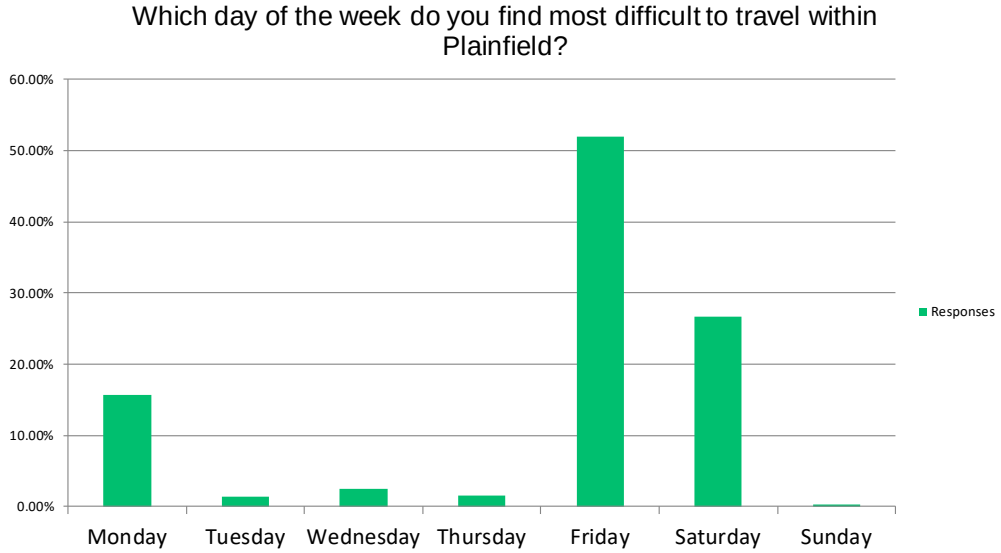
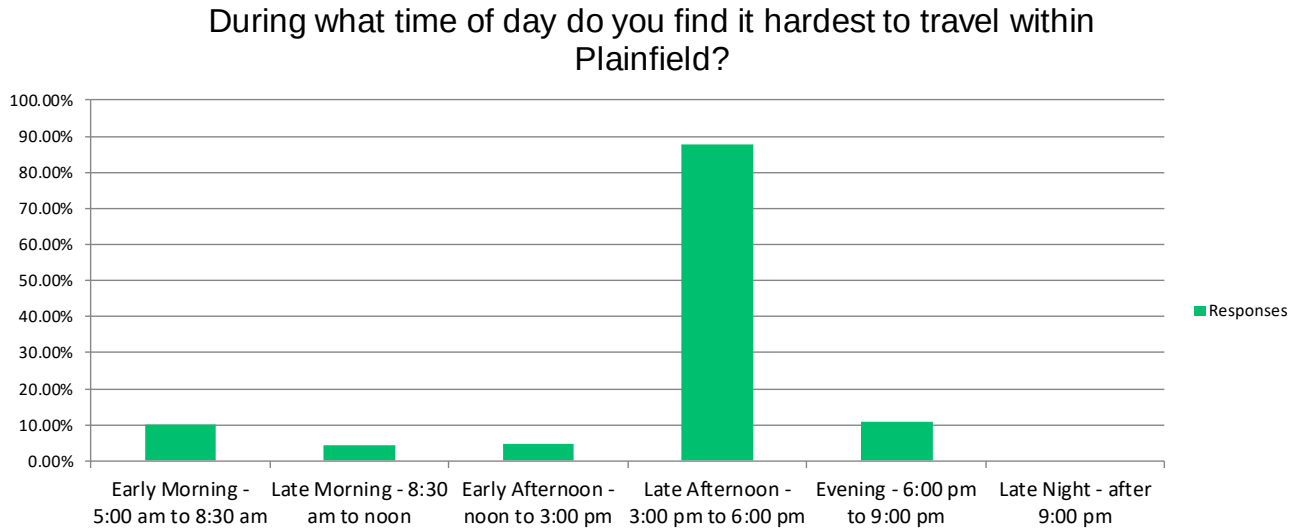
PUBLIC INPUT SUMMARY CONT.







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PUBLIC INPUT SUMMARY CONT.

Which criteria do you think should be a priority when selecting transportation projects?

	Not Important	Somewhat Important	Important	Very Important	Score
Reduces congestion	1	26	287	500	3.58
Improves safety	12	63	315	429	3.42
Increases connectivity and access to the places we live and work	18	148	396	248	3.08
Increases capacity for vehicular traffic	17	155	389	248	3.07
Supports economic development	26	168	448	172	2.94
Reduces energy consumption/pollution	69	218	299	224	2.84
Increases and improves pedestrian facilities (sidewalks, paths)	54	284	305	169	2.73
Improves freight movement	74	262	304	169	2.70
Improves travel choices	74	251	333	146	2.69
Increases bicycle facilities (bike lanes, paths)	126	314	237	136	2.47
				Answered	828
				Skipped	7

If you only had $100 to invest on transportation improvemets, how would you allocate your funds to the following projects?

	$0	$10	$20	$30	$40	$50	$60	$70	$80	$90	$100	Total
Maintaining existing streets and roadways	24	122	242	128	74	79	14	13	13	3	38	2367
Safety improvements on existing streets	141	273	146	53	14	23	4	2	3	2	13	1105
Greater access to Interstate 70	305	119	88	46	19	23	10	3	7	5	28	1086
Building new streets and roadways	214	190	135	60	21	18	5	8	3	1	7	1003
Sidewalks	123	345	130	37	12	9	3	0	2	1	13	982
Greenways/multi-use paths	188	274	125	43	20	17	5	4	1	1	4	933
Public transportation	295	174	90	41	12	20	6	4	4	3	15	898
On street bike lanes	336	173	70	24	10	12	3	1	2	0	6	586
Improvements in street appearance (trees, lights, landscaping, etc.)	296	237	64	16	5	9	2	1	2	1	7	592
											Answered	812
											Skipped	23

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PUBLIC INPUT SUMMARY CONT.

Think of a time you have visited another town or city. Did you notice anything transportation related that you would like to see in Plainfield?

Key themes:
Sidewalks and trails
Roundabouts
Public transit/ trolley system
Downtown parking
Flashing yellow turn signals
Bike lanes
Gateway/street marking and signage

Please name any specific intersections or roadway segments that concern you:

US 40 and Center Street
Hadley and Moon Road
Hadley and 267
Dan Jones and US 40
Downtown Plainfield
Intersection of 267 and Township Line Road
US 40 and 267
I-70 and 267
Center Street and Hadley Road
US 40 between 267 and Dan Jones
Ronald Reagan Parkway and US 40
Better access to I-70

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EXPLAINATION OF GROWTH ALLOCATION PROCESS

The proposed land uses identified within the following growth allocation exhibits are based on the current land use maps within the Town of Plainfield's and Hendricks County's Comprehensive Plans. However, some consideration has been given to parcels where development is occurring, or is planned to occur, which is different than the underlying assumption of the respective Comprehensive Plan.

Within the individual growth allocation models, each currently vacant parcel is competing for growth using a measure of "Economic Utility". The relative utility for a household or employer to locate in a particular parcel is influenced by:

- Accessibility to Jobs
- Accessibility to Workers
- Accessibility to Retail
- Travel time to nearest interchange
- Travel time to Indianapolis
- Proximity to similar land uses
- Parcel size
- Land cost

And constrained by:

- Land uses allowed by the Comprehensive Plan
- Maximum densities
- Development constraints such as floodplains and topographies

Each of the above mentioned items were developed from local GIS data resources; such as the Hendricks County Assessor Parcel layer, the Indianapolis MPO model network and TAZ files, or the Plainfield model network.

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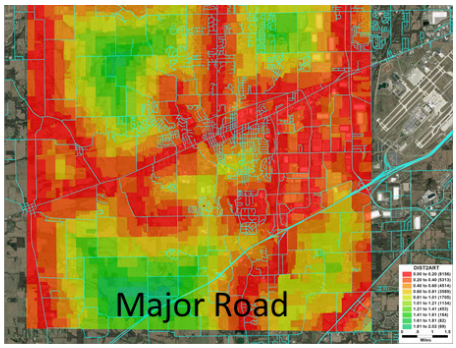
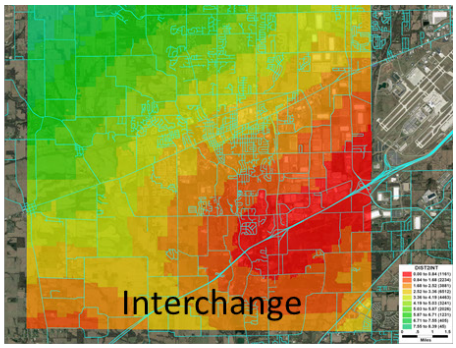
After the economic utility is computed for each parcel, growth is allocated to parcels using a probability (or growth share) using the following:

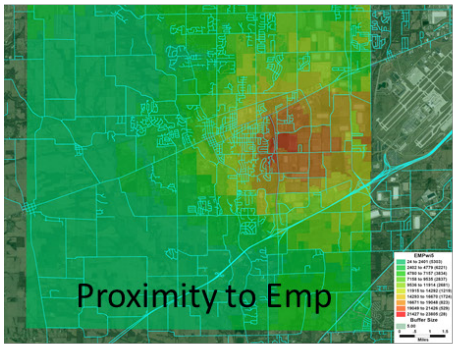
Parcel's Share of Total Growth = Parcel's economic utility for a particular land use / Sum of all economic utility for a particular land use.

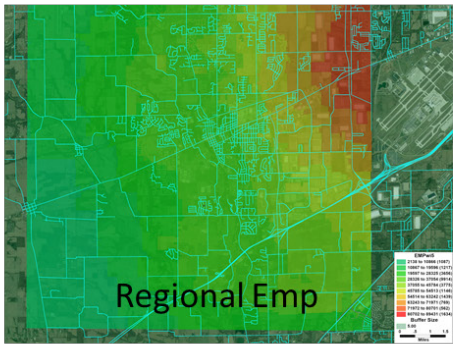
Parcel Accessibility Measures

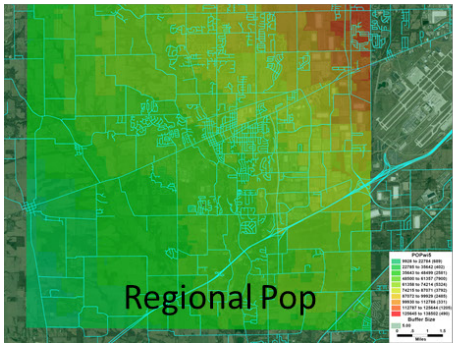
(Part of economic utility computation)

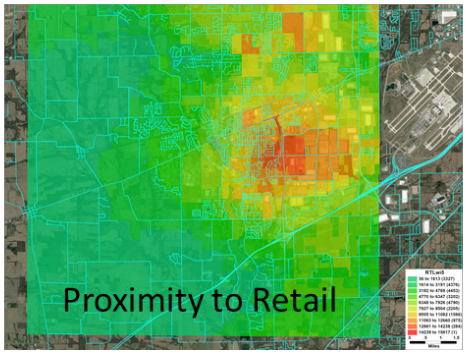


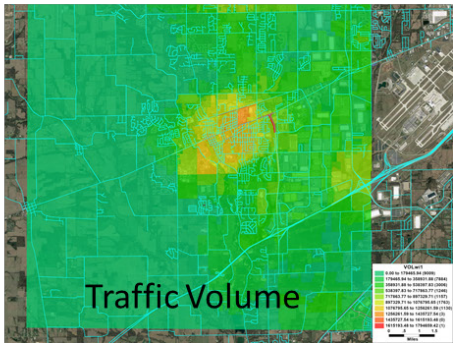












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Technical Procedure for Weighting Economic Utility Elements

The Plainfield growth allocation process used a Neural Network technique for estimating the relative importance of each of the variables (via numerical weights) used in the computation of the economic utility for a given land parcel for a given land use. Neural network techniques are a form of machine learning that identifies patterns in data that are useful for forecasting. Neural networks are commonly used in the business world for a wide range of applications: from credit worthiness of customers, to predictive marketing analytics, to economic cycles and stock market prices. Neural networks have the ability to learn by example; can be trained to recognize the image a face by showing them many examples of a face or to predict future stock prices by feeding them historical stock prices.
To summarize, neural networks perform these particular tasks by using the following procedure:

- We present the network with training examples, which consist of a pattern of activities for the input units together with the desired pattern of activities for the output units.

