I-80 OVER MISSISSIPPI RIVER PLANNING AND ENVIRONMENT LINKAGES (PEL) PURPOSE AND NEED STATEMENT

1.0 Introduction

The project's purpose and need statement sets the foundation for the project development process and helps in the development and evaluation of project alternatives. It identifies specific transportation problems (needs) that the project will address and describes the desired outcomes or goals (purpose) of the project.

The project study area shown in **Figure 1** is located in Rock Island County, Illinois and Scott County, Iowa. The western terminus is located at the SW 35th Street Overpass in Iowa and the eastern terminus is the I-88 interchange in Illinois. The analysis focuses on 1) the conditions of the existing bridges, 2) roadway conditions such as curves, grades, lane/shoulder widths, and sight distance that do not meet existing design standards 3) existing and future traffic levels of service (LOS), and 4) safety (i.e., crashes and their contributing factors). Based on the project purpose, performance measures were identified that will be used to evaluate project alternatives. This purpose and need statement summarizes information that was collected from the project's Existing Conditions Technical Report (July 2020).

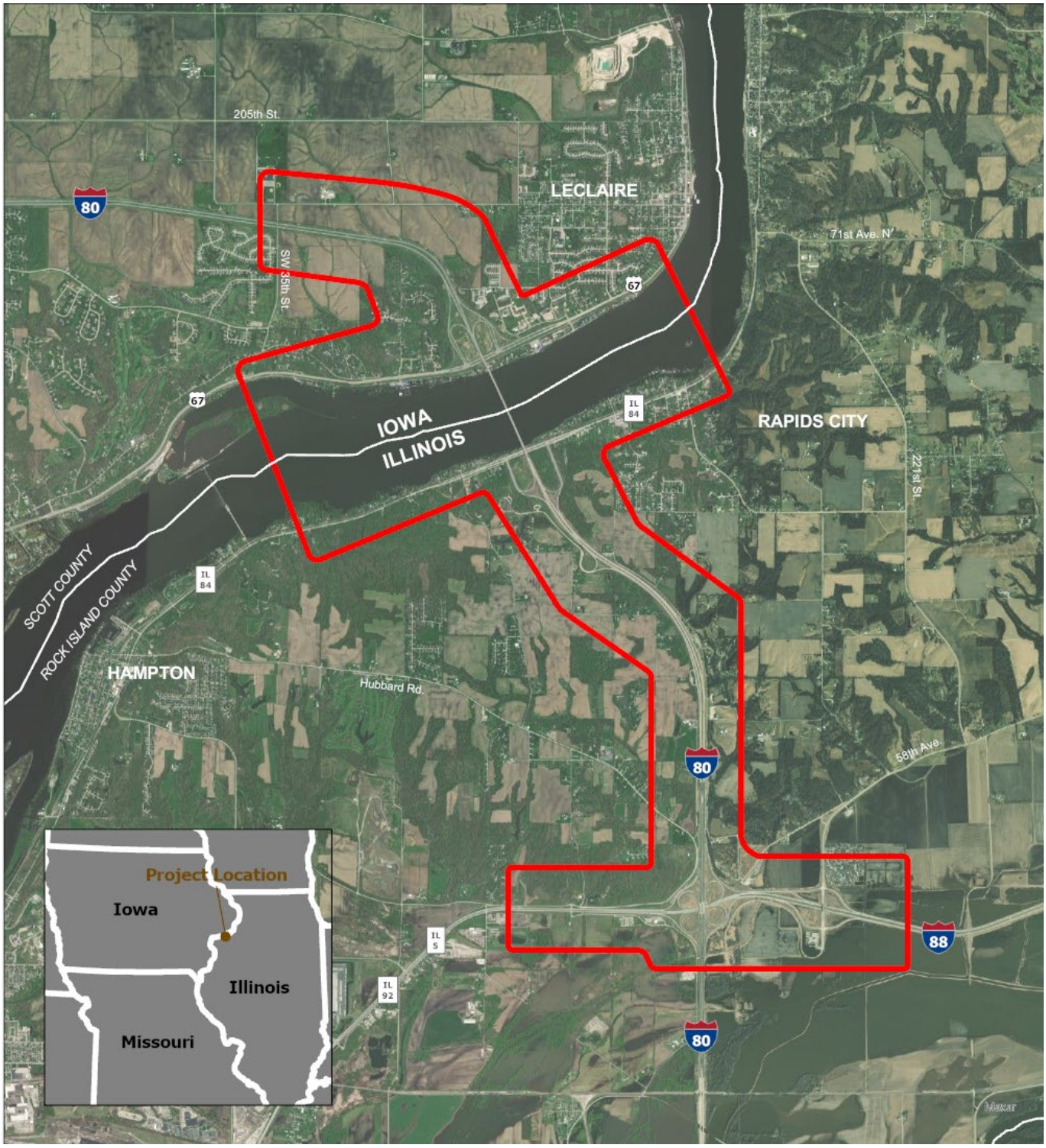
General Land Use: The project is located in a rural setting with rolling terrain. The vast majority of the land use along I-80 is comprised of agriculture, along with some residential development and forested habitat. There are also some large wetlands located south of the I-80/I-88 interchange. Along IL 84 and US 67, the primary land use is residential with some commercial development.

