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TECHNICAL MEMORANDUM

To:	City of Williams	**Date:**	August 23, 2011
Attn:	Gary Price, Chuck Bergson, P.E.	**Project:**	City of Williams
From:	OMNI-MEANS		On-Call Services
Re:	2010 Circulation Update Study	**Job No.:**	25-1731-02
		File No.:	C1163MEM007.DOC
CC:	Paula Danulek, Mac Birch		

INTRODUCTION

This technical memorandum is intended as a supplementary document to the Draft Citywide Circulation Study (Omni-Means 2007) to quantify the existing and future transportation conditions and facility needs within the City of Williams. Future traffic forecasts were prepared based upon proposed City General Plan buildout development assumptions as provided by Development Impact INC (June 1, 2011) following input from City officials, City staff and the General Plan Action Committee (GPAC). Omni-Means has updated the City travel demand model prepared for the 2007 Citywide Circulation Study based upon this data. Peak hour intersection turning movement volume projections were obtained from the updated model for updates to the intersection capacity models.

{Note: The 2007 Draft Citywide Circulation Study due to staff changes at the City was never finalized. This draft study included graphics depicting future roadway connections within the County south of the City's Sphere of Influence. These future roadway extensions of Hankins Road, Davis Road, and Walnut Drive along with a new east/west facility (not labeled) connecting Hankins Road (north/south portion) to Zumwalt Road were only concepts in the context of a draft circulation study and at the time had no standing either with the City or the County. For clarification, these future roadway connection concepts have been removed from all transportation facility graphics.}

EXISTING TRANSPORTATION SYSTEM

The City of Williams is located in Colusa County, located between Sacramento and Redding and along I-5 between the Husted Road and State Route 20 (SR 20) interchanges. The following roadways provide primary circulation through and within the City.

Interstate* 5 *(I-5) is a four-lane freeway that extends throughout California from Mexico to the Oregon border, providing regional access to the City of Williams from Redding, Sacramento, and the San Francisco Bay Area.. Within the City's sphere of influence, I-5 has interchanges at Husted Road, E Street and SR 20.

State Route 20 (SR 20) is a state highway facility that traverses in the east-west direction through central and northern California connecting Interstate Highway 5 with Interstate Highway 80. Regionally, SR 20 serves as an inter-regional auto and truck travel route that connects the Central Valley with the Cities of Williams, Marysville and Grass Valley, and Nevada City. Within the City's sphere of influence, SR 20 is predominantly a two-lane arterial.

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E Street (SR Business 20) is a two-lane roadway that extends east and west from I-5, connecting with SR 20 and Old Highway 99 to the west and Husted Rd. to the east. The posted speed limit on E Street varies from 25 mph to 35 mph. E Street forms all way stop controlled intersections with 7th Street and 5th Street. The facility has half street improvements as it crosses I-5, without any bicycle lanes.

Husted Road is a two-lane roadway that runs north-south and connects I-5, Old Highway 99, E Street, and SR 20. The facility does not have designated bike-lanes and sidewalks.

Old Highway 99 West is a two-lane north south arterial that traverses parallel to I-5, and connects to it via the Husted Road interchange ramps. Old Highway 99 West traverses through a mixed use commercial and residential areas. This roadway is designated as 7th Street between B Street and Theatre Road.

9th Street is a two lane north-south collector which provides connectivity between central Williams and areas south of the City. The roadway is designated as Zumwalt Road south of Theater Road. 9th Street is stop controlled at the intersection with E Street.

12th Street is a two lane north-south residential collector that begins in the south as a cul-de-sac, and then extends north to E Street. The roadway is designated as Engram Road, south of Hankins Road.

Freshwater Road is a two-lane collector facility that traverses in the east-west direction along the northern City Limits of Williams. Freshwater Road is stop controlled at the intersection with SR 20.

Davis Road is a two lane north-south collector that extends from E Street to the north and extends south of Hankins Road changing the orientation to east-west direction before terminating on Zumwalt Road. This roadway serves as a primary access for the residences along the street.

