FINAL REPORT

US 160 Corridor Profile Study Update

US 89 Junction to New Mexico State Line

PREPARED FOR ADOT JUNE 2022

ADOT WORK TASK NO.
MPD 0021-21

ADOT CONTRACT NO.
17-171963

PREPARED BY

Kimley»Horn

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Table of Contents

List of Figures

List of Tables

Appendices

ACRONYMS & ABBREVIATIONS

AADT	Average Annual Daily Traffic
ADOT	Arizona Department of Transportation
ASLD	Arizona State Land Department
AZTDM	Arizona Travel Demand Model
BCA	Benefit-Cost Analysis
BLM	Bureau of Land Management
BQAZ	Building a Quality Arizona
CCTV	Closed Circuit Television
CDP	Census Designated Places
CR	Cracking Rating
DMS	Dynamic Message Sign
DCR	Design Concept Report
EB	Eastbound
FY	Fiscal Year
HCRS	Highway Condition Reporting System
HPMS	Highway Performance Monitoring System
I-	Interstate
INRIX	Real-time traffic conditions database
IRI	International Roughness Index
ITS	Intelligent Transportation System
LCCA	Life-Cycle Cost Analysis
LOS	Level of Service
LOTTR	Level of Travel Time Reliability
LRTP	Long Range Transportation Plan
MAP 21	Moving Ahead for Progress in the 21st Century
MP	Milepost
MPD	Multimodal Planning Division
NACOG	Northern Arizona Council of Governments
NPV	Net Present Value
OP	Overpass
PES	Performance Effectiveness Score
P2P	Planning to Programming
PDI	Pavement Distress Index
PSR	Pavement Serviceability Rating
RTP	Regional Transportation Plan
STSP	Strategic Traffic Safety Plan
SR	State Route
TI	Traffic Interchange
TIP	Transportation Improvement Plan
TTTR	Truck Travel Time Reliability
UP	Underpass
USDOT	United States Department of Transportation
V/C	Volume to Capacity Ratio
VMT	Vehicle-Miles Traveled
WB	Westbound
WIM	Weigh-in-motion

Executive Summary

Executive Summary

EXECUTIVE SUMMARY

INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of US Route 160 between US Route 89 and the New Mexico Stateline. The study examines key performance measures relative to the US 160 Corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT has completed 21 original CPS within four separate groupings or rounds. In 2020, ADOT separated the previously studied corridors into six groupings to be updated and reassessed. The US 160 Corridor, depicted in **Figure ES-1** along with all CPS corridors**,** is one of the strategic statewide corridors identified and the subject of this CPS Update.

Corridor Study Purpose, Goals and Objectives

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. This purpose can be accomplished by following the process described below:

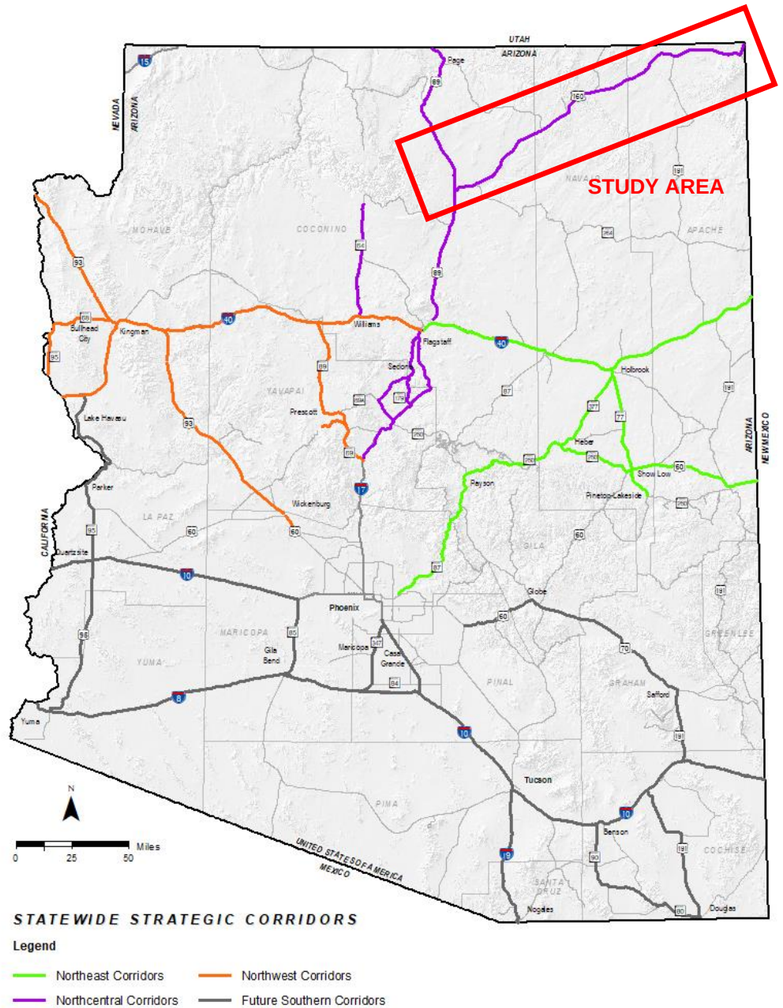
- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the performance measures
- Prioritize solutions for future implementation, accounting for performance effectiveness and risk analysis findings

The objective of this study is to identify a recommended set of prioritized potential solutions for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The US 160 CPS defines solutions and improvements for the corridor that are evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance.

The following goals are identified as the desired outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Develop solutions that address identified corridor needs based on measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

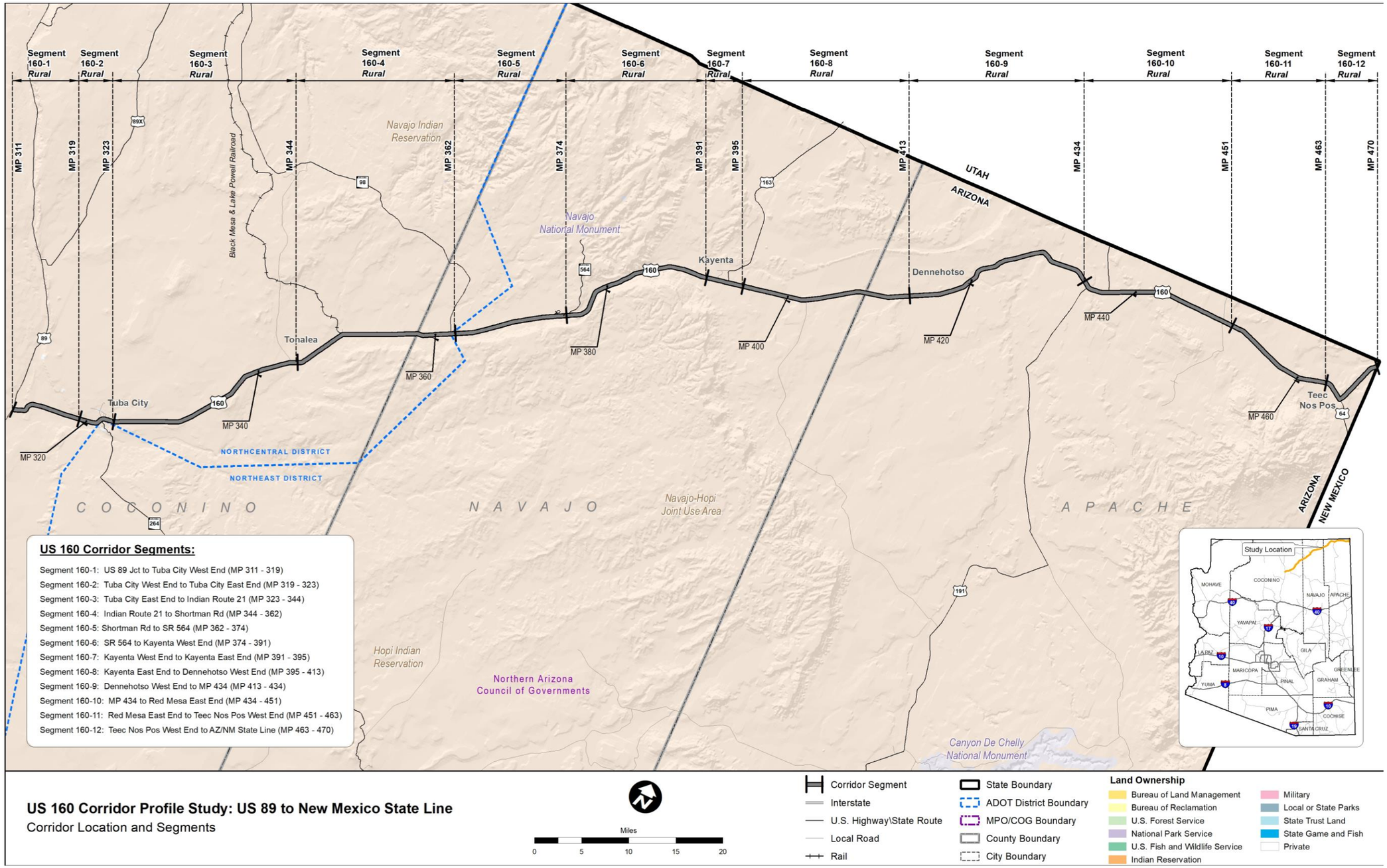
Figure ES-1: Corridor Study Area



Study Location and Corridor Segments

The US 160 Corridor is divided into 12 planning segments for analysis and evaluation. The corridor is segmented at logical breaks where the context changes due to differences in characteristics such as terrain, daily traffic volumes, or roadway typical sections. Corridor segments are shown in **Figure ES-2**.

Figure ES-2: Corridor Location and Segments



CORRIDOR PERFORMANCE

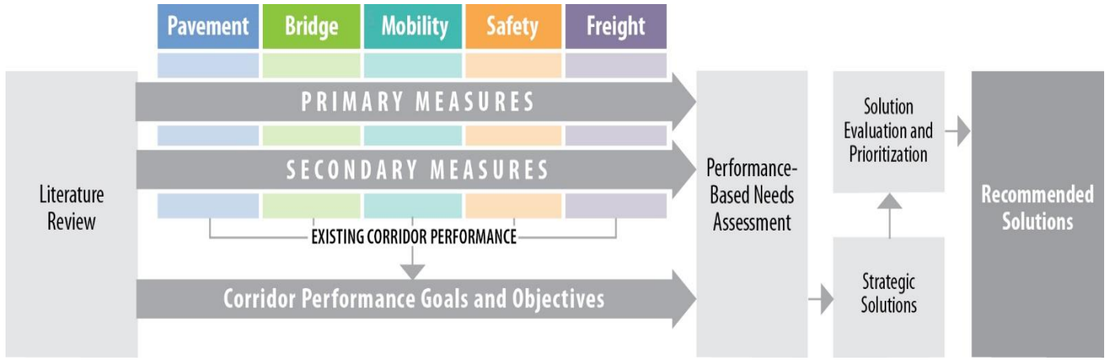
A series of performance measures is used to assess the US 160 Corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

Corridor Performance Framework

This study uses a performance-based process to define baseline corridor performance, diagnose corridor needs, develop corridor solutions, and prioritize strategic corridor investments. In support of this objective, a framework for the performance-based process was developed through a collaborative process involving ADOT and the CPS consultant teams.

Figure ES-3 illustrates the performance framework, which includes a two-tiered system of performance measures (primary and secondary) to evaluate baseline performance.

Figure ES-3: Corridor Profile Performance Framework



The following five performance areas guide the performance-based corridor analyses:

- Pavement
- Bridge
- Mobility
- Safety
- Freight

The performance measures include five primary measures: Pavement Index, Bridge Index, Mobility Index, Safety Index, and Freight Index. Additionally, a set of secondary performance measures provides for a more detailed analysis of corridor performance. **Table ES-1** provides the complete list of primary and secondary performance measures for each of the five performance areas.

Table ES-1: Corridor Performance Measures

Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index, cracking, and rutting	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • Bridge Rating • Bridge Hot Spots
Mobility	**Mobility Index** Based on combination of existing and future daily volume-to-capacity ratios	• Future Congestion • Peak Congestion • Travel Time Reliability • Multimodal Opportunities
Safety	**Safety Index** Based on frequency of fatal and suspected serious injury crashes	• Directional Safety Index • Strategic Traffic Safety Plan Emphasis Areas • Other Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck travel time reliability	• Travel Time Reliability • Bridge Vertical Clearance • Bridge Vertical Clearance Hot Spots

Each of the primary and secondary performance measures identified in the table above is comprised of one or more quantifiable indicators. A three-level scale was developed to standardize the performance scale across the five performance areas, with numerical thresholds specific to each performance measure:

Good/Above Average Performance – Rating is above the identified desirable/average range

Fair/Average Performance – Rating is within the identified desirable/average range

Poor/Below Average Performance – Rating is below the identified desirable/average range

The terms “good”, “fair”, and “poor” apply to the Pavement, Bridge, Mobility, and Freight performance measures, which have defined thresholds. The terms “above average”, “average”, and “below average” apply to the Safety performance measures, which have thresholds referenced to statewide averages.

Corridor Performance Summary

Table ES-2 shows a summary of corridor performance for all primary measures and secondary measure indicators for the US 160 Corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure as shown in **Table ES-2**. The following general observations were made related to the performance of the US 160 Corridor:

- The Pavement, Bridge, Mobility, Safety, and Freight performance measures show a mix of "good/above average", "fair/average", and "poor/below average" performance
- The weighted average of the Pavement Index shows "fair" overall performance for the US 160 Corridor; Segments 160-3, 5, 6, 8, 9, and 10 show "fair" or "poor" performance in one or more of the Pavement performance measures
- The weighted average of the Bridge Index shows "fair" overall performance for the US 160 Corridor; there are two bridges (Hamblin Wash Bridge and Walker Creek Bridge) with a rating of 5 along the corridor, neither of which has multiple 5 ratings
- The weighted average of the Mobility Index shows "good" overall performance for the US 160 Corridor; Segment 160-2 shows "poor" performance for the Mobility Index and the Future Daily V/C and "fair" performance for the Existing Peak Hour V/C and WB Directional LOTTR; Segment 160-7 shows "fair" performance for Closure Extent and EB Directional LOTTR; Segments 160-6, 11, and 12 are the only other segments that show "fair" performance for Directional LOTTR; all segments except Segment 160-2 show "poor" performance for % Bicycle Accommodation; all segments show "fair" or "poor" performance for % Non-SOV Trips
- The weighted average of the Safety Index shows "below average" overall performance for the US 160 Corridor; all segments show "below average" or "average" performance for the Safety Index and show "below average" performance for at least one direction for the Directional Safety Index; Segments 160-6 and 160-8 show "below average" performance for crashes involving lane departures.
- The weighted average of the Freight Index shows "poor" performance for the US 160 Corridor; all segments show "fair" or "poor" performance for the Freight Index except Segment 160-2; all segments show "fair" or "poor" performance for at least one direction for the Directional TTTR; Segment 160-8 shows "fair" performance for Closure Duration
- Segments 160-6, 7, and 9 show "poor/below average" performance for many performance measures
- Segments 160-1, 4, 5, and 11 show "good/above average" performance for many performance measures

Table ES-2: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area									
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/ milepost/year/mile)		Directional LOTTR (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			EB	WB							EB	WB	EB	WB	EB	WB		
160-1[2]	8	3.91	3.66	3.61	0.0%	5.00	71.70	5	0.26	0.30	0.26	0.21	0.08	0.05	1.11	1.09	0%	11.7%
160-2[2]	4	3.87	3.80	3.96	0.0%	No Bridges in Segment			1.01	1.16	0.59	0.71	0.10	0.10	1.11	1.16	96%	12.1%
160-3[2]	21	2.98	3.30	3.32	45.2%	No Bridges in Segment			0.17	0.20	0.16	0.15	0.10	0.10	1.07	1.06	19%	11.6%
160-4[2]	18	4.19	3.96	3.97	2.6%	6.00	64.30	6	0.15	0.17	0.12	0.12	0.06	0.04	1.06	1.05	9%	13.7%
160-5[2]	12	4.00	4.06	4.03	8.3%	No Bridges in Segment			0.20	0.24	0.16	0.14	0.13	0.12	1.06	1.06	0%	16.2%
160-6[2]	17	2.67	3.23	3.20	73.7%	No Bridges in Segment			0.26	0.30	0.24	0.21	0.11	0.11	1.07	1.15	0%	6.0%
160-7[2]	4	4.13	3.91	3.89	0.0%	No Bridges in Segment			0.28	0.29	0.27	0.27	0.25	0.30	1.15	1.14	6%	6.8%
160-8[2]	18	3.67	3.76	3.68	19.4%	6.00	85.20	6	0.08	0.05	0.12	0.09	0.10	0.10	1.09	1.06	0%	7.1%
160-9[2]	21	2.69	3.00	3.05	69.0%	7.00	87.84	7	0.07	0.04	0.11	0.11	0.10	0.05	1.13	1.12	1%	11.6%
160-10[2]	17	2.81	3.54	3.54	64.7%	5.00	62.70	5	0.16	0.16	0.19	0.12	0.07	0.06	1.07	1.07	1%	15.9%
160-11[2]	12	4.10	4.04	4.06	4.2%	No Bridges in Segment			0.18	0.21	0.18	0.11	0.10	0.07	1.06	1.17	0%	5.5%
160-12[2]	7	3.90	3.87	3.93	0.0%	No Bridges in Segment			0.17	0.20	0.21	0.12	0.03	0.00	1.24	1.21	4%	5.4%
Weighted Corridor Average		3.41	3.59	3.59	33.3%	6.00	76.60	6.00	0.18	0.20	0.18	0.15	0.10	0.08	1.09	1.10	6.5%	10.7%

SCALES

Performance Level	Non-Interstate			All			Rural	All	All	All	All
Good/Above Average Performance	> 3.60	> 3.50	< 0.56	> 6.5	> 80	> 6	< 0.56	< 0.22	< 1.15	> 90%	> 17%
Fair/Average Performance	2.80 – 3.60	2.90 – 3.50	0.56 – 0.76	5.0 – 6.5	50 – 80	5 – 6	0.56 – 0.76	0.22 – 0.62	1.15 – 1.50	60% – 90%	11% – 17%
Poor/Below Average Performance	< 2.80	< 2.90	> 0.89	< 5.0	< 50	< 5	> 0.76	> 0.62	> 1.50	< 60%	< 11%

[1]Urban Operating Environment
[2]Rural Operating Environment

Table ES-2: Corridor Performance Summary by Segment and Performance Measure (continued)

Segment #	Segment Length (miles)	Safety Performance Area								Freight Performance Area					
		Safety Index	Directional Safety Index		% of Fatal + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Segment Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Segment Fatal + Suspected Serious Injury Crashes Involving Bicycles	Freight Index	Directional TTTR		Closure Duration (minutes/milepost/year)		Bridge Vertical Clearance (feet)
			EB	WB							EB	WB	EB	WB	
160-1*e	8	1.94	2.58	1.31	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.52	1.70	1.35	19.10	7.83	No UP
160-2*e	4	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.39	1.31	1.46	15.60	16.80	No UP
160-3^e	21	2.21	1.67	2.76	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.23	1.22	1.24	19.59	15.89	No UP
160-4^e	18	1.02	0.00	2.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.21	1.17	1.26	11.23	8.38	No UP
160-5^e	12	1.39	2.73	0.05	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.21	1.20	1.23	33.17	22.83	No UP
160-6^e	17	1.91	2.55	1.28	Insufficient Data	86%	Insufficient Data	Insufficient Data	Insufficient Data	2.02	1.22	2.83	23.95	20.87	No UP
160-7*e	4	2.92	5.51	0.34	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	2.04	2.43	1.64	20.55	37.60	No UP
160-8^e	18	1.53	2.93	0.13	Insufficient Data	100%	Insufficient Data	Insufficient Data	Insufficient Data	1.26	1.35	1.17	59.61	19.88	No UP
160-9^e	21	1.60	1.89	1.30	Insufficient Data	33%	Insufficient Data	Insufficient Data	Insufficient Data	1.85	1.67	2.02	27.41	8.77	No UP
160-10^e	17	1.48	1.97	1.00	Insufficient Data	50%	Insufficient Data	Insufficient Data	Insufficient Data	1.23	1.25	1.21	18.13	9.60	No UP
160-11^e	12	1.00	0.05	1.95	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	2.23	1.16	3.29	18.27	15.42	No UP
160-12*e	7	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.88	6.02	1.73	10.74	0.00	No UP
Weighted Corridor Average		1.61	1.97	1.14	Insufficient Data	30.2%	Insufficient Data	Insufficient Data	Insufficient Data	1.63	1.55	1.70	24.95	14.36	No UP
SCALES															
Performance Level		**2 or 3 Lane Undivided Highway**								**Uninterrupted**			**All**		**All**
Good/Above Average Performance		< 0.92			< 11.2%	< 66.9%	< 3.8%	< 4.2%	< 0.0%	< 1.15			< 44.18		> 16.5
Fair/Average Performance		0.92 – 1.08			11.2% – 15.6%	66.9% – 74.5%	3.8% – 7.2%	4.2% -8.0%	0.0% – 3.3%	1.15 – 1.35			44.18 – 124.86		16.0 - 16.5
Poor/Below Average Performance		> 1.08			> 15.6%	> 74.5%	> 7.2%	> 8.0%	> 3.3%	> 1.35			> 124.86		< 16.0

^Uninterrupted Flow Facility
*Interrupted Flow Facility
[e] 2 or 3 Lane Undivided Highway

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings
"No UP" indicates no underpasses are present in the segment

NEEDS ASSESSMENT

Corridor Description

The US 160 Corridor is an important travel corridor in the northeastern part of the state. The corridor functions as a route for recreational, tourist, and regional traffic and provides critical connections between the communities it serves and the rest of the regional and interstate network.

Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP) 2010-2035 goals and objectives that were updated in 2017. Statewide performance goals that are relevant to US 160 performance areas were identified and corridor goals were then formulated for each of the five performance areas that aligned with the overall statewide goals established by the LRTP. Based on stakeholder input, corridor goals, corridor objectives, and performance results, three "emphasis areas" were identified for the US 160 Corridor: Pavement, Mobility, and Safety.

Taking into account the corridor goals and identified emphasis areas, performance objectives were developed for each quantifiable performance measure that identify the desired level of performance based on the performance scale levels for the overall corridor and for each segment of the corridor. For the performance emphasis areas, the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas.

Achieving corridor and segment performance objectives will help ensure that investments are targeted toward improvements that support the safe and efficient movement of travelers on the corridor. Corridor performance is measured against corridor and segment objectives to determine needs – the gap between observed performance and performance objectives.

Needs Assessment Process

The performance-based needs assessment evaluates the difference between the baseline performance and the performance objectives for each of the five performance areas used to characterize the health of the corridor: Pavement, Bridge, Mobility, Safety, and Freight. The performance-based needs assessment process is illustrated in **Figure ES-4**.

The needs assessment compares baseline corridor performance with performance objectives to provide a starting point for the identification of performance needs. This mathematical comparison results in an initial need rating of None, Low, Medium, or High for each primary and secondary performance measure. An illustrative example of this process is shown in **Figure ES-5**.

The initial level of need for each segment is refined to account for hot spots and recently completed or under construction projects, resulting in a final level of need for each segment. The final levels of need for each primary and secondary performance measure are combined to produce a weighted final need rating for each segment. A detailed review of available data helps identify contributing factors to the need and if there is a high level of historical investment.

Figure ES-4: Needs Assessment Process

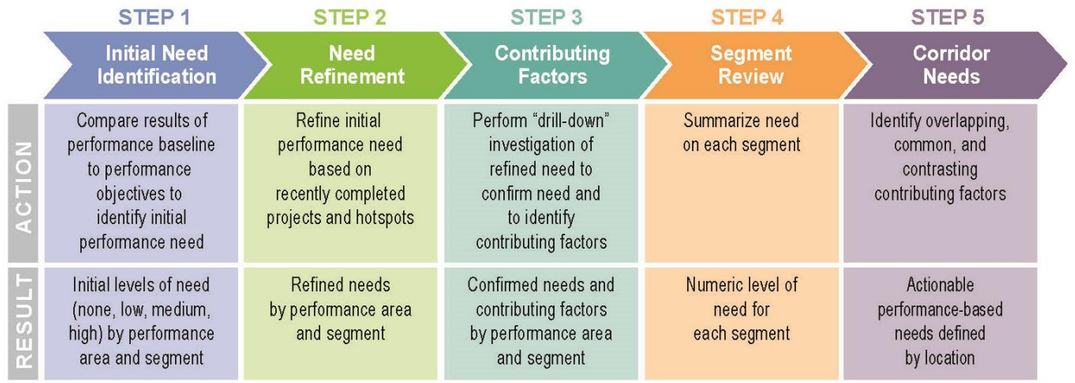


Figure ES-5: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
6.5	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
	Fair		
	Fair	Low	Middle 1/3 of Fair (5.5-6.0)
5.0	Fair	Medium	Lower 1/3 of Fair and top 1/3 of Poor (4.5-5.5)
	Poor		
	Poor	High	Lower 2/3 of Poor (<4.5)
	Poor		

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Summary of Needs

Table ES-3 provides a summary of needs for each segment across all performance areas, with the average need score for each segment presented in the last row of the table. A weighting factor of 1.5 is applied to the need scores of the performance areas identified as emphasis areas (Pavement, Mobility, and Safety for the US 160 Corridor). There are two segments with a High average need, seven segments with a Medium average need, and three segments with a Low average need. More information on the identified final needs in each performance area is provided below.

Pavement Needs

- The Pavement performance area is an emphasis area for US 160
- Three of the twelve segments (160-3, 160-9 and 160-10) exhibit a High level of pavement need
- Pavement hot spot failure needs were identified throughout the corridor
- A high level of historical investment was identified in Segment 160-6

Bridge Needs

- The Bridge performance area is not an emphasis area for US 160
- Bridge needs exist at five of the six bridges present along the corridor
- Segments 160-1 and 160-10 exhibit a Medium need
- The corridor does not exhibit potential historical investment issues

Mobility Needs

- The Mobility performance area is an emphasis area for US 160
- One segment (160-2) exhibits a High level of need, primarily due to the mobility index score and future daily V/C (congestion)

Safety Needs

- The Safety performance area is an emphasis area for US 160
- Eight of the twelve segments (160-1, 160-3, 160-5, 160-6, 160-7, 160-8, 160-9, and 160-10) exhibit a High need
- There are no Safety hot spots along the corridor

Freight Needs

- The Freight performance area is not an emphasis area for US 160
- Five segments (160-6, 160-7, 160-9, 160-11 and 160-12) exhibit a High need
- There are no underpasses along the corridor

Overlapping Needs

This section identifies overlapping performance needs on the US 160 Corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need (i.e., Medium or High). Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided below:

- Segment 160-1 contains a High need in the Safety performance area and a Medium need in the Bridge performance area
- Segment 160-3 contains High needs in the Pavement and Safety performance areas
- Segment 160-6 contains High needs in the Safety and Freight performance areas
- Segment 160-7 contains High needs in the Safety and Freight performance areas
- Segment 160-9 contains High needs in the Pavement, Safety, and Freight performance areas
- Segment 160-10 contains High needs in the Pavement and Safety performance areas and a Medium need in the Bridge performance area
- Average needs of Segments 160-1,160-3, 160-5, 160-6, 160-7, 160-8, and 160-11 are Medium and of Segments 160-9 and 160-10 are High

Table ES-3: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)											
	160-1	160-2	160-3	160-4	160-5	160-6	160-7	160-8	160-9	160-10	160-11	160-12
	MP 312-319	MP 319-323	MP 323-344	MP 344-362	MP 362-374	MP 374-391	MP 391-395	MP 395-413	MP 413-434	MP 434-451	MP 451-463	MP 463-471
Pavement*	None	Low	High	None	Low	None	None	Low	High	High	Low	None
Bridge	Medium	None	None	Low	None	None	None	None	None	Medium	None	None
Mobility*	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Safety*	High	N/A	High	Low	High	High	High	High	High	High	Low	N/A
Freight	Low	None	Low	Low	Low	High	High	Low	High	Low	High	High
Average Need	**1.38**	**0.92**	**1.77**	**0.77**	**1.31**	**1.38**	**1.38**	**1.31**	**2.08**	**2.08**	**1.15**	**0.69**

Level of Need	Average Need Range
None*	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

* Identified as an Emphasis Area for the US 160 Corridor
[#] N/A indicates insufficient or no data available to determine level of need
[+] A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study

STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State's key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need (i.e., Medium or High). Addressing areas of Medium or High need will have the greatest effect on corridor performance and are the focus of the strategic solutions. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. The US 160 strategic investment areas (resulting from the elevated needs) are shown in **Figure ES-6**.

Screening Process

In some cases, needs that are identified do not advance to solutions development and are screened out from further consideration because they have been or will be addressed through other measures, including:

- A project is programmed to address this need
- The need is a result of a Pavement or Bridge hot spot that does not show historical investment or rating issues; these hot spots will likely be addressed through other ADOT programming means
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need; this bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes
- The need is determined to be non-actionable (i.e., cannot be addressed through an ADOT project)
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need

Candidate Solutions

For each elevated need within a strategic investment area that is not screened out, a candidate solution is developed to address the identified need. Each candidate solution is assigned to one of the following three P2P investment categories based on the scope of the solution:

- Preservation
- Modernization
- Expansion

Documented performance needs serve as the foundation for developing candidate solutions for corridor preservation, modernization, and expansion. Candidate solutions are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the US 160 Corridor will be considered along with other candidate projects in the ADOT statewide programming process.

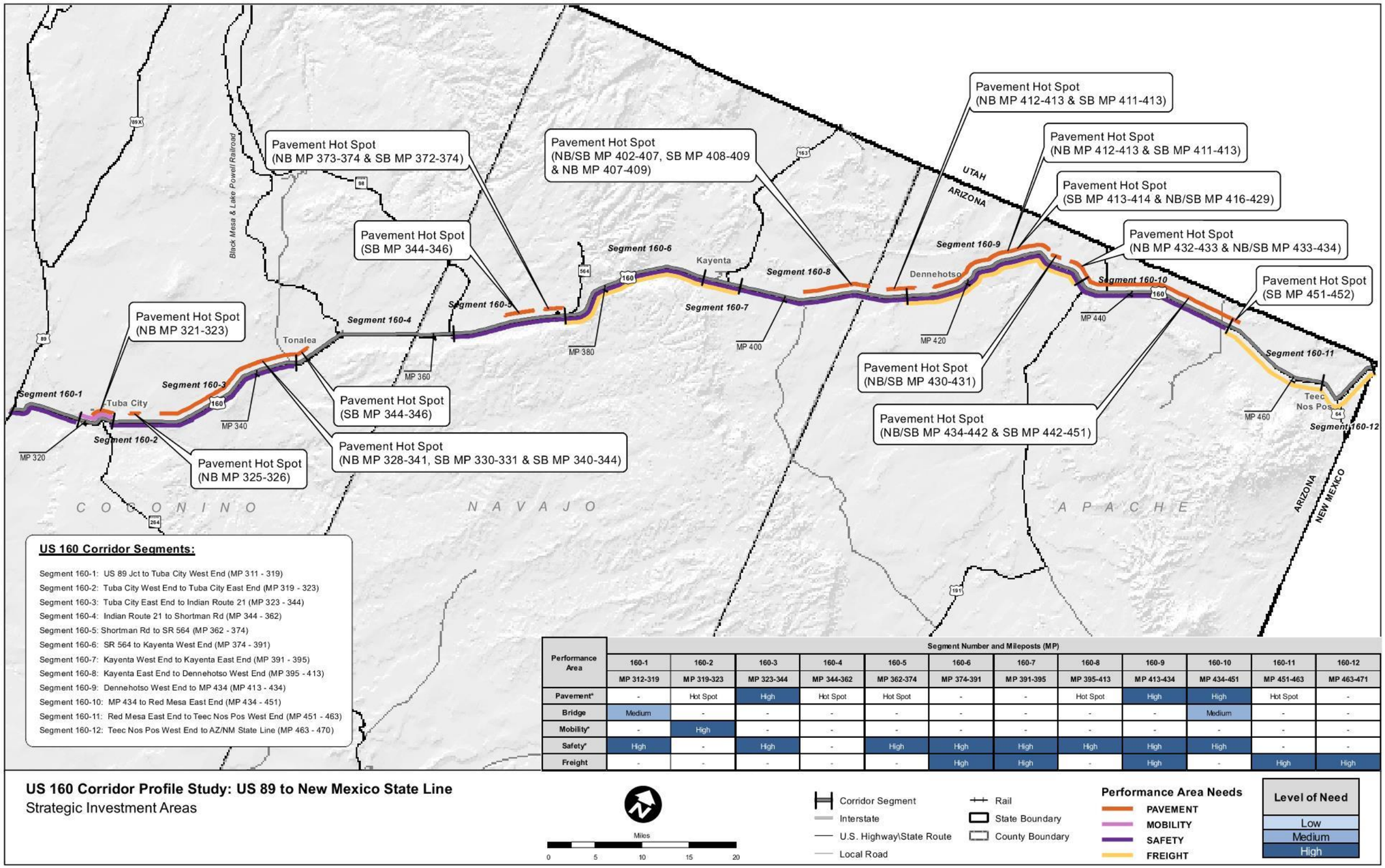
Candidate solutions should include some or all of the following characteristics:

- Do not recreate or replace results from normal programming processes
- May include programs or initiatives, areas for further study, and infrastructure projects
- Address elevated levels of need (High or Medium) and hot spots
- Focus on investments in modernization projects (to optimize current infrastructure)
- Address overlapping needs
- Reduce costly repetitive maintenance
- Extend operational life of system and delay expansion
- Leverage programmed projects that can be expanded to address other strategic elements
- Provide measurable benefit

Candidate solutions developed to address an elevated need in the Pavement or Bridge performance area will include two options: rehabilitation or full replacement. These solutions are initially evaluated through a Life-Cycle Cost Analysis (LCCA) to provide insights into the cost-effectiveness of these options so a recommended approach can be identified. Candidate solutions developed to address an elevated need in the Mobility, Safety, or Freight performance areas are advanced directly to the Performance Effectiveness Evaluation. In some cases, there may be multiple solutions identified to address the same area of need.

Candidate solutions that are recommended to expand or modify the scope of an already programmed project are noted and are not advanced to solution evaluation and prioritization. These solutions are directly recommended for programming.

Figure ES-6: Strategic Investment Areas



Performance Area	Segment Number and Mileposts (MP)											
	160-1	160-2	160-3	160-4	160-5	160-6	160-7	160-8	160-9	160-10	160-11	160-12
	MP 312-319	MP 319-323	MP 323-344	MP 344-362	MP 362-374	MP 374-391	MP 391-395	MP 395-413	MP 413-434	MP 434-451	MP 451-463	MP 463-471
Pavement*	-	Hot Spot	High	Hot Spot	Hot Spot	-	-	Hot Spot	High	High	Hot Spot	-
Bridge	Medium	-	-	-	-	-	-	-	-	Medium	-	-
Mobility*	-	High	-	-	-	-	-	-	-	-	-	-
Safety*	High	-	High	-	High	High	High	High	High	High	-	-
Freight	-	-	-	-	-	High	High	-	High	-	High	High

SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation are shown in **Figure ES-7** and described more fully below.

Life-Cycle Cost Analysis

All Pavement and Bridge candidate solutions have two options: rehabilitation/repair or reconstruction. These options are evaluated through an LCCA to determine the best approach for each location where a Pavement or Bridge solution is recommended. The LCCA can eliminate options from further consideration and identify which options should be carried forward for further evaluation.

When multiple independent candidate solutions are developed for Mobility, Safety, or Freight strategic investment areas, these candidate solution options advance directly to the Performance Effectiveness Evaluation without an LCCA.

Performance Effectiveness Evaluation

After completing the LCCA process, all remaining candidate solutions are evaluated based on their performance effectiveness. This process includes determining a Performance Effectiveness Score (PES) based on how much each solution impacts the existing performance and needs scores for each segment. This evaluation also includes a Performance Area Risk Analysis to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

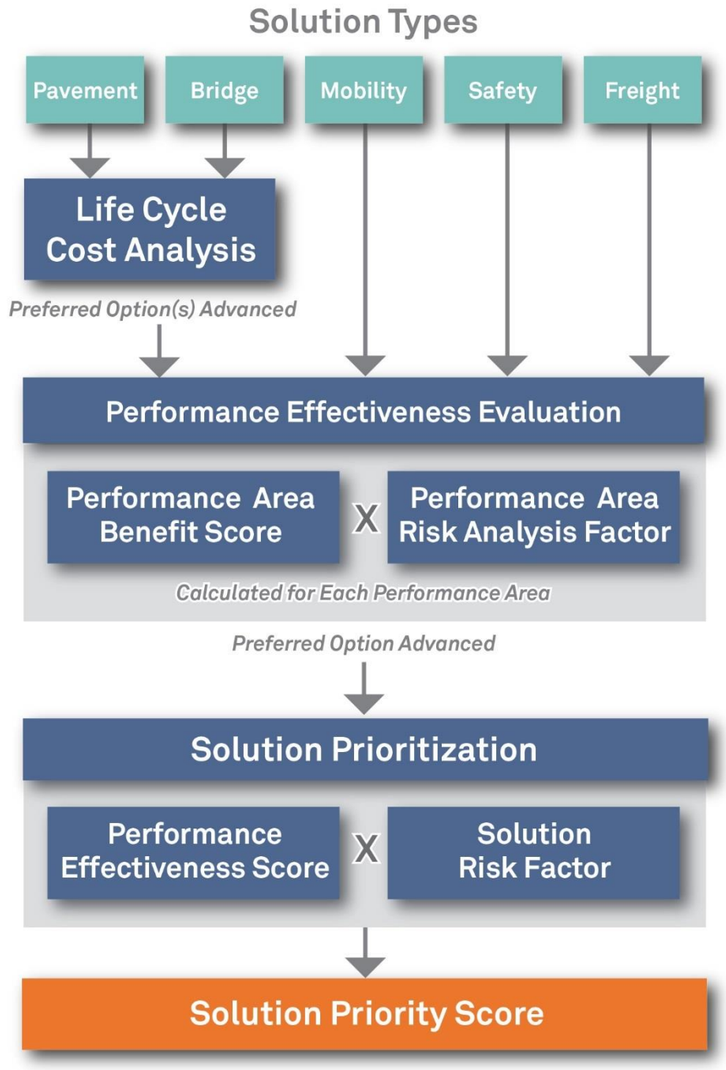
Solution Risk Analysis

All candidate solutions advanced through the Performance Effectiveness Evaluation are also evaluated through a Solution Risk Analysis process. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of performance failure.

Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score. The candidate solutions are ranked by prioritization score from highest to lowest. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Solutions that address multiple performance areas tend to score higher in this process.

Figure ES-7: Candidate Solution Evaluation Process



SUMMARY OF CORRIDOR RECOMMENDATIONS

Prioritized Candidate Solution Recommendations

Table ES-4 and **Figure ES-8** show the prioritized candidate solutions recommended for the US 160 Corridor in ranked order of priority. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Implementation of these solutions is anticipated to improve performance of the US 160 Corridor. The following observations were noted about the prioritized solutions:

- Most of the anticipated improvements in performance are in the Safety and Freight performance areas
- The highest-ranking solutions tended to have overlapping benefits in the Safety and Freight performance areas
- The highest-priority solution addresses needs in the Mexican Water area (MP 434-444)

Other Corridor Recommendations

As part of the investigation of strategic investment areas and candidate solutions, other corridor recommendations can also be identified. These recommendations could include modifications to the existing Statewide Construction Program, areas for further study, or other corridor-specific recommendations that are not related to construction or policy. The list below identifies other corridor recommendations for the US 160 Corridor:

- When recommending future projects along the US 160 Corridor, review historical ratings and levels of investment. According to data used for this study, the following pavement location has exhibited high historical investment issues:
  - Pavement MP 374-391
- As the area continues to grow, continue to provide support for a standard diamond interchange with a structure over US 89 at the US 89/US 160 intersection as recommended in the Final DCR - US 89 Antelope Hills to Jct. US 160 MP 442 to MP 484.

Policy and Initiative Recommendations

In addition to location-specific needs, general corridor and system-wide needs have also been identified through the CPS process. While these needs are more overarching and cannot be individually evaluated through this process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on the US 160 Corridor, but across the entire state highway system where the conditions are applicable. The following list, which is in no particular order of priority, was derived from the initial four CPS rounds:

- Install Intelligent Transportation System (ITS) conduit with all new infrastructure projects
- Prepare strategic plans for Closed Circuit Television (CCTV) camera and Road Weather Information System (RWIS) locations statewide
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic message signs (DMS), and call box locations to expand ITS applications across the state
- Consider solar power for lighting and ITS where applicable
- Investigate ice formation prediction technology where applicable
- Conduct highway safety manual evaluation for all future programmed projects
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects
- Develop standardized bridge maintenance procedures so districts can do routine maintenance work
- Review historical ratings and level of previous investment during scoping of pavement and bridge projects. In pavement locations that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project
- Expand programmed and future pavement projects as necessary to include shoulders
- Expand median cable barrier guidelines to account for safety performance
- Install CCTV cameras with all DMS
- In locations with limited communications, use CCTV cameras to provide still images rather than streaming video
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data
- When reconstruction or rehabilitation activities will affect existing bridge vertical clearance, the dimension of the new bridge vertical clearance should be a minimum of 16.25 feet where feasible
- All new or reconstructed roadway/shoulder edges adjacent to an unpaved surface should be constructed with a Safety Edge
- Collision data on tribal lands may be incomplete or inconsistent; additional coordination for data on tribal lands is required to ensure adequate reflection of safety issues
- Expand data collection devices statewide to measure freight delay
- Evaluate and accommodate potential changes in freight and goods movement trends that may result from improvements and expansions to the state roadway network
- At traffic interchanges with existing communication connectivity to the ADOT TOC, consideration should be given to adding thermal detection cameras for vehicle detection with the capability for wrong-way vehicle detection
- Improved vehicle detection systems, as recommended by ADOT Systems Technology group, should be deployed at traffic interchanges for improved traffic control

Next Steps

The candidate solutions recommended in this study are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the US 160 Corridor will be considered along with other candidate projects in the ADOT statewide programming process.

It is important to note that the candidate solutions are intended to represent strategic solutions to address existing performance needs related to the Pavement, Bridge, Mobility, Safety, and Freight performance areas. Therefore, the strategic solutions are not intended to preclude recommendations related to the ultimate vision for the corridor that may have been defined in the context of prior planning studies and/or design concept reports. Recommendations from such studies are still relevant to addressing the ultimate corridor objectives.

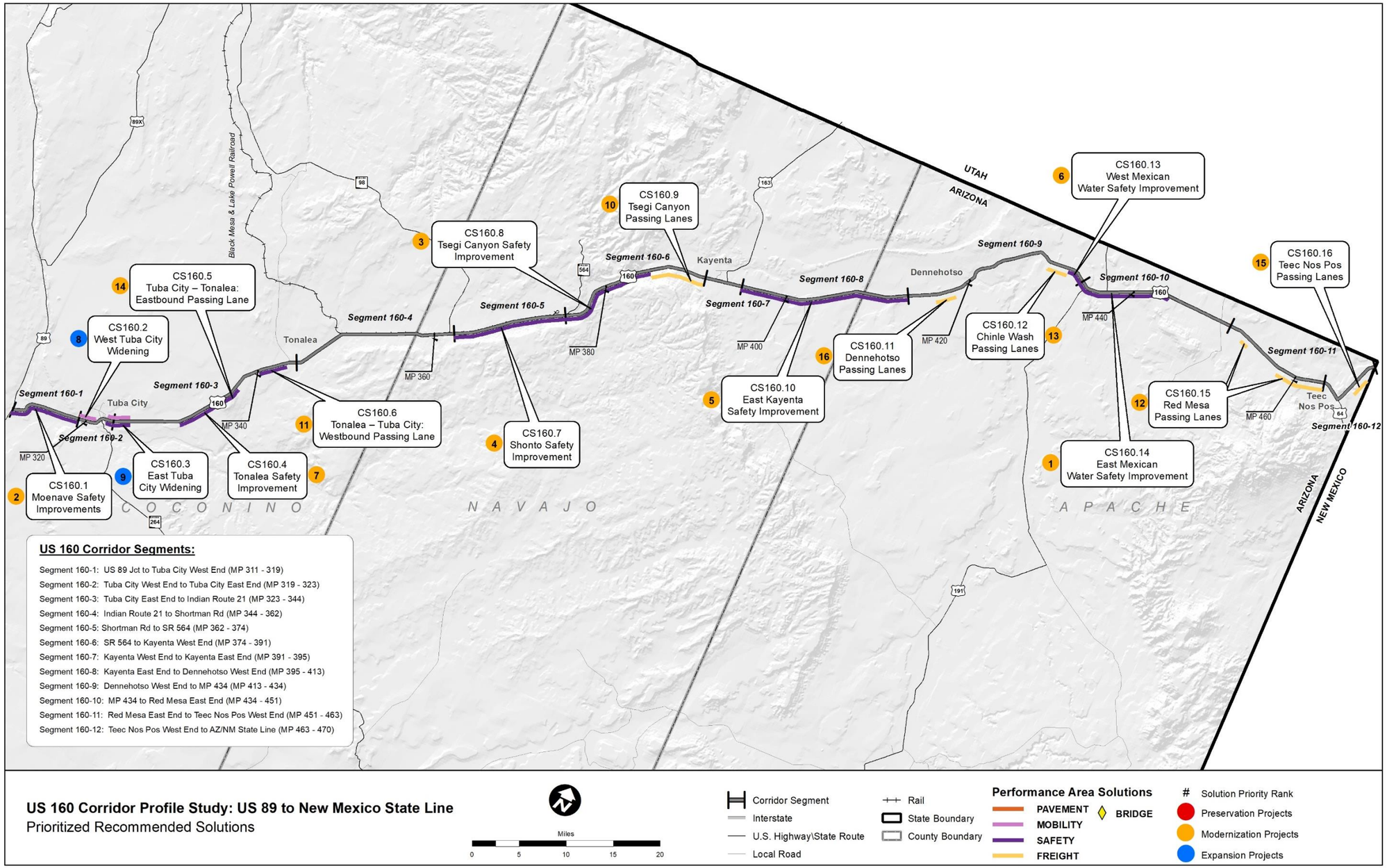
These results will be incorporated into a summary document comparing all corridors that is expected to provide a performance-based review of statewide needs and candidate solutions.

Table ES-4: Prioritized Recommended Solutions

Rank	Candidate Solution #	Option	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
1	CS160.14	-	East Mexican Water Safety Improvement (MP 434-444)	Install high visibility striping and delineators and rumble strips in both directions Install curve warning signs and speed feedback signs in both directions (MP 434 and MP 436) Install chevrons on curves (MP 434.5 to MP 435.5)	$1.95	M	1132
2	CS160.1	-	Moenave Safety Improvements (MP 312-319)	Install high visibility striping and delineators, reflective pavement markers, and rumble strips in both directions Install chevrons on curve (MP 312.5 to 314)	$1.26	M	877
3	CS160.8	-	Tsegi Canyon Safety Improvement (MP 374-385)	Install high visibility striping and delineators and rumble strips in both directions	$1.71	M	774
4	CS160.7	-	Shonto Safety Improvement (MP 362-374)	Install high visibility striping and delineators and rumble strips in both directions	$1.86	M	485
5	CS160.10	-	East Kayenta Safety Improvement (MP 395-413)	Install high visibility striping and delineators and rumble strips in both directions	$2.79	M	356
6	CS160.13	-	West Mexican Water Safety Improvement (MP 432-434)	Install curve warning signs and speed feedback signs in both directions (MP 432 and MP 434) Install chevrons on curves (MP 432.5 to MP 433.5)	$0.40	M	244
7	CS160.4	-	Tonalea Safety Improvement (MP 330-337)	Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) Install curve warning signs in both directions Install chevrons on curve (MP 336 to MP 336.5)	$7.75	M	107
8	CS160.2	-	West Tuba City Widening (MP 319-321.6)	Convert 2-Lane undivided highway to a 5-Lane highway	$23.41	E	49
9	CS160.3	-	East Tuba City Widening (MP 322.4-325)	Convert 2-Lane undivided highway to a 5-Lane highway	$17.72	E	36
10	CS160.9	-	Tsegi Canyon Passing Lanes (MP 385-391)	Construct westbound passing lane from MP 389 – MP 390 Construct eastbound passing lane from MP 385 – MP 391	$45.42	M	19
11	CS160.6	-	Tonalea – Tuba City: Westbound Passing Lane (MP 340-343)	Construct westbound passing lane from MP 340 – MP 341	$6.49	M	5

Rank	Candidate Solution #	Option	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
12	CS160.15	-	Red Mesa Passing Lanes (MP 453-463)	Construct eastbound passing lane from MP 453 – MP 454 Construct westbound passing lane from MP 458 – MP 463	$38.93	M	4
13	CS160.12	-	Chinle Wash Passing Lanes (MP 430-432)	Construct eastbound passing lane from MP 430 – MP 431 Construct westbound passing lane from MP 431 – MP 432	$12.98	M	3
14	CS160.5	-	Tuba City – Tonalea: Eastbound Passing Lane (MP 335-336.5)	Construct eastbound passing lane from MP 335 – MP 336.5	$9.73	M	1
15	CS160.16	-	Teec Nos Pos Passing Lanes (MP 467-469)	Construct eastbound passing lane from MP 467 – MP 468 Construct westbound passing lane from MP 468 – MP 469	$12.98	M	1
16	CS160.11	-	Dennehotso Passing Lanes (MP 416-418)	Construct eastbound passing lane from MP 416 – MP 417 Construct westbound passing lane from MP 417 – MP 418	$12.98	M	0

Figure ES-8: Prioritized Recommended Solutions



Final Report

Final Report

1 INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of US Route 160 between US Route 89 and the New Mexico Stateline. The study examines key performance measures relative to the US 160 Corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT has completed 21 original CPS within four separate groupings or rounds. In 2020, ADOT separated the previously studied corridors into six groupings to be updated and reassessed: Northeast, Northcentral, Northwest, Southeast, Southcentral, and Southwest. The 13 corridor studies within the three northern groupings began in Spring 2021 and include:

Northeast

- I-40: I-17 to New Mexico State Line
- SR 77: US 60 to SR 377
- SR 87: SR 202L to SR 260; SR 260: SR 87 to SR 277; SR 277: SR 260 to SR 377; SR 377: SR 277 to SR-40B; SR-40B: SR 377 to I-40
- SR 260: SR 277 to SR 73 and US 60: SR 260 to New Mexico State Line

Northcentral

- I-17: SR 69 to I-40
- US 89: Flagstaff to Utah State Line
- US 160: US 89 to New Mexico State Line
- SR 64: I-40 to Grand Canyon National Park
- SR 179: I-17 to SR 89A; SR 89A: SR 179 to I-17; and SR 260: SR 89A to I-17

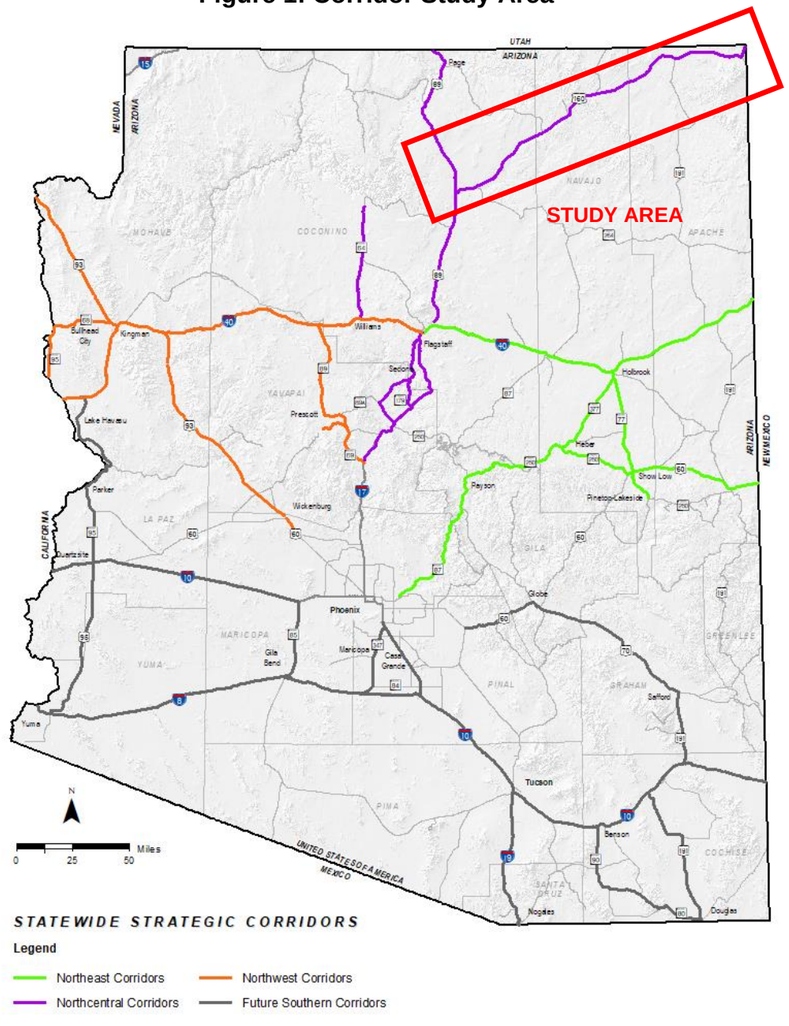
Northwest

- I-40: California State Line to I-17
- US 60: SR 74 to US 93; US 93: US 60 to Nevada State Line
- SR 68: SR 95 North to US 93 and SR 95 North: California State Line to Nevada State Line
- SR 69: I-17 to SR 89; Fain Rd: SR 69 to SR 89A; SR 89A: Fain Rd to SR 89; SR 89: SR 89A to I-40

The 8 corridor studies within the three southern groupings are proposed to begin in Spring 2022. The studies under this program assess the overall health, or performance, of the state's strategic highways. The CPS will identify candidate solutions for consideration in the Multimodal Planning Division's (MPD) P2P project prioritization process, providing information to guide corridor-specific project selection and programming decisions.

The US 160 Corridor, depicted in **Figure 1** along with all CPS corridors**,** is one of the strategic statewide corridors identified and the subject of this CPS Update.

Figure 1: Corridor Study Area



1.1 Corridor Study Purpose

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. This purpose can be accomplished by following the process described below:

- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the performance measures
- Prioritize solutions for future implementation, accounting for performance effectiveness and risk analysis findings

1.2 Study Goals and Objectives

The objective of this study is to identify a recommended set of prioritized potential solutions for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The US 160 CPS defines solutions and improvements for the corridor that are evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance. Corridor benefits can be categorized by the following three investment types:

- Preservation: Activities that protect transportation infrastructure by sustaining asset condition or extending asset service life
- Modernization: Highway improvements that upgrade efficiency, functionality, and safety without adding capacity
- Expansion: Improvements that add transportation capacity through the addition of new facilities and/or services

This study identifies potential actions to improve the performance of the US 160 Corridor. Proposed actions are compared based on their likelihood of achieving desired performance levels, life-cycle costs, cost effectiveness, and risk analysis to produce a prioritized list of solutions that help achieve corridor goals.

The following goals are identified as the desired outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Develop solutions that address identified corridor needs based on measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

1.3 Corridor Overview and Location

The US 160 Corridor provides an important connection from Northwest New Mexico and Southwest Colorado to economic and recreational activities in Northcentral Arizona and other destinations to the north and south of US 160. It begins at the intersection of US 89, west of Tuba City, and extends approximately 159 miles to the New Mexico state line, north of Teec Nos Pos, near Four Corners. The US 160 Corridor is generally a two-lane undivided rural arterial highway, except in Tuba City and Kayenta, where it becomes a four-lane highway to accommodate local traffic and provide various business and residential accesses.

The corridor is located in two ADOT Districts (Northcentral and Northeast), one planning area (Northern Arizona Council of Governments [NACOG]), and three counties (Coconino, Navajo and Apache). It serves as a primary east-west commuter and commercial route between Tuba City, Kayenta, and surrounding communities of the Navajo Nation and Hopi Reservation.

The route has high peak travel on the weekends from people traveling between the commerce centers of Tuba City and Kayenta and to Flagstaff, Arizona; Farmington, New Mexico; and Cortez, Colorado. Traffic is expected to increase along the corridor with Tuba City and Kayenta having been designated as the “growth centers” of the Navajo Nation. With the expected growth, increased congestion and safety concerns will likely occur unless this future traffic is accommodated with necessary improvements.

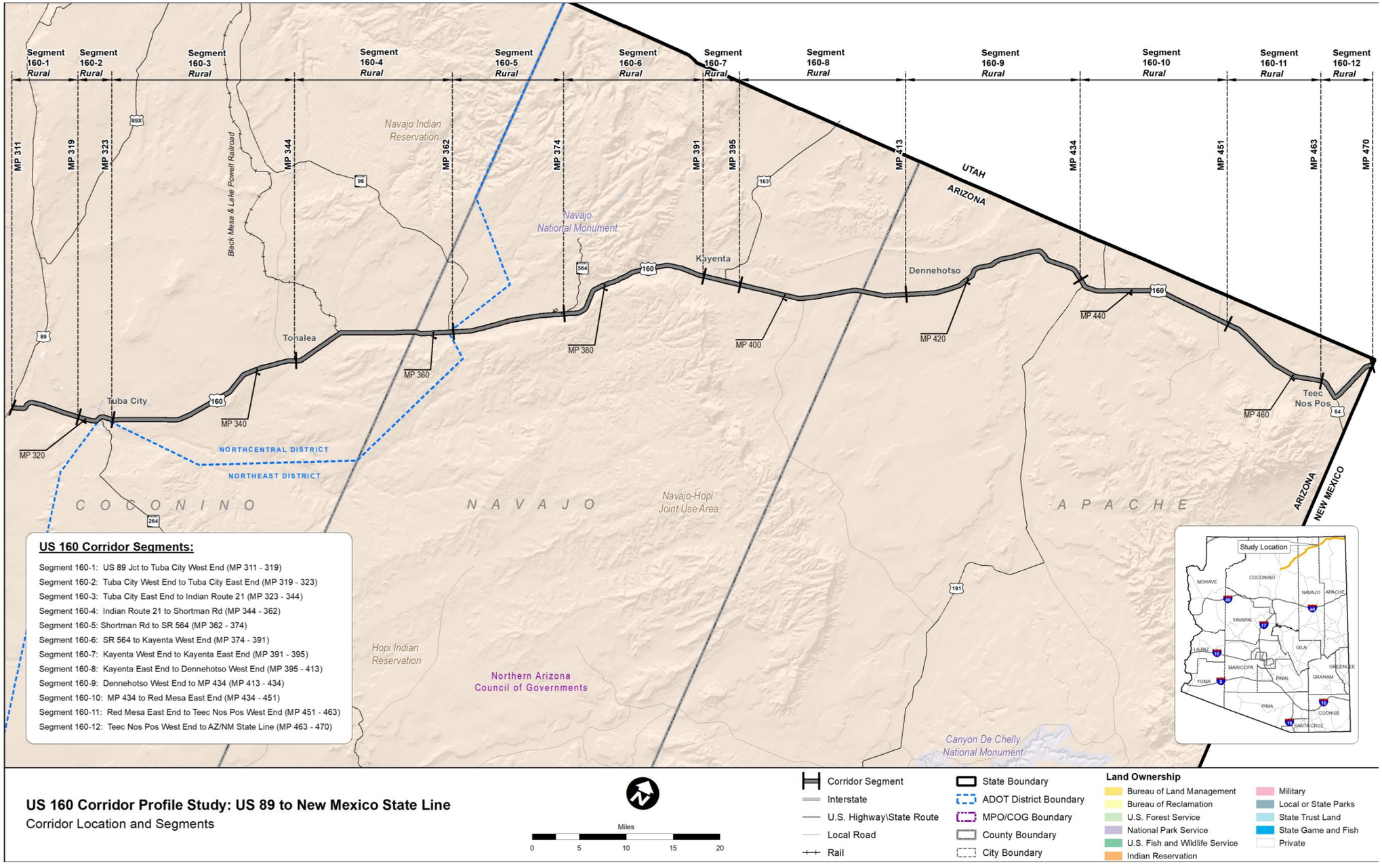
1.4 Corridor Segments

The US 160 Corridor is divided into 12 planning segments to allow for an appropriate level of detailed needs analysis, performance evaluation, and comparison between different segments of the corridor. The corridor is segmented at logical breaks where the context changes due to differences in characteristics such as terrain, daily traffic volumes, or roadway typical sections. Corridor segments are described in **Table 1** and shown in **Figure 2**.

Table 1: US 160 Corridor Segments

Segment #	Begin	End	Approx. Begin Milepost	Approx. End Milepost	Approx. Length (miles)	Typical Through Lanes (EB/WB)	2019/2040 Average Annual Daily Traffic Volume (vpd)	Character Description
160-1	US 89 Junction	Tuba City West End	311	319	8	1,1	6,000/8,300	Segment 160-1 is rural in nature and is located within Coconino County. Segment 160-1 is an undivided facility and includes one unsignalized junction with US 89 and provides bi-directional turn lane access to the Tuba City Airport.
160-2	Tuba City West End	Tuba City East End	319	323	4	2,2	13,900/19,200	Segment 160-2 is rural in nature, extends through the length of the Tuba City and Moenkopi town limits, and is located within Coconino County. Sections of Segment 160-2 are undivided with a flush median. It has one signalized junction with SR 264 Southbound, five unsignalized intersections, and various business/residential accesses.
160-3	Tuba City East End	Indian Route 21	323	344	21	1,1	4,800/6,500	Segment 160-3 is rural in nature and located within Coconino County. Segment 160-3 is an undivided facility and has various accesses to unpaved roads/trails.
160-4	Indian Route 21	Shortman Road	344	362	18	1,1	4,000/5,400	Segment 160-4 is rural in nature and located within Coconino and Navajo Counties. Segment 160-4 is an undivided facility and has one unsignalized junction with SR 98 Northbound and various accesses to unpaved roads/trails.
160-5	Shortman Road	SR 564	362	374	12	1,1	5,200/8,100	Segment 160-5 is rural in nature and located within Navajo County. Segment 160-5 has one unsignalized junction with SR 564 and various accesses to unpaved roads/trails.
160-6	SR 564	Kayenta West End	374	391	17	1,1	5,500/7,600	Segment 160-6 is rural in nature and located within Navajo County. Segment 160-6 is an undivided facility and has various accesses to unpaved roads/trails.
160-7	Kayenta West End	Kayenta Town East End	391	395	4	2,2	4,500/4,800	Segment 160-7 is rural in nature, extends through the Town of Kayenta and is located within Navajo County. Sections of Segment 160-7 are undivided with a flush center median. It has one signalized junction with US 163 North, one unsignalized intersection, and various business/residential accesses.
160-8	Kayenta Town East End	Dennehotso West End	395	413	18	1,1	3,400/1,600	Segment 160-8 is rural in nature and located within Navajo and Apache Counties. Segment 160-8 is an undivided facility and has one unsignalized intersection.
160-9	Dennehotso West End	MP 434	413	434	21	1,1	3,100/1,400	Segment 160-9 is rural in nature, extends through the Town of Dennehotso, and is located within Apache County. Segment 160-9 is an undivided facility, has various accesses to unpaved roads/trails, and intersects access routes to Mexican Water.
160-10	MP 434	Red Mesa East End	434	451	17	1,1	3,500/3,600	Segment 160-10 is rural in nature, extends through the Town of Red Mesa, and is located within Apache County. Segment 160-10 is a undivided facility and has two unsignalized junctions with US 191 South and US 191 North, one unsignalized intersection, and various accesses to unpaved roads/trails.
160-11	Red Mesa East End	Teec Nos Pos West End	451	463	12	1,1	3,500/4,800	Segment 160-11 is rural in nature and located within Apache County. Segment 160-11 is an undivided facility and has various accesses to unpaved roads/trails.
160-12	Teec Nos Pos West End	AZ/NM State Line	463	470	7	1,1	2,700/3,800	Segment 160-12 is rural in nature, extends through the Town of Teec Nos Pos, is located within Apache County, and terminates at the Arizona-New Mexico State Line. Segment 160-12 is an undivided facility and has one unsignalized junction with US 64 and various accesses to unpaved roads/trails.

Figure 2: Corridor Location and Segments



1.5 Corridor Characteristics

The US 160 Corridor provides an important connection from Northwest New Mexico and Southwest Colorado to economic and recreational activities in Northcentral Arizona and other destinations to the north and south of US 160. Beginning at the intersection of US 89, west of Tuba City, the corridor extends to the New Mexico state line, near Four Corners, providing a key economic and recreational link in the region and state.

National Context

US 160 is part of the National Highway System and is classified by ADOT as a Rural Principal Arterial, except within the Tuba City and Kayenta urban limits, where US 160 is classified as an Urban Principal Arterial. The corridor provides east-west connectivity from Arizona to New Mexico and Colorado.

The corridor is located in the Navajo Nation, which is the largest federally recognized Indian Reservation in the United States, encompassing over 27,000 square miles and extending into portions of Arizona, New Mexico, and Utah. The Navajo Nation is divided into five geographical districts generally referred to as agencies. US 160 Corridor plays an important part in the Navajo Nation economic road network, providing the most direct and fastest link between Tuba City Agency in Arizona and Shiprock Agency in New Mexico.

Regional Connectivity

US 160 crosses mostly rural terrain of Northeastern Arizona and intersects other north-south running U.S. Highways, State Routes, and Indian Routes as it travels east-west. The corridor begins at US 89 near the western edge of the Navajo Nation and provides gateway access to Northcentral Arizona, mainly Flagstaff, Page and the Grand Canyon National Park, for the eastern regions. Near Tuba City, it intersects State Route (SR) 264, which connects to various Hopi Reservation communities to the south. It goes through Tonalea and Cow Springs before intersecting SR 98, providing direct connection to Page to the north. As the corridor enters Kayenta, it intersects with US Route 163 which travels north to Monument Valley Navajo Tribal Park near the Arizona-Utah border. It continues northeast through Dennehotso, then intersects and has a brief overlap with US Route 191 in Mexican Water. It goes east until Teec Nos Pos, where it intersects US Route 64, then turns northeast to go to Four Corners, and enters New Mexico.

Commercial Truck Traffic

The US 160 Corridor is a regional truck route connecting Northern Arizona to Utah, New Mexico and Colorado. The corridor has been identified by ADOT's State Transportation Plan as a National Freight Truck Route for truck and hazardous material on the national highway system.

According to ADOT's 2019 Highway Performance Monitoring System (HPMS) data, the US 160 Corridor has a truck percentage that ranges between 9% and 14%. The high volume of trucks on this corridor can be attributed to the Tuba City and Kayenta growth centers of the Navajo Nation. Commercial trucks account for the transport of all consumer goods to markets and stores of the communities along the corridor.

The area is also a destination of fuel transportation to numerous local gas stations on or near the US 160 Corridor. Hazardous material transportation incidents involving the release of gasoline, diesel, and oil have been reported in the past. The sharing of a rural two-lane highway by relatively high truck and tourist volumes has become a safety concern.

Teec Nos Pos Port of Entry along Segment 160-12 at MP 465.2 is located at the intersection of US 160 and US 64. This location has a weigh station and requires the trucks to stop for inspection, which can create delay with commercial truck traffic.

Commuter Traffic

Moderate commuter traffic is present on US 160, especially at the junctions around Segments 160-1, 160-2, 160-6 and 160-7. This is due to commuters traveling to Flagstaff, Monument Valley Navajo Tribal Park, and between the commerce centers of Tuba City and Kayenta. Per the 2040 forecasts, traffic is generally expected to increase along these segments, and increased congestion and safety concerns will occur unless this future traffic is accommodated with necessary improvements.

Other population centers along the corridor, including Tonalea/Red Lake, Black Mesa, Tsegi, Dennehotso, Tes Nez Iah, Mexican Water, and Teec Nos Pos, add to the inter-city commuter traffic on US 160 to a lesser degree.

Recreation and Tourism

Various scenic sites are located along the US 160 Corridor, however, there are no designated national or state parks in the corridor area. The US 160 Corridor is mainly used to access roads leading to recreational areas such as the Navajo National Monument, located off SR 564; Monument Valley, located off US 163; and Four Corners Monument. Other local scenic viewpoints along US 160 include Dinosaur Tracks (MP 316.5), Elephants' Feet (MP 345) and White Mesa Natural Bridge (MP 345).

US 160 intersects US 89 on the west, thereby providing gateway access from New Mexico and Colorado to Northern Arizona, mainly Flagstaff, Page and the Grand Canyon National Park, which is one of the most visited national parks in the country with over 5 million visitors annually.

Multimodal Uses

Freight Rail

Black Mesa and Lake Powell Railroad is not a common carrier system and is owned by the Peabody Coal Company specifically to haul coal from the Kayenta Mine near Kayenta to the Salt River Project Navajo Generating Station power plant at Page. The railroad runs parallel to the US 160 Corridor from the Kayenta mine (west of SR 564) to MP 350 (Cow Springs Lake).

Overall, the railroad is about 78 miles in length and has no stations or terminals located along its main line and it does not cross the US 160 Corridor at any point. With the recent closure of the Navajo Generating Station, it is unclear if the railroad will be in use in the future.

Passenger Rail

There are no existing or proposed passenger rail services along the US 160 Corridor.

Bicycles/Pedestrians
Shoulders generally average 5 feet in width to accommodate cyclists on US 160.

Bus/Transit
Navajo Transit System (NTS) administers and operates inter-city bus transportation services for the general public. It is a department under the Division of General Services within the Navajo Nation Government and is funded primarily through the New Mexico and Arizona Departments of Transportation.

NTS provides bus services on 15 fixed routes along state highways out of which four routes run along US 160 Corridor, namely, Route 01: Tuba City/Fort Defiance, Route 03: Kayenta/Fort Defiance, Route 11: Flagstaff/Tuba City, and Route 12: Kayenta/Tuba City. NTS has proposed two new routes in its long-term transportation plan – Kayenta to Utah border and Kayenta to Page.

NTS buses pick up riders at designated stops, but no NTS stops/stations have been constructed. The transit system connects with Hopi Transit System, Greyhound Busline, Amtrak Passenger Train, and Flagstaff Mountain Line. Other public transit services that provide transportation along US 160 include school district buses and Community Health Representatives. (*Source: http://www.navajotransit.com/*)

Aviation
There are two public use airports along the US 160 Corridor: the Tuba City Airport in Segment 160-1 and Kayenta Airport in Segment 160-7, both of which are owned by the Navajo Nation.

Land Ownership, Land Uses, and Jurisdictions
As shown previously in **Figure 2**, the US 160 Corridor is located within Coconino, Apache, and Navajo counties and lies entirely within Navajo and Hopi Nation tribal lands. All Indian reservation lands are held in trust by the Federal government and obtaining any new right-of-way will need to be approved by the Secretary of the Department of Interior through the Bureau of Indian Affairs with simultaneous consent from the affected tribal governments.

Existing land uses along the study corridor generally consist of residential, ceremonial, commercial, transportation/utilities (e.g., power line and railroad, etc.), agricultural, and recreational with a majority being undeveloped vacant land primarily used for sheep and cattle grazing.

Several small to medium-sized unincorporated towns are located along the study corridor. Residential and commercial development is concentrated around the towns of Tuba City, Moenkopi, Red Lake, Tsegi, Dennehotso, Tes Nez Iah, Mexican Water, Red Mesa, and Teec Nos Pos. Kayenta is the Navajo Nation's fifth largest growth center and is the only incorporated community on the Navajo Nation. Kayenta Township is implementing a comprehensive plan for the development of the town with revenues collected from its local sales tax.

Population Centers
The US 160 Corridor extends through three counties (Coconino, Navajo, and Apache) and is entirely rural. There are two minor population centers along the corridor in Tuba City and Kayenta. Modest population growth is projected in Tuba City, however population losses are projected for Kayenta and other communities located along the corridor. **Table 2** shows historical (2010) and current (2020) population by county and town/census designated place along with projected future (2040) population and growth.

Table 2: Current and Future Population

Community	2010 Population	2020 Population	2040 Population	% Change 2010-2040	Total Growth
Coconino County	**134,421**	**148,376**	**161,771**	**20%**	**27,350**
Tuba City CDP	8,611	8,940	9,084	5%	473
Unincorporated	53,567	55,584	56,471	5%	2,904
Navajo County	**107,449**	**114,265**	**118,511**	**10%**	**11,062**
Kayenta	5,189	5,043	4,157	-20%	-1,032
Unincorporated	68,097	71,694	71,486	5%	3,389
Apache County	**71,518**	**73,551**	**69,113**	**-3%**	**-2,405**
Dennehotso	746	773	717	-4%	-29
Teec Nos Pos	730	757	701	-4%	-29
Unincorporated	61,192	62,658	56,910	-7%	-4,282

Source: U.S. Census, Arizona Department of Administration – Employment and Population Statistics

Major Traffic Generators
Much of the traffic on US 160 results from commercial, inter-city and long-distance recreational travel. The route experiences high peak travel on the weekends from people traveling to Flagstaff, Arizona; Farmington, New Mexico; and Cortez, Colorado. Also, various recreational spots like Navajo National Monument, Monument Valley, and Four Corners Monument that are located off the corridor generate tourist traffic.

Tuba City and Kayenta are significant employment centers and regional centers for health care and community services, schools, public safety as well as banking, shopping, dining and other services. The concentration of facilities at these two centers generates inter-city commuter traffic to and from other smaller communities located along the corridor. Freight traffic is observed as well due to the transport of consumer goods to markets and stores of the communities along the corridor.

The Kayenta mine, operated by Peabody Western Coal Company, is located south of the corridor near Segment 160-6. It constitutes an important employment generator in the region and attracts commuter traffic to and from the mine along US 160.

Tribes

The US 160 Corridor lies entirely within Navajo Nation and Hopi Tribe lands. The Navajo Nation controls a majority of the lands adjacent to US 160 with the exception of two areas that are controlled by the Hopi Tribe. The Hopi Tribe land includes Moenkopi Village near Tuba City and a small area located south of US 160 near MP 340. The Navajo Nation is divided into Chapters, which have their own local planning authority. The US 160 intersects 10 Navajo Chapters, which are listed in the table below. *(Source: http://www.navajo-nsn.gov/chapters.htm)*

Navajo Chapter	Approximate Mileposts
Bodaway	312.0-315.5
Coalmine Mesa	315.5-321.0
Tuba City	321.0-337.0
Red Lake	337.0-356.0
Shonto	356.0-375.0
Kayenta	375.0-407.0
Dennehotso	407.0-429.0
Mexican Water	429.0-439.5
Red Mesa	439.5-450.0
Teec Nos Pos	450.0-470.5

Many San Juan Paiute tribal members reside in several distinct communities located on the Navajo Nation, primarily in northern Arizona and southeastern Utah. The largest of these communities are located at Willow Springs, near Tuba City and at Navajo Mountain on the Arizona and Utah border.

Wildlife Linkages

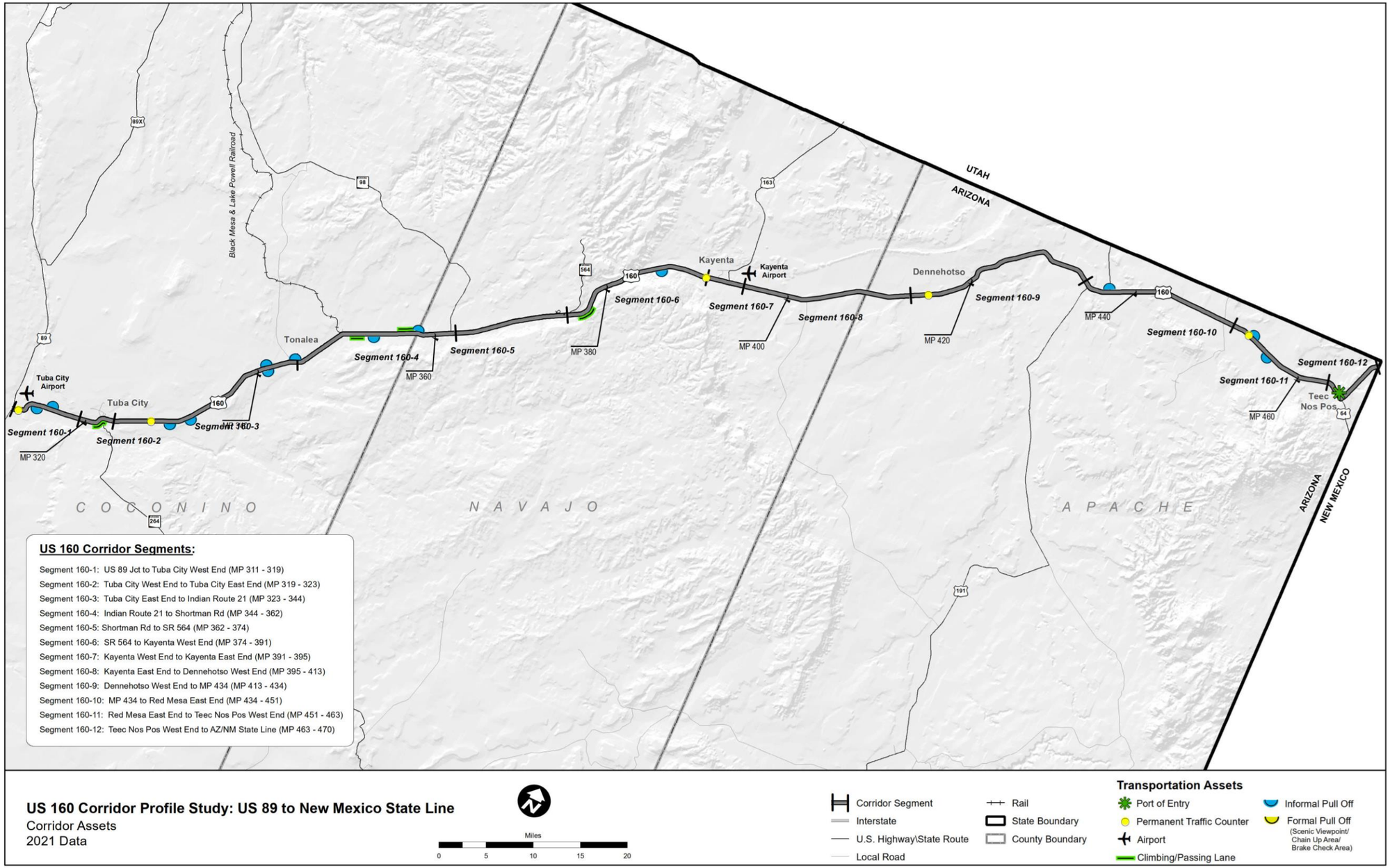
The Arizona State Wildlife Action Plan (SWAP) provides a 10-year vision for the entire state, identifying wildlife and habitats in need of conservation, insight regarding the stressors to those resources, and actions that can be taken to alleviate those stressors. Using the Habimap Tool that creates an interactive database of information included in the SWAP, the following were identified in relation to the US 160 Corridor:

- US 160 travels through three distinct vegetation zones, namely: Plains and Great Basin Grassland, Great Basin Desertscrub, and Great Basin Conifer Woodland
- Plains and Great Basin Grasslands are found northeast of Red Lake, south of Kayenta, and in the vicinity of Teec Nos Pos
- The Great Basin Desertscrub occurs between Tuba City and Red Lake and between Kayenta and Red Mesa
- The Woodland community occurs generally between Red Lake and Kayenta
- A Potential Wildlife Linkage Zone is identified along Segments 160-6 and 160-7, and it further extends along SR 564 and part of SR 163 in Kayenta. This portion of the Fracture Zone is designated as a Potential Linkage Zone to design and conserve functional linkage(s) critical for wildlife movement
- No Wildlife Waters are located along and around US 160
- Species of Greatest Conservation Need (SGCN) are identified around Segment 160-2, in Tuba City and Moenkopi, with the conservation potential ranging from medium to low
- Riparian areas in the Southwest are crucial habitats for wildlife sustainability and often serve as wildlife movement corridors within the landscape. Such areas exist around Segment 160-2, mostly in the southern west part of US 160 and the SR 264 intersection (Moenkopi), and are indicated as areas of high conservation potential
- Species of Economic and Recreational Importance are identified around Segment 160-2, in Tuba City and Moenkopi, with a low conservation potential
- The Wildlife Stressors are various potential stressors to Arizona's wildlife species. The stressors affecting the study corridor most are Air Traffic, Contaminants/Waste Water, Deicing, Drilling for Fuels, Habitat Degradation, Illegal Dumping, Loss of Keystone Species, Mining, and Railroads

Corridor Assets

Corridor transportation assets of note are summarized in **Figure 3**. A freight weigh station is located near the New Mexico border in Teec Nos Pos, Arizona. There are two public use airports, at Tuba City and Kayenta, owned by the Navajo Nation along US 160. With the corridor being a two-lane undivided rural arterial highway, it has no traffic interchanges or grade-separated road crossings; however, the corridor does have a few signaled traffic intersections, passing lanes, and informal pull-offs. There are a total of five permanent traffic counters located along the US 160 Corridor.

Figure 3: Corridor Assets



1.6 Corridor Stakeholders and Input Process

A Technical Advisory Committee (TAC) was created that comprised of representatives from the stakeholders. TAC meetings were held at key milestones to present results and obtain feedback. In addition, several meetings were conducted with key stakeholders to present the results and obtain feedback.

Key stakeholders identified for this study included:

- ADOT Northcentral District
- ADOT Northeast District
- ADOT Technical Groups
- NACOG
- Navajo Nation Government
- Hopi Tribal Council
- Federal Highway Administration (FHWA)

Several Working Papers were developed during the course of the CPS. The Working Papers were provided to the TAC for review and comment.

1.7 Prior Studies and Recommendations

This study identified recommendations from previous studies, plans, and preliminary design documents. Studies, plans, and programs pertinent to the US 160 Corridor were reviewed to understand the full context of future planning and design efforts within and around the study area. These studies are organized below into four categories: Framework and Statewide Studies, Regional Planning Studies, Planning Assistance for Rural Areas (PARAs) and Small Area Transportation Studies (SATS), and Design Concept Reports (DCRs) and Project Assessments (PAs).

Framework and Statewide Studies

- ADOT Bicycle and Pedestrian Plan Update (2013)
- ADOT Pedestrian Safety Action Plan (2017)
- ADOT Five-Year Transportation Facilities Construction Program (2021-2025)
- ADOT Climbing and Passing Lane Prioritization Study (2015)
- ADOT Arizona Key Commerce Corridors (2014)
- ADOT Arizona Multimodal Freight Analysis Study (2009)
- ADOT Arizona Ports of Entry Study (2021)
- ADOT Arizona State Airport Systems Plan (2008)
- ADOT Arizona State Freight Plan (2017)
- ADOT Arizona State Rail Plan (2011)
- AGFD Arizona State Wildlife Action Plan (2012)
- AGFD Arizona Wildlife Linkages Assessment (2006)
- ADOT Arizona Statewide Dynamic Message Sign Master Plan (2011)
- ADOT Arizona Statewide Intelligent Transportation System (ITS) Architecture (2018)
- ADOT Arizona Statewide Rail Framework Study (2010)
- ADOT Arizona Statewide Rest Area Study (2011)
- ADOT Arizona Statewide Shoulders Study (2015)
- ADOT Arizona Strategic Traffic Safety Plan (2019)
- ADOT Arizona Roadway Departure Safety Implementation Plan (RDSIP) (2014)
- ADOT AASHTO U.S. Bicycle Route System (2015)
- ADOT Low Volume State Routes Study (2017)
- ADOT Statewide Stormwater & Erosion Control Study (2020)
- ADOT Statewide Transportation Planning Framework – Building a Quality Arizona (BQAZ) (2010)
- ADOT Transportation Asset Management Plan (2019)
- ADOT What Moves You Arizona? Long-Range Transportation Plan (2018-2040)

Regional Planning Studies

- NACOG Regional Transportation Improvement Program (FY 2017-2023)
- Coconino County Comprehensive Plan Final Draft (2015)
- Coconino County Road Capital Improvement Plan (FY 2015-2024)
- Navajo County Comprehensive Plan (2011)
- Apache County Comprehensive Plan (2019)
- US 160 Corridor Profile Study (2018)

Planning Assistance for Rural Areas and Small Area Transportation Studies

- Kayenta Township Multimodal Transportation Study (2012)

Design Concept Reports and Project Assessments

- US 89 Antelope Hills to Jct. US 160 MP 442 to MP 484 DCR (2006)
- US 160, MP 460.5 to 462.6 Passing Lane, Final PA (2004)
- US 160, Jct. US 89 to Four Corners Final Feasibility Report & Corridor Improvement Plan, (2007)
- US 160, Red Mesa to Teec Nos Pos Pavement Preservation, Final PA, (2009)
- US 160, Tsegi to Kayenta Drainage Repairs, Final PA (2006)
- US 160, County Line to Black Mesa Pavement Preservation, Final PA (2011)
- US 160, Jct. US 89 to Van's Trading Post Pavement Preservation, Final PA, (2004)
- US 160, Kayenta to Jct. N 59 Pavement Preservation, Final PA (2004)
- US 160, Dennehotso to Linz Pavement Preservation, Final PA (2001)
- US 160, Jct. SR 564 to Tsegi Roadway Widening and Passing Lanes, Final PA (2000)

- US 160, E Tuba City to Navajo Co. Line Pavement Preservation, Final PA (2001)
- US 160, US 160 Passing Lanes, Final PA (2003)
- US 160, Van's Trading Post to East of SR 264 Roadway Widening and Drainage Improvements, Final PA (2001)

Summary of Prior Recommendations

Various studies and plans, including several DCRs, have recommended improvements to the US 160 Corridor as shown in **Table 3** and **Figure 4**. They include, but are not limited to:

- Widening numerous sections of US 160, some of which will require right-of-way acquisition. Many other proposed improvements are associated with the recommended widening:
  - Widening from a two-lane undivided highway to a four-lane divided highway with median, flush median or curbed median from MP 311.5 to MP 401.4 and MP 434.8 to MP 465.8
  - Approximately 50 miles of shoulder widening and improvement at various locations
- Addition of passing lanes at the following locations:
  - EB: MP311 - MP320
  - EB: MP335 - MP341
  - WB: MP343 - MP337
  - EB: MP361 - MP367
  - WB: MP369 - MP375
  - EB: MP385 - MP391
  - EB/WB: MP401 - MP435
  - WB: MP458 - MP463
- Addition of climbing lanes at the following locations:
  - EB: MP312 - MP314
  - WB: MP345 - MP343
  - EB: MP381 - MP384
  - WB: MP462 - MP460
- Addition of various roadway departure countermeasures such as centerline rumble stripes, shoulder rumble stripes, alignment delineation, and lighting
- Multimodal transportation upgrade at Kayenta
- Teec Nos Pos Port of Entry Improvements
- Development of Junction US 89/US 160 Diamond Interchange
- US 160/ SR 564 Traffic Intersection Improvement
- Scour Retrofit of Laguna Creek Bridge
- Bridge Replacement of Chinle Wash Bridge
- Intelligent Transportation System (ITS) improvements, such as dynamic message signs at:
  - EB DMS at MP386 (between Tsegi and Kayenta)
  - EB DMS at MP430 (before US 160 and US 191 Junction)
  - EB DMS at MP460
  - Constructing various safety improvements at the following locations: Mexican Water, MP 342-438
  - Tonalea, MP 331-341
  - Shonto, MP 346-362
- Constructing intersection improvements at US 160/US 191, MP 435-457
- Widening section of the following locations:
  - West Tuba City, MP 319-321.6
  - East Tuba City, MP 322.4-325
- Constructing passing lanes at the following locations:
  - WB Passing Lane, MP 340-341
  - EB Passing Lane, MP 342-343
  - WB Passing Lane, MP 389-390
  - EB Passing Lane, MP 390-391
  - EB Passing Lane, MP 335-336.5

Table 3: Corridor Recommendations from Previous Studies

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N?)	
1	311	-	-	Jct. US 89 / US 160 Diamond Interchange		√		-	N/A	Y (EA)	US 89 Antelope Hills to Jct. US 160 MP 442 to MP 484 DCR (2007)
2	311	470	159	US 160 widening to Four Corners area			√	-	N/A	N	Building a Quality Arizona (BQAZ) Transportation Planning Framework Study (2010) (ADOT)
3	311	470	159	Roadway Departure Countermeasures: • Alignment Delineation, Lighting (MP 392-392.5, 394.5-395)		√		-	N/A	N	Arizona Roadway Departure Safety Implementation Plan,(2014) (ADOT)
4	311	320	9	• US 160 EB: MP311 - MP320 Passing Lane • US 160 EB: MP312 - MP314 Climbing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study(2015) (ADOT)
5	311	321.68	10.68	US 89-MP 321.68 Paved Shoulder Need		√		-	N/A	N	Statewide Bicycle and Pedestrian Plan Update (2013) (ADOT)
6	311.5	401.4	89.9	• US 160 311.5 – MP 318.5 Expand to 4-lane Rural Divided with Median • US 160 318.5 – MP 324.4 Expand to 4-lane Fringe Urban with Flush Median • US 160 MP 324.4 – MP 343.8 Expand to 4-lane Rural Divided with Median • US 160 MP 343.8 – MP 361.6 Expand to 4-lane Rural Divided with Median • US 160 MP 361.6 – MP 374.3 Expand to 4-lane Rural Divided with Median • US 160 MP 374.3 – MP 392.6 Expand to 4-lane Rural Divided with Median • US 160 MP 392.6 – MP 395.7 Expand to 4-lane Fringe Urban with Curbed Median • US 160 MP 395.7 – MP 401.4 Expand to 4-lane Rural Divided with Median			√	-	N/A	Y (EO)	US 160, Jct. US 89 to Four Corners Final Feasibility Report & Corridor Improvement Plan (2007)
7	318	325	7	IR 6731 – SR 98 Bus Pullout		√		FY-19	F005901C	N	ADOT 2017-2021 State Transportation Improvement Program (2017)

Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N?)	
8	319	321.6	2.6	West Tuba City Widening: • Convert 2-Lane undivided highway to a 5-Lane highway			√	-	N/A	N	US 160 Corridor Profile Study (2018)
9	322.4	325	2.6	East Tuba City Widening: • Convert 2-Lane undivided highway to a 5-Lane highway • Install lighting (connecting to existing power) in both directions			√	-	N/A	N	US 160 Corridor Profile Study (2018)
10	323	324.5	1.5	US 160 323-324.5 Pedestrian Safety Improvements		√		-	N/A	N	Pedestrian Safety Action Plan (2017)
11	329.76	338	8.24	MP 329.76-BIA 021 Shoulder Paving		√		-	N/A	N	Statewide Bicycle and Pedestrian Plan Update (2013)
12	331	341	10	• Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) • Install curve warning signs in both directions • Install chevrons on curve (MP 336 to MP 336.5)		√		-	N/A	N	US 160 Corridor Profile Study (2018)
13	335	343	8	• US 160 EB: MP335 - MP341 Passing Lane • US 160 WB: MP343 - MP337 Passing Lane • US 160 EB: MP 335-336.5 Passing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study (2015) and US 160 Corridor Profile Study (2018)
14	340	343	3	Tonolea-Tuba City: Tuba City WB • Construct westbound passing lane from MP 340 – MP 341 • Construct westbound passing lane from MP 342 – MP 343			√	-	N/A	N	US 160 Corridor Profile Study (2018)
15	345	343	2	US 160 WB: MP345 - MP343 Climbing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study, (2015)

Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N?)	
16	346	362	16	Shonto Safety Improvements: • Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) • Install lighting (solar powered LED) at SR 98 intersection (MP 361.6) • Install curve warning signs in both directions • Install chevrons on curve (MP 358 to MP 359)		√		-	N/A	N	US 160 Corridor Profile Study (2018)
17	361	367	6	US 160 EB: MP 361 – MP 367 Passing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study, (2015)
18	364	374	10	Widen Shoulders (EB/WB) US 160: MP 364 - MP 366, MP 366 - MP 368, MP 368 - MP 370, MP 370 - MP 372, MP 372 - MP 374		√		-	N/A	N	Arizona Statewide Shoulders Study (2015)
19	369	375	6	US 160 WB: MP 369 – MP 375 Passing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study (2015)
20	373	390	17	Long House Valley – Kayenta Pavement Preservation	√			FY-20	N/A	N	ADOT 2017-2021 State Transportation Improvement Program (2017)
21	374	-	-	SR 564 Traffic Intersection Improvement		√		-	N/A	N	Building a Quality Arizona (BQAZ) Transportation Planning Framework Study (2010) (ADOT)
22	381	384	3	US 160 EB: MP381 - MP384 Climbing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study (2015)
23	385	391	6	US 160 EB: MP385 - MP391 Passing Lane		√		-	N/A	N	Climbing and Passing Lane Prioritization Study (2015)
24	386	-	-	US 160 MP 386 EB DMS Sign		√		-	N/A	N	Arizona Statewide Dynamic Message Sign Master Plan (2011)

Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N?)	
25	389	391	2	Tsegi Canyon Passing Lanes: • Construct westbound passing lane from MP 389 – MP 390 • Construct eastbound passing lane from MP 390 – MP 391		√		-	N/A	N	US 160 Corridor Profile Study (2018)
26	390	395	5	• US 160 Advance Intersection Warning Devices • US 163 and US-160 Streetlight Study • US 163 and US-160 Access Consolidation • US 163 and US 160 Roadway Beautification and Landscaping • Business Signs on US 160 and US 163 • Right-Turn Deceleration Lanes on US 163 and US 160 (MP 393.5) • Improve Access and Circulation US 163 and US 160 intersection (MP 393.5)		√		-	N/A	N	Kayenta Township Multimodal Transportation Study (2012)
27	392	394	2	Widen Shoulder US 160: MP 392 - MP 394 EB/WB		√		-	N/A	N	Arizona Statewide Shoulders Study (2015)
28	401.4	434.8	33.4	Climbing lane, passing lane, and shoulder widening improvements		√		-	N/A	Y (EO)	US 160, Jct. US 89 to Four Corners Final Feasibility Report & Corridor Improvement Plan (2007)
29	430	-	-	US 160 MP 430 EB DMS Sign		√		-	N/A	N	Arizona Statewide Dynamic Message Sign Master Plan(2011)
30	432	438	6	Mexican Water Safety Improvements: • Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) • Install curve warning signs in both directions • Install chevrons on curves (MP 432.5 to MP 433.5 and MP 434.5 to MP 435.5)		√		-	N/A	N	US 160 Corridor Profile Study (2018)

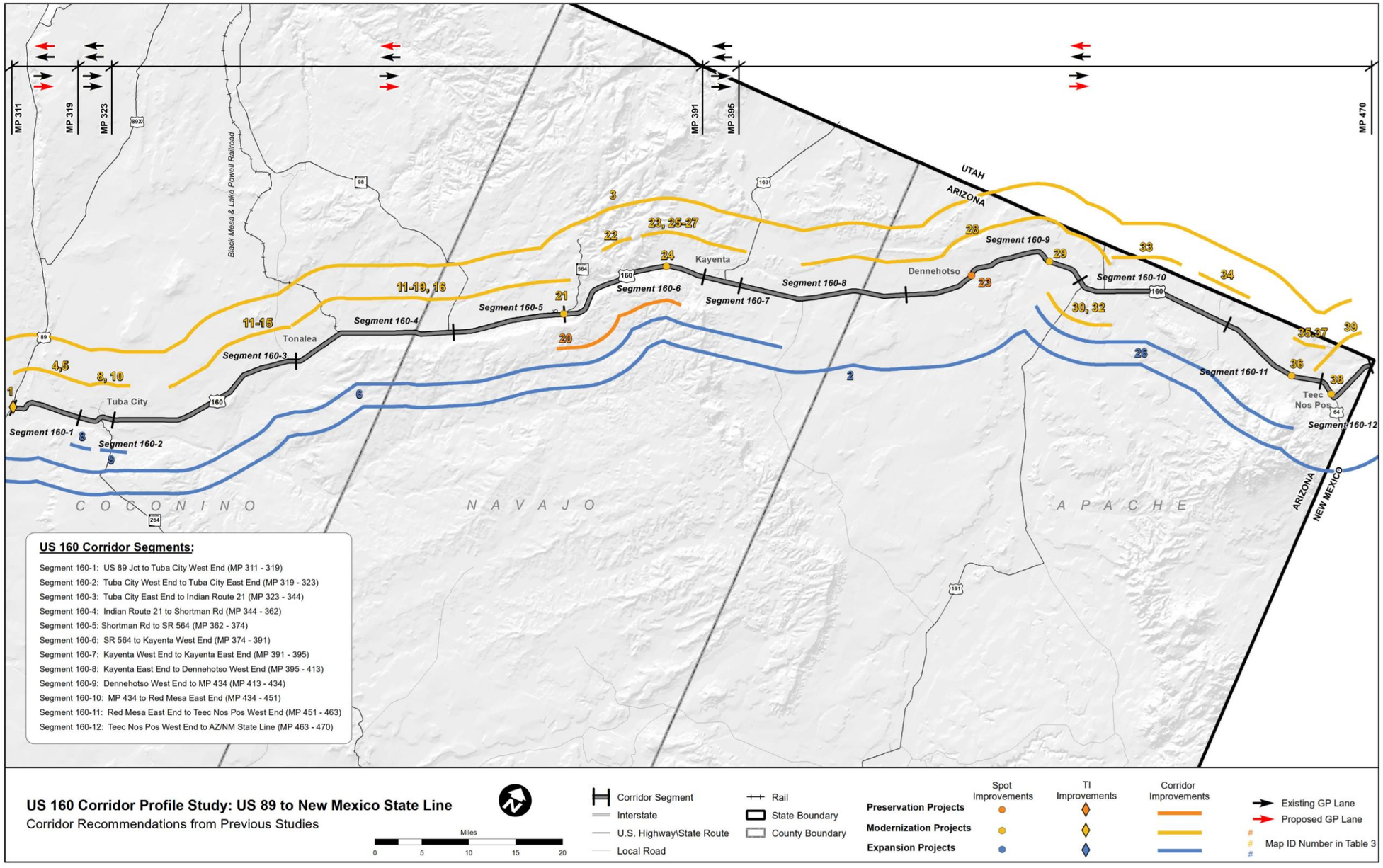
Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N?)	
31	434.8	465.8	31	• US 160 MP 434.8 – MP 437.2 Expand to 4-lane Rural Divided with Median • US 160 MP 437.2 – MP 463.7 Expand to 4-lane Rural Divided with Median • US 160 MP 463.7 – MP 465.1 Expand to 4-lane Fringe Urban with Flush Median • US 160 MP 465.1 – MP 465.8 Expand to 4-lane Urban with Flush Median			√	-	N/A	Y (EO)	US 160, Jct. US 89 to Four Corners Final Feasibility Report & Corridor Improvement Plan (2007)
32	435	437	2	US 160/US 191 Intersection Improvements: • Install eastbound acceleration lane at US 191 intersection (MP 434.8) • Install eastbound deceleration lane at US 191 intersection (MP 434.8) • Install westbound acceleration lane at US 191 intersection (MP 437.2) • Install lighting (solar powered LED) at US 191 intersections (MP 434.8 and MP 437.2)		√		-	N/A	N	US 160 Corridor Profile Study (2018)
33	438	444	2	Widen Shoulders (EB/WB) US 160:MP 438 - MP 440, MP 440 - MP 442, MP 442 - MP 444		√		-	N/A	N	Arizona Statewide Shoulders Study (2015)
34	446	452	2	Widen Shoulder (EB/WB) US 160: MP 446 - MP 448, MP 448 - MP 450, MP 450 - MP 452		√		-	N/A	N	Arizona Statewide Shoulders Study(2015)
35	458	463	5	• US 160 WB: MP458 - MP463 Passing Lane • US 160 WB: MP462 - MP460 Climbing Lane		√		-	H603701C N/A	Y (EO)	US 160, MP 460.5 - 462.6, Final Project Assessment (2007) Climbing and Passing Lane Prioritization Study(2015)
36	460	-	-	US 160 MP 460 EB DMS Sign		√		-	N/A	N	Arizona Statewide Dynamic Message Sign Master Plan (2011)

Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N?)	
37	460	462	2	Widen Shoulder US 160: MP 460 - MP 462 EB/WB Widen		√		-	N/A	N	Arizona Statewide Shoulders Study(2015) (ADOT)
38	465.2	-	-	Teec Nos Pos Mainline Screening (weight and credential screening, cameras, signage and signals on the mainline)		√		-	N/A	N	Arizona Port of Entry Study(2014) (ADOT) Arizona Key Commerce Corridors (2013) (ADOT)
39	465.8	470.8	5	Shoulder widening		√		-	N/A	Y (EO)	US 160, Jct. US 89 to Four Corners Final Feasibility Report & Corridor Improvement Plan (2007)

Figure 4: Corridor Recommendations from Previous Studies



2 CORRIDOR PERFORMANCE

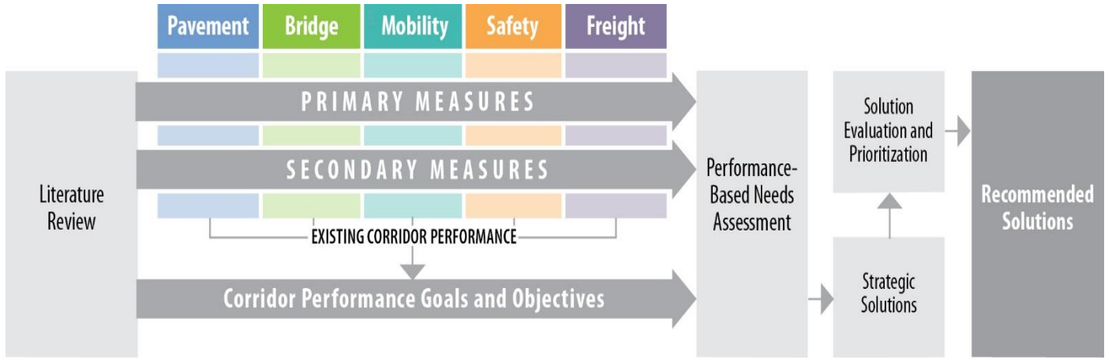
This chapter describes the evaluation of the existing performance of the US 160 Corridor. A series of performance measures is used to assess the corridor. The results of the performance evaluations are used to define corridor needs relative to the long-term goals and objectives for the corridor.