- We determine how closely the actual output of the network matches the desired output.

- We change the weight of each connection so that the network produces a better approximation of the desired output.

Neutral networks are very effective when lots of examples must be analyzed, or when a structure within these data must be analyzed but a single algorithmic solution is impossible to formulate. They are used as computational tools for examining data and developing models that help to identify patterns or structures in the data. The data used to develop these models is known as training data. Once a neural network has been trained and has learned the patterns that exist in that data, it can be applied to new data. The training data must contain numeric information on both the inputs and the outputs to generate a model. The model is then repeatedly trained with this data until it learns to represent these relationships correctly. For a given input pattern or data, the network produces an output (or set of outputs), and this response is compared to the known desired response of each neuron. Correction and changes are made to the weights of the network to reduce the errors before the next pattern is presented. The weights are continually updated in this manner until the total error across all training patterns is reduced below some pre-defined tolerance level. We refer to this learning algorithm as back-propagation.

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Process of a back-propagation

Forward pass, where the outputs are calculated and the error at the output units calculated.

Backward pass, the output unit error is used to alter weights on the output units. Then the error at the hidden nodes is calculated (by back-propagating the error at the output units through the weights), and the weights on the hidden nodes altered using these values.

The main steps of the back propagation learning algorithm are summarized below:

Forward Pass

Step 1: Input training data.

Step 2: Hidden nodes calculate their outputs.

Step 3: Output nodes calculate their outputs on the basis of Step 2.

Backward Pass

Step 4: Calculate the differences between the results of Step 3 and targets.

Step 5: Apply the first part of the training rule using the results of Step 4.

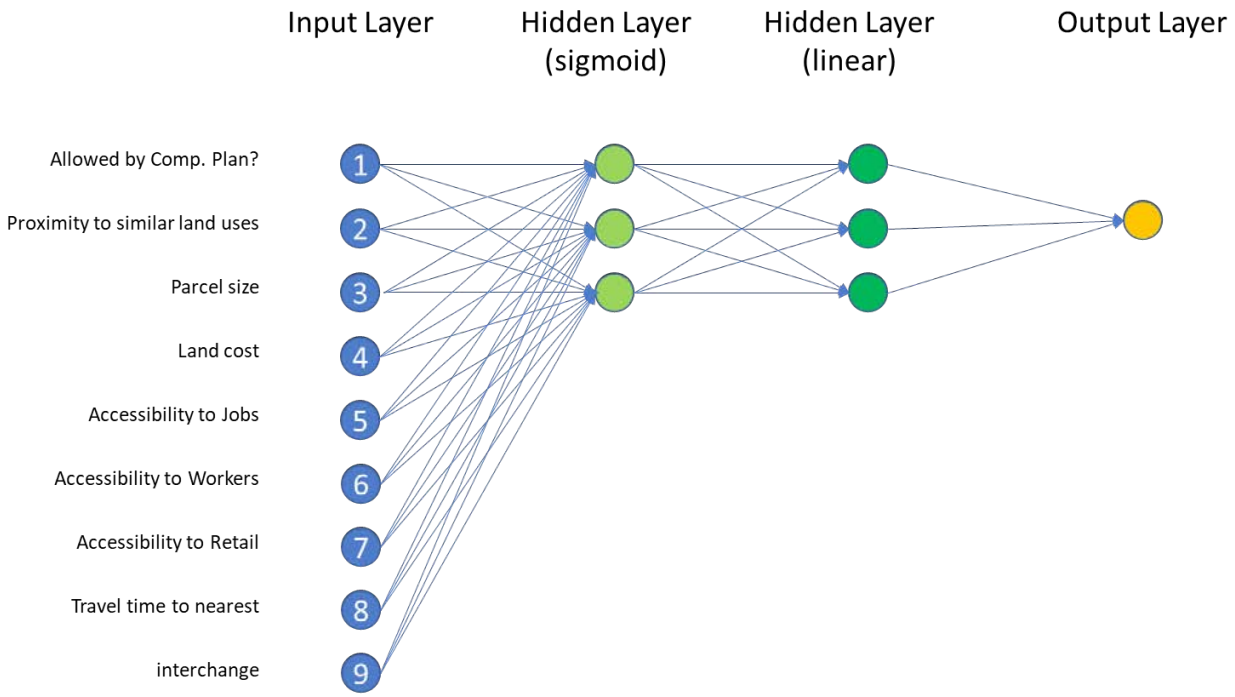
Step 6: For each hidden node, n, calculate d(n). (derivative)

Step 7: Apply the second part of the training rule using the results of Step 6.

For each data pair to be learned a forward pass and backwards pass is performed. This is repeated over and over again until the error is minimized.

The neutral network structure used in the Plainfield growth allocation model is illustrated below.

Economic Utility for a given Land Use, computed for each parcel



Weights are computed for each connection for a total of 39 weights, and are applied to all parcels

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Initial weights were set to random values, then four neural network models were trained using existing land use patterns for housing, retail employment, service employment, and basic employment separately. The other training inputs were obtained from the travel model network or other local GIS layers mentioned previously. The neural network training process involved thousands of iterations until a final set of weights emerged. Once each of the neural network model's weights was estimated, then they were used in the computation of economic utility for each parcel for a given land use type. The economic utility values were then used to compute the share of growth that each parcel is predicted to receive. Summarized housing and employment growth allocation results are shown in Exhibits O-R.

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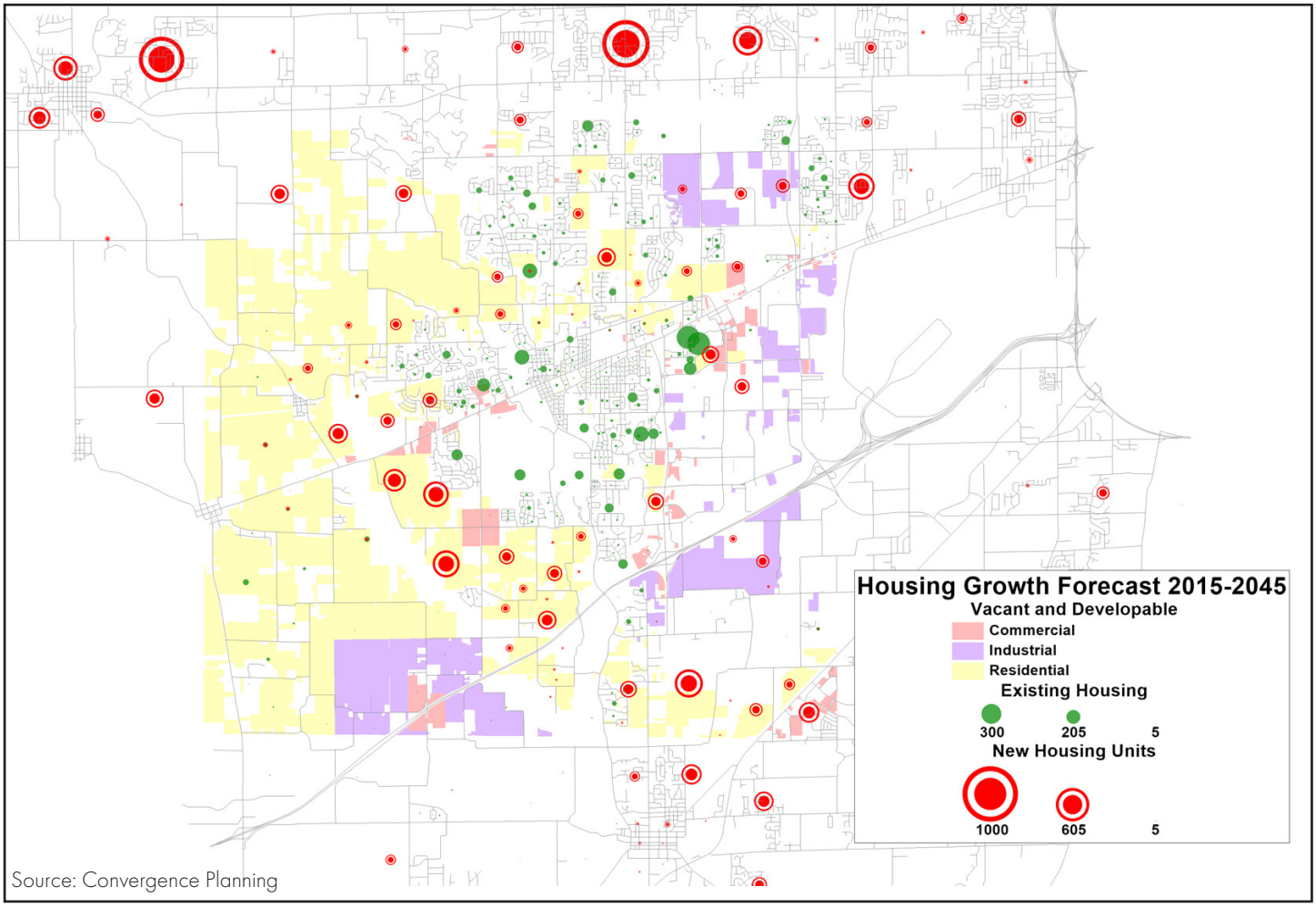
EXHIBIT M: 2015-2045 HOUSING GROWTH



