CHAPTER I
Purpose and Need Statement

A. Project Overview

1. Overview of Improve I-70

The Missouri Department of Transportation (MoDOT) and the Federal Highway Administration (FHWA) are investigating improvements to Interstate Route 70 (I-70) across Missouri, from Kansas City to St. Louis. This effort is known as Improve I-70. In accordance with the National Environmental Policy Act (NEPA), a tiered approach was taken in the Improve I-70 investigation. A First Tier Environmental Impact Statement (EIS) was initiated to examine the entire 200-mile (321.9-km) section of I-70. The First Tier EIS focused on identifying the most appropriate types of improvements for I-70 on a conceptual level. It also identified seven Sections of Independent Utility (SIU) within the 200-mile (321.9-km) First Tier study area. A series of Second Tier studies was undertaken to identify specific improvements most appropriate to each SIU. The Second Tier studies are more traditional project-oriented investigations. This document addresses SIU 4. The First Tier process is briefly summarized below as it relates to SIU 4. **Appendix I-A** contains a comprehensive summary of the First Tier process.

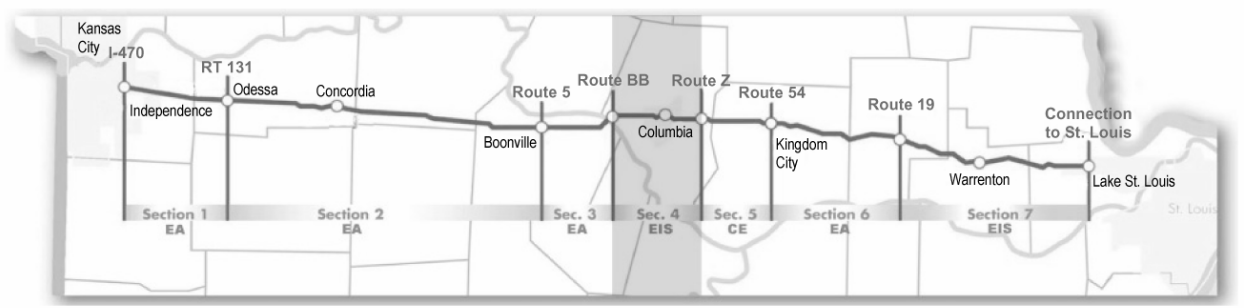
2. Overview of First Tier Process

With the issuance of a Record of Decision (ROD) for the First Tier EIS in December 2001, FHWA has approved/selected the Widen Existing I-70 Strategy for improving I-70 across the state of Missouri. This strategy is environmentally preferable and would result in the improvement and reconstruction of the existing facility. In a few areas, such as SIU 4, the possibility of continued investigation of relocating portions of the existing facility was also suggested. In those areas, the Second Tier studies would investigate not only the improvement and reconstruction of the existing facility, but also the viability of solving the SIU's transportation problems by implementing a relocation solution.

The First Tier Study also concluded that future travel demands would require six travel lanes in the rural sections of I-70 and eight or more lanes in the urban sections. Delineating the limits of urban and rural sections within each SIU would be determined in the Second Tier process.

As noted, the First Tier Study established the SIUs for the Second Tier EIS studies. Seven SIUs were created from the 200-mile (321.9-km) First Tier study area. Section of Independent Utility 4, the subject of this EIS, is the 18-mile (29.0-km) section of I-70 near Columbia. **Figure I-1** depicts the study area for the First Tier study and the seven SIUs created for the Second Tier studies. The establishment of the SIUs during the First Tier studies also established the logical termini to be used during the Second Tier studies.

Figure I-1: Improve I-70 First Tier Study Area and Second Tier SIUs



The overall goal of the Improve I-70 project is "to provide a safe, efficient, environmentally sound and cost-effective transportation facility that responds to corridor needs as well as expectations of a national interstate." This goal was discussed in the First Tier EIS purpose and need statement. The elements of the First Tier purpose and need statement are the following:

Roadway Capacity—Increase roadway system capacity in accordance with the projected travel demands to improve the general operating conditions of I-70.

Traffic Safety—Reduce the number and severity of traffic-related crashes occurring along I-70 between Kansas City and St. Louis.

Roadway Design Features—Upgrade roadway design features along I-70, including interchanges, roadway alignment and roadway cross sections.

System Preservation—Preserve the I-70 facility through continued and ongoing rehabilitation and maintenance activities of pavement and bridges.

Goods Movement—Improve the efficiency of freight movement using the I-70 corridor.

Access to Recreational Facilities—Facilitate motorist use of nearby regional facilities through improved accessibility.

National Security—The I-70 corridor plays an important role in the nation's defenses.

Each element was addressed in detail in the First Tier EIS as part of the corridor-wide purpose and need. The elements are applicable to the entire 200-mile (321.9-km) length of I-70 under study. They also serve as a starting point for the purpose and need statements for each individual SIU. The unique conditions within each of the individual SIUs would result in unique purpose and need statements, ones that would not only address the First Tier findings but also address site-specific conditions. **Table I-1** compares the linkages between the purpose and need elements from the First Tier EIS and those developed specifically for SIU 4. The balance of this document focuses on SIU 4.

Table I-1: Relationship and Linkage between the First Tier and Second Tier Purpose and Need Elements for SIU 4

Second Tier Purpose and Need Elements	First Tier Purpose and Need Elements	Linkage Between First Tier and Second Tier Purpose and Need Elements
1. Accommodate Existing and Future Traffic Volumes on I-70	Roadway Capacity	Virtually identical concepts. Second Tier focuses on the operational characteristics of the I-70 travel lanes.
2. Improve Outdated I-70 Design Elements	Roadway Design Features System Preservation National Security	Second Tier consolidates Roadway Design and System Preservation into a single element focused on eliminating outdated design elements and thus preserving the system. As a component of the Strategic Highway Network, I-70 has additional design elements it must adhere to.
3. Accommodate All Users of I-70	Goods Movement Access to Recreation Facilities	The Second Tier purpose and need broadens the concept of the different traffic streams to include not only those discussed in First Tier EIS, but also those specific to the Columbia-area (SIU 4).
4. Improve User Safety	Traffic Safety	Virtually identical concepts.

B. Proposed Action

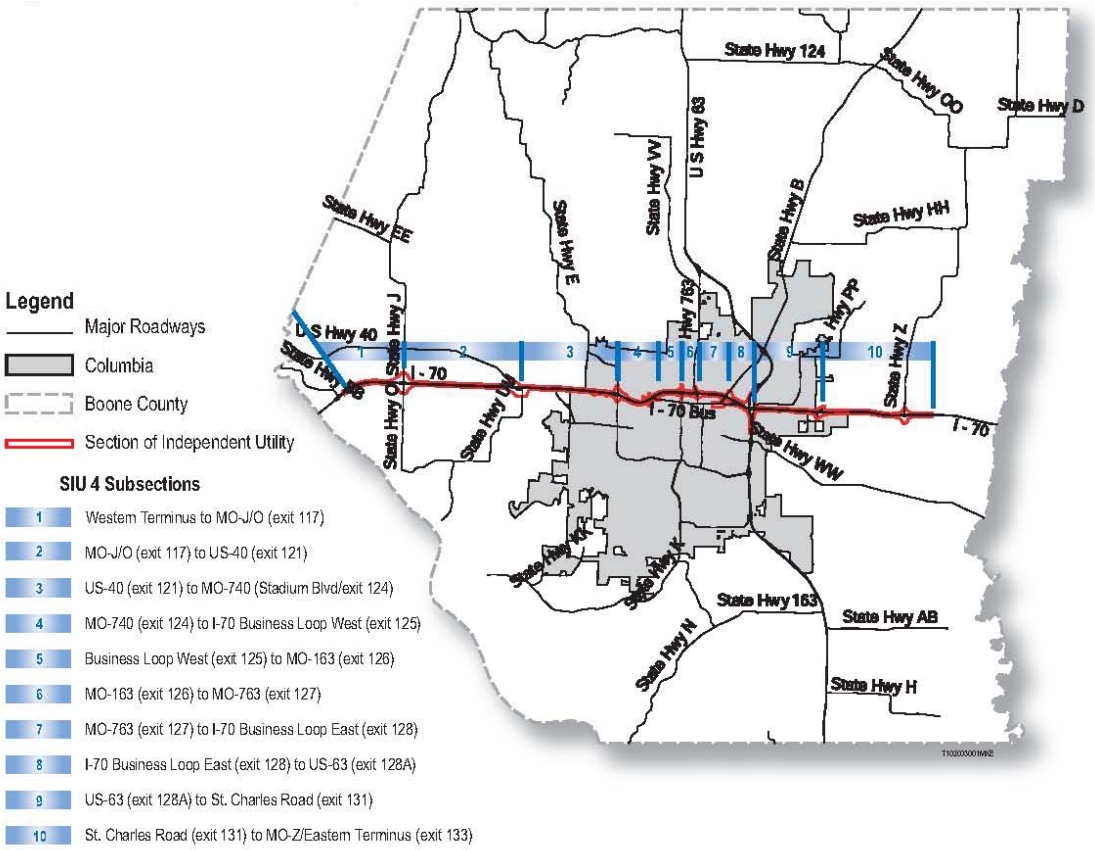
1. Project Background

Section of Independent Utility 4 includes the city of Columbia and the portion of I-70 from just west of the Missouri Route J/O interchange (MO-J/O, exit 117) to just east of the MO-Z interchange (exit 133). This 18-mile (29.0-km) section of four-lane divided highway has limited access and contains 10 interchanges. Section of Independent Utility 4 spans virtually the entire width of Boone County. The middle of the study area—the 7.7-mile (12.4-km) section of I-70 between the U.S. 40 interchange (exit 121) and the U.S. 63 interchange (exit 128A)—traverses the city of Columbia. The eastern and western ends of SIU 4 are outside the limits of Columbia and exhibit a noticeably less dense built environment, as compared to that in the Columbia portions of I-70. **Figure I-2** depicts the general vicinity of SIU 4.

As noted previously, MoDOT in consultation with FHWA, has been investigating the need to improve I-70 in SIU 4. The proposed action is the next step in implementing the highway improvements recommended in the First Tier EIS, which concluded with a Record of Decision in 2001. Relative to SIU 4, the Preferred Strategy (for study in the Second Tier) consists of (1) widening and improving I-70 along its existing alignment and (2) investigating the appropriateness of relocating the Columbia part of the corridor. In April 2002, the Second Tier study of a Near North corridor, a Far North corridor and an Improve Existing corridor was initiated (southerly relocations were eliminated from further consideration during the First Tier for reasons

that included higher potential environmental resource impacts, higher costs and lower user benefits).

