

**FLEX  
ROAD**

> LESS STOP,  
MORE GO

# I-80/94 BORMAN EXPRESSWAY

Planning and Environment Linkages  
(PEL) Study Report

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## Section 1 – INTRODUCTION

### 1.1 STUDY LOCATION AND DESCRIPTION

The I-80/94 Borman Expressway Planning and Environment Linkages (PEL) Study is being conducted by the Indiana Department of Transportation (INDOT), in cooperation with the Illinois Department of Transportation (IDOT) and the Federal Highway Administration (FHWA). The study corridor for the I-80/94 Borman Expressway PEL Study includes I-80/94 from I-65 in Indiana on the east (i.e., eastern logical termini) to IL 394 in Illinois on the west (i.e., western logical termini) (**Figure 1**). The Indiana portion of the corridor is referred to as the Borman Expressway and the Illinois portion is referred to as the Kingery Expressway. The limits of the study have been defined based on the identified needs in the corridor. East-west traffic in this area of the Midwest have several options east and west of Lake Michigan. However, to get around the south end of Lake Michigan, all the major routes are funneled into two main interstate corridors: I-80/94 and I-90 (toll). The eastern and western termini identified represent logical breaks/changes to I-80/94 which represents a consistent transportation facility between these termini. Congestion and safety concerns likely extend beyond the study termini, but this roadway segment is consistent in character (e.g., lane configuration, interchange spacing, development patterns, etc.) and the severity of the issues within these limits is higher. The traffic volumes decrease substantially outside of these termini. Further, beyond the east and west termini, the roadway leaves the jurisdiction of INDOT and IDOT, respectively, and is the responsibility of independent toll authorities with their own congestion management programs. At the western terminus, the I-80/94 traffic fans out to the west on I-80/I-294 (toll), to the south on IL 394, and to the north on I-94. At the eastern terminus at I-65, I-80/94 traffic splits out to the south on I-65 and to the east via I-94 and I-80/90 (toll). These logical termini create a study corridor with independent utility as improvements in this stretch of I-80/94 would benefit traffic operations whether or not other adjacent projects are completed.

While the study is focused on improving the traffic operations of I-80/94, depending on the improvements considered, work may be required outside the I-80/94 corridor at one or more of the interchanges. Also, upstream messaging may be necessary on the aforementioned roadways as they approach the I-80/94 corridor. For these reasons, at the east and west termini, the study area extends to the next interchange in each direction, and at intermediate interchanges, it generally extends to the next intersection or interchange to the north and south along the intersecting roadway (See the Environmental Features maps in **Appendix A**).

Interstate 80/94 is predominantly an eight-lane facility with four continuous general-purpose lanes in each direction that represents a critical link between the Chicago area and points east. The study corridor includes 10 interchanges comprised of two system interchanges and eight service interchanges. The IL 394/I-80/I-94/I-294 system interchange at the western terminus forms the confluence of the Tri-State Tollway (I-294), the Bishop Ford Expressway (I-94), and the Kingery Expressway (I-80/94). The Torrence Avenue (US 6/IL 83) interchange is a service interchange and the last interchange before entering Indiana. Moving from west to east there are service interchanges in Indiana at Calumet Avenue (US 41/IN 152), Indianapolis Boulevard (US 41/IN 152), Kennedy Avenue, Cline Avenue (IN 912), Burr Street, Grant Street, and Broadway (IN 53). The eastern terminus is the system interchange at I-65. The corridor traverses the communities of South Holland and Lansing in Illinois and the communities of Hammond, Munster, Highland, Gary, and Lake Station in Indiana. The western portion of the study corridor supports dense residential and commercial development while the eastern portion supports a mix of less dense residential development, undeveloped land, and large tracts of wetlands.

The average annual daily traffic (AADT) along the I-80/94 corridor ranges from 204,000 vehicles at the state line to 158,000 vehicles at I-65. The corridor is heavily used by trucks which comprise up to 31 percent of the daily traffic and up to 25 percent of peak-hour traffic. The corridor serves as both a connector for the local communities and a through-corridor for more regional trips. Origin-destination data shows that 60 percent of westbound and 44 percent of eastbound PM peak-period trips are through trips. Traffic volumes throughout the corridor are forecasted to increase by 2040, the study's design year. Peak-period traffic is expected to increase by up to 18 percent. Neither INDOT nor the Northwest Indiana Regional Planning Commission's (NIRPC) long range plans identify funds for significant expansion in the corridor, such as adding additional travel lanes, that would address the corridor's issues 20-30 years into the future because they are likely

beyond the states' available funding and would likely result in substantial right-of-way and environmental impacts.

Figure 1 - Study Location



## 1.2 PEL PROCESS

This PEL study was conducted in accordance with FHWA's PEL program which was established to help transportation planning agencies develop a collaborative, integrated, and seamless decision-making process that minimizes duplication of efforts between early (i.e., pre-National Environmental Policy Act [NEPA]) transportation planning studies and the NEPA process. The PEL process also helps reduce delays and streamline and accelerate the overall project schedule and delivery. The goal of this PEL study was to complete planning products such as the purpose and need statement and to develop, analyze, and screen a range of reasonable alternatives in a NEPA-compliant manner. As such, when the NEPA process is initiated, these planning products can be incorporated via reference because they meet NEPA requirements, providing a seamless transition between PEL and NEPA. As discussed in Section 5, agency coordination and public involvement occurred throughout the PEL process and at key points such as the introduction of the study, the determination of the project's purpose and need, and the identification and assessment of improvement strategies. As part of the PEL process, the FHWA PEL Questionnaire was completed for this study and is located in **Appendix B**.

## Section 2 – PURPOSE AND NEED

As part of this PEL study, the project's purpose and need was determined and the results documented in the *Preliminary Purpose and Need/Logical Termini* report located in **Appendix C**. The following is a summary of the project's purpose and need.



## 2.1 PROJECT NEEDS

The project need was determined based on evaluating traffic congestion (i.e., travel times, travel speeds, and levels of service) and safety (i.e., crash frequency) within the I-80/94 corridor. Ideally, traveling from end to end through the corridor without delay (free-flow) takes 18 minutes in the westbound direction and 16 minutes in the eastbound direction. Estimates for 2020 show delay in both directions during both the AM and PM peak periods, with the most severe delay in the eastbound direction during the PM peak period when travel time is 54 percent greater than free-flow speeds. By the year 2040, travel times are estimated to further degrade with additional traffic. The PM peak period delay in the eastbound direction nearly doubles from 8.7 minutes to 17.0 minutes and the total travel time is double the travel during free-flow conditions (33 minutes compared to 16 minutes). Travel time in the corridor also varies which affects travel time reliability. This creates uncertainty for motorists who must plan for additional travel time in order to reach their destination on time.

With regard to travel speed, it was determined that free-flow speed in the corridor is 62 mph. Average speeds below 50 mph indicate deteriorating levels of service. For a typical weekday in 2019, eastbound travel during the PM peak-period showed the lowest speeds with the worst areas being from the Illinois/Indiana state line to I-65. For the year 2040, AM peak-period travel speeds will remain relatively high (50+ mph) in both directions, except for a short period of lower speeds (35-45 mph) near the Burr Street interchange in the westbound direction. During the 2040 PM peak period, there are large sections of the corridor with speeds below 25 mph in the eastbound direction near weaving sections between Calumet Avenue and Indianapolis Boulevard, Cline Avenue and Burr Street, and Broadway and I-65. The 2040 PM speeds in the westbound direction shows a section with speeds below 25 mph in the area of Burr Street.

Levels of service (LOS) ranging from A (free-flow conditions) to F (severely congested conditions and low speeds) were calculated for the existing (i.e., year 2019) and future no-build conditions (i.e., year 2040) for all mainline segments in the corridor. LOS D or better is generally considered acceptable for a freeway facility while LOS E or F are considered unacceptable. For the existing year 2019, two segments out of 37 in the eastbound direction operate at LOS E or F while all the westbound segments operate at LOS D or better during the AM peak hour. During the PM peak hour, 10 segments out of 37 in the eastbound direction operate at LOS E or F, including five consecutive segments from the Grant Street interchange to I-65. The westbound direction shows one segment currently operating at LOS E or F during the PM peak hour. For the future no-build conditions in 2040, there are three additional segments operating at LOS E or LOS F.

With regard to safety, two indices were calculated, the Index of Crash Frequency (ICF) and the Index of Crash Cost (ICC), which are measures of frequency and severity, respectively. These indices refer to the number of standard deviations from the statewide average for that particular facility type. INDOT flags segments with an ICF greater than or equal to 2.0 as high-crash frequency segments. If a segment has an ICF less than 2.0 but has an ICC greater than or equal to 2.0 it is still identified as a high-crash severity location. The corridor was divided into 20 segments in the eastbound direction of travel and 22 segments in the westbound direction of travel. ICF and ICC were calculated for each segment using crashes from 2017 through 2019. Thirteen of the 20 eastbound segments were identified as either high-crash frequency (8) or high-crash severity (5) segments. Eleven of the 22 westbound segments were identified as high-crash frequency (6) or high-crash severity (5) segments.

Based on the assessment of existing and future conditions described above, the needs for this project have been identified as recurring congestion and elevated crash rates within the I-80/94 corridor. Motorists within this corridor experience recurring congestion during weekday peak commuting periods and on Sunday afternoons/evenings, especially during the summer. The congestion results in poor travel time reliability and low speeds during peak hours. In addition, the Northwestern Indiana Regional Planning Commission (NIRPC) has identified this roadway as the most congested interstate highway corridor in northwest Indiana<sup>1</sup>.

<sup>1</sup> MOVE NWI Congestion Management Process, NIRPC, 2020. <https://nirpc.org/wp-content/uploads/2020/09/Move-NWI-Congestion-Management-Process.pdf>

Two primary needs have been identified for the I-80/94 Borman Expressway project:

- Recurring traffic congestion – bottleneck locations that result in travel time delays, low travel speeds, and unacceptable levels of service, and
- Safety – segments of high crash rates in the corridor.

## 2.2 PROJECT PURPOSES

Based on the project's needs, the purpose of the project is to identify corridor improvements that, based on the design year of 2040, will:

- Increase the operational efficiency of the corridor by reducing travel times and increasing travel time reliability, and
- Improve safety in the corridor by reducing crashes.

## 2.3 PERFORMANCE MEASURES FOR SATISFYING PURPOSE AND NEED

Strategies were developed and evaluated based on their ability to satisfy the project's purpose and need using the following criteria. Not all of these criteria need to be met in order for a strategy to satisfy the project's purpose and need.

- Travel time through the I-80/94 corridor is reduced with no minimum level of reduction required.
- Travel time reliability through the I-80/94 corridor is increased with no minimum level of increase required. Reliability is measured based on the 95<sup>th</sup> percentile travel time, average travel speed, and planning time index.
- Freeway speed through the I-80/94 corridor is increased with no minimum level of increase required.
- Safety is improved based on a qualitative assessment that crashes will be reduced within the I-80/94 corridor with no minimum level of reduction required.

# Section 3 – EXISTING ENVIRONMENT

The following sections represent a summary of secondary source data collection efforts. Information was generally collected within a 0.5-mile radius of the I-80/94 study area as described in Section 1. For the Indiana portion of the study area, the data was documented in a *Red Flag Investigation* (RFI), following INDOT guidance (**Appendix D**). Data for the Illinois portion of the study area was collected through a combination of an Environmental Survey Request (ESR) to IDOT and through a report obtained through Environmental Data Resources, Inc. (EDR). The ESR (**Appendix E**) provided information regarding cultural resources, threatened and endangered species, Illinois Natural Area Inventory (INAI) sites, and Illinois Nature Preserves (NP). The EDR Report (**Appendix F**) identified hazardous waste/material sites in the study area. A summary of this secondary source data is provided in the following applicable sections and in **Appendix A**.

Resource data provided for the two states reflects the state-specific data collection processes described above. Therefore, data for all resources is not available in both states. For example, data on pipelines was collected in Indiana, but not in Illinois. During the NEPA phase, more detailed, and uniform, studies will be conducted, as needed, along with applicable agency coordination.

## 3.1 INFRASTRUCTURE

This section discusses the infrastructure (e.g., hospitals, schools, airports, etc.) that was identified as part of the RFI for the Indiana portion of the study area. Note that roadways are not identified as infrastructure in the RFI. For the Illinois portion, available secondary source data was collected for similar infrastructure resources. However, based on the availability of data and the collection process, not all of the same infrastructure information was collected for both states.

### 3.1.1 Indiana

**Table 1** presents the type and number of non-roadway infrastructure resources located within 0.5 mile of the I-80/94 project area.

**Table 1 - Indiana Infrastructure**

TYPE	NUMBER
Religious Facilities	80
Airports <sup>1</sup>	3
Cemeteries	2
Hospitals	0
Schools	19
Recreational Facilities*	75
Pipelines	41
Railroads	28
Trails*	29
Managed Lands*	30

<sup>1</sup>In order to complete the required airport review, a review of public-use airports within 3.8 miles (20,000 feet) is required.

\*Includes sites not mapped in GIS.

**Religious Facilities:** Eighty (80) religious facilities are located within the 0.5 mile search radius. The following nine (9) religious facilities are adjacent to the study area:

- Unity Church
- Riverside Community Reformed Church
- Assembly of God Church of Hessville, aka Life Point Church
- Pentecostal Church of God
- Grace Missionary Baptist Church
- Saint Timothy Community Church
- Abundant Life Tabernacle
- Greater Saint James African Methodist Episcopal Church
- Saint John Baptist Church

**Airports:** Although not located within the 0.5 mile search radius, three (3) public-use airports, Gary/Chicago International Airport, Griffith-Merrillville Airport, and the Hobart Sky Ranch Airport, are located within 3.8 miles (20,000 feet) of the study area. The Gary/Chicago International Airport is located approximately 2.3 miles north of the study area, the Griffith-Merrillville Airport is located approximately 3.3 miles south of the study area, and the Hobart Sky Ranch Airport is located approximately 1.0 mile south of the study area; therefore, early coordination with the INDOT Office of Aviation will be required.

**Cemeteries:** Two (2) cemeteries are located within the 0.5 mile search radius. The nearest cemetery, Evergreen Memorial, is located approximately 0.3 mile south of the study area.

**Schools:** Nineteen (19) schools are located within the 0.5 mile search radius. The following two (2) schools are located adjacent to the study area:

- Cline Avenue Baptist Childcare/Preschool
- Gary Academy & Blessed Beginning Daycare

**Recreational Facilities:** Seventy-five (75) recreational facilities are located within the 0.5 mile search radius. The following eleven (11) recreational facilities are adjacent to the study area:

- George W. Carlson Oxbow Park
- Hammond FOP 51 Memorial Field
- Rich's Park
- Griffith Golf Center (Note, this site is no longer a golf course and appears to be vacant and covered in vegetation.)
- Frederick Douglass Elementary School (Note, this is no longer a school and appears to be vacant.)
- Black Oak Elementary School (Note, this site is no longer a school and appears to be vacant and covered in vegetation.)
- MC Bennet Park (LWCF Conversion)
- Miller Park
- Three Rivers County Park
- Grand Boulevard Lake
- Four Winds Park

*Pipelines:* Forty-one (41) pipeline segments are located within the 0.5 mile search radius. Thirty (30) pipeline segments, owned by Northern Indiana Public Services Co., Buckeye Pipe Line Co., Phillips Pipe Line Co., Shell Oil Co. Inc., AMOCO Pipeline Co., Wolverine Pipe Line Co., Marathon Pipe Line Co., ARCO Pipe Line Co., Wabash Pipe Line Co., and Explorer Pipeline Co., cross the study area.

*Railroads:* Twenty-eight (28) railroads are located within the 0.5 mile search radius. Fourteen (14) railroad segments, owned by Canadian National Railroad, Chicago, Ft. Wayne & Eastern Railroad, CSX Railroad, and an unlabeled railroad, cross the study area.

*Trails:* Twelve (12) trails are located within the 0.5 mile search radius. The following ten (10) trails cross or are adjacent to the study area:

- Little Calumet River Levee Trail in Hammond, Highland, and Gary (cross)
- Monon Trail in Hammond (cross)
- Erie Trail Linear Park, also called the Erie Lackawanna Trail in Hammond (cross)
- Twin Rivers Trail in Hammond (planned trail that would cross the study area)
- Hammond Parks Trail in Hammond and Highland (adjacent)
- Unmapped Trail in Gary (cross)
- Gary Parks Trail in Gary (cross)
- Lake County Parks Trail in Lake Station (adjacent)
- East Lake Corridor Clay Street in Lake Station (planned trail that would cross the study area)
- Lake Station Parks Trail in Lake Station (adjacent)

*Managed Lands:* Thirty (30) managed lands are located within the 0.5 mile search radius. The following fourteen (14) managed lands are adjacent to the study area:

- River Drive Park
- Rich's Park
- Riverside Park
- Optimist Youth Sports Complex
- Centennial Plaza and Trail
- Wicker Memorial Park
- Edward C. Dowling Park
- Carlson – Oxbow Park
- Indiana Tolleston
- 25<sup>th</sup> Avenue Park
- North Gleason Park Pavilion
- Tolleston On the Hill
- Three Rivers County Park
- Grand Lake Recreation Area

### 3.1.2 Illinois

**Table 2** presents the type and number of infrastructure resources located within 0.5 mile of the I-80/94 study area.

**Table 2 - Illinois Infrastructure**

TYPE	NUMBER
Religious Facilities	13
Cemeteries	1
Schools	8
Railroads	8
Trails	4
Managed Lands	25

*Illinois data was not collected/not available for airports, hospitals, pipelines, and recreational facilities.*

**Religious Facilities:** Thirteen (13) religious facilities are located within the 0.5 mile search radius. The following two (2) religious facilities are adjacent to the study area:

- Unity Church
- Riverside Community Reformed Church

**Cemeteries:** One (1) cemetery is located within the 0.5 mile search radius. Mount Forest Cemetery is located approximately 0.4 mile south of the study area.

**Schools:** Eight (8) schools are located within the 0.5 mile search radius. The nearest school, Thornwood High School is located approximately 0.2 mile north of the study area.

**Railroads:** Eight (8) rail lines are located within the 0.5 mile search radius. Four (4) rail lines, two owned by CSX, one owned by UP Railroad, and an unlabeled rail line cross the study area.

**Trails:** Four (4) trails are located within the 0.5 mile search radius. The following three (3) trails cross or are adjacent to the study area:

- Burnham Greenway (adjacent)
- Thorn Creek Red Trail (cross)
- Thorn Creek Yellow Trail (cross)

**Managed Lands:** Twenty-five (25) managed lands are located within the 0.5 mile search radius. The following four (4) managed lands are located adjacent to the study area:

- Block Park
- Volbrecht Park
- Marian Mikrut Memorial Park
- Thornwood Park

## 3.2 WATER RESOURCES

This section discusses the water resources (e.g., wetlands, streams, floodways, etc.) that were identified as part of the RFI for the Indiana portion of the study area. For the Illinois portion, available secondary source data was collected for similar water resources. However, based on the availability of data and the collection process, not all of the same water resource information was collected for both states.

### 3.2.1 Indiana

**Table 3** presents the type and number of water resources located within 0.5 mile of the I-80/94 study area.

**Table 3 – Indiana Water Resources**

TYPE	NUMBER
Karst Springs	0
Canal Structures – Historic	0
NPS NRI Listed	2
IDEM 303d Listed Streams and Lakes (Impaired)	32
Rivers and Streams	65
Canal Routes - Historic	0
NWI - Wetlands	336
Lakes	97
Floodplain - DFIRM	82
Cave Entrance Density	0
Sinkhole Areas	0
Sinking-Stream Basins	0

*National Park Service (NPS) National Rivers Inventory (NRI) Listed:* Two (2) NPS NRI Listed segments for the same stream, Plum Creek, are located approximately 0.28 mile south of the study area.