Source: Convergence Planning

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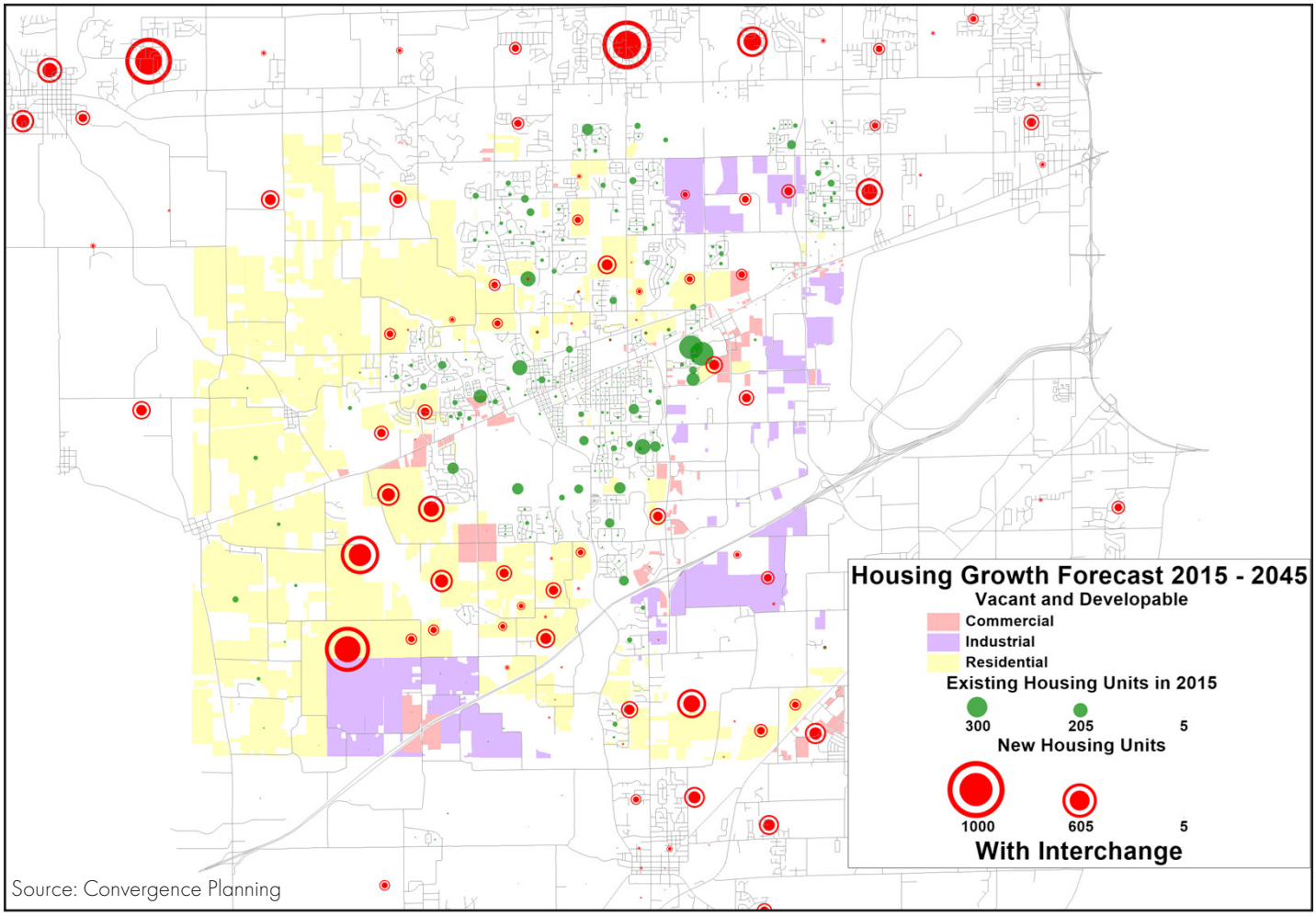
EXHIBIT N: 2015-2045 HOUSING GROWTH
WITH INTERCHANGE



Source: Convergence Planning

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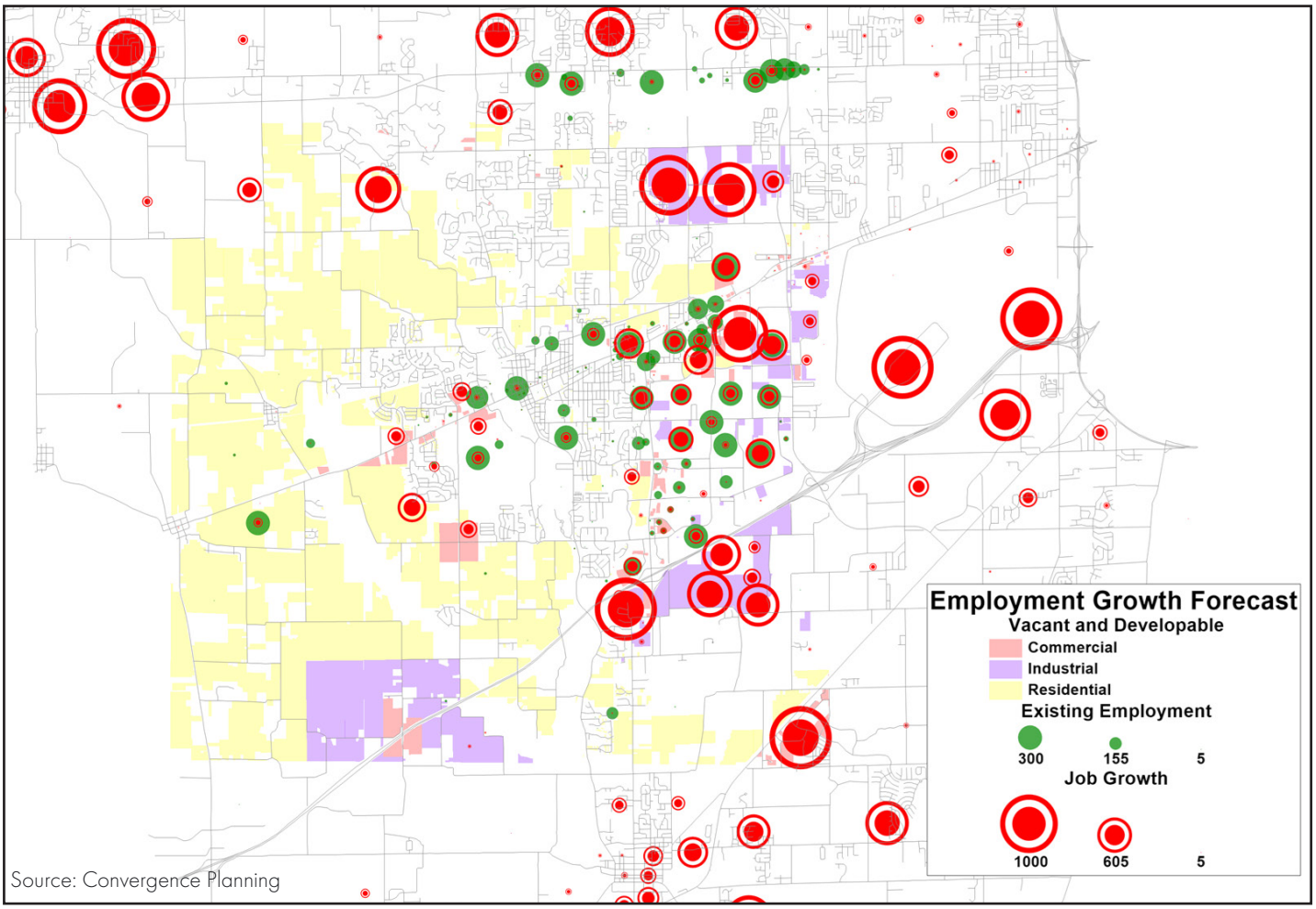
EXHIBIT O: 2015-2045 EMPLOYMENT GROWTH



Source: Convergence Planning

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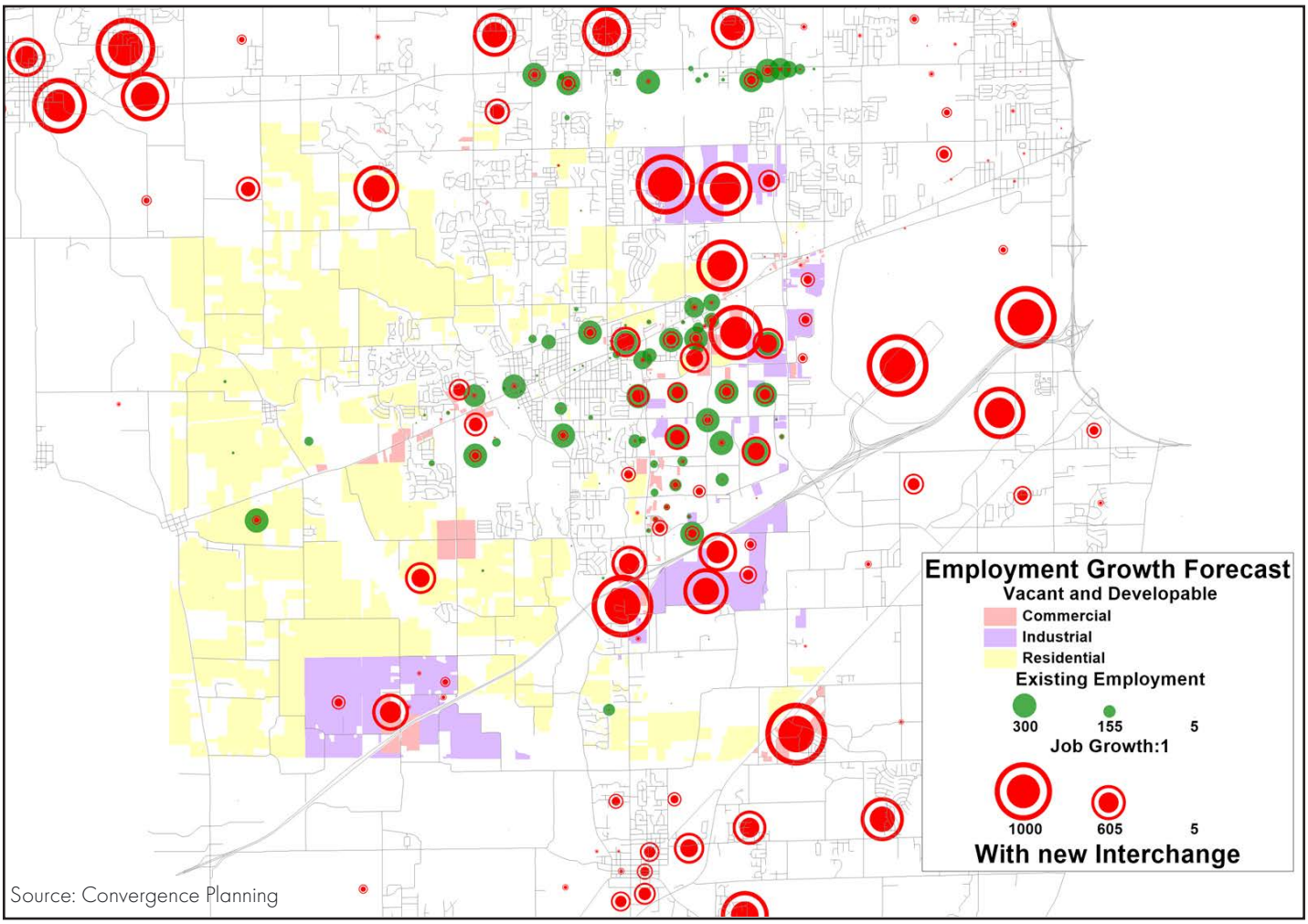
EXHIBIT P: 2015-2045 EMPLOYMENT GROWTH
WITH INTERCHANGE



