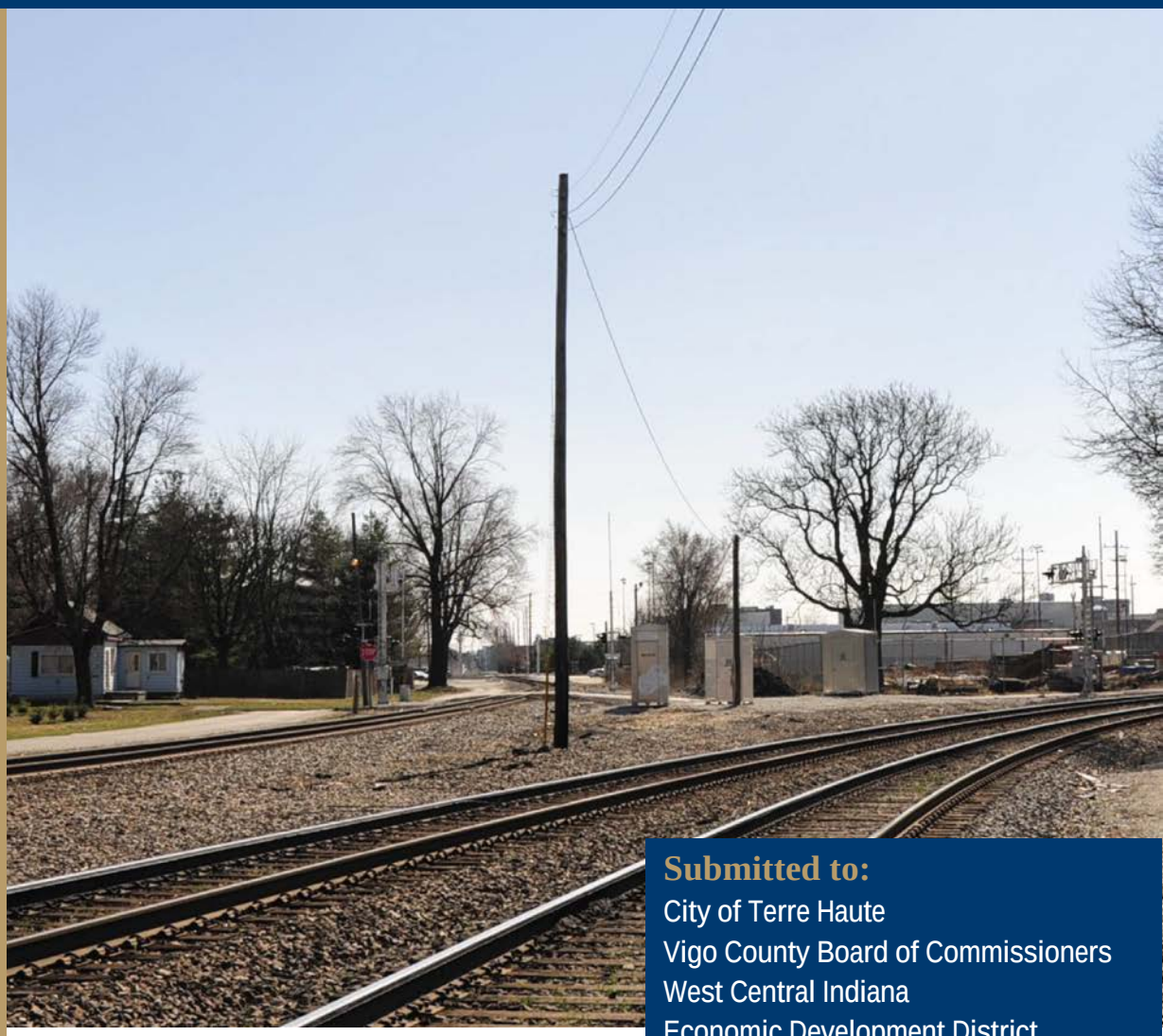
Terre Haute Urbanized Area Railroad Corridor Study



Submitted to:

City of Terre Haute
Vigo County Board of Commissioners
West Central Indiana
Economic Development District

Submitted by:

URS Corporation
The Corradino Group
HWC Engineering

May 15, 2012

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Executive Summary

This study was a collaborative effort lead by the City of Terre Haute, Vigo County Board of Commissioners, and the West Central Indiana Economic Development District – the designated Metropolitan Planning Organization (MPO) for the Terre Haute – Vigo County Metropolitan Planning Area. The study covers the Terre Haute Urbanized Area (UA) defined in 2000 by the U.S. Census Bureau. The goals of this study are to:

- Identify and validate the purpose and need for a series of practical short and long term improvement projects, with independent utility, to mitigate the adverse community effects of rail operations in the Terre Haute Urbanized Area (UA).
- Develop and write a formal plan (this report), adopted by the MPO's Transportation Policy Committee, that outlines both short-range and long-range strategies and actions to be completed over the next 5 to 20 years to mitigate identified adverse effects of rail operations in the urbanized area. The adopted plan will serve as the framework for making strategic decisions concerning funding, prioritization and rail line improvements and relocations projects.
- Evaluate and screen, within the framework of the National Environmental Policy Act (NEPA), practicable alternatives (projects) that can be funded, programmed and advanced to construction.

The study was funded through a grant by the Federal Railroad Administration (FRA) to the City of Terre Haute, who provided the requisite 10% in local matching funds. The MPO shared study and grant management responsibility with the City of Terre Haute to insure development of an acceptable planning document that satisfies both NEPA and multimodal transportation planning requirements prescribed in 23 CFR 450, Subpart C. The Indiana Division of the Federal Highway Administration (FHWA) and the Indiana Department of Transportation provided support and assistance, and were active participants throughout the study process.

This study followed the NEPA process to develop a project "Purpose and Need," initiated a thorough "Public Involvement Process" (PIP), and evaluated alternatives based on impacts to the built and natural environments. This study will serve as the basis for any subsequent environmental documentation required for any of the recommended projects of independent utility contained within.

The local study team included officials from the City of Terre Haute, Vigo County Board of Commissioners, and the West Central Indiana Economic Development District. The members of the local study committee are:

DUKE BENNETT, CHAIR
Mayor of Terre Haute

CHARLES ENNIS
Terre Haute City Engineer

JUDY ANDERSON
Vigo County Commissioner

JERRY NETHERLAIN
Vigo County Engineer

RON HINSENKAMP
MPO Chief
Transportation Planner

This study recommends the following projects of independent utility, listed in order of priority, for adoption by the Terre Haute MPO's Transportation Policy Committee.

1. Intelligent Transportation System (ITS) Application for Emergency Services
   NEPA Document Required: low-level CE or no documentation
   Targeted Completion: two years (2014)

2. Margaret Avenue Grade Separation with North-South CSX Near 19th Street
   NEPA Document Required: approved CE
   Targeted Completion: five years (2017)

3. 8th Avenue/13th Street Grade Separation with North-South and East-West CSX
   NEPA Documentation Required: CE
   Targeted Completion: 13 years (2025)

4. Pedestrian and Bicycle Safety Improvements Near ISU Campus
   NEPA Documentation Required: CE
   Targeted Completion: 15 years (2027)

5. Grade Separation with North-South and/or East-West CSX
   NEPA Documentation: CE
   Targeted Completion: 20 years (2032)

Upon adoption of this study by the MPO's Transportation Policy Committee, the study will be considered the Terre Haute-Vigo County Rail Line Relocation & Improvement Corridor Plan and the adopted plan will become a subset of the Terre Haute-Vigo County Long Range Transportation Plan 2030 (LRTP). However, projects identified in the adopted plan are considered illustrative (unfunded) until they are amended into the LRTP and included in the Transportation Improvement Program (TIP).

METROPOLITAN PLANNING ORGANIZATION
WEST CENTRAL INDIANA ECONOMIC DEVELOPMENT DISTRICT, INC.
TRANSPORTATION POLICY COMMITTEE

Resolution Number 051512-03

A resolution adopting the *Terre Haute Urbanized Area Railroad Corridor Study* (hereinafter referred to as the *THUA RR Corridor Study*).

WHEREAS, West Central Indiana Economic Development District, Inc. (WCIEDD) is the Metropolitan Planning Organization (MPO), designated by the Governor of Indiana, that is responsible for multimodal metropolitan transportation planning in the Terre Haute Urbanized Area and the Terre Haute – Vigo County Metropolitan Planning Area pursuant to 23 U.S.C. 450.310 (Designations); and

WHEREAS, Pursuant to the Section 1308 of the Transportation Equity Act for the 21st Century, TEA-21 (Pub L. 105-178) an MPO may undertake a multimodal, systems-level corridor or subarea planning study as part of the metropolitan transportation planning process; and

WHEREAS, The results or decisions of such transportation planning studies may be used as part of the overall project development process consistent with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*) and associated implementing regulations (23 CFR Part 771 and 40 CFR Parts 1500-1508); and

WHEREAS, The City of Terre Haute, Vigo County Board of Commissioners and the MPO partnered in the process of conducting the *THUA RR Corridor Study*, which was funded by the Federal Railroad Administration (FRA), for the purpose of:

- Identifying and validating the purpose and need for a series of practical short and long term improvement projects, with independent utility, to mitigate the adverse community effects of rail operations in the Terre Haute Urbanized Area (UA); and

- Developing and writing a formal plan (this report), adopted by the MPO's Transportation Policy Committee, that outlines both short-range and long-range strategies and actions to be completed over the next 5 to 20 years to mitigate identified adverse effects of rail operations in the urbanized area. The adopted plan will serve as the framework for making strategic decisions concerning funding, prioritization and rail line improvements and relocations projects; and

- Evaluating and screening, within the framework of NEPA, practicable alternatives (projects) that can be funded, programmed and advanced to construction; and

WHEREAS, The process used for conducting the *THUA RR Corridor Study* substantially complies with the intent of 23 CFR 134, the continuous, cooperative and comprehensive (3C) metropolitan planning process prescribed in 23 CFR 450, and the NEPA process; and

WHEREAS, The public was afforded the opportunity to provided input and comment about the *THUA RR Corridor Study* during public information meetings held on June 28, 2011 and on March 28, 2012; and

WHEREAS, Printed draft copies of the final draft report of the *THUA RR Corridor Study* were also made available for public review and comment from May 2nd to May 11th, 2012 at the MPO's office located at 1718 Wabash Ave., Terre Haute, IN 47807; at the Main Branch of Vigo County Library, One Library Square, Terre Haute, IN 47807; and in electronically accessible format on the World Wide Web; with no adverse public comments received; and

WHEREAS, Copies of the final draft report of the *THUA RR Corridor Study* were provided to the Federal Railroad Administration, the Federal Highway Administration, and the Indiana Department of Transportation on April 30, 2012 for comment and review; with no adverse comments of a material nature expected; Now

THEREFORE BE IT RESOLVED, The WCIEDD Transportation Policy Committee hereby approves and adopts the *Terre Haute Urbanized Area Railroad Corridor Study,* contingent upon satisfactory completion of the aforementioned review and comment period by the Federal Railroad Administration, the Federal Highway Administration and the Indiana Department of Transportation. The adopted study is hereby considered a subset of the Terre Haute-Vigo County Long Range Transportation Program 2030 (LRTP). However, projects identified in the study are considered illustrative (unfunded) until they are amended into the LRTP and included in the Transportation Improvement Program (TIP).

The above and foregoing resolution was hereby adopted this 15th day of May 2012 during a regular public meeting of the MPO's Transportation Policy Committee held in Terre Haute, IN.

ATTEST:

Judy A. Anderson
Vigo County Board of Commissioners
Transportation Policy Committee Chair

Ronald M. Hinsenkamp
WCIEDD Chief Transportation Planner
Transportation Policy Committee Recorder

Duke Bennett
Mayor of the City of Terre Haute
Transportation Policy Committee Vice Chair

U.S. Department of Transportation
Federal Highway Administration

Indiana Division

575 N. Pennsylvania Street, Room 254
Indianapolis, IN 46204
317-22-7475
317-226-7341

June 21, 2012

In Reply Refer To:
HAD-IN

Ms. Judy Anderson
Chairman, Transportation Policy Committee
Metropolitan Planning Organization
West Central Indiana Economic Development District, Inc.
1718 Wabash Avenue
Terre Haute, Indiana 47807

Dear Ms. Anderson:

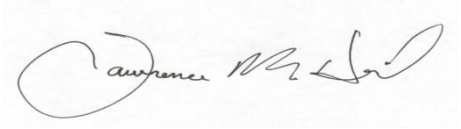
We have completed our review of the Terre Haute Urbanized Area Railroad Corridor Study and concur that the purpose and need and alternatives analysis establish a sound basis for advancing the following project:

1. Intelligent Transportation System (ITS) Application for Emergency Services (categorical exclusion needed; 2014 estimated completion date),
2. Margaret Avenue Grade Separation with North-South CSX Near 19th Street (Categorical Exclusion already approved; 2017 estimated completion date),
3. 8th Avenue/13th Street Grade Separation with North-South and East-West CSX (categorical exclusion needed; 2025 estimated completion date),
4. Pedestrian and Bicycle Safety Improvements Near ISU Campus (categorical exclusion needed; 2027 estimated completion date), and
5. Grade Separation with North-South and/or East-West CSX (categorical exclusion needed; 2032 estimated completion date).

We are particularly pleased with the quality of technical analysis that demonstrated that these projects provide the optimal investment strategy, both in terms of cost effectiveness and support from the community, railroad, and resource agencies. We believe the approach utilized to establish this local consensus is exemplary, and we intend to share it with other communities with similar challenges.

Should you or your staff have any questions regarding this planning finding, please contact Larry Heil at 317-226-7480.

Sincerely yours,



For: Robert F. Tally, Jr. P.E.
Division Administrator

Ron Hinsenkamp

From: Susan.Herre@dot.gov
Sent: Thursday, June 21, 2012 11:50 AM
To: rhinsenkamp@westcentralin.com
Cc: alice.alexander@dot.gov; wynne.davis@dot.gov
Subject: Terre Haute Rail Plan
Attachments: 120618 final draft report still dated May 15 2012 Terre Haute Rail Corridor Study 06-18-12.pdf

Ron Hinsenkamp
Chief Transportation Planner
Metropolitan Planning Organization
West Central Indiana Economic Development District, Inc.
1718 Wabash Avenue
Terre Haute, IN 47807-3323
(812) 917-3199

Hello Ron,

On June 12, 2012, FRA reviewed and commented on the draft planning report *Terre Haute Urbanized Area Railroad Corridor Study* dated May 15, 2012. Our comments were resolved by your email on June 19 with its attached revised report (report dated May 15, 2012; file dated June 18, 2012). We look forward to receiving the FINAL REPORT via email. Congratulations on the good work that this study represents.

Sincerely,

Susan

Susan M. Herre AIA AICP
Transportation Planner
Federal Railroad Administration
Washington, D.C.
Office 202 493-6151
Cell 202 747-4087
susan.herre@dot.gov

CSX TRANSPORTATION

500 Water Street - J202
Jacksonville, FL 32202
(904) 359-3572

L. L. Ratcliffe
Director - Network Planning

14 June 2012

Chairman, Transportation Policy Committee
Metropolitan Planning Organization
West Central Indiana Economic Development District
1718 Wabash Avenue
Terre Haute, Indiana 47807

Dear Chairman:

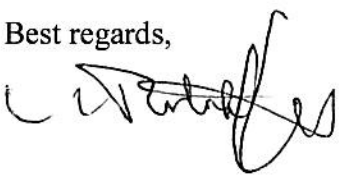
I have received the May 15, 2012 draft of Terre Haute Urbanized Area Railroad Corridor Study which I understand has been adopted by the MPO's Transportation Policy Committee. I wanted to take a moment to comment that this report is the result of a great deal of collaboration and workmanlike process.

Part of the reason for the quality of this report is the direct participation by the railroads through the whole process. I was pleased that CSX Transportation was invited to be involved through the study process and that railroad concerns were noted and addressed in realistic ways. CSX Transportation supports this type of railroad involvement and believes that if studies are handled properly, such rail studies can be completed more quickly and with better recommendations.

CSX Transportation's involvement through this study was in a way a test to gauge the impact of railroad participation in projects such as these. My conclusion is that the study benefited from railroad participation because rail operational concerns were identified and discussed up front, impractical options were quickly identified, and various options were jointly discussed and improved as the study progressed.

While CSX Transportation cannot participate in every rail study across its 21,000 mile network, in various situations railroad involvement would be beneficial to all concerned. As a result I would recommend that other communities consider the process developed in the Terre Haute study.

Best regards,



THE INDIANA RAIL ROAD COMPANY
101 WEST OHIO STREET, SUITE 1600, INDIANAPOLIS, INDIANA 46204 WWW.INRD.COM

Chairman, Transportation Policy Committee
Metropolitan Planning Organization
West Central Indiana Economic Development District
1718 Wabash Ave.
Terre Haute, IN 47807

June 18, 2012

RE: Terre Haute Urbanized Area Railroad Corridor Study

Indiana Rail Road Company fully supports the City of Terre Haute's and Vigo County's continuing efforts to minimize congestion and delays to vehicle traffic as a result of railroad operations.

