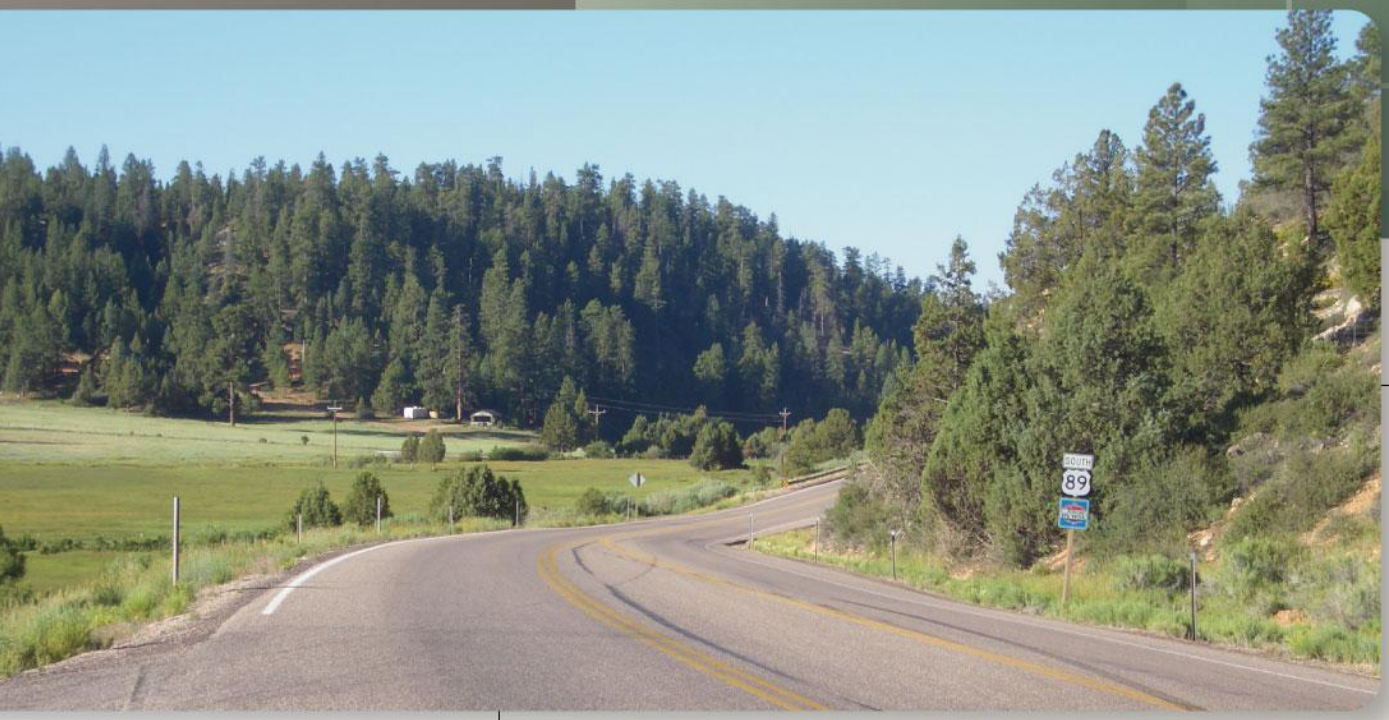
APPENDIX H.
COAL HOLLOW DEVELOPMENT ALTON COAL EIS - TRAFFIC TECHNICAL REPORT

FEHR & PEERS
TRANSPORTATION CONSULTANTS



Coal Hollow Development
Alton Coal EIS - Traffic Technical Report

Submitted to:

SWCA Environmental Consultants
July 2008
UT06-721

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1. Introduction

This section provides a brief summary of the overall project, the traffic analysis methodology, the analysis scenarios, and the report organization.

1.1. Background

The Alton Coal Development, LLC is proposing a new coal mine near the town of Alton, Utah. The project study area is in Southern Utah south of Panguitch and Bryce Canyon National Park and north of Glendale. Figure 1 displays the study area location.

1.2. Study Purpose and Analysis Scenarios

This report documents the analysis of traffic operations associated with existing conditions, existing plus coal truck conditions, future 2020 background conditions, and future 2020 plus coal truck conditions. These scenarios will provide information on current traffic conditions and for comparison of the additional project coal trucks.

The one signalized intersection that was evaluated along the proposed truck route includes:

1) I-15 SB Off-ramp / SR-56 (Cedar City)

The four unsignalized intersections that were evaluated along the proposed truck route include:

1) US-89 / SR-14
2) US-89 / SR-12
3) US-89 / SR-143 (Main St. Panguitch)
4) US-89 / SR-20

Twenty-four hour pneumatic tube counts were recorded at the following locations:

1) US-89, approximately two miles south of the SR-14 junction
2) US-89, approximately three miles north of the SR-12 junction
3) US-89, approximately two miles south of the SR-20 junction
4) SR-20, just east of the summit (westbound upslope, eastbound downslope)

1.3. Analysis Methodology

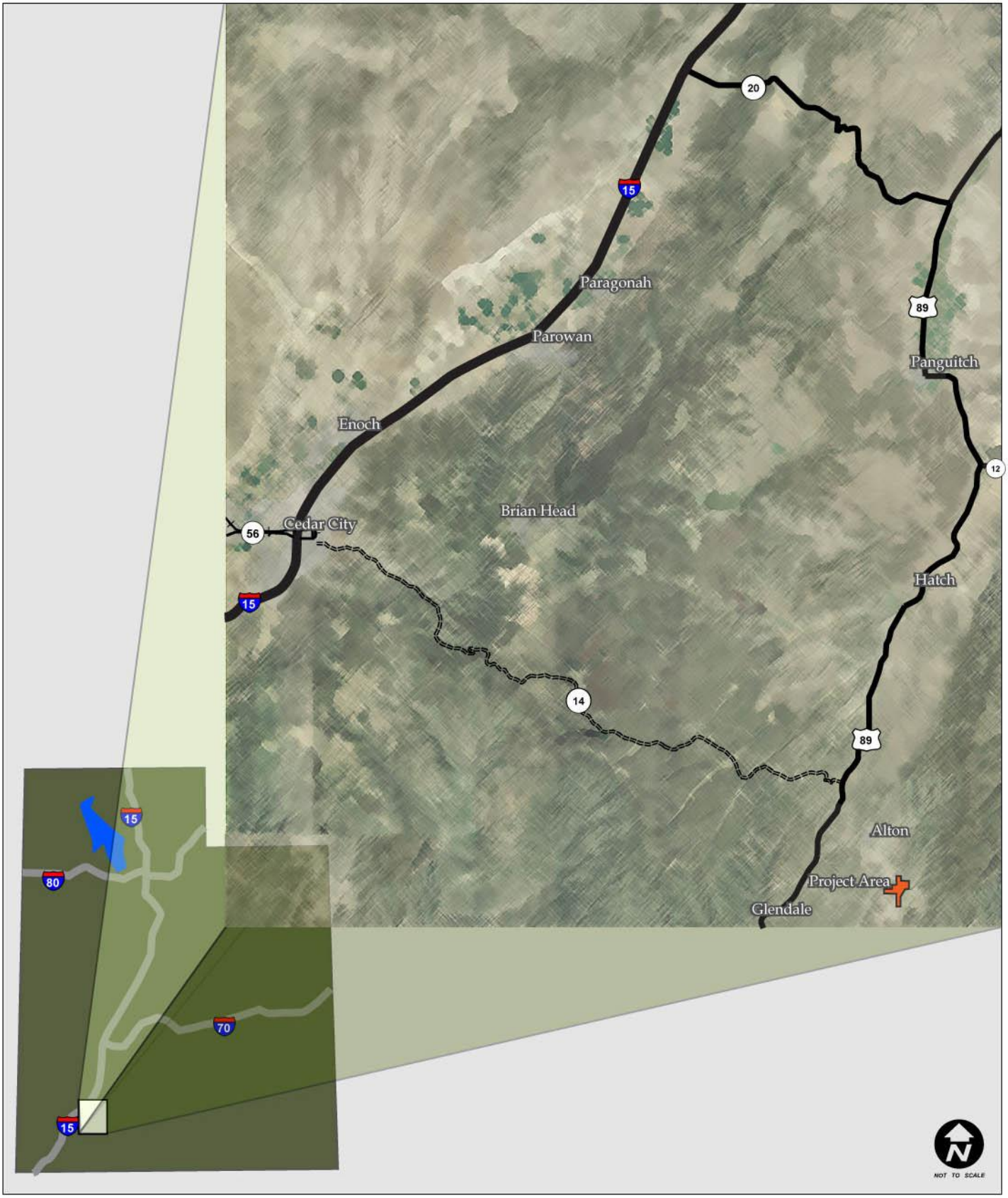
The Highway Capacity Manual 2000 (HCM 2000) methodology was used in this study to remain consistent with “state-of-the-practice” professional standards. Synchro and HCS software’s were used to apply this methodology.

1.3.1. Measures of Effectiveness

Two Measures of Effectiveness (MOEs) were used to quantify traffic conditions for the various scenarios. The MOEs for two lane highways are Level of Service (LOS) and Time-Spent-Following, and the MOEs used for intersections are LOS and delay (seconds per vehicle).

Intersection

LOS is a measure of traffic operating conditions, which varies from LOS A (the best) to LOS F (the worst). LOS reflects the amount of congestion and delay motorists experience at intersections. Table 1 describes the LOS and delay criteria from the *HCM 2000* for signalized and unsignalized intersections. The *HCM 2000* methodology has different quantitative evaluations for signalized and unsignalized intersections. For signalized intersections, the LOS is provided for the overall intersection (weighted average of all approach delays).



FEHR & PEERS
TRANSPORTATION CONSULTANTS

STUDY AREA
COAL HOLLOW TRAFFIC TECHNICAL REPORT
FIGURE 1

For unsignalized intersections, LOS is reported based on the worst approach. Fehr & Peers has also calculated overall delay values for unsignalized intersections, which provides additional information and represents the overall intersection conditions rather than just the worst approach. Both are reported in their respective tables throughout the report.

Table 1
Intersection Level of Service Descriptions

Level of Service	Description of Traffic Conditions	Signalized Intersections	Unsignalized Intersections
		Average Delay[1] (sec / veh)	Delay[2] (sec / veh)
A	*Free Flow / Insignificant Delay* Extremely favorable progression. Individual users are virtually unaffected by others in the traffic stream.	0 to 10	0 to 10
B	*Stable Operations / Minimum Delays* Good progression. The presence of other users in the traffic stream becomes noticeable.	> 10 to 20	> 10 to 15
C	*Stable Operations / Acceptable Delays* Fair progression. The operation of individual users is affected by interactions with others in the traffic stream.	> 20 to 35	> 15 to 25
D	*Approaching Unstable Flows / Tolerable Delays* Marginal progression. Operating conditions are noticeably more constrained.	> 35 to 55	> 25 to 35
E	*Unstable Operations / Significant Delays Can Occur* Poor progression. Operating conditions are at or near capacity.	> 55 to 80	> 35 to 50
F	*Forced, Unpredictable Flows / Excessive Delays* Unacceptable progression with forced or breakdown of operating conditions.	> 80	> 50

1. Overall intersection LOS and average delay (seconds/vehicle) for all approaches.
2. Worst approach LOS and delay (seconds/vehicle) only.
Source: Fehr & Peers Descriptions, based on *Highway Capacity Manual,* 2000 Methodology (Transportation Research Board).

Two-Lane Highway Segment

The MOEs used for two-way segments are: LOS and Percent Time-Spent-Following. LOS is a measure of traffic flow conditions, which varies from LOS A (the best) to LOS F (the worst). For Class I highways, LOS reflects the percent time-spent-following and average travel speed. For Class II highways, LOS is defined by percent time-spent-following. Table 2 shows the association of LOS with Percent Time-Spent-Following and Average Travel Speed based on criteria from the *HCM 2000* for two-lane Class I highways and Table 3 for Class II highways (Chapter 20).

Table 2 Two-Lane Highways (Class I) Level of Service Descriptions		
Level of Service	**Percent Time-Spent Following**	**Average Travel Speed (mi/h)**
A	0 to 35	> 55
B	> 35 to 50	> 50 to 55
C	> 50 to 65	> 45 to 50
D	> 65 to 80	> 40 to 45
E	> 80	40 to 0
F	See note below[1]	

1. LOS F applies whenever the flow rate exceeds the segment capacity.
Source: *Highway Capacity Manual,* 2000 Methodology (Transportation Research Board).

Table 3 Two-Lane Highways (Class II) Level of Service Descriptions	
Level of Service	**Percent Time-Spent Following**
A	0 to 40
B	> 40 to 55
C	> 55 to 70
D	> 70 to 85
E	> 85
F	See note below[1]

1. LOS F applies whenever the flow rate exceeds the segment capacity.
Source: *Highway Capacity Manual,* 2000 Methodology (Transportation Research Board).

The *HCM 2000* states that Directional Segment methodology addresses three types of directional segments: extended directional segments, specific upgrades, and specific downgrades. The methodology for directional segments is analogous to the two-way segment methodology, except that it estimates traffic performance measures and LOS for one direction of travel at a time. However, the operational assessment of one direction of travel on a two-lane highway necessarily considers the opposing traffic volume.

1.4. Report Organization

The report is organized into the following four sections:

- ***Section 1 - Introduction*** discusses the purpose, analysis methodology, and organization of the report.

- ***Section 2 - Existing Conditions*** describes the existing roadway network, data collection efforts, traffic characteristics, and results.
- ***Section 3 – Existing Plus Trucks Conditions*** addresses existing volumes with the additional project coal trucks traffic conditions including traffic operational results.
- ***Section 4 – Future 2020 Background Conditions*** addresses future 2020 background (without project coal trucks) traffic conditions including a description of the traffic forecasting process and traffic operational results.
- ***Section 5 – Future 2020 Plus Trucks Conditions*** addresses future 2020 background volumes with the additional project coal trucks traffic conditions including the traffic operational results.
- ***Section 6 – Commonly Used Acronyms*** lists acronyms used in the report and their meanings.
- ***Section 7 - References*** lists the references cited throughout the report.

2. Existing Conditions

This section of the report describes the existing study area characteristics and summarizes the data collection effort. The purpose of the existing (year 2007) analysis is to evaluate the intersections and roadways during the peak travel periods of the day under existing traffic and geometric conditions. Technical data supporting these findings are included in the appendix.