Source: Convergence Planning

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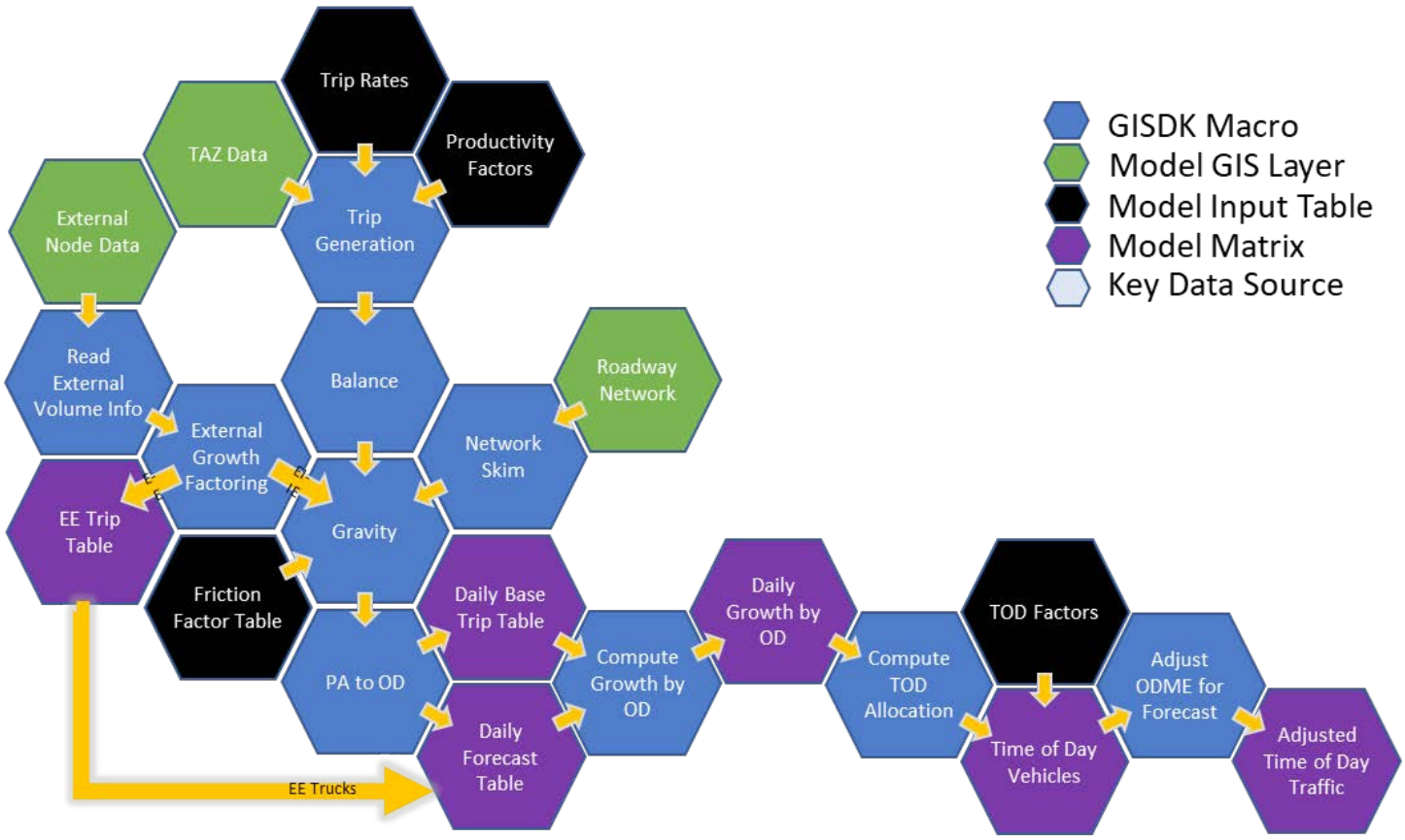
THE MODELING PROCESS



Source: Convergence Planning

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TECHNICAL MODELING MEMO

Network Modeling and Analysis

Overview

The primary purpose of the travel demand analysis was to provide insights into traffic impacts and capacity needs for the Town of Plainfield as it undergoes large-scale household and employment growth in the future. The traffic analysis was developed by forecasting specific land development, and then using a travel demand model built specifically for this project to generate trips, distribute trips, assign estimated vehicle flows to the various road network scenarios, and then compute performance measures.

This section documents the development of a TransCAD travel demand model for the Town of Plainfield, and an evaluation of traffic conditions under various transportation and land use scenarios. The project study area (see Figure 1) includes the Town of Plainfield, surrounding adjacent areas in Hendricks and Morgan Counties, and includes I-70, US 40, and SR 267 corridors. Any summary statistics cited within the Network Modeling and Analysis section pertain the study area highlighted in red in Figure 1. The travel model covers a wider area than the project's study area, such that it can include the entire area bounded by SR39, I-465, I-74, and the White River within the modeled area and includes road and traffic zone coverage for Hendricks and parts of Morgan Counties. The design of the modeled area was based on analysis conducted with the 2009 Central Indiana Household Travel Survey, such that it covers more than 90% of the trip destinations reported from Town of Plainfield households captured in the survey.

The Thoroughfare Plan's modeling analysis covered multiple alternatives to be tested for 30 year traffic forecasts:

- Base Year 2015 (for model calibration purposes)
- Existing (Current conditions)
- No Build Future (2045)
- Preferred Scenario without interchange
- Preferred Scenario with interchange and regular connector

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Base Model Development

A TransCAD (Version 8.0 travel demand model was developed by Convergence Planning to facilitate travel demand modeling analysis in this project. This section introduces the base model development.

Basic Model Components

The Plainfield travel model is a conventional travel demand model that is similar in structure and methodology to other current area-wide models used for traffic forecasting, and relies upon the Indianapolis Metropolitan Planning Organization and Indiana Statewide Travel Demand Model (ISTDM) for data sources on household and commercial travel behavior. It uses aggregate land use/socioeconomic data and road network data to estimate facility-specific roadway traffic volumes and performance.

The model applies sequential steps:

1) Trip Generation. This initial step translates household and employment data into person trip ends using trip generation rates established during model calibration. Household and commercial vehicle trip generation rates were derived from the Indy MPO model data sources.

2) External Trips. This step accounts for trips that pass through the study area without making a stop. For the Plainfield Thoroughfare Plan, I-70, US 40, and SR 267 trips (and other combinations with other major roads) are of particular interest. External trips are discussed in a section below.

3) Trip Distribution. The second general step estimates how many trips travel from one subarea of the region (defined as "transportation analysis zones") to any other zone. The distribution is based on the number of trip ends generated in each of the two zones, and on factors that relate the likelihood of travel between any two zones to the travel time between the two zones. Household and commercial vehicle trip distribution is driven by a set of friction factor curves. The friction factors are borrowed directly from the ISTDM model.

4) Trip Assignment. In this final step, vehicle trips from one zone to another are assigned to specific travel routes between the zones. The assignments to roads consider the effects of traffic congestion. The model steps listed above are conducted at the daily time scale, and then AM and PM factors are used to forecast trips by purpose and time of day. AM and PM hourly factors were derived from the INDOT's 2009 NHTS Add-On household survey, and from local traffic count data.

A feedback loop is used to pass congested speeds back through the modeling steps so that the trip distribution component produces results that are consistent with modeled congestion for a given scenario.

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Network & Traffic Analysis Zones (TAZ)

The roadway network is an essential element in a network model. The Plainfield base model network was developed based on a Hendricks County road-centerline GIS layer which covers all roadways in the study area. To have a thorough knowledge of roadway attributes, Convergence Planning reviewed Indy MPO and INDOT data sources and aerials to collect detailed roadway information which have been coded into the network. The collected information includes:

- number of lanes
- posted speed
- travel direction
- functional classification
- intersection types
- at-grade rail crossings
- grade separated rail crossings
- traffic counts

The traffic analysis zones (TAZ) structure directly affects centroid's location and level of detail. In this project, a very detailed sub-block level TAZ was developed according to the land parcel and/or Census Block boundaries with a total of 1128 internal zones and 52 external connectors. This approach contributes to a better simulation of traffic loading/parking choice in such a compact urban area. Centroid connectors were coded to represent traffic loading and parking options for each zone. Delays due to traffic signals and other traffic controls use the same methods as in the ISTDM model.

Roadway Speeds and Capacities

Network capacities vary by the functional classification and number of lanes. The Plainfield model's capacities are shown below. These were derived from the ISTDM capacity methodology, but simplified so that roadway geometric inputs were not required. Likewise for travel speeds, these were based on the ISTDM methodology and were applied using an adjustment to the posted speeds. The speed adjustments account for the actual travel times on roadway links after accounting for impacts of intersections and mid-block driveways on travel speeds.

Classification	FC	FHWA FC	AB Hourly per Lane	AB Daily per Lane	Speed Adj
Interstate	1	11	2100	16000	6.57
Other Freeway	2	12	2000	15000	5.42
Principal Arterial	3	14	1400	11000	-1.81
Minor Arterial	4	16	1300	10000	-3.19
Major Collector	5	17	1250	9900	-4.02
Minor Collector	6	17	1250	9600	-4.83
Local	7	19	1125	8600	-9.65
Centroid Connector	99	99	20000	200000	0.00

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External Travel

External stations are shown in Figure 3 above (orange dots). Each corresponds to a link in the ISTDM model, and a sub-area analysis process was used to extract the External Station trips for the base year and forecast years. Forecasts were interpolated from the INDOT forecasts to derive 2015, to 2035 and 2045 growth rates.

External trips are added to the internal-internal and internal-external/external-internal trip tables created directly with the Plainfield model trip distribution structure.

Table 1: 2017 External Station Vehicle Base 2015 Trips

Location	TAZID	Autos_2015	Trucks_2015
STATE RD 267 N of I-74	9002	27175	2956
E CO RD 600 N	9000	1864	12
RONALD REAGAN PKY N of I-74	9001	13902	498
I-465 at Mann Rd	9007	75812	31144
N STATE ST	9008	10278	746
W MAIN ST	9010	3908	320
I-74 W of SR39	9049	11014	6584
N CO RD 200 W	9019	372	14
STATE RD 236 W of SR39	9020	2200	120
N STATE ST	9012	6414	438
CHESTNUT ST	9013	4052	380
W STATE RD 42	9028	2199	155
E CO RD 400 S	9014	2612	270
S CO RD 250 W	9016	998	20
W CO RD 200 S	9017	710	20
S CO RD 200 W	9018	760	24
W CO RD 300 S	9023	760	20
W LINCOLN ST	9015	640	24
SUBURBAN DR	9024	828	22
W CO RD 500 S	9022	1768	158
W KENTUCKY ST	9021	2096	140
KENTUCKY AVE	9032	15776	4985
STATE RD 144	9035	9820	820
W KELLER HILL RD	9025	1563	98
I-70 W of SR39	9026	17330	16988
E CO RD 1000 S	9009	976	72
E CO RD 1000 S	9033	336	112
PHEASANT RUN	9011	118	10
I-465 at I-74	9004	81150	11302
W SOUTHPORT RD	9005	7990	850
RAMP	9006	5004	148
E WATSON RD	9031	732	38
S STATE RD 39	9027	6280	592
GOAT HOLLOW RD	9029	632	4
SUNSET LN	9030	638	548
COUNTRY CLUB RD	9034	854	546
US 40 W of SR 39	9036	7300	1310
CHURCH ST	9037	1294	164
Rockville Rd E of I-465	9038	31324	1072
10th St E of I-465	9039	32654	262
W WASHINGTON ST E of I-465	9040	20516	872
W 21ST ST	9042	214	2
DANDY TRL N of I-74	9041	5820	240
N CO RD 1000 E	9043	1294	108
N RACEWAY RD	9044	394	14
S VINEWOOD AVE	9045	2808	38
I-70 E of I-465	9046	33699	30281
Airport Expwy E of I-465	9047	24666	4932
SR 39 N of I-74	9048	2722	60
FRONTAGE RD	9003	696	398
N CO RD 275 E	9050	1554	36
N CO RD 500 E	9051	140	2

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Trip Generation and Distribution

The Plainfield model's trip generation procedure uses household trip generation rates taken from the Indianapolis MPO travel demand model, but collapses the trip purposes and market segmentation into a simplified format. The MPO trip generation rates are derived from the 2009 Central Indiana Household Travel Survey. Truck trip rates (and external truck trips) are taken directly from the Indiana Statewide Travel Demand Model. Household trip generation rates are shown below.