INRD was a member of the public/private committee that was formed to analyze numerous options to achieve the above objective. This model proved to be integral in enabling the team to arrive at a consensus best solution.

INRD strongly believes in these types of partnerships and recommends they be established on the front end of future transportation projects involving private railroads and public entities.

Sincerely,

Peter J. Ray P.E.
Vice President – Engineering

1. Introduction

1.1 Study Goal

This study was a collaborative effort lead by the City of Terre Haute, Vigo County Board of Commissioners, and the West Central Indiana Economic Development District – the designated Metropolitan Planning Organization (MPO) for the Terre Haute – Vigo County Metropolitan Planning Area. The study covers the Terre Haute Urbanized Area (UA) defined in 2000 by the U.S. Census Bureau (see **Appendix A**). The goals of this study are to:

- Identify and validate the purpose and need for a series of practical short and long term improvement projects, with independent utility, to mitigate the adverse community effects of rail operations in the Terre Haute Urbanized Area (UA).

- Develop and write a formal plan (this report), adopted by the MPO's Transportation Policy Committee, that outlines both short-range and long-range strategies and actions to be completed over the next 5 to 20 years to mitigate identified adverse effects of rail operations in the urbanized area. The adopted plan will serve as the framework for making strategic decisions concerning funding, prioritization and rail line improvements and relocations projects.

- Evaluate and screen, within the framework of the National Environmental Policy Act (NEPA), practicable alternatives (projects) that can be funded, programmed and advanced to construction.

The study was funded through a grant by the Federal Railroad Administration (FRA) to the City of Terre Haute, who provided the requisite 10% in local matching funds. The MPO shared study and grant management responsibility with the City of Terre Haute to insure development of an acceptable planning document that satisfies both NEPA and multimodal transportation planning requirements prescribed in 23 CFR 450, Subpart C. The Indiana Division of the Federal Highway Administration (FHWA) and the Indiana Department of Transportation provided support and assistance, and were active participants throughout the study process.

There have been numerous studies of railroad issues over the years in the Terre Haute area; however, this is the first study to follow the NEPA process to develop a project "Purpose and Need," initiate a thorough "Public Involvement Process" (PIP), and evaluate alternatives based on impacts to the built and natural environments. Prior to using federal funds for construction of an infrastructure project, an environmental document conforming to NEPA standards must be completed and approved. This study will serve as the basis for any subsequent environmental documentation required for any of the recommended

projects of independent utility. Subsequent environmental documents can refer back to this study's "Purpose and Need," alternatives analysis, public involvement, and coordination with other state and federal resource agencies. The primary focus of any subsequent environmental document needed will be the determination of that particular project's footprint on environmental resources.

The local study committee included officials from the City of Terre Haute, Vigo County Board of Commissioners, and the West Central Indiana Economic Development District. The members of the local study committee are:

DUKE BENNETT, CHAIR
Mayor of Terre Haute

CHARLES ENNIS
Terre Haute City Engineer

JUDY ANDERSON
Vigo County Commissioner

JERRY NETHERLAIN
Vigo County Engineer

RON HINSENKAMP
MPO Chief Transportation Planner

A team of consultants were chosen by the local study committee to complete the study following the INDOT LPA Consultant Selection Procedures. The team consisted of the following consultants:

URS CORPORATION
Paul Satterly

THE CORRADINO GROUP
David Cleveland
Sarah Hoch

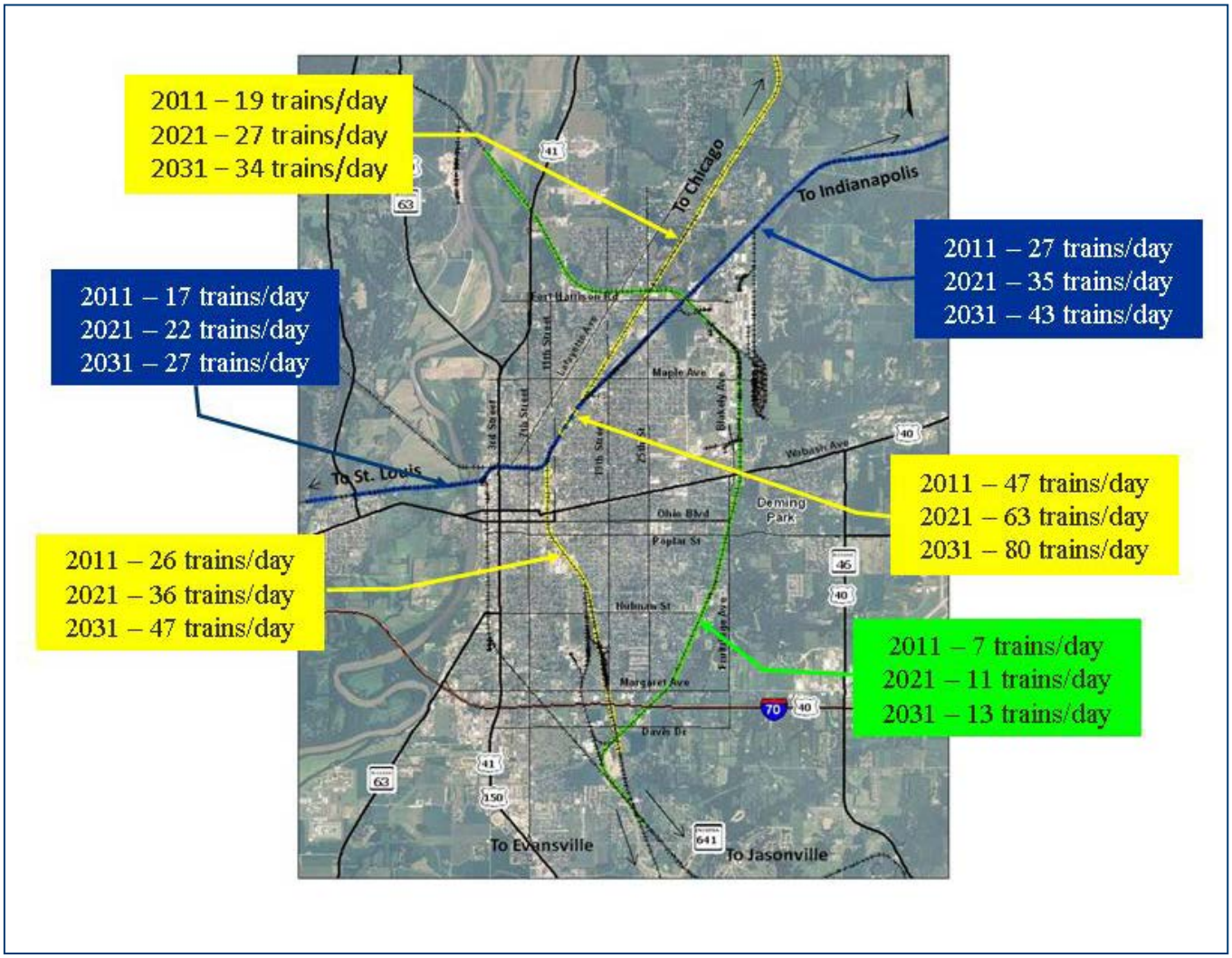
HWC ENGINEERING
Jim Rice

This study has been prepared from the perspective of the community and the roadway user. The alternatives analysis focuses on congestion, safety, and community cohesion experienced by the motoring public and non-motorized citizens. It is important to note that the railroads are private entities and the rail infrastructure is private property. The railroads have the right to operate as they are currently operating today. The railroads actively partnered with the study team to provide valuable information regarding rail operations and anticipated growth, and they also reviewed the study team's planning assumptions and cost estimates in order to make sure recommendations are based on accurate data. This partnership was critical to the identification of feasible, fundable projects to reduce congestion, improve safety, and better connect neighborhoods for the Terre Haute community.

1.2 Existing Conditions

There are currently two railroad companies operating within the Terre Haute UA, CSX Transportation (CSX) and the Indiana Rail Road Company (INRD). **Figure 1** illustrates the existing rail lines and forecasted train volumes in the Terre Haute UA. This study assigns colors to each rail corridor for clarity. The two railroads that run through downtown Terre Haute are operated by CSX. The Blue Corridor connects Indianapolis to St. Louis and is also referred to as the east-west corridor. There are currently two roadway grade separations along the Blue Corridor, the US 41 (3rd Street) overpass and the Fort Harrison Road overpass. The other CSX corridor, the Yellow Corridor, connects Chicago to Evansville and is also referred to as the north-south line. The Yellow Corridor has a single roadway grade separation, the I-70 overpass.

Figure 1
Existing Conditions Map



The Yellow (north-south) Corridor currently carries the highest train volume with 26 trains per day in 2011 and an anticipated 47 trains per day in 2031. The Blue (east-west) Corridor carried 17 trains per day in 2011, and is forecasted to carry 27 trains per day by 2031. The Yellow Corridor and Blue Corridor have a maximum train speed of 40 miles per hour (mph), with an exception for the Blue Corridor immediately north of the ISU campus where a maximum train speed of 25 mph is allowed due to the horizontal curvature of the track. The Yellow Corridor and Blue Corridor run parallel through the area known as the "Haley Interlocking", near the retired Haley Tower northeast of the Indiana State University (ISU) campus. This location experienced 47 trains per day in 2011 with an anticipated 80 trains per day in 2031.

INRD is a regional railroad that operates in Terre Haute. The INRD Green Corridor is located along the eastern side of the city. There are four existing roadway grade separations along the INRD, the I-70 overpass, the Wabash Avenue underpass, the Locust Street underpass, and the Beech Street underpass. The Green Corridor has the lowest train volume, carrying seven trains per day in 2011 with an anticipated volume of 13 trains per day in 2031. The Green Corridor has a maximum train speed of 25 mph.

There are three existing rail yards in Terre Haute. The Van Yard is located on the INRD Green Corridor at the Fruitridge Avenue grade crossing by the Fort Harrison Industrial Park. The Duane Yard is located on the CSX Blue (east-west) Corridor north of Maple Avenue and crosses 25th Street. The Baker Yard is located on the CSX Yellow (north-south) Corridor between I-70 and Hulman Street. The largest train stoppage delays in the community occur on the Yellow corridor at 19th Street and Margaret Avenue due to railroad activities at Baker Yard. Margaret Avenue crosses at the southern end of the Baker Yard at this location. The average blockage time at this location for through trains is only four minutes; however, it is common for the crossing to be blocked for up to an hour during switching operations.

2. Project Purpose and Need

2.1 Project Purpose

The purpose of this project is to improve safety, mobility, and community sustainability by mitigating the adverse effects that railroad operations have on the Terre Haute UA. This goal is achieved by meeting the following objectives:

- Reduce delay and improve mobility for motorists.
- Improve safety by reducing the potential for train, vehicle, and pedestrian collisions, and reducing emergency response times.
- Improve community sustainability by improving cohesion between neighborhoods and minimizing environmental impacts.
- Maintain railroad operations, including regional mobility, local mobility, and rail yard efficiency.

2.2 Need

The project ***need*** is to address issues related to mobility, public safety, community sustainability, and railroad operations. Within the study area, the existing rail lines fall within north-south and east-west corridors. The various alternatives being studied also conform to the north-south and east-west naming convention. The north-south and east-west rail corridors share the common "Needs" discussed below; however, each corridor's "Needs" inherently have slightly differing emphasis due to their differences in road networks, traffic patterns, and land use.

2.2.1 Mobility

Goal – Reduce vehicle hours of delay for motorists.

Train traffic through Terre Haute creates delays for motorists when crossings are temporarily blocked as trains pass through. There are 43 existing at-grade railroad crossings within the Terre Haute UA. The situation in Terre Haute is unique because trains often slow down or even stop in the urban area blocking numerous at-grade crossings. Stopped or slowed trains create additional delays above and beyond what most communities endure. Vehicular delays and queues have an adverse impact on air quality. Vehicular delays negatively impact the community through loss of productivity and lower quality of life.

2.2.2 Public Safety

Goals – Reduce the potential for train and vehicle or pedestrian collisions. Reduce the travel time between key destinations for emergency responders. Enable emergency responders to avoid long delays by providing dispatchers with up-to-date, crossing-blockage data.

Public safety is a factor in the decision making process for this study. This topic encompasses the potential for collisions between trains and vehicles or trains and pedestrians and emergency response (e.g., fire, ambulance, police, etc.,) that can be delayed by grade crossing blockages.

At-grade crossings create the potential for train and vehicle collisions. Using the FRA's web-based accident prediction system (WBAPS) tool, the potential for train and vehicle accidents can be quantified. Factors including the annual average daily traffic (AADT), the crossing treatment type, and the crash history are used by WBAPS to predict the probability of future crashes. While WBAPS is a valuable analysis tool, there are limitations on the coverage of factors that include sight-distance, highway congestion, bus or hazardous material traffic, and local topography. Vehicle and train collisions can be reduced by improving crossing protection or constructing grade separations. Pedestrian and train collisions mainly occur when pedestrians trespass onto railroad right-of-way; however, there is also a potential for pedestrian collisions at designated crossings.

Train-related crashes occurring in Vigo County from 1995 to 2010 were reviewed. There were 97 crashes involving roadway users (vehicles or pedestrians). Eight of the 97 crashes resulted in a fatality and 32 crashes resulted in injury. Crashes resulting in a fatality occurred at Feree Road (3 crash events), Lewis Road, Poplar Street, Wabash Avenue, College Street, and Fort Harrison Road. The crash history for the study area is not abnormally high. This is likely because the train speeds at the locations nearest the highest volume roadway at-grade crossings and the highest volume pedestrian areas, such as downtown and the ISU campus, are low. Improving safety is a goal, especially since train volumes are anticipated to nearly double over the next 20 years.

Response times for emergency personnel are an important aspect of public safety. Trains blocking grade crossings can delay personnel from responding to emergencies. There are two east-west existing roadway grade separations (US 41 and Ft. Harrison Road) and five existing north-south roadway grade separations (I-70, Wabash Avenue, Locust Street, Beech Street, and Fort Harrison Road) within the study area. Currently, it is difficult for First Responders (e.g., police, EMS, fire, etc.) to avoid delays caused by blocked crossings.

2.2.3 Community Sustainability

Goals – Minimize potential impacts to environmental resources, including wetlands, forested areas, endangered species, cultural resources, residences, and commercial and industrial properties. Promote railroad improvements that mesh with and support the goals of other locally supported and adopted planning efforts.

Community sustainability encompasses issues regarding environmental resources, quality of life, and community consensus. Environmental resources include wetlands, forested areas, endangered species, cultural resources, residences, and commercial and industrial properties. Minimizing impacts on these valuable resources is important to the community. Quality of life is inherently very broad and difficult to measure. For the purpose of this study, quality of life consists of noise generated by train horns, visual impacts, and impacts on residential areas. Train horns are an important aspect of at-grade crossing safety; however, they are a nuisance to residents. Grade separations or quiet zone crossings are methods of reducing the noise generated by train horns. Visual impacts include the effect of railroad infrastructure on the community; for example, grade separations or barriers in sensitive areas should be neutral or enhancing to the current landscape.

Community consensus is critical to the success of any project. Numerous locally initiated planning studies within the study area have been developed by planning professionals with input from stakeholders and the public. Some of these plans include *THRIVE 2025* (Terre Haute/Vigo County Comprehensive Plan), the *Rural Health Innovation Collaborative* (collaboration between institutes of higher education and regional medical services providers), and *the Indiana State University Strategic Long-Range Plan*. Railroad improvements will ideally compliment and accommodate these and other local planning efforts. Due to the amount of public involvement or adoption of these studies by governing bodies, they can be considered an evaluation tool for public consensus.

2.2.4 Railroad Operations

Goals – Maintain permitted train-travel speeds. Maintain local and regional train mobility, including customer access, rail yard access, travel length, and available switches.

Railroad operations affect the railroad's ability to do business in a profitable manner. Many employers in the Terre Haute community rely on the railroads as a part of their daily operations. The ability to complete switching operations and operate at reasonable speeds is critical to the railroads. Connectivity between existing rail yards (Baker Yard, Duane Yard, and Van Yard) and access to rail customers are also important. It is important for the railroads to be able to at least maintain their current operation levels; therefore, alternatives that reduce the railroads operations level are considered fatally flawed.

3. Tier 1 Alternatives Analysis

3.1 Tiered Analysis Approach

The purpose of the Tier 1 and Tier 2 analysis was to identify and prioritize, within a National Environmental Policy Act (NEPA) framework, a list of projects of independent utility that can be carried forward for further refinement and implementation. The main tool utilized in this analysis was the Tier 1 Analysis Matrix (**Table 1**). Tier 1 focused on corridor alternatives with a primary goal of determining corridor(s) in which to make future investments and improvements. Once the preferred Tier 1 corridors were identified, a more detailed benefit-cost analysis was conducted in Tier 2 to identify individual, fundable investment projects.

