usRAP Assessment of an Interstate Truck Corridor

Final Report

Prepared for

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Preface

This report presents the results of a safety evaluation of an interstate trucking corridor from Ocala, Florida, to Gary, Indiana. The report was prepared as part of the U.S. Road Assessment Program (usRAP), sponsored by the Roadway Safety Foundation (RSF). Funding was generously provided with a grant from FedEx, which has funded Road Assessment Protocol studies throughout the world to make roads and roadsides safer for all. The study was conducted by usRAP team members, MRIGlobal and Iowa State University (ISU), under MRIGlobal Project No. 311565. Staff members who contributed to the study included Mr. Douglas W. Harwood (MRIGlobal), Ms. Ingrid B. Potts (MRIGlobal), Mr. Zachary Hans (ISU), and Mr. Hossein Naraghi (ISU). The usRAP team appreciates the assistance of ISU students who coded roadway characteristics data for the study.

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Executive Summary

This report presents the results of a safety evaluation of an interstate truck corridor from Ocala, Florida, to Gary, Indiana, including 1,129 centerline miles of rural and urban freeways. The report was prepared as part of the U.S. Road Assessment Program (usRAP).

Data on selected roadway characteristics were coded for both directions of travel on all roadways throughout the corridor by Iowa State University students trained by the usRAP team. These data were coded for individual roadway segments with lengths of 327 ft (100 m) in each direction of travel on every roadway.

Each roadway segment in each direction of travel then was assessed using usRAP star ratings based on the presence or absence of roadway design and traffic control features related to highway safety. Star ratings for roadways range from one to five stars. A one-star roadway has very few safety-related design and traffic control features. A five-star roadway is an access-controlled facility with a full range of safety features. Controlled-access freeways are generally rated with three, four, or five stars.

Overall, 91 percent of the study corridor was rated with four or five stars, indicating the presence of extensive roadway design and traffic control features related to safety. Only 9 percent of the corridor was rated with three stars. While the entire corridor is in compliance with design standards for the Interstate highway system, the three-star roads tend to have a few more curves, ramp junctions, and roadside objects than the four- and five-star roadways.

The study corridor was found to be operating very safely. The study corridor has experienced only 0.117 fatal crashes per mile per year in a recent five-year period. Each mile of roadway in the study corridor (both directions of travel combined) has experienced only one fatal crash every 8.5 years. There have been only 0.040 truck crashes per mile per year in the study corridor in a recent five-year period. Each mile of roadway in the study corridor (both directions of travel combined) has experienced only one fatal truck crash every 25 years.

Infrastructure improvement needs in the study corridor that might potentially improve safety were assessed. A limited set of potentially cost-effective infrastructure improvements were identified, but none of these improvements appears to relate directly to any need to reduce truck crashes.

The study corridor appears to accommodate current truck operations in a very safe manner and no improvements needed to improve truck safety in the corridor were identified. The study corridor is well suited to accommodating truck traffic at present and should continue to accommodate truck traffic effectively into the future with normal roadway maintenance and with appropriate management of traffic operations as passenger car and truck volumes grow.

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Chapter 1. Introduction

This report presents a safety evaluation of an interstate trucking corridor from Ocala, Florida, to Gary, Indiana. The corridor is 1,129 mi in length and passes through five states: Florida, Georgia, Tennessee, Kentucky, and Indiana. The primary Interstate highways in the corridor include:

- I-75 from Florida's Turnpike (south of Ocala, Florida) to I-24 near Chattanooga, Tennessee (499 mi)
- I-24 from I-75 near Chattanooga, Tennessee, to I-65 in Nashville, Tennessee (141 mi)
- I-65 from I-24 in Nashville, Tennessee, to I-90 in Gary, Indiana (432 mi)

The corridor also includes Interstate highway bypass routes that bypass the central city in three metropolitan areas:

- I-475 from I-75 to I-75, bypassing Macon Georgia (15 miles)
- I-285 from I-75 to I-75, bypassing Atlanta, Georgia (23 miles)
- I-465 from I-65 to I-65, bypassing Indianapolis, Indiana (19 miles)

There are no logical Interstate highway bypass routes around Nashville, Tennessee, or Louisville, Kentucky. The use of these Interstate highway bypass routes around Macon, Atlanta, and Indianapolis is generally preferable to the more congested Interstate highways through the central city, except when an origin, destination, pickup point, or delivery point for a truck trip is located within the central city. In some metropolitan areas, such as Atlanta, through trucks are required to follow the bypass route. Using the bypass routes, where available, the *preferred route* through the corridor is 1,071 mi in length and consists of the following routes:

- I-75 from Florida's Turnpike (south of Ocala, Florida) to I-475 south of Macon, Georgia (300 mi)
- I-475 from I-75 south of Macon, Georgia, to I-75 north of Macon, Georgia (15 mi)
- I-75 from I-475 north of Macon, Georgia, to I-285 south of Atlanta, Georgia (61 mi)
- I-285 from I-475 south of Atlanta, Georgia to I-75 north of Atlanta, Georgia (23 mi)
- I-75 from I-285 north of Atlanta, Georgia, to I-24 near Chattanooga, Tennessee (97 mi)
- I-24 from I-285 near Chattanooga, Tennessee, to I-65 in Nashville, Tennessee (141 mi)
- I-65 from I-24 in Nashville, Tennessee, to I-465 south of Indianapolis, Indiana (277 mi)
- I-465 from I-65 south of Indianapolis, Indiana, to I-65 north of Indianapolis, Indiana (19 mi)
- I-65 from I-465 north of Indianapolis, Indiana, to I-90 in Gary, Indiana (138 mi)

The following *alternate routes* through central cities are also evaluated in this report:

- I-75 from I-475 to I-475 through Macon, Georgia (21 mi)
- I-75 from I-285 to I-285 through Atlanta, Georgia (20 mi)
- I-65 from I-465 to I-465 through Indianapolis, Indiana (17 mi)

Figure 1 shows the study corridor, including the preferred route and the alternate routes through central cities.

The preferred route includes 14 ramps used by through traffic at system interchanges to move from one freeway to another, 7 ramps for northbound traffic and 7 ramps for southbound traffic. The alternate routes include four ramps, two for northbound traffic and two for southbound traffic. The total length of ramps on the preferred and alternate routes is 15 mi. These ramps are included in the study corridor. However, the study does not address ramps at local service interchanges that would not generally be used by through trucks except for rest stops.

The report includes a review of fatal crash data from the Fatality Analysis Reporting System (FARS), maintained by the National Highway Traffic Safety Administration (NHTSA), and an assessment of roadway characteristics, star ratings, and safer roads investment plans for the corridor developed using the usRAP/iRAP ViDA software.

The remainder of the report is organized as follows. Chapter 2 presents a review of the roadway characteristics for the highways that make up the study corridor. Chapter 3 presents the usRAP star ratings for the corridor. Chapter 4 presents the results of the crash history review based on FARS data. Chapter 5 discusses roadway improvements that may be desirable in the corridor. Chapter 6 summarizes the study findings. The Appendix presents star rating maps of the study corridor.

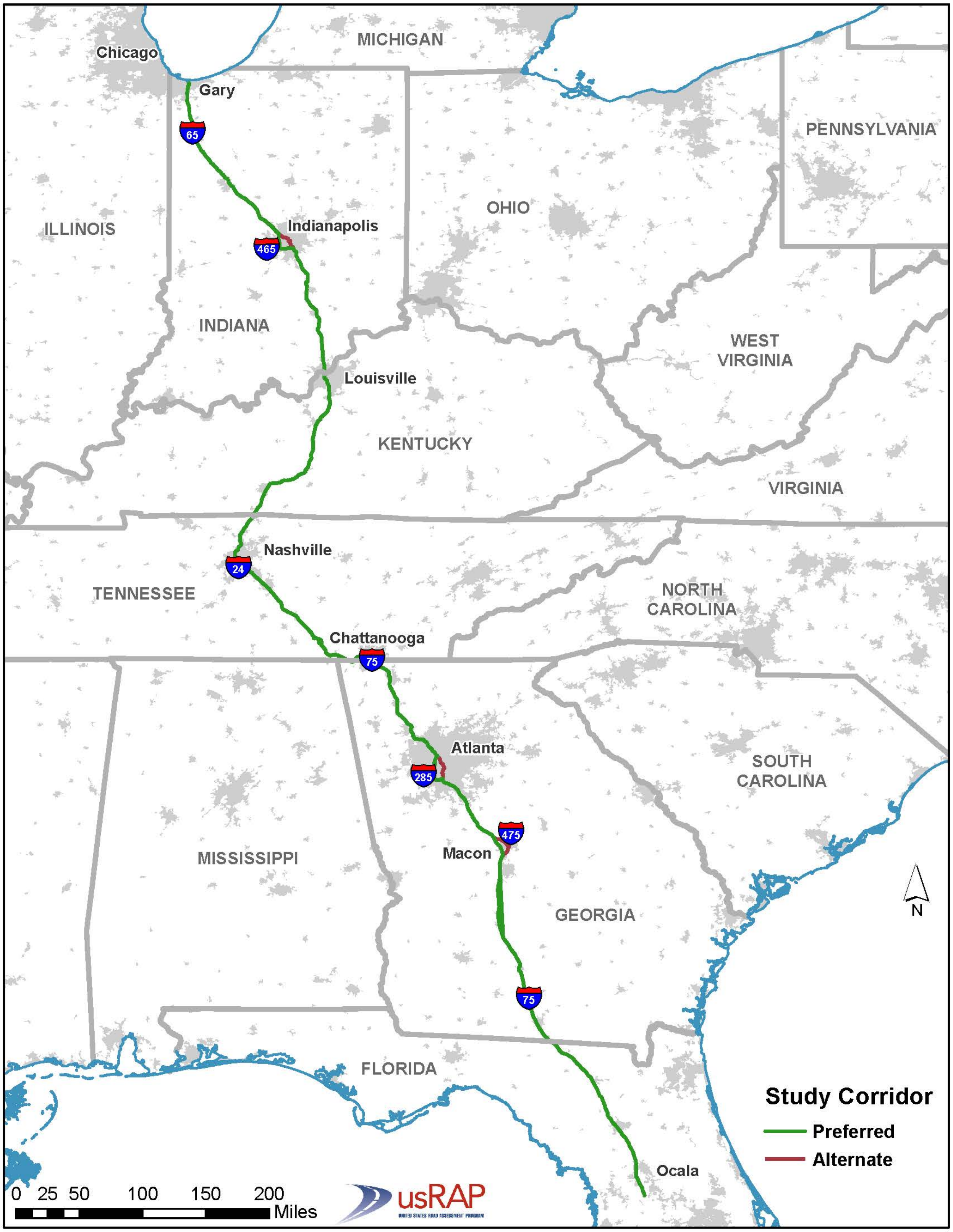


Figure 1. Map of Study Corridor

Chapter 2.
Roadway Characteristics for the Study Corridor

This chapter summarizes the roadway characteristics for the study corridor. The roadway characteristics data were coded by Iowa State University students trained by the usRAP team. Roadway characteristics data were coded for individual 327-ft (100-m) roadway segments in each direction of travel.

The summary tables in this chapter focus on the preferred route, including the Interstate highway bypass routes around Macon, Atlanta, and Indianapolis, but summary data for the Interstate routes through the central cities are also presented. The roadway characteristics addressed include: area type, traffic volume, number of through lanes, lane width, and shoulder width. The roadway characteristics for the study corridor documented in this Chapter are very typical of rural and urban interstate highways throughout the United States.

2.1 Area Type

Table 1 shows the roadway mileage for the preferred route in rural areas, major metropolitan areas, and smaller urban areas. The corridor is 58 percent rural and 42 percent urban, with the urban mileage being split nearly equally between major metropolitan areas and small urban areas. The alternate routes through the central cities that are not part of the preferred route include 57.8 mi and are classified as 100 percent urban within major metropolitan areas.