Plainfield Trip Generation Rates					
Trip Purpose	Household Auto Ownership	Household Size			
		1 Person	2 Persons	3 Persons	4 Persons
Home Based Work	0 Vehicles	0.14	0.48	0.67	0.81
Home Based Work	1 Vehicle	0.71	0.98	1.09	1.23
Home Based Work	2 Vehicles	0.81	1.62	2.00	1.91
Home Based Work	3+ Vehicles	0.99	2.03	2.38	2.79
Home Based Other	0 Vehicles	1.78	3.27	5.38	8.83
Home Based Other	1 Vehicle	1.87	3.91	5.51	8.97
Home Based Other	2 Vehicles	1.89	3.75	5.48	10.55
Home Based Other	3+ Vehicles	1.98	3.54	5.18	8.71
Non-Home Based	0 Vehicles	0.96	1.55	1.20	1.53
Non-Home Based	1 Vehicle	0.97	1.56	1.31	2.76
Non-Home Based	2 Vehicles	1.08	1.64	2.00	3.17
Non-Home Based	3+ Vehicles	1.22	1.77	2.16	2.79
Note: Home Based Other includes Shopping, K-12 School, and University Trips					

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The Plainfield model uses a gravity type trip distribution model and is based on friction factor tables calibrated by trip purpose. The friction factors are derived from the 2009 National Household Travel Survey, Indiana Add-on. Friction factors are shown in the table below.

Gravity Model Parameters

Travel Time in Minutes	HBW	HBO	NHB	Truck
0	1606942	853462	157035	8809
1	1621942	859462	168042	9657
2	1636942	861462	177233	10612
3	1647970	861962	184836	12288
4	1650640	861800	190797	14303
5	1639527	850499	195644	16204
6	1610682	828174	197496	17978
7	1581554	781350	195675	19690
8	1525249	719836	191168	21018
9	1442543	614632	178400	22559
10	1275589	449000	143391	23177
11	1039155	322797	105142	23432
12	760262	228383	73548	23608
13	448614	159019	57855	23637
14	258182	108965	45057	23505
15	160961	73481	34741	22970
16	121956	48766	26521	22714
17	102121	31850	20044	21972
18	85086	20471	14998	20969
19	70539	12949	11111	19955
20	58187	8061	8149	19197
21	47759	4938	5918	18565
22	39004	2977	4928	17863
23	31695	1767	4087	17049
24	25627	1032	3377	16388
25	20618	593	2779	15593
26	16505	335	2277	15023
27	13147	187	1859	14417
28	10419	102	1511	13909
29	8217	55	1224	13409
30	6634	29	987	12835

Note: this table is truncated at 30 minutes, but the model allows for times up to 120 minutes

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Model Validation

The ultimate test of a travel demand model is its ability to accurately predict traffic volumes on the transportation system. Therefore, in many areas traffic counts are the primary data parameter used for model validation. As discussed below, a number of checks are used to compare the model's simulated link values with the traffic counts.

Error statistics reported and used for diagnosing the possible sources of model errors include:

- percent root mean square errors (% RMSE),
- system-wide average error,
- mean loading errors and percentage errors, and
- total VMT errors and percentage errors.

Actual traffic counts available for the Plainfield study area are shown in Figure 5. The base year network model for Plainfield was validated by comparing the differences between observed daily traffic counts and assigned model daily volumes on the network links. System-wide validation statistics were broken out by roadway functional classification and volume-group range. The process resulted in a well-validated model, that complies with FHWA and INDOT guidelines regarding goodness of fit.

Functional Classification	%RMSE	%Error	%VMT error	FHWA Error Standard
Interstate	16.4%	4.2%	0.2%	7.0%
Major Arterial	15.7%	-0.5%	0.7%	15.0%
Minor Arterial	26.2%	-2.9%	-3.3%	15.0%
Collector	31.8%	3.1%	1.3%	25.0%
Local	132.8%	-51.9%	-37.4%	50.0%
Volume Group (Daily)	**%RMSE**	**%Error**	**%VMT error**	**FHWA Error Standard**
Under 1000	63.7%	11.6%	-0.5%	47%
1000 to 2500	30.6%	5.2%	-1.4%	36%
2500 to 5000	25.6%	0.6%	5.2%	30%
5000 to 10000	19.6%	3.1%	1.9%	24%
10000 to 15000	15.7%	-0.9%	-0.9%	20%
15000 to 25000	16.7%	-2.5%	-2.7%	15%
25000 to 50000	22.6%	-5.7%	-0.7%	10%
Overall Model	24.63%	-1.1%	-0.4%	

Table 2 – Model Validation Statistics

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Figure 4 Percent error by link volume compared to FHWA standard

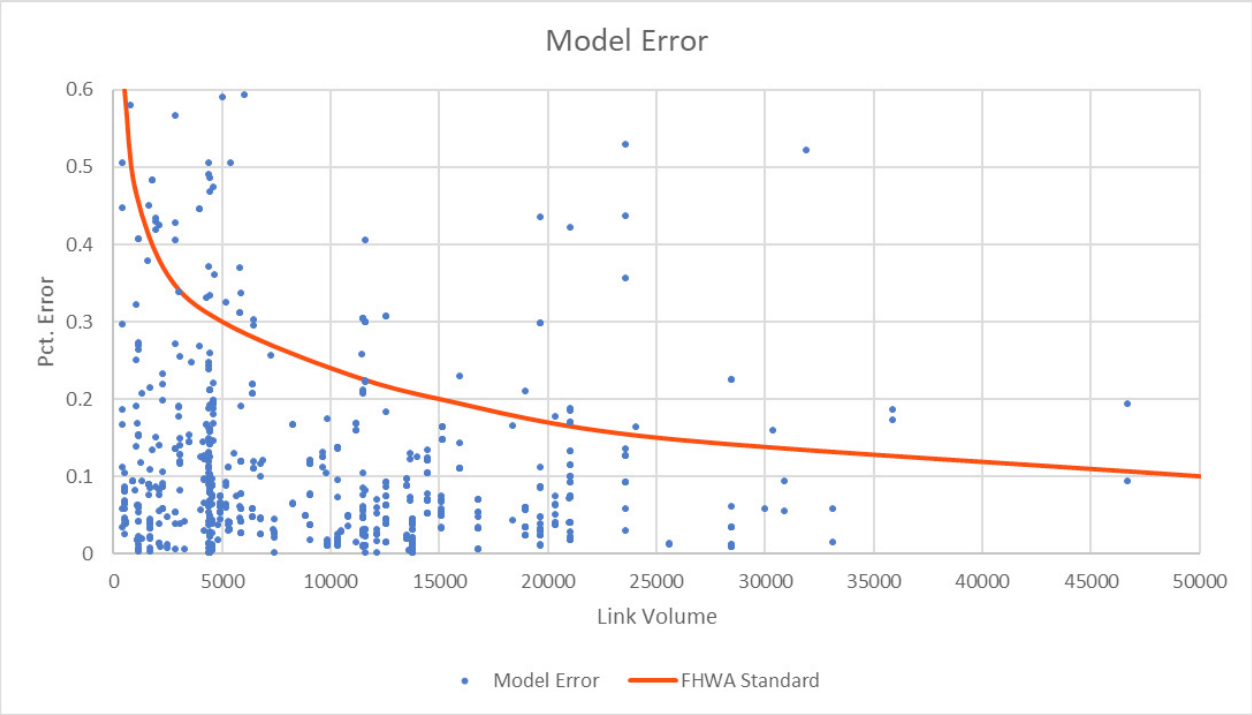
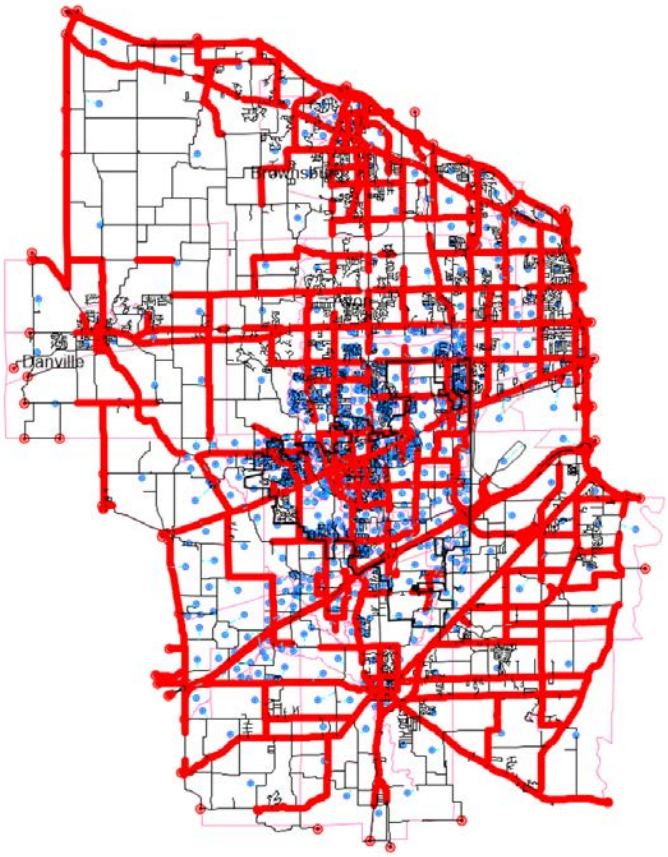