2.1 Corridor Performance Framework

This study uses a performance-based process to define baseline corridor performance, diagnose corridor needs, develop corridor solutions, and prioritize strategic corridor investments. In support of this objective, a framework for the performance-based process was developed through a collaborative process involving ADOT and the CPS consultant teams.

Figure 5 illustrates the performance framework, which includes a two-tiered system of performance measures (primary and secondary) to evaluate baseline performance. The primary measures in each of five performance areas are used to define the overall health of the corridor, while the secondary measures identify locations that warrant further diagnostic investigation to delineate needs. Needs are defined as the difference between baseline corridor performance and established performance objectives.

Figure 5: Corridor Profile Performance Framework



The following five performance areas guide the performance-based corridor analyses:

- Pavement
- Bridge
- Mobility
- Safety
- Freight

These performance areas reflect national performance goals stated in *Moving Ahead for Progress in the 21st Century* (MAP-21):

- Safety: To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
- Infrastructure Condition: To maintain the highway infrastructure asset system in a state of good repair.
- Congestion Reduction: To achieve a significant reduction in congestion on the National Highway System.
- System Reliability: To improve the efficiency of the surface transportation system.
- Freight Movement and Economic Vitality: To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- Environmental Sustainability: To enhance the performance of the transportation system while protecting and enhancing the natural environment.
- Reduced Project Delivery Delays: To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion.

In 2015, the *Fixing America's Surface Transportation Act* (FAST Act) was passed. The FAST Act continued to emphasize the performance management approach identified in MAP-21 but included additional provisions for meeting established performance targets.

The MAP-21 and FAST Act performance areas were considered in the development of ADOT's P2P process, which integrates transportation planning with capital improvement programming and project delivery. Because the P2P program requires the preparation of annual transportation system performance reports using the five performance areas, consistency is achieved among various ADOT processes by using these same performance areas.

While these performance areas were established prior to the earlier rounds of the CPS program, several related federal and ADOT reporting measures and targets were not yet in place at that time. These measures and targets have since been established (subsequent to completion of the prior CPS rounds). As such, it became necessary to revisit and revise the CPS performance measures to be more consistent with the latest federal and ADOT reporting measures and targets.

The performance measures include five primary measures: Pavement Index, Bridge Index, Mobility Index, Safety Index, and Freight Index. Additionally, a set of secondary performance measures provides for a more detailed analysis of corridor performance.

Each of the primary and secondary performance measures is comprised of one or more quantifiable indicators. A three-level scale was developed to standardize the performance scale across the five performance areas, with numerical thresholds specific to each performance measure:

Good/Above Average Performance – Rating is above the identified desirable/average range

Fair/Average Performance – Rating falls within the identified desirable/average range

Poor/Below Average Performance – Rating is below the identified desirable/average range

Table 4 provides the complete list of primary and secondary performance measures for each of the five performance areas.

Table 4: Corridor Performance Measures

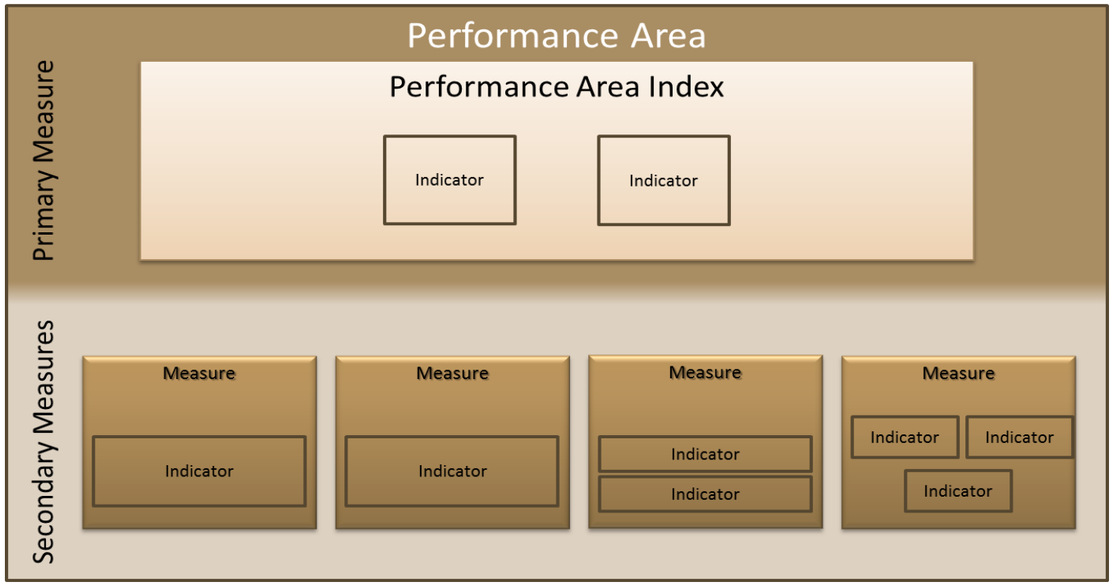
Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index, cracking, and rutting	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • Bridge Rating • Bridge Hot Spots
Mobility	**Mobility Index** Based on combination of existing and future daily volume-to-capacity ratios	• Future Congestion • Peak Congestion • Travel Time Reliability • Multimodal Opportunities
Safety	**Safety Index** Based on frequency of fatal and suspected serious injury crashes	• Directional Safety Index • Strategic Traffic Safety Plan Emphasis Areas • Other Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck travel time reliability	• Travel Time Reliability • Bridge Vertical Clearance • Bridge Vertical Clearance Hot Spots

The general template for each performance area is illustrated in **Figure 6**.

The guidelines for performance measure development are:

- Indicators and performance measures for each performance area should be developed for relatively homogeneous corridor segments
- Performance measures for each performance area should be tiered, consisting of primary measure(s) and secondary measure(s)
- Primary and secondary measures should assist in identifying those corridor segments that warrant in-depth diagnostic analyses to identify performance-based needs and a range of corrective actions known as solution sets
- One or more primary performance measures should be used to develop a Performance Index to communicate the overall health of a corridor and its segments for each performance area; the Performance Index should be a single numerical index that is quantifiable, repeatable, scalable, and capable of being mapped; primary performance measures should be transformed into a Performance Index using mathematical or statistical methods to combine one or more data fields from an available ADOT database
- One or more secondary performance measure indicators should be used to provide additional details to define corridor locations that warrant further diagnostic analysis; secondary performance measures may include the individual indicators used to calculate the Performance Index and/or “hot spot” features

Figure 6: Performance Area Template

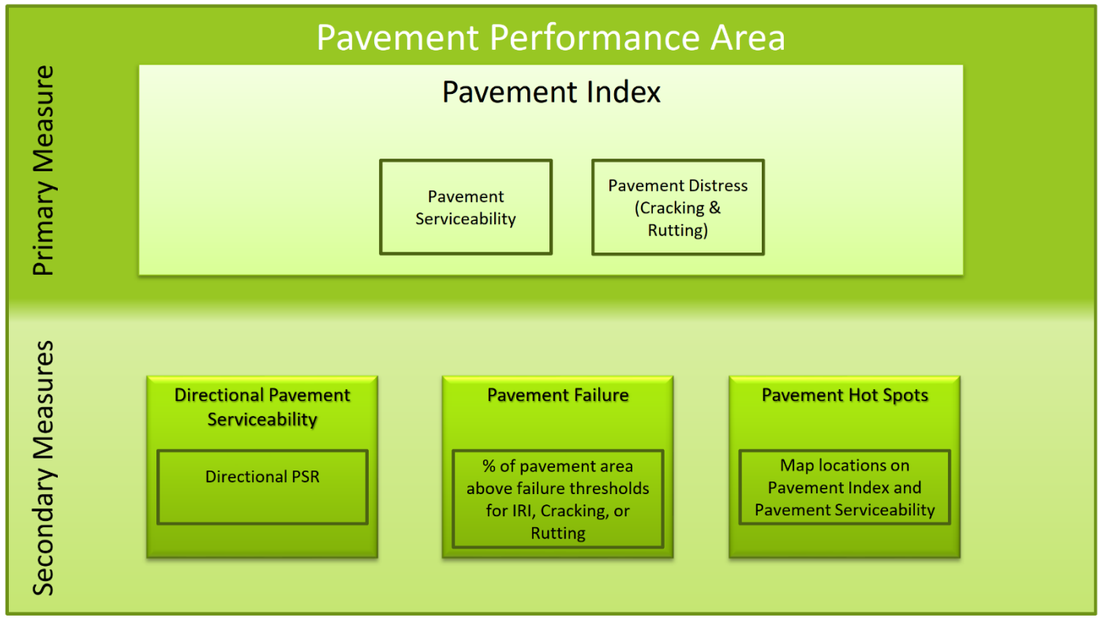


2.2 Pavement Performance Area

The Pavement Performance Area consists of a primary measure (Pavement Index) and three secondary measures, as shown in **Figure 7**. These measures assess the condition of the existing pavement along the US 160 Corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

This CPS is an update to a previously completed report. The performance measures and performance thresholds have been revised from the previous version. For the Pavement performance area, the new methodology includes the use of Rutting data and the performance thresholds have been slightly modified.

Figure 7: Pavement Performance Measures



Primary Pavement Index

The Pavement Index is calculated using two pavement condition ratings: the Pavement Serviceability Rating (PSR) and the Pavement Distress Index (PDI).

The PSR is extracted from the International Roughness Index (IRI), a measurement of pavement roughness based on field-measured longitudinal roadway profiles. The PDI is extracted from the Cracking Rating (CR) and Rutting Rating, field-measured samples from each mile of highway.

Both the PSR and PDI use a 0 to 5 scale with 0 representing the lowest performance and 5 representing the highest. The Pavement Index for each segment is a weighted average of the directional ratings based on the number of travel lanes. Therefore, the condition of a section with more travel lanes will have a greater influence on the resulting segment Pavement Index than the condition of a section with fewer travel lanes.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Pavement performance area, the relevant operating environments are designated as interstate and non-interstate segments. For the US 160 Corridor, the following operating environments were identified:

- Non-interstate: all segments

Secondary Pavement Measures

Three secondary measures provide an in-depth evaluation of the different characteristics of pavement performance.

Directional Pavement Serviceability

- Weighted average (based on number of lanes) of the PSR for the pavement in each direction of travel

Pavement Failure

- Percentage of pavement area rated above failure thresholds for IRI, Cracking, or Rutting

Pavement Hot Spots

- A Pavement “hot spot” exists where a given one-mile section of roadway rates as being in “poor” condition
- Highlights problem areas that may be under-represented in a segment average. This measure is recorded and mapped, but not included in the Pavement performance area rating calculations

Pavement Performance Results

The Pavement Index provides a high-level assessment of the pavement condition for the corridor and for each segment. The three secondary measures provide more detailed information to assess pavement performance.

Based on the results of this analysis, the following observations were made:

- The weighted average of the Pavement Index shows “fair” overall performance for the US 160 Corridor
- According to the Pavement Index, the pavement of all segments is in “good” or “fair” condition except for in Segments 160-6 and 160-9, which show “poor” performance
- Pavement hot spots along the corridor are located in Segments 160-3, 5, 6, 8, 9, and 10
- Directional PSR performance is “good”, with the exception of “fair” performance in Segments 160-3,160-6 and 160-9
- % Area Failure performance is “poor” in Segments 160-3, 6, 9, and 10.

Table 5 summarizes the Pavement performance results for the US 160 Corridor. **Figure 8** illustrates the primary Pavement Index performance and locations of Pavement hot spots along the US 160 Corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 5: Pavement Performance

Segment #	Segment Length (miles)	Pavement Index	Directional PSR		% Area Failure
			EB	WB	
160-1	8	3.91	3.66	3.61	0.0%
160-2	4	3.87	3.80	3.96	0.0%
160-3	21	2.98	3.30	3.32	45.2%
160-4	18	4.19	3.96	3.97	2.6%
160-5	12	4.00	4.06	4.03	8.3%
160-6	17	2.67	3.23	3.20	73.7%
160-7	4	4.13	3.91	3.89	0.0%
160-8	18	3.67	3.76	3.68	19.4%
160-9	21	2.69	3.00	3.05	69.0%
160-10	17	2.81	3.54	3.54	64.7%
160-11	12	4.10	4.04	4.06	4.2%
160-12	7	3.90	3.87	3.93	0.0%
Weighted Corridor Average		3.41	3.59	3.59	33.3%
SCALES					
Performance Level		**Non-Interstate**			
Good		> 3.60	> 3.50		< 5%
Fair		2.80 – 3.60	2.90 – 3.50		5% – 20%
Poor		< 2.80	< 2.90		> 20%

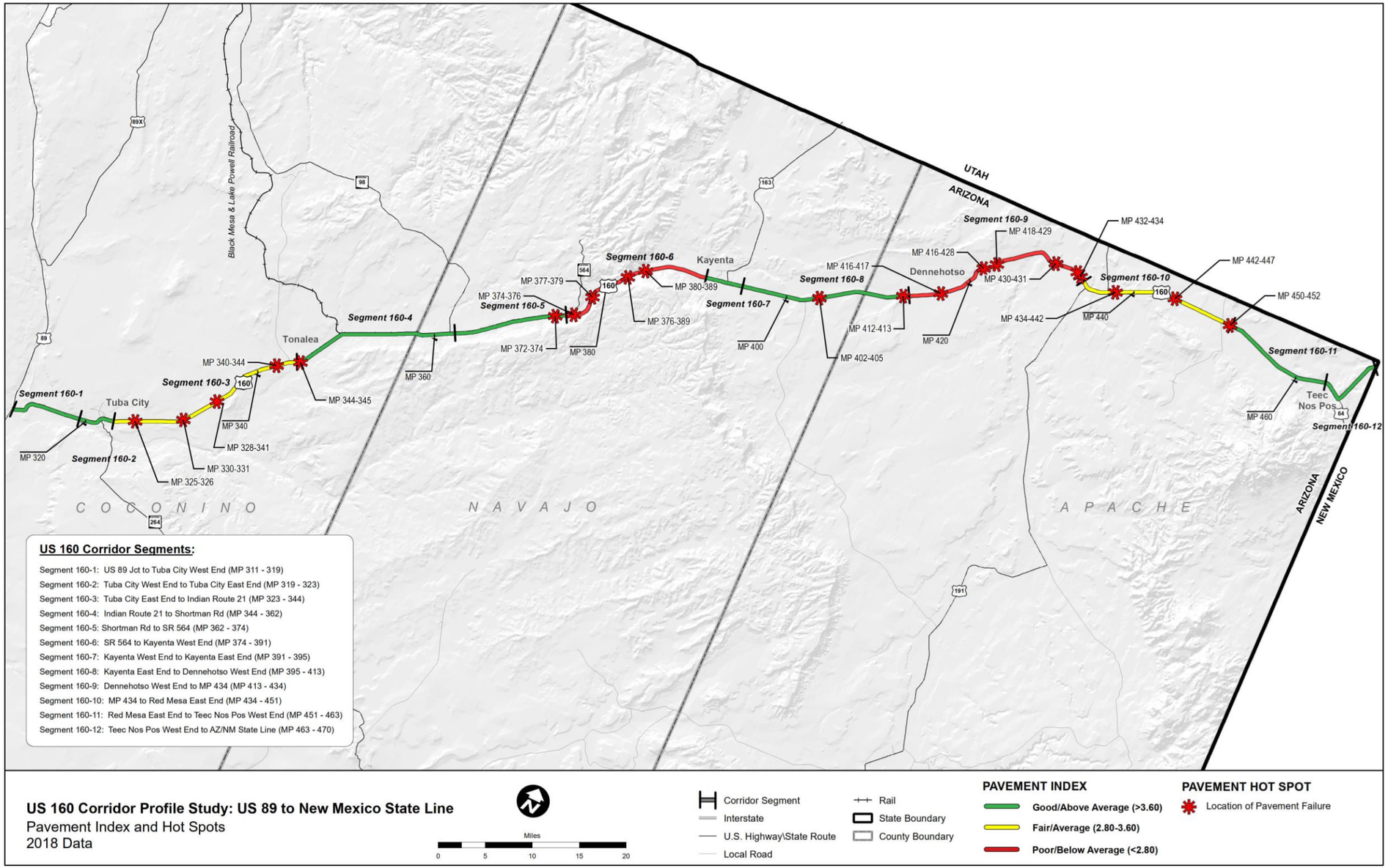
Statewide Transportation Asset Management Plan

Moving Ahead for Progress in the 21st Century Act of 2012 (MAP-21) identified national transportation system goals. The transportation asset management regulations associated with the infrastructure condition goals required the development of a Transportation Asset Management Plan (TAMP) covering National Highway System (NHS) bridges and pavements. As part of the statewide TAMP, ADOT developed pavement performance metrics and thresholds in compliance with federal tracking and reporting requirements, as shown in **Table 6**. The thresholds shown in Table 6 are the basis for the TAMP and ADOT's federal reporting and are different than those used in this CPS, which are based on ADOT's Pavement Management System, as shown in Table 5. The TAMP reports asset condition information in the aggregate at the statewide level and applying the thresholds shown in Table 6 would result in different segment-level performance than shown in Table 5.

Table 6: Statewide TAMP Metrics

Metric	Good	Fair	Poor
IRI (in./mile)	< 95	95-170	> 170
Cracking (%)	< 5	5-20 (asphalt) 5-15 (jointed concrete) 5-10 (cont. reinforced concrete)	> 20 > 15 > 10
Rutting (in.)	< 0.20	0.20–0.40	> 0.40
Faulting (in.)	<0.10	0.10-0.15	> 0.15

Figure 8: Pavement Performance

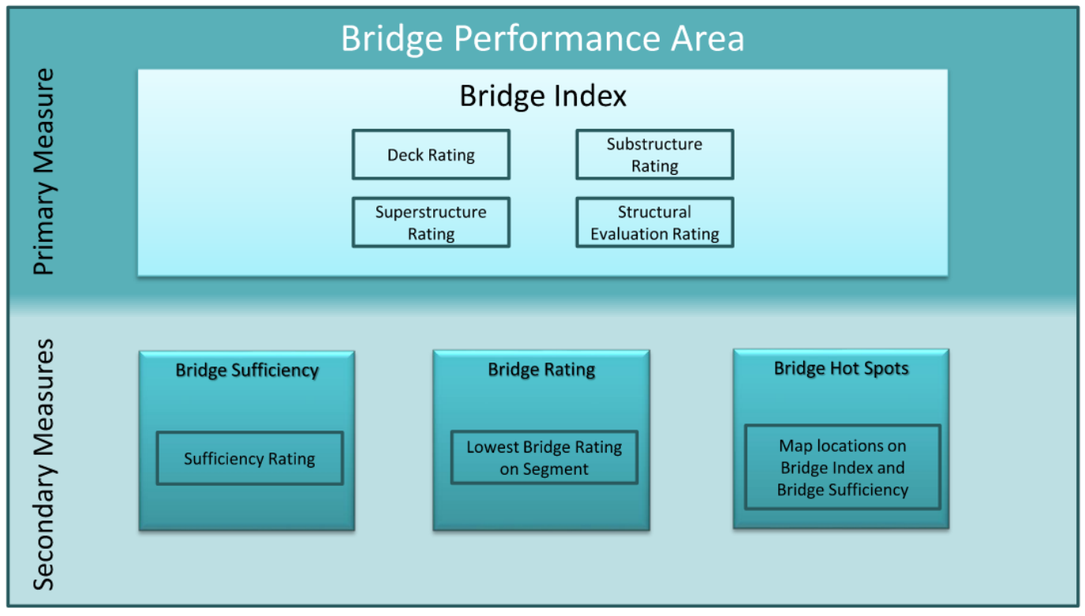


Bridge Performance Area

The Bridge Performance Area consists of a primary measure (Bridge Index) and three secondary measures, as shown in **Figure 9**. These measures assess the condition of the existing bridges along the US 160 Corridor. Only bridges that carry mainline traffic or bridges that cross the mainline are included in the calculation. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

This CPS is an update to a previously completed report. The performance measures and performance thresholds have been revised from the previous version. For the Bridge performance area, the new methodology does not include the performance metric related to Functionally Obsolete bridges, which was used in the previous methodology.

Figure 9: Bridge Performance Measures



Primary Bridge Index

The Bridge Index is calculated based on the use of four different bridge condition ratings from the ADOT Bridge Database, also known as the Arizona Bridge Information and Storage System (ABISS). The four ratings are the Deck Rating, Substructure Rating, Superstructure Rating, and Structural Evaluation Rating. These ratings are based on inspection reports and establish the structural adequacy of each bridge. The performance of each individual bridge is established by using the lowest of these four ratings. The use of these ratings, and the use of the lowest rating, is consistent with the approach used by the ADOT Bridge Group to assess the need for bridge rehabilitation. The Bridge Index is calculated as a weighted average for each segment based on deck area.

Secondary Bridge Measures

Three secondary measures provide an in-depth evaluation of the characteristics of each bridge:

Bridge Sufficiency

- Multipart rating includes structural adequacy and safety factors as well as functional aspects such as traffic volume and length of detour
- Rates the structural and functional sufficiency of each bridge on a 100-point scale

Bridge Rating

- The lowest rating of the four bridge condition ratings (substructure, superstructure, deck, and structural evaluation) on each segment
- Identifies lowest performing evaluation factor on each bridge

Bridge Hot Spots

- A Bridge “hot spot” is identified where a given bridge has a bridge rating of 4 or lower or multiple ratings of 5 between the deck, superstructure, and substructure ratings
- Identifies particularly low-performing bridges or those that may decline to low performance in the immediate future

Bridge Performance Results

The Bridge Index provides a high-level assessment of the structural condition of bridges for the corridor and for each segment. The four secondary measures provide more detailed information to assess bridge performance.

Based on the results of this analysis, the following observations were made:

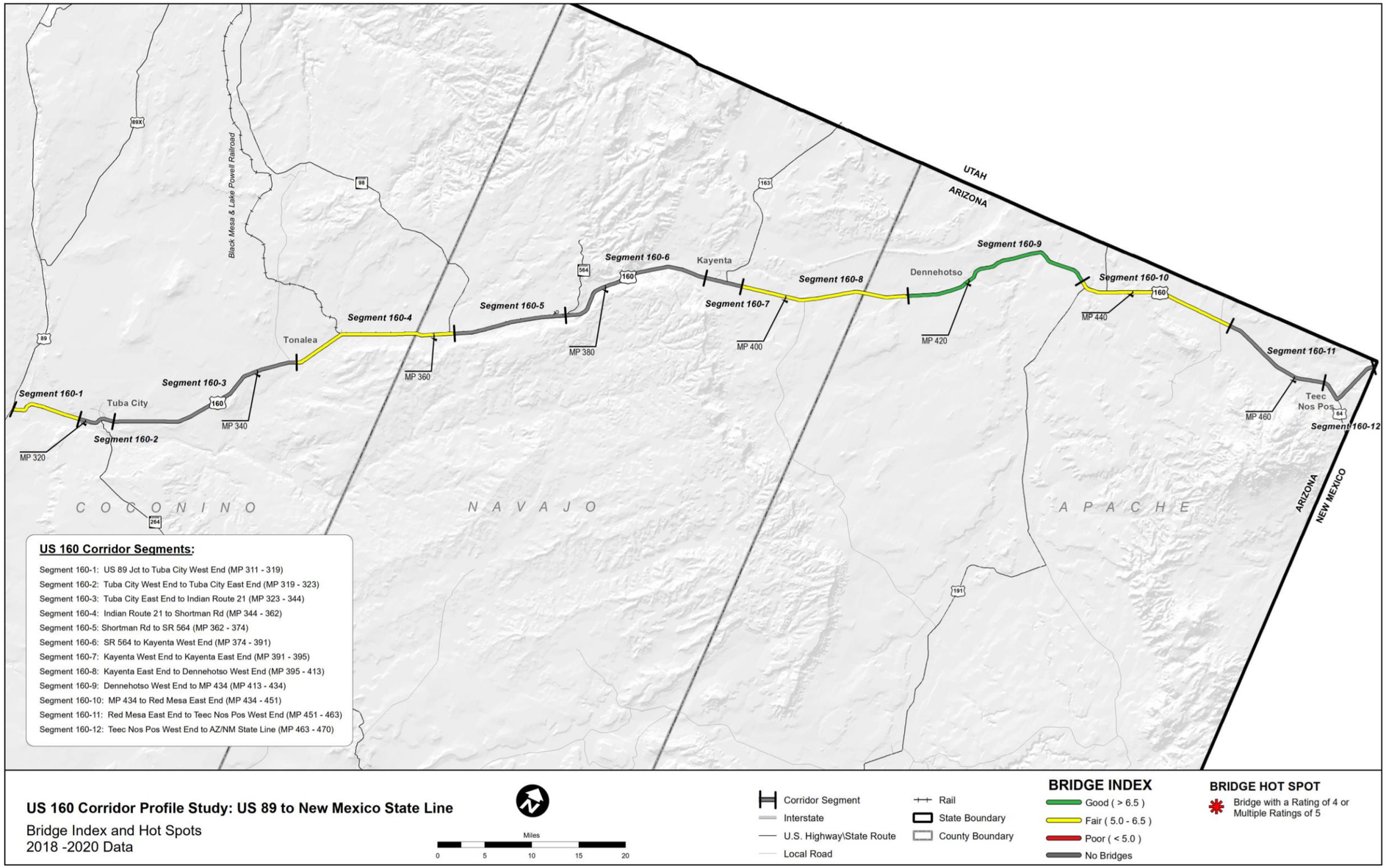
- Overall, based on the weighted average of the Bridge Index the corridor is generally performing in a “fair” manner. All the segments with bridges have a “fair” performance level, except Segment 160-9, which has a “good” performance level.
- There are no bridges located in seven out of the twelve segments, which are 160-2, 3, 5, 6, 7, 11, and 12.
- There are no bridges with a sufficiency rating of “poor” in the corridor.
- There are two bridges (Hamblin Wash Bridge, and Walker Creek Bridge) with a rating of 5 along the corridor but none of those has multiple 5 ratings.
- There are no bridge hot spots located throughout the entire US 160 Corridor.

Table 7 summarizes the Bridge performance results for the US 160 Corridor. **Figure 10** illustrates the primary Bridge Index performance and locations of Bridge hot spots along the US 160 Corridor. Maps for each secondary measure can be found in **Appendix A.**

Table 7: Bridge Performance

Segment #	Segment Length (miles)	# of Bridges	Bridge Index	Sufficiency Rating	Lowest Bridge Rating
160-1	8	1	5.00	71.70	5
160-2	4	0	No Bridges in Segment		
160-3	21	0	No Bridges in Segment		
160-4	18	1	6.00	64.30	6
160-5	12	0	No Bridges in Segment		
160-6	17	0	No Bridges in Segment		
160-7	4	0	No Bridges in Segment		
160-8	18	1	6.00	85.20	6
160-9	21	2	7.00	87.24	7
160-10	17	1	5.00	62.70	5
160-11	12	0	No Bridges in Segment		
160-12	7	0	No Bridges in Segment		
Weighted Corridor Average			6.00	76.60	6.00
SCALES					
Performance Level			**All**		
Good			> 6.5	> 80	> 6
Fair			5.0 – 6.5	50 - 80	5 - 6
Poor			< 5.0	< 50	< 5

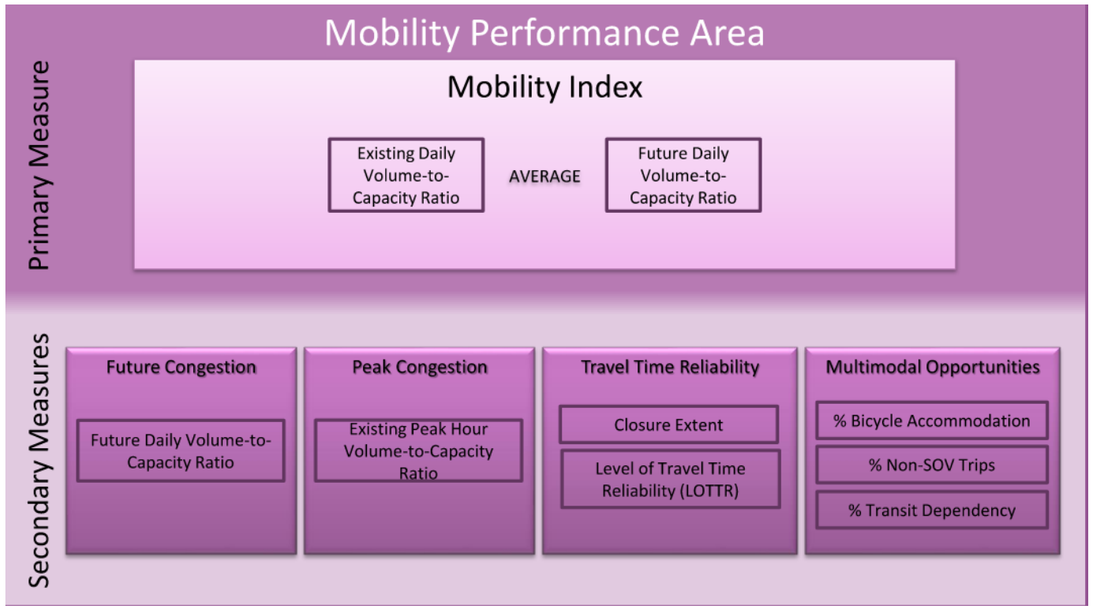
Figure 10: Bridge Performance



2.3 Mobility Performance Area

The Mobility performance area consists of a primary measure (Mobility Index) and four secondary measures, as shown in **Figure 11**. These measures assess the condition of existing mobility along the US 160 Corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 11: Mobility Performance Measures



Primary Mobility Index

The Mobility Index is an average of the existing (2019) daily volume-to-capacity (V/C) ratio and the future (2040 AZTDM) daily V/C ratio for each segment of the corridor. The V/C ratio is an indicator of the level of congestion. This measure compares the average annual daily traffic (AADT) volume to the capacity of the corridor segment as defined by the service volume for level of service (LOS) E. By using the average of the existing and future year daily volumes, this index measures the level of daily congestion projected to occur in approximately ten years (2030) if no capacity improvements are made to the corridor.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Mobility performance area, the relevant operating environments are urban vs. rural setting. For the US 160 Corridor, the following operating environments were identified:

- Rural Flow: Segments 160-1 through 160-12

Secondary Mobility Measures

Four secondary measures provide an in-depth evaluation of operational characteristics of the corridor:

Future Congestion – Future Daily V/C

- The future (2040 AZTDM) daily V/C ratio. This measure is the same value used in the calculation of the Mobility Index
- Provides a measure of future congestion if no capacity improvements are made to the corridor

Peak Congestion – Existing Peak Hour V/C

- The peak hour V/C ratio for each direction of travel
- Provides a measure of existing peak hour congestion during typical weekdays

Travel Time Reliability – Three separate travel time reliability indicators together provide a comprehensive picture of how much time may be required to travel within the corridor:

- Closure Extent:
  - The average number of instances a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel; a weighted average was applied to each closure that takes into account the distance over which the closure occurs
  - Closures related to crashes, weather, or other incidents are a significant contributor to non-recurring delays; construction-related closures were excluded from the analysis
- Level of Travel Time Reliability (LOTTR):
  - The ratio of the 80th percentile travel time to average (50th percentile) travel time for a given corridor segment in a specific direction; as corridor segments were often comprised of multiple roadway sections for which LOTTR was reported, a weighted average was applied to each section based on the section length in order to arrive at the segment LOTTR
  - The LOTTR reflects how consistent or dependable the travel might be from day to day or during different times of day

Multimodal Opportunities – Three multimodal opportunity indicators reflect the characteristics of the corridor that promote alternate modes to the single occupancy vehicle (SOV) for trips along the corridor:

- % Bicycle Accommodation:
  - Percentage of the segment that accommodates bicycle travel; bicycle accommodation on the roadway or on shoulders varies depending on traffic volumes, speed limits, and surface type
  - Encouraging bicycle travel has the potential to reduce automobile travel, especially on non-interstate highways

- % Non-SOV Trips:
  - The percentage of trips (less than 50 miles in length) by non-SOVs
  - The percentage of non-SOV trips in a corridor gives an indication of travel patterns along a section of roadway that could benefit from additional multimodal options
- % Transit Dependency:
  - The percentage of households that have zero or one automobile and households where the total income level is below the federally defined poverty level
  - Used to track the level of need among those who are considered transit dependent and more likely to utilize transit if it is available

Mobility Performance Results

The Mobility Index provides a high-level assessment of mobility conditions for the corridor and for each segment. The four secondary measures provide more detailed information to assess mobility performance.

Based on the results of this analysis, the following observations were made:

- The weighted average of the Mobility Index shows “good” overall performance for the US 160 Corridor
- Segment 160-2 is the only segment that has “poor” performance for the Mobility Index
- The performance of future traffic operations is anticipated to be “poor” in Segment 160-2. All other segments are anticipated to have “good” performance with respect to future traffic operations
- The performance for existing peak hour traffic operations is “good” along the entire corridor except for Segment 160-2, which is “fair”
- All of the segments show “good” performance relative to the Closure Extent performance measure except for Segment 160-7, which has “fair” performance
- The LOTTR EB measure shows “good” performance all along the corridor except for Segment 160-7 and Segment 160-11, which show “fair” performance
- The LOTTR WB measure shows “good” performance all along the corridor except for Segments 160-2, 6, 11, and 12, which show “fair” performance
- All the segments show “poor” performance for accommodation of bicycles except Segment 160-2, which shows “good” performance
- All corridor segments show “fair” or “poor” performance for non-SOV trips, meaning that many vehicles carry only a single occupant.

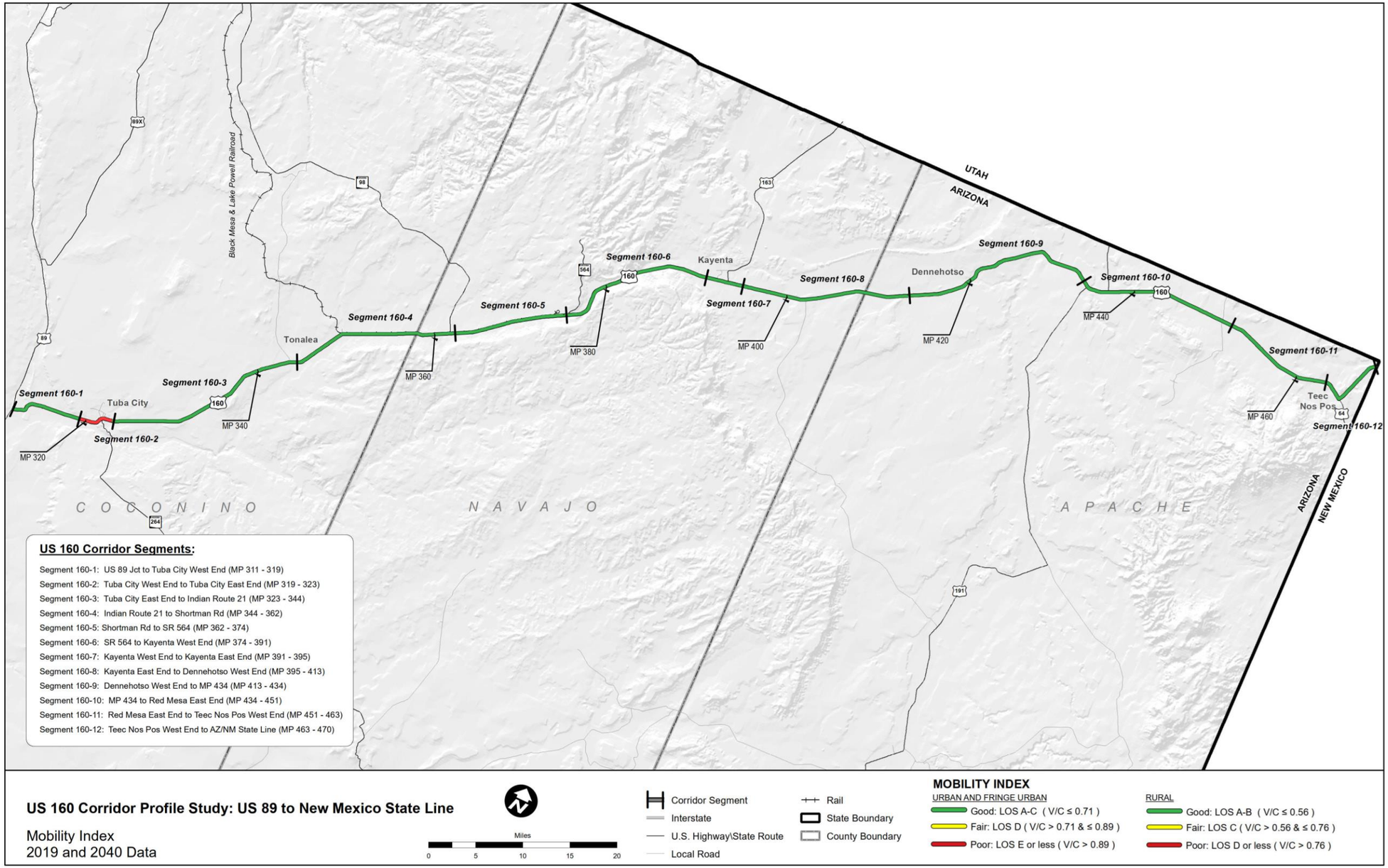
Table 8 summarizes the Mobility performance results for the US 160 Corridor. **Figure 12** illustrates the primary Mobility Index performance along the US 160 Corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 8: Mobility Performance

Segment #	Segment Length (miles)	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/milepost/year /mile)		Directional LOTTR (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
				EB	WB	EB	WB	EB	WB		
160-1[2]	8	0.26	0.30	0.26	0.21	0.08	0.05	1.11	1.09	0%	11.7%
160-2[2]	4	1.01	1.16	0.59	0.71	0.10	0.10	1.11	1.16	96%	12.1%
160-3[2]	21	0.17	0.20	0.16	0.15	0.10	0.10	1.07	1.06	19%	11.6%
160-4[2]	18	0.15	0.17	0.12	0.12	0.06	0.04	1.06	1.05	9%	13.7%
160-5[2]	12	0.20	0.24	0.16	0.14	0.13	0.12	1.06	1.06	0%	16.2%
160-6[2]	17	0.26	0.30	0.24	0.21	0.11	0.11	1.07	1.15	0%	6.0%
160-7[2]	4	0.28	0.29	0.27	0.27	0.25	0.30	1.15	1.14	6%	6.8%
160-8[2]	18	0.08	0.05	0.12	0.09	0.10	0.10	1.09	1.06	0%	7.1%
160-9[2]	21	0.07	0.04	0.11	0.11	0.10	0.05	1.13	1.12	1%	11.6%
160-10[2]	17	0.16	0.16	0.19	0.12	0.07	0.06	1.07	1.07	1%	15.9%
160-11[2]	12	0.18	0.21	0.18	0.11	0.10	0.07	1.06	1.17	0%	5.5%
160-12[2]	7	0.17	0.20	0.21	0.12	0.03	0.00	1.24	1.21	4%	5.4%
Weighted Corridor Average		0.18	0.20	0.18	0.15	0.10	0.08	1.09	1.10	6.5%	10.7%
SCALES											
Performance Level		**Rural**		**All**		**All**		**All**		**All**	**All**
Good		< 0.56		< 0.22		< 1.15		> 90%		> 17%	
Fair		0.56 – 0.76		0.22 – 0.62		1.15 – 1.50		60% – 90%		11% – 17%	
Poor		> 0.76		> 0.62		> 1.50		< 60%		< 11%	

[1]Urban Operating Environment
[2]Rural Operating Environment

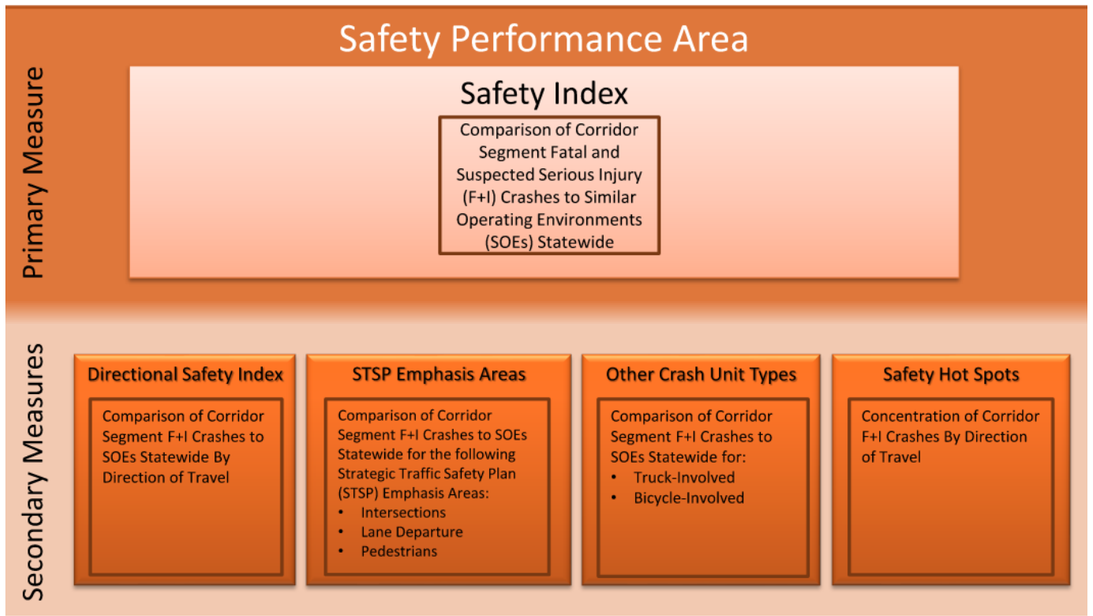
Figure 12: Mobility Performance



2.4 Safety Performance Area

The Safety performance area consists of a primary measure (Safety Index) and four secondary measures, as illustrated in **Figure 13**. All measures relate to crashes that result in fatal and suspected serious injuries, as these types of crashes are the emphasis of the ADOT Strategic Traffic Safety Plan (STSP), FHWA, and MAP-21. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 13: Safety Performance Measures



Primary Safety Index

The Safety Index is based on the bi-directional frequency and rate of fatal and suspected serious injury crashes, the relative cost of those types of crashes, and crash occurrences on similar roadways in Arizona. According to ADOT's 2018 Highway Safety Improvement Program Application, fatal crashes have an estimated cost that is 17.3 times the estimated cost of suspected serious injury crashes ($9.5 million compared to $555,000).

Each corridor segment is rated on a scale by comparing the segment score with the average statewide score for similar operating environments. Because crash frequencies and rates vary depending on the operating environment of a particular roadway, statewide values were developed for similar operating environments defined by functional classification, urban vs. rural setting, number of travel lanes, and traffic volumes. For the US 160 Corridor, the following operating environments were identified:

- 2 or 3 Lane Undivided Highway: all segments

Secondary Safety Measures

Four secondary measures provide an in-depth evaluation of the different characteristics of safety performance:

Directional Safety Index

- This measure is based on the directional frequency and rate of fatal and suspected serious injury crashes

STSP Emphasis Areas

ADOT's 2019 STSP identified several emphasis areas for reducing fatal and suspected serious injury crashes. This measure compared rates of crashes in three STSP emphasis areas to other corridors with a similar operating environment. The three STSP emphasis areas related to crashes involving:

- Intersections
- Lane departures
- Pedestrians

Other Crash Unit Types

- The percentage of total fatal and suspected serious injury crashes that involves crash unit types of trucks and bicycles is compared to the statewide average on roads with similar operating environments

Safety Hot Spots

- The hot spot analysis identifies abnormally high concentrations of fatal and suspected serious injury crashes along the study corridor by direction of travel

For the Safety Index and the secondary safety measures, any segment that has too small of a sample size to generate statistically reliable performance ratings for a particular performance measure is considered to have "insufficient data" and is excluded from the safety performance evaluation for that particular performance measure.

Safety Performance Results

The Safety Index provides a high-level assessment of safety performance for the corridor and for each segment. The four secondary measures provide more detailed information to assess safety performance.

Based on the results of this analysis, the following observations were made:

- A total of 58 fatal and suspected serious injury crashes occurred along the US 160 Corridor from 2015-2019; of these crashes, 40 were fatal and 18 involved suspected serious injuries
- The crash unit type performance measures for crashes at intersections and for crashes involving pedestrians, trucks, and bicyclists have insufficient data to generate reliable performance ratings for the US 160 Corridor. Segments 160-2 and 160-12 have insufficient data for all performance measures. Segments 160-1, 2, 3, 4, 5, 7, 11, and 12 have insufficient data for crashes involving lane departures
- The weighted average of the Safety Index shows “below average” performance for the US 160 Corridor compared to other segments statewide that have similar operating environments, meaning the corridor does not perform as well related to safety
- For the Safety Index, Segments 160-4 and 11 show “average” performance while Segments 160-1, 3, 5, 6, 7, 8, 9, and 10 show “below average” performance
- Segments 160-1, 3, 6, and 9 perform “below average” in the Safety Index and both directions of travel for the Directional Safety Index
- Segments 160-6 and 8 perform “below average” in the percentage of crashes involving lane departures
- Safety hot spots include:
    - MP 311-319
    - MP 323-344
    - MP 344-362
    - MP 362-374
    - MP 374-391
    - MP391-395
    - MP 395-413
    - MP 413-434
    - MP434-451
    - MP 451-463

Table 9 summarizes the Safety performance results for the US 160 Corridor. **Figure 14** illustrates the primary Safety Index performance and locations of Safety hot spots along the US 160 Corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 9: Safety Performance

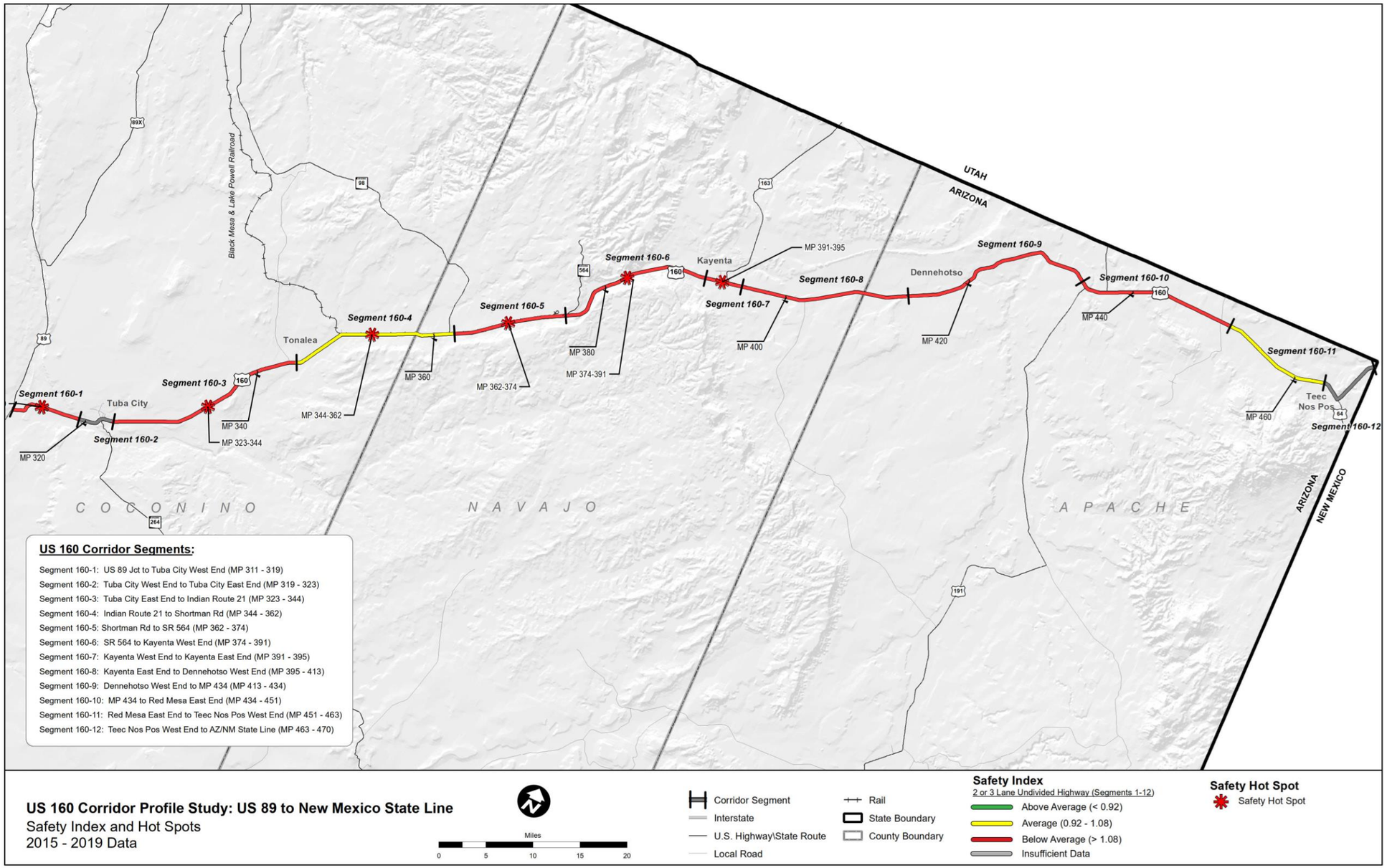
Segment #	Segment Length (miles)	Safety Index	Directional Safety Index		% of Fatal + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Fatal + Suspected Serious Injury Crashes Involving Bicycles
			EB	WB					
160-1[e]	8	1.94	2.58	1.31	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-2[e]	4	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-3[e]	21	2.21	1.67	2.76	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-4[e]	18	1.02	0.00	2.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-5[e]	12	1.39	2.73	0.05	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-6[e]	17	1.91	2.55	1.28	Insufficient Data	86%	Insufficient Data	Insufficient Data	Insufficient Data
160-7[e]	4	2.92	5.51	0.34	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-8[e]	18	1.53	2.93	0.13	Insufficient Data	100%	Insufficient Data	Insufficient Data	Insufficient Data
160-9[e]	21	1.60	1.89	1.30	Insufficient Data	33%	Insufficient Data	Insufficient Data	Insufficient Data
160-10[e]	17	1.48	1.97	1.00	Insufficient Data	50%	Insufficient Data	Insufficient Data	Insufficient Data
160-11[e]	12	1.00	0.05	1.95	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
160-12[e]	7	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Weighted Corridor Average		1.61	1.97	1.14	Insufficient Data	30.2%	Insufficient Data	Insufficient Data	Insufficient Data

Performance Level	**2 or 3 Lane Undivided Highway**					
Above Average	< 0.92	< 11.2%	< 66.9%	< 3.8%	< 4.2%	< 0.0%
Average	0.92 – 1.08	11.2% – 15.6%	66.9% – 74.5%	3.8% – 7.2%	4.2% – 8.0%	0.0% – 3.3%
Below Average	> 1.08	> 15.6%	>74.5%	> 7.2%	> 8.0%	> 3.3%

[e]2 or 3 Lane Undivided Highway

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings.

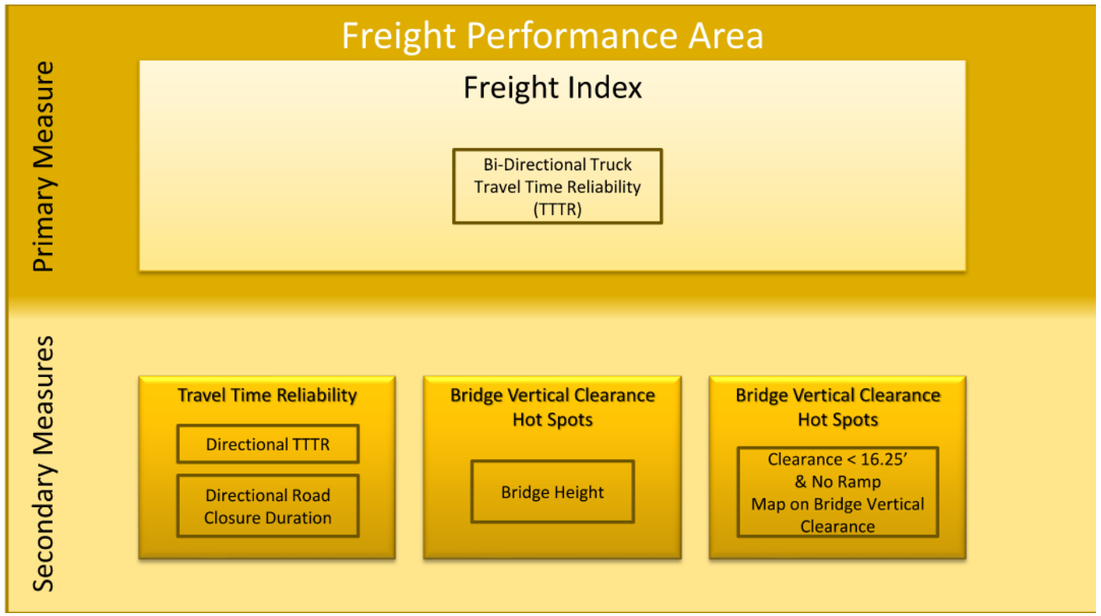
Figure 14: Safety Performance



2.5 Freight Performance Area

The Freight performance area consists of a single primary measure (Freight Index) and three secondary measures as illustrated in **Figure 15**. All measures relate to the reliability of truck travel as measured by observed truck travel time speed and delays to truck travel from freeway closures or physical restrictions to truck travel. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 15: Freight Performance Measures



Primary Freight Index

The Freight Index is a reliability performance measure based on the travel time reliability for truck travel. The Truck Travel Time Reliability (TTTR) is the ratio of the 95th percentile truck travel time to average (50th percentile) truck travel time. The TTTR reflects the extra buffer time needed for on-time delivery while accounting for delay resulting from circumstances such as recurring congestion, crashes, inclement weather, and construction activities.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Freight performance area, the relevant operating environments are interrupted flow (e.g., signalized at-grade intersections are present) and uninterrupted flow (e.g., controlled access grade-separated conditions such as a freeway or interstate highway).

For the US 160 Corridor, the following operating environments were identified:

- Interrupted Flow: Segments 160-1, 160-2, 160-7 and 160-12
- Uninterrupted Flow: Segments 160-3 through 160-6 and 160-8 through 160-11

Secondary Freight Measures

The Freight performance area includes three secondary measures that provide an in-depth evaluation of the different characteristics of freight performance:

Travel Time Reliability – Two separate travel time reliability indicators together provide a comprehensive picture of how much time may be required to travel within the corridor:

- Directional Truck Travel Time Reliability (TTTR):
  - The ratio of the 95th percentile truck travel time to average (50th percentile) truck travel time for a given corridor segment in a specific direction; as corridor segments were often comprised of multiple roadway sections for which TTTR was reported, a weighted average was applied to each section based on the section length in order to arrive at the segment TTTR
- Directional Closure Duration
  - The average time (in minutes) a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel; a weighted average is applied to each closure that takes into account the distance over which the closure occurs

Bridge Vertical Clearance

- The minimum vertical clearance (in feet) over the travel lanes for underpass structures on each segment

Bridge Vertical Clearance Hot Spots

- A Bridge vertical clearance "hot spot" exists where the underpass vertical clearance over the mainline travel lanes is less than 16.25 feet and no exit/entrance ramps exist to allow vehicles to bypass the low clearance location
- If a location with a vertical clearance less than 16.25 feet can be avoided by using immediately adjacent exit/entrance ramps rather than the mainline, it is not considered a hot spot

Freight Performance Results

The Freight Index provides a high-level assessment of the freight mobility for the corridor and for each segment. The three secondary measures provide more detailed information to assess freight performance for each segment.

Based on the results of this analysis, the following observations were made:

- The weighted average of the Freight Index shows “poor” performance for the US 160 Corridor, with Segments 160-1, 3, 4, 5, 8, and 10 showing “fair” performance and Segments 160-6, 7, 9, 11, and 12 showing “poor” performance
- All segments show “fair” performance for the EB Directional TTTR except for Segments 160-7, 8, 9 and 12, which show “poor” performance, and Segment 160-2, which shows “good” performance
- All segments show “fair” performance for the WB Direction TTTR except for Segments 160-6, 9, and 11, which show “poor” performance, and Segment 160-1, which shows “good” performance
- Overall performance for Directional TTTR shows “poor” for both EB and WB directions
- All segments show “good” performance in the Closure Duration performance measure except for Segment 160-8, which shows “fair” performance
- There are no underpasses along the corridor

Table 10 summarizes the Freight performance for the US 160 Corridor. **Figure 16** illustrates the primary freight index performance and locations of freight hot spots along US 160. Maps for each secondary measure can be found in **Appendix A.**

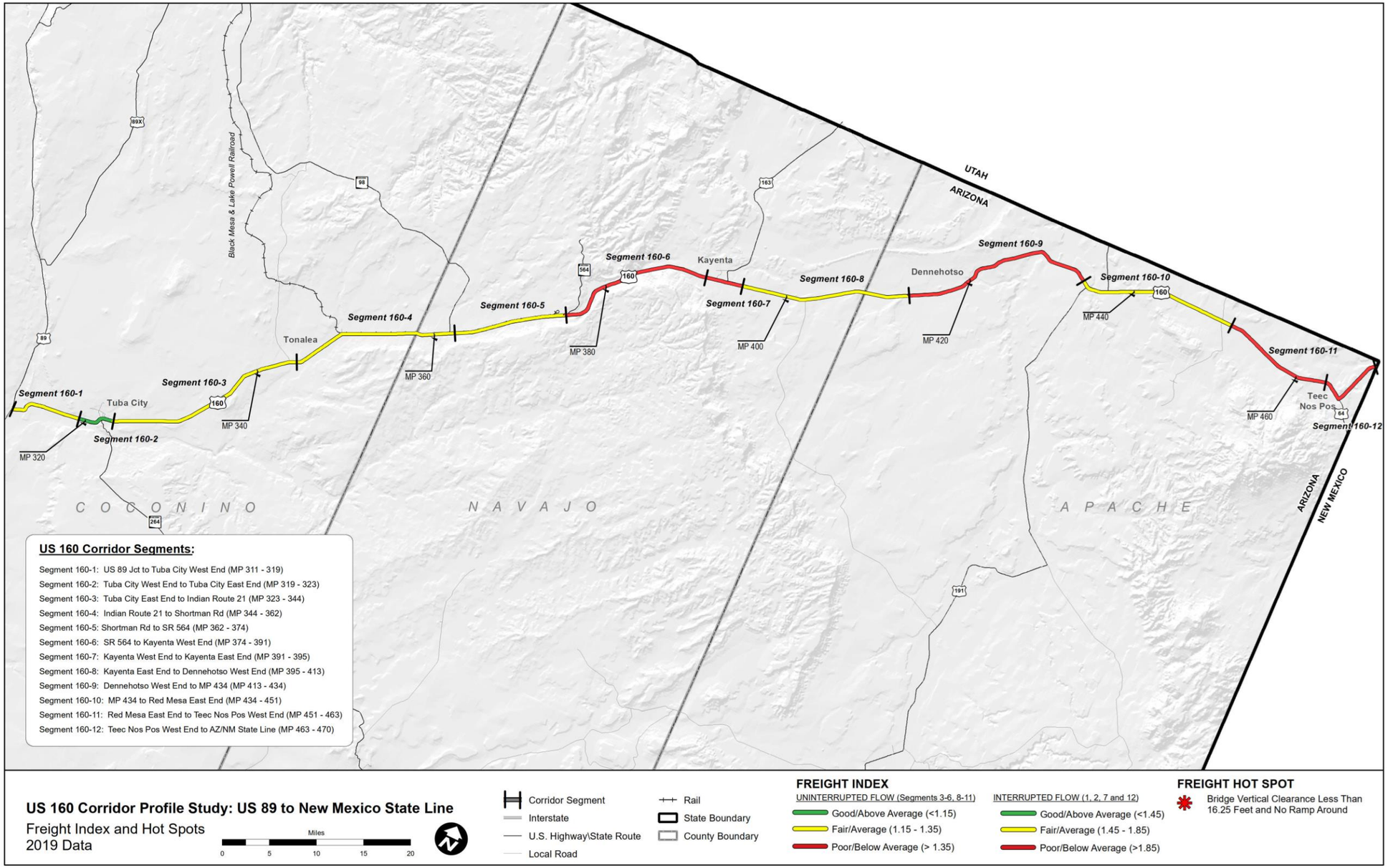
Table 10: Freight Performance

Segment #	Segment Length (miles)	Freight Index	Directional TTTR		Closure Duration (minutes/milepost/year/mile)		Bridge Vertical Clearance (feet)
			EB	WB	EB	WB	
160-1*	8	1.52	1.70	1.35	19.10	7.83	No UP
160-2*	4	1.39	1.31	1.46	15.60	16.80	No UP
160-3^	21	1.23	1.22	1.24	19.59	15.89	No UP
160-4^	18	1.21	1.17	1.26	11.23	8.38	No UP
160-5^	12	1.21	1.20	1.23	33.17	22.83	No UP
160-6^	17	2.02	1.22	2.83	23.95	20.87	No UP
160-7*	4	2.04	2.43	1.64	20.55	37.60	No UP
160-8^	18	1.26	1.35	1.17	59.61	19.88	No UP
160-9^	21	1.85	1.67	2.02	27.41	8.77	No UP
160-10^	17	1.23	1.25	1.21	18.13	9.60	No UP
160-11^	12	2.23	1.16	3.29	18.27	15.42	No UP
160-12*	7	3.88	6.02	1.73	10.74	0.00	No UP
Weighted Corridor Average		1.63	1.55	1.70	24.95	14.36	No UP

SCALES			
Performance Level	**Uninterrupted**	**All**	**All**
Good	< 1.15	< 44.18	> 16.5
Fair	1.15 – 1.35	44.18 – 124.86	16.0 – 16.5
Poor	> 1.35	> 124.86	< 16.0
Performance Level	**Interrupted**		
Good	< 1.45		
Fair	1.45 – 1.85		
Poor	> 1.85		

^Uninterrupted Flow Facility *Interrupted Flow Facility

Figure 16: Freight Performance



2.6 Corridor Performance Summary

Based on the results presented in the preceding sections, the following general observations were made related to the performance of the US 160 Corridor:

- The Pavement, Bridge, Mobility, Safety, and Freight performance measures show a mix of "good/above average", "fair/average", and "poor/below average" performance
- The weighted average of the Pavement Index shows "fair" overall performance for the US 160 Corridor; Segments 160-3, 5, 6, 8, 9, and 10 show "fair" or "poor" performance in one or more of the Pavement performance measures
- The weighted average of the Bridge Index shows "fair" overall performance for the US 160 Corridor; there are two bridges (Hamblin Wash Bridge and Walker Creek Bridge) with a rating of 5 along the corridor, neither of which has multiple 5 ratings.
- The weighted average of the Mobility Index shows "good" overall performance for the US 160 Corridor; Segment 160-2 shows "poor" performance for the Mobility Index and the Future Daily V/C and "fair" performance for the Existing Peak Hour V/C and WB Directional LOTTR; Segment 160-7 shows "fair" performance for Closure Extent and EB Directional LOTTR; Segments 160-6, 11, and 12 are the only other segments that show "fair" performance for Directional LOTTR; all segments except Segment 160-2 show "poor" performance for % Bicycle Accommodation; all segments show "fair" or "poor" performance for % Non-SOV Trips
- The weighted average of the Safety Index shows "below average" overall performance for the US 160 Corridor; all segments show "below average" or "average" performance for the Safety Index and show "below average" performance for at least one direction for the Directional Safety Index; Segments 160-6 and 160-8 show "below average" performance for crashes involving lane departures.
- The weighted average of the Freight Index shows "poor" performance for the US 160 Corridor; all segments show "fair" or "poor" performance for the Freight Index except Segment 160-2; all segments show "fair" or "poor" performance for at least one direction for the Directional TTTR; Segment 160-8 shows "fair" performance for Closure Duration
- Segments 160-6, 7, and 9 show "poor/below average" performance for many performance measures
- Segments 160-1, 4, 5, and 11 show "good/above average" performance for many performance measures

Figure 17 shows the percentage of the US 160 Corridor that rates either "good/above average performance", "fair/average performance", or "poor/below average" performance for each primary measure. Approximately 35% of the corridor shows "poor" performance and 13% shows "fair" performance for the Pavement Index. For the Bridge Index, 67% of the corridor shows "fair" performance. Approximately 97% of the corridor shows "good" performance in Mobility while the remaining 3% shows "poor" performance. The majority of the corridor (74%) for the Safety index shows "below average" performance while 7% of the corridor was considered to have "insufficient data". For the Freight Index, approximately 64% of the corridor shows "fair" performance while 34% shows "poor" performance. The lowest performance along the US 160 Corridor generally occurs in the Safety and Freight performance areas while the Mobility performance area has the highest performance.

Table 11 shows a summary of corridor performance for all primary measures and secondary measure indicators for the US 160 Corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure. The weighted average ratings are summarized in **Figure 18** which also provides a brief description of each performance measure. **Figure 18** represents the average for the entire corridor and any given segment or location could have a higher or lower rating than the corridor average.

Figure 17: Performance Summary by Primary Measure

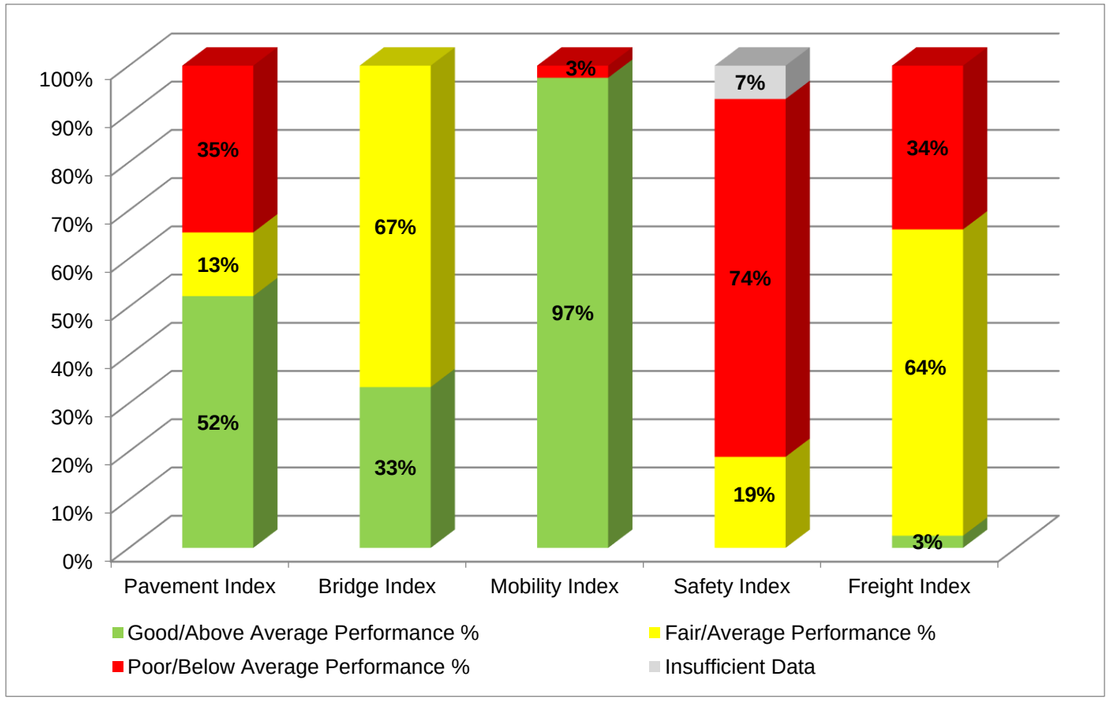


Figure 18: Corridor Performance Summary by Performance Measure

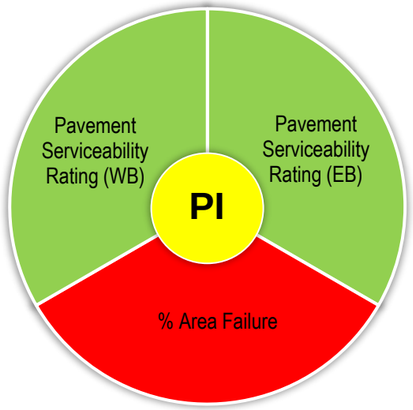
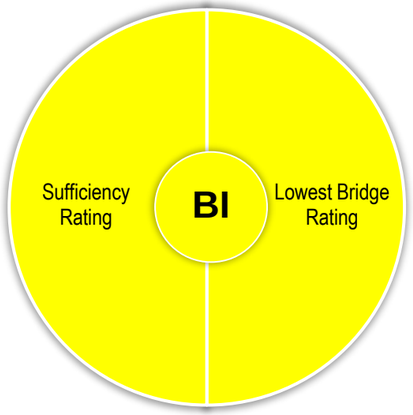
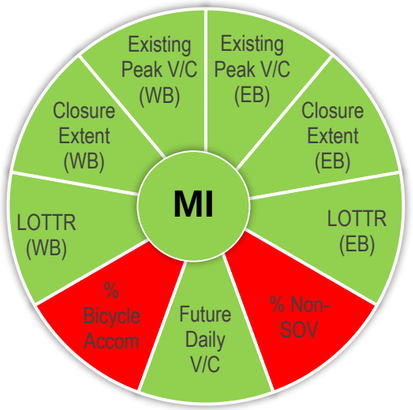
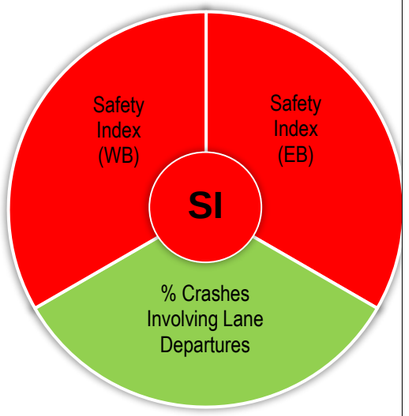
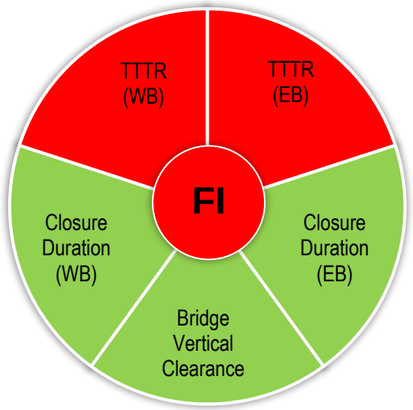
Pavement	Bridge	Mobility	Safety	Freight
				
Pavement Index (PI): based on three pavement condition ratings from the ADOT Pavement Database; the three ratings are the International Roughness Index (IRI), the Cracking Rating, and the Rutting Rating	**Bridge Index (BI):** based on four bridge condition ratings from the ADOT Bridge Database; the four ratings are the Deck Rating, Substructure Rating, Superstructure Rating, and Structural Evaluation Rating	**Mobility Index (MI):** an average of the existing daily volume-to-capacity (V/C) ratio and the projected long-term future daily V/C ratio	**Safety Index (SI):** combines the bi-directional frequency and rate of fatal and suspected serious injury crashes, compared to crash occurrences on roads with similar operating environments in Arizona	**Freight Index (FI):** a reliability performance measure based on the bi-directional Truck Travel Time Reliability (TTTR) for truck travel
➢ **Directional Pavement Serviceability Rating (PSR)** – the weighted average (based on number of lanes) of the PSR for the pavement in each direction of travel ➢ **% Area Failure** – the percentage of pavement area rated above failure thresholds for IRI, Cracking, or Rutting	➢ **Sufficiency Rating**– multipart rating includes structural adequacy and safety factors as well as functional aspects such as traffic volume and length of detour ➢ **Lowest Bridge Rating** –the lowest rating of the four bridge condition ratings on each segment	➢ **Future Daily V/C** – the future daily V/C ratio provides a measure of future congestion if no capacity improvements are made to the corridor ➢ **Existing Peak Hour V/C** – the existing peak hour V/C ratio for each direction of travel provides a measure of existing peak hour congestion during typical weekdays ➢ **Closure Extent** – the average number of instances a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel ➢ **Directional Level of Travel Time Reliability (LOTTR)** – the ratio of the 80th percentile peak period travel time to the 50th percentile peak period travel time for all vehicles ➢ **% Bicycle Accommodation** – the percentage of a segment that accommodates bicycle travel ➢ **% Non-Single Occupancy Vehicle (Non-SOV) Trips** –the percentage of trips that are taken by vehicles carrying more than one occupant	➢ **Directional Safety Index** – the combination of the directional frequency and rate of fatal and suspected serious injury crashes, compared to crash occurrences on roads with similar operating environments in Arizona ➢ **% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures** – the percentage of total fatal and suspected serious injury crashes involving lane departures compared to the statewide average percentage on roads with similar operating environments	➢ **Directional TTTR** – the ratio of the 95th percentile peak period travel time to the 50th percentile peak period travel time for trucks ➢ **Closure Duration** – the average time a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel ➢ **Bridge Vertical Clearance** – the minimum vertical clearance over the travel lanes for underpass structures on each segment.

Table 11: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area									
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/ milepost/year/mile)		Directional LOTTR (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			EB	WB							EB	WB	EB	WB	EB	WB		
160-1[2]	8	3.91	3.66	3.61	0.0%	5.00	71.70	5	0.26	0.30	0.26	0.21	0.08	0.05	1.11	1.09	0%	11.7%
160-2[2]	4	3.87	3.80	3.96	0.0%	No Bridges in Segment			1.01	1.16	0.59	0.71	0.10	0.10	1.11	1.16	96%	12.1%
160-3[2]	21	2.98	3.30	3.32	45.2%	No Bridges in Segment			0.17	0.20	0.16	0.15	0.10	0.10	1.07	1.06	19%	11.6%
160-4[2]	18	4.19	3.96	3.97	2.6%	6.00	64.30	6	0.15	0.17	0.12	0.12	0.06	0.04	1.06	1.05	9%	13.7%
160-5[2]	12	4.00	4.06	4.03	8.3%	No Bridges in Segment			0.20	0.24	0.16	0.14	0.13	0.12	1.06	1.06	0%	16.2%
160-6[2]	17	2.67	3.23	3.20	73.7%	No Bridges in Segment			0.26	0.30	0.24	0.21	0.11	0.11	1.07	1.15	0%	6.0%
160-7[2]	4	4.13	3.91	3.89	0.0%	No Bridges in Segment			0.28	0.29	0.27	0.27	0.25	0.30	1.15	1.14	6%	6.8%
160-8[2]	18	3.67	3.76	3.68	19.4%	6.00	85.20	6	0.08	0.05	0.12	0.09	0.10	0.10	1.09	1.06	0%	7.1%
160-9[2]	21	2.69	3.00	3.05	69.0%	7.00	87.84	7	0.07	0.04	0.11	0.11	0.10	0.05	1.13	1.12	1%	11.6%
160-10[2]	17	2.81	3.54	3.54	64.7%	5.00	62.70	5	0.16	0.16	0.19	0.12	0.07	0.06	1.07	1.07	1%	15.9%
160-11[2]	12	4.10	4.04	4.06	4.2%	No Bridges in Segment			0.18	0.21	0.18	0.11	0.10	0.07	1.06	1.17	0%	5.5%
160-12[2]	7	3.90	3.87	3.93	0.0%	No Bridges in Segment			0.17	0.20	0.21	0.12	0.03	0.00	1.24	1.21	4%	5.4%
Weighted Corridor Average		3.41	3.59	3.59	33.3%	6.00	76.60	6.00	0.18	0.20	0.18	0.15	0.10	0.08	1.09	1.10	6.5%	10.7%
SCALES																		
Performance Level		**Non-Interstate**				**All**				**Rural**			**All**		**All**		**All**	**All**
Good/Above Average Performance		> 3.60	> 3.50		< 5%	> 6.5	> 80	> 6		< 0.56			< 0.22		< 1.15		> 90%	> 17%
Fair/Average Performance		2.80 – 3.60	2.90 – 3.50		5% – 20%	5.0 – 6.5	50 – 80	5 – 6		0.56 – 0.76			0.22 – 0.62		1.15 – 1.50		60% – 90%	11% – 17%
Poor/Below Average Performance		< 2.80	< 2.90		> 20%	< 5.0	< 50	< 5		> 0.76			> 0.62		> 1.50		< 60%	< 11%

[1]Urban Operating Environment
[2]Rural Operating Environment

Table 11: Corridor Performance Summary by Segment and Performance Measure (continued)

Segment #	Segment Length (miles)	Safety Performance Area								Freight Performance Area					
		Safety Index	Directional Safety Index		% of Fatal + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Segment Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Segment Fatal + Suspected Serious Injury Crashes Involving Bicycles	Freight Index	Directional TTTR		Closure Duration (minutes/milepost/year)		Bridge Vertical Clearance (feet)
			EB	WB							EB	WB	EB	WB	
160-1*e	8	1.94	2.58	1.31	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.52	1.70	1.35	19.10	7.83	No UP
160-2*e	4	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.39	1.31	1.46	15.60	16.80	No UP
160-3^e	21	2.21	1.67	2.76	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.23	1.22	1.24	19.59	15.89	No UP
160-4^e	18	1.02	0.00	2.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.21	1.17	1.26	11.23	8.38	No UP
160-5^e	12	1.39	2.73	0.05	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.21	1.20	1.23	33.17	22.83	No UP
160-6^e	17	1.91	2.55	1.28	Insufficient Data	86%	Insufficient Data	Insufficient Data	Insufficient Data	2.02	1.22	2.83	23.95	20.87	No UP
160-7*e	4	2.92	5.51	0.34	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	2.04	2.43	1.64	20.55	37.60	No UP
160-8^e	18	1.53	2.93	0.13	Insufficient Data	100%	Insufficient Data	Insufficient Data	Insufficient Data	1.26	1.35	1.17	59.61	19.88	No UP
160-9^e	21	1.60	1.89	1.30	Insufficient Data	33%	Insufficient Data	Insufficient Data	Insufficient Data	1.85	1.67	2.02	27.41	8.77	No UP
160-10^e	17	1.48	1.97	1.00	Insufficient Data	50%	Insufficient Data	Insufficient Data	Insufficient Data	1.23	1.25	1.21	18.13	9.60	No UP
160-11^e	12	1.00	0.05	1.95	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	2.23	1.16	3.29	18.27	15.42	No UP
160-12*e	7	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.88	6.02	1.73	10.74	0.00	No UP
Weighted Corridor Average		1.61	1.97	1.14	Insufficient Data	30.2%	Insufficient Data	Insufficient Data	Insufficient Data	1.63	1.55	1.70	24.95	14.36	No UP
SCALES															
Performance Level		**2 or 3 Lane Undivided Highway**								**Uninterrupted**			**All**		**All**
Good/Above Average Performance		< 0.92			< 11.2%	< 66.9%	< 3.8%	< 4.2%	< 0.0%	< 1.15			< 44.18		> 16.5
Fair/Average Performance		0.92 – 1.08			11.2% – 15.6%	66.9% – 74.5%	3.8% – 7.2%	4.2% -8.0%	0.0% – 3.3%	1.15 – 1.35			44.18 – 124.86		16.0 - 16.5
Poor/Below Average Performance		> 1.08			> 15.6%	> 74.5%	> 7.2%	> 8.0%	> 3.3%	> 1.35			> 124.86		< 16.0

^Uninterrupted Flow Facility
*Interrupted Flow Facility
[e] 2 or 3 Lane Undivided Highway

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings
"No UP" indicates no underpasses are present in the segment

3 NEEDS ASSESSMENT

3.1 Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP) 2010-2035 goals and objectives that were updated in 2017. Statewide performance goals that are relevant to US 160 performance areas were identified and corridor goals were then formulated for each of the five performance areas that aligned with the overall statewide goals established by the LRTP. Based on stakeholder input, corridor goals, corridor objectives, and performance results, three “emphasis areas” were identified for the US 160 Corridor: Pavement, Mobility, and Safety.

Taking into account the corridor goals and identified emphasis areas, performance objectives were developed for each quantifiable performance measure that identify the desired level of performance based on the performance scale levels for the overall corridor and for each segment of the corridor. For the performance emphasis areas, the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas. **Table 11** shows the US 160 Corridor goals, corridor objectives, and performance objectives, and how they align with the statewide goals.

It is not reasonable within a financially constrained environment to expect that every performance measure will always be at the highest levels on every corridor segment. Therefore, individual corridor segment objectives have been set as fair or better and should not fall below that standard.

Achieving corridor and segment performance objectives will help ensure that investments are targeted toward improvements that support the safe and efficient movement of travelers on the corridor. Addressing current and future congestion, thereby improving mobility on congested segments, will also help the corridor fulfill its potential as a significant contributor to the region’s economy.

Corridor performance is measured against corridor and segment objectives to determine needs – the gap between observed performance and performance objectives.

Goal achievement will improve or reduce current and future congestion, increase travel time reliability, and reduce fatalities and suspected serious injuries resulting from vehicle crashes. Where performance is currently rated “good”, the goal is always to maintain that standard, regardless of whether or not the performance is in an emphasis area.

Table 12: Corridor Performance Goals and Objectives

ADOT Statewide LRTP Goals	US 160 Corridor Goals	US 160 Corridor Objectives	Performance Area	Primary Measure / Secondary Measure Indicators	Performance Objective: Corridor Average	Performance Objective: Segment
Improve Mobility, Reliability, and Accessibility **Make Cost Effective Investment Decisions and Support Economic Vitality**	Provide a safe and reliable route for tourist travel to/from four corners Provide safe, reliable and efficient connection to all communities along the corridor to permit efficient regional and local travel throughout the Navajo Indian Reservation	Maintain current levels of service for communities located along the corridor Plan to mitigate future congestion that accounts for anticipated growth and land use changes Reduce delays from recurring and non-recurring events to improve reliability Improve bicycle and pedestrian accommodations	Mobility (*Emphasis Area*)	Mobility Index	Good	Fair or better
				Future Daily V/C		
				Existing Peak Hour V/C		
				Closure Extent		
				Directional Level of Travel Time Reliability		
				% Bicycle Accommodation		
				% Non-SOV Trips		
	Provide a safe, reliable and efficient freight route between Arizona, Colorado, Utah and New Mexico	Reduce delays and restrictions to freight movement to improve reliability Improve travel time reliability (including impacts to motorists due to freight traffic)	Freight	Freight Index	Fair or better	Fair or better
				Truck Travel Time Reliability		
				Closure Duration		
				Bridge Vertical Clearance		
Preserve and Maintain the System	Preserve and modernize highway infrastructure	Maintain structural integrity of bridges along the corridor	Bridge	Bridge Index	Fair or better	Fair or better
				Sufficiency Rating		
				Lowest Bridge Rating		
		Improve pavement ride quality for all corridor users Reduce long-term pavement maintenance costs	Pavement *(Emphasis Area)*	Pavement Index	Good	Fair or better
				Directional Pavement Serviceability Rating		
				% Area Failure		
Enhance Safety	Provide a safe, reliable, and efficient connection between Tuba City, Kayenta, and Dennehotso Promote safety by implementing appropriate countermeasures	Reduce fatal and suspected serious injury crashes for all roadway users Maintain safety records to track performance over time	Safety *(Emphasis Area)*	Safety Index	Above Average	Average or better
				Directional Safety Index		
				% of Fatal + Suspected Serious Injury Crashes at Intersections		
				% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures		
				% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians		
				% of Fatal + Suspected Serious Injury Crashes Involving Trucks		
				% of Fatal + Suspected Serious Injury Crashes Involving Bicycles		

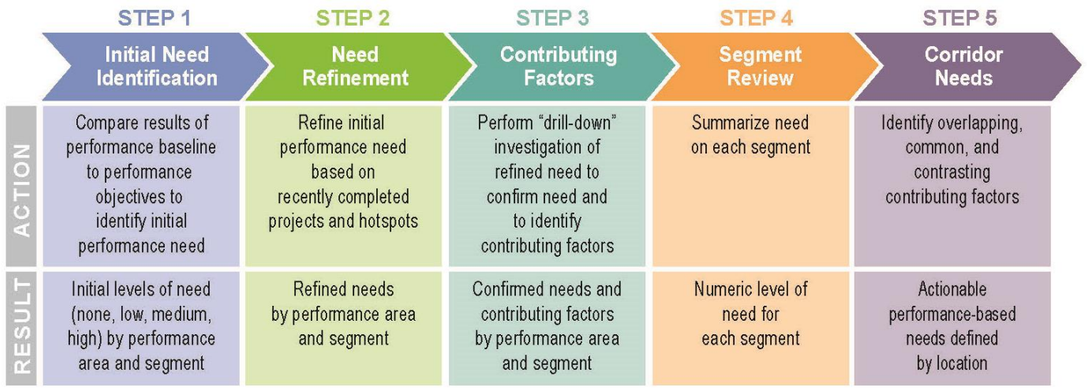
3.2 Needs Assessment Process

The following guiding principles were used as an initial step in developing a framework for the performance-based needs assessment process:

- Corridor needs are defined as the difference between the corridor performance and the performance objectives
- The needs assessment process should be systematic, progressive, and repeatable, but also allow for engineering judgment where needed
- The process should consider all primary and secondary performance measures developed for the study
- The process should develop multiple need levels including programmatic needs for the entire length of the corridor, performance area-specific needs, segment-specific needs, and location-specific needs (defined by MP limits)
- The process should produce actionable needs that can be addressed through strategic investments in corridor preservation, modernization, and expansion

The performance-based needs assessment process is illustrated in **Figure 19** and described in the following sections.

Figure 19: Needs Assessment Process



Step 1: Initial Needs Identification

The first step in the needs assessment process links baseline (existing) corridor performance with performance objectives. In this step, the baseline corridor performance is compared to the performance objectives to provide a starting point for the identification of performance needs. This mathematical comparison results in an initial need rating of None, Low, Medium, or High for each primary and secondary performance measure. An illustrative example of this process is shown in **Figure 20**.

Figure 20: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
6.5	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
	Fair		
	Fair	Low	Middle 1/3 of Fair (5.5-6.0)
5.0	Fair	Medium	Lower 1/3 of Fair and top 1/3 of Poor (4.5-5.5)
	Poor		
	Poor	High	Lower 2/3 of Poor (<4.5)
	Poor		

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

The initial level of need for each segment is refined to account for hot spots and recently completed or under construction projects, resulting in a final level of need for each segment. The final levels of need for each primary and secondary performance measure are combined to produce a weighted final need rating for each segment. Values of 0, 1, 2, and 3 are assigned to the initial need levels of None, Low, Medium, and High, respectively. A weight of 1.0 is applied to the Performance Index need and equal weights of 0.20 are applied to each need for each secondary performance measure. For directional secondary performance measures, each direction of travel receives a weight of 0.10.

Step 2: Need Refinement

In Step 2, the initial level of need for each segment is refined using the following information and engineering judgment:

- For segments with an initial need of None that contain hot spots, the level of need should be increased from None to Low
- For segments with an initial level of need where recently completed projects or projects under construction are anticipated to partially or fully address the identified need, the level of need should be reduced or eliminated as appropriate
- Programmed projects that are expected to partially or fully address an identified need are not justification to lower the initial need because the programmed projects may not be implemented as planned; in addition, further investigations may suggest that changes in the scope of a programmed project may be warranted

The resulting final needs are carried forward for further evaluation in Step 3.