Table 1. Roadway Mileage by Area Type

Area type	Length (mi)	Percent of length
Rural area	625.3	58.0
Major metropolitan area[a]	228.4	21.2
Small urban area[b]	223.6	20.8
Total	1,077.3	100.0

[a] includes Macon, Georgia; Atlanta, Georgia ; Chattanooga, Tennessee; Nashville, Tennessee; Louisville, Kentucky (including adjacent portions of Indiana); Indianapolis, Indiana; and Gary, Indiana.

[b] includes Ocala, Florida; Gainesville, Florida; Lake City, Florida; Valdosta, Georgia; Tifton, Georgia; Cordele, Georgia; Perry, Georgia; Cartersville, Georgia; Calhoun-Dalton, Georgia; Murfreesboro, Tennessee; Bowling Green, Kentucky; Elizabethtown, Kentucky; Columbus, Indiana; and Lafayette, Indiana.

2.2 Traffic Volumes

Traffic volumes on the preferred route within the study corridor for both directions of travel combined range from 16,114 to 297,000 veh/day. In rural areas, the traffic volumes on the preferred route for both directions of travel combined range from 16,114 to 98,400 veh/day. In urban areas, the traffic volumes on the preferred route for both directions of travel combined range from 18,862 to 297,000 veh/day. On the alternate routes through central cities, the traffic volumes on the preferred route for both directions of travel combined range from 32,200 to 409,000 veh/day.

The total travel in the corridor per year is estimated as:

- 247.7 hundred million veh-mi of travel per year for the preferred route as a whole
- 100.9 hundred million veh-mi of travel per year for the preferred route in rural areas
- 146.8 hundred million veh-mi of travel per year for the preferred route in urban areas
- 25.4 hundred million veh-mi of travel per year for the alternate routes through central cities

2.3 Number of Through Lanes

Table 2 shows the distribution of the number of lanes on the preferred and alternate routes, including through lanes but not auxiliary lanes, and excluding ramps.

Table 2. Distribution of Number of Through Lanes for Preferred and Alternate Routes

Number of through lanes[a]	Preferred route		Alternate routes		Entire corridor	
	Length (mi)[b]	Percent of length	Length (mi)[b]	Percent of length	Length (mi)[b]	Percent of length
4 lanes	299.1	27.9	12.1	20.9	311.2	27.6
6 lanes	643.1	60.1	23.4	40.4	666.4	59.0
8 lanes	128.5	12.0	22.4	38.7	150.9	13.4
TOTAL	1,070.7	100.0	57.9	100.0	1,128.5	100.0

[a] for both directions of travel combined.
[b] not including ramps.

2.4 Lane Width

All of the lanes on the preferred and alternate routes are at least 10.6 ft wide, with the exception of 0.12 mi (0.06 mi in each direction of travel) with 10-ft lanes. In most cases, the width of the through travel lanes is 12 ft.

2.5 Shoulder Width

Table 3 shows the distribution of the paved shoulder width for the right or outside shoulder on the preferred and alternate routes, excluding ramps. The table addresses shoulder types for the roadway in each direction of travel separately.

Table 3. Distribution of Paved Shoulder Width for Right or Outside Shoulder on Preferred and Alternate Routes (Excluding Ramps)

Paved shoulder width[a]	Preferred route		Alternate routes		Entire corridor	
	Length (mi)[b]	Percent of length	Length (mi)[b]	Percent of length	Length (mi)[b]	Percent of length
Wide (≥ 7.9 ft)	2,114.9	98.7	115.3	99.6	2,230.2	98.8
Medium (≥ 3 ft to < 7.9 ft)	25.0	1.2	0.5	0.4	25.5	1.1
Narrow (< 3 ft)	1.3	0.1	0.0	0.0	1.3	0.1
No paved shoulder	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2,141.2	100.0	115.8	100.0	2,257.0	100.0

[a] for right or outside shoulder.
[b] considering shoulders in each direction of travel separately; not including ramps.

Table 4 shows the distribution of the paved shoulder width for the left or median shoulder on the preferred and alternate routes, excluding ramps. The table addresses shoulder types for the roadway in each direction of travel separately.

Table 4. Distribution of Paved Shoulder Width for Left or Median Shoulder on Preferred and Alternate Routes (Excluding Ramps)

Paved shoulder width[a]	Preferred route		Alternate routes		Entire corridor	
	Length (mi)[b]	Percent of length	Length (mi)[b]	Percent of length	Length (mi)[b]	Percent of length
Wide (≥ 7.9 ft)	1,475.1	68.8	77.2	66.7	1,552.3	68.7
Medium (≥ 3 ft to < 7.9 ft)	665.5	31.1	37.7	32.6	703.2	31.1
Narrow (< 3 ft)	0.6	0.1	0.5	0.4	1.1	0.1
No paved shoulder	0.0	0.0	0.4	0.3	0.4	0.1
TOTAL	2,141.2	100.0	115.8	100.0	2,257.0	100.0

[a] for left or median shoulder.
[b] considering shoulders in each direction of travel separately; not including ramps.

usRAP UNITED STATES ROAD ASSESSMENT PROGRAM A program of the Roadway Safety Foundation

Chapter 3. Star Ratings

usRAP star ratings for a roadway represent the presence or absence of design and traffic control features related to safety. Star ratings for roadways range from one star, representing the simplest two-lane undivided roadway with few safety features, to five stars, representing an access-controlled roadway with a full range of safety features. Controlled-access freeways are generally rated with three, four, or five stars.

Separate star ratings are assigned to roadways representing the presence or absence of design and traffic control features relevant to safety for four types of road users: vehicle occupants, motorcyclists, pedestrians, and bicyclists. There are no specific star ratings applicable to trucks, but the vehicle occupant star ratings generally represent the design and traffic control features most relevant to trucks. Pedestrians and bicyclists are generally prohibited from using freeways, so pedestrian and bicyclist star ratings have not been developed for the study corridor.

Table 5 lists the design and traffic control factors whose effects were considered in determining vehicle occupant star ratings for the study corridor. Each of these factors was assessed for each 327-ft (100-m) roadway segment in the study corridor by review of aerial and street-level photographic images available in Google Maps®, Google Street View®, and similar on-line tools.

Table 5. Design and Traffic Control Factors Considered in Determining Vehicle Occupant Star Ratings for Divided Highways With Full Access Control (Freeways)

• Number of through lanes	• Presence of entrance ramp
• Lane width	• Quality of merge area
• Horizontal curvature	• 85th percentile traffic operating speed
• Quality of horizontal curve	• Presence of differential speed limit for trucks
• Percent grade	• Opposing traffic volume
• Median type/traversibility	• Delineation
• Type of roadside objects present	• Presence of street lighting
• Distance from traveled way to roadside objects	• Presence of sight distance limitation
• Paved shoulder width – right or outside shoulder	• Road surface condition (roughness/ surface irregularities)
• Paved shoulder width – left or median shoulder	• Road surface friction
• Shoulder rumble strips	

Table 6 presents the distribution of star ratings for roadways in the study corridor (mainline freeways and ramps), including both the preferred and alternate routes.

Table 6 shows that the preferred route is rated as consisting of 24 percent five-star roadways, 67 percent four-star roadways, and 9 percent three-star roadways. This is a very typical distribution of star ratings for freeway facilities in the U.S. The average star rating for the preferred route is 4.2.

Table 6 shows that the alternate routes are rated as consisting of 22 percent five-star roadways, 58 percent four-star roadways, and 20 percent three-star roadways. The average star rating for the alternate routes is 4.0.

Table 6. Distribution of usRAP Star Ratings for the Study Corridor

Roadway Section Location			Five-star Rating		Four-star Rating		Three-star Rating		Total Roadway Length (mi)	Average Star Rating
State	Route	Description	Roadway Length (mi)	Percent of Roadway length	Roadway Length (mi)	Percent of Roadway length	Roadway Length (mi)	Percent of Roadway length		
Preferred Route										
Florida	I-75	S of Ocala to Georgia	39.1	27.2	100.2	69.7	4.4	3.1	143.7	4.2
Georgia	I-75	Florida to I-475 S Junction	20.0	12.8	128.3	82.0	8.1	5.2	156.4	4.1
Georgia	I-475	Macon Bypass	0.3	2.0	10.8	72.0	3.9	26.0	15.0	3.8
Georgia	Ramps	Ramps on I-475 Macon Bypass	0.7[a]	46.7	0.8[a]	53.3	0.0[a]	0.0	1.5[a]	4.5
Georgia	I-75	I-475 N Junction to S Edge of Atlanta Metro Area	3.1	8.1	33.2	86.2	2.2	5.7	38.5	4.0
Georgia	I-75	S Edge of Atlanta Metro Area to I-285 S Junction	1.9	8.6	14.4	65.5	5.7	25.9	22.0	3.8
Georgia	I-285	Atlanta Bypass	0.3	1.3	14.6	64.6	7.7	34.1	22.6	3.7
Georgia	Ramps	Ramps on I-285 Atlanta Bypass	6.2[b]	78.5	0.0[b]	0.0	1.7[b]	21.5	7.9[b]	4.6
Georgia	I-75	I-285 N Junction to N Edge of Atlanta Metro Area	2.5	12.7	11.8	59.9	5.4	27.4	19.7	3.9
Georgia	I-75	N Edge of Atlanta Metro Area to Tennessee	16.2	21.2	55.0	71.9	5.3	6.9	76.5	4.1
Tennessee	I-75	Georgia to I-24	0.0	0.0	0.9	75.0	0.3	25.0	1.2	3.8
Tennessee	Ramps	Ramps Connecting I-75 and I-24	0.9[c]	100.0	0.0[c]	0.0	0.0[c]	0.0	0.9[c]	5.0
Tennessee	I-24	I-75 to Georgia	1.6	11.3	11.6	82.3	0.9	6.4	14.1	4.0
Georgia	I-24	Tennessee to Tennessee	0.0	0.0	3.4	79.1	0.9	20.9	4.3	3.9
Tennessee	I-24	Georgia to S Edge of Nashville Metro Area	11.2	11.2	81.7	82.0	6.8	6.8	99.7	4.0
Tennessee	I-24	S Edge of Nashville Metro Area to I-65 N Junction	1.6	7.0	13.4	58.8	7.8	34.2	22.8	3.7
Tennessee	I-65	I-24 N Junction to N Edge of Nashville Metro Area	1.6	12.7	6.0	47.9	5.0	39.7	12.6	3.7
Tennessee	I-65	N Edge of Nashville Metro Area to Kentucky	0.0	0.0	20.6	100.0	0.0	0.0	20.6	4.0
Kentucky	I-65	Tennessee to S Edge of Louisville Metro Area	9.2	7.9	90.4	78.1	16.2	14.0	115.8	3.9
Kentucky	I-65	S Edge of Louisville Metro Area to Indiana	5.0	23.3	12.6	58.6	3.9	18.1	21.5	4.1
Indiana	I-65	Kentucky to N Edge of Louisville Metro Area	2.2	17.7	9.6	77.5	0.6	4.8	12.4	4.1
Indiana	I-65	N Edge of Louisville Metro Area to S Edge of Indianapolis Metro Area	37.8	44.9	44.2	52.6	2.1	2.5	84.1	4.4

Table 6. Distribution of usRAP Star Ratings for the Study Corridor (Continued)

