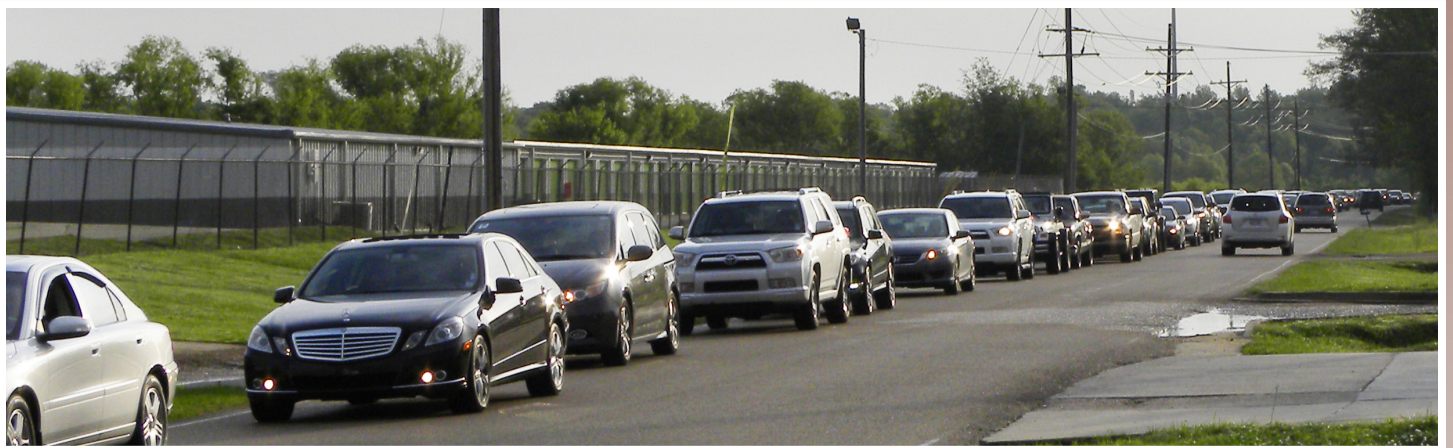


South Madison County Transportation Study

Madison County
M I S S I S S I P P I

May 2016



Prepared for:

Madison County Board of Supervisors

Prepared by:



Contents

- 1.0 Introduction 1
 - 1.1 Project Background 1
- 2.0 Existing Conditions 3
 - 2.1 MS Highway 463..... 3
 - 2.2 Stribling Road..... 4
 - 2.3 Gluckstadt Road 5
 - 2.4 Weisenberger Road..... 7
 - 2.5 Yandell Road 9
 - 2.6 Reunion Parkway..... 9
 - 2.7 Bozeman Road..... 10
 - 2.8 Catlett Road 11
 - 2.9 Parkway East 12
 - 2.10 Traffic Volumes..... 12
- 3.0 Capacity Analysis..... 17
 - 3.1 Methodology..... 17
 - 3.2 Arterial Link Capacity Level-of-Service 17
 - 3.3 Intersection Level-of-Service 19
 - 3.4 Intersection Capacity Limits..... 22
 - 3.5 Peak Hour Movements 24
- 4.0 Future Year Traffic Volumes 25
 - 4.1 Urban Transportation Model 25
 - 4.2 Historical Area Growth 26
 - 4.3 Traffic Forecast 26
 - 4.4 Future Year Traffic w/ Reunion Interchange..... 26
 - 4.5 Future Year Traffic w/ Reunion Interchange & US Hwy 51 Connector 29
- 5.0 Crash Data Summary 29
 - 5.1 Historical Crash Data..... 29
 - 5.2 Crash Totals by Adjacent Intersection..... 31
 - 5.3 Emergency Service Impacts 33
- 6.0 Corridor Improvements – Short Term..... 34
 - 6.1 MS Highway 463..... 34
 - 6.2 Bozeman Road..... 40
 - 6.3 Catlett Road..... 41
 - 6.4 Gluckstadt Road 44
 - 6.5 Yandell Road 46
- 7.0 Long Term Improvements..... 47
 - 7.1 Arterial Widening Projects 47
 - 7.2 New Road Construction..... 50
- 8.0 Future Year Capacity Analysis 52
 - 8.1 Levels-of-Service with Existing Geometry 52
 - 8.2 Link Levels-of-Service in Horizon Analysis Years..... 53
- 9.0 Recommendations and Conclusions..... 56
- Appendix..... 61

LIST OF TABLES

No.	Title	Page
1	2016 Existing Traffic Link Capacity/Level-of-Service – Arterial Roads West of I-55.....	18
2	2016 Existing Traffic Link Capacity/Level-of-Service – Arterial Roads East of I-55	19
3	Signalized Intersections – Year 2016 Existing Traffic Level-of-Service.....	20
4	Unsignalized Intersections – Year 2016 Existing Traffic Level-of-Service.....	21
5	Intersection Movement Theoretical Capacity.....	22
6	Peak Hour – Major Movements.....	24
7	Historical Population Changes	26
8	Crash Data by Roadway Segment	29
9	Crash Rankings by Intersection.....	31
10	Madison Middle School – Existing Westbound Left Turning Traffic Evaluation	35
11	Bozeman Road/MS Highway 463 – Existing Southbound Left Turning Traffic Evaluation	41
12	Signalized Intersections – Year 2030/2040 Level-of-Service w/ Existing Geometry	52
13	Year 2030/2040 Link Capacity/Level-of-Service – Arterial Roads West of I-55	53
14	Year 2030/2040 Link Capacity/Level-of-Service – Arterial Roads East of I-55	54
15	Summary of Short Term Improvements.....	57
16	Summary of Long Term Improvements	59

LIST OF FIGURES

No.	Title	Page
1	Study Area Map.....	2
2	2016 Existing Traffic – Turning Movements - West Study Area.....	13
3	2016 Existing Traffic – Turning Movements – East Study Area	14
4	2016 Existing Traffic – Link Volumes – West Study Area.....	15
5	2016 Existing Traffic – Link Volumes – East Study Area.....	16
6	Existing Link / Intersection Levels-of-Service.....	23
7	Daily Traffic Volumes without Reunion Parkway Interchange	27
8	Daily Traffic Volumes with Reunion Parkway Extension and Interchange.....	28
9	Daily Traffic Volumes with Reunion Parkway Interchange and Hwy 51 Connector	30
10	Six Year Crash Totals.....	32
11	Short Term Improvements.....	58
12	Long Term Improvements	60

APPENDIX

A	Short Term Improvement Graphics	A1-A13
B	<u>Tables & Graphs</u>	B1-B12
	Link Volume Calculation Tables B1-B2	B1-B2
	Table 4-8 FDOT Generalized Peak Hour Directional volumes	B3
	Table 4-2 FDOT Generalized Daily Two-Way volumes	B4
	Weisenberger Railroad Crossing Inventory	B5-B6
	Auxiliary Lane Warrant Graphs	B7-B9
	Functional Classification Map	B10
	Study Area - Crash Frequency Heat Map	B11
	FEMA FIRM Map – Yandell Road Area	B12
C	<u>Crash Data Tables</u>	C1-C14
	MS Hwy 463 C1-C4	Parkway East C11
	Bozeman Road C5	Stribling Rd C12
	Catlett Road C6	Weisenberger C13
	Gluckstadt Rd C7-C9	Yandell Rd C13
	MS Hwy 22 C10	US Highway 51 C14
D	<u>Transportation Model Scenarios</u>	D1-D21
	2013 Base Model Year	D1-D3
	2030 Base + Bozeman Road 4 lane to Reserve Subdivision	D4-D6
	2040 Base + Bozeman Road 4 lane to Reserve Subdivision (Alt 1)	D7-D9
	2040 Alt 1 + Reunion Parkway Phase 2+3/w Interchange (Alt 2)	D10-D13
	2040 Alt 2 + MS Hwy 463 4 lane to Annandale Parkway (Alt 3)	D14-D17
	2040 Alt 3 + Bozeman 4 lane to Gluckstadt, Realign Yandell to Gluckstadt 4 Lane Yandell east to Old Canton, US 51 4 lane to Yandell	D18-D21
E	<u>2016 Existing Geometry Intersection LOS Summary</u>	E1-E53
	2016 AM Signalized Intersection Summary	E1-E15
	2016 PM Signalized Intersection Summary	E16-E29
	2016 AM/PM All-Way Stop LOS	E30-E33
	2016 AM Un-signalized Intersection Summary	E34-E43
	2016 PM Un-signalized Intersection Summary	E44-E53
F	<u>2030 Existing Geometry Intersection LOS Summary</u>	F1-F53
	2030 AM Signalized Intersection Summary	F1-F15
	2030 PM Signalized Intersection Summary	F16-F29
	2030 AM/PM All-Way Stop LOS	F29-F33
	2030 AM Un-signalized Intersection Summary	F34-F43
	2030 PM Un-signalized Intersection Summary	F44-F53
G	<u>2040 Existing Geometry Intersection LOS Summary</u>	G1-G53
	2040 AM Signalized Intersection Summary	G1-G15
	2040 PM Signalized Intersection Summary	G16-G29
	2040 AM/PM All-Way Stop LOS	G29-G33
	2040 AM Un-signalized Intersection Summary	G34-G43
	2040 PM Un-signalized Intersection Summary	G44-G53

1.0 Introduction

The Madison County Board of Supervisors contracted with Neel-Schaffer to provide a planning level study of traffic circulation of selected arterial roadways in south Madison County to help prioritize roadway improvements where the traffic demands are the highest. Specific segments of arterial roadways were identified for inclusion in the planning study, particularly in areas that are experiencing significant congestion levels and travel delays during peak hours. Existing peak hour traffic volumes and horizon year volumes from the urban transportation model were used to evaluate the study area roadways and intersections. The location of the project study area is within south Madison County, including some roadways within the city limits of Madison, Mississippi and is shown in **Figure 1**.

In addition to capacity problems, crash frequency in the study area is a major concern. The volume of crashes has increased as congestion in the corridors has increased. While conducting traffic counts in the study area, multiple intersections had to be recounted due to crashes and that traffic diverted around the crash site. Traffic crashes occurred while we were counting vehicles on 2/25/16, 3/1/16, 3/2/16 and 3/4/16. During each of these events, the crash impacts were significant enough to divert traffic from one route to another due to excessive queues. As traffic crash data was being researched, we discovered that MS Highway 463 has averaged 264 crashes per year for the last 6 years, resulting in a crash every 33 hours (for 6 years). This crash frequency was apparent as we struggled to get traffic counts between rainy weather and significant crashes that changed traffic patterns.

This study did not evaluate interstate capacity or levels of service for I-55. Discussions with MDOT have identified that there is a need for additional thru lanes on I-55 to provide more interstate capacity prior to or concurrent with a new interchange on the Reunion Parkway alignment. MDOT has stated that the agency does not currently have funds budgeted for adding lanes to I-55 between MS Highway 463 and Reunion Parkway nor funds available for the Reunion Parkway interchange construction. Coordination with MDOT is important to the long range planning efforts for Madison County.

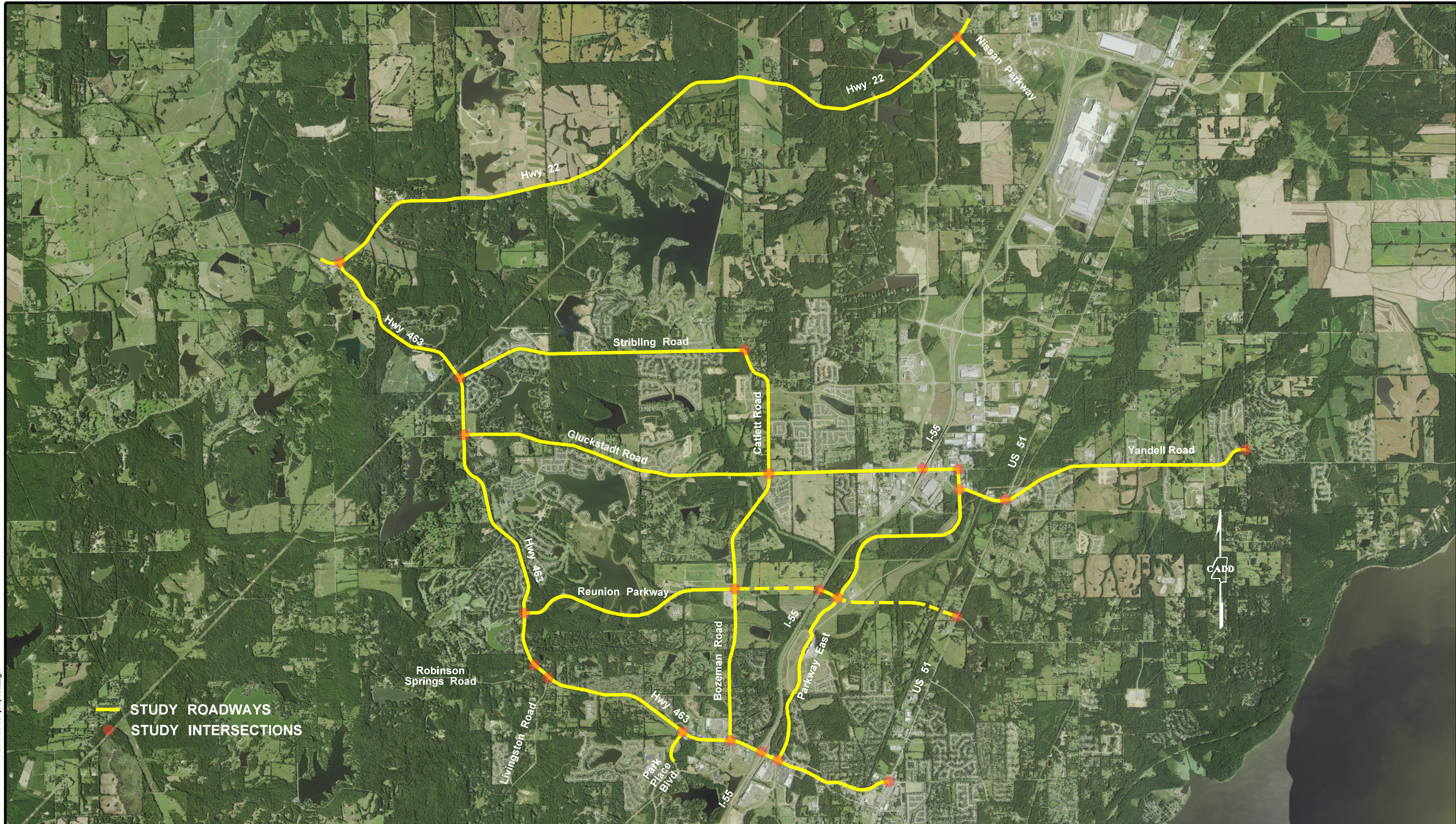
1.1 Project Background

Madison County has experienced significant growth in the past 20 years as urban sprawl has increased the demand for residential development. The corresponding retail growth and school enrollment increases have been equally significant. The City of Madison population has increased from 8,027 in 1990 to 24,262 in 2010, while the County population increased from 54,271 to 95,595 during this same time period, representing a compound annual growth of 5.7% for the city and 2.9% for the County. This growth has included the development of more industry, particularly related to the Nissan manufacturing plant and its suppliers within the I-55 corridor between Gluckstadt and Canton. This growth within the County has put a major strain on the existing roadways and intersections and has resulted in traffic congestion on many of the major routes.

The objectives of the project include:

- 1) Identify the trends in existing traffic volumes and major congestion areas,
- 2) Evaluate horizon year traffic volumes; and,
- 3) Identify short term and long term improvements to help reduce traffic congestion and prioritize future roadway construction projects.

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 STUDY ROADWAYS
 STUDY INTERSECTIONS

2.0 Existing Conditions

2.1 MS Highway 463

MS Highway 463 extends from MS Highway 22, approximately 10 miles to US Highway 51. MS 463 is a rural, two-lane highway with a posted speed limit of 55 mph west/north of Park Place Boulevard. MS 463 was realigned to extend due west of Highland Colony Parkway, rather than the circuitous route using Old Mannsdale Road to the north, in the early 1990's. MS 463 was later widened to 5 lanes between Park Place and Highland Colony Parkway/Bozeman Road in 2003/2004, with 6 lanes from Highland Colony Parkway, across I-55 at the single point urban interchange, to east of Grandview Boulevard. East of Grandview, westbound traffic has two lanes and eastbound traffic 3 lanes, with the 3rd lane dropping at Crawford Street. In 2012, the four lane divided roadway was realigned and extended over the CN-IC Railroad tracks to intersect US Highway 51 at Hoy Road.

MS 463 provides direct access to Mannsdale Elementary, Mannsdale Upper Elementary, St. Joseph Catholic School and Madison Middle School. MS 463 provides indirect access to Madison Station Elementary, Madison Central High School and St. Anthony Catholic School.

Non-residential development along MS 463 includes commercial development at the new Livingston development at MS 22, retail development from Park Place Boulevard east to US Highway 51, isolated church sites at Chapel of the Cross and China Grove Church, Madison Fire Station #3, and the school sites listed. In 2004, the construction of Home Depot and Colony Crossing on the west side of I-55, concurrent with the construction of Walmart on the east side of I-55 generated significant retail traffic near the I-55 interchange. In 2005, the extension of Grandview Boulevard south to Madison Avenue expanded the successful retail development in the area.

Residential development along MS 463 has increased significantly and caused an increase in commuting traffic and school traffic. Left turn lanes were constructed on MS 463 at Madison Middle School and Mannsdale Upper and Lower Elementary Schools. Turn lanes were also constructed at the entrance to Annandale/Reunion Parkway and at the intersection with MS 22.

Congestion along MS 463 is common at the school sites during pick up/drop off times and particularly in the two-lane section from Reunion Parkway to Park Place. The adjacent signalized intersections on each side of I-55 have significant congestion during peak hours. Traffic counts were conducted to evaluate the congestion levels. Southbound traffic queues routinely extend in excess of 3 miles during the AM Peak hour, typically from Annandale to Park Place Boulevard.

Signalized intersections exist in the corridor at:

- | | |
|-------------------------------|----------------------|
| 1- Annandale/Reunion Parkway | 8- I-55 |
| 2- Madison Middle School | 9- Grandview Blvd |
| 3- Park Place Boulevard | 10- Sunny Orchard Dr |
| 4- St. Joseph Catholic School | 11- Welch Farms Rd |
| 5- Colony Crossing Way | 12- Main Street |
| 6- Bozeman Rd/Highland Colony | 13- Post Oak Rd |
| 7-Summer Tree/Woodgreen Dr | 14-US Hwy 51 |

Peak hour commuting traffic volume trends identify a heavy southbound movement in the AM peak and northbound in the PM Peak, along with demand to and from the adjacent schools.

Vehicle detection at the signal at Reunion Parkway/MS 463 has not been effective in recent years. Routine false detection calls significantly reduce the through volume during the AM Peak hour and adversely affect the signal operations, particularly during off peak intervals. The radar detection on the minor street was recently repaired (April 2016) and has been more efficient since the repair. The major street detector is located more than 400 ft from the intersection. The minimum green time on MS Hwy 463 does not appear to be sufficiently long enough for cars to move off the detector and extend the green time, leaving traffic to have very long queues and only providing minimum green time on the major street each cycle. The pavement in the two-lane section of roadway is in poor condition with many areas in need of subgrade repairs.



MS Hwy 463 – Looking west toward Livingston Road

2.2 Stribling Road

In the late 1990's, Lake Caroline subdivision began to grow significantly. By 2004, other subdivisions in the area including: Hartfield, Devlin Springs and Johnstone were all developing residential lots with access to Stribling Road. In 2005, Ashbrooke subdivision began, and in 2007 Hatheway Lake subdivision followed, both with access to Stribling Road. In 2008, the Mannsdale Elementary School opened, and the Upper Elementary Mannsdale School opened in 2015 to accommodate the residential growth north of Gluckstadt Road. In 2009, Madison Crossing Middle School relocated to Calhoun Station Parkway (and was renamed to Germantown Middle School). In 2011, Germantown High School was constructed on Calhoun Station Parkway.

Stribling Road is a two lane rural arterial roadway connecting MS 463 with Catlett Road, a distance of approximately 3.4 miles. The posted speed limit is 45 mph on Stribling Road. In 2015, the intersection of Stribling Road at MS 463 was widened to provide a westbound right turn lane on Stribling Road, to facilitate the flow of traffic to and from the elementary school. Stribling Road is stop controlled at both MS 463 and Catlett Road, with MS 463 and Catlett Road free-flow. Traffic on Stribling Road has significantly increased with the residential development since 2004. The pavement is in poor condition in many areas with obvious base failures.



Stribling Road-Looking east near Hwy 463

2.3 Gluckstadt Road

Gluckstadt Road is an arterial roadway that extends approximately 5.8 miles from MS 463 to Weisenberger Road. The cross section of Gluckstadt Road is a two lane rural arterial roadway from MS 463 to approximately 1/3 mile west of Bozeman Road where the cross section widens to a three lane rural cross section. In 2008/9, Gluckstadt Road was realigned and widened just west of Bozeman Road, and widened to a 3 lane urban cross section east to Distribution Drive. A 2012 project extended the widening of Gluckstadt Road east, to include the extension of Calhoun Station Parkway to Gluckstadt Road from Church Road. In 2015, the new Gluckstadt Road/I-55 interchange project was completed, widening Gluckstadt Road to a four lane divided roadway from Calhoun Station Parkway east to I-55 and to a six lane roadway east to Weisenberger Road.

Gluckstadt Road is stop controlled at MS 463, signalized at Bozeman Road, Calhoun Station Parkway, I-55 SB Ramps, I-55 NB Ramps, Industrial Drive South, and Weisenberger Road. The posted speed limit is 35 mph east of Bozeman Road and 45 mph west of Bozeman Road.