Figure I-2: SIU 4 Vicinity Map



2. Logical Termini

The logical termini for SIU 4 were determined in the First Tier EIS and roughly conform to metropolitan planning boundaries[1]. The logical termini for SIU 4 are the following:

- **The MO-BB interchange (exit 115)—**The westernmost extent of SIU 4 is a point just east (prior to) of exit 115. Exit 115 is the first interchange east of the Missouri River crossing. This interchange and crossing are substantial undertakings and best considered together as part of SIU 3. From exit 115 eastward, the transportation problems associated with I-70 are related to the influence of Columbia.

[1] The Columbia Area Transportation Study Organization (CATSO) is the Metropolitan Planning Organization responsible for addressing the transportation needs of Boone County and the city of Columbia. The logical termini as well as the purpose and need of the Improve I-70 project conform with the goals of the CATSO Long-Range Transportation Plan. Chapter III.B.1.c describes in detail the transportation planning environment and Chapter III.B.2.k discusses the consistency of the I-70 project with the area's transportation planning goals.

- **The MO-Z interchange (exit 133)—**The easternmost extent of SIU 4 is exit 133. Exit 133 is the last interchange before the Boone County Line. From that point westward, the transportation problems associated with I-70 are related to the influence of Columbia.

These termini are logical because they encompass an area that will allow for the development/evaluation of all possible alternatives to address the area's transportation problems. Consequently, the SIU will not preclude any alternatives. Section of Independent Utility 4 fully represents the extent of influence that the City of Columbia has on I-70. The solution to the transportation problems associated with I-70 traversing a major urban center require examination of not only the current downtown portions of I-70, but also those outlying areas expected to experience similar development pressures in the future. Further, these termini are organized to allow for consideration of the full range of possible improvement scenarios for the adjoining SIUs, thereby not limiting the consideration of alternatives in those areas. Finally, these termini also avoid the bisection of known environmental constraints or important environmental resources.

3. Study Area Description

Within SIU 4, there are three principal local institutions that the Study Team coordinated with regarding transportation issues; these included the City of Columbia, Boone County and the Columbia Area Transportation Study Organization (CATSO). The study team met regularly with staff from CATSO, the City of Columbia and Boone County to determine and study the alternatives developed for the Columbia area. The group met regularly to review land use and traffic data, widening concepts and emerging alternatives. This collaborative effort provided guidance and insight throughout the process. The study team also made at least quarterly presentations to the CATSO board to update them on study progress and seek direction on Columbia-specific issues.

Because many of the traffic evaluations are organized by interchanges, the study area is described principally in those terms. The following text will describe the I-70 study area, sequentially. The description will proceed from west to east (mile marker 116 to 133). **Exhibit I-1** depicts the I-70 corridor and its most important cross roads and service roads.

a. Western Terminus to MO-J/O

The westernmost extent of SIU 4 is the point just east of the MO-BB interchange (exit 115). The interchange itself is a component of SIU 3. The distance between the western terminus and the MO-J/O interchange is 2.2 miles (3.5 km) long. The MO-J/O interchange is a standard diamond. MO Routes J and O are secondary state routes. There are no other crossroads or underpasses in this portion of I-70.

b. MO-J/O to U.S. 40

The distance between the MO-J/O interchange and the U.S. 40 interchange is 3.5 miles (5.6 km) (exit 117 to exit 121). The MO-J/O interchange is a standard diamond. The U.S. 40 interchange is a diamond with a direct loop connection to I-70, and is the eastern terminus of a separate U.S. 40. To the east, the route designation of U.S. 40 is on I-70. MO-UU begins on the eastbound U.S. 40 just before merging into I-70, and extends to the south. The skew of the U.S. 40 structure over I-70 is pronounced. The Midway Exposition Center and a truck stop are

located in the northwestern quadrant of the intersection. There are no other crossroads or underpasses in this portion of I-70.

c. U.S. 40 to MO-740

The distance between the U.S. 40 interchange and the MO-740 interchange is 3.2 miles (5.15 km) (exit 121 to exit 124). The MO-740 interchange is a standard diamond. Frontage roads flank both sides of I-70 (I-70 Drive NW and I-70 Drive SW). The interchange is the western terminus of MO-740 (MO-E begins at this point, extending to the north). MO-740, also known as Stadium Boulevard, is six miles (9.7 km) long and traverses central Columbia before ending with a grade-separated interchange at U.S. 63. The Sorrels Overpass Drive provides a connection between I-70 Drive NW and I-70 Drive SW, about 1.6 miles (2.6 km) west of the MO-740 interchange. The Sorrels Overpass Drive is roughly the westernmost extent of the city of Columbia. There are no other crossroads or underpasses in this portion of I-70.

d. MO-740 to I-70 Business Loop (west)

The distance between the MO-740 interchange and the western I-70 Business Loop interchange is 1.2 miles (1.9 km) (exit 124 to exit 125). The portion of I-70 Drive NW between Stadium Boulevard and exit 125 is known as the Western I-70 Business Loop. The business loop is about four miles (6.4 km) long and roughly parallels I-70. The Western Business Loop is north of I-70, the Eastern Business Loop to the south. The interchange is a modified diamond. The existing structure over I-70 is at a pronounced skew. This portion of I-70 is considered to be the central part of the Columbia corridor. There are no other crossroads or underpasses in this portion of I-70.

e. I-70 Business Loop (west) to MO-163

The distance between the Business Loop West interchange and the MO-163 interchange is one mile (1.6 km) (exit 125 to exit 126). The northern terminus of MO-163(known locally as Providence Road) is the I-70 interchange. Providence Road extends less than one mile (1.6 km) further north before it ends as a T-intersection with Vandiver Drive (an arterial). Missouri-163 is an important north-south corridor within the city of Columbia. The MO-163 interchange is a standard diamond. Garth Avenue is the only other crossroad over- or underpass in this portion I-70 of roadway.

f. MO-163 to MO-763

The distance between the MO-163 interchange and the MO-763 interchange is 0.5 mile (0.8 km) (exit 126 to exit 127). The MO-763 interchange is a standard diamond. The southern terminus of MO-763 (known locally as Range Line Road) is the intersection with Business Loop I-70 (0.3 mile [0.5 km] south of I-70). MO-763 continues northward 4.2 miles (6.8 km) and ends with the interchange at U.S. 63. There are no other crossroads or underpasses in this portion of I-70.

g. MO-763 to I-70 Business Loop (east)

The distance between the MO-763 interchange and the Business Loop East interchange is 1.3 miles (2.1 km) (exit 127 to exit 128). Movements at exit 128 are limited to westbound I-70 traffic to westbound Business Loop and eastbound Business Loop traffic to eastbound I-70. The Paris Road overpass is at a pronounced skew to I-70. A rail line passes over I-70, parallel to Paris Road in this area. There are no other crossroads or underpasses in this portion of I-70.

h. I-70 Business Loop (east) to U.S. 63

The distance between the Business Loop East interchange and the U.S. 63 interchange is 0.6 mile (1.0 km) (exit 128 to exit 128A). The eastbound and westbound parts of this portion of I-70 are on different alignments to facilitate the westbound ramps to the Business Loop. There is a standard diamond at U.S. 63. A U.S. 63 bypass of the interchange lies immediately to the west of the interchange. North-south through traffic on U.S. 63 can take the 1.2-mile (1.9 km) bypass and avoid the I-70/U.S. 63 interchange. There are no other crossroads or underpasses in this portion of I-70.

i. U.S. 63 to St. Charles Road

The distance between the U.S. 63 interchange and the St. Charles Road interchange is 2.1 miles (3.4 km) (exit 128A to exit 131). The St. Charles Road interchange is a standard diamond. A frontage road flanks the southern side of I-70 (i.e., I-70 Drive SE). The interchange is at the current outer limits of the city of Columbia. There are no other crossroads or underpasses in this portion of I-70.

j. St. Charles Road to MO-Z

The distance between the St. Charles Road interchange and the MO-Z interchange is 2.8 miles (4.5 km) (exit 131 to exit 133). The MO-Z interchange is a standard diamond. Frontage roads flank both sides of the interstate (I-70 Drive SE extends east and west of MO-Z and I-70 Drive NE starts at MO-Z and extends eastward). The MO-Z interchange is the last interchange within SIU 4. The study area extends eastward of the interchange only far enough to encompass the interchange ramps and transition to SIU 5. There are no other crossroads or underpasses in this portion of I-70.

C. Elements of Purpose and Need

Purpose and need are the transportation-related problems that a project is intended to address. The generation and evaluation of alternatives is conducted to develop the most appropriate solution to the identified problems. A preferred alternative would be selected, in part, on the basis of how well it satisfies the project's purpose and need.

The purpose and need associated with the Second Tier of the I-70 (SIU 4) EIS is to:

1. Accommodate existing and future traffic volumes on I-70;
2. Improve outdated I-70 design elements;
3. Accommodate all users of I-70; and
4. Improve user safety.

The remainder of this section addresses these elements. Together, the purpose of and need for the I-70 improvements shape the range of alternatives generated and evaluated in Chapter II.

1. Accommodating Existing and Future Traffic Volumes on I-70

Within SIU 4, the overall volume of traffic on I-70 is projected to at least double between 2000 and 2030[2]. With the No-Build Alternative, these increases would result in poor operational conditions for travelers on I-70. One element of the purpose and need is to develop alternatives that accommodate existing and projected traffic volumes.

Table I-2 summarizes traffic volume projections for 2000 and 2030 by roadway section under the No-Build Alternative. The projections are given in Average Daily Traffic (ADT). In 2000, I-70 traffic volumes ranged from 33,017 to 59,714. In 2030, I-70 traffic volumes are expected to range from 81,610 to 120,210. Nearly every portion of the system would experience at least a doubling in volume. The largest increase—158 percent—occurs between St. Charles Road and MO-Z. Both the overall magnitude of the volumes and the projected increases vary by location within the corridor. **Figure I-3** shows that the total volume of traffic within the Columbia parts of I-70 is higher than at the eastern or western ends. Within Columbia, 2030 ADT volumes routinely exceed 100,000. On the other hand, the traffic increases (on a percentage basis) are higher in the non-Columbia areas.