Hankins Road is a two lane east-west collector extends from Zumwalt Road to the east and changes its orientation to north-south beyond the city limit.

Crawford Road is a two lane east-west street and is split into two segments by I-5. This street extends up to 9th Street/Zumwalt Road to west and Husted Road to east. There are no plans to connect the eastern and western segments with a crossing of I-5 freeway. This street is stop controlled at the intersections with 9th Street and Husted Road.

Abel Road is a two lane east-west street which begins at Husted Road and extends beyond the City limits to east. This street is stop controlled at the intersection with Husted Road.

Specific intersections and roadway segments within the planning area have been selected for evaluation as a part of the Citywide Traffic Circulation Study and include the following:

1. SR 20/E. Street
2. SR 20/Old Highway 99 West
3. SR 20/I-5 SB Ramps
4. SR 20/I-5 NB Ramps
5. SR 20/Husted Road/Freshwater Road
6. E Street/9th Street North
7. E Street/9th Street South
8. E Street/7th Street
9. E Street/5th Street
10. E Street/I-5 SB Ramps
11. E Street/I-5 NB Ramps

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12. E Street/Vann Street
13. E Street/Husted Road
14. Husted Road/Husted Lateral Road
15. Husted Road/Abel Road
16. Husted Road/Crawford Road
17. Husted Road./Old Highway 99 West
18. Husted Road/I-5NB Ramps
19. Husted Road/I-5SB Ramps
20. E Street/Marguerite Drive (Cumulative Scenario)
21. SR 20/Marguerite Drive (Cumulative Scenario)

LEVEL OF SERVICE METHODOLIGIES

The Citywide Traffic Circulation Study quantifies current and projected future traffic operations through the determination of "level of service" (LOS). Level of service is a qualitative measure of traffic operating conditions, whereby, a letter grade "A" through "F" is assigned to an intersection or roadway segment representing progressively worsening traffic conditions.

Volume-to-Capacity (V/C) ratio will be the determining factor in assigning intersection level of service values. This analysis will be completed using methods documented in the Transportation Research Board (TRB) Publication *Highway Capacity Manual, Fourth Edition, 2000* (HCM-2000) and implemented in *Synchro Version 7* (Trafficware). For two-way-stop-controlled (TWSC) intersections, the "worst-case" movement V/C and LOS will be reported. For signalized intersections and all-way-stop-controlled (AWSC) intersections, the overall intersection V/C and LOS will be reported. The V/C-based LOS criteria for intersections are outlined in Table 1A. Table 1B presents the HCM based average daily traffic (ADT) based roadway level-of-service thresholds.

The current City of Williams General Plan does not identify a policy for acceptable LOS for transportation facilities.

The Caltrans published *Guide for the Preparation of Traffic Impact Studies* (dated December 2002) states the following:

> *"Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities, however, Caltrans acknowledges that this may not be always feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS."*

Based on the direction from City of Williams staff, for the analysis of transportation facilities within this memo, LOS D has been taken as the threshold for acceptable/tolerable operations *"herein referred to as Acceptable LOS. It is noted that the City will strive to meet a higher than LOS D and does for the most part through implementation of the various policies and programs identified in this study.*

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TABLE 1A
LEVEL OF SERVICE (LOS) CRITERIA FOR INTERSECTIONS

Level of Service	Type of Flow	Delay	Maneuverability	Volume-to-Capacity Ratio (V/C)
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	< 0.6
B	Stable Flow	Good progression and / or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	≥ 0.6 and < 0.7
C	Stable Flow	Higher delays resulting from fair progression and / or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted	≥ 0.7 and < 0.8
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	≥ 0.8 and < 0.9
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	≥ 0.9 and < 1.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	> 1.0