Gluckstadt Road – Looking east between Johnstone and Reunion subdivisions



Gluckstadt Road at Ridgefield Drive, looking west.

The reconstruction of the I-55 interchange at Gluckstadt Road included widening Gluckstadt Road to a 7 lane facility east to Weisenberger Road.



Gluckstadt Road at Industrial Drive, looking west.

2.4 Weisenberger Road

Weisenberger Road transitions from a north/south route connecting Parkway East with Gluckstadt Road at its northwest terminus to an east/west arterial roadway connecting Parkway East with Yandell Road-US Highway 51. The north/south segment is approximately 1,000 LF and the east/west segment is approximately 0.5 miles. There is no posted speed limit on Weisenberger Road between Parkway East and US Highway 51. Weisenberger Road crosses the CNIC Railroad tracks with an at-grade crossing between Parkway East and US Highway 51. The crossing number is identified as #299762H. Bear Creek crosses Weisenberger Road just west of the CNIC at-grade railroad crossing, flowing from south to north. Recent flash flooding in March 2016 caused Weisenberger Road to be closed at Bear Creek.

Weisenberger Road widens at US Highway 51 to provide an eastbound left turn lane and widens at Parkway East to provide a channelized westbound right turn lane and a westbound left turn lane.

The presence of the CNIC railroad parallel to US Highway 51 restricts the roadway crossings to the west. No public crossings of the CNIC railroad exist between Weisenberger Road and MS 463 except a crossing on County Barn Road into North Place subdivision, approximately 0.8 miles north of MS 463. With many of the residential developments east of the CNIC Railroad desiring to commute to destinations to the south where most of the regional employment centers exist, the lack of east/west routes to I-55 puts significant traffic pressure on US Highway 51, Weisenberger Road and MS 463.



Weisenberger Road looking west at CNIC Railroad tracks.

The five-lane section of Weisenberger Road serves as an extension of Parkway East to the north. The primary traffic movements are westbound to northbound in the AM and southbound to eastbound in the PM.



Weisenberger Road – Looking north at Gluckstadt Road.

2.5 Yandell Road

Yandell Road extends east of US Highway 51 as a rural two lane arterial roadway with a posted speed limit of 40 mph. Madison Crossing Middle School began in 2006 and relocated in 2009 to Germantown Middle School, transforming the campus to Madison Crossing Elementary School. Commuters and school traffic have continued to increase on Yandell Road, creating significant congestion and delays at the US Highway 51/Yandell Road/ Weisenberger Road intersection. The proximity to Jackson, Nissan and suppliers, Gluckstadt Industrial Park and good local schools have drawn many residents to Yandell Road in recent years. No auxiliary lanes exist along Yandell Road, except at the intersection with US Highway 51. The thru lane shifts north at US Highway 51 to create a left turn lane, with an abrupt lane shift that does not meet minimum standards for horizontal shift. The short storage length available provided in this left turn lane was observed to block the use of the thru lane by left turning traffic.



Yandell Road – Looking east at entrance to Madison Crossing Elementary School.

2.6 Reunion Parkway

Reunion Parkway is an arterial roadway that was constructed to connect MS Highway 463 with Bozeman Road. The east end of the Parkway was constructed in 2005, concurrent with the opening of Madison Station Elementary school. The Parkway was extended west to MS Highway 463 in 2008. The roadway is a four lane divided roadway with curb and gutter extending 2.6 miles from MS 463 to Bozeman Road. The posted speed limit is 45 mph with reduced speeds in the school zone when children are present.

When Reunion subdivision began development, a temporary access to MS 463 intersected near Annandale at Vinca Cove. The temporary access was removed in 2011, thus diverting more traffic to the Reunion Parkway access. There are only four access points to Reunion Parkway within the 2.6 mile corridor. Reunion subdivision has a single access to Reunion Parkway at Honours Drive. Madison Middle School has two driveways on Reunion Parkway and the new Parkway Church has a single driveway on Reunion Parkway.

Future plans for Reunion Parkway include a new roadway extending east of Bozeman Road to an interchange with I-55, then east to Parkway East, bridging over the CNIC Railroad, before terminating at US Highway 51 at Green Oak Lane.



Reunion Parkway – Looking west near Bozeman Road

The section of Reunion Parkway proposed between Parkway East and US Highway 51 is designated as “Phase 3.” Madison County recently selected an engineer for Phase 3, as the \$4.4 million in federal funds have been allocated for this project through Central Mississippi Planning and Development District (CMPDD).

2.7 Bozeman Road

Highland Colony Parkway changes names north of MS 463 to Bozeman Road. Bozeman Road extends north of MS 463 as a five lane roadway, that quickly narrows to 3 lanes at Colony Crossing Way and then to two lanes north to Gluckstadt Road. At its northern end, the intersection of Bozeman Road with Gluckstadt Road is a signalized intersection with split phasing north/south.

Bozeman Road provides access to the Colony Crossing retail plaza and numerous residential subdivisions along Bozeman Road and Mannsdale Road. Residential subdivisions include: Ingleside, Devereaux, The Reserve, Cherry Hill Plantation, and Belle Terre. Bozeman Road is the eastern-most north/south route parallel to I-55 on the west side of I-55. Interchanges with I-55 exist to the north at Gluckstadt Road and to the south via MS Highway 463. Southbound commuting traffic routinely queues in excess of 0.5 miles from MS Highway 463 north. The single (narrow) southbound thru lane on Bozeman Road connects to a two-way left turn lane (TWLTL) and short section of a dual left turn lane at the traffic signal at MS 463. The posted speed limit is 35 mph from The Reserve south, and 45 mph north of The Reserve.

Widening Bozeman Road to a four lane divided roadway has been discussed as a critical County project in recent years. The Environmental Assessment is planned to begin in May 2016 for Bozeman Road.



Bozeman Road – Looking north, south of Gluckstadt Road

2.8 Catlett Road

As Bozeman Road extends north across Gluckstadt Road, the roadway changes names to Catlett Road. The intersection of Bozeman Road/Catlett Road with Gluckstadt Road widens to provide exclusive left turn lanes on each approach and channelized right turn lanes. The east/west right turn lanes on Gluckstadt Road extend 200 ft from the intersection, while the north/south right turn lanes only have a channelized island but provide a 200 ft acceleration lane for merging onto Gluckstadt Road. The heavy southbound left turn movement in the AM peak creates the need for the north/south split phasing for the traffic signal. No other auxiliary turn lanes exist on Catlett Road. Two reverse curves exist on Catlett Road between Stribling Road and Stribling Road Extension. The flashing warning signs for the curve do not appear to be functioning properly for southbound traffic.



Catlett Road – Looking north toward Stribling Rd Extension

2.9 Parkway East

The north/south arterial roadway parallel to I-55 on the east side, between MS 463 and Gluckstadt Road is Galleria Parkway and Parkway East. The south portion was constructed in 2005/6 as a four lane divided roadway, extending north of MS 463 to just south of the (proposed) Reunion Parkway alignment. Parkway East was extended north in 2008/9 to extend the four lane divided roadway north to Gluckstadt Road. The posted speed limit is 45 mph on Parkway East. Signalized intersections exist at Gluckstadt Road, Weisenberger Road and MS Hwy 463.



Parkway East – Looking north, south of Weisenberger Road

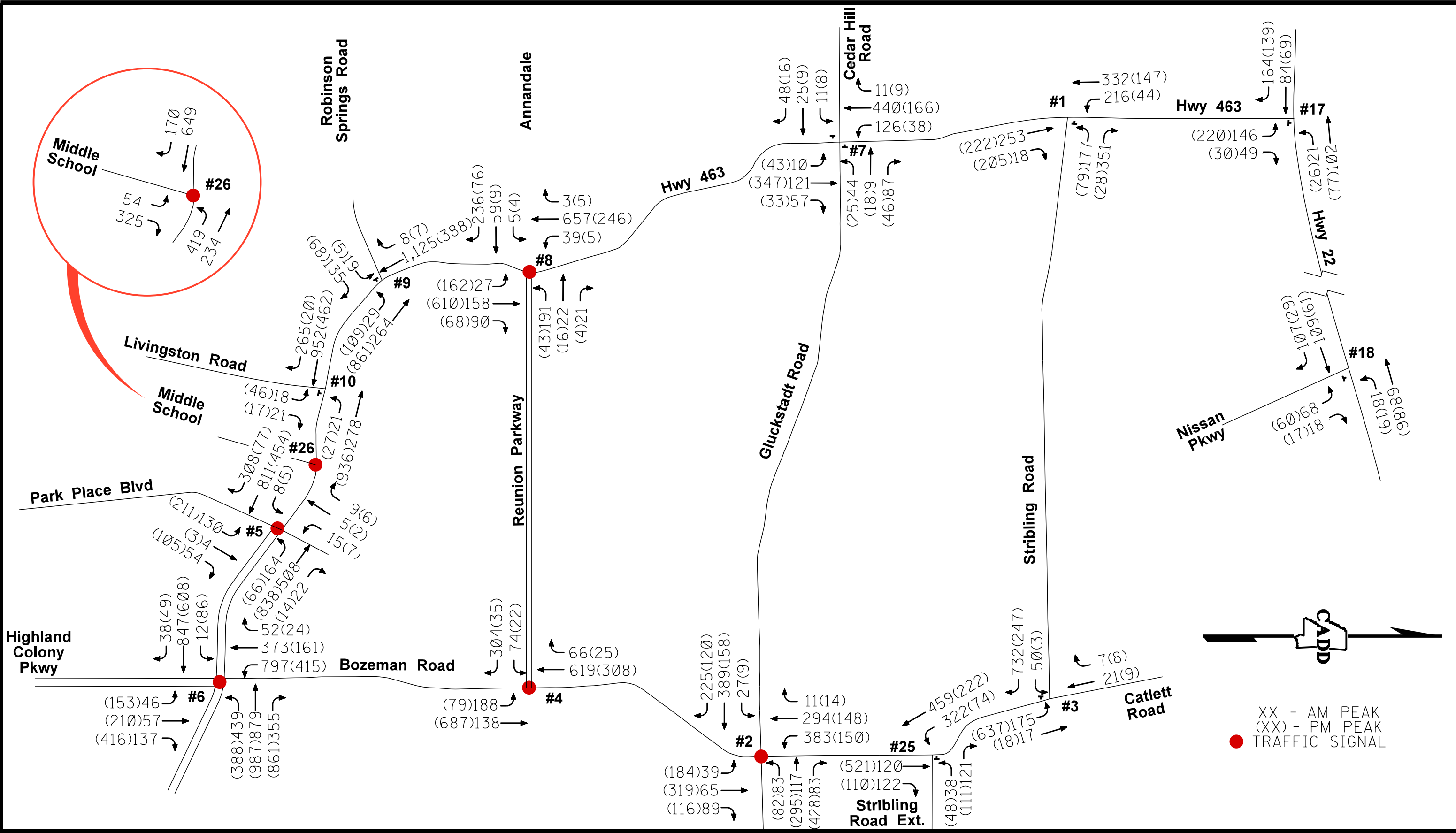
2.10 Traffic Volumes

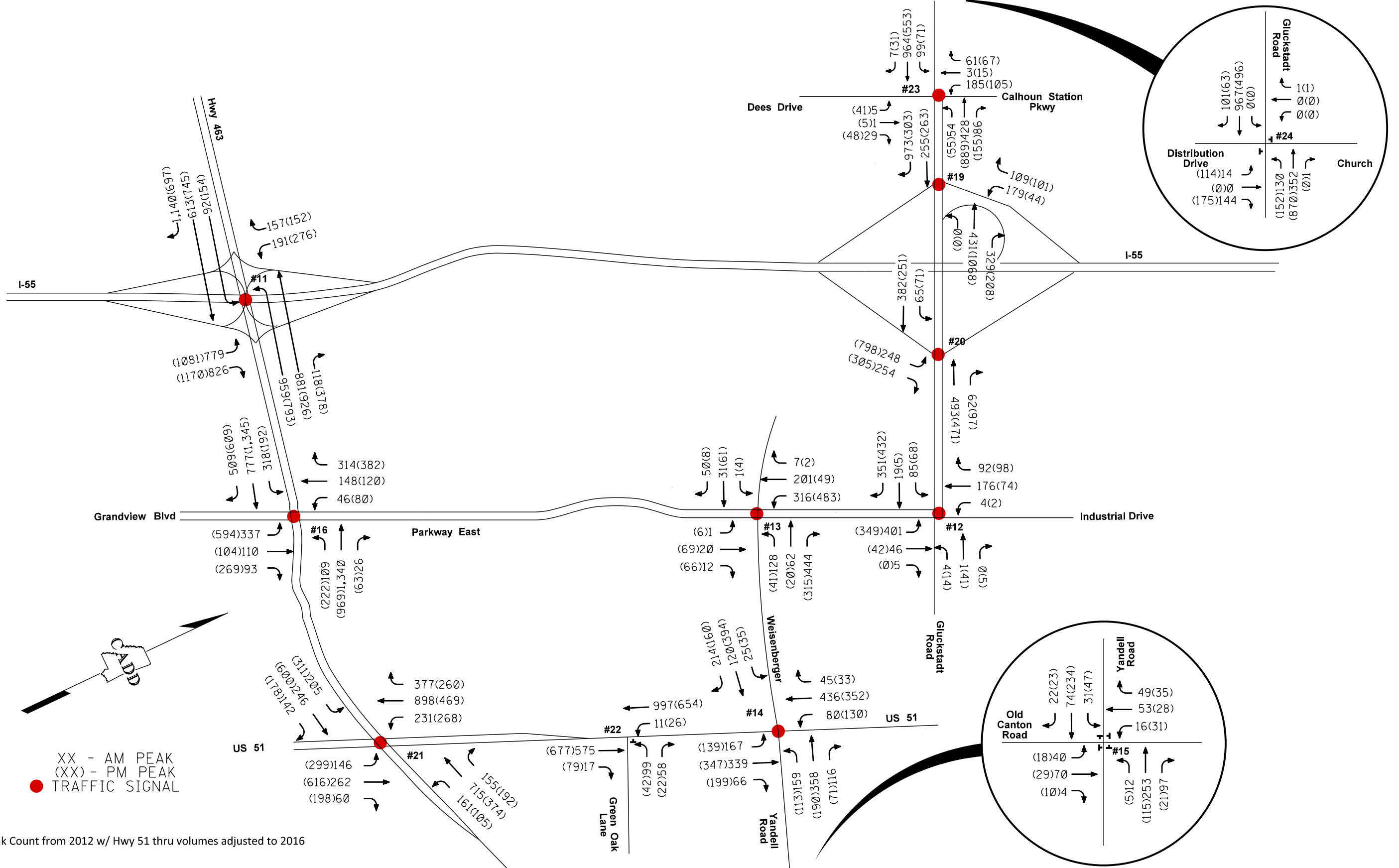
Peak hour turning movement counts were collected at the major study intersections, primarily from 6:45-8:45 AM and from 4:00-6:00 PM. Traffic volumes are usually collected on typical weekdays in good weather. Typical weekdays generally exclude counts on Monday mornings and Friday afternoons. The data collection effort was affected by the recurrence of multiple wrecks and rainy weather. Wrecks on MS 463 near Fairfield (2/25 AM) and on MS 463 near Robinson Springs Road (3/3 PM) affected traffic counts during these peaks. A wreck on I-55 on 3/1 resulted in many southbound I-55 vehicles exiting and diverting to Industrial Drive North and Parkway East. Several of these traffic counts had to be recounted to get data that wasn't skewed by traffic diverting from delays associated with these wrecks. Rainy weather occurred during each count week and traffic counts were not scheduled to be collected when the forecast called for rain. Traffic counts were not collected for the two week period spanning the Madison County schools Spring Break (March 7-11) and other local schools and colleges Spring Breaks (March 14-18), as volumes would have been below typical weekday traffic volumes.

Peak hour volumes are limited in many intersections by the capacity of the intersection, as the traffic demand exceeds the capacity in the peak direction. In many cases, traffic volumes are at capacity or exceed capacity on the arterial roadways in the peak direction particularly during the AM Peak hour for traffic accessing local schools and traveling toward the south to access I-55.

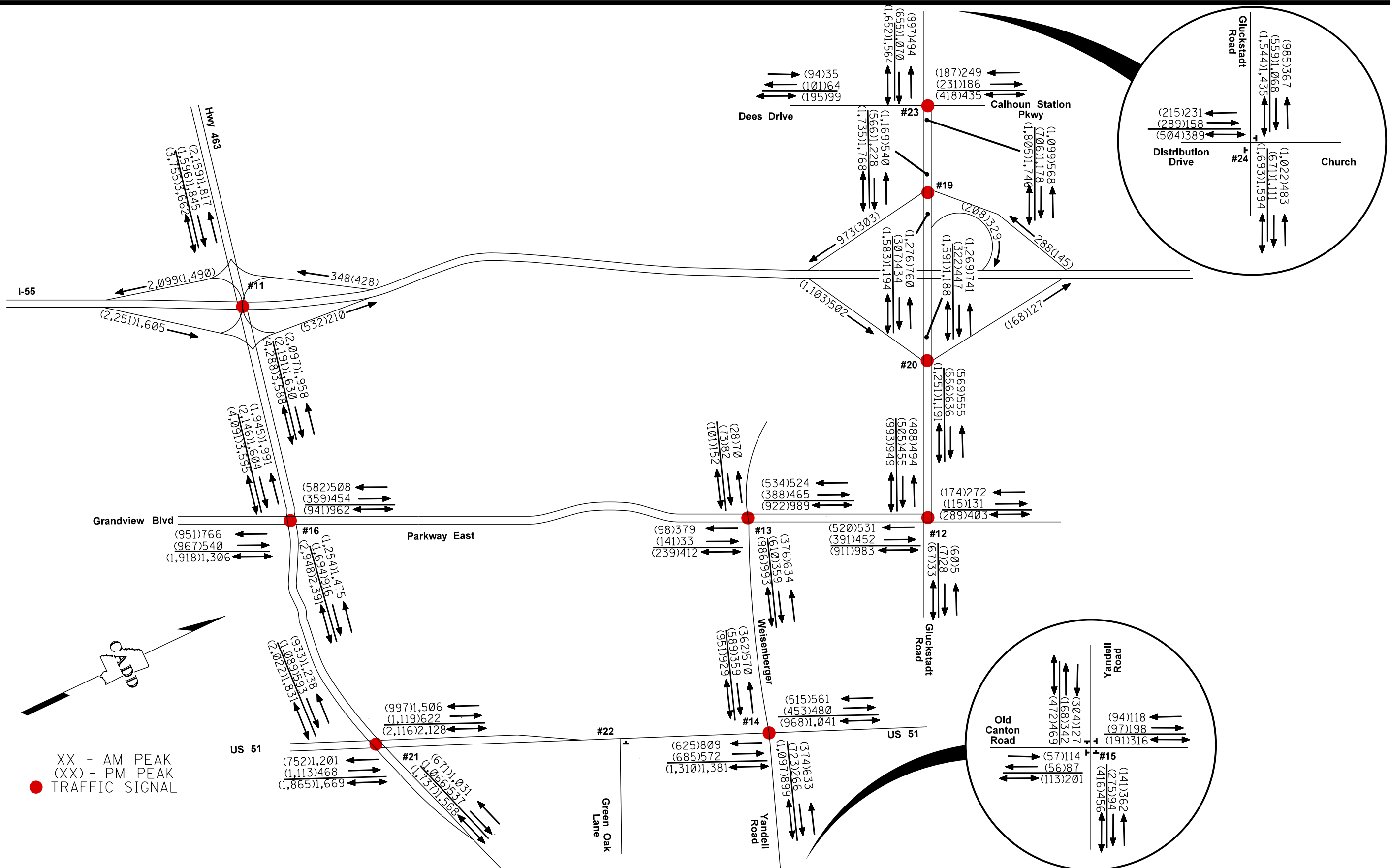
Existing (2016) peak hour turning movement volumes are shown graphically in **Figures 2-3** (Figure 2-west study area and Figure 3-east study area) and peak hour link volumes are shown in **Figures 4-5** (Figure 4-west study area and Figure 5-east study area).

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3.0 Capacity Analysis

3.1 Methodology

The capacity and level-of-service (LOS) of an intersection is evaluated based on the average vehicular delay during the peak hour periods. The vehicular delays are directly related to the turning movement volumes, traffic composition, traffic control and roadway geometrics at the intersection. The methodology utilized in this analysis is based on the *Highway Capacity Manual*, 2010 Edition (HCM 2010). The level-of-service, as outlined in the HCM, is reported as a letter designation of LOS A through LOS F (A is least delay, E is capacity, and F is over capacity and experiences the most delay). The traffic volumes recorded at the study intersections during the AM and PM peak hours were analyzed using the information provided in the HCM

The Florida Department of Transportation (FDOT) Quality and Level-of-Service Manual provides planning level capacity for bidirectional hourly traffic volumes for roadways. Table 4-8 from the planning manual identifies that for State two-way arterials, a two lane highway in an area transitioning into an urbanized area with 0-1.99 signalized intersections per mile would have a peak hour capacity of approximately 860 vph in the peak direction. As density of traffic signals increases, the capacity decreases. While intersections are typically the controlling factors on capacity on a roadway, the link volumes are indicative of capacity limitations as well. The FDOT LOS tables are provided in the Appendix.

3.2 Arterial Link Capacity Level-of-Service

The intersection turning movement counts were used to develop link volumes on the east and west sides of the intersections. These 2016 arterial roadway link volumes were compared to the planning level capacity volumes to identify the planning level link levels of service. The study area was divided by I-55, as the traffic flows west of I-55 tend to operate independent of the traffic volume east of I-55, as I-55 is a primary generator/ attractor of much of the peak hour traffic volumes.