Transportation Plans: The I-80 over the Mississippi River Bridge Project is currently listed in the Bi-State Regional Commission 2021-2024 Transportation Improvement Program (TIP). This project is included in the IDOT Fiscal Year 2022-2027 Proposed Highway Improvement Program with funding identified through construction. The project is also listed in the Iowa DOT 2022-2026 Iowa Transportation Improvement Program.

Previous/Existing Studies: In March 2017, IDOT District 2 completed the "Feasibility Review, I-80 over the Mississippi River" that considered additional lanes across the Mississippi River on I-80. The purpose for the review was to assist IDOT and Iowa DOT in arriving at consensus on several key project planning elements as well as provide direction for potential future studies. The primary focus was to compare the costs and benefits of completely removing the substructure to whether it should be reintegrated (i.e., re-used) into new construction. Based on a comparison of lifecycle costs and advantages and disadvantages, the review recommended that removal of the existing substructure be pursued under further study. In addition, removal was considered the preferred course of action over the re-use of the existing substructure.

Iowa DOT is studying I-80 immediately to the west of the I-80 over the Mississippi River Project, from the SW 35th Street overpass west to I-280. The study is at the preliminary engineering/NEPA phase with an Environmental Assessment being prepared. Additionally, Iowa DOT previously completed a Categorical Exclusion and Interchange Justification Report for improvements to the I-80 at Middle Road interchange. The proposed improvements include reconstructing the existing two-quadrant cloverleaf, also known as a folded diamond interchange, into a compressed diamond interchange. The I-80 at Middle Road Interchange project is included in the 2045 Quad Cities Long Range Transportation Plan as a 2026-2045 priority. It is also mentioned in the Quad Cities 2021-2024 Transportation Improvement Program as an Unmet Need, which indicates that a funding source has not yet been identified.

FIGURE 1 – I-80 PLANNING AND ENVIRONMENT LINKAGE STUDY AREA



1.1 Project Need Analysis

1.1.1 Existing Bridge Conditions

The I-80 bridge over the Mississippi River is approximately 3,500 feet long and also crosses over IL 84, Great River Trail, Burlington Northern Santa Fe Railroad, Canadian Pacific Railroad, Canal Shore Drive, and US 67. The I-80 bridge over the Mississippi River has four lanes with a concrete barrier in the median, 1-foot inside shoulders and 5-foot, 5-inch outside shoulders. The bridge was built in 1967 and reconstructed in 1996. In addition to the I-80 bridge over the Mississippi River and the bridges associated with the interchanges, the only other bridge in the project study area is the SW 35th Street bridge over I-80.

The following bridge deficiencies have been identified within the project study area. The locations of these bridge deficiencies are shown in **Figure 2**.

I-80 Mississippi River Bridge

- The bridge has substandard shoulder widths. The standard for inside and outside shoulder widths is 10 feet. The existing inside shoulder is one-foot wide, and the existing outside shoulder is five feet, 5 inches wide.
- The existing navigation span is 370 feet while the US Coast Guard (USCG) requires a minimum 420-foot-wide navigation span for new structures.
- The existing structure framing system is a non-redundant steel tension member two-girder system, which is also referred to as “fracture critical”. This means that the bridge does not include extra redundant girders so if either one of the two main girders supporting the bridge would fracture it could lead to partial or total bridge collapse. Due to the potential severe consequences of a fatigue crack causing a fracture, the outside lanes of the bridge have been closed twice to traffic when fatigue cracks at critical locations have been identified. In 2008, the outside lanes of the bridge were closed for two months after inspectors found cracks in the steel under the bridge deck. In 2009, cracks in the bridge forced IDOT to close the bridge again in a similar fashion for several months. Since I-80 is a key truck route across the Mississippi River, these bridge closures had a substantial impact on traffic flow as traffic rerouted to I-74 and I-280 to the west. The FHWA discourages the use of this type of two-girder framing system for new structures.
- Scour (i.e., erosion of the riverbed around the pier footings) has exposed the bottom of footings at piers 11, 16, and 18. The footings for this bridge are exposed footings that sit on the riverbed. Scour is the action of flowing water that erodes the riverbed. When flowing water hits the footing, the water is redirected in all directions including down and erodes the riverbed. A scour hole that becomes large enough will undermine the footing and cause it to fail. Time has shown that the rock of the riverbed at this location cannot be relied upon to resist scour over the life of the bridge. The partially exposed footings at piers 11, 16, and 18 have been found to develop scour holes which has led to partial undermining of the footings. Spread footings on rock may remain a viable foundation concept in principle, but they need to be implemented differently. The bottom of footing needs to be set deeper, and complete burial of the footing in the riverbed may be an appropriate scour counter measure. (Alternatively, the use of deep foundations such as drilled shafts socketed into deeper rock may be preferred.)
- The existing footings of piers 9 through 13 and 15 through 23 are exposed above the riverbed as part of the original design. As noted above, this is not preferred according to current design standards because these footings are more susceptible to scour. Footings that are buried beneath the riverbed provide better protection to the footing from scour.
- Seat lengths for the bridge abutments and intermediate hinges are inadequate to meet current design standards. Seat length is the length of overlap between the girder and the seat. The locations of inadequate support length are at the abutments and the in-span hinges. When seat length is insufficient, the displacements which result from moderate earthquake shaking can cause the bridge girders to fall from their supporting seats completely, resulting in total loss of the span. When modern seat length criteria are met, even if shaking damages or overturns a bearing element between the girder and the seat, the bridge superstructure unit can remain supported on the seat without total collapse.