2.1. Roadway Characteristics

There are four Federal and State roads along the proposed Alton Coal project haul route.

US-89 is a north/south state highway that extends through many cities and jurisdictional boundaries. In the project study area, a majority of US-89 is classified as a Category 2 (System Priority Rural) roadway. However, in the vicinity of towns of Hatch and Panguitch, US-89 is classified as a Category 4 (Regional Rural) roadway on the outskirts of town and a Category 7 (Community Rural) roadway in the center of town. US-89 has a two-lane cross section with occasional passing lanes on steep upgrades. The cross section is expanded to four-lanes through the town of Panguitch. US-89 also serves as the main tourist connection to National Parks such as Bryce Canyon and Zion Canyon. Within the study area, the speed limit is 60 mph except through the town of Hatch and Panguitch, where it is reduced to 40 mph and 35 mph respectively. The existing Average Daily Traffic (ADT) and percent heavy trucks along US-89 is as follows: 4,000 vpd and 18% trucks (South of SR-14 Junction), 4,100 vpd and 21% trucks (North of SR-12 Junction), 3,600 vpd and 25% trucks (South of SR-20 Junction).

SR-20 is an east/west state road that serves as a connector road between I-15 and US-89. SR-20 is classified as a Category 4 (Regional Rural) roadway. SR-20 has a two-lane cross section with a climbing lane for slower traffic on the steep updgrade towards the summit. SR-20 has a posted speed limit of 60 mph from the US-89 junction to the steep upgrade, 35 mph climbing the steep upgrade to the summit, and 65 mph from the summit to I-15. The existing ADT is 2,509 vpd with 27% heavy trucks.

I-15 is a four-lane divided interstate freeway that runs north/south through Utah and also traverses through the States of Idaho to the north and Nevada and Arizona to the south. Along the proposed coal truck haul route, I-15 has a speed limit of 75 mph from SR-20 to Cedar City. The existing ADT between SR-20 and Cedar City is 16,200 vpd with 26% heavy trucks.

SR-56 is an east/west state road that runs from SR-130 in Cedar City to the Nevada Stateline. SR-56 is labeled as 200 North running through the center of Cedar City. SR-56 is classified as a Category 5 (Regional Priority Urban) roadway through the center of Cedar City, a Category 3 (System Priority Urban) on the outskirts of Cedar City, a Category 4 (Regional Rural) outside of Cedar City, and a Category 9 (Other) towards the Nevada Stateline. SR-56 has a posted speed limit of 45 mph on the proposed coal truck haul route. The cross section varies from four-lanes in the center of Cedar City to two-lanes outside of the city. The existing ADT near the I-15 Junction is 8,600 vpd with 10% heavy trucks.

2.2. Land Use Characteristics

The project study area consists of a variety of land uses including residential and commercial through the towns and rural undeveloped areas outside of the towns.

2.3. Data Collection Effort

The data collection effort for the existing conditions included daily, a.m. and p.m. peak period traffic volumes, intersection geometry, GPS travel time runs, and accident information. This information was used provide a quantitative evaluation of existing traffic conditions.

2.3.1. Daily and Peak Hour Volume Counts

Twenty-four hour traffic counts were conducted from June 19 to June 25, 2007 at three locations on US-89 and one location on SR-20. These locations were selected to provide a general understanding of traffic conditions along the proposed coal truck haul route. Table 4 shows existing directional ADT volumes.

Table 4
Existing Average Daily Traffic (ADT) Volumes

Location	Direction of Travel		Total	Percentage Heavy Trucks
	Northbound[1]	Southbound[2]		
US-89 (south of SR-14)	2,110	1,866	3,978	24%
US-89 (north of SR-12)	2,064	1,998	4,062	26%
US-89 (south of SR-20)	1,790	1,806	3,596	25%
SR-20 (east of summit)	1,242	1,267	2,509	28%

1. Eastbound for the count on SR-20
2. Westbound for the count on SR-20
Source: Fehr & Peers, 2008

Peak period traffic counts were collected on June 19-26, 2007 at the following intersections:

- US-89 / SR-14 – (2-Way Stop)
- US-89 / SR-12 – (One-Way Stop/Yield)
- US-89 / SR-143 (Main St.) – (All-Way Stop)
- US-89 / SR-20 – (One-Way Stop)
- I-15 SB Off-ramp / SR-56 – (Signalized)

These counts were seasonally adjusted using information obtained from the Utah Department of Transportation (UDOT) permanent count stations. The appendix contains the traffic count data.

2.3.2. Intersection Geometry

Intersection geometries were measured during field visits to the study area.

2.4. Crash Information

UDOT Traffic and Safety generated a three-year crash history for US-89, SR-20, I-15, and SR-56. Accident rates are calculated by determining the number of accidents per million vehicle-miles traveled. Severity is a measure of damage that is caused by an accident. A severity of 1 indicates that the accident caused property damage and a severity of 5 indicates that there was a fatality; see Table 5 for these descriptions.

Table 5 Accident Severity	
Severity	**Description**
1	Property Damage
2	Possible Injury
3	Bruises and Abrasions
4	Broken Bones or Bleeding Wounds
5	Fatal
Source: UDOT, Division of Traffic and Safety CARS Codes, 2001.	

Accidents were summarized for the three-year period from 2003 to 2005. The detailed Operational Safety Report's (OSR) that were done by UDOT can be found in the Appendix. Below is a summary of the OSR's broken down by roadway:

US-89 – Mile Post (MP) 90.04 to 156.36 (Glendale to Jct. SR-20)

- Total Accidents: 287
- Total Fatalities: 0
- 3 Year Accident Average: 95.67

US-89 Summary

	Actual	Expected
Severity Rate:	1.59	1.70
Crash Rate:	2.59	1.46

As shown above, the actual rate of accidents over the three-year study period indicates that there is a higher occurrence of accidents than would be expected and a lower severity rate as would be expected for a roadway similar to SR-20. The OSR states that the predominant crash type is the single vehicle, accounting for 81.2% or 233 of the total number of crashes. The following list shows the breakdown of the single vehicle crashes:

Crash Type	**No.**	**% of Single Vehicle Crashes**
1. Wildlife Related	126	51.1
2. Ran Off Road Right	63	27.0
3. Ran Off Road Left	24	10.3
4. Fixed Object	10	4.3
5. Domestic Animal Related	5	2.1
6. Other Object	4	1.7
7. Overturned in Roadway	1	0.5
	233	100.0%

US-20 – MP 0.00 to 20.61 (I-15 to Jct. US-89)

- Total Accidents: 79
- Total Fatalities: 0
- 3 Year Accident Average: 26.33

US-20 Summary

	Actual	Expected
Severity Rate:	1.50	1.72
Crash Rate:	2.59	1.96

As shown above, the actual rate of accidents over the three-year study period indicates that there is a higher occurrence of accidents than would be expected, but a lower severity rate than would be expected for a roadway similar to SR-20. The OSR states that the predominant crash type is the single vehicle, accounting for 86.1% or 68 of the total number of crashes. The following list shows the breakdown of the single vehicle crashes:

Crash Type	**No.**	**% of Single Vehicle Crashes**
1. Ran Off Road Right	31	45.5
2. Ran Off Road Left	12	17.7
3. Wildlife Related	12	17.7
4. Fixed Object	10	14.7
5. Other Non-Collision	3	4.4
	68	100.0%

The OSR states that there were no clusters of crashes at any location and approximately 70% of these crashes occurred under inclement weather conditions (snowy/icy). The main contributing factor for crashes where vehicles ran off the road was excessive speed.

I-15 – MP 59.05 to 100.2 (Cedar City to SR-20)

- Total Accidents: 441
- Total Fatalities: 14
- 3 Year Accident Average: 147.00

I-15 Summary

	Actual	Expected
Severity Rate:	2.01	1.83
Crash Rate:	0.75	0.87

As shown above, the actual rate of accidents over the three-year study period indicates that there is a lower occurrence of accidents than would be expected, but a higher severity rate than would be expected for a roadway similar to I-15. The OSR states that the predominant crash types are:

- Single Vehicle Crashes, accounting for 77.6% or 342 of the total number of crashes.
- Rear End Crashes, accounting for 11.1% or 49 of the total number of crashes.
- Same Direction Side Swipe, accounting for 9.8% or 43 of the total number of crashes.

The following list shows the breakdown of the single vehicle crashes:

Crash Type	**No.**	**% of Single Vehicle Crashes**
1. Ran Off Road Right	108	31.6
2. Ran Off Road Left	68	19.9
3. Ran Off Road Thru Median	44	12.9
4. Wildlife Related	39	11.4

5. Other Object	25	7.3
6. Fixed Object	23	6.7
7. Other Non-Collision	22	6.4
8. Overturned in Roadway	10	2.9
9. Pedestrian Related	1	0.3
10. Bicycle Related	1	0.3
11. Domestic Animal Related	1	0.3
	342	100.0%

The OSR states that there were no clusters of crashes at any location. The primary factors for crashes where vehicles ran off the road were:

1. Excessive speed
2. Falling asleep at the wheel
3. Other improper driver behavior

Rear end crashes occurred mostly as some drivers were following too closely and sideswipe crashes were caused primarily by drivers attempting an unsafe passing maneuver.

The total of 12 fatal crashes resulted in 14 fatalities. The following are the crashes that are associated with the fatal crashes:

Crash Type	**No.**
1. Running Off Road	11 (6 caused by falling asleep at the wheel)
2. Rear End	1
3. Pedestrian Related	1
4. Sideswipe	1
	12

SR-56 – MP 9.80 to 61.39

- Total Accidents: 174
- Total Fatalities: 2
- 3 Year Accident Average: 58.00

SR-56 Summary

	Actual	Expected
Severity Rate:	1.69	1.77
Crash Rate:	2.03	2.14

As shown above, the actual rate of accidents over the three-year study period indicates that there is a lower occurrence of accidents than would be expected and a lower severity rate as would be expected for a roadway similar to SR-56. The OSR states that the predominant crash types are:

- Single Vehicle Crashes, accounting for 48.3% or 84 of the total number of crashes.
- Rear End Crashes, accounting for 19.0% or 33 of the total number of crashes.
- Right Angle Crashes, accounting for 16.1% or 28 of the total number of crashes.
- Left Turn Crashes, accounting for 6.90% or 12 of the total number of crashes.

The following list shows the breakdown of the single vehicle crashes:

Crash Type	No.	% of Single Vehicle Crashes
1. Wildlife Related	34	40.5
2. Ran Off Road Left	16	19.0
3. Ran Off Road Right	16	19.0
4. Domestic Animal Related	6	7.1
5. Fixed Object	4	4.8
6. Other Non-Collision	3	3.6
7. Other Object	2	2.4
8. Bicycle Related	2	2.4
9. Pedestrian Related	1	1.2
	84	100.0%

The OSR states that there were no clusters of crashes at any location. The primary factors for crashes where vehicles ran off the road were:

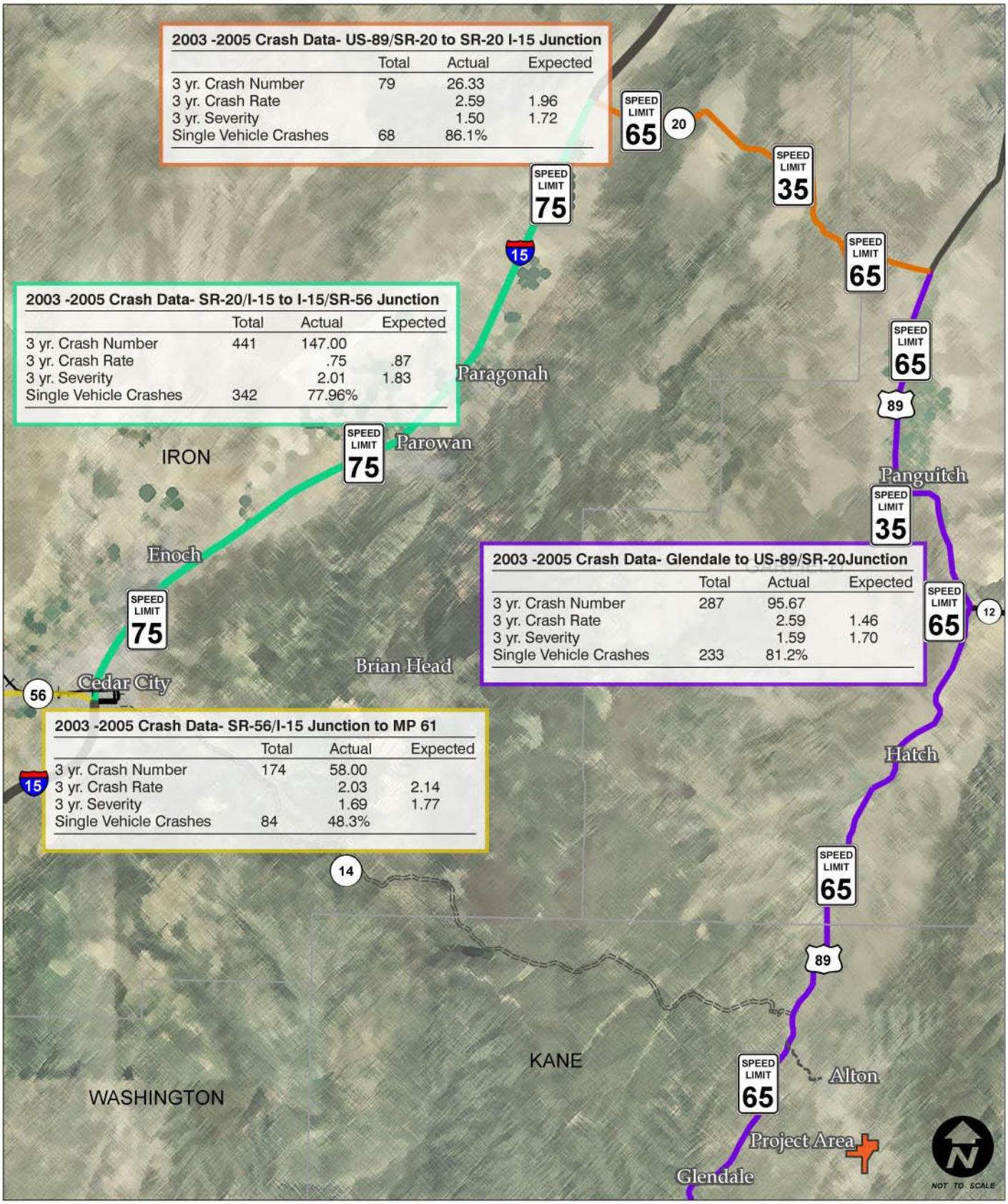
1. Excessive speed
2. Falling asleep at the wheel
3. Driving Under the Influence (DUI)

Rear end, left turn, and right angle crashes occurred mostly at intersections on the western boundary of Cedar City.