*Indiana Department of Environmental Protection (IDEM) 303d Listed Streams and Lakes:* Thirty-two (32) 303d Listed Streams are located within the 0.5 mile search radius. The Little Calumet River crosses the study area in several locations. The Little Calumet River is listed as impaired for E. coli and polychlorinated biphenyls (PCBs).

*Rivers and Streams:* Sixty-five (65) river and stream segments are located within the 0.5 mile search radius. Eighteen (18) river and stream segments are located within the study area.

*National Wetland Inventory (NWI) – Wetlands:* Three hundred and thirty-six (336) NWI Wetlands are located within the 0.5 mile search radius. Thirty-one (31) wetlands are located within the study area.

*Lakes:* Ninety-seven (97) lakes are located within the 0.5 mile search radius. Seven (7) lakes are adjacent to the study area.

*Floodplain – Digital Flood Insurance Rate Map (DFIRM):* Eighty-two (82) floodplain polygons are located within the 0.5 mile search radius. The study area is located within multiple floodplains.

### 3.2.2 Illinois

**Table 4** presents the type and number of water resources located within 0.5 mile of the I-80/94 study area.

**Table 4 – Illinois Water Resources**

TYPE	NUMBER
Rivers and Streams	204
NWI - Wetlands	32
Lakes	23
Floodplain - DFIRM	5

*Rivers and Streams:* Two hundred four (204) rivers and stream segments are located within the 0.5 mile search radius. Fifty-nine (59) stream segments are located within the study area.

*NWI – Wetlands:* Thirty-two (32) NWI Wetlands are located within the 0.5 mile search radius. Eight (8) NWI Wetlands are located within the study area.

*Lakes:* Twenty-three (23) lakes are located within the 0.5 mile search radius. No lakes are adjacent or within the study area.

*Floodplain – DFIRM:* Five (5) floodplain polygons are located within the 0.5 mile search radius. The study area is located within multiple floodplains.

### 3.3 MINING AND MINERAL EXPLORATION

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This section discusses the mining and mineral resources (e.g., petroleum wells, surface and underground mines, etc.) that were identified as part of the RFI for the Indiana portion of the study area. For the Illinois portion, secondary source data was unavailable for mining and mineral resources. However, based on the availability of data and the collection process, not all of the same information was collected for both states.

#### 3.3.1 Indiana

One (1) petroleum well is located within the 0.5 mile of the I-80/94 study area. No other mining or mineral exploration sites were found within 0.5 mile of the I-80/94 study area.

#### 3.3.2 Illinois

No data available.

### 3.4 HAZARDOUS MATERIAL CONCERNS

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This section discusses hazardous material sites (e.g., LUST sites, RCRA sites, brownfields, etc.) that were identified as part of the RFI for the Indiana portion of the study area. For the Illinois portion, the hazardous material sites were obtained from the EDR report. Based on the two different data collection sources, not all of the same information was collected for both states.

#### 3.4.1 Indiana

**Table 5** presents the type and number of hazardous material sites located within 0.5 mile of the I-80/94 study area.

Table 5 - Indiana Hazardous Material Sites

TYPE	NUMBER
Superfund	1
Resource Conservation and Recovery Act (RCRA) Generator/Treatment, Storage, and Disposal (TSD)	36
RCRA Corrective Action Sites	0
State Cleanup Sites*	15
Septage Waste Sites	0
Underground Storage Tank (UST) Sites	45
Voluntary Remediation Program	7
Construction Demolition Waste	1
Solid Waste Landfill	4
Infectious/Medical Waste Sites	1
Leaking Underground Storage (LUST) Sites	87
Manufactured Gas Plant Sites	0
Open Dump Waste Sites	1
Restricted Waste Sites	0
Waste Transfer Stations	0
Tire Waste Sites	1
Confined Feeding Operations (CFO)	0
Brownfields	17
Institutional Controls	91
National Pollution Discharge Elimination System (NPDES) Facilities	62
NPDES Pipe Locations	18
Notice of Contamination Sites	0

\*Includes sites not mapped in GIS.

**Superfund:** One (1) superfund site (Lake Sandy Jo M&M Landfill) is located adjacent to and north of the study area, along West 25<sup>th</sup> Avenue between Clark Road and Chase Street. This former landfill was listed on the National Priority List (aka Superfund) in 1983 and is currently in the monitoring phase. It also has multiple Institutional Controls (ICs), including onsite engineering controls as well as aquifer use restrictions.

**RCRA Generator/TSD:** Thirty-six (36) RCRA generator/TSD sites are located within the 0.5 mile search radius. Eleven (11) of these RCRA generator/TSD sites are adjacent to the study area:

**State Cleanup:** Fifteen (15) state cleanup sites are located within the 0.5 mile search radius. Four (4) of these state cleanup sites are adjacent to the study area:

**UST Sites:** Forty-five (45) UST sites are located within the 0.5 mile search radius. Nine (9) of these UST sites are adjacent to or near the study area:

**Voluntary Remediation Program (VRP):** Seven (7) VRP sites are located within the 0.5 mile search radius. Two (2) of these sites are located adjacent to the study area:

**Construction Demolition Waste:** One (1) construction demolition waste site (Lake Station Solid Fill Site) is located within the 0.5 mile search radius.



**Solid Waste Landfill:** Four (4) solid waste landfill sites are located within the 0.5 mile search radius. One of these landfills (Gary Landfill) is located adjacent to the study area.

**Infectious/Medical Waste Sites:** One (1) Infectious/Medical Waste Site (Stericycle Incorporated) is located approximately 0.25 mile west of the study area.

**LUST Sites:** Eighty-seven (87) LUST sites are located within the 0.5 mile search radius. Twenty-two (22) of these LUST sites are adjacent to the study area:

**Open Dump Waste Sites:** One (1) open dump waste site (Highland-Dump) is adjacent to the study area.

**Tire Waste Sites:** One (1) tire waste site (Phoenix Recycling Company) is located approximately 0.4 mile south of the study area.

**Brownfields:** Seventeen (17) brownfields are located within the 0.5 mile search radius. Two (2) of these brownfields are located near the study area:

**Institutional Controls:** Ninety-one (91) institutional control sites are located within the 0.5 mile search radius. Nine (9) of these institutional control facilities (including a facility with multiple ICs) are adjacent to the study area:

**NPDES Facilities:** Sixty-two (62) NPDES facilities are located within the 0.5 mile search radius. Twenty-one (21) NPDES facilities are adjacent to the study area.

**NPDES Pipe Locations:** Eighteen (18) NPDES pipe locations are located within the 0.5 mile search radius. Three (3) NPDES pipe locations are adjacent to the study area.

### 3.4.2 Illinois

The following information summarizes the results of the EDR Report that was prepared for the Illinois portion of the study (**Appendix F**). **Table 6** lists the type and number of sites that are mapped within/adjacent to the target property (i.e., study area). Unlike the RFI for Indiana, the location of these EDR sites were not verified and may not be accurate. These sites will be verified during the NEPA phase.

**Table 6 - Illinois Hazardous Material Sites Mapped  
Within/Adjacent to the Study Area**

TYPE	NUMBER
RCRA – Small Quantity Generator (SQG)	2
RCRA – Very Small Quantity Generator (VSQG)	2
Solid Waste Facilities (SWF)/Landfills (LF)	1
LUST	4
UST	4
SPILLS	5
RCRA – Non Generators (NonGen)/No Longer Regulated (NLR)	3
Integrated Compliance Information System (ICIS)	1
Facility Index System/Facility Registry System (FINDS))	19
Enforcement & Compliance History Information (ECHO)	11
Air Inventory List (AIRS)	1
Bureau of Land Inventory Database (BOL)	16
EDR Historical Auto Stations	3
EDR Historical Cleaners	1
Recovered Government Archive (RGA)/LUST	2

**Table 7** lists the type, search distance, and number of sites that are mapped within 0.125, 0.25, 0.5, or 1 mile from the target property (i.e., study area).

**Table 7 - Illinois Hazardous Material Sites Surrounding the Study Area**

TYPE	SEARCH DISTANCE	
	(MILE)	NUMBER
Superfund Enterprise Management System (SEMS)	0.5	1
SEMS – Archive	0.5	1
Corrective Action Report (CORRECTS)	1	1
RCRA – Large Quantity Generators (LQG)	0.25	1
RCRA – Small Quantity Generator (SQG)	0.25	10
RCRA – Very Small Quantity Generator (VSQG)	0.25	22
Solid Waste Facilities (SWF)/Landfills (LF)	0.5	4
Solid Waste Landfill Inventory (NIPC)	0.5	2
LUST	0.5	82
LUST Fund Payment Priority List (TRUST)	0.5	1
UST Facility List	0.25	63
UST AST	0.25	9
Engineering Controls	0.5	2
Institutional Controls	0.5	6
Site Remediation Program Database (SRP)	0.5	8
IL Brownfields	0.5	1
IN Brownfields	0.5	1
US Brownfields	0.5	1
RCRA – Non Generators (NonGen)/No Longer Regulated (NLR)	0.25	49
Formerly Used Defense Sites (FUDS)	1	1
Dry Cleaners	0.25	2
MN Manifest	0.25	1
PA Manifest	0.25	1
WI Manifest	0.25	2
EDR Historical Auto Stations	0.125	22
EDR Historical Cleaners	0.125	3

### 3.5 ECOLOGICAL INFORMATION

This section presents the results of a database search of endangered, threatened, and rare (ETR) species for the Indiana portion of the study area as part of the RFI and the results from IDOT's Natural Resources Review of the Illinois portion of the study area as part of the ESR.

#### 3.5.1 Indiana

As part of the RFI in Indiana, a preliminary review of the Indiana Natural Heritage Database by the INDOT Environmental Services Division (ESD) indicated the presence of endangered, threatened, and rare (ETR) species

within the 0.5 mile search radius (see **Appendix D** for the RFI and the list of ETR species for Lake County). A review of the US Fish and Wildlife Service (USFWS) database did not indicate the presence of endangered bat species in or within 0.5 mile of the study area. In the NEPA phase, the range-wide programmatic consultation for the Indiana bat and northern long-eared bat will be completed according to the most recent “Using the USFWS’s [Information for Planning and Conservation] IPaC System for Listed Bat Consultation for INDOT Projects”.

### 3.5.2 Illinois

In response to the ESR submitted to IDOT for the Illinois portion of the study, IDOT conducted a Natural Resources Review (**Appendix E**). The results of that review are presented below.

#### Illinois Natural Area Inventory (INAI) Sites, Nature Preserves (NP), and State-listed Threatened and Endangered Species

- Wampum Lake INAI and NP is located in the northwest quadrant of the I-80/IL 394 interchange.
- Wampum Lake Seepage Area INAI and Wampum Lake NP is located in the southwest quadrant of the I-80/IL 394 interchange. The INAI/NP contains the state listed star flower and state and federally listed eastern massasauga.
- Thornton-Lansing Road INAI and NP abuts the west side of IL 394. The INAI/NP contains the following listed species: star-flower, orange-fringed orchid, small cranberry, snake- mouth, grass pink orchid, wood orchid, tubercled orchid, Northern panic grass, sweetfern, Indian cucumber root, Kalm’s St. John’s wort, marsh speedwell, and a sedge.
- Jurgensen Woods INAI and Jurgensen Woods North NP abuts the west side of IL 394. The INAI/NP contains the following listed species: orange-fringed orchid, grass pink orchid, Kalm’s St. John’s wort, sweetfern, and narrow-leaved sundew.
- State listed Richardson’s rush abuts the south side of I-294 at the west end of the study area.
- Volbrecht Woods INAI containing Kalm’s St. John’s wort is located in the southeast quadrant of the I-80/IL 394 interchange.
- A record for state and federally listed northern long-eared bat occurs 1.1 miles west of IL 394.
- A federally and state listed rusty patched bumble bee High Potential Zone (RPBB HPZ) occurs 2 miles west of the study area. It contains a RPBB record 4 miles west of the study area.

#### Wetlands

There are inventoried Ducks Unlimited and National Wetland Inventory (NWI) wetlands within or adjacent to the ESR limits. The East Arm Little Calumet River is a Ducks Unlimited riverine wetland that crosses the north end of the study area. The following wetland types occur in various locations in the ESR limits: several ponds, forested/shrub wetlands, emergent wetland, and the Thorn Creek riverine wetland.

#### Federally-listed Threatened and Endangered Species

Based on the US Fish and Wildlife Service’s Information for Planning and Conservation (IPaC), the following species are listed in Cook County: northern long-eared bat (NLEB), Indiana bat, eastern massasauga, Hine’s emerald dragonfly, rusty patched bumble bee, eastern prairie fringed orchid (EPFO), leafy prairie-clover, and prairie bush-clover. There is no Critical Habitat in the study vicinity. The following additional information was provided for four of these species.

*Northern long-eared bat:* There is a record of maternity roost trees, maternity colonies or hibernacula 1.1 miles west of IL 394.

*Eastern prairie fringed orchid:* The limits of the proposed improvements were evaluated for the presence of potential suitable EPFO habitat. There are prairies and high-quality wetlands but no EPFO records in the study area.

*Eastern massasauga:* There is an eastern massasauga record in the Wampum Lake Seepage Area INAI and Wampum Lake NP located in the southwest quadrant of the I-80/IL 394 interchange.

*Rusty patched bumble bee:* The limits of the proposed improvements were evaluated for the presence of potential suitable rusty patched bumble bee habitat. It was determined that there is a USFWS High Potential Zone 2 miles west of the study area. It contains a RPBB record 4 miles west of the study area.

### 3.6 CULTURAL RESOURCES

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For the Indiana portion of the study area, the RFI does not include the identification of cultural resources. However, based on a review of IndianaMap, there are no historic sites or districts adjacent to or near the study area that are listed on the National Register of Historic Places (NRHP).

For the Illinois portion of the study area, the ESR included a review of cultural resources (**Appendix E**). This review determined that there are no known historic architectural resources within the ESR limits. As for archaeological resources, there are 12 previously recorded archaeological sites located within or adjacent to the ESR limits. One of these sites (i.e., Site 11CK4, the Hoxie site) has been previously determined eligible for the NRHP and is especially sensitive because it is a large Native American village known to have human burials. (Note, no disturbance of this site is anticipated from any of the strategies under consideration.)

### 3.7 AIR QUALITY

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The Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants that cause or contribute to air pollution which may reasonably be anticipated to endanger public health and welfare. The USEPA has set NAAQS for six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM), and sulfur dioxide (SO<sub>2</sub>). When levels of pollutants do not exceed the standards, an area is considered in attainment of the NAAQS. An area that does not meet the NAAQS for one or more pollutants is designated by the USEPA as a nonattainment area. Nonattainment areas that later are designated to attainment are considered maintenance areas.

Under the CAA, each state is required to establish a plan to achieve and/or maintain the NAAQS in nonattainment and maintenance areas. This plan is known as the State Implementation Plan (SIP) and sets the emission budget that meets the NAAQS. New transportation projects must conform with the emissions budget in the SIP. The process of determining whether a specific project, such as the I-80/94 Borman Expressway, conforms with the SIP is called transportation conformity. FHWA, in consultation with the Indiana Department of Environmental Management (IDEM), Illinois EPA, USEPA, INDOT, and IDOT, is responsible for determining transportation conformity in nonattainment and maintenance areas for the transportation-related pollutants (i.e., O<sub>3</sub>, NO<sub>2</sub>, PM, and CO).

In Indiana, the portion of the study area in Lake County is in nonattainment for ozone (O<sub>3</sub>). Similarly, in Illinois, the portion of the study area in Cook County is in nonattainment for ozone (O<sub>3</sub>). For all the other transportation-related pollutants, the study area is in attainment.

The I-80/94 Borman Expressway is listed in the NIRPC 2022-2026 Transportation Improvement Program (TIP), and the INDOT 2020-2024 State Transportation Improvement Program (STIP). However, the study is currently not included in the Chicago Metropolitan Agency for Planning's (CMAP) 2019-2024 TIP or the IDOT 2021-2024 STIP. Prior to approval of the project's NEPA document, the project will need to be added to the CMAP TIP and IDOT STIP.

While most of the strategies under consideration are exempt from air quality conformity analysis, some strategies may be considered non-exempt and would need to first be amended into the NIRPC and CMAP Metropolitan Transportation Plans (MTP). Amendments to an MTP must go through the congestion management process (CMP) and require an air quality conformity analysis and determination. Coordination with each of the applicable agencies will be required during the NEPA phase to ensure accurate listing in each of these planning documents and confirm the project's conformity status.

### 3.8 NOISE

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Because dense residential development (i.e., noise sensitive receptors) represents the predominant land use along the western half of the I-80/94 study corridor (i.e., west of the SR 912 interchange), noise barriers are located along most of this section of the corridor. The eastern half of the corridor (i.e., east of the SR 912 interchange) supports a mix of less dense residential development, undeveloped land, and large tracts of wetlands. As a result, most of this section of the corridor does not include noise barriers. There are only a few small areas of residential development along this section of the corridor that have noise barriers.

### 3.9 ENVIRONMENTAL JUSTICE

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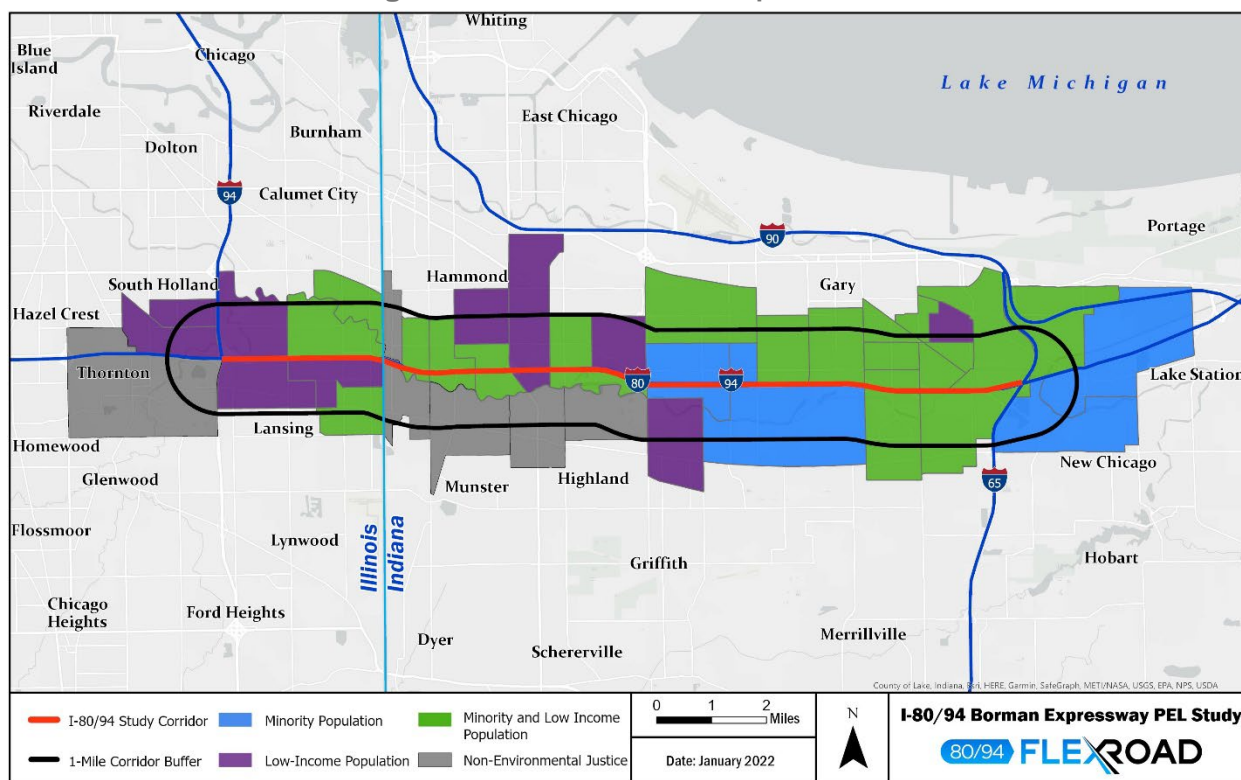
The process outlined in INDOT's Environmental Justice Guidance<sup>2</sup> was used to identify populations of concern for environmental justice (EJ) within the study area. Data from the United States Census American Community Survey (ACS), specifically the 5-year estimates for 2019, were used to identify minority and low-income population characteristics for census tracts in the study area.