3.2 Tier 1 Analysis Methodology

Tier 1 focused on the overall railroad corridors. Critical factors such as expense and feasibility of phased implementation were examined. Because railroad projects can be costly, it was important that each project of independent utility fit within the scheme of an overall plan. It would not be prudent to construct a grade separation or establish a quiet zone along an existing railroad corridor if the ultimate goal is to relocate that corridor, so the ability to construct the project in independently fundable and useful segments was a key component of the Tier 1 analysis. Other considerations such as reduction in motorist delay, effect on railroad operations, and environmental impacts, were also considered in the Tier 1 analysis.

In an effort to apply the analysis in a consistent manner, the Tier 1 corridors represented conceptual alternatives that were fully grade-separated with a railroad maximum speed of 60 mph. The Tier 1 alternatives were established for valid comparison between relocated corridors, either on a totally new terrain alignment or on an existing railroad corridor, and existing corridors with improvements that also allowed for a maximum 60 mph train speed. All of the Tier 1 corridor alternatives were established with grade separations located at roadways that are functionally classified as arterials or collectors and the closure of all other at-grade roadway crossings. Spacing of roadway grade separations were also considered in the analysis.

Besides major corridor improvements to the previously mentioned Blue (east-west) and Yellow (north-south) CSX corridors the Tier 1 analysis established corridors representing an east-west corridor relocation west of the Wabash River, a realignment of the Blue (east-west) Corridor in the area near the ISU campus, and two variations of a relocated Yellow (north-south) Corridor to the Green Corridor (IDNR) on the east side of Terre Haute.

The Tier 1 analysis performance criteria included items such as feasibility and ability to be broken into fundable phases with immediate associated benefits, reduction in motorist delay, continuation of existing railroad operations, compatibility with established local planning efforts, and impacts to environmental resources. Planning level costs were considered in the Tier 1 analysis (**Appendix E**). Tier 1 corridors considered feasible for phased implementation can be broken into projects that can be built as funding becomes available, with immediate benefit realized with the completion of that phase.

Reduction in motorist delay was calculated from data collected by the MPO using motion-activated cameras that recorded the time and duration of crossing blockage at strategic crossings. The hourly crossing blockage data was used to calculate the percentage of each hour the crossing was blocked. Hourly vehicle traffic data, which was also collected by the MPO, was then used to calculate the probability that a driver will encounter a train. For vehicles that encounter a train, engineering assumptions were made about the probability that a driver would wait for the train to pass versus diverting to an alternate route. Assuming that a portion of the vehicles would divert was necessary in order to avoid overestimating the amount of delay incurred. More detailed delay calculations, using travel demand modeling techniques, were used during the Tier 2 analysis.

Environmental impacts, including relocations, wetlands, floodplains, waterways, and forested areas were analyzed. Environmental impacts were identified for each Tier 1 corridor. The analysis area was defined by the planning-level construction limits, which were generated during preliminary engineering for railroad corridors (see **Appendix F**) and individual grade separations (see **Appendix G**). An additional 30' buffer area was added to the planning-level construction limits to make sure the estimated environmental impacts represented adequate estimates. The locations of wetlands, floodplains, forests, and waterways were taken from readily available state and federal agency mapping sources and superimposed on the Tier 1 corridor footprints using *Arcview* geographic information system (GIS) software to calculate the amount of the impacts on each resource.

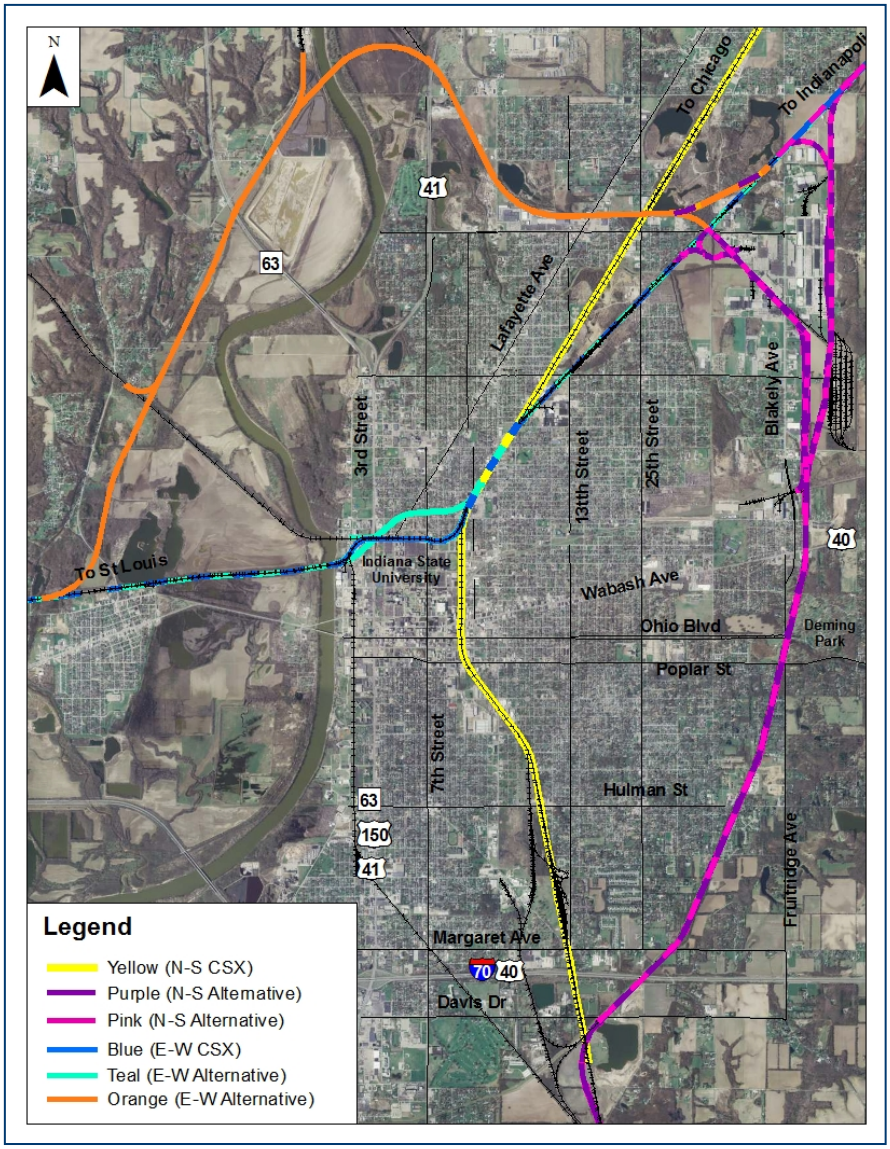
Potential residential and commercial relocations (total acquisitions) were identified using the most recent aerial photography and parcel information. Relocations were distinguished from partial acquisitions by assessing damages to individual parcels. Parcels with major damages such as removal of public road access, damage to structures, loss of all parking, etc., were considered as relocations.

3.3 Description of Tier 1 Corridor Alternatives

The Tier 1 Corridor Alternatives (**Figure 2**) included the following:

- Blue (existing CSX east-west with grade separations)
- Teal (Blue with realignment and/or depression through ISU campus area)
- Orange (east-west new terrain alignment west of Wabash River)
- Yellow (existing CSX north-south with grade separations)
- Pink (relocation of Yellow and Baker Yard to existing INRD corridor)
- Purple (variation of Pink with different connectivity to Blue at northern terminus – Note: **Figures 7** and **8** illustrate the variations between Pink and Purple)

Figure 2
Tier 1 Corridor Alternatives



3.3.1 Blue (existing CSX east-west with grade separations)

The existing CSX east-west corridor (**Figure 3**) is a double track mainline that runs between St. Louis and Indianapolis. The corridor was assumed to be fully grade-separated, 60 mph railroad design speed, with the exception of the 25 mph curves adjacent to the ISU campus. Depression of the grade introduces potential drainage challenges and utility conflicts, therefore track depression is not considered a cost effective solution.

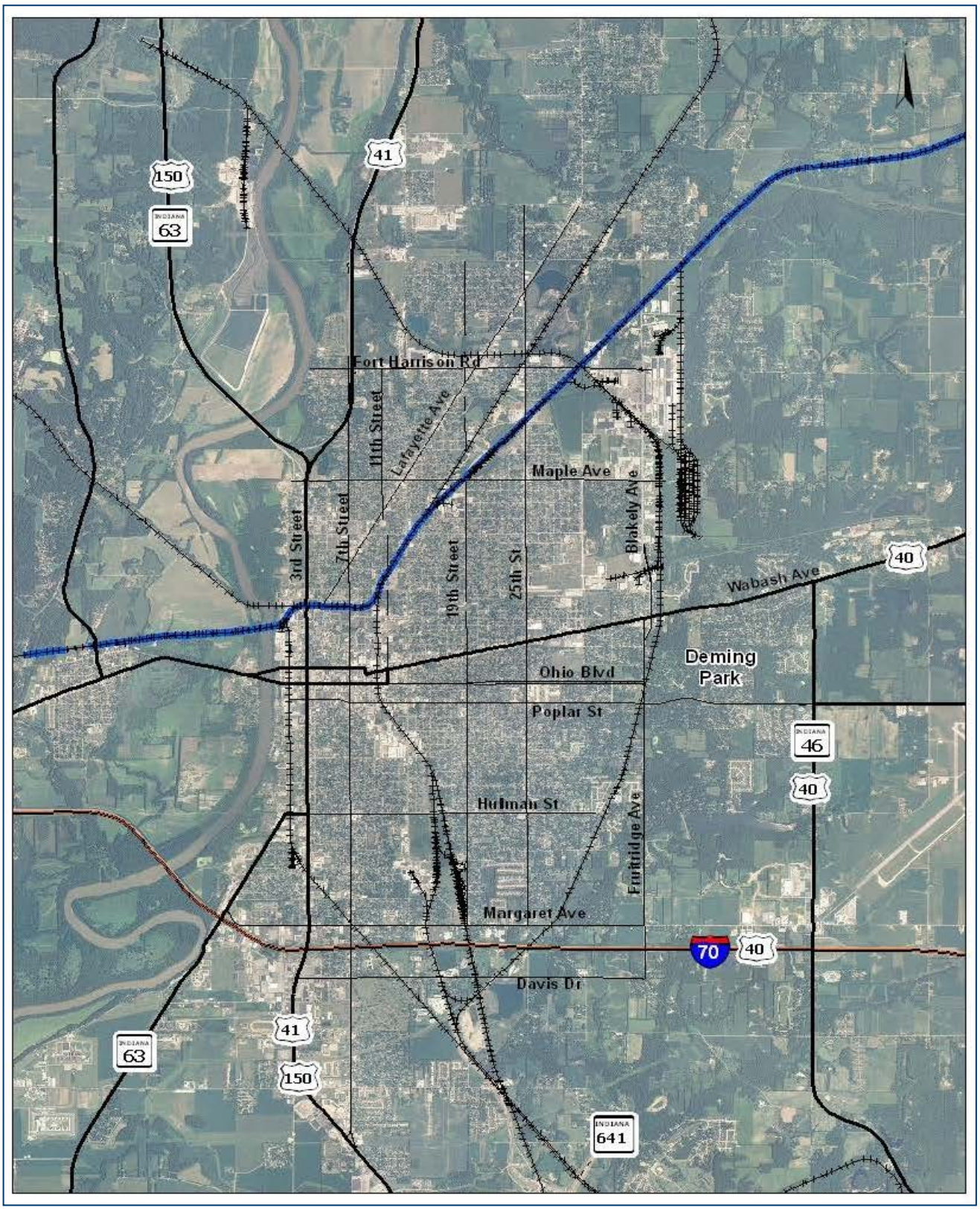
Grade separations, underpasses or overpasses, were included in the Tier 1 corridor analysis at the following locations (from west to east):

- US 150 (3rd Street)
- 5th Street/Lafayette Avenue
- 7th Street
- Locust Street (common with north-south corridor)
- 13th Street (common with north-south corridor)
- 8th Avenue (common with north-south corridor)
- Maple Avenue
- 25th Street
- Fruitridge Avenue
- Haythorne Avenue

Roadway closures were included in the Tier 1 corridor analysis at the following locations (from west to east):

- 1st Street
- 6th Street
- 8th Street
- 9th Street
- Elm Street
- 3rd Avenue
- 6th Avenue
- Ash Street
- Mill Dam Road

Figure 3
Blue Corridor Alternative



3.3.2 Teal (Blue with realignment and/or depression through ISU campus)

The Teal Corridor Alternative (**Figure 4**) utilized a majority of the existing CSX east-west corridor, but differed from Blue near the ISU campus. This portion of Blue was realigned, beginning at the east end of the existing CSX east-west bridge over the Wabash River, and traveled from southwest to northeast underneath the existing US 41 grade separation, where it traveled east parallel to the north side of Locust Street until it reconnected in the Haley Interlocking. The Teal Corridor Alternative has the option to depress the profile grade approximately twelve to fifteen feet below grade, but no more due to the need to match existing grade at each connection point to the existing corridor. Depression of the grade introduces potential drainage challenges and utility conflicts, therefore track depression is not considered a cost effective solution. The maximum train speed in the realigned portion, as restricted by the horizontal curvature, whether depressed or at-grade, would increase from 25 mph to 40 mph.

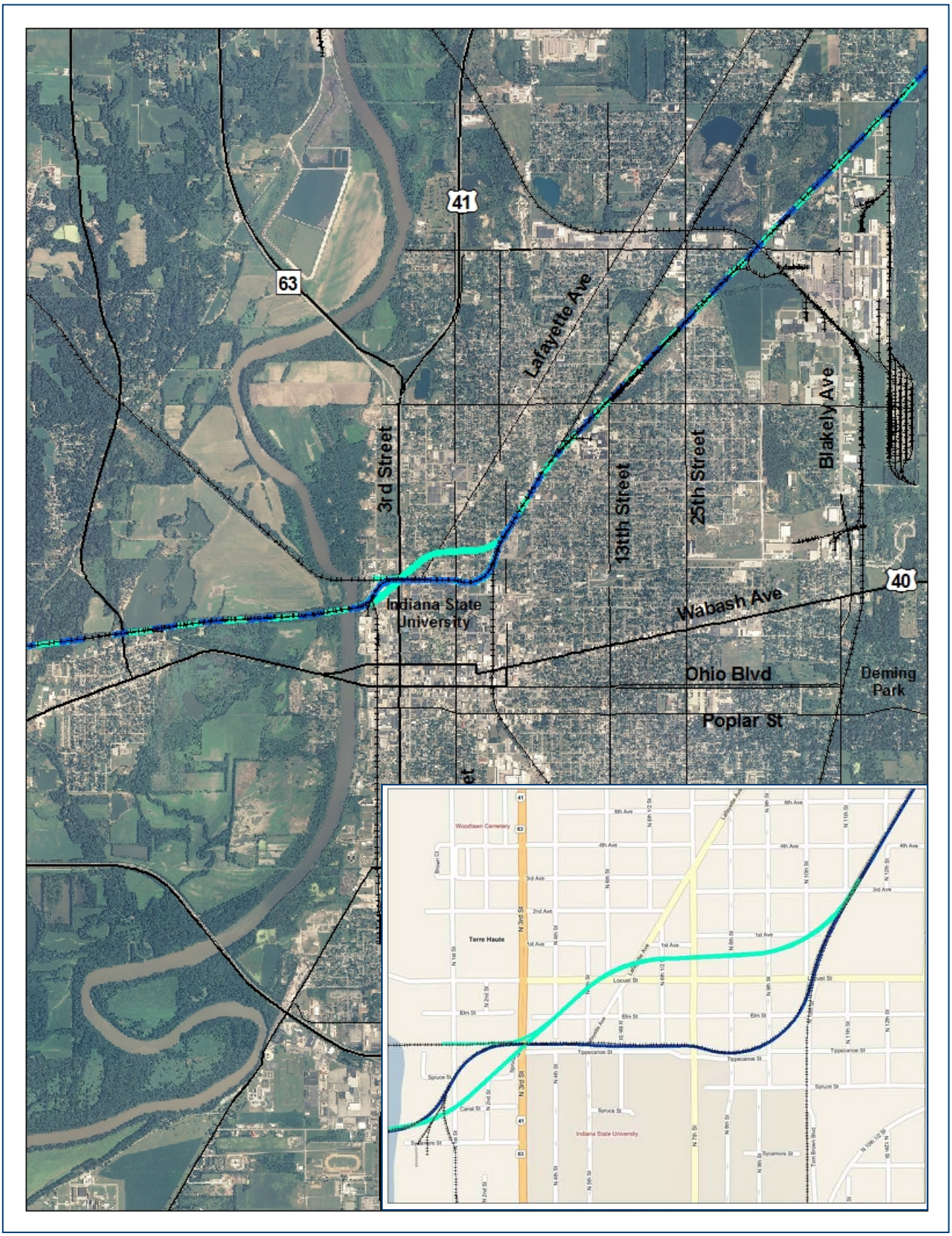
Grade separations, underpasses or overpasses, were included in the Tier 1 corridor analysis at the following locations (from west to east):

- 3rd Street/US 150
- Lafayette Avenue/Locust Street (within realigned portion)
- 7th Street (within realigned portion)
- 13th Street (common with north-south corridor)
- 8th Avenue (common with north-south corridor)
- Maple Avenue
- 25th Street
- Fruitridge Street
- Haythorne Avenue