Step 3: Contributing Factors

In Step 3, a more detailed review of the condition and performance data available from ADOT is conducted to identify contributing factors to the need. Typically, the same databases used to develop

the baseline performance serve as the principal sources for the more detailed analysis. However, other supplemental databases may also be useful sources of information. The databases used for diagnostic analysis are listed below:

Pavement Performance Area

- Pavement Rating Database

Bridge Performance Area

- ABISS

Mobility Performance Area

- Highway Performance Monitoring System (HPMS) Database
- AZTDM
- Real-time traffic conditions data produced by INRIX Database
- Highway Conditions Reporting System (HCRS) Database

Safety Performance Area

- Crash Database

Freight Performance Area

- INRIX Database
- HCRS Database

In addition, other sources considered helpful in identifying contributing factors are:

- Maintenance history (from ADOT PeCoS database for pavement), the level of past investments, or trends in historical data that provide context for pavement and bridge history
- Field observations from ADOT district personnel can be used to provide additional information regarding a need that has been identified
- Previous studies can provide additional information regarding a need that has been identified

Step 3 results in the identification of performance-based needs and contributing factors by segment (and MP locations, if appropriate) that can be addressed through investments in preservation, modernization, and expansion projects to improve corridor performance. See **Appendix D** for more information.

Step 4: Segment Review

In this step, the needs identified in Step 1 and refined in Step 2 are quantified for each segment to numerically estimate the level of need for each segment. Values of 0 to 3 are assigned to the final need levels (from Step 3) of None, Low, Medium, and High, respectively. A weighting factor is applied to the performance areas identified as emphasis areas and a weighted average need is calculated for each segment. The resulting average need score can be used to compare levels of need between segments within a corridor and between segments in different corridors.

Step 5: Corridor Needs

In this step, the needs and contributing factors for each performance area are reviewed on a segment-by-segment basis to identify actionable needs and to facilitate the formation of solution sets that address multiple performance areas and contributing factors. The intent of this process is to identify overlapping, common, and contrasting needs to help develop strategic solutions. This step results in the identification of corridor needs by specific location.

3.3 Corridor Needs Assessment

This section documents the results of the needs assessment process described in the prior section. The needs in each performance area were classified as either None, Low, Medium, or High based on how well each segment performed in the existing performance analysis. The needs for each segment were numerically combined to estimate the average level of need for each segment of the corridor

The final needs assessments for each performance measure, along with the scales used in analysis, are shown in **Table 13** through **Table 17**.

Pavement Needs

- Pavement hot spots were identified in Segments 160-2, 160-3, 160-4, 160-5, 160-6, 160-8, 160-9, 160-10, and 160-11
- A recently completed paving project that was almost all within Segment 160-6 addressed the needs of Segment 160-6
- The corridor exhibited potential historical investment issues in Segment 160-6
- The final Pavement needs for Segments 160-3, 160-9, and 160-10 were classified as High
- See **Appendix D** for detailed information on contributing factors

Table 13: Final Pavement Needs

Segment #	Performance Score and Level of Need				Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Pavement Index	Directional PSR		% Area Failure				
		EB	WB					
160-1	3.91	3.66	3.61	0%	0.00	None	None	None
160-2	3.87	3.80	3.96	36%	0.60	EB MP 321-323	None	Low
160-3	2.98	3.30	3.32	45%	2.60	EB MP 325-326, 328-341 & WB MP 330-331, 340-344	None	High
160-4	4.18	3.96	3.97	5%	0.00	WB MP 344-346	None	Low
160-5	4.00	4.06	4.03	25%	0.60	EB MP 368-371, 373-374 & WB MP 372-374	Pavement Rehabilitation & Rockfall Mitigation - MP 372.5-374 (2021)	Low
160-6	2.67	3.23	3.20	95%	2.80	EB/WB MP 374-390	Pavement Rehabilitation & Rockfall Mitigation - MP 374-389.5 (2021)	None
160-7	4.13	3.91	3.89	0%	0.00	None	None	None
160-8	3.67	3.76	3.68	44%	0.60	EB/WB MP 402-407, EB MP 407-409, 412-413, WB MP 408-409, 411-413	None	Low
160-9	2.69	3.00	3.05	76%	3.00	EB/WB MP 416-429, 430-431, 433-434, EB MP 432-433 & WB MP 413-414	None	High
160-10	2.88	3.54	3.54	74%	2.60	EB/WB MP 434-442 & WB MP 442-451	None	High
160-11	4.17	4.04	4.06	4%	0.00	WB MP 451-452	None	Low
160-12	3.95	3.87	3.93	0%	0.00	None	None	None

Level of Need (Score)	Performance Score Need Scale			Segment Level Need Scale
None* (0)	> 3.33	> 3.30	< 10%	0
Low (1)	3.07 - 3.33	3.30 - 3.10	10% - 15%	< 1.5
Medium (2)	2.53 - 3.07	3.10 - 2.70	15% - 25%	1.5 - 2.5
High (3)	< 2.53	< 2.70	> 25%	> 2.5

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Bridge Needs

- Bridge needs occur due to under-performing bridges on Segments 160-1, 160-4, and 160-10
- The corridor does not exhibit potential historical investment issues
- Segments 160-1 and 160-10 were identified with a Medium need, and Segment 160-4 with a Low need
- See **Appendix D** for detailed information on contributing factors

Table 14: Final Bridge Needs

Segment #	Performance Score and Level of Need			Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Bridge Index	Sufficiency Rating	Lowest Bridge Rating				
160-1	5.00	71.70	5.00	2.2	None	None	Medium
160-2	No Bridges	No Bridges	No Bridges	None	None	None	None
160-3	No Bridges	No Bridges	No Bridges	None	None	None	None
160-4	6.00	64.30	6.00	0.2	None	None	Low
160-5	No Bridges	No Bridges	No Bridges	None	None	None	None
160-6	No Bridges	No Bridges	No Bridges	None	None	None	None
160-7	No Bridges	No Bridges	No Bridges	None	None	None	None
160-8	6.00	85.20	6.00	0.0	None	None	None
160-9	7.00	87.84	7.00	0.0	None	Construct Bridge Replacement - Chinle Wash Br. MP 429 (2018)	None
160-10	5.00	62.70	5.00	2.4	None	None	Medium
160-11	No Bridges	No Bridges	No Bridges	None	None	None	None
160-12	No Bridges	No Bridges	No Bridges	None	None	None	None

Level of Need (Score)	Performance Score Need Scale			Segment Level Need Scale
None (0)	≥ 6.0	≥ 70	> 5	0
Low (1)	5.5 - 6.0	60 - 70	5	< 1.5
Medium (2)	4.5 - 5.5	40 - 60	4	1.5 - 2.5
High (3)	≤ 4.5	≤ 40	< 4	> 2.5

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicated that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Mobility Needs

- Low Mobility needs were identified on all segments except Segment 160-2, which has a High Mobility need
- High Mobility needs were identified on Segment 160-2 primarily due to the Mobility Index score and future daily V/C (congestion)
- See **Appendix D** for detailed information on contributing factors

Table 15: Final Mobility Needs

Segment #	Performance Score and Level of Need									Initial Segment Need	Recently Completed Projects	Final Segment Need
	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent		Directional TTTR		% Bicycle Accommodation			
			EB	WB	EB	WB	EB	WB				
160-1[2b]	0.3	0.3	0.26	0.21	0.08	0.05	1.11	1.09	0%	0.6	-	Low
160-2[2b]	1.01	1.16	0.59	0.71	0.10	0.10	1.11	1.16	96%	3.8	-	High
160-3[2a]	0.17	0.20	0.16	0.15	0.10	0.10	1.07	1.06	19%	0.6	-	Low
160-4[2a]	0.15	0.17	0.12	0.12	0.04	0.03	1.06	1.05	9%	0.6	-	Low
160-5[2a]	0.20	0.24	0.16	0.14	0.13	0.12	1.06	1.06	0%	0.6	Rockfall Mitigation - MP 372.5 Long House Valley (2021)	Low
160-6[2a]	0.26	0.30	0.24	0.21	0.09	0.09	1.07	1.15	0%	0.6	-	Low
160-7[2b]	0.28	0.29	0.27	0.27	0.25	0.30	1.15	1.14	6%	0.6	-	Low
160-8[2a]	0.08	0.05	0.12	0.09	0.10	0.10	1.09	1.06	0%	0.6	-	Low
160-9[2a]	0.07	0.04	0.11	0.11	0.10	0.05	1.13	1.12	1%	0.6	-	Low
160-10[2a]	0.16	0.16	0.19	0.12	0.07	0.06	1.07	1.01	1%	0.6	-	Low
160-11[2a]	0.18	0.21	0.18	0.11	0.10	0.07	1.06	1.17	0%	0.6	-	Low
160-12[2b]	0.17	0.20	0.21	0.12	0.03	0.00	1.24	1.21	4%	0.6	-	Low

Level of Need (Score)	Performance Score Need Scale				Segment Level Need Scale
None* (0)	≤ 0.77 (Urban) ≤ 0.63 (Rural)	< 0.35	< 1.21[a] < 1.53[b]	> 80%	0
Low (1)	0.77 - 0.83 (Urban) 0.63 - 0.69 (Rural)	0.35 - 0.49	1.21 - 1.27[a] 1.53 - 1.77[b]	70% - 80%	< 1.5
Medium (2)	0.83 - 0.95 (Urban) 0.69 - 0.83 (Rural)	0.49 - 0.75	1.27 - 1.39[a] 1.77 - 2.23[b]	50% - 70%	1.5 - 2.5
High (3)	≥ 0.95 (Urban) ≥ 0.83 (Rural)	> 0.75	> 1.39[a] > 2.23[b]	< 50%	> 2.5

1: Urban or Fringe Urban 2: Rural
a: Uninterrupted Flow Facility b: Interrupted Flow Facility

** A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Safety Needs

- Segments 160-1, 160-3, 160-5, 160-6, 160-7, 160-8, 160-9, and 160-10 were identified as having High final Safety needs
- There are no Safety hot spots along the corridor
- See **Appendix D** for detailed information on contributing factors

Table 16: Final Safety Needs

Segment #	Performance Score and Level of Need								Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Safety Index	Directional Safety Index		% of Fatal + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Fatal + Suspected Serious Injury Crashes Involving Bicycles				
		EB	WB									
160-1[a]	1.94	2.58	1.31	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.6	None	None	High
160-2[a]	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	N/A	None	None	N/A
160-3[a]	2.21	1.67	2.76	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.6	None	FY15 H803701C: US 160 at N21, US 160/ N21 Intersection Lighting (MP 343/343.7)	High
160-4[a]	1.02	0.00	2.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.3	None	None	Low
160-5[a]	1.39	2.73	0.05	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.3	None	None	High
160-6[a]	1.91	2.55	1.28	Insufficient Data	86%	Insufficient Data	Insufficient Data	Insufficient Data	4.2	None	None	High
160-7[a]	2.92	5.51	0.34	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.3	None	None	High
160-8[a]	1.53	2.93	0.13	Insufficient Data	100%	Insufficient Data	Insufficient Data	Insufficient Data	3.9	None	None	High
160-9[a]	1.60	1.89	1.30	Insufficient Data	33%	Insufficient Data	Insufficient Data	Insufficient Data	3.6	None	None	High
160-10[a]	1.48	1.97	1.00	Insufficient Data	50%	Insufficient Data	Insufficient Data	Insufficient Data	3.4	None	None	High
160-11[a]	1.00	0.05	1.95	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.3	None	None	Low
160-12[a]	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	N/A	None	None	N/A

Level of Need (Score)		Performance Score Needs Scale						Segment Level Need Scale
None* (0)	a	≤ 0.97	≤ 13%	≤ 69%	≤ 5%	≤ 5%	≤ 1%	0
Low (1)	a	0.98 - 1.02	14%	70% -72%	6%	6%	2%	≤ 1.5
Medium (2)	a	1.03 - 1.12	15% -17%	73% -76%	7%	7% -8%	3%	1.5 - 2.5
High (3)	a	≥ 1.13	≥ 17%	≥ 77%	≥ 8%	≥ 9%	≥ 4%	≥ 2.5

a: 2 or 3 Lane Undivided Highway

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Freight Needs

- High freight Needs were identified at Segments 160-6, 160-7, 160-9, 160-11, and 160-12
- There are no underpasses along the corridor
- See **Appendix D** for detailed information on contributing factors

Table 17: Final Freight Needs

Segment #	Performance Score and Level of Need						Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Freight Index	Directional TTTR		Closure Duration		Bridge Vertical Clearance				
		EB	WB	EB	WB					
160-1[b]	1.52	1.70	1.35	19.10	7.83	No UP	0.1	None	None	Low
160-2[b]	1.39	1.31	1.46	15.60	16.80	No UP	0.0	None	None	None
160-3[a]	1.23	1.22	1.24	19.59	15.89	No UP	1.2	None	None	Low
160-4[a]	1.21	1.17	1.26	7.57	4.71	No UP	0.1	None	None	Low
160-5[a]	1.21	1.20	1.23	33.17	22.83	No UP	0.1	None	None	Low
160-6[a]	2.02	1.22	2.83	22.56	19.48	No UP	3.4	None	None	High
160-7[b]	2.04	2.43	1.64	20.55	37.60	No UP	3.4	None	None	High
160-8[a]	1.26	1.35	1.17	59.61	19.88	No UP	1.2	None	None	Low
160-9[a]	1.85	1.67	2.02	27.41	8.77	No UP	3.6	None	None	High
160-10[a]	1.23	1.25	1.21	18.13	9.60	No UP	1.1	None	None	Low
160-11[a]	2.23	1.16	3.29	18.27	15.42	No UP	3.3	None	None	High
160-12[b]	3.88	6.02	1.73	10.74	0.00	No UP	3.5	None	None	High

Level of Need (Score)		Performance Score Need Scale				Segment Level Need Scale
None* (0)	a	≤ 1.22	≤ 1.22	≤ 71.07	≥ 16.33	0
	b	≤ 1.58	≤ 1.58			
Low (1)	a	1.22-1.28	1.22-1.28	71.07 - 97.97	16.17 - 16.33	≤ 1.5
	b	1.58-1.72	1.58-1.72			
Medium (2)	a	1.28-1.42	1.28-1.42	97.97 - 151.75	15.83 - 16.17	1.5 - 2.5
	b	1.72-1.98	1.72-1.98			
High (3)	a	≥ 1.42	≥ 1.42	≥ 151.75	≤ 15.83	≥ 2.5
	b	≥ 1.98	≥ 1.98			

a: Uninterrupted Flow Facility
b: Interrupted Flow Facility

** A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Segment Review

The needs for each segment were combined to numerically estimate the average level of need for each segment of the corridor. **Table 18** provides a summary of needs for each segment across all performance areas, with the average need score for each segment presented in the last row of the table. A weighting factor of 1.5 is applied to the need scores of the performance areas identified as emphasis areas (Pavement, Mobility, and Safety for the US 160 Corridor). There are three segments with a Low overall average need, seven segments with a Medium overall average need, and two segments with a High overall average need.

Table 18: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)											
	160-1	**160-2**	**160-3**	**160-4**	**160-5**	**160-6**	**160-7**	**160-8**	**160-9**	**160-10**	**160-11**	**160-12**
	MP 312-319	**MP 319-323**	**MP 323-344**	**MP 344-362**	**MP 362-374**	**MP 374-391**	**MP 391-395**	**MP 395-413**	**MP 413-434**	**MP 434-451**	**MP 451-463**	**MP 463-471**
Pavement*	None	Low	High	None	Low	None	None	Low	High	High	Low	None
Bridge	Medium	None	None	Low	None	None	None	None	None	Medium	None	None
Mobility*	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Safety*	High	N/A	High	Low	High	High	High	High	High	High	Low	N/A
Freight	Low	None	Low	Low	Low	High	High	Low	High	Low	High	High
Average Need	**1.38**	**0.92**	**1.77**	**0.77**	**1.31**	**1.38**	**1.38**	**1.31**	**2.08**	**2.08**	**1.15**	**0.69**

Level of Need	Average Need Range
None*	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

* Identified as an Emphasis Area for the US 160 Corridor
# N/A indicates insufficient or no data available to determine level of need
+ A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study

Summary of Corridor Needs

The needs in each performance area are shown in **Figure 21** and summarized below:

Pavement Needs

- The Pavement performance area is an emphasis area for US 160
- Three of the twelve segments (160-3, 160-9 and 160-10) exhibit a High level of pavement need
- Pavement hot spot failure needs were identified throughout the corridor
- A high level of historical investment was identified in Segment 160-6

Bridge Needs

- The Bridge performance area is not an emphasis area for US 160
- Bridge needs exist at five of the six bridges present along the corridor
- Segments 160-1 and 160-10 exhibit a Medium need
- The corridor does not exhibit potential historical investment issues

Mobility Needs

- The Mobility performance area is an emphasis area for US 160
- One segment (160-2) exhibits a High level of need, primarily due to the mobility index score and future daily V/C (congestion)

Safety Needs

- The Safety performance area is an emphasis area for US 160
- Eight of the twelve segments (160-1, 160-3, 160-5, 160-6, 160-7, 160-8, 160-9, and 160-10) exhibit a High need
- There are no Safety hot spots along the corridor

Freight Needs

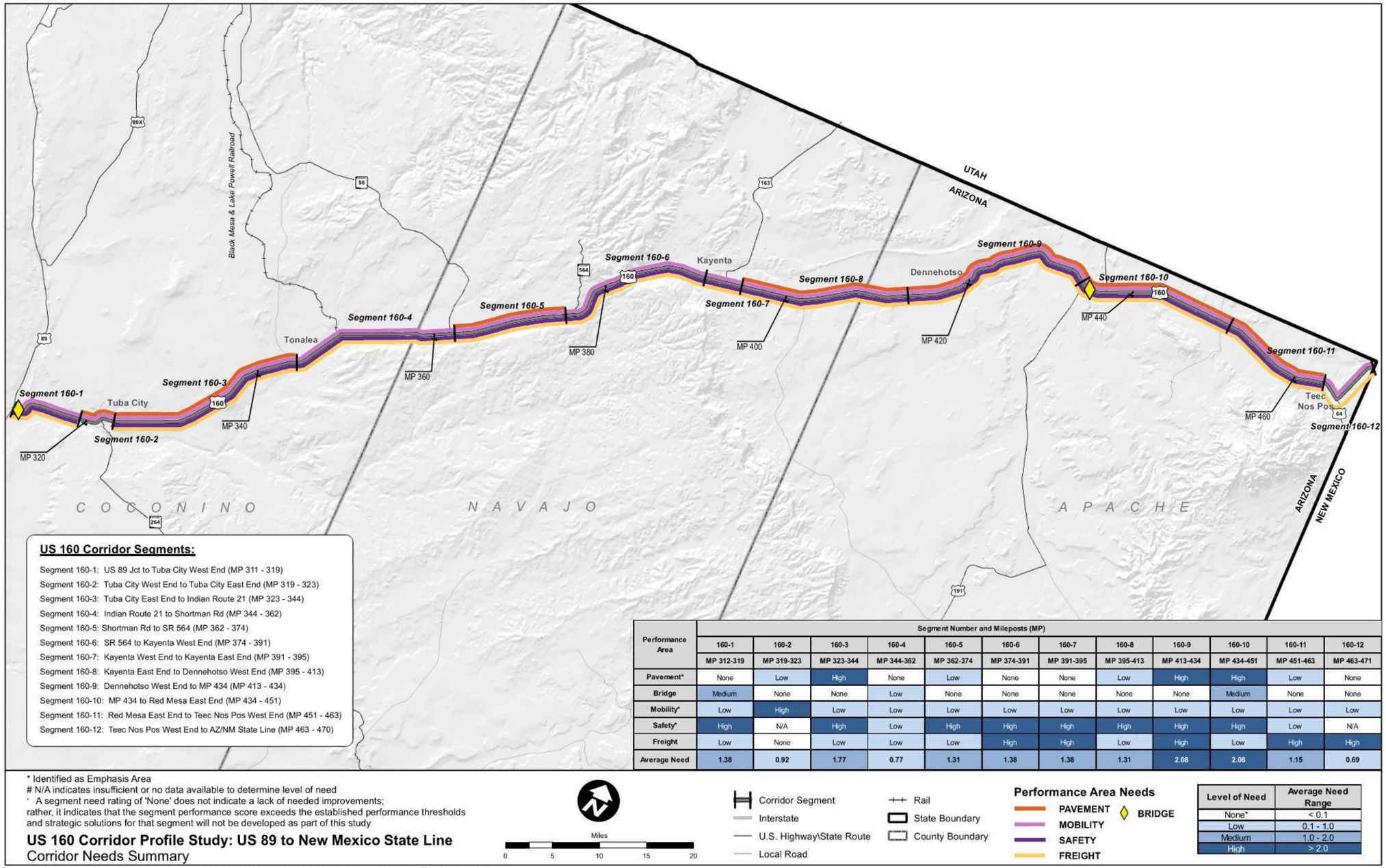
- The Freight performance area is not an emphasis area for US 160
- Five segments (160-6, 160-7, 160-9, 160-11 and 160-12) exhibit a High need
- There are no underpasses along the corridor

Overlapping Needs

This section identifies overlapping performance needs on the US 160 Corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need (i.e., Medium or High). Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided below:

- Segment 160-1 contains a High need in the Safety performance area and a Medium need in the Bridge performance area
- Segment 160-3 contains High needs in the Pavement and Safety performance areas
- Segment 160-6 contains High needs in the Safety and Freight performance areas
- Segment 160-7 contains High needs in the Safety and Freight performance areas
- Segment 160-9 contains High needs in the Pavement, Safety, and Freight performance areas
- Segment 160-10 contains High needs in the Pavement and Safety performance areas and a Medium need in the Bridge performance area
- Average needs of Segments 160-1,160-3, 160-5, 160-6, 160-7, 160-8, and 160-11 are Medium and of Segments 160-9 and 160-10 are High

Figure 21: Corridor Needs Summary



US 160 Corridor Segments:

Segment 160-1: US 89 Jct to Tuba City West End (MP 311 - 319)
Segment 160-2: Tuba City West End to Tuba City East End (MP 319 - 323)
Segment 160-3: Tuba City East End to Indian Route 21 (MP 323 - 344)
Segment 160-4: Indian Route 21 to Shortman Rd (MP 344 - 362)
Segment 160-5: Shortman Rd to SR 564 (MP 362 - 374)
Segment 160-6: SR 564 to Kayenta West End (MP 374 - 391)
Segment 160-7: Kayenta West End to Kayenta East End (MP 391 - 395)
Segment 160-8: Kayenta East End to Dennehotso West End (MP 395 - 413)
Segment 160-9: Dennehotso West End to MP 434 (MP 413 - 434)
Segment 160-10: MP 434 to Red Mesa East End (MP 434 - 451)
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

Performance Area	Segment Number and Mileposts (MP)											
	160-1	160-2	160-3	160-4	160-5	160-6	160-7	160-8	160-9	160-10	160-11	160-12
	MP 312-319	MP 319-323	MP 323-344	MP 344-362	MP 362-374	MP 374-391	MP 391-395	MP 395-413	MP 413-434	MP 434-451	MP 451-463	MP 463-471
Pavement*	None	Low	High	None	Low	None	None	Low	High	High	Low	None
Bridge	Medium	None	None	Low	None	None	None	None	None	Medium	None	None
Mobility*	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Safety*	High	N/A	High	Low	High	High	High	High	High	High	Low	N/A
Freight	Low	None	Low	Low	Low	High	High	Low	High	Low	High	High
Average Need	1.38	0.92	1.77	0.77	1.31	1.38	1.38	1.31	2.08	2.08	1.15	0.69

* Identified as Emphasis Area
# N/A indicates insufficient or no data available to determine level of need
* A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study

US 160 Corridor Profile Study: US 89 to New Mexico State Line
Corridor Needs Summary

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Performance Area Needs
PAVEMENT
BRIDGE
MOBILITY
SAFETY
FREIGHT

Level of Need	Average Need Range
None*	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

4 STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State's key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need (i.e., Medium or High). Addressing areas of Medium or High need will have the greatest effect on corridor performance and are the focus of the strategic solutions. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. The US 160 strategic investment areas (resulting from the elevated needs) are shown in **Figure 22**.

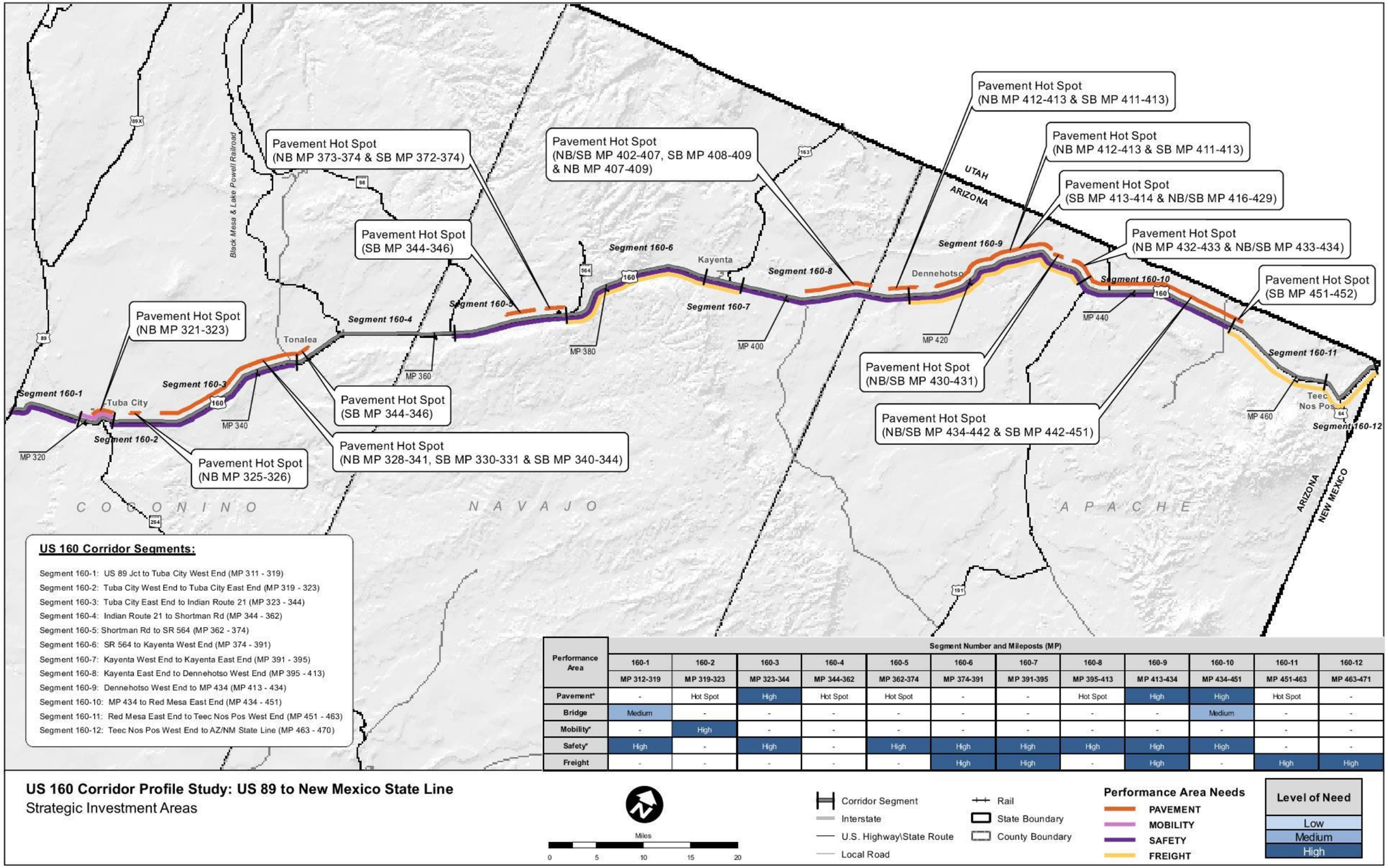
4.1 Screening Process

This section examines qualifying strategic needs and determines if the needs in those locations require action. In some cases, needs that are identified do not advance to solutions development and are screened out from further consideration because they have been or will be addressed through other measures including:

- A project is programmed to address this need
- The need is a result of a Pavement or Bridge hot spot that does not show historical investment or rating issues; these hot spots will likely be addressed through other ADOT programming means
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need; this bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes
- The need is determined to be non-actionable (i.e., cannot be addressed through an ADOT project)
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need

Table 19 notes if each potential strategic need advanced to solution development, and if not, the reason for screening the potential strategic need out of the process. Locations advancing to solutions development are marked with Yes (Y); locations not advancing are marked with No (N) and highlighted. This screening table provides specific information about the needs in each segment that will be considered for strategic investment. The table identifies the level of need – either Medium or High segment needs, or segments without Medium or High level of need that have a hot spot. Each area of need is assigned a location number in the screening table to help document and track locations considered for strategic investment.

Figure 22: Strategic Investment Areas



US 160 Corridor Segments:

Segment 160-1: US 89 Jct to Tuba City West End (MP 311 - 319)
Segment 160-2: Tuba City West End to Tuba City East End (MP 319 - 323)
Segment 160-3: Tuba City East End to Indian Route 21 (MP 323 - 344)
Segment 160-4: Indian Route 21 to Shortman Rd (MP 344 - 362)
Segment 160-5: Shortman Rd to SR 564 (MP 362 - 374)
Segment 160-6: SR 564 to Kayenta West End (MP 374 - 391)
Segment 160-7: Kayenta West End to Kayenta East End (MP 391 - 395)
Segment 160-8: Kayenta East End to Dennehotso West End (MP 395 - 413)
Segment 160-9: Dennehotso West End to MP 434 (MP 413 - 434)
Segment 160-10: MP 434 to Red Mesa East End (MP 434 - 451)
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

Performance Area	Segment Number and Mileposts (MP)											
	160-1	160-2	160-3	160-4	160-5	160-6	160-7	160-8	160-9	160-10	160-11	160-12
	MP 312-319	MP 319-323	MP 323-344	MP 344-362	MP 362-374	MP 374-391	MP 391-395	MP 395-413	MP 413-434	MP 434-451	MP 451-463	MP 463-471
Pavement*	-	Hot Spot	High	Hot Spot	Hot Spot	-	-	Hot Spot	High	High	Hot Spot	-
Bridge	Medium	-	-	-	-	-	-	-	-	Medium	-	-
Mobility*	-	High	-	-	-	-	-	-	-	-	-	-
Safety*	High	-	High	-	High	High	High	High	High	High	-	-
Freight	-	-	-	-	-	High	High	-	High	-	High	High

US 160 Corridor Profile Study: US 89 to New Mexico State Line
Strategic Investment Areas

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Performance Area Needs
PAVEMENT
MOBILITY
SAFETY
FREIGHT

Level of Need
Low
Medium
High

Table 19: Strategic Investment Area Screening

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
160-1 (MP 312-319)	-	Medium	-	High	-	L1	Bridge	Hamblin Wash Br (#736, MP 302.5) has 2020 eval rating of 5; not identified in historical review; is not considered a hot spot	N	Bridge does not have a rating of 4 or multiple ratings of 5 so it is not a hot spot and therefore is not considered a strategic investment; will likely be addressed by current ADOT processes
						L2	Safety	MP 312-319 has an overall Safety Index and Directional Safety Indexes above statewide averages 3 fatal crashes	Y	No programmed project to address Safety need
160-2 (MP 319-323)	Hot Spot	-	High	-	-	L3	Pavement	Hot spot EB MP 321-323	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L4	Mobility	MP 319-323 has a High level of need based on Mobility Index and Future Daily V/C performance; Existing Peak Hour V/C and WB Directional LOTTR ratings are fair	Y	No programmed project to address Mobility need
160-3 (MP 323-344)	High	-	-	High	-	L5	Pavement	Hot spots EB MP 325-326, MP 328-341 & WB MP 330-331, MP 340-344	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L6	Safety	MP 323-344 has an overall Safety Index and Directional Safety Indexes above statewide averages 8 fatal crashes, 1 suspected serious injury crash, 1 crash involving trucks, 1 crash involving bicycles, and 2 crashes involving a pedestrian; 44% involve overturning, 22% involve collision with a pedestrian, 11% involve bicycles, 56% involve a single vehicle, 50% occur in dark-unlighted conditions	Y	No programmed project to address Safety need
160-4 (MP 344-362)	Hot Spot	-	-	-	-	L7	Pavement	Hot spot WB MP 344-346	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes

Legend: Strategic investment area screened out from further consideration.

Table 19: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
160-5 (MP 362-374)	Hot Spot	-	-	High	-	L8	Pavement	Hot spot EB MP 368-371, MP 373-374 & WB MP 372-374	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L9	Safety	MP 362-374 has an overall Safety Index and EB Directional Safety Index above statewide averages 3 fatal crashes, 1 suspected serious injury crash, and 1 crash involving a pedestrian	Y	No programmed project to address Safety need
160-6 (MP 374-391)	-	-	-	High	High	L10	Safety	MP 374-391 has an overall Safety Index and Directional Safety Indexes above statewide averages 6 fatal crashes, 1 suspected serious injury crash, 1 crash involving trucks, and 1 crash involving a pedestrian; crash data analysis indicates percentage of crashes above statewide average related to lane departures; 29% involve collision with a fixed object, 14% involve collision with a pedestrian, 43% involve head on collision, 29% involve single vehicle, 33% involve drove in opposing lane, 29% involve a first unit event of ran off the road (left), 29% involve a first unit event of crossed centerline	Y	No programmed project to address Safety need
						L11	Freight	MP 374-391 has a High level of need based on poor overall Freight Index and WB Directional TTTR measures.	Y	No programmed project to address Freight need
160-7 (MP 391-395)	-	-	-	High	High	L12	Safety	MP 391-395 has an overall Safety Index and EB Directional Safety Index above statewide averages 2 fatal crashes, 2 suspected serious injury crashes	N	No identified crash pattern; no specific need to address
						L13	Freight	MP 391-395 has a High level of need based on poor overall Freight Index and EB Directional TTTR measures	N	Elevated Freight need likely due to truck stop locations at Kayenta
160-8 (MP 395-413)	Hot Spot	-	-	High	-	L14	Pavement	Hot spots EB/WB MP 402-407, EB MP 407-409, MP 412-413, WB MP 408-409, MP 411-413	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L15	Safety	MP 395-413 has an overall Safety Index and EB Directional Safety Index above statewide averages 4 fatal crashes, 3 suspected serious injury crashes; crash data analysis indicates percentage of crashes above statewide average related to lane departures; 71% involve overturning, 29% involve failure to keep in proper lane, 57% occur in dark-unlighted conditions	Y	No programmed project to address Safety need

Legend: Strategic investment area screened out from further consideration.

Table 19: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Paveme	Bridge	Mobility	Safety	Freight					
160-9 (MP 413-434)	High	-	-	High	High	L16	Pavement	Hot spots EB/WB MP 416-429, MP 430-431, MP 433-434, EB MP 432-433 & WB MP 413-414; has a high level of need based on poor Pavement Index performance score as well as 76% area failure	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L17	Safety	MP 413-434 has an overall Safety Index and Directional Safety Indexes above statewide averages 5 fatal crashes, 1 suspected serious injury crash, and 2 crashes involving a pedestrian; 33% involve collision with a pedestrian, 33% involve rear ends, 67% involve dark-unlighted conditions	Y	No programmed project to address Safety need
						L18	Freight	MP 413-434 has a High level of need based on poor overall Freight Index and Directional TTTR measures.	Y	No programmed project to address Freight need
160-10 (MP 434-451)	High	Medium	-	High	-	L19	Bridge	Walker Creek Br (#748, MP 3435.33) has 2020 deck rating of 5; not identified in historical review; is not considered a hot spot	N	Bridge does not have a rating of 4 or multiple ratings of 5 so it is not a hot spot and therefore is not considered a strategic investment; will likely be addressed by current ADOT processes
						L20	Pavement	Hot spots EB/WB MP 434-442, WB MP 442-451; has a high need based on poor Pavement Index performance score as well as 74% area failure	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L21	Safety	MP 434-451 has an overall Safety Index and EB Directional Safety Index above statewide averages 3 fatal crashes, 5 suspected serious injury crashes, and 1 crash involving trucks; 25% involve single vehicle, 25% involve ran STOP sign, 13% involve drove in opposing lane, 50% involve dark-unlighted conditions' 13% involve ice/frost conditions	Y	No programmed project to address Safety need
160-11 (MP 451-463)	Hot Spot	-	-	-	High	L22	Pavement	Hot spot WB MP 451-452	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L23	Freight	MP 451-463 has a High level of need based on poor overall Freight Index and WB Directional TTTR measures.	Y	No programmed project to address Freight need

Legend: Strategic investment area screened out from further consideration.

Table 19: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
160-12 (MP 463-471)	-	-	-	-	High	L24	Freight	MP 463-471 has a High level of need based on poor overall Freight Index and EB Directional TTTR measures.	Y	No programmed project to address Freight need

Legend: Strategic investment area screened out from further consideration.

4.2 Candidate Solutions

For each elevated need within a strategic investment area that is not screened out, a candidate solution is developed to address the identified need. Each candidate solution is assigned to one of the following three P2P investment categories based on the scope of the solution:

- Preservation
- Modernization
- Expansion

Documented performance needs serve as the foundation for developing candidate solutions for corridor preservation, modernization, and expansion. Candidate solutions are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the US 160 Corridor will be considered along with other candidate projects in the ADOT statewide programming process.

Characteristics of Strategic Solutions

Candidate solutions should include some or all of the following characteristics:

- Do not recreate or replace results from normal programming processes
- May include programs or initiatives, areas for further study, and infrastructure projects
- Address elevated levels of need (High or Medium) and hot spots
- Focus on investments in modernization projects (to optimize current infrastructure)
- Address overlapping needs
- Reduce costly repetitive maintenance
- Extend operational life of system and delay expansion
- Leverage programmed projects that can be expanded to address other strategic elements
- Provide measurable benefit

Candidate Solutions

A set of 16 candidate solutions are proposed to address the identified needs on the US 160 Corridor.

Table 20 identifies each strategic location that has been assigned a candidate solution with a number (e.g., CS160.1, 160.2, etc.). Each candidate solution is comprised of one or more components to address the identified needs. The assigned candidate solution numbers are linked to the location number and provide tracking capability through the rest of the process. The locations of proposed solutions are shown on the map in **Figure 23**.

Candidate solutions developed to address an elevated need in the Pavement or Bridge performance area will include two options: rehabilitation or full replacement. These solutions are initially evaluated through a Life-Cycle Cost Analysis (LCCA) to provide insights into the cost-effectiveness of these options so a recommended approach can be identified. Candidate solutions developed to address an elevated need in the Mobility, Safety, or Freight performance areas are advanced directly to the Performance Effectiveness Evaluation. In some cases, there may be multiple solutions identified to address the same area of need.

Candidate solutions that are recommended to expand or modify the scope of an already programmed project are noted and are not advanced to solution evaluation and prioritization. These solutions are directly recommended for programming.

Table 20: Candidate Solutions

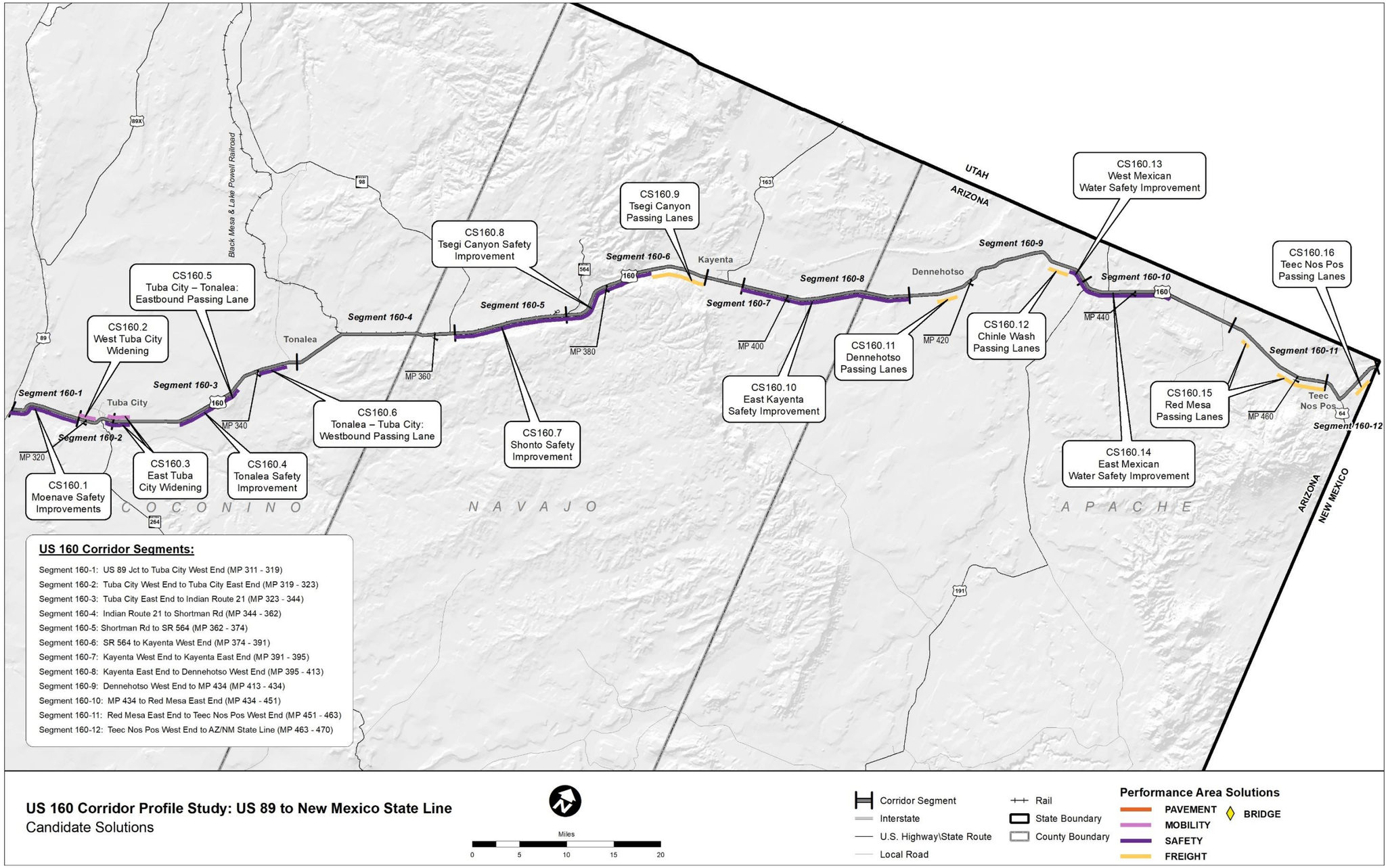
Candidate Solution #	Segment #	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option*	Candidate Solution Scope	Investment Category Preservation [P] Modernization [M] Expansion [E]
CS160.1	160-1	L2	312	319	Moenave Safety Improvements	-	Install high visibility striping and delineators, reflective pavement markers, and rumble strips in both directions Install chevrons on curve (MP 312.5 to 314)	M
CS160.2	160-2	L4	319	321.6	West Tuba City Widening	-	Convert 2-Lane undivided highway to a 5-Lane highway	E
CS160.3	160-2 & 160-3	L4/L6	322.4	325	East Tuba City Widening	-	Convert 2-Lane undivided highway to a 5-Lane highway	E
CS160.4	160-3	L6	330	337	Tonalea Safety Improvement	-	Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) Install curve warning signs in both directions Install chevrons on curve (MP 336 to MP 336.5)	M
CS160.5	160-3	L6	335	336.5	Tuba City – Tonalea: Eastbound Passing Lane	-	Construct eastbound passing lane from MP 335 – MP 336.5	M
CS160.6	160-3	L6	340	343	Tonalea – Tuba City: Westbound Passing Lane	-	Construct westbound passing lane from MP 340 – MP 341	M
CS160.7	160-5	L9	362	374	Shonto Safety Improvement	-	Install high visibility striping and delineators and rumble strips in both directions	M
CS160.8	160-6	L10	374	385	Tsegi Canyon Safety Improvement	-	Install high visibility striping and delineators and rumble strips in both directions	M
CS160.9	160-6	L11	385	391	Tsegi Canyon Passing Lanes	-	Construct westbound passing lane from MP 389 – MP 390 Construct eastbound passing lane from MP 385 – MP 391	M
CS160.10	160-8	L15	395	413	East Kayenta Safety Improvement	-	Install high visibility striping and delineators and rumble strips in both directions	M
CS160.11	160-9	L18	416	418	Dennehotso Passing Lanes	-	Construct eastbound passing lane from MP 416 – MP 417 Construct westbound passing lane from MP 417 – MP 418	M

Table 20: Candidate Solutions (Continued)

Candidate Solution #	Segment #	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option*	Candidate Solution Scope	Investment Category Preservation [P] Modernization [M] Expansion [E]
CS160.12	160-9	L18	430	432	Chinle Wash Passing Lanes	-	Construct eastbound passing lane from MP 430 – MP 431 Construct westbound passing lane from MP 431 – MP 432	M
CS160.13	160-9	L17	432	434	West Mexican Water Safety Improvement	-	Install curve warning signs and speed feedback signs in both directions (MP 432 and MP 434) Install chevrons on curves (MP 432.5 to MP 433.5)	M
CS160.14	160-10	L21	434	444	East Mexican Water Safety Improvement	-	Install high visibility striping and delineators and rumble strips in both directions Install curve warning signs and speed feedback signs in both directions (MP 434 and MP 436) Install chevrons on curves (MP 434.5 to MP 435.5)	M
CS160.15	160-11	L23	453	463	Red Mesa Passing Lanes	-	Construct eastbound passing lane from MP 453 – MP 454 Construct westbound passing lane from MP 458 – MP 463	M
CS160.16	160-12	L24	467	469	Teec Nos Pos Passing Lanes	-	Construct eastbound passing lane from MP 467 – MP 468 Construct westbound passing lane from MP 468 – MP 469	M

‘-‘indicates only one solution is being proposed and no options are being considered

Figure 23: Candidate Solutions



5 SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation are shown in **Figure 24** and described more fully below.

Life-Cycle Cost Analysis

All Pavement and Bridge candidate solutions have two options: rehabilitation/repair or reconstruction. These options are evaluated through an LCCA to determine the best approach for each location where a Pavement or Bridge solution is recommended. The LCCA can eliminate options from further consideration and identify which options should be carried forward for further evaluation.

When multiple independent candidate solutions are developed for Mobility, Safety, or Freight strategic investment areas, these candidate solution options advance directly to the Performance Effectiveness Evaluation without an LCCA.

Performance Effectiveness Evaluation

After completing the LCCA process, all remaining candidate solutions are evaluated based on their performance effectiveness. This process includes determining a Performance Effectiveness Score (PES) based on how much each solution impacts the existing performance and needs scores for each segment. This evaluation also includes a Performance Area Risk Analysis to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

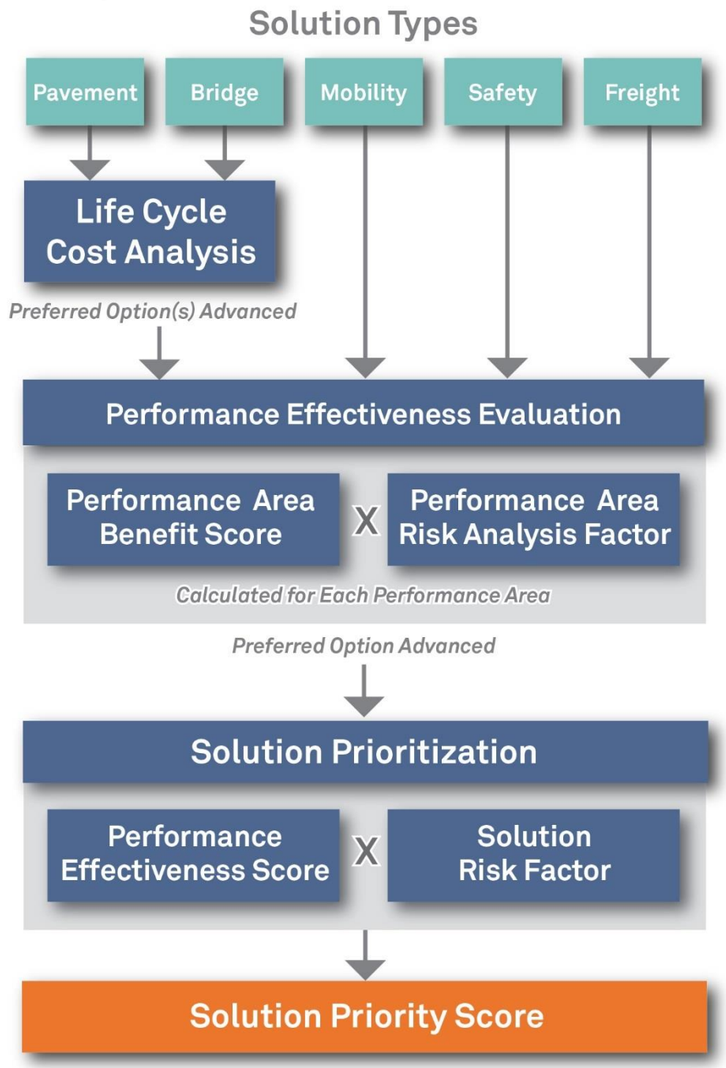
Solution Risk Analysis

All candidate solutions advanced through the Performance Effectiveness Evaluation are also evaluated through a Solution Risk Analysis process. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of performance failure.

Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score. The candidate solutions are ranked by prioritization score from highest to lowest. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Solutions that address multiple performance areas tend to score higher in this process.

Figure 24: Candidate Solution Evaluation Process



5.1. Life-Cycle Cost Analysis

LCCA is conducted for any candidate solution that is developed as a result of a need in the Pavement or Bridge Performance Area. The intent of the LCCA is to determine which options warrant further investigation and eliminate options that would not be considered strategic.

LCCA is an economic analysis that compares cost streams over time and presents the results in a common measure, the present value of all future costs. The cost stream occurs over an analysis period that is long enough to provide a reasonably fair comparison among alternatives that may differ significantly in scale of improvement actions over shorter time periods. For both bridge and pavement LCCA, the costs are focused on agency (ADOT) costs for corrective actions to meet the objective of keeping the bridge or pavement serviceable over a long period of time.

LCCA is performed to provide a more complete holistic perspective on asset performance and agency costs over the life of an investment stream. This approach helps ADOT look beyond initial and short-term costs, which often dominate the considerations in transportation investment decision making and programming.

Bridge LCCA

For the bridge LCCA, three basic strategies are analyzed that differ in timing and scale of improvement actions to maintain the selected bridges, as described below:

- Bridge replacement (large upfront cost but small ongoing costs afterwards)
- Bridge rehabilitation until replacement (moderate upfront costs then small to moderate ongoing costs until replacement)
- On-going repairs until replacement (low upfront and ongoing costs until replacement)

The bridge LCCA model developed for the CPS reviews the characteristics of the candidate bridges including bridge ratings and deterioration rates to develop the three improvement strategies (full replacement, rehabilitation until replacement, and repair until replacement). Each strategy consists of a set of corrective actions that contribute to keeping the bridge serviceable over the analysis period. Cost and effect of these improvement actions on the bridge condition are essential parts of the model. Other considerations in the model include bridge age, elevation, pier height, length-to-span ratio, skew angle, and substandard characteristics such as shoulders and vehicle clearance. The following assumptions are included in the bridge LCCA model:

- The bridge LCCA only addresses the structural condition of the bridge and does not address other issues or costs
- The bridge will require replacement at the end of its 75-year service life regardless of current condition
- The bridge elevation, pier height, skew angle, and length to span ratio can affect the replacement and rehabilitation costs
- The current and historical ratings are used to estimate a rate of deterioration for each candidate bridge
- Following bridge replacement, repairs will be needed every 20 years
- Different bridge repair and rehabilitation strategies have different costs, expected service life, and benefit to the bridge rating
- The net present value of future costs is discounted at 3% and all dollar amounts are in 2022 dollars
- If the LCCA evaluation recommends rehabilitation or repair, the solution is not considered strategic and the rehabilitation or repair will be addressed by normal programming processes
- Because this LCCA is conducted at a planning level, and due to the variabilities in costs and improvement strategies, the LCCA net present value results that are within 15% should be considered equally; in such a case, the solution should be carried forward as a strategic replacement project – more detailed scoping will confirm if replacement or rehabilitation is needed

Based on the candidate solutions presented in **Table 20**, LCCA was not conducted for any bridges on the US 160 Corridor, as noted in **Table 21**. Additional information regarding the bridge LCCA is included in **Appendix E**.

Pavement LCCA

The LCCA approach to pavement is very similar to the process used for bridges. For the pavement LCCA, three basic strategies are analyzed that differ in timing and scale of improvement actions to maintain the selected pavement, as described below:

- Pavement replacement (large upfront cost but small ongoing costs afterwards – could be replacement with asphalt or concrete pavement)
- Pavement major rehabilitation until replacement (moderate upfront costs then small to moderate ongoing costs until replacement)
- Pavement minor rehabilitation until replacement (low upfront and ongoing costs until replacement)

The pavement LCCA model developed for the CPS reviews the characteristics of the candidate paving locations including the historical rehabilitation frequency to develop potential improvement strategies (full replacement, major rehabilitation until replacement, and minor rehabilitation until replacement, for either concrete or asphalt, as applicable). Each strategy consists of a set of corrective actions that contribute to keeping the pavement serviceable over the analysis period. The following assumptions are included in the pavement LCCA model:

- The pavement LCCA only addresses the condition of the pavement and does not address other issues or costs
- The historical pavement rehabilitation frequencies at each location are used to estimate future rehabilitation frequencies
- Different pavement replacement and rehabilitation strategies have different costs and expected service life
- The net present value of future costs is discounted at 3% and all dollar amounts are in 2022 dollars

- If the LCCA evaluation recommends rehabilitation or repair, the solution is not considered strategic and the rehabilitation will be addressed by normal programming processes
- Because this LCCA is conducted at a planning level, and due to the variabilities in costs and improvement strategies, the LCCA net present value results that are within 15% should be considered equally; in such a case, the solution should be carried forward as a strategic replacement project – more detailed scoping will confirm if replacement or rehabilitation is needed

Based on the candidate solutions presented in **Table 20**, LCCA was not conducted for pavement on the US 160 Corridor, as noted in **Table 22.** Additional information regarding the pavement LCCA is included in **Appendix E.**

Table 21: Bridge Life-Cycle Cost Analysis Results

Candidate Solution	Present Value at 3% Discount Rate ($)			Ratio of Present Value Compared to Lowest Present Value			Other Needs	Results
	Replace	Rehab	Repair	Replace	Rehab	Repair		
No LCCA conducted for any bridges on the US 160 Corridor.								

Table 22: Pavement Life-Cycle Cost Analysis Results

Candidate Solution	Present Value at 3% Discount Rate ($)				Ratio of Present Value Compared to Lowest Present Value				Other Needs	Results
	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehabilitation	Asphalt Light Rehabilitation	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehabilitation	Asphalt Light Rehabilitation		
No LCCA conducted for pavement on the US 160 Corridor.										

5.2. Performance Effectiveness Evaluation

The results of the Performance Effectiveness Evaluation are combined with the results of a Performance Area Risk Analysis to determine a PES as defined in Section 5.0. The objectives of the Performance Effectiveness Evaluation include:

- Measure the benefit to the performance system versus the cost of the solution
- Include risk factors to help differentiate between similar solutions
- Apply to each performance area that is affected by the candidate solution
- Account for emphasis areas identified for the corridor

The Performance Effectiveness Evaluation includes the following steps:

- Estimate the post-solution performance for each of the five performance areas (Pavement, Bridge, Mobility, Safety, and Freight)
- Use the post-solution performance scores to calculate a post-solution level of need for each of the five performance areas
- Compare the pre-solution level of need to the post-solution level of need to determine the reduction in level of need (potential solution benefit) for each of the five performance areas
- Calculate performance area risk weighting factors for each of the five performance areas
- Use the reduction in level of need (benefit) and risk weighting factors to calculate the PES

Post-Solution Performance Estimation

For each performance area, a slightly different approach is used to estimate the post-solution performance. This process is based on the following assumptions:

- Pavement:
  - The IRI rating would decrease (to 30 for replacement or 45 for rehabilitation)
  - The Cracking rating would decrease (to 0 for replacement or rehabilitation)
  - The Rutting rating would decrease (to 0 for replacement or rehabilitation)
- Bridge:
  - The structural ratings would increase (+1 for repair, +2 for rehabilitation, or increase to 8 for replacement)
  - The Sufficiency Rating would increase (+10 for repair, +20 for rehabilitation, or increase to 98 for replacement)
- Mobility:
  - Additional lanes would increase the capacity and therefore affect the Mobility Index and associated secondary measures
  - Other improvements (e.g., ramp metering, parallel ramps, variable speed limits) would also increase the capacity (to a lesser extent than additional lanes) and therefore would affect the Mobility Index and associated secondary measures
  - Changes in the Mobility Index (due to increased capacity) and Safety Index (due to crash reductions) would have a direct effect on the LOTTR secondary measure
  - Changes in the Safety Index (due to crash reductions) would have a direct effect on the Closure Extent secondary measure
- Safety:
  - Crash modification factors were developed that would be applied to estimate the reduction in crashes (for additional information see **Appendix F**
- Freight:
  - Changes in the Mobility Index (due to increased capacity) and Safety Index (due to crash reductions) would have a direct effect on the Freight Index and the TTTR secondary measure
  - Changes in the Safety Index (due to crash reductions) would have a direct effect on the Closure Duration secondary measure

Performance Area Risk Analysis

The Performance Area Risk Analysis is intended to develop a numeric risk weighting factor for each of the five performance areas (Pavement, Bridge, Mobility, Safety, and Freight). This risk analysis addresses other considerations for each performance area that are not directly included in the performance system. A risk weighting factor is calculated for each candidate solution based on the specific characteristics at the solution location. For example, the Pavement Risk Factor is based on factors such as the elevation, daily traffic volumes, and amount of truck traffic. Additional information regarding the Performance Area Risk Factors is included in **Appendix G**.

Following the calculation of the reduction in level of need (benefit) and the Performance Area Risk Factors, these values are used to calculate the PES. In addition, the reduction in level of Need in each emphasis area is also included in the PES.

Net Present Value Factor

The benefit (reduction in need) is measured as a one-time benefit. However, different types of solutions will have varying service lives during which the benefits will be obtained. For example, a preservation solution would likely have a shorter stream of benefits over time when compared to a modernization or expansion solution. To address the varying lengths of benefit streams, each solution is classified as a 10-year, 20-year, 30-year, or 75-year benefit stream, or the net present value (NPV) factor (F_{NPV}). A 3% discount rate is used to calculate F_{NPV} for each classification of solution. The service lives and respective factors are described below:

- A 10-year service life is generally reflective of preservation solutions such as pavement and bridge preservation; these solutions would likely have a 10-year stream of benefits; for these solutions, a F_{NPV} of 8.8 is used in the PES calculation
- A 20-year service life is generally reflective of modernization solutions that do not include new infrastructure; these solutions would likely have a 20-year stream of benefits; for these solutions, a F_{NPV} of 15.3 is used in the PES calculation
- A 30-year service life is generally reflective of expansion solutions or modernization solutions that include new infrastructure; these solutions would likely have a 30-year stream of benefits; for these solutions, a F_{NPV} of 20.2 is used in the PES calculation

- A 75-year service life is used for bridge replacement solutions; these solutions would likely have a 75-year stream of benefits; for these solutions, a F_{NPV} of 30.6 is used in the PES calculation

Vehicle-Miles Travelled Factor

Another factor in assessing benefits is the number of travelers who would benefit from the implementation of the candidate solution. This factor varies between candidate solutions depending on the length of the solution and the magnitude of daily traffic volumes. Multiplying the solution length by the daily traffic volume results in vehicle-miles travelled (VMT), which provides a measure of the amount of traffic exposure that would receive the benefit of the proposed solution. The VMT is converted to a VMT factor (known as F_{VMT}), which is on a scale between 0 and 5, using the equation below:

$$F_{VMT} = 5 - (5 \times e^{VMT \times -0.0000139})$$

Performance Effectiveness Score

The PES is calculated using the following equation:

PES = (Sum of all Risk Factored Benefit Scores + Sum of all Risk Factored Emphasis Area Scores) / Cost) x F_{VMT} x F_{NPV}

Where:

Risk Factored Benefit Score = Reduction in Segment-Level Need (benefit) x Performance Area Risk Weighting Factor (calculated for each performance area)

Risk Factored Emphasis Area Score = Reduction in Corridor-Level Need x Performance Area Risk Factors x Emphasis Area Factor (calculated for each emphasis area)

*Cost = estimated cost of candidate solution in millions of dollars (see **Appendix H**)*

F_{VMT} = Factor between 0 and 5 to account for VMT at location of candidate solution based on existing daily volume and length of solution

F_{NPV} = Factor (ranging from 8.8 to 30.6 as previously described) to address anticipated longevity of service life (and duration of benefits) for each candidate solution

The resulting PES values are shown in **Table 23**. Additional information regarding the calculation of the PES is contained in **Appendix I**.

For candidate solutions with multiple options to address Mobility, Safety, or Freight needs, the PES should be compared to help identify the best performing option. If one option clearly performs better than the other options (more than twice the PES value and a difference in magnitude of at least 20 points) the other options can be eliminated from further consideration. If multiple options have similar PES values, or there are other factors not accounted for in the performance system that could significantly influence the ultimate selection of an option (e.g., potential environmental concerns, potential adverse economic impacts), those options should all be advanced to the prioritization process. On the US 160 Corridor, no candidate solutions have options to address needs.

Table 23: Performance Effectiveness Scores

Candidate Solution #	Segment #	Option	Candidate Solution Name	Milepost Location	Estimated Cost* (in millions)	Risk Factored Benefit Score					Risk Factored Emphasis Area Scores			Total Factored Benefit Score	F_{VMT}	F_{NPV}	Performance Effectiveness Score
						Pavement	Bridge	Mobility	Safety	Freight	Pavement	Mobility	Safety				
CS160.1	160-1	-	Moenave Safety Improvements	312-319	$1.26	0.00	0.00	0.00	12.51	0.00	0.00	0.00	0.76	13.27	2.21	15.3	356.9
CS160.2	160-2	-	West Tuba City Widening	319-321.6	$23.41	1.51	0.00	7.30	7.01	4.98	0.09	0.02	0.00	20.94	1.97	20.2	35.6
CS160.3	160-2 & 160-3	-	East Tuba City Widening	322.4-325	$17.72	1.51	0.00	7.30	7.01	4.98	0.09	0.03	1.13	22.07	1.10	20.2	14.6
CS160.4	160-3	-	Tonalea Safety Improvement	330-337	$7.75	0.00	0.00	0.00	8.05	0.00	0.00	0.00	1.30	9.35	1.84	15.3	34.0
CS160.5	160-3	-	Tuba City – Tonalea: Eastbound Passing Lane	335-336.5	$9.73	0.00	0.00	0.08	0.00	1.06	0.00	0.00	0.00	1.16	0.24	20.2	0.6
CS160.6	160-3	-	Tonalea – Tuba City: Westbound Passing Lane	340-343	$6.49	0.00	0.00	0.20	1.97	1.01	0.00	0.00	0.32	3.52	0.16	20.2	1.8
CS160.7	160-5	-	Shonto Safety Improvement	362-374	$1.86	0.00	0.00	0.00	8.12	0.00	0.00	0.00	0.59	8.71	2.91	15.3	208.1
CS160.8	160-6	-	Tsegi Canyon Safety Improvement	374-385	$1.71	0.00	0.00	0.00	12.57	0.00	0.00	0.00	1.56	14.13	2.48	15.3	315.2
CS160.9	160-6	-	Tsegi Canyon Passing Lanes	385-391	$45.42	0.00	0.00	0.00	8.53	0.00	0.00	0.00	0.00	8.53	2.07	20.2	7.9
CS160.10	160-8	-	East Kayenta Safety Improvement	395-413	$2.79	0.00	0.00	0.00	8.53	0.00	0.00	0.00	1.22	9.75	2.85	15.3	152.6
CS160.11	160-9	-	Dennehotso Passing Lanes	416-418	$12.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	20.2	0.0
CS160.12	160-9	-	Chinle Wash Passing Lanes	430-432	$12.98	0.00	0.00	0.03	0.00	1.20	0.00	0.00	0.31	1.53	0.41	20.2	1.0
CS160.13	160-9	-	West Mexican Water Safety Improvement	432-434	$0.40	0.00	0.00	0.00	3.60	0.00	0.00	0.00	0.59	4.19	0.41	15.3	65.9
CS160.14	160-10	-	East Mexican Water Safety Improvement	434-444	$1.95	0.00	0.00	0.00	18.41	0.00	0.00	0.00	1.66	20.07	1.94	15.3	305.8
CS160.15	1600-11	-	Red Mesa Passing Lanes	453-463	$38.93	0.00	0.00	0.00	2.65	0.00	0.00	0.00	0.02	2.67	1.28	20.2	1.8
CS160.16	160-12	-	Teec Nos Pos Passing Lanes	467-469	$12.98	0.00	0.00	0.07	0.00	1.05	0.00	0.00	0.00	1.11	0.36	20.2	0.6

*: See **Table 25** for total construction costs

5.3. Solution Risk Analysis

Following the calculation of the PES, an additional step is taken to develop the prioritized list of solutions. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of performance failure. **Figure 25** shows the risk matrix used to develop the risk weighting factors.

Figure 25: Risk Matrix

		Severity/Consequence				
		Insignificant	Minor	Significant	Major	Catastrophic
Frequency/Likelihood	Very Rare	Low	Low	Low	Moderate	Major
	Rare	Low	Low	Moderate	Major	Major
	Seldom	Low	Moderate	Moderate	Major	Severe
	Common	Moderate	Moderate	Major	Severe	Severe
	Frequent	Moderate	Major	Severe	Severe	Severe

Using the risk matrix in **Figure 25**, numeric values were assigned to each category of frequency and severity. The higher the risk, the higher the numeric factor assigned. The risk weight for each area of the matrix was calculated by multiplying the severity factor times the frequency factor. These numeric factors are shown in **Figure 26**.

Figure 26: Numeric Risk Matrix

			Severity/Consequence				
			Insignificant	Minor	Significant	Major	Catastrophic
		Weight	1.00	1.10	1.20	1.30	1.40
Frequency/Likelihood	Very Rare	1.00	1.00	1.10	1.20	1.30	1.40
	Rare	1.10	1.10	1.21	1.32	1.43	1.54
	Seldom	1.20	1.20	1.32	1.44	1.56	1.68
	Common	1.30	1.30	1.43	1.56	1.69	1.82
	Frequent	1.40	1.40	1.54	1.68	1.82	1.96

Using the values in **Figure 26**, risk weighting factors were calculated for each of the four risk categories (low, moderate, major, and severe). These values are simply the average of the values in **Figure 26** that fall within each category. The resulting average risk weighting factors are:

Low	Moderate	Major	Severe
1.14	1.36	1.51	1.78

The risk weighting factors listed above are assigned to the five performance areas as follows:

- Safety = 1.78
  - The Safety performance area quantifies the likelihood of fatal or incapacitating injury crashes; therefore, it is assigned the Severe (1.78) risk weighting factor
- Bridge = 1.51
  - The Bridge performance area focuses on the structural adequacy of bridges; a bridge failure may result in crashes or traffic being detoured for long periods of time resulting in significant travel time increases; therefore, it is assigned the Major (1.51) risk weighting factor
- Mobility and Freight = 1.36
  - The Mobility and Freight performance areas focus on capacity and congestion; failure in either of these performance areas would result in increased travel times but would not have significant effect on safety (crashes) that would not already be addressed in the Safety performance area; therefore, they are assigned the Moderate (1.36) risk weighing factor
- Pavement = 1.14
  - The Pavement performance area focuses on the ride quality of the pavement; failure in this performance area would likely be a spot location that would not dramatically affect drivers beyond what is already captured in the Safety performance area; therefore, it is assigned the Low (1.14) risk weighting factor

The benefit in each performance area is calculated for each candidate solution as part of the Performance Effectiveness Evaluation. Using this information on benefits and the risk factors listed above, a weighted (based on benefit) solution-level numeric risk factor is calculated for each candidate solution. For example, a solution that has 50% of its benefit in Safety and 50% of its benefit in Mobility has a weighted risk factor of 1.57 (0.50 x 1.36 + 0.50 x 1.78 = 1.57).

5.4. Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score as follows:

Prioritization Score = PES x Weighted Risk Factor x Segment Average Need Score

Where:

*PES = Performance Effectiveness Score as shown in **Table 23***

Weighted Risk Factor = Weighted factor to address risk of not implementing a solution based on the likelihood and severity of the performance failure

*Segment Average Need Score = Segment level need score as shown in **Table 18***

Table 23 shows the prioritization scores for the candidate solutions subjected to the solution evaluation and prioritization process. Solutions that address multiple performance areas tend to score higher in this process. A prioritized list of candidate solutions is provided in the subsequent section. See **Appendix J** for additional information on the prioritization process.

Table 24: Prioritization Scores

Candidate Solution #	Segment #	Option	Candidate Solution Name	Milepost Location	Estimated Cost (in millions)	Performance Effectiveness Score	Weighted Risk Factor	Segment Average Need Score	Prioritization Score	Percentage by which Solution Reduces Performance Area Segment Needs				
										Pavement	Bridge	Mobility	Safety	Freight
CS160.1	160-1	-	Moenave Safety Improvements	312-319	$1.26	356.9	1.78	1.38	877	-	0%	1%	41%	16%
CS160.2	160-2	-	West Tuba City Widening	319-321.6	$23.41	35.6	1.48	0.92	49	50%	-	82%	-	73%
CS160.3	160-2 & 160-3	-	East Tuba City Widening	322.4-325	$17.72	14.6	1.50	1.57	36	19%	-	22%	19%	41%
CS160.4	160-3	-	Tonalea Safety Improvement	330-337	$7.75	34.0	1.78	1.77	107	0%	-	1%	23%	27%
CS160.5	160-3	-	Tuba City – Tonalea: Eastbound Passing Lane	335-336.5	$9.73	0.6	1.36	1.77	1	0%	-	2%	0%	14%
CS160.6	160-3	-	Tonalea – Tuba City: Westbound Passing Lane	340-343	$6.49	1.8	1.64	1.77	5	0%	-	4%	6%	13%
CS160.7	160-5	-	Shonto Safety Improvement	362-374	$1.86	208.1	1.78	1.31	485	0%	-	1%	48%	19%
CS160.8	160-6	-	Tsegi Canyon Safety Improvement	374-385	$1.71	315.2	1.78	1.38	774	0%	-	1%	33%	2%
CS160.9	160-6	-	Tsegi Canyon Passing Lanes	385-391	$45.42	7.9	1.78	1.38	19	0%	-	11%	0%	2%
CS160.10	160-8	-	East Kayenta Safety Improvement	395-413	$2.79	152.6	1.78	1.31	356	0%	0%	1%	32%	36%
CS160.11	160-9	-	Dennehotso Passing Lanes	416-418	$12.98	0.0	0.00	2.08	0	0%	-	0%	0%	0%
CS160.12	160-9	-	Chinle Wash Passing Lanes	430-432	$12.98	1.0	1.45	2.08	3	0%	-	1%	0%	6%
CS160.13	160-9	-	West Mexican Water Safety Improvement	432-434	$0.40	65.9	1.78	2.08	244	0%	-	1%	15%	1%
CS160.14	160-10	-	East Mexican Water Safety Improvement	434-444	$1.95	305.8	1.78	2.08	1132	0%	0%	1%	85%	42%
CS160.15	1600-11	-	Red Mesa Passing Lanes	453-463	$38.93	1.8	1.78	1.15	4	0%	-	0%	32%	0%
CS160.16	160-12	-	Teec Nos Pos Passing Lanes	467-469	$12.98	0.6	1.36	0.69	1	-	-	1%	-	5%

6 SUMMARY OF CORRIDOR RECOMMENDATIONS

6.1 Prioritized Candidate Solution Recommendations

Table 25 and **Figure 27** show the prioritized candidate solutions recommended for the US 160 Corridor in ranked order of priority. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Implementation of these solutions is anticipated to improve performance of the US 160 Corridor. The following observations were noted about the prioritized solutions:

- Most of the anticipated improvements in performance are in the Safety and Freight performance areas
- The highest-ranking solutions tended to have overlapping benefits in the Safety and Freight performance areas
- The highest-priority solution addresses needs in the Mexican Water area (MP 434-444)

6.2 Other Corridor Recommendations

As part of the investigation of strategic investment areas and candidate solutions, other corridor recommendations can also be identified. These recommendations could include modifications to the existing Statewide Construction Program, areas for further study, or other corridor-specific recommendations that are not related to construction or policy. The list below identifies other corridor recommendations for the US 160 Corridor:

- When recommending future projects along the US 160 Corridor, review historical ratings and levels of investment. According to data used for this study, the following pavement location has exhibited high historical investment issues:
  - Pavement MP 374-391
- As the area continues to grow, continue to provide support for a standard Diamond Interchange with a structure over US 89 at the US 89/US 160 intersection as recommended in Final Design Concept Report - US 89 Antelope Hills to Jct. US 160 MP 442 to MP 484.

6.3 Policy and Initiative Recommendations

In addition to location-specific needs, general corridor and system-wide needs have also been identified through the CPS process. While these needs are more overarching and cannot be individually evaluated through this process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on the US 160 Corridor, but across the entire state highway system where the conditions are applicable. The following list, which is in no particular order of priority, was derived from the initial four CPS rounds:

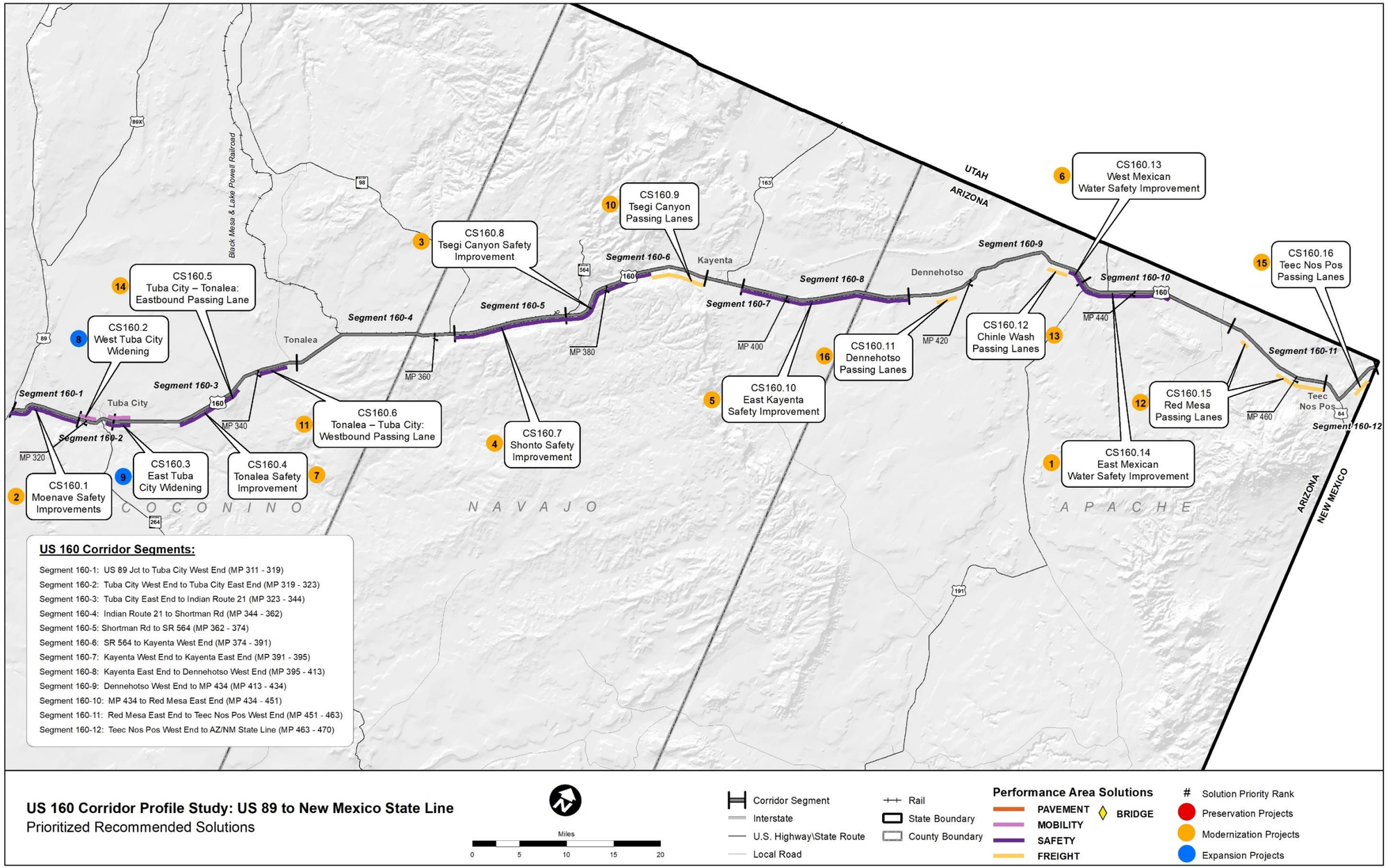
- Install Intelligent Transportation System (ITS) conduit with all new infrastructure projects
- Prepare strategic plans for Closed Circuit Television (CCTV) camera and Road Weather Information System (RWIS) locations statewide
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic message signs (DMS), and call box locations to expand ITS applications across the state
- Consider solar power for lighting and ITS where applicable
- Investigate ice formation prediction technology where applicable
- Conduct highway safety manual evaluation for all future programmed projects
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects
- Develop standardized bridge maintenance procedures so districts can do routine maintenance work
- Review historical ratings and level of previous investment during scoping of pavement and bridge projects. In pavement locations that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project
- Expand programmed and future pavement projects as necessary to include shoulders
- Expand median cable barrier guidelines to account for safety performance
- Install CCTV cameras with all DMS
- In locations with limited communications, use CCTV cameras to provide still images rather than streaming video
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data
- When reconstruction or rehabilitation activities will affect existing bridge vertical clearance, the dimension of the new bridge vertical clearance should be a minimum of 16.25 feet where feasible
- All new or reconstructed roadway/shoulder edges adjacent to an unpaved surface should be constructed with a Safety Edge
- Collision data on tribal lands may be incomplete or inconsistent; additional coordination for data on tribal lands is required to ensure adequate reflection of safety issues
- Expand data collection devices statewide to measure freight delay
- Evaluate and accommodate potential changes in freight and goods movement trends that may result from improvements and expansions to the state roadway network
- At traffic interchanges with existing communication connectivity to the ADOT TOC, consideration should be given to adding thermal detection cameras for vehicle detection with the capability for wrong-way vehicle detection
- Improved vehicle detection systems, as recommended by ADOT Systems Technology group, should be deployed at traffic interchanges for improved traffic control

Table 25: Prioritized Recommended Solutions

Rank	Candidate Solution #	Option	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
1	CS160.14	-	East Mexican Water Safety Improvement (MP 434-444)	Install high visibility striping and delineators and rumble strips in both directions Install curve warning signs and speed feedback signs in both directions (MP 434 and MP 436) Install chevrons on curves (MP 434.5 to MP 435.5)	$1.95	M	1132
2	CS160.1	-	Moenave Safety Improvements (MP 312-319)	Install high visibility striping and delineators, reflective pavement markers, and rumble strips in both directions Install chevrons on curve (MP 312.5 to 314)	$1.26	M	877
3	CS160.8	-	Tsegi Canyon Safety Improvement (MP 374-385)	Install high visibility striping and delineators and rumble strips in both directions	$1.71	M	774
4	CS160.7	-	Shonto Safety Improvement (MP 362-374)	Install high visibility striping and delineators and rumble strips in both directions	$1.86	M	485
5	CS160.10	-	East Kayenta Safety Improvement (MP 395-413)	Install high visibility striping and delineators and rumble strips in both directions	$2.79	M	356
6	CS160.13	-	West Mexican Water Safety Improvement (MP 432-434)	Install curve warning signs and speed feedback signs in both directions (MP 432 and MP 434) Install chevrons on curves (MP 432.5 to MP 433.5)	$0.40	M	244
7	CS160.4	-	Tonalea Safety Improvement (MP 330-337)	Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) Install curve warning signs in both directions Install chevrons on curve (MP 336 to MP 336.5)	$7.75	M	107
8	CS160.2	-	West Tuba City Widening (MP 319-321.6)	Convert 2-Lane undivided highway to a 5-Lane highway	$23.41	E	49
9	CS160.3	-	East Tuba City Widening (MP 322.4-325)	Convert 2-Lane undivided highway to a 5-Lane highway	$17.72	E	36
10	CS160.9	-	Tsegi Canyon Passing Lanes (MP 385-391)	Construct westbound passing lane from MP 389 – MP 390 Construct eastbound passing lane from MP 385 – MP 391	$45.42	M	19
11	CS160.6	-	Tonalea – Tuba City: Westbound Passing Lane (MP 340-343)	Construct westbound passing lane from MP 340 – MP 341	$6.49	M	5

Rank	Candidate Solution #	Option	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
12	CS160.15	-	Red Mesa Passing Lanes (MP 453-463)	Construct eastbound passing lane from MP 453 – MP 454 Construct westbound passing lane from MP 458 – MP 463	$38.93	M	4
13	CS160.12	-	Chinle Wash Passing Lanes (MP 430-432)	Construct eastbound passing lane from MP 430 – MP 431 Construct westbound passing lane from MP 431 – MP 432	$12.98	M	3
14	CS160.5	-	Tuba City – Tonalea: Eastbound Passing Lane (MP 335-336.5)	Construct eastbound passing lane from MP 335 – MP 336.5	$9.73	M	1
15	CS160.16	-	Teec Nos Pos Passing Lanes (MP 467-469)	Construct eastbound passing lane from MP 467 – MP 468 Construct westbound passing lane from MP 468 – MP 469	$12.98	M	1
16	CS160.11	-	Dennehotso Passing Lanes (MP 416-418)	Construct eastbound passing lane from MP 416 – MP 417 Construct westbound passing lane from MP 417 – MP 418	$12.98	M	0

Figure 27: Prioritized Recommended Solutions



6.4 Next Steps

The candidate solutions recommended in this study are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the US 160 Corridor will be considered along with other candidate projects in the ADOT statewide programming process.

It is important to note that the candidate solutions are intended to represent strategic solutions to address existing performance needs related to the Pavement, Bridge, Mobility, Safety, and Freight performance areas. Therefore, the strategic solutions are not intended to preclude recommendations related to the ultimate vision for the corridor that may have been defined in the context of prior planning studies and/or design concept reports. Recommendations from such studies are still relevant to addressing the ultimate corridor objectives.

These results will be incorporated into a summary document comparing all corridors that is expected to provide a performance-based review of statewide needs and candidate solutions.