Of the 40 census tracts in the study area, 34 of them have EJ populations above the identified thresholds. Of these 34 census tracts, ten of the census tracts have minority populations above the threshold, four of the census tracts have low-income populations above the threshold, and 20 of the census tracts have both minority and low-income populations above the thresholds (**Figure 2**). Given the generally elevated percentages of low-income and/or minority individuals in the census tracts that did not meet the advisory thresholds and in consultation with INDOT, the study team has determined that the entire study area (all 40 census tracts) should be considered as having EJ populations. Origin-Destination data from StreetLight indicates that about 37 percent of the trips on I-80/94 originate in areas of environmental justice populations.

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<sup>2</sup> Indiana Department of Transportation (INDOT), Environmental Justice in NEPA Documentation Process, April 3, 2012. Also, INDOT, Updated Environmental Justice (EJ) Analysis Steps, April 15, 2020.

Figure 2 - Environmental Justice Populations



## Section 4 – DESCRIPTION AND ASSESSMENT OF IMPROVEMENT STRATEGIES

In this section, Section 4.1 summarizes the initial TSMO strategies that were considered and dismissed as documented in the *Initial High-Level Assessment of Potential TSMO Strategies* report (**Appendix H**). Sections 4.2 to 4.11 provide a description of each improvement strategy and summarizes their assessment from the *Alternatives Assessment Report* (**Appendix G**). Each improvement strategy was evaluated based on the purpose and need performance measures in Section 2.3, other traffic performance measures such as vehicle miles traveled and vehicle hours traveled; environmental impacts; costs; and benefit-cost ratios. If an improvement strategy did not meet the project's purpose and need, it was dismissed from further consideration. In general, based on anticipated funding and right-of-way constraints, improvement strategies were limited to the existing infrastructure (e.g., no new alignments or travel lanes that would require substantial additional right-of-way).

### 4.1 INITIAL STRATEGIES CONSIDERED AND DISMISSED

Based on the results of the *Initial High-Level Assessment of Potential TSMO Strategies* report (**Appendix H**), the following strategies were considered and dismissed because, in general, they were not applicable, feasible, practicable, and/or would not meet the project's purpose and need.

#### 4.1.1 Integrated Corridor Management (ICM)

Integrated Corridor Management (ICM) is the utilization of alternate routing on adjacent arterials. For the ICM strategy, there are several factors that need to be considered such as roadway capacity, land use, potential for



upgrading or making intersection improvements (signal control), availability of interchanges with the interstate, equity, and acceptance of local agencies to increased traffic. Increased signage and routing information would need to be designed and implemented as well.

For the I-80/94 corridor, the study team looked at the use of the parallel road network as alternates to I-80/94 for extra capacity during both recurring and non-recurring congestion. On the south side of the corridor, Ridge Road provides a consistent parallel route throughout the length of the study corridor. On the north side of the freeway there are no continuous parallel routes that are viable, so four partial parallel routes were reviewed. The parallel routes evaluated are:

- Ridge Road – The only section of Ridge Road that could serve as a viable alternate route for the implementation of ICM concepts would be the 8-mile section between Calumet Avenue and Grant Street because the western and eastern portions of Ridge Road only include one lane in each direction and/or also include stop signs. Intersections controlled by stop signs do not allow for the potential of remotely controlled traffic signals that can be coordinated during a detour event. Ridge Road between Calumet Avenue and Grant Street has a continuous section of four lanes with turn pockets developed at the intersections, is mostly commercial in land use, and has no stop signs.
- 25<sup>th</sup> Avenue – There is a low to moderate potential to use the portion of 25<sup>th</sup> Avenue between Burr and Grant streets. However, this is only a 2.5-mile section of I-80/94 that could be rerouted between two adjacent interchanges. The eastern end of the section of roadway is a poor candidate for an alternate I-80/94 route because it has six stop signs and reduces to one lane in each direction at the Broadway interchange.
- 173<sup>rd</sup> Street – Several factors make the parallel route of 173<sup>rd</sup> Street a poor candidate for an alternate route to I-80/94 for traffic rerouting. There is only one through lane along the route and capacity is limited. There are numerous stop signs and the area is mostly residential which is not a good fit for traffic rerouting. Finally, 173<sup>rd</sup> Street only parallels I-80/94 for a span of three interchange, covering 2.5 miles, limiting the value as an alternate route.
- W 21<sup>st</sup> Avenue/Front Street – Several factors make the parallel route of W 21<sup>st</sup> Avenue a poor candidate for an alternate route to I-80/94 for traffic rerouting. There is only one through lane along the route and capacity is limited. There are numerous stop signs and the area is mostly residential which is not a good fit for traffic rerouting. Finally, there are only two interchange access points, spanning 1 mile, within the limits of this parallel route.
- 169<sup>th</sup> Street/W 15<sup>th</sup> Avenue – There is a low to moderate potential to use the portion of 169<sup>th</sup> Street and W 15<sup>th</sup> Avenue from US 41/Indianapolis Boulevard to Burr Street as an alternate I-80/94 route. It is two lanes in each direction with only one stop sign at Colfax Street near Burr Street. This would be a 4-mile section having three interchanges with I-80/94. The remaining portions of 169<sup>th</sup> Street are only one lane in each direction with numerous stop signs making them not viable for alternate routing.

Of these alternate routes, the best potential to provide alternate routing of traffic during incidents along I-80/94 would be the 8-mile section of Ridge Road between Calumet Avenue and Grant Street. This is a significant stretch as the entire corridor length from the Indiana/Illinois State line to I-65 is 12 miles. The current geometry is two through lanes in each direction with turn lanes developed at the signalized intersections for increased capacity. There are five interchanges along I-80/94 available in this section of Ridge Road for moving traffic off of and onto I-80/94. This corridor would require additional review for potential traffic signal upgrades, roadway widening, and other infrastructure improvements to further be considered for ICM.

However, ideally there should be consistent alternate routes available for the rerouting of traffic for both eastbound and westbound I-80/94. Eastbound traffic could use an alternate route on the south side of I-80 and westbound on the north side of I-80. There is no consistent stretch of roadway with adequate capacity on the north side of I-80. Rerouting both eastbound and westbound freeway traffic onto Ridge Road would likely cause severe congestion and would not be accepted by the municipalities in the area. Therefore, alternate traffic rerouting for Integrated Corridor Management was dismissed from further consideration.

#### 4.1.2 Transit

Transit is not well developed in the I-80/94 study corridor. There are no public transit routes that use I-80/94 nor are there any routes that are continuously parallel in this area. There are also no commuter rail routes that are directly adjacent to the corridor. There is not a major destination point (e.g., central business district (CBD)) at either end of the corridor. Therefore, the corridor does not lend itself to being a full transit route. However, the corridor is part of a longer commuter route from Northwest Indiana to the Chicago CBD. Currently, there is one regional bus route that makes this trip, the ChicaGo DASH bus. This express route from Valparaiso to Chicago currently runs three round trips per day. However, the route is via I-90, thus avoiding the I-80/94 corridor, likely because of the congestion and travel time reliability issues on I-80/94.

Because of the lack of a major destination at either end of the corridor, a strategy of developing transit from one end of the corridor to the other with the purpose of encouraging a major mode shift translating to fewer cars and congestion in the corridor is not feasible or practicable and would not meet the purpose and need for this project.

#### 4.1.3 Freight Management

While there is very heavy truck traffic on I-80/94 and some minor freight origins and destinations, there are no major freight facilities in the vicinity of the study corridor. As a result, Freight Management would not be an applicable strategy and was dismissed from further consideration.

#### 4.1.4 Tolling

In 2018, Indiana developed a Statewide Interstate Tolling Strategic Plan. At the conclusion of the study, it was determined that additional tolling options would not be pursued at that time. While tolling may be reviewed again as a long-term strategy, it was dismissed from further consideration for this short-term study. This includes any High-Occupancy Toll (HOT) lanes, Congestion Pricing, Tolloed Express Lanes, or any form of traditional tolling.

#### 4.1.5 Connected and Autonomous Vehicle (CAV)

Connected and Autonomous Vehicle (CAV) technologies will eventually play a very significant role in the optimization of the use of the roadway infrastructure. However, given the limited length, design life, budget, and diversity of traffic on I-80/94, this strategy was dismissed from further consideration because it would likely not be implemented within the timeframe of this study (i.e., 2040) to a level that would meet the project's purpose and need.

#### 4.1.6 Transit Signal Priority

This strategy manages traffic signals by using sensors or probe vehicle technology to detect when a bus nears a signal-controlled intersection, turning the traffic signals to green sooner or extending the green phase, thereby allowing the bus to pass through more quickly. In an Active Transportation and Demand Management (ATDM) approach, current and predicted traffic congestion, multi-agency bus schedule adherence information, and number of passengers affected may all be considered to determine conditionally if, where, and when transit signal priority may be applied. This strategy is not applicable because there are no signalized intersections on I-80/94. Also, as mentioned previously, there are no continuous, parallel bus routes adjacent to the corridor to which this strategy would be applicable. Therefore, this strategy was dismissed from further consideration.



## 4.2 NO-BUILD ALTERNATIVE

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### 4.2.1 Description

For the No-Build Alternative, it is assumed that all the transportation projects listed in the NIRPC 2022-2026 TIP would be implemented except for the improvements associated with the I-80/94 Borman Expressway study. It is also assumed that all the transportation projects listed in the CMAP 2019-2024 TIP would be implemented; to date, no improvements associated with this study have been added to the CMAP TIP.

### 4.2.2 Assessment

#### Purpose and Need Performance Measures

The *Preliminary Purpose and Need/Logical Termini* (Appendix C) describes the existing (2019) and No-Build (2040) traffic conditions. Drivers in the eastbound PM peak period currently incur approximately nine minutes of delay traveling the length of the corridor on an average day; that delay would increase to 17 minutes in 2040. Those delays would also be reflected in lower average freeway speeds. Existing average freeway speeds for eastbound vehicles during the PM peak period is 47 mph but would drop to 30 mph by 2040. Travel time reliability would also decline, with the 95<sup>th</sup> percentile travel time (the amount of time a driver should allow to arrive on time 95 percent of the time) increasing from 23.9 minutes in 2019 to travel the length of the corridor to 36.2 minutes in 2040.

As described in the *Preliminary Purpose and Need/Logical Termini* report, sixty percent of the roadway segments in the corridor were identified as either high crash frequency or high crash severity locations.

Based on increased travel time/delay, reduced freeway speeds and travel time reliability, and high crash locations, the No-Build Alternative would not improve traffic or safety performance in the corridor; therefore, it would not meet the project's purpose and need. It will, however, be carried forward into the NEPA phase to serve as a baseline for comparison to the other alternatives.

#### Environmental Impacts

The No-Build Alternative would not result in any construction; therefore, it would not result in any environmental impacts.

#### Cost and Benefit-Cost Ratio

The No-Build Alternative would not result in any improvements; therefore, it would have no construction cost (or benefits) and a benefit-cost ratio cannot be calculated.

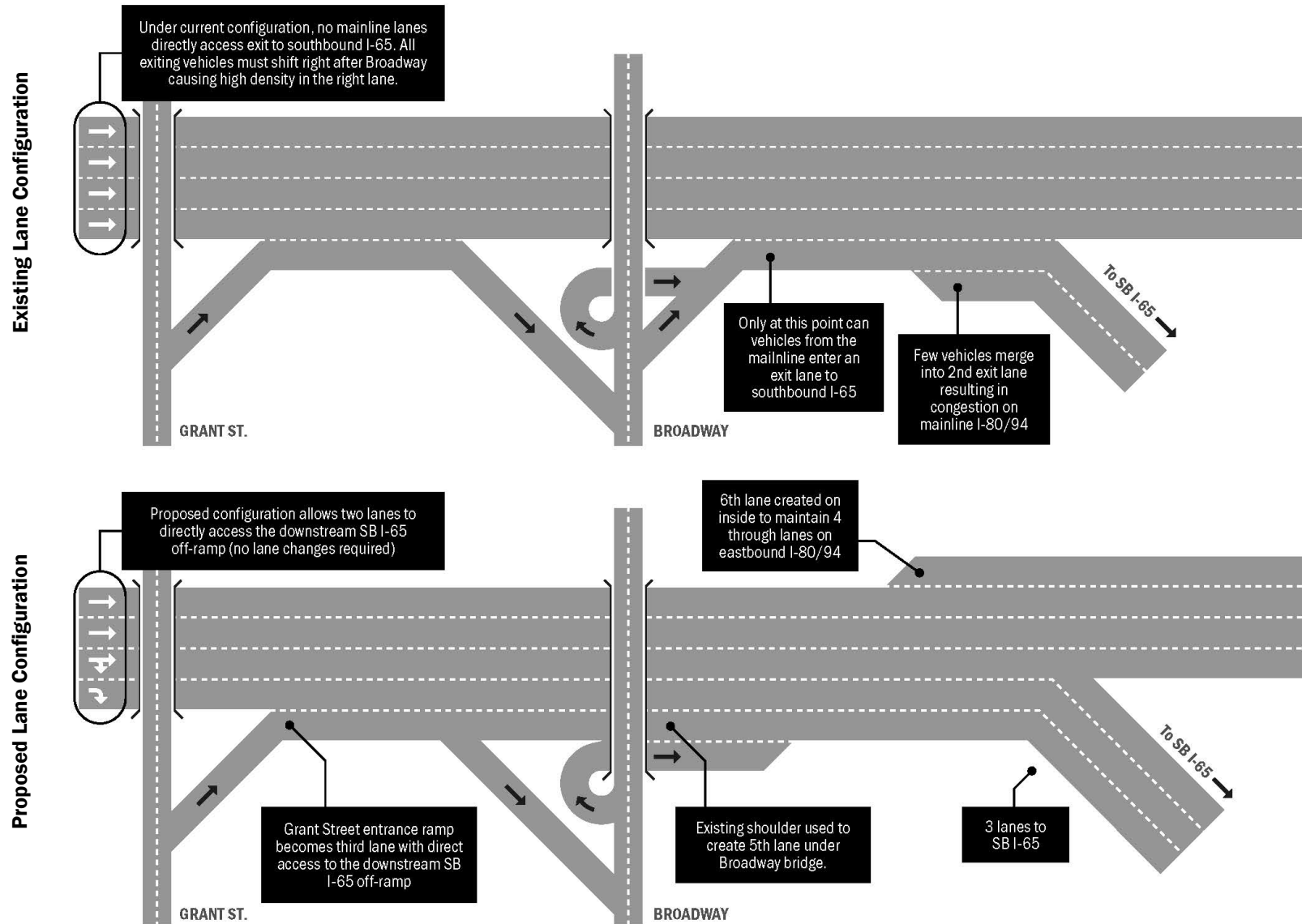
## 4.3 BROADWAY INTERCHANGE AND I-65 INTERCHANGE MODIFICATIONS

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### 4.3.1 Description

During evaluation of traffic operations in the corridor, a bottleneck was identified at the eastern end of the corridor. As shown in the "Existing" diagram in **Figure 3**, the existing lane capacity and configuration of the I-80/94 eastbound exit to southbound I-65 was determined to cause considerable congestion, which would limit the effectiveness of the TSMO strategies under consideration. To address this bottleneck, the following modifications, depicted in the "Proposed" diagram in **Figure 3**, would be made to the Broadway interchange and I-65 interchange.

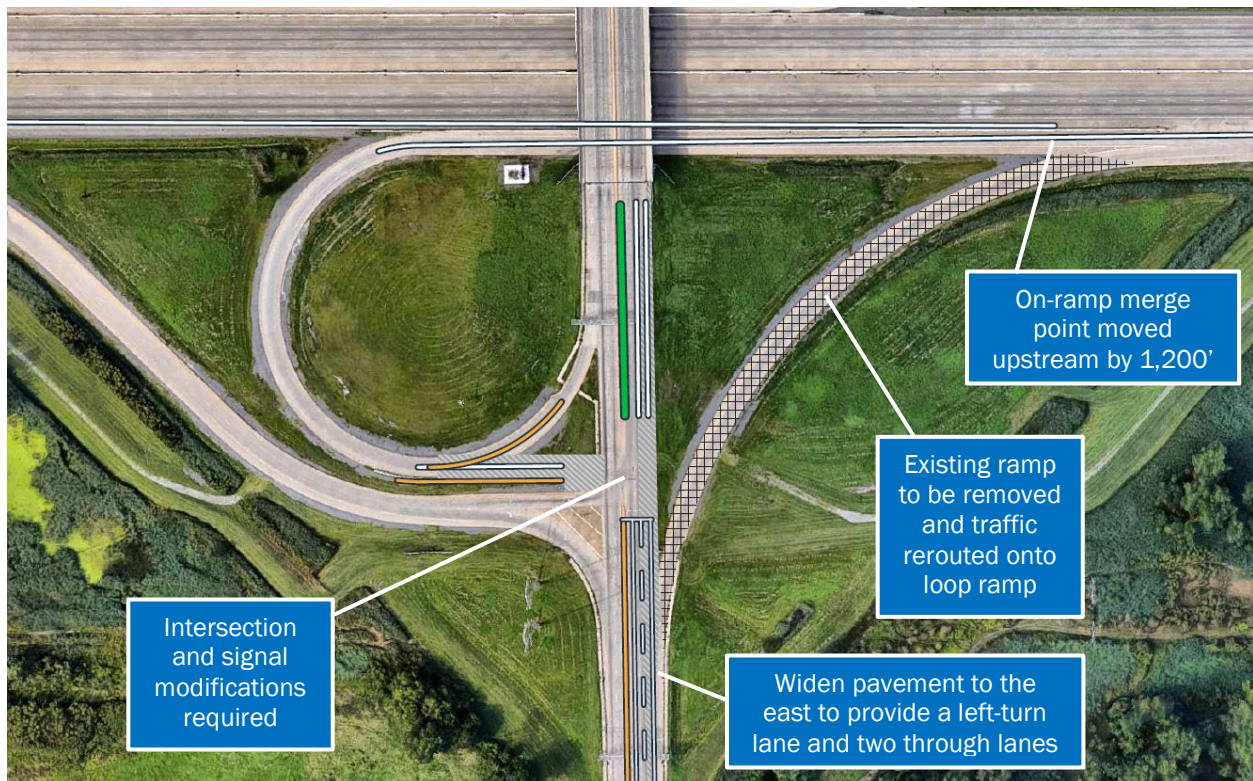
Figure 3 – Broadway Interchange and I-65 Interchange Lane Configuration



### Broadway Interchange

- The existing entrance ramp from northbound Broadway to eastbound I-80/94, accessed via a free-flow right-hand movement, would be removed. This movement would be accommodated by a modification to the eastbound ramp terminal intersection, requiring a left-turn movement onto the existing loop ramp.
- An additional through lane (5 total) for eastbound I-80/94 traffic would be provided at the Broadway exit ramp. This additional lane would be placed on the outside shoulder and the exit ramp would be configured as a tapered exit ramp (**Figure 4**). The fifth lane would be continued under the Broadway bridge to the east.

**Figure 4 – Broadway Interchange Modifications**



### I-65 Interchange

- In conjunction with the proposed Broadway interchange modifications, the eastbound I-80/94 exit ramp to southbound I-65 would be reconfigured to accommodate an additional ramp lane.
- With the removal of the northbound Broadway to eastbound I-80/94 ramp, the right two lanes on the mainline can be utilized for the exit to southbound I-65.
- Traffic would be shifted outward, utilizing the existing ramp pavement, which would allow the eastbound I-80/94 left lane to widen from one lane to two lanes. The middle lane would be configured as an exit option lane that would ultimately allow for the southbound exit to operate as three lanes and the eastbound mainline to maintain four through lanes (**Figure 3**).