One of the two fatal crashes was the result of a single vehicle that ran off the road. The other fatal crash was the result of an eastbound driver crossing the centerline and impacting the westbound driver head on. Figure 2 shows the study roadways with the associated crash data.

2.4.1 Future Crash Information

It is difficult to project increases in crashes due to the increase in truck traffic from the project. Historic crash data may not be indicative of future crash trends due to the disproportionate increase in truck traffic relative to general traffic. However, based on the projected increase in heavy trucks due to the proposed project, the risk of potential accidents in the study area will likely increase.



FEHR & PEERS
TRANSPORTATION CONSULTANTS

POSTED SPEEDS AND CRASH DATA
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 2

2.5. Existing Traffic Conditions Results

The existing conditions analysis was done using the Highway Capacity Software (HCS) for the unsignalized intersections and the Synchro 6.0 software for the signalized intersection. HCS was also used for the roadway segment LOS analysis.

2.5.1. Intersection Conditions

Existing conditions MOEs are reported in LOS and delay. Table 6 displays the existing 2007 a.m. LOS and delay (seconds/vehicle) for the study intersections. Figure 3 shows the a.m. and p.m. intersection volumes and LOS results.

Table 6
Existing 2007 a.m. Peak Hour LOS and Delay

Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	A	9.4	A	3.8
US-89 / SR-12	WB	A	9.5	A	5.8
US-89 / SR-143 (Main St.)	SB	A	8.7	A	8.1
US-89 / SR-20	SB	A	9.5	A	8.1
I-15 SB Off-ramp / SR-56				C	21.1

Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 6, all intersections operate at LOS C or better during the a.m. peak hour. Table 7 displays the existing 2007 p.m. LOS and delay for the study intersections.

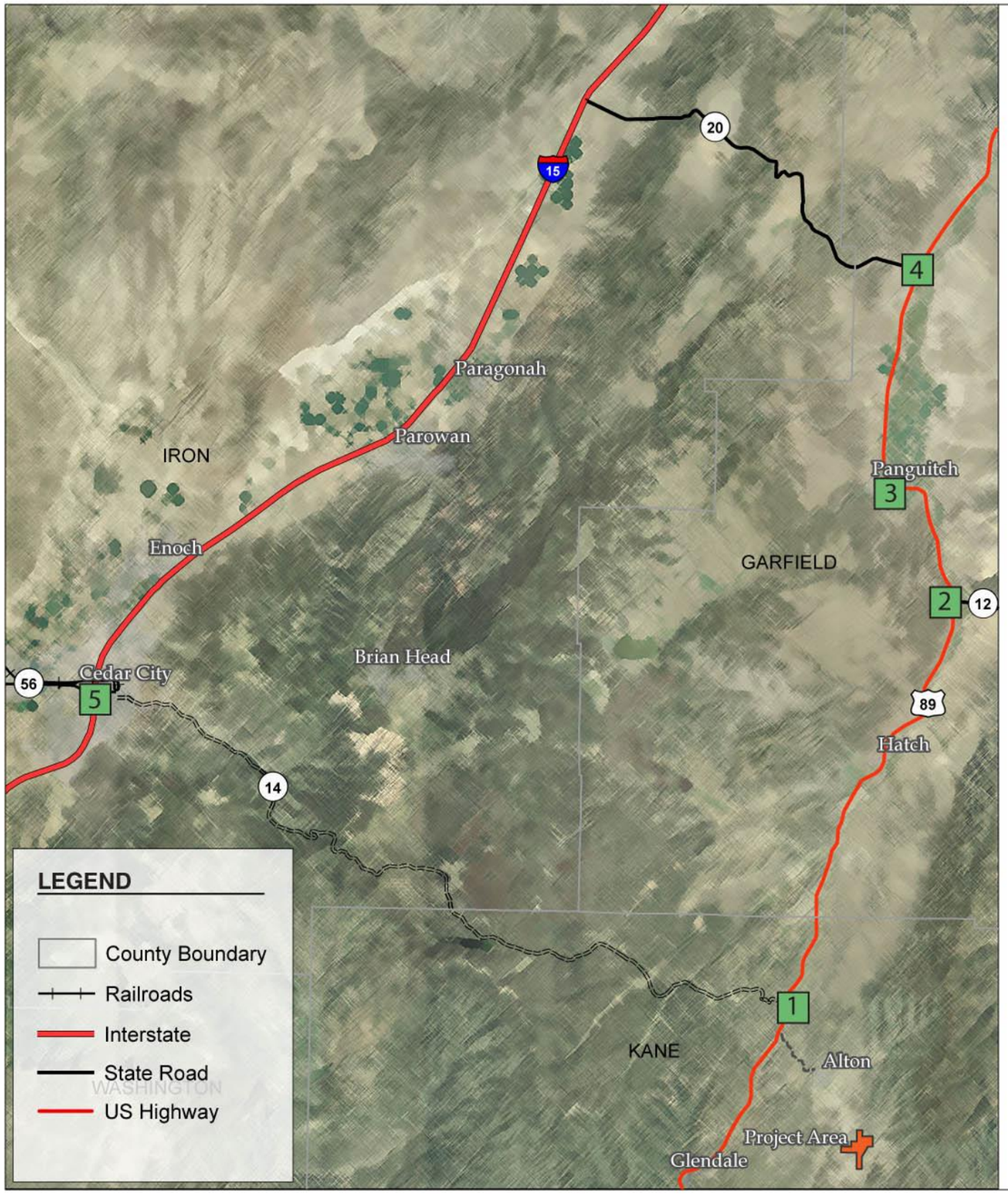
Table 7
Existing 2007 p.m. Peak Hour LOS and Delay

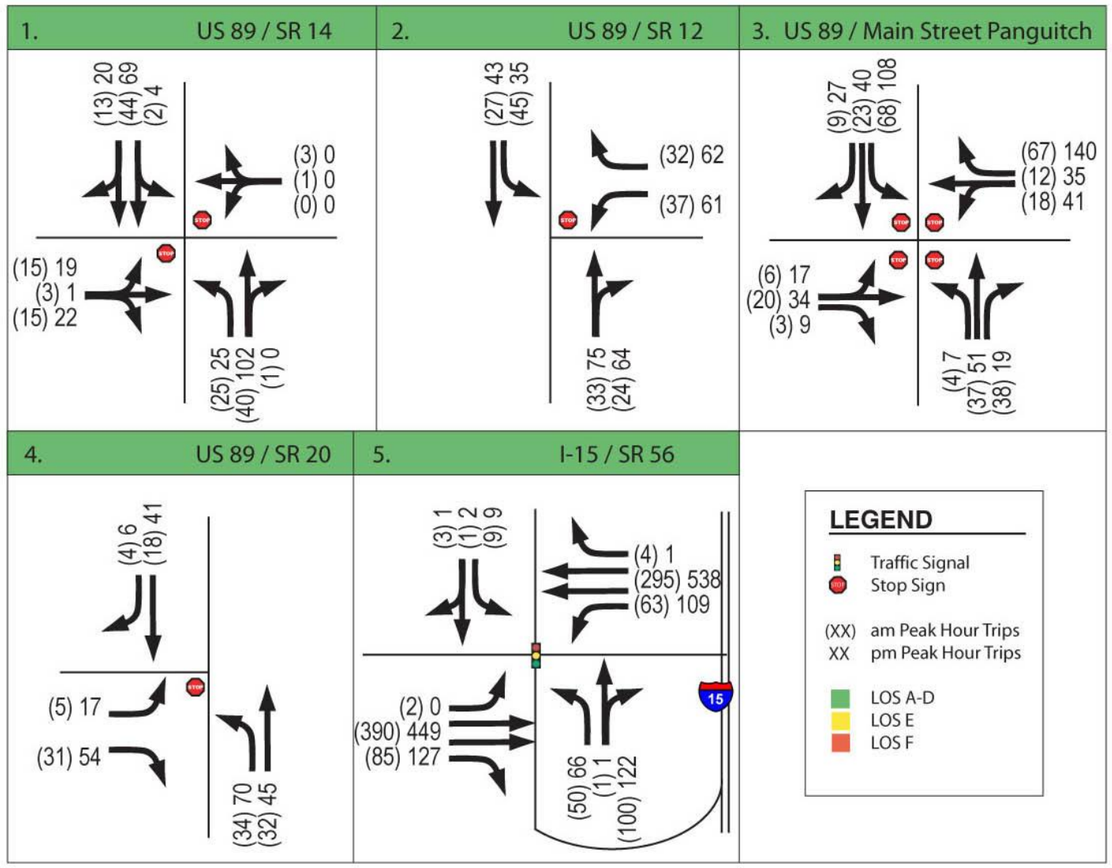
Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	A	9.8	A	2.1
US-89 / SR-12	WB	A	9.7	A	4.8
US-89 / SR-143 (Main St.)	SB	A	9.7	A	9.3
US-89 / SR-20	SB	A	9.8	A	7.5
I-15 SB Off-ramp / SR-56				C	20.6

Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 7, all intersections operate at LOS C or better during the p.m. peak hour.





FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING a.m. & p.m. TRAFFIC CONDITIONS
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 3

2.5.2. Directional Segment Conditions

Table 8 displays the existing 2007 weekday and weekend LOS and Percent Time-Spent-Following for the study roadway segments. Figures 4 and 5 show the results of the weekday and weekend directional segment LOS analysis.

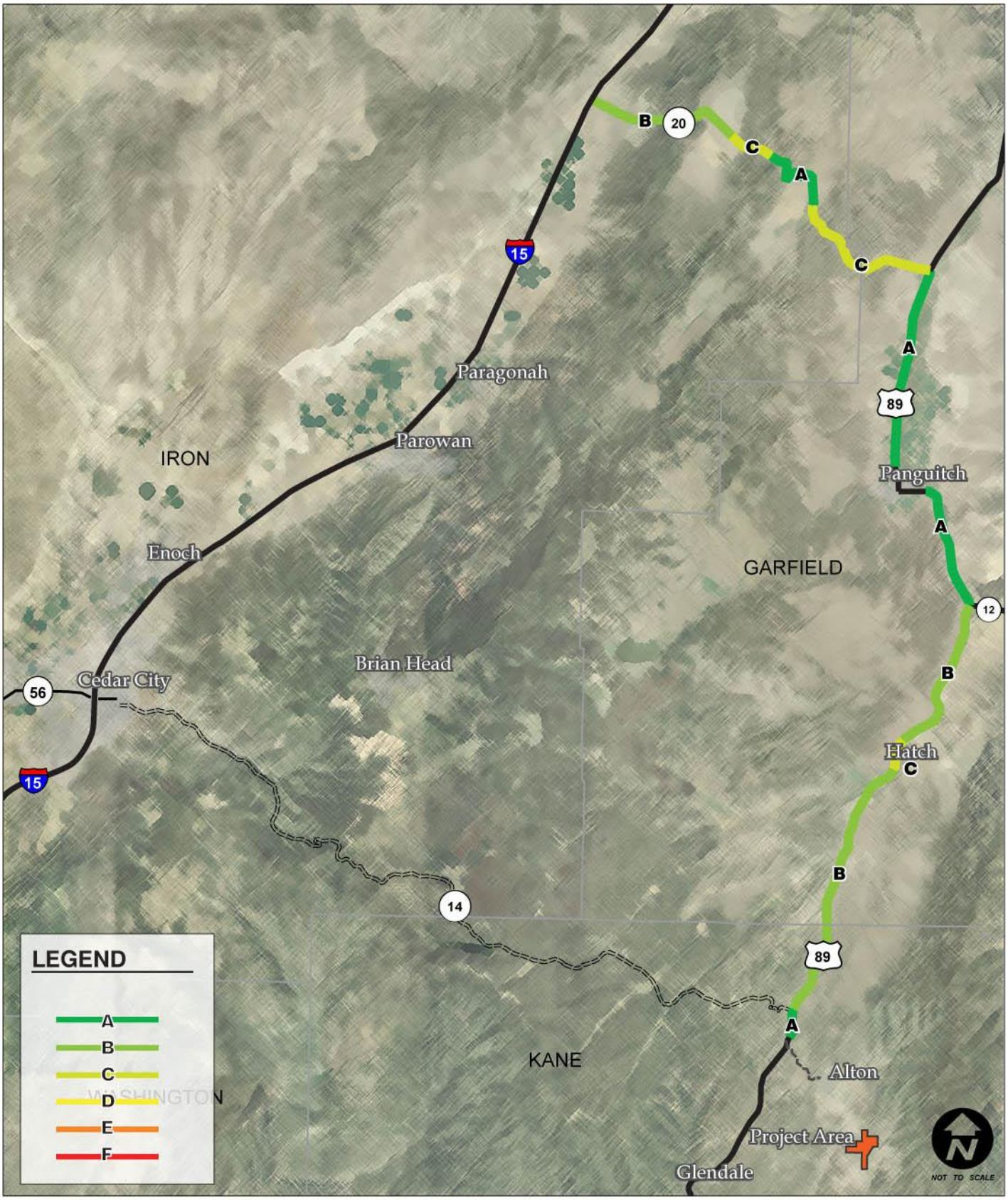
Table 8
Existing 2007 Directional Segment
Peak Hour LOS and Percent Time-Spent-Following

Intersection	Weekday			Weekend		
	Direction	LOS	% Time-Spent-Following	Direction	LOS	% Time-Spent-Following
US-89: Alton to SR-14	NB	A	33.3	NB	B	37.5
US-89: SR-14 to Hatch	NB	B	36.4	NB	B	40.6
US-89: Center of Hatch[1]	NB	C	87.0	NB	C	97.0
US-89: Hatch to SR-12	NB	B	39.5	NB	B	41.1
US-89: SR-12 to Panguitch	NB	A	27.6	NB	A	28.4
US-89: Panguitch to SR-20	NB	A	28.4	NB	A	30.8
SR-20: US-89 to Upslope	WB	C	33.4	WB	C	34.2
SR-20: Upslope to Summit[2]	WB	A	10.7	WB	A	13.7
SR-20: Summit to Downslope	WB	C	43.3	WB	C	45.2
SR-20: Downslope to I-15	WB	B	38.7	WB	C	39.0

Notes:
1. The analysis for the center of Hatch was done using HCS HIGHPLAN software due to the reduced highway speeds through town.
2. This segment of roadway was analyzed with a passing lane and as a Class II highway due to the low posted speed limit of 35 mph.