Appendices

Appendix A: Corridor Performance Maps

This appendix contains maps of each primary and secondary measure associated with the five performance areas for the US 160 corridor. The following are the areas and maps included:

Pavement Performance Area:

- Pavement Index and Hot Spots
- Pavement Serviceability and Hot Spots (directional)
- Percentage of Pavement Area Failure

Bridge Performance Area:

- Bridge Index and Hot Spots
- Bridge Sufficiency
- Lowest Bridge Rating

Mobility Performance Area:

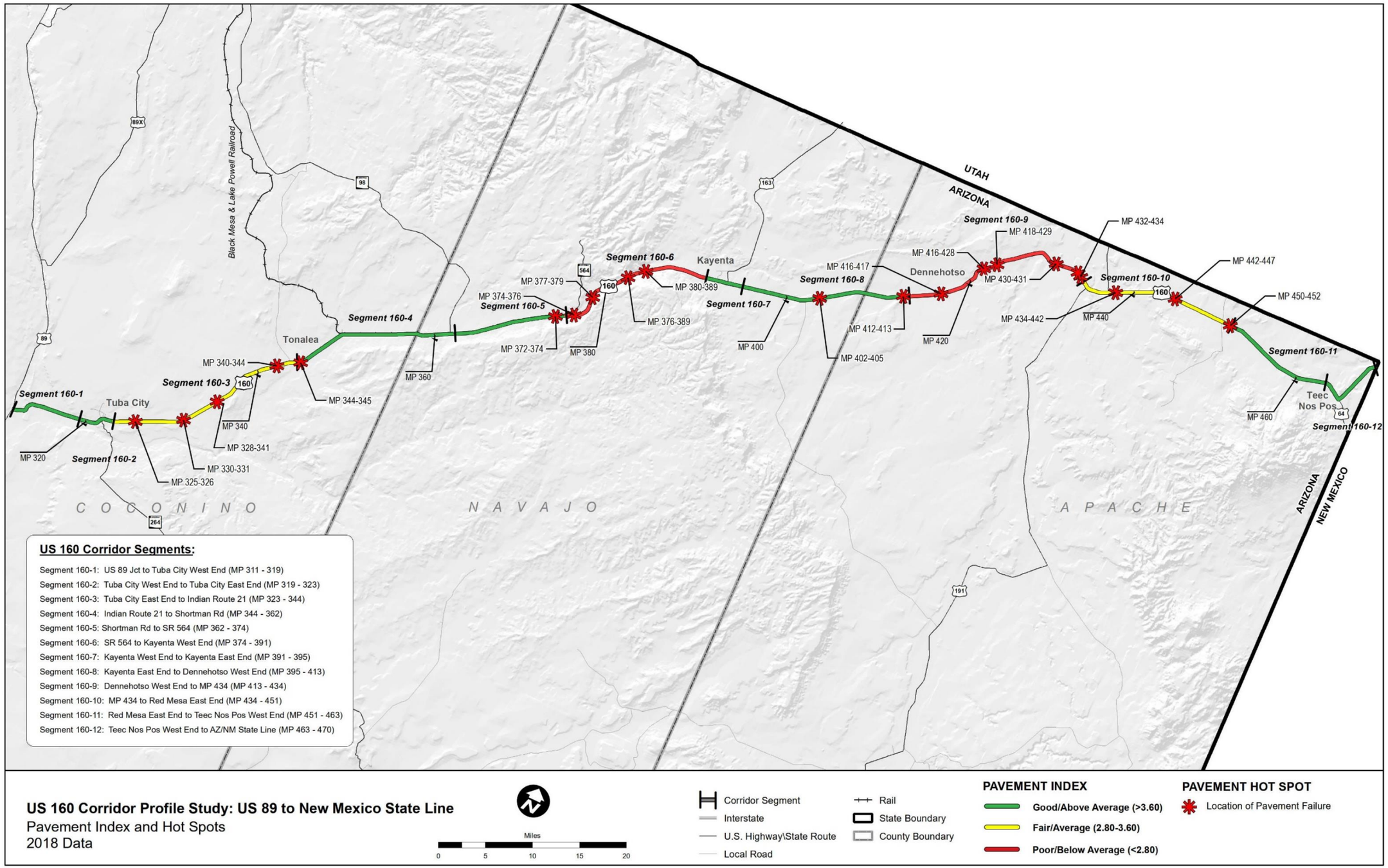
- Mobility Index
- Future Daily V/C Ratio
- Existing Peak Hour V/C Ratio (directional)
- Closure Frequency (directional)
- Level of Travel Time Reliability (directional)
- Multimodal Opportunities
- Percentage of Bicycle Accommodation

Safety Performance Area:

- Safety Index and Hot Spots
- Safety Index and Hot Spots (directional)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving Intersection Crashes Compared to the Statewide Average for Similar Segments (insufficient data – not included)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving Lane Departures Compared to the Statewide Average for Similar Segments
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving Pedestrians Compared to the Statewide Average for Similar Segments (insufficient data – not included)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving Trucks Compared to the Statewide Average for Similar Segments (insufficient data – not included)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving Bicycles Compared to the Statewide Average for Similar Segments (insufficient data – not included)

Freight Performance Area:

- Freight Index and Hot Spots
- Truck Travel Time Reliability (directional)
- Closure Duration (directional)
- Bridge Vertical Clearance


Black Mesa & Lake Powell Railroad
UTAH
ARIZONA
NEW MEXICO
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
Tuba City
Tonalea
Kayenta
Dennehotso
Teec Nos Pos
MP 320
MP 325-326
MP 328-341
MP 330-331
MP 340
MP 340-344
MP 344-345
MP 360
MP 372-374
MP 374-376
MP 376-389
MP 377-379
MP 380
MP 380-389
MP 400
MP 402-405
MP 412-413
MP 416-417
MP 416-428
MP 418-429
MP 420
MP 430-431
MP 432-434
MP 434-442
MP 440
MP 442-447
MP 450-452
MP 460
COCONINO
NAVAJO
APACHE
89
89X
98
160
163
264
564
64
191
US 160 Corridor Segments:
Segment 160-1: US 89 Jct to Tuba City West End (MP 311 - 319)
Segment 160-2: Tuba City West End to Tuba City East End (MP 319 - 323)
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Segment 160-5: Shortman Rd to SR 564 (MP 362 - 374)
Segment 160-6: SR 564 to Kayenta West End (MP 374 - 391)
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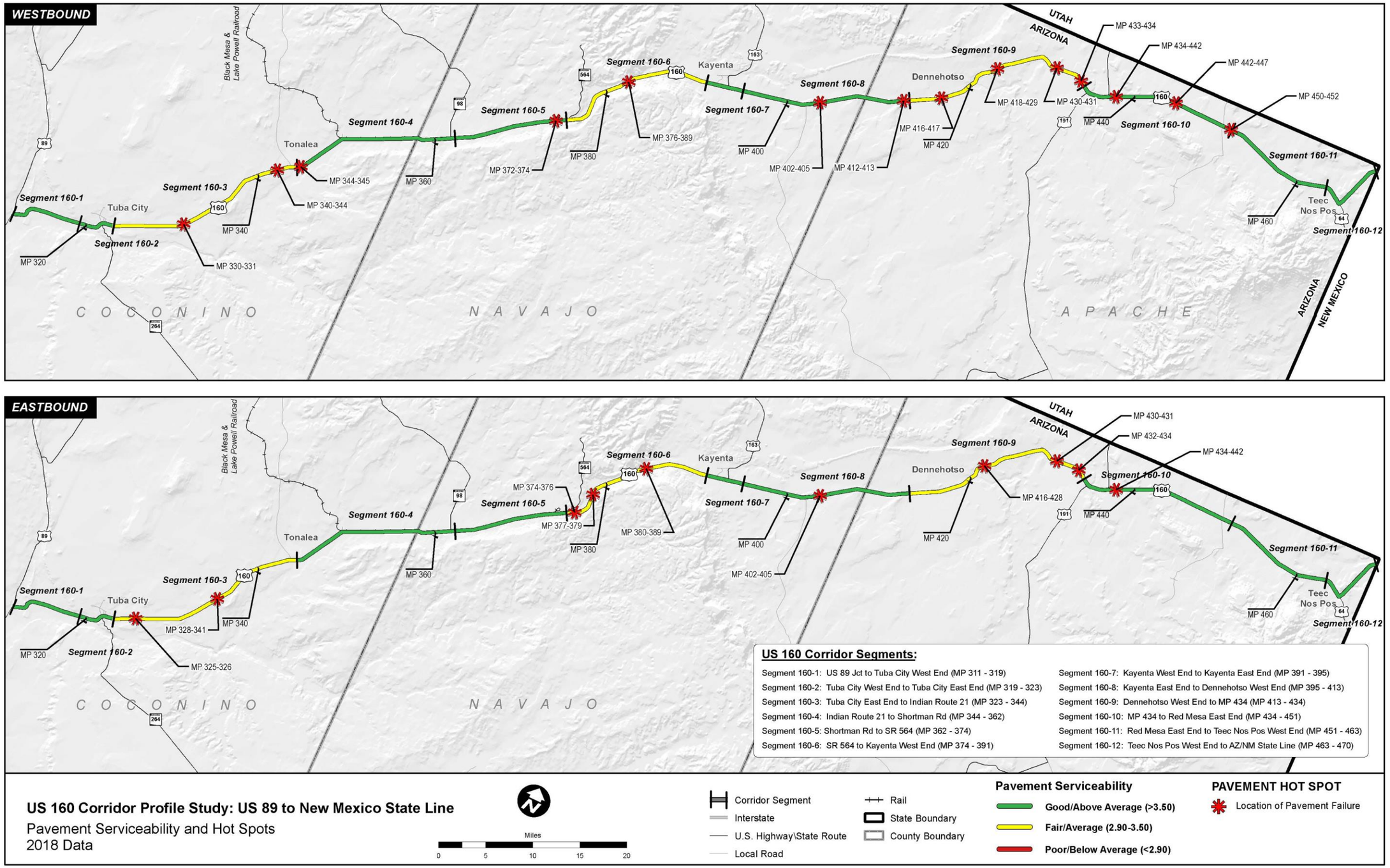
Segment 160-8: Kayenta East End to Dennehotso West End (MP 395 - 413)
Segment 160-9: Dennehotso West End to MP 434 (MP 413 - 434)
Segment 160-10: MP 434 to Red Mesa East End (MP 434 - 451)
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Pavement Index and Hot Spots
2018 Data
Miles
0
5
10
15
20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
PAVEMENT INDEX
Good/Above Average (>3.60)
Fair/Average (2.80-3.60)
Poor/Below Average (<2.80)
PAVEMENT HOT SPOT
Location of Pavement Failure


WESTBOUND
EASTBOUND
Black Mesa & Lake Powell Railroad
Tuba City
Tonalea
Kayenta
Dennehotso
Teec Nos Pos
UTAH
ARIZONA
NEW MEXICO
COCONINO
NAVAJO
APACHE
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
MP 320
MP 325-326
MP 328-341
MP 330-331
MP 340
MP 340-344
MP 344-345
MP 360
MP 372-374
MP 374-376
MP 376-389
MP 377-379
MP 380
MP 380-389
MP 400
MP 402-405
MP 412-413
MP 416-417
MP 416-428
MP 418-429
MP 420
MP 430-431
MP 432-434
MP 433-434
MP 434-442
MP 440
MP 442-447
MP 450-452
MP 460
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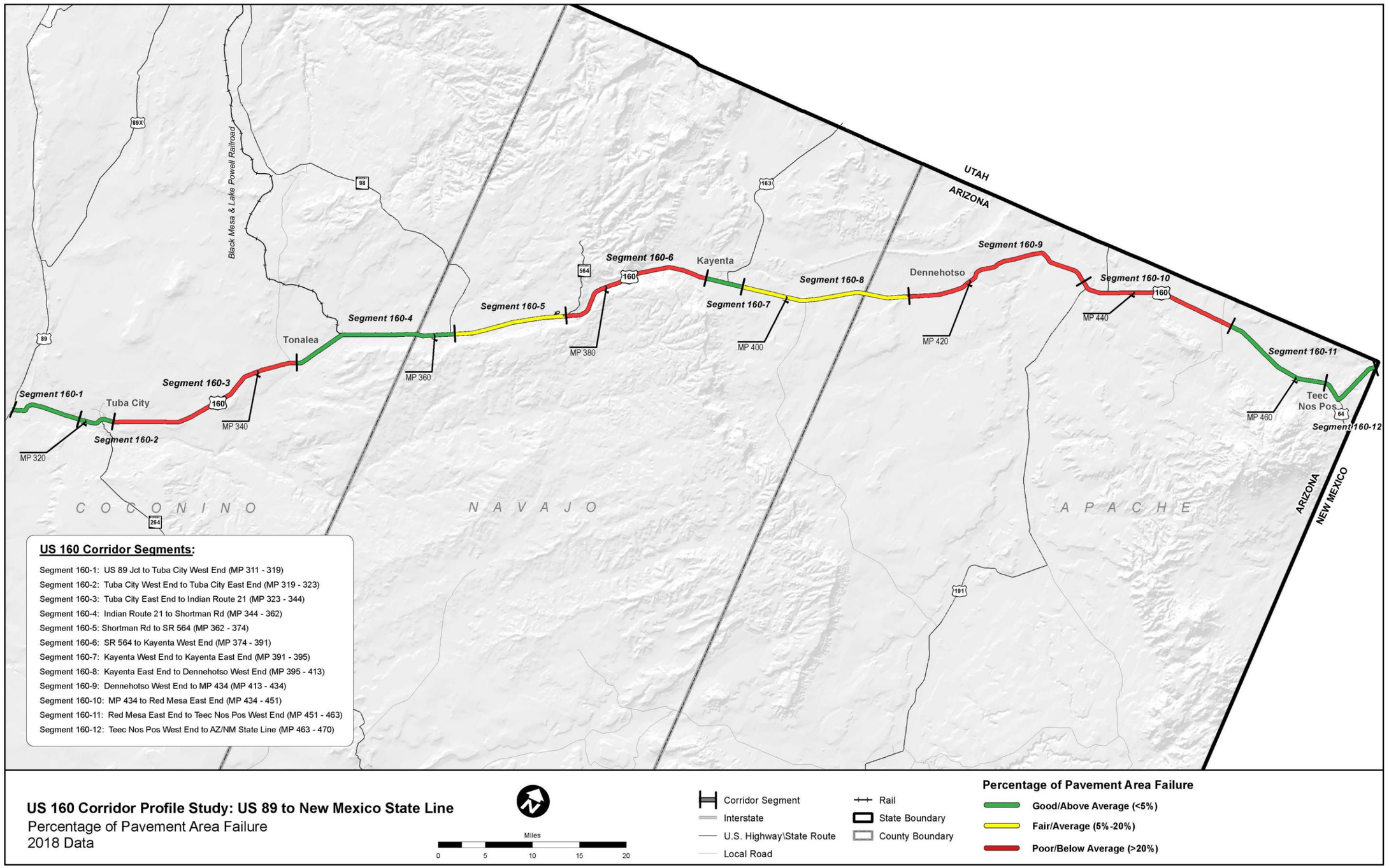
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Pavement Serviceability and Hot Spots
2018 Data
Miles
0 5 10 15 20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
Pavement Serviceability
Good/Above Average (>3.50)
Fair/Average (2.90-3.50)
Poor/Below Average (<2.90)
PAVEMENT HOT SPOT
Location of Pavement Failure



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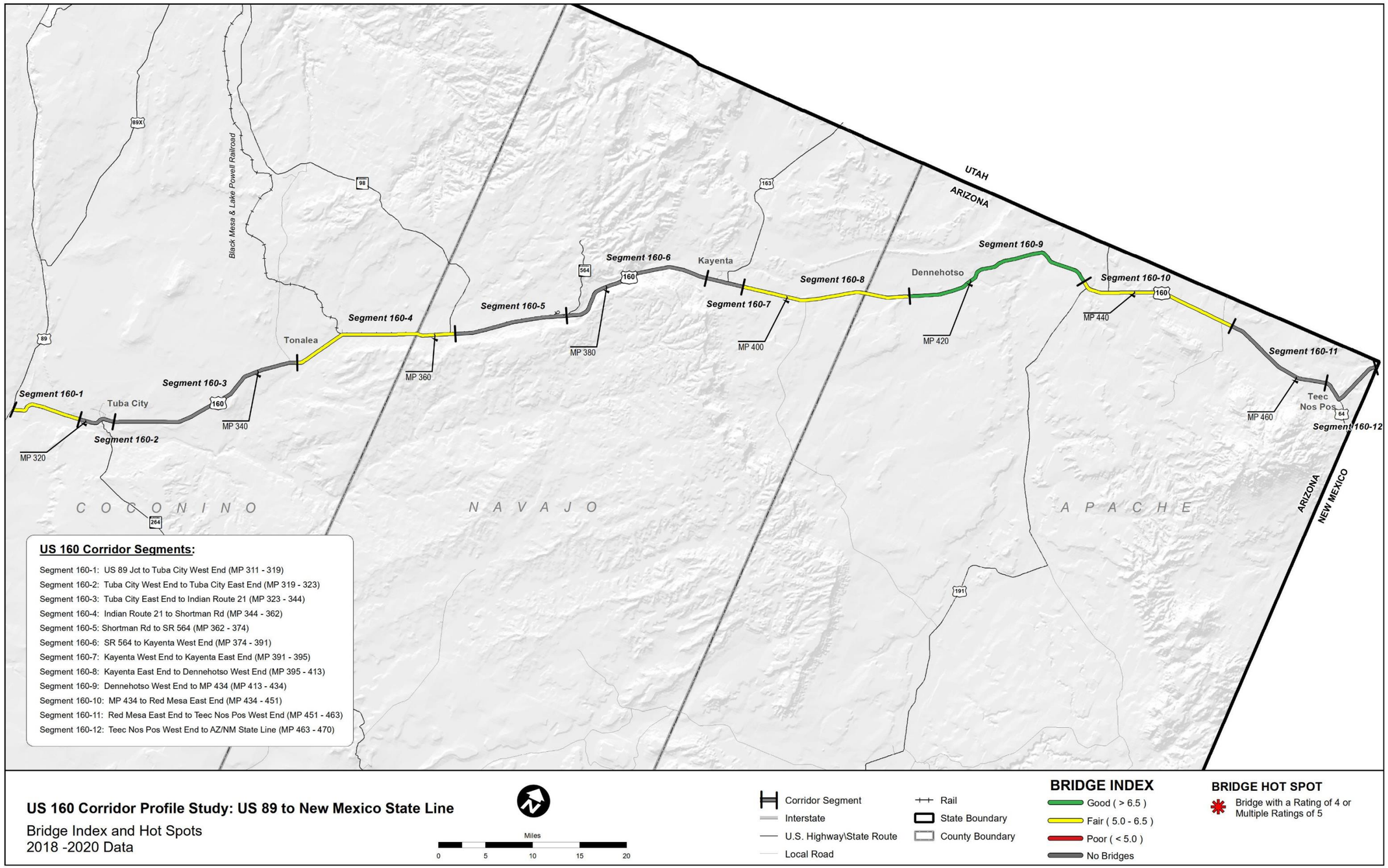
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line
Percentage of Pavement Area Failure
2018 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Percentage of Pavement Area Failure
Good/Above Average (<5%)
Fair/Average (5%-20%)
Poor/Below Average (>20%)



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Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line

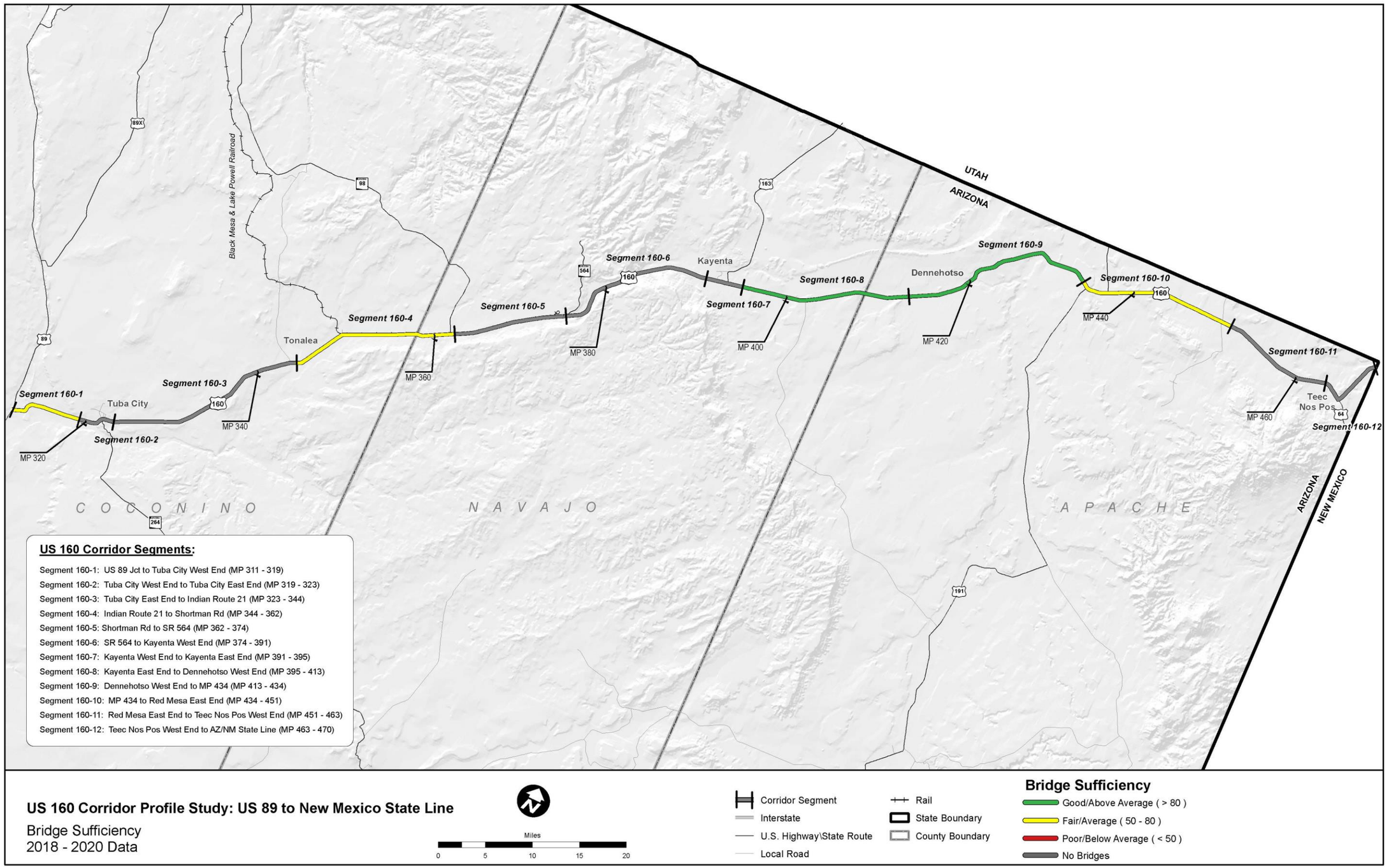
Bridge Index and Hot Spots
2018 -2020 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

BRIDGE INDEX
Good (> 6.5)
Fair (5.0 - 6.5)
Poor (< 5.0)
No Bridges

BRIDGE HOT SPOT
Bridge with a Rating of 4 or Multiple Ratings of 5


Black Mesa & Lake Powell Railroad
UTAH
ARIZONA
NEW MEXICO
ARIZONA
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
Tuba City
Tonalea
Kayenta
Dennehotso
Teec Nos Pos
MP 320
MP 340
MP 360
MP 380
MP 400
MP 420
MP 440
MP 460
COCONINO
NAVAJO
APACHE
US 160 Corridor Segments:
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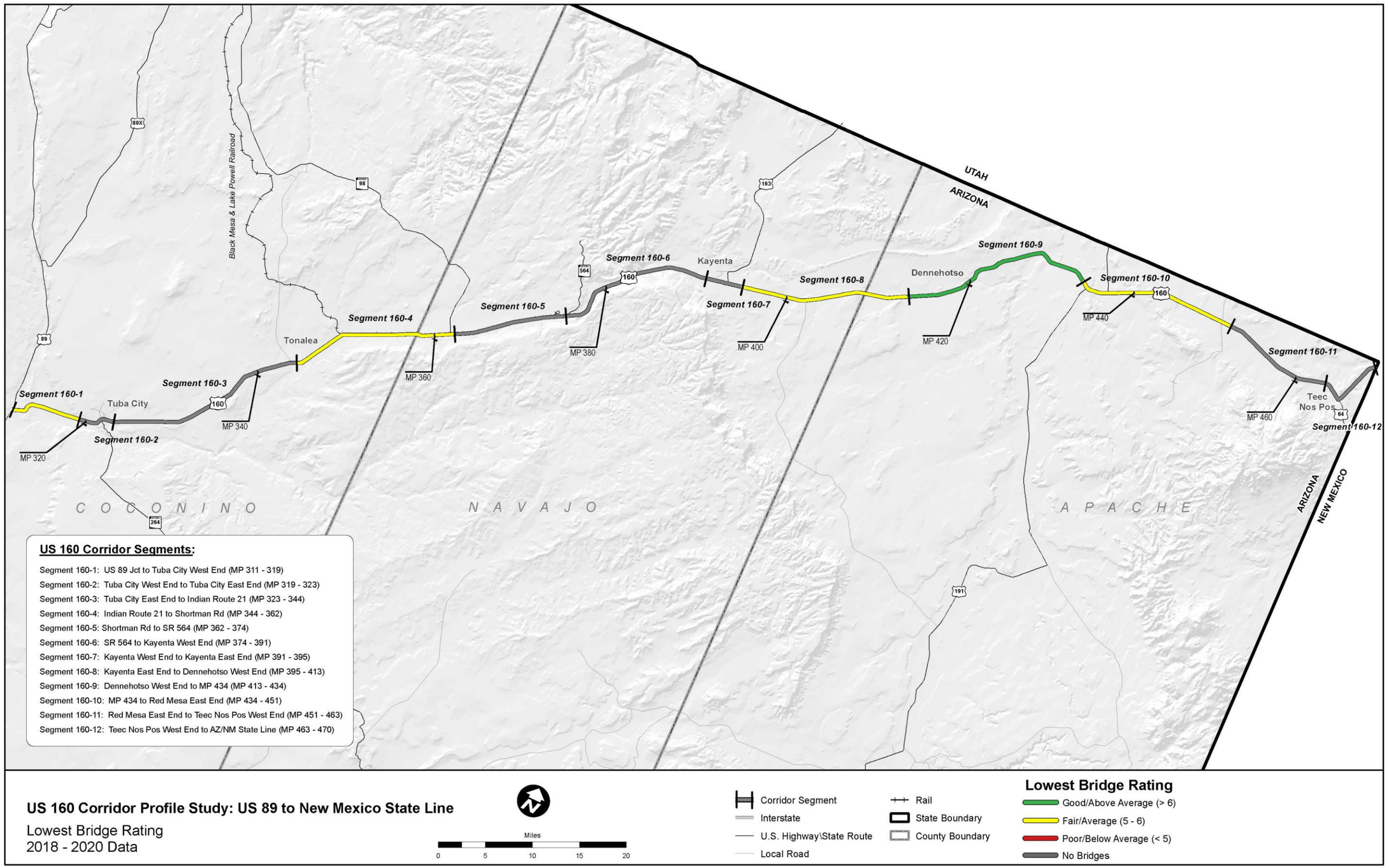
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Bridge Sufficiency
2018 - 2020 Data
Miles
0 5 10 15 20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
Bridge Sufficiency
Good/Above Average (> 80)
Fair/Average (50 - 80)
Poor/Below Average (< 50)
No Bridges



US 160 Corridor Segments:

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Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

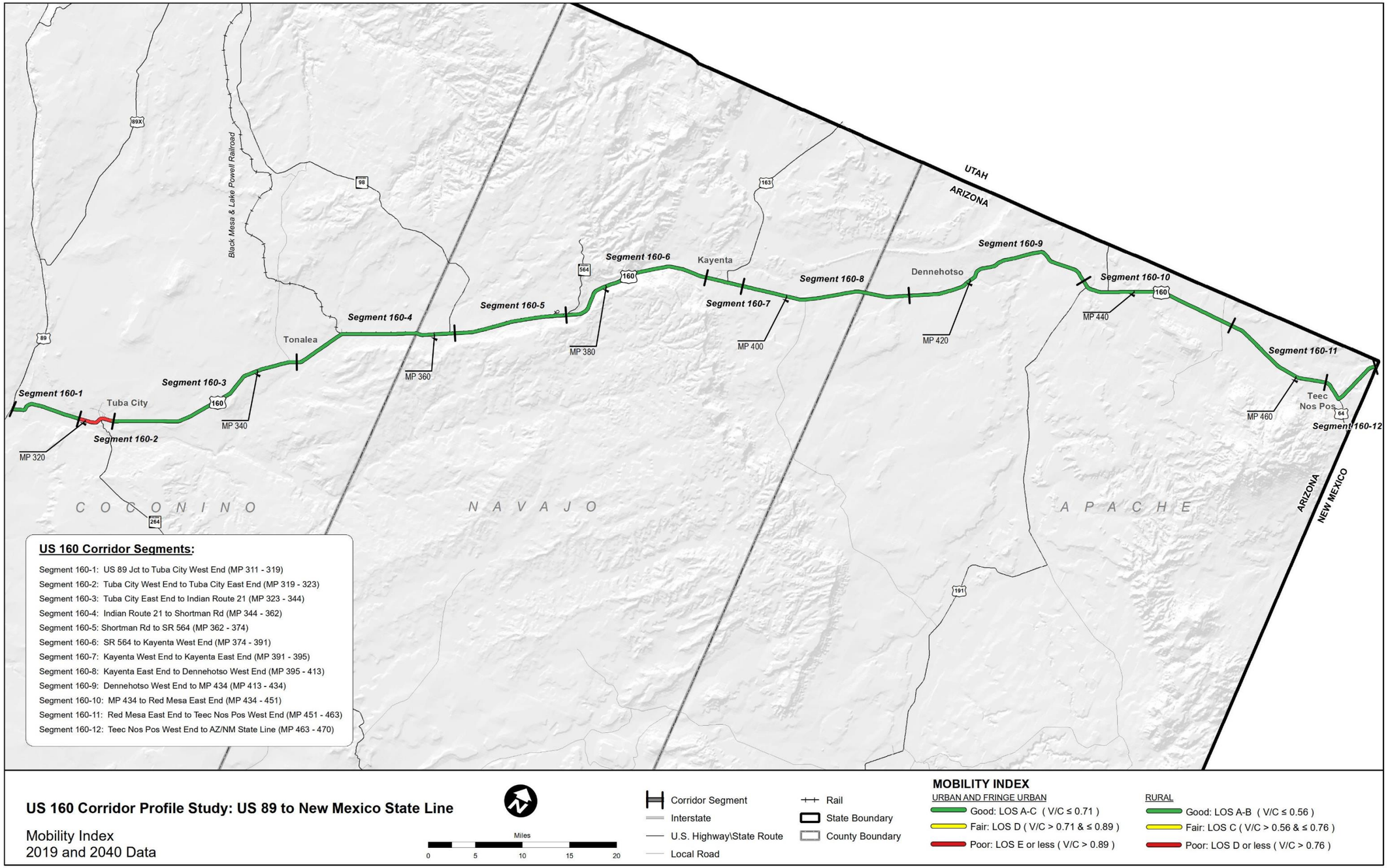
US 160 Corridor Profile Study: US 89 to New Mexico State Line

Lowest Bridge Rating
2018 - 2020 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Lowest Bridge Rating
Good/Above Average (> 6)
Fair/Average (5 - 6)
Poor/Below Average (< 5)
No Bridges


UTAH
ARIZONA
NEW MEXICO
ARIZONA
Black Mesa & Lake Powell Railroad
Tuba City
Tonalea
Kayenta
Dennehotso
Teec Nos Pos
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
MP 320
MP 340
MP 360
MP 380
MP 400
MP 420
MP 440
MP 460
COCONINO
NAVAJO
APACHE
US 160 Corridor Segments:
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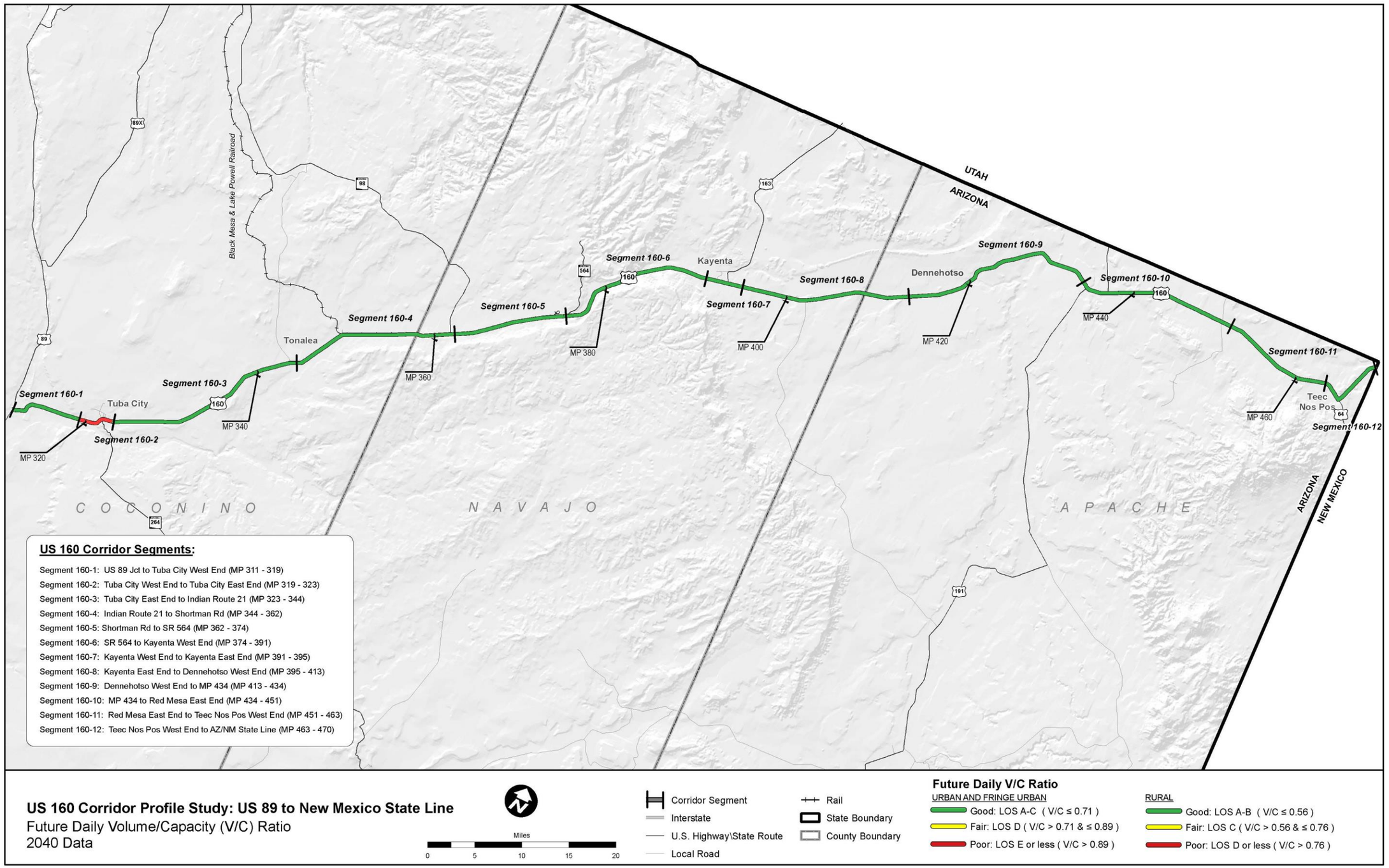
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Mobility Index
2019 and 2040 Data
Miles
0 5 10 15 20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
MOBILITY INDEX
URBAN AND FRINGE URBAN
Good: LOS A-C (V/C ≤ 0.71)
Fair: LOS D (V/C > 0.71 & ≤ 0.89)
Poor: LOS E or less (V/C > 0.89)
RURAL
Good: LOS A-B (V/C ≤ 0.56)
Fair: LOS C (V/C > 0.56 & ≤ 0.76)
Poor: LOS D or less (V/C > 0.76)



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Segment 160-10: MP 434 to Red Mesa East End (MP 434 - 451)
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line
Future Daily Volume/Capacity (V/C) Ratio
2040 Data

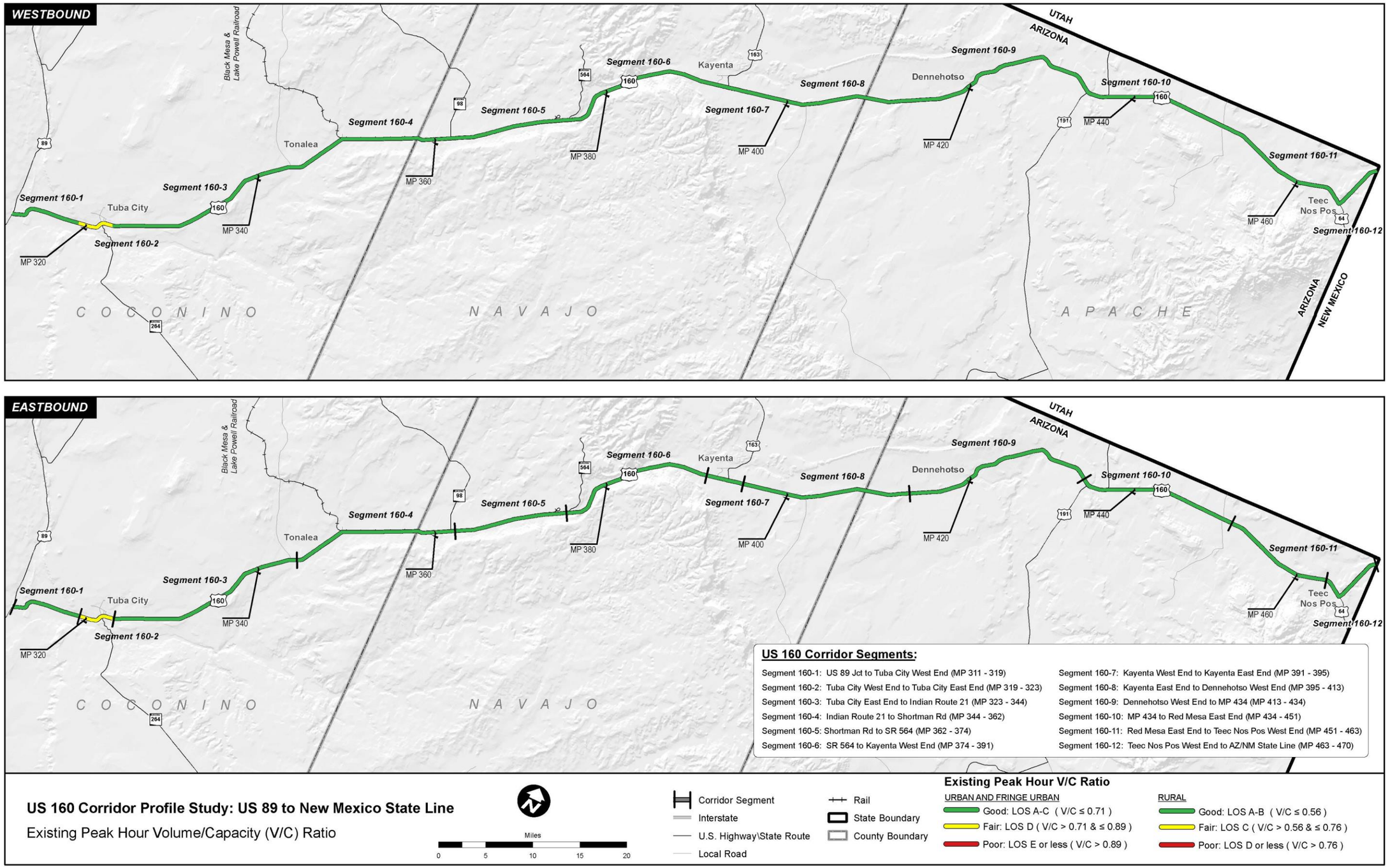
Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Future Daily V/C Ratio

URBAN AND FRINGE URBAN
Good: LOS A-C (V/C ≤ 0.71)
Fair: LOS D (V/C > 0.71 & ≤ 0.89)
Poor: LOS E or less (V/C > 0.89)

RURAL
Good: LOS A-B (V/C ≤ 0.56)
Fair: LOS C (V/C > 0.56 & ≤ 0.76)
Poor: LOS D or less (V/C > 0.76)



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Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line

Existing Peak Hour Volume/Capacity (V/C) Ratio

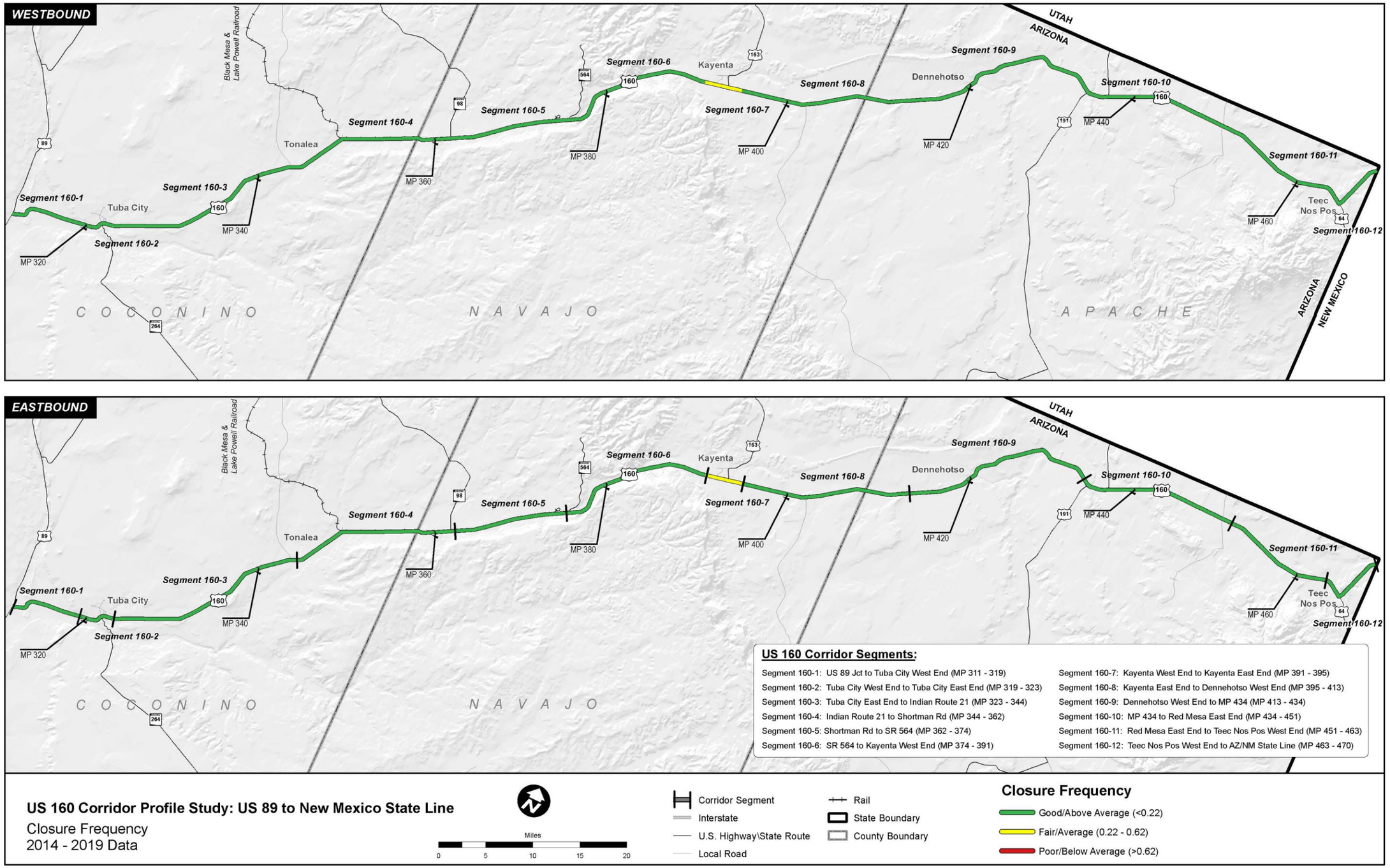
Miles: 0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Existing Peak Hour V/C Ratio

URBAN AND FRINGE URBAN
- Good: LOS A-C (V/C ≤ 0.71)
- Fair: LOS D (V/C > 0.71 & ≤ 0.89)
- Poor: LOS E or less (V/C > 0.89)

RURAL
- Good: LOS A-B (V/C ≤ 0.56)
- Fair: LOS C (V/C > 0.56 & ≤ 0.76)
- Poor: LOS D or less (V/C > 0.76)



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Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

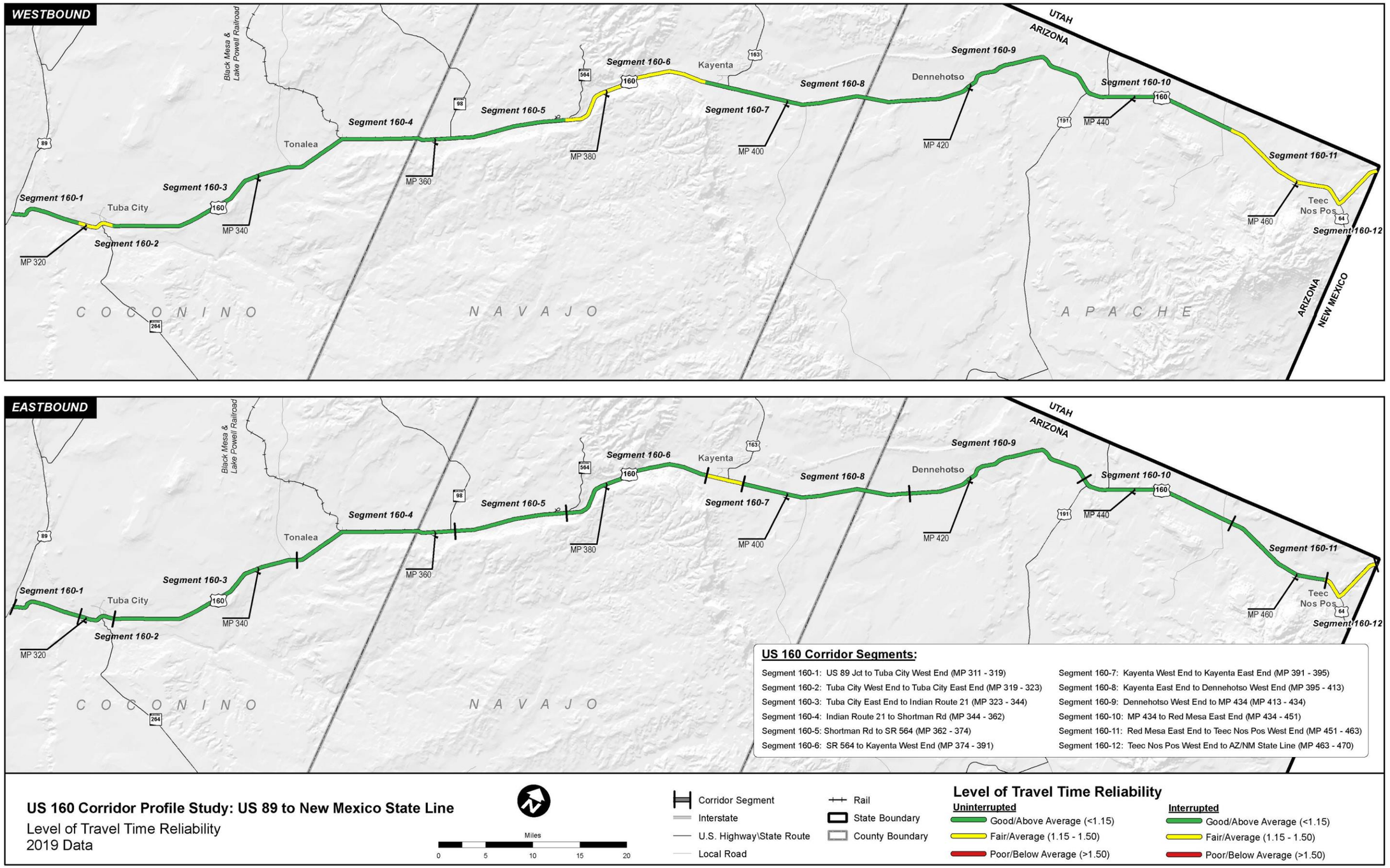
US 160 Corridor Profile Study: US 89 to New Mexico State Line

Closure Frequency
2014 - 2019 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Closure Frequency
Good/Above Average (<0.22)
Fair/Average (0.22 - 0.62)
Poor/Below Average (>0.62)



US 160 Corridor Segments:

Segment 160-1: US 89 Jct to Tuba City West End (MP 311 - 319)
Segment 160-2: Tuba City West End to Tuba City East End (MP 319 - 323)
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Segment 160-5: Shortman Rd to SR 564 (MP 362 - 374)
Segment 160-6: SR 564 to Kayenta West End (MP 374 - 391)
Segment 160-7: Kayenta West End to Kayenta East End (MP 391 - 395)
Segment 160-8: Kayenta East End to Dennehotso West End (MP 395 - 413)
Segment 160-9: Dennehotso West End to MP 434 (MP 413 - 434)
Segment 160-10: MP 434 to Red Mesa East End (MP 434 - 451)
Segment 160-11: Red Mesa East End to Teec Nos Pos West End (MP 451 - 463)
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line

Level of Travel Time Reliability
2019 Data

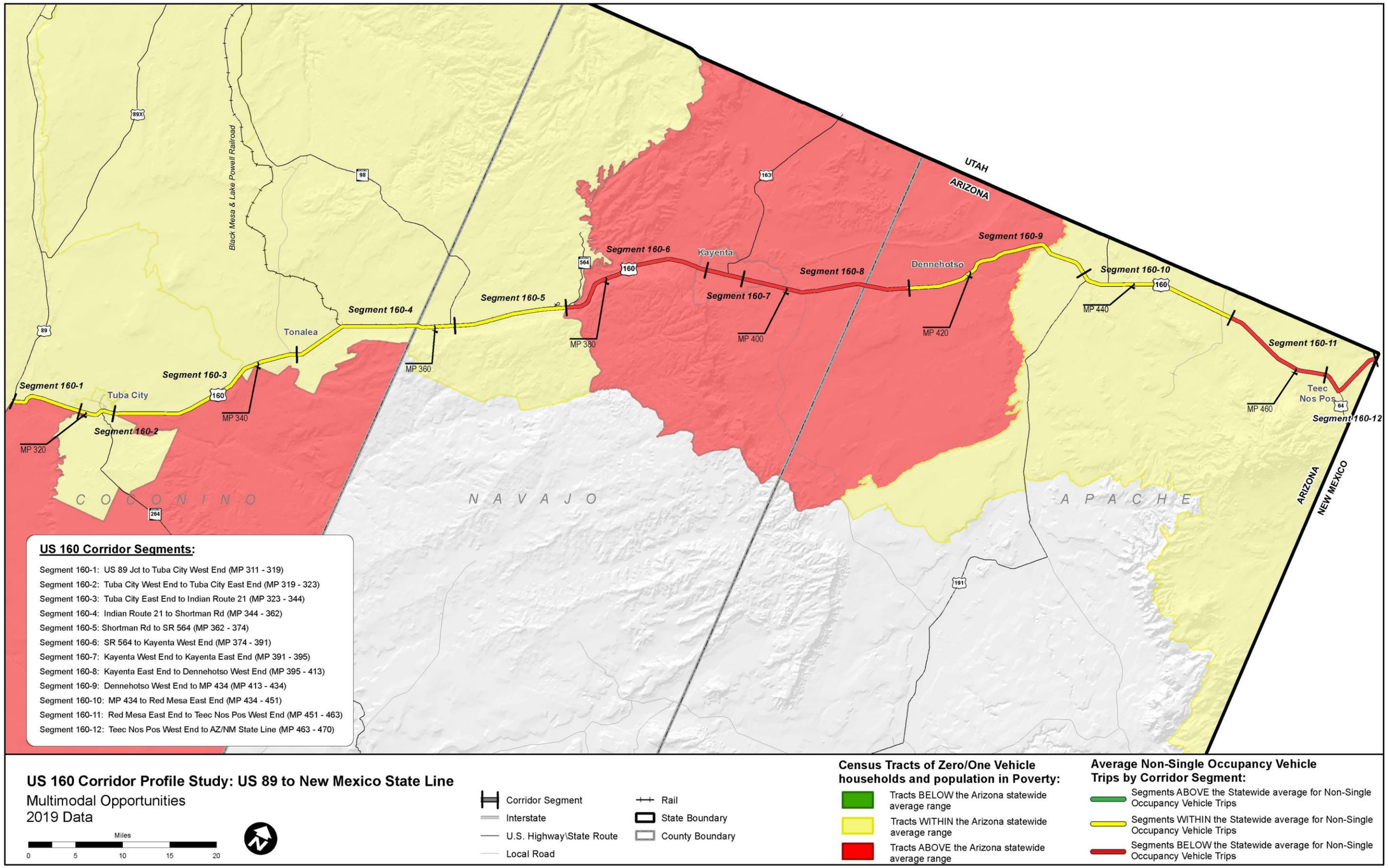
Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Level of Travel Time Reliability

Uninterrupted
Good/Above Average (<1.15)
Fair/Average (1.15 - 1.50)
Poor/Below Average (>1.50)

Interrupted
Good/Above Average (<1.15)
Fair/Average (1.15 - 1.50)
Poor/Below Average (>1.50)


Black Mesa & Lake Powell Railroad
UTAH
ARIZONA
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
Tuba City
Tonalea
Kayenta
Dennehotso
Teec Nos Pos
MP 320
MP 340
MP 360
MP 380
MP 400
MP 420
MP 440
MP 460
COCONINO
NAVAJO
APACHE
ARIZONA
NEW MEXICO
US 160 Corridor Segments:
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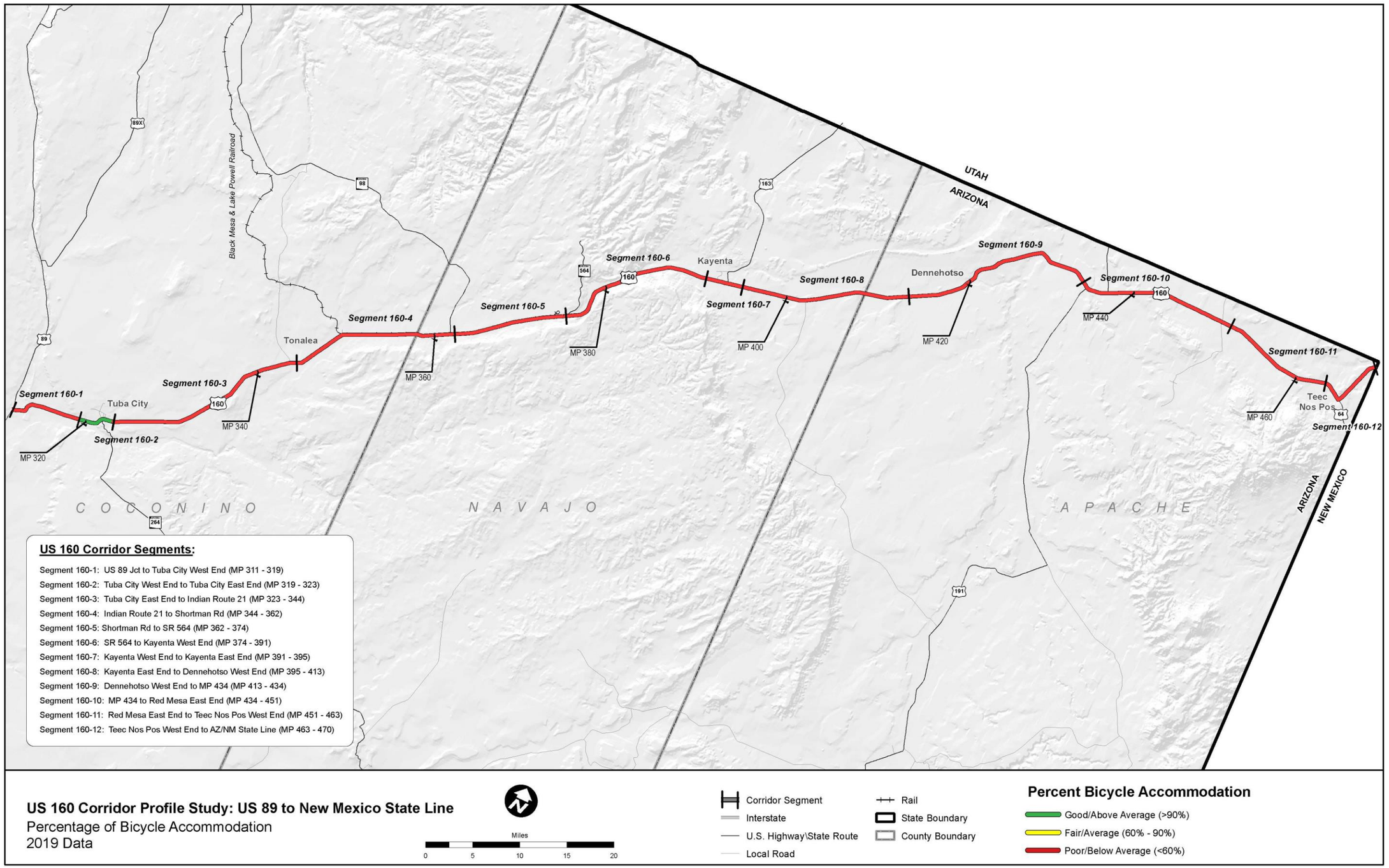
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Multimodal Opportunities
2019 Data
Miles
0 5 10 15 20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
Census Tracts of Zero/One Vehicle households and population in Poverty:
Tracts BELOW the Arizona statewide average range
Tracts WITHIN the Arizona statewide average range
Tracts ABOVE the Arizona statewide average range
Average Non-Single Occupancy Vehicle Trips by Corridor Segment:
Segments ABOVE the Statewide average for Non-Single Occupancy Vehicle Trips
Segments WITHIN the Statewide average for Non-Single Occupancy Vehicle Trips
Segments BELOW the Statewide average for Non-Single Occupancy Vehicle Trips



US 160 Corridor Segments:

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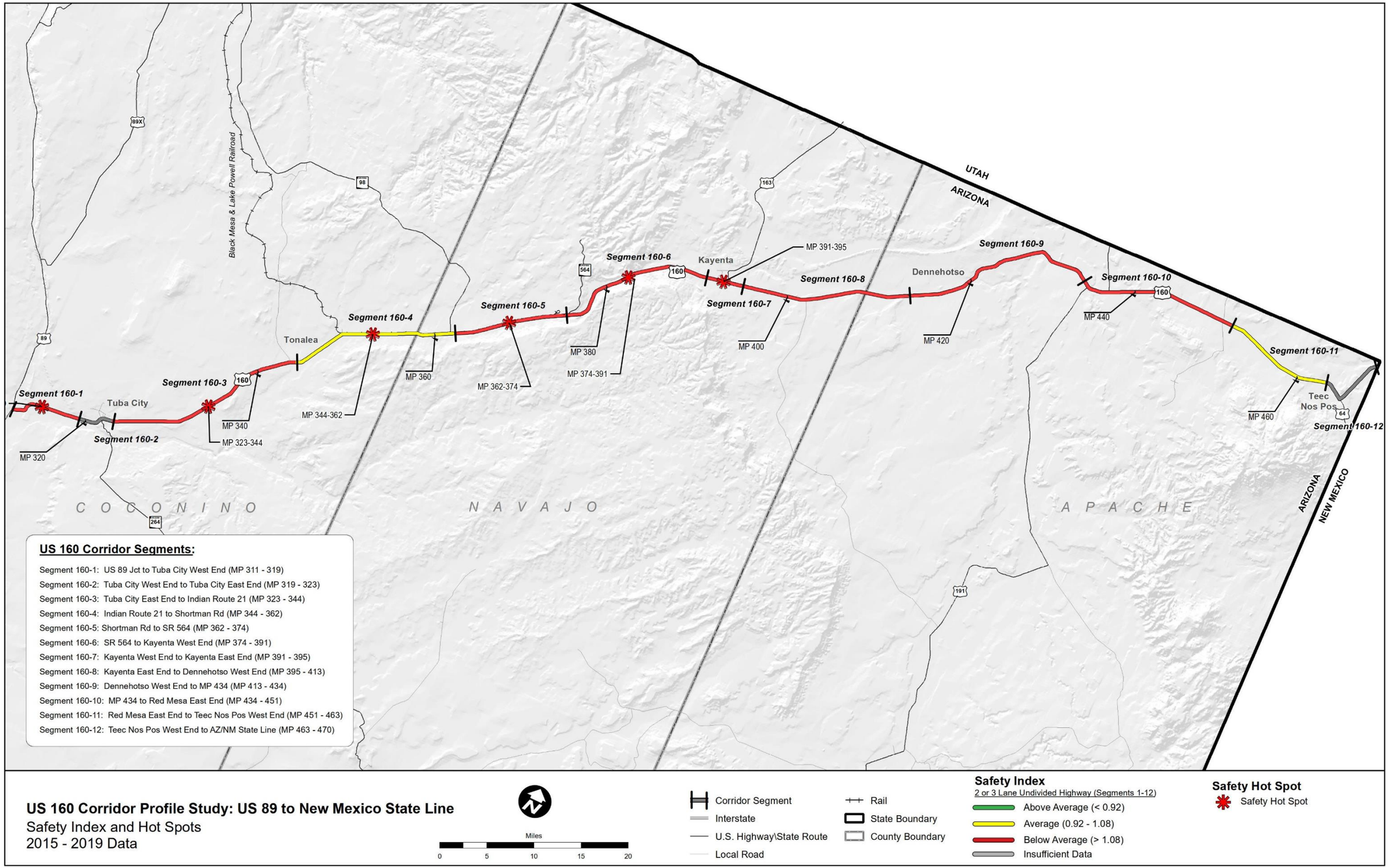
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line
Percentage of Bicycle Accommodation
2019 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Percent Bicycle Accommodation
Good/Above Average (>90%)
Fair/Average (60% - 90%)
Poor/Below Average (<60%)


UTAH
ARIZONA
NEW MEXICO
Black Mesa & Lake Powell Railroad
COCONINO
NAVAJO
APACHE
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
Tuba City
Tonalea
Kayenta
Dennehotso
Teec Nos Pos
MP 320
MP 323-344
MP 340
MP 344-362
MP 360
MP 362-374
MP 374-391
MP 380
MP 391-395
MP 400
MP 420
MP 440
MP 460
89
89X
98
160
163
264
564
191
64
US 160 Corridor Segments:
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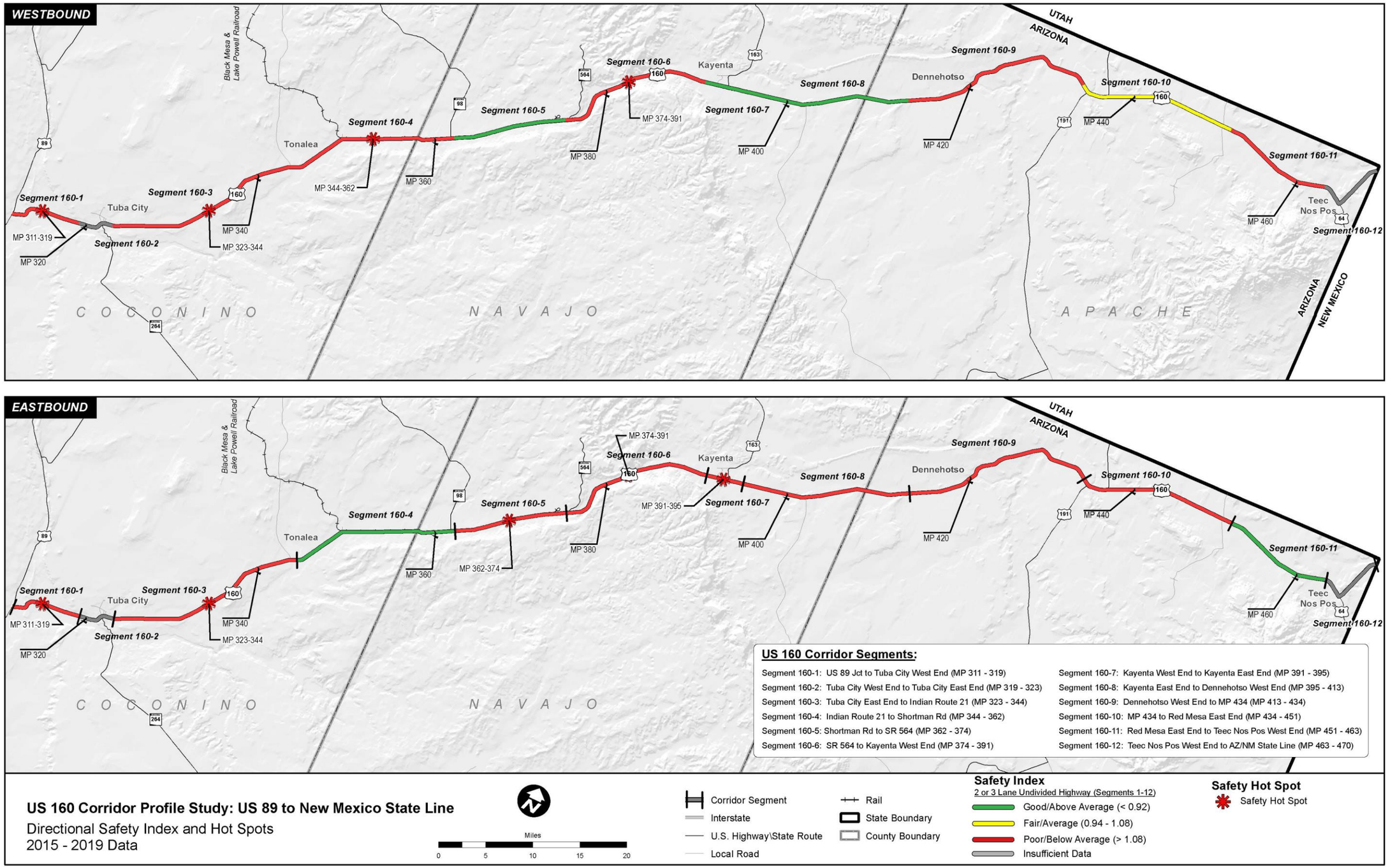
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Safety Index and Hot Spots
2015 - 2019 Data
Miles
0
5
10
15
20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
Safety Index
2 or 3 Lane Undivided Highway (Segments 1-12)
Above Average (< 0.92)
Average (0.92 - 1.08)
Below Average (> 1.08)
Insufficient Data
Safety Hot Spot
Safety Hot Spot


WESTBOUND
EASTBOUND
Black Mesa & Lake Powell Railroad
Tonalea
Tuba City
Kayenta
Dennehotso
Teec Nos Pos
UTAH
ARIZONA
NEW MEXICO
COCONINO
NAVAJO
APACHE
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
MP 311-319
MP 320
MP 323-344
MP 340
MP 344-362
MP 360
MP 362-374
MP 374-391
MP 380
MP 391-395
MP 400
MP 420
MP 440
MP 460
89
160
98
564
163
191
264
64
US 160 Corridor Segments:
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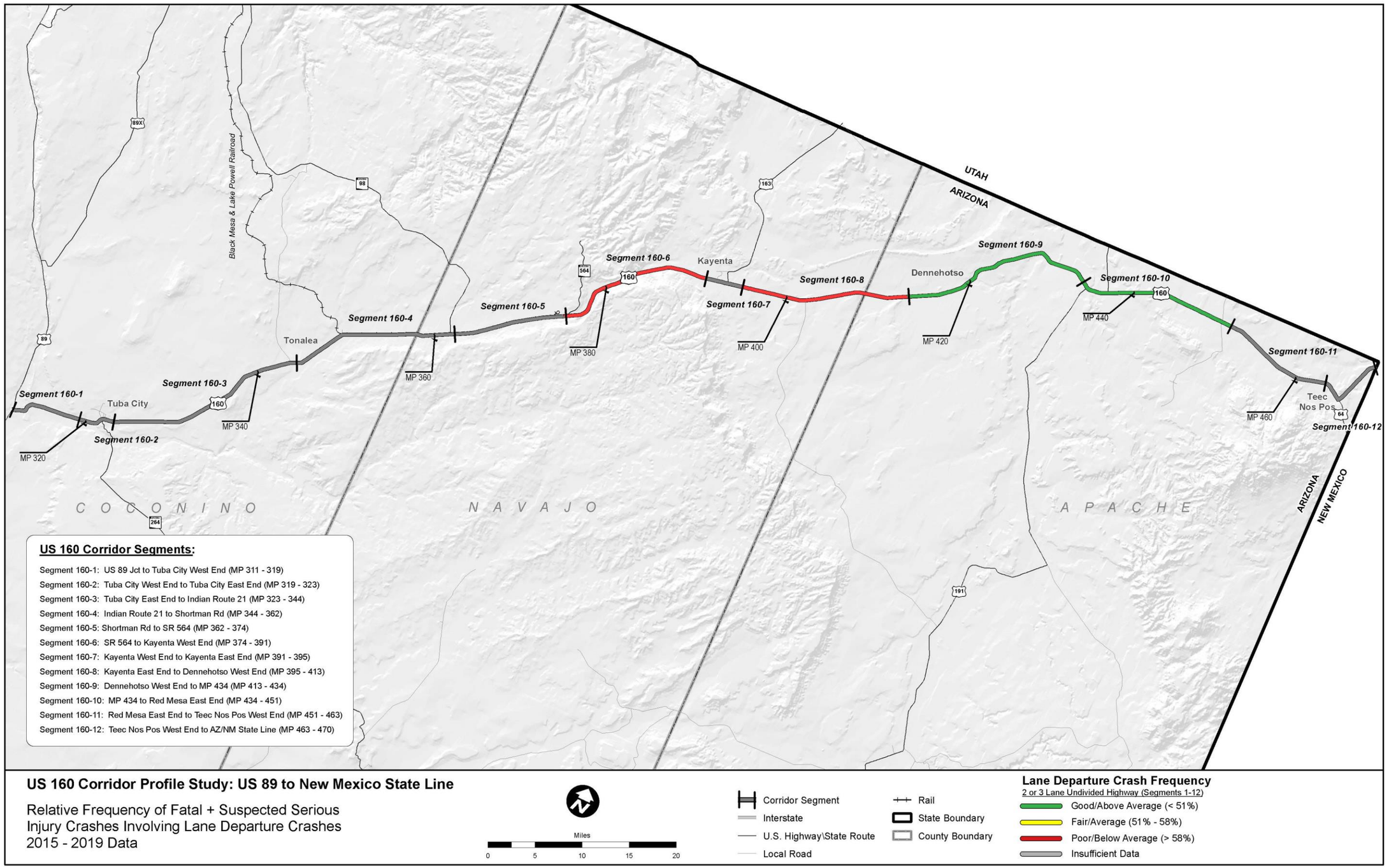
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Directional Safety Index and Hot Spots
2015 - 2019 Data
Miles
0 5 10 15 20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
Safety Index
2 or 3 Lane Undivided Highway (Segments 1-12)
Good/Above Average (< 0.92)
Fair/Average (0.94 - 1.08)
Poor/Below Average (> 1.08)
Insufficient Data
Safety Hot Spot
Safety Hot Spot



US 160 Corridor Segments:

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Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

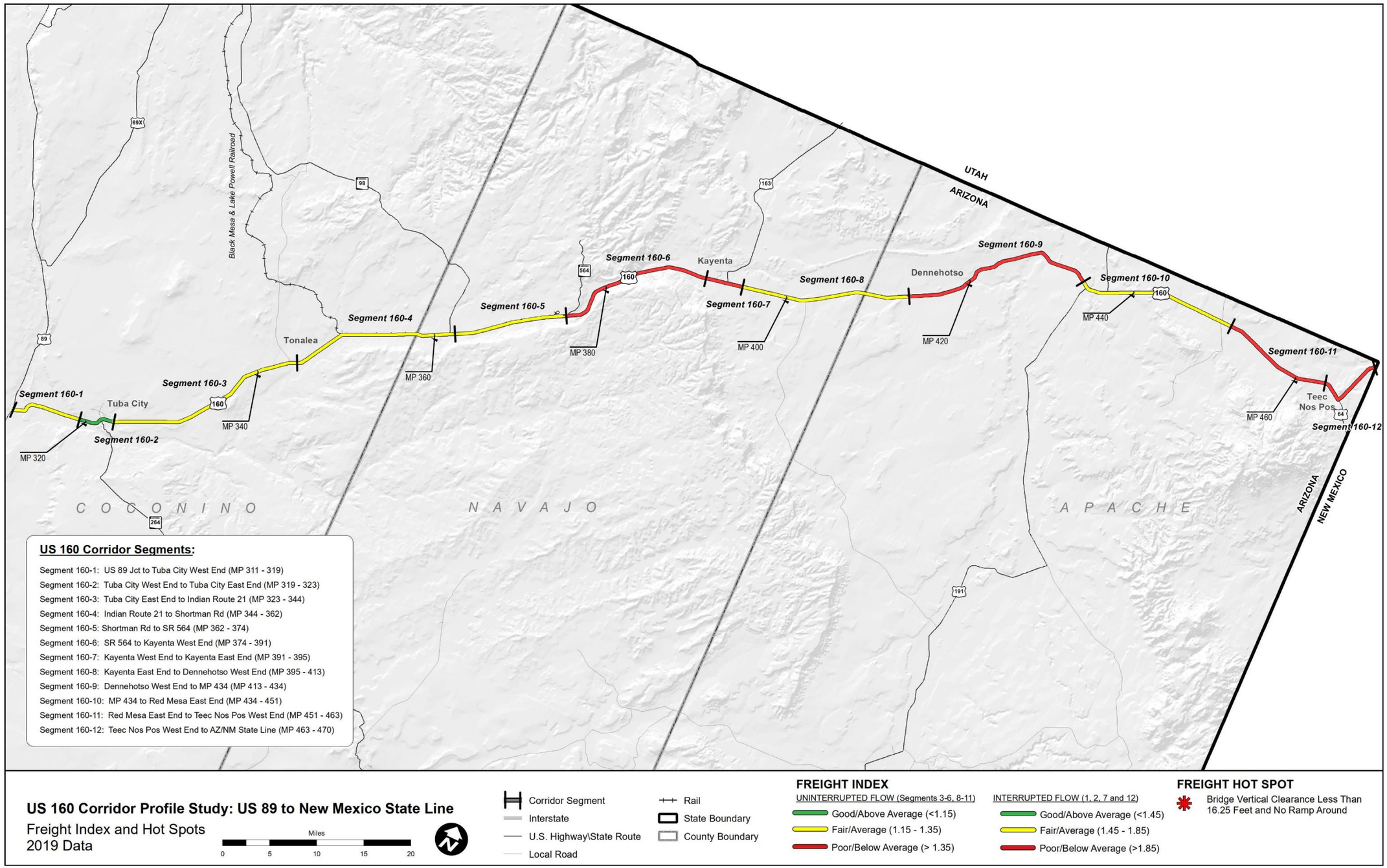
US 160 Corridor Profile Study: US 89 to New Mexico State Line

Relative Frequency of Fatal + Suspected Serious Injury Crashes Involving Lane Departure Crashes
2015 - 2019 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Lane Departure Crash Frequency
2 or 3 Lane Undivided Highway (Segments 1-12)
Good/Above Average (< 51%)
Fair/Average (51% - 58%)
Poor/Below Average (> 58%)
Insufficient Data



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US 160 Corridor Profile Study: US 89 to New Mexico State Line

Freight Index and Hot Spots
2019 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

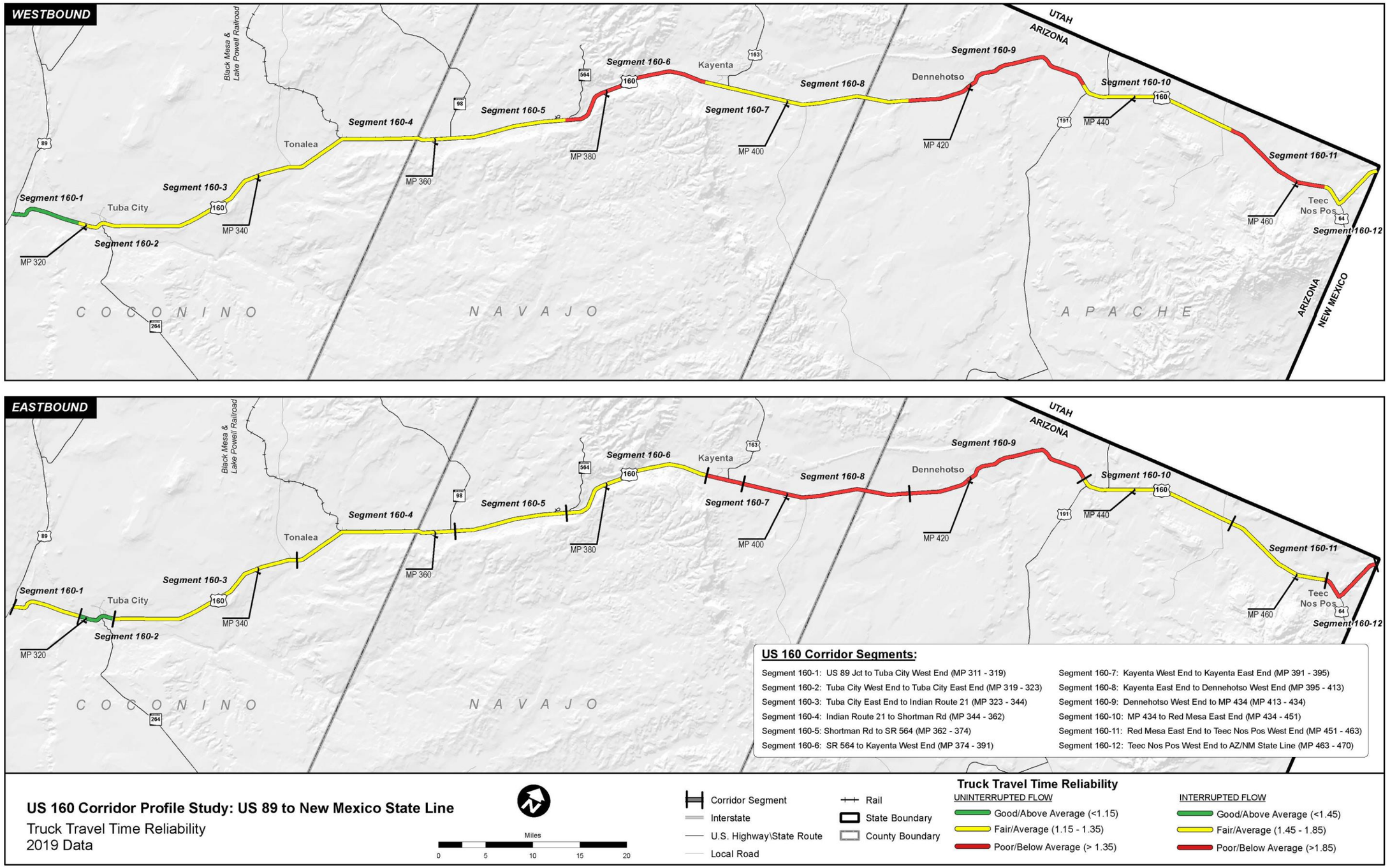
FREIGHT INDEX

UNINTERRUPTED FLOW (Segments 3-6, 8-11)
- Good/Above Average (<1.15)
- Fair/Average (1.15 - 1.35)
- Poor/Below Average (> 1.35)

INTERRUPTED FLOW (1, 2, 7 and 12)
- Good/Above Average (<1.45)
- Fair/Average (1.45 - 1.85)
- Poor/Below Average (>1.85)

FREIGHT HOT SPOT

Bridge Vertical Clearance Less Than 16.25 Feet and No Ramp Around



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Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line

Truck Travel Time Reliability
2019 Data

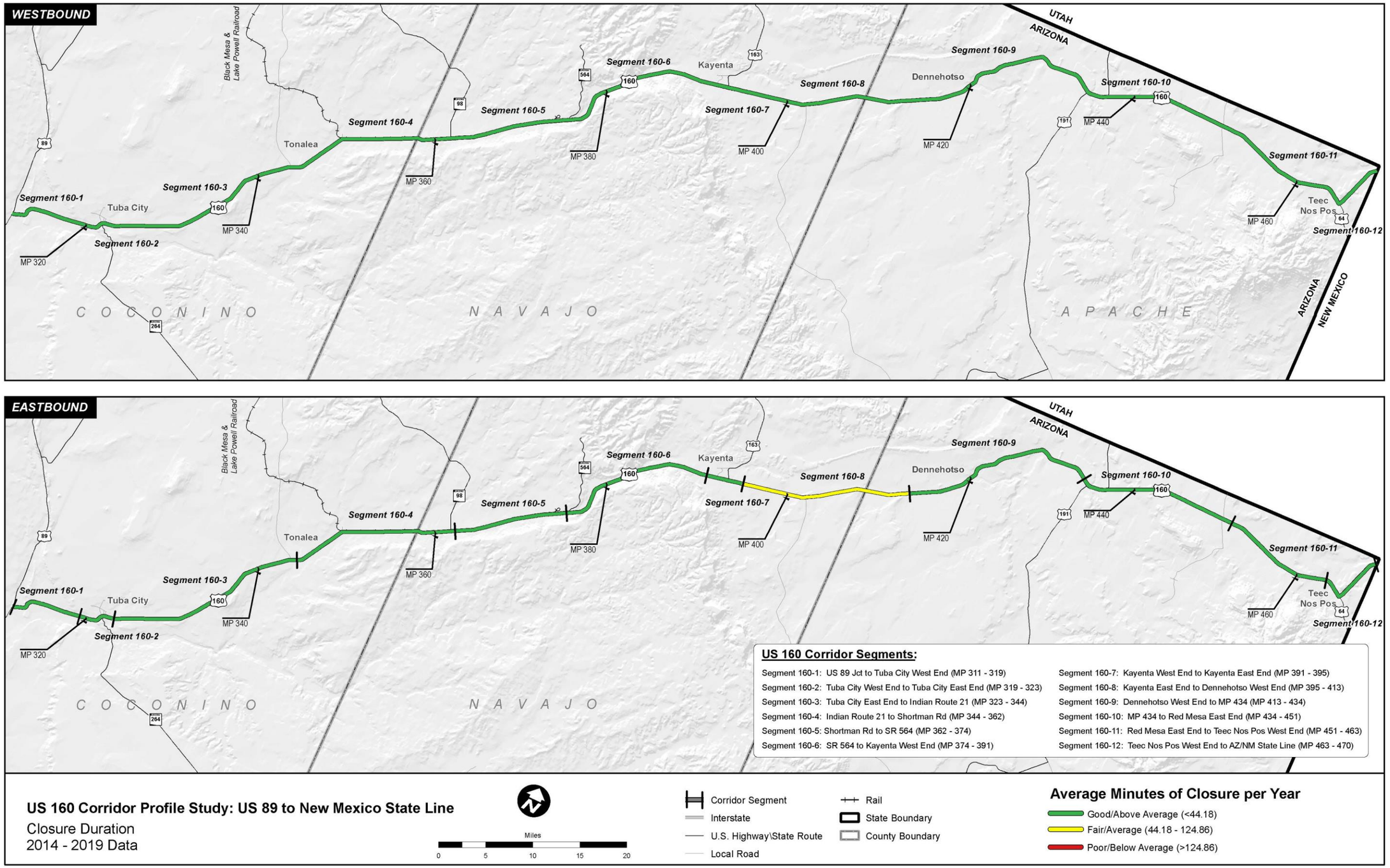
Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

Truck Travel Time Reliability

UNINTERRUPTED FLOW
- Good/Above Average (<1.15)
- Fair/Average (1.15 - 1.35)
- Poor/Below Average (> 1.35)

INTERRUPTED FLOW
- Good/Above Average (<1.45)
- Fair/Average (1.45 - 1.85)
- Poor/Below Average (>1.85)


WESTBOUND
EASTBOUND
Black Mesa & Lake Powell Railroad
Tonalea
Tuba City
Kayenta
Dennehotso
Teec Nos Pos
UTAH
ARIZONA
NEW MEXICO
Segment 160-1
Segment 160-2
Segment 160-3
Segment 160-4
Segment 160-5
Segment 160-6
Segment 160-7
Segment 160-8
Segment 160-9
Segment 160-10
Segment 160-11
Segment 160-12
MP 320
MP 340
MP 360
MP 380
MP 400
MP 420
MP 440
MP 460
COCONINO
NAVAJO
APACHE
US 160 Corridor Segments:
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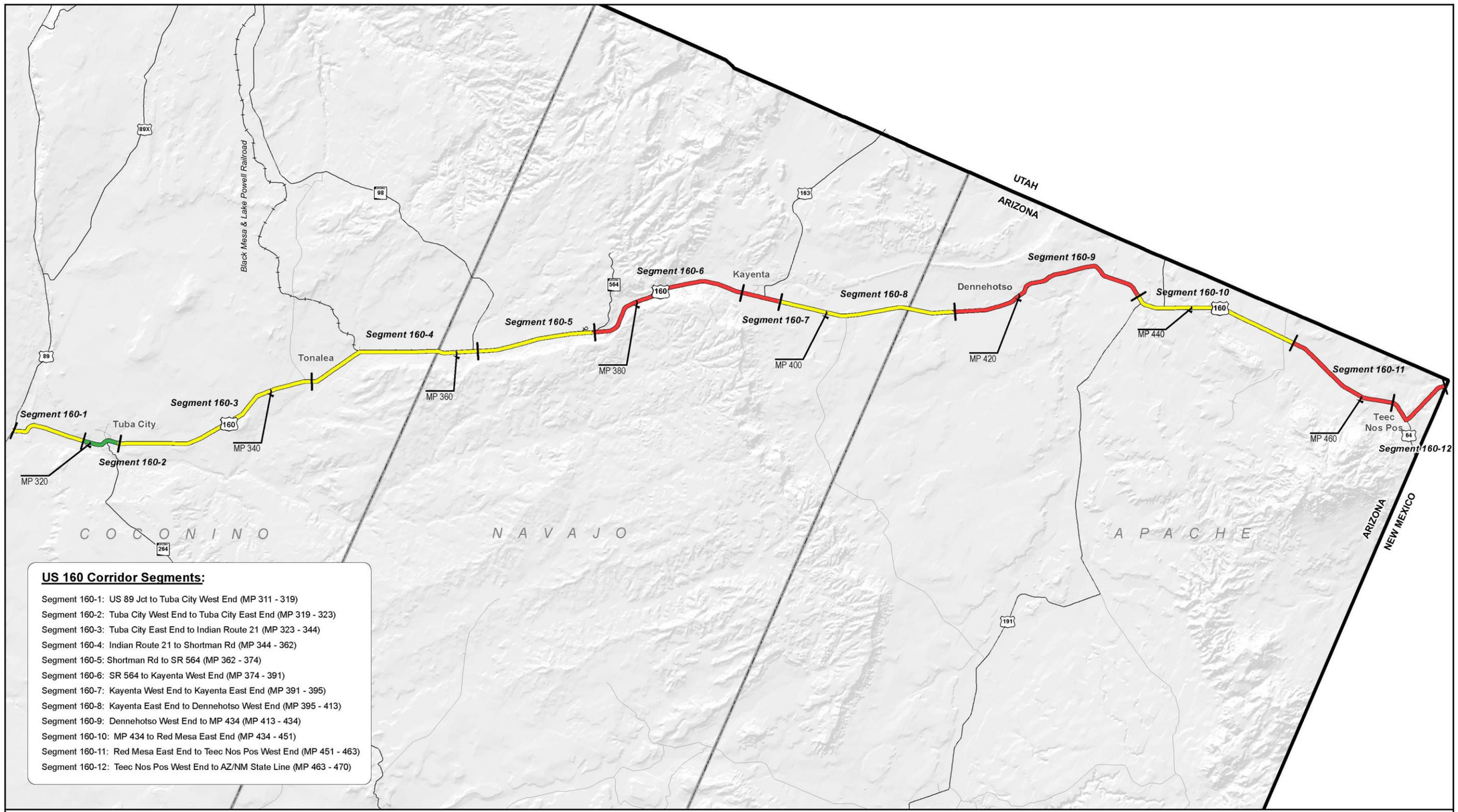
Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)
US 160 Corridor Profile Study: US 89 to New Mexico State Line
Closure Duration
2014 - 2019 Data
Miles
0 5 10 15 20
Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary
Average Minutes of Closure per Year
Good/Above Average (<44.18)
Fair/Average (44.18 - 124.86)
Poor/Below Average (>124.86)



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Segment 160-12: Teec Nos Pos West End to AZ/NM State Line (MP 463 - 470)

US 160 Corridor Profile Study: US 89 to New Mexico State Line

Bridge Vertical Clearance
2019 Data

Miles
0 5 10 15 20

Corridor Segment
Interstate
U.S. Highway\State Route
Local Road
Rail
State Boundary
County Boundary

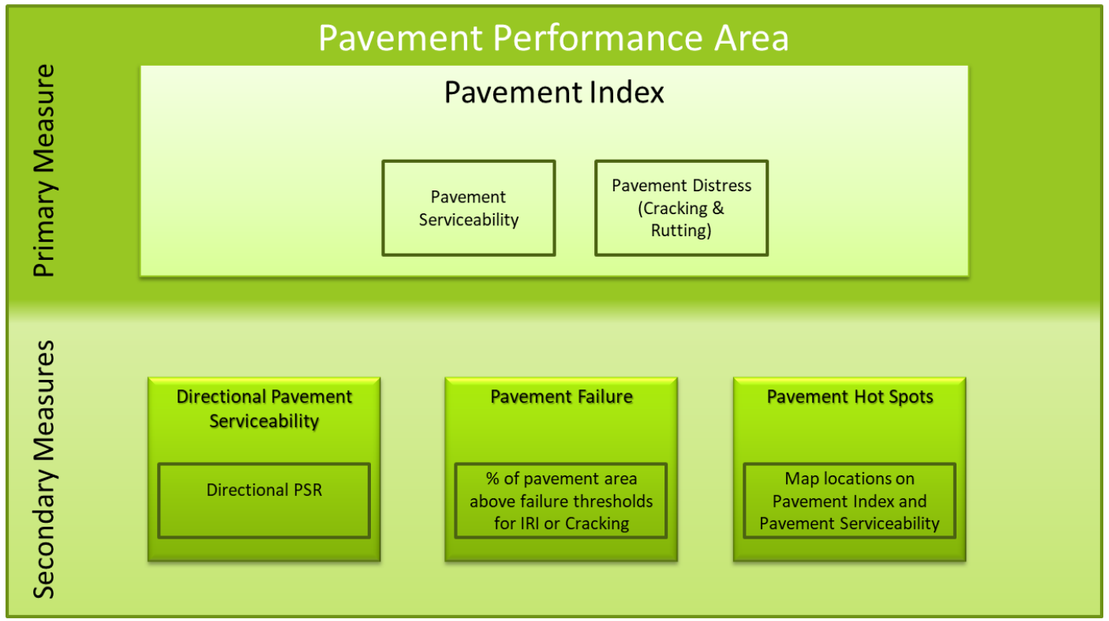
Bridge Vertical Clearance (ft)
Good/Above Average (> 16.5)
Fair/Average (16.0 - 16.5)
Poor/Below Average (< 16.0)

FREIGHT HOT SPOT
Bridge Vertical Clearance Less Than 16.25 Feet and No Ramp Around

Appendix B: Performance Area Detailed Calculation Methodologies

Pavement Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Pavement performance area as shown in the following graphic:



This performance area is used to evaluate mainline pavement condition. Pavement condition data for ramps, frontage roads, crossroads, etc. was not included in the evaluation.

Primary Pavement Index

The Pavement Index is calculated based on the use of three pavement condition ratings from the ADOT Pavement Database. The three ratings are the International Roughness Index (IRI), the Cracking rating, and the Rutting rating. The calculation of the Pavement Index uses a combination of these three ratings.

The IRI is a measurement of the pavement roughness based on field-measured longitudinal roadway profiles. To facilitate the calculation of the index, the IRI rating was converted to a Pavement Serviceability Rating (PSR) using the following equation:

$$PSR = 5 * e^{-0.0038*IRI}$$

The Cracking rating is a measurement of the amount of surface cracking based on a field-measured area of 1,000 square feet that serves as a sample for each mile. The Rutting rating is a measurement of the depth of pavement rutting based on field measurements. To facilitate the calculation of the index, the Cracking Rating and Rutting Rating were combined and converted to a Pavement Distress Index (PDI) using the following equation:

$$PDI = 5 - [\,(0.345 * C^{0.66}) + \left(0.01428 * \left(\frac{R}{2} * 100\right)^{1.32}\right) - \left(0.0823 * C^{0.18} * \left(\frac{R}{2} * 100\right)^{0.50}\right)\,]$$

Both the PSR and PDI use a 0 to 5 scale with 0 representing the lowest performance and 5 representing the highest performance. The performance thresholds for interstates and non-interstates shown in the tables below were used for the PSR and PDI.

Performance Level for Interstates	IRI (PSR)	Cracking & Rutting (PDI)
Good	<75 (>3.75)	Cracking <5.75 Rutting < 0.35
Fair	75 - 102 (3.40 - 3.75)	Cracking 5.75 - 12 Rutting 0.35 – 0.55
Poor	>102(<3.40)	Cracking >12 Rutting > 0.55

Performance Level for Non-Interstates	IRI (PSR)	Cracking & Rutting (PDI)
Good	<94 (>3.5)	Cracking < 5.75 Rutting < 0.35
Fair	94 - 142 (2.90 - 3.5)	Cracking 5.75 - 12 Rutting 0.35 – 0.55
Poor	>142 (<2.90)	Cracking >12 Rutting > 0.55

The PSR and PDI are calculated for each 1-mile section of roadway. If PSR or PDI falls into a poor rating (<3.4 for PSR for interstates, for example) for a 1-mile section, then the score for that 1-mile section is entirely (100%) based on the lower score (either PSR or PDI). If neither PSR or PDI fall into a poor rating for a 1-mile section, then the score for that 1-mile section is based on a combination of the lower rating (70% weight) and the higher rating (30% weight). The result is a score between 0 and 5 for each direction of travel of each mile of roadway based on a combination of both the PSR and the PDI.

The project corridor has been divided into segments. The Pavement Index for each segment is a weighted average of the directional ratings based on the number of travel lanes. Therefore, the condition of a section with more travel lanes will have a greater influence on the resulting segment Pavement Index than a section with fewer travel lanes.

Secondary Pavement Measures

Three secondary measures are evaluated:

- Directional Pavement Serviceability
- Pavement Failure
- Pavement Hot Spots

Directional Pavement Serviceability: Similar to the Pavement Index, the Directional Pavement Serviceability is calculated as a weighted average (based on number of lanes) for each segment. However, this rating only utilizes the PSR and is calculated separately for each direction of travel. The PSR uses a 0 to 5 scale with 0 representing the lowest performance and 5 representing the highest performance.

Pavement Failure: The percentage of pavement area rated above the failure thresholds for IRI, Cracking, or Rutting is calculated for each segment. In addition, the Standard score (z-score) is calculated for each segment.

The Standard score (z-score) is the number of standard deviations above or below the mean. Therefore, a Standard score between -0.5 and +0.5 is "average", less than -0.5 is lower (better) than average, and higher than +0.5 is above (worse) than average.

Pavement Hot Spots: The Pavement Index map identifies locations that have an IRI rating, Cracking rating, or Rutting rating that fall above the failure threshold as identified by ADOT Pavement Group. For interstates, an IRI rating above 105, a Cracking rating above 10, or a Rutting rating above 0.4 will be used as the thresholds which are slightly different than the ratings shown previously. For non-interstates, an IRI rating above 142, a Cracking rating above 10, or a Rutting rating above 0.4 will be used as the thresholds.

Scoring

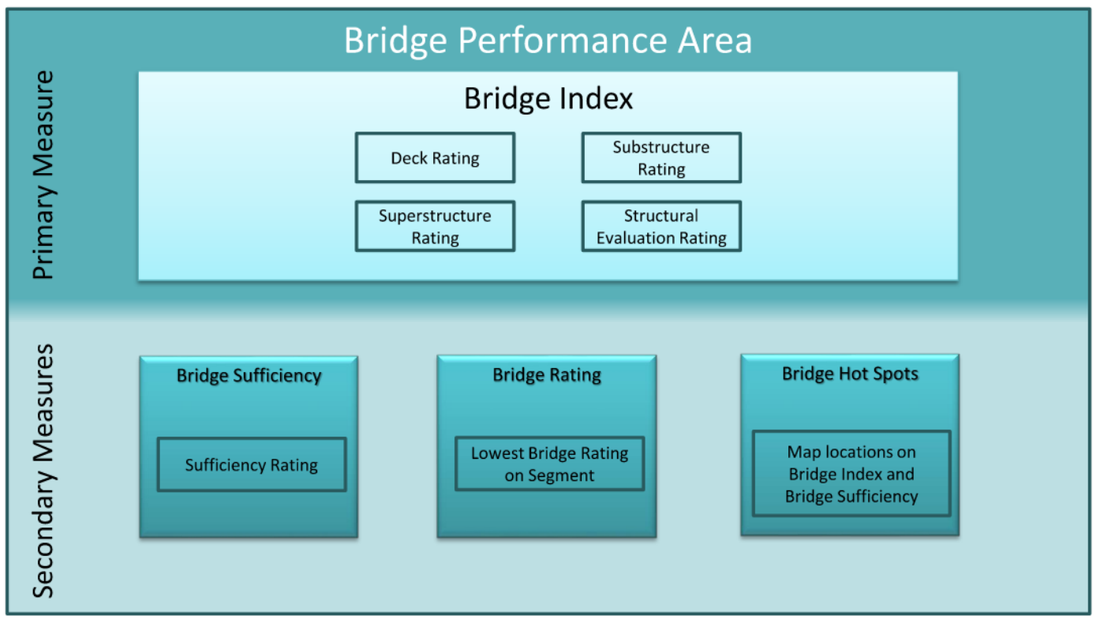
Performance Level	Pavement Index	
	Interstates	Non-Interstates
Good	>3.75	>3.6
Fair	3.0 - 3.75	2.8 - 3.6
Poor	<3.0	<2.8

Performance Level	Directional Pavement Serviceability	
	Interstates	Non-Interstates
Good	>3.75	>3.5
Fair	3.4 - 3.75	2.9 - 3.5
Poor	<3.4	<2.9

Performance Level	% Pavement Failure
Good	< 5%
Fair	5% – 20%
Poor	>20%

Bridge Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Bridge performance area as shown in the following graphic:



This performance area is used to evaluate mainline bridges. Bridges on ramps (that do not cross the mainline), frontage roads, etc. should not be included in the evaluation. Basically, any bridge that carries mainline traffic or carries traffic over the mainline should be included and bridges that do not carry mainline traffic, run parallel to the mainline (frontage roads), or do not cross the mainline should not be included.

Primary Bridge Index

The Bridge Index is calculated based on the use of four bridge condition ratings from the ADOT Bridge Database, also known as the Arizona Bridge Information and Storage System (ABISS). The four ratings are the Deck Rating, Substructure Rating, Superstructure Rating, and Structural Evaluation Rating. The calculation of the Bridge Index uses the lowest of these four ratings.

Each of the four condition ratings use a 0 to 9 scale with 0 representing the lowest performance and 9 representing the highest performance.

The project corridor has been divided into segments and the bridges are grouped together according to the segment definitions. In order to report the Bridge Index for each corridor segment, the Bridge Index for each segment is a weighted average based on the deck area for each bridge. Therefore, the condition of a larger bridge will have a greater influence on the resulting segment Bridge Index than a smaller bridge.

Secondary Bridge Measures

Three secondary measures will be evaluated:

- Bridge Sufficiency
- Bridge Rating
- Bridge Hot Spots

Bridge Sufficiency: Similar to the Bridge Index, the Bridge Sufficiency rating is calculated as a weighted average (based on deck area) for each segment. The Bridge Sufficiency rating is a scale of 0 to 100 with 0 representing the lowest performance and 100 representing the highest performance. A rating of 80 or above represents “good” performance, a rating between 50 and 80 represents “fair” performance, and a rating below 50 represents “poor” performance.

Bridge Rating: The Bridge Rating simply identifies the lowest bridge rating on each segment. This performance measure is not an average and therefore is not weighted based on the deck area. The Bridge Index identifies the lowest rating for each bridge, as described above. Each of the four condition ratings use a 0 to 9 scale with 0 representing the lowest performance and 9 representing the highest performance.

Bridge Hot Spots: The Bridge Index map identifies individual bridge locations that are identified as hot spots. Hot spots are bridges that have a single rating of 4 in any of the four ratings, or multiple ratings of 5 in the deck, substructure or superstructure ratings.

Scoring:

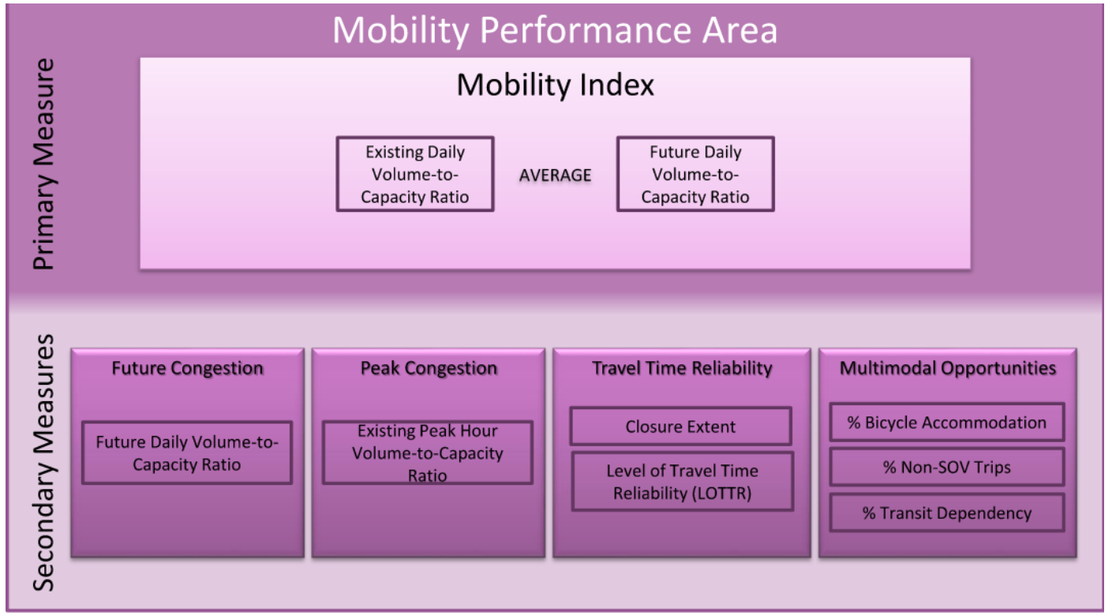
Performance Level	Bridge Index
Good	>6.5
Fair	5.0-6.5
Poor	<5.0

Performance Level	Sufficiency Rating
Good	>80
Fair	50-80
Poor	<50

Performance Level	Bridge Rating
Good	>6
Fair	5-6
Poor	<5

Mobility Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Mobility performance area as shown in the following graphic:



Primary Mobility Index

The primary Mobility Index is an average of the existing daily volume-to-capacity (V/C) ratio and the future daily V/C ratio for each segment of the corridor.

Existing Daily V/C: The existing daily V/C ratio for each segment is calculated by dividing the existing Annual Average Daily Traffic (AADT) volume for each segment by the total Level of Service (LOS) E capacity volume for that segment

The capacity is calculated using the HERS Procedures for Estimating Highway Capacity[1]. The HERS procedure incorporates HCM 2010 methodologies. The methodology includes capacity estimation procedures for multiple facility types including freeways, rural two-lane highways, multilane highways, and signalized and non-signalized urban sections.

The segment capacity is defined as a function of the number of mainline lanes, shoulder width, interrupted or uninterrupted flow facilities, terrain type, percent of truck traffic, and the designated urban or rural environment.

The AADT for each segment is calculated by applying a weighted average across the length of the segment based on the individual 24-hour volumes and distances associated with each HPMS count station within each segment.

The following example equation is used to determine the weighted average of a segment with two HPMS count locations within the corridor

((HPMS 1 Distance x HPMS 1 Volume) + (HPMS 2 Distance x HPMS 2 Volume))/Total Segment Length

For specific details regarding the HERS methodology used, refer to the *Procedures for Estimating Highway Capacity, draft Technical Memorandum.*

Future Daily V/C: The future daily V/C ratio for each segment is calculated by dividing the future AADT volume for each segment by the existing LOS E capacity. The capacity volume used in this calculation is the same as is utilized in the existing daily V/C equation.

The future AADT daily volumes are generated by applying an average annual compound growth rate (ACGR) to each existing AADT segment volume. The following equation is used to apply the average annual compound growth rate:

Future AADT = Existing AADT x ((1+ACGR)^(Future Year-Existing Year))

The ACGR for each segment is defined by comparing the total volumes in the existing Arizona Travel Demand Model (AZTDM2) to the future AZTDM2 traffic volumes at each existing HPMS count station location throughout the corridor. Each existing and future segment volume is defined using the same weighted average equation described in the *Existing Daily V/*C section above and then summing the directional volumes for each location. The following equation is used to determine the ACGR for each segment:

ACGR = ((Future Volume/Existing Volume)^(1/(Future Year-Existing Year))))-1

Secondary Mobility Measures

Four secondary measures are evaluated:

- Future Congestion
- Peak Congestion
- Travel Time Reliability
  - Closure Extent
  - Directional Level of Travel Time Reliability
- Multimodal Opportunities
  - % Bicycle Accommodation
  - % Non-Single Occupancy Vehicle (SOV) Trips

[1] HERS Support – 2011, Task 6: Procedures for Estimating Highway Capacity, draft Technical Memorandum. Cambridge Systematics. Prepared for the Federal Highway Administration. March 2013.

- % Transit Dependency

Future Congestion: The future daily V/C ratios for each segment in the corridor that are calculated and used in the Mobility Index as part of the overall average between Existing Daily V/C and Future Daily V/C are applied independently as a secondary measure. The methods to calculate the Future Daily V/C can be referenced in the Mobility Index section.

Peak Congestion: Peak Congestion has been defined as the peak hour V/C ratio in both directions of the corridor. The peak hour V/C ratio is calculated using the HERS method as described previously. The peak hour volume utilizes the directional AADT for each segment, which is calculated by applying a weighted average across the length of the segment based on the individual directional 24-hour volumes and distances associated with each HPMS count station within each segment. The segment capacity is defined based on the characteristics of each segment including number of lanes, terrain type, and environment, similar to the 24-hour volumes using the HERS method.

Travel Time Reliability: Travel time reliability is a secondary measure that includes two indicators. The two indicators are the number of times a piece of a corridor is closed for any specific reason and the directional Level of Travel Time Reliability (LOTTR).

Closure Extent: The number of times a roadway is closed is documented through the HCRS dataset. Closure Extent is defined as the average number of times a particular milepost of the corridor is closed per year per mile in a specific direction of travel. The weighted average of each occurrence takes into account the distance over which a specific occurrence spans.