I-80 PEL Study

Figure 2
Roadway and Bridge Deficiencies

Study Area

Bridge Deficiencies: SW 35th St. over I-80

Deficient Curve IA210

Deficient Curve IA320

Deficient Acceleration Lane

Deficient Taper

Bridge Deficiencies: I-80 over Mississippi River

Deficient Taper

Deficient Acceleration Lane

Deficient Curve R310

Deficient Curve R200

Deficient Curve A084200

Deficient Curve A084210

Deficient Curve A0041910

See Inset

Deficient Curve A0041480

SCOTT COUNTY

ROCK ISLAND COUNTY

INSET

Deficient Curve A004100210

Deficient Curve A0041380

Bridge Deficiencies: I-80 over I-88

Culvert Deficiencies: I-88 over Stream/207th St.

Deficient Curve A004100240

Deficient Curve A0041390

Deficient Curve A0041450

Deficient Curve A004100290

Deficient Curve A004100310

Deficient Curve A0041410

Deficient Curve A0041440

Deficient Curve A004100270

0 750 1,500 Feet

0 0.5 1 Mile

N

Date: May 2021

Iowa DNR, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

Iowa DNR, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA

I-80 Bridges over I-88

- For both bridges, the IDOT Structure Summary Report has designated the vertical/lateral under clearance as "intolerable - high priority for correction". The vertical under clearance refers to the distance between I-88 and the bottom of the I-80 bridge while lateral under clearance refers to the distance between the I-88 lanes and the I-80 bridge piers. For these bridges, the issue being identified as a high priority for correction is the insufficient lateral clearance. Existing lateral clearances are approximately four feet on the inside and seven feet on the outside, both below the standard of eight feet.

I-88 and 207th Street Concrete Box Culvert over a Stream

- There are no bridge railings and approaching guardrails.
- The IDOT Structure Summary Report rates the channel and channel protection as 4 out of 9, which is "poor", and it has advanced deterioration.

SW 35th Street over I-80

- The Iowa DOT Bridge Condition Report rated the bridge deck as 4 out 9, which is "poor". In general, any ratings of 4 and below indicate that the bridge deck is in "poor" condition and is a good candidate for repair or replacement.
- The approach guardrail and transitions to the bridge do not meet current Iowa DOT design standards.

1.1.2 Existing Roadway Conditions

Within the project study area, I-80 consists of four 12-foot lanes with a grass median ranging from 47 to 105 feet wide in Iowa and 40 feet wide in Illinois. In Iowa, the grass median includes a cable guardrail, while there is no guardrail in the grass median in Illinois. The inside and outside paved shoulders in Iowa are 6 and 10 feet wide, respectively. In Illinois, additional inside 12-foot lanes were constructed in each direction in 2010 that are currently striped out and functioning as a left shoulder from the permanent concrete crossover just south of the I-80/IL 84 interchange to the permanent concrete crossover located approximately 4,000 feet north of the I-80/I-88 interchange. The outside shoulders range from 6 to 12 feet wide. There is a westbound auxiliary lane between the weigh station entrance ramp in Illinois and the exit ramp at IL 84. Another weigh station is located on the eastbound side. South of the I-80/IL 84 interchange, there are eastbound exit and entrance ramps for the Mississippi Rapids Rest Area. There are three interchanges in the project study area that provide access between I-80 and US 67, IL 84, and I-88. There is a fourth interchange east of the I-80/I-88 interchange that provides access between I-88 and Old IL 2 (38th Avenue), which is a two-lane facility that is classified as a major collector. The I-80 interchanges with US 67 and IL 84 are partial cloverleafs. The ramp intersections are signalized at US 67 and unsignalized at IL 84. Both US 67 and IL 84 are four-lane facilities that are classified as principal arterials. The I-80/I-88 interchange is a full cloverleaf interchange while the I-88/IL 2 (38th Avenue) interchange is a diamond interchange with unsignalized ramp intersections. West of the I-80/I-88 interchange, I-88 transitions to IL 5/IL 92, which is a four-lane, divided highway that is classified as a principal arterial. On IL 5/IL 92, approximately 4,000 feet west of the I-80/I-88 interchange, there is an unsignalized intersection with Denhardt Road/193rd Street.