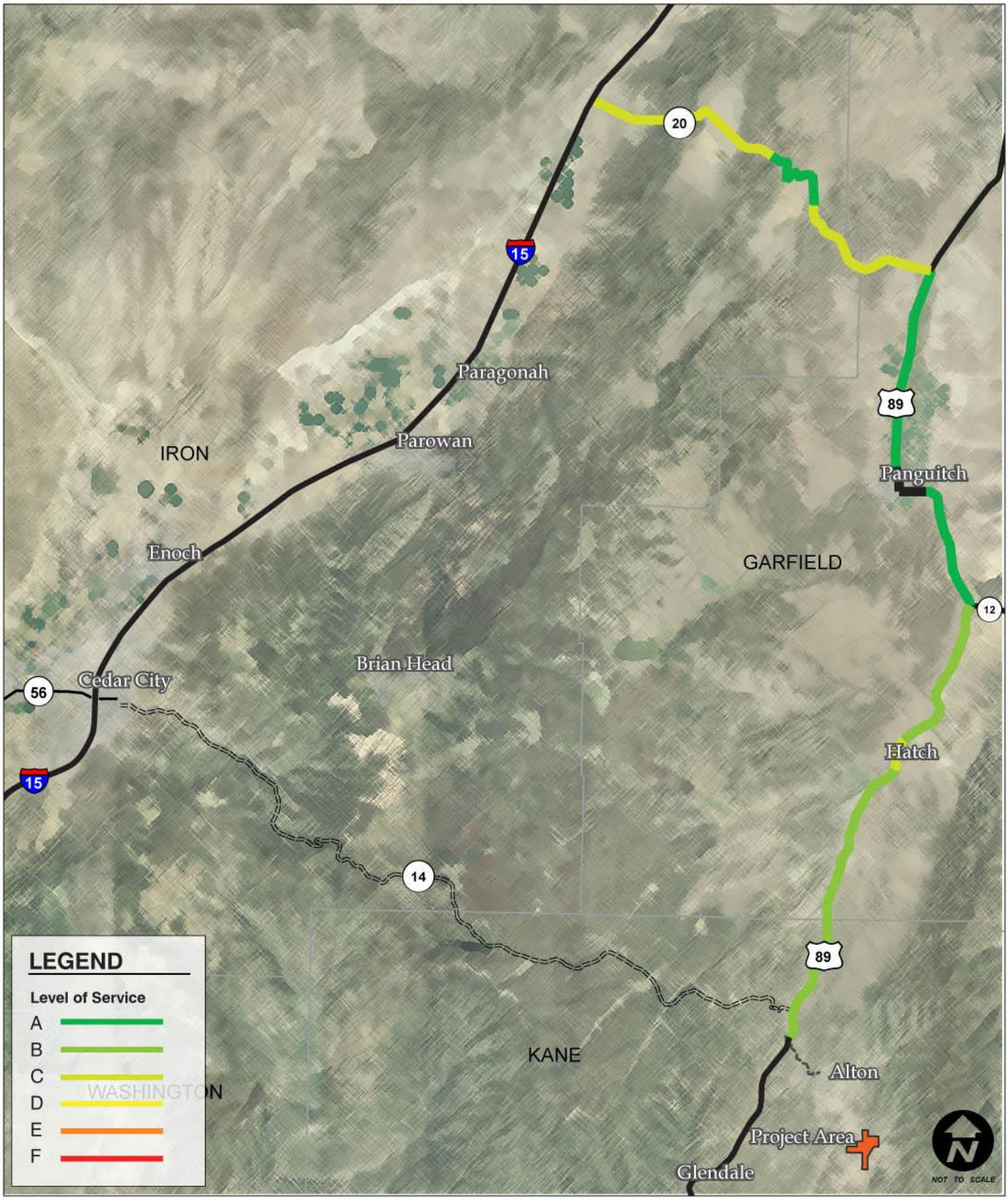
Source: Fehr & Peers, 2008

As shown in Table 8, all roadway segments operate at an LOS C or better except.



FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING WEEKDAY DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 4



FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING WEEKEND DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT

FIGURE 5

2.6. Travel Time Runs

Travel time runs were performed using a Global Positioning System (GPS) along the proposed coal truck haul route on US-89 and SR-20 traveling northbound on US-89 and westbound on SR-20. One travel time run was performed at free flow speeds and the other was performed while following a heavy truck to best simulate following a coal truck along the haul route.

Free Flow Run

	Travel Time (min)	Avg. Speed (mph)	Posted Speed (mph)
US-89: From Alton to SR-20	36	65	ranges from 35 to 65
SR-20: From US-89 to I-15	20	60	ranges from 35 to 65

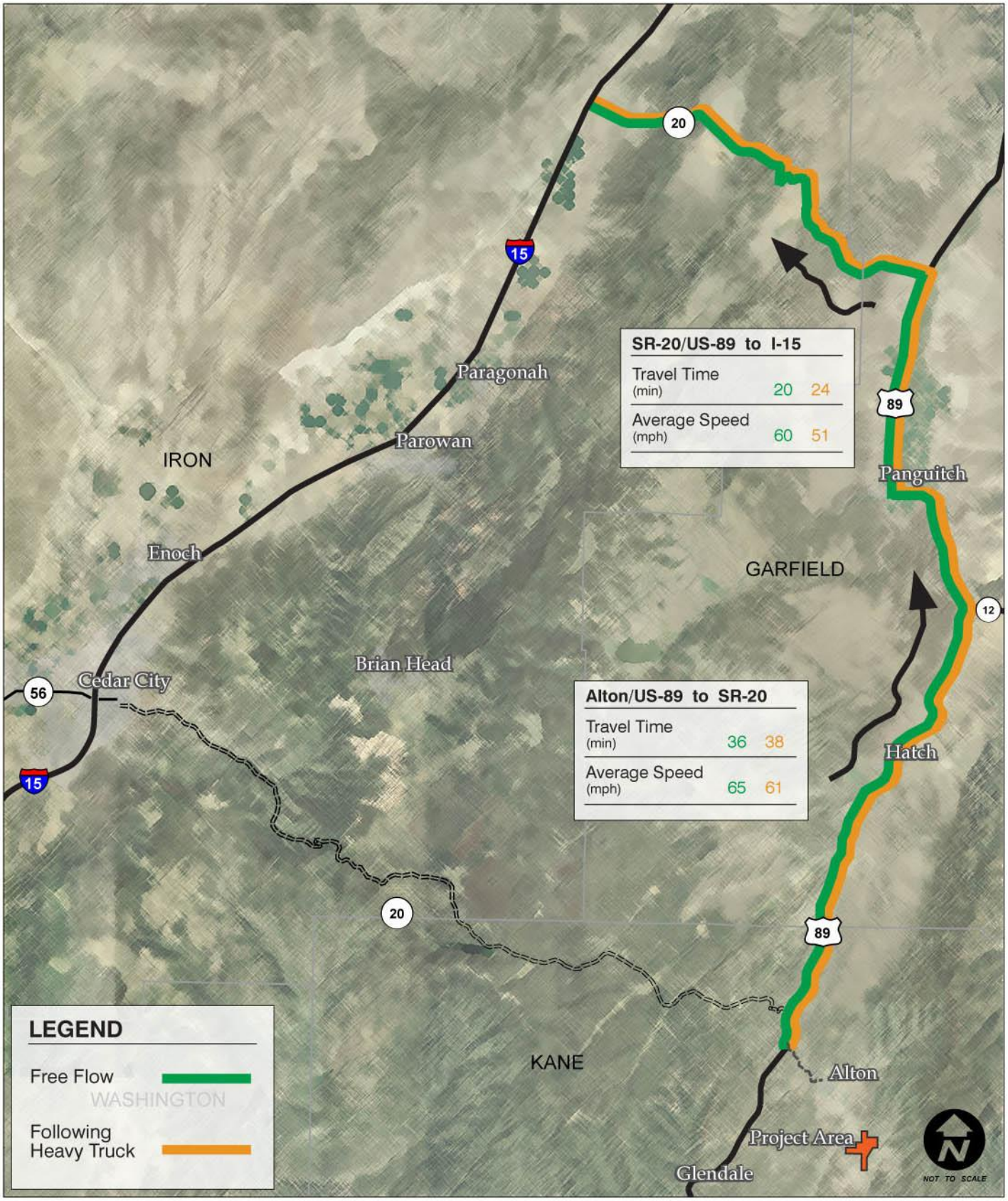
Following Heavy Truck

	Travel Time (min)	Avg. Speed (mph)	Posted Speed (mph)
US-89: From Alton to SR-20	38	61	ranges from 35 to 65
SR-20: From US-89 to I-15	24	51	ranges from 35 to 65

This shows that it takes an additional two minutes to travel from Alton to the SR-20 on US-89 while following a heavy truck and an additional four minutes to travel from US-89 to I-15 on SR-20. Figure 6 displays the travel time runs.

2.7. Existing Conditions Summary

Existing conditions at the study intersections have low delays per vehicle and little to no congestion. Existing conditions on the study roadways are low volumes with a substantial amount of capacity for future growth. Traffic generally flows at free flow speeds on all study roadways.



FEHR & PEERS
TRANSPORTATION CONSULTANTS

TRAVEL TIME RUNS
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT

FIGURE 6

3. Existing Plus Trucks Conditions

This section of the report describes the existing plus trucks study area characteristics. The purpose of the existing plus trucks analysis is to evaluate the intersections and roadways during the peak travel periods of the day under existing traffic and geometric conditions plus the additional coal trucks that are proposed with the project coal mine. Technical data supporting these findings are included in the appendix.

Employees
The Alton Coal Development is estimating 100 employees for the mining operation. Based on a proposed estimated employee shift schedule and the typical work week schedule (Monday through Friday), the project could generate between 25 and 50 (depending on how the shift schedules coincide) employee trips in the peak hours.

Due to the expected low number of employee trips generated by the mine development, the available capacity on the US-89 and the road to Alton, and the fact that a certain number of the employee trips will likely be captured internally to the town of Alton itself, no analysis was performed for employee generated traffic.

Trucks
The Alton Coal Development is proposing the mine operate 24 hours/day for six days a week (Monday through Saturday). The development estimates 150 coal trucks a day, or six trucks an hour, will be hauling coal from the mine site in Alton, UT north on US-89, west on SR-20, south on I-15, and west on SR-56 in Cedar City. The coal trucks are proposed to leave the coal mine site at nine and a half to ten minute headways.

3.1. Roadway Characteristics

The study roadways for the existing plus trucks conditions consists of the same geometry as the existing conditions; however, acceleration and deceleration lanes will need to be constructed at the proposed access onto US-89 near Alton.

3.2. Existing Plus Trucks Traffic Conditions Results

The existing plus trucks conditions analysis was done using HCS software for the unsignalized intersections and Synchro 6.0 software was used for the signalized intersection. HCS was also used for the roadway segment LOS analysis. As a conservative measure seven trucks an hour was used in the analysis.

Table 9 shows the increase in the percentage heavy trucks and the percentage increase in trucks with the additional trucks from the proposed development. The estimated 150 trucks were added in each direction to obtain the Existing + Project ADT and percentage of heavy trucks.

Table 9 Existing + Project Average Daily Traffic (ADT) Volumes					
Location	Direction of Travel		Total	Percentage Heavy Trucks[3]	Percentage Increase in Trucks[4]
	Northbound[1]	Southbound[2]			
US-89 (south of SR-14)	2,260	2,016	4,276	29%	31%
US-89 (north of SR-12)	2,214	2,148	4,362	31%	28%
US-89 (south of SR-20)	1,940	1,956	3,896	31%	33%
SR-20 (east of summit)	1,392	1,417	2,809	36%	43%

1. Eastbound for the count on SR-20
2. Westbound for the count on SR-20
3. The percent heavy trucks from existing volumes plus project truck volumes
4. The percent increase in heavy trucks with the addition of the project