References: 2000 Highway Capacity Manual

TABLE 1B
LEVEL OF SERVICE (LOS) CRITERIA FOR ROADWAY FACILITIES

Roadway Type	Average Daily Traffic (ADT) – Total of Both Directions				
	A	B	C	D	E
Six-Lane Freeway	60,000	80,000	100,000	120,000	140,000
Eight-Lane Divided Arterial	44,000	50,000	58,000	65,000	72,000
Four-Lane Freeway	35,000	50,000	65,000	80,000	95,000
Six-Lane Expressway	36,000	42,000	48,000	54,000	60,000
Six-Lane Divided Arterial	32,000	38,000	43,000	49,000	54,000
Four-Lane Expressway	24,000	28,000	32,000	36,000	40,000
Four-Lane Divided arterial	22,000	25,000	29,000	32,500	36,000
Four-Lane Undivided arterial	18,000	21,000	24,000	27,000	30,000
Two-Lane Divided Arterial	11,000	12,500	14,500	16,000	18,000
Two-Lane Undivided Arterial	9,000	10,500	12,000	13,500	15,000
Four-Lane Collector	12,000	15,000	18,000	21,000	24,000
Two-Lane Collector	6,000	7,500	9,000	10,500	12,000
Two-Lane Residential/ Collector with Frontages	1,600	3,200	4,800	6,400	8,000
Two-Lane Residential/Local	600	1,200	2,000	3,000	4,500

Notes: 1. Based on Highway Capacity Manual, Fourth Edition , Transportation Research Board, 2000.

2. All volume thresholds are approximate and assume ideal roadway characteristics. Actual thresholds for each LOS listed above may vary depending on a variety of factors including (but not limited to) roadway curvature and grade, intersection or interch

EXISTING LEVEL OF SERVICE CONDITIONS

Existing AM and PM peak hour intersection volumes were obtained from the May 2007 Circulation Study. These volumes were revised to reflect 2010/2011 conditions based on a conservative annual growth obtained from Caltrans Average Daily Traffic along the SR 20 and I-5 corridors. Caltrans data indicated that the annual growth rate will be approximately 2.15%. This growth rate was applied to all study intersection and roadway volumes.

Existing lane geometrics and updated 2010 AM and PM traffic volumes and are illustrated in Figure 1 and Figure 2 respectively. Table 2A shown below provides a summary of existing intersection LOS.

TABLE 2A
2010 EXISTING CONDITIONS: INTERSECTION LEVEL OF SERVICE

#	Intersection	Control Type[1]	Acceptable LOS	AM Peak Hour			PM Peak Hour		
				V/C[2]	LOS	Warrant Met?[3]	V/C[2]	LOS	Warrant Met?[3]
1	SR 20/E. Street	TWSC	D	0.08	A	No	0.16	A	No
2	SR 20/Old Highway 99W	TWSC	D	0.13	A	No	0.19	A	No
3	SR 20/I-5 SB Ramps	TWSC	D	0.11	A	No	0.21	A	No
4	SR 20/I-5 NB Ramps	TWSC	D	0.14	A	No	0.33	A	No
5	SR 20/Husted Rd./Freshwater Rd.	TWSC	D	0.21	A	No	0.28	A	No
6	E Street/9th Street North	TWSC	D	0.15	A	No	0.18	A	No
7	E Street/9th Street South	TWSC	D	0.20	A	No	0.17	A	No
8	E Street/7th Street	AWSC	D	0.53	A	No	0.49	A	No
9	E Street/5th Street	AWSC	D	0.55	A	No	0.69	B	No
10	E Street/I-5 SB Ramps	TWSC	D	0.26	A	No	0.34	A	No
11	E Street/I-5 NB Ramps	TWSC	D	0.49	A	No	0.33	A	No
12	E Street/Vann Street	TWSC	D	0.35	A	No	0.34	A	No
13	E Street/Husted Road	TWSC	D	0.23	A	No	0.16	A	No
14	Husted Road/Husted Road Lateral	TWSC	D	0.06	A	No	0.10	A	No
15	Husted Road/Abel Road	TWSC	D	0.06	A	No	0.05	A	No
16	Husted Road/Crawford Road	TWSC	D	0.06	A	No	0.01	A	No
17	Husted Road/Old Highway 99W	TWSC	D	0.10	A	No	0.16	A	No
18	Husted Road/I-5 NB Ramps	TWSC	D	0.05	A	No	0.05	A	No
19	Husted Road/I-5 SB Ramps	TWSC	D	0.02	A	No	0.07	A	No