Roadway Section Location			Five-star Rating		Four-star Rating		Three-star Rating		Total Roadway Length (mi)	Average Star Rating
State	Route	Description	Roadway Length (mi)	Percent of Roadway length	Roadway Length (mi)	Percent of Roadway length	Roadway Length (mi)	Percent of Roadway length		
Indiana	I-65	S Edge of Indianapolis Metro Area to I-465 S Junction	0.6	6.3	8.0	84.2	0.9	9.5	9.5	4.0
Indiana	I-465	Indianapolis Bypass	4.4	22.9	12.6	65.6	2.2	11.5	19.2	4.1
Indiana	Ramps	Ramps on I-465 Indianapolis Bypass	2.4[d]	85.7	0.4[d]	14.3	0.0[d]	0.0	2.8[d]	4.9
Indiana	I-65	I-465 N Junction to N Edge of Indianapolis Metro Area	4.5	61.6	2.2	30.1	0.6	8.2	7.3	4.5
Indiana	I-65	N Edge of Indianapolis Metro Area to S Edge of Gary Metro Area	81.7	71.0	32.3	28.0	1.2	1.0	115.2	4.7
Indiana	I-65	S Edge of Gary Metro Area to I-90	3.5	22.0	11.5	72.3	0.9	5.7	15.9	4.2
TOTAL – Preferred Route			258.5	23.9	730.5	67.4	94.7	8.7	1,083.7	4.2
ALTERNATE ROUTES										
Georgia	I-75	I-475 to I-475 through Macon	2.2	10.5	15.3	72.8	3.5	16.7	21.0	3.9
Georgia	Ramps	Ramps on I-75 at I-16 in Macon	0.0[e]	0.0	0.0[e]	0.0	1.1[e]	100.0	1.1[e]	3.0
Georgia	I-75	I-285 to I-285 through Atlanta	9.1	45.1	5.7	28.2	5.4	26.7	20.2	4.2
Indiana	I-65	I-465 to I-465 through Indianapolis	1.2	7.2	13.6	82.0	1.8	10.8	16.6	4.0
Indiana	Ramps	Ramps at I-65 and I-70 north junction in Indianapolis	0.4[f]	50.0	0.4[f]	50.0	0.0[f]	0.0	0.8[f]	4.5
TOTAL – Alternate Routes			12.9	21.6	35.0	58.6	11.8	19.8	59.7	4.0
TOTAL – Preferred and Alternate Routes			271.4	23.7	765.5	67.0	106.5	9.3	1,143.4	4.1

[a] four ramps, two in each direction of travel, with total length of 1.5 mi.
[b] six ramps, three in each direction of travel, with total length of 7.9 mi including collector-distributor roads.
[c] two ramps, one in each direction of travel, with total length of 0.9 mi.
[d] four ramps, two in each direction of travel, with total length of 2.8 mi.
[e] two ramps, one in each direction of travel, with total length of 1.1 mi.
[f] two ramps, one in each direction of travel, with total length of 0.7 mi.

The star rating results indicate that the roads in the study corridor, and especially the preferred route, have designs that are very favorable to safe operations, including safe operation for trucks. Overall, 91 percent of the preferred route is rated with four or five stars indicating the presence of extensive design and traffic control features related to safety. Only 9 percent of the preferred route is rated with the three stars and none of the corridor is rated below three stars. While the entire corridor is in compliance with design standards for the interstate highway system, the three-star portions of the preferred route tend to have a few more horizontal curves, ramp junctions and roadside objects than the four-and-five-star portions of the corridor.

The Appendix of this report presents star rating maps covering the entire study corridor including:

- maps showing star ratings for roadways in each of the five states (Florida, Georgia, Tennessee, Kentucky, and Indiana)
- maps showing star ratings for roadways in each of the seven major metropolitan areas (Macon, Georgia; Atlanta, Georgia; Chattanooga, Tennessee; Nashville, Tennessee; Louisville, Kentucky-Indiana; Indianapolis, Indiana; and Gary, Indiana)

Chapter 4.
Crash History Review

A review of the history of fatal crashes in the study corridor was conducted both to learn more about the safety performance of the corridor and to calibrate the crash prediction models used in Chapter 5 of this report. Crash history data were obtained from NHTSA's FARS database for the most recent available five-year period, 2013 through 2017, inclusive. These data are summarized in this section of the report. Detailed crash data for less severe crashes (injury and property-damage-only crashes) in the corridor are not publicly available.

4.1 Frequency of Fatal Crashes in the Study Corridor

The crash history review found that 668 fatal crashes occurred in the study corridor (including mainline freeways and ramps) during the five-year period from 2013 to 2017, inclusive (or an average of 133.6 fatal crashes per year). These included 628 crashes on the preferred route and 48 crashes on the alternate routes through central cities. Table 7 shows the distribution of the fatal crashes by location within the study corridor and the fatal crash rates by roadway section. The portions of the corridor with the highest fatal crash rates include:

- I-75 and I-285 through the Atlanta metropolitan area
- I-24 through the Chattanooga metropolitan area
- I-65 between Louisville and Indianapolis

Table 7. Fatal Crash Frequencies and Rates by Roadway Section within the Study Corridor, 2013-2017

Roadway Section Location			Length (mi)[a]	No. of Fatal Crashes (five years)	Fatal Crash Rate (per mi per year)	Travel (100 million veh-mi)	Fatal Crash Rate (per 100 million veh-mi)
State	Route	Description					
PREFERRED ROUTE							
Florida	I-75	S of Ocala to Georgia	143.7	82	0.114	138.3	0.593
Georgia	I-75	Florida to I-475 S Junction	156.4	66	0.084	139.6	0.473
Georgia	I-475	Macon Bypass	15.1	6	0.079	13.7	0.438
Georgia	I-75	Ramps on I-475 Macon Bypass	1.5[a]	0	0.000	0.7	0.000
Georgia	I-75	I-475 N Junction to S Edge of Atlanta Metro Area	38.5	21	0.109	56.9	0.369
Georgia	I-75	S Edge of Atlanta Metro Area to I-285 S Junction	22.0	32	0.291	58.7	0.545
Georgia	I-285	Atlanta Bypass	22.6	46	0.407	60.3	0.763
Georgia	I-285	Ramps on I-285 Atlanta Bypass	7.9[b]	1	0.025	10.0	0.100
Georgia	I-75	I-285 N Junction to N Edge of Atlanta Metro Area	19.7	24	0.244	63.7	0.377
Georgia	I-75	N Edge of Atlanta Metro Area to Tennessee	76.5	59	0.154	105.7	0.559
Tennessee	I-75	Georgia to I-24	1.2	1	0.167	2.5	0.400
Tennessee	Ramps	Ramps Connecting I-75 and I-24	0.9[c]	0	0.000	0.2	0.000
Tennessee	I-24	I-75 to Georgia	14.1	15	0.212	23.8	0.630
Georgia	I-24	Tennessee to Tennessee	4.3	5	0.232	4.6	1.087
Tennessee	I-24	Georgia to S Edge of Nashville Metro Area	99.7	54	0.108	91.8	0.588

Table 7. Fatal Crash Frequencies and Rates by Roadway Section within the Study Corridor, 2013-2017 (continued)

Roadway Section Location			Length (mi)[a]	No. of Fatal Crashes (five years)	Fatal Crash Rate (per mi per year)	Travel (100 million veh-mi)	Fatal Crash Rate (per 100 million veh-mi)
State	Route	Description					
Tennessee	I-24	S Edge of Nashville Metro Area to I-65 N Junction	22.8	31	0.272	64.6	0.480
Tennessee	I-65	I-24 N Junction to N Edge of Nashville Metro Area	12.6	12	0.190	25.5	0.471
Tennessee	I-65	N Edge of Nashville Metro Area to Kentucky	20.6	10	0.097	19.7	0.508
Kentucky	I-65	Tennessee to S Edge of Louisville Metro Area	115.8	41	0.071	99.2	0.413
Kentucky	I-65	S Edge of Louisville Metro Area to Indiana	21.5	24	0.223	47.1	0.510
Indiana	I-65	Kentucky to N Edge of Louisville Metro Area	12.4	1	0.016	9.8	0.102
Indiana	I-65	N Edge of Louisville Metro Area to S Edge of Indianapolis Metro Area	84.1	26	0.062	30.8	0.844
Indiana	I-65	S Edge of Indianapolis Metro Area to I-465 S Junction	9.5	6	0.126	7.6	0.789
Indiana	I-465	Indianapolis Bypass	19.2	9	0.094	39.7	0.227
Indiana	Ramps	Ramps on I-465 Indianapolis Bypass	2.8[d]	2	0.143	0.7	0.239
Indiana	I-65	I-465 N Junction to N Edge of Indianapolis Metro Area	7.3	2	0.055	7.5	0.267
Indiana	I-65	N Edge of Indianapolis Metro Area to S Edge of Gary Metro Area	115.2	37	0.064	93.4	0.396
Indiana	I-65	S Edge of Gary Metro Area to I-90	15.9	7	0.088	22.1	0.317
TOTAL – Preferred Route			1,083.8	620	0.114	1,238.2	0.501
ALTERNATE ROUTES							
Georgia	I-75	I-475 to I-475 through Macon	21.0	7	0.067	22.1	0.317
Georgia	Ramps	Ramps on I-75 at I-16 in Macon	1.1[e]	0	0.000	0.6	0.000
Georgia	I-75	I-285 to I-285 through Atlanta	20.2	34	0.337	89.7	0.379
Indiana	I-65	I-465 to I-465 through Indianapolis	16.6	7	0.084	14.3	0.490
Indiana	I-65	Ramps at I-65 and I-70 north junction in Indianapolis	0.8[f]	0	0.000	0.4	0.000
TOTAL – Alternate Routes			59.7	48	0.161	127.1	0.378
TOTAL – Preferred and Alternate Routes			1,143.5	668	0.117	1,365.3	0.489

[a] four ramps, two in each direction of travel, with total length of 1.5 mi.
[b] six ramps, three in each direction of travel, with total length of 7.9 mi including collector-distributor roads.
[c] two ramps, one in each direction of travel, with total length of 0.9 mi.
[d] four ramps, two in each direction of travel, with total length of 2.8 mi.
[e] two ramps, one in each direction of travel, with total length of 1.1 mi.
[f] two ramps, one in each direction of travel, with total length of 0.7 mi.

Table 7 illustrates that the study corridor has experienced 0.117 fatal crashes per mile per year over a recent five-year period. In other words, each mile of roadway in the study corridor has experienced only one fatal crash every 8.5 years. The overall fatal crash rate in the study corridor is 0.489 fatal crashes per 100 million veh-mi of travel.

4.2 Distribution of Fatal Crashes by Types of Vehicle Involved

Table 8 presents the fatal crash frequencies for each section on the preferred and alternate routes (excluding ramps) by types of vehicles involved in the crashes.

Table 8. Fatal Crash Frequencies by Vehicle Involvement Type and Roadway Section (Excluding Ramps) within the Study Corridor, 2013-2017

State	Route	Description	Length (mi)[a]	Number of fatal crashes by vehicle type involved in crash				
				Single-unit truck	Combination truck	Motorcycle	Passenger car or other vehicle type only	TOTAL
PREFERRED ROUTE								
Florida	I-75	S of Ocala to Georgia	143.7	11	22	3	46	82
Georgia	I-75	Florida to I-475 S Junction	156.4	0	26	4	36	66
Georgia	I-475	Macon Bypass	15.1	0	2	0	4	6
Georgia	I-75	I-475 N Junction to S Edge of Atlanta Metro Area	38.5	0	8	0	13	21
Georgia	I-75	S Edge of Atlanta Metro Area to I-285 S Junction	22.0	0	10	1	21	32
Georgia	I-285	Atlanta Bypass	22.6	2	15	1	28	46
Georgia	I-75	I-285 N Junction to N Edge of Atlanta Metro Area	19.7	0	7	1	16	24
Georgia	I-75	N Edge of Atlanta Metro Area to Tennessee	76.5	4	11	6	38	59
Tennessee	I-75	Georgia to I-24	1.2	0	1	0	0	1
Tennessee	I-24	I-75 to Georgia	14.1	0	2	1	12	15
Georgia	I-24	Tennessee to Tennessee	4.3	0	0	0	5	5
Tennessee	I-24	Georgia to S Edge of Nashville Metro Area	99.7	2	21	4	27	54
Tennessee	I-24	S Edge of Nashville Metro Area to I-65 N Junction	22.8	3	4	4	20	31
Tennessee	I-65	I-24 N Junction to N Edge of Nashville Metro Area	12.6	0	2	1	9	12
Tennessee	I-65	N Edge of Nashville Metro Area to Kentucky	20.6	0	2	1	7	10
Kentucky	I-65	Tennessee to S Edge of Louisville Metro Area	115.8	2	16	2	21	41
Kentucky	I-65	S Edge of Louisville Metro Area to Indiana	21.5	0	9	2	13	24
Indiana	I-65	Kentucky to N Edge of Louisville Metro Area	12.4	0	0	0	1	1
Indiana	I-65	N Edge of Louisville Metro Area to S Edge of Indianapolis Metro Area	84.1	1	10	1	14	26
Indiana	I-65	S Edge of Indianapolis Metro Area to I-465 S Junction	9.5	0	2	0	4	6
Indiana	I-465	Indianapolis Bypass	19.2	0	1	0	8	9
Indiana	I-65	I-465 N Junction to N Edge of Indianapolis Metro Area	7.3	0	1	0	1	2