Source: Fehr & Peers, 2008

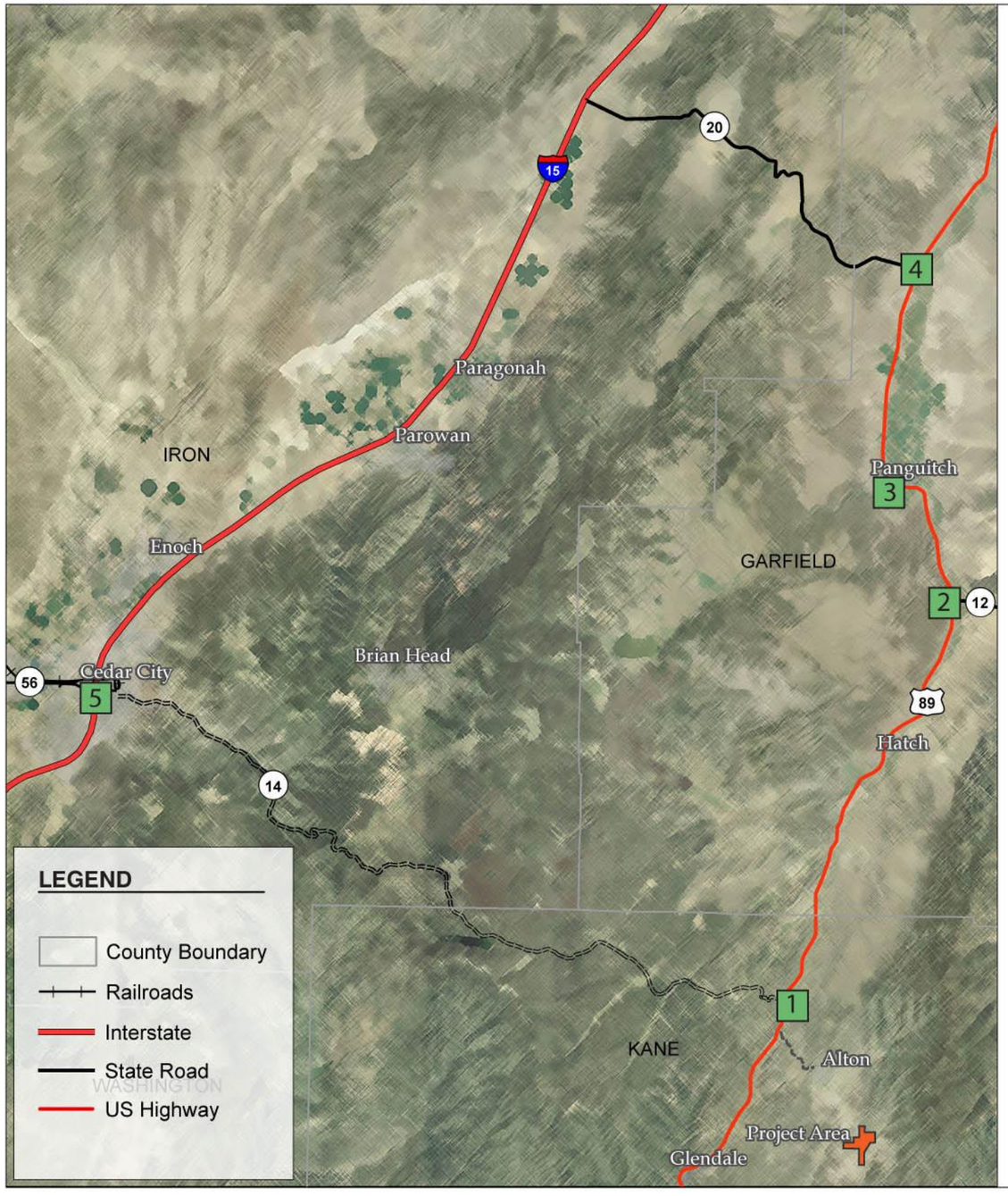
3.2.1. Intersection Conditions

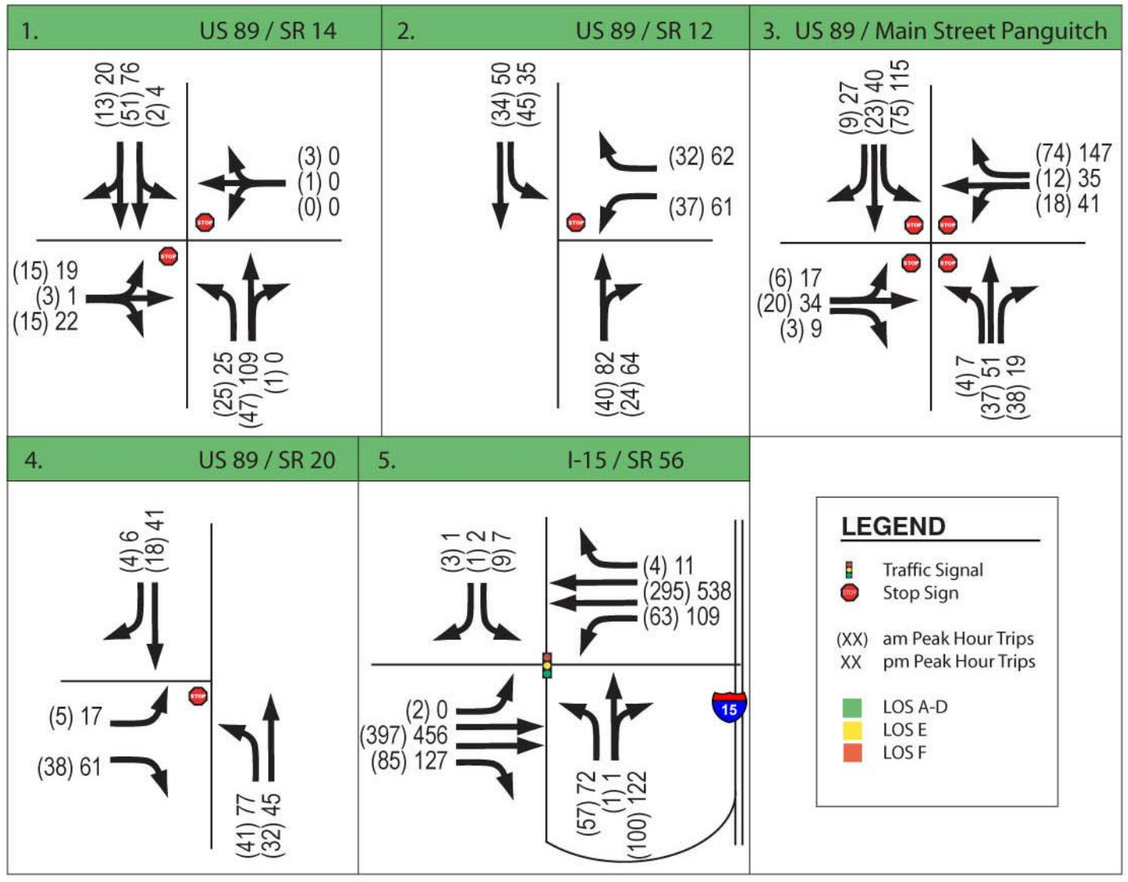
Existing plus trucks conditions MOEs are reported in LOS and delay. Table 9 displays the existing plus trucks a.m. LOS and delay for the study intersections. Figure 7 shows the a.m. and p.m. intersection volumes and LOS results.

Table 10 Existing Plus Trucks a.m. Peak Hour LOS and Delay					
Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	A	9.5	A	4.1
US-89 / SR-12	WB	A	9.5	A	5.5
US-89 / SR-143 (Main St.)	SB	A	8.9	A	8.3
US-89 / SR-20	SB	A	9.5	A	8.2
I-15 SB Off-ramp / SR-56				C	21.0

Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008





FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING PLUS TRUCKS A.M. & P.M. TRAFFIC CONDITIONS
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORTS
FIGURE 7

As shown in Table 10, all intersections operate at LOS C or better during the a.m. peak hour. Table 10 displays the existing plus trucks p.m. LOS and delay for the study intersections.

Table 11
Existing Plus Trucks p.m. Peak Hour LOS and Delay

Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	A	9.9	A	2.5
US-89 / SR-12	WB	A	9.8	A	4.5
US-89 / SR-143 (Main St.)	SB	B	10.0	A	9.5
US-89 / SR-20	SB	A	9.8	A	7.5
I-15 SB Off-ramp / SR-56				C	20.6

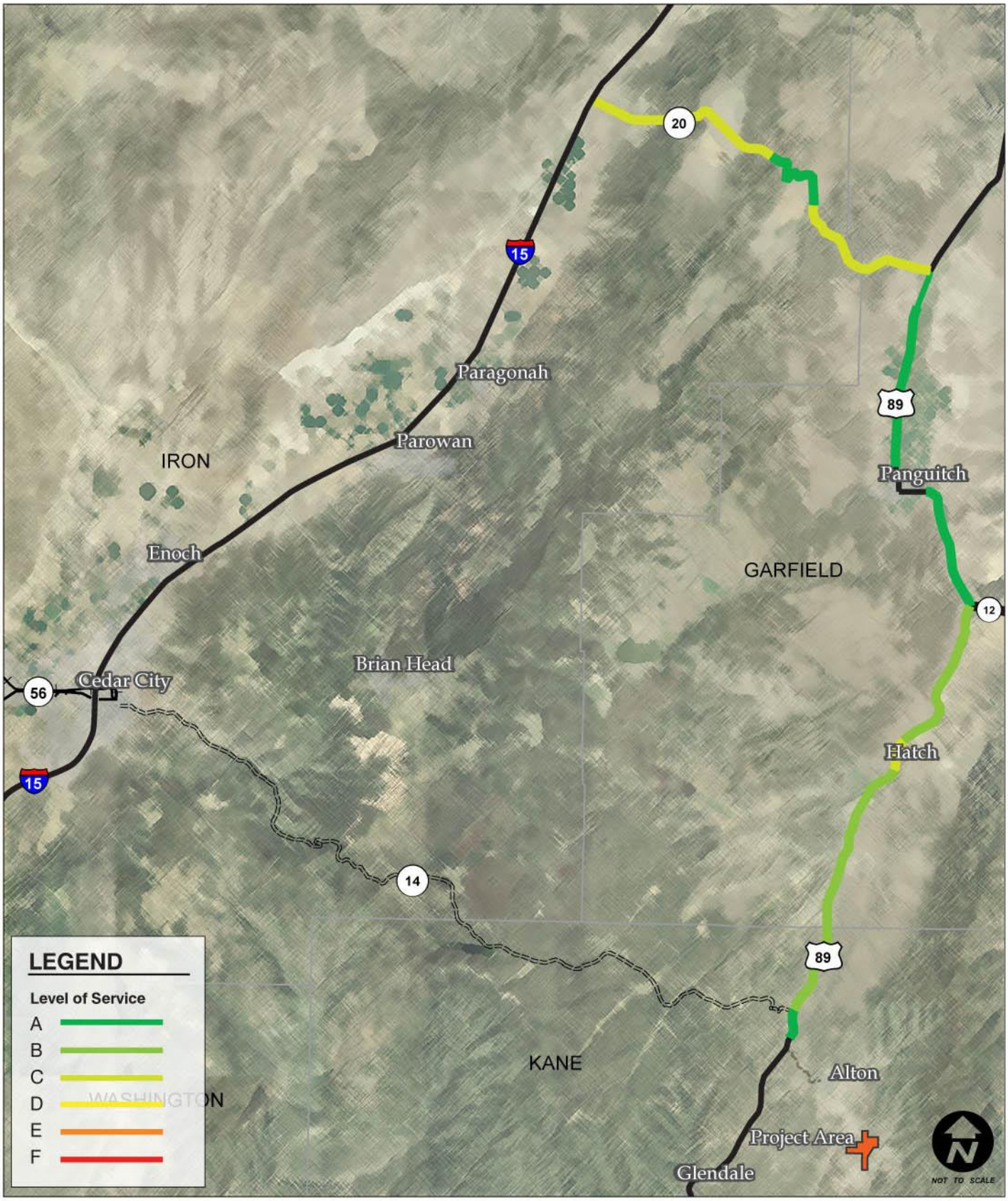
Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 11, all intersections operate at LOS C or better during the p.m. peak hour.

3.2.2. Directional Segment Conditions

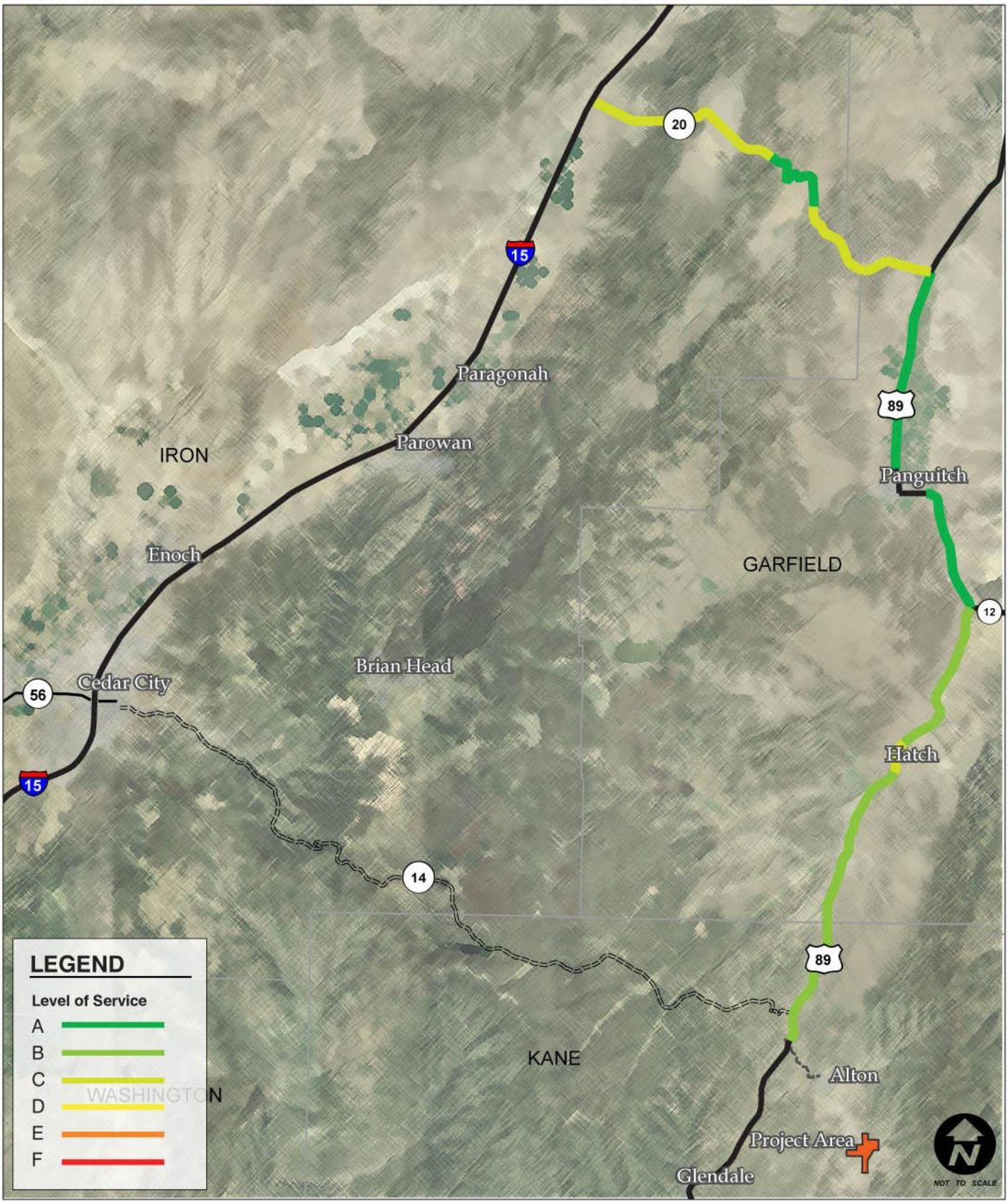
Existing plus trucks conditions MOEs for the two-lane highway directional segment analysis are reported in LOS and Percent Time-Spent-Following. Table 10 displays the existing plus trucks weekday and weekend LOS and Percent Time-Spent-Following for the study roadway segments. Figures 8 and 9 show the results of the weekday and weekend directional segment LOS analysis.



FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING PLUS TRUCKS
WEEKDAY DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW TRAFFIC TECHNICAL REPORT

FIGURE 8



FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING PLUS TRUCKS
WEEKEND DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 9

Table 12
Existing Plus Trucks Directional Segment
Peak Hour LOS and Percent Time-Spent-Following

Intersection	Weekday			Weekend		
	Direction	LOS	% Time-Spent-Following	Direction	LOS	% Time-Spent-Following
US-89: Alton to SR-14	NB	A	34.5	NB	B	38.7
US-89: SR-14 to Hatch	NB	B	37.7	NB	B	41.9
US-89: Center of Hatch[1]	NB	C	91.0	NB	C	97.0
US-89: Hatch to SR-12	NB	B	41.1	NB	B	42.4
US-89: SR-12 to Panguitch	NB	A	28.1	NB	A	29.6
US-89: Panguitch to SR-20	NB	A	30.0	NB	A	31.9
SR-20: US-89 to Upslope	WB	C	34.3	WB	C	35.7
SR-20: Upslope to Summit[2]	WB	A	11.8	WB	A	14.8
SR-20: Summit to Downslope	WB	C	42.8	WB	C	48.7
SR-20: Downslope to I-15	WB	C	40.1	WB	C	40.9

Notes:
1. The analysis for the center of Hatch was done using HCS HIGHPLAN software due to the reduced highway speeds through town.
2. This segment of roadway was analyzed with a passing lane and as a Class II highway due to the low posted speed limit of 35 mph.

Source: Fehr & Peers, 2008

As shown in Table 12, all roadway segments operate at an LOS C or better.

3.3. Existing Plus Trucks Conditions Summary

Existing plus trucks conditions at the study intersections continue to have low delays per vehicle and little to no congestion. The intersections continue to operate at acceptable LOS with the additional heavy coal trucks. Existing plus trucks conditions on the study roadways are low volumes with a substantial amount of capacity for future growth.

4. Future 2020 Background Conditions

This section of the report describes the future 2020 background study area characteristics. The purpose of the 2020 background analysis is to evaluate the intersections and roadways during the peak travel periods of the day under future 2020 traffic and geometric conditions. Technical data supporting these findings are included in the appendix.

4.1. Roadway Characteristics

The study corridor for the 2020 background conditions consists of the same geometry as the existing conditions.

4.2. Traffic Forecasting Process

Twenty years of UDOT's historic data was used to develop the future 2020 traffic volumes for the roadways and intersections in the study area. The resulting future 2020 a.m. and p.m. peak hour traffic volumes are shown in Figure 10 on page 27. Table 13 shows the future 2020 ADT for the respective roadways.

Traffic volumes for the future year 2020 were forecasted using the following linear growth rates for thirteen years:

- 3.6% for US-89, SR-14 to Garfield County Line
- 1.8% for US-89, Garfield County Line to Hatch
- 2.1% for US-89, Hatch to SR-12
- 1.9% for US-89, SR-12 to east side of Panguitch
- 1.9% for US-89, East side of Panguitch to SR-143
- 1.5% for US-89, SR-143 to north side of Panguitch
- 1.8% for US-89, North side of Panguitch to SR-20
- 2.3% for SR-14, SR-148 to US-89
- 3.5% for SR-20, US-89 to Iron County Line
- 3.6% for SR-20, Iron County Line to I-15
- 1.1% for SR-56, I-15 Junction

Table 13
Future 2020 Average Daily Traffic (ADT) Volumes

Location	Direction of Travel		Total
	Northbound[1]	Southbound[2]	
US-89 (south of SR-14)	3,100	2,750	5,850
US-89 (north of SR-12)	2,600	2,500	5,100
US-89 (south of SR-20)	2,200	2,200	4,400
SR-20 (east of summit)	1,800	1,800	3,600

1. Eastbound for the count on SR-20
2. Westbound for the count on SR-20
Source: Fehr & Peers, 2008

4.3. Future 2020 Background Traffic Conditions Results

The future 2020 background conditions analysis was done using HCS software for the unsignalized intersections and Synchro 6.0 software was used for the signalized intersection. HCS was also used for the roadway segment LOS analysis.

4.3.1. Intersection Conditions

Future 2020 background conditions MOEs are reported in LOS and delay. Table 14 displays the future 2020 a.m. LOS and delay for the study intersections. Figure 10 shows the future 2020 a.m. and p.m. intersection volumes and LOS results.

Table 14
Future 2020 a.m. Peak Hour LOS and Delay

Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	A	9.9	A	3.6
US-89 / SR-12	WB	A	9.8	A	6.0
US-89 / SR-143 (Main St.)	SB	A	9.1	A	8.4
US-89 / SR-20	NB	A	9.5	A	8.0
I-15 SB Off-ramp / SR-56				C	20.4

Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 14, all intersections operate at LOS C or better during the a.m. peak hour. Table 15 displays the future 2020 p.m. LOS and delay for the study intersections.

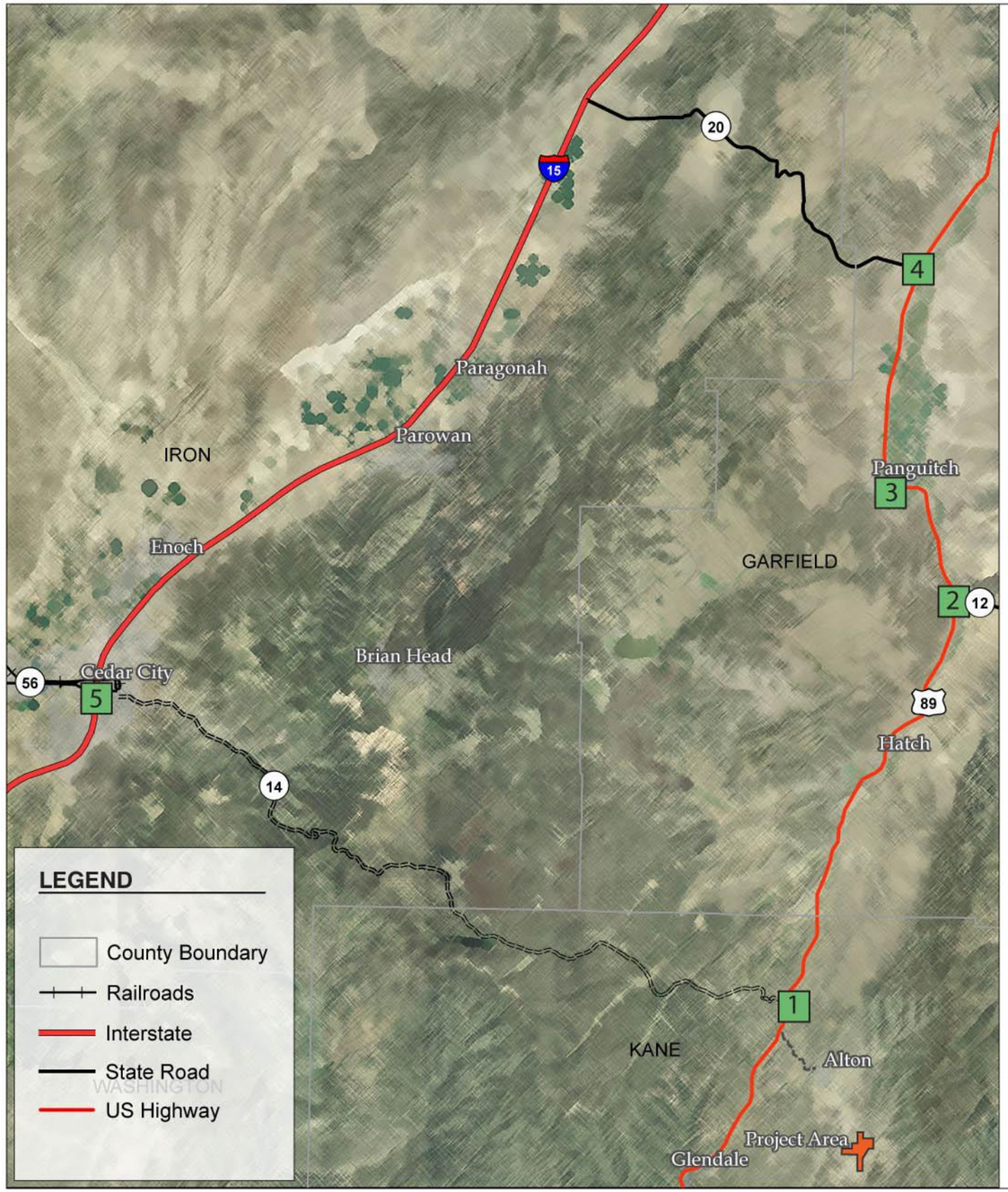
Table 15
Future 2020 p.m. Peak Hour LOS and Delay

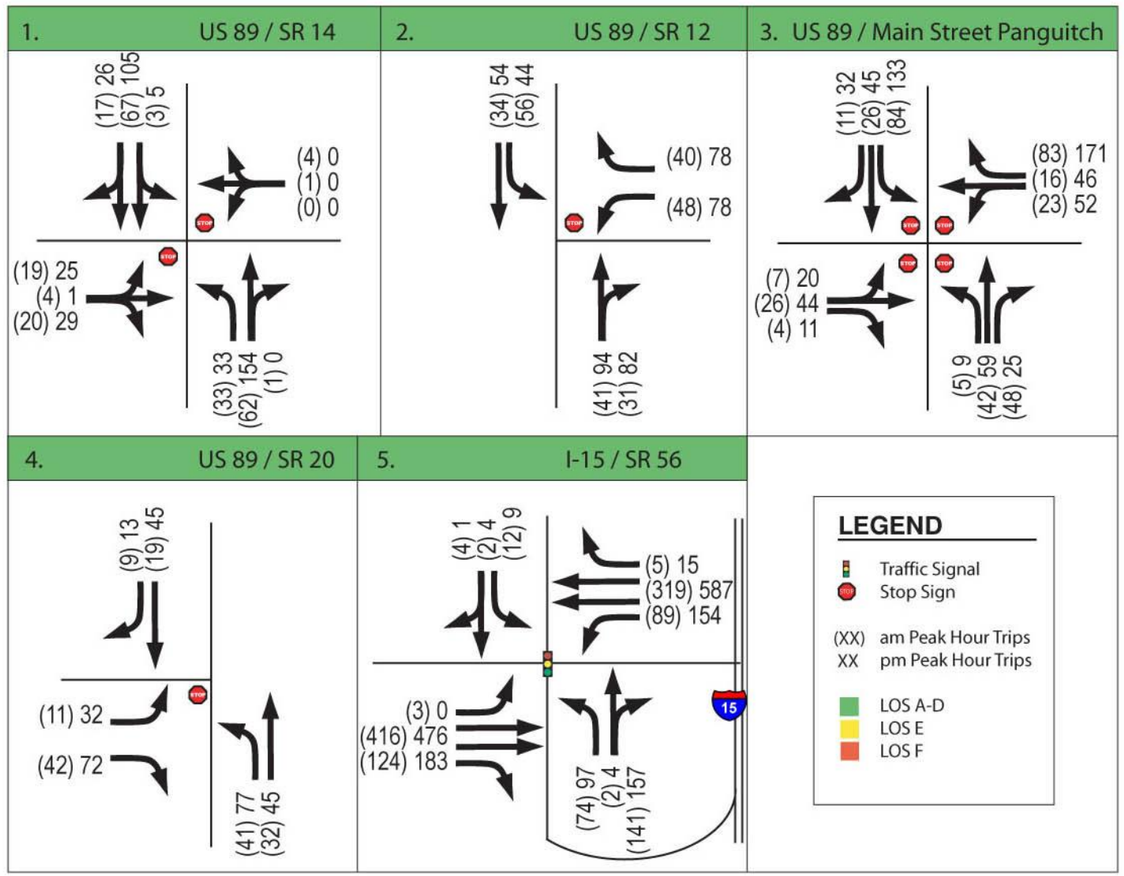
Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	B	10.7	A	2.5
US-89 / SR-12	WB	B	10.1	A	5.0
US-89 / SR-143 (Main St.)	SB	B	10.5	A	9.8
US-89 / SR-20	NB	B	10.1	A	7.7
I-15 SB Off-ramp / SR-56				C	19.5

Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 15, all intersections operate at LOS C or better during the p.m. peak hour.





FEHR & PEERS
TRANSPORTATION CONSULTANTS

FUTURE 2020 A.M. & P.M. TRAFFIC CONDITIONS
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 10

4.3.2. Directional Segment Conditions

Future 2020 background conditions MOEs for the two-lane highway directional segment analysis are reported in LOS and Percent Time-Spent-Following. Table 16 displays the future 2020 weekday and weekend LOS and Percent Time-Spent-Following for the study roadway segments. Figures 11 and 12 show the results of the weekday and weekend directional segment LOS analysis.