### 4.3.2 Assessment

For this section, the Broadway interchange and I-65 interchange modifications were assessed as a stand-alone strategy. However, the assessment of all the other strategies also included the Broadway interchange and I-65 interchange modifications with regard to their ability to meet the project's purpose and need performance measures.

## Purpose and Need and Other Performance Measures

The Broadway interchange and I-65 interchange modifications were analyzed using the microsimulation model for the AM and PM peak periods for the year 2040 using a range of performance measures. **Table 8** presents the results of the qualitative assessment of the traffic operation performance measures for each strategy. These qualitative assessments are based on more detailed and quantitative assessments from the *Alternatives Assessment Report* in **Appendix G**.

**Table 8 – Broadway Interchange and I-65 Interchange Modifications Traffic Performance**

BROADWAY INTERCHANGE AND I-65 INTERCHANGE MODIFICATIONS		
Freeway Speed		↑
Freeway Throughput		↗
Travel Time Savings	Freeway	↑
	Local Streets	→
	Ramp	→
	Arterial	→
Travel Time Reliability		↗
Traffic Diversion to Local Streets		→

**TABLE LEGEND (COMPARED TO NO BUILD)**

↑	Significantly Better	→	No Change	↓	Significantly Worse
↗	Moderately Better	↘	Moderately Worse		

With regard to vehicle hours traveled (VHT), **Table 9** shows that the modifications to the Broadway interchange and the I-65 interchange would provide considerable network travel time savings with a reduction of approximately 200 hours of delay during the AM peak period and 760 hours of delay during the PM peak period in 2040. The travel time savings amount to approximately a 2% reduction in overall network travel time compared to the No-Build Alternative.

**Table 9 - 2040 Network-Wide Vehicle Hours Traveled**

PEAK PERIOD/ ROADWAY	BROADWAY INTERCHANGE AND I-65 INTERCHANGE MODIFICATIONS	
	NO BUILD	Change in VHT
	VHT (hours)	(%)
<b>AM PEAK PERIOD</b>		
I-80/94	11,810	-120 (-1%)
Local Streets	7,270	-80 (-1%)
Total	19,080	-200 (-1%)
<b>PM PEAK PERIOD</b>		
I-80/94	21,980	-1200 (-5%)
Local Streets	18,080	+440 (2%)
Total	40,060	-760 (-2%)

In general, improved traffic conditions as indicated by the increased freeway speeds suggest an improvement in safety, particularly in the PM peak period when congestion is most severe. The traffic microsimulation model does not provide predictions regarding changes in crashes or overall safety. As a result, conclusions are limited to inferences based on the forecasted traffic conditions.

Based on improvements in freeway speed, travel time, and travel time reliability, this strategy would meet the project's purpose of increasing operational efficiency. While data is not available regarding safety improvements, the forecasted operational improvements are anticipated to result in improved safety in the corridor. As a result, this strategy would meet the project's purpose and need.

## Environmental Impacts

The reconfiguration of the Broadway interchange would require the removal of the existing northbound Broadway to eastbound I-80/94 entrance ramp, minor widening of Broadway to provide a new northbound left turn lane, and construction of the connection from the new left turn lane to the eastbound I-80/94 entrance ramp. While there would be some disturbance associated with these modifications, the work would occur within previously disturbed areas and no known sensitive resources are expected to be impacted.

Improvements to the eastbound I-80/94 to southbound I-65 ramp would require widening the existing ramp by up to 12 feet for a length of approximately 1,200 feet. While a retaining wall is anticipated in this area to minimize disturbance, impacts would extend approximately 30 feet from the existing edge of pavement. Based on a review of aerial photography and NWI mapping (see **Sheet 19** in **Appendix A**), the area adjacent to this ramp likely includes wetlands; it is anticipated that this strategy would impact less than 1 acre of wetland.

Detailed field surveys during the NEPA phase will confirm the presence of jurisdictional wetlands and potentially other sensitive resources in these areas.

With regard to potential noise impacts, although these interchange modifications are anticipated to be a Type I project under 23 CFR 772, which would require the evaluation of noise impacts and potential mitigation, there are no sensitive receptors within 800 feet of the roadway; therefore, noise impacts are not anticipated.



## Cost and Benefit-Cost Ratio

Preliminary cost estimates and benefits were prepared for the proposed modifications to the Broadway interchange and I-65 interchanges in the *Alternatives Assessment Report* (**Appendix G**) and are summarized in **Table 10**. Capital costs include new and removed pavement, retaining walls, and updated signage. No substantive operations and maintenance costs are anticipated. Travel time savings were used to calculate a benefit-cost ratio. As shown, the interchange improvements would cost approximately \$4.2 million dollars and have a benefit-cost ratio of 36.2 based on travel time savings predicted within the modeled roadway network.

**Table 10 – Broadway Interchange and  
I-65 Interchange Improvements Cost Estimates**

COST TYPE	COST
Civil Infrastructure	\$2,770
Systems	\$0
Design and Project Management	\$416
Contingency	\$956
<b>TOTAL</b>	<b>\$4,150</b>
Operations and Maintenance (annual)	\$0
<b>Benefit-Cost Ratio</b>	<b>36.2</b>

*Costs in thousands*

*Note: Benefit-cost ratio is based only on travel time savings*

## 4.4 SIGNING ENHANCEMENTS

### 4.4.1 Description

This strategy includes two distinct types of enhancements to highway signs in the corridor. While they function independently, they have been grouped as a single improvement strategy in this study.

#### Additional Warning Signs (Eastbound Lane Reduction)

To address the lack of advisory signing while approaching the existing left lane merge at the eastern limits of the study corridor approximately 1.4 miles east of the I-65 interchange, additional warning signs are proposed. Currently, only small shoulder-mounted Left Lane Ends warning signs (**Figure 5**) at one mile, one-half mile, and 1,000 feet and a Lane Ends warning sign are located in the median to provide advance warning to motorists of the approaching unconventional left lane merge. Noting the size of these signs, motorists may miss viewing these signs while viewing the other major sign structures in the area. For example, **Figure 6** shows a Left Lane Ends sign at one-half mile that is overshadowed by a large overhead dynamic message sign structure.

Figure 5 - Small Shoulder-Mounted Left Lane Ends Sign - Existing



Figure 6 - Left Lane Ends Sign Overshadowed by Dynamic Message Sign - Existing



To improve operations in advance of the physical taper, three large cantilever overhead warning signs at one mile, one-half mile, and at the taper point are proposed (**Figure 7**). These signs are INDOT's preferred treatment and should be located over the left lane and indicate (black on yellow warning sign) that the lane is ending and that traffic should merge right.

Figure 7 - Large Overhead Cantilever Left Lane Ends Sign - Proposed



### Interchange Sequence Signs

The application of interchange sequence signs within the study corridor could improve traffic operations in both directions by potentially reducing lane changing as well as achieving better lane utilization. Interchange sequence signs could be placed between interchanges to provide advance notice to drivers of the next three or four cross streets/interchanges, including their distance. Noting the number of lanes within the study corridor, and the high percentage of truck traffic, these interchange sequence signs should be located over the lanes.

A total of 16 interchange sequence signs would be required, eight in each direction of travel. The first sign in the westbound direction would be located between the I-65 northbound entrance ramp and the exit ramp to Broadway, whereas in the eastbound direction, the first sign would be located prior to the Torrence Avenue exit ramp.

#### 4.4.2 Assessment

##### Purpose and Need and Other Performance Measures

It is anticipated that providing improved guidance to drivers would reduce turbulence associated with late lane changes, resulting in reduced congestion.

Advantages of the additional warning signs include:

- Improved advisory messaging to drivers warning of the approaching high speed left lane merge configuration – which is somewhat unconventional and therefore may not meet driver expectations.
- Advanced warning may improve driver actions to potentially merge to the right prior to the lane ends taper and to perform this operation at potentially reduced speeds, appropriate for the operating conditions and roadway configuration.
- The advance warning signs are consistent with INDOT design manual guidance for left lane drops on high-speed facilities.

The interchange sequence signs are expected to result in the following benefits:

- Potential for better lane utilization as drivers may remain in the left lanes longer, now knowing the exact distance to their destination exit ramp, rather than continuing to use the right lanes for longer distance



due to the lack of sufficient signing information. This change in driver behavior may increase overall throughput during free flow conditions if the utilization is more equally distributed or proportional across all lanes.

- Minimizing longer distance travel in the right lane would improve merging operations at each interchange by reducing traffic volumes in the right lane and decreasing lane density.
- Consistent approach used on many urban freeways with closely spaced interchanges.

Quantitative data on the safety benefits of improved signage such as that proposed with these two strategies is not available. All of the traffic performance benefits cited above, however, are anticipated to result in improved safety as traffic conditions improve and drivers are provided with appropriate advance notification of roadway features ahead.

As previously described, the signing enhancements strategy is anticipated to improve traffic and safety performance in the corridor and, therefore, would meet the project's purpose and need.

## Environmental Impacts

The construction activities associated with the signing enhancements strategy is expected to be limited to the existing highway right-of-way. The installation of sign structures may require earth disturbance, but at this time it is anticipated that any impacts would be minimal. In addition, it is anticipated that changes in traffic operations would not result in impacts.

## Cost and Benefit-Cost Ratio

Preliminary cost estimates were prepared for the signing enhancements strategy in the *Alternatives Assessment Report (Appendix G)* and are summarized in **Table 11**. Capital costs include the proposed signage and associated improvements. No substantive operations and maintenance costs are anticipated. Based on the qualitative assessment of benefits, a benefit-cost ratio could not be calculated. As shown, the additional warning signs would cost approximately \$600,000 and the interchange sequence signs would cost approximately \$3.6 million, resulting in a total cost of approximately \$4.2 million.

**Table 11 – Signing Enhancements Strategy Cost Estimates**

COST TYPE	ADDITIONAL WARNING SIGNS	INTERCHANGE SEQUENCE SIGNS	ADDITIONAL WARNING SIGNS AND INTERCHANGE SEQUENCE SIGNS
Civil Infrastructure	\$400	\$2,420	\$2,820
Systems	\$0	\$0	\$0
Design and Project Management	\$60	\$363	\$423
Contingency	\$138	\$832	\$970
TOTAL	\$598	\$3,610	\$4,208
Operations and Maintenance (annual)	\$0	\$0	\$0
Benefit-Cost Ratio	N/A	N/A	N/A

*Costs in thousands*

## 4.5 RAMP METERING

### 4.5.1 Description

Ramp meters are traffic signals installed on freeway entrance ramps to control the frequency at which vehicles enter the flow of traffic on the freeway. Vehicles traveling from an adjacent arterial roadway would access the

on-ramp and stop at the ramp meter traffic signal and then be individually released onto the freeway mainline. **Figure 8** shows an example of a ramp meter.

**Figure 8 - Example of a Ramp Meter**



Adaptive ramp metering is a specific ramp metering application that dynamically controls the rate vehicles enter a freeway facility. Adaptive ramp metering utilizes traffic responsive or adaptive algorithms (as opposed to pre-timed or fixed time rates) that can optimize either local or system-wide conditions. Adaptive ramp metering can also utilize advanced metering technologies such as dynamic bottleneck identification, automated incident detection, and integration with adjacent arterial traffic signal operations. Using this ATDM approach, real-time and anticipated traffic volumes on the freeway facility are used to control the metering rate of vehicles entering the freeway facility. Based on the freeway operations, the ramp meter rates will be adjusted dynamically. Generally, as conditions worsen on the mainline, the metering is changed to decrease the rate of vehicles entering the mainline.

As part of this strategy, ramp meters would be installed at the following on-ramp locations along I-80/94.

- Calumet Avenue
- Indianapolis Boulevard
- Kennedy Avenue
- Cline Avenue
- Burr Street
- Grant Street
- Broadway

## 4.5.2 Assessment

### Purpose and Need and Other Performance Measures

**Table 12** presents the results of the qualitative assessment for the ramp metering strategy with regard to freeway speed, freeway throughput, travel time, travel time reliability, and traffic diversion to local streets. These qualitative assessments are based on more detailed and quantitative assessments from the *Alternatives Assessment Report* in **Appendix G**.

**Table 12 – Qualitative Assessment of Ramp Metering**

PERFORMANCE MEASURES		RAMP METERING
Freeway Speed		↗
Freeway Throughput		↗
Travel Time Savings	Freeway	↗
	Local Streets	↘
	Ramp	↘
	Arterial	→
Travel Time Reliability		↗
Traffic Diversion to Local Streets		↘

**TABLE LEGEND (COMPARED TO NO BUILD)**

↗	Significantly Better	→	No Change	↘	Significantly Worse
↗	Moderately Better	↘	Moderately Worse		

As shown in **Table 12**, ramp metering would result in moderate improvements to freeway speed, throughput, and travel time, along with travel time reliability. However, It would result in moderate declines in local street and ramp travel times and increased traffic diversion to local streets.

**Table 13** shows how ramp metering would affect VHT and vehicle miles traveled (VMT). As shown in the table, ramp metering would basically result in no changes to VHT during the AM peak period. During the PM peak period, however, it would result in a 6% reduction in VHT on I-80/94 and a 5% increase in VHT on local streets with a total reduction in VHT of 1%. With regard to VMT, ramp metering would basically result in no changes to VMT during the AM peak period. During the PM peak period, it would result in a 1% increase in VMT on I-80/94 and no changes to VMT on local streets, resulting in a total increase in VMT of 1%.

**Table 13 – Ramp Metering Network-Wide VHT and VMT**

PEAK PERIOD/ROADWAY	NO-BUILD	RAMP METERING	NO-BUILD	RAMP METERING
	VHT (hours)	Change in VHT (%)	VMT (thousand miles)	Change in VMT (%)
<b>AM PEAK PERIOD</b>				
I-80/94	11,690	+40 (0%)	1,083	-4 (0%)
Local Streets	7,190	+30 (0%)	281	0 (0%)
<b>Total</b>	<b>18,880</b>	<b>70 (0%)</b>	<b>1,364</b>	<b>-4 (0%)</b>
<b>PM PEAK PERIOD</b>				
I-80/94	20,780	-1310 (-6%)	1,301	+9 (+1%)
Local Streets	18,520	+840 (5%)	449	+2 (0%)
<b>Total</b>	<b>39,300</b>	<b>-470 (-1%)</b>	<b>1,364</b>	<b>+11 (+1%)</b>

In general, improved traffic conditions on the highway as indicated by the increased freeway speed, throughput, and travel time reliability and reduced freeway travel time associated with ramp metering suggest a reduction in congestion and, therefore, an improvement in safety on the highway, particularly in the PM peak period when congestion is most severe. The traffic microsimulation model does not provide predictions regarding changes in crashes or overall safety. As a result, conclusions are limited to inferences based on the forecasted traffic conditions.

Based on improvements in freeway speed, travel time, and travel time reliability, this strategy would meet the project's purpose of increasing operational efficiency. While data is not available regarding safety improvements, the forecasted operational improvements are anticipated to result in improved safety in the corridor. As a result, this strategy would meet the project's purpose and need.

## Environmental Impacts

The construction activities associated with the ramp metering strategy are expected to be limited to the existing highway right-of-way. The installation of the signals associated with the ramp meters would require earth disturbance, but at this time it is anticipated that any impacts would be minimal. Anticipated environmental impacts are limited to those associated with changes in traffic conditions as described below.

## Environmental Justice Impacts

As mentioned in Section 3.9, of the 40 census tracts in the study area, 34 have environmental justice (EJ) populations. In addition, given the generally elevated percentages of low-income and/or minority individuals in the census tracts that did not meet the EJ population thresholds, the study team has determined that the entire study area (all 40 census tracts) should be considered as having EJ populations.

The implementation of ramp metering is one strategy which has the potential to impact EJ populations. If ramp metering improves the mainline travel times at the expense of restricting the flow of on-ramp traffic and creating delay at the on-ramps, there could be impacts to the communities that utilize the metered on-ramps. Based on initial review of the traffic model output, there was some delay associated with ramp metering when applied as a standalone strategy, but that delay was mitigated when ramp metering was combined with the dynamic shoulder lanes strategy, due to the improvements to mainline traffic operations. Therefore, to better understand the potential for impacts, ramp metering and SC1 (dynamic shoulder lanes + ramp metering) were

evaluated with regard to localized travel time delays and the potential impacts to EJ populations. It is anticipated that the results of this analysis would be transferrable to other strategy combinations, based on whether they combine ramp metering with dynamic shoulder lanes (i.e., SC3 and SC4).

Travel times were used as the primary indicator of delay. The 2040 PM eastbound direction of travel was used as the analysis time period because that is when there is the most mainline congestion and when ramp meters would operate at the most restrictive metering rates. The travel times were examined on three levels: 1) travel time on the ramp caused by the ramp meter; 2) travel time on the mainline for the next three miles downstream of the entrance ramp; and 3) the total travel time (the summation of 1 and 2). The travel time for all three components were compared to the 2040 No-Build base condition to determine the net delay or travel time improvement. By looking at both the ramp delay and the mainline travel time, situations where ramp delay is made up for by mainline improvements can be identified. **Table 14** shows the travel times at each of the three levels for the eastbound metered on-ramps under 2040 No-Build, ramp metering, and SC1 (dynamic shoulder lanes + ramp metering) conditions.

An initial threshold of two minutes of additional delay compared to the No-Build Alternative was used to identify potential EJ impacts (see bold values in **Table 14**). As shown in **Table 14**, there were several ramps that exceeded this threshold with ramp metering; however, at each of these locations, when ramp metering was combined with dynamic shoulder lanes (i.e., SC1), the net effect was either an overall time savings or an increase of less than one minute. Under ramp metering, entrance ramps at Calumet Avenue and Broadway would have delays on the ramp that exceed two minutes. At the eastbound entrance ramp from southbound Kennedy Avenue, the additional total delay (ramp and mainline) would exceed two minutes. Based on these results, these three locations have the potential to result in impacts to EJ populations with the implementation of ramp metering. With SC1, the ramp meters cause less delay on the ramps because the dynamic shoulder lane improves the mainline sufficiently that the ramp meters can operate at a less restrictive rate. In addition, the improved conditions on the mainline help to offset delays on the ramps.

To better understand the EJ populations that may be impacted by any delays, StreetLight data was used to identify the origins of these trips. At Kennedy Avenue and Calumet Avenue, approximately 12 percent and 10 percent (respectively) of trips using the eastbound entrance ramps to I-80/94 originate in identified EJ areas. At the Broadway entrance ramps to eastbound I-80/94, 11 percent of the trips originate in EJ areas. As a result, the vast majority of the trips using these entrance ramps (i.e., 88 percent to 90 percent) originate from non-EJ areas. This suggests that the delay-related impacts would not result in disproportionately high and adverse impacts to EJ populations.

As described in the *Alternatives Assessment Report* and in Section 4.13 of this PEL Study Report, the alternatives being carried forward each include dynamic shoulder lanes. As such, ramp metering is not proposed for implementation without dynamic shoulder lanes and it is expected that any delay-related impacts would be similar to those shown for SC1 (i.e., less than one minute).

See the following Air Quality section regarding the potential impacts that ramp metering may have on air quality, which could potentially impact EJ populations.

The potential for impacts to EJ populations will be studied further during the NEPA phase.