Notes:
1. TWSC = Two Way Stop Control; AWSC = All Way Stop Control
2. V/C = Volume to Capacity Ratio; V/C for TWSC = Ratio of "Worst Case Movement" at Intersection
3. Warrant = Based on California MUTCD Warrant 3, performed only when operating at unacceptable LOS

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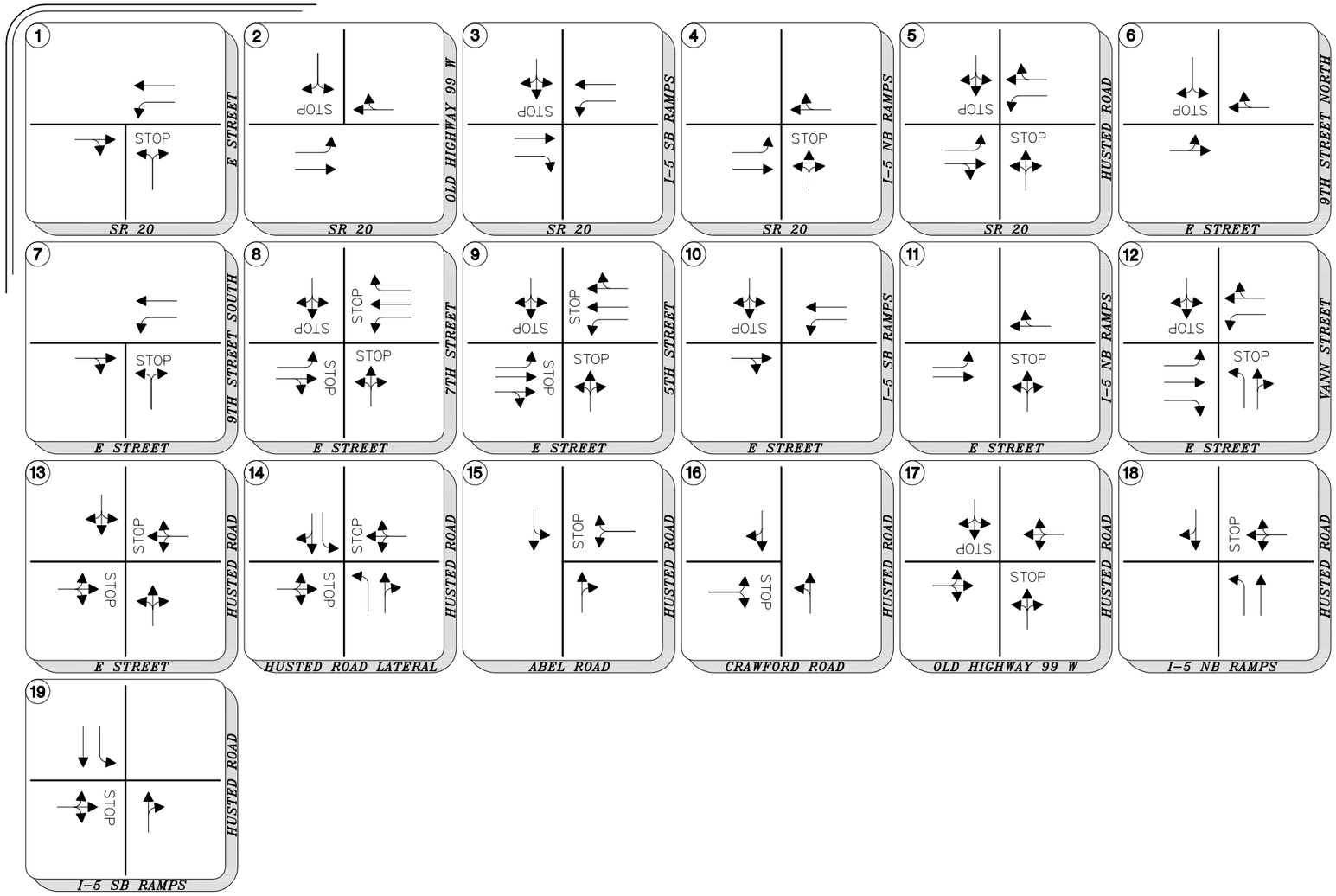