Table I-2: No-Build I-70 Traffic Volumes

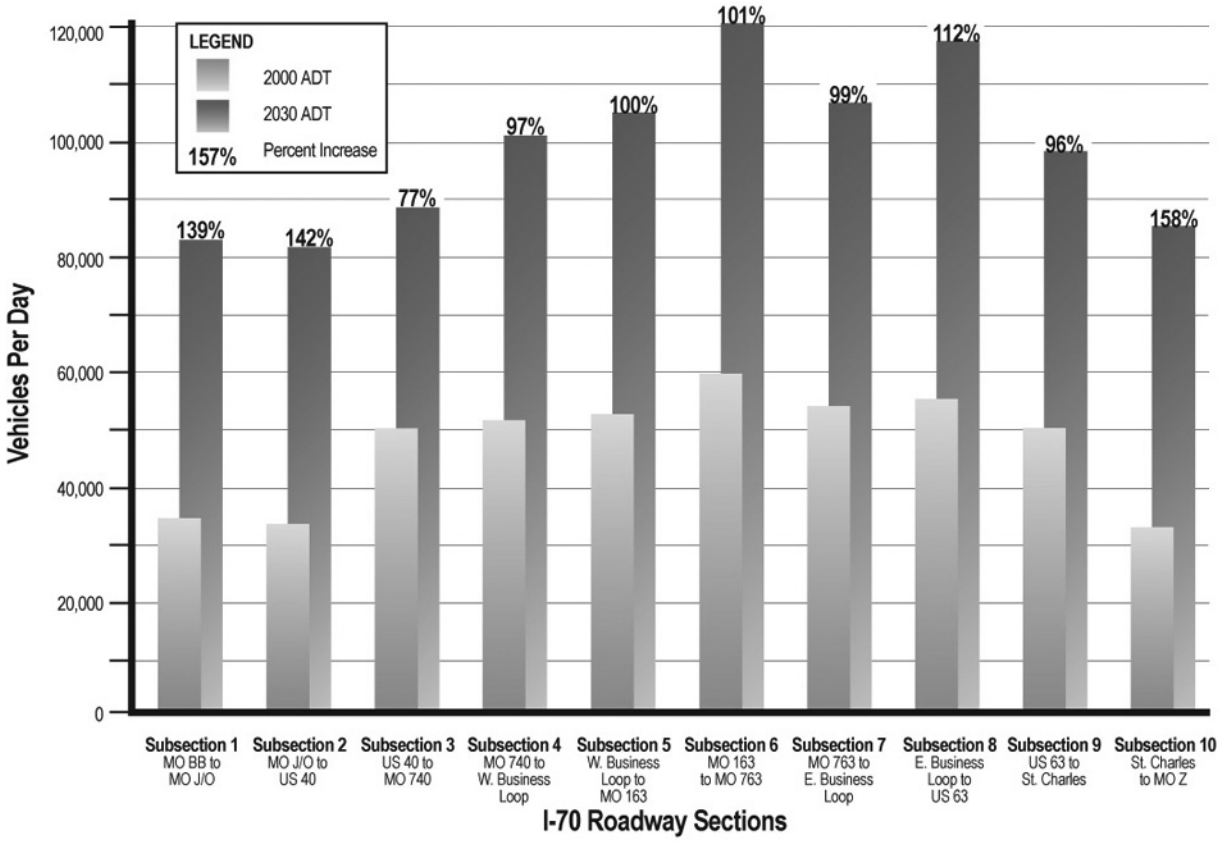
SIU 4 Subsection	2000 Average Daily Traffic	2030 Average Daily Traffic
1 MO-BB to MO-J/O	34,678	83,000
2 MO-J/O to U.S. 40	33,718	81,610
3 U.S. 40 to MO-740	50,149	88,940
4 MO-740 to Business Loop West	51,515	101,450
5 Business Loop West to MO-163	52,880	105,670
6 MO-163 to MO-763	59,714	120,210
7 MO-763 to Business Loop East	54,069	107,420
8 Business Loop East to U.S. 63	55,529	117,920
9 U.S. 63 to St. Charles Road	50,192	98,500
10 St. Charles Road to MO-Z	33,017	85,230
Note: Year 2002 traffic data has been reviewed. The results of the evaluation indicate no need to change the conclusions previously developed. Therefore, the traffic data and analysis has not been updated from the year 2000.		

As part of the Second Tier evaluation, all of SIU 4 is considered urban (for design purposes), except for the westernmost sections, between the western terminus and U.S. 40. The distinction between urban and rural pertains primarily to existing conditions and anticipated future development. In the urban area, the 2000 traffic volumes range from 33,017 to 59,714. In 2030, the urban volumes increase to between 85,230 and 120,210 (an increase of about 107 percent).

[2] The project's traffic calculations use year 2000 as an approximation of existing conditions and year 2030 as the Design Year. The year 2000 volumes come from MoDOT traffic count data. The year 2030 volumes come from the I-70 Columbia Travel Demand Model that was developed primarily from the CATSO Regional Travel Demand Model. The I-70 Columbia Travel Demand Model incorporated the roadway improvements discussed in the CATSO Long-Range Transportation Plan.

In the rural areas, the 2000 traffic volumes range from 33,718 to 34,678. In 2030, the rural volumes increase to between 81,610 and 83,000 (an increase of about 141 percent).

Figure I-3: No-Build I-70 Traffic Increases from 2000 to 2030



The distinction between urban and rural areas is important because it connotes a difference in the threshold for acceptable operation. In general, space is at a premium in urban areas. The higher level of development makes the construction costs and negative impacts of roadway improvements higher than for comparable improvements in rural areas. Also, there is a difference in driver expectations (such as reduced speed limits) in transitions from rural to urban highway sections. These fundamental differences result in a distinction relative to what is acceptable with respect to operational levels in urban and rural highway sections. In recognition of the difference between urban and rural highways, the threshold level of service (LOS) established for the I-70 project is LOS D in urban sections and LOS C in rural sections.

Level of Service is a measure of a highway's ability to handle traffic demand. Traffic parameters and roadway design factors, such as ADT volumes, percentage of daily volume occurring in the peak-hour, truck percentages, number of driving lanes, lane widths, vertical grades, presence or absence of traffic signals and type of access and spacing allowed all affect LOS. Guidelines for calculating LOS on various types of highways have been established by the Transportation Research Board (*Highway Capacity Manual,* Special Report 209, 2000). The LOS ranges from A to F in order of decreasing operational quality. The LOS categories used to describe freeway operations are summarized as follows:

LOS A—Uninterrupted traffic flow, lower volumes and higher travel speeds.

LOS B—Stable traffic flow, increasing traffic and reduced travel speed due to congestion.

LOS C—Stable flow, increasing traffic, travel speeds and maneuverability are restricted by higher volumes.

LOS D—Approaching unstable flow, tolerable travel speeds but considerably affected by changes in operating conditions.

LOS E—Unstable flow, with possible stopped conditions, lower operating speeds and volume approaching capacity of the roadway.

LOS F—Unstable flow, with speeds at low or stopped condition for varying times caused by congestion when downstream traffic volumes are at or over the roadway capacity.

The concept of LOS for highway operation is visually depicted in **Figure I-4**.

Figure I-4: Visual Depictions of Level of Service

Using LOS and the appropriate thresholds, all but one of the existing (2000) operations along I-70 are acceptable, for all sections, in both directions. The MO-163 Interchange area does not meet the threshold LOS for existing (2000) operations. By 2030 under the No-Build scenario, the situation is projected to be much different. If no corrective action is undertaken, all sections would fail to meet the threshold LOS (**Table I-3**). The central Columbia sections (near the Business Loop) perform the worst. The stop and go conditions that characterize LOS F are expected throughout this area. A LOS E or F is expected from MO-740 to St. Charles Road.

Because the existing facility would be unable to accommodate the traffic volumes expected to use it, one part of the purpose and need is to develop alternatives that would accommodate

existing and projected traffic volumes on I-70. As **Table I-1** shows, the need to accommodate existing and future traffic volumes is nearly identical to the Roadway Capacity purpose and need element presented in the First Tier EIS. The operational characteristics of the interchanges within SIU 4 are also predicted to be very poor. The conditions at the I-70 interchanges are discussed, within the context of SIU 4, as they relate to the need to accommodate all of the different traffic streams that use I-70 (the third element discussed in this section). This is appropriate because the poor traffic conditions at the interchanges seem to be better described as the result of conflicts occurring between traffic types, rather than merely as a capacity problem. A strategy to accommodate the users of I-70 must be developed in association with the redesign of the project's interchanges.

Table I-3: No-Build I-70 LOS Data

SIU 4 Subsections/Interchange Area	Desired Level of Service	2000 Peak Hour Level of Service		2030 Peak Hour Level of Service	
		Eastbound	Westbound	Eastbound	Westbound
1 MO-BB to MO-J/O	C	B	B	**D**	**D**
MO-J/O Interchange Area	C	B	B	**D**	**D**
2 MO-J/O to U.S. 40	C	B	B	**F**	**F**
U.S. 40 Interchange Area	D	C	C	**F**	**F**
3 U.S. 40 to MO-740	D	C	C	**F**	**F**
MO-740 Interchange Area	D	D	D	**F**	**F**
4 MO-740 to Bus Loop West	D	C	C	**F**	**F**
B. Loop (W) Interchange Area	D	D	D	**F**	**F**
5 Bus Loop West to MO-163	D	D	D	**F**	**E**
MO-163 Interchange Area	D	D	**E**	**F**	**F**
6 MO-163 to MO-763	D	C	D	**F**	**F**
MO-763 Interchange Area	D	D	D	**F**	**F**
7 MO-763 to Bus Loop East	D	D	D	**F**	**F**
B. Loop (E) Interchange Area	D	D	D	**F**	**F**
8 Bus Loop East to U.S. 63	D	D	D	**F**	**F**
U.S. 63 Interchange Area	D	D	D	**F**	**F**

Table I-3: No-Build I-70 LOS Data

SIU 4 Subsections/Interchange Area	Desired Level of Service	2000 Peak Hour Level of Service		2030 Peak Hour Level of Service	
		Eastbound	Westbound	Eastbound	Westbound
9 U.S. 63 to St. Charles Road	D	C	C	**F**	**F**
St. Charles Interchange Area	D	D	D	**F**	**F**
10 St. Charles Road to MO-Z	D	B	B	**F**	**F**
MO-Z Interchange Area	D	B	B	**E**	**E**

Shaded Bold *indicates that the LOS does not meet the threshold criteria.*

Rural LOS Threshold: C

Urban LOS Threshold: D

Subsections 1-3 are Rural; all others are Urban.