Table 16
Future 2020 Directional Segment
Peak Hour LOS and Percent Time-Spent-Following

Intersection	Weekday			Weekend		
	Direction	LOS	% Time-Spent-Following	Direction	LOS	% Time-Spent-Following
US-89: Alton to SR-14	NB	B	45.8	NB	C	51.4
US-89: SR-14 to Hatch	NB	B	49.4	NB	C	54.8
US-89: Center of Hatch[1]	NB	C	95.0	NB	C	99.0
US-89: Hatch to SR-12	NB	B	47.5	NB	B	49.0
US-89: SR-12 to Panguitch	NB	A	33.0	NB	A	34.8
US-89: Panguitch to SR-20	NB	A	32.0	NB	B	39.9
SR-20: US-89 to Upslope	WB	D	35.7	WB	D	49.5
SR-20: Upslope to Summit[2]	WB	A	14.2	WB	A	18.5
SR-20: Summit to Downslope	WB	C	48.8	WB	D	63.0
SR-20: Downslope to I-15	WB	C	40.9	WB	C	55.2

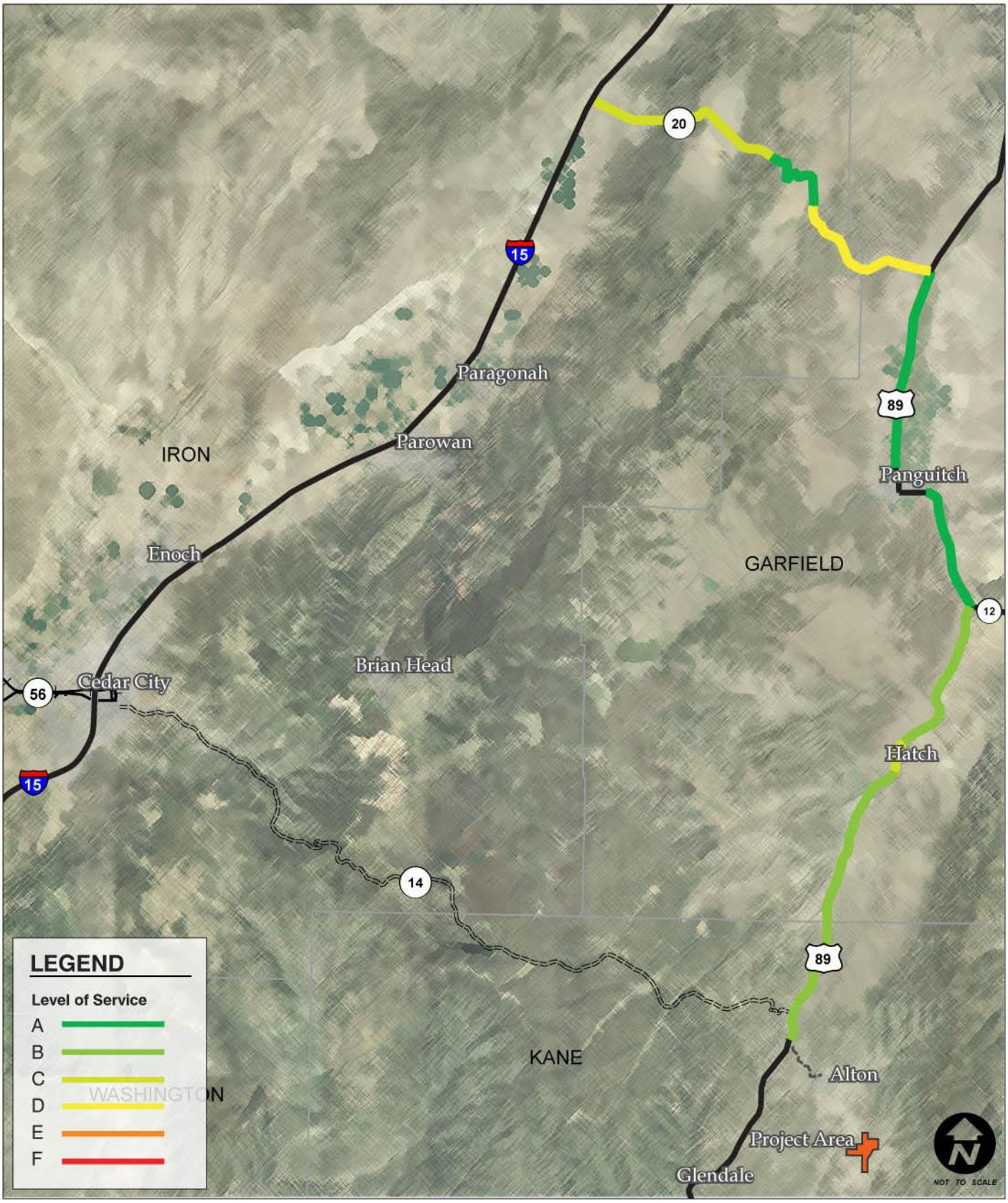
Notes:
1. The analysis for the center of Hatch was done using HCS HIGHPLAN software due to the reduced highway speeds through town.
2. This segment of roadway was analyzed with a passing lane and as a Class II highway due to the low posted speed limit of 35 mph.

Source: Fehr & Peers, 2008

As shown in Table 16, all roadway segments operate at an LOS D or better.

4.4. Future 2020 Background Conditions Summary

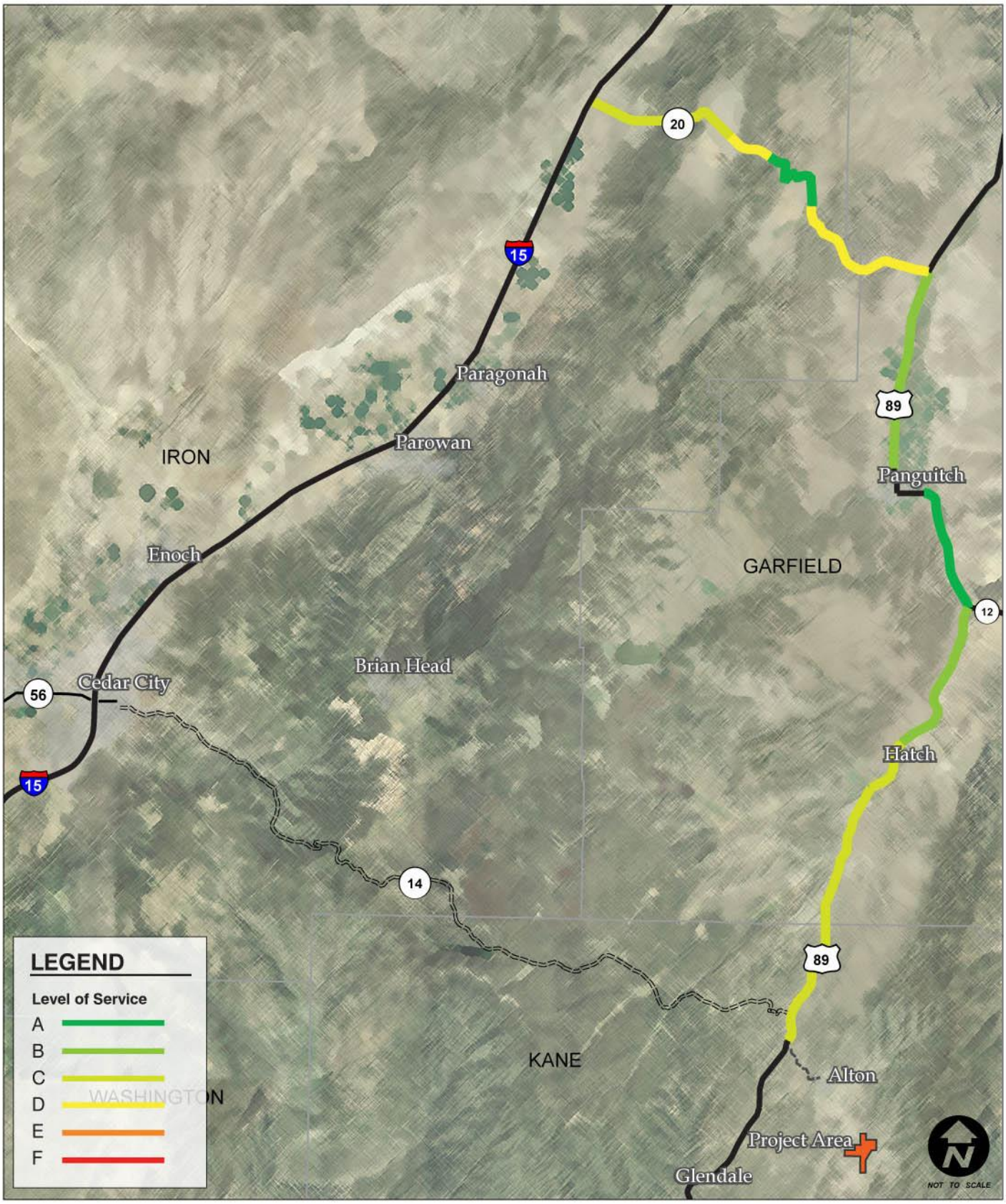
Future 2020 background conditions at the study intersections continue to have low delays per vehicle and little to no congestion. Future 2020 conditions on the study roadways continue to have relatively low traffic volumes and traffic is expected to travel at free flow speeds.



FEHR & PEERS
TRANSPORTATION CONSULTANTS

FUTURE 2020 BACKGROUND
WEEKDAY DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW TRAFFIC TECHNICAL REPORT

FIGURE 11



FEHR & PEERS
TRANSPORTATION CONSULTANTS

FUTURE 2020 BACKGROUND
WEEKEND DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 12

5. Future 2020 Plus Trucks Conditions

This section of the report describes the future 2020 plus trucks study area characteristics. The purpose of the future 2020 plus trucks analysis is to evaluate the intersections and roadways during the peak travel periods of the day under future 2020 traffic and geometric conditions plus the additional coal trucks that are proposed with the project coal mine. Technical data supporting these findings are included in the appendix.

5.1. Roadway Characteristics

The study roadways for the future 2020 plus trucks conditions consists of the same geometry as the existing plus trucks conditions.

5.2. Future 2020 Plus Trucks Traffic Conditions Results

The future 2020 plus trucks conditions analysis was done using HCS software for the unsignalized intersections and Synchro 6.0 software was used for the signalized intersection. HCS was also used for the roadway segment LOS analysis. As a conservative measure seven trucks an hour was used in the analysis.

5.2.1. Intersection Conditions

Future plus trucks conditions MOEs are reported in LOS and delay. Table 17 displays the future 2020 plus trucks a.m. LOS and delay for the study intersections. Figure 13 shows the a.m. and p.m. intersection volumes and LOS results.

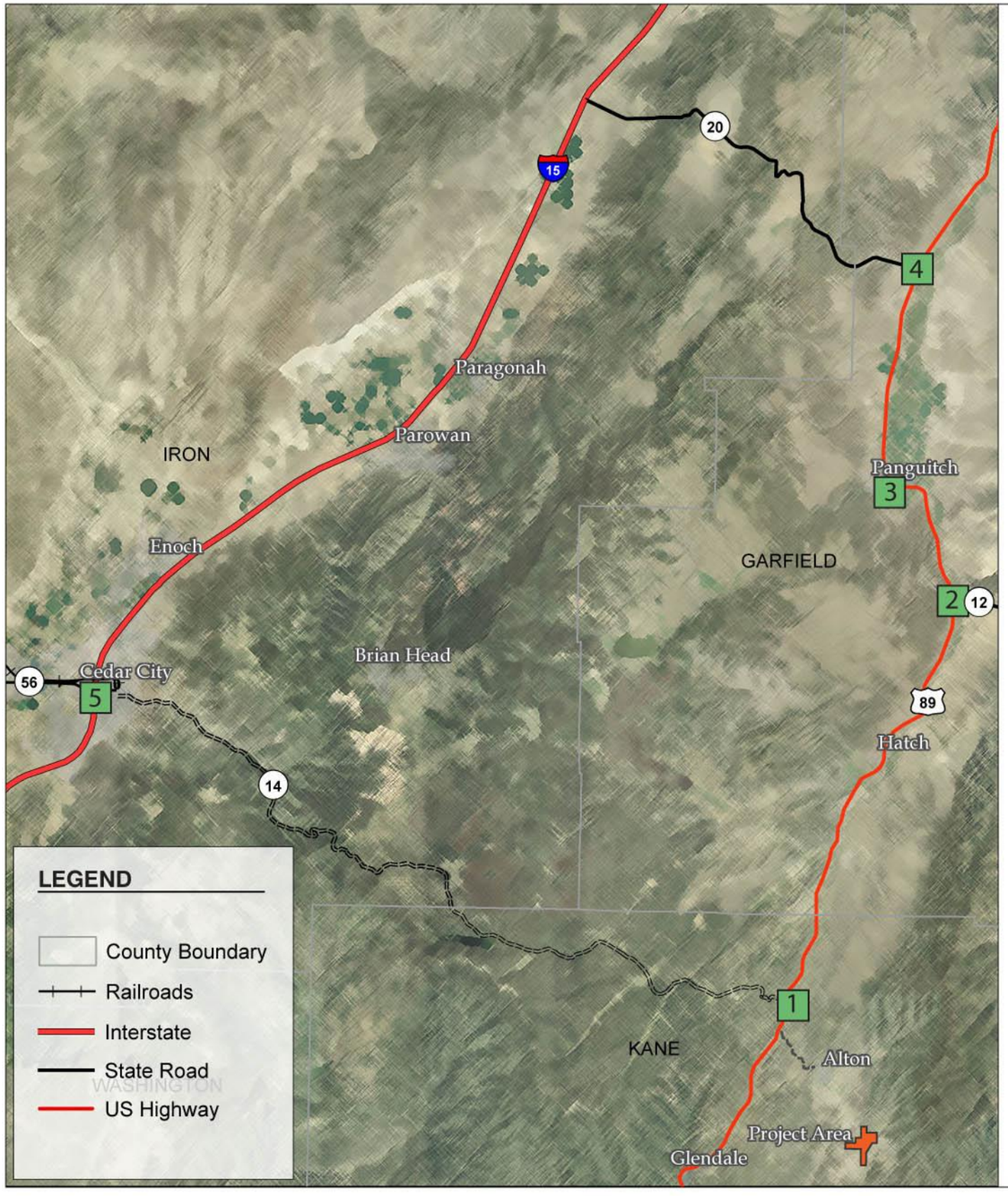
Table 17
Future 2020 Plus Trucks a.m. Peak Hour LOS and Delay

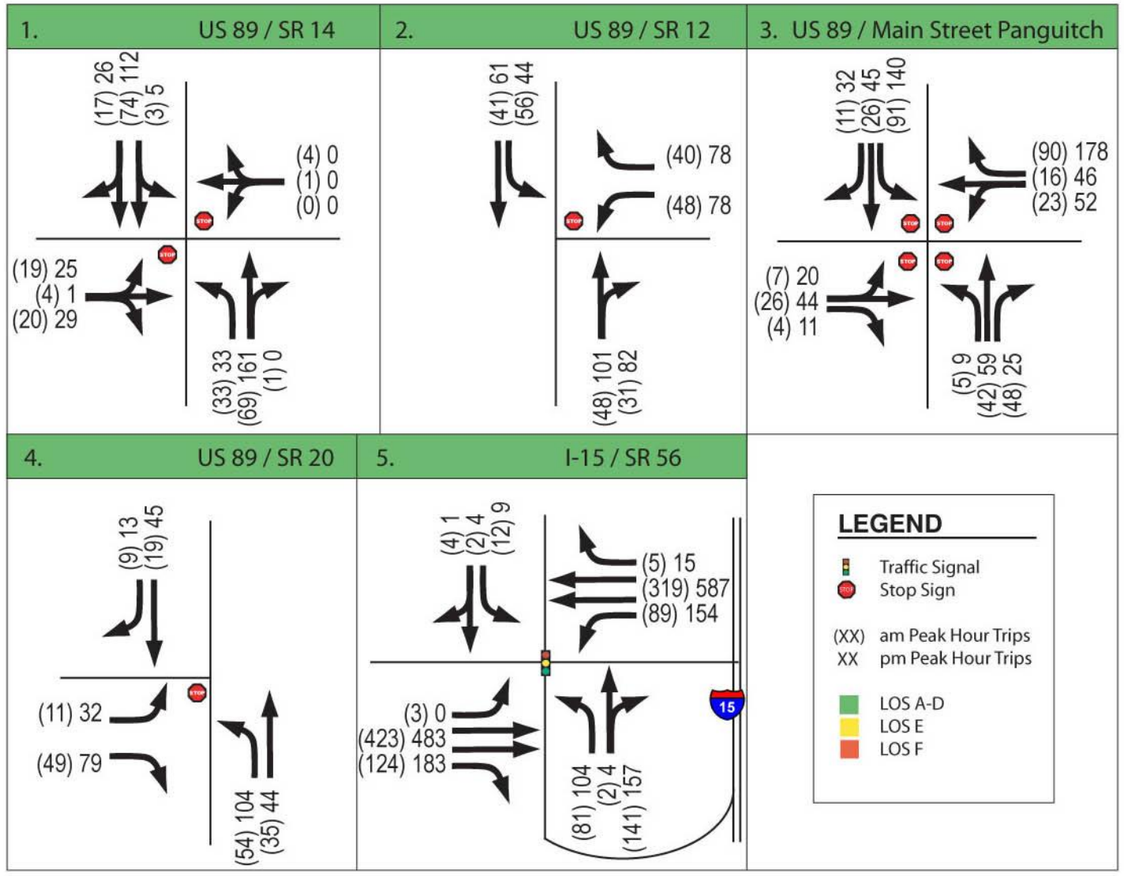
Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	B	10.0	A	3.4
US-89 / SR-12	WB	A	9.9	A	5.2
US-89 / SR-143 (Main St.)	SB	A	9.3	A	8.6
US-89 / SR-20	NB	A	9.6	A	7.9
I-15 SB Off-ramp / SR-56				C	20.2

Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 17, all intersections operate at LOS C or better during the a.m. peak hour.