The results of the arterial roadway link analysis are provided in **Table 1** for arterial roadway links west of I-55.

Table 1 – 2016 Existing Traffic
Link Capacity/Level-of-Service – Arterial Roads West of I-55

Segment (From-To)	Link Volume AM		Link Volume PM		Link LOS	
	NB/WB	SB/EB	NB/WB	SB/EB	AM	PM
<u>MS Hwy 463:</u>						
Hwy 22-Stribling Rd	604	548	250	191	C	C
Stribling Rd-Gluckstadt Rd	271	577	427	226	C	C
Gluckstadt Rd-Reunion Pkwy	188	699	618	256	D	C
Reunion Pkwy- Robinson Spgs	283	1,133	866	395	F	F
Robinson Spgs-Livingston Rd	296	1,260	982	482	F	F
Livingston Rd-Park Place Blvd	647	1,127	1,055	536	F	F
Park Place Blvd-Bozeman/HCP	977	897	1,164	743	D	D
Bozeman Rd/HCP - I-55	1,817	1,845	2,236	1,596	D	E
<u>MS Hwy 22:</u>						
W. of 463-MS 463	248	248	297	208	C	C
MS 463-Nissan Pkwy	136	216	146	99	C	B
Nissan Pkwy-E. of Nissan	86	127	105	78	B	B
<u>Stribling Road:</u>						
MS 463-Dewees Road	528	234	107	249	C	C
Dewees Road-Catlett Rd	182	782	645	250	D	C
<u>Stribling Road Extension:</u>						
Catlett Rd-E. of Catlett Rd	159	444	159	184	C	B
<u>Gluckstadt Road:</u>						
MS 463-Dewees Rd	140	208	89	80	B	B
Dewees Rd-Bozeman Rd	167	641	493	287	C	C
Bozeman Rd-Distribution Dr	367	1,068	985	559	F	F
Distribution Dr-Calhoun Stn Pkwy	494	1,111	1,022	671	F	F
Calhoun Stn Pkwy-I-55 SB	568	1,228	1,169	706	D	D
<u>Reunion Parkway:</u>						
MS 463-Honours Drive	234	188	63	82	A	A
Honours Dr-Bozeman Rd	254	378	104	57	B	A
<u>Catlett Road:</u>						
Stribling Rd-Stribling Rd Ext	241	781	655	296	D	C
Stribling Rd Ext-Gluckstadt Rd	242	688	756	312	C	D
<u>Bozeman Road:</u>						
Gluckstadt Rd-Reunion Pkwy	212	685	709	350	C	D
Reunion Pkwy-MS 463	424	1,222	1,157	600	F	F

Source: Neel-Schaffer, 2016, FDOT Quality/Level-of-Service Manual Table 4-8.

The evaluation of the arterial link volumes on the west side of I-55 (from a planning level capacity analysis of link volumes) reveals that existing traffic volumes exceed link capacity during both the AM and PM peak hours on:

- MS 463 from Reunion Parkway to Park Place Boulevard
- Gluckstadt Road from Bozeman Road to Calhoun Station Parkway, and
- Bozeman Road from Reunion Parkway to MS 463.

An evaluation of the arterial traffic volumes on the east side of I-55 is shown in **Table 2**.

Table 2 – 2016 Existing Traffic
Link Capacity/Level-of-Service – Arterial Roads East of I-55

Segment	Link Volume AM		Link Volume PM		Link LOS	
	NB/WB	SB/EB	NB/WB	SB/EB	AM	PM
<u>MS Hwy 463:</u>						
I-55 – Grandview Blvd	1,991	1,630	2,097	2,191	D	D
Grandview Blvd – Hwy 51	1,475	916	1,254	1,694	C	C
<u>Gluckstadt Road:</u>						
I-55 NB Ramps-Weisenberger Rd	555	636	569	556	C	C
<u>Weisenberger Road:</u>						
Gluckstadt Rd-Denim Way	465	531	391	534	B	B
Parkway East-Hwy 51	634	359	376	610	C	C
<u>Yandell Road:</u>						
Hwy 51-Clarkdell Rd	633	266	374	723	C	D
Clarkdell Rd to Old Canton Rd	342	127	168	304	C	C
<u>Parkway East:</u>						
Weisenberger Rd-Reunion Pkwy	33	379	239	98	C	C
<u>Galleria Parkway:</u>						
N. of Hwy 463 to Hwy 463	454	508	359	582	C	C
<u>US Highway 51:</u>						
N. of Yandell Rd-Yandell Rd	480	561	453	515	C	C
Yandell Rd-Green Oak Dr.	572	809	685	625	D	C
Green Oak Dr.-Hwy 463 (5-Lane)	622	1506	1119	997	D	C

Source: Neel-Schaffer, 2016, FDOT Quality/Level-of-Service Manual Table 4-8.

The evaluation of the arterial roadway link volumes on the east side of I-55 (from a planning level capacity analysis of link volumes) reveals that existing traffic volumes do not exceed link capacity during the AM or PM peak hours with existing traffic. Link volumes are good indicators of capacity constraints, but intersections typically dictate the operational level of service and capacity of roadways. Visual reviews of Yandell Road would reveal that this link is affected by the intersection at US Highway 51 in the AM peak.

3.3 Intersection Level-of-Service

The 2016 existing traffic volumes were analyzed using the existing intersection geometrics and peak hour traffic volumes based on the information provided in the Highway Capacity Manual (HCM 2010). The results of the capacity analysis are shown in **Table 3** for signalized intersections and **Table 4** for unsignalized intersections.

Table 3- Signalized Intersections
Year 2016 Existing Traffic Level-of-Service

Signalized Intersection	Time Period	Approach LOS				Intersection LOS
		EB	WB	NB	SB	
Reunion Pkwy/ MS Hwy 463#8	AM Peak	D	D	B	F	E
	PM Peak	D	C	A	A	B
Park Place Blvd MS Hwy 463#5	AM Peak	F	C	D	C	F
	PM Peak	D	F	D	C	F
Bozeman HCP/ MS Hwy 463#6	AM Peak	E	D	D	D	D
	PM Peak	C	C	D	D	D
I-55 Ramps/ MS Hwy 463#11	AM Peak	D	C	D	C	D
	PM Peak	D	E	D	C	E
Grandview Blvd/ MS Hwy 463#16	AM Peak	C	D	D	E	D
	PM Peak	D	D	D	E	D
US Hwy 51/ MS Hwy 463#21	AM Peak	D	D	C	D	D
	PM Peak	D	D	D	C	D
Bozeman Rd/ Gluckstadt Rd-#2	AM Peak	C	B	D	C	C
	PM Peak	B	B	C	C	C
Bozeman Rd/ Reunion Pkwy#4	AM Peak	D	-	B	C	C
	PM Peak	C	-	A	A	A
Calhoun Stn Pkwy Gluckstadt Rd#23	AM Peak	E	B	C	E	D
	PM Peak	A	B	C	C	B
I-55 SB Ramps/ Gluckstadt Rd#19	AM Peak	B	A	-	C	B
	PM Peak	A	A	-	C	A
I-55 NB Ramps/ Gluckstadt Rd#20	AM Peak	A	A	C	-	B
	PM Peak	A	B	C	-	C
Weisenberger Rd/ Gluckstadt Rd#12	AM Peak	C	D	A	A	A
	PM Peak	C	C	A	A	B
Parkway East/ Weisenberger#13	AM Peak	C	C	B	A	B
	PM Peak	C	C	B	A	B
US Hwy 51/ Yandell Rd#14	AM Peak	E	C	C	C	C
	PM Peak	F	B	E	C	D

Source: Neel-Schaffer, 2016. HCM 2010

Signalized intersections were shown to be at/over capacity on MS Hwy 463 at Reunion Parkway (AM), MS Hwy 463 at Park Place Boulevard (AM & PM), and MS Hwy 463 at I-55 Ramps (PM). Approaches are at or over capacity on Grandview Boulevard (SB - AM & PM) at Hwy 463, Calhoun Station Parkway/Gluckstadt Road (AM) and US Hwy 51/Yandell Road-Weisenberger Road. These intersections are key commuting corridors with few alternatives for residents. MS Highway 463, Gluckstadt Road and Yandell Road experience significant AM Peak hour traffic queues for commuting traffic.

The AM Peak hour westbound movement for Yandell Road does not reveal a failing LOS; however, observed delays reveal that this movement exceeds capacity. The recorded volume does not necessarily reflect the demand volume, as the uneven spacing and gaps in queue advancements can cause the traffic signal to cycle to the next approach even when there is a constant demand. As a result, the recorded volume is not reflective of the demand volume, as many autos that would have entered the intersection are waiting in a queue and cannot traverse the intersection when they arrive. The westbound approach did not clear the entire queue between 7:00 AM and 8:15 AM.

Table 4 – Unsignalized Intersections
Year 2016 Existing Traffic Level-of-Service

Unsignalized Intersection	Time Period	Critical Movement Level of Service											
		Eastbound			Westbound			Northbound			Southbound		
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
MS Hwy 463/ MS Hwy 22 #17	AM Peak	-	-	-	A	-	-	B	-	A	-	-	-
	PM Peak	-	-	-	A	-	-	B	-	A	-	-	-
MS Hwy 463/ Stribling Road #1	AM Peak	-	-	-	F	-	D	-	-	-	A	-	-
	PM Peak	-	-	-	C	-	B	-	-	-	A	-	-
MS Hwy 463/ Gluckstadt Rd #7	AM Peak	D	D	D	E	E	E	A	-	-	A	-	-
	PM Peak	B	B	B	C	C	C	A	-	-	A	-	-
MS Hwy 463/ Robinson Spgs #9	AM Peak	F	-	F	-	-	-	B	-	-	-	-	-
	PM Peak	B	-	B	-	-	-	A	-	-	-	-	-
MS Hwy 463/ Livingston Rd #10	AM Peak	-	-	-	B	-	-	E	-	E	-	-	-
	PM Peak	-	-	-	A	-	-	F	-	F	-	-	-
Catlett Road/ Stribling Road #3	AM Peak	C	-	C	-	-	-	A	-	-	-	-	-
	PM Peak	B	-	B	-	-	-	A	-	-	-	-	-
Catlett Road/ Stribling Rd Ext#25	AM Peak	-	-	-	D	-	D	-	-	-	A	-	-
	PM Peak	-	-	-	C	-	C	-	-	-	A	-	-
Nissan Parkway/ MS Hwy 22 #18	AM Peak	-	-	-	A	-	-	B	-	A	-	-	-
	PM Peak	-	-	-	A	-	-	B	-	A	-	-	-
Hwy 51/ Green Oak Ln #22	AM Peak	-	-	-	F	-	F	-	-	-	A	-	-
	PM Peak	-	-	-	E	-	E	-	-	-	A	-	-
Distribution Drive/ Gluckstadt Rd #24	AM Peak	A	-	-	B	-	-	F	F	F	B	B	B
	PM Peak	A	-	-	A	-	-	F	F	F	C	C	C
All-Way Stop Intersection	Time Period	Approach Level-of-Service											
		Northbound			Southbound			Eastbound			Westbound		
N Old Canton Rd/ Yandell Road #15	AM Peak	A			A			A			B		
	PM Peak	A			A			B			A		

Source: Neel-Schaffer, 2016.

The unsignalized intersection analysis of existing traffic identifies that the minor street traffic volumes are at/over capacity from a delay standpoint on:

- Stribling Road westbound left turns at MS 463,
- Gluckstadt Road westbound left turns at MS 463,
- Robinson Springs Road eastbound left and right turns at MS 463,
- Livingston Road northbound left and right turns at MS 463,
- Green Oak Lane westbound left and right turns at US Highway 51, and
- Distribution Drive northbound movements at Gluckstadt Road.

3.4 Intersection Capacity Limits

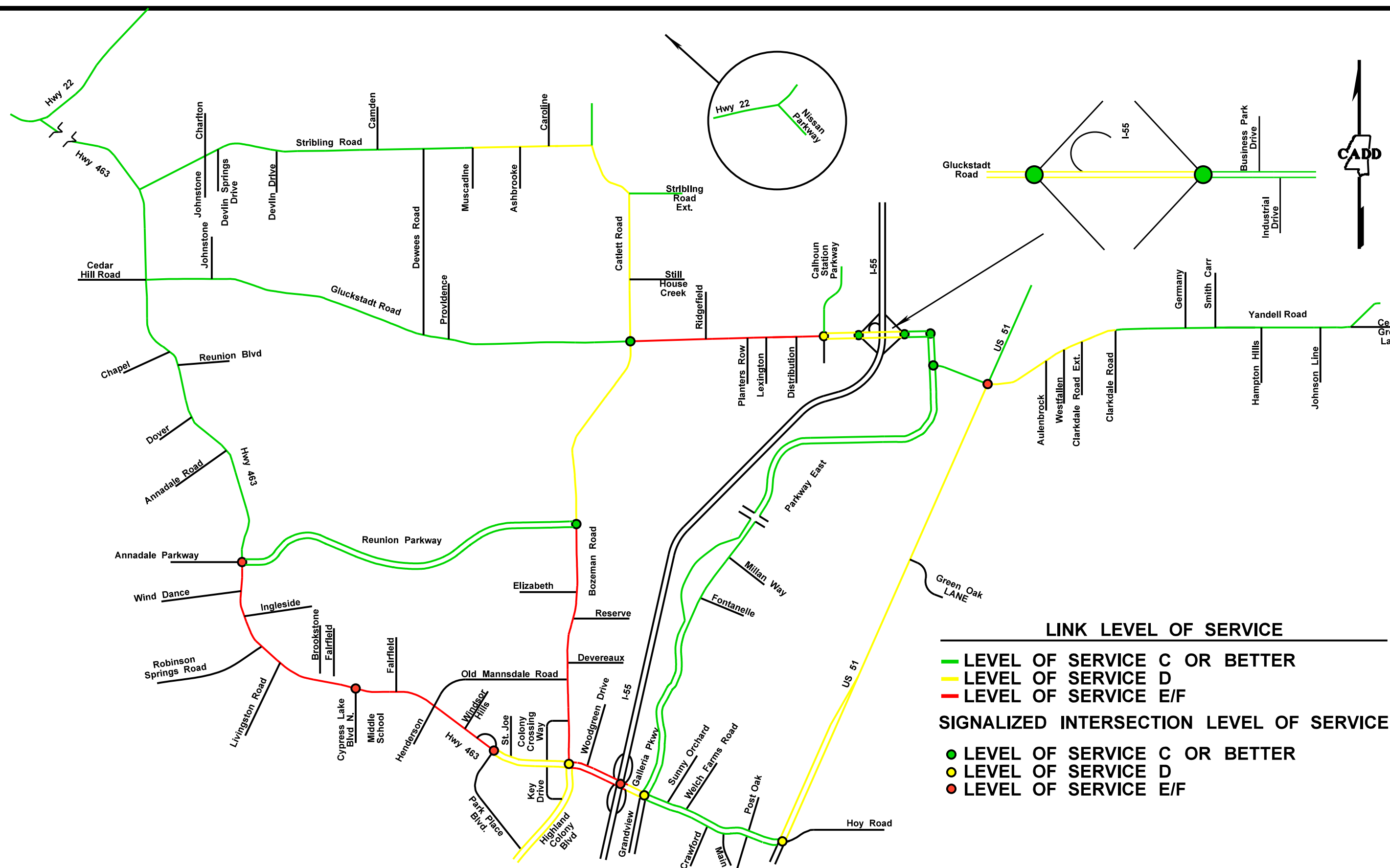
The signalized intersections create the majority of the capacity limitations within the study area. MS Highway 463 routinely has (in excess) of 6 minutes of delay at the intersection of Annandale/Reunion Parkway for southbound traffic during the AM Peak hour. These delays are not balanced, as the intersection has less than 1 minute of delay (per vehicle) on the minor street approaches. Prior to the April 2016 radar detector repairs, the intersection detection had false calls for green during both peak and off peak times that added to the intersection delays. Because the minor streets get serviced with green time more frequently than required, the delays on the major street are increased and there is a maximum number of vehicles that can traverse the signalized intersection in the peak hour. At locations where there are extended traffic queues, the traffic demand is higher than the recorded volume, as traffic cannot physically traverse the intersection, although they plan to, and will cross the intersection once the queue recedes or they wait their turn in line. The 15 minute recorded volumes identify that a maximum flow has occurred at an intersection, as there is a traffic queue and the volume doesn't exceed a certain level. As more development occurs, the additional traffic is anticipated to add to the traffic queue, not to the through volume during the peak hour, as more traffic cannot physically traverse the intersection in the peak hour due to these capacity limitations. The peaking characteristics of these intersections are listed in **Table 5**.

Table 5
Intersection Movement Theoretical Capacity

Intersection	Direction	Interval	15 Minute Interval					Theoretical Maximum Capacity	Theoretical Available Capacity	Calc V/C	
			1	2	3	4	Total				
Catlett Road	Stribling Rd	EB Right	7:00-8:00	177	200	200	146	723	800	77	0.84
MS Hwy 463	Park Place Blvd	EB Thru	7:00-8:00	228	248	201	183	860	1,000	140	1.49
MS Hwy 463	Bozeman Rd	SB Left	7:15-8:15	233	201	205	158	797	932	135	0.96
MS Hwy 463	Bozeman Rd	EB Thru	7:15-8:15	205	255	186	201	847	1,020	173	0.97
MS Hwy 463	Reunion Pkwy	SB Thru	7:00-8:00	170	188	178	121	657	752	95	1.09
Yandell Rd	Hwy 51	WB Lt+Th	7:15-8:15	181	131	159	162	633	724	91	0.76
Gluckstadt Rd	Calhoun Stn	EB Thru	7:15-8:15	261	248	248	207	964	1,044	80	1.05

Source: Neel-Schaffer, 2016.

The volumes listed in Table 5 identify that there is a limited available capacity in the AM Peak hour at the major commuting corridors that connect residential areas with I-55. Significant growth in these corridors will increase the peak hour demand, despite the lack of available capacity. The Middle School on MS Highway 463 has a traffic signal that is controlled by a traffic officer limiting through traffic to only 120 eastbound through vehicles each 15 minute interval for 45 minutes before school starts at 8:20 AM. The segments and intersection levels of service for existing traffic are summarized graphically in **Figure 6**.



- LINK LEVEL OF SERVICE**
- LEVEL OF SERVICE C OR BETTER
 - LEVEL OF SERVICE D
 - LEVEL OF SERVICE E/F
- SIGNALIZED INTERSECTION LEVEL OF SERVICE**
- LEVEL OF SERVICE C OR BETTER
 - LEVEL OF SERVICE D
 - LEVEL OF SERVICE E/F

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3.5 Peak Hour Movements

The existing peak hour traffic volume demand for traffic traveling in the study corridor was summarized to quantify the volume of traffic west of I-55 that is traveling to the east and south in the AM Peak and to the west and north in the PM Peak. Traffic east of I-55 was also quantified to determine the volume of traffic traveling in the peak directions across the CNIC railroad tracks and to areas to the south. The summary of the volumes is provided in **Table 6**.

Table 6
Peak Hour – Major Movements

Location			AM Peak Hour			PM Peak Hour		
<u>West of I-55</u>	<u>Travel to/from East</u>		<u>EB</u>	<u>WB</u>	<u>Total</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>
	Stribling Rd Ext	E. of Catlett Rd	444	159	603	184	159	343
	Gluckstadt Rd	E. of Bozeman Rd	861	283	1,144	397	721	1,118
	MS Hwy 463	E. of Bozeman Rd	1,781	1,673	3,454	1,439	2,236	3,675
	Subtotal		3,086	2,115	5,201	2,020	3,116	5,136
	<u>Travel to/from South</u>		<u>SB</u>	<u>NB</u>	<u>Total</u>	<u>SB</u>	<u>NB</u>	<u>Total</u>
	Livingston Rd	S. of Hwy 463	286	39	325	47	63	110
	Park Place Blvd	S. of Hwy 463	477	188	665	145	319	464
	Highland Colony	S. of Hwy 463	850	240	1,090	598	779	1,377
	Subtotal		1,613	467	2,080	790	1,161	1,951
Total		4,699	2,582	7,281	2,837	4,361	7,198	
<u>East of I-55</u>	<u>Travel to/from East over RR tracks</u>		<u>EB</u>	<u>WB</u>	<u>Total</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>
	Weisenberger Rd	W. of US Hwy 51	359	570	929	589	362	951
	MS Hwy 463	W. of US Hwy 51	593	1,238	1,831	1,089	933	2,022
	Subtotal		952	1,808	2,760	1,678	1,295	2,973
	<u>Travel to/from South</u>		<u>NB</u>	<u>SB</u>	<u>Total</u>	<u>NB</u>	<u>SB</u>	<u>Total</u>
	Grandview Blvd	S. of Hwy 463	540	766	1,306	967	951	1,918
	US Hwy 51	S. of Hwy 463	468	1,201	1,669	1,113	752	1,865
	Subtotal		1,008	1,967	2,975	2,080	1,703	3,783
	Total		1,960	3,775	5,735	3,758	2,998	6,756

Source: Neel-Schaffer, 2016.

The volumes outlined in Table 6 identify that in excess of 3,000 vph are eastbound in the AM peak, distributed by 3 east/west roadways in one hour west of I-55. Similarly, on the east side of I-55, there are approximately 1,800 vph westbound across the CNIC railroad tracks split between two railroad crossings. Additional capacity is needed for east/west traffic movements to serve existing traffic and future growth.

4.0 Future Year Traffic Volumes

4.1 Urban Transportation Model

The urban transportation model for the Jackson Urbanized Area was developed for Central Mississippi Planning and Development District (CMPDD). This urban model had a base year that was calibrated to year 2013 volumes and then used to forecast traffic to years 2030 and 2040. The model used different scenarios for build and no-build to evaluate trends in traffic patterns based on planned growth areas. Planning models are good tools for evaluating the traffic impacts for large areas and the rerouting of trips based on roadway widening or new road construction.