The interchange Area LOSs are composite LOSs, meaning that they represent the worst LOS of the respective ramps and mainline traffic within each interchange area.

Year 2002 traffic data have been reviewed. The results of the evaluation indicate no need to change the conclusions developed previously. Therefore, the traffic data and analysis have not been updated from the year 2000.

2. Improve Outdated I-70 Design Elements

Interstate 70 has been in place for many decades and several design features do not meet the standards required of modern roadway facilities. Because the overall intent of the Improve I-70 program is the examination of a 200-mile (321.9 km) section of I-70 and redeveloping it to satisfy future needs, there is an opportunity to correct outdated design elements. The First Tier study concluded that regardless of the benefits that a relocation alternative may have, the existing roadway would continue to be important and should comply with current standards. Consequently, one element of the purpose and need is to improve the existing facility in order to more closely adhere to current standards.

As defined here, outdated design elements are geometric elements of the roadway design that do not adhere to current standards. An example of this would be roadway lane widths that are narrower than the applicable minimum. There are numerous geometric standards associated with a roadway design, including horizontal alignment, vertical alignment, cross section elements and median width. Poorly adapted design elements degrade operation and safety. The conditions found within SIU 4 are not uncommon to an interstate highway of this age, and are often the result of reasonable standards and decision-making at the time of the original design. As the planning process moves toward implementation of a large-scale improvement project, it is prudent to design the preferred alternative to improve as many outdated design elements as possible. All other things being equal, an alternative that eliminates outdated design elements is superior to one that does not.

In considering design features for improvement, the First Tier EIS included recommendations for improving roadway conditions. Features identified for improvement included shoulder and median widths, clear zones, vertical alignments, climbing lane placement and interchange

configurations[3]. The Second Tier analysis began with an examination of existing conditions. Several of the roadway design features are summarized below:

a. Horizontal Alignment

To evaluate the horizontal alignment, a maximum degree of curvature was used. This was calculated assuming a design speed of 75 miles per hour (mph) in the rural sections and 70 mph in the urban section. The maximum degree of curvature (central angle of a circle, subtended by a 100-foot [30.5-m] arc) was compared to the Second Tier standard of 1°30′ (3,820-foot [1,164.3-m] radius) with an eight percent superelevation (banking of the road). Locations of I-70 that fail to maintain this standard include the following:

- The 1°59′59" degree of curvature (2,865-foot [873.3-m] radius) at the Stadium Boulevard interchange;
- The 2°01′31" degree of curvature (2,829-foot [862.3-m] radius) between the Stadium Boulevard interchange and Business Loop West interchange; and
- The 2°59′58" degree of curvature (1,910-foot [582.2-m] radius) at the interchange of I-70 and U.S. 63.

b. Vertical Alignment

The required safe stopping sight distance (SSD) for passenger vehicles is defined by the design speed of the road. The design speed of 75 mph was used for rural areas and 70 mph for urban areas. A ramp design speed of 50 mph was used throughout. The SSD defines the rate of vertical curvature (K = length of curve in feet/difference in grades in percent). The Second Tier standard for crest vertical curves is 312 in rural sections and 247 in urban sections. For sag vertical curves the rates are 206 and 181 respectively. These K-Values were used to evaluate the existing vertical alignment.

Approximately one-half the vertical curves in SIU 4 fail to meet these standards. Adherence to this basic element of roadway design is expected to yield important safety and operational benefits.

c. Vertical Clearance

To allow traffic to pass under bridges safely, a 19'-0" (5.8-m) vertical clearance goal has been established for SIU 4. Of the existing bridges over I-70, only U.S. 63 Southbound achieves this

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[3] MoDOT, in coordination with FHWA, has established overall program-level design criteria and guidance for the Second Tier preliminary engineering studies of the I-70 improvements. These guidelines were established based on MoDOT's *Policy Procedure and Design Manual* and AASHTO's *Policy on Geometric Design of Highways and Streets*. However, recognizing that the investments in I-70 would be long term, more stringent and conservative design criteria have been defined in anticipation of future corridor needs and ever-evolving design parameters. A more flexible design criteria has been established allowing design flexibility within the corridor yielding a more comprehensive assessment of impacts (more "worst case assessment"). Furthermore, a more stringent design criteria provides a more conservative estimate of the impacts of the project for the purposes of the environmental planning process and documentation. As an example, the minimum vertical clearance at bridges is greater than what would be required per currently adopted standards. This would allow the improvements to accept future changes in vertical clearance requirements. For all such instances, MoDOT would assess the program's overall design criteria during subsequent design development and is committed to adhering, at a minimum, to the appropriate currently adopted criteria and design standards. The goal would be to provide a consistent standard throughout the corridor. However, MoDOT recognizes that constraints in some areas, such as the urban areas, may affect the ability to reasonably accomplish the more stringent criteria. If necessary, the rural areas may provide a more stringent design while the urban areas, due to tighter constraints, may hold to the minimum design standards.

goal. The MoDOT minimum vertical clearance for grade separation structures is 16'-6" (5.05-m). Eight of the thirteen existing bridges over I-70 do not meet the MoDOT minimum vertical clearance. The existing bridges that meet minimum vertical clearance are at MO-B, U.S. 63 Connector, U.S. 63 Southbound, U.S. 63 Northbound, and MO-Z.

d. Median Width

The size and condition of the median (the area between the eastbound and westbound lanes) plays an important role in safety and operation. The Second Tier goal is 124 feet (37.8 m) in rural areas and median treatment of 26 feet (7.9 m), plus two 12-foot (3.7 m) shoulders with a median barrier in urban areas. No sections of the existing facility meet this goal.

e. Pavement Condition

The pavement serviceability rating (PSR), collected by MoDOT in 2002, was used to evaluate pavement condition. The pavement condition for 81 percent of the subsection was rated as fair or good as shown in **Table I-4**. The following sections received a poor or very poor rating: westbound section from U.S. 40 to MO-740, eastbound section from Business Loop West to MO-163 and the westbound section from St. Charles to MO-Z. MoDOT has an ongoing pavement resurfacing program so that at any given time the percentage of poor pavements will vary.

Table I-4: Pavement Serviceability Rating Percentages for I-70

PSR RATING	GOOD	FAIR	POOR	VERY POOR
% of SIU 4	16	65	13	6

f. Bridge Condition

There are 24 bridges along or over I-70 in SIU 4. Most of the bridges were built when the interstate was constructed in the 1950s and 1960s and completed around 1965 Therefore, most of the bridges are between 39 to 54 years old. Bridges typically are designed to last about 50 to 75 years; concrete structures generally last longer than steel structures. The bridge ratings indicate that three bridges in SIU 4 are in very poor condition and these three are the U.S. 40 bridge over I-70, the Sorrels Overpass Drive bridge over I-70 and the I-70 West loop ramp over I-70 eastbound. At a minimum, these three bridges require replacement, regardless of whether the No-Build Alternative is selected. The other bridges in SIU 4 are serviceable but aging. As many as 10 bridges are in need of substantial repair in the near future to maintain their structural integrity. Most of the I-70 overpass bridges do not provide adequate inside and/or outside shoulders for the roadway on the bridge.

To evaluate bridge condition, the bridge inspection ratings were used. Bridge inspection ratings are numeric values that range from zero to nine. Three different aspects of each bridge are rated and they are the bridge deck, the bridge superstructure and the bridge substructure. All of the bridges on I-70 have a substructure rating above five (fair condition). A majority of the substructure ratings were a six (satisfactory condition) or seven (good condition). All of the bridges have a superstructure rating above five (fair condition). A majority of the substructure ratings fell in a range of five (fair condition) to seven (good condition). All but three of the bridges had a deck rating above five (fair condition). The following three bridges have a deck rating of three (serious condition): the U.S. 40 bridge over I-70, the Sorrels Overpass Drive

bridge over I-70 and the I-70 West loop ramp over I-70 eastbound. The number of bridges in each component condition for SIU 4 is shown in **Table I-5**. This table includes all bridges on and over I-70.

Table I-5: Number of Bridges Categorized by Bridge Condition Ratings

Bridge Condition Rating and Description	Deck	Super	Sub
9 - New/Excellent Condition	1	0	2
8 - Very Good Condition - no repairs needed	2	2	2
7 - Good Condition - needs minor maintenance	8	13	8
6 - Satisfactory Condition - needs major maintenance	4	3	11
5 - Fair Condition - needs major rehabilitation	6	6	1
4 - Poor Condition - needs major rehabilitation	0	0	0
3 - Serious Condition - needs immediate repair or rehabilitation	3	0	0
2 - Critical Condition - facility closed - needs urgent repair or rehabilitation	0	0	0
1 - Imminent Failure Condition - facility closed - study to determine if repairs are possible	0	0	0
0 - Failed Condition	0	0	0
Deck = Bridge Deck *Super = Bridge Superstructure* *Sub = Bridge Substructure*			

g. Summary

The existing facility includes design features not in compliance with current standards/guidelines. Adherence to these standards/guidelines maximizes the opportunity for efficient and safe operation, therefore one element of purpose and need for SIU 4 is to develop alternatives that would improve as many outdated design elements as possible. Design standards are discussed in more detail in Chapter II. **Appendix II-A** contains a tabular report of the applicable design criteria.