Thresholds that determine levels of good, fair, and poor are based on the average number of closures per mile per year within each of the identified statewide significant corridors by ADOT. The thresholds shown at the end of this section represent statewide averages across those corridors.

Directional Level of Travel Time Reliability: In terms of overall mobility, the LOTTR is the relationship of 80th percentile travel time to average (50th percentile) travel time for a given corridor segment in a specific direction.

Using INRIX data provided by ADOT, four time periods for each data point were collected throughout the day (AM peak, mid-day, PM peak, and off-peak). The highest value of the four time periods calculation is defined as the LOTTR for that data point. The weighted average LOTTR is calculated within each segment based on the number of data points collected and the length associated with the TMC location. The value of the weighted average LOTTR across each entry is used as the LOTTR for each respective segment within the corridor.

Multimodal Opportunities: Three multimodal opportunity indicators reflect the characteristics of the corridor that promote alternate modes to a single occupancy vehicle (SOV) for trips along the corridor. The three indicators include the percent bicycle accommodation, non-SOV trips, and transit dependency along the corridor.

Percent Bicycle Accommodation: For this secondary performance evaluation, outside shoulder widths are evaluated considering the roadway's context and conditions. This requires use of the roadway data that includes right shoulder widths, shoulder surface types, and speed limits, all of which are available in the following ADOT geographic information system (GIS) data sets:

- Right Shoulder Widths
- Left Shoulder Widths (for undivided roadways)
- Shoulder Surface Type (Both Left/Right)
- Speed Limit

Additionally, each segment's average AADT, estimated earlier in the Mobility performance area methodology, is used for the criteria to determine if the existing shoulder width meets the effective width.

The criteria for screening if a shoulder segment meets the recommended width criteria are as followed:

(1) If AADT <= 1500 OR Speed Limit <= 25 miles per hour (mph):
The segment's general purpose lane can be shared with bicyclists (no effective shoulder width required)

(2) If AADT > 1500 AND Speed Limit between (25 - 50 mph) AND Pavement Surface is Paved:
Effective shoulder width required is 4 feet or greater

(3) If AADT > 1500 AND Speed Limit >= 50 mph and Pavement Surface is Paved:
Effective shoulder width required is 6 feet or greater

The summation of the length of the shoulder sections that meet the defined effective width criteria, based on criteria above, is divided by the segment's total length to estimate the percent of the segment that accommodates bicycles as illustrated at the end of this section. If shoulder data is not available or appears erroneous, field measurements can substitute for the shoulder data.

Percent Non-SOV Trips: The percentage of non-SOV trips over distances less than 50 miles gives an indication of travel patterns along a section of the corridor that could benefit from additional multimodal options in the future.

Thresholds that determine levels of good, fair, and poor are based on the percent non-SOV trips within each of the identified statewide significant corridors by ADOT. The thresholds shown at the end of this section represent statewide averages across those corridors.

Percent Transit Dependency: U.S. Census American Community Survey tract and state level geographic data and attributes from the tables B08201 (Number of Vehicles Available by Household Size) and B17001 (Population in Poverty within the Last 12 Months) were downloaded with margins of error included from the Census data retrieval application Data Ferret. Population ranges for each tract were determined by adding and subtracting the margin of error to each estimate in excel. The

tract level attribute data was then joined to geographic tract data in GIS. Only tracts within a one mile buffer of each corridor are considered for this evaluation.

Tracts that have a statistically significantly larger number of either people in poverty or households with only one or no vehicles available than the state average are considered potentially transit dependent.

Example: The state average for zero or one vehicles households (HHs) is between 44.1% and 45.0%. Tracts which have the lower bound of their range above the upper bound of the state range have a greater percentage of zero/one vehicle HHs than the state average. Tracts that have their upper bound beneath the lower bound of the state range have a lesser percentage of zero/one vehicles HHs than the state average. All other tracts that have one of their bounds overlapping with the state average cannot be considered statistically significantly different because there is a chance the value is actually the same.

In addition to transit dependency, the following attributes are added to the Multimodal Opportunities map based on available data.

- Shoulder width throughout the corridor based on 'Shoulder Width' GIS dataset provided by ADOT
- Intercity bus routes
- Multiuse paths within the corridor right-of-way, if applicable

Scoring:

Volume-to-Capacity Ratios		
Urban and Fringe Urban		
Good - LOS A-C	V/C ≤ 0.71	*Note - ADOT Roadway Design Standards indicate Urban and Fringe Urban roadways should be designed to level of service C or better
Fair - LOS D	V/C > 0.71 & ≤ 0.89	
Poor - LOS E or less	V/C > 0.89	
Rural		
Good - LOS A-B	V/C ≤ 0.56	*Note - ADOT Roadway Design Standards indicate Rural roadways should be designed to level of service B or better
Fair - LOS C	V/C > 0.56 & ≤ 0.76	
Poor - LOS D or less	V/C > 0.76	

Performance Level	Closure Extent
Good	≤ 0.22
Fair	> 0.22 & ≤ 0.62
Poor	V/C > 0.62

Performance Level	LOTTR on Uninterrupted Flow Facilities
Good	< 1.15
Fair	≥ 1.15 & < 1.50
Poor	≥ 1.50

Performance Level	LOTTR on Interrupted Flow Facilities
Good	< 1.15
Fair	≥ 1.15 & < 1.50
Poor	≥ 1.50

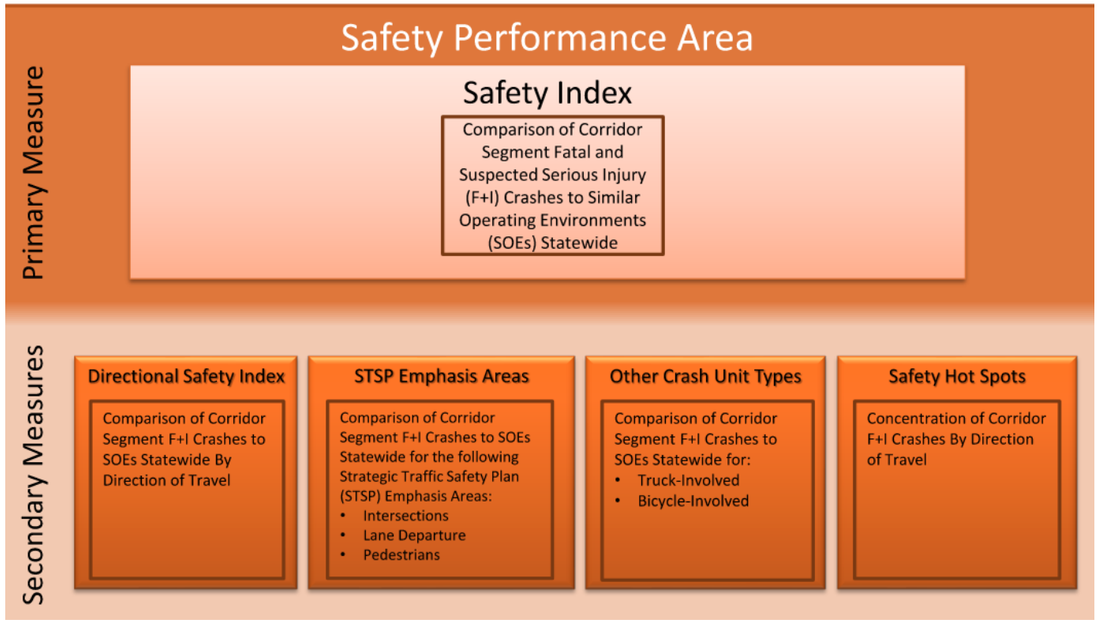
Performance Level	Percent Bicycle Accommodation
Good	≥ 90%
Fair	> 60% & ≤ 90%
Poor	< 60%

Performance Level	Percent Non-SOV Trips
Good	≥ 17%
Fair	> 11% & ≤ 17%
Poor	< 11%

Performance Level	Percent Transit Dependency
Good	Tracts with both zero and one vehicle household population in poverty percentages below the statewide average
Fair	Tracts with either zero and one vehicle household or population in poverty percentages below the statewide average
Poor	Tracts with both zero and one vehicle household and population in poverty percentages above the statewide average

Safety Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Safety performance area as shown in the following graphic:



Primary Safety Index

The Safety Index is a safety performance measure based on the bi-directional (i.e., both directions combined) frequency and rate of fatal and suspected serious injury crashes, the relative cost of those types of crashes, and crash occurrences on similar roadways in Arizona. According to ADOT's 2018 Highway Safety Improvement Program Manual, fatal crashes have an estimated cost that is 17.3 times the estimated cost of suspected serious injury crashes ($9.5 million compared to $550,000).

The Combined Safety Score (CSS) is an interim measure that combines fatal and suspected serious injury crashes into a single value. The CSS is calculated using the following generalized formula:

*CSS = 17.3 * (Normalized Fatal Crash Rate + Frequency) + (Normalized Suspected Serious Injury Crash Rate + Frequency)*

Because crashes vary depending on the operating environment of a particular roadway, statewide CSS values were developed for similar operating environments defined by functional classification, urban vs. rural setting, number of travel lanes, and traffic volumes. To determine the Safety Index of a particular segment, the segment CSS is compared to the average statewide CSS for the similar statewide operating environment.

The Safety Index is calculated using the following formula:

Safety Index = Segment CSS / Statewide Similar Operating Environment CSS

The average annual Safety Index for a segment is compared to the statewide similar operating environment annual average, with one standard deviation from the statewide average forming the scale break points.

The more a particular segment's Safety Index value is below the statewide similar operating environment average, the better the safety performance is for that particular segment as a lower value represents fewer crashes.

Scoring:

The scale for rating the Safety Index depends on the operating environments selected, as shown in the table below.

Similar Operating Environment	Safety Index (Overall & Directional)	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	0.92	1.08
2 or 3 or 4 Lane Divided Highway	0.81	1.19
4 or 5 Lane Undivided Highway	0.78	1.22
6 Lane Highway	0.76	1.24
Rural 4 Lane Freeway with Daily Volume < 25,000	0.84	1.16
Rural 4 Lane Freeway with Daily Volume > 25,000	0.78	1.22
Urban 4 Lane Freeway	0.73	1.27
Urban or Rural 6 Lane Freeway	0.65	1.35
Urban > 6 Lane Freeway	0.89	1.11

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Some corridor segments may have a very low number of total fatal and suspected serious injury crashes. Low crash frequencies (i.e., a small sample size) can translate into performance ratings that can be unstable. In some cases, a change in crash frequency of one crash (one additional crash or one less crash) could result in a change in segment performance of two levels. To avoid reliance on performance ratings where small changes in crash frequency result in large changes in performance, the following two criteria were developed to identify segments with "insufficient data" for assessing performance for the Safety Index. Both of these criteria must be met for a segment to have "insufficient data" to reliably rate the Safety Index performance:

- If the crash sample size (total fatal plus suspected serious injury crashes) for a given segment is less than five crashes over the five-year analysis period; AND
- If a change in one crash results in a change in segment performance by two levels (i.e., a change from below average to above average performance or a change from above average

to below average frequency), the segment has “insufficient data” and Safety Index performance ratings are unreliable.

Secondary Safety Measures

The Safety performance area has four secondary measures related to fatal and suspected serious injury crashes:

- Directional Safety Index
- Strategic Traffic Safety Plan (SHSP) Emphasis Areas
- Other Crash Unit Types
- Safety Hot Spots

Directional Safety Index: The Directional Safety Index shares the same calculation procedure and thresholds as the Safety Index. However, the measure is based on the directional frequency and rate of fatal and suspected serious injury crashes.

Similar to the Safety Index, the segment CSS is compared to the average statewide CSS for the similar statewide operating environment. The Directional Safety Index follows the lead of the Safety Index in terms of “insufficient data” status. If the Safety Index meets both criteria for “insufficient data”, the Directional Safety Index should also be changed to “insufficient data”. If the Safety Index does not meet both criteria for “insufficient data”, the Directional Safety Index would also not change to say “insufficient data”

STSP Emphasis Areas: ADOT’s 2019 STSP identifies several emphasis areas for reducing fatal and suspected serious injury crashes. The three relevant STSP emphasis areas relate to crashes involving:

- Intersections
- Lane departures
- Pedestrians

To develop a performance measure that reflects these emphasis areas, the percentage of total fatal and suspected serious injury crashes that involves a given emphasis area on a particular segment is compared to the statewide average percentage of crashes involving that same emphasis area on roads with similar operating environments in a process similar to how the Safety Index is developed.

The STSP emphasis areas performance is calculated using the following formula:

% Crashes Involving STSP Emphasis Area = Segment Crashes Involving STSP Emphasis Area / Total Segment Crashes

The percentage of total crashes involving STSP emphasis areas for a segment is compared to the statewide percentages on roads with similar operating environments. One standard deviation from the statewide average percentage forms the scale break points.

When assessing the performance of the STSP emphasis areas, the more the frequency of crashes involving STSP emphasis areas is below the statewide average implies better levels of segment performance. Thus, lower values are better, similar to the Safety Index.

Scoring:

The scale for rating the STSP emphasis areas performance depends on the crash history on similar statewide operating environments, as shown in the tables below:

Similar Operating Environment	Crashes at Intersections	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	11.2%	15.6%
2 or 3 or 4 Lane Divided Highway	23.4%	29.3%
4 or 5 Lane Undivided Highway	43.8%	49.5%
6 Lane Highway	57.8%	73.2%
Rural 4 Lane Freeway with Daily Volume < 25,000	0.00%	0.00%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.00%	0.00%
Urban 4 Lane Freeway	0.00%	0.00%
Urban or Rural 6 Lane Freeway	0.00%	0.00%
Urban > 6 Lane Freeway	0.00%	0.00%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Similar Operating Environment	Crashes Involving Lane Departures	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	66.9%	74.5%
2 or 3 or 4 Lane Divided Highway	56.4%	65.0%
4 or 5 Lane Undivided Highway	21.1%	32.1%
6 Lane Highway	11.7%	38.1%
Rural 4 Lane Freeway with Daily Volume < 25,000	72.8%	76.4%
Rural 4 Lane Freeway with Daily Volume > 25,000	69.0%	77.5%
Urban 4 Lane Freeway	60.6%	78.1%
Urban or Rural 6 Lane Freeway	55.7%	62.9%
Urban > 6 Lane Freeway	40.4%	43.2%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Similar Operating Environment	Crashes Involving Pedestrians	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	3.8%	7.2%
2 or 3 or 4 Lane Divided Highway	2.4%	3.6%
4 or 5 Lane Undivided Highway	8.8%	13.5%
6 Lane Highway	0.4%	11.9%
Rural 4 Lane Freeway with Daily Volume < 25,000	1.0%	3.3%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.7%	4.7%
Urban 4 Lane Freeway	0.0%	4.9%
Urban or Rural 6 Lane Freeway	4.0%	7.9%
Urban > 6 Lane Freeway	1.6%	4.7%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

The STSP emphasis area secondary safety performance measures for the Safety performance area include proportions of specific types of crashes within the total fatal and suspected serious injury crash frequencies. This more detailed categorization of fatal and suspected serious injury crashes can result in low crash frequencies (i.e., a small sample size) that translate into performance ratings that can be unstable. In some cases, a change in crash frequency of one crash (one additional crash or one less crash) could result in a change in segment performance of two levels. To avoid reliance on performance ratings where small changes in crash frequency result in large changes in performance, the following criteria were developed to identify segments with "insufficient data" for assessing performance for the STSP emphasis area secondary safety performance measures. If any of these criteria are met for a segment, that segment has "insufficient data" to reliably rate that STSP emphasis area performance:

- If the crash sample size (total fatal plus suspected serious injury crashes) for a given segment is less than five crashes over the five-year analysis period, the segment has "insufficient data" and performance ratings are unreliable. OR
- If a change in one crash results in a change in segment performance by two levels (i.e., a change from below average to above average performance or a change from above average to below average frequency), the segment has "insufficient data" and performance ratings are unreliable. OR
- If the corridor average segment crash frequency for any of the STSP emphasis area performance measures is less than two crashes over the five-year analysis period, that entire STSP emphasis area performance measure has "insufficient data" and performance ratings are unreliable.

Other Crash Unit Types: Other crash unit types of interest are:

- Truck-involved crashes
- Bicycle-involved crashes

To develop a performance measure that reflects the aforementioned crash unit types, the percentage of total fatal and suspected serious injury crashes that involves a given crash unit type on a particular segment is compared to the statewide average percentage of crashes involving that same crash unit type on roads with similar operating environments in a process similar to how the Safety Index is developed.

The crash unit type performance is calculated using the following formula:

% Crashes Involving Crash Unit Type = Segment Crashes Involving Crash Unit Type / Total Segment Crashes

The percentage of total crashes involving each crash unit type for a segment is compared to the statewide percentages on roads with similar operating environments. One standard deviation from the statewide average percentage forms the scale break points.

When assessing the performance of the crash unit types, the more the frequency of crashes involving crash unit types is below the statewide average implies better levels of segment performance. Thus, lower values are better, similar to the Safety Index.

Scoring:

The scale for rating the unit-involved crash performance depends on the crash history on similar statewide operating environments, as shown in the following tables.

Similar Operating Environment	Crashes Involving Trucks	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	4.2%	8.0%
2 or 3 or 4 Lane Divided Highway	3.7%	9.9%
4 or 5 Lane Undivided Highway	0.8%	5.5%
6 Lane Highway	4.3%	7.5%
Rural 4 Lane Freeway with Daily Volume < 25,000	19.0%	22.5%
Rural 4 Lane Freeway with Daily Volume > 25,000	8.5%	18.0%
Urban 4 Lane Freeway	6.9%	12.4%
Urban or Rural 6 Lane Freeway	5.0%	12.9%
Urban > 6 Lane Freeway	1.9%	5.1%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Similar Operating Environment	Crashes Involving Bicycles	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	0.0%	3.3%
2 or 3 or 4 Lane Divided Highway	0.0%	2.2%
4 or 5 Lane Undivided Highway	0.5%	3.8%
6 Lane Highway	0.0%	7.2%
Rural 4 Lane Freeway with Daily Volume < 25,000	0.0%	0.9%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.0%	0.0%
Urban 4 Lane Freeway	0.0%	0.0%
Urban or Rural 6 Lane Freeway	0.0%	1.3%
Urban > 6 Lane Freeway	0.0%	0.0%

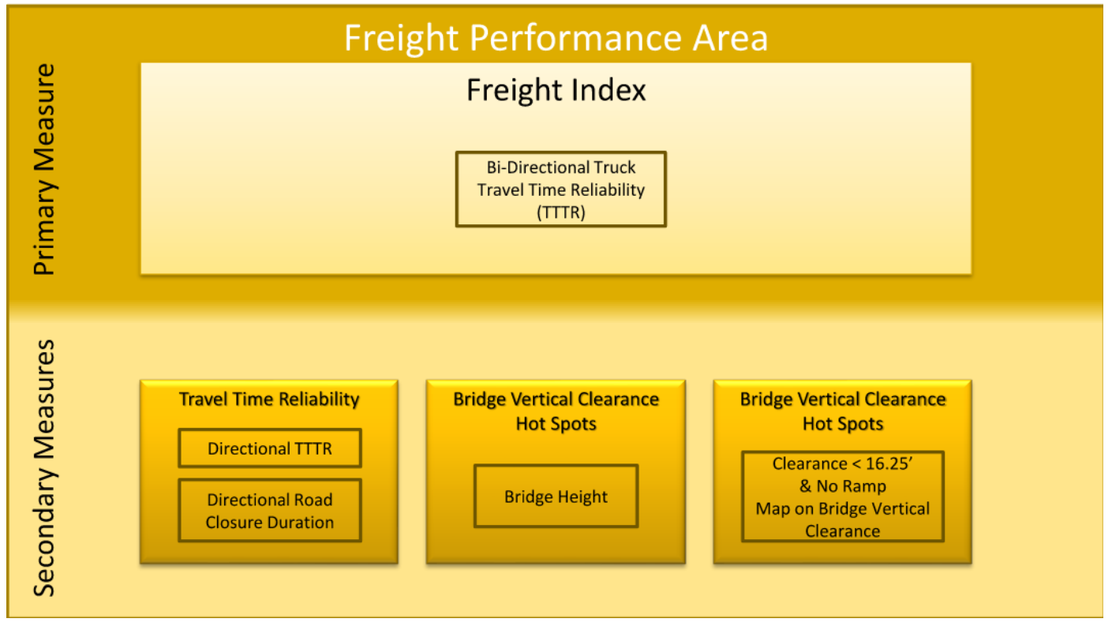
** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

The crash unit types have the same “insufficient data” criteria as the STSP emphasis areas.

Safety Hot Spots: A hot spot analysis was conducted that identified abnormally high concentrations of fatal and suspected serious injury crashes along the study corridor by direction of travel. The identification of crash concentrations involves a GIS-based function known as “kernel density analysis”. This measure is mapped for graphical display purposes with the Directional Safety Index but is not included in the Safety performance area rating calculations.

Freight Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Freight performance area as shown in the following graphic:



Primary Freight Index

The Freight Index is a reliability performance measure based on the bi-directional truck travel time reliability (TTTR) for truck travel. The industry standard definition for the Truck Travel Time Reliability (TTTR) is the ratio of the 95th percentile travel time to average (50th percentile) travel time for trucks.

Using INRIX data provided by ADOT, four time periods for each data point were collected throughout the day (AM peak, mid-day, PM peak, and off-peak).

The highest calculated value of the four time periods is defined as the TTTR for that data point. The weighted average TTTR is calculated within each segment based on the number of data points collected and the length associated with the TMC location. The value of the weighted average TTTR across each entry is used as the TTTR for each respective segment within the corridor.

For each corridor segment, the TTTR is calculated for each direction of travel and then averaged to create a bi-directional TTTR. The Freight Index is equal to the average bi-directional TTTR for the segment.

The scale for rating the Freight Index differs between uninterrupted and interrupted flow facilities.

Secondary Freight Measures

The Freight performance area includes three secondary measures that provide an in-depth evaluation of the different characteristics of freight performance:

- Travel Time Reliability
  - Directional Truck Travel Time Reliability
  - Closure Duration
- Bridge Vertical Clearance
- Bridge Vertical Clearance Hot Spots

Travel Time Reliability: Travel time reliability is a secondary measure that includes two indicators. The two indicators are the directional Truck Travel Time Reliability (TTTR) and the duration a piece of a corridor is closed for any specific reason.

Truck Travel Time Reliability: The performance measure for truck travel time reliability is directional TTTR. The industry standard definition for TTTR is the ratio of 95th percentile travel time to average (50th percentile) travel time for trucks for a given corridor segment in a specific direction.

Using INRIX data provided by ADOT, four time periods for each data point were collected throughout the day (AM peak, mid-day, PM peak, and off-peak). The highest value of the four time periods calculation is defined as the TTTR for that data point. The weighted average TTTR is calculated within each segment based on the number of data points collected and the length associated with the TMC location. The value of the weighted average TTTR across each entry is used as the TTTR for each respective segment within the corridor.

Closure Duration: This performance measure related to road closures is average roadway closure (i.e., full lane closure) duration time in minutes. There are three main components to full closures that affect reliability – frequency, duration, and extent. In the freight industry, closure duration is the most important component because trucks want to minimize travel time and delay.

Data on the frequency, duration, and extent of full roadway closures on the ADOT State Highway System is available in the HCRS database that is managed and updated by ADOT.

The average closure duration in a segment – in terms of the average time a milepost is closed per mile per year on a given segment – is calculated using the following formula:

*Closure Duration = Sum of Segment (Closure Clearance Time * Closure Extent) / Segment Length*

The segment closure duration time in minutes can then be compared to statewide averages for closure duration in minutes, with one-half standard deviation from the average forming the scale break points. The scale for rating closure duration in minutes is found at the end of this section.

Bridge Vertical Clearance: This performance measure uses the vertical clearance information from the ADOT Bridge Database to identify locations with low vertical clearance. The minimum vertical clearance for all underpass structures (i.e., structures under which mainline traffic passes) is determined for each segment.

Bridge Vertical Clearance Hot Spots: This performance measure related to truck restrictions is the locations, or hot spots, where bridge vertical clearance issues restrict truck travel. Sixteen feet three inches (16.25') is the minimum standard vertical clearance value for state highway bridges over travel lanes.

Locations with lower vertical clearance values than the minimum standard are categorized by the ADOT Intermodal Transportation Department Engineering Permits Section as either locations where ramps exist that allow the restriction to be avoided or locations where ramps do not exist and the restriction cannot be avoided. The locations with vertical clearances below the minimum standard that cannot be ramped around are considered hot spots. This measure is mapped for graphical display purposes with the bridge vertical clearance map but is not included in the Freight performance area rating calculations.

Scoring:

Performance Level	Freight Index	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	< 1.15	< 1.45
Fair	1.15 – 1.35	1.45 – 1.85
Poor	> 1.35	> 1.85

Performance Level	TTTR	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	< 1.15	< 1.45
Fair	1.15 – 1.35	1.45 – 1.85
Poor	> 1.35	> 1.85

Performance Level	Closure Duration (minutes)
Good	< 44.18
Fair	44.18 – 124.86
Poor	> 124.86

Performance Level	Bridge Vertical Clearance
Good	> 16.5'
Fair	16.0' – 16.5'
Poor	< 16.0'

Appendix C: Performance Area Data

Pavement Performance Area Data

				Direction 1 (Northbound)				Direction 2 (Southbound)				Direction 1 (Northbound)		Direction 2 (Southbound)		Composite		Pavement Index	% Pavement Failure	
				# of Lanes	IRI	Cracking	Rutting	# of Lanes	IRI	Cracking	Rutting	PSR	PDI	PSR	PDI	Dir 1 (NB/EB)	Dir 2 (SB/WB)		Dir 1 (NB/EB)	Dir 2 (SB/WB)
Segment 1		***Interstate?***	**No**																	
Milepost	312	to 313		1	91.82	3.75	0.10	1	105.54	5.83	0.13	3.53	4.29	3.35	4.01	3.76	3.55		0	0
Milepost	313	to 314		1	85.42	5.10	0.09	1	86.34	1.40	0.10	3.61	4.12	3.60	4.64	3.77	3.91		0	0
Milepost	314	to 315		1	70.03	2.55	0.08	1	72.61	0.36	0.10	3.83	4.47	3.79	4.86	4.02	4.11		0	0
Milepost	315	to 316		1	74.80	3.64	0.09	1	80.22	0.36	0.08	3.76	4.31	3.69	4.87	3.93	4.04		0	0
Milepost	316	to 317		1	65.04	1.64	0.13	1	64.34	2.36	0.12	3.91	4.59	3.92	4.48	4.11	4.08		0	0
Milepost	317	to 318		1	86.66	0.25	0.11	1	92.07	1.17	0.11	3.60	4.88	3.52	4.68	3.98	3.87		0	0
Milepost	318	to 319		1	102.59	0.60	0.10	1	103.82	0.70	0.13	3.39	4.80	3.37	4.76	3.81	3.79		0	0
		Total		7				7												58
		Weighted Average										3.66	4.49	3.61	4.61	3.91	3.91			
		Factor										1.00		1.00						
		Indicator Score										3.66		3.61						**0.0%**
		Pavement Index																3.91		
Segment 2		***Interstate?***	**No**																	
Milepost	319	to 320		1	102.17	2.90	0.11	1	102.23	5.90	0.17	3.39	4.40	3.39	3.98	3.69	3.57		0	0
Milepost	320	to 321		1	66.26	4.91	0.21	1	62.25	8.82	0.19	3.89	4.05	3.95	3.64	4.00	3.73		0	0
Milepost	321	to 322		2	68.88	12.91	0.22	1	59.11	1.00	0.14	3.85	3.23	3.99	4.68	3.42	4.20		2	0
Milepost	322	to 323		2	64.55	10.40	0.12	2	43.55	0.00	0.17	3.91	3.54	4.24	4.76	3.65	4.60		2	0
		Total		6				5												38
		Weighted Average										3.80	3.67	3.96	4.36	3.64	4.14			
		Factor										1.00		1.00						
		Indicator Score										3.80		3.96						**36.4%**
		Pavement Index																3.87		
Segment 3		***Interstate?***	**No**																	
Milepost	323	to 324		1	125.24	8.90	0.17	1	114.69	0.00	0.17	3.11	3.66	3.23	4.76	3.27	3.69		0	0
Milepost	324	to 325		1	141.73	8.09	0.17	1	138.26	0.00	0.15	2.92	3.74	2.96	4.80	3.16	3.51		0	0
Milepost	325	to 326		1	158.23	2.18	0.17	1	114.63	0.00	0.14	2.74	4.46	3.23	4.82	2.74	3.71		1	0
Milepost	326	to 327		1	141.46	3.62	0.15	1	118.65	0.00	0.12	2.92	4.28	3.19	4.85	3.33	3.69		0	0
Milepost	327	to 328		1	127.99	5.91	0.14	1	107.67	0.00	0.10	3.07	4.00	3.32	4.88	3.35	3.79		0	0
Milepost	328	to 329		1	144.19	5.73	0.15	1	128.71	0.00	0.11	2.89	4.02	3.07	4.87	2.89	3.61		1	0
Milepost	329	to 330		1	150.78	5.27	0.14	1	138.58	0.00	0.15	2.82	4.07	2.95	4.80	2.82	3.51		1	0
Milepost	330	to 331		1	146.32	5.00	0.14	1	152.90	0.00	0.16	2.87	4.10	2.80	4.77	2.87	2.80		1	1
Milepost	331	to 332		1	106.84	23.36	0.19	1	111.27	0.00	0.17	3.33	2.41	3.28	4.75	2.41	3.72		1	0
Milepost	332	to 333		1	105.61	42.82	0.22	1	103.65	0.00	0.18	3.35	1.08	3.37	4.75	1.08	3.79		1	0
Milepost	333	to 334		1	110.65	33.09	0.21	1	110.92	0.00	0.16	3.28	1.70	3.28	4.78	1.70	3.73		1	0

Milepost	334	to	335	1	122.49	39.00	0.23	1	114.55	0.00	0.15	3.14	1.31	3.24	4.80	1.31	3.71		1	0
Milepost	335	to	336	1	104.49	33.17	0.27	1	102.12	0.00	0.13	3.36	1.64	3.39	4.84	1.64	3.83		1	0
Milepost	336	to	337	1	101.01	37.36	0.32	1	102.51	0.00	0.07	3.41	1.31	3.39	4.92	1.31	3.85		1	0
Milepost	337	to	338	1	90.36	42.09	0.27	1	95.09	0.00	0.11	3.55	1.08	3.48	4.86	1.08	3.90		1	0
Milepost	338	to	339	1	92.54	45.18	0.30	1	94.13	0.00	0.13	3.52	0.85	3.50	4.83	0.85	3.90		1	0
Milepost	339	to	340	1	93.57	45.18	0.29	1	99.29	0.00	0.07	3.50	0.87	3.43	4.92	0.87	3.88		1	0
Milepost	340	to	341	1	90.43	15.82	0.27	1	98.19	45.36	0.07	3.55	2.92	3.44	0.95	3.10	0.95		1	1
Milepost	341	to	342	1	57.56	0.00	0.08	1	67.75	19.75	0.11	4.02	4.91	3.87	2.72	4.29	2.72		0	1
Milepost	342	to	343	1	46.42	0.00	0.07	1	62.78	17.64	0.12	4.19	4.92	3.94	2.89	4.41	3.21		0	1
Milepost	343	to	344	1	67.21	0.00	0.09	1	106.98	18.09	0.14	3.87	4.90	3.33	2.85	4.18	2.99		0	1
			Total	21				21												19
			Weighted Average									3.30	2.96	3.32	4.35	2.51	3.45			
			Factor									1.00		1.00						
			Indicator Score									3.30		3.32						**45.2%**
			Pavement Index															2.98		
Segment 4		***Interstate?***		**No**																
Milepost	344	to	345	1	73.86	0.00	0.09	1	90.58	19.58	0.15	3.78	4.89	3.54	2.73	4.11	2.73		0	1
Milepost	345	to	346	1	61.53	0.00	0.09	1	70.43	13.73	0.12	3.96	4.90	3.83	3.23	4.24	3.41		0	1
Milepost	346	to	347	1	72.06	0.00	0.10	1	77.18	0.00	0.12	3.80	4.88	3.73	4.85	4.13	4.06		0	0
Milepost	347	to	348	1	52.17	0.00	0.09	1	53.47	0.00	0.11	4.10	4.90	4.08	4.86	4.34	4.31		0	0
Milepost	348	to	349	1	62.59	0.00	0.09	1	56.88	0.00	0.09	3.94	4.90	4.03	4.90	4.23	4.29		0	0
Milepost	349	to	350	1	69.87	0.00	0.10	1	79.30	0.00	0.14	3.83	4.88	3.70	4.82	4.15	4.04		0	0
Milepost	350	to	351	1	71.72	0.00	0.12	1	66.33	0.00	0.16	3.81	4.84	3.89	4.78	4.12	4.15		0	0
Milepost	351	to	352	1	75.34	0.00	0.21	2	50.46	0.00	0.16	3.76	4.68	4.13	4.79	4.03	4.59		0	0
Milepost	352	to	353	1	60.77	0.00	0.09	1	57.55	0.00	0.13	3.97	4.90	4.02	4.82	4.25	4.26		0	0
Milepost	353	to	354	1	58.92	0.00	0.08	1	54.00	0.00	0.14	4.00	4.91	4.07	4.81	4.27	4.29		0	0
Milepost	354	to	355	1	62.73	0.00	0.11	1	49.84	0.00	0.14	3.94	4.87	4.14	4.82	4.22	4.34		0	0
Milepost	355	to	356	1	66.87	0.00	0.12	1	67.05	0.00	0.13	3.88	4.84	3.88	4.83	4.17	4.16		0	0
Milepost	356	to	357	1	60.47	0.00	0.14	2	74.30	0.00	0.21	3.97	4.81	3.77	4.68	4.22	4.04		0	0
Milepost	357	to	358	1	62.80	0.00	0.12	1	64.87	0.00	0.14	3.94	4.85	3.91	4.82	4.21	4.18		0	0
Milepost	358	to	359	1	52.36	0.91	0.09	1	48.13	0.00	0.10	4.10	4.74	4.16	4.88	4.55	4.38		0	0
Milepost	359	to	360	1	48.13	7.50	0.12	1	42.17	0.00	0.11	4.16	3.83	4.26	4.86	3.93	4.68		0	0
Milepost	360	to	361	1	48.59	6.18	0.10	1	52.93	0.00	0.10	4.16	3.99	4.09	4.88	4.04	4.33		0	0
Milepost	361	to	362	1	51.62	3.18	0.11	1	45.56	0.36	0.13	4.11	4.36	4.21	4.83	4.29	4.64		0	0
			Total	18				20												2
			Weighted Average									3.96	4.72	3.97	4.63	4.19	4.18			
			Factor									1.00		1.00						
			Indicator Score									3.96		3.97						**5.3%**
			Pavement Index															4.18		
Segment 5		***Interstate?***		**No**																

Milepost	362	to	363	1	38.03	4.80	0.14	1	39.82	3.45	0.10	4.33	4.13	4.30	4.33	4.19	4.32		0	0
Milepost	363	to	364	1	45.98	5.18	0.13	1	49.61	1.91	0.10	4.20	4.09	4.14	4.56	4.12	4.44		0	0
Milepost	364	to	365	1	45.33	2.18	0.12	1	45.44	0.18	0.09	4.21	4.50	4.21	4.91	4.41	4.70		0	0
Milepost	365	to	366	1	39.43	7.82	0.13	1	42.60	0.00	0.09	4.30	3.79	4.25	4.90	3.95	4.70		0	0
Milepost	366	to	367	1	38.46	4.70	0.15	1	38.66	0.30	0.10	4.32	4.14	4.32	4.88	4.19	4.71		0	0
Milepost	367	to	368	1	42.35	6.50	0.12	1	45.87	1.50	0.11	4.26	3.94	4.20	4.62	4.04	4.50		0	0
Milepost	368	to	369	1	60.83	11.55	0.11	1	61.71	0.91	0.10	3.97	3.43	3.95	4.74	3.59	4.19		1	0
Milepost	369	to	370	1	62.87	10.91	0.11	1	57.96	3.55	0.11	3.94	3.49	4.01	4.31	3.63	4.22		1	0
Milepost	370	to	371	1	62.64	13.80	0.12	1	52.66	1.30	0.09	3.94	3.22	4.09	4.67	3.44	4.50		1	0
Milepost	371	to	372	1	48.76	6.75	0.11	1	45.01	6.92	0.10	4.15	3.92	4.21	3.91	3.99	4.00		0	0
Milepost	372	to	373	1	74.09	9.18	0.14	1	89.59	25.36	0.19	3.77	3.65	3.56	2.26	3.69	2.26		0	1
Milepost	373	to	374	1	103.27	12.64	0.10	1	122.27	16.82	0.21	3.38	3.33	3.14	2.90	3.34	2.97		1	1
			Total	12				12												6
			Weighted Average									4.06	3.80	4.03	4.25	3.88	4.12			
			Factor									1.00		1.00						
			Indicator Score									4.06		4.03						**25.0%**
			Pavement Index															4.00		
Segment 6		***Interstate?***		**No**																
Milepost	374	to	375	1	124.33	24.00	0.14	1	122.62	12.36	0.17	3.12	2.39	3.14	3.32	2.39	3.19		1	1
Milepost	375	to	376	2	86.63	19.45	0.25	2	77.37	13.00	0.20	3.60	2.65	3.73	3.24	2.65	3.39		2	2
Milepost	376	to	377	2	69.16	14.00	0.22	2	70.10	18.73	0.23	3.84	3.13	3.83	2.73	3.35	2.73		2	2
Milepost	377	to	378	1	143.54	21.09	0.17	1	149.18	29.00	0.22	2.90	2.60	2.84	1.98	2.60	1.98		1	1
Milepost	378	to	379	1	127.05	35.09	0.12	1	146.98	23.00	0.18	3.09	1.62	2.86	2.44	1.62	2.44		1	1
Milepost	379	to	380	1	126.64	11.64	0.13	1	147.04	13.55	0.14	3.09	3.41	2.86	3.23	3.19	2.86		1	1
Milepost	380	to	381	1	151.22	20.36	0.12	1	140.29	24.91	0.17	2.81	2.67	2.93	2.31	2.81	2.31		1	1
Milepost	381	to	382	1	119.43	22.80	0.10	1	175.90	30.90	0.25	3.18	2.49	2.56	1.82	2.49	1.82		1	1
Milepost	382	to	383	1	126.74	16.92	0.12	1	153.38	26.83	0.18	3.09	2.95	2.79	2.16	2.99	2.16		1	1
Milepost	383	to	384	1	145.96	23.27	0.12	1	139.14	20.82	0.19	2.87	2.45	2.95	2.60	2.45	2.60		1	1
Milepost	384	to	385	1	197.67	22.09	0.14	1	152.67	30.64	0.22	2.36	2.53	2.80	1.87	2.36	1.87		1	1
Milepost	385	to	386	1	114.40	15.09	0.12	1	149.86	29.00	0.22	3.24	3.11	2.83	1.98	3.15	1.98		1	1
Milepost	386	to	387	1	119.50	17.64	0.13	1	130.02	32.55	0.21	3.18	2.89	3.05	1.75	2.97	1.75		1	1
Milepost	387	to	388	1	135.33	22.18	0.14	1	127.08	44.18	0.20	2.99	2.53	3.08	1.01	2.53	1.01		1	1
Milepost	388	to	389	1	129.87	28.27	0.15	1	118.46	27.91	0.17	3.05	2.08	3.19	2.09	2.08	2.09		1	1
Milepost	389	to	390	1	83.53	12.18	0.12	1	69.85	12.27	0.14	3.64	3.37	3.83	3.35	3.45	3.50		1	1
Milepost	390	to	391	1	62.39	2.27	0.12	1	60.11	3.55	0.10	3.94	4.49	3.98	4.32	4.32	4.21		0	0
			Total	19				19												36
			Weighted Average									3.23	2.80	3.20	2.54	2.81	2.53			
			Factor									1.00		1.00						
			Indicator Score									3.23		3.20						**94.7%**
			Pavement Index															2.67		

Segment 7		***Interstate?***	**No**																
Milepost	391	to 392	1	54.67	6.00	0.12	1	57.15	1.70	0.11	4.06	4.00	4.02	4.59	4.02	4.42		0	0
Milepost	392	to 393	1	58.26	1.75	0.10	1	53.49	2.00	0.10	4.01	4.58	4.08	4.55	4.41	4.41		0	0
Milepost	393	to 394	2	72.59	1.20	0.15	2	82.10	4.90	0.13	3.79	4.64	3.66	4.12	4.05	3.80		0	0
Milepost	394	to 395	1	65.82	3.25	0.15	1	58.36	3.83	0.15	3.89	4.32	4.01	4.25	4.20	4.17		0	0
		Total	5				5												0
		Weighted Average									3.91	4.44	3.89	4.33	4.14	4.12			
		Factor									1.00		1.00						
		Indicator Score									3.91		3.89						**0.0%**
		Pavement Index															4.13		
Segment 8		***Interstate?***	**No**																
Milepost	395	to 396	1	65.47	0.55	0.12	1	58.27	0.55	0.11	3.90	4.80	4.01	4.80	4.17	4.25		0	0
Milepost	396	to 397	1	64.30	0.09	0.13	1	55.24	7.73	0.11	3.92	4.90	4.05	3.81	4.21	3.89		0	0
Milepost	397	to 398	1	48.37	0.45	0.12	1	50.14	3.36	0.11	4.16	4.82	4.13	4.34	4.62	4.28		0	0
Milepost	398	to 399	1	55.12	0.45	0.11	1	64.36	1.73	0.11	4.06	4.83	3.92	4.58	4.29	4.11		0	0
Milepost	399	to 400	1	61.62	1.27	0.12	1	66.83	2.36	0.11	3.96	4.66	3.88	4.48	4.17	4.06		0	0
Milepost	400	to 401	1	82.99	0.73	0.13	1	82.14	2.00	0.12	3.65	4.75	3.66	4.53	3.98	3.92		0	0
Milepost	401	to 402	1	76.75	3.00	0.14	1	53.64	3.36	0.13	3.74	4.37	4.08	4.32	3.93	4.25		0	0
Milepost	402	to 403	1	68.46	17.36	0.23	1	66.12	16.73	0.14	3.85	2.84	3.89	2.96	3.15	3.24		1	1
Milepost	403	to 404	1	70.67	17.20	0.20	1	84.09	18.70	0.15	3.82	2.88	3.63	2.80	3.16	3.05		1	1
Milepost	404	to 405	1	77.28	18.58	0.24	1	72.87	16.17	0.14	3.73	2.73	3.79	3.01	2.73	3.24		1	1
Milepost	405	to 406	1	85.37	12.82	0.21	1	89.71	14.45	0.18	3.61	3.25	3.56	3.13	3.36	3.26		1	1
Milepost	406	to 407	1	85.96	12.73	0.18	1	99.01	12.82	0.16	3.61	3.28	3.43	3.29	3.38	3.33		1	1
Milepost	407	to 408	1	85.50	11.18	0.21	1	97.76	7.82	0.13	3.61	3.40	3.45	3.80	3.46	3.55		1	0
Milepost	408	to 409	1	75.14	13.00	0.21	1	93.11	14.36	0.14	3.76	3.23	3.51	3.16	3.39	3.27		1	1
Milepost	409	to 410	1	86.69	3.45	0.15	1	93.64	9.64	0.16	3.60	4.29	3.50	3.59	3.81	3.56		0	0
Milepost	410	to 411	1	87.86	5.36	0.17	1	88.05	8.27	0.14	3.58	4.04	3.58	3.74	3.72	3.69		0	0
Milepost	411	to 412	1	85.24	7.27	0.18	1	109.46	10.91	0.12	3.62	3.82	3.30	3.49	3.76	3.36		0	1
Milepost	412	to 413	1	95.99	11.36	0.18	1	139.99	16.00	0.15	3.47	3.41	2.94	3.01	3.43	2.96		1	1
		Total	18				18												16
		Weighted Average									3.76	3.90	3.68	3.71	3.70	3.63			
		Factor									1.00		1.00						
		Indicator Score									3.76		3.68						**44.4%**
		Pavement Index															3.67		
Segment 9		***Interstate?***	**No**																
Milepost	413	to 414	1	78.45	4.36	0.20	1	121.46	12.00	0.14	3.71	4.13	3.15	3.38	3.84	3.22		0	1
Milepost	414	to 415	1	88.66	6.27	0.16	1	89.17	0.82	0.18	3.57	3.94	3.56	4.68	3.68	3.90		0	0
Milepost	415	to 416	1	127.59	8.73	0.15	1	124.77	5.00	0.20	3.08	3.69	3.11	4.06	3.26	3.40		0	0
Milepost	416	to 417	1	116.01	29.18	0.19	1	125.73	27.45	0.20	3.22	1.99	3.10	2.10	1.99	2.10		1	1
Milepost	417	to 418	1	149.70	23.55	0.18	1	101.56	14.82	0.17	2.83	2.40	3.40	3.10	2.40	3.19		1	1

Milepost	418	to	419	1	125.57	23.64	0.15	1	97.83	18.00	0.22	3.10	2.41	3.45	2.79	2.41	2.99		1	1
Milepost	419	to	420	1	100.81	20.09	0.16	1	87.61	20.18	0.22	3.41	2.68	3.58	2.62	2.68	2.62		1	1
Milepost	420	to	421	1	136.52	31.73	0.19	1	107.83	36.27	0.28	2.98	1.81	3.32	1.43	1.81	1.43		1	1
Milepost	421	to	422	1	116.33	33.64	0.22	1	100.84	33.00	0.24	3.21	1.67	3.41	1.68	1.67	1.68		1	1
Milepost	422	to	423	1	116.98	31.36	0.27	1	111.47	48.73	0.26	3.21	1.77	3.27	0.69	1.77	0.69		1	1
Milepost	423	to	424	1	151.34	21.09	0.34	1	152.57	29.36	0.24	2.81	2.41	2.80	1.93	2.41	1.93		1	1
Milepost	424	to	425	1	229.25	13.73	0.16	1	239.42	16.00	0.18	2.09	3.20	2.01	3.00	2.09	2.01		1	1
Milepost	425	to	426	1	178.34	15.82	0.18	1	178.73	15.82	0.20	2.54	3.01	2.54	2.99	2.54	2.54		1	1
Milepost	426	to	427	1	165.96	17.64	0.14	1	163.98	15.45	0.22	2.66	2.88	2.68	3.00	2.66	2.68		1	1
Milepost	427	to	428	1	167.47	17.00	0.13	1	173.01	20.00	0.19	2.65	2.94	2.59	2.67	2.65	2.59		1	1
Milepost	428	to	429	1	134.05	10.75	0.14	1	169.60	15.24	0.16	3.00	3.49	2.62	3.07	3.15	2.62		1	1
Milepost	429	to	430	1	64.15	0.00	0.11	1	78.24	0.00	0.15	3.92	4.86	3.71	4.79	4.20	4.04		0	0
Milepost	430	to	431	1	148.26	3.40	0.15	1	143.07	5.90	0.16	2.85	4.30	2.90	3.99	2.85	3.23		1	1
Milepost	431	to	432	1	121.59	1.64	0.12	1	112.04	4.70	0.15	3.15	4.59	3.27	4.13	3.58	3.53		0	0
Milepost	432	to	433	1	163.96	3.27	0.15	1	135.44	3.18	0.17	2.68	4.32	2.99	4.31	2.68	3.39		1	0
Milepost	433	to	434	1	194.30	2.73	0.18	1	173.04	4.45	0.20	2.39	4.36	2.59	4.12	2.39	2.59		1	1
			Total	21				21												32
			Weighted Average									3.00	3.18	3.05	3.07	2.70	2.68			
			Factor									1.00		1.00						
			Indicator Score									3.00		3.05						**76.2%**
			Pavement Index															2.69		
Segment 10		***Interstate?***		**No**																
Milepost	434	to	435	1	153.59	1.18	0.17	1	160.71	3.82	0.18	2.79	4.62	2.71	4.22	2.79	2.71		1	1
Milepost	435	to	436	1	107.02	15.91	0.22	1	111.44	22.27	0.24	3.33	2.97	3.27	2.45	3.08	2.45		1	1
Milepost	436	to	437	1	74.89	18.82	0.24	1	94.73	21.09	0.27	3.76	2.72	3.49	2.50	2.72	2.50		1	1
Milepost	437	to	438	1	75.93	20.55	0.23	1	101.97	18.36	0.24	3.75	2.59	3.39	2.75	2.59	2.75		1	1
Milepost	438	to	439	1	81.81	22.55	0.30	1	112.71	17.82	0.30	3.66	2.36	3.26	2.72	2.36	2.72		1	1
Milepost	439	to	440	1	71.24	20.64	0.24	1	105.10	17.18	0.31	3.81	2.57	3.35	2.76	2.57	2.94		1	1
Milepost	440	to	441	1	65.94	26.09	0.21	1	63.60	17.09	0.24	3.89	2.19	3.93	2.85	2.19	3.17		1	1
Milepost	441	to	442	1	70.78	18.27	0.17	1	73.07	26.00	0.24	3.82	2.81	3.79	2.17	3.12	2.17		1	1
Milepost	442	to	443	1	68.27	0.00	0.18	1	90.13	42.45	0.26	3.86	4.75	3.55	1.07	4.13	1.07		0	1
Milepost	443	to	444	1	71.34	0.00	0.24	1	70.41	30.91	0.24	3.81	4.62	3.83	1.82	4.05	1.82		0	1
Milepost	444	to	445	1	81.28	0.00	0.23	1	74.90	34.83	0.26	3.67	4.64	3.76	1.55	3.96	1.55		0	1
Milepost	445	to	446	1	85.64	0.00	0.20	1	67.65	21.90	0.24	3.61	4.71	3.87	2.47	3.94	2.47		0	1
Milepost	446	to	447	1	92.21	0.00	0.18	1	80.96	31.58	0.23	3.52	4.74	3.68	1.80	3.89	1.80		0	1
Milepost	447	to	448	1	99.19	0.00	0.12	1	85.53	15.00	0.23	3.43	4.85	3.61	3.03	3.86	3.21		0	1
Milepost	448	to	449	1	117.79	0.00	0.18	1	75.83	13.73	0.17	3.20	4.73	3.75	3.20	3.66	3.36		0	1
Milepost	449	to	450	1	128.20	0.00	0.21	1	90.25	12.58	0.19	3.07	4.68	3.55	3.28	3.55	3.36		0	1
Milepost	450	to	451	1	125.24	0.00	0.21	1	106.84	31.64	0.30	3.11	4.69	3.33	1.72	3.58	1.72		0	1
			Total	17				17												25

			Weighted Average										3.54	3.84	3.54	2.49	3.30	2.46		
			Factor										1.00		1.00					
			Indicator Score										3.54		3.54					**73.5%**
			Pavement Index																2.88	
Segment 11		***Interstate?***		**No**																
Milepost	451	to	452	1	103.90	0.00	0.15	1	113.51	36.91	0.31	3.37	4.79	3.25	1.35	3.80	1.35		0	1
Milepost	452	to	453	1	70.16	0.00	0.16	1	64.92	7.00	0.12	3.83	4.78	3.91	3.89	4.11	3.89		0	0
Milepost	453	to	454	1	46.85	0.00	0.13	1	43.17	1.82	0.12	4.18	4.84	4.24	4.56	4.64	4.47		0	0
Milepost	454	to	455	1	45.27	0.00	0.10	1	41.09	3.91	0.13	4.21	4.88	4.28	4.25	4.68	4.26		0	0
Milepost	455	to	456	1	44.70	0.00	0.11	1	52.69	5.64	0.13	4.22	4.87	4.09	4.04	4.67	4.05		0	0
Milepost	456	to	457	1	50.28	0.00	0.11	1	46.08	1.00	0.13	4.13	4.86	4.20	4.70	4.35	4.55		0	0
Milepost	457	to	458	1	43.85	0.00	0.13	1	43.42	3.82	0.16	4.23	4.84	4.24	4.24	4.66	4.24		0	0
Milepost	458	to	459	1	50.84	5.73	0.12	1	46.31	2.82	0.13	4.12	4.03	4.19	4.40	4.06	4.34		0	0
Milepost	459	to	460	1	56.01	0.91	0.12	1	53.64	2.64	0.14	4.04	4.73	4.08	4.42	4.25	4.32		0	0
Milepost	460	to	461	1	59.26	2.64	0.12	1	56.40	2.55	0.13	3.99	4.43	4.04	4.44	4.30	4.32		0	0
Milepost	461	to	462	1	54.39	2.82	0.13	1	52.35	7.00	0.13	4.07	4.40	4.10	3.88	4.30	3.95		0	0
Milepost	462	to	463	1	54.91	3.36	0.14	1	48.41	3.36	0.12	4.06	4.31	4.16	4.33	4.24	4.28		0	0
			Total	12				12												1
			Weighted Average									4.04	4.65	4.06	4.04	4.34	4.00			
			Factor									1.00		1.00						
			Indicator Score									4.04		4.06						**4.2%**
			Pavement Index															4.17		

Segment 12		***Interstate?***		**No**																
Milepost	463	to	464	1	76.39	8.82	0.18	1	58.72	1.82	0.13	3.74	3.66	4.00	4.55	3.68	4.39		0	0
Milepost	464	to	465	1	73.64	6.91	0.17	1	61.53	8.36	0.16	3.78	3.86	3.96	3.71	3.84	3.79		0	0
Milepost	465	to	466	1	74.41	8.45	0.17	1	84.85	8.27	0.18	3.77	3.70	3.62	3.71	3.72	3.69		0	0
Milepost	466	to	467	1	55.22	7.09	0.15	1	57.83	0.73	0.16	4.05	3.86	4.01	4.72	3.92	4.23		0	0
Milepost	467	to	468	1	50.75	3.73	0.16	1	47.71	1.73	0.18	4.12	4.26	4.17	4.51	4.22	4.41		0	0
Milepost	468	to	469	1	55.58	6.09	0.16	1	51.87	5.73	0.19	4.05	3.96	4.11	3.98	3.99	4.02		0	0
Milepost	469	to	470	1	87.41	7.82	0.19	1	85.04	5.09	0.20	3.59	3.75	3.62	4.04	3.70	3.75		0	0
			Total	7				7												0
			Weighted Average									3.87	3.87	3.93	4.18	3.87	4.04			
			Factor									1.00		1.00						
			Indicator Score									3.87		3.93						**0.0%**
			Pavement Index															3.95		

Bridge Performance Area Data

Structure Name (A209)	Structure # (N8)	Milepost (A232)	Area (A225)	Bridge Sufficiency	Bridge Index					Functionally Obsolete Bridges	Bridge Rating	Hot Spots on Bridge Index map
				Sufficiency Rating	Deck (N58)	Sub (N59)	Super (N60)	Eval (N67)	Lowest	Deck Area on Func Obsolete		
Segment 1												
Hamblin Wash Br	531	312.20	9534	71.70	6.00	6.00	6.00	5.00	5.0	0		
Total			9,534									
Weighted Average				71.70					5.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**71.70**						**0.00%**	**5**	
Bridge Index									**5.00**			
Segment 2												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 3												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 4												
Begashbito Wash Br	1011	349.90	3300	64.30	6.00	6.00	6.00	6.00	6.0	0		
Total			3,300									
Weighted Average				64.30					6.00	0.00		
Factor				1.00					1.00	1.00		
Indicator Score				**64.30**						**0.00%**	**6**	
Bridge Index									**6.00**			
Segment 5												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 6												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 7												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 8												
Church Rock Wash Br	747	400.53	4636	85.20	6.00	6.00	7.00	6.00	6.0	0		
Total			4,636									
Weighted Average				85.20					6.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**85.20**						**0.00%**	**6**	
Bridge Index									**6.00**			
Segment 9												
Laguna Creek Bridge	20001	420.10	6833	89.50	7.00	8.00	8.00	8.00	7.0	0		
Chinle Wash Bridge	20150	429.06	10864	86.80	7.00	8.00	8.00	8.00	7.0	0		
Total			17,697									

	Weighted Average			87.84					7.00	0.00%		
	Factor			1.00					1.00	1.00		
	Indicator Score			**87.84**						**0.00%**	**7**	
	Bridge Index								**7.00**			
Segment 10												
Walker Creek Bridge	748	435.33	8126	62.70	5.00	7.00	6.00	6.00	5.0	0		
	Total		8,126									
	Weighted Average			62.70					5.00	0.00%		
	Factor			1.00					1.00	1.00		
	Indicator Score			**62.70**						**0.00%**	**5**	
	Bridge Index								**5.00**			
Segment 11												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 12												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		

Mobility Performance Area Data

Segment	Begin MP	End MP	Length (mi)	Facility Type	Flow Type	Terrain	No. of Lanes	Capacity Environment Type	Lane Width (feet)	EB/NB/EB Right Shoulder Width	WB/SB/WB Right Shoulder Width	EB/NB/EB Left Shoulder Width	WB/SB/WB Left Shoulder Width	NB/EB/EB AADT	SB/WB/WB AADT	2019 AADT	K Factor	D Factor	T Factor	Weighted Average Posted Speed Limit (mph)	Divided or Undivided	Access Points (per mile)	% No-Passing Zone	Street Parking
160-1	311	319	8	Rural	Interrupted	Rolling	2	Rural Two-Lane, Non-Signalized	12.00	5.00	5.00	N/A	N/A	3301	2700	6001	11%	55 %	9%	63	Undivided	1.5	32%	N/A
160-2	319	323	4	Rural	Interrupted	Rolling	2	Urban/Rural Single or Multilane Signalized	12.00	5.09	6.09	N/A	N/A	6296	7586	13881	8 %	55%	10%	49	Undivided	N/A	42%	N/A
160-3	323	344	21	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	5.04	6.13	N/A	N/A	2459	2270	4729	11 %	52%	11%	64	Undivided	1.7	12%	N/A
160-4	344	362	18	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	5.22	5.54	N/A	N/A	1981	1981	3961	10%	50%	13%	65	Undivided	1.6	33%	N/A
160-5	362	374	12	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	5.00	5.00	N/A	N/A	2765	2452	5217	10 %	53%	11%	65	Undivided	2.3	14%	N/A
160-6	374	391	17	Rural	Uninterrupted	Rolling	2	Rural Two-Lane, Non-Signalized	12.00	5.00	5.00	N/A	N/A	2923	2569	5492	11%	53%	11%	64	Undivided	1.9	24%	N/A
160-7	391	395	4	Rural	Interrupted	Rolling	2	Urban/Rural Single or Multilane Signalized	12.00	4.13	4.12	N/A	N/A	2253	2253	4,505	10%	50%	11%	60	Undivided	N/A	47%	N/A
160-8	395	413	18	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	4.99	4.95	N/A	N/A	1994	1385	3,379	11%	59%	11%	65	Undivided	0.4	9%	N/A
160-9	413	434	21	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	5.02	5.01	N/A	N/A	1543	1543	3,085	12%	50%	11%	65	Undivided	1.5	20%	N/A
160-10	434	451	17	Rural	Uninterrupted	Rolling	2	Rural Two-Lane, Non-Signalized	12.00	4.94	4.99	N/A	N/A	2141	1393	3534	10%	61%	14%	64	Undivided	1.3	25%	N/A
160-11	451	463	12	Rural	Uninterrupted	Rolling	2	Rural Two-Lane, Non-Signalized	12.00	5.00	5.00	N/A	N/A	2195	1346	3541	10%	62%	14%	65	Undivided	1.7	21%	N/A
160-12	463	470	7	Rural	Interrupted	Rolling	2	Rural Two-Lane, Non-Signalized	12.00	5.04	5.26	N/A	N/A	1712	1006	2718	12%	63%	14%	60	Undivided	3.6	31%	N/A

Car LOTTR and Truck TTTR - Northbound

Segment	TMC [Internal ID]	Time Period	Road Name	Direction	Miles	Cars 50th % Travel Time (seconds)	Trucks 50th % Travel Time (seconds)	Cars 80th % Travel Time (seconds)	Trucks 95th % Travel Time (seconds)	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
1	115+06556	1 AM Peak	US-160	Eastbound	4.89	291	304	320	454	1.10	1.49	1.11	1.69	99%	1.11	1.70
1	115+06556	2 Mid Day	US-160	Eastbound	4.89	288	304	315	514	1.09	1.69					
1	115+06556	3 PM Peak	US-160	Eastbound	4.89	287	303	312	419	1.09	1.39					
1	115+06556	4 Weekend	US-160	Eastbound	4.89	289	304	320	430	1.11	1.41					
1	115P05877	1 AM Peak	US-160	Eastbound	0.03	2	2	3	7	1.52	2.93	1.65	3.08	1%		
1	115P05877	2 Mid Day	US-160	Eastbound	0.03	2	3	4	8	1.65	3.08					
1	115P05877	3 PM Peak	US-160	Eastbound	0.03	3	2	4	3	1.43	1.40					
1	115P05877	4 Weekend	US-160	Eastbound	0.03	3	2	4	5	1.28	2.05					
2	115+05878	1 AM Peak	US-160	Eastbound	1.467	106	123	123	171	1.16	1.39	1.17	1.42	25%	1.11	1.31
2	115+05878	2 Mid Day	US-160	Eastbound	1.47	108	120	126	169	1.17	1.41					
2	115+05878	3 PM Peak	US-160	Eastbound	1.47	108	122	126	171	1.17	1.40					
2	115+05878	4 Weekend	US-160	Eastbound	1.47	108	120	126	170	1.17	1.42					
2	115+06557	1 AM Peak	US-160	Eastbound	3.84	220	223	233	256	1.06	1.15	1.07	1.24	66%		
2	115+06557	2 Mid Day	US-160	Eastbound	3.84	221	223	237	277	1.07	1.24					
2	115+06557	3 PM Peak	US-160	Eastbound	3.84	220	223	234	261	1.07	1.17					
2	115+06557	4 Weekend	US-160	Eastbound	3.84	220	223	234	261	1.07	1.17					
2	115+06558	1 AM Peak	US-160	Eastbound	0.523	45	51	56	73	1.24	1.42	1.27	1.50	9%		
2	115+06558	2 Mid Day	US-160	Eastbound	0.53	45	53	57	79	1.27	1.50					
2	115+06558	3 PM Peak	US-160	Eastbound	0.53	47	54	59	79	1.26	1.46					
2	115+06558	4 Weekend	US-160	Eastbound	0.53	47	52	59	76	1.25	1.47					
3	115+06560	1 AM Peak	US-160	Eastbound	14.88	824	851	874	1002	1.06	1.18	1.07	1.18	68%	1.07	1.22
3	115+06560	2 Mid Day	US-160	Eastbound	14.88	816	846	860	974	1.05	1.15					
3	115+06560	3 PM Peak	US-160	Eastbound	14.88	816	844	860	960	1.05	1.14					
3	115+06560	4 Weekend	US-160	Eastbound	14.88	820	846	874	992	1.07	1.17					
3	115+06559	1 AM Peak	US-160	Eastbound	0.80	52	55	57	65	1.10	1.18	1.11	1.24	4%		
3	115+06559	2 Mid Day	US-160	Eastbound	0.80	52	55	57	65	1.10	1.18					
3	115+06559	3 PM Peak	US-160	Eastbound	0.80	53	55	58	68	1.11	1.24					
3	115+06559	4 Weekend	US-160	Eastbound	0.80	53	55	58	68	1.10	1.24					
3	115+06561	1 AM Peak	US-160	Eastbound	5.86	324	332	343	404	1.06	1.22	1.07	1.31	27%		
3	115+06561	2 Mid Day	US-160	Eastbound	5.86	324	333	342	413	1.05	1.24					
3	115+06561	3 PM Peak	US-160	Eastbound	5.86	324	335	346	398	1.07	1.19					
3	115+06561	4 Weekend	US-160	Eastbound	5.86	324	335	346	439	1.07	1.31					
3	115+06562	1 AM Peak	US-160	Eastbound	0.33	20	22	23	28	1.11	1.28	1.13	1.28	2%		
3	115+06562	2 Mid Day	US-160	Eastbound	0.33	20	21	22	26	1.11	1.22					
3	115+06562	3 PM Peak	US-160	Eastbound	0.33	20	22	23	26	1.11	1.20					
3	115+06562	4 Weekend	US-160	Eastbound	0.33	20	21	23	27	1.13	1.24					

Segment	TMC [Internal ID]	Time Period	Road Name	Direction	Miles	Cars 50th % Travel Time (seconds)	Trucks 50th % Travel Time (seconds)	Cars 80th % Travel Time (seconds)	Trucks 95th % Travel Time (seconds)	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
4	115+06563	1 AM Peak	US-160	Northbound	5.96	328	338	346	400	1.06	1.18	1.06	1.18	28%	1.06	1.17
4	115+06563	2 Mid Day	US-160	Northbound	5.96	326	336	345	390	1.06	1.16					
4	115+06563	3 PM Peak	US-160	Northbound	5.96	327	338	346	387	1.06	1.14					
4	115+06563	4 Weekend	US-160	Northbound	5.96	328	335	346	390	1.06	1.16					
4	115+06564	1 AM Peak	US-160	Eastbound	8.73	476	487	499	551	1.05	1.13	1.06	1.17	40%		
4	115+06564	2 Mid Day	US-160	Eastbound	8.73	472	486	492	551	1.04	1.13					
4	115+06564	3 PM Peak	US-160	Eastbound	8.73	473	487	499	545	1.06	1.12					
4	115+06564	4 Weekend	US-160	Eastbound	8.73	476	484	499	567	1.05	1.17					
4	115-05879	1 AM Peak	US-160	Westbound	6.91	366	383	383	432	1.05	1.13	1.05	1.15	32%		
4	115-05879	2 Mid Day	US-160	Westbound	6.91	374	383	390	435	1.04	1.14					
4	115-05879	3 PM Peak	US-160	Westbound	6.91	377	383	395	440	1.05	1.15					
4	115-05879	4 Weekend	US-160	Westbound	6.91	372	383	392	429	1.05	1.12					
5	115+06565	1 AM Peak	US-160	Eastbound	6.91	377	389	398	478	1.06	1.23	1.06	1.23	55%	1.06	1.20
5	115+06565	2 Mid Day	US-160	Eastbound	6.91	377	389	395	460	1.05	1.19					
5	115+06565	3 PM Peak	US-160	Eastbound	6.91	377	389	398	444	1.06	1.14					
5	115+06565	4 Weekend	US-160	Eastbound	6.91	377	389	398	452	1.06	1.16					
5	115+06566	1 AM Peak	US-160	Eastbound	5.76	319	327	334	380	1.05	1.17	1.07	1.17	45%		
5	115+06566	2 Mid Day	US-160	Eastbound	5.76	319	329	336	377	1.05	1.15					
5	115+06566	3 PM Peak	US-160	Eastbound	5.76	319	329	337	384	1.06	1.17					
5	115+06566	4 Weekend	US-160	Eastbound	5.76	319	329	340	379	1.07	1.15					
6	115+06567	1 AM Peak	US-160	Northbound	7.41	411	424	434	496	1.06	1.17	1.06	1.21	72%	1.07	1.22
6	115+06567	2 Mid Day	US-160	Northbound	7.41	407	417	429	506	1.05	1.21					
6	115+06567	3 PM Peak	US-160	Northbound	7.41	405	420	429	504	1.06	1.20					
6	115+06567	4 Weekend	US-160	Northbound	7.41	407	419	430	496	1.06	1.18					
6	115+06568	1 AM Peak	US-160	Eastbound	2.93	165	170	176	207	1.07	1.22	1.08	1.24	28%		
6	115+06568	2 Mid Day	US-160	Eastbound	2.93	165	170	176	203	1.06	1.19					
6	115+06568	3 PM Peak	US-160	Eastbound	2.93	165	168	176	207	1.07	1.24					
6	115+06568	4 Weekend	US-160	Eastbound	2.93	165	170	177	207	1.08	1.22					
7	115+05880	1 AM Peak	US-160	Eastbound	8.86	504	525	580	1276	1.15	2.43	1.15	2.43	100%	1.15	2.43
7	115+05880	2 Mid Day	US-160	Eastbound	8.86	506	523	561	886	1.11	1.69					
7	115+05880	3 PM Peak	US-160	Eastbound	8.86	506	523	558	886	1.10	1.69					
7	115+05880	4 Weekend	US-160	Eastbound	8.86	507	523	570	1059	1.12	2.03					
8	115+06569	1 AM Peak	US-160	Eastbound	8.34	470	507	527	772	1.12	1.52	1.12	1.52	56%	1.09	1.35
8	115+06569	2 Mid Day	US-160	Eastbound	8.34	476	500	525	750	1.10	1.50					
8	115+06569	3 PM Peak	US-160	Eastbound	8.34	476	496	525	715	1.10	1.44					
8	115+06569	4 Weekend	US-160	Eastbound	8.34	476	500	527	715	1.11	1.43					
8	115+06570	1 AM Peak	US-160	Eastbound	6.42	345	356	364	403	1.05	1.13	1.05	1.13	44%		
8	115+06570	2 Mid Day	US-160	Eastbound	6.42	345	353	361	385	1.05	1.09					

Segment	TMC [Internal ID]	Time Period	Road Name	Direction	Miles	Cars 50th % Travel Time (seconds)	Trucks 50th % Travel Time (seconds)	Cars 80th % Travel Time (seconds)	Trucks 95th % Travel Time (seconds)	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
8	115+06570	3 PM Peak	US-160	Eastbound	6.42	345	350	359	379	1.04	1.08					
8	115+06570	4 Weekend	US-160	Eastbound	6.42	345	354	361	392	1.05	1.11					
9	115+06571	1 AM Peak	US-160	Eastbound	7.19	386	398	403	446	1.04	1.12	1.05	1.12	33%	1.13	1.67
9	115+06571	2 Mid Day	US-160	Eastbound	7.19	384	398	401	432	1.05	1.08					
9	115+06571	3 PM Peak	US-160	Eastbound	7.19	386	392	402	424	1.04	1.08					
9	115+06571	4 Weekend	US-160	Eastbound	7.19	384	398	399	432	1.04	1.08					
9	115+06572	1 AM Peak	US-160	Eastbound	4.71	257	261	273	343	1.06	1.32	1.06	1.32	22%		
9	115+06572	2 Mid Day	US-160	Eastbound	4.71	257	261	269	305	1.05	1.17					
9	115+06572	3 PM Peak	US-160	Eastbound	4.71	257	261	271	292	1.06	1.12					
9	115+06572	4 Weekend	US-160	Eastbound	4.71	255	261	269	314	1.05	1.20					
9	115+06573	1 AM Peak	US-160	Eastbound	9.83	553	565	681	1264	1.23	2.24	1.23	2.24	45%		
9	115+06573	2 Mid Day	US-160	Eastbound	9.83	553	562	649	1162	1.17	2.07					
9	115+06573	3 PM Peak	US-160	Eastbound	9.83	553	553	642	1099	1.16	1.99					
9	115+06573	4 Weekend	US-160	Eastbound	9.83	550	562	626	1141	1.14	2.03					
10	115+06574	1 AM Peak	US-160	Eastbound	7.04	384	403	409	517	1.06	1.28	1.07	1.28	40%	1.07	1.25
10	115+06574	2 Mid Day	US-160	Eastbound	7.04	384	398	409	478	1.06	1.20					
10	115+06574	3 PM Peak	US-160	Eastbound	7.04	384	395	409	474	1.06	1.20					
10	115+06574	4 Weekend	US-160	Eastbound	7.04	378	397	405	497	1.07	1.25					
10	115+06575	1 AM Peak	US-160	Eastbound	5.76	324	337	347	415	1.07	1.23	1.07	1.23	33%		
10	115+06575	2 Mid Day	US-160	Eastbound	5.76	324	335	346	404	1.07	1.21					
10	115+06575	3 PM Peak	US-160	Eastbound	5.76	324	329	346	384	1.07	1.17					
10	115+06575	4 Weekend	US-160	Eastbound	5.76	322	330	343	377	1.07	1.14					
10	115+05881	1 AM Peak	US-160	Eastbound	4.73	262	266	279	321	1.07	1.21	1.07	1.21	27%		
10	115+05881	2 Mid Day	US-160	Eastbound	4.73	262	266	279	305	1.07	1.15					
10	115+05881	3 PM Peak	US-160	Eastbound	4.73	262	266	277	304	1.06	1.14					
10	115+05881	4 Weekend	US-160	Eastbound	4.73	260	266	275	307	1.06	1.16					
11	115+06576	1 AM Peak	US-160	Eastbound	8.63	478	486	509	560	1.06	1.15	1.06	1.16	100%	1.06	1.16
11	115+06576	2 Mid Day	US-160	Eastbound	8.63	478	486	507	565	1.06	1.16					
11	115+06576	3 PM Peak	US-160	Eastbound	8.63	478	482	506	555	1.06	1.15					
11	115+06576	4 Weekend	US-160	Eastbound	8.63	471	486	495	565	1.05	1.16					
12	115+05883	1 AM Peak	US-160	Eastbound	6.76	393	416	470	2306	1.20	5.55	1.24	6.02	100%	1.24	6.02
12	115+05883	2 Mid Day	US-160	Eastbound	6.76	408	449	507	2705	1.24	6.02					
12	115+05883	3 PM Peak	US-160	Eastbound	6.76	399	403	465	676	1.16	1.68					
12	115+05883	4 Weekend	US-160	Eastbound	6.76	386	396	435	716	1.12	1.81					

Car LOTTR and Truck TTTR - Southbound

Segment	TMC [Internal ID]	Time Period	Road Name	Direction	Miles	Cars 50th % Travel Time (seconds)	Trucks 50th % Travel Time (seconds)	Cars 80th % Travel Time (seconds)	Trucks 95th % Travel Time (seconds)	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
1	115-06556	1 AM Peak	US-160	Westbound	3.84	216	222	231	266	1.07	1.20	1.07	1.31	99%	1.09	1.35
1	115-06556	2 Mid Day	US-160	Westbound	3.84	222	223	237	293	1.07	1.31					
1	115-06556	3 PM Peak	US-160	Westbound	3.84	223	223	239	271	1.07	1.22					
1	115-06556	4 Weekend	US-160	Westbound	3.84	220	223	234	261	1.07	1.17					
1	115N05877	1 AM Peak	US-160	Westbound	0.03	2	3	4	11	1.74	4.11	3.33	6.40	1%		
1	115N05877	2 Mid Day	US-160	Westbound	0.03	3	3	10	17	3.10	5.00					
1	115N05877	3 PM Peak	US-160	Westbound	0.03	3	3	11	20	3.33	6.40					
1	115N05877	4 Weekend	US-160	Westbound	0.03	3	3	10	17	3.00	6.00					
2	115-05878	1 AM Peak	US-160	Westbound	0.53	41	51	52	70	1.26	1.37	1.26	1.50	19%	1.16	1.46
2	115-05878	2 Mid Day	US-160	Westbound	0.53	46	53	58	79	1.26	1.50					
2	115-05878	3 PM Peak	US-160	Westbound	0.53	48	54	61	79	1.26	1.46					
2	115-05878	4 Weekend	US-160	Westbound	0.53	47	53	57	73	1.21	1.38					
2	115-06557	1 AM Peak	US-160	Westbound	1.47	100	115	115	172	1.15	1.49	1.15	1.60	53%		
2	115-06557	2 Mid Day	US-160	Westbound	1.47	106	115	118	160	1.12	1.39					
2	115-06557	3 PM Peak	US-160	Westbound	1.47	108	115	123	183	1.14	1.60					
2	115-06557	4 Weekend	US-160	Westbound	1.47	106	114	120	171	1.14	1.49					
2	115-06558	1 AM Peak	US-160	Westbound	0.80	49	52	55	60	1.12	1.15	1.12	1.20	28%		
2	115-06558	2 Mid Day	US-160	Westbound	0.80	51	52	57	62	1.12	1.20					
2	115-06558	3 PM Peak	US-160	Westbound	0.80	52	53	58	62	1.12	1.17					
2	115-06558	4 Weekend	US-160	Westbound	0.80	50	52	55	61	1.10	1.17					
3	115-06560	1 AM Peak	US-160	Westbound	5.86	315	340	337	437	1.07	1.29	1.07	1.29	22%	1.06	1.24
3	115-06560	2 Mid Day	US-160	Westbound	5.86	324	335	345	402	1.06	1.20					
3	115-06560	3 PM Peak	US-160	Westbound	5.86	329	337	351	430	1.07	1.27					
3	115-06560	4 Weekend	US-160	Westbound	5.86	324	338	346	421	1.07	1.25					
3	115-06559	1 AM Peak	US-160	Westbound	14.88	792	818	829	893	1.05	1.09	1.05	1.16	55%		
3	115-06559	2 Mid Day	US-160	Westbound	14.88	812	824	851	940	1.05	1.14					
3	115-06559	3 PM Peak	US-160	Westbound	14.88	820	824	857	957	1.05	1.16					
3	115-06559	4 Weekend	US-160	Westbound	14.88	807	824	846	908	1.05	1.10					
3	115-06561	1 AM Peak	US-160	Westbound	0.33	20	23	22	32	1.13	1.37	1.18	1.41	1%		
3	115-06561	2 Mid Day	US-160	Westbound	0.33	21	23	24	30	1.13	1.30					
3	115-06561	3 PM Peak	US-160	Westbound	0.33	21	23	25	32	1.18	1.41					
3	115-06561	4 Weekend	US-160	Westbound	0.33	21	24	24	32	1.16	1.34					
3	115-06562	1 AM Peak	US-160	Southbound	5.96	318	335	336	453	1.06	1.35	1.06	1.36	22%		
3	115-06562	2 Mid Day	US-160	Southbound	5.96	325	335	345	413	1.06	1.23					
3	115-06562	3 PM Peak	US-160	Southbound	5.96	328	335	346	416	1.06	1.24					
3	115-06562	4 Weekend	US-160	Southbound	5.96	324	336	344	457	1.06	1.36					

Segment	TMC [Internal ID]	Time Period	Road Name	Direction	Miles	Cars 50th % Travel Time (seconds)	Trucks 50th % Travel Time (seconds)	Cars 80th % Travel Time (seconds)	Trucks 95th % Travel Time (seconds)	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
4	115-06563	1 AM Peak	US-160	Westbound	8.73	459	477	484	515	1.05	1.08	1.05	1.13	47%	1.05	1.26
4	115-06563	2 Mid Day	US-160	Westbound	8.73	469	479	487	533	1.04	1.11					
4	115-06563	3 PM Peak	US-160	Westbound	8.73	473	484	491	547	1.04	1.13					
4	115-06563	4 Weekend	US-160	Westbound	8.73	465	477	487	529	1.05	1.11					
4	115-06564	1 AM Peak	US-160	Westbound	2.78	149	154	158	205	1.06	1.33	1.06	1.90	15%		
4	115-06564	2 Mid Day	US-160	Westbound	2.78	152	156	162	298	1.06	1.90					
4	115-06564	3 PM Peak	US-160	Westbound	2.78	154	156	162	200	1.05	1.28					
4	115-06564	4 Weekend	US-160	Westbound	2.78	152	155	159	185	1.05	1.19					
4	115-05879	1 AM Peak	US-160	Westbound	6.91	366	383	383	432	1.05	1.13	1.05	1.15	37%		
4	115-05879	2 Mid Day	US-160	Westbound	6.91	374	383	390	435	1.04	1.14					
4	115-05879	3 PM Peak	US-160	Westbound	6.91	377	383	395	440	1.05	1.15					
4	115-05879	4 Weekend	US-160	Westbound	6.91	372	383	392	429	1.05	1.12					
5	115-06565	1 AM Peak	US-160	Westbound	5.76	306	322	324	375	1.06	1.16	1.06	1.21	44%	1.06	1.23
5	115-06565	2 Mid Day	US-160	Westbound	5.76	313	321	329	370	1.05	1.15					
5	115-06565	3 PM Peak	US-160	Westbound	5.76	314	322	332	389	1.06	1.21					
5	115-06565	4 Weekend	US-160	Westbound	5.76	314	324	329	366	1.05	1.13					
5	115-06566	1 AM Peak	US-160	Southbound	7.41	411	430	437	519	1.06	1.21	1.07	1.24	56%		
5	115-06566	2 Mid Day	US-160	Southbound	7.41	417	430	444	507	1.06	1.18					
5	115-06566	3 PM Peak	US-160	Southbound	7.41	417	430	445	535	1.07	1.24					
5	115-06566	4 Weekend	US-160	Southbound	7.41	417	431	443	513	1.06	1.19					
6	115-06567	1 AM Peak	US-160	Westbound	2.93	162	173	174	207	1.07	1.20	1.07	1.24	25%	1.15	2.83
6	115-06567	2 Mid Day	US-160	Westbound	2.93	166	173	177	211	1.07	1.22					
6	115-06567	3 PM Peak	US-160	Westbound	2.93	168	173	179	215	1.07	1.24					
6	115-06567	4 Weekend	US-160	Westbound	2.93	167	173	179	211	1.07	1.22					
6	115-06568	1 AM Peak	US-160	Westbound	8.86	506	550	572	1181	1.13	2.15	1.18	3.35	75%		
6	115-06568	2 Mid Day	US-160	Westbound	8.86	523	552	602	1181	1.15	2.14					
6	115-06568	3 PM Peak	US-160	Westbound	8.86	529	559	625	1876	1.18	3.35					
6	115-06568	4 Weekend	US-160	Westbound	8.86	523	559	618	1257	1.18	2.25					
7	115-05880	1 AM Peak	US-160	Westbound	8.34	470	492	523	750	1.11	1.53	1.14	1.64	100%	1.14	1.64
7	115-05880	2 Mid Day	US-160	Westbound	8.34	484	499	540	742	1.12	1.49					
7	115-05880	3 PM Peak	US-160	Westbound	8.34	484	509	554	836	1.14	1.64					
7	115-05880	4 Weekend	US-160	Westbound	8.34	480	499	536	715	1.12	1.43					
8	115-06569	1 AM Peak	US-160	Westbound	6.42	350	362	367	420	1.05	1.16	1.06	1.21	47%	1.06	1.17
8	115-06569	2 Mid Day	US-160	Westbound	6.42	353	361	371	413	1.05	1.14					
8	115-06569	3 PM Peak	US-160	Westbound	6.42	353	361	373	436	1.05	1.21					
8	115-06569	4 Weekend	US-160	Westbound	6.42	350	362	373	424	1.06	1.17					
8	115-06570	1 AM Peak	US-160	Westbound	7.19	389	398	407	439	1.05	1.10	1.05	1.14	53%		
8	115-06570	2 Mid Day	US-160	Westbound	7.19	392	398	408	446	1.04	1.12					

Segment	TMC [Internal ID]	Time Period	Road Name	Direction	Miles	Cars 50th % Travel Time (seconds)	Trucks 50th % Travel Time (seconds)	Cars 80th % Travel Time (seconds)	Trucks 95th % Travel Time (seconds)	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
8	115-06570	3 PM Peak	US-160	Westbound	7.19	389	398	408	454	1.05	1.14					
8	115-06570	4 Weekend	US-160	Westbound	7.19	386	398	405	439	1.05	1.10					
9	115-06571	1 AM Peak	US-160	Westbound	4.71	261	263	278	303	1.07	1.15	1.07	1.22	24%	1.12	2.02
9	115-06571	2 Mid Day	US-160	Westbound	4.71	260	261	273	297	1.05	1.14					
9	115-06571	3 PM Peak	US-160	Westbound	4.71	261	263	273	320	1.05	1.22					
9	115-06571	4 Weekend	US-160	Westbound	4.71	259	265	273	303	1.06	1.14					
9	115-06572	1 AM Peak	US-160	Westbound	9.83	558	571	656	1608	1.17	2.82	1.17	2.82	51%		
9	115-06572	2 Mid Day	US-160	Westbound	9.83	560	566	658	1368	1.17	2.42					
9	115-06572	3 PM Peak	US-160	Westbound	9.83	561	575	649	1420	1.16	2.47					
9	115-06572	4 Weekend	US-160	Westbound	9.83	553	571	629	1257	1.14	2.20					
9	115-06573	1 AM Peak	US-160	Westbound	4.73	260	266	275	313	1.06	1.18	1.07	1.18	25%		
9	115-06573	2 Mid Day	US-160	Westbound	4.73	259	262	275	304	1.06	1.16					
9	115-06573	3 PM Peak	US-160	Westbound	4.73	260	266	278	310	1.07	1.16					
9	115-06573	4 Weekend	US-160	Westbound	4.73	258	266	276	310	1.07	1.16					
10	115-06574	1 AM Peak	US-160	Westbound	5.76	329	340	352	396	1.07	1.17	1.08	1.22	27%	1.07	1.21
10	115-06574	2 Mid Day	US-160	Westbound	5.76	327	335	351	384	1.07	1.15					
10	115-06574	3 PM Peak	US-160	Westbound	5.76	324	340	352	415	1.08	1.22					
10	115-06574	4 Weekend	US-160	Westbound	5.76	327	335	352	378	1.08	1.13					
10	115-06575	1 AM Peak	US-160	Westbound	8.63	474	484	506	586	1.07	1.21	1.07	1.21	40%		
10	115-06575	2 Mid Day	US-160	Westbound	8.63	474	478	501	540	1.06	1.13					
10	115-06575	3 PM Peak	US-160	Westbound	8.63	472	490	501	568	1.06	1.16					
10	115-06575	4 Weekend	US-160	Westbound	8.63	471	482	493	545	1.05	1.13					
10	115-05882	1 AM Peak	US-160	Westbound	7.04	384	393	406	469	1.06	1.19	1.06	1.19	33%		
10	115-05882	2 Mid Day	US-160	Westbound	7.04	381	387	402	444	1.06	1.15					
10	115-05882	3 PM Peak	US-160	Westbound	7.04	381	393	403	461	1.06	1.17					
10	115-05882	4 Weekend	US-160	Westbound	7.04	378	390	402	449	1.06	1.15					
11	115-06576	1 AM Peak	US-160	Westbound	6.76	409	435	466	1432	1.14	3.29	1.17	3.29	100%	1.17	3.29
11	115-06576	2 Mid Day	US-160	Westbound	6.76	413	432	481	1281	1.17	2.97					
11	115-06576	3 PM Peak	US-160	Westbound	6.76	406	428	458	609	1.13	1.42					
11	115-06576	4 Weekend	US-160	Westbound	6.76	396	421	440	551	1.11	1.31					
12	115-05883	1 AM Peak	US-160	Southbound	6.22	407	455	482	700	1.18	1.54	1.21	1.73	100%	1.21	1.73
12	115-05883	2 Mid Day	US-160	Southbound	6.22	400	423	484	676	1.21	1.60					
12	115-05883	3 PM Peak	US-160	Southbound	6.22	407	435	487	722	1.20	1.66					
12	115-05883	4 Weekend	US-160	Southbound	6.22	394	431	476	746	1.21	1.73					

Closure Data

			Total miles of closures		Average Occurrences/Mile/Year	
Segment	Length (miles)	# of closures	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160
1	8.00	4	3.0	2.0	0.08	0.05
2	4.00	3	2.0	2.0	0.10	0.10
3	21.00	16	11.0	11.0	0.10	0.10
4	18.00	5	4.0	3.0	0.04	0.03
5	12.00	13	8.0	7.0	0.13	0.12
6	17.00	11	8.0	8.0	0.09	0.09
7	4.00	9	5.0	6.0	0.25	0.30
8	18.00	13	9.0	9.0	0.10	0.10
9	21.00	11	11.0	5.0	0.10	0.05
10	17.00	10	6.0	5.0	0.07	0.06
11	12.00	8	6.0	4.0	0.10	0.07
12	7.00	1	1.0	0.0	0.03	0.00

	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
Segment	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160
160-1	0	0	2	1	1	1	0	0	0	0	0	0
160-2	0	0	1	2	1	0	0	0	0	0	0	0
160-3	0	1	2	2	9	7	0	1	0	0	0	0
160-4	0	0	1	1	3	2	0	0	0	0	0	0
160-5	0	0	0	1	7	6	1	0	0	0	0	0
160-6	0	0	2	1	6	6	0	1	0	0	0	0
160-7	0	0	1	1	4	5	0	0	0	0	0	0
160-8	0	0	1	3	8	5	0	1	0	0	0	0
160-9	0	0	2	2	9	3	0	0	0	0	0	0
160-0	0	0	0	1	6	4	0	0	0	0	0	0
160-11	0	0	1	0	5	4	0	0	0	0	0	0
160-12	0	0	1	0	0	0	0	0	0	0	0	0

HPMS Data

SEGMENT	MP_FROM	MP_TO	WEIGHTED AVERAGE NB/EB AADT	WEIGHTED AVERAGE SB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB AADT	2019 AADT	K Factor	D-Factor	T-Factor
160-1	311.00	319.00	3064	2924	5989	3301	2700	6001	11	55	9
160-2	319.00	323.00	5525	6582	12107	6296	7586	13881	8	55	10
160-3	323.00	343.40	2395	2351	4747	2459	2270	4729	11	52	11
160-4	343.40	362.15	1820	1795	3615	1981	1981	3961	10	50	13
160-5	362.15	374.27	2491	2452	4943	2765	2452	5217	10	53	11
160-6	374.27	391.00	2877	2742	5620	2923	2569	5492	11	53	11
160-7	391.00	395.00	2487	2123	4610	2253	2253	4505	10	50	11
160-8	395.00	413.00	1585	1410	2994	1994	1385	3379	11	59	11
160-9	413.00	434.00	1575	1552	3127	1543	1543	3085	12	50	11
160-10	434.00	448.30	1756	1498	3255	2141	1393	3535	10	61	14
160-11	448.30	463.00	1766	1486	3252	2195	1346	3541	10	62	14
160-12	463.00	469.60	1270	1123	2393	1712	1006	2718	12	63	14

SEGMENT	Loc ID	BMP	EMP	Length	Pos Dir AADT	Neg Dir AADT	Corrected Pos Dir AADT	Corrected Neg Dir AADT	2019 AADT	K Factor	D-Factor	D-Factor Adjusted	T-Factor
160-1	102171	311.46	318.49	7.03	3301	2700	3301	2700	6001	11	55	55	9
160-2	102172	318.49	321.95	3.46	6356	7461	6356	7461	13817	8	54	54	10
	102173	321.95	322.35	0.40	5776	8663	5776	8663	14439	9	60	60	10
160-3	102174	322.35	343.58	21.23	2459	2270	2459	2270	4729	11	52	52	11
160-4	102175	343.58	361.62	18.04	1981	1981	1981	1981	3961	10	50	50	13
160-5	102176	361.62	374.28	12.66	2765	2452	2765	2452	5217	10	53	53	11
160-6	102177	374.28	382.27	7.99	2892	2779	2892	2779	5671	10	51	51	11
	102178	382.97	393.55	10.58	2946	2411	2946	2411	5357	12	55	55	11
160-7	102286	393.55	401.45	7.90	0	0	2253	2253	4505	10	61	50	11
160-8	102179	401.46	413.00	11.54	1994	1385	1994	1385	3379	11	59	59	11
160-9	102287	413.00	434.83	21.83	0	0	1543	1543	3085	12	51	50	11
160-10	102180	434.83	437.15	2.32	1819	1679	1819	1679	3498	9	52	52	14
	102181	437.15	451.00	13.85	2195	1346	2195	1346	3541	10	62	62	14
160-11	102181	451.00	465.40	14.40	2195	1346	2195	1346	3541	10	62	62	14
160-12	102182	465.40	470.73	5.33	1712	1006	1712	1006	2718	12	63	63	14

Bicycle Accommodation Data

Segment	BMP	EMP	Divided or Non	NB/EB Right Shoulder Width	SB/WB Right Shoulder Width	NB/EB/ Left Shoulder Width	SB/WB Left Shoulder Width	NB/EB Effective Length of Shoulder	SB/WB Effective Length of Shoulder	% Bicycle Accommodation
160-1	1	311	319	Undivided	5.0	5.0	N/A	N/A	0.0	0.0
160-2	2	319	323	Undivided	5.1	6.1	N/A	N/A	3.9	3.8
160-3	3	323	344	Undivided	5.0	6.1	N/A	N/A	0.3	7.9
160-4	4	344	362	Undivided	5.2	5.5	N/A	N/A	1.4	2.0
160-5	5	362	374	Undivided	5.0	5.0	N/A	N/A	0.0	0.0
160-6	6	374	391	Undivided	5.0	5.0	N/A	N/A	0.0	0.0
160-7	7	391	395	Undivided	4.1	4.1	N/A	N/A	0.2	0.2
160-8	8	395	413	Undivided	5.0	5.0	N/A	N/A	0.1	0.0
160-9	9	413	434	Undivided	5.0	5.0	N/A	N/A	0.1	0.1
160-10	10	434	451	Undivided	4.9	5.0	N/A	N/A	0.0	0.2
160-11	11	451	463	Undivided	5.0	5.0	N/A	N/A	0.0	0.0
160-12	12	463	470	Undivided	5.0	5.3	N/A	N/A	0.3	0.3

AZTDM Data

SEGMENT	Growth Rate	% Non-SOV
1	1.50%	11.7%
2	1.48%	12.1%
3	1.48%	11.6%
4	1.45%	13.7%
5	2.01%	16.2%
6	1.51%	6.0%
7	0.25%	6.8%
8	-3.30%	7.1%
9	-3.56%	11.6%
10	0.03%	15.9%
11	1.42%	5.5%
12	1.59%	5.4%

HERS Capacity Calculation Data

Segment	Capacity Environment Type	Facility Type	Terrain	Lane Width	NB/EB/EB Rt. Shoulder	SB/WB/WB Rt. Shoulder	F_{lw} or f_w or f_{LS}	NB/EB/EB F_{lc}	SB/WB/WB F_{lc}	Total Ramp Density	PHF	E_T	f_{HV}	f_M	f_A	g/C	f_G	f_{NP}	Nm	f_p	NB/EB/EB FFS	SB/WB/WB FFS	NB/EB/EB Peak-Hour Capacity	SB/WB/WB Peak-Hour Capacity	Major Direction Peak-Hour Capacity	Daily Capacity
1	4	Rural	Rolling	12.00	5.00	5.00	0.0	N/A	N/A	N/A	0.88	2	0.917	N/A	0.38	N/A	0.9	2.35	N/A	N/A	72.63	72.63	N/A	N/A	1417.40	26,998
2	3	Rural	Rolling	12.00	5.09	6.09	1.0	N/A	N/A	N/A	0.9	2	0.909	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	855.00	16,286
3	4	Rural	Level	12.00	5.04	6.13	0.0	N/A	N/A	N/A	0.88	1.4	0.958	N/A	0.43	N/A	1	2.20	N/A	N/A	73.58	73.58	N/A	N/A	1704.02	32,457
4	4	Rural	Level	12.00	5.22	5.54	0.0	N/A	N/A	N/A	0.88	1.5	0.939	N/A	0.4	N/A	1	2.75	N/A	N/A	74.60	74.60	N/A	N/A	1695.71	32,299
5	4	Rural	Level	12.00	5.00	5.00	0.0	N/A	N/A	N/A	0.88	1.4	0.958	N/A	0.58	N/A	1	2.20	N/A	N/A	74.43	74.43	N/A	N/A	1750.18	33,337
6	4	Rural	Rolling	12.00	5.00	5.00	0.0	N/A	N/A	N/A	0.88	2.1	0.892	N/A	0.48	N/A	0.83	1.90	N/A	N/A	73.53	73.53	N/A	N/A	1327.68	25,289
7	3	Rural	Rolling	12.00	4.13	4.12	1.0	N/A	N/A	N/A	0.9	2	0.901	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	847.30	16,139
8	4	Rural	Level	12.00	4.99	4.95	0.0	N/A	N/A	N/A	0.88	1.5	0.948	N/A	0.1	N/A	1	2.20	N/A	N/A	74.90	74.90	N/A	N/A	1757.46	33,475
9	4	Rural	Level	12.00	5.02	5.01	0.0	N/A	N/A	N/A	0.88	1.5	0.948	N/A	0.38	N/A	1	2.20	N/A	N/A	74.63	74.63	N/A	N/A	1742.68	33,194
10	4	Rural	Rolling	12.00	4.94	4.99	0.0	N/A	N/A	N/A	0.88	2.3	0.846	N/A	0.33	N/A	0.75	1.65	N/A	N/A	73.68	73.68	N/A	N/A	1152.19	21,946
11	4	Rural	Rolling	12.00	5.00	5.00	0.0	N/A	N/A	N/A	0.88	2.3	0.846	N/A	0.43	N/A	0.75	1.10	N/A	N/A	74.58	74.58	N/A	N/A	1204.36	22,940
12	4	Rural	Rolling	12.00	5.04	5.26	0.0	N/A	N/A	N/A	0.88	2.3	0.846	N/A	0.9	N/A	0.75	1.65	N/A	N/A	69.10	69.10	N/A	N/A	987.59	18,811

Safety Performance Area Data

Segment	Operating Environment	Segment Length (miles)	NB/EB Fatal Crashes 2015-2019	SB/WB Fatal Crashes 2015-2019	Segment NB/EB Suspected Serious Injury Crashes	Segment SB/WB Suspected Serious Injury Crashes	Fatal + Suspected Serious Injury Crashes at Intersections	Fatal + Suspected Serious Injury Crashes Involving Lane Departures
160-1	2 or 3 Lane Undivided Highway	8	2	1	0	0	0	3
160-2	2 or 3 Lane Undivided Highway	4	0	1	0	0	1	0
160-3	2 or 3 Lane Undivided Highway	20.4	3	5	1	0	0	6
160-4	2 or 3 Lane Undivided Highway	18.75	0	3	0	1	3	1
160-5	2 or 3 Lane Undivided Highway	12.12	3	0	0	1	0	3
160-6	2 or 3 Lane Undivided Highway	16.73	4	2	1	0	0	6
160-7	2 or 3 Lane Undivided Highway	4	2	0	0	2	0	1
160-8	2 or 3 Lane Undivided Highway	18	4	0	0	3	0	7
160-9	2 or 3 Lane Undivided Highway	21	3	2	0	1	1	2
160-10	2 or 3 Lane Undivided Highway	14.3	2	1	4	1	2	4
160-11	2 or 3 Lane Undivided Highway	14.7	0	2	1	2	1	3
160-12	2 or 3 Lane Undivided Highway	6.6	0	0	0	0	0	0

Segment	Operating Environment	Fatal + Suspected Serious Injury Crashes Involving Pedestrians	Fatal + Suspected Serious Injury Crashes Involving Trucks	Fatal + Suspected Serious Injury Crashes Involving Bicycles	Weighted Average NB/EB AADT	Weighted Average SB/WB AADT	Weighted Average Total AADT
160-1	2 or 3 Lane Undivided Highway	0	0	0	3064	2924	5988
160-2	2 or 3 Lane Undivided Highway	1	0	0	5525	6582	12107
160-3	2 or 3 Lane Undivided Highway	2	1	1	2395	2351	4746
160-4	2 or 3 Lane Undivided Highway	0	0	0	1820	1795	3615
160-5	2 or 3 Lane Undivided Highway	1	0	0	2491	2452	4943
160-6	2 or 3 Lane Undivided Highway	1	1	0	2877	2742	5620
160-7	2 or 3 Lane Undivided Highway	0	0	0	2487	2123	4610
160-8	2 or 3 Lane Undivided Highway	0	0	0	1585	1410	2994
160-9	2 or 3 Lane Undivided Highway	2	0	0	1575	1552	3126
160-10	2 or 3 Lane Undivided Highway	0	1	0	1756	1498	3255
160-11	2 or 3 Lane Undivided Highway	0	0	0	1766	1486	3252
160-12	2 or 3 Lane Undivided Highway	0	0	0	1270	1123	2393

HPMS Data

2015-2019 Weighted Average						2019			2018			2017			2016			2015		
SEGMENT	MP_FROM	MP_TO	WEIGHTED AVERAGE NB/EB/EB AADT	WEIGHTED AVERAGE SB/WB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB/ AADT	2019AADT	NB/EB AADT	SB/WB AADT	2018 AADT	NB/EB AADT	SB/WB AADT	2017 AADT	NB/EB/ AADT	SB/WB AADT	2016 AADT	NB/EB AADT	SB/WB/ AADT	2015 AADT
160-1	311.00	319.00	3064	2924	5989	3301	2700	6001	3030	2917	5947	3031	3031	6062	3023	3027	6053	2933	2946	5880
160-2	319.00	323.00	5525	6582	12107	6296	7586	13881	6837	7156	13993	3957	3957	7913	5355	7224	12580	5180	6987	12166
160-3	323.00	343.40	2395	2351	4747	2459	2270	4729	2401	2369	4770	2420	2420	4839	2394	2394	4787	2303	2304	4608
160-4	343.40	362.15	1820	1795	3615	1981	1981	3961	1967	1986	3953	1932	1563	3495	1649	1764	3413	1572	1682	3254
160-5	362.15	374.27	2491	2452	4943	2765	2452	5217	2650	2557	5207	2660	2660	5320	2243	2351	4594	2138	2241	4379
160-6	374.27	391.00	2877	2742	5620	2923	2569	5492	2835	2768	5604	2915	2834	5749	2866	2787	5652	2848	2755	5604
160-7	391.00	395.00	2487	2123	4610	2253	2253	4505	3047	1449	4496	2399	1962	4361	2761	2761	5521	1975	2191	4166
160-8	395.00	413.00	1585	1410	2994	1994	1385	3379	1812	1560	3372	1418	1413	2831	1382	1377	2759	1317	1313	2630
160-9	413.00	434.00	1575	1552	3127	1543	1543	3085	1688	1558	3246	1574	1574	3148	1543	1543	3086	1526	1541	3068
160-10	434.00	448.30	1756	1498	3255	2141	1393	3535	1907	1315	3222	1623	1644	3267	1592	1608	3200	1518	1533	3050
160-11	448.30	463.00	1766	1486	3252	2195	1346	3541	1906	1294	3200	1628	1650	3278	1587	1608	3195	1513	1533	3046
160-12	463.00	469.60	1270	1123	2393	1712	1006	2718	1372	1341	2713	1257	1257	2513	1030	1030	2059	982	982	1963

Freight Performance Area Data

Segment	Length (miles)	# of closures	Total minutes of closures		Average Mins/Mile/Year	
			NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160
160-1	8.00	4	3.0	2.0	19.10	7.83
160-2	4.00	3	2.0	2.0	15.60	16.80
160-3	21.00	16	11.0	11.0	19.59	15.89
160-4	18.00	5	4.0	3.0	7.57	4.71
160-5	12.00	13	8.0	7.0	33.17	22.83
160-6	17.00	11	8.0	8.0	22.56	19.48
160-7	4.00	9	5.0	6.0	20.55	37.60
160-8	18.00	13	9.0	9.0	59.61	19.88
160-9	21.00	11	11.0	5.0	27.41	8.77
160-10	17.00	10	6.0	5.0	18.13	9.60
160-11	12.00	8	6.0	4.0	18.27	15.42
160-12	7.00	1	1.0	0.0	10.74	0.00

	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
Segment	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160	NB/EB US 160	SB/WB US 160
160-1	0	0	2	1	1	1	0	0	0	0	0	0
160-2	0	0	1	2	1	0	0	0	0	0	0	0
160-3	0	1	2	2	9	7	0	1	0	0	0	0
160-4	0	0	1	1	3	2	0	0	0	0	0	0
160-5	0	0	0	1	7	6	1	0	0	0	0	0
160-6	0	0	2	1	6	6	0	1	0	0	0	0
160-7	0	0	1	1	4	5	0	0	0	0	0	0
160-8	0	0	1	3	8	5	0	1	0	0	0	0
160-9	0	0	2	2	9	3	0	0	0	0	0	0
160-10	0	0	0	1	6	4	0	0	0	0	0	0
160-11	0	0	1	0	5	4	0	0	0	0	0	0
160-12	0	0	1	0	0	0	0	0	0	0	0	0

See the **Mobility Performance Area Data** section for other Freight Performance Area related data.