Table 14. Comparison of Travel Times With and Without Ramp Meters

Interchange	Segment	TRAVEL TIME (MIN)		CHANGE IN TRAVEL TIME (MIN)	
		No-Build	Ramp Metering	SC1	
				Dynamic Shoulder Lanes + Ramp Metering	
Calumet Ave – NB to EB	Ramp	0.3	+2.2	+0.2	
	Mainline	6.1	+0.3	-1.5	
	TOTAL	6.4	+2.6	-1.1	
Calumet Ave – SB to EB	Ramp	0.5	+3.8	+0.2	
	Mainline	6.1	+0.3	-1.5	
	TOTAL	6.6	+4.4	-1.1	
Indianapolis Blvd – NB to EB	Ramp	0.3	+0.7	+0.1	
	Mainline	6.5	+0.6	-1.6	
	TOTAL	7.1	+1.1	-1.3	
Indianapolis Blvd – SB to EB	Ramp	0.4	+1.7	+0.1	
	Mainline	6.5	+0.6	-1.6	
	TOTAL	7.2	+1.6	-1.3	
Kennedy Ave – NB to EB	Ramp	0.2	+0.6	+0.1	
	Mainline	5.5	+0.5	-1.4	
	TOTAL	6.6	+1.1	-1.0	
Kennedy Ave – SB to EB	Ramp	0.4	+1.8	+0.1	
	Mainline	5.8	+0.5	-1.4	
	TOTAL	6.8	+2.1	-1.0	
Cline Ave – NB to EB	Ramp	2.6	+0.2	-0.1	
	Mainline	3.3	+0.1	+0.1	
	TOTAL	6.1	+0.2	-0.1	
Cline Ave – SB to EB	Ramp	3.4	+0.9	-0.1	
	Mainline	3.3	+0.1	+0.1	
	TOTAL	6.9	+0.9	-0.2	
Burr St – NB to EB	Ramp	0.4	+0.1	+0.1	
	Mainline	4.5	+0.3	+0.0	
	TOTAL	5.0	+0.4	+0.2	
Burr St – SB to EB	Ramp	0.4	+0.1	+0.1	
	Mainline	4.5	+0.3	+0.0	
	TOTAL	4.9	+0.5	+0.2	
Grant St – NB to EB	Ramp	0.5	+0.2	+0.2	
	Mainline	4.4	+0.2	+0.2	
	TOTAL	4.9	+0.4	+0.6	
Grant St – SB to EB	Ramp	0.7	+0.2	+0.2	
	Mainline	4.4	+0.2	+0.2	
	TOTAL	5.0	+0.4	+0.6	
Broadway – NB to EB	Ramp	0.3	+2.4	+0.5	
	Mainline	3.6	+0.1	+0.2	
	TOTAL	3.6	+2.1	+0.8	
Broadway – SB to EB	Ramp	0.4	+3.0	+0.4	
	Mainline	3.6	+0.1	+0.2	
	TOTAL	3.8	+2.2	+0.8	

Note: Because of the floating car method of travel time calculation, some of the ramp + mainline travel times will not exactly equal the total. DSL – Dynamic Shoulder Lanes; EB – Eastbound; NB – Northbound; SB – Southbound



## Air Quality

As noted in Section 3.7, the study area is in attainment for all criteria pollutants except for ozone. Should this study progress to the NEPA phase, the study team will ensure that the improvements are appropriately listed in the TIP for both NIRPC and CMAP in order to demonstrate project-level air quality conformity. Research has shown that corridor-level air quality is often improved by the more stable, smoother traffic flows associated with ramp metering.<sup>3</sup>

Inherent in ramp metering is forcing vehicles to wait to get onto the freeway, creating acceleration and deceleration maneuvers on the ramps. Research has also been conducted to determine whether ramp metering has the potential to create air quality “hot spots” (isolated locations with a significant air quality issue), but this research has not been conclusive.<sup>4</sup> Based on the INDOT *Procedural Manual for Preparing Environmental Documents* (2008), the proposed improvements do not meet the requirements for a hot spot analysis; this determination will be reviewed during the NEPA phase.

USEPA and FHWA have determined that ramp metering is exempt from transportation conformity requirements under 40 CFR 93.126.<sup>5</sup>

## Cost and Benefit-Cost Ratio

As shown in **Table 15**, the total cost for ramp metering would be approximately \$4.8 million with a benefit-cost ratio of 14.4. Any ratio greater than one means that the monetary travel time savings (i.e., benefits) associated with ramp metering are greater than the implementation costs. For more detailed information regarding the cost of ramp metering and all the other improvement strategies, see the *Alternatives Assessment Report* in **Appendix G**.

**Table 15 - Ramp Metering Cost Estimates**

COST TYPE	COST
Civil Infrastructure	\$1,480
Systems	\$1,570
Design and Project Management	\$608
Contingency	\$1,100
<b>TOTAL</b>	<b>\$4,750</b>
Operations and Maintenance (annual)	\$170
Benefit-Cost Ratio	14.4

*Costs in thousands*

*Note: Benefit-cost ratio is based only on travel time savings*

<sup>3</sup> Jacobson, Leslie N. Ramp Management and Control: Handbook, U.S. Dept. of Transportation, Federal Highway Administration, 2006. [https://ops.fhwa.dot.gov/publications/ramp\\_mgmt\\_handbook/manual/manual/index.htm](https://ops.fhwa.dot.gov/publications/ramp_mgmt_handbook/manual/manual/index.htm).

<sup>4</sup> Chaudhary, Nadeem A., et al. Potential Use of Ramp Metering as Congestion Management Strategy in the Dallas-Fort Worth Metroplex, Texas A&M Transportation Institute, Nov. 2018. <https://static.tti.tamu.edu/tti.tamu.edu/documents/O-6945-R1.pdf>.

<sup>5</sup> Air Quality and Sustainable Transportation Highlights, U.S. Dept. of Transportation, Federal Highway Administration, November/December 2017. [https://www.fhwa.dot.gov/environment/sustainability/a\\_m/news/fhwahep18023.pdf](https://www.fhwa.dot.gov/environment/sustainability/a_m/news/fhwahep18023.pdf)

## 4.6 DYNAMIC SHOULDER LANES

### 4.6.1 Description

The dynamic shoulder lanes strategy, also referred to as hard shoulder running, enables the use of the existing shoulder as a travel lane(s) based on congestion levels during peak periods and in response to incidents or other conditions as warranted during non-peak periods. In contrast to a static time-of-day schedule for using a shoulder lane, an ATDM approach continuously monitors conditions and uses real-time and anticipated congestion levels to determine the need for using a shoulder lane. Use of the shoulder lane can be applied to the existing inside and outside shoulders in both directions along the study corridor. **Figure 9** shows an example of a dynamic shoulder lane.

Figure 9 - Example of an Inside Dynamic Shoulder Lane



To address recurring traffic congestion, the existing inside shoulders would be used as dynamic shoulder lanes during the peak periods on the weekdays and potentially on Sundays when the corridor is experiencing higher traffic demand. Lane control signals would be used to indicate whether the shoulder lane is open for travel (downward green arrow) or closed for travel (red X). Ingress and egress to the shoulder lane would be permitted at any point along the shoulder that is open for travel. Lane control signals will be located at approximately 0.5-mile spacings along the length of the proposed dynamic shoulder lane. Tighter spacing will be used at the terminus of the shoulder lane (approximately the last mile) to provide additional guidance that the shoulder is closed ahead and traffic needs to merge right. The inside shoulder lane would operate at a 45 mph speed limit, which would require the use of variable speed limit signs.



To address incidents (e.g., crashes) and maintenance issues, short segments of the existing outside shoulder lane would be used as a “bypass lane”. Ingress and egress to the shoulder lane would be permitted at any point along the shoulder that is open for travel. Lane control signals would be used to indicate whether the shoulder lane is open for travel (downward green arrow) or closed for travel (red X). Lane control signals will be located at approximately 0.5-mile spacings along the length of the proposed dynamic shoulder lane. To improve safety, the outside shoulder lane would operate at a reduced speed limit in the range of 20 mph to 30 mph, which would require variable speed signs to advise motorists of the change in the posted speed in the vicinity of the incident or maintenance activity.

#### 4.6.2 Assessment

##### Purpose and Need and Other Performance Measures

**Table 16** presents the results of the qualitative assessment of the freeway speed, freeway throughput, travel time, travel time reliability, and traffic diversion to local streets for the dynamic shoulder lanes strategy. These qualitative assessments are based on more detailed and quantitative assessments from the *Alternatives Assessment Report* in **Appendix G**.

**Table 16 – Qualitative Assessment of Dynamic Shoulder Lanes**

PERFORMANCE MEASURES		DYNAMIC SHOULDER LANES
Freeway Speed		↑
Freeway Throughput		↑
Travel Time Savings	Freeway	↑
	Local Streets	↗
	Ramp	↗
	Arterial	↗
Travel Time Reliability		↑
Traffic Diversion to Local Streets		→

**TABLE LEGEND (COMPARED TO NO BUILD)**

↑	Significantly Better	→	No Change	↓	Significantly Worse
↗	Moderately Better	↘	Moderately Worse		

As shown in **Table 16**, dynamic shoulder lanes would result in significant improvements to freeway speed, throughput, and travel time, along with traffic diversion to local streets. It would also result in moderate improvements in travel time on the local streets, ramps, and arterials, while there would be no changes regarding traffic diversion to local streets.

**Table 17** shows how dynamic shoulder lanes would affect VHT and VMT. As shown in the table, during the AM peak period, dynamic shoulder lanes would result in a 5% and 3% increase in VHT on I-80/94 and the local streets, respectively, with a total increase in VHT of 4%. During the PM peak period, however, it would result in a 10% and 6% reduction in VHT on I-80/94 and the local streets, respectively, with a total reduction in VHT of 8%. With regard to VMT, during the AM peak period, dynamic shoulder lanes would result in a 3% and 2% increase on I-80/94 and the local streets, respectively, with a total increase of 3%. During the PM peak period, it would result in a 7% increase on I-80/94 and no changes on the local streets, resulting in a total increase in VMT of 5%.

Table 17 – Dynamic Shoulder Lanes Network-Wide VHT and VMT

PEAK PERIOD/ROADWAY	NO-BUILD	DYNAMIC SHOULDER LANES	NO-BUILD	DYNAMIC SHOULDER LANES
	VHT (hours)	Change in VHT (%)	VMT (thousand miles)	Change in VMT (%)
<b>AM PEAK PERIOD</b>				
I-80/94	11,690	+563 (+5%)	1,083	+33 (+3%)
Local Streets	7,190	+211 (+3%)	281	+5 (+2%)
<b>Total</b>	<b>18,880</b>	<b>+770 (+4%)</b>	<b>1,364</b>	<b>+38 (+3%)</b>
<b>PM PEAK PERIOD</b>				
I-80/94	20,780	-2023 (-10%)	1,301	+90 (+7%)
Local Streets	18,520	-1070 (-6%)	449	+2 (0%)
<b>Total</b>	<b>39,300</b>	<b>-3090 (-8%)</b>	<b>1,364</b>	<b>+92 (+5%)</b>

In general, improved traffic conditions as indicated by the increased freeway speed, throughput, and travel time reliability and reduced freeway travel time associated with dynamic shoulder lanes suggest a reduction in congestion and, therefore, an improvement in safety, particularly in the PM peak period when congestion is most severe. The traffic microsimulation model does not provide predictions regarding changes in crashes or overall safety. As a result, conclusions are limited to inferences based on the forecasted traffic conditions.

Based on improvements in freeway speed, travel time, and travel time reliability, this strategy would meet the project's purpose of increasing operational efficiency. While data is not available regarding safety improvements, the forecasted operational improvements are anticipated to result in improved safety in the corridor. As a result, this strategy would meet the project's purpose and need.

## Environmental Impacts

The construction activities associated with the dynamic shoulder lanes strategy are expected to be limited to the existing highway right-of-way. The installation of the gantries and potential new or modified noise barriers associated with the dynamic shoulder lanes would require earth disturbance, but at this time it is anticipated that any impacts would be minimal. The potential for noise impacts and the need to install new noise barriers or modify existing barriers is discussed in the following section.

## Noise Impacts

It is anticipated that the implementation of dynamic shoulder lanes for routine use, as proposed for the inside shoulder on this study, would be a Type I project under 23 CFR 772, requiring evaluation of noise impacts and potential mitigation. However, the use of the outside shoulder is anticipated to be limited and infrequent, therefore, it would likely not be considered a Type I project. A preliminary assessment of noise impacts associated with the inside shoulder dynamic shoulder lanes was conducted and is described in detail in Appendix I.

The analysis found that the additional capacity provided by dynamic shoulder lanes has the potential to increase noise levels in areas adjacent to I-80/94. The first part of the analysis evaluated areas in the corridor where existing barriers do not exist to determine if sensitive receptors may be impacted and, if they are, whether noise mitigation was potentially cost-effective based on INDOT and IDOT policies. Two locations were

identified where potential new noise barriers may be appropriate, as shown in **Table 18**. The second part of the analysis evaluated areas where existing noise barriers may warrant increases in height to address the additional noise impacts associated with dynamic shoulder lanes. Two such areas were identified where potential noise barrier modifications may be needed and are shown in **Table 18**.

**Table 17. Potential Noise Mitigation Costs – Qualitative Assessment Results**

SECTION	TYPE	NUMBER OF RECEPTORS	ESTIMATED NOISE BARRIER LENGTH (FEET)	ESTIMATED COST
Northeast quadrant of Burr Street interchange	Potential New Noise Barrier	41	2,470	\$1,111,500
Northeast quadrant of Grant Street interchange	Potential New Noise Barrier	48	2,770	\$1,246,500
Southeast quadrant of IL 394 interchange	Potential Noise Barrier Modification	24	1,540	\$693,000
North side of I-80/94, east of Burnham Greenway Trail	Potential Noise Barrier Modification	30	1,360	\$612,000

These conclusions are considered preliminary for the PEL study phase. A complete Traffic Noise Impact Assessment with comprehensive noise modeling will be performed for the entire study area when the study is in the NEPA phase.

### Air Quality

It is anticipated that the implementation of dynamic shoulder lanes for routine use, as proposed for the inside shoulder on this study, would be considered non-exempt from transportation conformity requirements. Further analysis and coordination with NIRPC and CMAP will be required during the NEPA phase.

### Cost and Benefit-Cost Ratio

As shown in **Table 19**, the total cost for dynamic shoulder lanes would be approximately \$71.6 million with a benefit-cost ratio of 3.7. Any ratio greater than one means that the monetary travel time savings (i.e., benefits) associated with dynamic shoulder lanes are greater than the implementation costs. For more detailed information regarding the cost of dynamic shoulder lanes and all the other improvement strategies, see the *Alternatives Assessment Report* in **Appendix G**.

**Table 19 – Dynamic Shoulder Lanes Cost Estimates**

COST TYPE	COST
Civil Infrastructure	\$27,700
Systems	\$20,300
Design and Project Management	\$7,190
Contingency	\$16,600
TOTAL	\$71,600
Operations and Maintenance (annual)	\$615
Benefit-Cost Ratio	3.7

*Costs in thousands*

*Note: Benefit-cost ratio is based only on travel time savings*

## 4.7 VARIABLE SPEED LIMITS

### 4.7.1 Description

This strategy would adjust speed limits based on real-time traffic, roadway incidents, events, work zones, and/or weather conditions. Variable speed limits can either be enforceable (regulatory) speed limits or recommended speed advisories, and they can be applied to an entire roadway segment or individual lanes. In an ATDM approach, real-time and anticipated traffic conditions are used to adjust the speed limits dynamically to meet typical agency goals and objectives for safety and mobility. **Figure 10** shows an example of variable speed limits.

Figure 10 - Example of Variable Speed Limits



Variable speed limit systems used for congestion-based Active Traffic Management (ATM) are sometimes referred to as “speed harmonization” systems. The purpose of speed harmonization is to dynamically and automatically reduce speed limits in or before areas of congestion, incidents, or special events to maintain smooth traffic flow and to reduce the risk of collisions due to speed differentials. These variable speed limit systems are usually used in conjunction with other ATM strategies such as queue warning and hard shoulder running.

The variable speed limit strategy would be located throughout the I-80/94 corridor in both directions of travel. The variable speed limit messaging would start just west of the IL 394 interchange on the west and approximately 1.5 miles east of the I-65 interchange on the east. The proposed spacing for the variable speed limit signs would be approximately 0.5 mile. Most of the signs would be mounted on overhead gantries (in conjunction with other field devices such as lane control signals). Additional standalone variable speed limit signs would be located in advance of each end of the corridor.

#### 4.7.2 Assessment

##### Purpose and Need and Other Performance Measures

**Table 20** presents the results of the qualitative assessment of the freeway speed, freeway throughput, travel time, travel time reliability, and traffic diversion to local streets for the variable speed limits strategy. These qualitative assessments are based on more detailed and quantitative assessments from the *Alternatives Assessment Report* in **Appendix G**

**Table 20 – Qualitative Assessment of Variable Speed Limits**

PERFORMANCE MEASURES		VARIABLE SPEED LIMITS
Freeway Speed		→
Freeway Throughput		↗
Travel Time Savings	Freeway	→
	Local Streets	↑
	Ramp	→
	Arterial	↗
Travel Time Reliability		↗
Traffic Diversion to Local Streets		→

**TABLE LEGEND (COMPARED TO NO BUILD)**

↑	Significantly Better	→	No Change	↓	Significantly Worse
↗	Moderately Better	↘	Moderately Worse		

As shown in **Table 20**, variable speed limits would result in either moderate improvements or no changes to all of the performance measures except for travel time on local streets, which would experience a significant improvement.

**Table 21** shows how variable speed limits would affect VHT and VMT. As shown in the table, during the AM peak period, variable speed limits would result in basically no changes to VHT. During the PM peak period, however, it would result in a 3% and 11% reduction in VHT on I-80/94 and the local streets, respectively, with a total reduction in VHT of 7%. With regard to VMT, variable speed limits would result in no changes during both the AM and PM peak periods.

Table 21 – Variable Speed Limits Network-Wide VHT and VMT

PEAK PERIOD/ROADWAY	VARIABLE SPEED LIMITS		VARIABLE SPEED LIMITS	
	NO-BUILD VHT (hours)	Change in VHT (%)	NO-BUILD VMT (thousand miles)	Change in VMT (%)
<b>AM PEAK PERIOD</b>				
I-80/94	11,690	-20 (0%)	1,083	-4 (0%)
Local Streets	7,190	-20 (0%)	281	-1 (0%)
<b>Total</b>	<b>18,880</b>	<b>-40 (0%)</b>	<b>1,364</b>	<b>-4 (0%)</b>
<b>PM PEAK PERIOD</b>				
I-80/94	20,780	-600 (-3%)	1,301	+1 (0%)
Local Streets	18,520	-1980 (-11%)	449	0 (0%)
<b>Total</b>	<b>39,300</b>	<b>-2580 (-7%)</b>	<b>1,364</b>	<b>+1 (0%)</b>

In general, improved traffic conditions as indicated by the increased throughput and travel time reliability associated with variable speed limits suggest a reduction in congestion and, therefore, an improvement in safety, particularly in the PM peak period when congestion is most severe.

Safety benefits related to variable speed limits were assessed quantitatively through the application of crash modification factors (CMF), which represent the percent reductions in crashes that can be expected after a strategy is implemented. CMF values were identified based on research from real-world implementation of variable speed limits. The implementation of variable speed limits was assessed quantitatively using the RoadHAT software. In the assessment of safety benefits, it was assumed that the system would be in operation on weekdays (Monday through Friday) in the AM and PM peak periods. Based on a review of available data, an 8% reduction in total crashes was applied in the RoadHAT analysis. This reduction in crashes is estimated to result in a savings of \$277 million from 2025-2040 based on the avoidance of crash-related costs.

Based on improvements in travel time, this strategy would meet the project's purpose of increasing operational efficiency. In addition to the estimated safety benefits, the forecasted operational improvements are also anticipated to result in improved safety in the corridor. As a result, this strategy would meet the project's purpose and need.

## Environmental Impacts

The construction activities associated with the variable speed limits strategy are expected to be limited to the existing highway right-of-way. The installation of the gantries associated with the variable speed limits would require earth disturbance, but at this time it is anticipated that any impacts would be minimal.

## Cost and Benefit-Cost Ratio

As shown in **Table 22**, the total cost for variable speed limits would be approximately \$20.5 million with a benefit-cost ratio of 3.9 with regard to traffic operations and a benefit-cost ratio of 12.1 with regard to safety. Any ratio greater than one means that the monetary savings (i.e., benefits) associated with variable speed limits is greater than the implementation costs. For more detailed information regarding the cost of dynamic shoulder lanes and all the other improvement strategies, see the *Alternatives Assessment Report* in **Appendix G**.