3. Accommodate All Users of I-70

Section of Independent Utility 4 is roughly equidistant between the major population centers of Missouri: Kansas City and St. Louis. Interstate 70 is the primary east-west link across the state. As a result, it plays an important role in freight movement and general inter/intra-state travel. This is borne out by the high percentages of truck traffic and through movements within the I-70 traffic stream. Because SIU 4 traverses the city of Columbia[4], it is also an important component

[4] The local transportation planning agencies have extensively documented the transportation issues associated within Columbia/Boone County. The responsibility for ensuring the adequacy of the transportation system within Boone County and Columbia is shared among the City and County governments and with CATSO. The principal planning documents developed by

in the local roadway network. The numerous I-70 interchanges within Columbia allow local users[5] to enter and exit I-70 throughout the city. This creates a situation where the existing traffic streams are in conflict. Trucks present an additional operational challenge because of their size and limited maneuverability. Motorists (truck and non-truck) on non-local and through trips expect the interstate to minimize their travel time, making them less likely to react well to sudden stops or movements. Local users can also be either trucks or passenger vehicles. By their nature, they tend to strain interchange capacities because, per mile of travel, they use such facilities very heavily. The high numbers of entrances and exits tend to create conflicts with through traffic. It is the intent of this project to accommodate the various traffic streams to the extent practical. Consequently, one element of the purpose and need for SIU 4 is to develop alternatives that accommodate all users of I-70. All other things being equal, the alternative that best accommodates all users of I-70 would be superior.

The remainder of this section discusses the elements related to accommodating all users of SIU 4. The nature of the major traffic streams that use I-70 is discussed first, followed by an investigation of interchange operation. Operations at the interchanges affect all I-70 users. Finally, how local movements interface with I-70 would also be examined. This includes how I-70 affects north-south traffic and how the existing service road system affects operation. How well alternatives accommodate the different traffic streams, how well they manage traffic at the interchanges and how effective they are at providing non-highway alternatives for local travelers would determine the extent to which they can be said to accommodate all of the users of I-70.

a. I-70 Traffic Streams

Based on an examination of I-70 traffic data, several distinct traffic streams can be identified. This section will examine I-70 traffic in terms of its substantial truck component, the traditional long-distance (through) traffic component and the local traffic stream associated with Columbia. The basic nature of these traffic streams bring them into conflict. Within SIU 4, the conflicts can be substantial as traffic is forced to negotiate an urban area. The magnitude of the conflicts make the development and evaluation of alternatives difficult. In order to evaluate the ability of different roadway configurations to accommodate these traffic streams, the development of alternatives would first examine the impacts associated with the application of management systems uniformly throughout the corridor. Based on the results, different combinations, or hybrids, can be investigated. This process is more fully examined in Chapter II.

Truck Traffic

According to the MoDOT Long-Range Transportation Plan, roughly 35 percent of all freight moving into and out of Missouri is moved by truck. Within Missouri, 87 percent of freight movement is by truck. The First Tier EIS concluded that encouraging any meaningful amount of freight/truck trips to use other modes (e.g., rail instead of truck) is very difficult. The magnitude

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these organizations include the region's existing Thoroughfare Plan, Long-Range Transportation Plan, mass transit facilities and plans, air and rail service and bicycle/pedestrian resources. Through reference to these plans, it would be possible to determine how alternatives would affect the existing and planned transportation environment. The integration of local interests is the heart of this purpose and need element. Its importance also led to the inclusion of the local planning agencies in the project team. Chapter III.B.1.c describes the local transportation planning environment and uses it in the identification of the recommended preferred alternative.

[5] Local is defined as those vehicles that use I-70 as a link in their trips as they would any other arterial or collector roadway. In general, local trips are incompatible with the transportation planning goals of the Interstate Highway System. Rather than distance traveled, the local trips are more easily identified by their travel pattern. Local trips tend to enter and exit I-70 after travelling only an interchange or two.

of the transition that would be necessary to make a demonstrable difference on I-70 is unlikely, even under the most ambitious program.

Along the entire length of I-70, truck traffic varies from 22 to 32 percent of the total traffic volume. In addition, almost 90 percent of the trucks on I-70 are combination vehicles, such as tractor trailers. According to the *Highway Capacity Manual,* the principal characteristic influencing capacity, service flow rate and LOS is vehicle type. Heavy vehicles affect traffic adversely because they occupy more space and have poorer operating capabilities than other vehicles. They can create large gaps in the traffic stream because the trucks cannot keep pace with the passenger vehicles. The gaps are difficult to fill by normal passing movements and represent serious inefficiencies. According to the *Highway Capacity Manual,* one truck is the equivalent of 1.5 to eight passenger cars, depending on terrain. Because of their prevalence along I-70, trucks represent a distinct traffic stream that the SIU 4 project needs to address.

Within SIU 4, truck traffic makes up roughly 22 percent of the traffic stream. On a vehicle equivalency basis (see above), truck traffic can be seen as the dominant component affecting operations on I-70. While many are on long-distance trips, many are also bound for Columbia. This complicates the situation because dedicated truck segregation techniques become ineffective as the number of users decreases. This situation led the First Tier evaluations to eliminate truck-only lanes from further consideration. Nevertheless, truck traffic is a substantial component of the SIU 4 traffic stream—one that needs to be effectively managed to allow I-70 to operate in a manner consistent with its role within the Interstate Highway System. The development and evaluation of alternatives would need to incorporate how well they manage truck traffic into the decision-making process.

Through Traffic

Another distinct traffic stream is through traffic. Generally thought of as long-distance trips, a precise definition of minimum trip length is probably unnecessary within the context of this discussion. More important are the expectations of through traffic. The most important of these expectations is for high-speed travel. They also expect other drivers to behave in a manner consistent with high-speed travel—steady speeds with a minimum of lane changes and no quick movements. The actual trip length is less important than the expected behavior. Regardless of how a trip is characterized, through traffic can be seen as a substantial component on I-70. The First Tier EIS predicted that by 2030, 11,600 trips per day would make the entire 200-mile (321.9-km) trip between St. Louis and Kansas City (roughly 66 percent are expected to be trucks). The First Tier EIS also identified I-70 as “the largest gateway to the vast amount of tourist and recreational destinations in the state” and identified the intrinsic value of the trip itself. This clearly stresses the importance of through traffic and the driver’s expectation of high-speed travel, regardless of trip length.

Within SIU 4, the best quantification of through traffic comes from the I-70 Columbia Travel Demand Model. This analysis was intended to identify the number of I-70 users on short-term trips (trips on I-70 of two or fewer interchanges). Seen another way, it provides an approximation of users who may have the expectation of high-speed travel. In the subsections of SIU 4 farthest from Columbia (both east and west), only about five to 10 percent of the traffic stream makes short-term trips. This could mean that perhaps as many as 30,000 vehicles per day are operating under the expectation of high-speed travel.

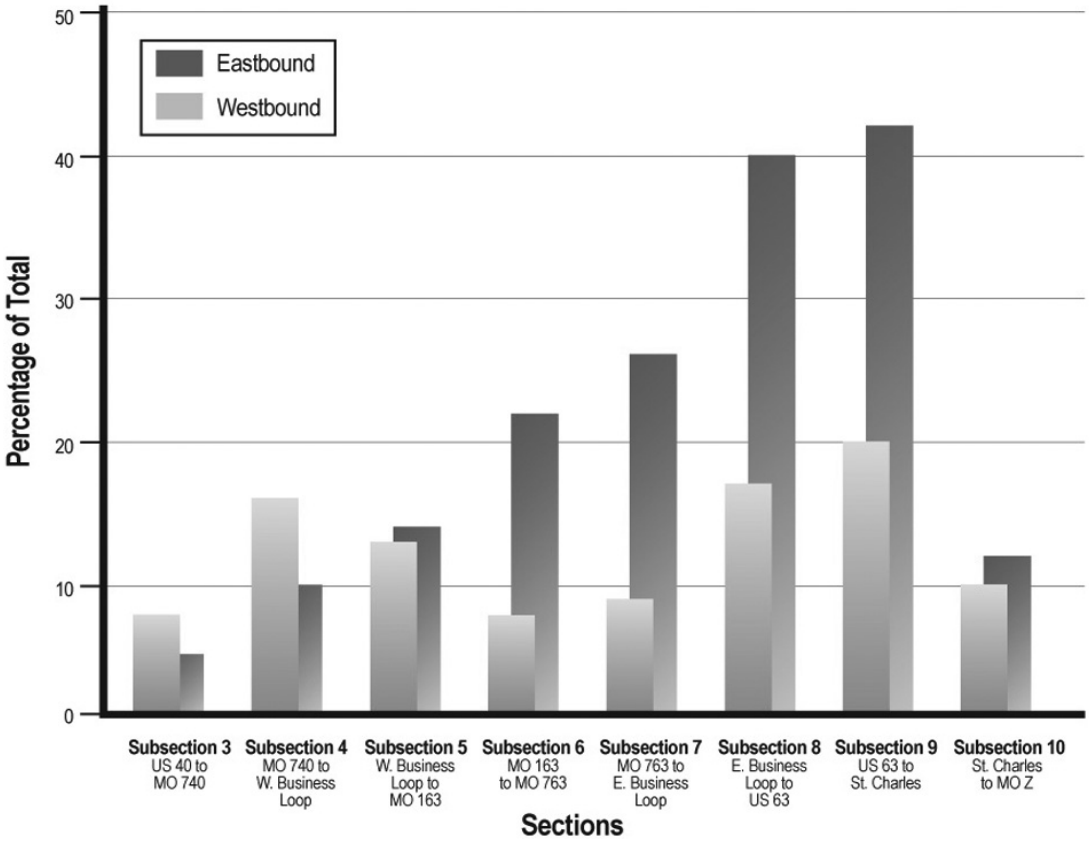
Regardless of the actual trip length, through traffic is a substantial and important component of the SIU 4 traffic stream; one that needs to be effectively managed to allow I-70 to operate in a manner consistent with its role within the Interstate Highway System. The development and evaluation of alternatives would need to incorporate how well they manage through traffic into the decision-making process.

Local Traffic

Because I-70 traverses the city of Columbia, it has become an integral part of the city's transportation network. Currently, there are several interchanges providing direct access to Columbia from I-70 (exits 124, 125, 126, 127, 128/128A and 131). The interchange spacing between these interchanges is often less than one mile (1.6 km). This pattern of closely spaced interchanges is typical of urban areas and allows local traffic to easily use I-70 as a link in trips from one part of Columbia to another. This traffic adds volume to the affected interchanges and conflicts with through traffic as the local trips enter and exit the freeway.