The base model for 2013 was compared to the traffic counts from year 2016. The model volumes are provided as daily counts, representing Average Daily Traffic (ADT). Year 2016 volumes were obtained as hourly counts to provide a more detailed analysis than daily traffic. The portion of traffic that occurs in the peak hour in relation to the daily volume, is the “K” value. The typical range for “K” values is 8%-12%, meaning that the peak hour volume is typically 8%-12% of the daily traffic volume. A “K” value of 10% was used on existing peak hour volumes to estimate current daily volumes for comparison to the 2013 model.

Transportation models are sometimes not as accurate around the outer limits of the model, and the study area has several roadway segments on the outer limits of the model. Base year model volumes were compared to 2016 counts and quantified as a percentage over or under the 2013 base model condition. Future year projections were forecast with planned area projects included in the transportation network. The different model scenarios were provided to evaluate changes in the roadway network including:

1. Year 2030 w/ Bozeman Road widening north to the Reserve subdivision.
2. Year 2040 w/ Bozeman Road widening north to the Reserve subdivision.
3. Year 2040 w/ Bozeman Road widening north to the Reserve subdivision, Reunion Parkway interchange, and Reunion Parkway extension from Bozeman Road to Highway 51.
4. Year 2040 w/ Bozeman Road widening north to the Reserve subdivision, Reunion Parkway interchange, Reunion Parkway extension from Bozeman Road to Highway 51, and 4-lane Highway 463 west from Park Place Boulevard to Annandale/Reunion Parkway.
5. Year 2040 w/ Bozeman Road widening extended north to Gluckstadt Road, Reunion Parkway interchange, Reunion Parkway extension from Bozeman Road to Highway 51, 4-lane Highway 463 west from Park Place Boulevard to Annandale/Reunion Parkway, extend Gluckstadt Road over CNIC Railroad, widen Yandell Road east to Old Canton Road, and US Highway 51 widening north to Yandell Road.

These different model scenarios are provided in the report Appendix. Volumes from the base model year were compared to Year 2030 and Year 2040 for each alternate to identify planned area growth. Some roadways analyzed have existing volumes that are greater than the Year 2040 forecast. Model volume forecasts are provided in the Appendix.

4.2 Historical Area Growth

The census data for Madison the City and Madison County were researched to compare the population changes since 1990. For comparison, City of Jackson population changes were also listed, identifying the trends as Jackson population has decreased, and Madison County populations have increased. The historical population changes are listed in **Table 7**.

Table 7
Historical Population Changes

Location	Population by Year			Compound Annual Percent Change		
	1990	2000	2010	'90-'00	'00-'10	'90-'10
Madison County	54,271	75,063	95,595	3.30%	2.45%	2.87%
City of Madison, MS	8,027	18,978	24,262	8.99%	2.49%	5.69%
City of Jackson, MS	196,526	185,260	173,714	-0.59%	-0.64%	-0.62%

Source: US Census.gov.

The population changes are significant, as Madison County has seen a 20 year growth rate at 2.87% per year, with the City of Madison at 5.69% (annually) since 1990, although some of the city growth has been through annexation. These growth rates have put significant pressure on the existing roadway network.

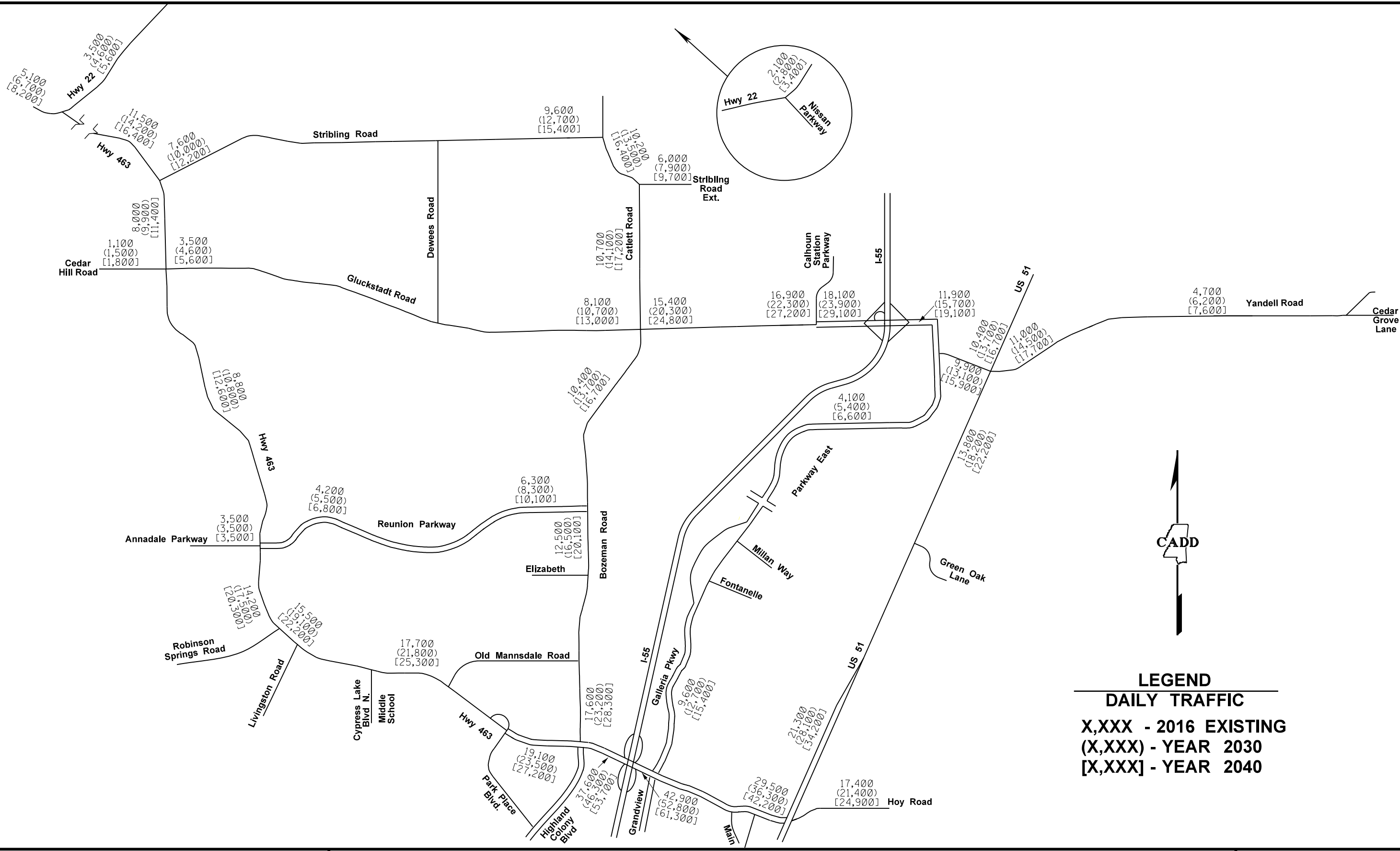
4.3 Traffic Forecast

Future year volumes were forecast to year 2030 and year 2040. Volumes are limited on the arterial roadways by the capacity of the roadway. Diversion of traffic was provided by the urban model, as a percentage of total traffic. The growth was calculated from the model base year to the horizon year of 2040 based on the traffic assignment in the urban model. Demographic data in the model included population increase from 2013-89,660 to 2040-129,107, total dwelling unit increase from 2013-36,234 to 2040-52,254 and total employment increase from 2013-65,223 to 2040-94,213.

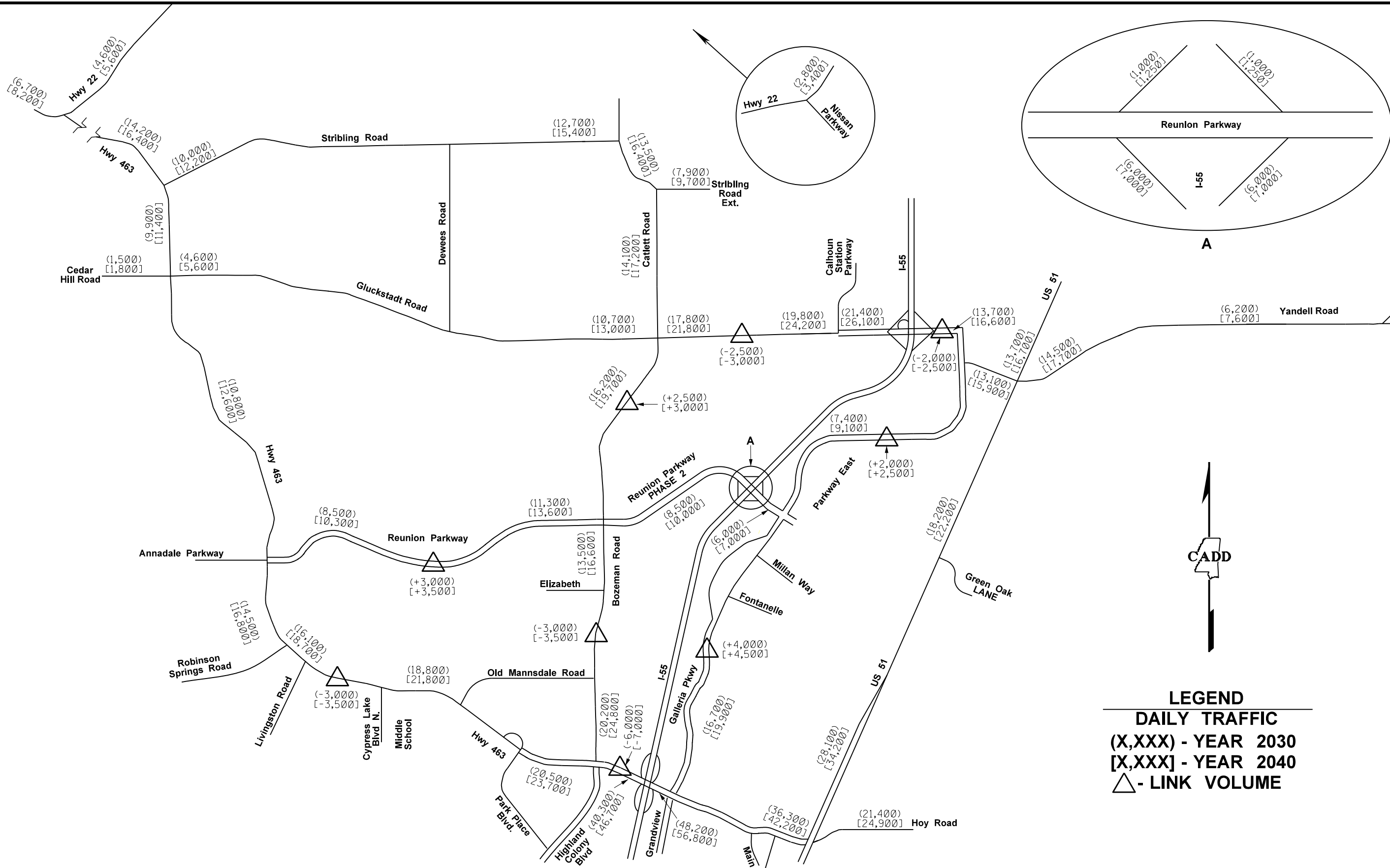
MS Highway 463 traffic averaged a 1.5% compound annual growth rate in the model. This 1.5% compound annual growth rate was applied to MS Highway 463 without consideration of restrictions on link capacity. This level of growth would yield a 23% increase by year 2030 and 43% increase by year 2040. Using this methodology, a growth rate for the other arterial roadway segments was developed and used a 2% compound annual growth, yielding a 32% increase by 2030 and 61% increase by 2040. The existing 2016, 2030 and 2040 traffic volumes are shown in **Figure 7** for the roadway network that does not include the new Reunion Parkway interchange.

4.4 Future Year Traffic w/ Reunion Interchange

The urban transportation model was used as the base condition for evaluating traffic pattern changes associated with the proposed interchange and extension of Reunion Parkway east to Parkway East. The model included a new interchange at I-55/Reunion Parkway and a four-lane divided extension of Reunion Parkway connecting from Parkway East to Bozeman Road. The traffic volumes were evaluated to identify the diversion of traffic that is anticipated from MS Highway 463 to Reunion Parkway, and from Bozeman Road to an extension of Reunion Parkway connecting to I-55. The excessive delays and congestion that routinely occur along MS Hwy 463 between Annandale and Park Place Boulevard and along Bozeman Road at MS Highway 463 create an increased demand for an alternate route. The AM Peak hour eastbound right turn volume from MS Highway 463 to Livingston Road (265 vph) is evidence of the congestion as drivers use Livingston as a diversion around the existing congestion. The new interchange route is also a good alternate for traffic on Gluckstadt Road, as the congestion and traffic queues extend west to Bozeman Road. The diverted daily traffic volumes are shown graphically in **Figure 8** for the extension of Reunion Parkway and the construction of a new I-55 interchange.



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LEGEND
DAILY TRAFFIC
 (X,XXX) - YEAR 2030
 [X,XXX] - YEAR 2040
 △ - LINK VOLUME



**DAILY TRAFFIC VOLUMES
 WITH REUNION PARKWAY EXTENSION AND INTERCHANGE**

**FIGURE
 8**

4.5 Future Year Traffic w/ Reunion Interchange & US Hwy 51 Connector

The urban transportation model was also used to evaluate the impacts on traffic for the extension of Reunion Parkway (Phase 3) east of Parkway East to US Highway 51. The proposed route for Phase 3 includes crossing Bear Creek, the railroad tracks and flood zones/floodways before intersecting US Highway 51 near (or directly aligning with) Green Oak Lane. Because the existing roadways crossing the CNIC railroad on Madison Parkway and Weisenberger Road are operating within capacity limits, the model did not assign a significant volume of traffic to the proposed route. The model does not take into account the effects that this roadway would have on emergency service response times, particularly when trains block the at-grade crossing on Weisenberger Road; nor does the model take into account the economic development impacts that a roadway connection can have on an area or the desire by commuters to have a more reliable commute (avoiding an at-grade railroad crossing). The diverted daily traffic volumes are shown graphically in **Figure 9** for the extension of Reunion Parkway (Phase 3) between Bozeman Road and US Highway 51 with a new I-55 interchange.

5.0 Crash Data Summary

5.1 Historical Crash Data

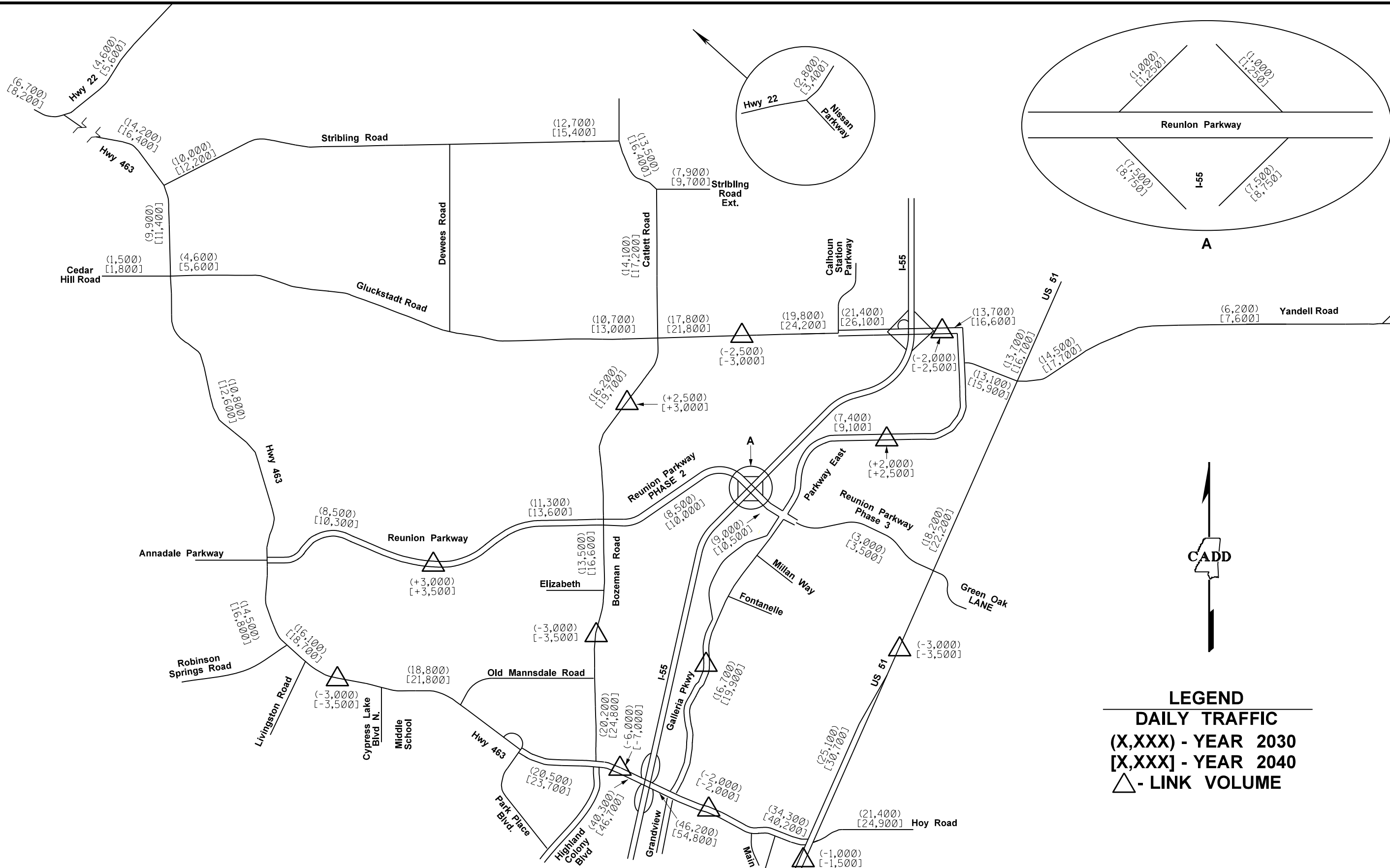
Crash records were provided by MDOT from the Safety Analysis Management System (SAMS) database. Crash records for a six year history were provided on selected routes from 1/1/2010-12/31/15. The crash records were summarized based on crash type, by location and by injury type. Each roadway segment was evaluated using the intersection description and the coordinates of the crash. Crash records were filtered by location and isolated to individual roadway segments and intersections. A summary of the crash records by segment are listed in **Table 8**.

Table 8 - Crash Data by Roadway Segment

Roadway	From	To	Crash Year						Crash Total	Distance (miles)
			2010	2011	2012	2013	2014	2015		
MS Hwy 463	Stribling Rd	N. of Reunion Pky	18	11	14	14	16	17	90	3.0
	Reunion Parkway	Park Place	43	31	50	56	63	51	294	2.5
	St Joe	W. of I-55	46	42	56	59	62	72	337	0.9
	I-55	Grandview	83	77	89	98	88	99	534	0.3
	E. of Grandview	US Hwy 51	19	26	53	66	87	79	330	1.4
	Stribling Rd	US Hwy 51	209	187	262	293	316	318	1,585	8.1
Bozeman Rd	S. of Gluckstadt Rd	N. of Hwy 463	10	11	9	12	20	22	84	3.2
Catlett Road	S. of Stribling Road	N. of Gluckstadt Rd	0	4	2	4	2	6	18	1.5
Gluckstadt Rd	E. of Hwy 463	W. of Bozeman Rd	2	2	5	5	5	6	25	3.5
	Bozeman Road	W. of I-55	7	12	9	8	20	27	83	1.7
	I-55	Weisenberger Rd	27	21	26	29	25	26	154	0.4
	E. of Hwy 463	Weisenberger Rd	36	35	40	42	50	59	262	5.6
MS Hwy 22	MS Hwy 463	Nissan Parkway	7	5	7	9	9	2	39	8.2
Parkway East	Weisenberger Rd	N. of Hwy 463	5	7	1	2	3	4	22	4.3
Stribling Road	E of MS Hwy 463	Catlett Road	2	2	5	6	5	10	30	3.4
Weisenberger/ Yandell Road	S. of Gluckstadt Rd	N. Old Canton Rd	26	25	21	29	43	35	179	3.7
Reunion Pkwy	E. of MS Hwy 463	W. of Bozeman Rd	0	0	0	0	0	0	0	2.6
US Hwy 51	N. of Hoy Road	S. of Yandell Rd	19	18	17	34	40	24	152	3.5
		Total All Crashes	314	294	364	431	488	480	2,371	44.1

Source: MDOT , Neel-Schaffer, 2016.

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LEGEND
DAILY TRAFFIC
 (X,XXX) - YEAR 2030
 [X,XXX] - YEAR 2040
 △ - LINK VOLUME



**DAILY TRAFFIC VOLUMES
 WITH REUNION PARKWAY INTERCHANGE
 AND HWY 51 CONNECTOR**

**FIGURE
 9**

The crash data reveals that the 8.1 mile section of MS Highway 463 from Stribling Road to Highway 51 has averaged 264 crashes per year. Geographically, the crashes are shown in **Figure 10**.