Table 22 – Variable Speed Limits Cost Estimates

COST TYPE	COST
Civil Infrastructure	\$4,990
Systems	\$8,680
Design and Project Management	\$2,053
Contingency	\$4,720
TOTAL	\$20,500
Operations and Maintenance (annual)	\$174
Benefit-Cost Ratio	
Traffic Operations	3.9 <sup>1</sup>
Safety	12.1 <sup>2</sup>

*Costs in thousands*<sup>1</sup>Based only on travel time savings<sup>2</sup>Based only on crash-related cost reductions

## 4.8 DYNAMIC LANE CONTROL

### 4.8.1 Description

Dynamic Lane Control involves dynamically closing or opening individual traffic lanes as warranted and providing advance warning of the closure(s) through the use of lane control signals, in order to safely merge traffic into adjoining lanes. In an ATM approach, as the network is continuously monitored, real-time incident and congestion data is used to control the lane use ahead of the lane closure(s) and dynamically manage the location to reduce rear-end and other secondary crashes. **Figure 11** shows an example of dynamic lane control signs.

Figure 11 - Examples of Dynamic Lane Control Signs



This strategy would allow for the opening and closing of all other individual lanes to support needed maintenance and incident management.

This strategy would involve the use of full-width gantry lane control across all the freeway lanes and, if combined with dynamic shoulder lanes, the shoulders within the study limits. In addition to the lane control signals, the system would also include dynamic message signs to provide advanced warning for lane closures and the smooth transitioning of vehicles when approaching the closed lanes. The gantries supporting the lane control signals are anticipated to be placed at 0.5-mile intervals such that motorists can see the lane control signals on the next gantry as they pass under the previous gantry.

## 4.8.2 Assessment

### Purpose and Need Performance Measures

The focus of the dynamic lane control strategy is improving safety on the highway. As such, it does not lend itself to analysis in the traffic microsimulation model. As documented in the project's purpose and need, crashes and other events on the highway are a common cause of congestion and secondary crashes; as such, it is anticipated that any strategy that reduces crashes would benefit traffic operations in the corridor.

A qualitative assessment of the safety benefits associated with the implementation of dynamic lane control was conducted because quantitative data does not exist. Dynamic lane control can help reduce the potential for rear end crashes, which is the predominant crash type along the study corridor, as the advance warning of congestion and/or incidents would provide drivers more time to respond and slow down. It can also help reduce the potential for side swipe crashes, which represent the second highest number of crashes along the study corridor, as any necessary lane change movements related to the lane closure(s) are carefully directed by the overhead lane signs.

Based on this qualitative assessment, dynamic lane control would meet the project's purpose of improved safety. As previously mentioned, it is anticipated that any strategy that reduces crashes would also benefit traffic operations in the corridor. As a result, this strategy would meet the project's purpose and need.

### Environmental Impacts

The construction activities associated with dynamic lane control are expected to be limited to the existing highway right-of-way. The installation of gantries would require earth disturbance, but at this time it is anticipated that any impacts would be minimal. In addition, it is anticipated that changes in traffic operations would not result in impacts.

### Cost and Benefit-Cost Ratio

As shown in **Table 23**, the total cost for dynamic lane control would be \$76.0 million. A benefit-cost ratio is not applicable due to the lack of quantifiable benefits data for dynamic lane control. For more detailed information regarding the cost of dynamic lane control and all the other improvement strategies, see the *Alternatives Assessment Report* in **Appendix G**.

**Table 23 – Dynamic lane Control Cost Estimates**

COST TYPE	COST
Civil Infrastructure	\$22,000
Systems	\$28,900
Design and Project Management	\$7,640
Contingency	\$17,600
<b>TOTAL</b>	<b>\$76,000</b>
Operations and Maintenance (annual)	\$787
Benefit-Cost Ratio	N/A

*Costs in thousands*

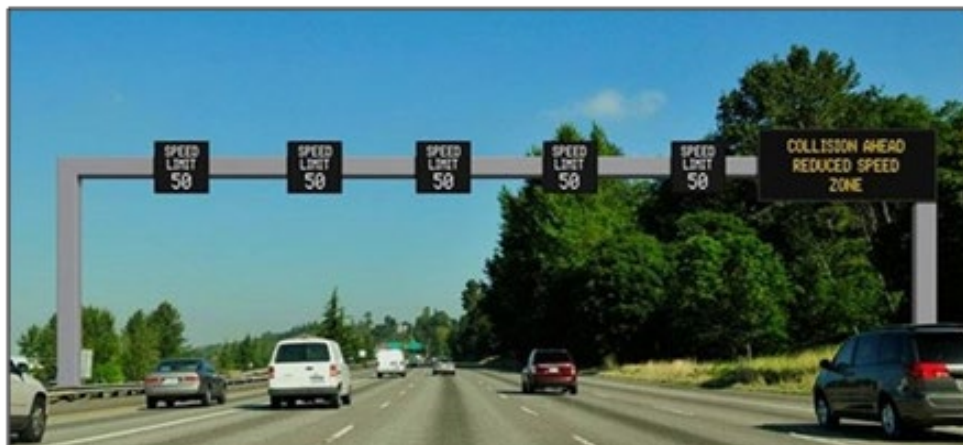
## 4.9 QUEUE WARNING

### 4.9.1 Description

This strategy involves real-time displays of warning messages (typically on dynamic message signs and possibly coupled with flashing lights) along a roadway to alert motorists that queues or significant slowdowns are ahead, thus improving traffic safety by reducing the potential for rear-end crashes or other secondary incidents. In an ATDM approach, as the traffic conditions are monitored continuously, the warning messages are dynamically displayed based on the location and severity of the queues and slowdowns detected. Queue warning is frequently deployed in coordination with variable speed systems.

Small dynamic message signs would supplement the existing dynamic message signs in the corridor with placement of at least one sign anticipated between each interchange. If combined with another TSMO strategy where full width gantries are provided, the queue warning dynamic message signs could be located on the right side of every third gantry which would equate to a 1.5 mile spacing. An example of a queue warning digital message sign on a full gantry is shown in **Figure 12**.

Figure 12 - Example of Queue Warning Digital Message Sign



### 4.9.2 Assessment

#### Purpose and Need Performance Measures

The focus of the queue warning strategy is improving safety on the highway. As such, it does not lend itself to analysis in the traffic microsimulation model. As documented in the project's purpose and need, crashes and other events on the highway are a common cause of congestion and secondary crashes; as such, it is anticipated that any strategy that reduces crashes would benefit traffic operations in the corridor.

Safety benefits related to queue warning were assessed quantitatively through the application of crash modification factors (CMF), which represent the percent reductions in crashes that can be expected after a strategy is implemented. CMF values were identified based on research from real-world implementation of the queue warning strategy. The implementation of a queue warning system was assessed quantitatively using the RoadHAT software. In the assessment of safety benefits, it was assumed that the strategy would be in operation on weekdays (Monday through Friday) from 6:00 AM to 9:00 PM. Based on a review of available data, a 16% reduction in rear-end fatal/injury crashes and a 16% increase in rear-end property damage only (PDO) crashes were used in the RoadHAT analysis. As shown in **Table 24**, this change in crash rates is estimated to result in a net savings of \$11.4 million from 2025-2040 based on the avoidance of crash-related costs.

**Table 24 – Queue Warning Safety Performance**

Fatal/Injury Rear-End Crashes	-16%
Property Damage Only Rear-End Crashes	+16%
Crash-Related Cost Savings (2025-2040)	\$11,400

*Cost in thousands*

Based on this assessment, queue warning would meet the project's purpose of improved safety. As previously mentioned, it is anticipated that any strategy that reduces crashes would also benefit traffic operations in the corridor. As a result, this strategy would meet the project's purpose and need.

## Environmental Impacts

The construction activities associated with queue warning are expected to be limited to the existing highway right-of-way. The installation of gantries would require earth disturbance, but at this time it is anticipated that any impacts would be minimal. In addition, it is anticipated that changes in traffic operations would not result in impacts.

## Cost and Benefit-Cost Ration

As shown in **Table 25**, the total cost for queue warning would be \$13.7 million with a benefit-cost ratio of 0.78. Any ratio greater than one means that the monetary benefits associated with queue warning are greater than the implementation costs. While the independent application of the queue warning system may not be economically warranted, some of the systems costs may be reduced if it is implemented in conjunction with other strategies. Thus, the queue warning strategy was carried forward for further consideration. For more detailed information regarding the cost of queue warning and all the other improvement strategies, see the *Alternatives Assessment Report* in **Appendix G**.

**Table 25 – Queue Warning Cost Estimates**

COST TYPE	COST
Civil Infrastructure	\$3,300
Systems	\$5,820
Design and Project Management	\$1,368
Contingency	\$3,150
<b>TOTAL</b>	<b>\$13,700</b>
Operations and Maintenance (annual)	\$117
Benefit-Cost Ratio	0.78

*Costs in thousands**Note: Benefit-cost ratio is based only on crash-related cost reductions*

## 4.10 EVENT MANAGEMENT

### 4.10.1 Description

The Event Management strategy represents several TSMO components that are primarily intended to support the efficient management of events within the study corridor in order to reduce further delays and improve traffic safety. The event management components are:

- Maintenance and Operation Enhancements

- Complementary Strategies
- Work Zone Management

Several of the other TSMO-related strategies also play a role in the event management strategy, with the field devices and systems related to these other strategies engaged to effectively manage traffic during a planned or unplanned event within the study corridor.

## Maintenance and Operations Enhancement

The Maintenance and Operations Enhancement component would include the following operational upgrades and refinements.

### Towing and Recovery Incentive Program (TRIP)

The Towing and Recovery Incentive Program (TRIP) would standardize the response by towing operators to incidents involving heavy commercial vehicles and provides a monetary incentive to the towing operator to arrive on-scene within a specified period of time (typically in the range of 30-45 minutes depending upon location); clear the incident within a specified period of time (typically 90 minutes); and to do so in a safe and responsible manner. Incidents that require a TRIP activation involve heavy commercial vehicles (or other large vehicles) that are blocking lanes or involve a recovery that would require one or more lanes to be blocked. The TRIP towing companies would deploy a minimum of a 50-ton wrecker, a 35-ton wrecker, and a support vehicle that carries a pre-defined complement of tools and equipment to each TRIP event. Towing operators who fail to achieve the established performance goals may be subject to a disincentive provision.

### Enhanced Hoosier Helper Program

Currently, Hoosier Helpers patrol interstates including I-80/94 from the Illinois State Line to I-90. They assist motorists, and keep highways safe by changing flat tires, fixing minor mechanical problems, removing debris from the road at the scene of an accident, providing minimal amounts of fuel, and providing emergency medical assistance. The Hoosier Helpers are also a valuable asset to numerous agencies including the Indiana State Police and local first responders in assisting with various emergencies on Indiana interstates. Each Hoosier Helper personnel are trained in First Aid, CPR, the use of an Automatic External Defibrillator (AED), HAZMAT, and have completed medical helicopter training.

Under the current program, the Hoosier Helper vehicles do not have the ability to tow disabled vehicles. In an effort to minimize clearance times in the study corridor, an additional Hoosier Helper truck with tow capabilities would be added to the corridor. The ability to tow would, in many cases, decrease clearance times for incidents and also provide the ability for the Hoosier Helpers to help clear stalled or disabled vehicles from the Hard Shoulder prior to opening – as required.

Hoosier Helpers currently operate five days a week during the peak periods and sometimes six days per week when needed. Enhanced service could expand this to 24 hours/7 days a week in the study corridor. The Hoosier Helper program is currently sponsored by Geico. However, any changes to the program would only involve approval from INDOT (Division of Traffic Management) and any additional costs associated with these changes would be attributed to INDOT.

## Complementary TSMO Components

Common to many Advanced Traffic Management Systems (ATMS) deployments, the following are complementary operational and system components that can enhance the effectiveness of the event management strategy. These complementary components leverage the devices and infrastructure that would be deployed to support the other TSMO strategies with limited additional costs.

In this section, each complementary component is described in terms of how they are anticipated to fit within the study corridor as well as how they may be expanded to support the corridor needs. However, to provide

context with the potential fit of these complementary components, the following describes the current Traffic Management Centers (TMC) operations and ATMS employed by INDOT.

INDOT currently operates three TMCs, including one in Indianapolis and one in Gary. The Indianapolis TMC is the only center that operates 24/7/365.

The Gary TMC currently operates from 6:00 am to 10:00 pm and manages and operates the ITS devices in the region, dispatches Hoosier Helpers, and coordinates between emergency response agencies (e.g., law enforcement, fire department, etc.) and the state maintenance staff that support the clearance of the roadway.

INDOT currently uses Iron Mountain and IRIS (Intelligent Roadway Information System) systems. Iron Mountain is the INDOT legacy ATMS and is used to enter event details through the Global Event Manager (GEM). All activities and events are logged and tracked in the GEM. Based on the event details, the Iron Mountain system recommends messages to be displayed on the digital message signs.

IRIS is an open-source ATMS software project developed by the Minnesota Department of Transportation. The ATMS is an integrated platform used by transportation agencies to monitor and manage interstate and highway traffic as well as to manage traffic monitoring and control devices. The IRIS software presents a map-based interface to system operators and is currently used to view and control the CCTV within the region.

Traffic or event information is passed to the public through the CARS 511 system. There is currently limited integration between the ATMS and the CARS 511 system and some duplicate entry is required by the operators to manage events and fully utilize the ITS infrastructure.

The Gary TMC currently coordinates with other agencies through the Great Lakes Regional Transportation Operations Coalition (GLRTOC). The GLRTOC includes transportation agencies responsible for operations on major transportation routes stretching from Minneapolis, Minnesota to Toronto, Ontario (Canada). The GLRTOC was formed in May 2010 with a core mission to collaborate on improving cross-regional transportation operations in support of regional economic competitiveness and improved quality of life. The major GLRTOC goals include incident management, improved freight operations, work zone coordination and regional coordinated traveler information. The GLRTOC three strategic focus areas include freight operations, reliability and mobility strategies, and traffic incident management/emergency transportation operations.

### **Provide Optimal Intelligent Transportation System (ITS) Device Deployment**

If INDOT installs gantries and ITS equipment and communications as part of other TSMO strategies, optimal ITS devices, systems, and inter-agency connections should be provided to improve event management, road weather management, active demand management, and traffic surveillance. In addition to optimizing ITS device deployment, two additional Road Weather Information System (RWIS) stations could be considered to improve the accuracy of the automated weather responses that would in turn improve safety and minimize delays resulting from weather related accidents. Additional RWIS stations would also assist in supporting decisions related to when the dynamic shoulder lane can be safely opened.

### **Leverage Variable Speed Limits and Queue Warning Equipment**

The variable speed limits and queue warning strategies would require additional vehicle detection stations throughout the corridor. This added vehicle detection can also be used to provide very timely and more accurate travel times through the corridor. These travel times could be used to drive dynamic message signs travel time messages and Advanced Traveler Information System (ATIS) feeds as well as providing relevant information to adjacent agencies (e.g., transit) to support demand management strategies and to encourage broader alternative routes or modes during times of significant congestion.

### **Optimize Data and Image Sharing**

Dynamic shoulder lane functionality would require additional closed-circuit television (CCTV) cameras to provide sufficient coverage that would permit rapid confirmation that the shoulders are safe to open for vehicle travel. The use of these cameras should also be leveraged to help optimize all event responses by making



camera images available to the TMC, INDOT maintenance, and Indiana State Police Dispatch which in turn would support faster and more accurate responses. Sharing camera images with IDOT, Illinois Tollway and Indiana Toll Road should also be considered.

### **Center to Center Interfaces**

The full ATMS solution would include full comprehensive near real time sharing of traffic and event data, as well as camera images between INDOT, IDOT, Illinois Tollway, and Indiana Toll Road. The I-80/94 corridor is a major connector between these road authorities and significant issues in the corridor can have a large impact on traffic throughout the larger region. Rapid and accurate coordination between the agencies can significantly reduce impacts and help motorists make good decisions relating to their travel.

As described in Section 4.1.1, within the immediate study area, there are very limited alternate routes that could readily be used for integrated corridor management (ICM) strategies without a very significant investment. However, there are alternate routes outside the study area that may be appropriate alternatives when there are significant events detected on the I-80/94 corridor. A near real time interface with adjacent systems would allow these other systems, using traffic or event data from the study corridor, to promote the use of these alternatives when significant congestion is detected.

### **Computer Aided Dispatch (CAD) Integration**

Given the high traffic volumes and the potential use of the shoulders (DSL) to improve throughput, rapid identification and response to roadway incidents is even more important. ATMS integration with the Indiana State Police dispatch would shorten detection times and support a coordinated response. It is noted from other agency experience that ATMS CAD integration is proven to be an effective measure in minimizing response and clearance times.

### **Maintenance and Emergency Response Agency Access to CCTV**

INDOT Maintenance and the Indiana State Police do not currently have access to INDOT CCTV cameras in the corridor. This strategy would involve providing maintenance and emergency response staff with access to existing CCTV cameras (as well as any added as part of a TSMO strategy), allowing these responders the opportunity to review the conditions in advance of responding to the event. This potentially critical information would result in more accurate initial responses as opposed to current procedures that typically involve getting a person on scene and then coordinating a second response to get the appropriate crews in the field.

### **Advanced Transit Operations Integration**

The strategy would involve the integration between major transit agencies in the region to allow corridor condition information to be shared seamlessly. Under significant congestion events, rapid access to corridor conditions related data (event and traffic delays) would provide the transit agencies with the ability to promote the use of the transit options. While bus transit is not a major contributor to people movement within the corridor, there are viable rail options available.

### **Work Zone Management**

Work zones play a key role in maintaining and upgrading the road network. Unfortunately, daily changes in traffic patterns, narrowed rights-of-way, and other construction activities often create a combination of factors resulting in crashes. These crashes also cause excessive delays, especially given the constrained driving environment found on the I-80/94 corridor.

As indicated in the previous section, other aspects of an overall event management strategy would provide infrastructure that help support work zone management. An effective work zone management system should provide the following specific functionality:

- The variable speed limit system modules should allow operators to set maximum speeds throughout a work zone and use the same step-down logic as used for the variable speed limits system to slow traffic prior to the work zone.
- Lane control signals should provide the ability to close and open any lane or shoulder. The system should provide for appropriate advanced signing to move traffic, one lane at a time to avoid closed lanes.
- The system should provide the ability to enter planned events into the system prior to the time of the closure and provide for advanced messaging to warn motorists of the upcoming work and related lane closure(s).
- The system should allow for automated advanced dynamic messaging signs that provides motorists the information needed to consider alternate routes in advance of approaching decision points.
- The system should provide adequate CCTV coverage to monitor the entire work zone and all associated dynamic message signs and lane control.
- The system should provide the ability to manage and store work zone and maintenance contacts for easy access by the operators.
- The system should provide adequate detection to monitor work zone speeds and approximate end of queues within the corridor.
- The system should provide an interface to adjacent ATMS to pass work zone details and allow for advanced signing through the other ATMS.

#### 4.10.2 Assessment

The evaluation of the event management strategy assumed the implementation of all the components discussed on Section 4.10.1. In addition, the combination of the event management strategy and dynamic shoulder lanes strategy was also evaluated.

#### Purpose and Need Performance Measures

To assess the potential benefits of the event management strategy, two representative incidents were simulated using the traffic microsimulation model:

- Single lane closure lasting 1 hour – intended to simulate a typical passenger vehicle crash
- Two lane closure lasting 2 hours – intended to simulate a crash involving a semi-truck

Crash data from 2019 was reviewed to identify the frequency of each of these closure scenarios as well as the day and time of incidents. Using this data, annual travel time savings associated with the event management strategy was calculated for both existing 2019 and 2040 conditions. The analysis also estimated the travel time savings associated with the combination of the event management strategy and a dynamic shoulder lane. As shown in **Table 26**, the event management strategy would result in 66,400 hours of crash-related delay avoided in 2040; combining this strategy with dynamic shoulder lanes would increase those time savings by a factor of 17.