The following sections and tables present the deficient horizontal curvatures (i.e., curves) along the I-80 mainline and all the interchanges within the project study area. No deficient curves were identified on I-88, IL 84, or US 67.

There are no deficient lane, shoulder, or median widths on the roadways. However, as previously mentioned, the shoulder widths of the I-80 Mississippi River bridge do not meet current design standards.

All vertical curves with regard to grades and stopping sight distance meet current design standards.

With regard to interchange ramp terminals, the entrance loop ramps at the partial cloverleaf interchanges at IL 84 and US 67 do not meet current design standards because the length of the acceleration lanes and tapers are too short.

Correlation between crashes within the project study area and substandard curves, bridge and shoulder widths, and ramp terminals is presented in Section 1.1.4 Safety.

I-80 MAINLINE (IL AND IA) EXISTING HORIZONTAL CURVATURE

Mainline I-80 consists of three horizontal curves in the project study area. Two of the curves are located on the Illinois side between the Mississippi River and I-88, and one curve is located on the Iowa side of the Mississippi River. All three horizontal curves fail to meet design criteria. On the Illinois side, the existing superelevation (i.e., the difference in heights between the inner and outer edges of a highway pavement) rates (3.3% and 3.8%) associated with the existing radii (5,730.12' and 4,912.16', respectively) are considered substandard.

The horizontal curve on the Iowa side does not meet the design criteria. According to the Iowa Design Manual Section 1C-1, the minimum curve radius at a 75-mph design speed is 2,210'. The existing radius is 2,113.44', which is deficient due to being less than the minimum radius. The existing superelevation rate for Curve IA210 is 7.7%, which meets the maximum criteria of 8%. However, the radius associated with this curve is 2,113.44'. According to the Iowa DOT Design Manual Section 2A-3 Table 9, the superelevation is required to be 8% at the minimum required radius. Since the existing radius is even less than the minimum radius, the existing 7.7% superelevation is considered deficient. **Table 1** identifies deficient geometry along I-80 in Illinois and Iowa. **Figure 2** shows the locations of all the roadway geometric deficiencies within the project study area.

TABLE 1 – DEFICIENT CURVE GEOMETRY ALONG I-80 IN ILLINOIS AND IOWA

Curve Number	Design Element	Existing Condition	Design Criteria
A084200 (IL)	Superelevation	3.3%	4% minimum
A084210 (IL)	Superelevation	3.8%	4.6% minimum
IA210 (IA)	Superelevation	7.7%	8% minimum
	Radius	2,113.44'	2,210'

I-80/IL 84 INTERCHANGE (IL) EXISTING HORIZONTAL CURVATURE

The interchange at I-80 and IL 84 is a partial cloverleaf interchange. There are four ramps: Ramps A, B, C, and D. For this assessment, Ramp A is the I-80 westbound entrance ramp, Ramp B is the I-80 westbound exit ramp, Ramp C is the I-80 eastbound entrance ramp, and Ramp D is the I-80 eastbound exit ramp.

There are no geometric deficiencies for either of the entrance ramps (Ramp A or Ramp C). There is one curve on each of the exit ramps, Ramp B and Ramp D, that fail to meet design criteria. Ramp B fails to meet criteria for superelevation while Ramp D fails to meet criteria for minimum radius. **Table 2** identifies deficient geometry at the IL 84 interchange with I-80 in Illinois.

TABLE 2 – DEFICIENT GEOMETRY AT THE I-80/IL 84 INTERCHANGE IN ILLINOIS

Curve Number	Design Element	Existing Condition	Design Criteria
R310 Ramp B	Superelevation	7%	8% minimum
R200 Ramp D (see Note)	Radius	690.00'	960'

Note: Exit terminal speed 55 mph from 37-6.G of the BDE Manual.

I-80/US 67 INTERCHANGE (IA) EXISTING HORIZONTAL CURVATURE

The interchange at I-80 and US 67 is also a partial cloverleaf interchange. There are four ramps: Ramp B, Loop D, Ramp C, and Loop E. For this assessment, Ramp B is the I-80 eastbound exit ramp, Loop D is the I-80 eastbound entrance

ramp, Ramp C is the I-80 westbound entrance ramp, and Loop E is the I-80 westbound exit ramp. Ramp B, Loop D, and Ramp C have no deficiencies. Loop E does not meet the design criteria for radius. **Table 3** identifies deficient geometry at the US 67 interchange with I-80 in Iowa.