Table 8. Fatal Crash Frequencies by Vehicle Involvement Type and Roadway Section (Excluding Ramps) within the Study Corridor, 2013-2017 (Continued)

State	Route	Description	Length (mi)[a]	Number of fatal crashes by vehicle type involved in crash				
				Single-unit truck	Combination truck	Motorcycle	Passenger car or other vehicle type only	TOTAL
Indiana	I-65	N Edge of Indianapolis Metro Area to S Edge of Gary Metro Area	115.2	1	20	1	15	37
Indiana	I-65	S Edge of Gary Metro Area to I-90	15.9	0	2	1	4	7
TOTAL – Preferred Route			1,070.7	26	194	34	363	617
Alternate Routes								
Georgia	I-75	I-475 to I-475 through Macon	21.0	0	0	0	7	7
Georgia	I-75	I-285 to I-285 through Atlanta	20.2	1	1	4	28	34
Indiana	I-65	I-465 to I-465 through Indianapolis	16.6	0	2	0	5	7
TOTAL – Alternate Routes			57.8	1	3	4	40	48
TOTAL – Preferred and Alternate Routes			1,128.5	27	197	38	403	665

4.3 Distribution of Fatal Crashes by Crash Type and Manner of Collision

Table 9 presents the distribution of fatal crashes in the study corridor (including mainline roadways and ramps) by crash type/manner of collision and the location of the first harmful event with respect to the roadway. The table shows that most common crash types in the corridor are collisions with roadside fixed objects (28 percent), rear-end collisions (24 percent), and collisions with pedestrians (13 percent). The predominance of roadside fixed object crashes and rear-end collisions between motor vehicles is typical of U.S. freeways. The relatively high incidence of collisions with pedestrians is surprising because the presence of pedestrians on Interstate freeways is generally illegal.

Table 9. Distribution of Fatal Crashes in the Study Corridor by Crash Type/Manner of Collision and Location of First Harmful Event with Respect to Roadway, 2013-2017

Crash Type/Manner of Collision	In Traveled Way		On Shoulder		On Roadside		Total	
	Number of Crashes	Percent of Crashes	Number of Crashes	Percent of Crashes	Number of Crashes	Percent of Crashes	Number of Crashes	Percent of Crashes
SINGLE-VEHICLE CRASHES								
Collision with ditch or embankment	0	0.0	0	0.0	40	14.9	40	6.0
Collision with fixed object	0	0.0	1	5.3	184	68.4	185	27.7
Collision with other object	1	0.3	0	0.0	3	1.1	4	0.6
Collision with parked vehicle	0	0.0	13	68.3	10	3.7	23	3.4
Collision with pedestrian	80	21.0	4	21.1	4	1.5	88	13.2
Rollover/overturning	26	6.8	1	5.3	27	10.0	54	8.1
Other single-vehicle crash	3	0.8	0	0.0	1	0.4	4	0.6
Total single-vehicle crashes	110	28.9	19	100.0	269	100.0	398	59.6
MULTIPLE-VEHICLE CRASHES								
Angle collision	32	8.4	0	0.0	0	0.0	32	4.8
Head-on collision	25	6.6	0	0.0	0	0.0	25	3.7
Rear-end collision	159	41.8	0	0.0	0	0.0	159	23.9
Sideswipe – same direction	44	11.6	0	0.0	0	0.0	44	6.6
Sideswipe – opposite direction	1	0.3	0	0.0	0	0.0	1	0.1
Other multiple-vehicle collision	9	2.4	0	0.0	0	0.0	9	1.3
Total multiple-vehicle crashes	270	71.1	0	0.0	0	0.0	270	40.4
TOTAL	380	100.0	19	100.0	269	100.0	668	100.0

4.4 Characteristics of Truck Crashes

Table 10 shows the distribution of the fatal truck crashes (excluding locations on ramps) by location within the corridor and the fatal crash rates by roadway section. Crash rates per hundred million veh-mi of travel are not included because consistent data on truck volumes throughout the corridor are not available.

Table 10 shows that the study corridor operates in a very safe manner for trucks. The overall fatal crash rate for trucks is only 0.040 crashes per mile per year. In other words, each mile of freeway in the corridor (both directions of travel combined) has experienced only one fatal truck crash every 25 years.

Table 10. Fatal Truck Crash Frequencies and Rates by Roadway Section (Excluding Ramps) within the Study Corridor, 2013-2017

Roadway Section Location			Length (mi)	No. of Fatal Truck Crashes (five years)[a]	Fatal Crash Rate (per mi per year)
State	Route	Description			
PREFERRED ROUTE					
Florida	I-75	S of Ocala to Georgia	143.7	33	0.046
Georgia	I-75	Florida to I-475 S Junction	156.4	26	0.027
Georgia	I-475	Macon Bypass	15.1	2	0.026
Georgia	I-75	I-475 N Junction to S Edge of Atlanta Metro Area	38.5	8	0.042
Georgia	I-75	S Edge of Atlanta Metro Area to I-285 S Junction	22.0	10	0.091
Georgia	I-285	Atlanta Bypass	22.6	17	0.150
Georgia	I-75	I-285 N Junction to N Edge of Atlanta Metro Area	19.7	7	0.071
Georgia	I-75	N Edge of Atlanta Metro Area to Tennessee	76.5	15	0.039
Tennessee	I-75	Georgia to I-24	1.2	1	0.167
Tennessee	I-24	I-75 to Georgia	14.1	2	0.028
Georgia	I-24	Tennessee to Tennessee	4.3	0	0.000
Tennessee	I-24	Georgia to S Edge of Nashville Metro Area	99.7	23	0.046
Tennessee	I-24	S Edge of Nashville Metro Area to I-65 N Junction	22.8	7	0.061
Tennessee	I-65	I-24 N Junction to N Edge of Nashville Metro Area	12.6	2	0.032
Tennessee	I-65	N Edge of Nashville Metro Area to Kentucky	20.6	2	0.019
Kentucky	I-65	Tennessee to S Edge of Louisville Metro Area	115.8	18	0.031
Kentucky	I-65	S Edge of Louisville Metro Area to Indiana	21.5	9	0.084
Indiana	I-65	Kentucky to N Edge of Louisville Metro Area	12.4	0	0.000
Indiana	I-65	N Edge of Louisville Metro Area to S Edge of Indianapolis Metro Area	84.1	11	0.026
Indiana	I-65	S Edge of Indianapolis Metro Area to I-465 S Junction	9.5	2	0.042
Indiana	I-465	Indianapolis Bypass	19.2	1	0.010
Indiana	I-65	I-465 N Junction to N Edge of Indianapolis Metro Area	7.3	1	0.027
Indiana	I-65	N Edge of Indianapolis Metro Area to S Edge of Gary Metro Area	115.2	21	0.036
Indiana	I-65	S Edge of Gary Metro Area to I-90	15.9	2	0.025
TOTAL – Preferred Route			1,070.7	220	0.041
ALTERNATE ROUTES					
Georgia	I-75	I-475 to I-475 through Macon	21.0	0	0.000
Georgia	I-75	I-285 to I-285 through Atlanta	20.2	2	0.020
Indiana	I-65	I-465 to I-465 through Indianapolis	16.6	2	0.024
TOTAL – Alternate Routes			57.8	4	0.014
TOTAL – Preferred and Alternate Routes			1,128.5	224	0.040

Table 11 presents the distribution of fatal truck crashes in the study corridor (including mainline roadways and ramps) by crash type and manner of collision. The pattern of truck crash types shown in Table 11 is very similar to the pattern of crash types for all vehicle types combined shown in Table 9.

Table 11. Distribution of Fatal Truck Crashes in the Study Corridor by Crash Type/Manner of Collision and Location of First Harmful Event with Respect to Roadway, 2013-2017

Crash Type/ Manner of Collision	In Traveled Way		On Shoulder		On Roadside		Total	
	Number of Crashes	Percent of Crashes	Number of Crashes	Percent of Crashes	Number of Crashes	Percent of Crashes	Number of Crashes	Percent of Crashes
SINGLE-VEHICLE CRASHES								
Collision with ditch or embankment	0	0.0	0	0.0	5	10.9	5	2.2
Collision with fixed object	0	0.0	0	0.0	32	69.5	32	14.2
Collision with other object	0	0.0	0	0.0	0	0.0	0	0.0
Collision with parked vehicle	0	0.0	6	100.0	5	10.9	11	4.9
Collision with pedestrian	29	16.7	0	0.0	1	2.2	30	13.3
Rollover/overturning	3	1.7	0	0.0	2	4.3	5	2.2
Other single-vehicle crash	1	0.6	0	0.0	1	2.2	2	0.9
Total single-vehicle crashes	33	19.0	6	100.0	46	100.0	85	37.7
MULTIPLE-VEHICLE CRASHES								
Angle collision	13	7.5	0	0.0	0	0.0	13	5.8
Head-on collision	6	3.4	0	0.0	0	0.0	6	2.7
Rear-end collision	98	56.3	0	0.0	0	0.0	98	43.3
Sideswipe – same direction	20	11.5	0	0.0	0	0.0	20	8.8
Sideswipe – opposite direction	1	0.6	0	0.0	0	0.0	1	0.4
Other multiple-vehicle collision	3	1.7	0	0.0	0	0.0	3	1.3
Total multiple-vehicle crashes	141	81.0	0	0.0	0	0.0	141	62.3
TOTAL	174	100.0	6	100.0	46	100.0	226	100.0

4.5 Frequency of Serious Injury Crashes

The ViDA software used to process roadway data for developing safer roads investment plans (see Chapter 5) considers both fatal and serious injury crashes in the study corridor. The frequency of fatal crashes was obtained from the FARS data summarized in Section 4.1 to 4.4 of this report. Detailed data on serious injuries in the study corridor are not publicly available. However, two sources, one from Florida and one from Tennessee were available to estimate the ratio of serious injury to fatal crashes:

- A Florida report shows the number of fatal and serious injury crashes per year for the Interstate highway system in Florida, including not only the portion of I-75 in the study corridor but also all other Interstate highways in Florida.
- A Tennessee web site shows the number of fatal and serious injury crashes per year for I-24, I-65, and I-75 in the specific counties included in the study corridor.

The average of these sources shows that these roadways experience 6.36 times as many serious injury crashes as fatal crashes. Since the corridor is known to experience an average of 133.6 fatal crashes year, it is estimated that the corridor experiences an average of 849.7 serious injury crashes per year. These estimates were used as the basis for investigating infrastructure improvement needs in Chapter 5.

Chapter 5.
Infrastructure Improvement Needs in the Study Corridor

The ViDA software was used to investigate infrastructure improvement needs for the corridor. The ViDA software has the capability to identify cost-effective potential infrastructure improvements on specific roadway segments. The software considers the potential need for over 70 crash countermeasures for each 100-m (327-ft) section of roadway, separately for each direction of travel. The study considered potential crash countermeasures that are cost-effective with a benefit-cost ratio of 1.0 or more. The potential infrastructure improvement needs suggested for a limited number of specific locations in the corridor included:

- installation of traffic barriers at selected locations
- installation of street lighting at selected merge areas
- installation of shoulder rumble strips at selected locations where they are not already present.

None of these suggested infrastructure improvements appears to relate directly to any specific need to reduce truck crashes.