5.2 Crash Totals by Adjacent Intersection

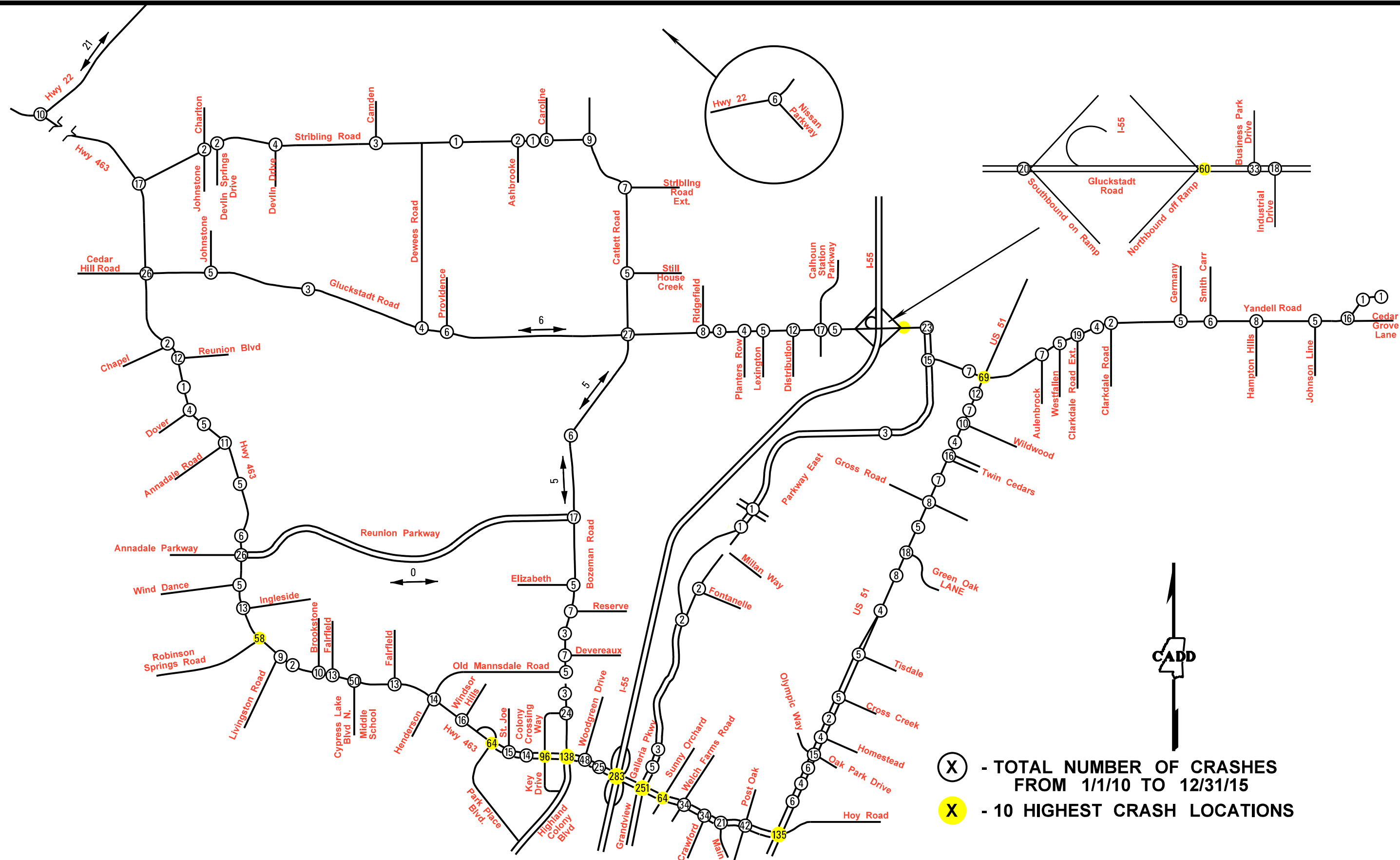
Crashes were sorted by location and sorted to identify particular intersections associated with crashes. The crashes are referenced by an intersecting route. The intersecting routes were then compared to other intersections to identify the locations with the highest crash totals. Because crash rate is a function of entering volume, locations with higher entering traffic volumes will typically have a higher crash total, but not necessarily a higher crash rate. The locations with the highest crash totals for the 6 year crash history evaluated (1/1/2010-12/31/15) are listed in **Table 9**.

Table 9
Crash Rankings by Intersection

Intersection	2010	2011	2012	2013	2014	2015	Total	Rank
Hwy 463/I-55	40	37	55	57	53	41	283	1
Hwy 463/Grandview Blvd	43	40	34	41	35	58	251	2
Hwy 463/Highland Colony	22	16	17	25	26	32	138	3
Hwy 463/US 51-Hoy Rd	5	9	21	31	39	30	135	4
Hwy 463/Colony Crossing Way-Key Dr	15	10	25	12	14	20	96	5
Gluckstadt Rd/I-55	12	6	14	13	14	16	75	6
Yandell Rd/US 51	10	6	6	10	25	12	69	7
Hwy 463/Sunny Orchard Dr	6	3	11	11	20	13	64	8
Hwy 463/Park Place Blvd	10	7	9	11	12	15	64	8
Hwy 463/Robinson Springs Rd	10	9	11	7	10	11	58	10
Hwy 463/Cypress Lake Blvd N	6		10	10	12	12	50	11
Hwy 463/Woodgreen Dr	5	9	7	9	12	6	48	12
Hwy 463/Post Oak Rd		1	7	14	10	10	42	13
Hwy 463/Crawford St	7	8	7	3	6	3	34	14
Hwy 463/Welch Farms Rd	1	4	5	5	5	14	34	14
Hwy 463/Annandale/Reunion Pkwy	5	2	6	8	9	2	32	16
Gluckstadt Rd/Business Park Dr	10	6	7	7	2		32	16
Gluckstadt Rd/Bozeman-Catlett Rd	3	1	4	4	12	6	30	18
Hwy 463/Gluckstadt-Cedar Hill Rd	4	1	3	4	8	6	26	19
Hwy 463/Woodgreen Pl	1	2	4	7	3	8	25	20
Total Top 20 Crash Locations	215	177	263	289	327	315	1,586	
Total All Crash Locations	314	294	364	431	488	480	2,371	

Source: MDOT, Neel-Schaffer, 2016.

Crash locations were cross referenced with GPS coordinates for each crash record and exported into Google Earth to geographically identify the locations of crashes within the study area.



(X) - TOTAL NUMBER OF CRASHES FROM 1/1/10 TO 12/31/15
 (X) - 10 HIGHEST CRASH LOCATIONS

5.3 Emergency Service Impacts

As crashes occur during peak hours, the congestion levels affect the ability of emergency services to respond to the crash site, or to respond to other emergencies and the congestion can adversely affect access and response times. The intersection at Livingston Road and MS Highway 463 had to be counted multiple times, as there were crashes nearby during peak hours that diverted traffic. The video of the intersection revealed that fire trucks, police cars and ambulance services each had to drive down the road in opposing lanes, to access the crash site. The crash video identified traffic queues from a crash at the adjacent intersection of Robinson Springs Road/MS Highway 463 at 17:23:40 on March 2, 2016.



Livingston Road/MS Hwy 463 – Police car driving westbound in eastbound lane, 9 mins after crash.



Livingston Road/MS Hwy 463 – Fire truck driving westbound in eastbound lane, 13 mins after crash.



Livingston Road/MS Hwy 463 – Ambulance driving westbound in eastbound lane, 16 mins after crash.

6.0 Corridor Improvements-Short Term

Policy improvements can make a significant impact on future transportation demands and help to prevent some of the current traffic issues facing Madison County. The adoption of policies requiring traffic studies for proposed developments, requiring construction of auxiliary left turn and right turn lanes for new developments, adoption of minimum right-of-way widths and building setbacks for Principal and Minor Arterials can help to avoid traffic issues in the future similar to what Madison County is currently facing. In the absence of those requirements, the short term corrective measures identified in this analysis are needed more urgently as there are few options for navigating the existing roadway network that is overly congested and in desperate need of auxiliary turn lanes to help move traffic during peak hours.

6.1 MS Highway 463

MS Highway 463 provides a vital link for Madison County connecting residential areas to schools and commercial areas. The sections of MS Highway 463 have different demands based on land use, schools and interstate access. Intersection improvements can help to temporarily alleviate some of the congestion levels currently being experienced along the corridor west of I-55. Ultimately, traffic projections and resulting level of service analyses show that the section of MS Highway 463 from Reunion Parkway/Annandale to Park Place Boulevard (2.6 miles) needs to be widened to a four-lane divided roadway; however, intersection improvements can help to alleviate some of the congestion issues and potentially corresponding high crash frequency until additional thru lanes are constructed.

Park Place Boulevard/MS Highway 463

The intersection of Park Place Boulevard with MS Highway 463 experiences significant queuing in the AM and PM peak hours. The intersection has the 8th highest crash total in the corridor. The change in width from a five-lane facility to a two-lane roadway at this intersection creates congestion and traffic queues during peak hours. Eastbound AM traffic queues can extend from Park Place Boulevard to north of Annandale Parkway, particularly in conjunction with the Middle School traffic. The single eastbound thru lane at Park Place Boulevard is the major limiting factor, as traffic queues routinely block access to the right turn lane that provides access to Park Place Boulevard and Madison Central High School. Construction of a second thru lane and new right turn lane would significantly improve the intersection capacity and reduce traffic queues that affect the Middle School traffic. The right turn lane is recommended to extend 250 ft west of Park Place Boulevard and the dual eastbound thru lanes extend a minimum of 700 ft west of Park Place Boulevard to provide sufficient space for traffic queues to accommodate and service the AM peak hour traffic peaking characteristics.

Westbound traffic typically experiences the largest traffic queues in the PM peak hour, but these queues are not as significant as the eastbound queues in the AM Peak hour. Extending two through westbound lanes across Park Place to Windsor Hills Drive could improve the westbound traffic queues, although the ultimate improvement (long term) is to widen this section of MS Highway 463 to a four lane divided roadway.

Madison Middle School/MS Highway 463

Traffic volumes at the Middle School are primarily impacted by the westbound left turning volume into the school between 7:30 and 8:20 AM. The school uses a traffic officer to direct traffic in the mornings. On the day of the traffic count, the officer started directing traffic at 7:47 AM and continued until 8:26 AM. Approximately 70% of the traffic accessing the Middle School originates from the east, resulting in a peak hour left turn volume of 419 vph. The intersection of MS Highway 463/Madison Middle School (Cypress Lake Boulevard North) had the 11th highest crash total in the study area with 50 crashes over 6 years.



MS 463-Madison Middle School – looking east at traffic queue across intersection during the AM peak.

The westbound left turn volume exceeds the existing left turn storage length (360 ft). As the westbound left turn volume backs into the westbound thru lane, the traffic officer typically initiates manual traffic control. The manual traffic control is not as efficient as the signal control, as with signal control, permissive left turns are allowed. The officer does not allow permissive left turns. Additionally, there is conflict with drivers that have two contradictory traffic control directions: the officer directing traffic and the traffic signal. Many drivers are more cautious with the presence of a person standing in the road and many of these drivers slow or stop at the red signal indication despite the directions being given by the officer. The inefficiency is clear in the headway per vehicle (more than 3 sec per vehicle). Typical signal cycle lengths range from 70-140 seconds. The average cycle being provided manually by the officer was recorded as 4 minutes 25 seconds, which creates excessive traffic queues on MS Highway 463, particularly for eastbound traffic. The traffic control as directed by the officer for the westbound left turn from MS Highway 463 into the Madison Middle School on 4/15/16 is summarized in **Table 10**.

Table 10
Madison Middle School
Existing Westbound Left Turning Traffic Evaluation

Begin	End	WB Lt Turn	Time	sec / veh	cycle
7:50:55	7:52:39	34	0:01:44	3.06	
7:54:00	7:55:35	30	0:01:35	3.17	0:03:05
7:58:50	8:00:53	37	0:02:03	3.32	0:04:50
8:04:20	8:06:27	41	0:02:07	3.10	0:05:30
8:08:36	8:10:28	36	0:01:52	3.11	0:04:16
8:12:54	8:14:36	34	0:01:42	3.00	0:04:18
8:17:23	8:19:10	33	0:01:47	3.24	0:04:29
	Average	35	0:01:50	3.14	0:04:25

Source: Neel-Schaffer, 2016.

Extending the westbound left turn storage is recommended so that the traffic signal can control traffic and the traffic control officer will no longer be needed. The introduction of a person into the traffic lanes puts the officer at significant risk of injury and reduces the efficiency of the intersection. The storage length is recommended to be extended to 800 ft to accommodate the autos and school buses that queue in the westbound left turn lane. Extending this left turn lane is anticipated to remove the need for manual traffic control at the intersection during the AM Peak hour and be more efficient, thus reducing the eastbound traffic queues and delays.

The eastbound right turn lane is routinely blocked by eastbound thru queuing traffic. Drivers routinely use the gravel shoulder to access the right turn lane and have worn significant holes in the shoulder. Extending the eastbound right turn lane from 160 ft to 280 ft, which will extend the full width turn lane from the fire station driveway to the Middle School entrance road.

Reconstructing the northbound right turn egress lane from the school is recommended to move the right turn lane adjacent to the left turn lane without the channelization. This configuration is recommended to include a Type 7R signal head to allow a green arrow display for northbound right turning traffic leaving the school while the westbound left turning traffic is moving. This signal display and improved viewing angle for egress traffic from the school is anticipated to improve the flow of traffic leaving the school in the AM peaks.

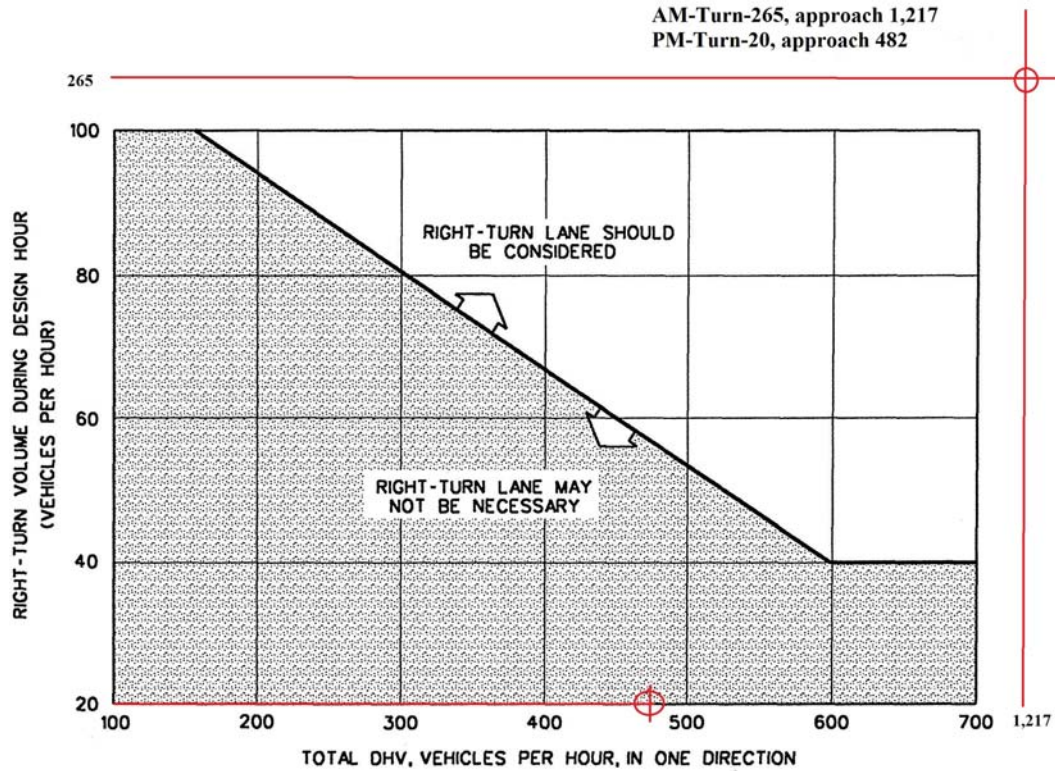
Livingston Road/MS Highway 463

Congestion routinely extends across Livingston Road for eastbound traffic in the AM peak hour. There is minimal westbound left turn traffic from MS Highway 463 (less than 30 vph in AM and PM peaks). Providing a 100 ft section of paved shoulder for westbound traffic is recommended at Livingston Road on MS Highway 463 to provide a refuge area for traffic to divert to the shoulder to avoid a potential rear-end collision with left turning vehicles as the posted speed limit is 55 mph and this intersection is at the end of a horizontal curve.

The primary turning movement is in the AM peak as people use Livingston Road to bypass the delays experienced along MS Highway 463 east to I-55. The eastbound right turn volume in the AM peak hour was recorded as 265 vph in the AM peak. This turning volume was compared to the MDOT right turn lane warrants.



MS Highway 463 – Looking east toward Livingston Road during the AM peak.

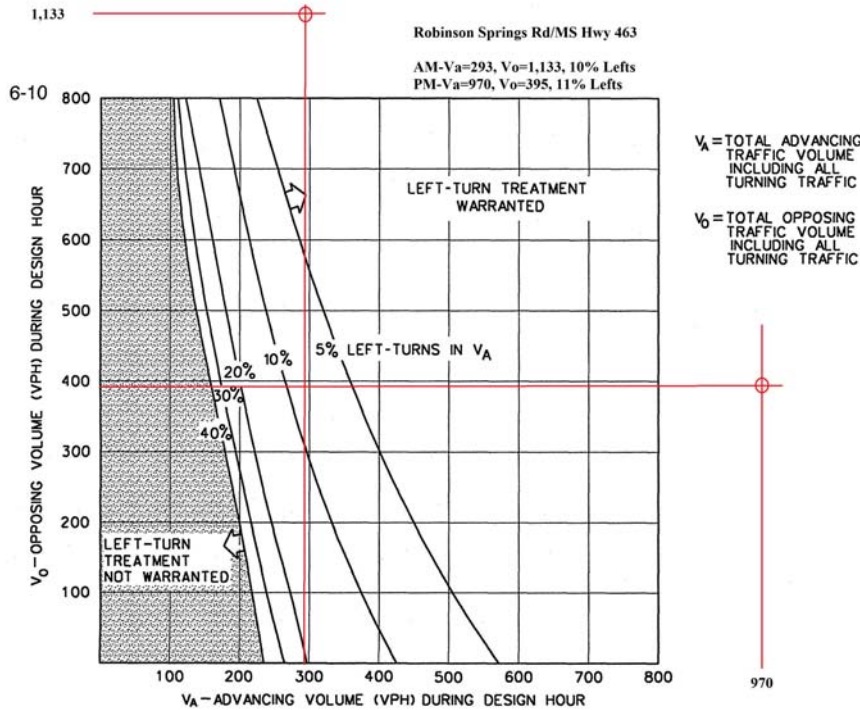


Right Turn Lane Warrant: MDOT, Neel-Schaffer, 2016.

The volume graphic identifies that the right turn lane is needed in the AM peak hour. An eastbound right turn lane is recommended at Livingston Road on MS Highway 463. The lane is recommended to be a minimum of 225 ft in length. This turn lane construction would improve the movement of traffic eastbound in the AM peak and reduce the impacts that turning traffic has on the through movements along MS Highway 463.

Robinson Springs Road/MS Highway 463

Traffic entering/exiting MS Highway 463 from Robinson Springs Road primarily relies on MS Highway 463 drivers to let them into traffic in the AM peak. This intersection has the 10th highest crash total in the corridor, and the highest crash total of any unsignalized intersection in the study area. The primary crash type is rear end crash (44 of 58 crashes) and 43 of 58 crashes are westbound on MS Highway 463. The posted speed limit is 55 mph in this 2 lane section of roadway. Travel speeds are typically less than 20 mph in the AM peak hour. The frequency of westbound left turning traffic at Robinson Springs Road from MS Highway 463 is affected by the higher posted speed and the location of the intersection within a slight horizontal curve. This speed differential contributes to the rear-end crash frequency as thru vehicles are accelerating and with the high volume of turning traffic, there is a greater risk of rear-end crashes. The turn volumes on Robinson Springs Road are 135 vph turning right onto MS Highway 463 in the AM peak and 109 vph turning left from MS Highway 463 onto Robinson Springs Road in the PM peak.



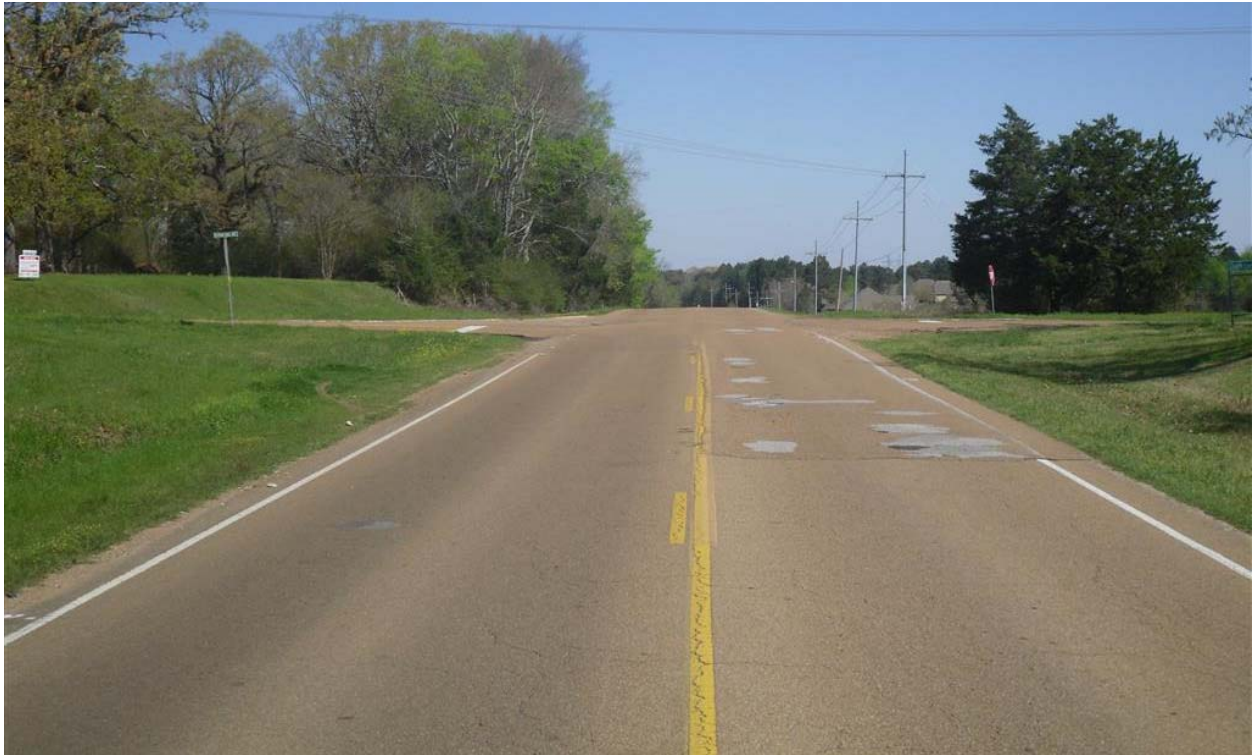
Left turn lane warrant: MDOT, Neel-Schaffer, 2016.