Roadway closures were included in the Tier 1 corridor analysis at the following locations (from west to east):

- 1st Street
- 6th Street
- 8th Street
- 9th Street
- Elm Street
- 3rd Avenue
- 6th Avenue
- Ash Street
- Mill Dam Road

Figure 4
Teal Corridor Alternative



3.3.3 Orange (east-west new terrain alignment west of Wabash River)

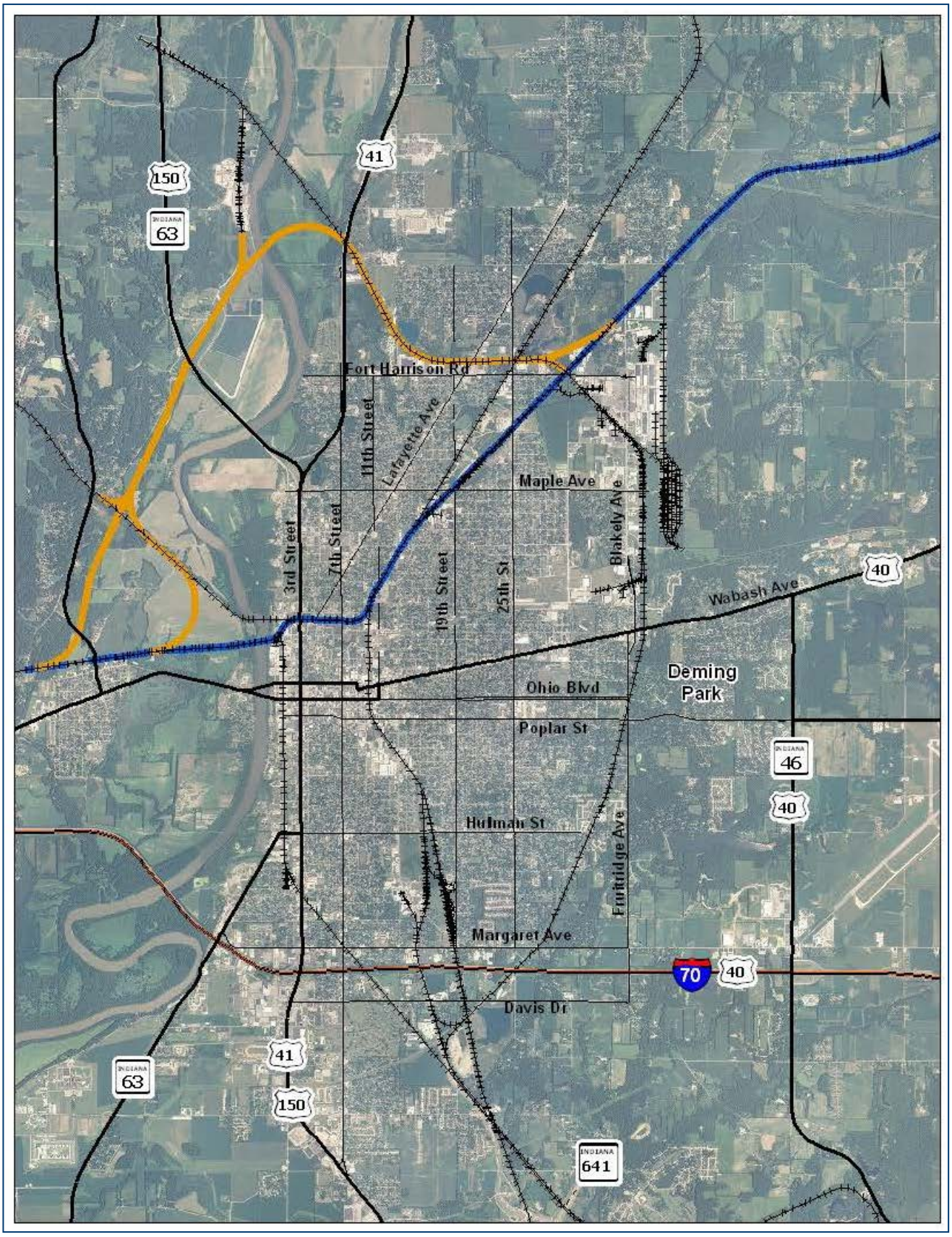
The Orange Corridor Alternative (**Figure 5**) relocated the CSX east-west corridor to the west side of the Wabash River. The Orange Corridor Alternative diverged from the existing CSX east-west line west of Izaak Walton Lake, traveled north and crossed the Danville Secondary rail corridor before turning east to cross the Wabash River near the power plant. The river crossing would require construction of a new bridge. The Orange Corridor Alternative utilized the existing INRD corridor on the north side of Terre Haute, travelling east to connect with the Yellow and Blue corridors. Grade separations, underpasses or overpasses, were included in the Tier 1 corridor analysis at the following locations (from west to east):

- US 150 (3rd Street)
- SR 63
- Haythorne Avenue
- 13th Street
- Lafayette Avenue
- 25th Street
- Fruitridge Avenue
- Haythorne Avenue

Roadway closures were included in the Tier 1 corridor analysis at the following locations (from west to east):

- Mill Dam Road

Figure 5
Orange Corridor Alternative



3.3.4 Yellow (existing CSX north-south with grade separations)

The Existing CSX north-south corridor (**Figure 6**) is a single track mainline that runs between Chicago and Evansville. The existing corridor was assumed to be upgraded to a fully grade-separated, 60 mph railroad design speed for the Tier 1 analysis.

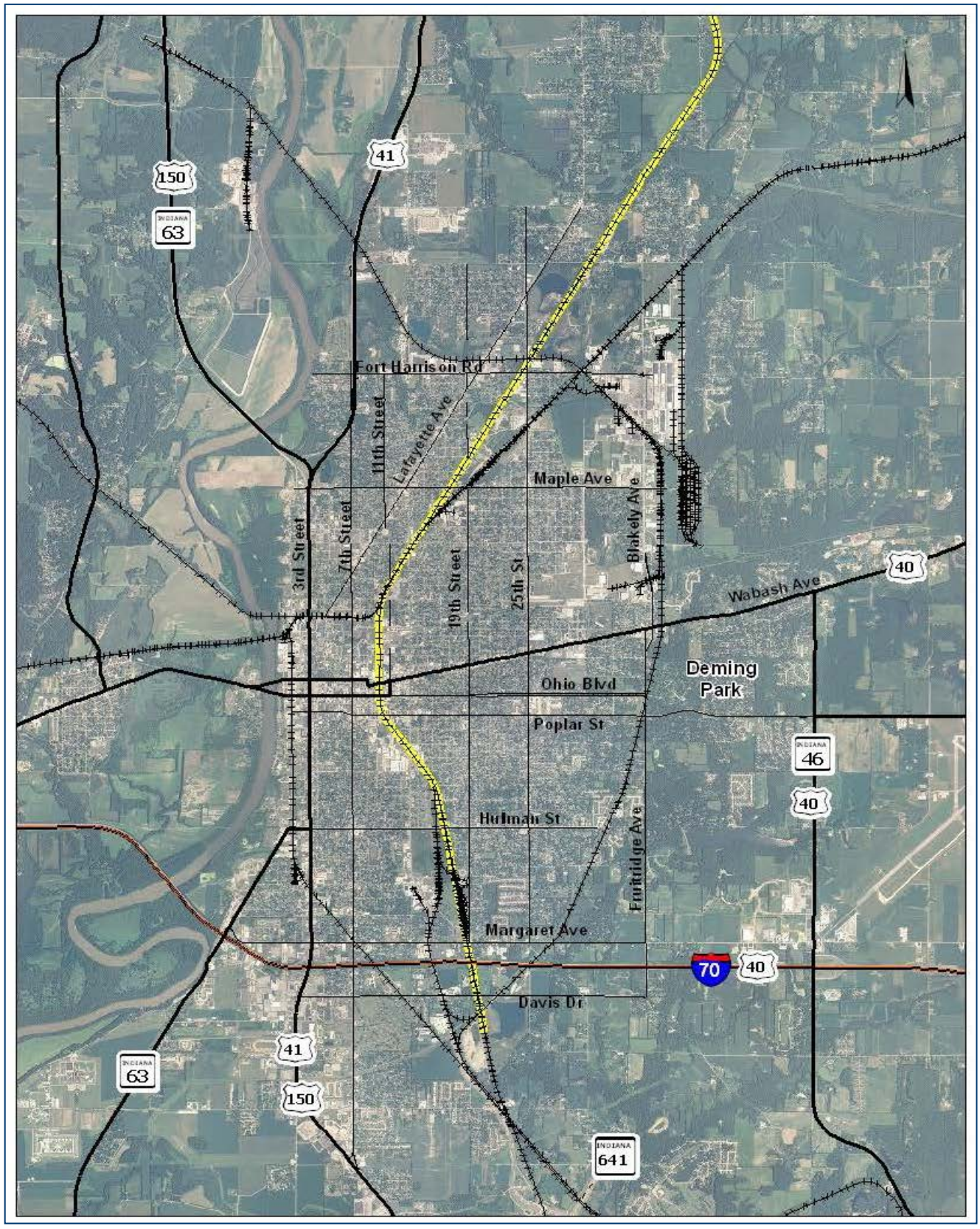
Grade separations, underpasses or overpasses, were included in the Tier 1 corridor analysis at the following locations (from south to north):

- Spring Hill Drive
- Margaret Avenue
- Hulman Street
- 13th Street
- Poplar Street
- Ohio Street
- Wabash Avenue
- Locust Street (common with east-west corridor)
- 13th Street (common with east-west corridor)
- 8th Avenue (common with east-west corridor)
- Maple Avenue
- Ft. Harrison Road
- 25th Street
- Haythorne Avenue
- Park Avenue

Roadway closures were included in the Tier 1 corridor analysis at the following locations (from south to north):

- Davis Drive
- Washington Avenue
- College Avenue
- Crawford Street
- Walnut Street
- Chestnut Street
- Spruce Street
- Elm Street
- 3rd Avenue
- 6th Avenue
- Ash Street
- Grant Avenue
- Erickson Street

Figure 6
Yellow Corridor Alternative



3.3.5 Pink (relocation of Yellow Corridor and Baker Yard to existing INRD corridor)

The Pink Corridor Alternative (**Figure 7**) began near Spring Hill Drive and ran north along the existing CSX north-south corridor to the crossing of INRD. At this point, the corridor alternative turned northeast and followed the existing INRD corridor on the east side of the City. The Pink Corridor ran along the east side of the Ft. Harrison Industrial Park and connected with the existing CSX east-west corridor (Blue). The Pink Corridor Alternative ran north along the existing CSX corridor and then diverged to the north to connect with the existing CSX north-south mainline at Otter Creek Junction and Rose Hill Avenue. This alternative relocated Baker Yard to the Ft. Harrison Industrial Park area. The Pink Corridor would be fully-grade separated and have a 60 mph railroad design speed.

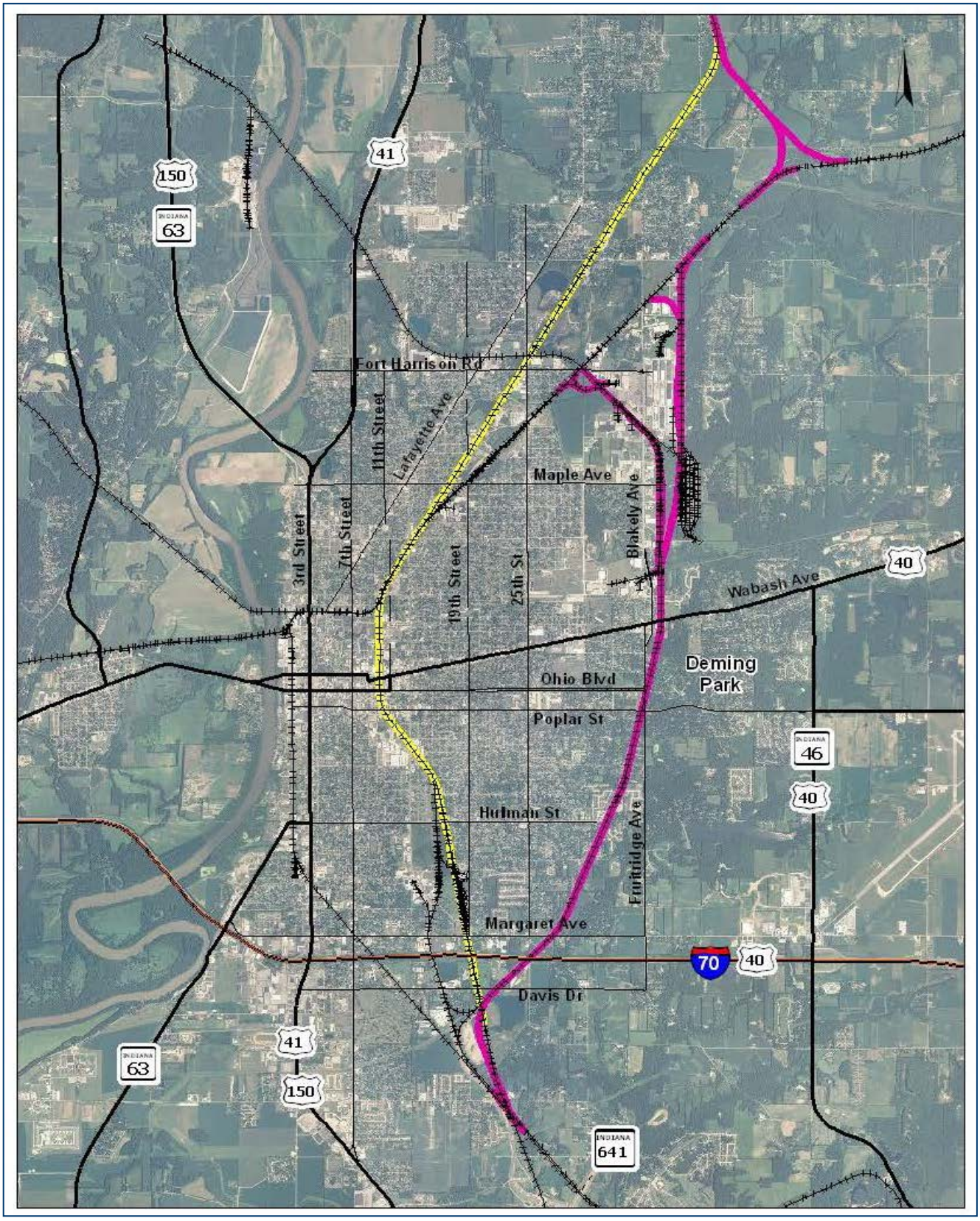
Grade separations, underpasses or overpasses, were included in the Tier 1 corridor analysis at the following locations (from south to north):

- Spring Hill Drive
- Margaret Avenue
- Hulman Street
- Poplar Street
- Fruitridge Avenue
- Deming Drive (Ohio Street)
- Wabash Avenue (replacement)
- Locust Street (replacement)
- Beech Street (replacement)
- Haythorne Avenue
- Rosedale Road

Roadway closures were included in the Tier 1 corridor analysis at the following locations (from south to north):

- Davis Drive
- Sidenbender Road
- Wallace Avenue
- College Avenue
- Steelton Avenue
- Mill Dam Road
- Grant Avenue
- Devenald Avenue

Figure 7
Pink Corridor Alternative



3.3.6 Purple (variation of Pink Corridor with different northern terminus connection)

The Purple Corridor Alternative (**Figure 8**) mirrored the Pink Corridor from Spring Hill Drive north to the US 40 (Wabash Avenue) overpass, following the existing INRD corridor on the east side of Terre Haute. The northeast quadrant connector track ran north along the east side of the Ft. Harrison Industrial Park and connected with the existing CSX east-west mainline at Haythorne Avenue. The Purple Corridor Alternative followed the INRD alignment across Fruitridge Avenue and traveled over the existing CSX east-west corridor (Blue) with a railroad grade separation. The Purple Corridor Alternative followed an abandoned railroad corridor north of Ft. Harrison Road through a gravel pit area and connected into the existing CSX north-south corridor (Yellow) at Haythorne Avenue. Similar to the Pink Corridor, the Purple Corridor Alternative relocated the Baker Yard to the Ft. Harrison Industrial Park area. The Purple Corridor will be fully-grade separated and have a 60 mph railroad design speed.