Figure 5 – Model Links with Traffic Data for Model Validation



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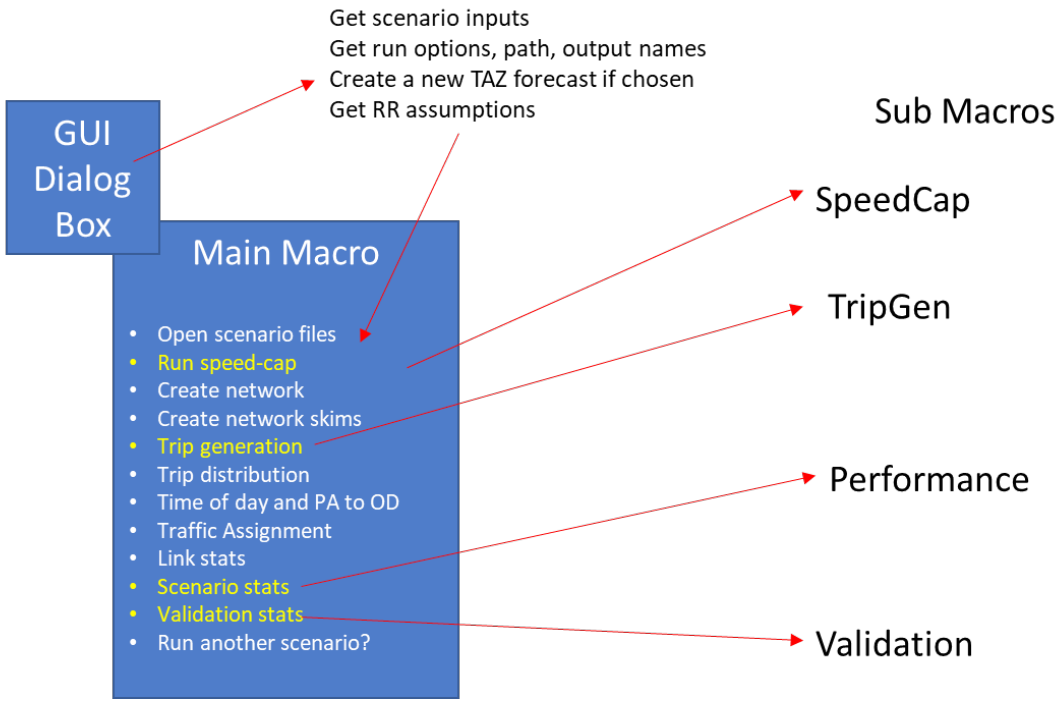
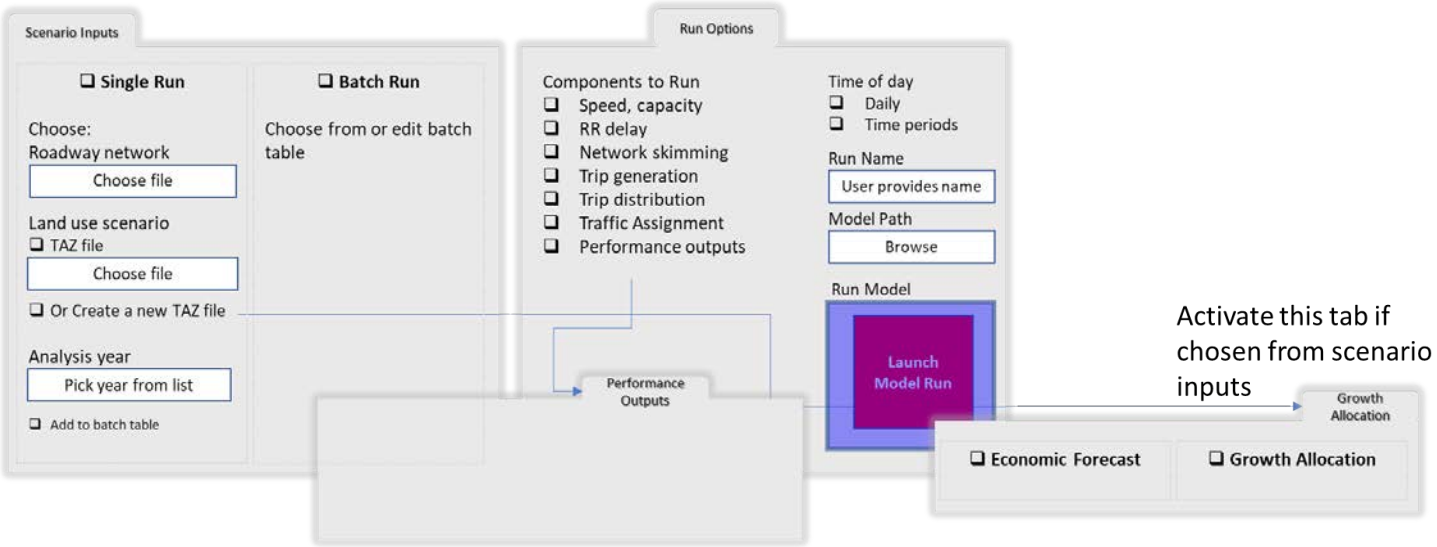
Model Flowchart



Graphical User Interface (GUI)



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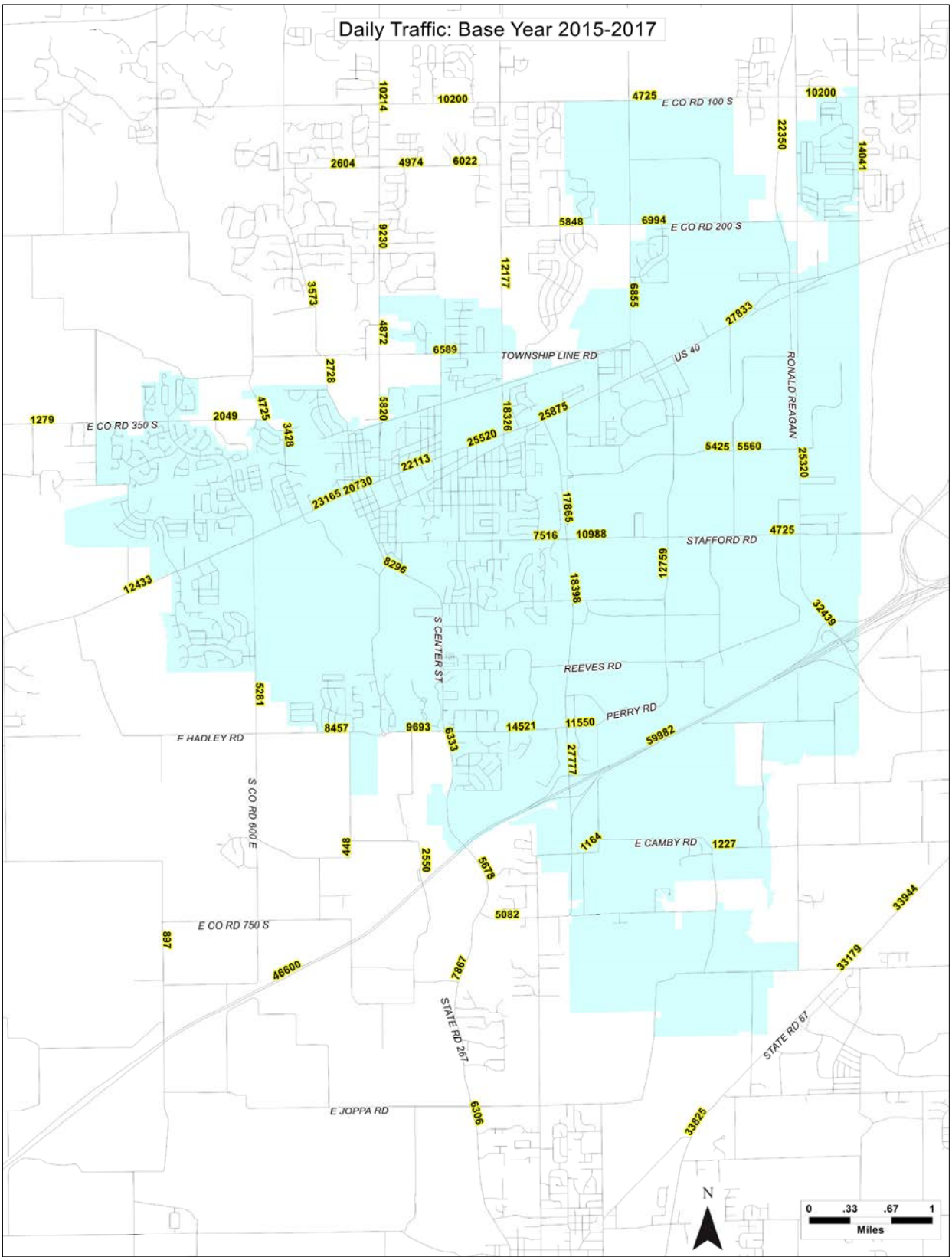
CURRENT CONDITIONS ADT



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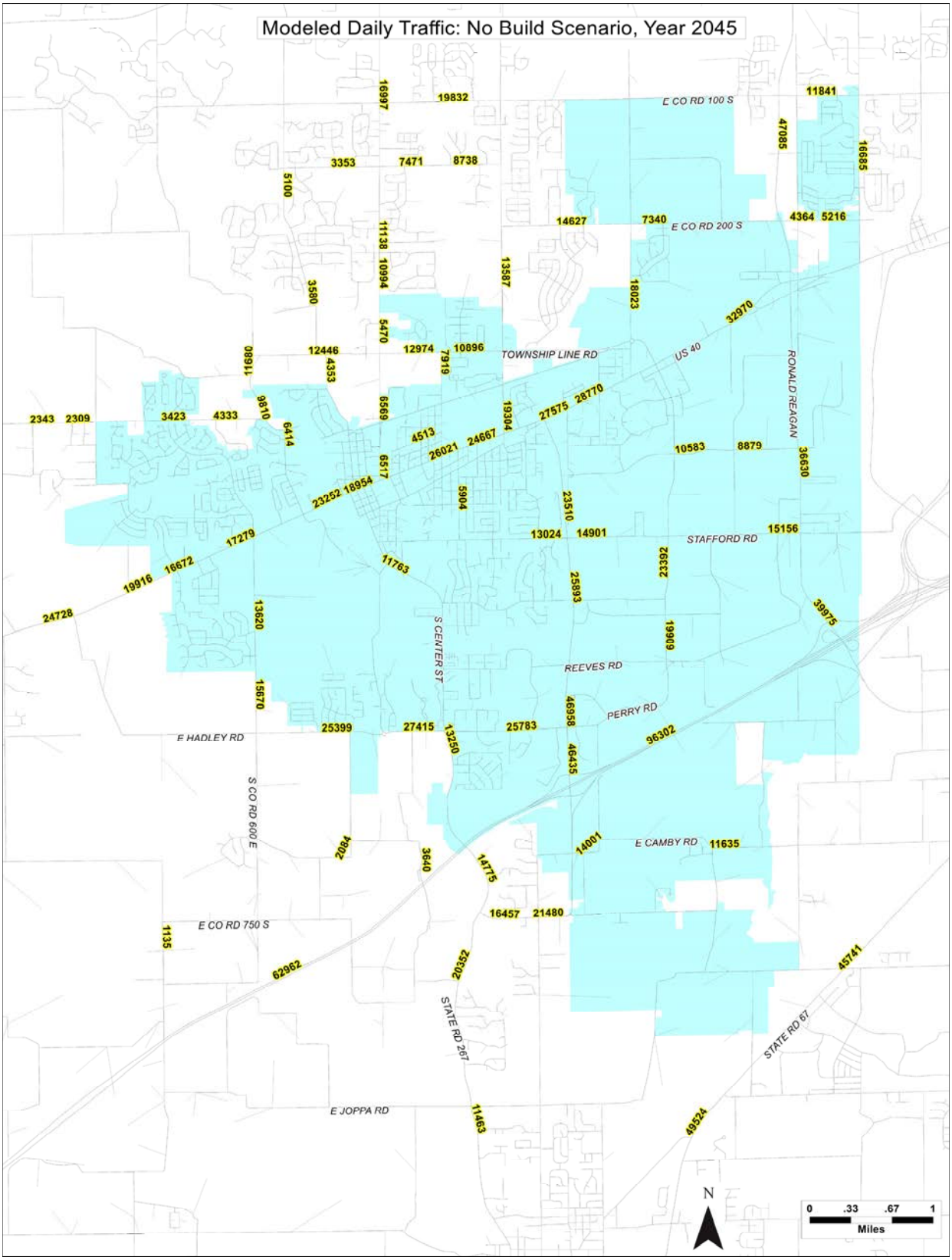
NO BUILD FUTURE 2045 ADT