The volume analysis of the left turn lane warrant identifies that a left turn lane is warranted on MS Highway 463 at Robinson Springs Road. Construction of a westbound left turn lane is anticipated to reduce the crash frequency currently experienced at this location.

Gluckstadt Road/MS Highway 463

The intersection of Gluckstadt Road/Cedar Hill Road with MS Highway 463 is currently a two-way stop controlled intersection. The major movement along MS Highway 463 is free-flow with Gluckstadt Road and Cedar Hill Road stop controlled. A vertical curve exists on the north approach, limiting the available sight distance for traffic entering or crossing MS Highway 463. The left turn and crossing movements (minor street) at this intersection do not meet traffic signal volume warrants for installation of a traffic control signal. Left turn lanes on MS Highway 463 would be beneficial at this location, as there were 26 crashes at this intersection in the 6 year crash history and left turn lane warrants are met. Improving the right turn – turning radii at the intersection are recommended to improve the turning speed for traffic turning right from MS Highway 463. Existing turning radii do not meet minimum standards for a roadway with a posted speed limit of 55 mph.

Twelve of the 26 crashes (46%) at this intersection were related to deer/animals. Additional lighting at the intersection and on the intersection approaches could help reduce the crashes associated with animals by providing more opportunity for drivers to identify these animals and give drivers more time to react. Additionally, the intersection lighting could help improve turning movement safety from minor streets as drivers could better identify approaching vehicular speeds with supplemental lighting on the intersection approaches.

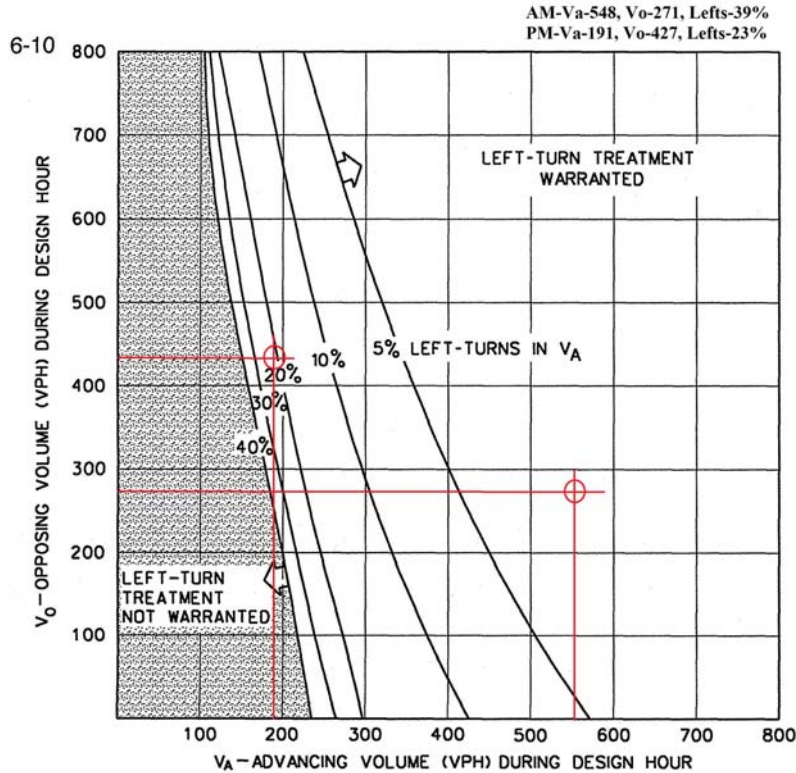


MS Highway 463 at Gluckstadt Road – Looking north at crest vertical curve.

Stribling Road/MS Highway 463

The recent construction and expansion of the Mannsdale Elementary School north of Stribling Road has significantly changed traffic patterns across this intersection, with the elementary school being a significant traffic generator to the north. As a result, turning traffic on MS Highway 463 to/from Stribling Road has created congestion issues during peak hours. Crash records identify 17 crashes over 6 years with 6 angle crashes (35%).

Southbound left turning traffic was recorded at 216 vph in the AM peak. A southbound left turn lane is recommended to be constructed. With the amount of undeveloped property on Stribling Road, residential developments and this southbound left turning volume to/from the school are anticipated to increase. The proposed left turn lane is recommended to provide 200 ft of storage (minimum). Additionally, a northbound right turn lane is recommended on MS Hwy 463 at Stribling Road.



Left turn lane warrant: MDOT, Neel-Schaffer, 2016.

Gluckstadt Road/Weisenberger Road

The intersection of Gluckstadt Road/Weisenberger Road has a free-flow eastbound right turn to southbound movement. The intersection striping and signage is recommended to be modified to provide additional information for drivers to alert them to this free-flow movement. Many drivers yield or stop, when the free flow condition has the right-of-way with an added lane southbound. Striping is recommended to be modified to better delineate this southbound lane addition, concurrent with a W4-3 *Added Lane* sign.



6.2 Bozeman Road

Future plans for Bozeman Road include widening north of MS Highway 463 to a four-lane divided roadway. The intersection of Bozeman Road with MS Highway 463 ranks 3rd in the study area with 138 crashes over a six year study period. Congestion issues are likely contributing to the intersection crash rate. The crash data revealed that 106 out of 138 crashes are rear-end, 16 sideswipe, 8 left turn same roadway, 7 angle and 1 deer.

Interim improvements could be constructed to improve the capacity of the southbound left turn on Bozeman Road at MS Highway 463. Widening Bozeman Road to allow southbound traffic to access and queue within two southbound turn lanes would be beneficial during the AM peak. Existing conditions provide only 120 ft of left turn storage for the eastern turn lane of the two southbound left turn lanes. Typically, no more than 6 vehicles can access this second left turn lane, limiting the volume of left turning traffic that can traverse the intersection during each green interval for southbound traffic. An evaluation of the efficiency of the southbound left turn volume is summarized in **Table 11**.

Table 11
 Bozeman Road/MS Highway 463
 Existing Southbound Left Turning Traffic Evaluation

Begin	End	SB Left Turn	Time	sec / veh	cycle
7:16:51	7:17:37	34 vehicles	0:00:46	1.35	
7:18:54	7:19:38	29 vehicles	0:00:44	1.52	0:02:03
7:21:06	7:21:50	32 vehicles	0:00:44	1.38	0:02:12
7:23:12	7:23:58	37 vehicles	0:00:46	1.24	0:02:06
7:25:06	7:25:50	31 vehicles	0:00:44	1.42	0:01:54
7:27:05	7:27:51	29 vehicles	0:00:46	1.59	0:01:59
7:29:08	7:29:54	25 vehicles	0:00:46	1.84	0:02:03
7:31:23	7:32:08	30 vehicles	0:00:45	1.50	0:02:15
7:33:32	7:34:18	30 vehicles	0:00:46	1.53	0:02:09
	Average	30.8 vehicles	0:00:45	1.49	0:02:05

Source: Neel-Schaffer, 2016.

The analysis of the left turn revealed that the efficiency could be improved with additional southbound left turn storage. The interaction of the adjacent signal at Woodgreen Drive affects the ability of the traffic to clear the intersections to the east; however, more southbound left turning capacity could be achieved with the extension of the southbound left turn storage for the second (eastern) left turn lane.

Sight distance on MS Highway 463 is limited for the eastbound left turn lane when the westbound left turn bays are occupied. Prohibition of the permissive left is recommended during peak hours, as the lack of sight distance for the eastbound left turn increases the chances of angle/left turn crashes.

6.3 Catlett Road

Catlett Road connects the residential areas of Lake Caroline, Ashbrooke and other residential developments with Catlett Road Extension and Gluckstadt Road. Development in the area is occurring at a rapid pace as new schools have opened with Germantown High and Middle Schools located on 16th Section land to the east.

Stribling Road/Catlett Road

The intersection of Stribling Road at Catlett Road is stop controlled for eastbound Stribling Road and free-flow for north/south traffic on Catlett Road. However, more than 90% of the peak hour traffic volumes are to/from Stribling Road. The inefficiency of the stop-control for eastbound traffic in the AM peak creates unnecessary delays and queues on Stribling Road. Ultimately, additional development to the north could balance the traffic volumes on the north/south approaches; however, an interim modification is recommended to reduce delays. Construction of a roundabout would provide some traffic calming effects through speed reduction, as well as allow for future growth to the north without having to reconfigure the intersection and provide a gateway feature entering this residential area. Having a “yield” on entry with a roundabout would allow a more efficient eastbound movement rather than the existing “stop” control.



Catlett Road – Looking north at Stribling Road

An alternate to a roundabout would be the construction of a channelized right turn lane for eastbound traffic, with a southbound acceleration lane. The combination of the channelized right turn lane and acceleration lane would make the predominant AM peak hour movement much more efficient where all eastbound right turning traffic (732 vph in the AM peak) would not be required to “Stop” at Catlett Road.

A second option would be to convert the alignment of the roadways so that Stribling Road connects with the south approach of Catlett Road with a horizontal curve while reconstructing the north approach to be stop controlled. The horizontal curve radius would have a 2,900 ft radius for a 50 mph design speed and 4% super-elevation or 1,800 ft radius for 6% super-elevation. Both of these options would require significant right-of-way acquisition in the southwest quadrant of the intersection to accommodate the large turning radius required for realigning this intersection.

Stribling Road Extension/Catlett Road

The intersection of Stribling Road Extension at Catlett Road is stop controlled for westbound Stribling Road Extension and free-flow for north/south traffic on Catlett Road. The southbound AM peak hour traffic recorded 322 left turns in the peak hour (41% of southbound traffic) without an exclusive southbound left turn lane. The lack of a left turn lane affects the southbound movement efficiency. The MDOT left turn lane volume warrant is met for both the AM and PM peak hours. Construction of a roundabout would provide some traffic calming effects through speed reduction, as well as allow for future growth to the north and east without having to reconfigure the intersection and provide a gateway feature for this residential area. Having a “yield” on entry with a roundabout would allow more efficient movements and roundabouts reduce crash severity over conventional signalized or stop controlled intersections.

An alternative to the roundabout would be the construction of a southbound left turn lane, northbound right turn lane, and westbound right turn lane at the intersection. These auxiliary turn lanes and future year growth will likely result in justification for a future traffic signal at this intersection if a roundabout is no constructed.



Catlett Road – Looking north at Stribling Road Extension.

Sign placement on the signs in the photos above do not meet minimum sign standards. The sign placement throughout the County is deficient on the appropriate sign height (5 ft minimum above adjacent asphalt where there are no pedestrians), and on the rules about use of multiple signs per pole/ in conjunction with other signs. The Manual on Uniform Traffic Control Devices (MUTCD) sets these minimum standards and serves as the national standard for signing and striping regulations.

Gluckstadt Road/Bozeman Road-Catlett Road

The signalized intersection of Catlett Road-Bozeman with Gluckstadt Road had 30 reported crashes over a six year reporting period, ranking 18th in the study area. The intersection timing patterns use a split north/south phase. This split phase is likely related to the heavy southbound left turn movement (383 vph in AM peak). When turning volumes exceed 300 vph, consideration is usually given to providing dual left turn lanes. As left turning volumes increase, the southbound thru lane could be restriped to be a shared left/thru/right turn lane, as there are two receiving lanes. The second receiving lane would need the taper to be reconstructed to provide a more gradual transition, but the second thru lane would transition into the two-way left turn lane. This lane could be dropped at Ridgefield to the east and the intersection would be able to clear more left turning traffic, particularly during the AM peak hour. The project is primarily a striping project to repurpose the existing lanes, along with a taper reconstruction to meet minimum lane shift standards.



Gluckstadt Road – Looking east across Bozeman Road/Catlett Road

6.4 Gluckstadt Road

Distribution Drive/Gluckstadt Road

The cross section of Gluckstadt Road was widened to a 3-lane roadway with curb and gutter from Church Road (now Calhoun Station Parkway) west to Bozeman Road/Catlett Road. This widening has placed a restriction on the capacity of east/west traffic, limiting the hourly capacity to around 900 vph. The existing volume is further restricted by the interaction of the new signal at Calhoun Station Parkway and the traffic accessing the adjacent street of Distribution Drive. Distribution Drive extends south of Gluckstadt Road, parallel to Dees Drive, without a connection to Dees Drive. The amount of industrial development and commercial businesses accessed via Distribution Drive creates significant congestion issues in the AM peak hour, as there are two children's daycare facilities – Children's Academy and Little Footprints, along with numerous other commercial and industrial developments. Eastbound traffic queues on Gluckstadt Road extend across Distribution Drive, creating turning conflicts. Turning left from Distribution Drive (northbound) is difficult due to traffic queues from the signal/close proximity of Calhoun Station Parkway and the channelized southbound right turn lane at the adjacent signal.

Short term improvements are recommended to include extending a second eastbound thru lane east of Distribution Drive to Calhoun Station Parkway, allowing for free-flow of northbound right turning traffic from Distribution Drive to connect with the two eastbound receiving lanes constructed with the new interchange. Additionally, connecting Dees Drive with Distribution Drive could be accomplished at the south end of Dees Drive, connecting with Hazelton Cove. This connection would require right-of-way to be acquired across four parcels to connect these two roadways, allowing for left turning traffic to access the signal at Calhoun Station Parkway/Gluckstadt Road. A similar access limitation exists with Enterprise Drive, relying solely on Distribution Drive for access to Gluckstadt Road. Connecting Enterprise Drive to Lexington Drive would provide an alternate route for ingress/egress into the industrial area and help to diffuse some of the traffic issues occurring on Distribution Drive.

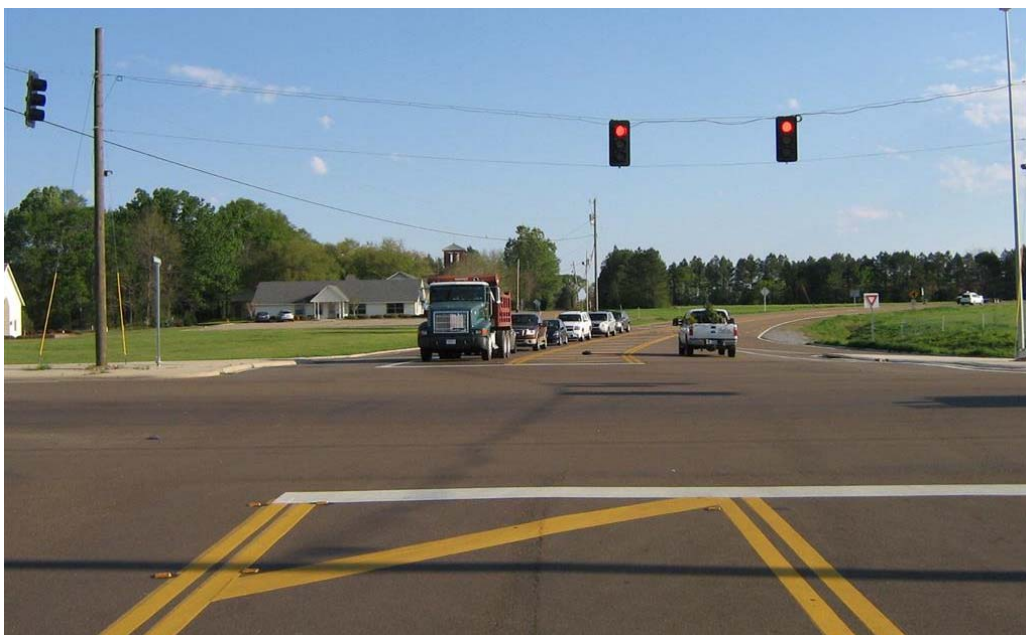
Distribution Drive is only 500 ft west of the signal at Calhoun Station Parkway. Spacing traffic signals so closely together affects the progression of traffic on the major roadway. In absence of connecting Dees Road with Distribution Drive, installation of a traffic signal, interconnected with the signal at Calhoun Station Parkway may be necessary to alleviate some of the congestion issues that exist at this location. Based on the four hours of count data collected at the study intersection, the peak-hour and four-hour signal warrants are satisfied at Distribution Drive/Gluckstadt Road.



Gluckstadt Road – Looking west across Distribution Drive.

Calhoun Station Parkway/Gluckstadt Road

Striping is recommended to be modified to allow dedicated north/south left turn lanes. Existing asphalt has been striped out to prohibit the use of this paved area. The traffic volumes recorded have nearly equal split between left and right turning traffic. Providing a dedicated left turn lane north/south within this striped out area could improve the efficiency of the existing paved area.



Dees Drive – Looking north across Gluckstadt Road at Calhoun Station Parkway

6.5 Yandell Road

US Highway 51/Yandell Road-Weisenberger Road

Significant traffic congestion on Yandell Road was observed to occur during the AM peak hour. The AM peak is affected by the Madison Crossing Elementary School, located approximately 1 mile east of US Highway 51. The lane geometry on the Yandell Road approach is affected by drainage structures that drain to Bear Creek. The east approach was not designed to accommodate this significant volume of westbound traffic. The construction of the fire station on this east approach further complicates the traffic circulation as there are emergency events and vehicles routinely obstruct the fire station driveway without the ability to clear the intersection. Madison County is currently working to install an emergency signal at this location, but the lane geometry does not allow much opportunity for vehicles to clear the fire station driveway.



Yandell Road – Looking west at US Highway 51

The westbound left turn lane at the intersection with US Highway 51 has less than 100 ft of storage. The protected westbound left turn phase is not fully utilized, as the left turning traffic is routinely impeded by through traffic queues. The angle and grade change for westbound right turning traffic make the right turning vehicles much slower than thru traffic; therefore, the right turners adversely affect the thru movement travel speeds. The drainage structures and utilities are impediments to widening, but the east approach is recommended to be widened to accommodate a westbound left turn lane, thru lane and right turn lane.

Drainage structures are recommended to be extended to accommodate widening this east approach of Yandell Road. The existing billboard will have to be removed to accommodate the roadway widening. Property on the north side of Yandell Road is identified as the South Madison County Fire Protection District. The widening is recommended to be extended 500 ft east of US Highway 51, allowing for a center turn lane across the fire station driveway and the right turn lane to extend 200 ft east of US Highway 51. Yandell Road is within a flood zone so a hydraulic study is recommended to be conducted as part of the intersection design to help mitigate the potential for flood waters to overtop the roadway.

The traffic signal is recommended to be upgraded to provide more modern/reliable vehicular detection, along with updated timing patterns with the improved lane geometry. The project is recommended to include the emergency signal with interconnect so that the two signals work together.

The extension of Yandell Road to align with Gluckstadt Road could be years before funding/construction are feasible. The increase in traffic on Yandell Road and potential future widening of US Highway 51 could mean that dual westbound left turn lanes from Yandell Road (on the existing alignment) to US Highway 51 could be accommodated. For this reason, the widening of the Yandell Road approach for the short term improvements is recommended to include a striped shoulder on each side that could be converted to a future second left turn lane, if cost feasible. Utilities may preclude the additional widening; however, the design phase is recommended to evaluate this widening opportunity.

Yandell Road/Madison Crossing Elementary School

Construction of an eastbound left turn lane is recommended at the elementary school entrance on Yandell Road to reduce the impacts that turning traffic has on thru traffic. The school traffic circulates counter-clockwise, with the eastern drive on Yandell Road serving as the school's one-way entrance and the west drive the school's one-way exit.

7.0 Long Term Improvements

7.1 Arterial Widening Projects

The continued development of residential property in the areas bordering the City of Madison will increase traffic demands on the roadway infrastructure. West of I-55, the east/west roadways connecting to I-55 are limited to include: MS Highway 463, Gluckstadt Road and MS Highway 22. MS Highway 463 and Gluckstadt Road are experiencing significant congestion in isolated areas. These three roadways are the only east/west Principal Arterial roadways west of I-55 between County Line Road and Canton. As wrecks occur on Bozeman Road, Gluckstadt Road and MS Highway 463, traffic shifts from one route to another. As these routes are currently at (or over) capacity, the traffic pattern shifts during a significant car crash overwhelms the community with excessive delays and increased traffic queues.

The potential widening of these arterial roadways is recommended. Conventional design in prior years has included widening from two/three lane to five-lane and seven-lane roadways. As many of these five and seven lane roadways have been constructed, jurisdictions have learned through increased crash histories that these roadways with two-way left turn lanes underperform when traffic volumes exceed 20,000-22,000 vpd. A multi-lane roadway with a two-way left turn lane has a significantly greater number of crashes than a similar roadway with a raised curb median. Recommendations in typical section for four lane roadways are recommended to have raised curb medians to help reduce crash rates in the study corridors.