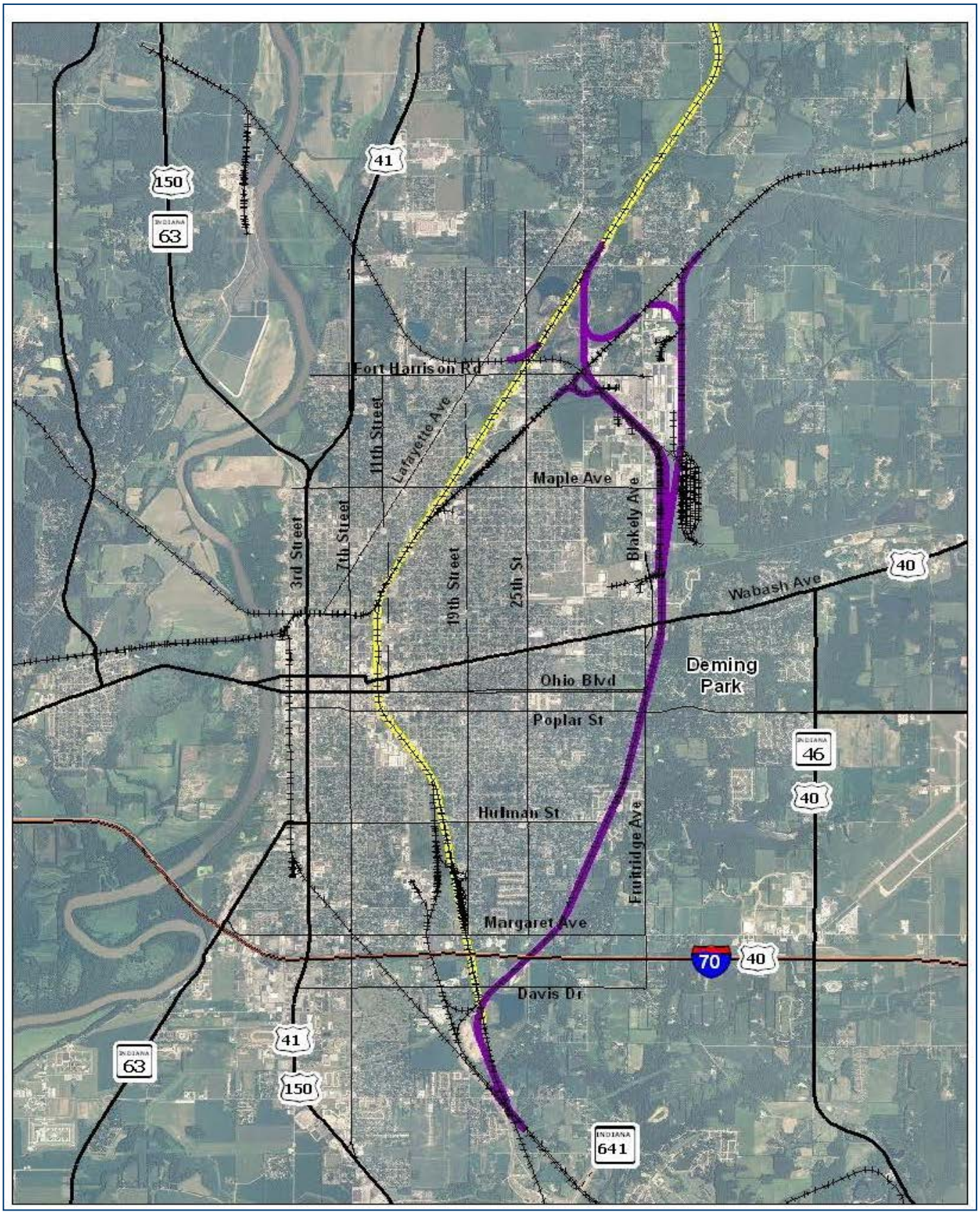
Grade separations, underpasses or overpasses, were included in the Tier 1 corridor analysis at the following locations (from south to north):

- Spring Hill Drive
- Margaret Avenue
- Hulman Street
- Poplar Street
- Fruitridge Avenue
- Deming Drive (Ohio Street)
- Wabash Avenue (replacement)
- Locust Street (replacement)
- Beech Street (replacement)
- Fruitridge Avenue (second grade separation)
- Ft. Harrison Road
- Haythorne Avenue
- Park Avenue

Roadway closures were included in the Tier 1 corridor analysis at the following locations (from south to north):

- Davis Drive
- Sidenbender Road
- Wallace Avenue
- College Avenue
- Grant Avenue
- Erickson Street
- Steelton Avenue

Figure 8
Purple Corridor Alternative



3.4 Tier 1 Analysis

Table 1 summarizes the Tier 1 analysis of the six fully grade-separated, 60 mph railroad design speed corridor alternatives and the No-Build option. An explanation of the performance criteria follows **Table 1**.

Table 1
Tier 1 Analysis Summary

Evaluation Criteria	Tier 1 Corridors						
	East-West			North-South			No Build
	Blue	Teal	Orange	Yellow	Pink	Purple	
(1) Feasibility of phased implementation	●	●	●	●	●	●	n/a
(2) Planning Level Cost [Million USD]	$ 94.10	$ 129.20	$ 226.20	$162.20	$ 274.20	$ 304.30	$ 0
(3) Reduction in Motorist Delay [veh-hr]	593	593	517	600	340	340	0
(4) Railroad Operations	●	●	●	●	●	●	●
(5) Compatibility with established long-range and economic development plans	●	●	●	●	●	●	●
(6a) Residential Relocations	63	110	8	86	47	68	0
(6b) Commercial Relocations	10	14	14	37	4	5	0
(6c) Industrial Relocations	18	18	0	11	1	9	0
(6d) Agricultural Relocations	1	1	5	1	8	2	0
(6e) Wetlands	< 1 acre	< 1 acre	32 acres	0	7 acres	11 acres	n/a
(6f) Floodplains	< 1 acre	< 1 acre	114 acres	0	26 acres	19 acres	n/a
(6g) Waterways	0	0	830 ft	0	2,180 ft	580 ft	n/a
(6h) Forested Areas	0	0	32 acres	0	11 acres	11 acres	n/a

(1) Feasibility of phased implementation - measures whether or not an alternative can be built in phases that yield immediate benefits. For example, grade separations can be built as funding becomes available and the benefits will be immediate for the dollars invested.

- ● Easily separated into projects of independent utility suitable for phasing.
- ● Cannot be separated into projects of independent utility suitable for phasing.

(2) Preliminary cost estimates, for construction, land acquisition, and engineering, in current year USD (United States dollars).

(3) Total hours of vehicular delay calculated for each rail corridor using current traffic counts and current rail crossing delay. Only delay due to railroad crossing occupation is considered. Delay is measured in vehicle-hours (veh-hr).

(4) Impact on railroad operations, including customer access, rail yard access, travel length, permitted speed, and available switches.

- ● Maintains or improves rail operations.

- Negatively impacts rail operations, i.e. added mileage.

(5) Compatibility with established long-range and economic development plans.

- Accommodates established plans.
- Could potentially accommodate established plans.
- Does not accommodate established plans.

(6) Potential environmental impacts based on planning level construction limits with a buffer of 30 additional feet. The environmental impacts include residential, commercial, industrial, and agricultural relocations. Impacts to wetlands, floodplains, waterways, and forested areas are also included.

The Blue Corridor Alternative is feasible to implement in phases. Roadway grade separations could be constructed along the existing corridor and the benefits to the community would be realized immediately. There is no risk associated with constructing multiple roadway grade separations over time, because each grade separation could be pursued as a project of independent utility. The Blue Corridor improvements costs are less than the other corridor alternatives and the corridor has very minimal environmental impacts to wetlands, floodplains, waterways, and forested areas. The Blue Corridor would have 91 total relocations and a motorist delay reduction of 593 vehicle-hours per day.

The Teal Corridor Alternative is feasible to implement in phases; however, the entire realigned portion must be addressed as a project of independent utility. Roadway grade separations could be built along the portion that follows the existing east-west corridor and benefits would be realized immediately. Roadway grade separations along the realigned portion must be bundled together with the realignment. Teal has the most relocations (142) but scores near the best in the least amount of impacts to environmental resources such as wetlands, floodplains, waterways, and forested areas. Teal's ability to reduce motorist delay is equivalent to the Blue Corridor Alternative; however, Teal's cost is significantly higher than Blue. Depression of the grade is not considered a cost effective solution. The corridor is not detrimental to railroad operations; in fact, the realignment near ISU campus actually increases the allowable rail speed by 15 mph. Increased railroad speeds do not make the alternative more desirable since the roadway grade separations provide the same delay reduction for the motoring public as the Blue Corridor Alternative. The project's Purpose and Need states that railroad operations should be maintained, it does not need to be improved. Teal conflicts with the *Rural Health Innovation Collaborative* (RHIC) District plans, which identifies areas north of the existing east-west CSX corridor for future medical use and residential and commercial use to support the hospital complex and ISU. There are numerous vacant lots in the area and many parcels are already owned by Union Hospital and ISU. With some coordination, it might be possible to reserve a future rail corridor through the area.

The Orange Corridor Alternative produces the most significant impacts to wetlands, floodplains, waterways, and forested areas. During resource agency coordination, the US Environmental Protection Agency (USEPA) and the US Fish and Wildlife Service (USFWS) recommended the elimination of Orange. The Orange Corridor Alternative has a significantly higher cost than east-west corridor alternatives Blue and Teal, and Orange is not feasible to implement in a phased approach. Partial implementation will yield no benefit; the entire corridor must be constructed at one time. Trains routed from the existing east-west CSX line (Blue) would travel between 1 and 2 additional miles, which is detrimental to railroad operations. The additional mileage and increased operating cost is considered a fatal flaw for not meeting the project's Purpose and Need.

The Yellow Corridor Alternative is feasible to implement in phases. Roadway grade separations could be constructed along the existing corridor and the benefits to the community would be realized immediately. There is no risk associated with constructing multiple roadway grade separations over time because each grade separation could be pursued as a project of independent utility. Full Yellow implementation costs more than east-west Blue and Teal, but is the least expensive of the north-south corridor alternatives. Yellow has the second highest number of relocations (134) but has the lowest amount of impacts to wetlands, floodplains, waterways, and forested areas of any of the corridor alternatives. Yellow provides the most reduction in motorist delay at 600 vehicle-hours per day.

The Pink Corridor Alternative was originally thought to be feasible to implement in phases; however, additional analysis proved this to be invalid. The existing INRD corridor must be improved to accommodate rail traffic routed from the existing CSX north-south line. The first step, constructing the relocated Baker Yard and associated connections, will not yield significant benefits. The full benefits can only be realized after the entire INRD corridor is improved to accommodate the trains routed from the existing CSX north-south line. The Pink Corridor impacts 7 acres of wetlands and 11 acres of forested areas. Information regarding the feasibility analysis of the phased Pink Corridor Alternative is contained in the following section of this study.

The Purple Corridor Alternative has the highest preliminary level cost estimate. As previously discussed, Purple is very similar to the Pink Corridor Alternative. The primary difference between the two corridors is the potential location of the relocated Baker Yard and the associated connections. The additional costs for the connections include a rail-over-rail grade separation. The Purple Corridor has similar environmental impacts as the Pink Corridor.

3.5 Tier 1 Corridor Alternatives Eliminated From Further Consideration

3.5.1 Orange Corridor Alternative

The Orange Corridor Alternative was not carried forward for further study. This alternative did could not be implemented in phases and no benefits would be realized until the entire project is completed. Funding prospects would be low because the entire investment would be needed in a single phase. Orange does not satisfy Purpose and Need because it negatively impacts rail efficiency by requiring additional track mileage, which increases operating and maintenance cost. Orange also has significantly more impacts on environmental resources such as wetland, forested lands, and floodplains and was recommended for elimination by state and federal resource agencies (see **Appendix D**).

3.5.2 Teal Corridor Alternative

The Teal Corridor Alternative was not carried forward for further study. The realignment of the rail corridor allows for faster train speeds than Blue, which reduces delay to the motoring public in the ISU campus area; however, this area has significant pedestrian traffic and the increased rail speeds could reduce overall safety. Teal is more expensive than Blue. The Tier 2 analysis investigates alternative projects to enhance pedestrian safety.

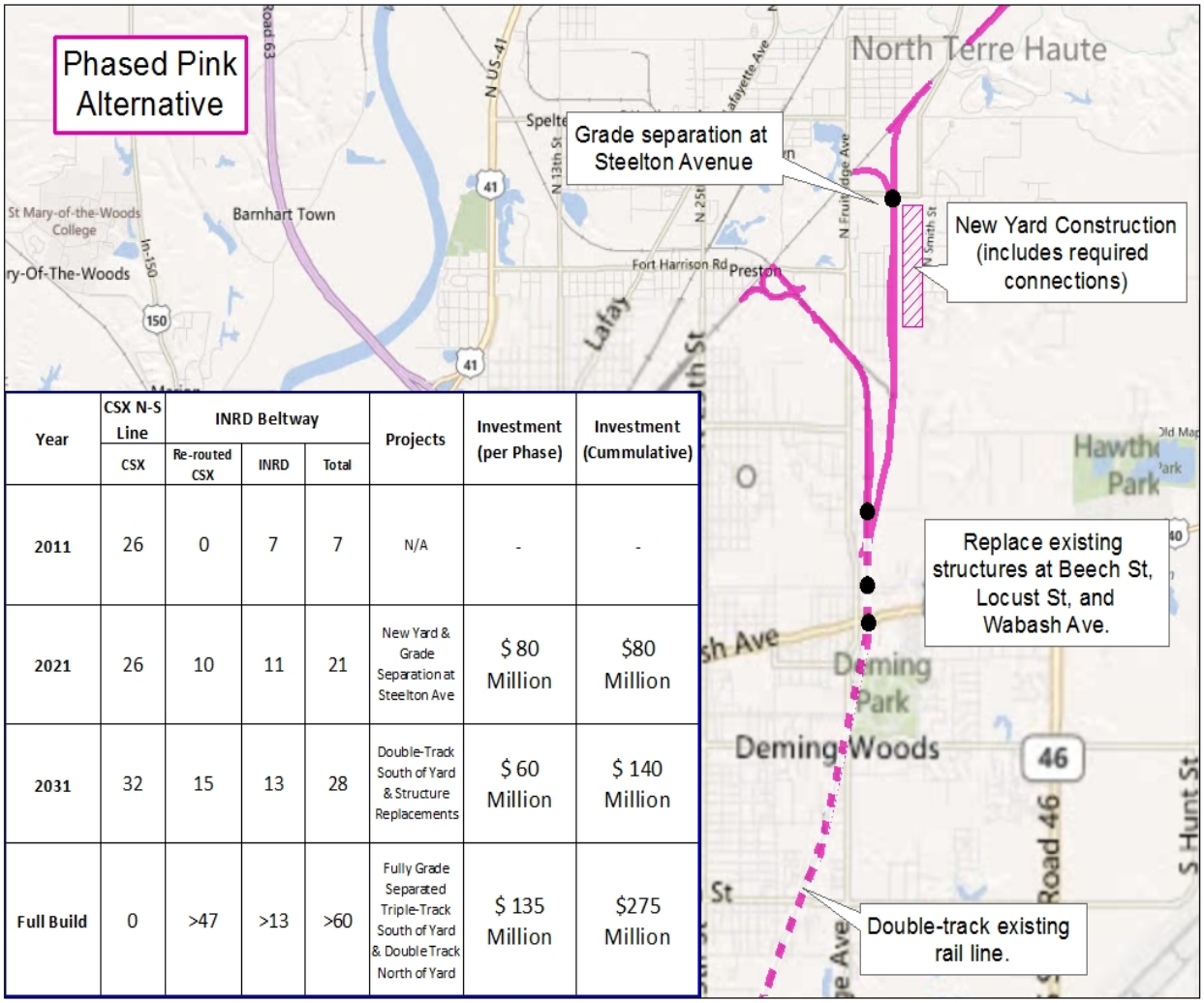
3.5.3 Pink and Purple Corridor Alternatives

The Pink and Purple Corridor Alternatives were not carried forward for further study. Pink and Purple had very similar impacts; however, Pink enjoyed more support from the railroads and had a lower overall cost. Purple was, therefore, eliminated from further consideration. Additional analysis was performed on the Pink Corridor Alternative to see if it could be broken into logical phases that could be constructed over time, with the ultimate goal of relocating all north-south CSX (Yellow) rail traffic from downtown Terre Haute. The initial supposition was that this phased approach could provide sufficient benefits to make the phased approach feasible.

Phase 1 would occur over 10 years and Phase 2 would occur over the following 10 years. Phase 1 includes relocating Baker Yard from 19th Street and Margaret Avenue to near the Fort Harrison Industrial Park with required connector tracks. A grade separation would be required at Steelton Avenue. Existing grade separations at Beech Street, Locust Street, and Wabash Avenue are not proposed to be improved during Phase 1. The railroads were actively engaged to provide data regarding potential number of trains to be relocated per phase. The railroads also reviewed cost estimates for each phase. Approximately eight to twelve trains would be relocated from the north-south CSX line (Yellow) to the existing INRD tracks. **Figure 9** summarizes the

feasibility of each phase. Even when broken into phases, the proposed improvements greatly exceed the amount of benefit anticipated per phase. For this reason, Pink was eliminated from further consideration.

Figure 9
Pink Phased Alternative



Year	CSX N-S Line	INRD Beltway			Projects	Investment (per Phase)	Investment (Cummulative)
	CSX	Re-routed CSX	INRD	Total			
2011	26	0	7	7	N/A	-	-
2021	26	10	11	21	New Yard & Grade Separation at Steelton Ave	$ 80 Million	$80 Million
2031	32	15	13	28	Double-Track South of Yard & Structure Replacements	$ 60 Million	$ 140 Million
Full Build	0	>47	>13	>60	Fully Grade Separated Triple-Track South of Yard & Double Track North of Yard	$ 135 Million	$275 Million

3.6 Tier 1 Corridor Alternatives Carried Forward To Tier 2

The Blue Corridor Alternative and the Yellow Corridor Alternative were recommended to be carried forward to Tier 2 for detailed analysis to identify and prioritize projects of independent utility along these corridors.