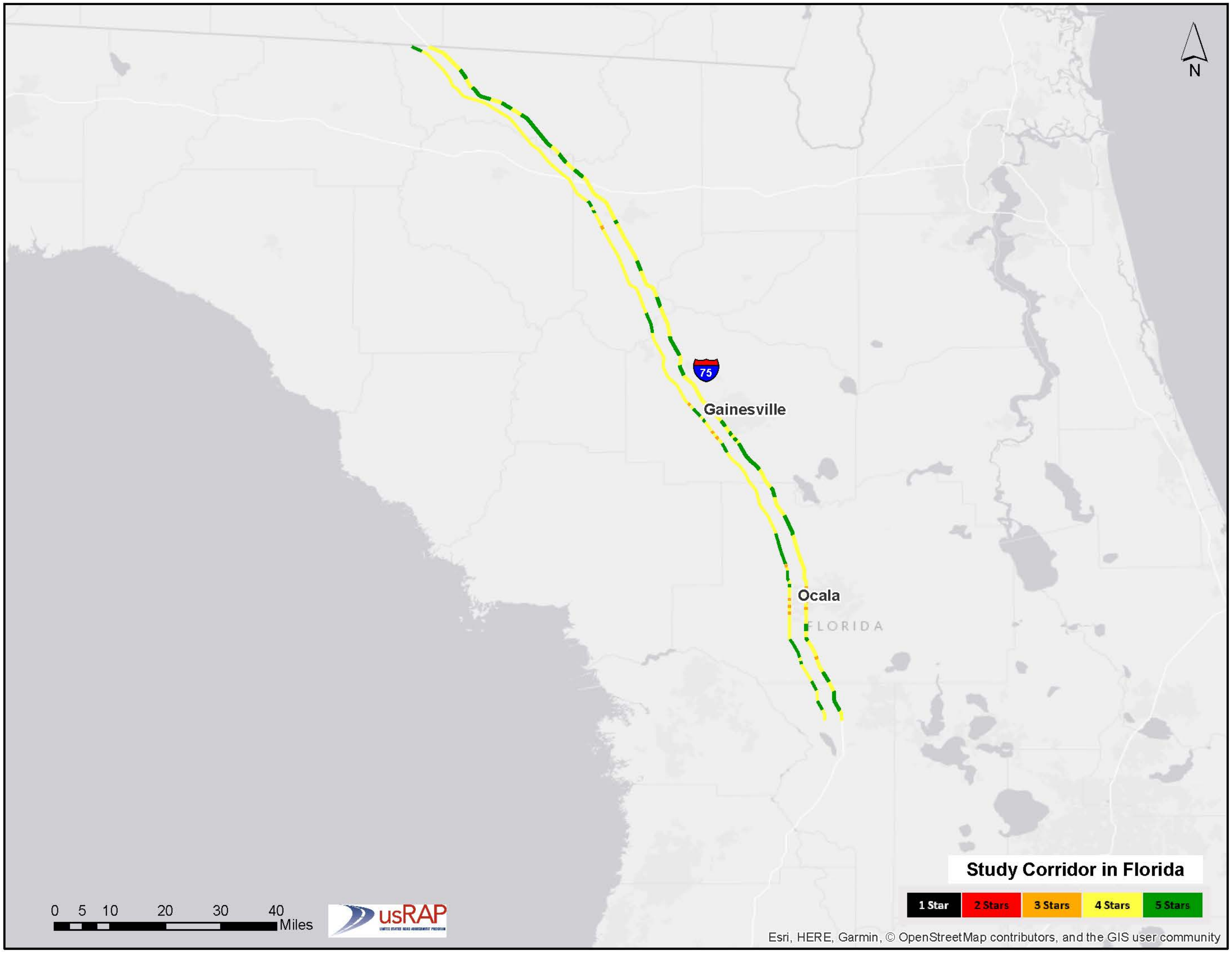
Chapter 6. Conclusions

The study has found that the study corridor extending from Ocala, Florida, to Gary, Indiana, has geometric design and traffic control features that are very typical of Interstate highways in the U.S. Approximately 91 percent of the corridor has been assessed with four- and five-star ratings based on the presence of roadway design and traffic control features related to safety. The 9 percent of the study corridor assessed with three-star ratings meets the design standards for Interstate highways, but has a few more curves, ramp junctions, and roadside objects than the four- and five-star roads.

The crash history of the study corridor is typical of Interstate highways, which are among the safest roads on the U.S. highway system. On average, each mile of the study corridor has experienced only one fatal crash every 8.5 years and only one fatal truck crash every 25 years. A limited set of infrastructure improvement needs has been identified for the study corridor, but none of these improvements appears to relate directly to any need to reduce truck crashes.

The study corridor is well suited to accommodating truck traffic at present and should continue to accommodate truck traffic effectively into the future with normal roadway maintenance and with appropriate management of traffic operations as passenger car and truck volumes grow.

Appendix A.
Star Rating Maps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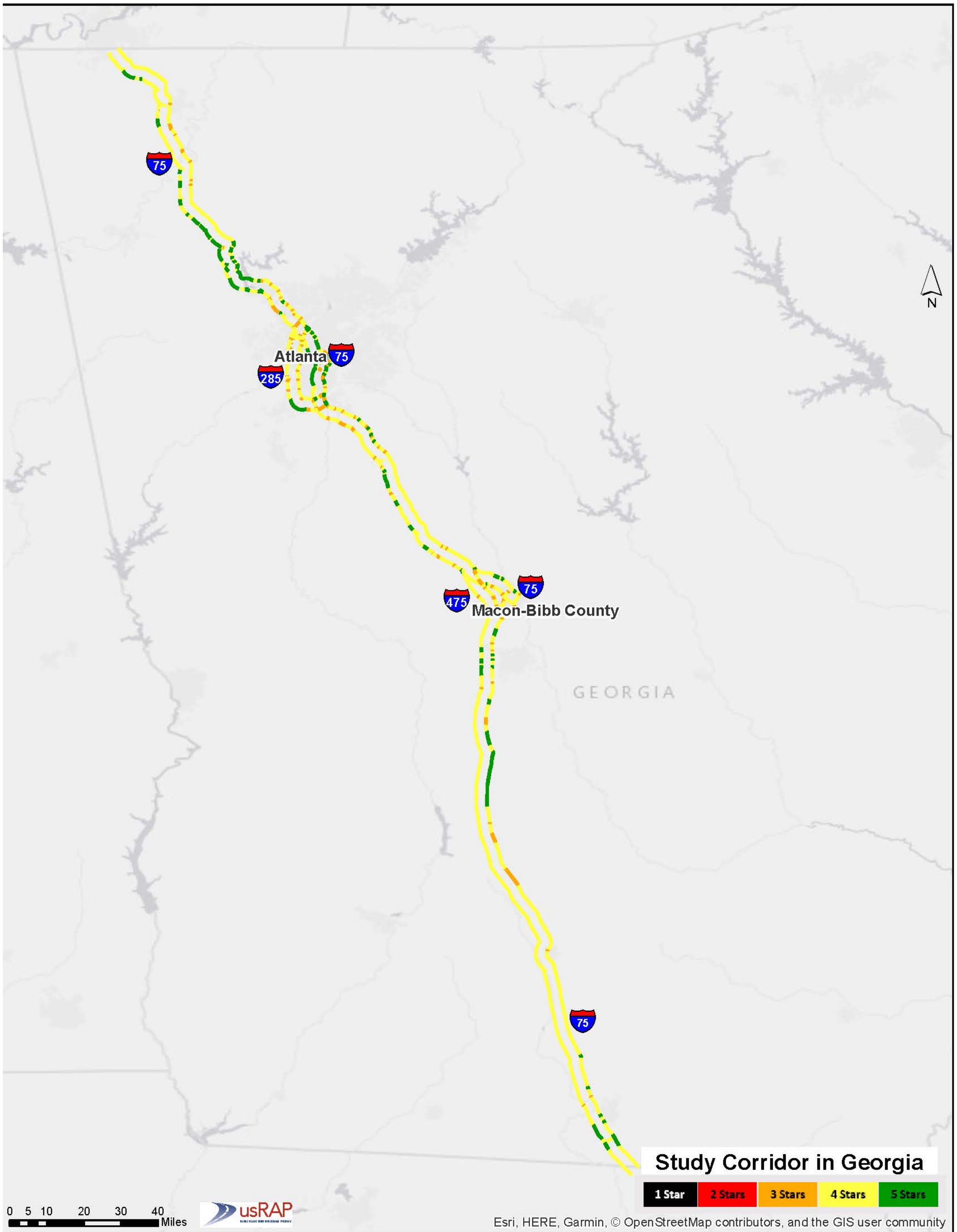
Gainesville
75
Ocala
FLORIDA
Study Corridor in Florida
1 Star
2 Stars
3 Stars
4 Stars
5 Stars
0 5 10 20 30 40
Miles
usRAP
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



Atlanta
75
285
475
Macon-Bibb County
GEORGIA
N
Study Corridor in Georgia
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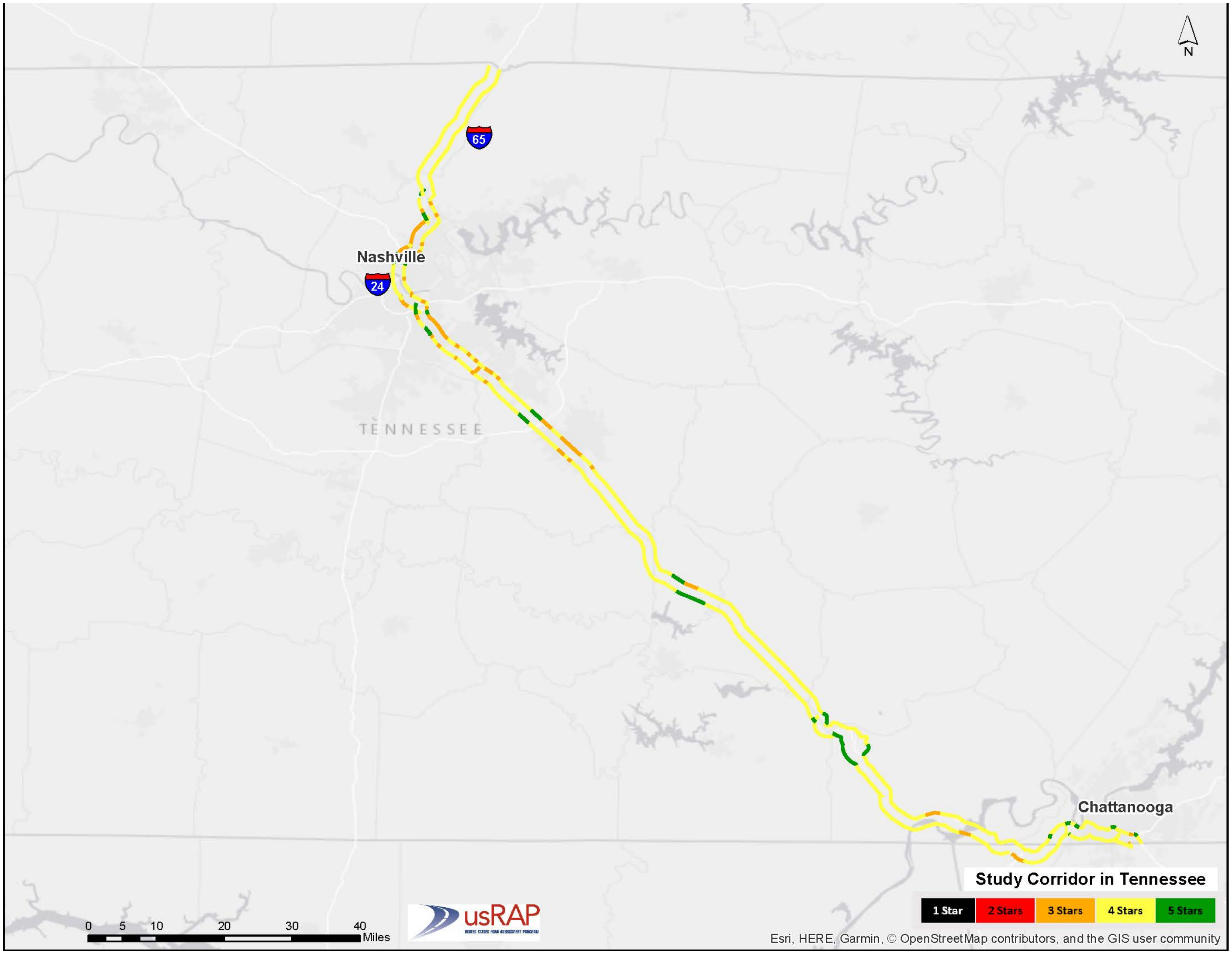
2 Stars
3 Stars
4 Stars
5 Stars
0 5 10 20 30 40
Miles
usRAP
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