MS Highway 463: Park Place Blvd to Annandale/Reunion Parkway – 2.6 miles

MS Highway 463 is over capacity in the 2-lane section between Park Place Boulevard and Annandale/Reunion Parkway based on existing 2016 traffic counts. Traffic forecasts show conservative estimates of increases to (in excess of) 25,000 vpd, based on a 1.5% compound annual growth. A four-lane divided roadway is needed to accommodate not only the existing traffic, but also the anticipated future growth in this 2.6 mile section of roadway. North of Annandale/Reunion Parkway, traffic diffuses and is not projected to justify widening to a four-lane facility by year 2040.

Existing congestion levels have resulted in significant crash totals along MS Highway 463. In absence of a widened roadway with a raised curb median, congestion levels will continue to have drivers forced to accept shorter gaps for turning movements and thus taking more risk. Widening MS Highway 463 directly affects the Madison Middle School traffic circulation and the ability of emergency services to respond within this area during peak hours. The cross section of the four-lane roadway is recommended to include a sidewalk and multi-use path from Annandale to Park Place Boulevard, connecting these residential areas with the Middle School and High School and future multi-use paths along Highland Colony Parkway.

Gluckstadt Road: Bozeman Road to Calhoun Station Parkway – 1.5 miles

Gluckstadt Road was widened to a 3-lane curb and gutter section in 2008/2009. Building the curbs and gutters onto the 3-lane roadway severely limited the east/west capacity of this Principal Arterial roadway. With the access to I-55 primarily limited to two interchanges west of I-55, the 3-lane section is not sufficient to accommodate existing or projected traffic volumes. Existing volumes create traffic queues west to Bozeman Road from Calhoun Station Parkway. The absence of a connection between Distribution Drive and Dees Drive restricts one of the largest industrial developed areas in the County to a single access point without signalization.

Concurrent with the three-lane widening, many developments have been approved without sufficient building setbacks or with appropriate driveway widths, spacing, or turning radii. The introduction of numerous driveways with insufficient turning radii adversely affects traffic on Gluckstadt Road. Traffic turning into developments must come to a near complete stop to enter the facility because of insufficient turning radii. The lack of appropriate building setbacks severely limits the available space for future roadway widening and could result in expensive building acquisitions to get sufficient space to provide for adequate roadway capacity and public utilities.



Driveway on Gluckstadt Road with insufficient turning radii.

Widening Gluckstadt Road to a four-lane divided roadway is essential to the future development of Madison County and the anticipated increases in traffic. Existing traffic volumes reveal that there is an immediate need for widening Gluckstadt Road in this 1.5 mile section. Existing volumes range from 15,000 at Bozeman Road to 18,000 at Calhoun Station Parkway. The interchange to the east was widened to a four lane divided roadway, but cannot receive that level of traffic because of the three-lane curb and gutter section of Gluckstadt Road to the west. The widened section of Gluckstadt Road is recommended to include four travel lanes, a center median, and a multi-use path.

If sufficient width cannot be achieved in some of the more developed eastern sections of Gluckstadt Road to accommodate a raised center median, a two-way left turn lane (TWLTL) could be constructed in place of the raised median. Securing additional right-of-way and appropriate setbacks is recommended to begin as soon as possible, as the adjacent property is developing at an accelerated rate.

Bozeman Road: MS Highway 463 to Reunion Parkway – 1.75 miles

Bozeman Road is the only contiguous north/south route between I-55 and MS Highway 463. This roadway changes names from Catlett Road to Bozeman Road to Highland Colony Parkway as it extends south of MS Highway 22 in Madison County. This section of roadway is classified as a minor arterial roadway. As more residential units are developed in this area, the traffic volumes on Bozeman Road have increased significantly as more drivers use Bozeman Road to get to MS Highway 463 to attend local schools or access I-55. The southbound left turn from Bozeman Road to MS Highway 463 is approximately 800 vph in the AM peak. This volume is near the maximum volume that can traverse the intersection turning left in one hour, given the limited queueing space for southbound traffic.

The 2016 daily volume is approximately 12,500 vehicles per day (vpd) south of Reunion Parkway and 17,600 vpd north of MS Highway 463. These volumes are forecast to be 20,100 vpd and 28,300 vpd by year 2040. Current plans are to widen Bozeman Road north of MS Highway 463 to Reunion Parkway to a four-lane divided roadway. Without an alternate route, traffic will continue to use Bozeman Road, MS Highway 463 and Gluckstadt Road and accept longer queues and associated delays concurrent with area growth. A multi-use path is recommended to be part of the typical section to ultimately extend south along Highland Colony Parkway and connect with the Natchez Trace and Ridgeland trail system.

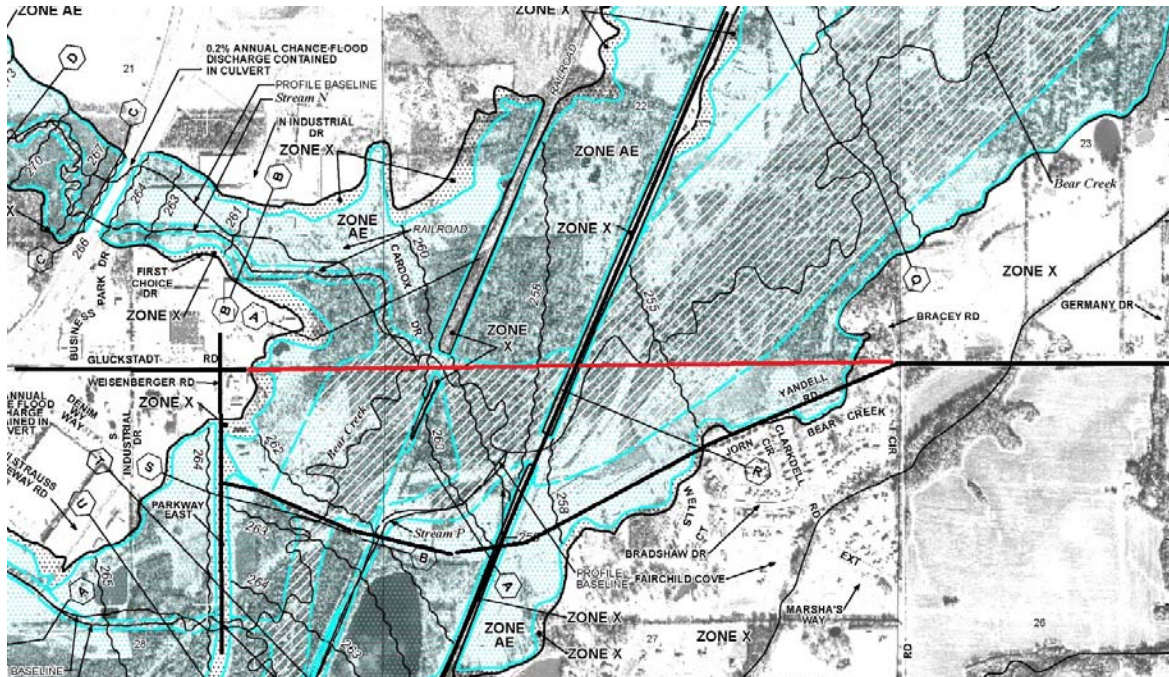
Even with the construction of the Reunion Parkway Interchange, the future year traffic volumes on Bozeman Road reveal that widening to a four-lane boulevard is still needed.

Yandell Road: US Highway 51 to Madison Crossing Elementary School - 1.0 mile

Ultimately, the alignment of Yandell Road is planned to be shifted north and reconstructed to directly align with Gluckstadt Road with an overpass at the railroad tracks. The realignment of Yandell to the north will require bridges, as the alignment crosses flood zones, Bear Creek (floodway), as well as the CNIC railroad. The railroad typically requires 21-25 ft of vertical clearance over the rail for bridges. The bridge over the railroad would likely be 2,000 lf and the adjacent Bear Creek floodway would also have to be bridged. Ultimately, the realignment of Yandell Road could require nearly 4,000 linear feet (lf) of bridge due to the railroad and floodway/flood zone construction restrictions. A bridge of this magnitude would likely cost approximately \$20 million (2016 dollars).

The majority of the traffic currently on Yandell Road crossing US Highway 51 to Weisenberger Road would divert to this northern bypass route. However, the lack of funding makes the construction of this realignment unlikely in the near future. Existing developments on Yandell Road have been constructed with minimal setbacks within narrow right-of-way. The ultimate width of Yandell Road is restricted between US Highway 51 and Clarkdell Road due to these right-of-way constraints. Therefore, the widening of Yandell Road is recommended to include a 3-lane rural cross section from US Highway 51 to Madison Crossing Elementary School, a distance of approximately 1 mile. This additional turn lane will

help turning traffic have less impacts on through volumes for the most densely developed areas of Yandell Road. The auxiliary turn lane will also help school traffic circulation during school peak hours and reduce impacts to thru traffic on Yandell Road. Widening this one mile of Yandell Road to three lanes (without curb and gutter) concurrent with the short term intersection improvements at US Highway 51 is anticipated to significantly improve travel and delays on Yandell Road. A hydraulic analysis would be necessary as part of the design process to avoid adverse effects on flooding potential with the proposed widening project.



FEMA Flood Insurance Rate Map at Yandell Road w/ future realignment of Yandell Road in red. Source: Neel-Schaffer, FEMA, 2016.

US Highway 51: Tisdale Road to Yandell Road – 2.5 miles

MDOT widened US Highway 51 through Ridgeland and Madison in 2007, terminating the project approximately 1.4 miles north of Hoy Road (just north of Tisdale Road). Traffic demands on US Highway 51 are significant as US Highway 51 serves as a parallel facility to I-55 and much of the interstate traffic diverts to US Highway 51 when there are major delays on I-55. Additionally, the presence of the Nissan plant and suppliers, along with many industrial employers in the Gluckstadt area, attracts commuters to US Highway 51. Traffic volume forecasts reveal that US Highway 51 is anticipated to exceed 22,000 vpd south of Yandell Road by 2040. Widening US Highway 51 to a four-lane divided roadway is recommended prior to Year 2030. The widening is recommended to extend 2.5 miles from the existing five-lane, north to 0.4 miles north of Yandell Road at the Gluckstadt Road alignment (future Yandell Road intersection).

7.2 New Road Construction

Reunion Parkway Extension: Bozeman Road to Parkway East + New I-55 Interchange - 1.2 miles

The extension of Reunion Parkway east to Parkway East would provide an alternate route for east/west traffic to cross and access I-55. The project was designed in the early 2000’s and ultimately the permit for the County was rejected by MDOT which resulted in litigation and a financial settlement. The need for the connecting route is exacerbated by the fact that the two east/west Principal Arterial routes (MS Highway 463 and Gluckstadt Road) are both over capacity and experiencing extended traffic queues and significant delays at signalized intersections on these commuting/school routes during peak hours.

The construction of Reunion Parkway between Bozeman Road and Parkway East is needed to provide additional capacity to relieve some of the congestion issues currently being experienced on Gluckstadt Road and MS Highway 463 and to provide improved emergency service response times as the congestion is adversely affecting access for emergency service vehicles. The need for additional east/west capacity on the west side of I-55 in Madison County is paramount, as evidenced by the significant traffic volumes on both MS Highway 463 and Gluckstadt Road, high crash frequency, and daily traffic queues/delays. The capacity restrictions on Gluckstadt Road with a three-lane curb and gutter section have limited the ultimate east/west capacity, west of I-55.

The availability of undeveloped land and the rate of new housing construction leads future year traffic volume forecasting to anticipate that volumes will continue to increase at accelerated rates. Based on the existing (2016) traffic volumes, the construction of this section of Reunion Parkway is anticipated to divert approximately 20% of the eastbound AM Peak hour traffic currently using Gluckstadt Road and MS Highway 463 during the peak hours to Reunion Parkway. This diversion is anticipated to significantly improve traffic congestion issues that are currently being experienced during peak hours on Gluckstadt Road and MS Highway 463.

Design plans for the interchange and roadway construction were developed and submitted to Madison County and right-of-way was delineated for the roadway and the proposed interchange. In the seven years since the plans were completed and right-of-way delineated, design standards have changed and existing conditions may have also changed. The addition of a multi-use path along Reunion Parkway is recommended to connect to the system of regional trails that are being developed along Bozeman Road and Highland Colony Parkway, extending south to the Natchez Trace trail system.

The Environmental Assessment for the proposed Reunion Parkway interchange will have to be updated as required by the Federal Highway Administration (FHWA). FHWA is one of two primary agencies that have review/approval authority over new interstate access requests (MDOT is the other agency). FHWA has changed their review process and now will not review or approve Environmental Assessments unless funding for the proposed project has been identified and secured. The previously prepared interchange design plans will need to be updated to ensure that the roadway and bridge plans meet current MDOT standards. MDOT has stated that I-55 will require widening north of MS Highway 463 with new thru lanes north and south to the proposed Reunion Parkway interchange (a distance of approximately 2 miles) concurrent with or in advance of the proposed interchange at Reunion Parkway. MDOT has stated that their current and near term budgets do not include funds for this I-55 lane widening project, nor the interchange.

Reunion Parkway Phase 3: Parkway East to US Highway 51 – 1.5 miles

The limited number of east/west crossings of the railroad tracks connecting US Highway 51 with I-55 is similar on the east side of I-55. Only Weisenberger Road and Madison Parkway connect to US Highway 51 in this 3.5 mile corridor. While MS Highway 463 and Gluckstadt Road have 2,642 vph eastbound, Weisenberger Road and Madison Parkway have 1,808 vph westbound, about 32% fewer vehicles. Both Madison Parkway and Weisenberger Road are operating within the link capacity; however, Weisenberger Road has an at-grade railroad crossing that can block traffic when trains cross and can impede access for emergency service vehicles.

Extending Reunion Parkway east from Parkway East to US Highway 51 to intersect at Green Oak Lane will provide an additional grade separated crossing over the railroad tracks and will require a bridge over Bear Creek. The cross section is intended to be a two-lane roadway. A multi-use path is recommended to be constructed as part of the typical section. As new developments locate along Parkway East, the traffic demands for this connecting route are anticipated to increase.

8.0 Future Year Capacity Analysis

8.1 Levels-of-Service with Existing Geometry

The 2016 existing traffic volumes were forecast to years 2030 and 2040 using the transportation model and area growth rates. The results of the capacity analysis are shown in **Table 12**.

Table 12- Signalized Intersections
Year 2030/2040 Level-of-Service w/ Existing Geometry

Signalized Intersection	Time Period	Approach LOS (2030/2040)				Intersection LOS
		EB	WB	NB	SB	
Reunion Pkwy/ MS Hwy 463#8	AM Peak	F/F	F/F	B/C	D/F	E/F
	PM Peak	C/D	C/D	B/C	B/B	B/C
Park Place Blvd MS Hwy 463#5	AM Peak	F/F	E/F	E/F	D/D	E/F
	PM Peak	C/C	F/F	F/F	D/D	E/F
Bozeman HCP/ MS Hwy 463#6	AM Peak	F/F	F/F	D/E	F/F	F/F
	PM Peak	D/F	D/F	E/E	F/F	D/F
I-55 Ramps/ MS Hwy 463#11	AM Peak	E/F	D/F	E/F	C/D	E/F
	PM Peak	F/F	E/F	F/F	C/C	F/F
Grandview Blvd/ MS Hwy 463#16	AM Peak	C/D	E/F	D/E	F/F	E/F
	PM Peak	F/F	D/F	E/F	F/F	E/F
US Hwy 51/ MS Hwy 463#21	AM Peak	E/F	F/F	E/F	E/F	E/F
	PM Peak	F/F	D/F	F/F	E/F	F/F
Bozeman Rd/ Gluckstadt Rd-#2	AM Peak	D/E	C/E	D/E	D/E	D/E
	PM Peak	C/D	C/D	C/D	D/E	C/D
Bozeman Rd/ Reunion Pkwy#4	AM Peak	F/F	-	B/E	B/E	F/F
	PM Peak	C/C	-	A/A	A/A	A/A
Calhoun Stn Pkwy Gluckstadt Rd#23	AM Peak	F/F	B/B	D/D	F/F	F/F
	PM Peak	C/C	F/F	D/F	C/E	E/F
I-55 SB Ramps/ Gluckstadt Rd#19	AM Peak	E/F	A/A	-	D/E	D/F
	PM Peak	A/A	A/A	-	C/D	A/A
I-55 NB Ramps/ Gluckstadt Rd#20	AM Peak	A/B	B/B	C/C	-	B/B
	PM Peak	B/B	C/C	C/C	-	C/C
Weisenberger Rd/ Gluckstadt Rd#12	AM Peak	C/C	D/D	A/A	B/B	B/B
	PM Peak	C/C	C/C	A/A	B/B	B/B
Parkway East/ Weisenberger#13	AM Peak	C/C	C/C	B/B	A/A	B/B
	PM Peak	C/D	C/C	B/C	B/B	B/B
US Hwy 51/ Yandell Rd#14	AM Peak	F/F	E/F	D/E	D/F	E/F
	PM Peak	F/F	B/E	F/F	D/F	F/F

Source: Neel-Schaffer, 2016. HCM 2010

Signalized intersections were shown to be at/over capacity on MS Hwy 463 at each study intersection without geometric improvements. Bozeman Road at Reunion Parkway (AM), Gluckstadt Road at Calhoun Station Parkway and Yandell Road at US Highway 51 are shown to be over capacity in the horizon analysis years.

8.2 Link Levels-of-Service in Horizon Analysis Years

Study area roadway segments were evaluated to determine the impacts that widening projects will have on the levels-of-service. The link volumes for future year traffic west of I-55 are listed in **Table 13** with corresponding LOS based on daily traffic volume forecasts and proposed roadway widening projects.

**Table 13 - Year 2030/2040
Link Capacity/Level-of-Service – Arterial Roads West of I-55**

Segment (From-To)	Daily Volume		Link LOS		Widened Link LOS	
	2030	2040	2030	2040	2030	2040
<u>MS Hwy 463:</u>						
Hwy 22-Stribling Rd	14,200	16,400	D	F		
Stribling Rd-Gluckstadt Rd	9,900	11,400	C	C		
Gluckstadt Rd-Reunion Pkwy	10,800	12,600	C	C		
Reunion Pkwy- Robinson Spgs	17,500	20,300	F	F	B	B
Robinson Spgs-Livingston Rd	19,100	22,200	F	F	B	B
Livingston Rd-Park Place Blvd	21,800	25,300	F	F	B	B
Park Place Blvd-Bozeman/HCP	23,500	27,200	D	D		
Bozeman Rd/HCP - I-55	46,300	53,700	E	F		
<u>MS Hwy 22:</u>						
W. of 463-MS 463	6,700	8,200	C	C		
MS 463-Nissan Pkwy	4,600	5,600	C	C		
Nissan Pkwy-E. of Nissan	2,800	3,400	B	B		
<u>Stribling Road:</u>						
MS 463-Dewees Road	10,000	12,200	C	C		
Dewees Road-Catlett Rd	12,700	15,400	C	D		
<u>Stribling Road Extension:</u>						
Catlett Rd-E. of Catlett Rd	7,900	9,700	C	C		
<u>Gluckstadt Road:</u>						
MS 463-Dewees Rd	4,600	5,600	C	C		
Dewees Rd-Bozeman Rd	10,700	13,000	C	C		
Bozeman Rd-Distribution Dr	20,300	24,800	F	F	B	B
Distribution Dr-Calhoun Stn Pkwy	22,300	27,200	F	F	B	B
Calhoun Stn Pkwy-I-55 SB	23,900	29,100	D	E		
<u>Reunion Parkway:</u>						
MS 463-Honours Drive	5,500	6,800	B	B		
Honours Dr-Bozeman Rd	8,300	10,100	B	B		
<u>Catlett Road:</u>						
Stribling Rd-Stribling Rd Ext	13,500	16,400	D	F		
Stribling Rd Ext-Gluckstadt Rd	14,100	17,200	D	F		
<u>Bozeman Road:</u>						
Gluckstadt Rd-Reunion Pkwy	13,700	16,700	D	F	B	B
Reunion Pkwy-MS 463	23,200	28,300	F	F	B	C

Source: Neel-Schaffer, 2016, FDOT Quality/Level-of-Service Manual Table 4-2.

The evaluation of the arterial link volumes on the west side of I-55 (from a planning level capacity analysis of link volumes) reveals that proposed widening projects are anticipated to accommodate year 2040 traffic. Catlett Road is shown to need re-evaluation as year 2040 volumes exceed capacity while year 2030 volumes do not. MS Highway 463 volumes north of Stribling Road are shown in 2040 to exceed capacity, primarily related to the school volumes in this area. Re-evaluation of these volumes is recommended, but widening MS Highway 463 north of Reunion Parkway is not shown to be necessary based on the traffic projections. Future development in Livingston and at the Mannsdale Elementary School could affect the north end of the corridor in horizon years.

Link volumes on MS Highway 463 and Gluckstadt Road adjacent to I-55 are shown to be at (or over) capacity limits in 2030 and 2040. These are the highest volume locations and have the most traffic demand as these are the primary commuting routes for area residents to access I-55. Providing another east/west connecting route to I-55 (Reunion Parkway) is anticipated to provide significant relief to the I-55/MS Highway 463 interchange. An evaluation of the arterial traffic volumes on the east side of I-55 is shown in **Table 14**.