4. Tier 2 Project Alternatives Analysis

4.1 Tier 2 Analysis Methodology

The goal of Tier 2 analysis was to identify and prioritize projects of independent utility associated with the corridor alternatives carried forward from Tier 1. The first type of project analyzed in Tier 2 was roadway grade separations. A more analytical method, utilizing travel demand modeling, was undertaken to identify and prioritize locations for roadway grade separations. The MPO's *TransCAD* travel demand model was used as the basis to perform analysis to quantify the user benefits for each alternative. New traffic counts, provided by the MPO, were coded into the network, and the model was calibrated to replicate 2010/2011 conditions. The model's roadway network was modified to add short links at existing at-grade rail crossings. Railroad crossing delay is not typically accounted for in travel demand models. The delay incurred locally, which was calculated in Tier 1, was coded on each newly created short link. The existing conditions or "No Build" scenario served as the baseline for the analysis.

For each project alternative, whether it was a single grade separation or group of grade separations, the model links were modified to represent the alternative. If the existing at-grade crossing was to remain in place, the newly created link, with its associated delay, was left in the model. If a roadway grade separation was proposed, the delay was removed from the link. The travel demand model automatically assigned traffic to the available network based on travel times with the assumption that motorists will take the route that requires the least amount of time. The model provides an objective approach to the analysis.

The roadway grade separation locations analyzed in Tier 2 were strategically chosen based on public input, roadway functional classification, spacing, and engineering constraints. The network-wide performance measures produced by the analysis included local crossing delays, vehicle-hours traveled (VHT), vehicle-miles traveled (VMT), and congested vehicle-miles traveled.

The highest performing individual grade separations, compared by benefit-cost analysis, were then analyzed in various combinations. It is important to note that the benefits realized by combinations of roadway-grade separations is not simply the sum of the benefits of the individual roadway grade separations. There is a margin of diminishing return; two grade separations do not produce double the benefit of the individual grade separations. The same is true for a group of three grade separations when compared to two grade separations.

Benefit-cost analysis was performed for each project alternative using standard Indiana Department of Transportation (INDOT) procedures. The performance measures, vehicle-miles traveled (VMT) and vehicle-hours traveled (VHT), were used to monetize user benefits using INDOT's accepted assumptions and methodology. The benefits included time savings, roadway network safety, rail crossing safety, and operation costs.

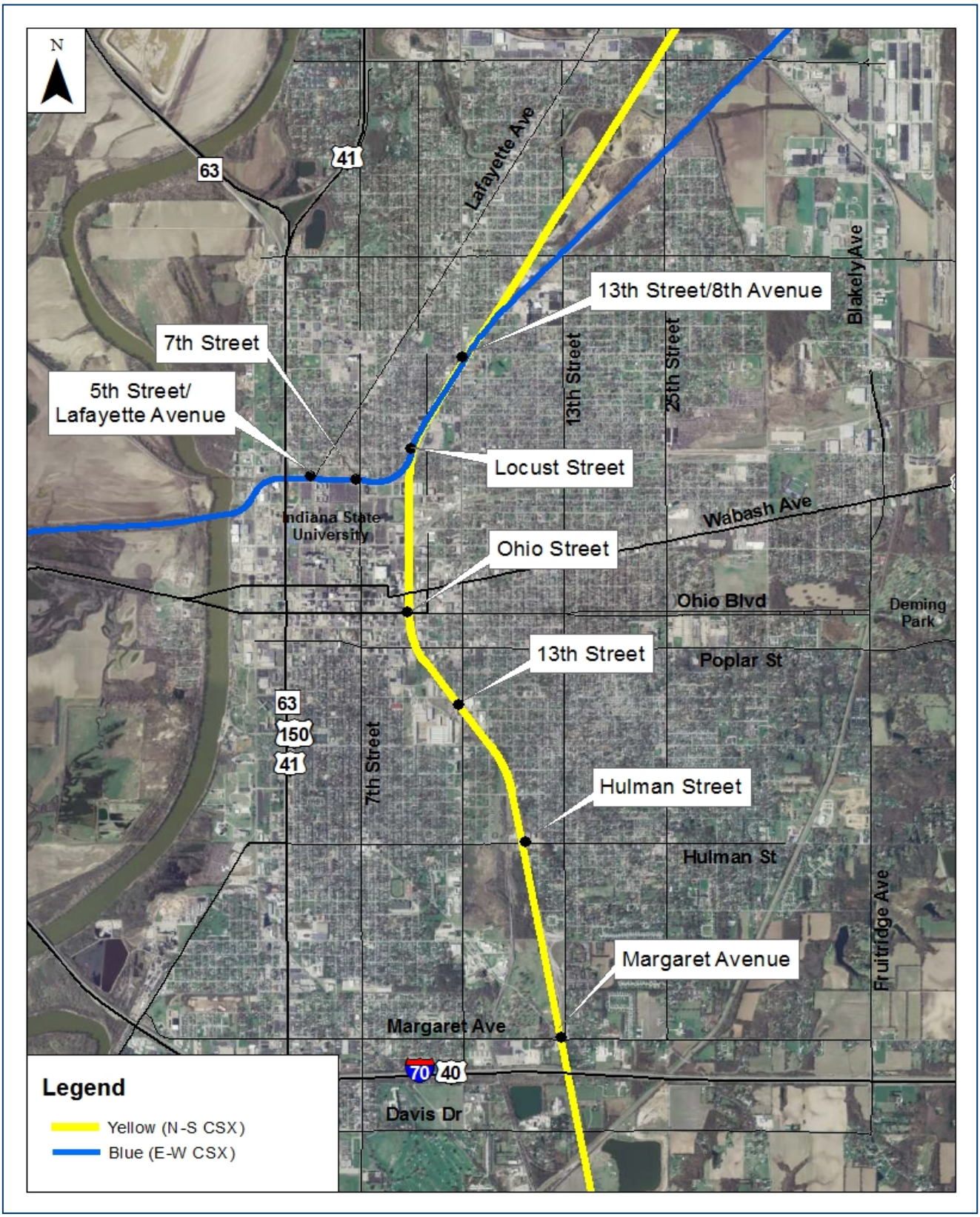
Benefits were annualized over a 30 year period at a 3% discount rate. The net present value benefits and preliminary cost estimate were used to calculate the benefit-cost ratio. A benefit-cost ratio of less than one indicated a poor investment, i.e. the benefits did not outweigh the costs. A benefit-cost ratio of greater than one indicates potential for an acceptable investment since the benefits exceeded costs. Generally speaking the higher the benefit-cost ratio, the better the investment; however, it is important to realize that the benefit-cost ratio is just a single tool to be used when prioritizing investments. A small, inexpensive project may have a high benefit-cost ratio because the denominator represents a small cost. That same project might provide very little benefit to its intended users. The scale of the benefit is important, as are other items such as community concerns, connectivity, and proximity to other roadway grade separations.

4.2 Description of Tier 2 Grade Separation Project Alternatives

Potential roadway grade separation locations were chosen based on individual at-grade crossing delay reductions calculated for each crossing during the Tier 1 analysis, as well as the extensive public involvement (see **Appendix B**) during the study. Six potential roadway grade separation locations were investigated for the Yellow (north-south) Corridor Alternative, two each for the south, central, and north areas of Terre Haute. Two additional potential roadway grade separations were investigated for the Blue (east-west) Corridor Alternative in the ISU campus area. The following potential roadway grade separation locations (**Figure 10**) were modeled individually and in various combinations:

- Margaret Avenue near 19th Street
- Hulman Street between 13th Street and 19th Street
- 13th Street near Crawford Street
- Ohio Street downtown
- 5th Street/Lafayette Avenue near ISU
- 7th Street near ISU
- Locust Street northeast of ISU
- 13th Street/8th Avenue area

Figure 10
Potential Tier 2 Roadway Grade Separation Locations



4.3 Tier 2 Analysis

The "No Build" scenario in **Table 2** represents the modeled delay for the entire network caused by all existing at-grade rail crossings. The modeled reductions in community-wide delay for various alternatives, i.e. single grade separations and combinations of two and three grade separations, are also summarized. Parentheses indicate a negative number or a decrease. Crossing delay is indicated in hours per day for the community-wide motoring public. Vehicle hours travelled (VHT) and vehicle miles traveled (VMT) are also reported as a "per day" community-wide quantity. The congested VMT captures alternatives that route traffic onto a corridor that experiences congestion such as a level of service (LOS) D or greater. This indicates that additional road improvements may be necessary.

Table 2
Summary of Modeled Reduction in Delay

Daily Network Statistics (2010)

Scenario	Description	Crossing Delays	VHT	VMT	Congested VMT
No Build	*Existing Conditions*	873.98	59,732	2,753,840	373,463
Project 1	*Build Grade Separation at Margaret Ave.*	811.90	59,618	2,750,098	373,320
A	Net Change from Existing Conditions-->	(62)	(114)	(3,742)	(143)
Project 2	*Build Grade Separation at Hulman Street*	852.48	59,688	2,752,051	374,425
B	Net Change from Existing Conditions-->	(22)	(44)	(1,788)	962
Project 3	*Build Grade Separation at 13th Street*	849.77	59,649	2,752,356	372,388
C	Net Change from Existing Conditions-->	(24)	(83)	(1,484)	(1,074)
Project 4	*Build Grade Separation at Ohio Street*	852.50	59,668	2,752,945	373,755
D	Net Change from Existing Conditions-->	(21)	(64)	(894)	293
Project 5	*Build Grade Separation at Locust Street*	825.50	59,627	2,752,622	375,287
E	Net Change from Existing Conditions-->	(48)	(105)	(1,217)	1,824
Project 6	*Build Grade Separation at 13th/8th*	791.67	59,546	2,751,864	385,032
F	Net Change from Existing Conditions-->	(82)	(186)	(1,976)	11,569
Project 7	*Build Grade Separation at Margaret Ave. and at Locust Street*	763.41	59,542	2,750,722	376,248
A, E	Net Change from Existing Conditions-->	(111)	(190)	(3,117)	2,785
Project 8	*Build Grade Separation at Margaret Ave.and at 13th/8th*	729.58	59,460	2,749,883	384,648
A, F	Net Change from Existing Conditions-->	(144)	(272)	(3,956)	11,186
Project 9	*Build Grade Separation at Margaret Ave,.at 13th Street, and at Locust Street*	705.36	59,490	2,750,985	376,079
A,C,E	Net Change from Existing Conditions-->	(169)	(242)	(2,855)	2,616
Project 10	*Build Grade Separation at Margaret Ave,.at 13th Street, and at 13th/8th*	658.35	59,412	2,750,107	385,859
A,C,F	Net Change from Existing Conditions-->	(216)	(320)	(3,732)	12,397
Project 11	*Build Grade Separation at 5th Street/Lafayette Ave.*	864.28	59,665	2,751,896	371,921
	Net Change from Existing Conditions-->	(10)	(66)	(1,943)	(1,542)
Project 12	*Build Grade Separation at 7th Street*	830.97	59,659	2,751,506	380,507
	Net Change from Existing Conditions-->	(43)	(73)	(2,334)	7,045
Pink	*Upgrade INRR, Divert all Yellow CSX*		59,310	2,749,451	373,837
	Net Change from Existing Conditions-->		(421)	(4,389)	374
Yellow	*Upgrade Yellow (N-S) CSX to 60 mph*		59,438	2,758,339	392,277
	Net Change from Existing Conditions-->		(294)	4,500	18,815
Blue	*Upgrade Blue (E-W) CSX to 60 mph*		59,240	2,750,335	391,477
	Net Change from Existing Conditions-->		(492)	(3,504)	18,014

The individual grade separations were compared. Then the best performing grade separations that complement each other were placed into groups of two and three grade separations. In groups of two grade separations, it was desirable to choose locations that serve the north portion of the city and the south portion of the city. In groups of three grade separations, it was desirable to choose locations that serve the north side of the city, downtown, and the south side of the city.

The reduction in delay from **Table 2** was converted into monetary benefit using INDOT procedures for this type of analysis. The travel time saved was converted into dollars using different hourly rates for personal trips versus commercial trips. Operating cost such as fuel, oil changes, and routine vehicular maintenance was calculated. Safety benefits included the reduced exposure rate for vehicular collisions with trains as well as reduced vehicular collisions in general resulting from the reduced vehicle miles traveled. **Table 3** summarizes these benefits.

Table 3
Summary of Modeled Benefits

Scenario	Travel Time Cost Savings		Operating Cost Savings		Safety Cost Savings		Annual Benefit ($ millions)
	Auto	Truck	Auto	Truck	RR Xing	Road Network	
Project 1 A	$546,056	$244,780	$437,979	$203,245	$25,029	$116,629	$ 1.57
Project 2 B	$210,776	$94,484	$209,331	$97,140	$4,800	$55,742	$ 0.67
Project 3 C	$399,560	$179,110	$173,636	$80,576	$6,311	$46,237	$ 0.89
Project 4 D	$307,202	$137,709	$104,673	$48,574	$5,672	$27,873	$ 0.63
Project 5 E	$504,981	$226,367	$142,458	$66,108	$4,735	$37,935	$ 0.98
Project 6 F	$893,136	$400,365	$231,264	$107,319	$21,770	$61,583	$ 1.72
Project 7 A, E	$914,165	$409,792	$364,857	$169,313	$29,764	$97,157	$ 1.99
Project 8 A, F	$1,306,926	$585,854	$463,055	$214,882	$46,799	$123,306	$ 2.74
Project 9 A,C,E	$1,162,975	$521,326	$334,122	$155,050	$36,075	$88,973	$ 2.30
Project 10 A,C,F	$1,538,352	$689,595	$436,865	$202,728	$53,111	$116,332	$ 3.04
Project 11 5th	$319,282	$143,124	$227,470	$105,558	$4,946	$60,573	$ 0.86
Project 12 7th	$350,710	$157,212	$273,157	$126,759	$5,393	$72,739	$ 0.99
Pink	$2,023,960	$907,278	$513,688	$238,378	$167,906	$136,789	$ 3.99
Yellow	$1,413,783	$633,755	($526,658)	($244,397)	$93,498	($140,243)	$ 1.23
Blue	$2,360,423	$1,058,104	$410,178	$190,344	$180,387	$109,226	$ 4.31

Benefit-cost ratios (**Table 4**) for each alternative were calculated using the annualized benefits from **Table 3** divided by the preliminary planning level costs. Planning level cost estimates are contained in **Appendix E**.

Table 4
Summary of Modeled Benefit-Cost Ratios

Road User Benefit-Cost Analysis Results 3% Discount Rate		Project Capital Costs ($2011 millions)	30 Year Period Net Present Value ($2011 in millions)			
Scenario	**Description**		**Benefits**	**Costs**	**Residual**	**B/C**
Project 1	*Build Grade Separation at Margaret Ave.*	$ 16.50	$ 32.51	$ 16.54	$ 0.79	2.01
Project 2	*Build Grade Separation at Hulman Street*	$ 14.00	$ 13.89	$ 14.03	$ 0.67	1.04
Project 3	*Build Grade Separation at 13th Street*	$ 10.40	$ 18.29	$ 10.42	$ 0.50	1.80
Project 4	*Build Grade Separation at Ohio Street*	$ 10.90	$ 13.05	$ 10.92	$ 0.52	1.24
Project 5	*Build Grade Separation at Locust Street*	$ 9.00	$ 20.30	$ 9.02	$ 0.43	2.30
Project 6	*Build Grade Separation at 13th/8th*	$ 19.50	$ 35.44	$ 19.54	$ 0.94	1.86
Project 7	*Build Grade Separation at Margaret Ave. and at Locust Street*	$ 25.50	$ 40.35	$ 25.31	$ 1.22	1.64
Project 8	*Build Grade Separation at Margaret Ave.and at 13th/8th*	$ 36.00	$ 55.22	$ 35.54	$ 1.73	1.60
Project 9	*Build Grade Separation at Margaret Ave,.at 13th Street, and at Locust Street*	$ 35.90	$ 45.78	$ 35.20	$ 1.72	1.35
Project 10	*Build Grade Separation at Margaret Ave,.at 13th Street, and at 13th/8th*	$ 46.40	$ 59.71	$ 45.16	$ 2.23	1.37
Project 11	*Build Grade Separation at 5th Street/Lafayette Ave.*	$ 8.70	$ 17.79	$ 8.72	$ 0.42	2.09
Project 12	*Build Grade Separation at 7th Street*	$ 9.80	$ 20.37	$ 9.82	$ 0.47	2.12
Pink	*Upgrade INRR, Divert all Yellow CSX*	$ 240.90	$ 52.31	$ 180.11	$ 10.90	0.35
Yellow	*Upgrade Yellow (N-S) CSX to 60 mph*	$ 162.20	$ 16.38	$ 129.64	$ 7.79	0.19
Blue	*Upgrade Blue (E-W) CSX to 60 mph*	$ 94.10	$ 57.41	$ 75.21	$ 4.52	0.82

4.3.1 Margaret Avenue

A grade separation at Margaret Avenue/19th Street had a benefit-cost ratio of 2.01. The Margaret Avenue delays differ from other locations because of the long individual delays associated with railroad yard operations at the Baker Yard. The City of Terre Haute and the MPO have been working to improve the entire Margaret Avenue Corridor in phases over the past decade, and a categorical exclusion (CE) environmental document is in place and covers the full corridor. Reconstruction of the section of Margaret Avenue from US 41 (3rd Street) to 7th Street is underway, and the section from 7th Street to Canal Road is currently being designed. A portion of New Margaret

Avenue near SR 46 has also been constructed. A Margaret Avenue project that includes a bridge over the railroad near 19th Street would likely extend from 14th Street/Canal Road to 25th Street. The preliminary planning cost estimate in this study only covers the cost of the segment of Margaret Avenue reconstruction necessary to build the grade separation. This was done so that this cost estimating methodology would be consistent among all of the other grade separation projects in the study.