The I-70 Columbia Regional Travel Demand Model was used to help quantify the nature of the local component using I-70. Local trips are those entering I-70 and then exiting at the first or second interchange encountered. This trip analysis used the origin-destination data generated by the project's traffic model. As expected, local trips are most closely related to Columbia. In some cases, more than 40 percent of the trips can be described as local. In contrast, only five to 10 percent of the trips on the eastern and western-most sections of I-70 were short-term/local. **Figure I-5** summarizes the distribution of local trip data. The highest percentage of local trips occurs near the I-70/U.S. 63 interchange. As an overall average (combining east- and west-bound movements), roughly one-third of the trips in this area are destined for another interchange in Columbia. The percentage of local trips is lower in the other parts of Columbia, but still substantial—generally between 13 and 18 percent. For example, assuming that the local percentage remains the same into the future, the overall average of 13 percent for section 4 (MO-740 to West Business Loop) would relate to over 13,000 vehicles per day using I-70 for local trips. The generation and evaluation of alternatives should consider the impacts associated with a traffic stream of this magnitude.

Figure I-5: Short-Term or Local Trips (as a percentage of the total)



In addition to quantifying the location and magnitude of local trips on I-70, the select-link analysis also uncovered some other interesting facts about local traffic on I-70. For example, it was determined that the combination of added capacity on I-70 and a new relocation around Columbia resulted in no discernable improvement with respect to the percentage of short trips on I-70, compared to adding capacity to I-70 alone. Further, when evaluating the addition of capacity alone, the percentage of local trips is roughly the same, regardless of whether the interstate is improved to six lanes or eight. This seems to indicate that using I-70 is so attractive that local drivers would use it regardless of operational conditions on I-70. Although through traffic would see poor operations along this portion of I-70 as a problem, local traffic seems to be willing to endure it because it still represents the best route. Consequently, it would be a challenge to persuade local traffic to take alternatives to I-70.

In addition to typical vehicular traffic (cars and trucks), there are other important components that make up local traffic and need to be considered. One is transit service; Columbia Transit is the existing publicly funded bus system. It runs four full-service fixed routes and one commuter route, and offers complementary paratransit service for disabled persons within the city of Columbia. Four transit routes cross or approach the I-70 project corridor. Route 1 is a north-south route that crosses I-70 along Garth Avenue. Route 2 is an east-west route that crosses I-70 three times: Stadium Boulevard, Business Loop 70 West and Paris Road. Route 3 runs in the Columbia Mall area and crosses I-70 at Paris Road. Route 4 is another east-west route serving the commercial areas southeast of the U.S. 63 interchange. Route 4 does not cross I-70.

Another component of local traffic that needs to be considered is non-motorized transportation, typically pedestrians and bicyclists. Although non-motorized travel along I-70 is prohibited, pedestrians and bicyclists need to have access across the facility on the existing crossroads. Additionally, there are local planning provisions for trails along the stream corridors that cross I-70. All of these modes would need to be considered within the decision-making process.

Local traffic is a substantial and important component of the SIU 4 traffic stream; one that needs to be managed effectively to allow I-70 to operate in a manner consistent with its role within the Interstate Highway System. The development and evaluation of alternatives would need to incorporate how well they manage local traffic into the decision-making process.

b. Interchange Operation

An element that affects all the major traffic streams on I-70—trucks, through traffic and local traffic—is the operational efficiency of the interchanges along I-70. Based on existing data, SIU 4 interchange operation can be described overall as acceptable. Areas where current operations do not meet threshold criteria include the eastbound movements at the I-70/U.S. 63 interchange, the westbound movements at the I-70/U.S. 40 interchange and the westbound movements at the I-70/MO-740 interchange. Based on the expected future conditions, operations at every interchange are expected to degrade and most would be unacceptable by 2030. In the year 2030, interchange LOS is expected to be F at every interchange between exit 121 (U.S. 40) and exit 128A (U.S. 63). Consequently, implementation of interchange designs that achieve acceptable LOS is an important component of accommodating all of the users of I-70.

Table I-6 presents the No-Build LOS for the signalized crossroad/ramp terminals at each SIU 4 interchange. These were calculated at the signalized intersection at the end of each interchange's on- and off-ramps. Although there are other ways to calculate LOS at an interchange, this measurement is critical and representative of the degradation in operation that is expected over time.

Table I-6: No-Build Interchange Crossroad/Ramp Terminal Level of Service Data

Signal Location	2000		2030	
	A.M.	P.M.	A.M.	P.M.
I-70 eastbound at U.S. 40	B	A	**F**	**F**
I-70 westbound at U.S. 40	C	**E**	**F**	**F**
I-70 eastbound at MO-740	B	B	**F**	**F**
I-70 westbound at MO-740	C	**E**	**F**	**F**
I-70 eastbound at Bus Loop West	B	C	**F**	**F**
I-70 eastbound at MO-163	B	B	**F**	**F**
I-70 westbound at MO-163	B	C	**F**	**F**
I-70 eastbound at MO-763	B	C	**E**	D
I-70 westbound at MO-763	B	B	D	**E**
I-70 eastbound at U.S. 63	D	**F**	**F**	**F**
I-70 westbound at U.S. 63	C	C	**F**	**F**

Shaded Bold *indicates that the LOS does not meet the threshold criteria.*

Rural LOS Threshold: C

Urban LOS Threshold: D

For I-70 to operate in a manner consistent with its role within the Interstate Highway System, its interchanges must operate effectively. The overall system would suffer if the interchanges cannot accommodate traffic loads. The presence of through traffic (with no option to avoid Columbia) and local traffic (which would endure congestion) creates a situation where the development and evaluation of alternatives must incorporate operation of the interchanges into the decision-making process. This would include not only the operation of the controlling intersections but also ramp operations, weaving movements, acceleration/deceleration and local road connectivity. The ability to design effective interchange configurations, within the highly developed I-70 corridor, would be a challenge throughout the Second Tier process.

c. Local Connectivity

As noted, I-70 bisects the city of Columbia. Consequently, it can be seen as a barrier to vehicular and pedestrian traffic within Columbia. The ability to cross I-70 is important for local connectivity. This text examines two elements relating to local connectivity—overpass/ underpass operations and parallel roadway operations. The implementation of an I-70 improvement alternative that effectively incorporates local connectivity is key to accommodating all users of I-70.

Overpass Operations

It is possible for traffic to cross I-70 at nine interchanges within SIU 4: exits 117, 121, 124, 125, 126, 127, 128A, 131 and 133. There are also three non-interchange opportunities to cross I-70: Sorrels Overpass Drive in Subsection 3, Garth Avenue in Subsection 5 and Paris Road in

Subsection 7. There are numerous cul-de-sacs within Columbia abutting I-70. To accommodate the resulting movements, an I-70 service road system has been developed. This creates traffic patterns whereby drivers intending to cross I-70, must use the parallel roadways to migrate to an existing overpass or use an interchange and I-70 to complete their trips. The existing service road system is discontinuous. This offers the project an opportunity to improve local connectivity and I-70 operations through the cost-effective addition of over/underpass options during the development of the interchange configurations. The public involvement process and the project's on-going coordination with local officials would also afford opportunities to identify over/underpass locations that may provide benefits to both I-70 and the local roadway system.

Parallel Roadway Operations

Currently, there is a discontinuous system of local roadways parallel to I-70. West of Perche Creek, the frontage roads are known by various names, and east of Perche Creek to MO-Z the frontage roads are known as I-70 Drives (NW, SW, NE and SE). Other key parallel roads include Vandiver Drive, Clark Lane and MO-PP. The most important parallel roadway is Business Loop 70, running between MO-740 to the Business Loop East interchange. This road acts as a quasi frontage road/local arterial, interfacing directly or indirectly with the five interchanges in central Columbia. It provides the only continuous opportunity to divert I-70 traffic for incident management between MO-740 and the East Business Loop interchange. **Exhibit I-1** depicts the location of the roadways parallel to I-70. The roadways provide important local access/connectivity. All the existing parallel roadways are two-way roads with very little access control. Many roadways do not provide continuous/direct access to the next adjacent interchange. The Improve I-70 project provides the opportunity to develop a more effective system of parallel roadways. As discussed herein, the guiding factor in re-developing the parallel roadway system would be the benefit that it can provide to the operations within the I-70 corridor. The benefits associated with the various options for providing an improved parallel roadway would evolve in an iterative process of development and assessment.

To evaluate the ability of different systems to improve I-70, the development of alternatives first examined the impacts associated with the application of a uniform parallel roadway system throughout the corridor. Based on the results, different combinations, or hybrids, were then investigated. This process is more fully examined in Chapter II.

d. National Security

The need to have efficient, convenient and expeditious movement of large quantities of people and goods requires that transportation systems must have a high degree of access. In cases such as the highway system, access is almost unlimited. Most of the transportation infrastructure was designed and built long before concerns about security and terrorism had arisen.

Although the highway system has many of the same vulnerabilities as other surface transportation modal systems, the highway system has the benefit of redundancy. To provide the necessary redundancy, the individual corridors must be robust enough to meet the demands if other links are impacted. The other key to taking advantage of the redundancy in the system is the ability to provide information on the system's status.

Current planning related to the highway system security is focusing on:

- Protecting critical mobility assets;

- Enhancing traffic management capabilities; and
- Improving emergency response capabilities.

The American Association of State Highway and Transportation Officials' (AASHTO) Transportation Security Task Force identified that investment in these three security initiatives would yield other general mobility benefits. The reverse is also true. Investments in general highway system enhancements, such as improving the I-70 corridor, would yield security benefits.

Additional capacity along the I-70 corridor would increase the ability of the corridor to handle diversion from other highway links should some type of disaster occur. The increased capacity also enhances the ability to handle emergency responses. The I-70 corridor is part of the Strategic Highway Network (STRAHNET) and several interchanges provide connections to STRAHNET connecting links. The STRAHNET is designed to facilitate the movement of personnel and equipment for deployment and emergency response.

Proposed intelligent transportation system (ITS) implementation along the corridor would assist in protecting critical assets and would enhance traffic management capabilities. Closed-circuit television cameras could be used for surveillance of critical assets in the I-70 corridor such as the Missouri River bridge (SIU 3). Alarm systems can also be facilitated by the ITS communication network.

The physical protection of assets would be considered as part of the design process. An example is designing a barrier system to eliminate the ability of vehicles to park under critical bridges. The careful consideration of security issues in the design of highway facilities is still evolving as the transportation community comes to grips with new threats to security. In the design process, a risk assessment based approach would be used to determine the appropriate investment in security.