TABLE 3 – DEFICIENT GEOMETRY AT I-80/US 67 INTERCHANGE IN IOWA

Curve Number	Design Element	Existing Condition	Design Criteria
IA320 Loop E	Radius	693.82’	758’

I-80/I-88 SYSTEM INTERCHANGE (IL) EXISTING HORIZONTAL CURVATURE

The interchange at I-80 and I-88 is a full cloverleaf interchange. There is a total of eight ramps, four exit ramps, and four entrance ramps. The ramps are categorized as southwest, northwest, northeast, and southeast. The ramps labeled A1 are the inner loop ramps, and the ramps labeled B1 are the outer ramps. The majority of the ramps (seven out of eight) have substandard radii on the first curve after the exit taper and some have multiple substandard radii. **Table 4** identifies deficient geometry at the I-80/I-88 system interchange in Illinois.

TABLE 4 – DEFICIENT GEOMETRY AT I-80/I-88 SYSTEM INTERCHANGE IN ILLINOIS

Curve Number	Design Element	Existing Condition	Design Criteria
A004100210 NE Ramp A1	Radius	267.13’	314’
A004100270 SW Ramp A1	Radius	258.20’	314’
A004100290 SW Ramp A1	Radius	266.72’	314’
A0041410 SW Ramp B1	Radius	407.95’	587’
A004100240 NW Ramp A1	Radius	267.93’	314’
A0041380 NW Ramp B1	Radius	415.73’	587’
A0041390 NW Ramp B1	Radius	476.27’	587’
A004100310 SE Ramp A1	Radius	266.38’	314’
A0041440 SE Ramp B1	Radius	420.62’	587’
A0041450 SE Ramp B1	Radius	475.21’	587’

I-88/OLD IL 2 INTERCHANGE (IL) EXISTING HORIZONTAL CURVATURE

The interchange at I-88 and Old IL 2 is a diamond interchange that consists of four ramps. **Table 5** identifies deficient geometry at the Old IL 2 interchange with I-88 in Illinois. Note that this assessment applies only to the west half of the interchange. Geometric data for the east half of the interchange was not available. As shown in **Table 5**, there are two ramps that do not meet the design criteria for radius.

TABLE 5 – DEFICIENT GEOMETRY AT I-88/OLD IL 2 INTERCHANGE IN ILLINOIS

Curve Number	Design Element	Existing Condition	Design Criteria
A0041480 SW Ramp A1	Radius	483.57’	587’
A0041910 NW Ramp A3	Radius	521.46’	587’

1.1.3 Traffic

Traffic operations for mainline I-80, I-88, and the interchange ramps were analyzed for the existing year (2017) for the AM (7:15 to 8:15) and PM (4:30 to 5:30) peak hours. Future no-build (2050) traffic analysis was completed for the same interstate sections for AM and PM peak hours. Highway Capacity Software (HCS) 2010 was used to analyze traffic operations. The analysis includes basic freeway sections, ramp merges and diverges, and weaving. Factors such as hourly volumes (see **Figures 3 and 4** for existing and future traffic volumes), percentage of heavy vehicles, number of lanes, and merging/diverging/weaving lengths were used as inputs to determine level of service (LOS). LOS ranges from A through F, which is based on density in passenger cars/mile/lane (pc/mi/ln). The lowest densities represent LOS A with free-flowing traffic while the highest densities represent LOS F with heavy traffic congestion. Both IDOT and Iowa DOT list LOS C as the design standard for urban interstates. The sections of I-80 and I-88 within the project study area are designated as urban interstates.

EXISTING (2017) TRAFFIC CONDITIONS

All of the sections within the project study area operate at LOS A or LOS B under existing conditions except for one section located at the I-80 eastbound PM diverge at the IL 84 exit ramp, which operates at LOS C. As a result, all of the sections currently operate at an acceptable LOS for an urban interstate.

FUTURE (2050) TRAFFIC CONDITIONS

Most of the sections are expected to operate at LOS A or LOS B in the future no-build conditions, with one section expected to operate at LOS C in the AM and 12 sections expected to operate at LOS C in the PM. LOS C meets the design standard for urban interstates. **Figure 5** and **Table 6** present the sections with LOS C. These sections include four freeway sections, including the eastbound and westbound sections of the I-80 bridge over the Mississippi River, the I-80 diverge and merge sections of the US 67 and IL 84 interchanges, the I-80 westbound diverge section at the weigh station, and the I-80 eastbound diverge to IL 5/92 westbound.