As a planning effort, separate from this study, the City of Terre Haute and the MPO investigated the feasibility of providing a Margaret Avenue grade separation with a three-lane section instead of the four-lane boulevard section identified in the CE. Traffic capacity analysis, based on the travel demand model results from this study, indicates that the three-lane section, one travel lane in each direction with a continuous center two-way-left-turn-lane (TWLTL), would operate at an adequate level of service for the next 50 years. Pulling the left-turning traffic out of the travel lanes was the key to this corridor's performance. Since no left turns would be available on the approaches to the bridge, the bridge structure would only need to be wide enough to carry two lanes of traffic. Right-of-way would be purchased according to the limits established in the CE and the three-lane section could be widened to the full four-lane divided boulevard section if and when such action is needed. It was estimated that implementation of the three-lane option could reduce initial overall project costs by up to 40 percent and significantly improve air quality by eliminating 62 vehicle-hours of delay each day.

Margaret Avenue is in close proximity to the I-70 grade separation for the Yellow (north-south) corridor; however, access to I-70 is not provided at this location. A grade separation at Margaret Avenue would cross the Yellow corridor, which is forecasted to carry 47 trains per day in 2031. A grade separation at Margaret Avenue garnered strong support during the public involvement process and is documented later in this study.

4.3.2 Hulman Street

A grade separation at Hulman Street had benefits that exceeded cost with a narrow margin resulting in a benefit-cost ratio of 1.04. Hulman Street is not a main corridor and would require roadway improvements to accommodate traffic drawn by the grade separation. The crossing is located on the south side of town within proximity to Margaret Avenue, which has been identified as a main corridor. A grade separation at Hulman Street did not perform well in terms of benefits realized and was not analyzed in combinations with other grade separations.

4.3.3 13th Street

A grade separation at 13th Street had a benefit-cost ratio of 1.80. Local planning efforts identified 13th Street as a key north-south corridor within the community. This crossing is located just south of downtown. A grade separation at 13th Street would cross the Yellow (north-south) corridor, which is forecasted to carry 47 trains per day in 2031.

4.3.4 Ohio Street

A grade separation at Ohio Street had a benefit-cost ratio of 1.24. Currently, Ohio Street is a one-way street that serves as an eastbound I-70 alternate in case of emergency. In the analysis, Ohio Street was assumed to be two-way. This crossing is located near the downtown area. A grade separation at Ohio Street was not feasible, so this location was not analyzed in combinations with other grade separations.

4.3.5 Locust Street

A grade separation at Locust Street had a benefit-cost ratio of 2.30 and $11.71 million of benefits in excess of costs. Locust Street is not a major corridor and would likely require improvements to handle increases in traffic attracted to the grade separation. Locust Street crosses both the Yellow (north-south) and Blue (east-west) corridors, which are forecasted to carry 80 trains per day in 2031.

4.3.6 13th Street and 8th Avenue

A grade separation at 13th Street and 8th Avenue had a benefit-cost ratio of 1.86 and $16.04 million of benefits in excess of costs. The grade separation would allow northbound/southbound vehicles on 13th Street and eastbound/westbound vehicles on 8th Avenue to cross both the Yellow (north-south) and Blue (east-west) corridors, which are forecasted to carry 80 trains per day in 2031. The crossing is located north of downtown, adjacent to Union Hospital, a regional medical facility. A grade separation in the 13th Street and 8th Avenue area garnered strong support during the public involvement process, documented later in this study.

4.3.7 5th Street/Lafayette Avenue

A grade separation at 5th Street/Lafayette Avenue had a benefit-cost ratio of 2.09 and $9.49 million of benefits in excess of costs. This grade separation is located on the Blue (east-west) corridor near the ISU campus and its proximity to the existing 3rd Street/US 41 grade separation limits the utility of constructing a grade separation at this location. The Blue corridor is forecasted to carry 27 trains per day in 2031 across 5th Street. The predicted growth for the Blue (east-west) corridor is less aggressive than the predicted growth for the Yellow (north-south) corridor. The 5th Street and Lafayette Avenue corridors are not continuous through the city. This location was not analyzed in combinations with other grade separations.

4.3.8 7th Street

A grade separation at 7th Street had a benefit-cost ratio of 2.12 and $11.02 million of benefits in excess of costs. This grade separation is located on the Blue (east-west) corridor near the ISU campus. The Blue corridor is forecasted to carry 27 trains per day in 2031 at this location. The predicted growth for the CSX east-west line is less aggressive than the predicted growth for the CSX north-south line. 7th Street is a continuous corridor through Terre Haute and carries more traffic than the 5th Street/Lafayette Avenue corridor; however, this location was not analyzed in combinations with other grade separations.

4.3.9 Combinations of Two Grade Separations (Margaret Avenue and Locust Street; and Margaret Avenue and 13th Street/8th Avenue)

Both combinations include Margaret Avenue as the grade separation for the southern portion of the city. The northern location, 13th Street/8th Avenue or Locust Street, are comparable in terms of location and spacing. 13th Street/8th Avenue provides direct access to Union Hospital, a regional medical facility. The design of the 13th Street/8th Avenue grade separation may be challenging, as two intersecting roadways will be served by a single grade separation. A grade separation at 13th Street/8th Avenue would better serve the northern portion of the city, which includes the Maple Avenue and 25th Street area.

4.3.10 Combinations of Three Grade Separations (Margaret Avenue, 13th Street; and 13th Street/8th Avenue and Margaret Avenue, Locust Street, and 13th Street)

Both combinations include Margaret Avenue as the southern grade separation and 13th Street as the grade separation serving the middle of Terre Haute. 13th Street/8th Avenue as the northern crossing would provide continuity along 13th Street, which is identified as a major corridor in planning efforts. 13th Street/8th Avenue provides direct access to Union Hospital, a regional medical facility. The design of the 13th Street/8th Avenue may be challenging, as two intersecting roadways will be served by a single grade separation.

4.4 Additional Projects Considered

4.4.1 Intelligent Transportation System (ITS)

Two ITS applications were considered in this study. The first application is a system that provides E911 dispatchers the capability to monitor train traffic traveling through the urbanized area so they can relay information about blocked or potentially blocked crossings to emergency services personnel responding to emergencies. The second system, which uses data collect by the first application, involves installation of variable

message signs at strategic locations to provide motorists with information about blocked crossings so they can consider alternate routes.

4.4.1.1 ITS Application for Emergency Services, Railroad Monitoring System

This project involves installation of a new system to monitor train traffic that traverses the Terre Haute UA. The system will use a series of detectors (eye-safe lasers, radar, etc.) mounted on existing poles, in existing public right-of-way, to detect the presence of trains at 15 to 20 crossings in the urbanized area and to collect information about the direction, speed and length of detected trains. Collected data will then be sent via existing Supervisory Control and Data Acquisition (SCADA) systems to a server located in the E911 Center where it will be processed using custom software. The positions, directions and lengths of trains, represented as train icons, will then be displayed on a web-based geographical information system (GIS) map to give dispatchers in the E911 Center and emergency services personnel, with mobile Internet access, information about the location of trains and their projected path. Users will be able mouse over a crossing icon on the train's projected path to produce a callout with an estimated time to closure (countdown timer) and the amount of time until the crossing is expected to reopen. Dispatchers and emergency services personnel can then use this information to make informed dispatch and routing decisions, and, therefore, reduce emergency response time by avoiding blocked or potentially blocked crossings where time lost waiting for a crossing to clear could contribute to injury or death.

The system could have video feed capability at select monitoring sites to confirm train detections and to check activity at crossings that are often blocked by yard switching activities. The system will be customized to meet the needs of emergency service providers and local government agencies. Input about the system design capabilities will be collected during the planning and design process. A system could be established for approximately $500,000.

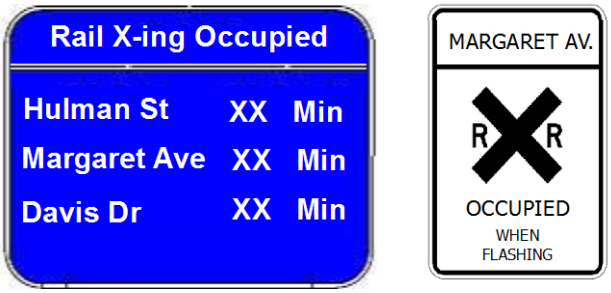
The intended audiences are the emergency service providers (typically E911, fire, police and ambulance services) and eventually the general public. Features can be restricted to produce a public version. The public version, for example, might only produce the train icons with no time callout capability to minimize liability and misuse. This ITS application would serve as the back-bone infrastructure for development of the message boards, discussed in the following section.

4.4.1.2 ITS Message Signs

The purpose of ITS message signs is to mitigate motorist delay caused by high congestion crossings. The ITS application will inform motorists of a blocked crossing with variable message signage. For example, if ITS message signs were placed at

crossing (e.g. Margaret Avenue), signage could also be provided at key decision points (e.g. 13th Street, 13th Street/Canal Road, 25th Street, Hulman Street, Davis Drive, and Spring Hill Drive). There are two types of signs, overhead panel signage and sheet signage (**Figure 11**). The panel signage, which costs approximately $65,000 per sign, would be located on the crossing approaches. This type of sign could feature count-up timers to notify motorists regarding how long a crossing has been blocked. The post signage costs approximately $30,000 per group of six signs, which includes three post signs placed at key decisions points. Each sign would have a flashing beacon when the crossing is blocked. The trains would be monitored with non-invasive devices or with access to preempt circuitry. These ITS projects meet the goals of the project Purpose and Need, and cost considerably less than a typical roadway grade separation.

Figure 11
Example ITS Message Signs



4.4.2 Pedestrian and Bicycle Safety Countermeasures

Pedestrian and bicycle safety countermeasures could be developed along the north border of the ISU campus, a high-pedestrian area. Currently, the railroad right-of-way is unprotected and pedestrians can cross all along the corridor. Passive or active devices may be used to supplement the existing devices that focus on motorists. Fencing, swing gates, pedestrian barriers, pavement markings, signage, automated pedestrian gates, and pedestrian signals are potential countermeasures. A pedestrian bridge would not be appropriately used unless pedestrian access to the railroad was cut off by fencing or walls. The following safety countermeasures can be considered:

- Fencing or pedestrian barriers: Pedestrian barriers can reduce accidental or malicious trespassing onto railroad property. Any fences or barriers should incorporate context sensitive design. Pedestrian barriers would require pedestrians to cross at designated crossings.

- Automated pedestrian crossing gates: Automated pedestrian gates (**Figure 12**) function the same way gates for vehicular traffic function.

Figure 12
Example of a Pedestrian Crossing Gate

4.4.3 Quiet Zones

Train horn noise was discussed at the public information meetings and the community advisory meetings, which are documented later in this study. A quiet zone designation removes routine use of train horns; however, horns will still be used at the engineer's discretion for safety purposes.

Quiet zone applications are typically made when a group with vested interest, such as a neighborhood, approaches the local public agency (LPA) and makes a case for the quiet zone. If the LPA agrees to pursue a quiet zone, the LPA submits an application to the railroad company and the FRA. To apply, quiet zones must be at least one-half mile long. Supplemental safety measures (SSM) are used to improve the risk index of the rail corridor. The goal of the SSM is to prevent vehicles from driving around traditional gates to beat a train to the crossing. Four-quadrant gates, gates with a channelized, non-mountable roadway median, one-way streets with gates, and roadway closures are typical SSM's. The corridor-wide safety rating is considered. Alternative safety measures (ASM), which include photo enforcements and public education campaigns, may be used in special circumstances. The initial SSM investment would be made by the LPA. Four-quadrant gates systems (**Figure 13**) typically cost between $300,000 to $500,000 per crossing. Channelized medians are typically less expensive than four-quadrant gate systems but can cause road maintenance issues such as drainage and snowplow concerns. Closing the road at the crossing location, thus eliminating the crossing, is the least expensive and most effective safety improvement; however, this reduces the overall mobility of the roadway network, which can be an unpopular proposal for residents and business owners.

While quiet zones are only required to be one-half mile in length, longer zones are encouraged. Quiet zones are most commonly located in residential areas. A quiet

zone could be pursued as an individual initiative or as part of a larger project. While no detailed quiet zone analysis is contained within this study, potential quiet zone locations are discussed below.

- Existing CSX (east-west) from 1st Street to Elm Street: The necessary improvements for the quiet zone could be pursued with pedestrian and bicycle safety improvements near ISU campus. The required supplemental safety measures would include a crossing closure at 6th Street, which conforms to the RHIC planning effort. Crossings at 8th Street and 9th Street, which are currently one-way streets with gates, qualify as pre-existing supplemental safety measures.

- Existing CSX (north-south) from Davis Drive to Fort Harrison Road: The required supplemental safety measures would include construction of grade separations and the closure of at-grade crossings in the proximity of the new grade separations. Some of the potential grade separation locations previously discussed in the Tier 2 analysis section of this study include Margaret Avenue, 13th Avenue, and the 13th Street/8th Avenue intersection area. Crossing closures could include 7th Avenue, Ash Street, and Crawford Street. Crossings at Ohio Street and Walnut Street, which are currently one-way streets with gates, qualify as pre-existing supplemental safety measures.

- Existing CSX (east-west) from Ash Street to Fort Harrison Road. The required supplemental safety measures would include a closure of the Ash Street crossing.

Figure 13
Example of a Four-quadrant Gate Crossing

5. Resource Agency Coordination

The initial coordination with the Federal Railroad Administration (FRA) and the Federal Highway Administration (FHWA) began with a conference call held on January 21, 2011. The purpose of the meeting was to introduce the project, update the agencies on the progress-to-date, and discuss the roles of FHWA and FRA in the study. The study will follow the Indiana Department of Transportation (INDOT) and FHWA NEPA process. The final product of the study will be recommended projects of independent utility. The MPO will work with local project sponsor to seek project funding from a combination of sources.

The local study team hosted the first resource agency review meeting on April 13, 2011, at 9:00 AM at the Girl Scout office in Fairbanks Park. The purpose of the meeting was to introduce the study, solicit feedback from relevant agencies, and perform a site visit. A packet of information was sent to the resource agencies prior to the meeting, which included a brief description of the study, a frequently asked questions (FAQ) page, draft Purpose & Need statement, map of the Terre Haute UA with wetlands and floodplains, and a map of Tier 1 Corridors. In addition to FHWA, the participating agencies included INDOT, USEPA, USFWS, and US Department of Housing and Urban Development (HUD). The feedback from the resource agencies on the study methodology called for more emphasis to be placed on reducing motorist delay and the ability for projects to be implemented in feasible phases. The USEPA and USFWS recommended elimination of the Tier 1 Orange Corridor Alternative because of the large impacts to wetlands, floodplains, waterways, and forested lands.

The local study team hosted a second resource agency review meeting on March 21, 2012, at 10:00 AM at the Girl Scout office in Fairbanks Park. The purpose of the meeting was to review the results of the alternatives analysis. The review agencies were provided with a copy of the draft report, a *PowerPoint* presentation, and a copy of the previously approved CE for the Margaret Avenue corridor. An early coordination meeting was held between FRA's and FHWA's Environmental Specialists for Indiana and the MPO on March 15th since the FRA specialist could not participate in the reviewing meeting on the 21st. The FRA specialist concurred with overall study approach and the analysis. In addition to FWHA, the INDOT and USFWS participated in the meeting on March 21st. These agencies also concurred with the analysis that lead to the recommendation of smaller improvements, rather than corridor-wide improvements or railroad relocation projects. Resource agency coordination documentation is contained in **Appendix C**.

6. Public Involvement

6.1 Methodology

The Community Advisory Committee (CAC) is a diverse group of individuals representing key organizations or interests within the community such as neighborhood groups, local transportation officials, emergency services personnel, school corporation representatives, and institutes of higher education. Three CAC meetings were held throughout the course of this study. The CAC served as a working group, providing input to the study team and ensuring that the study reflected the sentiment of the community.