Nashville
65
24
TENNESSEE
Chattanooga
N
Study Corridor in Tennessee
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2 Stars
3 Stars
4 Stars
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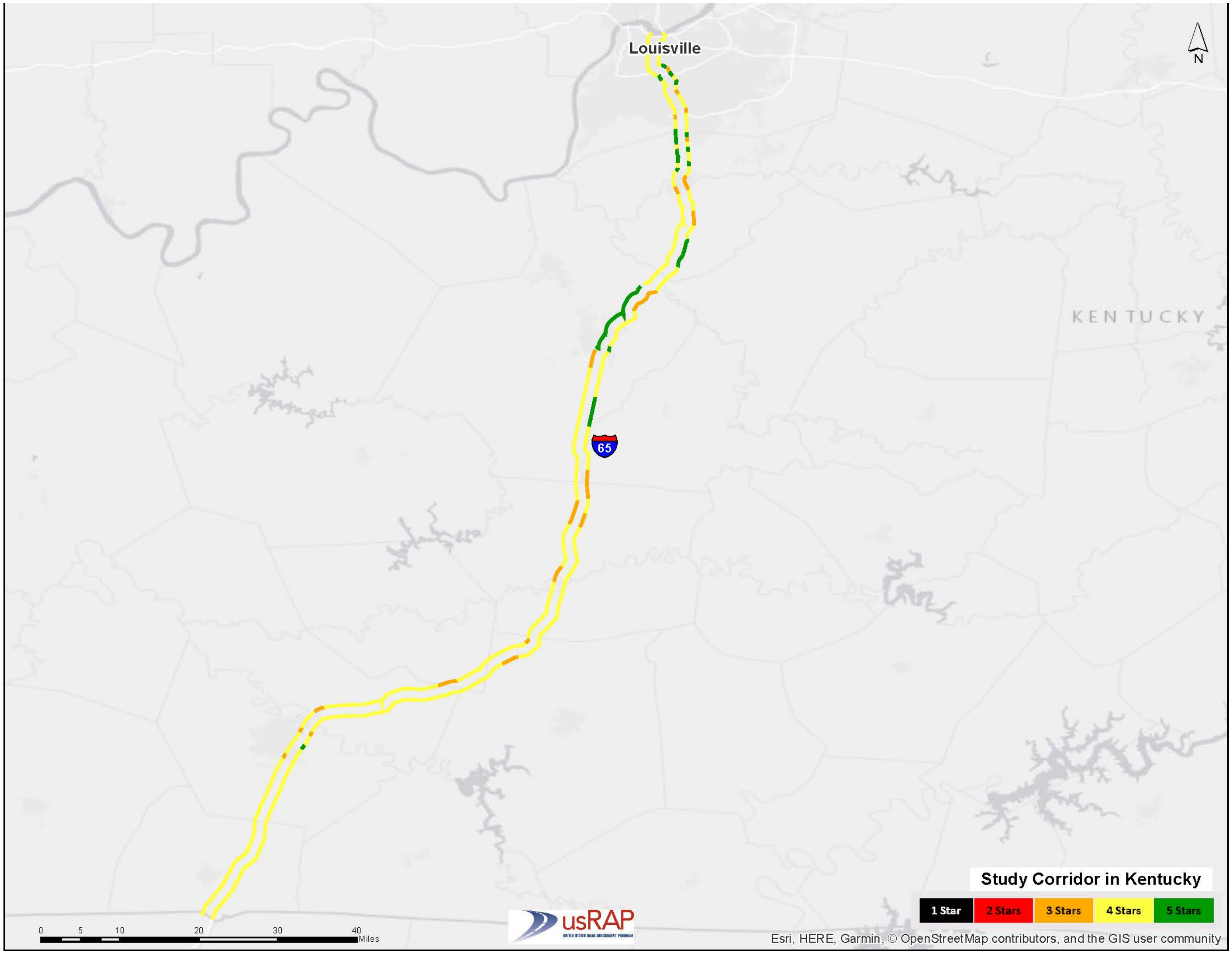
Miles
usRAP
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community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N
KENTUCKY
65
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2 Stars
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10
20
30
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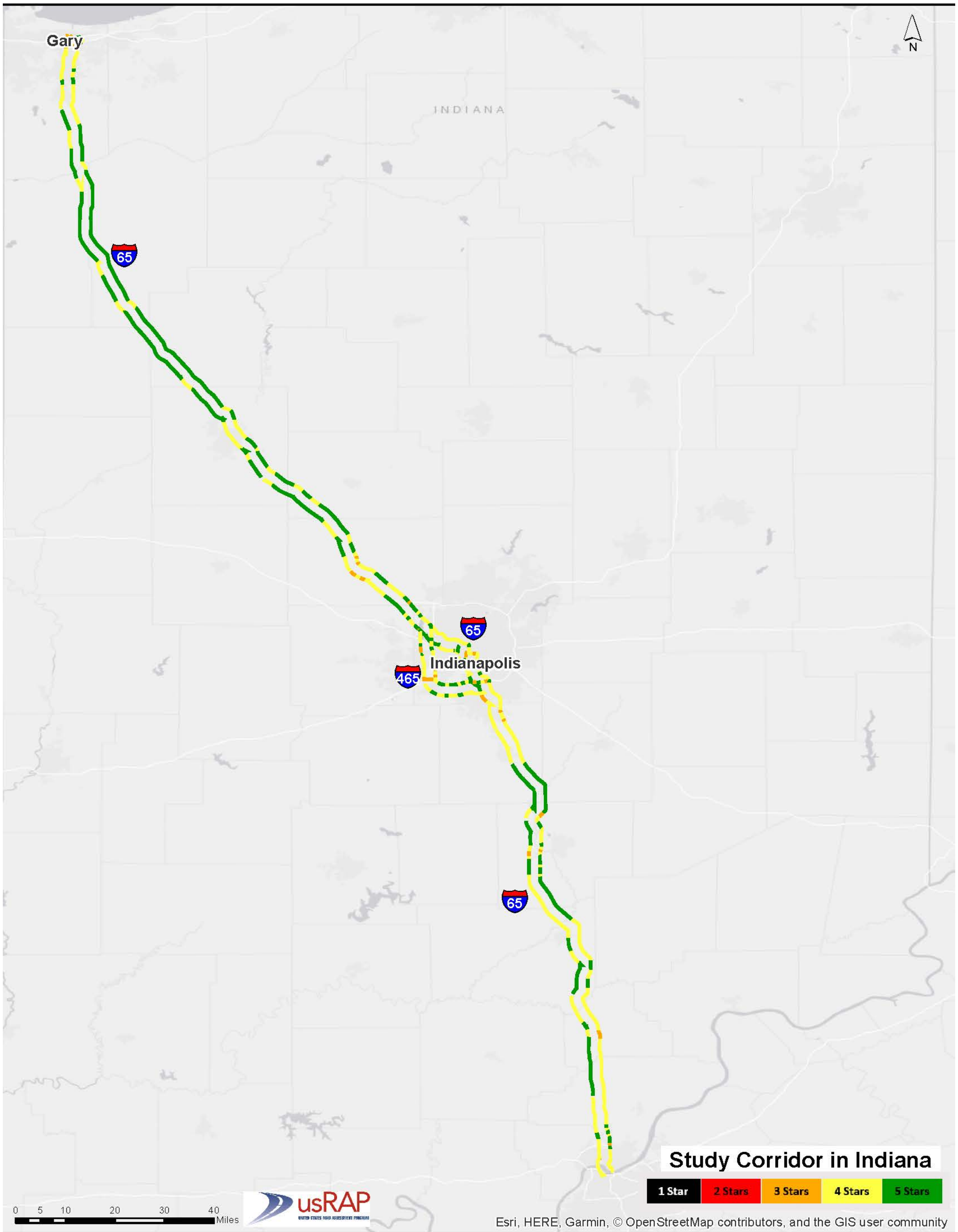
Miles
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


Gary
INDIANA
65
65
465
Indianapolis
65
N
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3 Stars
4 Stars
5 Stars
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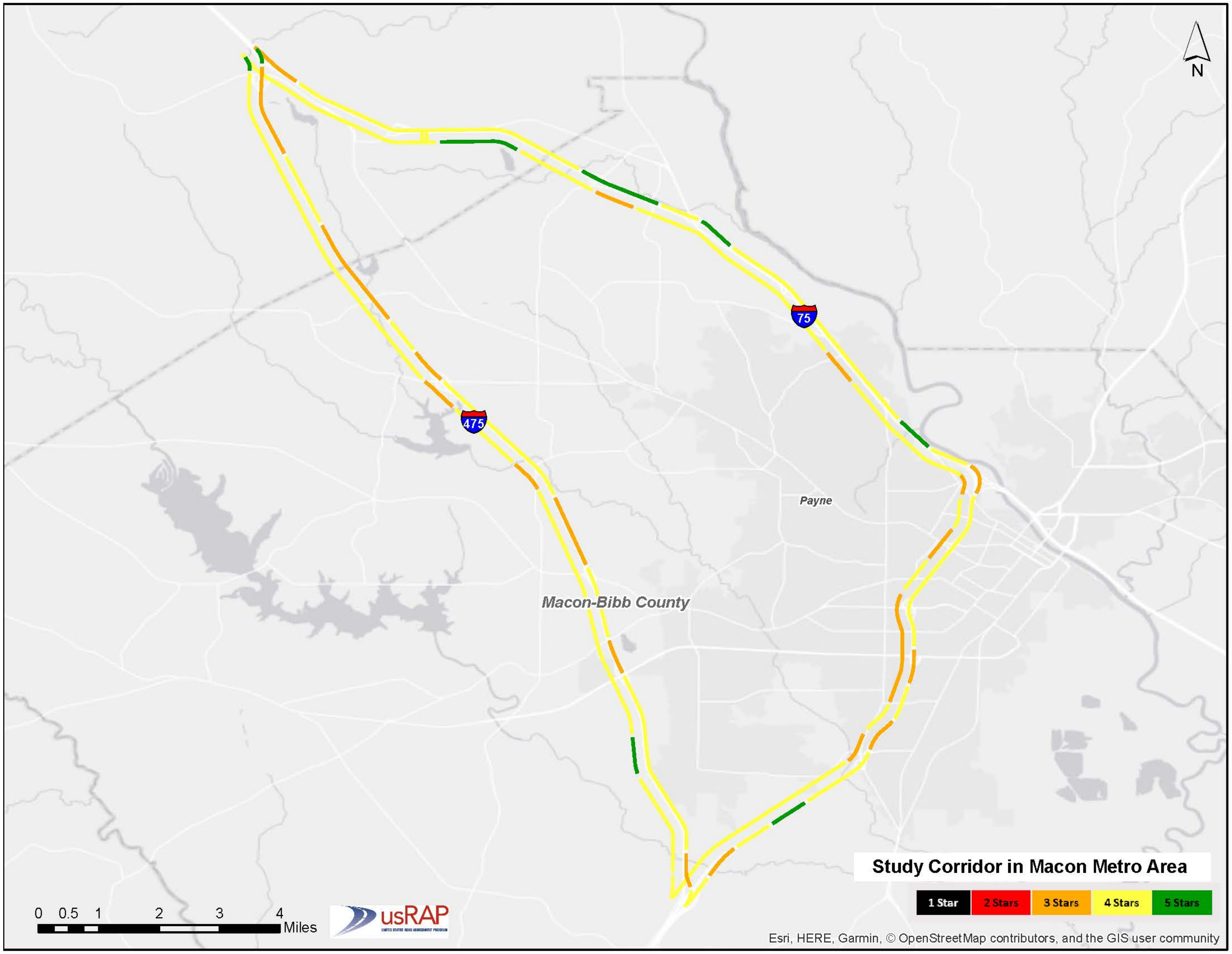
Miles
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