Appendix D: Needs Analysis Contributing Factors and Scores

Pavement Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Pavement Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for Pavement. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scales" within the Step 1 template.

To develop an aggregate Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scored, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Enter the appropriate segment information into the columns titled "Segment", "Segment Length", "Segment Mileposts" and "Facility Type".

Step 1.2

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis into the appropriate "Performance Score" columns. Copy the performance score for each segment to the appropriate "Performance Score" column. Paste only the "values" and do not overwrite the formatting.

Step 1.3

Indicate if Pavement is an Emphasis Area by selecting "Yes" or "No" in the row immediately below the segment information.

Step 1.4

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the segment information and the initial needs from the Step 1 template to the "Initial Need" column of the Step 2 template.

Step 2.2

Note in the "Hot Spots" column any pavement failure hot spots identified as part of the baseline corridor performance. For each entry, include the milepost limits of the hot spot. Hot spots are identified in the Pavement Index spreadsheet by the red cells in the columns titled "% Pavement Failure". These locations are based on the following criteria:

Interstates: IRI > 105 or Cracking > 10 or Rutting > 0.4

Non-Interstates: IRI > 142 or Cracking > 10 or Rutting > 0.4

Every segment that has a % Pavement Failure greater than 0% will have at least one hot spot. Hot spot locations should be described as extending over consecutive miles. For example, if there is a pavement failure location that extends 5 consecutive miles, it should be identified as one hot spot, not 5 separate hot spots.

Step 2.3

Identify recently completed or under construction paving projects in the "Previous Projects" column. Include only projects that were completed after the pavement condition data period (check dates in pavement condition data provided by ADOT) that would supersede the results of the performance system.

Step 2.5

Update the "Final Need" column using the following criteria:

- If "None" but have a hot spot (or hot spots), the Final Need = Low, and note the reason for the change in the "Comments" column (column H).

- If a recent project has superseded the performance rating data, change the Final Need to "None" and note the reason for the change in the "Comments" column.

Example Scales for Level of Need

Pavement Index (Interstates) Performance Thresholds		Initial Need	Description (Non-Emphasis Area)
3.75		None	All of Good Performance and upper third of Fair Performance (>3.50)
		Low	Middle third of Fair Perf. (3.25 - 3.5)
3.0		Medium	Lower third of Fair and top third of Poor Performance (2.75-3.25)
		High	Lower two-thirds of Poor Performance (<2.75)

Need Scale for Interstates

Measure	None >=	Low >=	> Medium <		High <=
Pavement Index (corridor non-emphasis area)	3.5	3.25	3.25	2.75	2.75
Pavement Index (corridor emphasis area)	4.0	3.5	3.5	3.00	3.00
Pavement Index (segments)	3.5	3.25	3.25	2.75	2.75
Directional PSR	3.63	3.52	3.52	3.28	3.28
%Pavement Failure	10%	15%	15%	25%	25%

Need Scale for Highways (Non-Interstates)

Measure	None >=	Low >=	> Medium <		High <=
Pavement Index (corridor non-emphasis area)	3.33	3.07	3.07	2.53	2.53
Pavement Index (corridor emphasis area)	3.87	3.33	3.33	2.80	2.80
Pavement Index (segments)	3.33	3.07	3.07	2.53	2.53
Directional PSR	3.30	3.10	3.10	2.70	2.70
%Pavement Failure	10%	15%	15%	25%	25%

Step 2.6

Note any programmed projects that could have the potential to mitigate pavement needs in in the "Comments" column. Programmed projects are provided as information and do not impact the need rating. The program information can be found in ADOT's 5-year construction program. If there are other comments relevant to the needs analysis (such as information from previous reports), they can be entered in the "Comments" column. However, only include information related to needs that have been identified through this process. Do not add or create needs from other sources.

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab. The steps to complete Step 3 include:

Step 3.1

Input the level of historical investment for each segment. This will be determined from the numeric score from the Pavement History Table based on the following thresholds:

- Low = < 4.60
- Medium = 4.60 – 6.60
- High = > 6.60

If the PeCoS data shows a high level of maintenance investment, increase the historical investment rating by one level.

Step 3.2

Note the milepost ranges of pavement failure hot spots into the column titled "Contributing Factors and Comments."

Step 3.3

Note any other information that may be contributing to the deficiency, or supplemental information, in the "Contributing Factors and Comments" column. This could come from discussions with ADOT District staff, ADOT Materials/Pavement Group, previous reports, or the historical investment data.

Step 3.4

Include any programmed projects from ADOT's 5-year construction program in the "Contributing Factors and Comments" column.

Bridge Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Bridge Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for Bridge. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scales" within the Step 1 template.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scored, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial level of need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Enter the appropriate segment information into the columns titled "Segment", "Segment Length", "Segment Mileposts" and "Number of Bridges."

Step 1.2

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis into the appropriate "Performance Score" columns. Copy the performance score for each segment to the appropriate "Performance Score" column. Paste only the "values" and do not overwrite the formatting.

Step 1.3

Indicate if Bridge is an Emphasis Area by selecting "Yes" or "No" in the row immediately below the segment information.

Step 1.4

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial needs from the Step 1 template to the "Initial Need" column of the Step 2 template.

Step 2.2

Note in the column titled "Hot Spots" any bridge hot spots identified as part of the baseline corridor performance. For each entry, note the specific location. Hot spots are identified as having any bridge rating of 4 or less, or multiple ratings of 5 in the deck, substructure, or superstructure ratings.

Step 2.3

Identify recently completed or under construction bridge projects in the "Previous Projects" column. Include only projects that were completed after the bridge condition data period (check dates in bridge condition data provided by ADOT) that would supersede the results of the performance system.

Step 2.4

Update the Final Need on each segment based on the following criteria:

- If the Initial Need is "None" and there is at least one hot spot located on the segment, change the Final Need to "Low".
- If a recent project has superseded the performance rating data, the performance data should be adjusted to increase the specific ratings and the resulting need should be reduced to account for the project.
- Note the reason for any change in the "Comments" column.

Step 2.5

Historical bridge rating data was tabulated and graphed to find any bridges that had fluctuations in the ratings. Note in the “Historical Review” column any bridge that was identified as having a potential historical rating concern based on the following criteria:

- Ratings increase or decrease (bar chart) more than 2 times
- Sufficiency rating drops more than 20 points

This is for information only and does not affect the level of need.

Step 2.6

Note the number of functionally obsolete bridges in each segment in the column titled “# Functionally Obsolete Bridges”. This is for information only and does not affect the level of need.

Step 2.7

Identify each bridge “of concern” in the “Comments” column. Note any programmed projects that could have the potential to mitigate bridge needs. Programmed projects are provided as information and do not impact the need rating. The program information can be found in ADOT’s 5-year construction program. If there are other comments relevant to the needs analysis (such as information from previous reports), they can be entered in the “Comments” column. However, only include information related to needs that have been identified through this process. Do not add or create needs from other sources.

Example Scales for Level of Need

Bridge Index Performance Thresholds	Level of Need		Description (Non-Emphasis Area)
6.5	Good	None	All of Good Performance and upper third of Fair Performance (>6.0)
	Good		
	Good		
	Fair		
	Fair	Low	Middle third of Fair Performance (5.5-6.0)
5.0	Fair	Medium	Lower third of Fair and top third of Poor Performance (4.5-5.5)
	Poor		
	Poor	High	Lower two-thirds of Poor Performance (<4.5)
	Poor		

Need Scale

Measure	None >=	Low >=	> Medium <		High <=
Bridge Index (corridor non-emphasis area)	6.0	5.5	5.5	4.5	4.5
Bridge Index (corridor emphasis area)	7.0	6.0	6.0	5.0	5.0
Bridge Index (segments)	6.0	5.5	5.5	4.5	4.5
Bridge Sufficiency	70	60	60	40	40
Bridge Rating	6.0	5.0	4.0	4.0	3.0

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab. The steps to compete Step 3 include:

Step 3.1

Input the bridge name, structure number, and milepost information for each bridge “of concern” resulting from Step 2.

Step 3.2

For bridges that have a current rating of 5 or less, enter the specific rating, or state “No current ratings less than 6”.

Step 3.3

For bridges that were identified for a historical review (step 2.5), state “Could have a repetitive investment issue”. If a bridge was not identified for a historical review, state “This structure was not identified in historical review”.

Step 3.4

Input any programmed projects from ADOT’s 5-year construction program. Note any other information that may be contributing to the deficiency, or supplemental information. This could come from discussions with ADOT District staff, ADOT Bridge Group, or previous reports.

Mobility Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Mobility Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Refined Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score for each segment to the appropriate "Performance Score" columns from Existing Performance Analysis. This includes the primary and secondary measures for Mobility. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scales" in the Step 1 tab.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scores, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Input the accurate number of segments for your corridor in the column titled 'Segment' and the appropriate segment milepost limits and segment lengths in adjacent columns.

Step 1.2

Select the appropriate 'Environment Type' and 'Facility Operation Type' from the drop down menus as defined in Existing Performance Analysis.

Step 1.3

Select 'Yes' or 'No' from the drop down list to not if the Mobility Performance Area is an Emphasis Area for your corridor.

Step 1.4

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis. Copy the performance score for each segment to the appropriate "Performance Score" column.

Step 1.5

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2 The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial deficiencies from the Step 1 template to the Step 2 template.

Step 2.2

Identify recently completed or under construction projects that would be considered relevant to mobility performance. Include only projects that were constructed after the date for which the HPMS data used for traffic volumes would not include. Any completed or under construction roadway project after the HPMS data date that has the potential to mitigate a mobility issue on a corridor segment should be listed in the template. Such projects should include the construction of new travel lanes or speed limit changes on the main corridor only. Do not include projects involving frontage roads or crossings as they would not impact the corridor level performance.

Step 2.3

Update the Final Need using the following criteria:

- If a recent project has superseded the performance rating data and it is certain the project addressed the deficiency, change the need rating to "None".
- If a recent project has superseded the performance rating data but it is uncertain that a project addressed the need, maintain the current deficiency rating and note the uncertainty as a comment.

Step 2.4

Note any programmed or planned projects that have the potential to mitigate any mobility needy on the segment. Programmed and Planned projects are provided as information and do not impact the deficiency rating. Future projects will be reviewed in the development of solution sets for identified needs and deficiencies. The source of future projects can be found in ADOT's 5-year construction program or other planning documents. Other comments relevant to the needs analysis can be entered.

Example Scales for Level of Need

Mobility Index (Urban and Fringe Urban) Performance Thresholds	Initial Need	Description (Non-Emphasis Area)
0.71	None	All of Good Performance and upper third of Fair Performance (<0.77)
	Low	Middle third of Fair Performance (0.77 - 0.83)
0.89	Medium	Lower third of Fair and top third of Poor Performance (0.83-0.95)
	High	Lower two-thirds of Poor Performance (>0.95)

Needs Scale

Measure		None <=	Low <=	> Medium <		High >=
Mobility Index (Corridor Emphasis Area)		Weighted calculation for the segment totals in corridor (urban vs. rural)				
Mobility Index (Corridor Non-Emphasis Area)		Weighted calculation for the segment totals in corridor (urban vs. rural)				
Mobility Index (Segment)	Urban	0.77	0.83	0.83	0.95	0.95
	Rural	0.63	0.69	0.69	0.83	0.83
Future Daily V/C	Urban	0.77	0.83	0.83	0.95	0.95
	Rural	0.63	0.69	0.69	0.83	0.83
Existing Peak hour V/C	Urban	0.77	0.83	0.83	0.95	0.95
	Rural	0.63	0.69	0.69	0.83	0.83
Closure Extent		0.35	0.49	0.49	0.75	0.75
Directional LOTTR	Uninterrupted	1.27	1.38	1.38	1.62	1.62
	Interrupted	1.27	1.38	1.38	1.62	1.62
Bicycle Accommodation		80%	70%	70%	50%	50%

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab. The steps to compete Step 3 include:

Step 3.1

Input data from Mobility Index worksheet and corridor observations in appropriate columns for Roadway Variables.

Step 3.2

Input traffic variable data in appropriate columns as indicated, Buffer Index scores will auto populate.

Step 3.3

Input relevant mobility related infrastructure located within each segment as appropriate

Step 3.4

Input the Closure Extents that have occurred along the study corridor. Road closure information can be detailed out by the reason for the closure as documented in Highway Condition Reporting System (HCRS) data analyzed as part of the baseline corridor performance. Closure reasons include incident/accidents, winter storms, obstruction hazards, and undefined closures. Statewide average percentages for the various closure reasons have been calculated for most recent five-year period on ADOT's designated strategic corridors. Compare these statewide average percentages to the corridor percentages for the various closure reasons to identify higher than average percentages of one or more closure reasons on any given segment. Input the closures as follows and use red text to indicate that the segment percentage exceeds statewide averages:

- Total Number of Closures
- % Incidents/Accidents
- % Obstructions/Hazards
- % Weather Related

Step 3.5

List the non-actionable conditions that are present within each segment by milepost if possible. Non-Actionable conditions are conditions that exist within the environment of each segment that cannot be improved through an engineered solution. For example, the border patrol check point in Segment 3 of I-19 is a non-actionable condition.

Step 3.6

Considering all information input, identify and list the contributing factors to the Final Need score.

Safety Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Safety Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the corridor characteristics and existing performance score for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for safety. As each performance score is input into the template, the Level of Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Scale" within the Step 1 template.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scored, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Populate the Step 1 template with the corridor characteristics information. This includes segment operating environments and segment length. Also specify if the safety performance area is an emphasis area as determined in Goals and Objectives. The "Level of Need" is dependent on the input of the operating environment and "Emphasis Area" as the thresholds dynamically update accordingly.

Input the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis. Copy the performance score (paste values only) for each segment to the appropriate "Performance Score" column and conditional formatting should color each cell green, yellow, or red based on the corresponding performance thresholds.

Step 1.2

The thresholds for the corridor safety index are based on the segments' operating environments. To ensure that the correct corridor safety index threshold is applied, input the unique segment operating environments that exist with the corridor. Once the input is complete, the average of the Good/Fair and Fair/Poor thresholds for each of the operating environments is calculated and the "Level of Need" thresholds will be derived and applied to the main Step 1 Table.

Step 1.3

Confirm that the following criteria for "Insufficient Data" have been applied and that the resulting Level of Need has been shown as "N/A" where applicable.

- Crash frequency for a segment is less than 5 crashes over the 5-year crash analysis period.
- The change in +/- 1 crash results in the change of need level of 2 levels (i.e., changes from Above Average to Below Average or changes from Below Average to Above Average).
- The average segment crash frequency for the overall corridor (total fatal plus suspected serious injury crash frequency divided by the number of corridor segments) is less than 2 per segment over the 5-year crash analysis period.

Step 1.4

Confirm that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial needs from the Step 1 template to the Step 2 template**.**

Step 2.2

Using the crash concentration (hot spot) map developed as part of the baseline corridor performance, note the direction of travel and approximate milepost limits of each hot spot.

Step 2.3

Identify recently completed or under construction projects that would be considered relevant to safety performance. Include only projects that were not taken into account during the five-year

crash data analysis period. Any completed or under construction roadway project after the crash analysis period that has the potential to mitigate a safety issue on a corridor segment should be listed in the template. Sources of recent or current project activity can include ADOT MPD staff, ADOT public notices, and ADOT District staff.

Step 2.4

Update the Final Need based on the following criteria:

- If there is a crash hot spot concentration on a “None” segment, upgrade the need rating to “Low.”

Step 2.5

Note any programmed projects that could have the potential to mitigate any safety need on the segment. Programmed projects are provided as information and do not impact the need rating. Programmed projects will be reviewed in the development of solution sets for identified needs. The source of the programming information can be found in ADOT’s 5-year construction program. Any other relevant issues identified in previous reports should also be reported.

Example Scales for Level of Need

Safety Index (6 Lane Highway) Performance Thresholds	Initial Need	Description (Non-Emphasis Area)
0.76	None	All of Above Average Performance and upper third of Average Performance (<0.92)
	Low	Middle third of Average Performance (0.92 - 1.08)
1.24	Medium	Lower third of Average and top third of Below Average Performance (1.08-1.40)
	High	Lower two-thirds of Below Average Performance (>1.40)

Needs Scale

Measure		None <=	Low <=	> Medium <		High >=
Safety Index (Corridor Emphasis Area)		Weighted calculation for the segment totals in corridor (operating environments)				
Safety Index (Corridor Non-Emphasis Area)		Weighted calculation for the segment totals in corridor (operating environments)				
Safety Index and	2 or 3 Lane Undivided Highway	0.97	1.02	1.02	1.13	1.13
	2 or 3 or 4 Lane Divided Highway	0.94	1.07	1.07	1.32	1.32
Directional Safety Index (Segment)	4 or 5 Lane Undivided Highway	0.93	1.08	1.08	1.37	1.37
	6 Lane Highway	0.92	1.08	1.08	1.4	1.4
	Rural 4 Lane Freeway with Daily Volume < 25,000	0.95	1.06	1.06	1.27	1.27
	Rural 4 Lane Freeway with Daily Volume > 25,000	0.93	1.08	1.08	1.37	1.37
	Urban 4 Lane Freeway	0.91	1.09	1.09	1.45	1.45
	Urban or Rural 6 Lane Freeway	0.88	1.11	1.11	1.58	1.58
	Urban > 6 Lane Freeway	0.96	1.03	1.03	1.18	1.18
% of Fatal + Susp. Serious Injury Crashes at Intersections	2 or 3 Lane Undivided Highway	13%	14%	14%	17%	17%
	2 or 3 or 4 Lane Divided Highway	25%	27%	27%	31%	31%
	4 or 5 Lane Undivided Highway	46%	48%	48%	52%	52%
	6 Lane Highway	63%	68%	68%	78%	78%
	Rural 4 Lane Freeway with Daily Volume < 25,000	0%	0%	0%	0%	0%
	Rural 4 Lane Freeway with Daily Volume > 25,000	0%	0%	0%	0%	0%
	Urban 4 Lane Freeway	0%	0%	0%	0%	0%
	Urban or Rural 6 Lane Freeway	0%	0%	0%	0%	0%
	Urban > 6 Lane Freeway	0%	0%	0%	0%	0%
% of Fatal + Susp. Serious Injury Crashes Involving Lane Departures	2 or 3 Lane Undivided Highway	69%	72%	72%	77%	77%
	2 or 3 or 4 Lane Divided Highway	59%	62%	62%	68%	68%
	4 or 5 Lane Undivided Highway	25%	29%	29%	36%	36%
	6 Lane Highway	21%	30%	30%	47%	47%
	Rural 4 Lane Freeway with Daily Volume < 25,000	74%	75%	75%	78%	78%
	Rural 4 Lane Freeway with Daily Volume > 25,000	72%	75%	75%	81%	81%
	Urban 4 Lane Freeway	66%	72%	72%	84%	84%
	Urban or Rural 6 Lane Freeway	58%	60%	60%	65%	65%
	Urban > 6 Lane Freeway	41%	42%	42%	44%	44%
% of Fatal + Susp. Serious Injury Crashes Involving Pedestrians	2 or 3 Lane Undivided Highway	5%	6%	6%	8%	8%
	2 or 3 or 4 Lane Divided Highway	3%	3%	3%	4%	4%
	4 or 5 Lane Undivided Highway	10%	12%	12%	15%	15%
	6 Lane Highway	4%	8%	8%	16%	16%
	Rural 4 Lane Freeway with Daily Volume < 25,000	2%	3%	3%	4%	4%
	Rural 4 Lane Freeway with Daily Volume > 25,000	2%	3%	3%	6%	6%
	Urban 4 Lane Freeway	2%	4%	4%	7%	7%
	Urban or Rural 6 Lane Freeway	5%	6%	6%	9%	9%
	Urban > 6 Lane Freeway	3%	4%	4%	6%	6%

% of Fatal + Susp. Serious Injury Crashes Involving Trucks	2 or 3 Lane Undivided Highway	5%	6%	6%	9%	9%
	2 or 3 or 4 Lane Divided Highway	6%	8%	8%	12%	12%
	4 or 5 Lane Undivided Highway	2%	4%	4%	7%	7%
	6 Lane Highway	5%	6%	6%	8%	8%
	Rural 4 Lane Freeway with Daily Volume < 25,000	20%	21%	21%	24%	24%
	Rural 4 Lane Freeway with Daily Volume > 25,000	12%	15%	15%	22%	22%
	Urban 4 Lane Freeway	9%	11%	11%	15%	15%
	Urban or Rural 6 Lane Freeway	8%	11%	11%	16%	16%
	Urban > 6 Lane Freeway	3%	4%	4%	6%	6%
% of Fatal + Susp. Serious Injury Crashes Involving Bicycles	2 or 3 Lane Undivided Highway	1%	2%	2%	4%	4%
	2 or 3 or 4 Lane Divided Highway	1%	2%	2%	3%	3%
	4 or 5 Lane Undivided Highway	2%	3%	3%	5%	5%
	6 Lane Highway	2%	4%	4%	9%	9%
	Rural 4 Lane Freeway with Daily Volume < 25,000	0%	0%	0%	1%	1%
	Rural 4 Lane Freeway with Daily Volume > 25,000	0%	0%	0%	0%	0%
	Urban 4 Lane Freeway	0%	0%	0%	0%	0%
	Urban or Rural 6 Lane Freeway	0%	0%	0%	1%	1%
	Urban > 6 Lane Freeway	0%	0%	0%	0%	0%

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab.

Table 3 - Step 3 Template

A separate *Crash Summary Sheet* file contains summaries for 8 crash attributes for the entire corridor, for each corridor segment, and for statewide roadways with similar operating environments (the database of crashes on roadways with similar operating environments was developed in Existing Performance Analysis (the baseline corridor performance)). The crash attribute summaries are consistent with the annual ADOT Publication, *Crash Facts*. The 8 crash attribute summaries consist of the following:

- First Harmful Event (FHET)
- Crash Type (CT)
- Violation or Behavior (VB)
- Lighting Condition (LC)
- Roadway Surface Type (RST)
- First Unit Event (FUE)
- Driver Physical Condition (Impairment)
- Safety Device Usage (Safety Device)

Non-colored tabs in this spreadsheet auto-populate with filtered crash attributes. Each tab is described below:

- **Step_3_Summary** – This tab contains the filtered summary of crashes that exceed statewide thresholds for crashes on roadways with similar operating environments. Data in this tab are copied into the Step 3 template.
- **Statewide** – This tab contains a summary of statewide crashes from roadways with similar operating environments filtered by the 8 crash type summaries listed above. The crash type summaries calculate statewide crash thresholds (% total for fatal plus suspected serious crashes). The crash thresholds were developed to provide a statewide expected proportion of crash attributes against which the corridor segments' crash attributes can be compared. The crash thresholds were developed using the *Probability of Specific Crash Types Exceeding a Threshold Proportion* as shown in the Highway Safety Manual, Volume 1 (2010). The thresholds are automatically calculated within the spreadsheet. The threshold proportion was calculated as follows:

$$p*_i = \frac{\sum N_{Observed,i}}{\sum N_{Observed,i(total)}}$$

Where:

$p*_i$ = Threshold proportion

$\sum N_{Observed,i}$ = Sum of observed target crash frequency within the population

$\sum N_{Observed,i(total)}$ = Sum of total observed crash frequency within the population

A minimum crash sample size of 5 crashes over the 5-year crash analysis period is required for a threshold exceedance to be displayed in the Step 3 template. The probability of exceeding the crash threshold was not calculated to simplify the process.

- **Corridor** – A summary of corridor-wide crashes filtered by the 8 crash attribute summaries listed above.
- **Segment FHET** – A segment-by-segment summary of crashes filtered by first harmful event attributes.
- **Segment CT** – A segment-by-segment summary of crashes filtered by crash type attributes.
- **Segment VB** - A segment-by-segment summary of crashes filtered by violation or behavior attributes.
- **Segment LC** – A segment-by-segment summary of crashes filtered by lighting condition attributes.
- **Segment RST** – A segment-by-segment summary of crashes filtered by roadway surface attributes.

- **Segment FUE** – A segment-by-segment summary of crashes filtered by first unit event attributes.
- **Segment Impairment** – A segment-by-segment summary of crashes filtered by driver physical condition attributes related to impairment.
- **Segment Safety Device** – A segment-by-segment summary of crashes filtered by safety device usage attributes.

The steps to compete Step 3 include:

Step 3.1

Using the Crash_Summary_Sheet.xlsx, go to the “Step_3_Summary” tab. Input the operating environments for each segment in the table.

Step 3.2

Filter data from the ADOT database for the “CORRIDOR_DATA” tab by inserting the following data in the appropriate columns that are highlighted in gray for the “INPUT_CORRIDOR_DATA” tab:

- Incident ID
- Incident Crossing Feature (MP)
- Segment Number (Non-native ADOT data – must be manually assigned based on the location of the crash)
- Operating Environment (Non-native ADOT data – should already be assigned but if for some reason it isn’t, it will need to be manually assigned)
- Incident Injury Severity
- Incident First Harmful Description
- Incident Collision Manner
- Incident Lighting Condition Description
- Unit Body Style
- Surface Condition
- First Unit Event Sequence
- Person Safety Equipment
- Personal Violation or Behavior
- Impairment

Note that columns highlighted in yellow perform a calculated input to aggregate specific crash descriptions. For example, crashes can contain various attributes for animal-involved crashes. The crash attributes that involve an animal were combined into a common attribute, such as “ANIMAL”. This will allow the summaries to be consistent with the ADOT *Crash Facts*.

The data in the Impairment category contains blank descriptions if it was found that there was “No Apparent Influence” or if it was “Unknown”. Using the crash data fields “PersonPhysicalDescription” 0 - 99, fill in the blank columns to reflect if the physical description is described as “No Apparent Influence” or “Unknown”. Note that the native physical description data from the ADOT database may need to be combined to a single column.

Step 3.3

Confirm that the crash database is being properly filtered by comparing crash frequencies from the summary tables with the frequencies developed in Existing Performance Analysis. For example, the lookup function will fail if the filter is for “NO IMPROPER ACTION” if the database has the attribute of “NO_IMPROPER_ACTION”.

Step 3.4

Copy and paste the Step_3_Summary into the Safety Needs Assessment spreadsheet in the Step 3 tab. Paste values only and remove the summaries with “0%s” for a clean display. Where duplicate values exist, go to the "Calcs" tab in the Crash_Summary_Sheet file to determine which categories have the same %. If there are more crash types with the same % than there is space in the table, select the crash type with the highest difference between the segment % and the statewide average %

Step 3.5

The Step 3 table in the Safety Needs Assessment spreadsheet should be similar to the Step 3 template. In the Segment Crash Summaries row, the top three crash attributes are displayed. Change the font color of the crash attributes that exceed the statewide crash threshold to red for emphasis. The attributes with a red font in the “Calcs” tab have exceeded statewide crash thresholds. Note that corridor-wide values are not compared to statewide values as corridor-wide values are typically a blend of multiple similar operating environments while the statewide values apply to one specific similar operating environment.

Step 3.6

Provide a summary of any observable patterns found within the crash Hot Spots, if any exist in the segments.

Step 3.7

Input any historic projects (going no further back than 15 years) that can be related to improving safety. Projects more than five years old may have exceeded their respective design life and could be contributing factors to safety performance needs.

Step 3.8

Input key points from District interviews or any important information from past discussions with District staff that is consistent with needs and crash patterns identified as part of the performance and needs assessment as this may be useful in identifying contributing causes. This information may be obtained from District Maintenance personnel by requesting the mile post locations that may be considered safety issues.

Step 3.9

For segments with one or more of the following characteristics, review crashes of all severity levels (not just fatal and suspected serious injury crashes). Identify likely contributing factors and compare that to the above statewide average comparison findings already calculated for fatal and suspected serious injury crashes. Refine the contributing factors list accordingly.

- Segments with Medium or High need
- Segments with a crash hot spot concentration (but only review crashes at the concentration areas)
- Segments with no apparent predominant contributing factors based on the comparison of fatal and suspected serious injury crashes to statewide averages if the segment has a Medium or High need.

Step 3.10

Considering all information in Steps 1-3, list the contributing factors using engineering judgment and the information on contributing factors available in Section 6.2 of the 2010 Highway Safety Manual. Additional sources for determining contributing factors may include aerial, “streetview”, and/or ADOT photologs. Other documents such as Design Concept Reports (DCR) or Road Safety Assessments can provide insight into the study corridor’s contributing factors.

Add comments as needed on additional information related to contributing factors that may have been provided by input from ADOT staff.

Freight Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Freight Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score and color for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for Freight. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scale" within the Step 1 template.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted score, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis. Copy the performance score for each segment to the appropriate "Performance Score" column. Select the *Facility Operations* for each segment from the drop-down list and input whether or not the performance area is an emphasis area. The corridor needs assessment scales will be updated automatically.

Step 1.2

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial need from the Step 1 template to the Step 2 template.

Step 2.2

Note any truck height restriction hot spots (clearance < 16.25') identified as part of the baseline corridor performance. For each entry, note the milepost of the height restriction and if the height restriction can be detoured by ramping around the obstruction. If it is not possible for a truck to ramp around the height restriction, note the existing height as well.

Step 2.3

Identify recently completed or under construction projects that would be considered relevant to freight performance. Include only projects that were not taken into account during the freight data analysis period. Any completed or under construction roadway project after the date of the data that has the potential to mitigate a freight issue on a corridor segment should be listed in the template. Such projects can include the construction of climbing lanes or Dynamic Message Signs (DMS) installation. Sources of recent or current project activity can be ADOT MPD staff, ADOT public notices, and ADOT District staff.

Step 2.4

Update the Final Need using the following criteria:

- If there is one or more truck height restriction hot spots where a truck cannot ramp around on a 'None' segment, increase (i.e., worsen) the need rating to 'Low'.
- If a recent project has superseded the performance rating data and it is certain the project addressed the need, change the need rating to "None".
- If a recent project has superseded the performance rating data but it is uncertain that a project addressed the need, maintain the current need rating and note the uncertainty as a comment.

Step 2.5

Note any programmed projects that could have the potential to mitigate any freight need on the segment. Programmed projects are provided as information and do not impact the need rating. Programmed projects will be reviewed in the development of solution sets for identified needs. The source of the programming information can be found in ADOT's 5-year construction program. If there are other comments relevant to the needs analysis, they can be entered in the right-most column.

Example Scales for Level of Need

Freight Index (Interrupted) Performance Score Thresholds	Performance Level	Initial Performance Level of Need	Description (Non-emphasis Area)
	Good	None	All levels of Good and the top third of Fair (<1.58)
	Good		
1.45	Good		
	Fair		
	Fair	Low	Middle third of Fair (1.58-1.72)
1.85	Fair	Medium	Lower third of Fair and top third of Poor (1.72-1.98)
	Poor		
	Poor	High	Lower two-thirds of Poor (>1.98)
	Poor		

Needs Scale

Measure	None <=	Low <=	> Medium <		High >=
Corridor Freight Index (Emphasis Area)	Dependent on weighted average of interrupted vs. uninterrupted segments				
Corridor Freight Index (Non-Emphasis Area)	Dependent on weighted average of interrupted vs. uninterrupted segments				
Freight Index (Segment)					
Interrupted	1.58	1.72	1.72	1.98	1.98
Uninterrupted	1.22	1.28	1.28	1.42	1.42
Directional TTTR					
Interrupted	1.58	1.72	1.72	1.98	1.98
Uninterrupted	1.22	1.28	1.28	1.42	1.42
Closure Duration					
All Facility Operations	71.07	97.97	97.97	151.75	151.75
Measure	**None >=**	**Low >=**	**< Medium >**		**High <=**
Bridge Clearance (feet)					
All Bridges	16.33	16.17	16.17	15.83	15.83

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab.

The steps to compete Step 3 include:

Step 3.1

Input all roadway variable data that describe each segment into the appropriate columns. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment.

Step 3.2

Input all traffic variables for each segment into the appropriate columns. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment.

Step 3.3

Input any freight-related infrastructure that currently exists on the corridor for each segment. The relevant infrastructure can include DMS locations, weigh stations, Ports of Entry (POE), rest areas, parking areas, and climbing lanes. Include the mileposts of the listed infrastructure. This data can be extracted from the most recent Highway Log and the 2015 Climbing and Passing Lane Prioritization Study.

Step 3.4

Input the Closure Extents that have occurred along the study corridor. Road closure information can be detailed out by the reason for the closure as documented in Highway Condition Reporting System (HCRS) data analyzed as part of the baseline corridor performance. Closure reasons include incident/accidents, winter storms, obstruction hazards, and undefined closures. Statewide average percentages for the various closure reasons have been calculated for the analysis period on ADOT's designated strategic corridors. Compare these statewide average percentages to the corridor percentages for the various closure reasons to identify higher than average percentages of one or more closure reasons on any given segment. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment. Input the closures as follows and use red text to indicate that the segment percentage exceeds statewide averages:

- Total Number of Closures
- % Closures (No Reason)
- % Incidents/Accidents
- % Obstructions/Hazards
- % Weather Related

Step 3.5

List the non-actionable conditions that are present within each segment by milepost if possible. Non-Actionable conditions are conditions that exist within the environment of each segment that

cannot be improved through an engineered solution. Examples of Non-Actionable conditions can include border patrol check points and other closures/restrictions not controlled by ADOT. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment.

Step 3.6

Input any programmed and planned projects or issues that have been identified from previous documents or studies that are relevant to the Final Need. Sources for this data include the current Highway Log, the 2015 Climbing and Passing Lane Prioritization Study, and ADOT's 5-year construction program.

Step 3.7

Considering all information in Steps 1-3, identify the contributing factors to the Final Need column. Potential contributing factors to freight performance needs include roadway vertical grade, number of lanes, traffic volume-to-capacity ratios, presence/lack of a climbing lanes, and road closures. Also identify higher than average percentages of one or more closure reasons on any given segment.

Pavement Performance Needs Analysis

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Facility Type	Pavement Index			Directional PSR					% Area Failure			Initial Need
				Performance Score	Performance Objective	Level of Need	Performance Score		Performance Objective	Level of Need		Performance Score	Performance Objective	Level of Need	
							NB/EB	SB/WB		NB/EB	SB/WB				
160-1	8	311-319	Highway	3.91	Fair or Better	None	3.66	3.61	Fair or Better	None	None	0%	Fair or Better	None	None
160-2	4	319-323	Highway	3.87	Fair or Better	None	3.80	3.96	Fair or Better	None	None	36%	Fair or Better	High	Low
160-3	21	323 - 344	Highway	2.98	Fair or Better	Medium	3.30	3.32	Fair or Better	None	None	45%	Fair or Better	High	High
160-4	18	344 - 362	Highway	4.18	Fair or Better	None	3.96	3.97	Fair or Better	None	None	5%	Fair or Better	None	None
160-5	12	362 - 374	Highway	4.00	Fair or Better	None	4.06	4.03	Fair or Better	None	None	25%	Fair or Better	High	Low
160-6	17	374 - 391	Highway	2.67	Fair or Better	Medium	3.23	3.20	Fair or Better	Low	Low	95%	Fair or Better	High	High
160-7	4	391 - 395	Highway	4.13	Fair or Better	None	3.91	3.89	Fair or Better	None	None	0%	Fair or Better	None	None
160-8	18	395 - 413	Highway	3.67	Fair or Better	None	3.76	3.68	Fair or Better	None	None	44%	Fair or Better	High	Low
160-9	21	413 - 434	Highway	2.69	Fair or Better	Medium	3.00	3.05	Fair or Better	Medium	Medium	76%	Fair or Better	High	High
160-10	17	434 - 451	Highway	2.88	Fair or Better	Medium	3.54	3.54	Fair or Better	None	None	74%	Fair or Better	High	High
160-11	12	451 - 463	Highway	4.17	Fair or Better	None	4.04	4.06	Fair or Better	None	None	4%	Fair or Better	None	None
160-12	7	463 - 470	Highway	3.95	Fair or Better	None	3.87	3.93	Fair or Better	None	None	0%	Fair or Better	None	None
Emphasis Area?	Yes	Weighted Average		3.42	Good	Low									

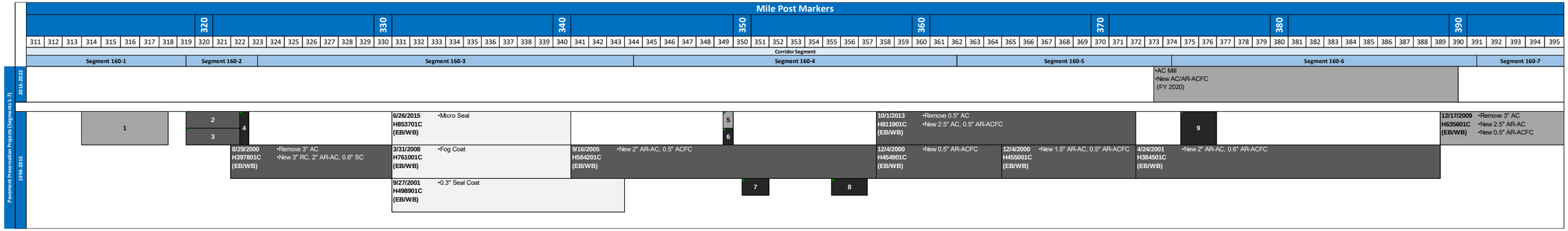
Segment #	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Need Adjustments		Final Need	Comments (may include programmed projects or issues from previous reports)
				Hot Spots	Previous Projects (which supersede condition data)		
160-1	8	311-319	None	None		None	
160-2	4	319-323	Low	NB MP 321-323		Low	
160-3	21	323 - 344	High	NB MP 325-326, 328-341 & SB MP 330-331, 340-344		High	
160-4	18	344 - 362	None	SB MP 344-346		Low	
160-5	12	362 - 374	Low	NB MP 368-371, 373-374 & SB MP 372-374	Pavement Rehabilitation & Rockfall Mitigation - MP 372.5-374 (2021)	Low	
160-6	17	374 - 391	High	NB/SB MP 374-390	Pavement Rehabilitation & Rockfall Mitigation - MP 374-389.5 (2021)	None	
160-7	4	391 - 395	None	None		None	

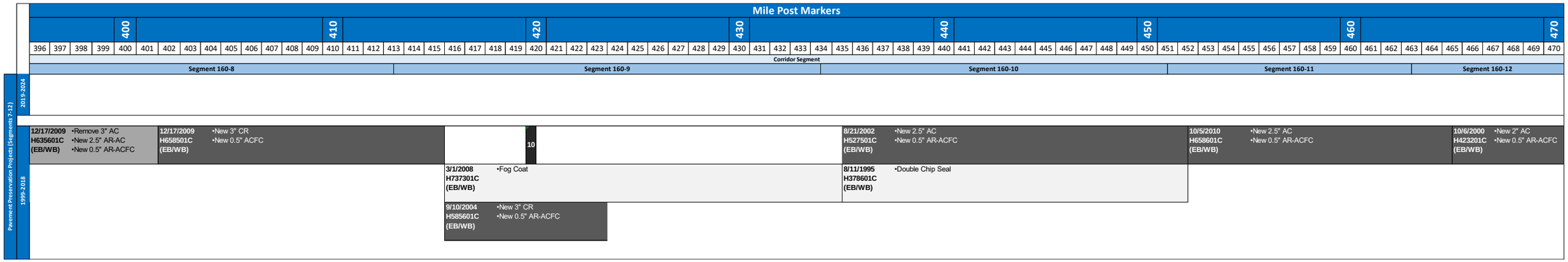
160-8	18	395 - 413	Low	NB/SB MP 402-407, NB MP 407-409, 412-413, SB MP 408-409, 411-413		Low	
160-9	21	413 - 434	High	NB/SB MP 416-429, 430-431, 433-434, NB MP 432-433 & SB MP 413-414		High	
160-10	17	434 - 451	High	NB/SB MP 434-442 & SB MP 442-451		High	
160-11	12	451 - 463	None	SB MP 451-452		Low	
160-12	7	463 - 470	None	None		None	

Pavement Performance Needs Analysis (continued)

Segment	Segment Length (miles)	Segment Mileposts (MP)	Final Need	Bid History Investment	PeCos History Investment	Resulting Historical Investment	Contributing Factors and Comments
160-1	8	311-319	None	Low	Low	Low	
160-2	4	319-323	Low	Low	Low	Low	
160-3	21	323 - 344	High	Low	Low	Low	
160-4	18	344 - 362	Low	Medium	Low	Medium	
160-5	12	362 - 374	Low	Medium	Low	Medium	
160-6	17	374 - 391	None	High	High	High	
160-7	4	391 - 395	None	Low	Medium	Low	
160-8	18	395 - 413	Low	Low	Medium	Low	
160-9	21	413 - 434	High	Low	Medium	Low	
160-10	17	434 - 451	High	Low	Medium	Low	
160-11	12	451 - 463	Low	Low	Low	Low	
160-12	7	463 - 470	None	Low	Medium	Low	

Pavement History





Pavement Treatment Reference Numbers	
1. 2/23/2012 H798801C (EB/WB): Remove 0.5" AC, New 0.5" ACFC	
2. 9/8/2008 H460101C (EB): Remove 0.5" AC, New 6" AB, New 4" AC, New 0.5" AR-ACFC	
3. 9/8/2008 H460101C (WB): New 6" AB, New 4" AC, New 2" AC, New 0.5" AR-ACFC	
4. 8/29/2000 H397801C (EB/WB): New 4" AB, 9" AC, 0.6" SC	
5. 8/19/2011 H709101C (EB): Remove 0.5", New 0.5" AR-ACFC	
6. 8/19/2011 H709101C (WB): New 8" AB, 5"AC, 0.5" ACFC	
7. 9/16/2005 H584201C (EB): New 6" AB, 2.5"AC, 2" AR, 0.5" AR-ACFC	
8. 9/16/2005 H584201C (WB): New 6" AB, 2.5" AC, 2" AR, 0.5" AR-ACFC	
9. 6/11/2014 H512001C (EB/WB): Remove 0.5" AC, New 6" AB, 6.5" AC, 0.5" AR-ACFC	
10. 10/13/2013 H757101 (EB/WB): New 8" AB, 4" AC, 0.5" ACFC	

Legend

- New Paving or Reconstruction
- Mill and Overlay (Adding Structural Thickness)
- Mill and Replace (No Change Structural Thickness)
- Fog Coat or Thin Overlay Treatments
- PCCP Pavement Border
- AC Pavement Border

Cost Value	Level	Segment Number																					
		1		2		3		4		5		6		7		8		9		10		11		12	
		Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir
1	L1						56%												84%						
1							56%														89%				
1							72%																		
1																									
3	L2		50%					3%			8%		88%		100%		33%								
3													12%												
3																									
3																									
3																									
3																									
4	L3			60%	25%		40%		71%		56%		82%				64%						15%		37%
4				60%			17%		24%		13%										89%		85%		63%
4									24%		47%								48%						
4											13%														
6	L4				10%			3%					12%						2%						
6								8%																	
6								10%																	
6																									
6																									
6																									
Sub-Total		0.0	1.5	4.8	1.6	0.0	4.1	1.4	4.8	0.0	5.4	0.0	7.0	0.0	3.0	0.0	3.6	0.0	2.9	0.0	4.5	0.0	4.0	0.0	4.0
Total		**1.5**		**4.0**		**4.1**		**5.4**		**5.4**		**7.0**		**3.0**		**3.6**		**2.9**		**4.5**		**4.0**		**4.0**	

Value	Level	Segment Number											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	L1	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.8	0.9	0.0	0.0
3	L2	1.5	0.0	0.0	0.0	0.2	3.0	3.0	1.0	0.0	0.0	0.0	0.0
4	L3	0.0	3.4	2.3	4.8	5.2	3.3	0.0	2.6	1.9	3.6	4.0	4.0
6	L4	0.0	0.6	0.0	0.6	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.0
Total		1.5	4.0	4.1	5.4	5.4	7.0	3.0	3.6	2.9	4.5	4.0	4.0

Bridge Performance Needs Analysis

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Bridge Index			Lowest Bridge Rating			Sufficiency Rating			Initial Need
				Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	
160-1	8	312-319	1	5.00	Fair or Better	Medium	5	Fair or Better	Low	71.7	Fair or Better	None	Medium
160-2	4	319-323	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
160-3	21	323-344	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
160-4	18	344-362	1	6.00	Fair or Better	None	6	Fair or Better	None	64.3	Fair or Better	Low	Low
160-5	12	362-374	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
160-6	17	374-391	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
160-7	5	391-395	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
160-8	18	395-413	1	6.00	Fair or Better	None	6	Fair or Better	None	85.2	Fair or Better	None	None
160-9	21	413-434	2	7.00	Fair or Better	None	7	Fair or Better	None	87.84	Fair or Better	None	None
160-10	17	434-451	1	5.00	Fair or Better	Medium	5	Fair or Better	Low	62.7	Fair or Better	Low	Medium
160-11	12	451-463	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
160-12	7	463-470	0	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	No Bridges	Fair or Better	N/A	N/A
Emphasis Area?	No	Weighted Avg		6.00	Fair or Better	None							

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Initial Need	Need Adjustments		Final Need	Historical Review	Comments
					Hot Spots (Rating of 4 or multiple 5's)	Previous Projects (which supersede condition data)			
160-1	8	312-319	1	Medium	None		Medium		
160-2	4	319-323	0	N/A	None		None		
160-3	21	323-344	0	N/A	None		None		

160-4	18	344-362	1	Low	None		Low		
160-5	12	362-374	0	N/A	None		None		
160-6	17	374-391	0	N/A	None		None		
160-7	5	391-395	0	N/A	None		None		
160-8	18	395-413	1	None	None		None		
160-9	21	413-434	2	None	None	Construct Bridge Replacement - Chinle Wash Br. MP 429 (2018)	None		Construct Scour Retrofit - Laguna Creek Bridge (#20001) MP 420 (2017)
160-10	17	434-451	1	Medium	None		Medium		
160-11	12	451-463	0	N/A	None		None		
160-12	7	463-470	0	N/A	None		None		

Segment	Segment Length (Miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Final Need	Contributing Factors			Comments
					Bridge	Current Ratings	Historical Review	
160-1	8	312-319	1	Medium	**Hamblin Wash Br, #531, MP 312.20**	**2021 Current Eval Rating, 5**	**No Historial Review**	
160-2	4	319-323	0	None	**No bridges with current ratings less than 6 and no historical issues**			
160-3	21	323-344	0	None	**No bridges with current ratings less than 6 and no historical issues**			
160-4	18	344-362	1	Low	**No bridges with current ratings less than 6 and no historical issues**			
160-5	12	362-374	0	None	**No bridges with current ratings less than 6 and no historical issues**			
160-6	17	374-391	0	None	**No bridges with current ratings less than 6 and no historical issues**			
160-7	5	391-395	0	None	**No bridges with current ratings less than 6 and no historical issues**			
160-8	18	395-413	1	None	**No bridges with current ratings less than 6 and no historical issues**			
160-9	21	413-434	2	None	**No bridges with current ratings less than 6 and no historical issues**			
160-10	17	434-451	1	Medium	**Walker Creek Bridge, #748, MP 435.33**	**2021 Current Deck Rating, 5**	**No Historial Review**	
160-11	12	451-463	0	None	**No bridges with current ratings less than 6 and no historical issues**			
160-12	7	463-470	0	None	**No bridges with current ratings less than 6 and no historical issues**			

Mobility Performance Needs Analysis

Segment #	Segment Mileposts	Segment Length (miles)	Environment Type	Facility Operation	Mobility Index			Future Daily V/C			Existing Peak Hour V/C					Closure Extent (occurrences/year/mile)				
											Performance Score			Level of Need		Performance Score			Level of Need	
					Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	NB/EB	SB/WB	Performance Objective	NB/EB	SB/WB	NB/EB	SB/WB	Performance Objective	NB/EB	SB/WB
160-1	311 - 319	8	Rural	Interrupted	0.26	Fair or Better	None	0.30	Fair or Better	None	0.26	0.21	Fair or Better	None	None	0.08	0.05	Fair or Better	None	None
160-2	319-323	4	Rural	Interrupted	1.01	Fair or Better	High	1.16	Fair or Better	High	0.59	0.71	Fair or Better	None	Medium	0.10	0.10	Fair or Better	None	None
160-3	323 - 344	21	Rural	Uninterrupted	0.17	Fair or Better	None	0.20	Fair or Better	None	0.16	0.15	Fair or Better	None	None	0.10	0.10	Fair or Better	None	None
160-4	344 - 362	18	Rural	Uninterrupted	0.15	Fair or Better	None	0.17	Fair or Better	None	0.12	0.12	Fair or Better	None	None	0.04	0.03	Fair or Better	None	None
160-5	362 - 374	12	Rural	Uninterrupted	0.20	Fair or Better	None	0.24	Fair or Better	None	0.16	0.14	Fair or Better	None	None	0.13	0.12	Fair or Better	None	None
160-6	374 - 391	17	Rural	Uninterrupted	0.26	Fair or Better	None	0.30	Fair or Better	None	0.24	0.21	Fair or Better	None	None	0.09	0.09	Fair or Better	None	None
160-7	391 - 395	4	Rural	Interrupted	0.28	Fair or Better	None	0.29	Fair or Better	None	0.27	0.27	Fair or Better	None	None	0.25	0.30	Fair or Better	None	None
160-8	395 - 413	18	Rural	Uninterrupted	0.08	Fair or Better	None	0.05	Fair or Better	None	0.12	0.09	Fair or Better	None	None	0.10	0.10	Fair or Better	None	None
160-9	413 - 434	21	Rural	Uninterrupted	0.07	Fair or Better	None	0.04	Fair or Better	None	0.11	0.11	Fair or Better	None	None	0.10	0.05	Fair or Better	None	None
160-10	434 - 451	17	Rural	Uninterrupted	0.16	Fair or Better	None	0.16	Fair or Better	None	0.19	0.12	Fair or Better	None	None	0.07	0.06	Fair or Better	None	None
160-11	451 - 463	12	Rural	Uninterrupted	0.18	Fair or Better	None	0.21	Fair or Better	None	0.18	0.11	Fair or Better	None	None	0.10	0.07	Fair or Better	None	None
160-12	463 - 470	7	Rural	Interrupted	0.17	Fair or Better	None	0.20	Fair or Better	None	0.21	0.12	Fair or Better	None	None	0.03	0.00	Fair or Better	None	None
Mobility Emphasis Area		Yes	Weighted Average		0.18	Good	None													

Segment #	Segment Mileposts	Segment Length (miles)	Environment Type	Facility Operation	Directional LOTTR (all vehicles)					Bicycle Accommodation			Initial Need
					Performance Score		Performance Objective	Level of Need		Performance Score	Performance Objective	Level of Need	
					NB/EB	SB/WB		NB/EB	SB/WB				
160-1	311 - 319	8	Rural	Interrupted	1.11	1.09	Fair or Better	None	None	0%	Fair or Better	High	Low
160-2	319-323	4	Rural	Interrupted	1.11	1.16	Fair or Better	None	None	96%	Fair or Better	None	High
160-3	323 - 344	21	Rural	Uninterrupted	1.07	1.06	Fair or Better	None	None	19%	Fair or Better	High	Low
160-4	344 - 362	18	Rural	Uninterrupted	1.06	1.05	Fair or Better	None	None	9%	Fair or Better	High	Low
160-5	362 - 374	12	Rural	Uninterrupted	1.06	1.06	Fair or Better	None	None	0%	Fair or Better	High	Low
160-6	374 - 391	17	Rural	Uninterrupted	1.07	1.15	Fair or Better	None	None	0%	Fair or Better	High	Low
160-7	391 - 395	4	Rural	Interrupted	1.15	1.14	Fair or Better	None	None	6%	Fair or Better	High	Low
160-8	395 - 413	18	Rural	Uninterrupted	1.09	1.06	Fair or Better	None	None	0%	Fair or Better	High	Low
160-9	413 - 434	21	Rural	Uninterrupted	1.13	1.12	Fair or Better	None	None	1%	Fair or Better	High	Low
160-10	434 - 451	17	Rural	Uninterrupted	1.07	1.01	Fair or Better	None	None	1%	Fair or Better	High	Low
160-11	451 - 463	12	Rural	Uninterrupted	1.06	1.17	Fair or Better	None	None	0%	Fair or Better	High	Low
160-12	463 - 470	7	Rural	Interrupted	1.24	1.21	Fair or Better	None	None	4%	Fair or Better	High	Low

Mobility Performance Needs Analysis (continued)

Segment #	Segment Mileposts (MP)	Segment Length (miles)	Initial Need	Need Adjustments	Final Need	Planned and Programmed Future Projects
				Recently Completed Projects		
160-1	311 - 319	8	Low		Low	
160-2	319-323	4	High		High	
160-3	323 - 344	21	Low		Low	
160-4	344 - 362	18	Low		Low	US 160 & SR 98 Flashing Stop Ahead, Intersection Ahead and Speed Feeback Signs - MP 361-362
160-5	362 - 374	12	Low	Rockfall Mitigation - MP 372.5 Long House Valley (2021)	Low	US 160 & SR 98 Flashing Stop Ahead, Intersection Ahead and Speed Feeback Signs - MP 361-362
160-6	374 - 391	17	Low		Low	
160-7	391 - 395	4	Low		Low	
160-8	395 - 413	18	Low		Low	
160-9	413 - 434	21	Low		Low	
160-10	434 - 451	17	Low		Low	
160-11	451 - 463	12	Low		Low	
160-12	463 - 470	7	Low		Low	

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Roadway Variables								Traffic Variables			Relevant Mobility Related Existing Infrastructure
				Functional Classification	Environmental Type (Urban/Rural)	Terrain	# of Lanes/ Direction	Weighted Average Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2035 LOS	% Trucks	
160-1	311 - 319	8	Low	State Highway	Rural	Rolling	2	63	No	Non-Divided	32%	A-B	A-B	9%	
160-2	319-323	4	High	State Highway	Rural	Rolling	2	49	No	Non-Divided	42%	C	D-F	10%	
160-3	323 - 344	21	Low	State Highway	Rural	Level	2	64	No	Non-Divided	12%	A-B	A-B	11%	
160-4	344 - 362	18	Low	State Highway	Rural	Level	2	65	No	Non-Divided	33%	A-B	A-B	13%	
160-5	362 - 374	12	Low	State Highway	Rural	Level	2	65	No	Non-Divided	14%	A-B	A-B	11%	
160-6	374 - 391	17	Low	State Highway	Rural	Rolling	2	64	No	Non-Divided	24%	A-B	A-B	11%	
160-7	391 - 395	4	Low	State Highway	Rural	Rolling	2	60	No	Non-Divided	47%	A-B	A-B	11%	
160-8	395 - 413	18	Low	State Highway	Rural	Level	2	65	No	Non-Divided	9%	A-B	A-B	11%	
160-9	413 - 434	21	Low	State Highway	Rural	Level	2	65	No	Non-Divided	20%	A-B	A-B	11%	
160-10	434 - 451	17	Low	State Highway	Rural	Rolling	2	64	No	Non-Divided	25%	A-B	A-B	14%	
160-11	451 - 463	12	Low	State Highway	Rural	Rolling	2	65	No	Non-Divided	21%	A-B	A-B	14%	
160-12	463 - 470	7	Low	State Highway	Rural	Rolling	2	60	No	Non-Divided	31%	A-B	A-B	14%	

Mobility Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent							Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need	Contributing Factors
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related			
160-1	311 - 319	8	Low	5	5	100%	0	0%	0	0%			
160-2	319-323	4	High	4	4	100%	0	0%	0	0%			
160-3	323 - 344	21	Low	22	20	91%	1	5%	0	0%			
160-4	344 - 362	18	Low	7	7	100%	0	0%	0	0%			
160-5	362 - 374	12	Low	15	14	93%	1	7%	0	0%			
160-6	374 - 391	17	Low	16	15	94%	1	6%	0	0%			
160-7	391 - 395	4	Low	11	11	100%	0	0%	0	0%			
160-8	395 - 413	18	Low	18	17	94%	1	6%	0	0%			
160-9	413 - 434	21	Low	16	16	100%	0	0%	0	0%			
160-10	434 - 451	17	Low	11	11	100%	0	0%	0	0%			

Safety Performance Needs Analysis

Segment	Operating Environment	Segment Length (miles)	Segment Mileposts (MP)	Safety Index			Directional Safety Index					% of Fatal + Incapacitating Injury Crashes at Intersections		
				Performance Score	Performance Objective	Level of Need	NB/EB Performance Score	SB/WB Performance Score	Performance Objective	NB/EB Level of Need	SB/WB Level of Need	Performance Score	Performance Objective	Level of Need
160-1	2 or 3 Lane Undivided Highway	8	311-319	1.94	Average or Better	High	2.58	1.31	Average or Better	High	High	*Insufficient Data*	Average or Better	N/A
160-2	2 or 3 Lane Undivided Highway	4	319-323	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	*Insufficient Data*	Average or Better	N/A	N/A	*Insufficient Data*	Average or Better	N/A
160-3	2 or 3 Lane Undivided Highway	20.4	323-343.4	2.21	Average or Better	High	1.67	2.76	Average or Better	High	High	*Insufficient Data*	Average or Better	N/A
160-4	2 or 3 Lane Undivided Highway	18.75	343.4-362.15	1.02	Average or Better	Low	0.00	2.04	Average or Better	None	High	*Insufficient Data*	Average or Better	N/A
160-5	2 or 3 Lane Undivided Highway	12.12	362.15-374.27	1.39	Average or Better	High	2.73	0.05	Average or Better	High	None	*Insufficient Data*	Average or Better	N/A
160-6	2 or 3 Lane Undivided Highway	16.73	374.27-391	1.91	Average or Better	High	2.55	1.28	Average or Better	High	High	*Insufficient Data*	Average or Better	N/A
160-7	2 or 3 Lane Undivided Highway	4	391-395	2.92	Average or Better	High	5.51	0.34	Average or Better	High	None	*Insufficient Data*	Average or Better	N/A
160-8	2 or 3 Lane Undivided Highway	18	395-413	1.53	Average or Better	High	2.93	0.13	Average or Better	High	None	*Insufficient Data*	Average or Better	N/A
160-9	2 or 3 Lane Undivided Highway	21	413-434	1.60	Average or Better	High	1.89	1.30	Average or Better	High	High	*Insufficient Data*	Average or Better	N/A
160-10	2 or 3 Lane Undivided Highway	14.3	434-448.3	1.48	Average or Better	High	1.97	1.00	Average or Better	High	Low	*Insufficient Data*	Average or Better	N/A
160-11	2 or 3 Lane Undivided Highway	14.7	448.3-463	1.00	Average or Better	Low	0.05	1.95	Average or Better	None	High	*Insufficient Data*	Average or Better	N/A
160-12	2 or 3 Lane Undivided Highway	6.6	463-469.6	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	*Insufficient Data*	Average or Better	N/A	N/A	*Insufficient Data*	Average or Better	N/A
Safety Emphasis Area?		**Yes**	**Weighted Average**	1.50	Above Average	High								

Segment	Operating Environment	Segment Length (miles)	Segment Mileposts (MP)	% of Fatal + Incapacitating Injury Crashes Involving Lane Departures			% of Fatal + Incapacitating Injury Crashes Involving Pedestrians			% of Fatal + Incapacitating Injury Crashes Involving Trucks		
				Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need
160-1	2 or 3 Lane Undivided Highway	8	311-319	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-2	2 or 3 Lane Undivided Highway	4	319-323	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-3	2 or 3 Lane Undivided Highway	20.4	323-343.4	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-4	2 or 3 Lane Undivided Highway	18.75	343.4-362.15	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-5	2 or 3 Lane Undivided Highway	12.12	362.15-374.27	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-6	2 or 3 Lane Undivided Highway	16.73	374.27-391	86%	Average or Better	High	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-7	2 or 3 Lane Undivided Highway	4	391-395	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-8	2 or 3 Lane Undivided Highway	18	395-413	100%	Average or Better	High	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-9	2 or 3 Lane Undivided Highway	21	413-434	33%	Average or Better	None	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-10	2 or 3 Lane Undivided Highway	14.3	434-448.3	50%	Average or Better	None	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-11	2 or 3 Lane Undivided Highway	14.7	448.3-463	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A
160-12	2 or 3 Lane Undivided Highway	6.6	463-469.6	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A

Segment	Operating Environment	Segment Length (miles)	Segment Mileposts (MP)	% of Fatal + Incapacitating Injury Crashes Involving Bicycles			Initial Need
				Performance Score	Performance Objective	Level of Need	
160-1	2 or 3 Lane Undivided Highway	8	311-319	*Insufficient Data*	Average or Better	N/A	8
160-2	2 or 3 Lane Undivided Highway	4	319-323	*Insufficient Data*	Average or Better	N/A	4
160-3	2 or 3 Lane Undivided Highway	20.4	323-343.4	*Insufficient Data*	Average or Better	N/A	20.4
160-4	2 or 3 Lane Undivided Highway	18.75	343.4-362.15	*Insufficient Data*	Average or Better	N/A	18.75
160-5	2 or 3 Lane Undivided Highway	12.12	362.15-374.27	*Insufficient Data*	Average or Better	N/A	12.12

160-6	2 or 3 Lane Undivided Highway	16.73	374.27-391	*Insufficient Data*	Average or Better	N/A	16.73
160-7	2 or 3 Lane Undivided Highway	4	391-395	*Insufficient Data*	Average or Better	N/A	4
160-8	2 or 3 Lane Undivided Highway	18	395-413	*Insufficient Data*	Average or Better	N/A	18
160-9	2 or 3 Lane Undivided Highway	21	413-434	*Insufficient Data*	Average or Better	N/A	21
160-10	2 or 3 Lane Undivided Highway	14.3	434-448.3	*Insufficient Data*	Average or Better	N/A	14.3
160-11	2 or 3 Lane Undivided Highway	14.7	448.3-463	*Insufficient Data*	Average or Better	N/A	14.7
160-12	2 or 3 Lane Undivided Highway	6.6	463-469.6	*Insufficient Data*	Average or Better	N/A	6.6

Safety Performance Needs Analysis (continued)

Segment	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Hot Spots	Relevant Recently Completed or Under Construction Projects (which supersede performance data)*	Final Need	Comments (may include tentatively programmed projects with potential to address need or other relevant issues identified in previous reports)
160-1	8	311-319	High	-	-	High	No previously completed projects identified that supersede condtion data.
160-2	4	319-323	N/A	-	-	N/A	No previously completed projects identified that supersede condtion data.
160-3	20.4	323-343.4	High	-	FY15 H803701C: US 160 at N21, US 160/ N21 Intersection Lighting (MP 343/343.7)	High	FY 24 NACOG 21-00: Intersection Improvements at US 160 and IR 21 Intersection (Flashing Stop Ahead, Intersection Ahead, and Speed Feedback Signs) No previously completed projects identified that supersede condtion data.
160-4	18.75	343.4-362.15	Low	-	-	Low	FY 23 NACOG 21-00: Intersection Improvements at US 160 and SR 98 Intersection (Flashing Stop Ahead, Intersection Ahead, and Speed Feedback Signs) FY 24 NACOG 21-00: Intersection Improvements at US 160 and IR 21 Intersection (Flashing Stop Ahead, Intersection Ahead, and Speed Feedback Signs) No previously completed projects identified that supersede condtion data.
160-5	12.12	362.15-374.27	High	-	-	High	FY 21 F0144014/01C: Road Reconstruction/Rehabilitation and Rockfall Mitigation, MP 372.5 - 389.5 No previously completed projects identified that supersede condtion data.
160-6	16.73	374.27-391	High	-	-	High	FY 21 F0144014/01C: Road Reconstruction/Rehabilitation and Rockfall Mitigation, MP 372.5 - 389.5 No previously completed projects identified that supersede condtion data.
160-7	4	391-395	High	-	-	High	No previously completed projects identified that supersede condtion data.

160-8	18	395-413	High	-	-	High	No previously completed projects identified that supersede condtion data.
160-9	21	413-434	High	-	-	High	No previously completed projects identified that supersede condtion data.
160-10	14.3	434-448.3	High	-	-	High	No previously completed projects identified that supersede condtion data.
160-11	14.7	448.3-463	Low	-	-	Low	No previously completed projects identified that supersede condtion data.
160-12	6.6	463-469.6	N/A	-	-	N/A	No previously completed projects identified that supersede condtion data.

Safety Performance Needs Analysis (continued)

Segment Number		**160-1**	**160-2**	**160-3**	**160-4**	**160-5**	**160-6**	**160-7**	**160-8**	**160-9**	**160-10**	**160-11**	**160-12**	**Corridor-Wide Crash Characteristics**
Segment Length (miles)		**8**	**4**	**20.4**	**18.75**	**12.12**	**16.73**	**4**	**18**	**21**	**14.3**	**14.7**	**6.6**	
Segment Milepost (MP)		**311-319**	**319-323**	**323-343.4**	**343.4-362.15**	**362.15-374.27**	**374.27-391**	**391-395**	**395-413**	**413-434**	**434-448.3**	**448.3-463**	**463-469.6**	
Final Need		High	None	High	Low	High	High	High	High	High	High	Low	None	
Segment Crash Overview		3 Crashes were fatal 0 Crashes had suspected serious injuries 0 Crashes at intersections 3 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	1 Crashes were fatal 0 Crashes had suspected serious injuries 1 Crashes at intersections 0 Crashes involve lane departures 1 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	8 Crashes were fatal 1 Crashes had suspected serious injuries 0 Crashes at intersections 6 Crashes involve lane departures 2 Crashes involve pedestrians 1 Crashes involve trucks 1 Crashes involve bicycles	3 Crashes were fatal 1 Crashes had suspected serious injuries 3 Crashes at intersections 1 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	3 Crashes were fatal 1 Crashes had suspected serious injuries 0 Crashes at intersections 3 Crashes involve lane departures 1 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	6 Crashes were fatal 1 Crashes had suspected serious injuries 0 Crashes at intersections 6 Crashes involve lane departures 1 Crashes involve pedestrians 1 Crashes involve trucks 0 Crashes involve bicycles	2 Crashes were fatal 2 Crashes had suspected serious injuries 0 Crashes at intersections 1 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	4 Crashes were fatal 3 Crashes had suspected serious injuries 0 Crashes at intersections 7 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	5 Crashes were fatal 1 Crashes had suspected serious injuries 1 Crashes at intersections 2 Crashes involve lane departures 2 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	3 Crashes were fatal 5 Crashes had suspected serious injuries 2 Crashes at intersections 4 Crashes involve lane departures 0 Crashes involve pedestrians 1 Crashes involve trucks 0 Crashes involve bicycles	2 Crashes were fatal 3 Crashes had suspected serious injuries 1 Crashes at intersections 3 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	0 Crashes were fatal 0 Crashes had suspected serious injuries 0 Crashes at intersections 0 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	40 Crashes were fatal 18 Crashes had suspected serious injuries 8 Crashes at intersections 36 Crashes involve lane departures 7 Crashes involve pedestrians 3 Crashes involve trucks 1 Crashes involve bicycles
Segment Crash Summaries (Fatal and Suspected Serious Injury Crashes)	**First Harmful Event Type**	N/A - Sample Size Too Small	N/A - Sample Size Too Small	44% Involve Overturning 22% Involve Collision with Pedestrian 11% Involve Collision with Pedalcyclist	N/A - Sample Size Too Small	N/A - Sample Size Too Small	57% Involve Collision with Motor Vehicle 29% Involve Collision with Fixed Object 14% Involve Collision with Pedestrian	N/A - Sample Size Too Small	71% Involve Overturning 29% Involve Collision with Motor Vehicle	50% Involve Collision with Motor Vehicle 33% Involve Collision with Pedestrian 17% Involve Overturning	63% Involve Collision with Motor Vehicle 13% Involve Overturning 13% Involve Collision with Non-Fixed Object	100% Involve Collision with Motor Vehicle	N/A - No Crashes Reported	53% Involve Collision with Motor Vehicle 23% Involve Overturning 12% Involve Collision with Pedestrian
	Collision Type	N/A - Sample Size Too Small	N/A - Sample Size Too Small	56% Involve Single Vehicle 33% Involve Other 11% Involve Head On	N/A - Sample Size Too Small	N/A - Sample Size Too Small	43% Involve Head On 29% Involve Single Vehicle Involve Sideswipe (opposite) 14%	N/A - Sample Size Too Small	71% Involve Single Vehicle 14% Involve Head On 14% Involve Sideswipe (Opposite)	33% Involve Rear End 33% Involve Other 17% Involve Single Vehicle	25% Involve Single Vehicle 25% Involve Head On 25% Involve Other	40% Involve Head On 20% Involve Sideswipe (same) 20% Involve Angle	N/A - No Crashes Reported	36% Involve Head On 28% Involve Other 13% Involve Angle
	Violation or Behavior	N/A - Sample Size Too Small	N/A - Sample Size Too Small	44% Involve Unknown 22% Involve No Improper Action 11% Involve Speed too Fast for Conditions	N/A - Sample Size Too Small	N/A - Sample Size Too Small	33% Involve Drove in Opposing Lane 33% Involve Unknown Conditions 17% Involve Unsafe Lane Change	N/A - Sample Size Too Small	29% Involve Speed too Fast for Conditions 29% Involve Failure to Keep in Proper Lane 29% Involve Unknown	60% Involve Speed too Fast for Conditions 20% Involve No Improper Action 20% Involve Exceeded Lawful Speed	25% Involve Speed too Fast for Conditions 25% Involve Ran STOP sign 13% Involve Drove in Opposing Lane	40% Involve Unknown 20% Involve Speed too Fast for Conditions 20% Involve Ran STOP sign	N/A - No Crashes Reported	35% Involve Unknown 12% Involve No Improper Action 12% Drove in Opposing Lane
	Lighting Conditions	N/A - Sample Size Too Small	N/A - Sample Size Too Small	50% Occur in Dark-Unlighted Conditions 25% Occur in Daylight Conditions 13% Occur in Dawn Conditions	N/A - Sample Size Too Small	N/A - Sample Size Too Small	57% Occur in Daylight Conditions 29% Occur in Dark-Unlighted Conditions 14% Occur in Dark-Unknown Lighting Conditions	N/A - Sample Size Too Small	57% Occur in Dark-Unlighted Conditions 29% Occur in Daylight Conditions 14% Occur in Dark-Unknown Lighting Conditions	67% Occur in Dark-Unlighted Conditions 33% Occur in Dusk Conditions	50% Occur in Daylight Conditions 50% Occur in Dark Unlighted Conditions	60% Occur in Daylight Conditions 40% Occur in Dark-Unlighted Conditions	N/A - No Crashes Reported	44% Occur in Dark-Unlighted Conditions 39% Occur in Daylight Conditions 11% Occur in Dark-Unknown Lighting Conditions
	Surface Conditions	N/A - Sample Size Too Small	N/A - Sample Size Too Small	67% Involve Dry Conditions 22% Involve Unknown Conditions 11% Involve Wet Conditions	N/A - Sample Size Too Small	N/A - Sample Size Too Small	71% Involve Dry Conditions 29% Involve Unknown Conditions	N/A - Sample Size Too Small	80% Involve Dry Conditions 20% Involve Wet Conditions	100% Involve Dry Conditions	50% Involve Dry Conditions 38% Involve Wet Conditions 13% Involve Ice/Frost Conditions	100% Involve Dry Conditions	N/A - No Crashes Reported	74% Involve Dry Conditions 14% Involve Unknown Conditions 11% Involve Wet Conditions
	First Unit Event	N/A - Sample Size Too Small	N/A - Sample Size Too Small	33% Involve a first unit event of Collision with Pedestrian 33% Involve a first unit event of Overturn 11% Involve a first unit event of Motor Vehicle in Transport	N/A - Sample Size Too Small	N/A - Sample Size Too Small	29% Involve a first unit event of Ran Off the Road (Left) 29% Involve a first unit event of Crossed Centerline 29% Involve a first unit event of Motor Vehicle in Transport	N/A - Sample Size Too Small	43% Involve a first unit event of Overturn 29% Involve a first unit event of Motor Vehicle in Transport 14% Involve a first unit event of Ran Off the Road (Right)	50% Involve a first unit event of Motor Vehicle in Transport 33% Involve a first unit event of Collision with Pedestrian 17% Involve a first unit event of Overturn	25% Involve a first unit event of Ran Off the Road (Left) 25% Involve a first unit event of Ran Off the Road (Right) 25% Involve a first unit event of Motor Vehicle in Transport	60% Involve a first unit event of Motor Vehicle in Transport 20% Involve a first unit event of Crossed Centerline 20% Involve a first unit event of Overturn	N/A - No Crashes Reported	100% Involve a first unit event of Collision with Pedestrian
	Driver Physical Condition	N/A - Sample Size Too Small	N/A - Sample Size Too Small	56% No Apparent Influence 33% Unknown 11% Under the Influence of Drugs or Alcohol	N/A - Sample Size Too Small	N/A - Sample Size Too Small	29% Under the Influence of Drugs or Alcohol 29% Unknown 29% No Apparent Influence	N/A - Sample Size Too Small	43% Under the Influence of Drugs or Alcohol 29% No Apparent Influence 14% Medications	50% Under the Influence of Drugs or Alcohol 50% No Apparent Influence	63% No Apparent Influence 25% Under the Influence of Drugs or Alcohol 13% Unknown	40% Under the Influence of Drugs or Alcohol 40% Unknown 20% No Apparent Influence	N/A - No Crashes Reported	40% No Apparent Influence 29% Unknown 28% Under the Influence of Drugs or Alcohol
	Safety Device Usage	N/A - Sample Size Too Small	N/A - Sample Size Too Small	44% Shoulder And Lap Belt Used 33% Unknown 22% None Used	N/A - Sample Size Too Small	N/A - Sample Size Too Small	43% Shoulder And Lap Belt Used 29% Unknown 14% Not Applicable	N/A - Sample Size Too Small	71% Shoulder And Lap Belt Used 14% None Used 14% Unknown	67% Shoulder And Lap Belt Used 17% None Used 17% Unknown	50% Shoulder And Lap Belt Used 25% None Used 13% Air Bag Deployed/Shoulder-Lap Belt	60% Shoulder And Lap Belt Used 20% Air Bag Deployed/Shoulder-Lap Belt 20% Unknown	N/A - No Crashes Reported	46% Shoulder And Lap Belt Used 19% None Used 18% Unknown

Safety Performance Needs Analysis (continued)

Segment Number	160-1	160-2	160-3	160-4	160-5	160-6	160-7	160-8	160-9	160-10	160-11	160-12	Corridor-Wide Crash Characteristics
Segment Length (miles)	8	4	20.4	18.75	12.12	16.73	4	18	21	14.3	14.7	6.6	
Segment Milepost (MP)	311-319	319-323	323-343.4	343.4-362.15	362.15-374.27	374.27-391	391-395	395-413	413-434	434-448.3	448.3-463	463-469.6	
Final Need	High	None	High	Low	High	High	High	High	High	High	Low	None	
Hot Spot Crash Summaries	None	None	None	None	None	None	None	None	None	None	None	None	None
Previously Completed Safety-Related Projects	-	-	FY15 H803701C: US 160 at N21, US 160/ N21 Intersection Lighting (MP 343/343.7)	-	-	-	-	-	-	-	-	-	-
District Interviews/Discussions	None	None	None	None	None	None	None	None	None	None	None	None	None
Contributing Factors	-Driver behavior (speeding and impairment) -Vertical curvature -Roadside conditions/clear zone slope	-Pedestrian violation (crossed midblock)	-Higher frequency of single vehicle/run-off road crashes -Higher frequency of non-motorized crashes -Two lane roadway/limited passing opportunities	-All crashes are intersection-related crashes -Traffic control device visibility/retroreflectivity -Intersection sight visibility	-Higher frequency of single vehicle/run-off road crashes -Two lane roadway/limited passing opportunities -Driver behavior (speeding/impairment)	-Higher frequency of single vehicle/run-off road crashes -Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope -Driver behavior (speeding/impairment)	-Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope -Pavement surface/friction	-Higher frequency of single vehicle/run-off road crashes -Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope -Driver behavior (speeding/impairment)	-Driver behavior (speeding and impairment) -Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope	-Driver behavior (speeding and impairment) -Pavement surface/friction -Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope	-Driver behavior (speeding and impairment) -Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope	N/A	-Higher frequency of single vehicle/run-off road crashes -Two lane roadway/limited passing opportunities -Roadside conditions/clear zone slope -Driver behavior (speeding/impairment)

Freight Performance Needs Analysis

Segment #	Facility Operations	Segment Mileposts (MP)	Segment Length (miles)	Freight Index			Directional TTTR (trucks only)				
				Performance Score	Performance Objective	Level of Need	Performance Score		Performance Objective	Level of Need	
							NB/EB	SB/WB		NB/EB	SB/WB
160-1	Interrupted	311 - 319	8	1.52	Fair or Better	None	1.70	1.35	Fair or Better	Low	None
160-2	Interrupted	319-323	4	1.39	Fair or Better	None	1.31	1.46	Fair or Better	None	None
160-3	Uninterrupted	323 - 344	21	1.23	Fair or Better	Low	1.22	1.24	Fair or Better	Low	Low
160-4	Uninterrupted	344 - 362	18	1.21	Fair or Better	None	1.17	1.26	Fair or Better	None	Low
160-5	Uninterrupted	362 - 374	12	1.21	Fair or Better	None	1.20	1.23	Fair or Better	None	Low
160-6	Uninterrupted	374 - 391	17	2.02	Fair or Better	High	1.22	2.83	Fair or Better	Low	High
160-7	Interrupted	391 - 395	4	2.04	Fair or Better	High	2.43	1.64	Fair or Better	High	Low
160-8	Uninterrupted	395 - 413	18	1.26	Fair or Better	Low	1.35	1.17	Fair or Better	Medium	None
160-9	Uninterrupted	413 - 434	21	1.85	Fair or Better	High	1.67	2.02	Fair or Better	High	High
160-10	Uninterrupted	434 - 451	17	1.23	Fair or Better	Low	1.25	1.21	Fair or Better	Low	None
160-11	Uninterrupted	451 - 463	12	2.23	Fair or Better	High	1.16	3.29	Fair or Better	None	High
160-12	Interrupted	463 - 470	7	3.88	Fair or Better	High	6.02	1.73	Fair or Better	High	Medium
Emphasis Area?	No	**Weighted Average**		1.63	Fair or Better	High					

Freight Performance Needs Analysis (continued)

Segment	Facility Operations	Segment Mileposts (MP)	Segment Length (miles)	Closure Duration (minutes/mile/year)					Bridge Clearance (feet)			Initial Need
				Performance Score		Performance Objective	Level of Need		Performance Score	Performance Objective	Level of Need	
				NB/EB	SB/WB		NB/EB	SB/WB				
160-1	Interrupted	311 - 319	8	19.10	7.83	Fair or Better	None	None	No UP	Fair or Better	None	Low
160-2	Interrupted	319-323	4	15.60	16.80	Fair or Better	None	None	No UP	Fair or Better	None	None
160-3	Uninterrupted	323 - 344	21	19.59	15.89	Fair or Better	None	None	No UP	Fair or Better	None	Low
160-4	Uninterrupted	344 - 362	18	7.57	4.71	Fair or Better	None	None	No UP	Fair or Better	None	Low
160-5	Uninterrupted	362 - 374	12	33.17	22.83	Fair or Better	None	None	No UP	Fair or Better	None	Low
160-6	Uninterrupted	374 - 391	17	22.56	19.48	Fair or Better	None	None	No UP	Fair or Better	None	High
160-7	Interrupted	391 - 395	4	20.55	37.60	Fair or Better	None	None	No UP	Fair or Better	None	High
160-8	Uninterrupted	395 - 413	18	59.61	19.88	Fair or Better	None	None	No UP	Fair or Better	None	Low
160-9	Uninterrupted	413 - 434	21	27.41	8.77	Fair or Better	None	None	No UP	Fair or Better	None	High
160-10	Uninterrupted	434 - 451	17	18.13	9.60	Fair or Better	None	None	No UP	Fair or Better	None	Low
160-11	Uninterrupted	451 - 463	12	18.27	15.42	Fair or Better	None	None	No UP	Fair or Better	None	High
160-12	Interrupted	463 - 470	7	10.74	0.00	Fair or Better	None	None	No UP	Fair or Better	None	High

Freight Performance Needs Analysis (continued)

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Vertical Clearance Hot Spots (Vertical Clearance < 16.25' and No Ramps)	Relevant Recently Completed or Under Construction Projects (which supersede performance data)*	Final Need	Comments (may include tentatively programmed projects with potential to address needs or other relevant issues identified in previous reports)
160-1	8	311 - 319	Low	None	None	Low	
160-2	4	319-323	None	None	None	None	
160-3	21	323 - 344	Low	None	None	Low	
160-4	18	344 - 362	Low	None	None	Low	
160-5	12	362 - 374	Low	None	None	Low	
160-6	17	374 - 391	High	None	None	High	
160-7	4	391 - 395	High	None	None	High	
160-8	18	395 - 413	Low	None	None	Low	
160-9	21	413 - 434	High	None	None	High	
160-10	17	434 - 451	Low	None	None	Low	
160-11	12	451 - 463	High	None	None	High	
160-12	7	463 - 470	High	None	None	High	

Freight Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Roadway Variables								Traffic Variables			Relevant Freight Related Existing Infrastructure
				Functional Classification	Environmental Type (Urban/Rural)	Terrain	# of Lanes/ Direction	Weighted Average Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2035 LOS	% Trucks	
160-1	311 - 319	8	Low	State Highway	Rural	Rolling	2	63	No	Non-Divided	32%	A-B	A-B	9%	
160-2	319-323	4	None	State Highway	Rural	Rolling	2	49	No	Non-Divided	42%	C	D-F	10%	
160-3	323 - 344	21	Low	State Highway	Rural	Level	2	64	No	Non-Divided	12%	A-B	A-B	11%	
160-4	344 - 362	18	Low	State Highway	Rural	Level	2	65	No	Non-Divided	33%	A-B	A-B	13%	
160-5	362 - 374	12	Low	State Highway	Rural	Level	2	65	No	Non-Divided	14%	A-B	A-B	11%	
160-6	374 - 391	17	High	State Highway	Rural	Rolling	2	64	No	Non-Divided	24%	A-B	A-B	11%	
160-7	391 - 395	4	High	State Highway	Rural	Rolling	2	60	No	Non-Divided	47%	A-B	A-B	11%	
160-8	395 - 413	18	Low	State Highway	Rural	Level	2	65	No	Non-Divided	9%	A-B	A-B	11%	
160-9	413 - 434	21	High	State Highway	Rural	Level	2	65	No	Non-Divided	20%	A-B	A-B	11%	
160-10	434 - 451	17	Low	State Highway	Rural	Rolling	2	64	No	Non-Divided	25%	A-B	A-B	14%	
160-11	451 - 463	12	High	State Highway	Rural	Rolling	2	65	No	Non-Divided	21%	A-B	A-B	14%	
160-12	463 - 470	7	High	State Highway	Rural	Rolling	2	60	No	Non-Divided	31%	A-B	A-B	14%	

Freight Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent							Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need	Contributing Factors
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related			
160-1	311 - 319	8	Low	5	5	100%	0	0%	0	0%	160-1		
160-2	319-323	4	None	4	4	100%	0	0%	0	0%	160-2		
160-3	323 - 344	21	Low	22	20	91%	1	5%	0	0%	160-3		
160-4	344 - 362	18	Low	7	7	100%	0	0%	0	0%	160-4		
160-5	362 - 374	12	Low	15	14	93%	1	7%	0	0%	160-5		
160-6	374 - 391	17	High	16	15	94%	1	6%	0	0%	160-6		
160-7	391 - 395	4	High	11	11	100%	0	0%	0	0%	160-7		
160-8	395 - 413	18	Low	18	17	94%	1	6%	0	0%	160-8		
160-9	413 - 434	21	High	16	16	100%	0	0%	0	0%	160-9		
160-10	434 - 451	17	Low	11	11	100%	0	0%	0	0%	160-10		
160-11	451 - 463	12	High	10	10	100%	0	0%	0	0%	160-11		
160-12	463 - 470	7	High	1	1	100%	0	0%	0	0%	160-12		

Needs Summary Table

Performance Area	Segment Number and Mileposts (MP)											
	160-1	160-2	160-3	160-4	160-5	160-6	160-7	160-8	160-9	160-10	160-11	160-12
	MP 312-319	MP 319-323	MP 323-344	MP 344-362	MP 362-374	MP 374-391	MP 391-395	MP 395-413	MP 413-434	MP 434-451	MP 451-463	MP 463-471
Pavement[+]	None	Low	High	None	Low	None	None	Low	High	High	Low	None
Bridge	Medium	None	None	Low	None	None	None	None	None	Medium	None	None
Mobility[+]	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Safety[+]	High	N/A	High	Low	High	High	High	High	High	High	Low	N/A
Freight	Low	None	Low	Low	Low	High	High	Low	High	Low	High	High
Average Need	**1.38**	**0.92**	**1.77**	**0.77**	**1.31**	**1.38**	**1.38**	**1.31**	**2.08**	**2.08**	**1.15**	**0.69**

[+] Identified as Emphasis Areas for US 160 Corridor
* A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study

Level of Need	Average Need Range
None*	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

Appendix E: Life-Cycle Cost Analysis

No LCCA conducted for any Pavement or Bridge candidate solutions on the US 160 corridor

Appendix F: Crash Modification Factors and Factored Unit Construction Costs

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
REHABILITATION											
Rehabilitate Pavement (AC)	$276,500	1.74	$481,110	Mile	2.20	$610,000	$1,060,000	Mill and replace 1"-3" AC pavement; accounts for 38' width; for one direction of travel on two-lane roadway; includes pavement, striping, delineators, RPMs, rumble strips	0.70	0.68	Updated to include 2 additional values (in addition to 3 previous values) from CMF Clearinghouse and revised combination of rehabilitate pavement (0.88), striping, delineators, RPMs (0.77 for combination), and rumble strips (0.89) = 0.68
Rehabilitate Bridge	$65	1.74	$113	SF	2.20	$140	$250	Based on deck area; bridge only - no other costs included	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
GEOMETRIC IMPROVEMENT											
Re-profile Roadway	$974,500	1.74	$1,695,630	Mile	2.20	$2,140,000	$3,730,000	Includes excavation of approximately 3", pavement replacement (AC), striping, delineators, RPMs, rumble strips, for one direction of travel on two-lane roadway (38' width)	0.70	0.70	Assumed - this is similar to rehab pavement. This solution is intended to address vertical clearance at bridge, not profile issue; factor the cost as a ratio of needed depth to 3".
Realign Roadway	$2,960,000	1.74	$5,150,400	Mile	2.20	$6,510,000	$11,330,000	All costs per direction except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.50	0.50	Based on Caltrans and NCDOT
Improve Skid Resistance	$675,000	1.74	$1,174,500	Mile	2.20	$1,490,000	$2,580,000	Average cost of pavement replacement and variable depth paving to increase super-elevation; for one direction of travel on two-lane roadway; includes pavement, striping, delineators, RPMs, rumble strips	0.66	0.65	Updated to include 6 additional values (in addition to 6 previous values) from CMF Clearinghouse (0.71) and calculated composite CMF value using that 0.71 value, the HSM value (0.87) for skid resistance; striping, delineators, RPMs (0.77 for combination), and rumble strips (0.89) = 0.65
INFRASTRUCTURE IMPROVEMENT											
Reconstruct to Urban Section	$1,000,000	1.74	$1,740,000	Mile	2.20	$2,200,000	$3,828,000	Includes widening by 16' total (AC = 12'+2'+2') to provide median, curb & gutter along both side of roadway, single curb for median, striping (doesn't include widening for additional travel lane).	0.88	0.88	From HSM

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Auxiliary Lanes (AC)	$914,000	1.74	$1,590,360	Mile	2.20	$2,011,000	$3,499,000	For addition of aux lane (AC) in one direction of travel; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.78	0.78	Average of 4 values from clearinghouse
Construct Climbing Lane (High)	$3,000,000	1.74	$5,220,000	Mile	2.20	$6,600,000	$11,484,000	In one direction; all costs except bridges; applicable to areas with large fills and cuts, retaining walls, rock blasting, steep slopes on both sides of road	0.75	0.75	From HSM
Construct Climbing Lane (Medium)	$2,250,000	1.74	$3,915,000	Mile	2.20	$4,950,000	$8,613,000	In one direction; all costs except bridges; applicable to areas with medium or large fills and cuts, retaining walls, rock blasting, steep slopes on one side of road	0.75	0.75	From HSM
Construct Climbing Lane (Low)	$1,500,000	1.74	$2,610,000	Mile	2.20	$3,300,000	$5,742,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.75	0.75	From HSM
Construct Reversible Lane (Low)	$2,400,000	1.74	$4,176,000	Lane-Mile	2.20	$5,280,000	$9,190,000	All costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.73 for uphill and 0.88 for downhill	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a concrete barrier
Construct Reversible Lane (High)	$4,800,000	1.74	$8,352,000	Lane-Mile	2.20	$10,560,000	$18,370,000	All costs except bridges; applicable to areas with large fills and cuts, retaining walls, rock blasting, mountainous terrain	0.73 for uphill and 0.88 for downhill	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a concrete barrier
Construct Passing Lane	$1,500,000	1.74	$2,610,000	Mile	2.20	$3,300,000	$5,742,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.63	0.63	Average of 3 values from clearinghouse
Construct Entry/Exit Ramp	$730,000	1.74	$1,270,200	Each	2.20	$1,610,000	$2,790,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork & drainage; does not include any major structures or improvements on crossroad	1.09	1.09	Average of 16 values on clearinghouse; for adding a ramp not reconstructing. CMF applied to crashes 0.25 miles upstream/downstream from the gore.
Relocate Entry/Exit Ramp	$765,000	1.74	$1,331,100	Each	2.20	$1,680,000	$2,930,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork, drainage, and demolition of existing ramp; does not include any major structures or improvements on crossroad	1.00	1.00	Assumed to not add any crashes since the ramp is simply moving and not being added. CMF applied to crashes 0.25 miles upstream/downstream from the gore.