The project website (www.terrehauterailstudy.com) was a tool used by the study team to reach out to the public. Meeting announcements and public meeting materials were posted on the website. The website provided contact information and a direct email for comment submittal.

Two public information meetings (PIM) were held to present findings and solicit input directly from the public. The media was invited to participate in all public meetings, and press releases were used to promote the public meetings and the electronic survey available on the study website.

Printed copies of the final draft report were made available for public review and comment from May 2nd to May 11th, 2012 at the MPO's office located at 1718 Wabash Ave., Terre Haute, IN 47807; at the Main Branch of Vigo County Library, One Library Square, Terre Haute, IN 47807; and in electronically accessible format on the World Wide Web. No public comments were received.

6.2 Timeline of Public Involvement Activities

The first CAC meeting was held on February 23, 2011, at 5:30 PM at the Girl Scout office in Fairbanks Park. The study was introduced to the CAC. The CAC members participated in a breakout session to discuss the locations and topics of concern. Each group ranked the top five locations where rail traffic is of most concern (**Table 5**).

Table 5
CAC Locations of Top Concern

	Downtown Terre Haute	ISU Campus Area	8th Ave and 13th Street Area	Maple Ave and 25th Street Area	19th Street & Margaret Avenue	Fruitridge Street	Haythorne Street	1st Street
First Priority	0	0	0	0	5	0	0	0
Second Priority	1	2	1	1	0	0	0	0
Third Priority	3	1	0	0	0	0	0	1
Fourth Priority	1	1	2	0	0	1	0	0
Fifth Priority	0	1	0	1	0	0	1	1

The top five locations were Margaret Avenue & 19th Street, 8th Avenue & 13th Street, CSX north-south line downtown, and ISU campus vicinity. The crossing at Fruitridge Street near Bemis, 1st Street, and Haythorne Street crossing were also ranked by the CAC. The topics of highest concern were emergency response vehicles' ability to respond to emergencies, delays to motorists, train horn noise, the city's image and economic potential, trains blocking crossings, and quality of life.

The second CAC meeting was held on June 15, 2011, at 5:30 PM at the Girl Scout office in Fairbanks Park. Tier 1 corridor alternatives and potential ITS solutions were discussed. The CAC members participated in a collaborative activity to reaffirm their concerns for the top five locations identified during the first CAC meeting. CAC members were asked to consider what role, if any, ITS applications might play at each location. CAC members were also asked to consider whether individual roadway grade separations are a feasible solution. The potential for quiet zones was also discussed.

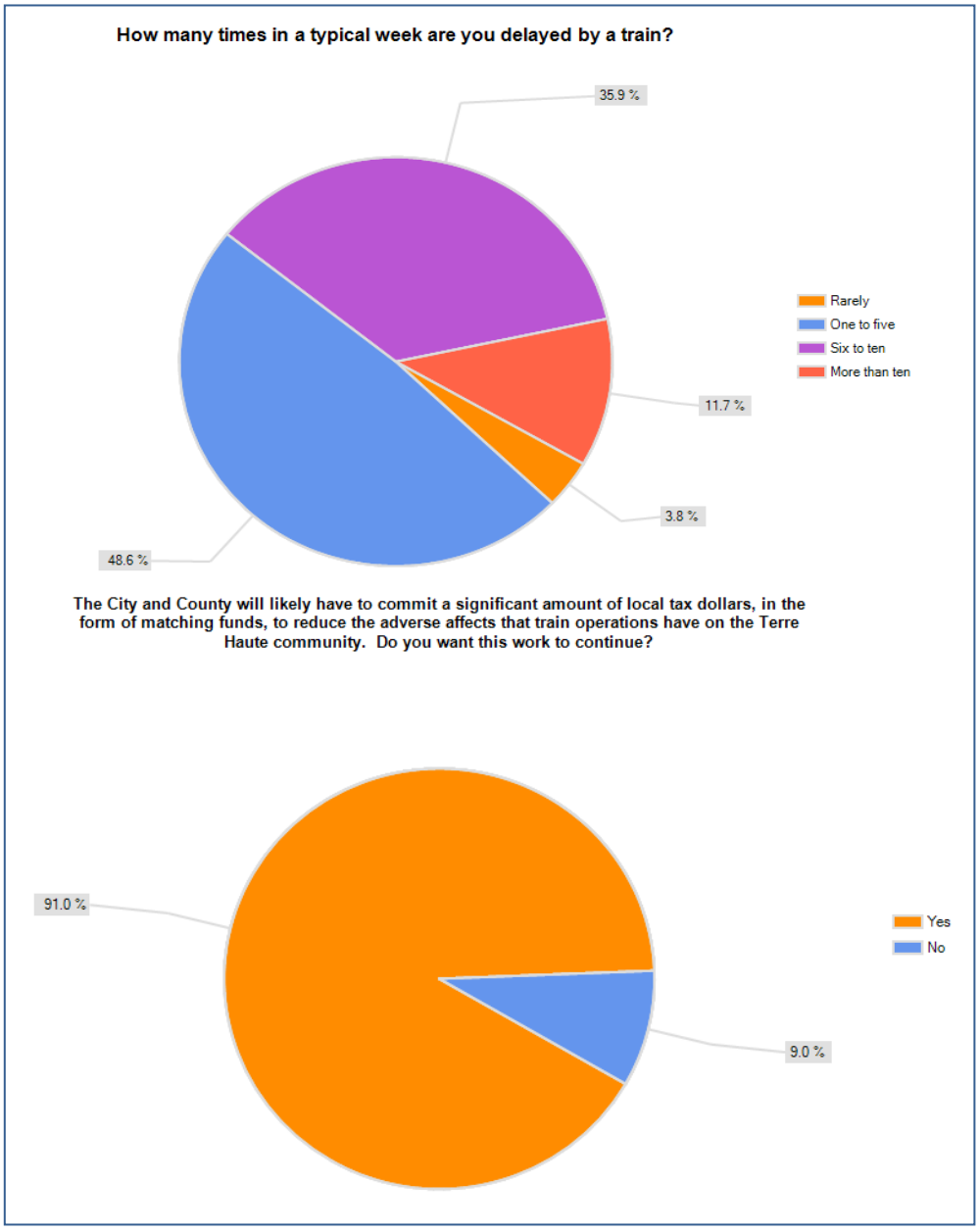
The first PIM was held on June 28, 2011, at the Girl Scout office in Fairbanks Park. A presentation was given to introduce the attendees to the study and report the findings to date. The presentation was followed by a question and answer session.

Attendees were asked to fill out a brief survey, which was also available online and accessible through the study website. There were 395 responses to the survey. The survey asked participants to rate the top five locations identified by the CAC based on how much of an issue congestion poses at each location (**Table 6**). Participants were asked how many times during a typical week they are delayed by trains and if they would like to see a significant amount of tax dollars used to reduce the adverse effect of trains on the community (**Figure 14**).

Table 6
Summary of Responses to the Electronic Survey

	Downtown Terre Haute	ISU Campus Area	8th Ave and 13th Street Area	Maple Ave and 25th Street Area	19th Street & Margaret Avenue
Very Congested -3	33.2%	18.2%	46.8%	56.5%	88.5%
Somewhat Congested - 2	46.4%	47.2%	41.9%	33.4%	7.5%
Little to No Problem – 1	20.4%	34.6%	11.3%	10.1%	4.0%

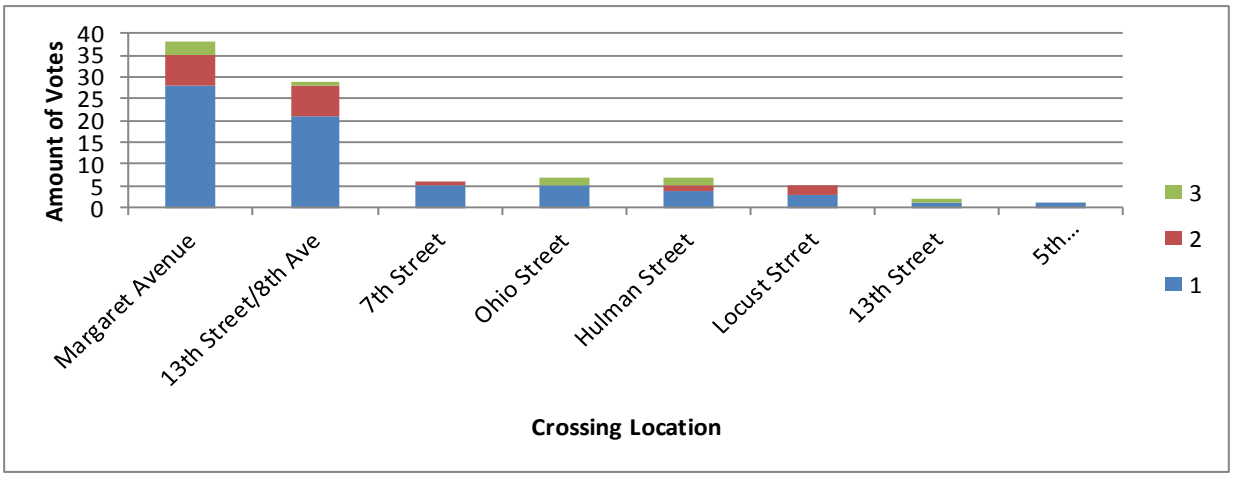
Figure 14
Summary of Responses to the Electronic Survey



The third CAC meeting was held on March 21, 2012, at 6:00 PM at the Girl Scout Office. The public survey results and the results of the analysis were shared.

The second PIM was held on March 28, 2012, at 6:00 PM at the Girl Scout Office. A presentation was given to present the public survey results and the results of the analysis. Attendees were asked to fill out a comment card to rank the top two to three roadway grade separation locations, based on the analysis presented and summaries from CAC meetings and the electronic survey. The crossing location rankings 1, 2, and 3 designate first, second, and third priority, respectively. **Table 7** summarizes the attendees' responses.

Table 7
Summary of Comment Card Responses



Attendees were also asked if local officials should pursue development of a computer based system that provides the E911 Center, emergency responders, and potentially motorists with information about local train activity and blocked crossings. Of the 42 people that filled out the comment card, 35 or 83% responded in favor of the ITS system. Public comments were accepted until April 12, 2012. All public involvement documentation, including the electronic survey form and results, is contained in **Appendix B**.

7. Railroad Coordination

CSX and INRD were engaged throughout the study process. Representatives from CSX and INRD attended coordination meetings and participated in public involvement meetings, including two CAC meetings and one PIM. The study team coordinated with the railroad companies on how railroad traffic would adjust to a phased Pink Corridor Alternative. CSX and INRD reviewed the study team's planning assumptions and preliminary planning cost estimates.

Early railroad coordination meetings were held with CSX and INRD to introduce the project and gather relevant information. On January 6th, 2011, 9:00 AM, CSX and URS held a conference call. INRD and URS held a meeting January 20, 2011, at 2:30 PM at the INRD Office in Indianapolis.

The first railroad coordination meeting was held on February 23, 2011, at 1:00 PM at the Girl Scout office in Fairbanks Park. The purpose of the meeting was to review the conceptual railroad alignment alternatives and gather feedback from CSX and INRD.

Existing train counts were gathered by the MPO using motion-activated cameras at key locations. *The National Rail Freight Infrastructure Capacity and Investment Study* was used as an initial source for train volume growth factors. A draft of the freight rail traffic assumptions was sent to CSX and INRD for review on September 9, 2011. Growth rates and train volume forecasted were revised based on feedback received from CSX and INRD.

A railroad coordination meeting was held on January 12, 2012, at 1:30 PM at the MPO office in Terre Haute. The purpose of the meeting was to share the preliminary analysis results with CSX and INRD. The benefit-cost analysis completed in Tier 2 was presented. All attendees concurred with the planning assumptions contained within this study. It was requested that benefit-cost analysis be performed for a phased Pink Corridor.

A railroad coordination meeting was held on January 30, 2012, at 1:30 PM via conference call. The purpose of the meeting was to follow-up on questions that came up during the previous coordination meeting on January 12, 2012. The phased Pink Corridor benefit-cost analysis and sensitivity analysis were shared with CSX and INRD.

8. Recommended Projects of Independent Utility

This study recommends the following projects of independent utility, listed in order of priority, be programmed and advanced through the project development cycle (environmental, preliminary engineering and design, right-of-way acquisition) to construction over the next 5 to 20 years. The actual timeline for programming and advancement will depend on the ability of local officials and the MPO to secure funding for the projects.

Table 8
Summary of Recommended Projects of Independent Utility

Priority	Project	Targeted Completion Date	Targeted Funding Source(s) [1]	Estimated Cost
1	Intelligent Transportation System (ITS) Application for Emergency Services	Two years (2014)	90% - FRA Rail Line Relocation & Improvement Program 10% - Local	$500,000
2	Margaret Avenue Grade Separation with N-S CSX	Five years (2017)	80% - STP, CMAQ & TIGER 20% - Local	$16.50 Million
3	8th Avenue/13th Street Grade Separation with N-S and E-W CSX	13 years (2025)	80% - STP, CMAQ & TIGER 20% - Local	$19.50 Million
4	Pedestrian and Bicycle Safety Improvements Near ISU Campus	15 years (2027)	90% - FRA RLRIP 10% - Local	$2.0 Million
5	Grade Separation with N-S and/or E-W CSX	20 years (2032)	80% - STP, CMAQ & TIGER 20% - Local	$15.0 Million

(1) Funding Code Program Abbreviations:
FRA RLRIP: FRA Rail Line Relocation & Improvement Program – Nationwide Competitive Program
CMAQ: MPO Congestion Mitigation & Air Quality Program – Local Competitive Program
STP: MPO Surface Transportation Program – Local Competitive Program
TIGER: Transportation Investment Generating Economic Recovery Program - Nationwide Competitive Program

The above project recommendations flow directly from the results of the previously discussed Tier 2 alternatives analysis, considered in tandem with the extensive public outreach for this study. These projects of independent utility are feasible, fundable, and maximize the benefit to the community while minimizing the expenditure of funds.

The Tier 2 analysis benefit-costs analysis results for the potential grade separations, both as individual projects and as combinations of grade separations, illustrate a diminishing return to providing grade separations. For each additional grade separation that is provided, a diminished amount of incremental benefit is anticipated. Since the

incremental anticipated benefit decreases sharply following construction of the third grade separation, only three grade separations are recommended as projects of independent utility in this study. The Margaret Avenue Grade Separation with N-S CSX is the first priority while the second priority is the 8th Avenue/13th Street Grade Separation with N-S and E-W CSX. A placeholder project serves as the third grade separation priority with a final location to be chosen in the future from the locations analyzed in this study.

The following sections contain brief descriptions for each of the recommended projects of independent utility.

8.1 ITS Application for Emergency Services

All of the required ITS infrastructure could likely be placed within an existing, public right-of-way, thus eliminating the need for a NEPA document. If a NEPA document is required, it would be a low-level CE. The planning-level cost estimate for the ITS application for emergency services is $500,000 and targeted completion is within two years (2014).

8.2 Margaret Avenue Grade Separation with North-South CSX Near 19th Street

The Margaret Avenue grade separation improvements should include a three-lane roadway section extending from Canal Road to 25th Street. This project fits within a previously approved CE for the Margaret Avenue corridor. This study serves as a Supplemental Information document to the original CE. The planning-level cost estimate for the Margaret Avenue grade separation is $16.50 million and targeted completion is within five years (2017).

8.3 8th Ave/13th Street Grade Separation with North-South and East-West CSX

This project needs further refinement to determine the type and configuration of the grade separation. The project provides access across both existing CSX corridors, forecasted to carry 80 trains per day in 2031, for 13th Street, a critical north-south road corridor, and for 8th Avenue, a critical east-way road corridor. This project greatly reduces delay and significantly improves safety by providing access to Union Hospital, a major regional health center for Western Indiana and Eastern Illinois. The required NEPA document will be a CE, which can refer to this study's Purpose and Need, alternatives analysis, and public involvement. The planning-level cost estimate for the 8th Avenue/13th Street grade separation is $19.50 million and targeted completion is within 13 years (2025).

8.4 Pedestrian and Bicycle Safety Improvements Near ISU Campus

This project needs further refinement to determine the type of fencing and/or walls to prevent pedestrian trespass over the east-west CSX tracks along the north side of the ISU campus. A pedestrian bridge is not recommended by this study; however, access should be controlled between at-grade public road railroad crossings. The required NEPA document will be a CE, which can refer to this study's Purpose and Need, alternatives analysis, and public involvement. The pedestrian and bicycle safety improvements targeted completion is within 15 years (2027).

8.5 Grade Separation with North-South and/or East-West CSX

This project is a grade separation with the north-south and/or east-west CSX lines at a location to be determined in the future. Local government officials will select a third grade separation location only after funding is secured for the grade separation at 13th Street/8th Avenue or funding will be pursued in combination with the grade separation at 13th Street/8th Avenue. The third grade separation location will be selected only from the grade separation locations analyzed in Tier 2. The required NEPA document will be a CE, which can refer to this study's Purpose and Need, alternatives analysis, and public involvement. The third grade separation targeted completion is within 20 years (2032).