One approach to the issue of transportation security is the concept of a layered security system, where multiple security features are connected and provide backup for one another. This approach offers the advantage that perfection from each element of the system is not required, as other elements can compensate for any shortcomings. At the same time enhancements to one layer of the system can boost the performance of the system as a whole. Improving I-70 can help to increase transportation system security in Missouri and in the nation as a whole.

4. Improve User Safety[6]

Both the frequency and severity of crashes on I-70 have been increasing over time. The First Tier EIS related the increasing levels of crashes to the ever-higher traffic volumes on I-70. Traffic volumes on SIU 4 are expected to at least double by 2030. The number of crashes would proportionally increase as traffic volumes increase. Consequently, one purpose and need element for SIU 4 is to develop alternatives that improve user safety on I-70.

The SIU 4 crash records for the six-year period 1995 to 2000[7] were analyzed as part of the Second Tier process. A total of 1,704 crashes were recorded on I-70 during that period. See **Figure I-6** for distribution by crash type.

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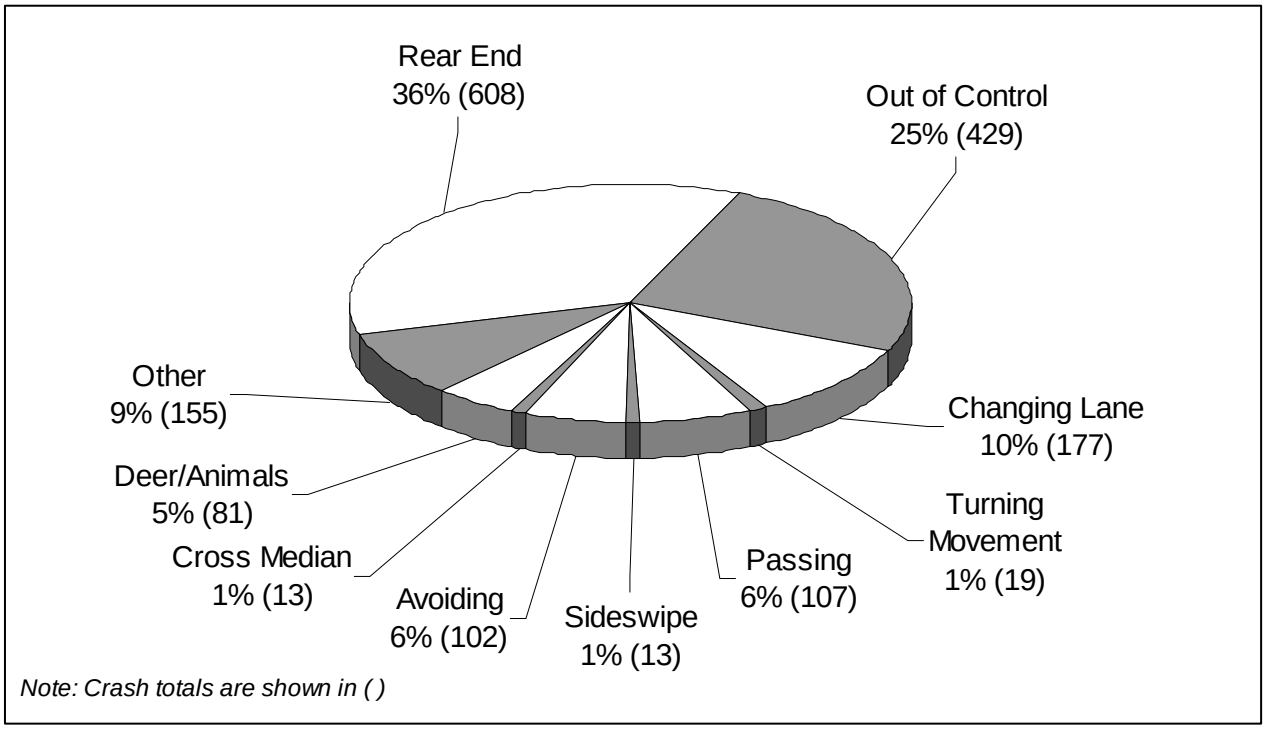
6 Crash statistics and safety data summarized or presented in this EIS are protected under federal law. **See Appendix I-B**.

Figure I-6: SIU 4 Crash Type Distribution



Note: Crash totals are shown in ( )

A total of 1,623 crashes were used to develop crash rates for mainline I-70. Crashes involving deer and other animals were not included with the crashes for determination of crash rates. See **Table I-7** for numbers of crashes along I-70 and **Table I-8** for crash rates along I-70. Overall, 15 fatal crashes were reported in SIU 4 with 29 percent of all crashes resulting in either injury or fatality. Of the 15 fatal crashes, 13 occurred in sections without median barrier. Four of the 15 fatal crashes were classified as cross median crashes. Most crashes (48 percent, or 772) occurred in Columbia between MO-740 and U.S. 63. Not surprisingly, those areas also have the highest traffic volumes. **Table I-8** summarizes the crash rates developed during the crash analysis. These rates show that the crash environment is the most intense within the Columbia portions of SIU 4. Perhaps the most telling conclusion is that 36 percent of all crashes were rear-end crashes. Rear-end crashes typically are associated with scenarios in which drivers are confronted with an unexpected speed differential, such as through trips confronted with slowdowns at interchange weaves.

[7] Year 2002 traffic and years 2001-2003crash data has been reviewed. The results of the evaluation indicate no need to change the conclusions previously developed. Therefore, the traffic and crash analysis has not been updated from the year 2000.

Table I-7: Number of Crashes—Existing I-70 Freeway Sections (1995 - 2000)

SIU 4 Subsection	Number of Crashes			
	Property Damage Only	Injury	Fatal	Total
1 MO-BB to MO-J/O	55	21	1	77
2 MO-J/O to U.S. 40	127	53	5	185
3 U.S. 40 to MO-740	230	85	1	316
4 MO-740 to Bus Loop West	71	19	0	90
5 Bus Loop West to MO-163	99	37	1	137
6 MO-163 to MO-763	71	25	1	97
7 MO-763 to Bus Loop East	123	47	0	170
8 Bus Loop East to U.S. 63	211	64	3	278
9 U.S. 63 to St. Charles Road	97	65	3	165
10 St. Charles Road to MO-Z	71	37	0	108
Total (All subsections in SIU 4)	1,155	453	15	1,623

Note: Crashes involving deer and other animals are not included in this table.

Table I-8: Crash Rate Analysis—Existing I-70 Freeway Sections (1995 – 2000)

SIU 4 Subsection	Crash Rate*				Statewide Interstate Average Rate*
	Property Damage Only	Injury	Fatal	Total	
1 MO-BB to MO-J/O	33	13	1	46	Rural - 69
2 MO-J/O to U.S. 40	49	21	2	**72**	Rural - 69
3 U.S. 40 to MO-740	65	24	0	90	Urban - 127
4 MO-740 to Business Loop West	57	15	0	73	Urban - 127
5 Business Loop West to MO-163	85	32	1	118	Urban - 127
6 MO-163 to MO-763	109	38	2	**148**	Urban - 127
7 MO-763 to Business Loop East	74	28	0	103	Urban - 127
8 Business Loop East to U.S. 63	347	105	5	**457**	Urban - 127
9 U.S. 63 to St. Charles Road	42	28	1	71	Urban - 127
10 St. Charles Road to MO-Z	38	20	0	57	Urban - 127

** Crash Rate: Crash per hundred million vehicle miles of travel. The current statewide interstate average crash rate is a five-year crash rate that is calculated by MoDOT.*

Rates shown in bold represent rates that are above the statewide average rate

Proposed improvements to I-70 would have significant safety benefits. A monetary safety benefit was determined by applying monetary values to forecasted 2030 crashes by severity. The 1995-2000 crash rates were adjusted to reflect improvements to I-70 due to adding additional lanes, wider median and improved geometry. The adjusted crash rates were used in conjunction with forecasted 2030 traffic volumes to determine the number of crashes. A safety benefit was calculated comparing the Build and No-Build Alternatives. The Build Alternative uses the improved crash rates to determine the projected number of crashes. The No-Build uses the 1995-2000 crash rates to determine the projected number of crashes. The results are shown in **Table I-9**. The total safety benefit of the improvements to I-70 during the year of 2030 is projected to be $56 million and a reduction of just over 400 crashes.

Table I-9: Safety Benefit for Build/No Build for Forecasted 2030 Traffic Volumes

	Monetary Totals by Crash Severity			
	Property Damage Only	**Injury**	**Fatal**	**Total**
No-Build	$10,741,000 (2,396)	$58,046,000 (945)	$154,565,000 (33)	$221,445,000 (3,374)
Build	$9,464,000 (2,111)	$49,938,000 (813)	$107,727,000 (23)	$166,748,000 (2,947)
Difference	$1,277,000 [285]	$8,108,000 [132]	$46,838,000 [10]	$56,223,000 [427]

Number of crashes based on forecasted 2030 traffic volumes are shown in ( )'s.
Crash reductions based on forecasted 2030 traffic volumes are shown in [ ]'s.
Monetary totals are in $2005's

The remainder of this section discusses important concepts relating to user safety. The effect that the composition of the traffic stream has on user safety is addressed first, followed by discussion of how safety is improved by adherence to engineering-related standards such as MoDOT's *Access Management Guidelines.* Finally, there is discussion of the conditions that are considered precursors to crashes (the elimination of these precursor conditions can be expected to provide important safety benefits). The development and evaluation of alternatives would need to incorporate these concepts into the decision-making process.

a. Traffic Stream Composition and User Safety

While driver error generally is the cause ascribed to most crashes, the First Tier EIS found that on I-70, underlying driver error was the concept of how forgiving the system is. In other words, how much of a margin of error do drivers have? The composition of the traffic stream bears directly on how forgiving the roadway is. Because of their large size, less nimble operation and limited lines of sight, trucks represent an obstacle to other drivers. The *Highway Capacity Manual* equates a heavy truck as equivalent to 1.5 to eight passenger cars. Twenty-two percent of the SIU 4 traffic stream consists of trucks. This creates a situation where truck traffic can be the dominant element on I-70. According to the First Tier EIS, 29 percent of all I-70 crashes involved trucks. In comparison to total miles traveled, heavy trucks were also involved in a disproportionate share of crashes. Added to this is the increased severity/damage potential associated with truck crashes. Given that truck traffic is a substantial component of the SIU 4 traffic stream, it needs to be managed effectively to allow I-70 to operate in a safe manner.

b. MoDOT's Access Management Guidelines

This purpose and need statement has already discussed the need to improve outdated I-70 design elements. Adherence to these types of standards is intended, in part, to ensure that highway safety is incorporated into every project. Another type of engineering-related standard that needs to be discussed in conjunction with SIU 4 is MoDOT's Access Management Guidelines. These guidelines are specifically intended to improve the operational characteristics of Missouri's roadways.