Table 14 – Year 2030/2040
Link Capacity/Level-of-Service – Arterial Roads East of I-55

Segment	Daily Volume		Link LOS		Widened Link LOS	
	2030	2040	2030	2040	2030	2040
<u>MS Hwy 463:</u>						
I-55 – Grandview Blvd	52,800	61,300	F	F		
Grandview Blvd – Hwy 51	36,300	42,200	F	F		
<u>Gluckstadt Road:</u>						
I-55 NB Ramps-Weisenberger Rd	15,700	19,100	C	D		
<u>Weisenberger Road:</u>						
Gluckstadt Rd-Denim Way	13,100	15,900	B	B		
Parkway East-Hwy 51	13,100	15,900	C	E		
<u>Yandell Road:</u>						
Hwy 51-Clarkdell Rd	14,500	17,700	D	F		
Clarkdell Rd to Old Canton Rd	6,200	7,600	C	C		
<u>Parkway East:</u>						
Weisenberger Rd-Reunion Pkwy	5,400	6,600	C	C		
<u>Galleria Parkway:</u>						
N. of Hwy 463 to Hwy 463	12,700	15,400	C	C		
<u>US Highway 51:</u>						
N. of Yandell Rd-Yandell Rd	13,700	16,700	D	F	B	B
Yandell Rd-Green Oak Dr.	18,200	22,200	F	F	B	B
Green Oak Dr.-Hwy 463 (5-Lane)	28,100	34,200	C	D		

Source: Neel-Schaffer, 2016, FDOT Quality/Level-of-Service Manual Table 4-8.

Link LOS reveal that MS Highway 463 is shown to be over capacity between US Highway 51 and I-55. This segment of roadway will likely benefit from a diversion of traffic with the construction of the proposed Reunion Parkway interchange. Growth projections affect these segments of roadway more, as these are some of the highest corridor volumes. Weisenberger Road between US Highway 51 and Parkway East is shown to be at capacity in 2040. A bypass route along Gluckstadt Road alignment or new connection (Reunion Parkway Phase 3) would help to alleviate some of this volume. Widening within this flood zone and across the railroad tracks will be require lengthy bridges, which will increase the project costs.

Yandell Road is shown to have a link over capacity in 2040 between US Highway 51 and Clarkdell Road. The proximity of the existing developments along the roadway inhibits the ability to widen on the existing alignment beyond 3-lanes without acquisition of existing structures. A temporary improvement would be the 3-lane widening east of US Highway 51 to the Elementary School. Using a rural cross section would still allow for future widening if benefit/cost analysis identifies that structure acquisition is more affordable than the bridges required for the realignment of Yandell Road to Gluckstadt Road.

US Highway 51 is shown to be over capacity in 2030 between Yandell Road and Green Oak Drive, and then in 2040 north of Yandell Road. MDOT does not have any funds budgeted or plans to widen US Highway 51 at this time. Traffic projections identify that this corridor is anticipated to need additional lanes by year 2030 south of Yandell Road and north of Yandell Road by 2040.

9.0 Recommendations and Conclusions

The study area has many congestion and safety needs. Commuters along the study corridors are well aware of the extended traffic queues and delays associated with peak hour travel. The elementary and middle school traffic circulation creates isolated issues within the study corridors. The lack of design reviews and planning has led to a large amount of development with minimal infrastructure to support it.

Minimum standards are recommended to be adopted by the County to require new developments to provide auxiliary turn lanes and minimum right-of-way dedication to accommodate the ultimate cross section needed to support the growth in the County. Existing traffic signals have significant pressure and routinely have detection issues that affect operation. Upgrading traffic signals to implement more advanced vehicular detection is recommended to get the maximum efficiency out of the existing signals as the intersections do not have sufficient roadway capacity and with malfunctioning detection, the signal operation is even less efficient.

Similarly, the turning radii used on many driveways along arterial streets is not sufficient for drivers to enter the driveway without coming to a complete stop in thru traffic. Increased turning radii are needed to maintain operational speeds along arterial routes. Access management practices are also needed to combine driveways, have cross access and prohibit new driveways in close proximity to traffic signals or major intersections. The use of roundabouts in place of conventional traffic signals is recommended, as roundabouts have been proven to reduce fatal and life threatening crashes by more than 80%. Roundabouts help to reduce travel speeds and don't have the overhead visual clutter associated with typical signalized intersections. The combined effects of providing auxiliary lanes at new developments (when justified), improved turning radii, appropriate right-of-way widths, access management practices and more efficient/modern traffic control detection and controllers will significantly improve the infrastructure and future efficiency of the County roadways.

Traffic control signage in Madison County is deficient. The majority of the street signs have not been placed in accordance with standards. Most signs are not at the appropriate sign mounting height and don't comply with the maximum number of signs per sign post. Studies have demonstrated that improperly placed signs do not obtain the same compliance rates as properly placed signs. The County's regulatory and warning signs are recommended to be reviewed (County wide) and brought into compliance with sign standards outlined in the *Manual on Uniform Traffic Control Devices (MUTCD)*.

One of the major side effects of the excessive congestion is the effect on emergency service responders. Police, fire and ambulance service routinely have to go into oncoming traffic lanes on two-lane roadways when there is an emergency. Improvements to the congestion level and delays could help improve emergency service response times in the area.

The interstate capacity issues and changes with FHWA reviews for Environmental Assessments (EA) raises two major challenges that must be addressed for the ultimate roadway circulation on the west side of I-55 to be improved. MDOT has stated that funding is not available to widen I-55 between MS Highway 463 and Reunion Parkway and that this widening would be required for the Reunion Parkway interchange to be constructed. FHWA now requires funding to be identified and secured for a project before the agency will review (and approve) an EA. FHWA approval for an EA is required for new access to the interstate. Madison County is recommended to initiate discussions with MDOT to further understand the potential for the Reunion Parkway interchange. The pace of development in the areas west of I-55 is going to continue to put additional burden on the two interchanges on I-55, but especially the MS Highway 463/I-55 interchange which carries significantly more traffic than Gluckstadt Road.

Short Term Improvements

Many short term improvements were identified to help reduce the congestion and delays in the study area. The short term improvements identified are summarized in **Table 15** with peak hour entering volumes and ranking of the total crashes. The improvements are sorted by total number of crash rankings.

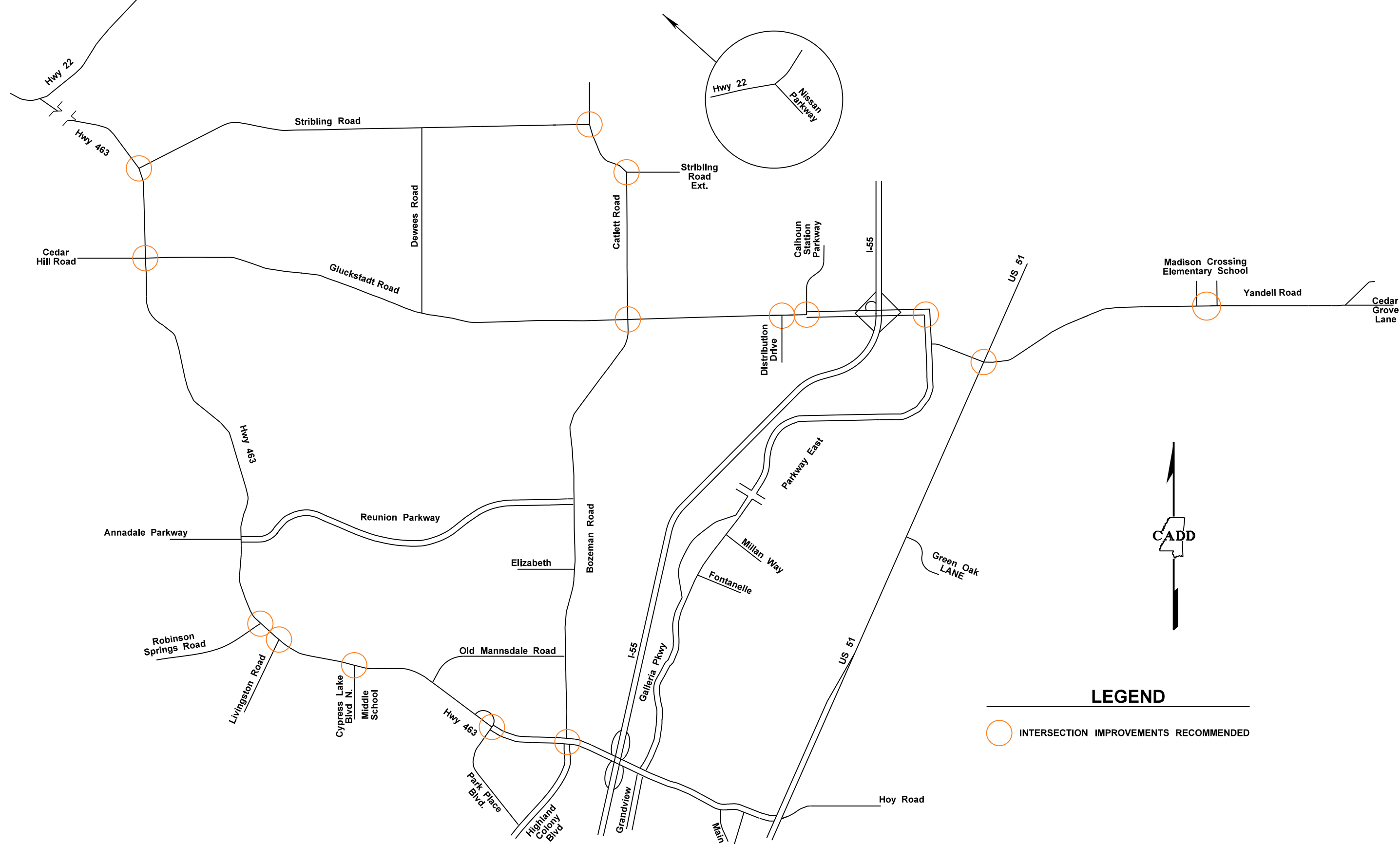
Table 15
Summary of Short Term Improvements

Intersection	Improvement Description	6 Year Total # of Crashes	Entering Vol	
			AM	PM
Bozeman Rd/ MS Hwy 463*	Widen north approach to provide storage for dual SB left turn lanes (400 ft). Construct separate NB left for Colony Crossing Way widening to the east, so n/s lefts don't compete for the same space. Restrict EB left turns from MS Hwy 463 to "protected only" during peak hours because of sight distance from opposing dual lefts	138	4,032	4,358
US Highway 51/ Yandell Rd	Widen east approach to provide 500 ft left turn lane and 200 ft right turn lane. Provide paved shoulder if cost feasible. Install emergency signal. Upgrade signal detection equipment and timing plans.	69	2,126	2,163
Park Place Blvd/ MS Hwy 463	Widen to provide 2 EB thru lanes (700 ft) + EB right turn lane (250 ft). Widen to provide 2 WB thru lanes to Windsor Hills Drive	64	2,038	1,788
Robinson Springs/ MS Hwy 463	Construct WB left turn lane	58	1,580	1,438
Middle School/ MS Hwy 463	Extend WB left turn lane from 360 ft to 800 ft. Extend EB right turn lane from 160 ft to 280 ft to provide full width right lane between fire station and MMS. Reconstruct NB right turn lane to eliminate channelization and provide Type 7R head.	50	1,851	n/a
Gluckstadt Road/ Bozeman Road	Restripe north approach to all dual SB lefts, reconstruct taper on east approach and restripe center turn lane to provide dual eastbound lanes to Ridgefield.	27	1,805	1,846
Gluckstadt Rd/ MS Hwy 463	Construct N/S left turn lanes, improve right turn radii, add intersection lighting.	26	989	758
Gluckstadt Rd / Weisenberger Rd	Restripe southbound lane to better delineate dedicated thru and provide <i>added lane</i> (W4-3) signing.	23	1,184	1,130
Calhoun Stn Pkwy/ Gluckstadt Rd	Restripe north/south approaches to provide dedicated left turn lanes within existing asphalt.	17	1,924	2,036
Stribling Rd/ MS Hwy 463	Construct SB left turn lane (200 ft), NB right turn lane (175 ft).	17	1,347	725
Distribution Drive/ Gluckstadt Rd	Widen east approach to provide two EB lanes to Calhoun Station Parkway. Install traffic signal at Distribution Drive, interconnected with Calhoun Station Parkway. Connect Distribution Drive to Dees Dr at Hazleton Cove. Connect Enterprise Dr with Lexington Dr.	12	1,711	1,871
Livingston Rd/ MS Hwy 463	Construct EB right turn lane - 225 ft in length (min). Construct 100 ft paved shoulder for westbound traffic at Livingston Rd intersection.	9	1,555	1,508
Stribling Road/ Catlett Road	Construct roundabout for traffic control, rather than "Stop" for Eastbound traffic, or construct channelized EB right turn lane with southbound acceleration lane.	9	1,002	922
Stribling Road Ext/ Catlett Road	Construct roundabout for traffic control, rather than "Stop" for Westbound traffic, or construct SB left turn lane, NB right turn lane and WB right turn lane.	7	1,182	1,086
Yandell Road/ Elementary School	Construct eastbound left turn lane at Madison Crossing Elementary School entrance.	0	n/a	n/a

*Bozeman Road widening is a funded project that is planned to start the Environmental phase in 2016. Source: Neel-Schaffer, 2016.

The short term improvements are shown graphically in **Figure 11** and in more detail in Appendix A.

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LEGEND

○ INTERSECTION IMPROVEMENTS RECOMMENDED

Long Term Improvements

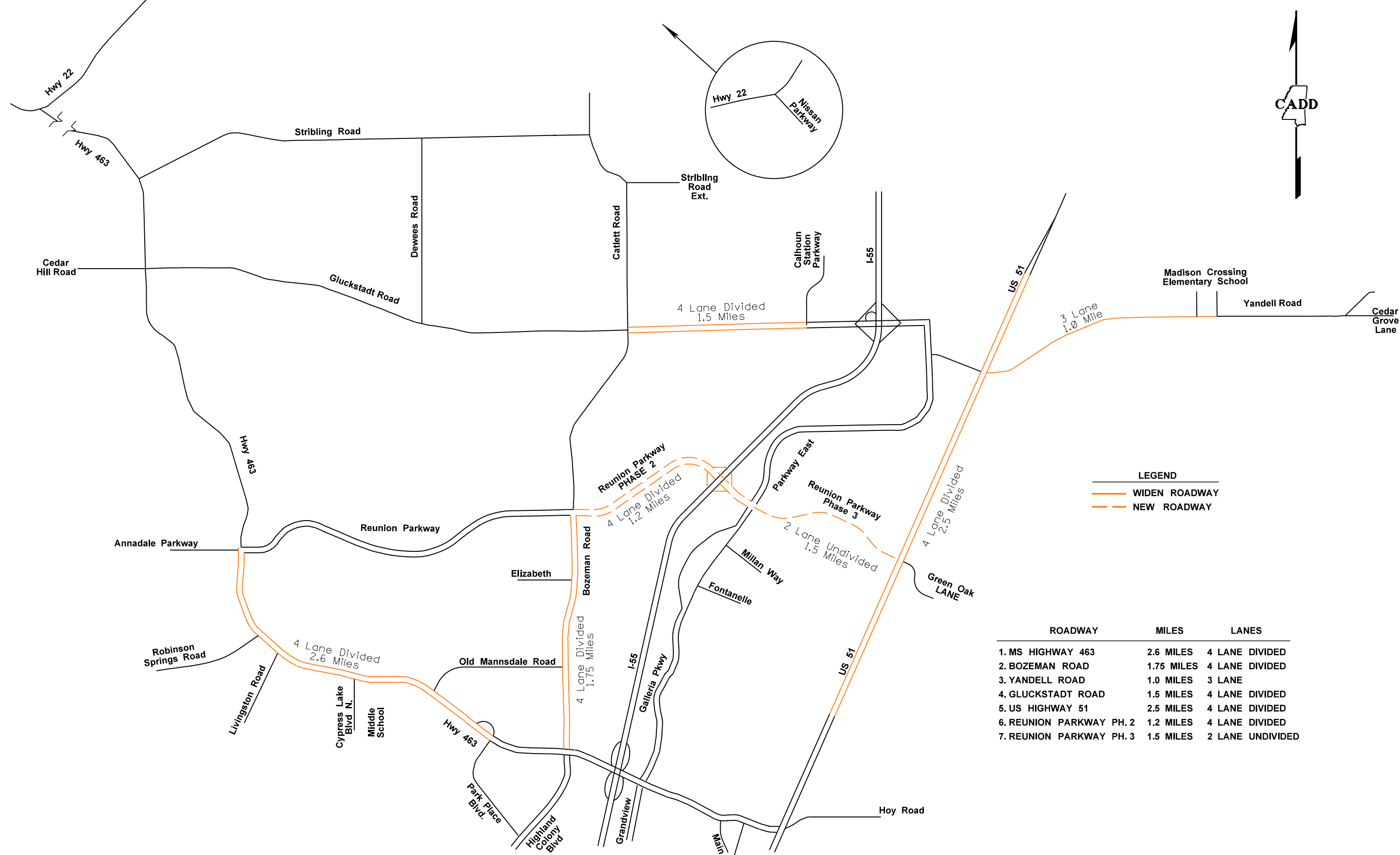
The long term improvements were identified as larger capital investments with improvements to a roadway corridor or new roadway construction. The Functional Classification of streets identifies the major transportation corridors as Principal or Minor Arterial Streets. These transportation corridors are vital to the quality of life of the people living and working in these areas. The improvements to these roadways are recommended to include multi-use paths, when feasible, as multi-use paths have been demonstrated to add to the quality of life in communities and also have a positive impact on property values. A summary of the long term improvements is provided in **Table 16**.

Table 16
Summary of Long Term Improvements

Roadway	Improvement Description	Project Length (mi)	Six Year Total # of Crashes	Entering Vol	
				AM	PM
MS Highway 463	Widen from 2 lane to 4 lane divided between Park Place Boulevard and Annandale/Reunion Parkway. Include sidewalk and multi-use path.	2.6	294	1,774	1,591
Bozeman Road*	Widen from 2 lane to 4 lane divided between MS Highway 463 and Reunion Parkway. Include sidewalk and multi-use path.	1.75	206	1,646	1,757
US Highway 51	Widen from 2 lane to 4 lane divided between Tisdale Road and Yandell Road. Include sidewalk and multi-use path.	2.5	174	1,381	1,310
Yandell Road	Widen from 2 lane to 3 lane (w/o curb and gutter - rural section) between US Highway 51 and Madison Crossing Elementary. Include sidewalk and multi-use path if feasible.	1.00	107	899	1,097
Gluckstadt Road	Widen from 3 lane to 4 lane divided between Calhoun Station Parkway and Bozeman Road. Include multi-use path.	1.5	83	1,564	1,652
Reunion Parkway-Phase 2	New construction of 4 lane divided roadway from Bozeman Road to Parkway East with new interchange at I-55.	1.2	n/a	n/a	n/a
Reunion Parkway-Phase 3*	New construction of 2 lane roadway from Parkway East to US Highway 51. Includes bridge over railroad and bridge over Bear Creek.	1.5	n/a	n/a	n/a

*Bozeman Road widening and Reunion Parkway Phase 3 are funded projects that are planned to start the Environmental phase in 2016. Note: MS Highway 463, US Highway 51 and I-55 interchange projects are under the jurisdiction of MDOT. Widening or interchange projects on these facilities would have to be coordinated, planned and led by MDOT. Source: Neel-Schaffer, 2016.

The long term improvements are shown graphically in **Figure 12**.



Appendix

A	Short Term Improvement Graphics	A1-A13
B	<u>Tables & Graphs</u>	B1-B12
	Link Volume Calculation Tables B1-B2	B1-B2
	Table 4-8 FDOT Generalized Peak Hour Directional volumes	B3
	Table 4-2 FDOT Generalized Daily Two-Way volumes	B4
	Weisenberger Railroad Crossing Inventory	B5-B6
	Auxiliary Lane Warrant Graphs	B7-B9
	Functional Classification Map	B10
	Study Area - Crash Frequency Heat Map	B11
	FEMA FIRM Map – Yandell Road Area	B12
C	<u>Crash Data Tables</u>	C1-C14
	MS Hwy 463	C1-C4
	Bozeman Road	C5
	Catlett Road	C6
	Gluckstadt Rd	C7-C9
	MS Hwy 22	C10
	Parkway East	C11
	Stribling Rd	C12
	Weisenberger	C13
	Yandell Rd	C13
	US Highway 51	C14
D	<u>Transportation Model Scenarios</u>	D1-D21
	2013 Base Model Year	D1-D3
	2030 Base + Bozeman Road 4 lane to Reserve Subdivision	D4-D6
	2040 Base + Bozeman Road 4 lane to Reserve Subdivision (Alt 1)	D7-D9
	2040 Alt 1 + Reunion Parkway Phase 2+3/w Interchange (Alt 2)	D10-D13
	2040 Alt 2 + MS Hwy 463 4 lane to Annandale Parkway (Alt 3)	D14-D17
	2040 Alt 3 + Bozeman 4 lane to Gluckstadt, Realign Yandell to Gluckstadt	
	4 Lane Yandell east to Old Canton, US 51 4 lane to Yandell	D18-D21
E	<u>2016 Existing Geometry Intersection LOS Summary</u>	E1-E53
	2016 AM Signalized Intersection Summary	E1-E15
	2016 PM Signalized Intersection Summary	E16-E29
	2016 AM/PM All-Way Stop LOS	E30-E33
	2016 AM Un-signalized Intersection Summary	E34-E43
	2016 PM Un-signalized Intersection Summary	E44-E53
F	<u>2030 Existing Geometry Intersection LOS Summary</u>	F1-F53
	2030 AM Signalized Intersection Summary	F1-F15
	2030 PM Signalized Intersection Summary	F16-F29
	2030 AM/PM All-Way Stop LOS	F29-F33
	2030 AM Un-signalized Intersection Summary	F34-F43
	2030 PM Un-signalized Intersection Summary	F44-F53
G	<u>2040 Existing Geometry Intersection LOS Summary</u>	G1-G53
	2040 AM Signalized Intersection Summary	G1-G15
	2040 PM Signalized Intersection Summary	G16-G29
	2040 AM/PM All-Way Stop LOS	G29-G33
	2040 AM Un-signalized Intersection Summary	G34-G43
	2040 PM Un-signalized Intersection Summary	G44-G53