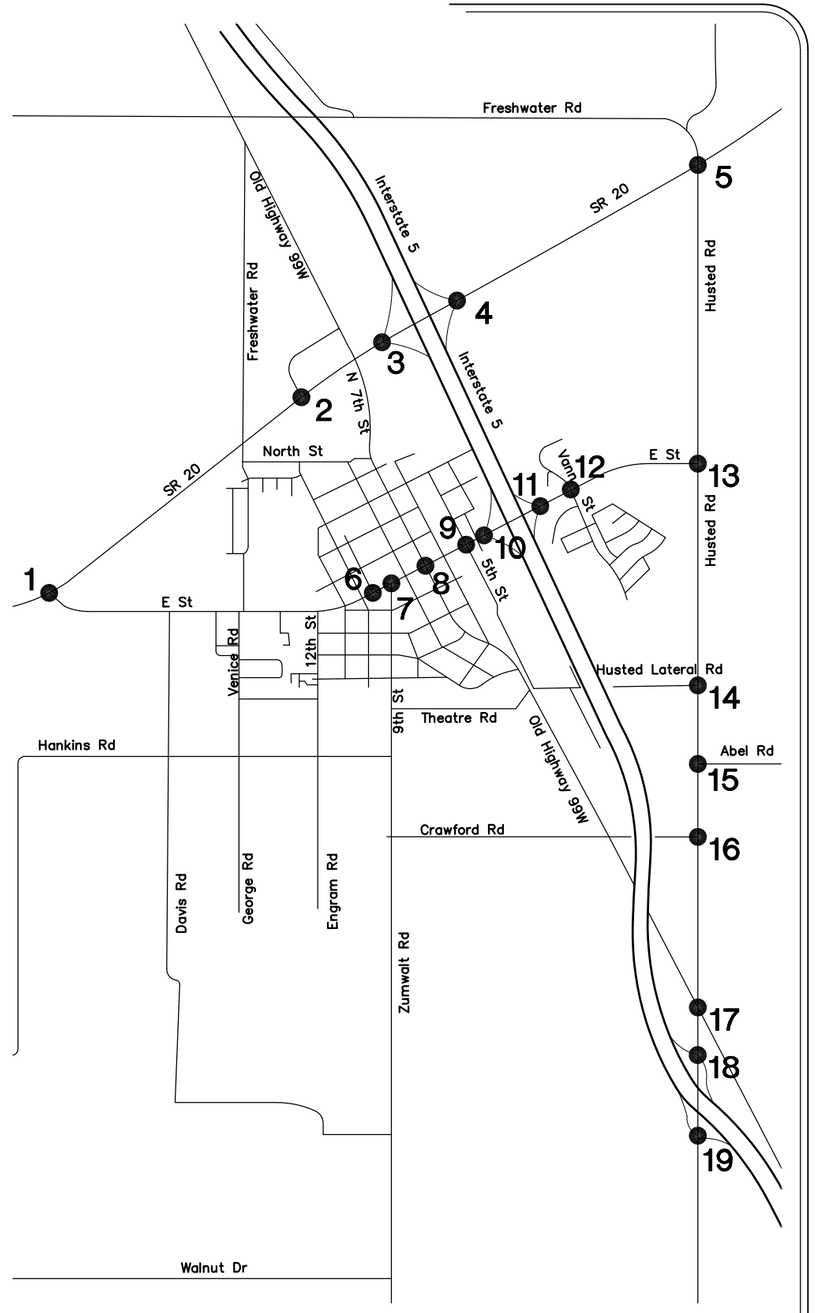

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Figure 1

Existing Lane Geometrics and Control

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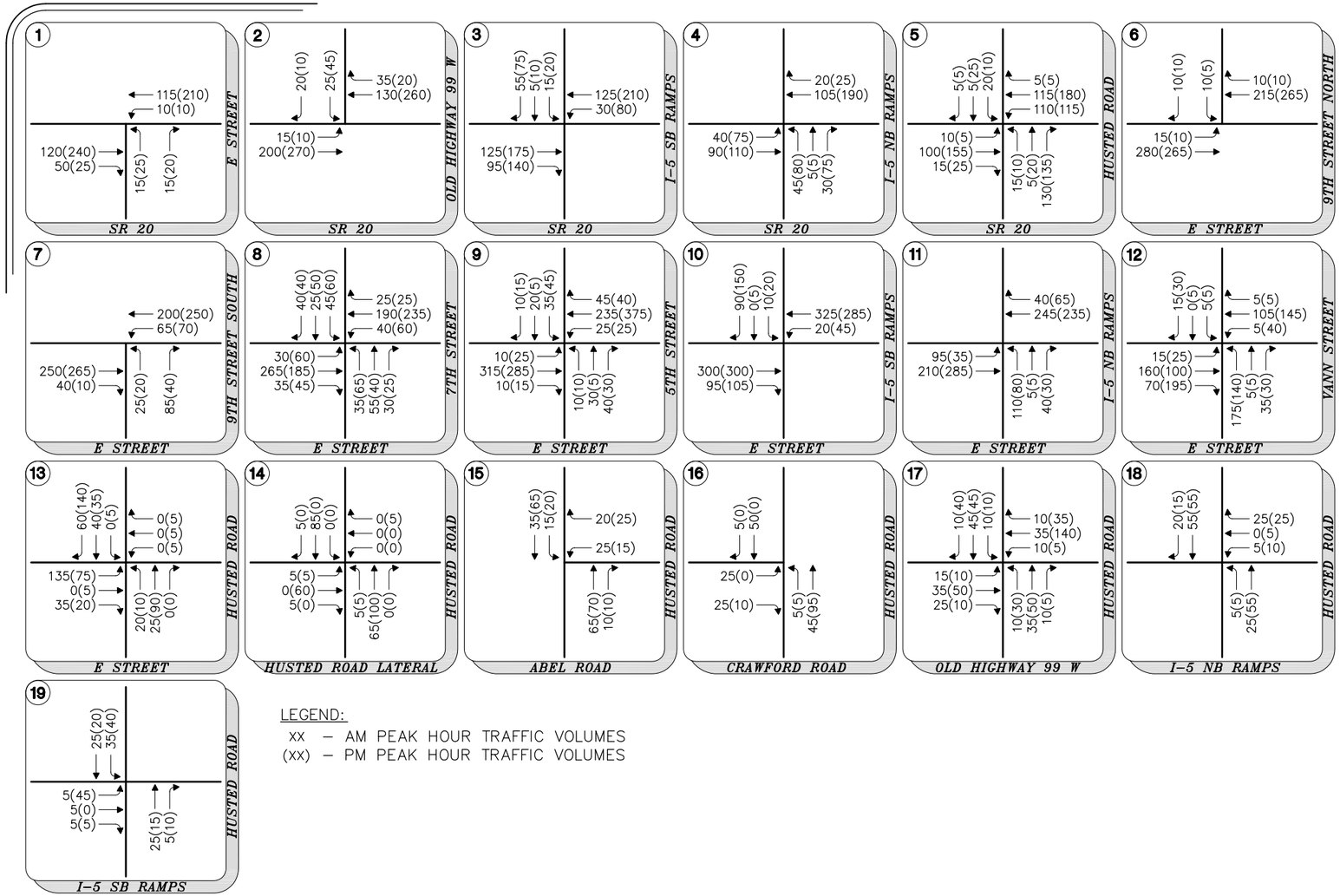

City of Williams On-Call Services

Figure 2

Existing Peak Hour Intersection Volumes

As shown in Table 2, all study intersections are projected to operate at or below acceptable level of service conditions.

Existing roadway operations were quantified using the HCM LOS thresholds (Table 1B). Roadway operations are presented in Table 2B.