I-80 PEL Study
Figure 3
Existing Traffic Volumes

Study Area

17,310
Annual Average Daily Traffic

1,000 / 1,000 -
AM Peak-Hour Volume /
PM Peak-Hour Volume

17,360
1,425 / 1,555

16,500
1,015 / 1,665

1,520
105 / 285

1,740
225 / 160

4,180
330 / 480

4,820
320 / 425

19,800
1,530 / 1,875

19,800
1,230 / 1,805

3,350
327 / 246

3,200
285 / 368

1,250
101 / 98

1,300
96 / 128

Rest Area
125
12 / 15
Exit
125
13 / 17
Entrance

Weigh Station
2,500
157 / 237
Exit
2,500
157 / 237
Entrance

Weigh Station
2,250
123 / 175
Exit
2,250
123 / 175
Entrance

17,750
1,299 / 1,757

17,850
1,047 /1,537

8,200
486 / 600

8,325
611 / 590

7,700
436 / 769

14,250
781 / 1,228

13,700
1,096 / 1,443

8,825
531 / 830

See Inset

INSET

4,600
268 / 352

1,850
143 / 159

1,350
76 / 122

950
80 / 71

1,250
128 / 80

2,550
149 / 195

25
1 / 3

1,400
82 / 114

1,600
91 / 179

25
3 / 2

750
42 / 75

3,850
241/ 347

1,000
67 / 81

0 1,000 2,000 Feet

0 0.5 1 Mile

N

Date: May 2021

Iowa DNR, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

Iowa DNR, Esri, HERE, Garmin, INCREMEN NASA, EPA, USDA

I-80 PEL Study
Figure 4
Future (2050) Traffic Volumes

Study Area

17,310
Annual Average Daily Traffic

1,000 / 1,000 -
AM Peak-Hour Volume /
PM Peak-Hour Volume

22,800
1,872 / 2,042

22,600
1,390 / 2,281

3,200
221 / 600

2,900
375 / 267

5,600
442 / 643

6,400
425 / 564

25,500
1,970 / 2,415

25,800
1,603 / 2,352

5,200
508 / 382

5,200
463 / 598

2,300
186 / 180

1,600
118 / 158

Rest Area
175
17 / 21
Exit
175
18 / 24
Entrance

Weigh Station
2,600
163 / 246
Exit
2,600
163 / 246
Entrance

Weigh Station
2,350
128 / 182
Exit
2,350
128 / 182
Entrance

21,900
1,603 / 2,168

22,900
1,343 / 1,972

14,100
835 / 1,031

7,700
565 / 546

6,500
368 / 649

14,600
800 / 1,259

14,500
1,160 / 1,527

14,300
860 / 1,344

See Inset

SCOTT COUNTY

ROCK ISLAND COUNTY

INSET

9,400
547 / 719

2,700
209 / 232

2,400
135 / 217

900
76 / 67

1,800
184 / 116

8,600
501 / 658

800
45 / 90

1,500
88 / 122

2,100
119 / 236

1,200
68 / 120

800
82 / 51

9,200
576 / 829

2,600
173 / 210

0 1,000 2,000 Feet

0 0.5 1 Mile

N

Date: July 2021

Iowa DNR, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

Iowa DNR, Esri, HERE, Garmin, INCREMENT P, Intern NASA, EPA, USDA

I-80 PEL Study

Figure 5
Sections with Future (2050) Level of Service C

Study Area

LOS AM/PM

Merge/Diverge/Weave - Denotes type of HCS analysis. All others basic freeway sections

LOS B / C Eastbound

LOS B / C Diverge

LOS B / C Merge

LOS C / C Diverge

LOS B / C Merge

LOS B / C Westbound

LOS B / C Eastbound

LOS B / C Merge

LOS B / C Diverge

LOS B / C Diverge Westbound Weigh Station

LOS B / C Westbound

LOS B / C Diverge

SCOTT COUNTY

ROCK ISLAND COUNTY

0 0.5 1 Mile

N

Date: July 2021

Iowa DNR, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA

TABLE 6 – I-80/I-88 FUTURE NO-BUILD TRAFFIC CONDITIONS (2050)

Route	Direction	At	Type	LOS	
				AM	PM
I-80	EB	Middle Rd to US-67	Freeway	B	C
I-80	EB	US-67	Diverge	B	C
I-80	EB	US-67	Merge	B	C
I-80	WB	US-67	Diverge	C	C
I-80	WB	US-67	Merge	B	C
I-80	WB	US-67 to IL-84	Freeway	B	C
I-80	EB	IL-84 to US-67	Freeway	B	C
I-80	EB	IL-84	Diverge	B	C
I-80	WB	IL-84	Merge	B	C
I-80	WB	Weigh Station	Diverge	B	C
I-80	WB	I-88 to Weigh Station	Freeway	B	C
I-80	EB	IL-5/92 WB	Diverge	B	C

1.1.4 Safety

Crashes in Illinois and Iowa were analyzed for the years 2014 through 2018. **Figure 6** shows the locations of these crashes. The crash data was evaluated to determine if there are any concentrations of crashes and/or trends in crash types and if there are any correlations with the roadway and bridge geometric deficiencies that were previously identified in Section 1.1.1 and 1,1.2. The results of this evaluation are also presented in **Table 7** and **Figure 7** (Note: Animal-related crashes were not counted because it was assumed that they were not associated with any geometric deficiencies). Based on this evaluation, the following most notable crash trends were identified.