Virtually without exception, the existing interchanges and connecting roads do not comply with the Access Management Guidelines. Because Improve I-70 consists of reconstructing an existing roadway system, complete adherence to the guidelines may be an unrealistic goal, but even partial compliance can benefit user safety. The costs and benefits of adherence would necessarily require evaluation on a case-by-case basis. All other factors being equal, alternatives that adhere to MoDOT's Access Management Guidelines are superior to those that do not.

c. Crash Precursors

As part of the Second Tier investigations of SIU 4, crash precursors (areas particularly susceptible to crashes) were investigated and identified. Sometimes, these areas were identified during engineering investigations. Sometimes, the crash precursors evolved out of anecdotal information obtained through public involvement/agency coordination. Among the crash precursors identified thus far in the preliminary development process are:

- **Eastbound I-70 Perche Creek Bridge (approximately Mile Marker 122)—**A high number of crashes occur on this bridge suggesting that icing conditions may be a precursor.
- **Eastbound I-70 under Sorrels Overpass Drive (approximately Mile Marker 123)—**A number of crashes occur under this bridge suggesting that sight distance and congestion conditions may be precursors.
- **Eastbound and westbound I-70 in the vicinity of the MO-740 Bridge (approximately Mile Marker 124)—**There have been a number of crashes, caused by a variety of influencing factors, on the mainline near this bridge.
- **MO-740/Stadium Boulevard (approximately Mile Marker 124)—**A number of crashes occur on this bridge and south of the interchange, suggesting that congestion conditions and driver inattention may be precursors.
- **The unusual interchange configuration at exit 125 (Business Loop West)—** Among the difficult elements associated with this area include the small radius five-legged roundabout at the intersection of the Business Loop, Creasy Springs Road and westbound ramps of the interchange. Additionally, the eastbound ramps and West Boulevard meet at a high skew angle and in close proximity to the intersections of West Boulevard with I-70 Drive SW and other local streets.
- **The on- and off-ramps at exits 126 and 127—**The distance between the end of the westbound on-ramp of the MO-163 interchange (exit 126) and the westbound off-ramp of the MO-763 interchange (exit 127) is roughly 0.3 mile (0.5 km). Similar conditions exist eastbound. The weave of vehicles on and off I-70 within such a short distance is seen as a crash precursor. Relatively high crash rates on this portion of

I-70 validate this crash precursor (see Subsection 6 of **Table I-7**). In addition, the westbound on-ramp from MO-163 and eastbound on-ramp from MO-763 are experiencing a concentration of crashes potentially due to the merge conditions.

- **The eastbound off-ramp at exit 128A (U.S. 63 interchange)—**Traffic volumes routinely exceed the storage capacity at this location, forcing backups that encroach on I-70. This condition is compounded by poor lines of sight. Additionally, traffic from the I-70 Business Loop East enters I-70 in this area. High crash rates on this part of I-70 validate this crash precursor.
- **The westbound off-ramp at exit 128 (Business Loop East) —**Westbound I-70 traffic can exit onto the Business Loop through a left lane exit ramp. This is an atypical situation (most interstate exits take place from the right lane). This is further exacerbated by the movement from vehicles entering I-70 at the U.S. 63 interchange and quickly weaving into the left lane to exit at the Business Loop[8].

The investigation and elimination of potentially hazardous traffic conditions can be expected to result in important safety improvements.

D. Summary and Conclusions

A project's purpose and need is the transportation problem that the project is intended to address. Alternatives are generated and evaluated to develop the most appropriate solution to the identified problems. Selection of a preferred alternative is based, in part, on how well it satisfies the project's purpose and need. The purpose and need associated with the Second Tier of the I-70 (SIU 4) EIS is summarized as follows.

1. Accommodate Existing and Future Traffic Volumes on I-70

Within SIU 4, the overall volume of traffic on I-70 is projected to at least double between 2000 and 2030. With the No-Build Alternative, these increases would result in poor operation for travelers on I-70. By 2030 under the No-Build scenario, nearly all sections of I-70 fail to meet the applicable threshold LOS. Because the existing facility would be unable to accommodate the traffic volumes, one element of purpose and need for SIU 4 is to develop alternatives that would accommodate existing and projected traffic volumes on I-70.

2. Improve Outdated Design Elements

Many design features of I-70 do not meet the standards required of modern roadway facilities. The First Tier EIS concluded that regardless of the benefits a bypass alternative may have, the existing roadway would continue to be important and should comply with current standards. Because the facility includes nonstandard design features and because existing standards and guidelines maximize the opportunity for efficient and safe operation, an element of the purpose and need is to develop alternatives that would eliminate as many outdated design elements as possible.

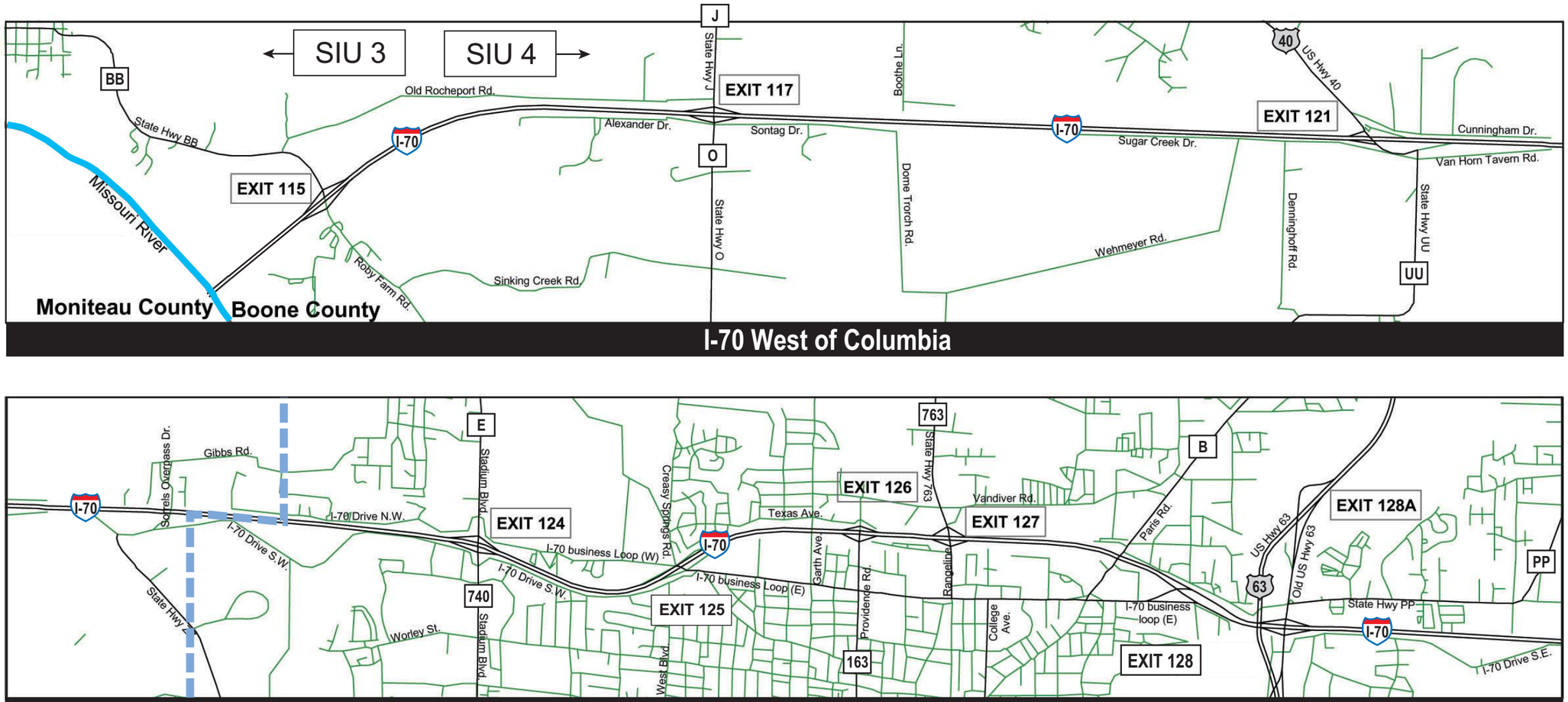
[8] The ability to go from the U.S. 63 interchange to the Business Loop (via I-70) is currently being eliminated by MoDOT in an independent safety project. Only movements from the U.S. 63 interchange to I-70 to the Business Loop would be affected, normal access from westbound I-70 to the Business Loop would continue to be allowed.

3. Accommodate All Users of I-70

Section of Independent Utility 4 is important to several different traffic streams, among them truck/freight movement, long-distance inter- and intra-state travel and local movements within the city of Columbia. These movements often create conflict among the traffic streams. Conflict notwithstanding, the traffic streams are all important and must be accommodated. Consequently, one element of purpose and need for SIU 4 is to develop alternatives that would accommodate all users of I-70. Among the important elements to be considered during this process is the implementation of properly functioning interchange designs as well as attention to local connectivity, including overpass/underpass opportunities and parallel local roadway operation.

4. Improve User Safety

Because crash rates are typically related to traffic volumes, the substantial traffic increases predicted between 2000 and 2030 can be expected to result in deteriorating safety conditions. Consequently, one element of purpose and need for SIU 4 is to develop alternatives that would improve user safety on I-70. Among the important elements to be considered during this process is the composition of the traffic stream, the ability to adhere to MoDOT's Access Management Guidelines and the degree to which crash precursors can be eliminated.



I-70 West of Columbia

I-70 Columbia

I-70 East of Columbia

MoDOT IMPROVE i70

SECTION
4
Rocheport to Route Z

LEGEND
- Columbia
- Boone County
- I-70 Interstate
- 63 US Highways
- PP State Highway

N

Approximate Scale: 1" = 1.6 miles

SIU No. 4 Study Area Map

Exhibit
I-1

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