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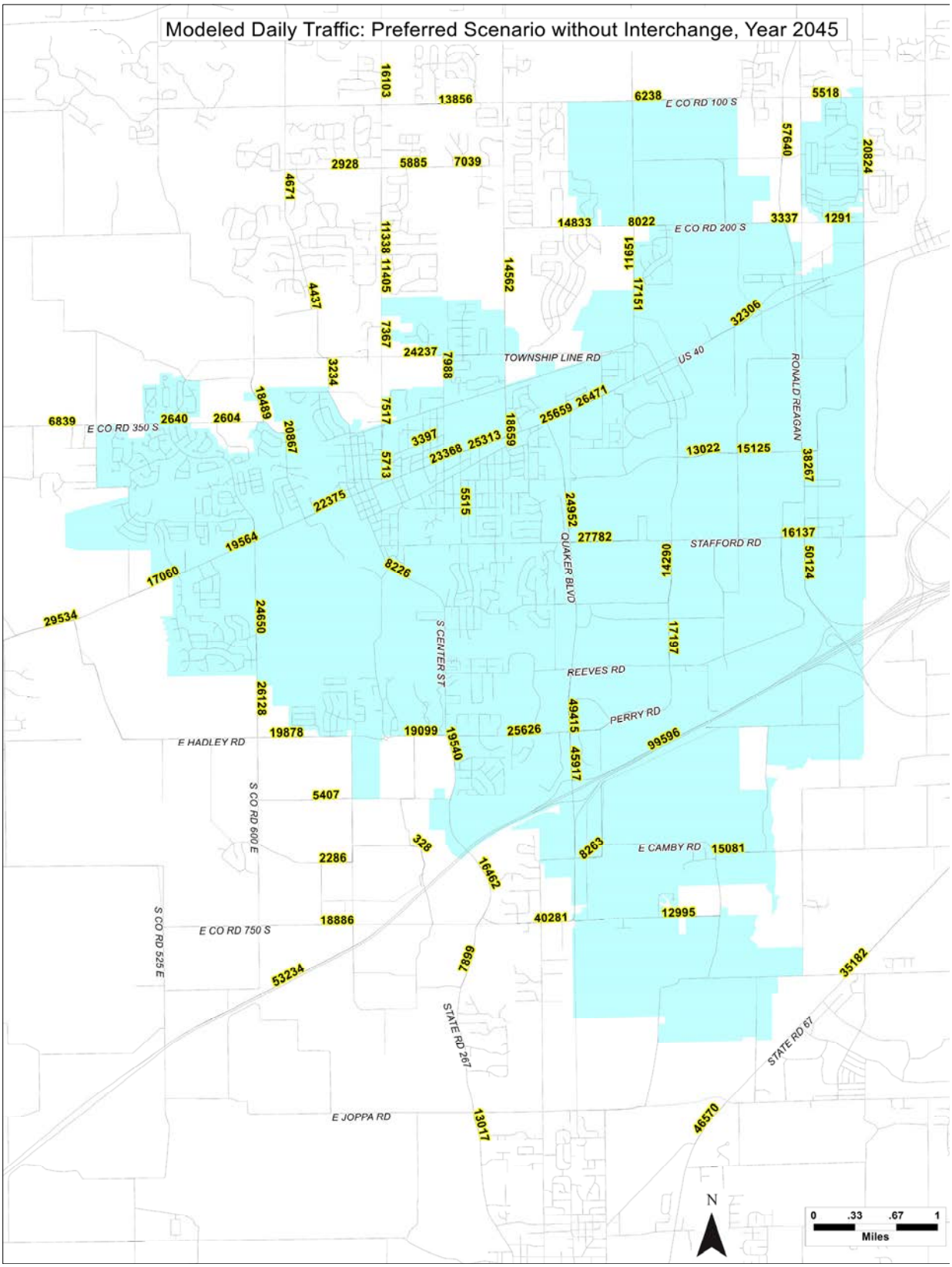
PREFERRED SCENARIO 1



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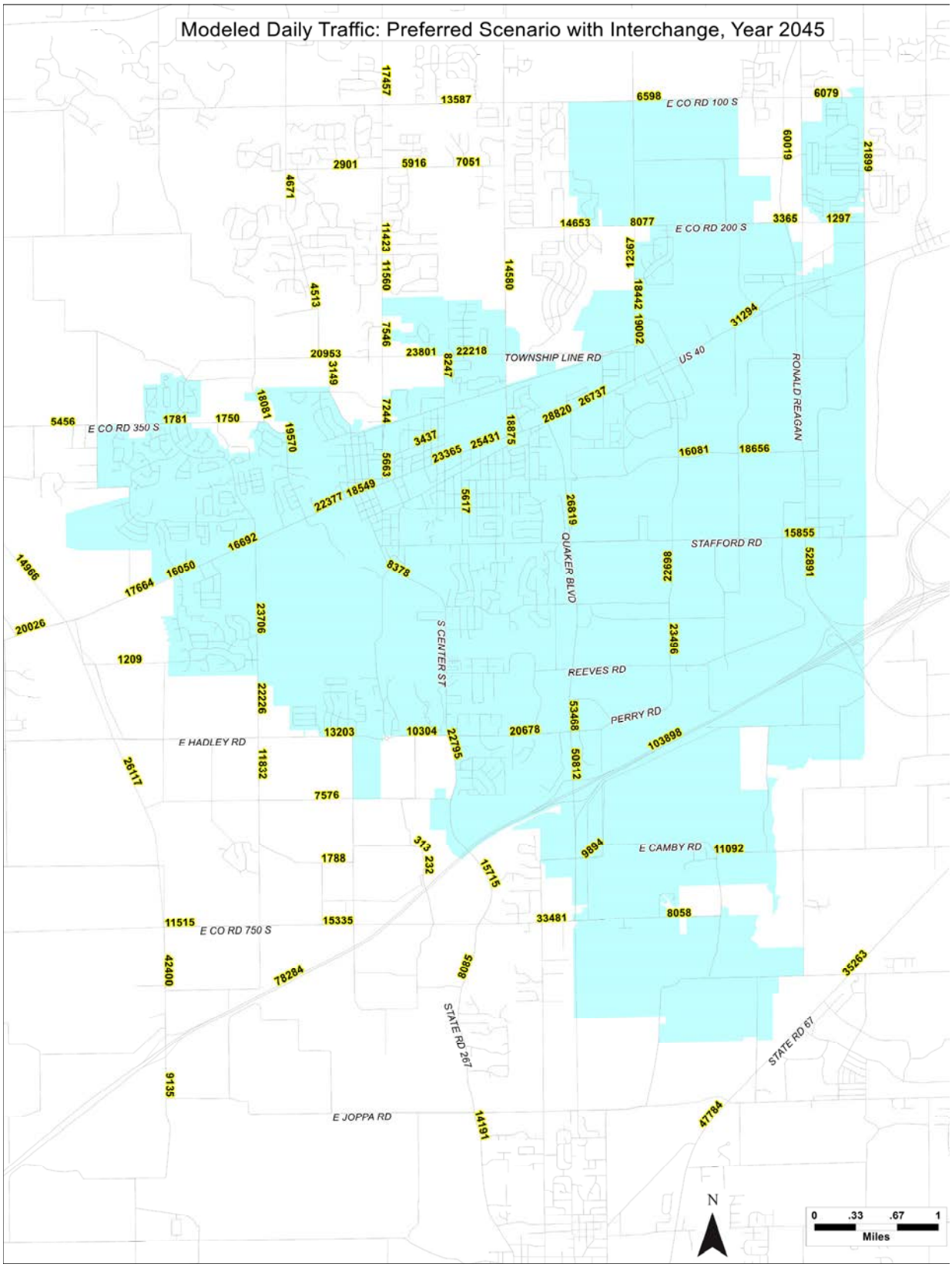
PREFERRED SCENARIO 2 (with interchange)



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SHORT-TERM CAPACITY PROJECTS LIST & PROBABLE COST ESTIMATES

Number	Capacity Project	Project Description	Functional Class	Lanes	Speed	Scenario 1	Scenario 2	Plan Cost Estimate (in $)
1	Hadley Rd (Sugar Grove Road to Byscand Blvd.)	Improve existing roadway to 3-lane section	Principal Arterial	3	45	X	X	Complete
2	Carr Road, US-40, and Township Line Rd	Carr Rd reconstruction: widen to 3-lane section	Major Collector	2	30	X	X	3,580,000
3	Smith Rd (Phase 2: 25%)	Improve from Township Line Rd to Main St.	Major Collector	2	25	X	X	970,000
4	Smith Rd (Phase 1: 75%)	Improve from CR 200 S to Township Line Rd	Major Collector	2	25	X	X	3,320,000
5	Stout Heritage PKWY Widening	Planned to widened to accommodate Canyon Club	Major Collector	2	25	X	X	Complete
6	Widen Stout Heritage to 4 Lanes	Widen from Ronald Regan PKWY to Airtech PKWY	Major Collector	4	35	X	X	1,830,000
7	New I-70 Interchange	New Interchange located at 525 E	Interstate	6	70		X	20,000,000
8	Airtech-Whitaker Connection	2-lane local industrial roadway	Minor Collector	2	25	X	X	660,000
9	Klondike Rd - South	3-lane section road connecting U.S. 40 to Airtech	Minor Collector	3	25	X	X	1,610,000
10	Klondike Rd - North	3-lane section road connecting U.S. 40 to Bradford Rd.	Minor Collector	3	25	X	X	2.600,000
11	Hadley Rd. Widening	5-lane section from Moon Road to Hunters Ridge	Principal Arterial	4	45	X	X	3,540,000
12	Moon Rd. Upgrade	5-lane section from Hadley to Belvista	Minor Arterial	4	45	X	X	3,770.000
13	Moon Rd. Upgrade	5-lane section from Belvista to US 40	Minor Arterial	4	45	X	X	3,400,000
14	Moon/Hadley Intersection	Intersection improvements	Intersection			X	X	2,200,000
15	Moon/US 40 Intersection	Intersection improvements	Intersection			X	X	2,600,000
16	SR 267/750 S Intersection	Intersection improvements	Intersection			X	X	2,200,000
17	US40/Perry Rd Intersection	Intersection improvements	Intersection			X	X	2,200,000
18	Stout Heritiage/ Reagan Intersection	Intersection improvements	Intersection			X	X	2,200,000
19	SR267/Hadley Intersection	Intersection improvements	Intersection			X	X	2,800,000
20	SR 267/Reeves Intersection	Intersection improvements	Intersection			X	X	2,600,000
21	SR 267/Stafford Rd Intersection	Intersection improvements	Intersection			X	X	2,600,000

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MID-TERM CAPACITY PROJECTS LIST & PROBABLE COST ESTIMATES CONT.

***Planning Cost Estimates are for planning purposes only. Detailed cost estimates will need to be developed once detailed project scope and requirements are established.**

	Capacity Project	Project Description	Functional Class	Lanes	Speed	Scenario 1	Scenario 2	Plan Cost Estimate (in $)
22	Stout Heritage PKWY - Elm Extension	Open access to SR-267 via Metropolis/Elm	Minor Collector	2	25	X	X	1,010,000
23	Hadley Road Extension	From Regional Connector to Moon Rd	Principal Arterial	2	25	X	X	1,200,000
24	CR 675 E Reconstruction	MOU with Westport Homes to improve / widen roads	Minor Collector	2	35	X	X	1,740,000
25	NE Warehouse District, Project 2	Connects AllPoints Rd to Ronald Regan PKWY between	Minor Collector	2	25	X	X	1,830,000
26	Southfield Dr	Connect Stanley to Reeves	Local	2	25	X	X	790,000
27	Bradford Rd from Raceway to CR 1050 E	Reconstruct County Road Section to Town Standards	Minor Collector	2	35	X	X	1,760,000
28	Wabash St, Realignment	--	Local	2	25	X	X	310,000
29	Raceway Rd Extension	From Stout Hertiage to US40	Major Collector	2	45	X	X	6,560,000
30	Raceway Rd Extension	From Stafford to Stout Heritage	Major Collector	2	45	X	X	
31	Airtech Extension	From Reagan to Raceway Extension	Local	2	35	X	X	520,000
32	Smith Rd	Upgrade from 200S to 100S	Minor Collector	2	35	X	X	3,550,000
33	Allpoints Pkwy	Upgrade from Smith Rd to Allpoints	Minor Collector	2	35	X	X	2,370,000
34	Road Extension	Extend from US40 to Metropolis	Minor Collector	2	35	X	X	2,120,000
35	Allpoints Pkwy Extension	Connect from Reagan to 6points	Minor Collector	2	35	X	X	560,000
36	Plainfield Commons Extension	New Road from US40 to Smith Rd	Major Collector	4	45	X	X	790,000
37	Upgrade 575 E	From new I-70 Interchange to 750 S	Major Collector	4	45		X	4,110,000
38	Reagan Parkway	Added Lanes	Principal Arterial	6	45	X	X	8,320,000
39	200 S Extension	From Reagan Pkwy to Raceway Rd	Local	2	35	X	X	990,000
40	251 S Extension	From Reagan Pkwy to Raceway Rd	Local	2	35	X	X	800,000
41	Earlhan Ln Connector	From 251S to 200S	Local	2	35	X	X	600,000

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LONG-TERM CAPACITY PROJECTS LIST & PROBABLE COST ESTIMATES CONT.