- **I-80/US 67 Eastbound Ramp Intersection** – Twelve crashes occurred at this signalized intersection, most of which involved rear-end collisions. There are no roadway geometric deficiencies associated with this interchange so the cause of these crashes is undetermined.
- **I-80 Bridge Over the Mississippi** – A total of 29 crashes occurred on the bridge with 75% (i.e., 22) of the crashes occurring on the Iowa side. The cause of the higher number of crashes on the Iowa side is undetermined. No notable trends were identified regarding crash types but a number of these crashes (e.g., vehicles hitting the concrete barrier) could have been attributed to the substandard/narrow shoulders.
- **I-80/IL 84 Westbound Ramp Intersection** – Eighteen crashes occurred at this unsignalized intersection on IL 84 and four occurred on the off-ramp approaching the intersection, most of the crashes were associated with rear-end collisions or turning movements. There are no roadway geometric deficiencies associated with this interchange so the cause of these crashes is undetermined. However, it should be noted that the intersection is unsignalized.
- **I-80 Mainline between the IL 84 Interchange and the Mississippi Rapids Rest Area Exist Ramp** – A total of 44 crashes (excluding 13 animal-related crashes) occurred along this section of I-80. Crashes classified as Fixed Object that are associated with vehicles running of the roadway represent 37% of the crash types. These crashes could be attributed to the deficient curve.
- **I-80 Eastbound Exit Ramp to I-88 Eastbound** – Seven crashes occurred on the first 600 feet of the ramp's curve, which is a deficient curve. All the crashes involved trucks with the crash types involving overturned vehicles (4) or vehicles that ran off the road and hit a fixed object (3). All but one of the crashes involved an injury. These crashes could be attributed to the deficient curve.

I-80 PEL Study

Figure 6

Crash Locations
Injury Type

(2014 through 2018)

Study Area

Crash Severity

- **Fatal**
- **Injury**
- **Property Damage Only**

0 0.5 1 Mile

N

Date: May 2021

INSET

0 750 1,500 Feet

See Inset

TABLE 7 – CRASH TRENDS AND GEOMETRIC DEFICIENCIES (2014 THROUGH 2018)

Geometric Deficiency	Number of Crashes	Crash Type													
		Angle	Broadside	Fixed Object	Non-collision (Single Vehicle)	Other	Other Non-Collision	Other Object	Overturned	Parked Motor Vehicle	Rear End	Rear-End (Front to Rear)	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning
Curve IA210	8				6							1	1		
Acceleration Lane - Iowa	3				1	1							1		
Taper - Iowa	1				1										
I-80/US 67 Eastbound Ramp Intersection[1,2]	12		1		2							9			
I-80 Mississippi River Bridge[1]	29	1		3	9	1					1	8	6		
I-80/IL 84 Westbound Ramp Intersection[1,2]	22			2							11		2		7
Taper - Illinois	2			1									1		
Acceleration Lane - Illinois	8	1		2				1			2		2		
Curve R310	1			1											
Curve A084200[1]	44	1		17			3	1	4	1	7		10		
Curve A084210	12			4			1	2	1	1	2		1		
Curve A0041380	1								1						
Curve A004100240	1			1											
Curve A004100290	1								1						
Curve A004100270[1]	7			3					4						
Curve A0041440	2								2						
Curve A004100310	1						1								
Curve A0041450	2						1		1						
Curve A0041910	2								1				1		

[1] Location with notable crash trends.
[2] No Geometric Deficiencies.

I-80 PEL Study

Figure 7

Crash Trend Locations
Collision Type

(2014 through 2018)

Bridge Deficiencies:
SW 35th St. over I-80
• Not applicable

Deficient Curve - IA210
8 crashes
• 6 non-collision (single vehicle)
• 1 rear end (front to rear)
• 1 sideswipe (same direction)

Deficient Curve - IA320
0 crashes

Deficient Acceleration Lane
3 crashes
• 1 sideswipe (same direction)
• 1 non-collision (single vehicle)
• 1 other

I-80/US 67 Eastbound Ramp Intersection
12 crashes
• Most of the crashes involved rear-end collisions

Deficient Taper
1 crash
• non-collision (single vehicle)

Deficient Taper
2 crashes
• 1 fixed object
• 1 sideswipe (same direction)

I-80/IL 84 Westbound Ramp Intersection
22 crashes
• Most of the crashes involved rear-end collisions or turning movements
• Intersection is unsignalized

I-80 Bridge over the Mississippi River
29 crashes
• No notable trends in crash types but 75% of the crashes were on the Iowa Side
• Substandard shoulders

Deficient Acceleration Lane
8 crashes
• 2 rear end
• 2 sideswipe (same direction)
• 2 fixed object
• 1 angle
• 1 other object

Deficient Curve R200
0 crashes

Deficient Curve - R310
1 crash
• fixed object

I-80 Mainline between IL 84 and Mississippi Rapids Rest Area
44 crashes
• Fixed Object associated with running off the roadway represents 37% of the crash types
• Deficient Curve - A084200