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Turn Lanes	$42,500	1.74	$73,950	Each	2.20	$93,500	$163,000	Includes 14' roadway widening (AC) for one additional turn lane (250' long) on one leg of an intersection; includes AC pavement, curb & gutter, sidewalk, ramps, striping, and minor signal modifications	0.81	0.81	Average of 7 values from HSM; CMF applied to intersection-related crashes; this solution also applies when installing a deceleration lane
Modify Entry/Exit Ramp	$445,000	1.74	$774,300	Each	2.20	$979,000	$1,703,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting existing ramp to parallel-type configuration	0.21	0.21	Average of 4 values from clearinghouse (for exit ramps) and equation from HSM (for entrance ramp). CMF applied to crashes within 1/8 mile upstream/downstream from the gore.
Widen & Modify Entry/Exit Ramp	$619,000	1.74	$1,077,060	Each	2.20	$1,361,800	$2,370,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting 1-lane ramp to 2-lane ramp and converting to parallel-type ramp	0.21	0.21	Will be same as "Modify Ramp"
Replace Pavement (AC) (with overexcavation)	$1,446,500	1.74	$2,516,910	Mile	2.20	$3,180,000	$5,540,000	Accounts for 38' width; for one direction of travel on two-lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	0.70	Same as rehab
Replace Pavement (PCCP) (with overexcavation)	$1,736,500	1.74	$3,021,510	Mile	2.20	$3,820,000	$6,650,000	Accounts for 38' width; for one direction of travel on two-lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	0.70	Same as rehab
Replace Bridge (Short)	$125	1.74	$218	SF	2.20	$280	$480	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing small washes	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
Replace Bridge (Medium)	$160	1.74	$278	SF	2.20	$350	$610	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing over the mainline freeway, crossroads, or large washes	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
Replace Bridge (Long)	$180	1.74	$313	SF	2.20	$400	$690	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing large rivers or canyons	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
Widen Bridge	$175	1.74	$305	SF	2.20	$390	$670	Based on deck area; bridge only - no other costs included	0.90	0.90	Assumed - should have a minor effect on crashes at the bridge

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Install Pedestrian Bridge	$135	1.74	$235	SF	2.20	$300	$520	Includes cost to construct bridge based on linear feet of the bridge. This cost includes and assumes ramps and sidewalks leading to the structure.	0.1 (pedestrian only)	0.1 (pedestrian only)	Assumed direct access on both sides of structure
Implement Automated Bridge De-icing	$115	1.74	$200	SF	2.20	$250	$440	Includes cost to replace bridge deck and install system	0.72 (snow/ice)	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Install Wildlife Crossing Under Roadway	$650,000	1.74	$1,131,000	Each	2.20	$1,430,000	$2,488,000	Includes cost of structure for wildlife crossing under roadway and 1 mile of fencing in each direction that is centered on the wildlife crossing	0.25 (wildlife)	0.25 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Install Wildlife Crossing Over Roadway	$1,140,000	1.74	$1,983,600	Each	2.20	$2,508,000	$4,364,000	Includes cost of structure for wildlife crossing over roadway and 1 mile of fencing in each direction that is centered on the wildlife crossing	0.25 (wildlife)	0.25 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Construct Drainage Structure - Minor	$280,000	1.74	$487,200	Each	2.20	$616,000	$1,072,000	Includes 3-36" pipes and roadway reconstruction (approx. 1,000 ft) to install pipes	0.70	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Intermediate	$540,000	1.74	$939,600	Each	2.20	$1,188,000	$2,067,000	Includes 5 barrel 8'x6' RCBC and roadway reconstruction (approx. 1,000 ft) to install RCBC	0.70	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Major	$8,000	1.74	$13,920	LF	2.20	$17,600	$30,600	Includes bridge that is 40' wide and reconstruction of approx. 500' on each approach	0.70	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Install Acceleration Lane	$127,500	1.74	$221,850	Each	2.20	$280,500	$488,000	For addition of an acceleration lane (AC) on one leg of an intersection that is 1,000' long plus a taper; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.85	0.85	Average of 6 values from the FHWA Desktop Reference for Crash Reduction Factors
Install Curb and Gutter	$211,200	1.74	$367,488	Mile	2.20	$465,000	$808,000	In both directions; curb and gutter	0.89	0.89	From CMF Clearinghouse
Install Sidewalks, Curb, and Gutter	$475,200	1.74	$826,848	Mile	2.20	$1,045,000	$1,819,000	In both directions; 5' sidewalks, curb, and gutter	0.89 installing sidewalk 0.24 (pedestrian crashes only)	0.89 installing sidewalk 0.24 (pedestrian crashes only)	From CMF Clearinghouse Avg of 6 values from FHWA Desktop Reference

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Install Sidewalks	$264,000	1.74	$459,360	Mile	2.20	$581,000	$1,011,000	In both directions; 5' sidewalks	0.24 (pedestrian crashes only)	0.24 (pedestrian crashes only)	Avg of 6 values from FHWA Desktop Reference
OPERATIONAL IMPROVEMENT											
Implement Variable Speed Limits (Wireless, Overhead)	$718,900	1.25	$898,625	Mile	2.20	$1,580,000	$1,980,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Variable Speed Limits (Wireless, Ground-mount)	$169,700	1.25	$212,125	Mile	2.20	$373,300	$467,000	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Variable Speed Limits (Wireless, Solar, Overhead)	$502,300	1.25	$627,875	Mile	2.20	$1,110,000	$1,380,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors, solar power	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Variable Speed Limits (Wireless, Solar, Ground-mount)	$88,400	1.25	$110,500	Mile	2.20	$194,500	$243,000	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors, solar power	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Ramp Metering (Low)	$25,000	1.25	$31,250	Each	2.20	$55,000	$68,800	For each entry ramp location; urban area with existing ITS backbone infrastructure; includes signals, poles, timer, pull boxes, etc.	0.64	0.64	From 1 value from clearinghouse; CMF applied to crashes 0.25 miles after gore
Implement Ramp Metering (High)	$150,000	1.25	$187,500	Mile	2.20	$330,000	$413,000	Area without existing ITS backbone infrastructure; in addition to ramp meters, also includes conduit, fiber optic lines, and power	0.64	0.64	From 1 value from clearinghouse
Implement Signal Coordination	$140,000	1.25	$175,000	Mile	2.20	$308,000	$385,000	Includes conduit, conductors, and controllers for 4 intersections that span a total of approximately 2 miles	0.90	0.90	Assumed

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Implement Left-Turn Phasing	$7,500	1.25	$9,375	Each	2.20	$16,500	$20,600	Includes four new signal heads (two in each direction) and associated conductors for one intersection	0.88 (protected) 0.98 (permitted /protected or protected/ permitted)	0.88 (protected) 0.98 (permitted /protected or protected/ permitted)	From HSM; CMF = 0.94 for each protected approach and 0.99 for each permitted/protected or protected/permitted approach. CMFs of different approaches should be multiplied together. CMF applied to crashes within intersection
Install Adaptive Signal Control and Signal Coordination	$363,500	1.25	$454,375	mile	2.20	$800,000	$1,000,000	Controller upgrades, advanced detection, software configuration, cameras; includes conduit, conductors, and controllers for 4 intersections that span a total of approximately 2 miles for coordination	0.81 (adaptive control)0.90 (signal coordination)	0.78 (adaptive control)0.90 (signal coordination)	Updated to include 15 additional values (in addition to 2 previous values) for adaptive control from CMF Clearinghouse
ROADSIDE DESIGN											
Install Guardrail	$130,000	1.74	$226,200	Mile	2.20	$286,000	$498,000	One side of road	0.62 (ROR)	0.62 (ROR)	0.62 is average of 2 values from clearinghouse
Install Cable Barrier	$80,000	1.74	$139,200	Mile	2.20	$176,000	$306,000	In median	0.81	0.65	Updated to include 5 additional values (in addition to 5 previous values) from CMF Clearinghouse
Widen Shoulder (AC)	$256,000	1.74	$445,440	Mile	2.20	$563,000	$980,000	Assumes 10' of existing shoulder (combined left and right), includes widening shoulder by a total of 4'; new pavement for 4' width and mill and replace existing 10' width; includes pavement, minor earthwork, striping edge lines, RPMs, high-visibility delineators, safety edge, and rumble strips	0.68 (1-4') 0.64 (>= 4')	0.68 (1-4') 0.64 (>= 4')	0.86 is average of 5 values from clearing house for widening shoulder 1-4'. 0.76 is calculated from HSM for widening shoulder >= 4'. (Cost needs to be updated if dimension of existing and widened shoulder differ from Description.)
Rehabilitate Shoulder (AC)	$113,000	1.74	$196,620	Mile	2.20	$249,000	$433,000	One direction of travel (14' total shoulder width-4' left and 10' right); includes paving (mill and replace), striping, high-visibility delineators, RPMs, safety edge, and rumble strips for both shoulders	0.72	0.72	0.98 is average of 34 values on clearinghouse for shoulder rehab/replace; include striping, delineators, RPMs (0.77 combined CMF), and rumble strips (0.89). (Cost needs to be updated if dimension of existing shoulder differs from Description.)

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Replace Shoulder (AC)	$364,000	1.74	$633,360	Mile	2.20	$801,000	$1,393,000	One direction of travel (14' total shoulder width-4' left and 10' right); includes paving (full reconstruction), striping, high-visibility delineators, RPMs, safety edge, and rumble strips for both shoulders	0.72	0.72	0.98 is average of 34 values on clearinghouse for shoulder rehab/replace; include striping, delineators, RPMs (0.77 combined CMF), and rumble strips (0.89). (Cost needs to be updated if dimension of existing shoulder differs from Description.)
Install Rumble Strip	$5,500	1.74	$9,570	Mile	2.20	$12,000	$21,000	Both edges - one direction of travel; includes only rumble strip; no shoulder rehab or paving or striping	0.89	0.89	Average of 75 values on clearinghouse and consistent with HSM
Install Centerline Rumble Strip	$2,800	1.74	$4,872	Mile	2.20	$6,000	$11,000	Includes rumble strip only; no pavement rehab or striping	0.85	0.85	From HSM
Install Wildlife Fencing	$340,000	1.74	$591,600	Mile	2.20	$748,000	$1,302,000	Fencing only plus jump outs for 1 mile (both directions)	0.50 (wildlife)	0.50 (wildlife)	Assumed
Remove Tree/Vegetation	$200,000	1.74	$348,000	Mile	2.20	$440,000	$766,000	Intended for removing trees that shade the roadway to allow sunlight to help melt snow and ice (see Increase Clear Zone CMF for general tree/vegetation removal in clear zone)	0.72 (snow/ice)	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Increase Clear Zone	$59,000	1.74	$102,660	Mile	2.20	$130,000	$226,000	In one direction; includes widening the clear zone by 10' to a depth of 3'	0.71	0.71	Median of 14 values from FHWA Desktop Reference for Crash Reduction Values
Install Access Barrier Fence	$15	1.74	$26	LF	2.20	$33	$60	8' fencing along residential section of roadway	0.10 (pedestrian only)	0.10 (pedestrian only)	Equal to pedestrian overpass
Install Rock-Fall Mitigation - Wire Mesh	$1,320,000	1.74	$2,296,800	Mile	2.20	$2,904,000	$5,053,000	Includes wire mesh and rock stabilization (one direction)	0.75 (debris)	0.75 (debris)	Assumed
Install Rock-Fall Mitigation - Containment Fence & Barrier	$2,112,000	1.74	$3,674,880	Mile	2.20	$4,646,000	$8,085,000	Includes containment fencing, concrete barrier, and rock stabilization (one direction)	0.75 (debris)	0.75 (debris)	Assumed
Install Raised Concrete Barrier in Median	$650,000	1.74	$1,131,000	Mile	2.20	$1,430,000	$2,488,000	Includes concrete barrier with associated striping and reflective markings; excludes lighting in barrier (one direction)	0.90 (Cross-median and head on crashes eliminated completely)	0.90 (Cross-median and head on crashes eliminated completely)	All cross median and head-on fatal or incapacitating injury crashes are eliminated completely; all remaining crashes have 0.90 applied
Formalize Pullout (Small)	$7,500	1.74	$13,050	Each	2.20	$17,000	$29,000	Includes paving and signage (signs, posts, and foundations) - approximately 4,200 sf	0.97	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign

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Formalize Pullout (Medium)	$27,500	1.74	$47,850	Each	2.20	$61,000	$105,000	Includes paving and signage (signs, posts, and foundations) - approximately 22,500 sf	0.97	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
Formalize Pullout (Large)	$80,500	1.74	$140,070	Each	2.20	$177,100	$308,000	Includes paving and signage (signs, posts, and foundations) - approximately 70,000 sf	0.97	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
INTERSECTION IMPROVEMENTS											
Construct Traffic Signal	$150,000	1.74	$261,000	Each	2.20	$330,000	$574,000	4-legged intersection; includes poles, foundations, conduit, controller, heads, luminaires, mast arms, etc.	0.95	0.95	From HSM; CMF applied to crashes within intersection only
Improve Signal Visibility	$35,000	1.74	$60,900	Each	2.20	$77,000	$134,000	4-legged intersection; signal head size upgrade, installation of new back-plates, and installation of additional signal heads on new poles.	0.85	0.85	Average of 7 values from clearinghouse; CMF applied to crashes within intersection only
Install Raised Median	$360,000	1.74	$626,400	Mile	2.20	$792,000	$1,378,000	Includes removal of 14' wide pavement and construction of curb & gutter; does not include cost to widen roadway to accommodate the median; if the roadway needs to be widened, include cost from New General Purpose Lane	0.83	0.83	Average from HSM
Install Transverse Rumble Strip/Pavement Markings	$3,000	1.74	$5,220	Each	2.20	$7,000	$11,000	Includes pedestrian markings and rumble strips only across a 30' wide travelway; no pavement rehab or other striping	0.95	0.95	Average of 17 values from clearinghouse; CMF applied to crashes within 0.5 miles after the rumble strips and markings
Construct Single-Lane Roundabout	$1,500,000	1.74	$2,610,000	Each	2.20	$3,300,000	$5,742,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.22	0.22	From HSM; CMF applied to crashes within intersection only
Construct Double-Lane Roundabout	$1,800,000	1.74	$3,132,000	Each	2.20	$3,960,000	$6,890,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.40	0.40	From HSM; CMF applied to crashes within intersection only
Install Indirect Left Turn Intersection	$1,140,000	1.74	$1,983,600	each	2.20	$2,500,000	$4,364,000	Raised concrete median improvements; intersection improvements; turn lanes	0.80	0.76	Updated to include 2 additional values (in addition to 1 previous value) from CMF Clearinghouse

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Convert Standard Diamond Interchange to Diverging Diamond Interchange	$2,272,700	1.74	$3,954,498	each	2.20	$5,000,000	$8,700,000	Convert traditional diamond interchange into diverging diamond interchange; assumes re-use of existing bridges	0.67	0.56	Updated to include 2 additional values (in addition to 1 previous value) from CMF Clearinghouse
Left-in Only Center Raised Median Improvements	$84,100	1.74	$146,334	each	2.20	$185,000	$322,000	Left-in only center raised median improvements	0.87	0.87	CMF Clearinghouse
ROADWAY DELINEATION											
Install High-Visibility Edge Line Striping	$10,800	1.25	$13,500	Mile	2.20	$23,800	$29,700	2 edge lines and lane line - one direction of travel	0.77	0.77	Average of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install High-Visibility Delineators	$6,500	1.25	$8,125	Mile	2.20	$14,300	$17,900	Both edges - one direction of travel			Average of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install Raised Pavement Markers	$2,000	1.25	$2,500	Mile	2.20	$4,400	$5,500	Both edges - one direction of travel			Average of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install In-Lane Route Markings	$6,000	1.25	$7,500	Each	2.20	$13,200	$16,500	Installation of a series of three in-lane route markings in one lane	0.95	0.95	Assumed; CMF applied to crashes within 1.0 mile before the gore
IMPROVED VISIBILITY											
Cut Side Slopes	$80	1.74	$139	LF	2.20	$200	$300	For small grading to correct sight distance issues; not major grading	0.85	0.85	Intent of this solution is to improve sight distance. Most CMF's are associated with vehicles traveling on slope. Recommended CMF is based on FDOT and NCDOT but is more conservative.
Install Lighting (connect to existing power)	$270,000	1.74	$469,800	Mile	2.20	$594,000	$1,034,000	One side of road only; offset lighting, not high-mast; does not include power supply; includes poles, luminaire, pull boxes, conduit, conductor	0.75 (night)	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM

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Install Lighting (solar powered LED)	$10,000	1.74	$17,400	Pole	2.20	$22,000	$38,300	Offset lighting, not high-mast; solar power LED; includes poles, luminaire, solar panel	0.75 (night)	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM
DRIVER INFORMATION/WARNING											
Install Dynamic Message Sign (DMS)	$250,000	1.25	$312,500	Each	2.20	$550,000	$688,000	Includes sign, overhead structure, and foundations; wireless communication; does not include power supply	1.00	1.00	Not expected to reduce crashes
Install Dynamic Weather Warning Beacons	$40,000	1.25	$50,000	Each	2.20	$88,000	$110,000	Assumes solar operation and wireless communication or connection to existing power and communication; ground mounted; includes posts, foundations, solar panel, and dynamic sign	0.80 (weather-related)	0.80 (weather-related)	Average of 3 values from FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign
Install Dynamic Speed Feedback Signs	$25,000	1.25	$31,250	Each	2.20	$55,000	$68,800	Assumes solar operation and no communication; ground mounted; includes regulatory sign, posts, foundations, solar panel, and dynamic sign	0.94	0.94	Average of 2 clearinghouse values; CMF applies to crashes within 0.50 miles after a sign
Install Chevrons	$18,400	1.25	$23,000	Mile	2.20	$40,500	$50,600	On one side of road - includes signs, posts, and foundations	0.79	0.79	Average of 11 clearinghouse values
Install Curve Warning Signs	$2,500	1.25	$3,125	Each	2.20	$5,500	$6,900	Includes 2 signs, posts, and foundations	0.83	0.83	Average of 4 clearinghouse values; CMF applies to crashes within 0.25 miles after a sign
Install Traffic Control Device Warning Signs (e.g., stop sign ahead, signal ahead, etc.)	$2,500	1.25	$3,125	Each	2.20	$5,500	$6,900	Includes 2 signs, posts, and foundations	0.85	0.85	FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign
Install Other General Warning Signs (e.g., intersection ahead, wildlife in area, slow vehicles, etc.)	$2,500	1.25	$3,125	Each	2.20	$5,500	$6,900	Includes 2 signs, posts, and foundations	0.97	0.97	Assumed; CMF applies to crashes within 0.25 miles after a sign

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Wildlife Warning System	$162,000	1.25	$202,500	Each	2.20	$356,400	$446,000	Includes wildlife detection system at a designated wildlife crossing, flashing warning signs (assumes solar power), advance signing, CCTV (solar and wireless), game fencing for approximately 0.25 miles in each direction - centered on the wildlife crossing, and regular fencing for 1.0 mile in each direction - centered on the wildlife crossing.	0.50 (wildlife)	0.50 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Install Warning Sign with Beacons	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	In both directions; includes warning sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.75	0.75	FHWA Desktop Reference for Crash Reduction Factors for Installing Flashing Beacons as Advance Warning; CMF applies to crashes within 0.25 miles after a sign
Install Rectangular Rapid Flashing Beacons (RRFB)	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	In both directions; includes warning sign, post, and foundation, and flashing beacons (assumes solar power) at one location	n/a	0.53 (pedestrian)	CMF Clearinghouse Countermeasures Tech Sheet
Install Larger Stop Sign with Beacons	$10,000	1.25	$12,500	Each	2.20	$22,000	$27,500	In one direction; includes large stop sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.85/0.81	0.85/0.81	Use 0.85 for adding beacons to an existing sign; 0.81 for installing a larger sign with flashing beacons; CMF applies to intersection-related crashes
Install Advanced Warning Signal System	$108,000	1.25	$135,000	each	2.20	$238,000	$297,000	Overhead static sign with flashing beacons, detectors, and radar system. Signs for each mainline approach of the intersection (2)	0.61	0.61	FHWA Desktop Reference for CRF
DATA COLLECTION											
Install Roadside Weather Information System (RWIS)	$60,000	1.25	$75,000	Each	2.20	$132,000	$165,000	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	1.00	Not expected to reduce crashes
Install Closed Circuit Television (CCTV) Camera	$25,000	1.25	$31,250	Each	2.20	$55,000	$68,800	Assumes connection to existing ITS backbone or wireless communication; does not include fiber-optic backbone infrastructure; includes pole, camera, etc.	1.00	1.00	Not expected to reduce crashes
Install Vehicle Detection Stations	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	1.00	Not expected to reduce crashes

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Flood Sensors (Activation)	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	Sensors with activation cabinet to alert through texting (agency)	1.00	1.00	Not expected to reduce crashes
Install Flood Sensors (Gates)	$100,000	1.25	$125,000	Each	2.20	$220,000	$275,000	Sensors with activation cabinet to alert through texting (agency) and beacons (public) plus gates	1.00	1.00	Not expected to reduce crashes
WIDEN CORRIDOR											
Construct New General Purpose Lane (PCCP)	$1,740,000	1.74	$3,027,600	Mile	2.20	$3,830,000	$6,660,000	For addition of 1 GP lane (PCCP) in one direction; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.90	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.87
Construct New General Purpose Lane (AC)	$1,200,000	1.74	$2,088,000	Mile	2.20	$2,640,000	$4,590,000	For addition of 1 GP lane (AC) in one direction; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.90	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.88
Convert a 2-Lane undivided highway to a 5-Lane highway	$1,576,000	1.74	$2,742,240	Mile	2.20	$3,467,200	$6,030,000	For expanding a 2-lane undivided highway to a 5-lane highway (4 through lanes with TWLTL), includes standard shoulder widths but no curb, gutter, or sidewalks	0.60	0.60	Assumed to be slightly lower than converting from a 4-lane to a 5-lane highway
Install Center Turn Lane	$1,053,000	1.74	$1,832,220	Mile	2.20	$2,316,600	$4,030,000	For adding a center turn lane (i.e., TWLTL); assumes symmetrical widening on both sides of the road; includes standard shoulder widths but no curb, gutter, or sidewalk	0.75	0.75	From FHWA Desktop Reference for Crash Reduction Factors, CMF Clearinghouse, and SR 87 CPS comparison
Construct 4-Lane Divided Highway (Using Existing 2-Lane Road for one direction)	$3,000,000	1.74	$5,220,000	Mile	2.20	$6,600,000	$11,484,000	In both directions; one direction uses existing 2-lane road; other direction assumes addition of 2 new lanes (AC) with standard shoulders; includes all costs except bridges	0.67	0.67	Assumed
Construct 4-Lane Divided Highway (No Use of Existing Roads)	$6,000,000	1.74	$10,440,000	Mile	2.20	$13,200,000	$22,968,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.67	0.67	Assumed

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Bridge over At-Grade Railroad Crossing	$10,000,000	1.74	$17,400,000	Each	2.20	$22,000,000	$38,280,000	Assumes bridge width of 4 lanes (AC) with standard shoulders; includes abutments and bridge approaches; assumes vertical clearance of 23'4" + 6'8" superstructure	0.72 (All train-related crashes eliminated)	0.72 (All train-related crashes eliminated)	Removes all train-related crashes at at-grade crossing; all other crashes CMF = 0.72
Construct Underpass at At-Grade Railroad Crossing	$15,000,000	1.74	$26,100,000	Each	2.20	$33,000,000	$57,420,000	Assumes underpass width of 4 lanes (AC) with standard shoulders; includes railroad bridge with abutments and underpass approaches; assumes vertical clearance of 16'6" + 6'6" superstructure	0.72 (All train-related crashes eliminated)	0.72 (All train-related crashes eliminated)	Removes all train-related crashes at at-grade crossing; all other crashes CMF = 0.72
Construct High-Occupancy Vehicle (HOV) Lane	$900,000	1.74	$1,566,000	Mile	2.20	$1,980,000	$3,445,000	For addition of 1 HOV lane (AC) in one direction with associated signage and markings; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.95	0.95	Similar to general purpose lane
ALTERNATE ROUTE											
Construct Frontage Roads	$2,400,000	1.74	$4,176,000	Mile	2.20	$5,280,000	$9,190,000	For 2-lane AC frontage road; includes all costs except bridges; for generally at-grade facility with minimal walls	0.90	0.90	Assumed - similar to new general purpose lane
Construct 2-Lane Undivided Highway	$3,000,000	1.74	$5,220,000	Mile	2.20	$6,600,000	$11,484,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.90	0.90	Assuming new alignment for a bypass

^ Factor accounts for traffic control, erosion control, construction surveying and quality control, mobilization, construction engineering, contingencies, indirect cost allocation, and miscellaneous work

Appendix G: Performance Area Risk Factors

Pavement Performance Area

- Elevation
- Mainline Daily Traffic Volume
- Mainline Daily Truck Volume

Elevation

Variance above 4000' divided by 1000; (Elev-4000)/1000

Score	Condition
0	< 4000’
0-5	4000’- 9000’
5	> 9000’

Mainline Daily Traffic Volume

Exponential equation; score = 5-(5*e$^{(ADT*-0.000039)}$)

Score	Condition
0	< 6,000
0-5	6,000 – 160,000
5	>160,000

Mainline Daily Truck Volume

Exponential equation; score = 5-(5*e$^{(ADT*-0.00025)}$)

Score	Condition
0	<900
0-5	900-25,000
5	>25,000

Bridge Performance Area

- Mainline Daily Traffic Volume
- Elevation
- Carries Mainline Traffic
- Detour Length
- Scour Critical Rating
- Vertical Clearance

Mainline Daily Traffic Volume

Exponential equation; score = 5-(5*e$^{(ADT*-0.000039)}$)

Score	Condition
0	<6,000
0-5	6,000-160,000
5	>160,000

Elevation

Variance above 4000' divided by 1000; (Elev-4000)/1000

Score	Condition
0	< 4000’
0-5	4000’- 9000’
5	> 9000’

Carries Mainline Traffic

Score	Condition
0	Does not carry mainline traffic
5	Carries mainline traffic

Detour Length

Divides detour length by 10 and multiplies by 2.5

Score	Condition
0	0 miles
0-5	0-20 miles
5	> 20 miles

Scour Critical Rating

Variance below 8

Score	Condition
0	Rating > 8
0-5	Rating 8 - 3
5	Rating < 3

Vertical Clearance

Variance below 16’ x 2.5; (16 –Clearance) x 2.5

Score	Condition
0	>16’
0-5	16’-14’
5	<14’

Mobility Performance Area

- Mainline VMT
- Detour Length
- Outside Shoulder Width

Mainline VMT

Exponential equation; score = 5-(5*e(ADT*-0.0000139))

Score	Condition
0	<16,000
0-5	16,000-400,000
5	>400,000

Detour Length

Score	Condition
0	Detour < 10 miles
5	Detour > 10 miles

Outside Shoulder Width

Variance below 10', if only 1 lane in each direction

Score	Condition
0	10' or above or >1 lane in each direction
0-5	10'-5' and 1 lane in each direction
5	5' or less and 1 lane in each direction

Safety Performance Area

- Mainline Daily Traffic Volume
- Interrupted Flow
- Elevation
- Outside Shoulder Width
- Vertical Grade

Mainline Daily Traffic Volume

Exponential equation; score = 5-(5*e$^{(ADT*-0.000039)}$)

Score	Condition
0	<6,000
0-5	6,000-160,000
5	>160,000

Interrupted Flow

Score	Condition
0	Not interrupted flow
5	Interrupted Flow

Elevation

Variance above 4000' divided by 1000; (Elev-4000)/1000

Score	Condition
0	< 4000'
0-5	4000'- 9000'
5	> 9000'

Outside Shoulder Width

Variance below 10'

Score	Condition
0	10' or above
0-5	10' - 5'
5	5' or less

Grade

Variance above 3% x 1.5

Score	Condition
0	< 3%
0-5	3% - 6.33%
5	>6.33%

Freight Performance Area

- Mainline Daily Truck Volume
- Detour Length
- Outside Shoulder Width

Mainline Daily Truck Volume

Exponential equation; score = 5-(5*e$^{(ADT*-0.00025)}$)

Score	Condition
0	<900
0-5	900-25,000
5	>25,000

Detour Length

Score	Condition
0	Detour < 10 miles
5	Detour > 10 miles

Outside Shoulder Width

Variance below 10', if only 1 lane in each direction

Score	Condition
0	10' or above or >1 lane in each direction
0-5	10'-5' and 1 lane in each direction
5	5' or less and 1 lane in each direction

Solution Number	Mainline Traffic Vol (vpd) (2-way)	Solution Length (miles)	Bridge Detour Length (miles) (N19)	Elevation (ft)	Scour Critical Rating (0-9)	Carries Mainline Traffic (Y/N)	Bridge Vert. Clear (ft)	Mainline Truck Vol (vpd) (2-way)	Detour Length > 10 miles (Y/N)	Grade (%)	Interrupted Flow (Y/N)	Outside/ Right Shoulder Width (ft)	1-lane each direction
CS160.1	6,001			4,692						5		5	
CS160.2	13,881	2.6		4,716				1,388	Y	4	Y	4	Y
CS160.3-2	13,881	0.6		4,858				1,388	Y	4	Y	4	Y
CS160.3-3	4,729	2		5,044				520	Y	5	N	5	Y
CS160.4	4,729			5,540						5		5	
CS160.5	4,729	1.5		5,663				520	Y	5	N	5	Y
CS160.6	4,729	1		5,667				520	Y	5	N	5	Y
CS160.7	5,217			6,669						5		5	
CS160.8	5,492			6,685						5		5	
CS160.9	5,492	6		6,056				604	Y	5		5	Y
CS160.10	3,379	18		5,661				372		5	N	5	
CS160.11	3,085	2		5,073					Y	5		5	Y
CS160.12	3,085	2		4,907				339	Y	5	N	5	Y
CS160.13	3,085	2		4,958				339		5	N	5	
CS160.14	3,535			5,492						5	N	5	
CS160.15	3,541	6		5,513						5	N	5	
CS160.16	2,718	2		5,123				381	Y	5	Y	5	Y

Solution Number	Bridge	Pavement	Mobility	Safety	Freight	Risk Score (0 to 10)				
						Bridge	Pavement	Mobility	Safety	Freight
CS160.1	N	N	N	Y	N	0.00	0.00	0.00	4.69	0.00
CS160.2	N	Y	Y	Y	Y	0.00	2.84	7.98	7.12	7.65
CS160.3-2	N	Y	Y	Y	Y	0.00	2.94	7.03	7.09	7.65
CS160.3-3	N	Y	Y	Y	Y	0.00	1.66	7.08	4.75	7.08
CS160.4	N	N	N	Y	N	0.00	0.00	0.00	4.57	0.00
CS160.5	N	N	Y	Y	Y	0.00	0.00	6.98	5.00	7.08
CS160.6	N	N	Y	Y	Y	0.00	0.00	6.88	4.26	7.08
CS160.7	N	N	N	Y	N	0.00	0.00	0.00	3.91	0.00
CS160.8	N	N	N	Y	N	0.00	0.00	0.00	5.46	0.00
CS160.9	N	N	Y	Y	Y	0.00	0.00	7.89	3.20	7.14
CS160.10	N	N	N	Y	N	0.00	0.00	0.00	4.91	0.00
CS160.11	N	N	Y	Y	Y	0.00	0.00	6.94	4.65	6.67
CS160.12	N	N	Y	Y	Y	0.00	0.00	6.94	4.59	6.94
CS160.13	N	N	N	Y	N	0.00	0.00	0.00	4.61	0.00
CS160.14	N	N	N	Y	N	0.00	0.00	0.00	4.85	0.00
CS160.15	N	N	Y	Y	Y	0.00	0.00	4.18	4.86	3.33
CS160.16	N	N	Y	Y	Y	0.00	0.00	6.91	6.65	6.97

Appendix H: Candidate Solution Cost Estimates

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS160.1	L2	Moenave Safety Improvements	Install high visibility striping and delineators, reflective pavement markers, and rumble strips in both directions	312	319	mi	7.0	$148,200	$31,000	$104,000	$0	$1,037,400	$1,172,400	Unit cost matching other corridors
			Install chevrons on curve	312.5	314	mi	1.5	$50,600	$2,000	$8,000	$0	$75,900	$86,000	
			Solution Total	**$33,000**	**$112,000**	**$0**	**$1,114,000**	**$1,258,000**						
CS160.2	L4	West Tuba City Widening	Convert 2-lane undivided highway to a 5-lane highway	319.0	320.0	mi	1.0	$6,030,000	$181,000	$603,000	$0	$6,030,000	$6,814,000	
			Convert 3-lane highway to a 5-lane highway	320	321.6	mi	1.6	$9,180,000	$441,000	$1,469,000	$0	$14,688,000	$16,598,000	
			Solution Total	**$622,000**	**$2,072,000**	**$0**	**$20,718,000**	**$23,412,000**						
CS160.3	L4/L6	East Tuba City Widening	Convert 2-lane undivided highway to a 5-lane highway (160.3-2)	323.0	325.0	mi	2.0	$6,030,000	$362,000	$1,206,000	$0	$12,060,000	$13,628,000	
			Convert 2-lane undivided highway to a 5-lane highway (160.3-1)	322.4	323.0	mi	0.6	$6,030,000	$109,000	$362,000	$0	$3,618,000	$4,089,000	
			Solution Total	**$362,000**	**$1,206,000**	**$0**	**$12,060,000**	**$17,717,000**						
CS160.4	L6	Tonalea Safety Improvement	Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips)	330.0	337.0	mi	7.0	$980,000	$206,000	$686,000	$0	$6,860,000	$7,752,000	Assumes 10' of existing shoulder (combined left and right), includes widening shoulder by a total of 6'
			Install curve warning signs in both directions	336.0	336.5	each	2.0	$6,900	$0	$1,000	$0	$13,800	$14,800	
			Install chevrons on curve	336.0	336.5	mi	0.5	$50,600	$1,000	$3,000	$0	$25,300	$29,300	
			Solution Total	**$206,000**	**$686,000**	**$0**	**$6,860,000**	**$7,752,000**						
CS160.5	L6	Tuba City - Tonalea: Eastbound Passing Lane	Construct eastbound passing lane	335.0	336.5	mi	1.5	$5,742,000	$258,000	$861,000	$0	$8,613,000	$9,732,000	
			Solution Total	**$258,000**	**$861,000**	**$0**	**$8,613,000**	**$9,732,000**						
CS160.6	L6		Construct westbound passing lane	340.0	341.0	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
		Tuba City - Tonalea: Westbound Passing Lane	**Solution Total**	**$172,000**	**$574,000**	**$0**	**$5,742,000**	**$6,488,000**						
CS160.7	L9	Shonto Safety Improvement	Install high visibility striping and delineators and rumble strips in both directions	362	374	mi	12.0	$137,200	$49,000	$165,000	$0	$1,646,400	$1,860,400	
			Solution Total	**$49,000**	**$165,000**	**$0**	**$1,646,000**	**$1,860,000**						
CS160.8	L10	Tsegi Canyon Safety Improvement	Install high visibility striping and delineators and rumble strips in both directions	374	385	mi	11.0	$137,200	$45,000	$151,000	$0	$1,509,200	$1,705,000	
			Solution Total	**$45,000**	**$151,000**	**$0**	**$1,510,000**	**$1,705,000**						
CS160.9	L11	Tsegi Canyon Passing Lanes	Construct westbound passing lane	389	390	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Construct eastbound passing lane	385	391	mi	6.0	$5,742,000	$1,034,000	$3,445,000	$0	$34,452,000	$38,931,000	
			Solution Total	**$1,206,000**	**$4,019,000**	**$0**	**$40,194,000**	**$45,419,000**						
CS160.10	L15	East Kayenta Safety Improvement	Install high visibility striping and delineators and rumble strips in both directions	395	413	mi	18.0	$137,200	$74,000	$247,000	$0	$2,469,600	$2,791,000	
			Solution Total	**$74,000**	**$247,000**	**$0**	**$2,470,000**	**$2,791,000**						
CS160.11	L18	Dennehotso Passing Lanes	Construct westbound passing lane	417	418	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Construct eastbound passing lane	416	417	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Solution Total	**$344,000**	**$1,148,000**	**$0**	**$11,484,000**	**$12,976,000**						
CS160.12	L18	Chinle Wash Passing Lanes	Construct westbound passing lane	431	432	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Construct eastbound passing lane	430	431	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Solution Total	**$344,000**	**$1,148,000**	**$0**	**$11,484,000**	**$12,976,000**						

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS160.13	L17	West Mexican Water Safety Improvement	Install curve warning signs and speed feedback signs in both directions	432	434	each	2.0	$151,400	$9,000	$30,000	$0	$302,800	$342,000	
			Install chevrons on curve	432.5	433.5	mi	1.0	$50,600	$2,000	$5,000	$0	$50,600	$58,000	
			Solution Total	**$11,000**	**$35,000**	**$0**	**$354,000**	**$400,000**						
CS160.14	L21	East Mexican Water Safety Improvement	Install high visibility striping and delineators and rumble strips in both directions	434.0	444.0	mi	10.0	$137,200	$41,000	$137,000	$0	$1,372,000	$1,550,000	
			Install curve warning signs and speed feedback signs in both directions	434.0	436.0	each	2.0	$151,400	$9,000	$30,000	$0	$302,800	$341,800	curve warning signs $6,900 for 2 signs; speed feedback signs $68,800 for each
			Install chevrons on curve	434.5	435.5	mi	1.0	$50,600	$2,000	$5,000	$0	$50,600	$57,600	
			Solution Total	**$52,000**	**$172,000**	**$0**	**$1,725,000**	**$1,949,000**						
CS160.15	L23	Red Mesa Passing Lanes	Construct westbound passing lane	458	463	mi	5.0	$5,742,000	$861,000	$2,871,000	$0	$28,710,000	$32,442,000	
			Construct eastbound passing lane	453	454	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Solution Total	**$1,033,000**	**$3,445,000**	**$0**	**$34,452,000**	**$38,930,000**						
CS160.16	L24	Teec Nos Pos Passing Lanes	Construct westbound passing lane	468	469	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Construct eastbound passing lane	467	468	mi	1.0	$5,742,000	$172,000	$574,000	$0	$5,742,000	$6,488,000	
			Solution Total	**$344,000**	**$1,148,000**	**$0**	**$11,484,000**	**$12,976,000**						

Appendix I: Performance Effectiveness Scores

Need Reduction

LEGEND:
- user entered value
- calculated value for reference only
- calculated value for entry/use in other spreadsheet
- for input into Performance Effectiveness Score spreadsheet
- assumed values (do not modify)

			Solution #	CS160.1	CS160.2	CS160.3-1	CS160.3-2	CS160.4	CS160.5	CS160.6	CS160.7	CS160.8	CS160.9	CS160.10	CS160.11	CS160.12	CS160.13	CS160.14	CS160.15	CS160.16
			Description	Moenave Safety Improvements	West Tuba City Widening	East Tuba City Widening	East Tuba City Widening	Tonalea Safety Improvement	Tuba City - Tonalea; Eastbound Passing Lane	Tonalea - Tuba City Westbound Passing Lane	Shonto Safety Improvement	Tsegi Canyon Safety Improvements	Tsegi Canyon Passing Lanes	East Kayenta Safety Improvement	Dennehotso Passing Lane	Chinle Wash Passing Lanes	West Mexican Water Safety Improvement	East Mexican Water Safety Improvement	Red Mesa Passing Lanes	Teec Nos Pos Passing Lanes
			Project Beg MP	312	319	322.4	323	330	335	340	362	374	385	395	416	430	432	434	453	467
			Project End MP	319	321.6	323	325	337	336.5	343	374	385	391	413	418	432	434	444	463	469
			Project Length (miles)	7	2.6	0.6	2	7	1.5	3	12	11	6	18	2	2	2	10	10	2
			Segment Beg MP	312	319	319	323	323	323	323	362	374	374	395	413	413	413	434	451	463
			Segment End MP	319	323	323	344	344	344	344	374	391	391	413	434	434	434	444	463	471
			Segment Length (miles)	7	4	4	21	21	21	21	12	17	17	18	21	21	21	17	12	8
			Segment #	160-1	160-2	160-2	160-3	160-3	160-3	160-3	160-5	160-6	160-6	160-8	160-9	160-9	160-9	160-10	160-11	160-12
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	2.00	3.30	2.30	2.19	2.00	2.07	2.14	2.00	2.00	2.71	2.00	2.00	2.00	2.00	2.00	2.00	2.00
		Notes and Directions	Description																	
SAFETY	DIRECTIONAL SAFETY	Input current value from performance system (direction 1)	Orig Segment Directional Safety Index (EB)	2.580	1.000	1.000	1.670	1.670	1.670	1.670	2.730	2.550	2.550	2.930	1.890	1.890	1.890	1.970	0.050	1.000
		Input current value from performance system (direction 1)	Orig Segment Directional Fatal Crashes (EB)	2	0	0	3	3	3	3	3	4	4	4	3	3	3	2	0	0
		Input current value from performance system (direction 1)	Orig Segment Directional Suspected Serious Crashes (EB)	0	0	0	1	1	1	1	0	1	1	0	0	0	0	4	1	0
		Input current value from performance system (direction 1)	Original Fatal Crashes in project limits (EB)	2	0	0	2	1	0		3	4	0	4	0	0	1	1	0	
		Input current value from performance system (direction 1)	Original Suspected Serious Crashes in project limits (EB)	0	0	0	1	1	0		0	1	0	0	0	0	0	2	0	
		Input CMF value (direction 1) - If no CMF enter 1.0	CMF 1 (EB)(lowest CMF)		1	1	0.6		0.63											
		Input CMF value (direction 1) - If no CMF enter 1.0	CMF 2 (EB)		1	1	1		1											
		Input CMF value (direction 1) - If no CMF enter 1.1	CMF 3 (EB)	Total CMF calculated in separate worksheet	1	1	1	Total CMF calculated in separate worksheet	1		Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet		Total CMF calculated in separate worksheet			Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet		
		Input CMF value (direction 1) - If no CMF enter 1.2	CMF 4 (EB)		1	1	1		1											
		Input CMF value (direction 1) - If no CMF enter 1.0	CMF 5 (EB)		1	1	1		1											
		Calculated Value (direction 1)	Total CMF (EB)	-	1.000	1.000	0.600	-	0.630	0.500	-	-	0.500	-	0.500	0.500	-	-	0.500	0.500
		Calculated Value (direction 1)	Fatal Crash reduction (EB)	0.545	0.000	0.000	0.800	0.360	0.000	0.000	0.771	1.028	0.000	1.028	0.000	0.000	0.279	0.410	0.000	0.000
		Calculated Value (direction 1)	Suspected Serious Crash reduction (EB)	0.000	0.000	0.000	0.400	0.360	0.000	0.000	0.000	0.257	0.000	0.000	0.000	0.000	0.000	0.714	0.000	0.000
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 1)	Post-Project Segment Directional Fatal Crashes (EB)	1.455	0.000	0.000	2.200	2.640	3.000	3.000	2.229	2.972	4.000	2.972	3.000	3.000	2.721	1.590	0.000	0.000
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 1)	Post-Project Segment Directional Suspected Serious Crashes (EB)	0.000	0.000	0.000	0.600	0.640	1.000	1.000	0.000	0.743	1.000	0.000	0.000	0.000	0.000	3.286	1.000	0.000
		Input value from updated Safety Index spreadsheet (direction 1)	Post-Project Segment Directional Safety Index (EB)	1.870	No Changes	No Changes	1.220	1.470	1.670	1.670	2.030	1.890	2.550	2.180	1.890		1.710	1.120	0.050	
		Enter in Safety Needs spreadsheet to calculate new segment level Safety Need (direction 1)	Post-Project Segment Directional Safety Index (EB)	1.870	No Changes	No Changes	1.220	1.470	1.670	1.670	2.030	1.890	2.550	2.180	1.890	0.000	1.710	1.120	0.050	0.000
		Input current value from performance system (direction 2)	Orig Segment Directional Safety Index (WB)	1.310	1.000	1.000	2.760	2.760	2.760	2.760	0.050	1.280	1.280	0.130	1.300	1.300	1.300	1.000	1.950	1.000
		Input current value from performance system (direction 2)	Orig Segment Directional Fatal Crashes (WB)	1	1	1	5	5	5	5	0	2	2	0	2	2	2	1	2	0
		Input current value from performance system (direction 2)	Orig Segment Directional Suspected Serious Crashes (WB)	0	0	0	0	0	0	0	1	0	0	3	1	1	1	2	0	
		Input current value from performance system (direction 2)	Original Fatal Crashes in project limits (WB)	1	1	1	1	3		1	0	2	0	0	0	0	1	0		
		Input current value from performance system (direction 2)	Original Suspected Serious Crashes in project limits (WB)	0	0	0	0	0		0	1	0	0	3	0	0	0	1		
		Input CMF value (direction 2) - If no CMF enter 1.0	CMF 1 (WB)(lowest CMF)				0.6			0.63								0.63		
		Input CMF value (direction 2) - If no CMF enter 1.0	CMF 2 (WB)				1			1								1		
		Input CMF value (direction 2) - If no CMF enter 1.1	CMF 3 (WB)	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	1	Total CMF calculated in separate worksheet		1	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet		Total CMF calculated in separate worksheet			Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet		
		Input CMF value (direction 2) - If no CMF enter 1.2	CMF 4 (WB)				1			1								1		
		Input CMF value (direction 2) - If no CMF enter 1.0	CMF 5 (WB)				1			1								1		
		Calculated Value (direction 2)	Total CMF (WB)	-	-	-	0.600	-	0.500	0.630	-	-	0.500	-	0.500	0.500	-	-	0.630	0.500
		Calculated Value (direction 2)	Fatal Crash reduction (WB)	0.349	0.100	0.100	0.400	1.080	0.000	0.370	0.000	0.514	0.000	0.000	0.000	0.000	0.279	0.320	0.000	0.000
		Calculated Value (direction 2)	Suspected Serious Crash reduction (WB)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.257	0.000	0.000	0.771	0.000	0.000	0.000	0.000	0.370	0.000
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 2)	Post-Project Segment Directional Fatal Crashes (WB)	0.651	0.900	0.900	4.600	3.920	5.000	4.630	0.000	1.486	2.000	0.000	2.000	2.000	1.721	0.680	2.000	0.000
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 2)	Post-Project Segment Directional Suspected Serious Crashes (WB)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.743	0.000	0.000	2.229	1.000	1.000	1.000	1.000	1.630	0.000
		Input value from updated Safety Index spreadsheet (direction 2)	Post-Project Segment Directional Safety Index (WB)	0.850	No Changes	No Changes	2.540	2.160	2.760	2.550	0.040	0.950	1.280	0.100	1.300		1.130	0.470	1.940	
		Enter in Safety Needs spreadsheet to calculate new segment level Safety Need (direction 2)	Post-Project Segment Directional Safety Index (WB)	0.850	No Changes	No Changes	2.540	2.160	2.760	2.550	0.040	0.950	1.280	0.100	1.300	0.000	1.130	0.470	1.940	0.000
	SAFETY INDEX	Calculated Value - verify that it matches current performance system	Current Safety Index	1.945	1.000	1.000	2.215	2.215	2.215	2.215	1.390	1.915	1.915	1.530	1.595	1.595	1.595	1.485	1.000	1.000
		Enter in Safety Needs spreadsheet to calculate new segment level Safety Need	Post-Project Safety Index	1.360	1.000	#DIV/0!	1.880	1.815	2.215	2.110	1.035	1.420	1.915	1.140	1.595	0.000	1.420	0.795	0.995	0.000
	Needs	User entered value from Safety Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Safety Need	**6.58**	**0.00**	**0.00**	**7.78**	**7.78**	**7.78**	**7.78**	**4.29**	**6.95**	**6.95**	**5.40**	**5.06**	**5.06**	**5.06**	**4.47**	**1.70**	**0.00**
		User entered value from Safety Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Safety Need	**3.91**	**0.00**	**0.00**	**6.31**	**6.02**	**7.78**	**7.32**	**2.22**	**4.64**	**6.95**	**3.66**	**5.06**	**5.06**	**4.28**	**0.68**	**1.16**	**0.00**

			Solution #	CS160.1	CS160.2	CS160.3-1	CS160.3-2	CS160.4	CS160.5	CS160.6	CS160.7	CS160.8	CS160.9	CS160.10	CS160.11	CS160.12	CS160.13	CS160.14	CS160.15	CS160.16
			Description	Moenave Safety Improvements	West Tuba City Widening	East Tuba City Widening	East Tuba City Widening	Tonalea Safety Improvement	Tuba City - Tonalea; Eastbound Passing Lane	Tonalea - Tuba City Westbound Passing Lane	Shonto Safety Improvement	Tsegi Canyon Safety Improvements	Tsegi Canyon Passing Lanes	East Kayenta Safety Improvement	Dennehotso Passing Lane	Chinle Wash Passing Lanes	West Mexican Water Safety Improvement	East Mexican Water Safety Improvement	Red Mesa Passing Lanes	Teec Nos Pos Passing Lanes
	LEGEND:		Project Beg MP	312	319	322.4	323	330	335	340	362	374	385	395	416	430	432	434	453	467
		- user entered value	Project End MP	319	321.6	323	325	337	336.5	343	374	385	391	413	418	432	434	444	463	469
		- calculated value for reference only	Project Length (miles)	7	2.6	0.6	2	7	1.5	3	12	11	6	18	2	2	2	10	10	2
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	312	319	319	323	323	323	323	362	374	374	395	413	413	413	434	451	463
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	319	323	323	344	344	344	344	374	391	391	413	434	434	434	451	463	471
		- assumed values (do not modify)	Segment Length (miles)	7	4	4	21	21	21	21	12	17	17	18	21	21	21	17	12	8
			Segment #	160-1	160-2	160-2	160-3	160-3	160-3	160-3	160-5	160-6	160-6	160-8	160-9	160-9	160-9	160-10	160-11	160-12
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	2.00	3.30	2.30	2.19	2.00	2.07	2.14	2.00	2.00	2.71	2.00	2.00	2.00	2.00	2.00	2.00	2.00
		Notes and Directions	**Description**																	
MOBILITY	MOBILITY INDEX	Input current value from performance system	Original Segment Mobility Index	0.260	1.010	1.010	0.170	0.170	0.170	0.170	0.200	0.260	0.260	0.080	0.070	0.070	0.070	0.160	0.180	0.170
		Enter in Mobility Index Spreadsheet to determine new segment level Mobility Index	Post-Project # of Lanes (both directions)	2.00	3.30	2.30	2.19	2.00	2.07	2.14	2.00	2.00	2.71	2.00	2.00	2.00	2.00	2.00	2.00	2.00
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Mobility Index	0.26	0.61	0.88	0.15	0.17	0.15	0.14	0.20	0.26	0.15	0.08	0.07	0.07	0.07	0.16	0.18	0.17
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Mobility Index	0.260	0.610	0.880	0.150	0.170	0.150	0.140	0.200	0.260	0.150	0.080	0.070	0.070	0.070	0.160	0.180	0.170
	FUT V/C	Input current value from performance system	Original Segment Future V/C	0.300	1.160	1.160	0.200	0.200	0.200	0.200	0.240	0.300	0.300	0.050	0.040	0.040	0.040	0.160	0.210	0.200
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Future V/C	0.300	0.700	1.010	0.170	0.200	0.170	0.160	0.240	0.300	0.180	0.050	0.040	0.040	0.040	0.160	0.210	0.200
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Future V/C	0.300	0.700	1.010	0.170	0.200	0.170	0.160	0.240	0.300	0.180	0.050	0.040	0.040	0.040	0.160	0.210	0.200
	PEAK HOUR V/C	Input current value from performance system (direction 1)	Original Segment Peak Hour V/C (NB)	0.260	0.590	1.090	0.160	0.160	0.160	0.160	0.160	0.240	0.240	0.120	0.110	0.110	0.110	0.190	0.180	0.210
		Input current value from performance system (direction 2)	Original Segment Peak Hour V/C (SB)	0.210	0.710	0.710	0.150	0.150	0.150	0.150	0.140	0.210	0.210	0.090	0.110	0.110	0.110	0.120	0.110	0.120
		***If One-Way project**, enter in Mobility Index Spreadsheet to determine new segment level Peak Hour V/C. **If Two-Way project,** disregard	Adjusted total # of Lanes for use in directional peak hr	N/A	N/A	N/A	N/A	N/A	2.14	2.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Input value from updated Mobility Index spreadsheet (direction 1)	Post-Project Segement Peak Hr V/C (NB)	0.260	0.360	0.510	0.130	0.160	0.140	0.130	0.16	0.24	0.14	0.12	0.11	0.11	0.11	0.19	0.18	0.21
		Input value from updated Mobility Index spreadsheet (direction 2)	Post-Project Segement Peak Hr V/C (SB)	0.210	0.430	0.620	0.120	0.150	0.130	0.120	0.14	0.21	0.13	0.09	0.11	0.11	0.11	0.12	0.11	0.12
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Peak Hr V/C (NB)	0.260	0.360	0.510	0.130	0.160	0.140	0.130	0.160	0.240	0.140	0.120	0.110	0.110	0.110	0.190	0.180	0.210
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Peak Hr V/C (SB)	0.210	0.430	0.620	0.120	0.150	0.130	0.120	0.140	0.210	0.130	0.090	0.110	0.110	0.110	0.120	0.110	0.120
	LOTTR	Calculated Value (both directions)	Safety Reduction Factor	0.699	1.000	1.000	0.849	0.819	1.000	0.953	0.745	1.000	1.000	0.745	1.000	0.000	0.890	0.535	0.995	0.000
		Calculated Value (both directions)	Safety Reduction	0.301	1.000	1.000	0.151	0.181	0.000	0.047	0.255	0.258	0.000	0.255	0.000	1.000	0.110	0.465	0.005	1.000
		Calculated Value (both directions)	Mobility Reduction Factor	1.000	0.604	0.871	0.882	1.000	0.882	0.824	1.000	1.000	0.577	1.000	1.000	1.000	1.000	1.000	1.000	1.000
		Calculated Value (both directions)	Mobility Reduction	0.000	0.396	0.129	0.118	0.000	0.118	0.176	0.000	0.000	0.423	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Assumed effect on LOTTR (% of mobility reduction)	Mobility effect on LOTTR	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		Assumed effect on LOTTR (% of safety reduction)	Safety effect on LOTTR	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
		Input current value from performance system (direction 1)	Original Directional Segment LOTTR (NB)	1.110	1.110	1.110	1.070	1.070	1.070	1.070	1.060	1.070	1.070	1.090	1.130	1.130	1.130	1.070	1.060	1.240
		Input current value from performance system (direction 2)	Original Directional Segment LOTTR (SB)	1.090	1.160	1.160	1.060	1.060	1.060	1.060	1.060	1.150	1.150	1.060	1.120	1.120	1.120	1.010	1.170	1.210
		Calculated Value (both directions)	Reduction Factor for Segment LOTTR	0.090	0.379	0.326	0.069	0.054	0.050	0.077	0.074	0.078	0.085	0.076	0.000	0.300	0.033	0.139	0.002	0.300
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Directional Segment LOTTR (NB)	1.010	1.055	1.055	1.035	1.012	1.045	1.017	1.030	1.035	1.035	1.007	1.130	1.065	1.093	1.035	1.058	1.120
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Directional Segment LOTTR (SB)	1.045	1.080	1.080	1.030	1.003	1.060	1.060	1.030	1.061	1.053	1.030	1.12	1.06	1.083	1.005	1.168	1.105
	CLOSURE EXTENT	Input current value from performance system (direction 1)	Orig Segment Directional Closure Extent (NB)	0.080	0.100	0.100	0.100	0.100	0.100	0.100	0.130	0.090	0.090	0.100	0.100	0.100	0.100	0.070	0.100	0.030
		Input current value from performance system (direction 2)	Orig Segment Directional Closure Extent (SB)	0.050	0.100	0.1	0.1	0.1	0.1	0.100	0.120	0.090	0.090	0.100	0.050	0.050	0.050	0.060	0.070	0.000
		Input value from HCRS	Segment Closures with fatalities/injuries	4	3	3	9	9	9	9	8	6	6	7	6	6	6	5	4	1
		Input value from HCRS	Total Segment Closures	4	3	3	16	16	16	16	13	11	11	13	11	11	11	10	8	1
		Calculated Value (both directions)	% Closures with Fatality/Injury	1.00	1.00	1.00	0.56	0.56	0.56	0.56	0.62	0.55	0.55	0.54	0.55	0.55	0.55	0.50	0.50	1.00
		Calculated Value (both directions)	Closure Reduction	0.301	1.000	1.000	0.085	0.102	0.000	0.027	0.157	0.141	0.000	0.137	0.000	0.545	0.060	0.232	0.003	1.000
		Calculated Value (both directions)	Closure Reduction Factor	0.699	0.000	0.000	0.915	0.898	1.000	0.973	0.843	0.859	1.000	0.863	1.000	0.455	0.940	0.768	0.998	0.000
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Segment Directional Closure Extent (NB)	0.056	0.000	0.000	0.091	0.090	0.100	0.097	0.110	0.077	0.090	0.086	0.100	0.045	0.094	0.054	0.100	0.000
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Segment Directional Closure Extent (SB)	0.035	0.000	0.000	0.091	0.090	0.100	0.100	0.101	0.077	0.090	0.086	0.050	0.023	0.047	0.046	0.070	0.000
	BICYCLE ACCOM	Input current value from performance system	Orig Segment Bicycle Accomodation %	0.0%	96.0%	96.0%	19.0%	19.0%	19.0%	19.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	0.0%	4.0%
		Input current value from performance system	Orig Segment Outside Shoulder width	5.00	5.09	5.09	5.04	5.04	5.04	5.04	5.00	5.00	5.00	4.95	5.01	5.01	5.01	4.94	5.00	5.04
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Outside Shoulder width																	
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Bicycle Accomodation (%)																	
		Enter in Mobility Needs spreadsheet to calculate new segment level Mobility Need	Post-Project Segment Bicycle Accomodation (%)	0.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Needs	User entered value from Mobility Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Mobility Need	**1.097**	**5.222**	**5.222**	**0.930**	**0.930**	**0.930**	**0.930**	**1.041**	**1.105**	**1.105**	**0.902**	**0.886**	**0.886**	**0.886**	**0.974**	**1.012**	**0.979**
		User entered value from Mobility Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Mobility Need	**1.088**	**0.964**	**3.870**	**0.898**	**0.921**	**0.915**	**0.892**	**1.033**	**1.097**	**0.979**	**0.895**	**0.886**	**0.881**	**0.881**	**0.969**	**1.012**	**0.966**

			Solution #	CS160.1	CS160.2	CS160.3-1	CS160.3-2	CS160.4	CS160.5	CS160.6	CS160.7	CS160.8	CS160.9	CS160.10	CS160.11	CS160.12	CS160.13	CS160.14	CS160.15	CS160.16
			Description	Moenave Safety Improvements	West Tuba City Widening	East Tuba City Widening	East Tuba City Widening	Tonalea Safety Improvement	Tuba City - Tonalea; Eastbound Passing Lane	Tonalea - Tuba City Westbound Passing Lane	Shonto Safety Improvement	Tsegi Canyon Safety Improvements	Tsegi Canyon Passing Lanes	East Kayenta Safety Improvement	Dennehotso Passing Lane	Chinle Wash Passing Lanes	West Mexican Water Safety Improvement	East Mexican Water Safety Improvement	Red Mesa Passing Lanes	Teec Nos Pos Passing Lanes
	LEGEND:		Project Beg MP	312	319	322.4	323	330	335	340	362	374	385	395	416	430	432	434	453	467
		- user entered value	Project End MP	319	321.6	323	325	337	336.5	343	374	385	391	413	418	432	434	444	463	469
		- calculated value for reference only	Project Length (miles)	7	2.6	0.6	2	7	1.5	3	12	11	6	18	2	2	2			
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	312	319	319	323	323	323	323	362	374	374	395	413	413	413	434	451	463
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	319	323	323	344	344	344	344	374	391	391	413	434	434	434	451	463	471
		- assumed values (do not modify)	Segment Length (miles)	7	4	4	21	21	21	21	12	17	17	18	21	21	21			
			Segment #	160-1	160-2	160-2	160-3	160-3	160-3	160-3	160-5	160-6	160-6	160-8	160-9	160-9	160-9	160-10	160-11	160-12
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	2.00	3.30	2.30	2.19	2.00	2.07	2.14	2.00	2.00	2.71	2.00	2.00	2.00	2.00			
		Notes and Directions	**Description**																	
	TTTR	Assumed effect on TTTR (% of mobility reduction)	Mobility effect on TTTR	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		Assumed effect on TTTR (% of safety reduction)	Safety effect on TTTR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		Input current value from performance system (direction 1)	Original Directional Segment TTTR (NB)	1.700	1.310	1.310	1.220	1.220	1.220	1.220	1.200	1.220	1.220	1.350	1.670	1.670	1.670	1.250	1.160	6.020
		Input current value from performance system (direction 2)	Original Directional Segment TTTR (SB)	1.350	1.460	1.460	1.240	1.240	1.240	1.240	1.230	2.830	2.830	1.170	2.020	2.020	2.020	1.210	3.290	1.730
		Calculated Value (both directions)	Reduction Factor for Segment TTTR (both directions)	0.045	0.190	0.163	0.034	0.027	0.012	0.025	0.038	0.039	0.042	0.038	0.000	0.150	0.016	0.070	0.001	0.150
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Post-Project Directional Segment TTTR (NB)	1.623	1.062	1.097	1.178	1.187	1.206	1.190	1.154	1.173	1.168	1.298	1.670	1.420	1.643	1.163	1.159	5.117
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Post-Project Directional Segment TTTR (SB)	1.289	1.183	1.222	1.197	1.206	1.240	1.240	1.183	2.720	2.710	1.125	2.020	1.717	1.987	1.126	3.288	1.471
	FREIGHT INDEX	Value from above	Original Segment MAX TTTR (NB)	1.700	1.310	1.310	1.220	1.220	1.220	1.220	1.200	1.220	1.220	1.350	1.670	1.670	1.670	1.250	1.160	6.020
		Value from above	Original Segment MAX TTTR (SB)	1.350	1.460	1.460	1.240	1.240	1.240	1.240	1.230	2.830	2.830	1.170	2.020	2.020	2.020	1.210	3.290	1.730
		Calculated Value	Original Segment Freight Index	1.5250	1.3850	1.3850	1.2300	1.2300	1.2300	1.2300	1.2150	2.0250	2.0250	1.2600	1.8450	1.8450	1.8450	1.2300	2.2250	3.8750
		Calculated Value	Post-Project Segment MAX TTTR (NB)	1.623	1.062	1.097	1.178	1.187	1.206	1.190	1.154	1.173	1.168	1.298	1.670	1.420	1.643	1.163	1.159	5.117
		Calculated Value	Post-Project Segment MAX TTTR (SB)	1.289	1.183	1.222	1.197	1.206	1.240	1.240	1.183	2.720	2.710	1.125	2.020	1.717	1.987	1.126	3.288	1.471
		Enter in Freight Needs spreadsheet to update segment level Freight Need	Post-Project Segment Freight Index	1.456	1.122	1.159	1.188	1.197	1.223	1.215	1.168	1.946	1.939	1.212	1.845	1.568	1.815	1.144	2.223	3.294
	CLOSURE DURATION	Input current value from performance system (direction 1)	Orig Segment Directional Closure Duration (dir 1)	19.100	15.600	15.600	19.590	19.590	19.590	19.590	33.170	22.560	22.560	59.610	27.410	27.410	27.410	18.130	18.270	10.740
		Input current value from performance system (direction 2)	Orig Segment Directional Closure Duration (dir 2)	7.830	16.800	16.800	15.890	15.890	15.890	15.890	22.830	19.480	19.480	19.880	8.770	8.770	8.770	9.600	15.420	0.000
		Calculated Value	Segment Closures with fatalities	4	3	3	9	9	9	9	8	6	6	7	6	6	6	5	4	1
		Calculated Value	Total Segment Closures	4	3	3	16	16	16	16	13	11	11	13	11	11	11	10	8	1
		Calculated Value	% Closures with Fatality	1.00	1.00	1.00	0.56	0.56	0.56	0.56	0.62	0.55	0.55	0.54	0.55	0.55	0.55	0.50	0.50	1.00
		Calculated Value	Closure Reduction	0.301	1.000	1.000	0.085	0.102	0.000	0.027	0.157	0.141	0.000	0.137	0.000	0.545	0.060	0.232	0.003	1.000
		Calculated Value	Closure Reduction Factor	0.699	0.000	0.000	0.915	0.898	1.000	0.973	0.843	0.859	1.000	0.863	1.000	0.455	0.940	0.768	0.998	0.000
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Post-Project Segment Directional Closure Duration (NB)	13.355	0.000	0.000	17.923	17.600	19.590	19.068	27.957	19.379	22.560	51.428	27.410	12.459	25.770	13.918	18.224	0.000
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Post-Project Segment Directional Closure Duration (SB)	5.475	0.000	0.000	14.538	14.276	15.890	15.890	19.242	16.733	19.480	17.151	8.770	3.986	8.245	7.370	15.381	0.000
	VERT CLR	Input current value from performance system	Original Segment Vertical Clearance																	
		Input current value from performance system	Original vertical clearance for specific bridge																	
		Input post-project value (depends on solution)	Post-Project vertical clearance for specific bridge																	
		Input post-project value (depends on solution)(force segment clearance to equal this specific bridge)	Post-Project Segment Vertical Clearance																	
		Enter in Freight Needs spreadsheet to update segment level Freight Need	Post-Project Segment Vertical Clearance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Needs	User entered value from Freight Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Freight Need	**1.13**	**0.75**	**0.75**	**1.45**	**1.45**	**1.45**	**1.45**	**1.18**	**4.07**	**4.07**	**2.01**	**3.96**	**3.96**	**3.96**	**1.41**	**4.21**	**4.06**
		User entered value from Freight Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Freight Need	**0.95**	**0.20**	**0.28**	**1.02**	**1.06**	**1.25**	**1.26**	**0.95**	**3.98**	**3.98**	**1.28**	**3.96**	**3.73**	**3.94**	**0.82**	**4.21**	**3.86**

			Solution #	CS160.1	CS160.2	CS160.3-1	CS160.3-2	CS160.4	CS160.5	CS160.6	CS160.7	CS160.8	CS160.9	CS160.10	CS160.11	CS160.12	CS160.13	CS160.14	CS160.15	CS160.16
			Description	Moenave Safety Improvements	West Tuba City Widening	East Tuba City Widening	East Tuba City Widening	Tonalea Safety Improvement	Tuba City - Tonalea; Eastbound Passing Lane	Tonalea - Tuba City Westbound Passing Lane	Shonto Safety Improvement	Tsegi Canyon Safety Improvements	Tsegi Canyon Passing Lanes	East Kayenta Safety Improvement	Dennehotso Passing Lane	Chinle Wash Passing Lanes	West Mexican Water Safety Improvement	East Mexican Water Safety Improvement	Red Mesa Passing Lanes	Teec Nos Pos Passing Lanes
	LEGEND:		Project Beg MP	312	319	322.4	323	330	335	340	362	374	385	395	416	430	432	434	453	467
		- user entered value	Project End MP	319	321.6	323	325	337	336.5	343	374	385	391	413	418	432	434	444	463	469
		- calculated value for reference only	Project Length (miles)	7	2.6	0.6	2	7	1.5	3	12	11	6	18	2	2	2			
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	312	319	319	323	323	323	323	362	374	374	395	413	413	413	434	451	463
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	319	323	323	344	344	344	344	374	391	391	413	434	434	434	451	463	471
		- assumed values (do not modify)	Segment Length (miles)	7	4	4	21	21	21	21	12	17	17	18	21	21	21			
			Segment #	160-1	160-2	160-2	160-3	160-3	160-3	160-3	160-5	160-6	160-6	160-8	160-9	160-9	160-9	160-10	160-11	160-12
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	2.00	3.30	2.30	2.19	2.00	2.07	2.14	2.00	2.00	2.71	2.00	2.00	2.00	2.00			
		Notes and Directions	**Description**																	
BRIDGE	**BRIDGE INDEX**	Input current value from performance system	Original Segment Bridge Index	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input current value from performance system	Original lowest rating for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input post-project value (For repair +1, rehab +2, replace=8)	Post-Project lowest rating for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Enter in Bridge Index spreadsheet to calculate new Bridge Index	Post-Project lowest rating for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input updated segment value from updated Bridge Index spreadsheet	Post-Project Segment Bridge Index	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Bridge Index	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	SUFF RATING	Input current value from performance system	Original Segment Sufficiency Rating	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input current value from performance system	Original Sufficiency Rating for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input post-project value (For repair +10, rehab +20, replace=98)	Post-Project Sufficiency Rating for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Enter in Bridge Index spreadsheet to calculate new Bridge Index	Post-Project Sufficiency Rating for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input updated segment value from updated Bridge Index spreadsheet	Post-Project Segment Sufficiency Rating	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Sufficiency Rating	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	BR RTNG	Input current value from performance system	Original Segment Bridge Rating	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input updated segment value from updated Bridge Index spreadsheet	Post-Project Segment Bridge Rating	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Bridge Rating	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Needs	User entered value from Bridge Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Bridge Need	**2.18**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.00**	**0.00**	**0.00**	**2.35**	**0.00**	**0.00**
		User entered value from Bridge Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Bridge Need	**2.183**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	0.5	0	0	0	2.346	0	0

			Solution #	CS160.1	CS160.2	CS160.3-1	CS160.3-2	CS160.4	CS160.5	CS160.6	CS160.7	CS160.8	CS160.9	CS160.10	CS160.11	CS160.12	CS160.13	CS160.14	CS160.15	CS160.16
			Description	Moenave Safety Improvements	West Tuba City Widening	East Tuba City Widening	East Tuba City Widening	Tonalea Safety Improvement	Tuba City - Tonalea; Eastbound Passing Lane	Tonalea - Tuba City Westbound Passing Lane	Shonto Safety Improvement	Tsegi Canyon Safety Improvements	Tsegi Canyon Passing Lanes	East Kayenta Safety Improvement	Dennehotso Passing Lane	Chinle Wash Passing Lanes	West Mexican Water Safety Improvement	East Mexican Water Safety Improvement	Red Mesa Passing Lanes	Teec Nos Pos Passing Lanes
	LEGEND:		Project Beg MP	312	319	322.4	323	330	335	340	362	374	385	395	416	430	432	434	453	467
		- user entered value	Project End MP	319	321.6	323	325	337	336.5	343	374	385	391	413	418	432	434	444	463	469
		- calculated value for reference only	Project Length (miles)	7	2.6	0.6	2	7	1.5	3	12	11	6	18	2	2	2			
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	312	319	319	323	323	323	323	362	374	374	395	413	413	413	434	451	463
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	319	323	323	344	344	344	344	374	391	391	413	434	434	434	451	463	471
		- assumed values (do not modify)	Segment Length (miles)	7	4	4	21	21	21	21	12	17	17	18	21	21	21			
			Segment #	160-1	160-2	160-2	160-3	160-3	160-3	160-3	160-5	160-6	160-6	160-8	160-9	160-9	160-9	160-10	160-11	160-12
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	2.00	3.30	2.30	2.19	2.00	2.07	2.14	2.00	2.00	2.71	2.00	2.00	2.00	2.00			
		Notes and Directions	**Description**																	
PAVEMENT	**PAVEMENT INDEX**	Input current value from performance system	Original Segment Pavement Index	No Change	3.87	3.87	2.98	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input current value from performance system	Original Segment IRI in project limits	No Change	59.11-102.23	64.55	141.73-125.24	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input current value from performance system	Original Segment Cracking in project limits	No Change	0-12	10.4	8.09-8.90	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input current value from performance system	Original Segment Rutting in project limits	No Change	0.11-0.22	0.12	0.07-0.29	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input post-project value (For rehab, increase to 45; for replace increase to 30)	Post-Project IRI in project limits	No Change	45	45	45	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Enter in Pavement Index spreadsheet to calculate new Pavement Index	Post-Project IRI in project limits	No Change	45	45	45	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input post-project value (Lower to 0 for rehab or replace)	Post-Project Cracking in project limits	No Change	0	0	0													
		Enter in Pavement Index spreadsheet to calculate new Pavement Index	Post-Project Cracking in project limits	No Change	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Input post-project value (Lower to 0 for rehab or replace)	Post-Project Rutting in project limits	No Change	0	0	0													
		Enter in Pavement Index spreadsheet to calculate new Pavement Index	Post-Project Rutting in project limits	No Change	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Input updated segment value from updated Pavement Index spreadsheet	Post-Project Segment Pavement Index	No Change	4.33	3.98	3.08													
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Pavement Index	No Change	4.33	3.98	3.08	0	0	0	0	0	0	0	0	0	0	0	0	0
	DIRECTION PSR	Input current value from performance system (direction 1)	Original Segment Directional PSR (NB)		3.8	3.8	3.3													
		Input current value from performance system (direction 2)	Original Segment Directional PSR (SB)		3.96	3.96	3.32													
		Value from above	Original Segment IRI in project limits	No Change	59.11-102.23	64.55	141.73-125.24	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Value from above	Post-Project directional IRI in project limits	No Change	45	45	45	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
		Input updated segment value from updated Pavement Index spreadsheet (direction 1)	Post-Project Segment Directional PSR (NB)	No Change	4.11	3.9	3.42													
		Input updated segment value from updated Pavement Index spreadsheet (direction 2)	Post-Project Segment Directional PSR (SB)	No Change	4.22	3.95	3.42													
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (NB)	No Change	4.11	3.9	3.42	0	0	0	0	0	0	0	0	0	0	0	0	0
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (SB)	No Change	4.22	3.95	3.42	0	0	0	0	0	0	0	0	0	0	0	0	0
	% FAIL	Input current value from performance system	Original Segment % Failure	No Change	36.0%	36.0%	45.0%													
		Input value from updated Pavement Index spreadsheet	Post-Project Segment % Failure	No Change	18.0%	18.0%	45.0%													
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment % Failure	No Change	18.0%	18.0%	45.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Needs	User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Pavement Need	**0.00**	**0.73**	**0.73**	**2.67**	**2.67**	**2.67**	**2.67**	**0.50**	**4.32**	**4.32**	**0.89**	**4.06**	**4.06**	**4.06**	**3.33**	**0.04**	**0.00**
		User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Pavement Need	**0.00**	**0.360**	**0.360**	**2.406**	**2.67**	**2.67**	**2.67**	**0.50**	**4.32**	**4.32**	**0.89**	**4.06**	**4.06**	**4.06**	**3.33**	**0.04**	**0.00**

CMF Application

US 160 Corridor Profile Study
CMF Application

CS 160.1 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
312	312.5	0.77	0.89	1	1			EB	0.728	0	0	0.000	0.000	0.000	0.000
312.5	314	0.77	0.89	0.79	1			EB	0.651	0	0	0.000	0.000	0.000	0.000
314	319	0.77	0.89	1	1			EB	0.728	2	0	1.455	0.000	0.545	0.000
										2	0			**0.545**	**0.000**

CS 160.1 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
312	312.5	0.77	0.89	1	1			WB	0.728	0	0	0.000	0.000	0.000	0.000
312.5	314	0.77	0.89	0.79	1			WB	0.651	1	0	0.651	0.000	0.349	0.000
314	319	0.77	0.89	1	1			WB	0.728	0	0	0.000	0.000	0.000	0.000
										1	0			**0.349**	**0.000**

CS 160.2 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
319	320	0.6	1	1	1			EB	0.600	0	0	0.000	0.000	0.000	0.000
320	321.6	0.9	1	1	1			EB	0.900	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.2 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
319	320	0.6	1	1	1			WB	0.600	0	0	0.000	0.000	0.000	0.000
320	321.6	0.9	1	1	1			WB	0.900	1	0	0.900	0.000	0.100	0.000
										1	0			**0.100**	**0.000**

CS 160.3-1 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
322.4	323	0.6	1	1	1			WB	0.600	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.3-1 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
322.4	323	0.6	1	1	1			EB	0.600	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.3-2 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
323	325	0.6	1	1	1			WB	0.600	1	0	0.600	0.000	0.400	0.000
										1	0			**0.400**	**0.000**

CS 160.3-2 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
323	325	0.6	1	1	1			EB	0.600	2	1	1.200	0.600	0.800	0.400
										2	1			**0.800**	**0.400**

CS 160.4 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
330	336	0.64	1	1	1			WB	0.640	3	0	1.920	0.000	1.080	0.000
336	336.5	0.64	0.83	0.79	1			WB	0.524	0	0	0.000	0.000	0.000	0.000
336.5	337	0.64	1	1	1			WB	0.640	0	0	0.000	0.000	0.000	0.000
										3	0			**1.080**	**0.000**

CS 160.4 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
330	336	0.64	1	1	1			EB	0.640	1	1	0.640	0.640	0.360	0.360
336	336.5	0.64	0.83	0.79	1			EB	0.524	0	0	0.000	0.000	0.000	0.000
336.5	337	0.64	1	1	1			EB	0.640	0	0	0.000	0.000	0.000	0.000
										1	1			**0.360**	**0.360**

CS 160.5 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
335	336.5	0.63	1	1	1			EB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.6 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
340	341	0.63	1	1	1			WB	0.630	1	0	0.630	0.000	0.370	0.000
										1	0			**0.370**	**0.000**

CS 160.7 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
362	374	0.85	0.85	0.89	1			WB	0.743	0	1	0.000	0.743	0.000	0.257
										0	1			**0.000**	**0.257**

CS 160.7 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
362	374	0.85	0.85	0.89	1			EB	0.743	3	0	2.229	0.000	0.771	0.000
										3	0			**0.771**	**0.000**

CS 160.8 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
374	385	0.85	0.85	0.89	1			WB	0.743	2	0	1.486	0.000	0.514	0.000
										2	0			**0.514**	**0.000**

CS 160.8 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
374	385	0.85	0.85	0.89	1			EB	0.743	4	1	2.972	0.743	1.028	0.257
										4	1			**1.028**	**0.257**

CS 160.9 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
389	390	0.63	1	1	1			EB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.9 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
385	391	0.63	1	1	1			WB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.10 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
395	413	0.85	0.85	0.89	1			WB	0.743	0	3	0.000	2.229	0.000	0.771
										0	3			**0.000**	**0.771**

CS 160.10 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
395	413	0.85	0.85	0.89	1			EB	0.743	4	0	2.972	0.000	1.028	0.000
										4	0			**1.028**	**0.000**

CS 160.11 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
417	418	0.63	1	1	1			WB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.11 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
416	417	0.63	1	1	1			EB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.12 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
431	432	0.63	1	1	1			WB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.12 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
430	431	0.63	1	1	1			EB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.13 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
432	432.5	0.83	0.94	1	1			WB	0.805	0	0	0.000	0.000	0.000	0.000
432.5	433.5	0.83	0.94	0.79	1			WB	0.721	1	0	0.721	0.000	0.279	0.000
433.5	434	0.83	0.94	1	1			WB	0.805	0	0	0.000	0.000	0.000	0.000
										1	0			**0.279**	**0.000**

CS 160.13 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
432	432.5	0.83	0.94	1	1			EB	0.805	0	0	0.000	0.000	0.000	0.000
432.5	433.5	0.83	0.94	0.79	1			EB	0.721	1	0	0.721	0.000	0.279	0.000
433.5	434	0.83	0.94	1	1			EB	0.805	0	0	0.000	0.000	0.000	0.000
										1	0			**0.279**	**0.000**

CS 160.14 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
434	434.5	0.85	0.85	0.89	0.83	0.94	1	WB	0.680	0	0	0.000	0.000	0.000	0.000
434.5	435.5	0.85	0.85	0.89	0.83	0.94	0.79	WB	0.680	1	0	0.680	0.000	0.320	0.000
435.5	436	0.83	0.94	0.89	0.83	1	1	WB	0.696	0	0	0.000	0.000	0.000	0.000
										1	0			**0.320**	**0.000**

CS 160.14 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4	CMF5	CMF6	Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
434	434.5	0.85	0.85	0.89	0.83	0.94	1	EB	0.659	0	0	0.000	0.000	0.000	0.000
434.5	435.5	0.85	0.85	0.89	0.83	0.94	0.79	EB	0.590	1	1	0.590	0.590	0.410	0.410
435.5	436	0.83	0.94	0.89	0.83	1	1	EB	0.696	0	1	0.000	0.696	0.000	0.304
										1	2			**0.410**	**0.714**

CS 160.15 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
458	463	0.63	1	1	1			WB	0.630	0	1	0.000	0.630	0.000	0.370
										0	1			**0.000**	**0.370**

CS 160.15 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
453	454	0.63	1	1	1			EB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.16 (Westbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
468	469	0.63	1	1	1			WB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

CS 160.16 (Eastbound)

									Effective	Current		Post-Project		Reduction	
BMP	EMP	CMF1	CMF2	CMF3	CMF4			Dir	CMF	Fatal	Incap	Fatal	Incap	Fatal	Incap
467	468	0.63	1	1	1			EB	0.630	0	0	0.000	0.000	0.000	0.000
										0	0			**0.000**	**0.000**

Performance Area Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Pavement					Bridge					Safety					Mobility					Freight				
				Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score
CS160.1	Moenave Safety Improvements	312-319	1.26	0.000	0.000	0.000	0.00	0.000	2.183	2.183	0.000	0.00	0.000	6.578	3.911	2.667	4.69	12.510	1.097	1.088	0.009	0.00	0.000	1.130	0.950	0.180	0.00	0.000
CS160.2	West Tuba City Widening	319-321.6	23.41	0.727	0.360	0.367	2.84	1.513	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	7.12	7.013	5.222	0.964	4.258	5.99	7.299	0.750	0.200	0.550	5.74	4.978
CS160.3	**East Tuba City Widening**	322.4-325	17.72	3.40	2.77	0.629		1.513	0.00	0.00	0.000		0.000	7.782	6.31	1.476		7.013	6.152	4.77	1.384		7.299	2.200	1.30	0.900		4.978
CS160.3-1	East Tuba City Widening	322.4-323	4.09	0.727	0.360	0.367	2.94	1.078	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	7.09	0.000	5.222	3.870	1.352	5.27	7.129	0.750	0.280	0.470	5.74	2.696
CS160.3-2	East Tuba City Widening	323-325	13.63	2.668	2.406	0.262	1.66	0.435	0.000	0.000	0.000	0.00	0.000	7.782	6.306	1.476	4.75	7.013	0.930	0.898	0.032	5.31	0.170	1.450	1.020	0.430	5.31	2.282
CS160.4	Tonalea Safety Improvement	330-337	7.75	2.668	2.668	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	7.782	6.020	1.762	4.57	8.052	0.930	0.921	0.009	0.00	0.000	1.450	1.060	0.390	0.00	0.000
CS160.5	Tuba City – Tonalea: Eastbound Passing Lane	335-336.5	9.73	2.668	2.668	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	7.782	7.782	0.000	5.00	0.000	0.930	0.915	0.015	5.23	0.079	1.450	1.250	0.200	5.31	1.061
CS160.6	Tonalea – Tuba City: Westbound Passing Lane	340-343	6.49	2.668	2.668	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	7.782	7.320	0.462	4.26	1.968	0.930	0.892	0.038	5.16	0.196	1.450	1.260	0.190	5.31	1.008
CS160.7	Shonto Safety Improvement	362-374	1.86	0.500	0.500	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	4.294	2.219	2.075	3.91	8.119	1.041	1.033	0.008	0.00	0.000	1.180	0.950	0.230	0.00	0.000
CS160.8	Tsegi Canyon Safety Improvement	374-385	1.71	4.322	4.322	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	6.947	4.643	2.304	5.46	12.571	1.105	1.097	0.008	0.00	0.000	4.070	3.980	0.090	0.00	0.000
CS160.9	Tsegi Canyon Passing Lanes	385-391	45.42	4.322	4.322	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	6.947	6.947	0.000	3.20	8.532	1.105	0.979	0.126	5.92	0.000	4.070	3.980	0.090	5.35	0.000
CS160.10	East Kayenta Safety Improvement	395-413	2.79	0.889	0.889	0.000	0.00	0.000	0.500	0.500	0.000	0.00	0.000	5.397	3.659	1.738	4.91	8.532	0.902	0.895	0.007	0.00	0.000	2.010	1.280	0.730	0.00	0.000
CS160.11	Dennehotso Passing Lanes	416-418	12.98	4.060	4.060	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	5.059	5.059	0.000	4.65	0.000	0.886	0.886	0.000	5.21	0.000	3.960	3.960	0.000	5.00	0.000
CS160.12	Chinle Wash Passing Lanes	430-432	12.98	4.060	4.060	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	5.059	5.059	0.000	4.59	0.000	0.886	0.881	0.005	5.21	0.026	3.960	3.730	0.230	5.20	1.197
CS160.13	West Mexican Water Safety Improvement	432-434	0.40	4.060	4.060	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	5.059	4.278	0.781	4.61	3.599	0.886	0.881	0.005	0.00	0.000	3.960	3.940	0.020	0.00	0.000
CS160.14	East Mexican Water Safety Improvement	434-444	1.95	3.330	3.330	0.000	0.00	0.000	2.346	2.346	0.000	0.00	0.000	4.469	0.675	3.794	4.85	18.409	0.974	0.969	0.005	0.00	0.000	1.410	0.820	0.590	0.00	0.000
CS160.15	Red Mesa Passing Lanes	453-463	38.93	0.042	0.042	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	1.700	1.155	0.545	4.86	2.649	1.012	1.012	0.000	3.14	0.000	4.210	4.210	0.000	2.50	0.000
CS160.16	Teec Nos Pos Passing Lanes	467-469	12.98	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	6.65	0.000	0.979	0.966	0.013	5.18	0.067	4.060	3.860	0.200	5.23	1.046

Performance Effectiveness Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Safety Emphasis Area						Mobility Emphasis Area						Pavement Emphasis Area						Total Factored Benefit	VMT Factor	NPV Factor	Performance Effectiveness Score
				Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score	Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score	Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score				
CS160.1	Moenave Safety Improvements	312-319	1.26	4.044	3.936	0.108	4.69	1.50	0.760	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	13.270	2.21	15.3	356.9
CS160.2	West Tuba City Widening	319-321.6	23.41	4.044	4.044	0.000	7.12	1.50	0.000	0.187	0.177	0.010	5.99	1.50	0.048	1.662	1.638	0.024	2.84	1.50	0.094	20.945	1.97	20.2	35.6
CS160.3	East Tuba City Widening	322.4-325	17.72	8.09	7.93	0.158			1.126	0.374	0.37	0.006			0.048	3.324	3.291	0.033			0.094	22.071	1.10	20.2	14.6
CS160.3-1	East Tuba City Widening	322.4-323	4.09	4.044	4.044	0.000	7.09	1.50	0.000	0.187	0.184	0.003	5.27	1.50	0.024	1.662	1.656	0.006	2.94	1.50	0.026	10.954	0.55	20.2	29.6
CS160.3-2	East Tuba City Widening	323-325	13.63	4.044	3.886	0.158	4.75	1.50	1.126	0.187	0.184	0.003	5.31	1.50	0.024	1.662	1.635	0.027	1.66	1.50	0.067	11.117	0.62	20.2	10.2
CS160.4	Tonalea Safety Improvement	330-337	7.75	4.044	3.855	0.189	4.57	1.50	1.296	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	9.348	1.84	15.3	34.0
CS160.5	Tuba City – Tonalea: Eastbound Passing Lane	335-336.5	9.73	4.044	4.044	0.000	5.00	1.50	0.000	0.187	0.185	0.002	5.23	1.50	0.016	1.662	1.662	0.000	0.00	1.50	0.000	1.156	0.24	20.2	0.6
CS160.6	Tonalea – Tuba City: Westbound Passing Lane	340-343	6.49	4.044	3.994	0.050	4.26	1.50	0.320	0.187	0.183	0.004	5.16	1.50	0.031	1.662	1.662	0.000	0.00	1.50	0.000	3.523	0.16	20.2	1.8
CS160.7	Shonto Safety Improvement	362-374	1.86	4.044	3.944	0.100	3.91	1.50	0.587	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	8.706	2.91	15.3	208.1
CS160.8	Tsegi Canyon Safety Improvement	374-385	1.71	4.044	3.853	0.191	5.46	1.50	1.563	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	14.135	2.48	15.3	315.2
CS160.9	Tsegi Canyon Passing Lanes	385-391	45.42	4.044	4.044	0.000	3.20	1.50	0.000	0.187	0.175	0.012	5.92	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	8.532	2.07	20.2	7.9
CS160.10	East Kayenta Safety Improvement	395-413	2.79	4.044	3.878	0.166	4.91	1.50	1.222	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	9.754	2.85	15.3	152.6
CS160.11	Dennehotso Passing Lanes	416-418	12.98	4.044	4.044	0.000	4.65	1.50	0.000	0.187	0.187	0.000	5.21	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	0.000	0.41	20.2	0.0
CS160.12	Chinle Wash Passing Lanes	430-432	12.98	4.044	3.999	0.045	4.59	1.50	0.310	0.187	0.187	0.000	5.21	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	1.533	0.41	20.2	1.0
CS160.13	West Mexican Water Safety Improvement	432-434	0.40	4.044	3.958	0.086	4.61	1.50	0.594	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	4.193	0.41	15.3	65.9
CS160.14	East Mexican Water Safety Improvement	434-444	1.95	4.044	3.816	0.228	4.85	1.50	1.659	0.187	0.187	0.000	0.00	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	20.068	1.94	15.3	305.8
CS160.15	Red Mesa Passing Lanes	453-463	38.93	4.044	4.041	0.003	4.86	1.50	0.022	0.187	0.187	0.000	3.14	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	2.671	1.28	20.2	1.8
CS160.16	Teec Nos Pos Passing Lanes	467-469	12.98	4.044	4.044	0.000	6.65	1.50	0.000	0.187	0.187	0.000	5.18	1.50	0.000	1.662	1.662	0.000	0.00	1.50	0.000	1.113	0.36	20.2	0.6