N
75
475
Payne
Macon-Bibb County
Study Corridor in Macon Metro Area
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2 Stars
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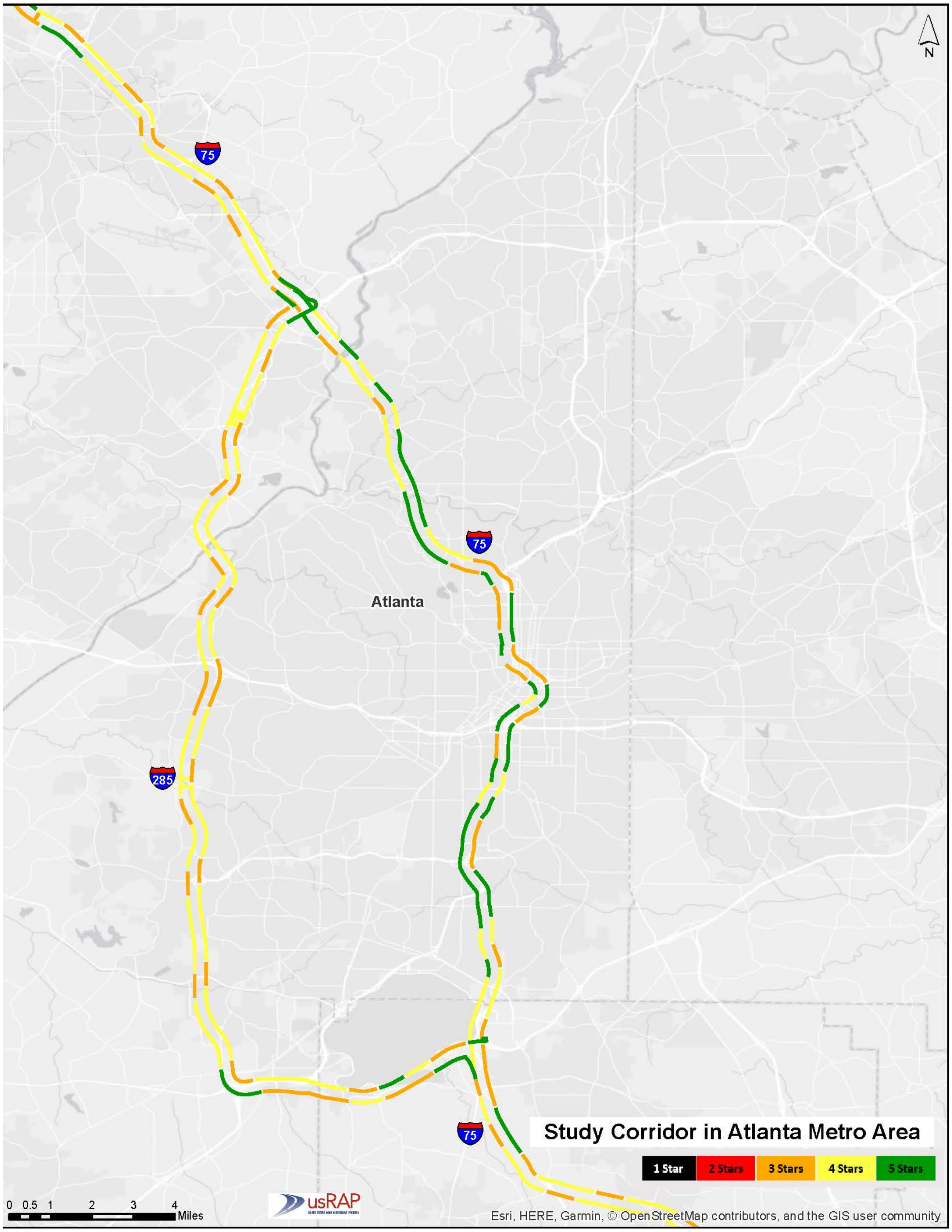
Miles
usRAP
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



N
75
75
Atlanta
285
75
Study Corridor in Atlanta Metro Area
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3 Stars
4 Stars
5 Stars
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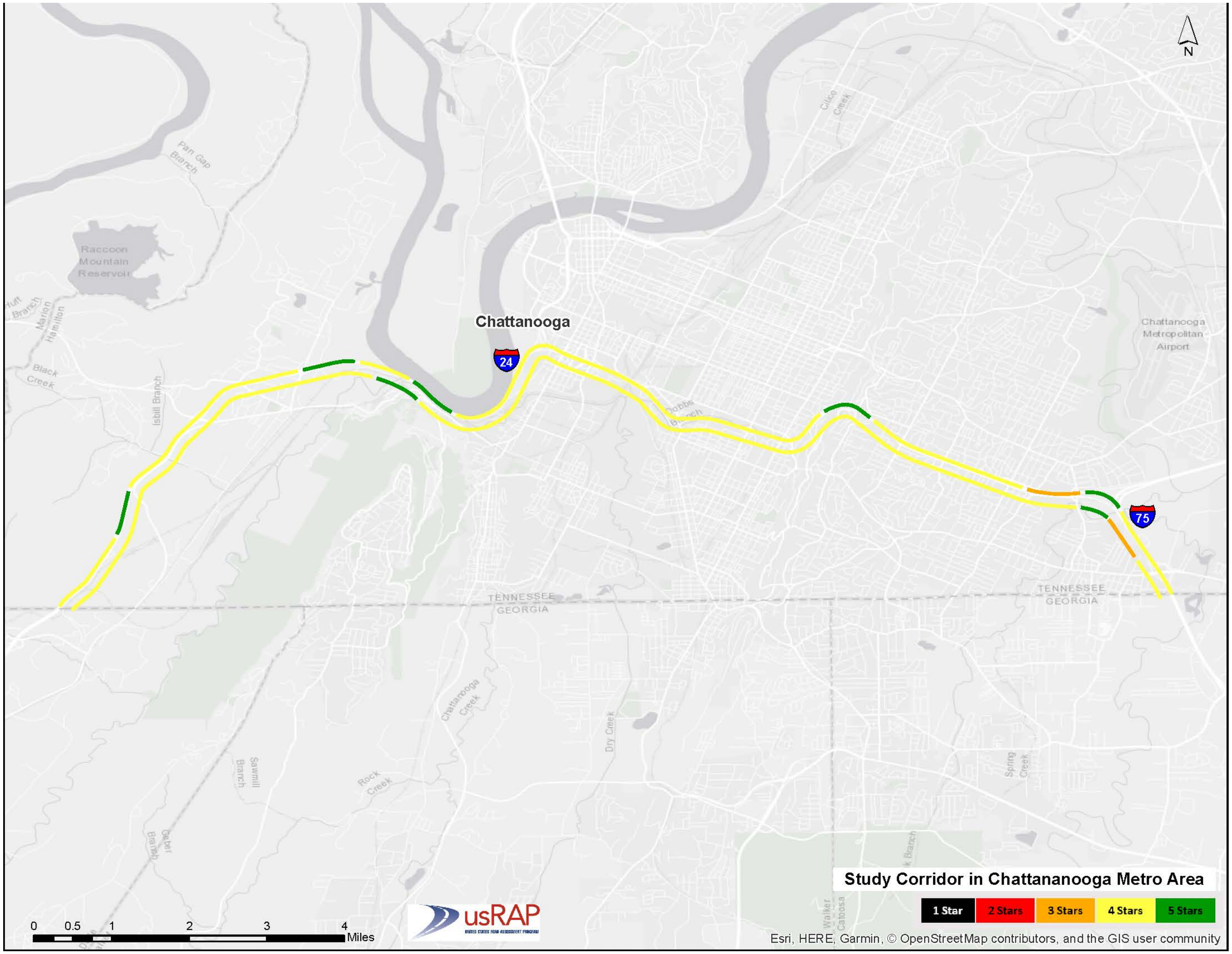
Miles
usRAP
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community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Chattanooga
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Raccoon Mountain Reservoir
Chattanooga Metropolitan Airport
TENNESSEE
GEORGIA
TENNESSEE
GEORGIA
Study Corridor in Chattananooga Metro Area
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4 Stars
5 Stars
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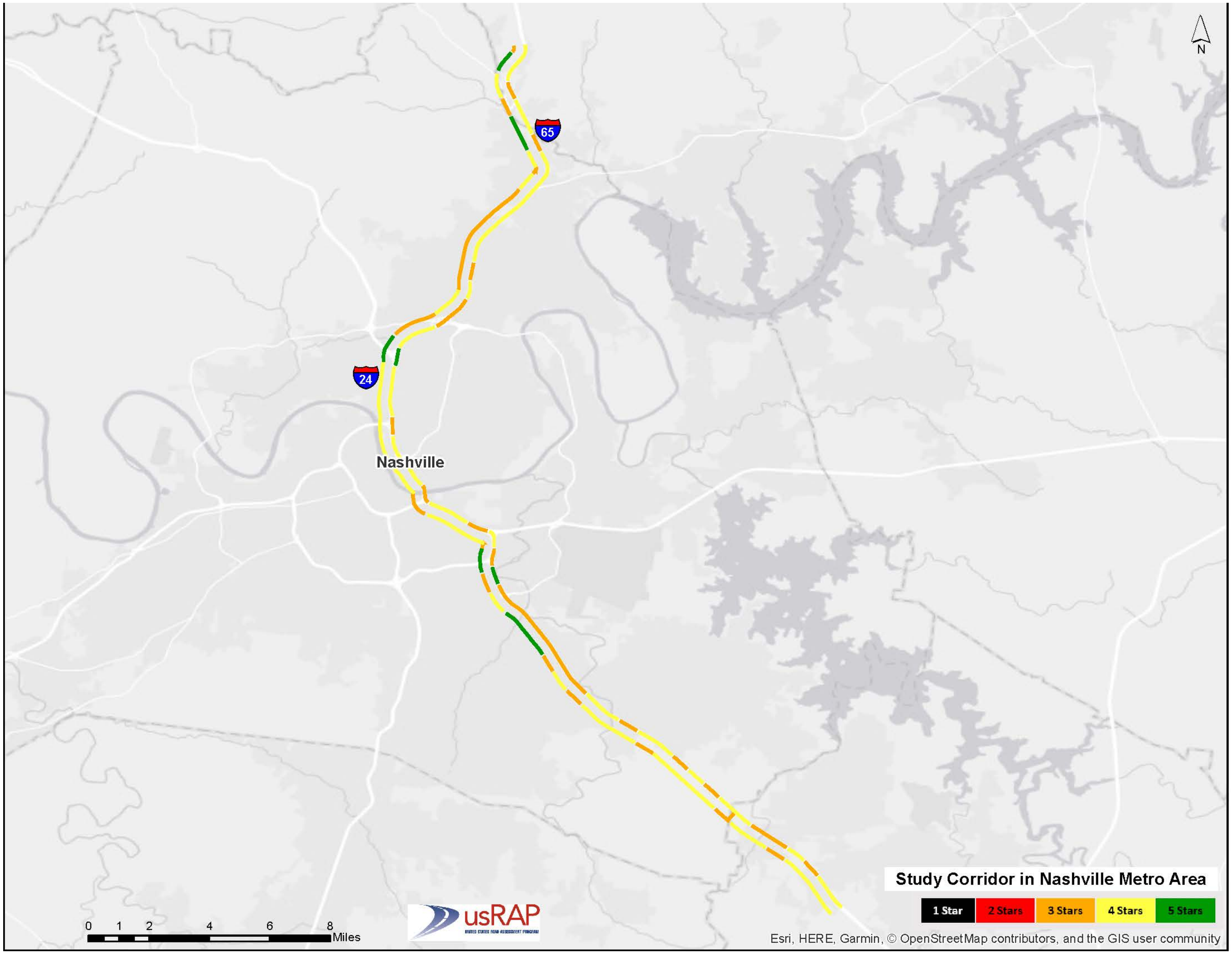
Miles
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community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24
Nashville
N
0 1 2 4 6 8
Miles
Study Corridor in Nashville Metro Area
1 Star
2 Stars
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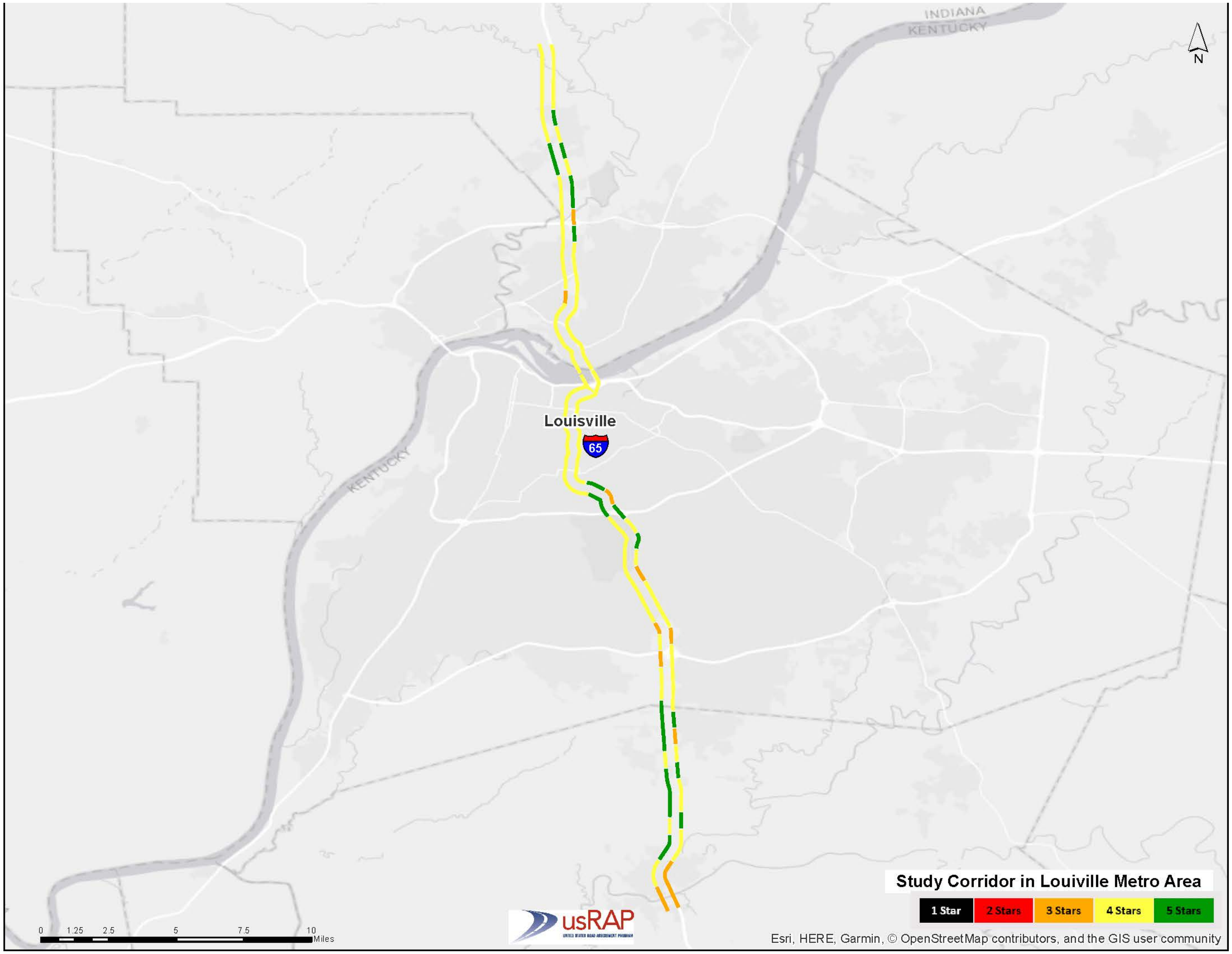
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KENTUCKY
N
Louisville
65
KENTUCKY
Study Corridor in Louiville Metro Area
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3 Stars
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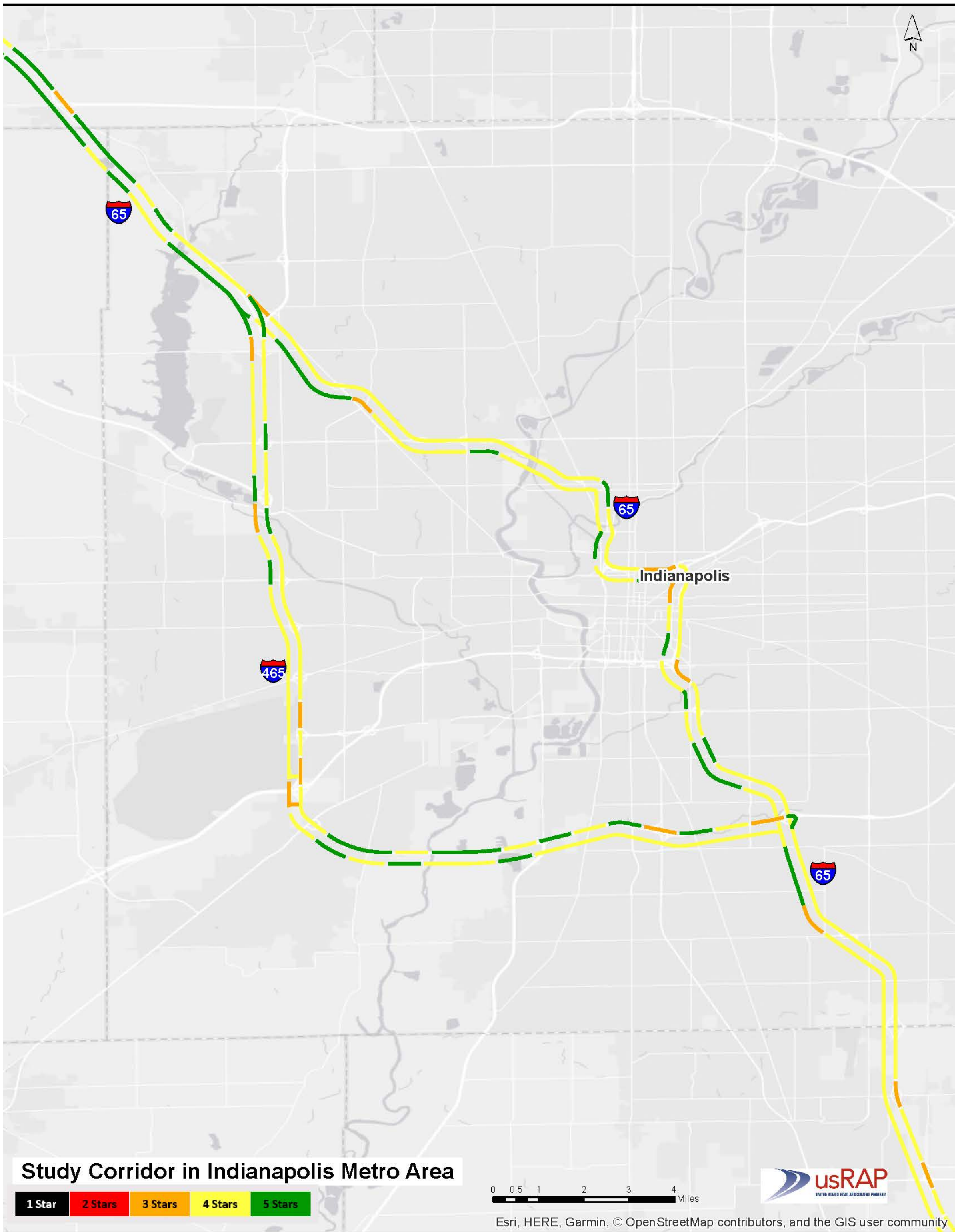
2.5
5
7.5
10
Miles
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