Deficient Curve - A084210
12 crashes
• 4 fixed object
• 2 rear end
• 2 other object
• 1 overturned
• 1 sideswipe same direction
• 1 parked motor vehicle
• 1 other non-collision

Deficient Curve - A0041910
2 crashes
• 1 overturned
• 1 sideswipe same direction

See Inset

Deficient Curve - A0041480
0 crashes

INSET

Deficient Curve - A0041380
1 crash
• overturned

Deficient Curve - A004100210
0 crashes

Bridge Deficiencies:
I-80 over I-88
0 crashes

Deficient Curve - A004100240
1 crash
• fixed object

Culvert Deficiencies:
I-88 over Stream/207th St.
• Not applicable

Deficient Curve - A0041390
0 crashes

Deficient Curve - A0041450
2 crashes
• 1 overturned
• 1 other non-collision

Deficient Curve - A004100290
1 crash
• overturned

Deficient Curve - A004100310
1 crash
• other non-collision

Deficient Curve - A0041410
0 crashes

I-80 Eastbound Exit Ramp to I-88 Eastbound
7 crashes
• All crashes involved trucks that either overturned or ran off the road
• Deficient curve - A004100270

Deficient Curve - A0041440
2 crashes
• overturned

0 750 1,500 Feet

Collision Type

- Angle
- Turning
- Overturned
- Head On
- Rear End
- Broadside
- Sideswipe Same Direction
- Sideswipe Opposite Direction
- Animal
- Parked Motor Vehicle
- Non-Collision (single vehicle)
- Fixed Object
- Other Object
- Other Non-Collision
- Other
- Not reported

Study Area

Locations with higher concentrations of crashes and/or crash types

0 0.5 1 Mile

Date: May 2021

N

1.1.5 Project Need Statement

Based on the analysis of bridge conditions, existing roadway geometric deficiencies, existing and future traffic conditions, and safety detailed above, the following represents the project need.

- The I-80 Mississippi River Bridge, built in 1967, is a non-redundant, two-girder system design. Based on historical experience with this structure, this bridge is susceptible to cracking. The structural cracks can quickly propagate to the point of local bridge component failure. This could, in turn, trigger immediate load restrictions and possible long-term bridge closure. Emergency lane closures due to cracking have occurred multiple times in the past.
- Costly bridge inspections are necessary to assure integrity of the bridge. A typical biennial inspection of a redundant steel framing system looks for steel section loss due to corrosion. Obvious cracks in steel members are also noted, but inspection detail to discover small fatigue cracks is not necessarily performed since the failure of a redundant member does not cause the structure to collapse. For the I-80 Mississippi River Bridge, inspection of fracture critical members needs to be much more meticulous since member failure could lead to structure collapse. Sudden member loss due to fracture typically initiates at the tip of small fatigue cracks, thus it is important for the inspector to be satisfied these small cracks are not present. At critical locations the inspector needs to clean rusted steel to bare metal and perform dye penetrant or magnetic particle tests. Some steel members such as pins will be ultrasonic inspected. The inspection of a fracture critical structure is more labor intensive and requires staff with special skills.
- There are bridge deficiencies on the I-80 bridge over the Mississippi River, the I-80 bridges over I-88, one local road bridge over I-80, and one I-88 culvert within the project study area.
- There are three deficient curves on the I-80 mainline and 13 deficient curves associated with the US 67, IL 84, and I-88 interchanges. There are also two deficient curves associated with the I-88/Old IL 2 interchange. In addition, the ramp terminals associated with the entrance loop ramps at the IL 84 and US 67 interchanges do not meet current design standards.
- Crash trends (i.e., higher concentrations of crash numbers and/or crash types) occur at the following locations:
  - I-80/US 67 Eastbound Ramp Intersection
  - I-80 Bridge Over the Mississippi
  - I-80/IL 84 Westbound Ramp Intersection
  - I-80 Mainline between the IL 84 Interchange and the Mississippi Rapids Rest Area Exist Ramp
  - I-80 Eastbound Exit Ramp to I-88 Eastbound

1.2 Project Purpose

Based on the project's need, the following represents the project purpose.

- Provide a structurally sound bridge over the Mississippi River.
- Improve deficient conditions on existing bridges and culvert.
- Improve roadway geometrics where they are clearly a contributing cause to safety issues.
- Improve safety on I-80 mainline and interchanges.

1.3 Performance Measures for Satisfying the Project's Purpose and Need

Based on the project purpose, the following performance measures will be used in evaluating whether project alternatives meet the project's purpose and need.

- A structurally sound bridge over the Mississippi River.
- Reduce the existing bridge/culvert deficiencies within the project study area.
- Eliminate or reduce roadway geometric deficiencies where they are contributing cause to safety issues.

- Reduced crash rates and trends on the I-80 mainline and interchanges.