FEHR & PEERS
TRANSPORTATION CONSULTANTS

FUTURE 2020 PLUS TRUCKS A.M. & P.M. TRAFFIC CONDITIONS
COAL HOLLOW DEVELOPMENT TRAFFIC TECHNICAL REPORT
FIGURE 13

Table 18 displays the future 2020 plus trucks p.m. LOS and delay for the study intersections.

Table 18
Future 2020 Plus Trucks p.m. Peak Hour LOS and Delay

Intersection	Worst Approach[1]			Overall Intersection[2]	
	Approach	LOS	Delay	LOS	Delay
US-89 / SR-14	EB	B	10.8	A	2.4
US-89 / SR-12	WB	B	10.2	A	4.9
US-89 / SR-143 (Main St.)	SB	B	10.8	B	10.0
US-89 / SR-20	NB	B	10.2	A	7.7
I-15 SB Off-ramp / SR-56				B	19.4

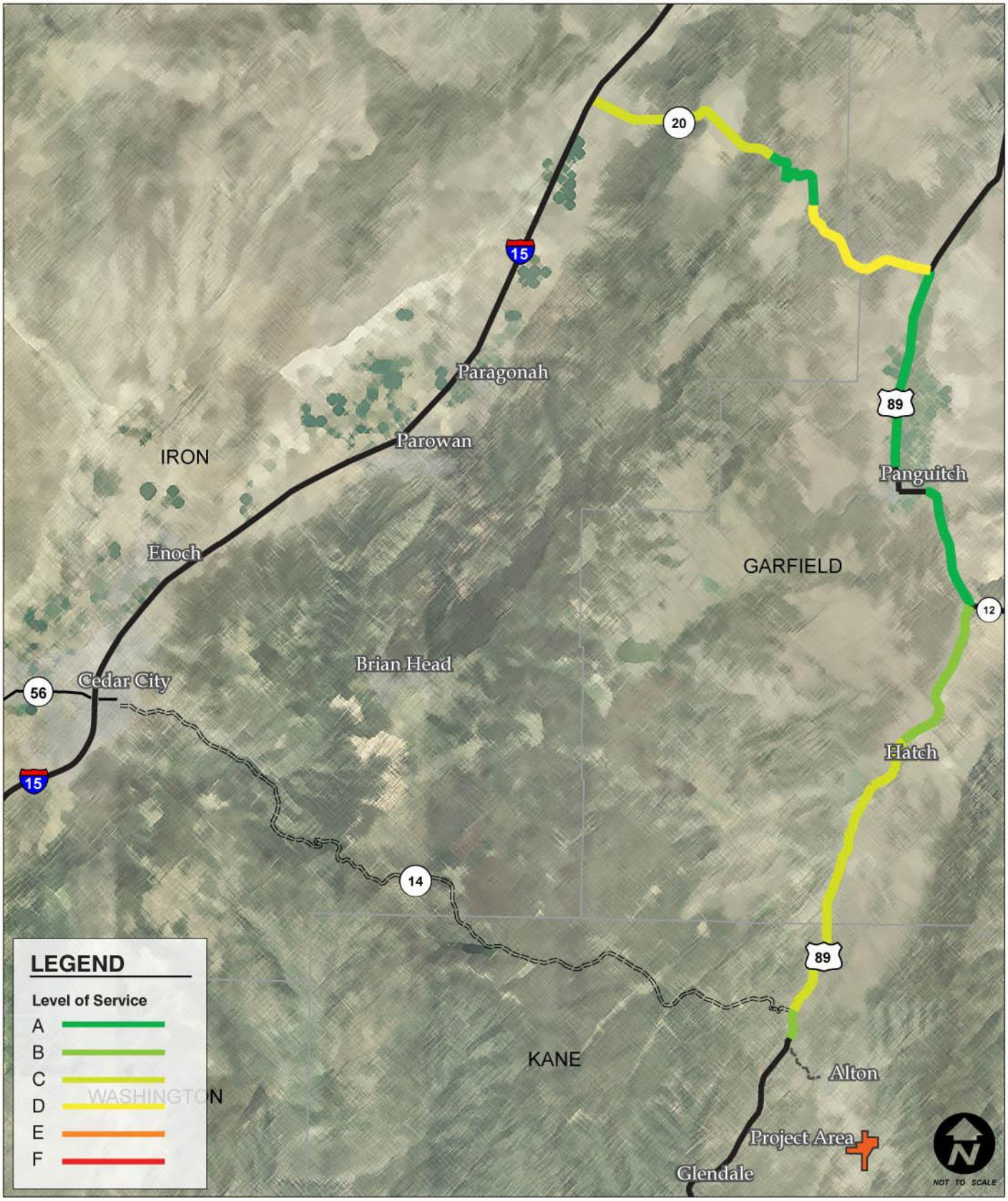
Notes:
1. This represents the worst approach LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).

Source: Fehr & Peers, 2008

As shown in Table 18, all intersections operate at LOS B or better during the p.m. peak hour.

5.2.2. Directional Segment Conditions

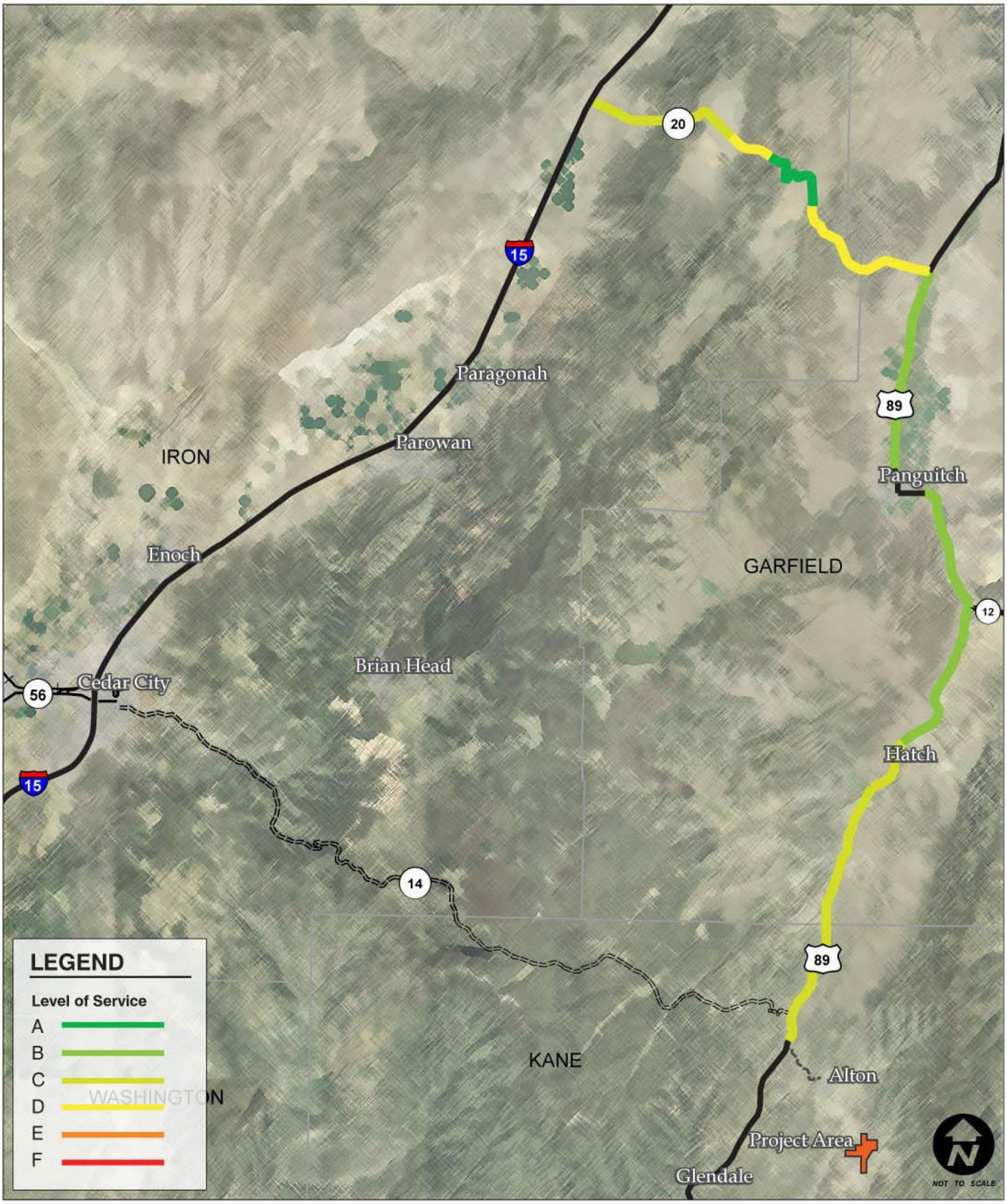
Future 2020 plus trucks conditions MOEs for the two-lane highway directional segment analysis are reported in LOS and Percent Time-Spent-Following. Table 19 displays the existing plus trucks weekday and weekend LOS and Percent Time-Spent-Following for the study roadway segments. Figures 14 and 15 show the results of the weekday and weekend directional segment LOS analysis.



FEHR & PEERS
TRANSPORTATION CONSULTANTS

FUTURE 2020 PLUS TRUCKS
WEEKDAY DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW DEVELPMENT TRAFFIC TECHNICAL REPORT

FIGURE 14



FEHR & PEERS
TRANSPORTATION CONSULTANTS

FUTURE 2020 PLUS TRUCKS
WEEKEND DIRECTIONAL LEVELS OF SERVICE
COAL HOLLOW TRAFFIC TECHNICAL REPORT
FIGURE 15

Table 19
Future 2020 Plus Trucks Directional Segment
Peak Hour LOS and Percent Time-Spent-Following

Intersection	Weekday			Weekend		
	Direction	LOS	% Time-Spent-Following	Direction	LOS	% Time-Spent-Following
US-89: Alton to SR-14	NB	B	47.0	NB	C	52.4
US-89: SR-14 to Hatch	NB	C	50.3	NB	C	55.6
US-89: Center of Hatch[1]	NB	C	96.0	NB	C	99.0
US-89: Hatch to SR-12	NB	B	48.7	NB	B	49.8
US-89: SR-12 to Panguitch	NB	A	34.1	NB	B	35.7
US-89: Panguitch to SR-20	NB	A	33.8	NB	B	41.0
SR-20: US-89 to Upslope	WB	D	36.8	WB	D	50.9
SR-20: Upslope to Summit[2]	WB	A	15.4	WB	A	19.7
SR-20: Summit to Downslope	WB	C	50.3	WB	D	65.8
SR-20: Downslope to I-15	WB	C	42.5	WB	C	56.6

Notes:
1. The analysis for the center of Hatch was done using HCS HIGHPLAN software due to the reduced highway speeds through town.
2. This segment of roadway was analyzed with a passing lane and as a Class II highway due to the low posted speed limit of 35 mph.

Source: Fehr & Peers, 2008

As shown in Table 19, all roadway segments operate at an LOS D or better.

5.3. Future 2020 Plus Trucks Conditions Summary

Future 2020 plus trucks conditions at the study intersections continue to have low delays per vehicle and little to no congestion. Future 2020 plus trucks conditions on the study roadways continue to have relatively low traffic volumes and traffic is expected to travel at free flow speeds. Based upon the accident history, there are not a lot of accidents involving truck traffic.

6. Commonly Used Acronyms

Table 20 Commonly Used Acronyms	
Acronym	**Definition**
ADT	Average Daily Traffic
GPS	Global Positioning System
HCM 2000	Highway Capacity Manual 2000
HCS	Highway Capacity Software
LOS	Level of Service
MOE	Measures of Effectiveness
MP	Mile Post
OSR	Operational Safety Report
UDOT	Utah Department of Transportation

7. References

Transportation Research Board. Highway Capacity Manual 2000. Washington, D. C.: National Research Council, 2000.

Utah Department of Transportation. Operational Safety Report #07-037; US-89, MP 90.04 to MP 156.36 (Glendale to Jct. SR-20). Safety Evaluation. UDOT, 2007.

Utah Department of Transportation. Operational Safety Report #07-038; SR-20, MP 0.00 to MP 20.61. (I-15 to Jct. US-89). Safety Evaluation. UDOT, 2007.

Utah Department of Transportation. Operational Safety Report #07-039; I-15, MP 59.05 to MP 100.02 (Cedar City to SR-20). Safety Evaluation. UDOT, 2007.

Utah Department of Transportation. Operational Safety Report #07-040; SR-56, MP 9.80 to MP 61.39. Safety Evaluation. UDOT, 2007.

Utah Department of Transportation, Division of Traffic and Safety. CARS Codes. UDOT, 2001.