Appendix J: Solution Prioritization Scores

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Pavement		Bridge		Safety		Mobility		Freight		Total Factored Score	Risk Factors					Weighted Risk Factor	Segment Need	Prioritization Score
				Score	%	Score	%	Score	%	Score	%	Score	%		Pavement	Bridge	Safety	Mobility	Freight			
CS160.1	Moenave Safety Improvements	312-319	1.26	0.000	0.0%	0.000	0.0%	13.270	100.0%	0.000	0.0%	0.000	0.0%	13.270	1.14	1.51	1.78	1.36	1.36	1.780	1.38	**877**
CS160.2	West Tuba City Widening	319-321.6	23.41	1.607	7.7%	0.000	0.0%	7.013	33.5%	7.347	35.1%	4.978	23.8%	20.945	1.14	1.51	1.78	1.36	1.36	1.484	0.92	**49**
CS160.3	**East Tuba City Widening**	322.4-325	17.72	1.607	7.3%	0.000	0.0%	8.139	36.9%	7.347	33.3%	4.978	23%	22.071	1.14	1.51	1.78	1.36	1.36	1.499	1.57	**36**
CS160.3-1	East Tuba City Widening	322.4-323	4.09	1.104	10.1%	0.000	0.0%	0.000	0.0%	7.153	65.3%	2.696	24.6%	10.954	1.14	1.51	1.78	1.36	1.36	1.338	0.92	**36**
CS160.3-2	East Tuba City Widening	323-325	13.63	0.503	4.5%	0.000	0.0%	8.139	73.2%	0.194	1.7%	2.282	20.5%	11.117	1.14	1.51	1.78	1.36	1.36	1.658	1.77	**30**
CS160.4	Tonalea Safety Improvement	330-337	7.75	0.000	0.0%	0.000	0.0%	9.348	100.0%	0.000	0.0%	0.000	0.0%	9.348	1.14	1.51	1.78	1.36	1.36	1.780	1.77	**107**
CS160.5	Tuba City – Tonalea: Eastbound Passing Lane	335-336.5	9.73	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.094	8.2%	1.061	91.8%	1.156	1.14	1.51	1.78	1.36	1.36	1.360	1.77	**1**
CS160.6	Tonalea – Tuba City: Westbound Passing Lane	340-343	6.49	0.000	0.0%	0.000	0.0%	2.288	64.9%	0.227	6.4%	1.008	28.6%	3.523	1.14	1.51	1.78	1.36	1.36	1.633	1.77	**5**
CS160.7	Shonto Safety Improvement	362-374	1.86	0.000	0.0%	0.000	0.0%	8.706	100.0%	0.000	0.0%	0.000	0.0%	8.706	1.14	1.51	1.78	1.36	1.36	1.780	1.31	**485**
CS160.8	Tsegi Canyon Safety Improvement	374-385	1.71	0.000	0.0%	0.000	0.0%	14.135	100.0%	0.000	0.0%	0.000	0.0%	14.135	1.14	1.51	1.78	1.36	1.36	1.780	1.38	**774**
CS160.9	Tsegi Canyon Passing Lanes	385-391	45.42	0.000	0.0%	0.000	0.0%	8.532	100.0%	0.000	0.0%	0.000	0.0%	8.532	1.14	1.51	1.78	1.36	1.36	1.780	1.38	**19**
CS160.10	East Kayenta Safety Improvement	395-413	2.79	0.000	0.0%	0.000	0.0%	9.754	100.0%	0.000	0.0%	0.000	0.0%	9.754	1.14	1.51	1.78	1.36	1.36	1.780	1.31	**356**
CS160.11	Dennehotso Passing Lanes	416-418	12.98	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	1.14	1.51	1.78	1.36	1.36	0.000	2.08	**0**
CS160.12	Chinle Wash Passing Lanes	430-432	12.98	0.000	0.0%	0.000	0.0%	0.310	20.2%	0.026	1.7%	1.197	78.1%	1.533	1.14	1.51	1.78	1.36	1.36	1.445	2.08	**3**
CS160.13	West Mexican Water Safety Improvement	432-434	0.40	0.000	0.0%	0.000	0.0%	4.193	100.0%	0.000	0.0%	0.000	0.0%	4.193	1.14	1.51	1.78	1.36	1.36	1.780	2.08	**244**
CS160.14	East Mexican Water Safety Improvement	434-444	1.95	0.000	0.0%	0.000	0.0%	20.068	100.0%	0.000	0.0%	0.000	0.0%	20.068	1.14	1.51	1.78	1.36	1.36	1.780	2.08	**1132**
CS160.15	Red Mesa Passing Lanes	453-463	38.93	0.000	0.0%	0.000	0.0%	2.671	100.0%	0.000	0.0%	0.000	0.0%	2.671	1.14	1.51	1.78	1.36	1.36	1.780	1.15	**4**
CS160.16	Teec Nos Pos Passing Lanes	467-469	12.98	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.067	6.1%	1.046	93.9%	1.113	1.14	1.51	1.78	1.36	1.36	1.360	0.69	**1**

Appendix K: Preliminary Scoping Reports for Prioritized Solutions

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Moenave Safety Improvements (CS160.1)	
City/Town: N/A	**County:** Coconino
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 312	
End Limit: MP 319	
Project Length: 7 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 312 to MP 319, there is a High level of need based on higher than statewide averages of overall Safety Index and Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by installing high visibility striping and delineators, reflective pavement markers, rumble strips, and chevrons.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

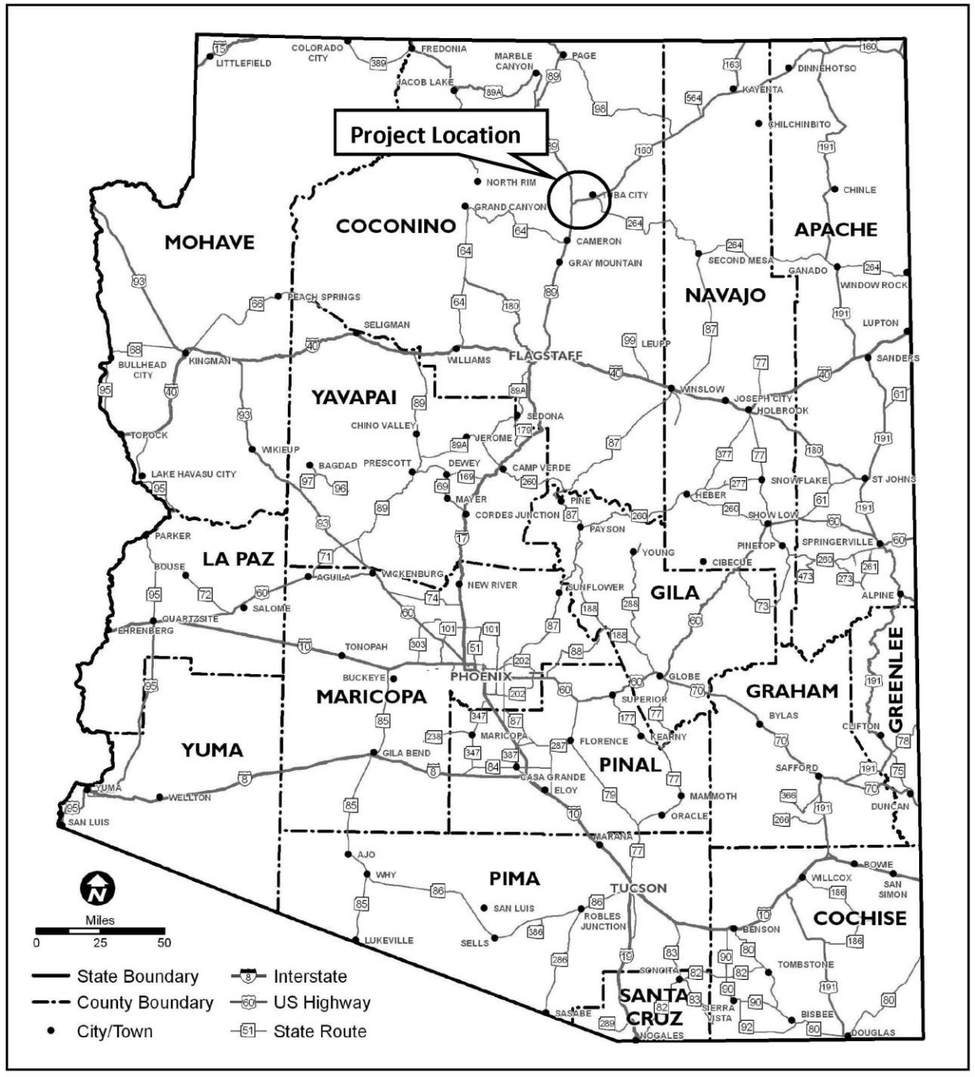
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$33,000	$112,000	$0	$1,114,000	$1,258,000

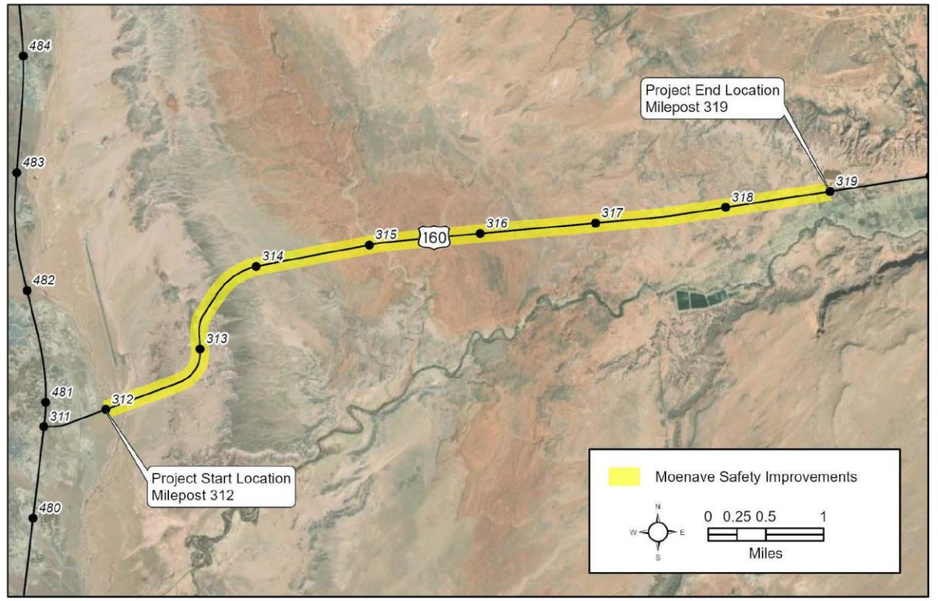
RECOMMENDED PROJECT DELIVERY		
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:
Design Program Year: FY		
Construction Program Year: FY		

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install high visibility striping and delineators, reflective pavement markers, and rumble strips in both directions • Install chevrons on curve (MP 312.5 to 314)

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: West Tuba City Widening (CS160.2)	
City/Town: N/A	**County:** Coconino
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 319	
End Limit: MP 321.6	
Project Length: 2.6 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Mobility Need: From MP 319 to MP 323, there is a High level of need based in Mobility Index and Future Daily V/C performance, Existing Peak Hour V/C, and southbound/westbound Directional LOTTR ratings.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☐	Expansion ☒
Address Mobility Need by converting 2-Lane undivided highway to a 5-Lane highway.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

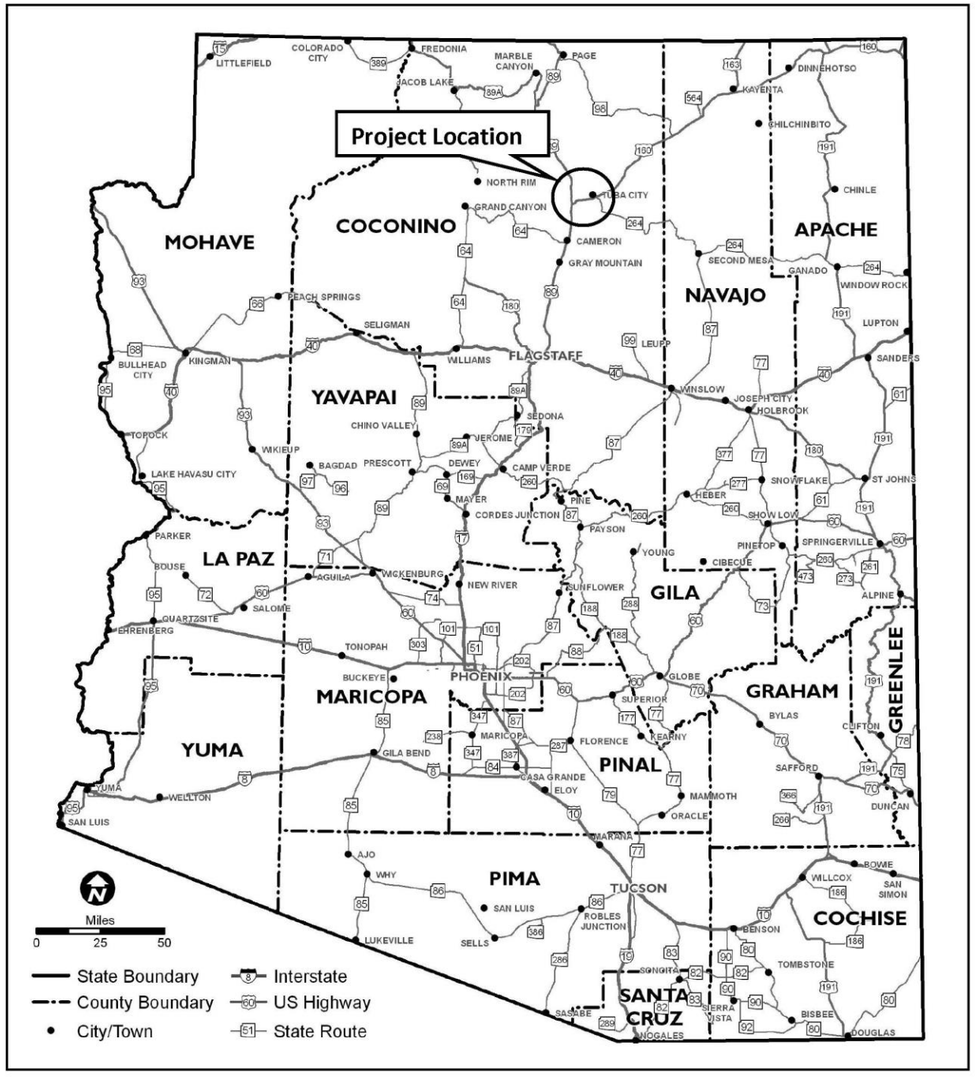
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$622,000	$2,072,000	$0	$20,718,000	$23,412,000

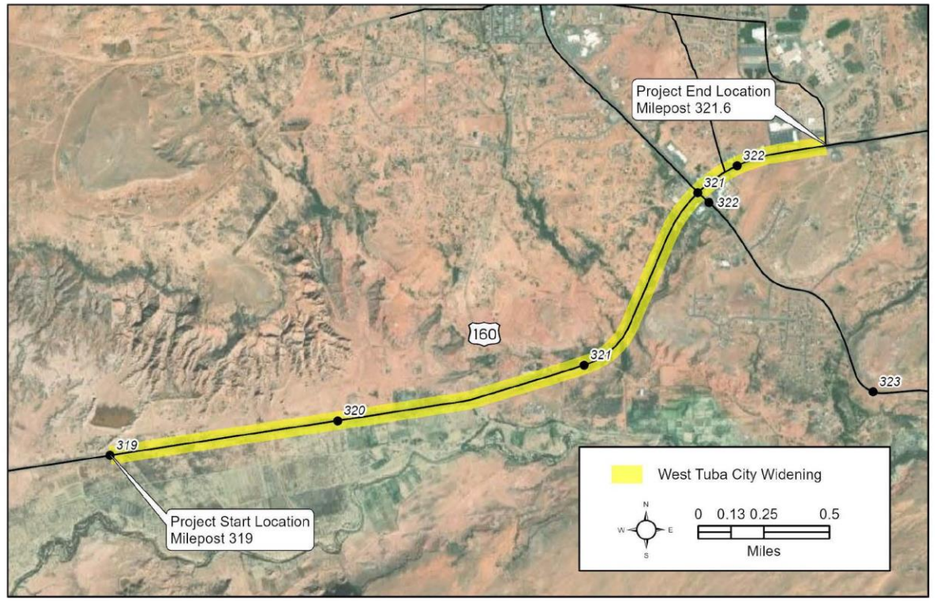
RECOMMENDED PROJECT DELIVERY		
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:
Design Program Year: FY		
Construction Program Year: FY		

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Convert 2-Lane undivided highway to a 5-Lane highway

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: East Tuba City Widening (CS160.3)	
City/Town: N/A	**County:** Coconino
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 322.4	
End Limit: MP 325	
Project Length: 2.6 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Mobility Need: From MP 319 to MP 323, there is a High level of need based in Mobility Index and Future Daily V/C performance, Existing Peak Hour V/C, and southbound/westbound Directional LOTTR ratings. *Safety Need: From MP 323 to MP 344, there is a High level of need based on higher than statewide averages of overall Safety Index and Directional Safety Index values.*

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☐	Expansion ☒
Address Mobility and Safety Needs by converting 2-Lane undivided highway to a 5-Lane highway.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

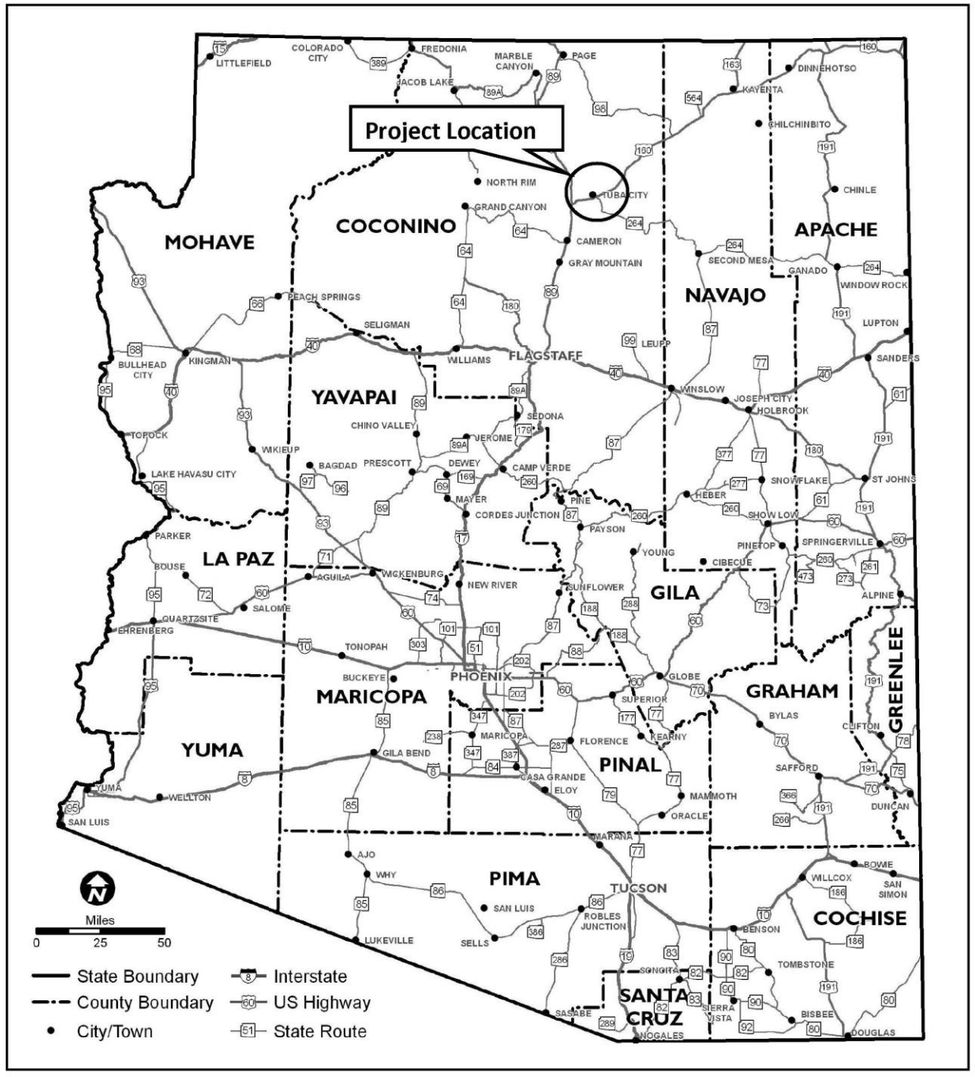
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$362,000	$1,206,000	$0	$12,060,000	$17,717,000

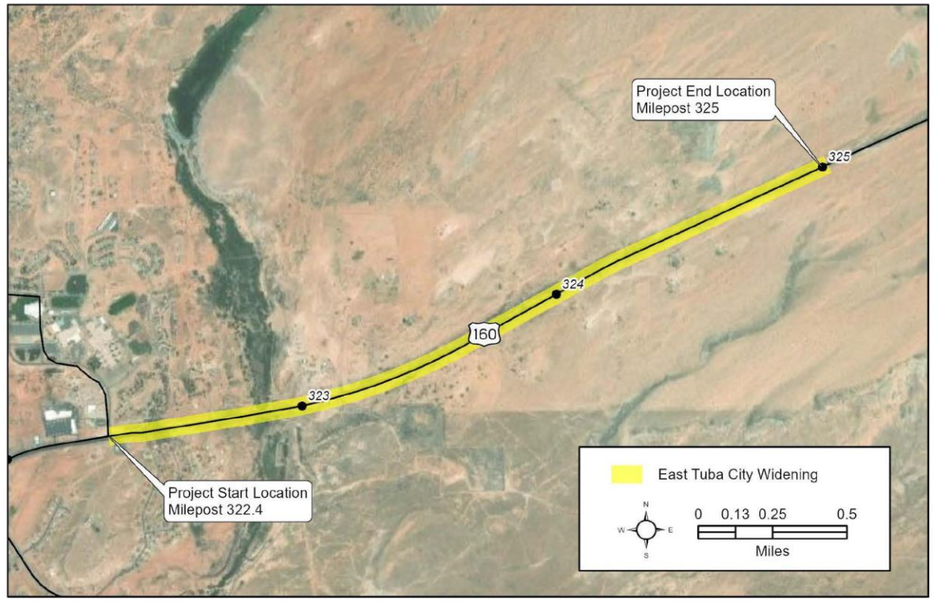
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Convert 2-Lane undivided highway to a 5-Lane highway

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Tonalea Safety Improvement (CS160.4)	
City/Town: N/A	**County:** Coconino
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 330	
End Limit: MP 337	
Project Length: 7 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 323 to MP 344, there is a High level of need based on higher than statewide averages of overall Safety Index and Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by widening roadways shoulders, installing curve warning signs, and installing chevrons on the curve.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

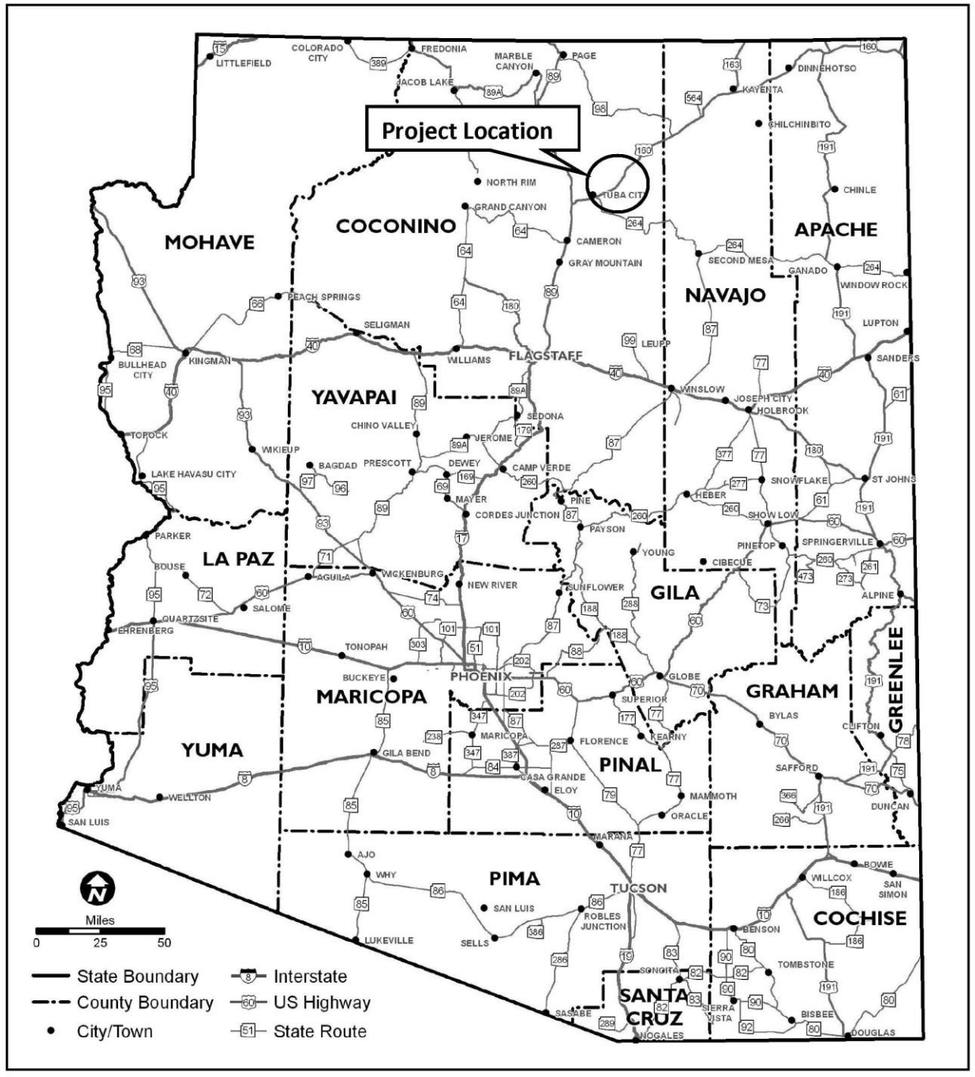
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$206,000	$686,000	$0	$6,860,000	$7,752,000

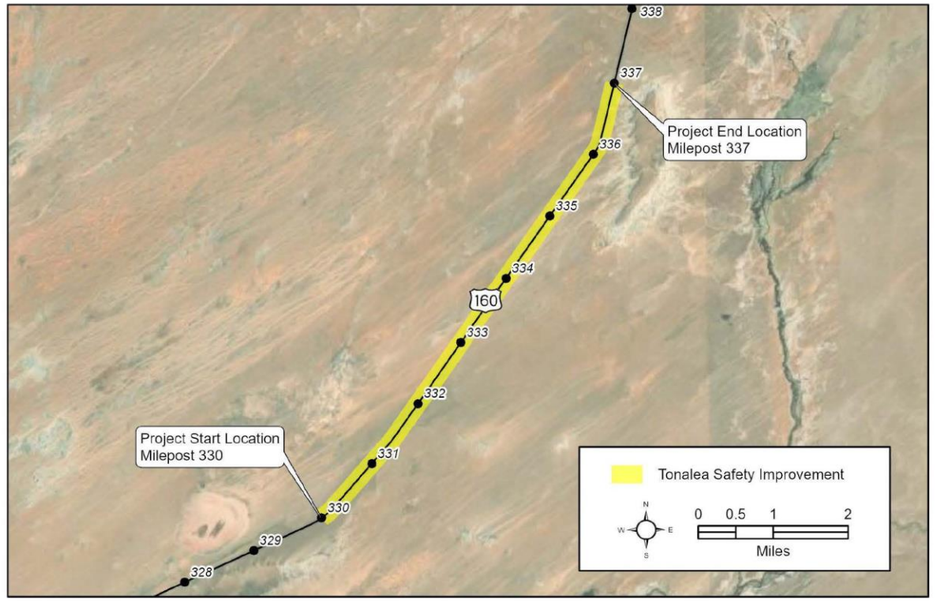
RECOMMENDED PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Widen shoulder in both directions (includes pavement, minor earthwork, striping edge lines, RPMs, high visibility delineators, safety edge, and rumble strips) • Install curve warning signs in both directions • Install chevrons on curve (MP 336 to MP 336.5)

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Tuba City – Tonalea: Eastbound Passing Lane (CS160.5)	
City/Town: N/A	**County:** Coconino
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 335	
End Limit: MP 336.5	
Project Length: 1.5 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 323 to MP 344, there is a High level of need based on higher than statewide averages of overall Safety Index and Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by constructing an eastbound passing lane.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

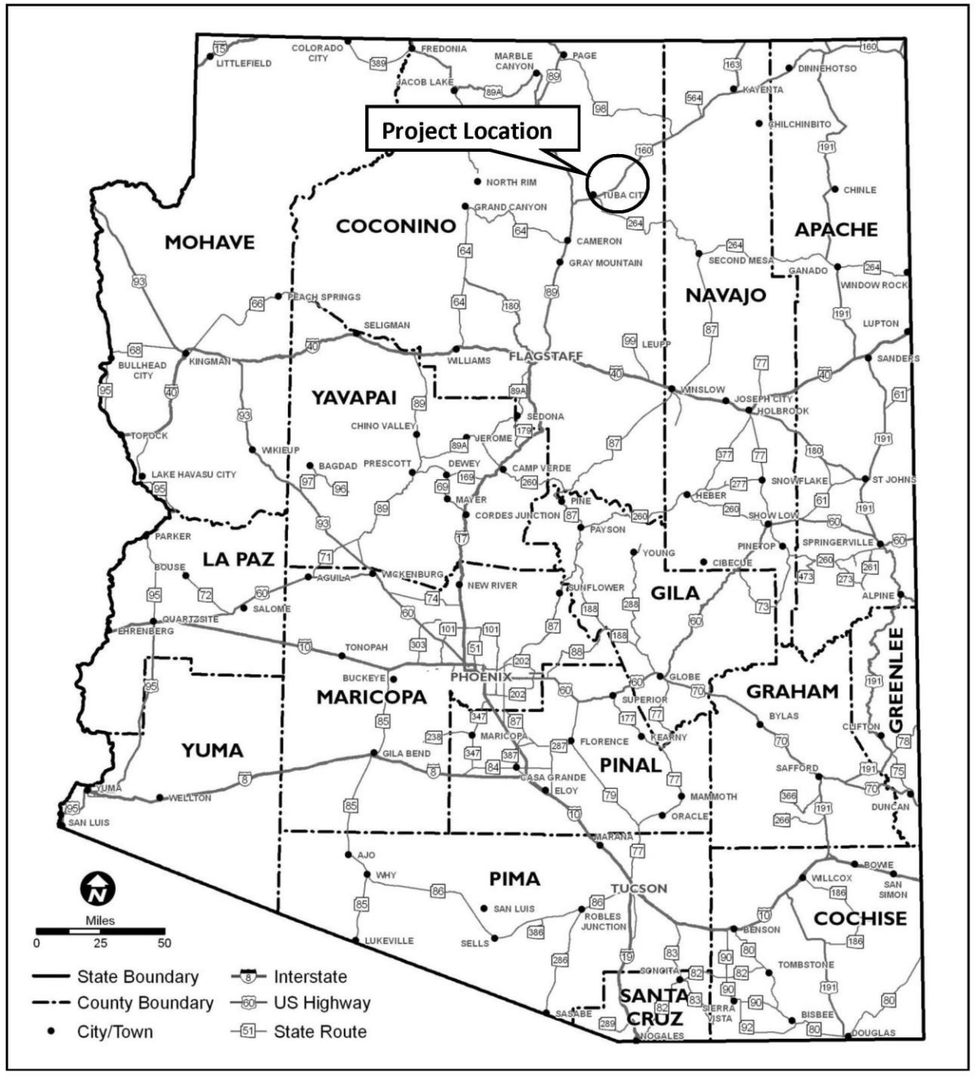
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$258,000	$861,000	$0	$8,613,000	$9,732,000

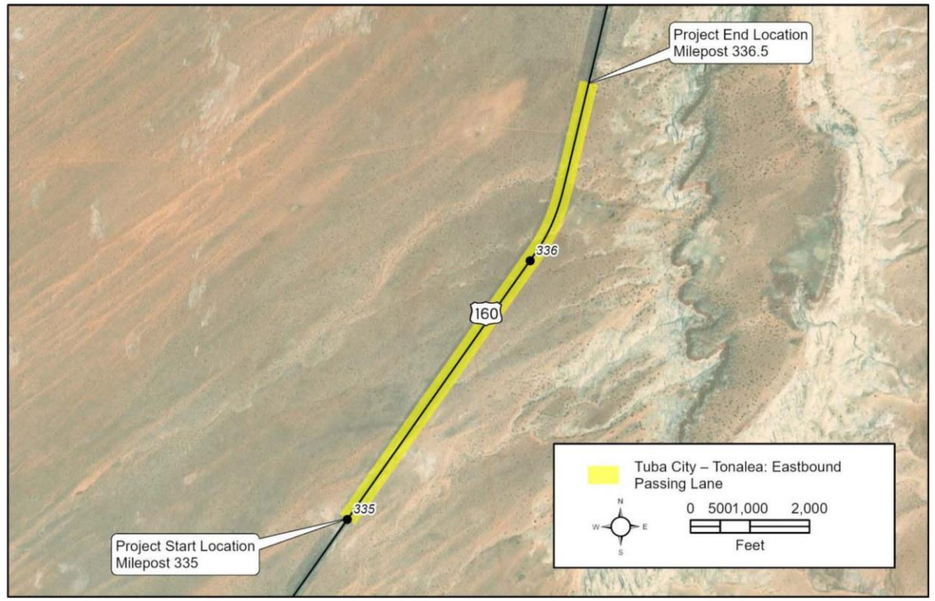
RECOMMENDED PROJECT DELIVERY		
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:
Design Program Year: FY		
Construction Program Year: FY		

ATTACHMENTS
1) State Location Map
2) Project Vicinity Map
3) Project Scope of Work

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct eastbound passing lane, MP 335-336.5

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Tonalea – Tuba City: Westbound Passing Lane (CS160.6)	
City/Town: N/A	**County:** Coconino
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 340	
End Limit: MP 343	
Project Length: 3 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 323 to MP 344, there is a High level of need based on higher than statewide averages of overall Safety Index and Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by constructing a westbound passing lane.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

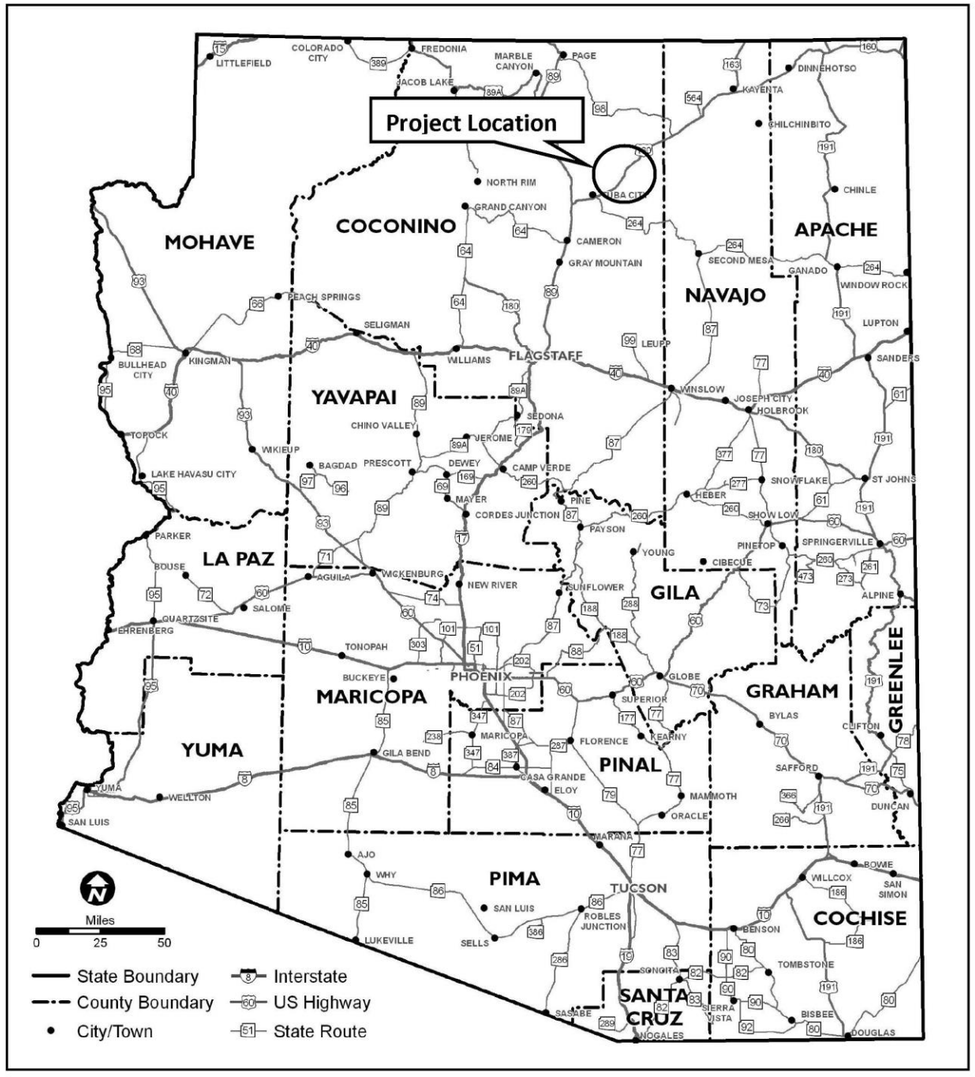
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$172,000	$574,000	$0	$5,742,000	$6,488,000

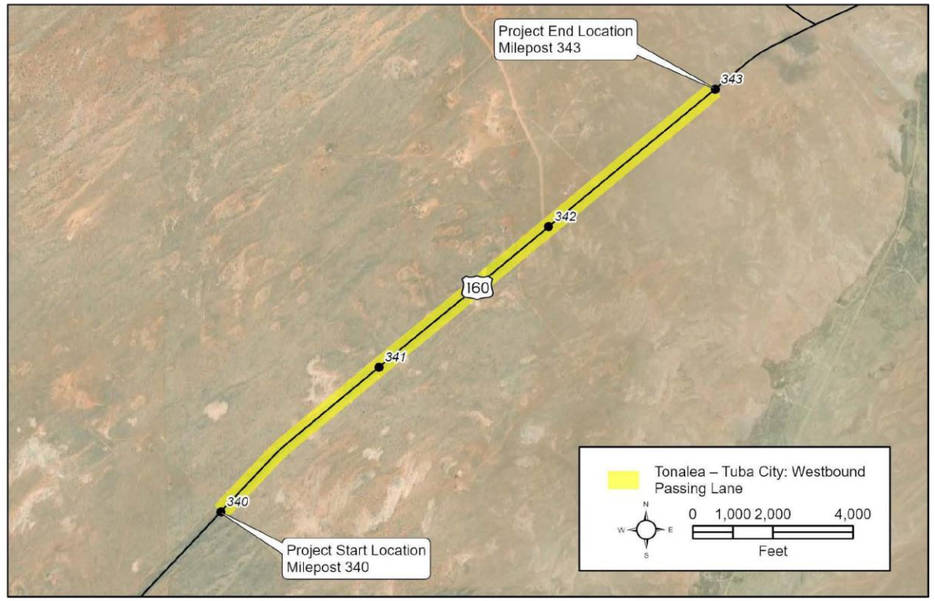
RECOMMENDED PROJECT DELIVERY		
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:
Design Program Year: FY		
Construction Program Year: FY		

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct westbound passing lane, MP 340-341

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Shonto Safety Improvement (CS160.7)	
City/Town: N/A	**County:** Navajo
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 362	
End Limit: MP 374	
Project Length: 12 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 362 to MP 374, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by installing high visibility striping, delineators, and rumble strips.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

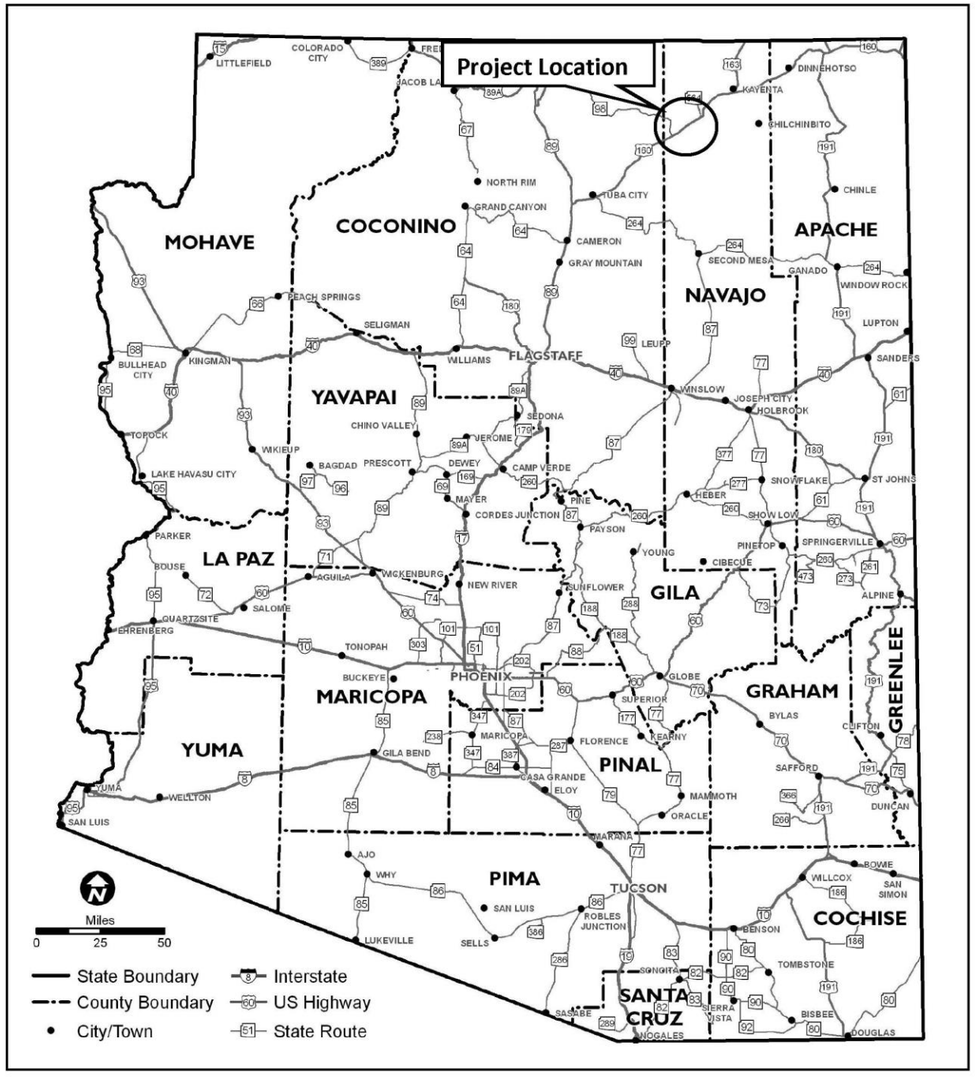
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$49,000	$165,000	$0	$1,646,000	$1,860,000

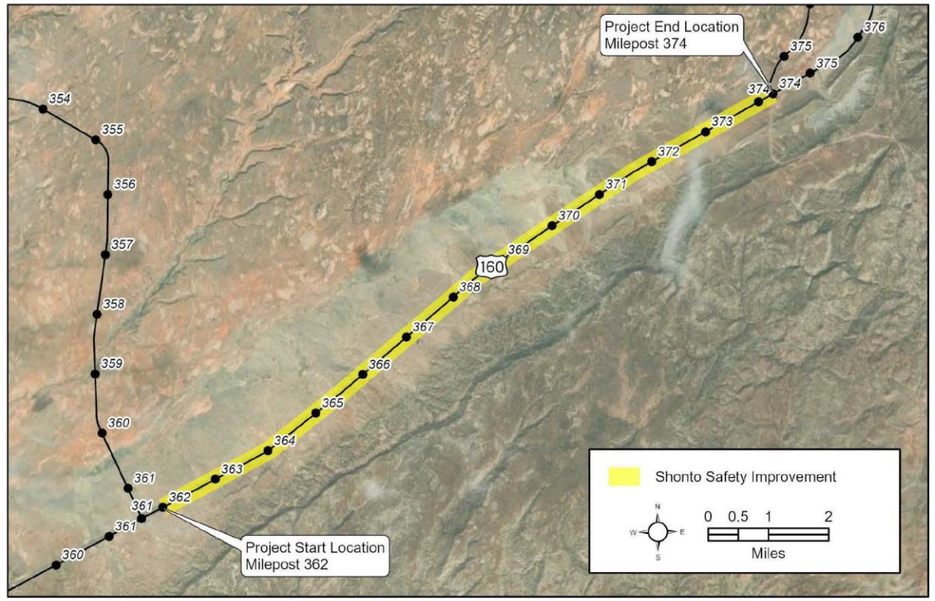
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install high visibility striping and delineators and rumble strips in both directions

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Tsegi Canyon Safety Improvement (CS160.8)	
City/Town: N/A	**County:** Navajo
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 374	
End Limit: MP 385	
Project Length: 11 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 374 to 391 there are overall Safety Index and Directional Safety Indexes above statewide averages. *Freight Need: From MP 374 to 391 there is a High level of need based on poor overall Freight Index and SB/WB Directional TTTR measures.*

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by installing high visibility striping and delineators and rumble strips.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

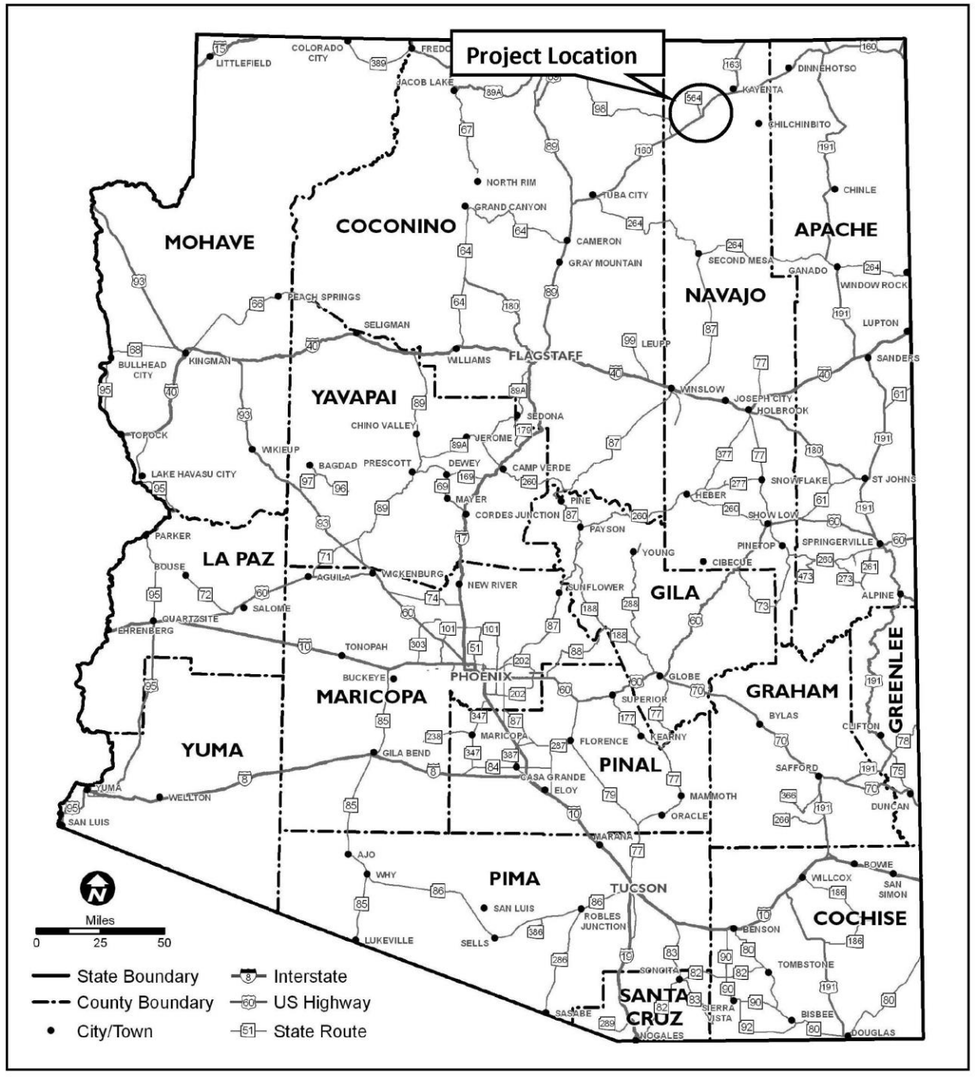
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$45,000	$151,000	$0	$1,510,000	$1,705,000

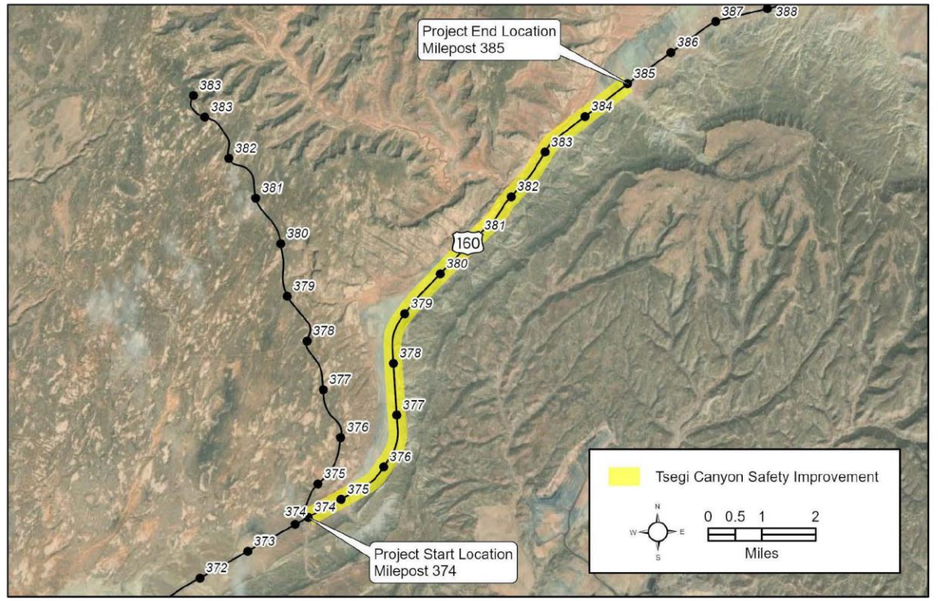
RECOMMENDED PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install high visibility striping and delineators and rumble strips in both directions

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Tsegi Canyon Passing Lanes (CS160.9)	
City/Town: N/A	**County:** Navajo
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 385	
End Limit: MP 391	
Project Length: 6 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 374 to MP 391, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values. *Freight Need: From MP 374 to MP 391, there is a High level of need based on poor overall Freight Index and southbound/westbound Directional TTTR measures.*

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by constructing westbound and eastbound passing lanes.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

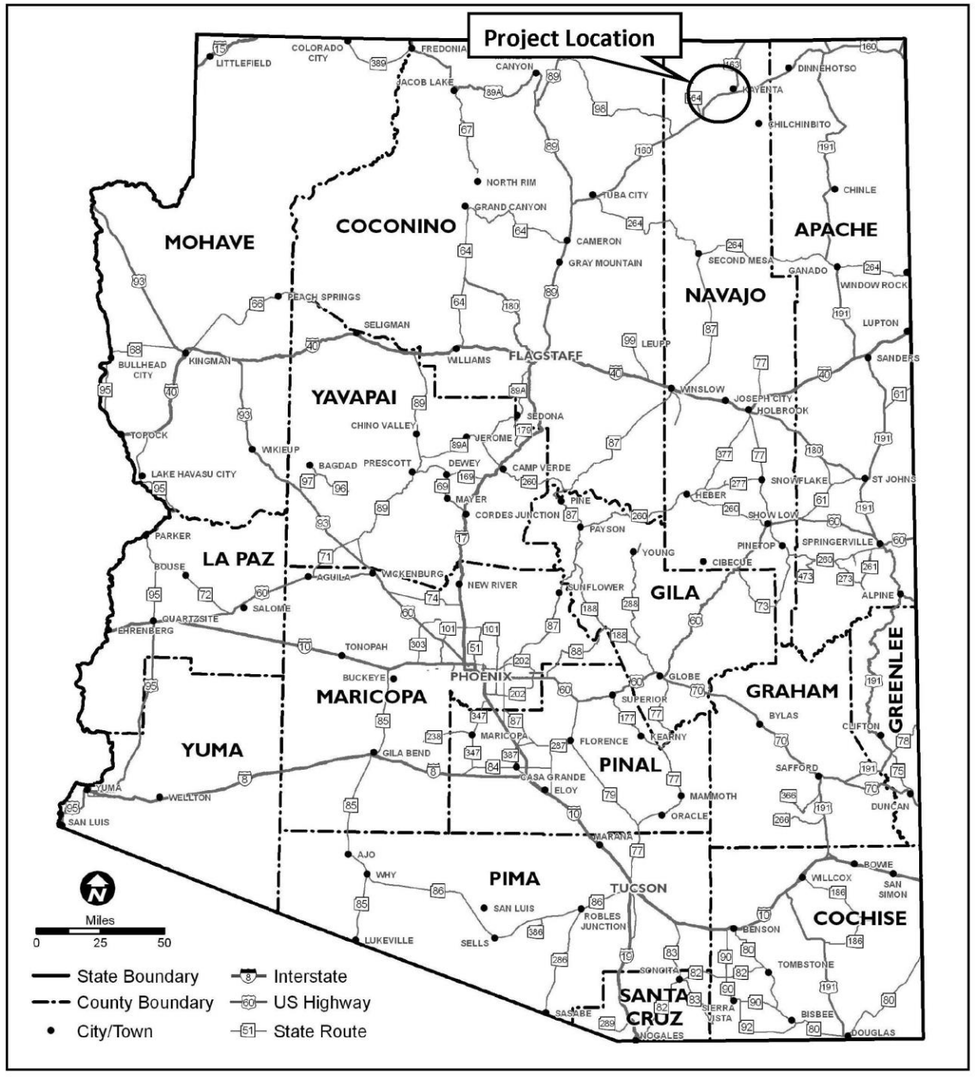
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$1,206,000	$4,019,000	$0	$40,194,000	$45,419,000

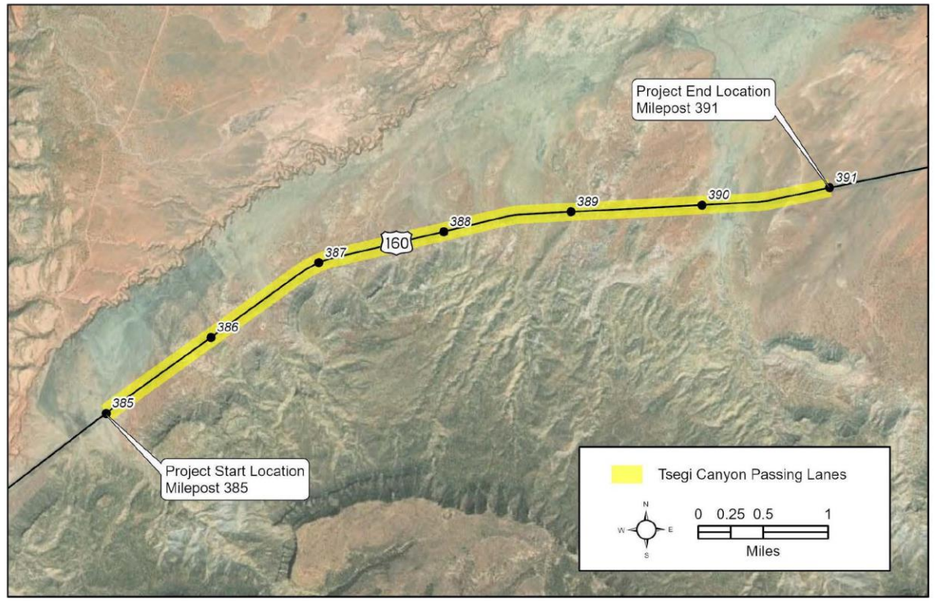
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct westbound passing lane, MP 389-390 • Construct eastbound passing lane, MP 385-391

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: East Kayenta Safety Improvement (CS160.10)	
City/Town: N/A	**County:** Navajo/Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 395	
End Limit: MP 413	
Project Length: 18 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 395 to MP 413, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety Need by installing high visibility striping and delineators and rumble strips in both directions.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

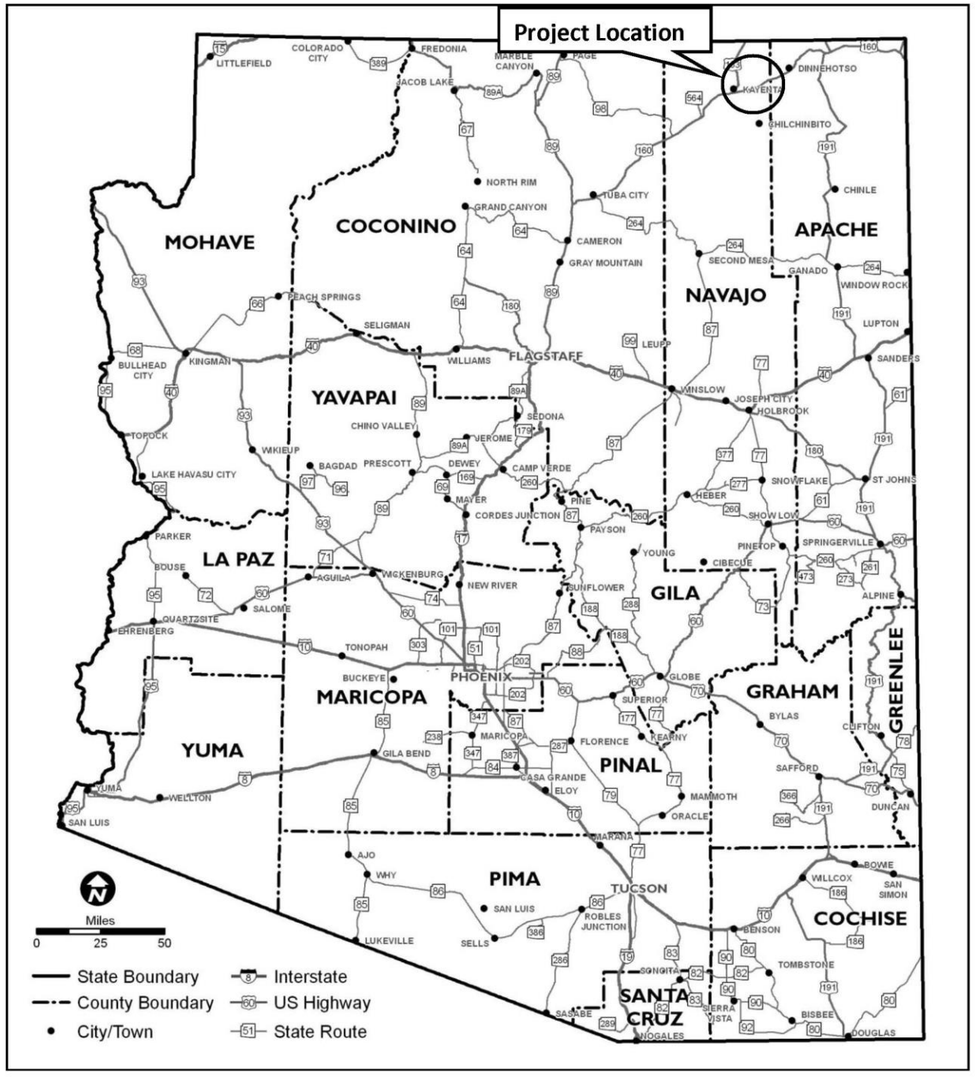
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$74,000	$247,000	$0	$2,470,000	$2,791,000

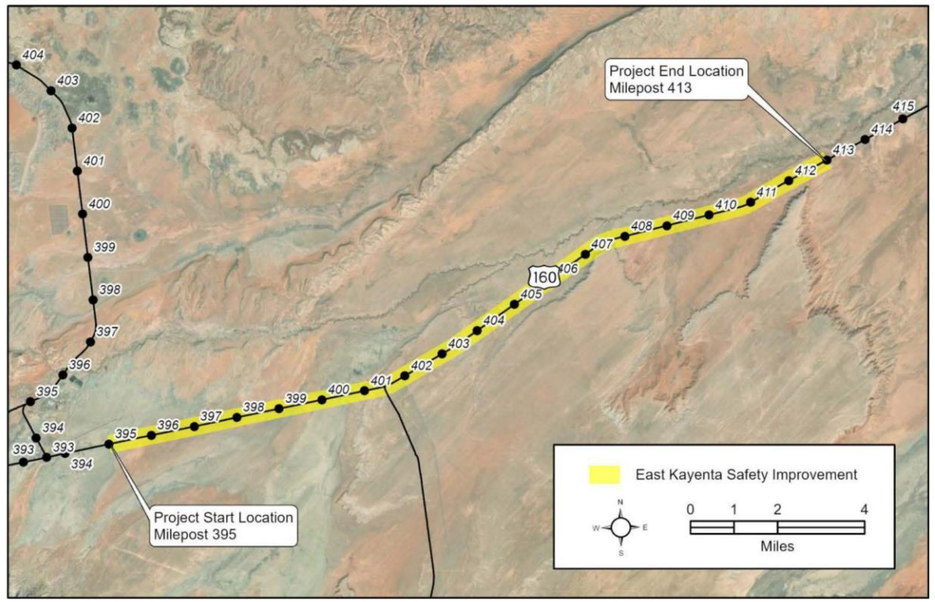
RECOMMENDED PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install high visibility striping and delineators and rumble strips in both directions

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Dennehotso Passing Lanes (CS160.11)	
City/Town: N/A	**County:** Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 416	
End Limit: MP 418	
Project Length: 2 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 413 to MP 434, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values. *Freight Need: From MP 413 to MP 434, there is a High level of need based on poor overall Freight Index and Directional TTTR measures.*

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety and Freight Needs by constructing eastbound and westbound passing lanes.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

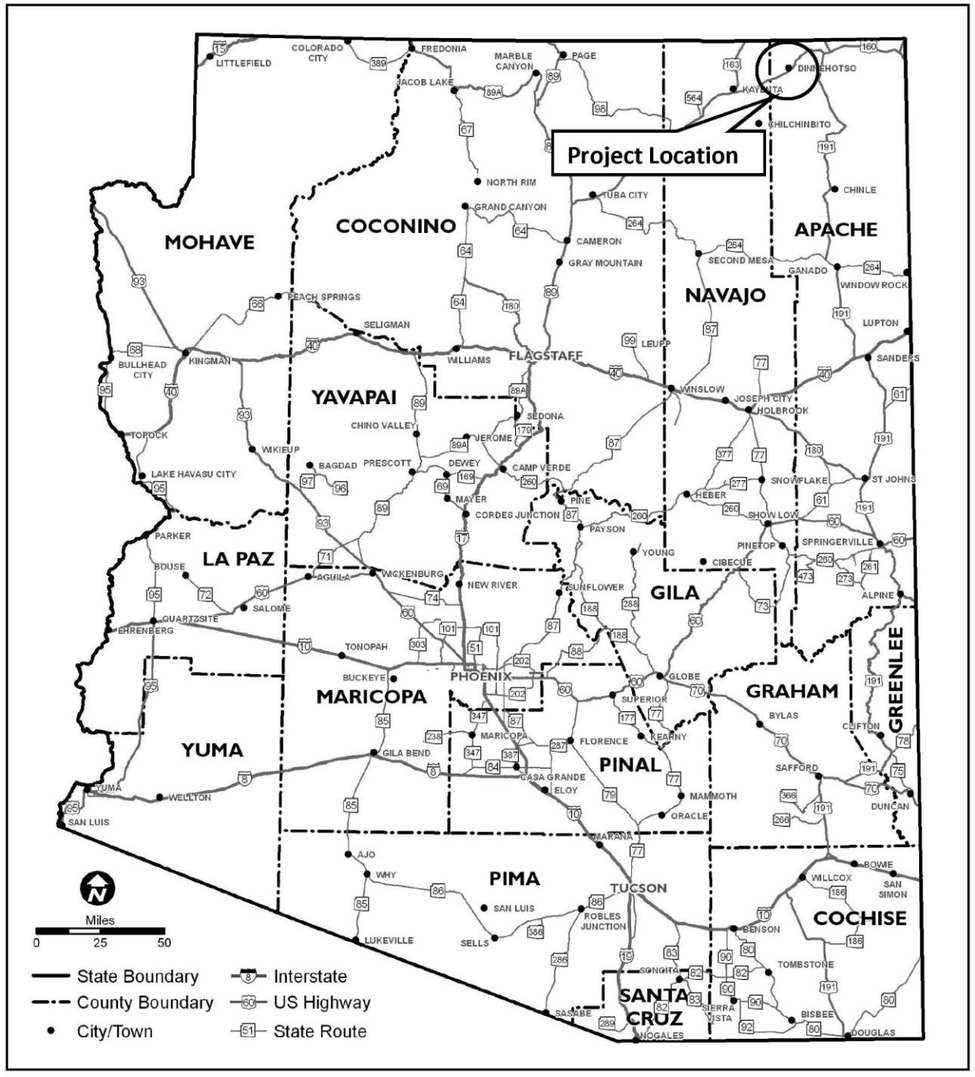
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$344,000	$1,148,000	$0	$11,484,000	$12,976,000

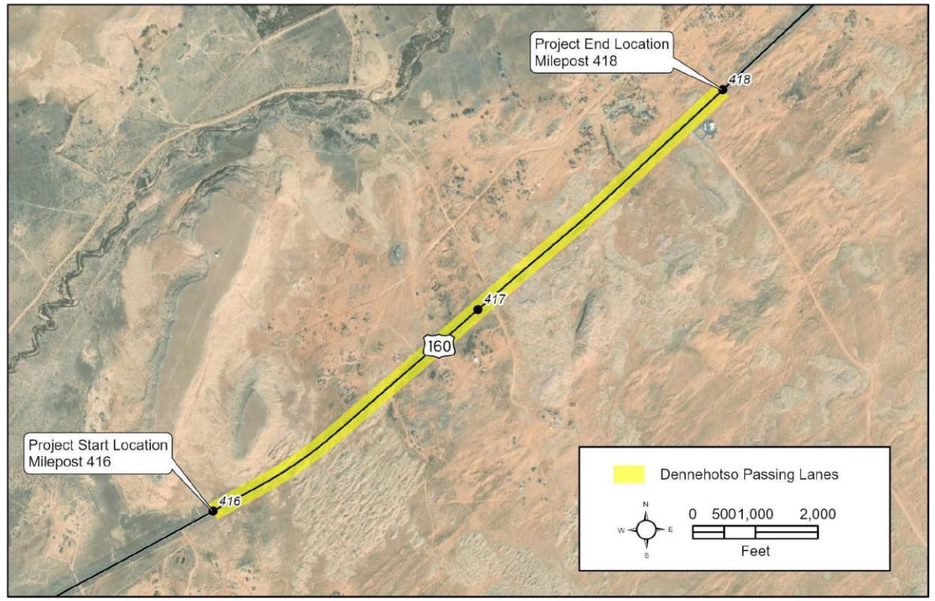
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct eastbound passing lane, MP 416-417 • Construct westbound passing lane, MP 417-418

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Chinle Wash Passing Lanes (CS160.12)	
City/Town: N/A	**County:** Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 430	
End Limit: MP 432	
Project Length: 2 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 413 to MP 434, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values. *Freight Need: From MP 413 to MP 434, there is a High level of need based on poor overall Freight Index and Directional TTTR measures.*

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety and Freight Needs by constructing eastbound and westbound passing lanes.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

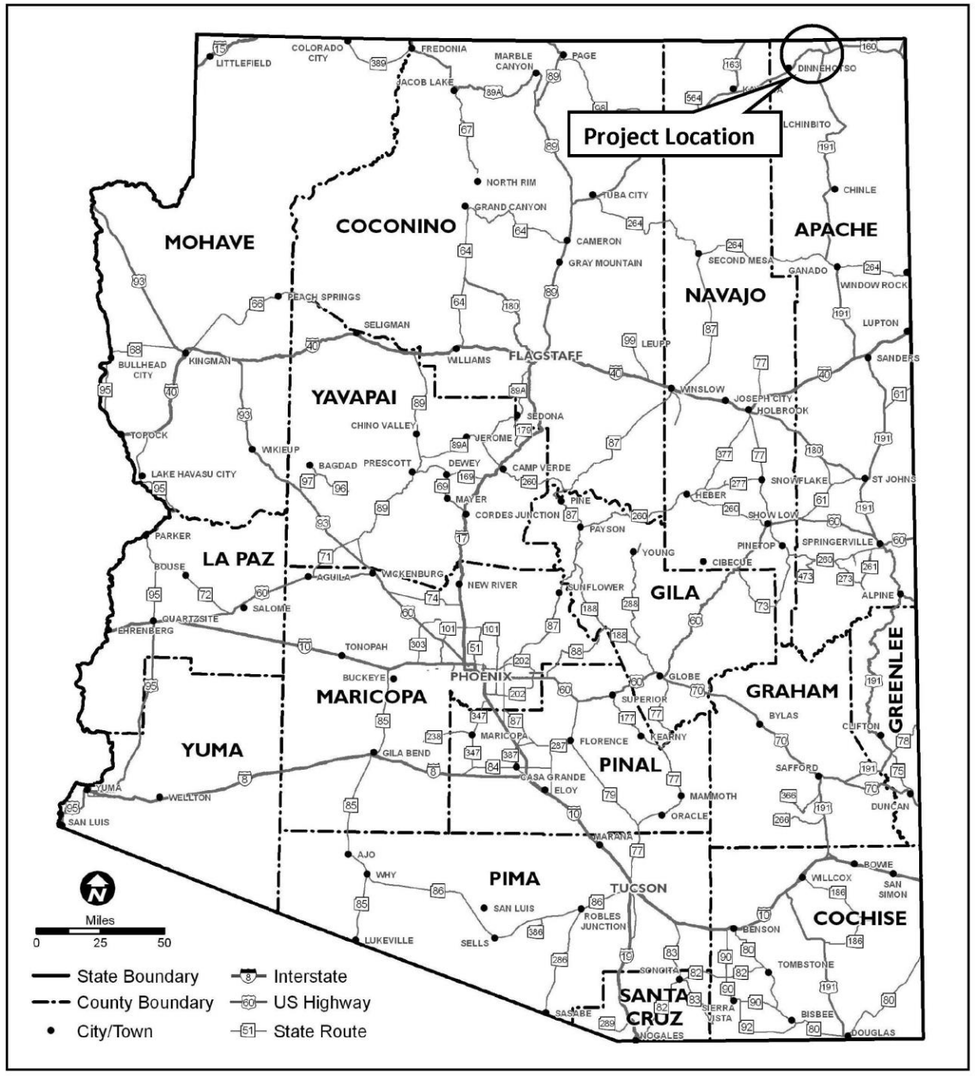
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$344,000	$1,148,000	$0	$11,484,000	$12,976,000

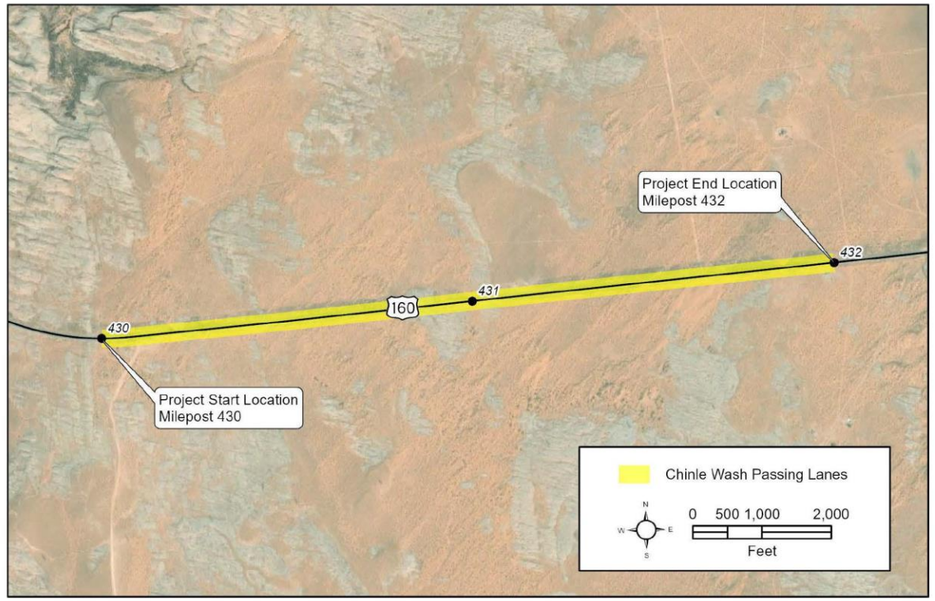
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct eastbound passing lane, MP 430-431 • Construct westbound passing lane, MP 431-432

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: West Mexican Water Safety Improvement (CS160.13)	
City/Town: N/A	**County:** Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 432	
End Limit: MP 434	
Project Length: 2 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 413 to MP 434, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values. *Freight Need: From MP 413 to MP 434, there is a High level of need based on poor overall Freight Index and Directional TTTR measures.*

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety and Freight Needs by installing curve warning signs, speed feedback signs, and chevrons on the curve.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

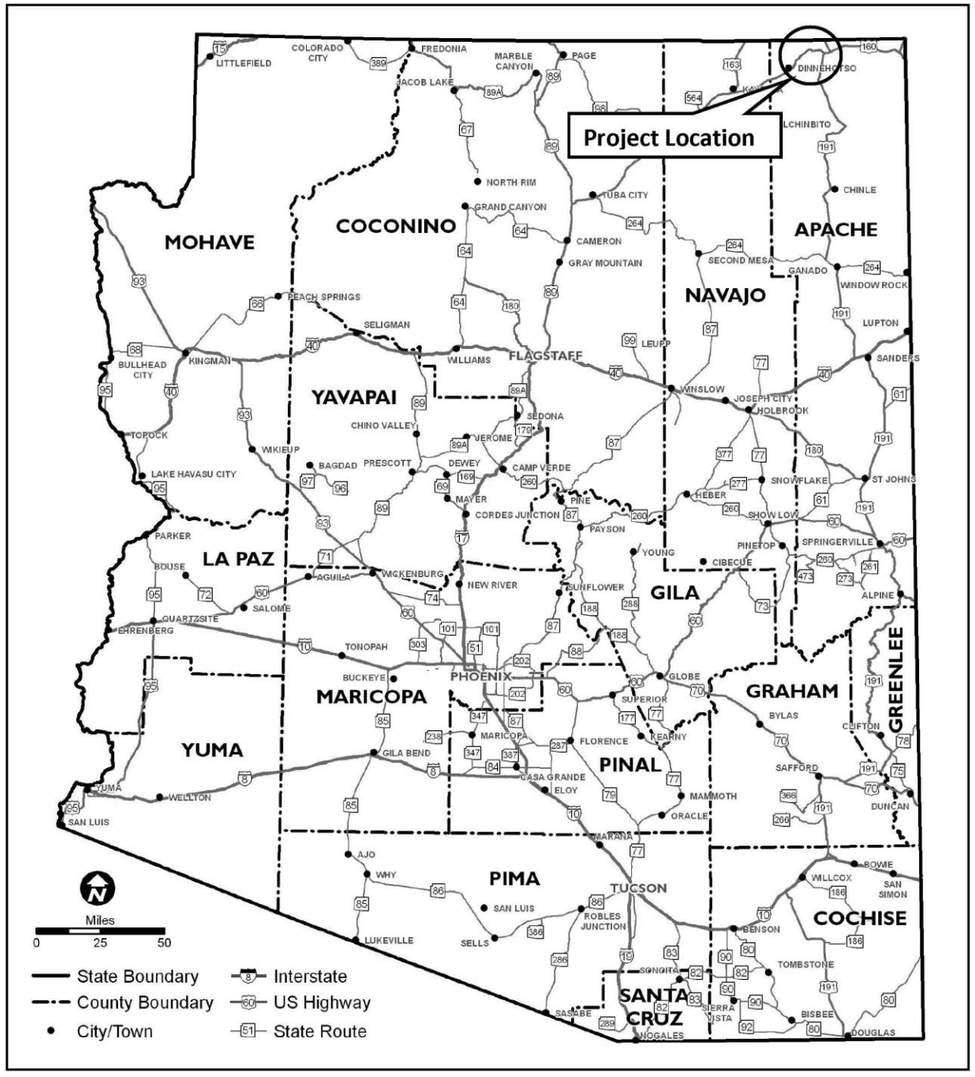
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$11,000	$35,000	$0	$354,000	$400,000

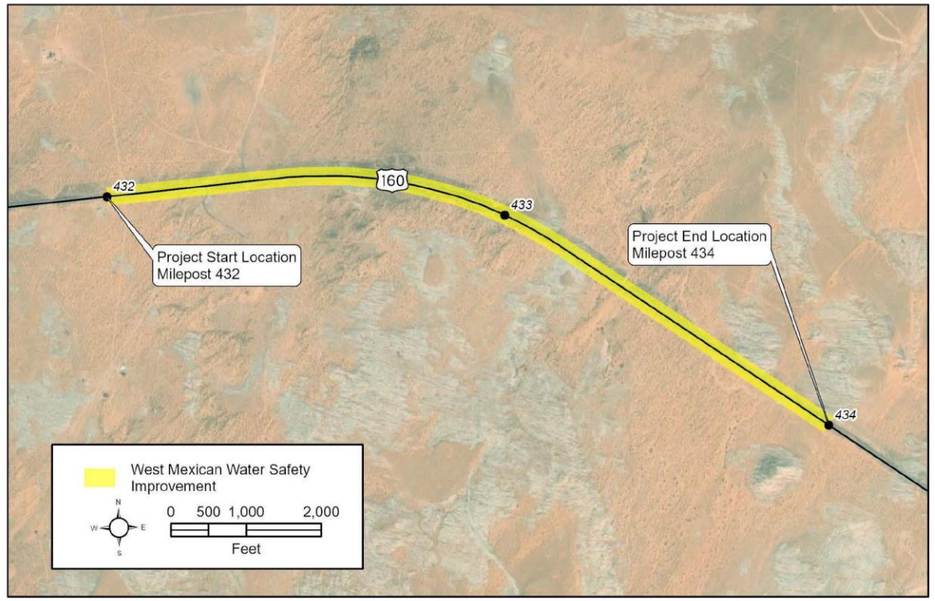
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install curve warning signs and speed feedback signs in both directions (MP 432 and MP 434) • Install chevrons on curves (MP 432.5-433.5)

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: East Mexican Water Safety Improvement (CS160.14)	
City/Town: N/A	**County:** Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 434	
End Limit: MP 444	
Project Length: 10 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety Need: From MP 434 to MP 451, there is a High level of need based on higher than statewide averages of overall Safety Index and northbound/eastbound Directional Safety Index values.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Safety and Freight Needs by installing high visibility striping and delineators, rumble strips, curve warning signs, speed feedback signs, and chevrons on the curve.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

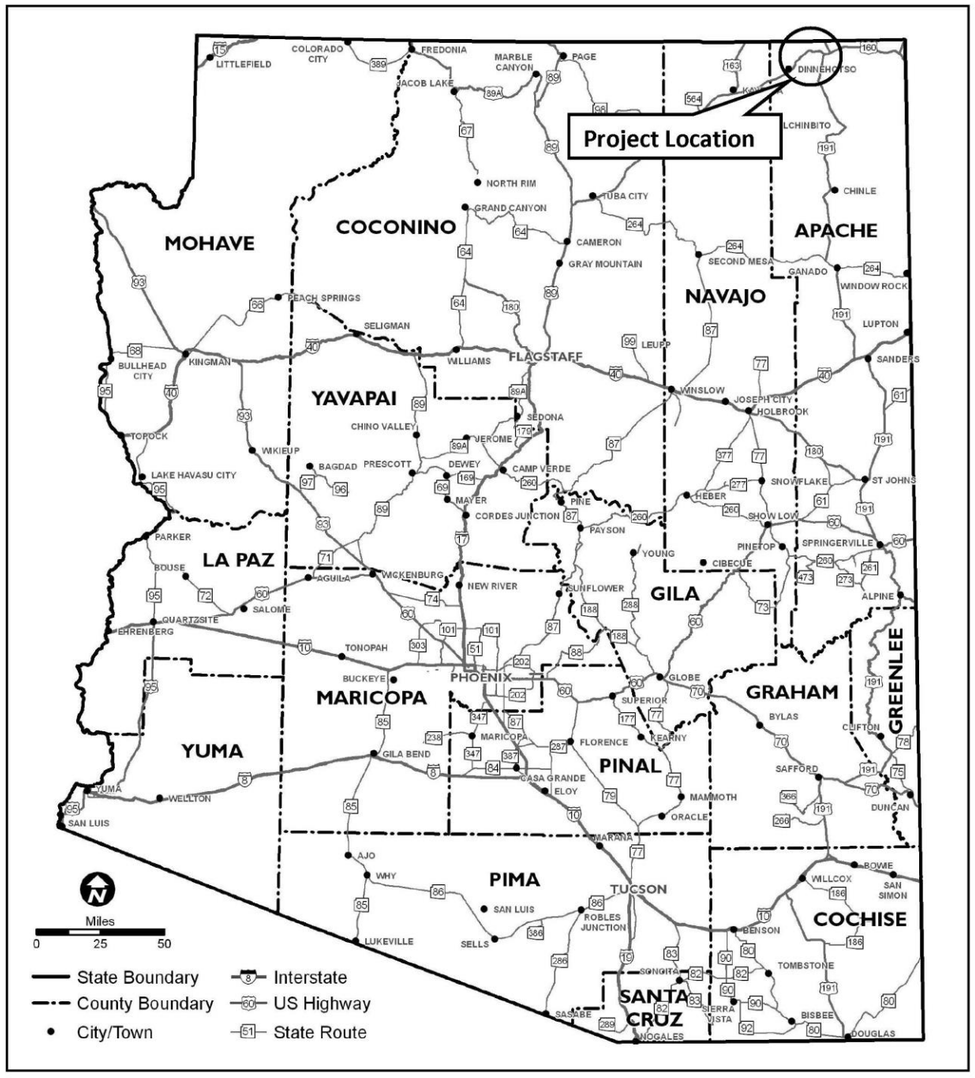
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$52,000	$172,000	$0	$1,725,000	$1,949,000

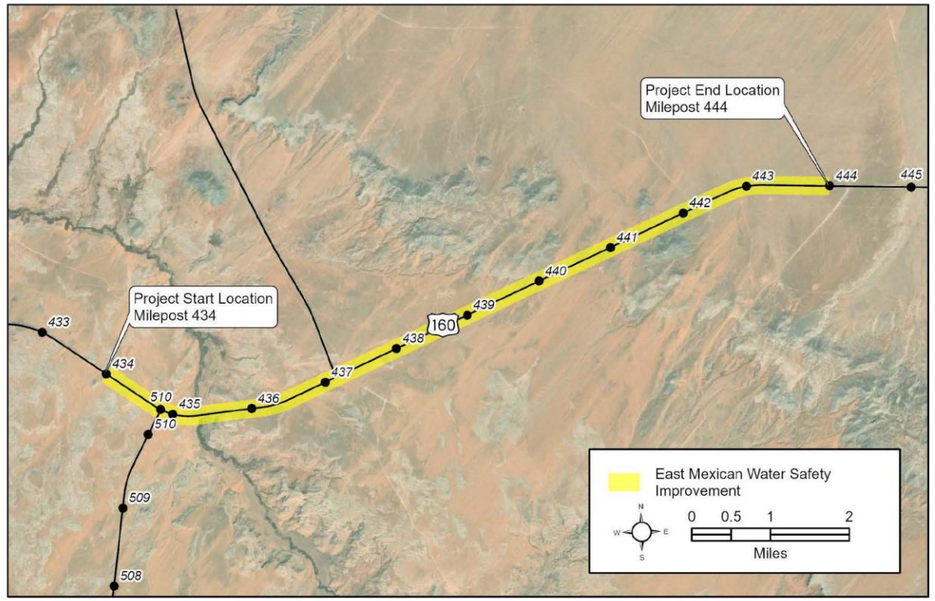
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install high visibility striping and delineators and rumble strips in both directions • Install curve warning signs and speed feedback signs in both directions (MP 434 and MP 436) • Install chevrons on curves (MP 434.5-435.5)

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Red Mesa Passing Lanes (CS160.15)	
City/Town: N/A	**County:** Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 453	
End Limit: MP 463	
Project Length: 10 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Freight Need: From MP 451 to MP 463, there is a High level of need based on poor overall Freight Index and southbound/westbound Directional TTTR measures.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Freight Needs by constructing eastbound and westbound passing lanes.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

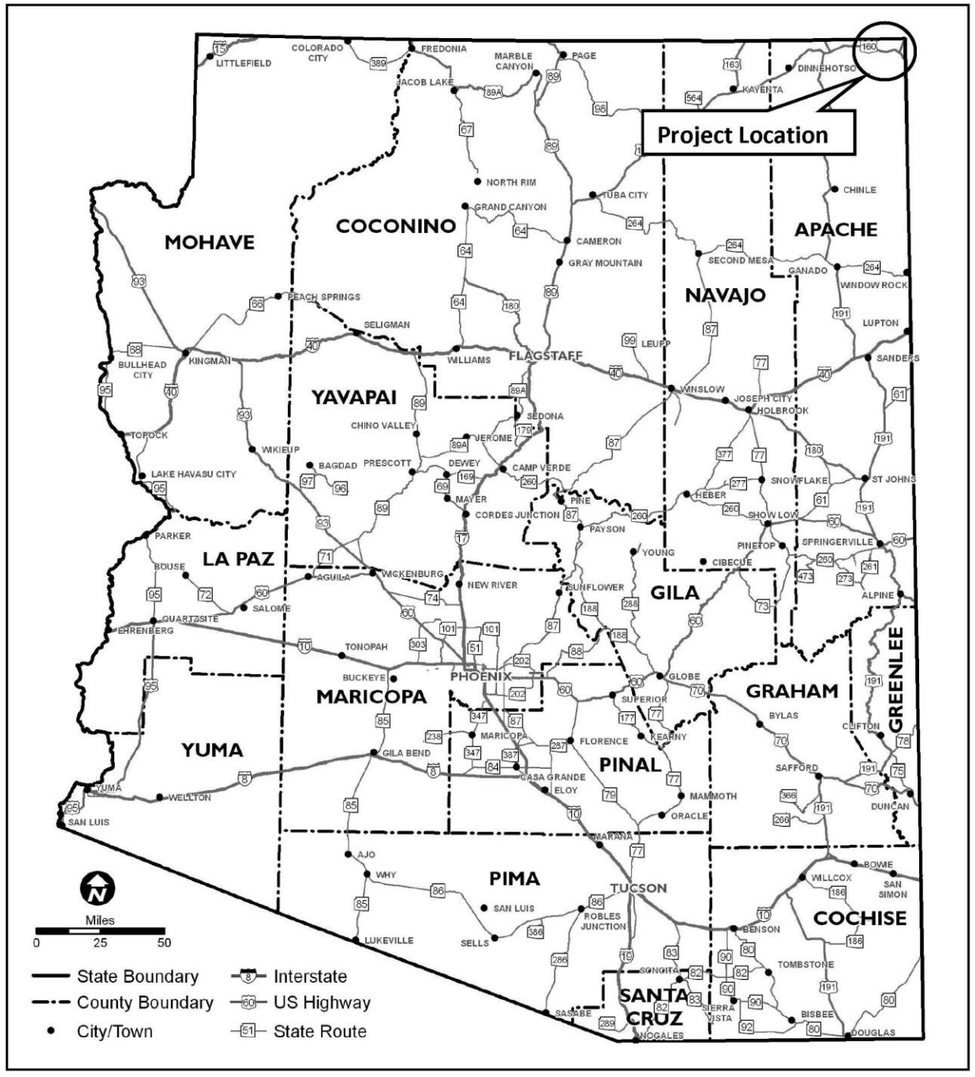
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$1,033,000	$3,445,000	$0	$34,452,000	$38,930,000

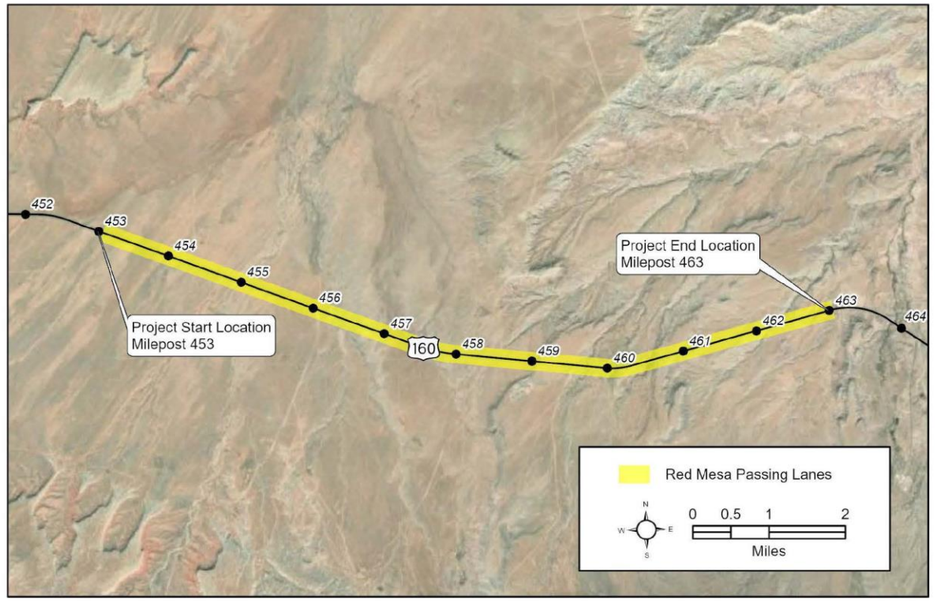
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct eastbound passing lane, MP 453-454 • Construct westbound passing lane, MP 458-463

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

ADOT

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: May 9, 2022	**ADOT Project Manager:**
Project Name: Teec Nos Passing Lanes (CS160.16)	
City/Town: N/A	**County:** Apache
COG/MPO: NACOG	**ADOT District:** Northcentral
Primary Route/Street: US 160	
Beginning Limit: MP 467	
End Limit: MP 469	
Project Length: 2 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town; ☐ County; ☒ ADOT; ☐ Private; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☐ Private; ☐ Federal; ☒ Tribal; ☐ Other: *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Freight Need: From MP 463 to MP 471, there is a High level of need based on poor overall Freight Index and northbound/eastbound Directional TTTR measures.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address Freight Needs by constructing eastbound and westbound passing lanes.			

ADOT

PRELIMINARY SCOPING REPORT

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

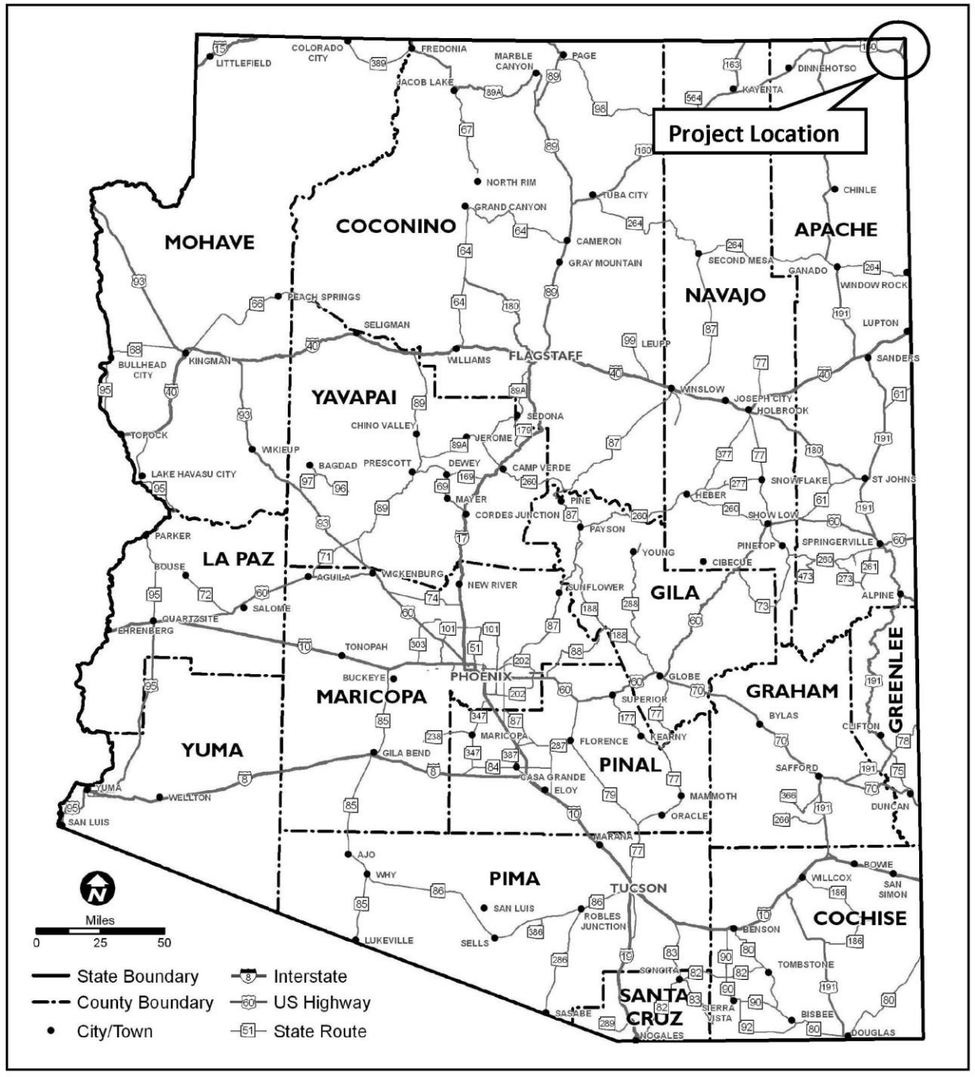
POTENTIAL FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STBG	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Tribal	☐ Other:

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$344,000	$1,148,000	$0	$11,484,000	$12,976,000

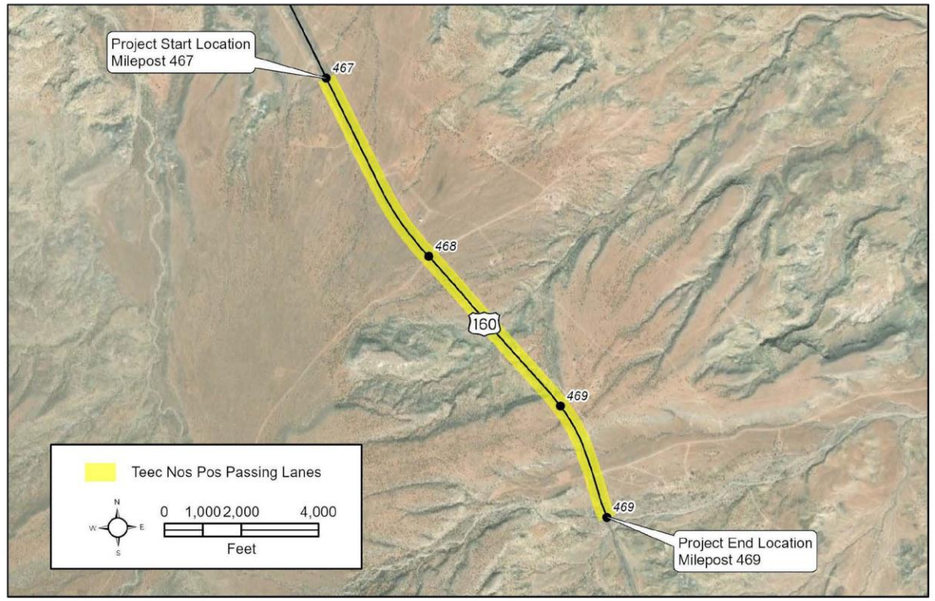
RECOMMENDED PROJECT DELIVERY			
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:	
Design Program Year: FY			
Construction Program Year: FY			

ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct eastbound passing lane, MP 467-468 • Construct westbound passing lane, MP 468-469

SCOPE ITEMS CONSIDERED, BUT NOT INCLUDED
N/A

Pursuant to 23 USC 409: Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or rail-way-highway crossings, pursuant to sections 130, 144, and 148 [152] of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.