TABLE 2B
2010 EXISTING CONDITIONS: ROADWAY LEVEL OF SERVICE

#	Roadway Segment	Capacity Configuration	Acceptable LOS	Average Daily Traffic (ADT)	Estimated LOS
1	Freshwater Road from Freshwater Lateral to Husted Road	Two-Lane Collector	D	700	A
2	Husted Road from Freshwater Road to E Street	Two-Lane Collector	D	3,450	C
3	Husted Road from E Street to Abel Road	Two-Lane Collector	D	1,850	C
4	Husted Road from Abel Road to I-5 SB Ramps	Two-Lane Collector	D	1,400	C
5	E Street from Husted Road to I-5 SB Ramps	Two-Lane Divided Arterial	D	4,700	C
6	E Street from I-5 SB Ramps to 5th Street	Four-Lane Divided Arterial	D	8,450	B
7	E Street from 5th Street to 9th Street South (Downtown)	Four-Lane Divided Arterial	D	7,050	A
8	E Street from 9th Street South to SR 20	Two-Lane Collector	D	3,200	A
9	SR 20 from E Street to I-5 NB Ramps	Two-Lane Undivided Arterial	D	5,300	A
10	SR 20 from I-5 NB Ramps to Husted Street	Two-Lane Undivided Arterial	D	4,000	A
11	Old Highway 99W from SR 20 to E Street	Two-Lane Collector	D	2,750	A
12	Old Highway 99W from E Street to Thearter Road	Two-Lane Collector	D	2,850	A
13	Old Highway 99W from Theatre Road to Husted Road	Two-Lane Collector	D	2,800	A
14	9th Street from Theatre Road to E Street	Two-Lane Collector	D	1,400	A
15	12th Street from Hankins to E Street	Two-Lane Collector	D	680	A

Notes:

1. Bolded entries denote roadways operating at unacceptable LOS

2. Average Daily Traffic Volumes have been estimated from peak hour counts using a 10% peak hour volume factor

As presented in Table 2B, all roadway segments were found to be operating at acceptable LOS during the PM peak hour.

GENERAL PLAN UPDATE - BUILDOUT LAND USES

Buildout uses that correspond to the City of Williams proposed General Plan Update Land Use Plan were as provided by Development Impact INC (June 1, 2011). Using these development forecasts, Omni-Means has updated AM, PM, and daily trip generation estimates based upon this new data. The land use units and trip generation results are discussed in detail within the following sections of this memorandum.

EXISTING 2010 LAND USES AND TRIP GENERATION VALUES

The existing 2010 land use quantities were as provided by Development Impact INC. Table 3A presents the trip generation associated with the 2010 land use quantities.

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TABLE 3A
EXISTING LAND USE: QUANTITIES AND TRIP GENERATION

Land Use Type	Units	Quantity	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
				Total	In	Out	Total	In	Out
Industrial	Acres	246	9,535	1,810	1,312	498	2,020	808	1,212
Office / Service	Acres	14	1,400	245	216	29	230	37	193
Residential	Dwelling Units	1,385	11,667	979	245	734	1,119	705	414
Retail	Acres	42	15,755	665	399	266	1,410	705	705
Total		*1,686*	*38,357*	*3,699*	*2,172*	*1,527*	*4,779*	*2,255*	*2,524*

Notes:
1. Daily, AM, and PM Trips determined from ITE Trip Generation (Eighth Edition)

As presented in Table 3A, the existing land uses within the City of Williams are estimated to generate 38,357 net daily trips, of which 3,699 would occur during the AM peak hour, and 4,779 would occur during the PM peak hour. These trips were calculated using the trip rate information contained within the *ITE Trip Generation Manual (8th Edition)*.

YEAR 2030 TRIP GENERATION: METHODOLOGIES AND ASSUMPTIONS

The land use growth quantities from the proposed General Plan Land Use Plan were provided in gross acres. These gross acreages have been processed into trip generation forecasts based on methodologies and trip rates found in the *ITE Trip Generation Manual (8th Edition)*. Assumptions and conversion factors used to forecast City land use growth by TAZ are summarized below.