**Table 26 – Event Management Strategy Traffic Performance**

	EVENT MANAGEMENT STRATEGY	EVENT MGMT STRATEGY + DYNAMIC SHOULDER LANES
2019 Annual Travel Time Savings (hours)	-39,100	-487,400
2040 Annual Travel Time Savings (hours)	-66,400	-1,224,800
Present Value Benefit (2025-2040)	\$16,700,000	\$280,000,000

Quantitative data regarding the safety benefits of this strategy is not available. However, experience shows that a portion of the crashes in the corridor are “secondary crashes”, that is they result from the stop-and-go traffic that often occurs as a result of a primary crash. As a result, to the extent that the event management strategies reduce the duration of a closure and facilitate a return to normal operations, the probability of secondary crashes is reduced, which would improve safety. A 2017 Virginia Transportation Research Council study found that “during peak periods on urban freeways, every 2 to 3 minutes on the scene increases the

probably of a secondary crash by 1%. On low-volume sections and during evenings, risk increases by about 1 percentage point every 5 min.”<sup>6</sup>

The improvements in travel time indicate that the event management strategy would meet the project’s purpose of increasing operational efficiency. While data is not available regarding safety improvements, the forecasted operational improvements are anticipated to result in improved safety in the corridor. Based on the available analysis, this strategy would meet the project’s purpose and need.

## Environmental Impacts

It is anticipated that implementation of the event management strategy would result in no environmental impacts. Additional field equipment would be installed on existing infrastructure and system upgrades would occur within existing facilities. See Section 4.6.2 regarding the potential environmental impacts associated with the addition of the dynamic shoulder lanes.

## Cost and Benefit-Cost Ratio

Preliminary cost estimates were prepared for the event management strategy with and without the dynamic shoulder lanes strategy in the *Alternatives Assessment Report (Appendix G)* and are summarized in **Table 27**. The event management strategies would not require any capital expenditures. Yearly operations and maintenance costs were also estimated. Travel time savings were used to calculate a benefit-cost ratio. As shown in the table, the event management strategy would have a total cost of \$900,000 with a benefit-cost ratio 7.5. With the addition of the dynamic shoulder lanes, the cost would increase to approximately \$61.7 million and the benefit-cost ratio would be reduced to 2.6.

**Table 27 – Event Management Strategy Cost Estimates**

Cost Type	IMPROVEMENT STRATEGY	
	Event Management Strategies	Event Management Strategies + Dynamic Shoulder Lanes
Civil Infrastructure	\$0	\$27,700
Systems	\$1,025	\$21,325
Design and Project Management	\$0	\$7,190
Contingency	\$0	\$16,600
TOTAL	\$1,025	\$72,625
Operations and Maintenance (annual)	\$730	\$1,345
Benefit-Cost Ratio	1.6	3.6

*Costs in thousands*

*Note: Benefit-cost ratio is based only on travel time savings*

## 4.11 TSMO STRATEGY COMBINATIONS

### 4.11.1 Description

With ramp metering, dynamic shoulder lanes, and variable speed limits individually representing plausible means to improve traffic operations in the I-80/94 corridor, it was determined that combinations of these

<sup>6</sup> Goodall, Noah J. “Probability of Secondary Crash Occurrence on Freeways with the Use of Private-Sector Speed Data.” *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2635, no. 1, 1 Jan. 2017, pp. 11–18.

three TSMO strategies could also form a potential “strategy combination” (SC) that could further improve traffic operations. **Table 28** presents the four strategy combinations that were created from these three individual TSMO strategies.

**Table 28 –TSMO Strategy Combinations**

STRATEGY COMBINATION	DESCRIPTION
SC1	Dynamic Shoulder Lanes + Ramp Metering (DSL + RM)
SC2	Dynamic Shoulder Lanes + Variable Speed Limits (DSL + VSL)
SC3	Ramp Metering + Variable Speed Limits (RM + VSL)
SC4	Dynamic Shoulder Lanes + Ramp Metering + Variable Speed Limits (DSL + RM + VSL)

#### 4.11.2 Assessment

##### Purpose and Need and Other Performance Evaluations

**Table 29** presents the results of the qualitative assessment of the freeway speed, freeway throughput, travel time, travel time reliability, and traffic diversion to local streets for the TSMO strategy combinations. These qualitative assessments are based on more detailed and quantitative assessments from the *Alternatives Assessment Report* in **Appendix G**.

**Table 29 – Qualitative Assessment of TSMO Strategy Combinations**

PERFORMANCE MEASURES		SC1 DSL+RM	SC2 DSL+VSL	SC3 RM+VSL	SC4 DSL+RM+VSL
Freeway Speed		↑	↑	↗	↑
Freeway Throughput		↑	↑	↗	↑
Travel Time Savings	Freeway	↑	↑	→	↑
	Local Streets	↗	↗	↗	↗
	Ramp	→	↗	↘	↗
	Arterial	↗	↗	→	↗
Travel Time Reliability		↑	↑	→	↑
Traffic Diversion to Local Streets		→	→	↘	→

**TABLE LEGEND (COMPARED TO NO BUILD)**

↑	Significantly Better	→	No Change	↓	Significantly Worse
↗	Moderately Better	↘	Moderately Worse		

As shown in the table, in general, the TSMO strategy combinations would provide notable improvements to freeway speed, throughput, travel times, and travel time reliability, but would result in either no changes or moderately worse changes with regard to traffic diversion to local streets. The application of the dynamic shoulder lanes appears to provide the greatest improvement to traffic operations, as shown by the overall lower improvement ratings associated with SC3, which does not include dynamic shoulder lanes. Ramp metering performed well in terms of freeway operations but would result in diversion to the local street network when not paired with dynamic shoulder lanes. Adding the dynamic shoulder lanes to ramp metering increases capacity and improves operations on the freeway sufficiently that the rate at which the ramp meter can allow vehicles onto the freeway can be increased. Overall, when comparing the strategies, those that include the dynamic shoulder lanes (SC1, SC2, and SC4) would have the greatest improvements to traffic operations.

**Table 30** shows how the TSMO strategy combinations would affect VHT. As shown in the table, during the AM peak period, SC1, SC2, and SC4 would result in a 5% and 3% increase in VHT on I-80/94 and the local streets, respectively, with a total increase in VHT of 4% while SC3 would basically result in no changes to VHT. During the PM peak period, SC1, SC2, and SC4 would result in a 11% and 6%-7% reduction in VHT on I-80/94 and the local streets, respectively, with a total reduction in VHT of 8%-9%. These higher reductions in VHT are primarily associated with the inclusion of the dynamic shoulder lanes. SC3 would result in a 3% and 6% reduction in VHT on I-80/94 and the local streets, respectively, with a total reduction in VHT of 5%. The reduction in VHT is lower for SC3 because it doesn't include the dynamic shoulder lanes.

**Table 30 – TSMO Strategy Combinations Network-Wide VHT**

PEAK PERIOD/ROADWAY	NO-BUILD	SC1 DSL+RM	SC2 DSL+VSL	SC3 RM+VSL	SC4 DSL+RM+VSL
	VHT (hours)	Change in VHT (%)			
AM PEAK PERIOD					
I-80/94	11,690	+533 (+5%)	+572 (+5%)	+20 (0%)	+543 (+5%)
Local Streets	7,190	+201 (+3%)	+193 (+3%)	0 (0%)	+200 (+3%)
Total	18,880	+730 (+4%)	+760 (+4%)	+20 (0%)	+740 (+4%)
PM PEAK PERIOD					
I-80/94	20,780	-2302 (-11%)	-2216 (-11%)	-690 (-3%)	-2219 (-11%)
Local Streets	18,520	-1092 (-6%)	-1250 (-7%)	-1120 (-6%)	-1119 (-6%)
Total	39,300	-3390 (-9%)	-3470 (-9%)	-1810 (-5%)	-3340 (-8%)

**Table 31** shows how the TSMO strategy combinations would affect VMT. As shown in the table, during the AM peak period, SC1, SC2, and SC4 would result in a 3% and 2% increase in VMT on I-80/94 and the local streets, respectively, with a total increase in VMT of 3% while SC3 would basically result in no changes to VMT. During the PM peak period, SC1, SC2, and SC4 would result in a 7% and 1% increase in VMT on I-80/94 and the local streets, respectively, with a total increase in VMT of 5% while SC3 would basically result in no changes to VMT. The increases in VMT for SC1, SC2, and SC4 are primarily associated with the inclusion of the dynamic shoulder lanes. SC3 would result in no changes to VMT primarily because it does not include the dynamic shoulder lanes.

Table 31 – TSMO Strategy Combinations Network-Wide VMT

PEAK PERIOD/ROADWAY	NO-BUILD	SC1 DSL+RM	SC2 DSL+VSL	SC3 RM+VSL	SC4 DSL+RM+VSL
	VMT (thousand miles)	Change in VMT (%)			
AM PEAK PERIOD					
I-80/94	1,083	+30 (+3%)	+33 (+3%)	-5 (0%)	+30 (+3%)
Local Streets	281	+5 (+2%)	+5 (+2%)	0 (0%)	+5 (+2%)
Total	1,364	+35 (+3%)	+38 (+3%)	-5 (0%)	+35 (+3%)
PM PEAK PERIOD					
I-80/94	1,301	+89 (+7%)	+94 (7%)	-1 (0%)	+89 (+7%)
Local Streets	449	+6 (+1%)	+2 (+1%)	+2 (0%)	+4 (+1%)
Total	1,750	+95 (+5%)	+96 (+5%)	+1 (0%)	+94 (+5%)

## Environmental Impacts

The construction activities associated with each of the TSMO strategy combinations are expected to be limited to the existing highway right-of-way. The installation of gantries to support dynamic shoulder lanes and variable speed limits and the installation of signals associated with ramp meters would require earth disturbance, but at this time it is anticipated that any impacts would be minimal. See Section 4.5.2 regarding potential EJ and air quality impacts associated with ramp metering and Section 4.6.2 regarding potential noise impacts associated with dynamic shoulder lanes.

## Cost and Benefit-Cost Ratio

As shown in **Table 32**, SC1, SC2, and SC4 would have similar costs ranging from \$76.3 million (SC1) to \$79.5 million (SC4), a difference of 4%. These costs are more than three times the cost of SC3 (\$24.2 million). The higher costs of SC1, SC2, and SC4 are primarily associated with the dynamic shoulder lanes. SC1, SC2, and SC4 would also have similar benefit-cost ratios ranging from 4.0 (SC1) to 4.3 (SC2). SC3 would have the lowest benefit-cost ratio of 3.5. Any ratio greater than one means that the monetary travel time savings (i.e., benefits) associated with the TSMO strategy combinations are greater than the implementation costs. For more detailed information regarding the cost of the TSMO strategy combinations and all the other improvement strategies, see the *Alternatives Assessment Report* in **Appendix G**.



**Table 32 – TSMO Strategy Combinations Cost Estimates**

	<b>SC1</b> <b>DSL+RM</b>	<b>SC2</b> <b>DSL+VSL</b>	<b>SC3</b> <b>RM+VSL</b>	<b>SC4</b> <b>DSL+RM+VSL</b>
Civil Infrastructure	\$29,100	\$29,900	\$6,710	\$30,400
Systems	\$22,000	\$21,600	\$9,480	\$22,900
Design and Project Management	\$7,670	\$7,730	\$2,430	\$7,980
Contingency	\$17,700	\$17,800	\$5,590	\$18,400
<b>TOTAL</b>	<b>\$76,300</b>	<b>\$76,900</b>	<b>\$24,200</b>	<b>\$79,500</b>
Operations and Maintenance (annual)	\$719	\$642	\$330	\$737
Benefit-Cost Ratio	4.0	4.3	3.5	4.1

*Costs in thousands*  
*Note: Benefit-cost ratio is based only on travel time savings*

## 4.12 SUMMARY OF STRATEGY ASSESSMENTS

The qualitative and quantitative assessments provided in the previous sections have been summarized in **Table 33**.

**Table 33 - Comparison of Improvement Strategies**

	NO-BUILD	BDWAY/ I-65 INTERCH	SIGNING	RAMP METERING	DYNAMIC SHOULDER LANES	VARIABLE SPEED LIMITS	DYNAMIC LANE CONTROL	QUEUE WARNING	EVENT MGMT STRATEGY	EVENT MGMT STRATEGY + DYNAMIC SHOULDER LANES	SC1	SC2	SC3	SC4
Traffic Performance	➡	⬆	↗	↗	⬆	↗	N/A	N/A	↗	⬆	⬆	⬆	↗	⬆
Safety Performance	➡	↗	↗	↗	↗	↗	↗	⬆	↗	↗	↗	↗	↗	↗
P&N	✖	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Environmental	⊖	W	⊖	EJ	N	⊖	⊖	⊖	⊖	⊖	EJ, N	N	EJ	EJ, N
Cost (\$M)	\$0	\$4.2	\$4.2	\$4.8	\$71.6	\$20.5	\$76.0	\$13.7	\$0.9	\$72.5	\$76.3	\$76.9	\$24.2	\$79.5
Benefit-Cost Ratio	N/A	18.0	N/A	14.4	3.7	3.9/12.1 <sup>1</sup>	N/A	0.78 <sup>1</sup>	1.6	3.6	4.0	4.3	3.5	4.1

<sup>1</sup>Benefit-cost ratio is based only on crash-related cost reductions. All other benefit-cost ratios are based only on travel time savings.

**LEGEND**
**Traffic and Safety Measures**

- ⬆ Significantly Better
- ↗ Moderately Better
- ➡ No Change
- ↘ Moderately Worse
- ⬇ Significantly Worse

**Purpose and Need Evaluation**

- ✖ Does not meet purpose and need
- ✓ Meets purpose and need

**Traffic Operations Strategy Combinations**

- SC1 Dynamic Shoulder Lanes + Ramp Metering
- SC2 Dynamic Shoulder Lanes + Variable Speed Limit
- SC3 Ramp Metering + Variable Speed Limit
- SC4 Dynamic Shoulder Lanes + Ramp Metering + Variable Speed Limit

**Environmental Evaluation**

- ⊖ Minimal anticipated environmental impacts
- EJ Further environmental justice analysis required
- N Potential noise impacts
- W Potential wetland impacts

## 4.13 ALTERNATIVES RECOMMENDED FOR FURTHER EVALUATION IN THE NEPA PHASE

This section draws on the analysis in the previous sections to identify alternatives that are comprised of combinations of improvement strategies (*i.e.*, packages), that are recommended for further analysis in the NEPA phase. The alternatives, summarized in **Table 34**, were developed based on the anticipated traffic and safety benefits, potential environmental impacts, and estimated costs. The alternatives seek to capitalize on the complementary nature of the improvement strategies and provide a representative range of reasonable alternatives for detailed analysis during the environmental review process conducted under NEPA. The notable cost difference between Alternatives 1 and 2 and Alternatives 3 and 4 is primarily due to the cost of extending gantries across the entire roadway and installing dynamic signage above all the lanes. There is, however, a corresponding increase in the benefit-cost ratio, largely attributable to the safety benefits of the added strategies. The range of costs reflected in the alternatives also provides flexibility as INDOT and IDOT identify available funding for improvements in the corridor. In accordance with NEPA guidelines, the No-Build Alternative will also be carried forward into the NEPA phase to serve as a baseline comparison to the alternatives even though it does not meet the project's purpose and need.

**Table 34: Alternatives Recommended for Further Evaluation in NEPA**

<b>Alternative 1 Base Package</b>	<b>Alternative 2 Base Package + Ramp Metering</b>	<b>Alternative 3 Base Package + Mainline Safety*</b>	<b>Alternative 4 Base Package + Mainline Safety + Ramp Metering</b>
Dynamic Shoulder Lanes Event Management Broadway Interchange and I-65 Interchange Modifications Signing Enhancements	Dynamic Shoulder Lanes Event Management Broadway Interchange and I-65 Interchange Modifications Signing Enhancements <hr/> Ramp Metering	Dynamic Shoulder Lanes Event Management Broadway Interchange and I-65 Interchange Modifications Signing Enhancements <hr/> Variable Speed Limits Dynamic Lane Control Queue Warning	Dynamic Shoulder Lanes Event Management Broadway Interchange and I-65 Interchange Modifications Signing Enhancements <hr/> Variable Speed Limits Dynamic Lane Control Queue Warning Ramp Metering
<b>Cost</b>			
\$82,400,000	\$87,300,000	\$135,100,000	\$139,300,000
<b>Benefit-Cost Ratio</b>			
4.62	4.80	6.69	6.51

\*Mainline Safety refers to those improvement strategies that focused primarily on safety and not traffic operations, which include variable speed limits, dynamic lane control, and queue warning.

## Section 5 – AGENCY COORDINATION AND PUBLIC INVOLVEMENT

### 5.1 AGENCY COORDINATION

Agency coordination for the I-80/94 Borman Expressway PEL Study involved the creation of a Resource Agency Committee (RAC) that included local, state, and federal agencies. Three RAC meetings were held virtually at key milestones during the course of the PEL Study to present information to the agencies and obtain their

input. The following is a brief summary of the information that was presented at these meetings and comments received. Complete meeting summaries with agency comments and presentation materials are provided in **Appendix J**. Below is the list of RAC members that were invited to the RAC meetings.

- U.S. Environmental Protection Agency
- Chicago Metropolitan Agency for Planning (CMAP)
- Illinois Department of Natural Resources
- Illinois Department of Transportation, Region 1
- Illinois Historic Preservation Agency
- Illinois Environmental Protection Agency
- U.S. Army Corps of Engineers, Chicago District
- U.S. Department of Housing & Urban Development, Chicago Regional Office
- City of Gary, Parks & Recreation Board
- City of Hammond, Parks & Recreation Board
- Indiana Department of Environmental Management
- Indiana Department of Natural Resources, Division of Fish and Wildlife
- Indiana Geological & Water Survey
- Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology
- Lake County Surveyor
- Natural Resources Conservation Service
- Northwestern Indiana Regional Planning Commission (NIRPC)
- U.S. Fish and Wildlife Service, Northern Indiana Suboffice
- National Park Service, Midwest Regional Office
- Little Calumet River Basin Development Commission

### 5.1.1 RAC Meeting #1 (April 29, 2021)

The following information was presented at this meeting.

- Study limits (i.e., logical termini), scope, and schedule
- Role of the RAC
- PEL process
- Study needs
- Proposed Transportation Systems Management and Operations (TSMO) strategies
- Public involvement and agency coordination process
- Environmental analysis approach

The following RAC members attended the meeting.

- Indiana Department of Environmental Management
- Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology
- Illinois Department of Natural Resources
- Illinois Historic Preservation Agency
- Chicago Metropolitan Agency for Planning
- Northwestern Indiana Regional Planning Commission
- National Park Service

The following comments and questions were received during the meeting.

- The IL Historic Preservation Agency asked if the Area of Potential Effects (APE) and other cultural resource information will be distributed to the RAC group. It was explained that the Section 106 process, including the definition of the APE and consulting party engagement, will not formally start until the NEPA process is initiated (after the PEL Study). During PEL, the Red Flag Investigation will identify previously documented cultural resources.
- The Illinois Department of Natural Resources noted that the Wampum Lake Woods Forest Preserve is highly protected and is close to the corridor.
- The Northwestern Indiana Regional Planning Commission stated that we should look at the drainage and flooding events along the corridor, especially in the lanes along the edge. It was explained that the civil

engineering team is paying close attention to drainage and flooding due to the potential to utilize the shoulders where most drainage structures are located.

- The FHWA Indiana Division asked how the PEL study will be incorporated into the NEPA process. Will the purpose and need (P&N) and alternatives analysis be referenced or used to inform the NEPA process or is the plan to adopt those into the NEPA process? It was explained that the study team anticipates carrying the draft purpose and need statement and the alternatives screening work completed during the PEL process into NEPA.

### **5.1.2 RAC Meeting #2 (August 11, 2021)**

The following information was presented at this meeting.