***Planning Cost Estimates are for planning purposes only. Detailed cost estimates will need to be developed once detailed project scope and requirements are established.**

	Capacity Project	Project Description	Functional Class	Lanes	Speed	Scenario 1	Scenario 2	Plan Cost Estimate (in $)
42	Upgrade Moon Rd.	From 650 S to Hadley Rd.	Major Collector	4	45	X	X	
43	New Int. and Regional Connector	New I-70 Int. and new alignment connector to US 40	Principal Arterial	4	55		X	25,140,000
44	Joppa Rd	Upgrade and add lanes	Minor Collector	4	45		X	21,490,000
45	New Road 825 E	Connect Mooresville to SR267 Interchange	Minor Collector	4	45	X	X	10,690,000
46	New Road - South I-70 Frontage Rd	Connect SR 267 to Ameriplex	Minor Collector	2	35	X	X	9,370,000
47	Stanley Rd Extension	New road between Center and Moon	Major Collector	4	45	X	X	7,190,000
48	Lincoln St Extension to Avon Ave	New connection	Minor Collector	2	25	X	X	150,000
49	Quaker Blvd. Extension	New road from US 40 to Township Line Rd	Principal Arterial	4	45	X	X	
50	Upgrade 350S	From Saratoga to 300 E	Minor Collector	2	35	X	X	7,670,000
51	Regional Connector Segment #2	From US 40 to Cartersburg Rd	Principal Arterial	4	55		X	14,180,000
52	Extension of 521 E	Extend 521 E south to 650 S	Local	2	35	X	X	200,000
53	Extension of 521 E	Extend 521 E north from Hadley Rd to Chazmal	Local	2	35		X	890,000
54	Extension of Chazmal	From existing cul de sac westward to new Regional Connector	Local	2	35		X	1,140,000
55	Upgrade 725 E	From 650S to Hadley Rd	Local	2	35	X	X	710,000
56	New Road 650 S	From 675 E to Center	Minor Collector	2	35	X	X	2,680,000
57	New Road 565 E	New N-S road from Mockernut Ct to Hadley Rd	Local	2	35	X	X	1,290,000
58	Upgrade 700S	Upgrade between Moon and 675E	Local	2	35	X	X	1,160,000
59	Upgrade 750 S	improve between 600 E and 675 E	Minor Collector	2	45	X	X	2,680,000
60	New Road 675 E	From 750 S to 700 S	Minor Collector	2	35	X	X	1,800,000
61	New Road 750 S	Extend 750 S from 375 E to 525 E	Minor Collector	2	45		X	
62	Upgrade 675 S	From 675 E to 725 E	Minor Collector	2	35	X	X	850,000

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LONG-TERM CAPACITY PROJECTS LIST & PROBABLE COST ESTIMATES CONT.

***Planning Cost Estimates are for planning purposes only. Detailed cost estimates will need to be developed once detailed project scope and requirements are established.**

	Capacity Project	Project Description	Functional Class	Lanes	Speed	Scenario 1	Scenario 2	Plan Cost Estimate (in $)
63	Upgrade 725 E	From I-70 to 675 S	Minor Collector	2	35	X	X	1,050,000
64	Upgrade 675 S	From 675 E to 725 E	Local	2	35	X	X	2,540,000
65	Upgrade 675 S	From 700S to 650 S	Minor Collector	2	35	X	X	1,800,000
66	Upgrade Center St.	From SR267 to Hadley Rd	Minor Arterial	4	45	X	X	11,340,000
67	Moon Rd Upgrade	From 750 S to 650 S	Major Collector	4	45	X	X	4,570,000
68	New Road 650 S	From Moon Rd to 675 E	Major Collector	2	35	X	X	
69	New Road 650 S	From Regional Connector to Moon Rd	Minor Collector	2	35		X	
70	Upgrade 750 S	Improve 750 S to 4 lane minor arterial	Minor Arterial	4	45		X	
71	South Connector Option #1	From 675 E at I-70 to SR 267	Major Collector	4	45		X	
72	Extend 750 S across I-70	New Road replacing rest area	Minor Arterial	4	45	X	X	
73	Camby Rod upgrade	Upgrade from SR 267 to Marion Co	Minor Collector	2	35	X	X	

Costs/Mile by Classification	
Major Arterial	$7,000,000
Minor Arterial	$5,500,000
Major Collector	$4,500,000
Minor Collector	$3,500,000
Local	$1,500,000

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PREFERRED SCENARIO 2 MCIBAS ANALYSIS SUMMARY

INDOT

SIMPLIFIED ECONOMIC ANALYSIS TOOL
PROJECT ANALYSIS RESULTS SUMMARY

MCIBAS

Project: Economic impacts of Plainfield Thoroughfare Plan Projects
Analyzer Name: Dean Munn, Convergence Planning LLC
Analysis Date: 3/11/2019
Run Date: 3/11/2019
Model Run File Name: 2045 Build Network Scenario 16

PROJECT PERFORMANCE

OTHER PERFORMANCE MEASURES	
Daily Vehicle-Hours of Delay (DVHD) Savings	17,119
Annual Reduction in Total Accidents	83
Annual Reduction in Fatal Accidents	0.04

A: NON-BUSINESS USER BENEFITS (mil. 2015$)	25-Year Total	Annual Average
Travel Time Savings (Non-Business)	$930.5	$37.2
Vehicle Oper Cost Savings (Non-Business)	$23.0	$0.9
Acc Cost Savings (Non-Bus & Non-Economic)	$80.4	$3.2
Emissions Cost Savings	$21.5	$0.9

B: BUSINESS USER BENEFITS (mil. 2015$)	25-Year Total	Annual Average
Travel Time Savings (Business)	$340.8	$13.6
Vehicle Oper Cost Savings (Business)	$59.6	$2.4
Accident Cost Savings (Business)	$5.5	$0.2

D: LONG-TERM ECONOMIC IMPACTS	25-Year Total	Annual Average
Gross Regional Product (mil. 2015$)	$1,721.4	$68.9
Real Personal Income (mil. 2015$)	$1,686.3	$67.5
Employment (job-years)	18,865	755

Notes: Economic Impacts do not include short-term effect of construction and are calculated using simplified method.

C = A + B DIRECT USER BENEFITS (mil. 2015$)	25-Year Total	Annual Average
Travel Time Savings	$1,271.3	$50.9
Vehicle Operating Cost Savings	$82.6	$3.3
Accident Cost Savings	$85.9	$3.4
Emissions Cost Savings	$21.5	$0.9
Residual Value at End of Analysis	$0.0	
TOTAL DIRECT USER BENEFITS	$1,461.3	
USER BENEFIT-COST RATIO	6.3	
NET PRESENT VALUE (mil. 2015$)	$1,229.5	

E = A + D USER AND ECONOMIC BENEFITS (mil. 2015$)	25-Year Total	Annual Average
Travel Time Savings (Non-Business)	$930.5	$37.2
Vehicle Oper Cost Savings (Non-Business)	$23.0	$0.9
Acc Cost Savings (Non-Bus & Non-Economic)	$80.4	$3.2
Emissions Cost Savings	$21.5	$0.9
Real Per Income (Bus Cost Savings & Attract)	$662.9	$26.5
Residual Value at End of Analysis	$0.0	
TOTAL USER AND ECONOMIC BENEFITS	$1,718.3	
BENEFIT-COST RATIO with economic benefits	7.4	
NET PRESENT VALUE (mil. 2015$)	$1,486.6	

SCENARIO COMPARISONS TABLE

Comparison of Modeled Scenarios				
Year	2017	2045	2045	2045
Network	Existing	No Build	Preferred Scenario 1	Preferred Scenario 2 (with interchange)
Daily Vehicle Trips	843,789	934,611	1,029,765	1,047,511
Daily VMT				
Interstate	477,512	728,501	683,519	797,802
Principal Arterial	871,512	1,185,093	1,353,587	1,517,643
Minor Arterial	345,339	636,440	842,179	746,809
Collector	50,029	96,755	71,924	107,252
Local	561,615	810,587	633,314	820,340
Total	*2,305,913*	*3,457,375*	*3,584,523*	*3,990,845*
Daily VHT				
Interstate	8,059	13,285	12,918	15,144
Principal Arterial	52,815	72,739	68,818	74,258
Minor Arterial	18,537	37,866	32,573	29,260
Collector	2,800	5,253	3,364	4,461
Local	55,889	73,990	60,680	69,173
Total	*138,098*	*203,133*	*178,353*	*192,296*
Average Trip Duration (min.)	9.82	13.04	10.39	11.2
Daily Vehicle Delay Hours				
Interstate	185.2	1,261.8	1,485.3	1,828.3
Principal Arterial	33,285	46,128.2	38,760.0	40,962.9
Minor Arterial	9,504	21,467.3	11,145.7	10,459.1
Collector	1,383.8	2,727.8	1,399.4	1,617.3
Local	33,862	42,687.5	35,954.1	37,042.0
Total	*78,219.9*	*114,563.7*	*88,744.5*	*91,909.7*
Average Delay Per Vehicle (min)	5.56	7.35	5.17	5.36
Average Speed	16.7	17	20.1	20.8

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Comparison of Modeled Scenarios *(continued)*				
Year	2017	2045	2045	2045
Network	Current	No Build	Preferred Scenario 1	Preferred Scenario 2 (with interchange)
Daily VMT at LOS				
A or B	1,608,949	1,399,577	2,069,843	2,069,521
C	306,643	654,741	312,316	294,489
D	105,916	171,021	192,075	446,087
E	77,585	175,457	324,936	455,698
F	207,020	1,056,579	685,354	725,049
Deficient Lane Miles				
Interstate	0.51	3.5	4.13	11.32
Principal Arterial	8.02	21.04	20.27	24.50
Collector	2.74	13.03	5.05	5.50
Local	0.79	1.45	0.11	0.62
Total	*12.07*	*39.02*	*29.57*	*41.94*
Estimated Cost to Fix (Mil)	$26.98	$85.52	$71.65	$106.65
Accidents				
Fatal	3.76	5.06	5.26	5.84
Injury	406.75	546.23	561.48	633.45
Property Damage	$2,633.04	$3,519.36	$3,604.03	$4,075.33

REVISED FINAL DRAFT 4.15.2019