N
65
65
Indianapolis
465
65
Study Corridor in Indianapolis Metro Area
1 Star
2 Stars
3 Stars
4 Stars
5 Stars
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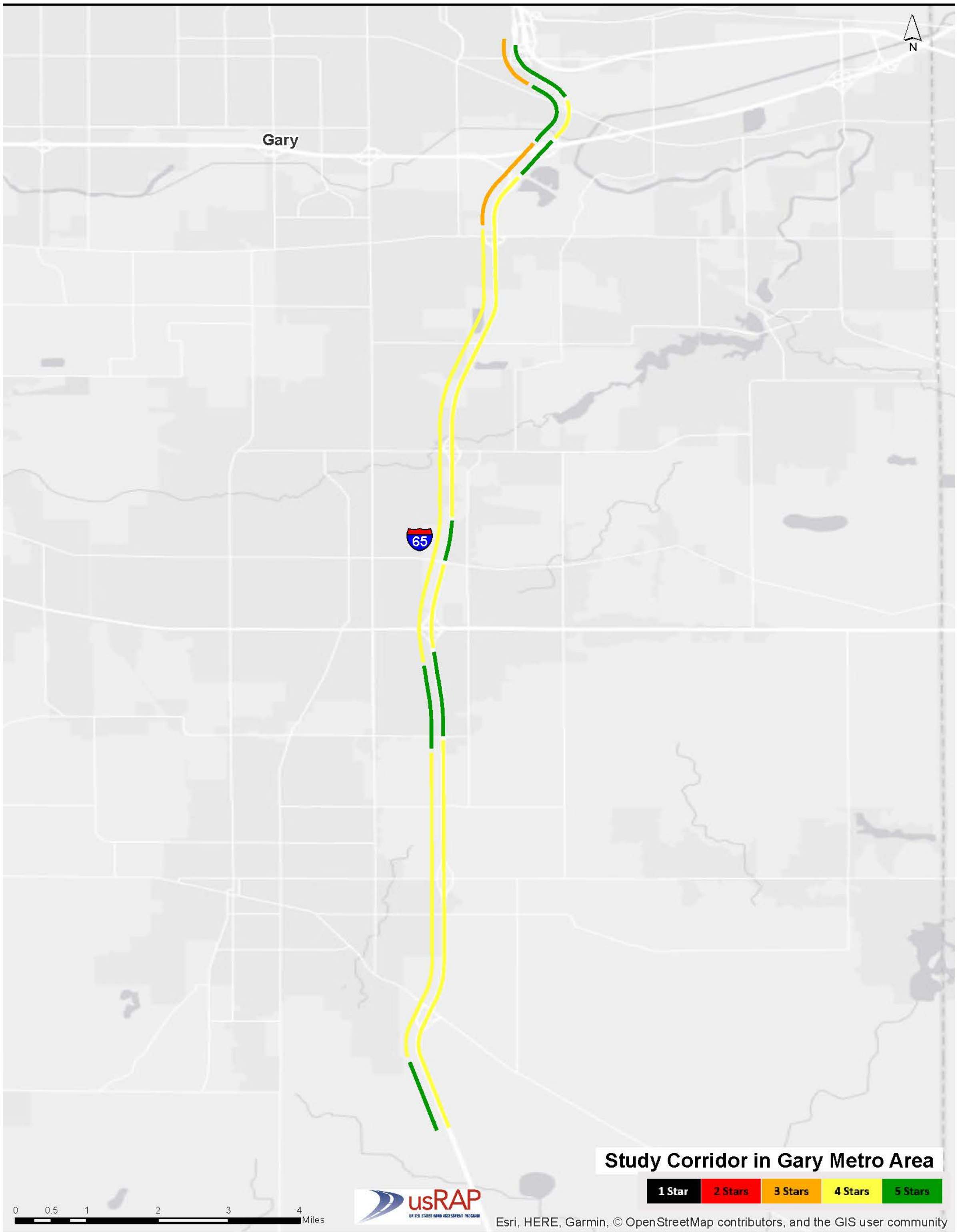
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


Gary
65
N
Study Corridor in Gary Metro Area
1 Star
2 Stars
3 Stars
4 Stars
5 Stars
0
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Miles
usRAP
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community