- Existing traffic (i.e., travel times and speeds) and safety (i.e., crash frequency) conditions
- Preliminary purpose and need
- A more detailed description of the TSMO strategies
- Upcoming traffic analysis and evaluation of TSMO strategies
- Updates on the environmental analysis

The following RAC members attended the meeting.

- Indiana Department of Natural Resources, Division of Fish and Wildlife
- Illinois Department of Natural Resources
- Illinois Historic Preservation Agency
- Northwestern Indiana Regional Planning Commission
- City of Hammond
- U.S. Environmental Protection Agency

The following comments and questions were received during the meeting.

- USEPA asked about feedback from the public regarding the study. It was explained that the study team has not sorted through all the public responses yet but some local residents suggested coordinating with other entities such as the trucking agencies while others commented on continued corridor maintenance and the historic handling of the Borman and specific concerns about safety issues and noise walls. maintenance at the public meetings.
- USEPA also asked if the study team has gone into the EJ communities to bring them into the study planning process. It was explained that the study team has been coordinating with the CAC members, the NAACP, Hammond Hispanic Community Committee, and others, to help spread the word about the study and gather feedback. The study team translated the public meeting materials into Spanish to increase accessibility to local residents.

### **5.1.3 RAC Meeting #3 (October 21, 2021)**

The following information was presented at this meeting.

- Grouping of TSMO strategies
- Results from the evaluation of the TSMO strategies
- Proposed geometric improvements at the Broadway interchange and I-65 interchange
- Updates on the environmental analysis

The following RAC members attended the meeting.

- Indiana Department of Environmental Management
- Illinois Department of Natural Resources
- Illinois Historic Preservation Agency
- Chicago Metropolitan Agency for Planning
- U.S. Department of Housing & Urban Development
- U.S. Fish and Wildlife Service

No comments were received during the meeting. One comment was received via email following the meeting from the Indiana Department of Natural Resources, Division of Fish and Wildlife stating that they had no comments on the meeting material and they are not aware of many high quality resources along the corridor.

## 5.2 PUBLIC INVOLVEMENT

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Public Involvement for the I-80/94 Borman Expressway PEL Study involved the creation of a Community Advisory Committee (CAC) that met three times in person and/or virtually at key milestones during the course of the PEL Study to present information to the CAC members and obtain their input. In addition, two sets of public information meetings were held in person and virtually to present information to the general public about the PEL Study and obtain their input. The following is a brief summary of these meetings and comments received. The complete meeting summaries with public comments and presentation materials are provided in **Appendix K**. Below is the list of CAC members that were invited to the CAC meetings.

- Northwestern Indiana Regional Planning Commission (NIRPC)
- Chicago Metropolitan Agency for Planning (CMAP)
- City of Gary, Public Works
- City of Hammond, Public Works
- Gary Schools
- City of Hammond Schools
- NAACP Gary Branch
- NAACP Chicago Southside Branch
- Urban League of Northwest Indiana
- Chicago Urban League
- Hammond Hispanic Community Committee
- Casa Central
- Latinos Progresando
- Indiana Department of Homeland Security
- Indiana State Police
- Lake County Highway Department
- Cook County Transportation and Highways
- City of Gary
- City of Gary Common Council
- City of Hammond
- City of Hammond Common Council
- Town of Highland
- Town of Munster

### 5.2.1 CAC Meeting #1 (virtual) – April 30, 2021

The following information was presented at this meeting.

- Study limits, scope, and schedule
- Role of the CAC
- PEL process
- Study needs
- Proposed Transportation Systems Management and Operations (TSMO) strategies
- Public involvement process
- Environmental analysis approach

The following CAC members attended the meeting.

- City of Gary
- Town of Highland
- NIRPC
- Indiana Department of Homeland Security



The following comments and questions were received during the meeting.

- The Indiana Department of Homeland Security (IDHS) asked about whether the study design has taken into consideration emergency service routes and whether EMS personnel were interviewed. It was explained that Traffic Management plans will be discussed later down the road during NEPA and design phases. It was discussed that IDHS will see if there are other EMS personnel that would be interested in providing their input on the study.
- A CAC member mentioned that he participated in a coordinating meeting where potential EMS systems were discussed and addressed for the study (post construction). More cameras will probably be installed as a result of the TSMO solutions selected which can lead to a better understanding of current traffic conditions and routes for EMS personnel.
- The Northwestern Indiana Regional Planning Commission (NIRPC) asked about the fidelity of the heatmaps (shown during the presentation) and whether they alone can be used for lane by lane analysis and justification of the study. It was explained that the heatmaps in the presentation are just a small example from the whole data set and only used for basic reference during the presentation. Also, there is more modeling going on and other methods of analysis of the corridor being used for justification.
- NIRPC also asked if there are potential solutions under consideration to alert motorists what corridor to use during travel. It was explained coordination with INDOT and IDOT is going on so they can utilize their knowledge and technology to help alert motorists based on the system's needs.

## **5.2.2 CAC Meeting #2 (in person and virtual) – July 28, 2021**

The following information was presented at this meeting.

- Existing traffic (i.e., travel times and speeds) and safety (i.e., crash frequency) conditions
- Preliminary purpose and need
- A more detailed description of the TSMO strategies
- Upcoming traffic analysis and evaluation of TSMO strategies

The following CAC members attended the meeting.

- City of Gary
- City of Hammond
- CMAP
- Cook County Transportation and Highways
- Hammond Hispanic Community Committee
- NAACP
- NAACP Chicago Southside Branch

The following comments and questions were received during the meeting.

- A member of the Hammond Hispanic Community Committee asked how the crash rates on the Borman Expressway compared to other corridors in Indiana. It was explained that this is the most traveled corridor in the state of Indiana.
- A representative of the NAACP said that when trains cause backups, they cause travelers to try and “make up” that time which causes unsafe conditions. Additionally, she asked how other DOT projects in the area tie-in together. Many projects are adding new train tracks and increasing traffic along the corridor. The more building that occurs leads to more traffic and congestion. It was explained that the study team and organizations in the area, like NIRPC, look at future growth models. They base these models on local data, plans, and growth to try and predict how these studies will affect the future. The study team will look ahead and use technology to inform corridor users on how they can travel efficiently.
- One CAC member commented that it appears there could be a gap in coordination between agencies, entities, and departments that have vested interest in transportation. Seems like these strategies need greater coordination for it to work effectively. It was explained that ITS requires greater coordination and communication between entities. Sharing of information between these entities allows for quicker response to incidents and a better understanding of the situation. The study team is currently coordinating with entities now but there is room for improvement.
- The member of the Hammond Hispanic Community Committee asked if the coming transition to electric and autonomous cars is being taken into consideration. It was explained that the technology is there with

these vehicles, leading to a greater amount of data for a better understanding of how motorists travel. It will be quite some time until connected autonomous vehicles are available, but they can bring about more intelligent travel. These vehicles should be able to receive information from traffic management systems, but autonomous vehicles are not specifically being planned for at this time.

- A representative from the City of Gary asked if the current construction on I-80/94 is related to this study. It was explained that the current construction on I-80/94 is not related to the FlexRoad study.

### 5.2.3 CAC Meeting #3 (in person and virtual) – October 19, 2021

The following information was presented at this meeting.

- Grouping of TSMO strategies
- Results from the evaluation of the TSMO strategies
- Proposed geometric improvements at the Broadway interchange and I-65 interchange
- Updates on the environmental analysis

The following CAC members attended the meeting.

- NIRPC
- Hammond Schools Transportation

The following comments and questions were received during the meeting.

- NIRPC asked whether the queue warning would increase the number of gantries along the corridor or utilize existing signage? The price tag was only \$1 million to implement. It was explained that the queue warning would only use existing gantries.

### 5.2.4 Public Information Meeting #1 – July 28 and 29 (in person) and August 3 (virtual), 2021

The study team held two in-person public information meetings in July 2021 and one virtual public meeting in August 2021. For the in-person meetings, the doors opened at 5:00 PM and the meeting space was setup in an open-house style. Members of the public were asked to sign-in at a front table, and were provided with comment forms and fact sheets. A three-question survey was also handed out during the public meeting and made available electronically on the study's website ([www.indianaflexroad.com](http://www.indianaflexroad.com)). Members of the study team interacted with the public and answered any questions. Two sets of five graphic boards were displayed with study team members stationed at either set. A four minute video providing an overview of the study was played on loop at one station. Another station had a laptop setup with the [indianaflexroad.com](http://indianaflexroad.com) interactive comment map. At 6:00 PM, INDOT conducted a presentation. Following the presentation, the study team facilitated a question and answer session.

The virtual public meeting was held via WebEx with the presentation starting at 6:00 PM, followed by a question and answer session. Attendees were directed to access the public meeting boards, fact sheet, and other materials on the study's website ([www.indianaflexroad.com](http://www.indianaflexroad.com)).

The following information was presented at these meetings.

- Study limits, scope, and schedule
- Existing traffic (i.e., travel times and speeds) and safety (i.e., crash frequency) conditions
- Upcoming traffic analysis and evaluation of TSMO strategies
- Preliminary purpose and need
- Proposed Transportation Systems Management and Operations (TSMO) strategies
- PEL process
- Public involvement program

The deadline for comments for this phase of the study and these public information meetings extended from July 12, 2021 to September 3, 2021. Comments could be submitted via regular mail, email, the study's website ([www.indianaflexroad.com](http://www.indianaflexroad.com)), or in-person at the meetings.

During the public comment period, the study's website had over 3,500 visits, of which were 1,004 unique visitors. Users left 62 comments on the study map and submitted nine surveys electronically. Over 30 people attended the three public meetings, provided the study team with over 40 comments, and completed two surveys. The content of the public comments is summarized below.

#### *Congestion Hotspots – 16 Comments*

Specific areas of congestion were noted on the study website and are summarized below. Comments generally mentioned areas where lanes began or ended which led to cars moving around and leading to slow downs. Trucks using the left lanes was mentioned in multiple comments.

- Lanes feel tighter and more restrictive when crossing into Indiana due to the high sound barriers and the curve in the road. The perception of a constricted roadway leads to slowdowns.
- Eastbound I-294/94 merges two lanes into one. Also, vehicles are moving across lanes to exit to Calumet Avenue.
- Merging traffic from Torrence Avenue to eastbound I-80/94 disrupts traffic because of a short auxiliary lane causing traffic to cut in front of mainline travel.
- Eastbound congestion approaching I-65 as motorists decide too late to move lanes to exit. The ramp is also not wide enough even after the original expansion. Three lanes on the exit ramp are recommended.
- Westbound I-80/94 traffic slows down before Broadway.
- Section of roadway near Torrence Avenue is congested, especially westbound I-80/94.

#### *Safety Issues – 21 Comments*

Specific areas where safety issues arise were noted on the study website and are summarized below. Comments ranged from line of sight, bottlenecks, speeding, cars moving back and forth, drainage, and asking for dedicated police patrols. Primarily, safety issues mentioned were from cars and trucks moving back and forth between lanes. Additionally, comments noted potholes, and drainage issues and debris in the shoulders along the corridor.

- Motorists use the exit ramp lanes to cut into traffic at the last minute at the I-294 interchange.
- The entrance ramp to eastbound I-80/94 from Bishop Ford has cars moving across all lanes when entering from 159<sup>th</sup> Street.
- There is a dip in the road on westbound I-80/94 close to Torrence Avenue in the first lane.
- The Illinois/Indiana border has different lanes and there is a curve in the road.
- Trucks are using all lanes near the I-65 interchange causing unsafe conditions.

#### *Ramp Issues – 17 Comments*

Specific ramp issue areas were noted on the study website and are summarized below. Primary issues noted were concerning bottlenecks and cars moving across lanes to exit or enter quickly causing slowdowns and safety issues. Cars enter onto 80/94 without adequate spacing between them. The ramps and auxiliary lanes associated with entrances and exits were also noted to be long which caused more safety issues.

- The Calumet Avenue on-ramp to westbound I-80/94 holds water which can block traffic during heavier rain events.
- The piers on the Cline Avenue on-ramp bridge to eastbound I-80/94 are large and will limit the use of the inside shoulder for potential TSMO strategies.
- There is not enough space for people to merge onto eastbound I-80/94 from Cline Avenue as people are also exiting to Burr Street.
- Entrance ramp from Burr Street to westbound I-80/94 needs two lanes. The merged lanes on the ramp are unsafe.
- Traffic volume at the Burr Street interchange is too great with the new casino. There needs to be a combined westbound exit for Burr Street and Cline Avenue.
- The eastbound entrance ramp from Broadway and I-65 exit ramp is difficult to navigate.
- The signage on northbound I-65 to I-80/94 is not clear and the ramp design to westbound I-80/94 is difficult to navigate.

#### *General Comments – 43 Comments*

General comments ranged from a variety of topics, but many mentioned trucks using left lanes, speeding, and amount of congestion due to lack of other routes through the area. Multiple comments mentioned pursuing

dedicated truck, express, or high occupancy vehicle lanes to ease traffic. Updating signage was also mentioned multiple times.

#### Survey Responses – 11 Responses

Question 1 – What do you think are the biggest transportation problems in the corridor? Be as specific as you can regarding the problem, where it occurs, and if it is most prevalent during specific times.

Answers mentioned weaving cars, trucks, and traffic volume as the primary problems in the corridor.

Question 2 – What do you like/dislike about the strategies? Are there other strategies that you think we should be considering?

Ramp metering and queue warning were the most liked strategies but also had mixed reactions from other comments. Comments noted that ramp metering with the current ramp design does not seem like a good idea. People would not know how to adjust to a new system of driving on the shoulder or using ramp meters. Additionally, one comment expressed that ramp metering should only be considered for smaller interchanges, not Cline Avenue, as most people will not likely abide. Drainage should be considered if the inside shoulder may be used for hard shoulder running. Strategies that keep trucks in the right lanes and out of the left were mentioned multiple times.

Question 3 – What groups or organizations should we be reaching out to? How can we spread the word effectively?

Answers mentioned contacting trucking organizations, Indiana Constructors Inc., and cities in the area. Additionally, one comment mentioned school parent associations and churches to help spread information.

#### 5.2.5 Public Information Meeting #2 – October 19 (in person) and October 21 (virtual), 2021

INDOT held one in-person and one virtual public information meeting in October 2021. For the in-person meeting, the doors opened at 5:30 PM and the meeting space was setup in an open-house style. Members of the public were asked to sign-in at the front table and were provided with comment forms and fact sheets (both handouts were available in English and Spanish). Members of the study team interacted with the public and answered any questions. One set of eight graphic boards were displayed. Another set of boards was setup in an adjoining room while a video explaining traffic systems management and operations (TSMO) and potential strategies played on a loop. At 6:00 PM, INDOT conducted a presentation. Following the presentation, the study team facilitated a question and answer session.

The virtual public meeting was held via WebEx with the presentation starting at 6:00 PM, followed by a question and answer session. Attendees were directed to access the public meeting boards, fact sheet, and other materials on the study's website ([www.indianaflexroad.com](http://www.indianaflexroad.com)).

A total of 32 people attended these meetings (20 in-person and 12 virtual).

The following information was presented at these meetings.

- Grouping of TSMO strategies
- Results from the evaluation of the TSMO strategies
- Proposed geometric improvements at the Broadway interchange and I-65 interchange

The deadline for comments for this phase of the study and these public information meetings extended from October 19, 2021 to November 22, 2021. Comments could be submitted via regular mail, email, the study website ([www.indianaflexroad.com](http://www.indianaflexroad.com)), or in-person at the meetings.

A total of 18 comments were submitted (16 in-person and 2 online). Also, five people responded to the survey questions. The following is a summary of the comments received and the responses to the survey questions.

The following is a summary of the comments received.

- It feels like the project is achievable and will benefit the region.
- The tolls need to be removed on I-90 west of the Portage toll plaza to the Illinois state line. Lack of lanes on I-80/94 is the problem. This study needed to include the I-80/90 and I-94 interchange in Lake Station.

- Westbound on I-80/94 at Calumet Avenue, utilize the shoulder at the I-294/94/IL 394 split when there is an issue. Add pavement markings at that entrance indicating I-94 (lane close to wall) and I-294 first lane. Burr Street to westbound I-80/94 is a great place for ramp metering.
- The shoulders and drains are not made to withstand the load of being driven on.
- It is obvious that many motorists are using their cell phones in this traffic. I would suggest that cell signals get jammed and only emergency numbers can be used.

The following is a summary of the responses to the survey questions.

Question 1 - What do you think about the strategies/results?

- Overall, great.
- Very beneficial.
- Implement the strategies and see what happens.
- Seems to be half measures” and that “we need to start the Illiana Expressway.
- The I-65 ramp and Broadway interchange geometric improvements are an excellent idea. Also, can the 3<sup>rd</sup> lane can be a hard shoulder lane and can we add pavement markings indicating the right two lanes are southbound I-65?

Question 2 - What additional factors need to be considered? Are there specific concerns we should be aware of?

- Environmental impacts, proper drainage, spills, and potential pollutants from runoff.
- Would a left lane exit ramp from eastbound I-80/94 to southbound I-65 prevent cross over issues?
- Why can't the tolls on I-90 west of Portage be removed?
- Queue warnings on eastbound I-294 at Halsted Street/IL 1 heading to Indiana and I-80/94 to alert people of congestion at the IN/IL state line. Variable speed limits at Burnham Ave alerting traffic at the IN/IL state line. Bring in hard shoulder at the IN/IL line.
- Gapers delay increases travel times. Can you add opaque barriers in the median to reduce gapers delay. Barriers may be decorative. Also add signage about traffic backups on local roads before entering expressway.

Question 3 - Are there groups or organizations that we should be contacting? How can we spread the word more effectively?

- Work with local colleges and organizations for students to get experience in the field. Push these strategies and their projected benefits out to the public via social media.
- Greater Northwest Indiana Association of Realtors GNIAR.com.
- Lake Truckers Association. Not sure if Indiana's oversize/overweight - IFTA-IRP websites offer newsletters.
- Social organizations and professional organizations/association such as ASCE.

## 5.2.6 Study Website

In addition to the CAC, RAC, and public information meetings, a website ([www.indianaflexroad.com](http://www.indianaflexroad.com)) was created that included study information and provided the public the opportunity to submit comments throughout the course of the study.

## Section 6 – OUTSTANDING ISSUES

As described, throughout this report, the strategies under consideration are focused on improving the operations of the existing infrastructure with limited potential for environmental impact. Section 4 identified several areas that will require detailed consideration in future phases:

- Noise – During the NEPA phase, a detailed analysis of the noise environment, potential impacts, and the likelihood for additional noise mitigation in the corridor will be required.
- Environmental Justice – The preliminary assessment suggests that none of the alternatives proposed to be carried forward would result in a disproportionately high and adverse impact to environmental justice populations. This analysis should be revisited as analysis of the alternatives is refined. In additional,

outreach to environmental justice populations and stakeholders should continue to ensure that potential impacts are identified and addressed.

- Air Quality – Prior to approval of any NEPA document, the applicable regional/state planning and conformity documents – TIP, STIP, and MTP, including completion of the congestion management process – must be updated to reflect the anticipated scope and cost of any improvements. Coordination with NIRPC, CMAP, INDOT, and IDOT will occur during the NEPA phase.
- Wetlands, Streams, and other Natural Resources – Field surveys should be conducted in all areas of potential disturbance to confirm the presence of any sensitive natural resources.
- Agency Coordination – At the start of NEPA, early coordination with agencies should be initiated to ensure that all potential impacts and procedural requirements are addressed. Additionally, the Section 106 process should be initiated, including the identification of potential consulting parties.

## Section 7 – NEXT STEPS

At the completion of this PEL study, it is anticipated that INDOT and IDOT will initiate the NEPA and preliminary engineering processes to continue the evaluation of the build alternatives identified in Section 4.13. The NEPA process is expected to be completed in 2022 and construction could begin in 2023. Depending on the alternative selected for implementation, construction is anticipated to take 1-2 years.