- For the purposes of trip generation calculations, a floor-to-area ratio of 20% was assumed for retail and office/service type uses and 40% for industrial uses.
- Trip generation for industrial land uses were based on ITE 110 General Light Industrial, 140 Manufacturing, 151 Mini-Warehouse, and 152 High-Cube Warehouse acre rates.
- Trip generation for retail land uses were converted from acres to square feet with a 43,560 conversion ratio and calculated using the appropriate ITE Category.
- Trip generation for office and service land uses were converted from acres to square feet with a 43,560 conversion ratio and calculated using the appropriate ITE Category.
- Trip generation for residential land uses were converted from acres to dwelling units based on Table 3.2 LU Acreages & Population provided by the City. The final trip generation per dwelling unit type was calculated using the appropriate ITE Category.

Table 3B presents the trip generation associated with this additional development.

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TABLE 3B
GP BUILDOUT GROWTH: LAND USE QUANTITIES AND TRIP GENERATION

Land Use Type	Units	Quantity	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
				Total	In	Out	Total	In	Out
Industrial	Acres	378	12,130	805	584	221	685	274	411
Office / Service	Acres	319	30,685	4,410	3,881	529	4,250	680	3,570
Residential	Dwelling Units	1,255	12,025	944	236	708	1,268	799	469
Retail	Acres	94	35,080	1,340	804	536	3,030	1,515	1,515
Total		*2,045*	*89,920*	*7,499*	*5,504*	*1,995*	*9,233*	*3,268*	*5,965*

Notes:
1. Daily, AM, and PM Trips determined from ITE Trip Generation (Eighth Edition)

As presented in Table 3B, the additional development per the June 1, 2011 Land Use Map is expected to generate 89,920 net daily trips, of which 7,499 would occur during the AM peak hour, and 9,233 would occur during the PM peak hour.

Table 3C presents the trip generation for the buildout (Year 2030) scenario (Existing + growth quantities from the proposed General Plan Land Use Plan).

TABLE 3C
CITY OF WILLIAMS YEAR 2030 LAND USE SUMMARY

Land Use Type	Units	Quantity	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
				Total	In	Out	Total	In	Out
Industrial	Acres	623	21,665	2,615	1,896	719	2,705	1,082	1,623
Office / Service	Acres	333	32,085	4,655	4,096	559	4,480	717	3,763
Residential	Dwelling Units	2,640	23,692	1,923	481	1,442	2,387	1,504	883
Retail	Acres	136	50,835	2,005	1,203	802	4,440	2,220	2,220
Total		*3,731*	*128,277*	*11,198*	*7,676*	*3,522*	*14,012*	*5,522*	*8,489*

Notes:
1. Daily, AM, and PM Trips determined from ITE Trip Generation (Eighth Edition)

From Table 3C, the Year 2030 buildout scenario is expected to generate 128,277 net daily trip ends, of which 11,198 trips would occur during the AM peak hour, and 14,012 trips would occur during the PM peak hour. Trip ends within and external to the City are matched based upon trip production and attraction characteristics. It is understood that the City wants to take advantage of its regionally significant location at the crossroads of Interstate 5 and Highway 20 and have planned large areas for both commercial and industrial/warehousing uses. Thus, within the City west of I-5, internal travel is well matched between residential and non-residential uses. The planned areas of the City east of I-5 with its large parcels planned for commercial and industrial/warehousing uses has a greater orientation for regional travel to support regional needs The majority of vehicular trips within the City Planning Area would be satisfied internally. Full development of the commercial, industrial and office land uses would result in a matching of trips outside the Planning Area.

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GENERAL PLAN BUILDOUT LEVEL OF SERVICE CONDITIONS WITHOUT IMPROVEMENTS

Omni-Means has updated the City travel demand model based upon the proposed General Plan Land Use Plan. Peak hour intersection turning movement volume projections were obtained from the updated model. Figure 3 illustrates General Plan buildout peak hour traffic volumes while Table 4A summarizes intersection LOS associated with Year 2030 volumes with existing lane geometrics and control. Table 4B presents the roadway intersection LOS results.

TABLE 4A
GENERAL PLAN BUILDOUT CONDITIONS: INTERSECTION LEVEL OF SERVICE

#	Intersection	Control Type[1]	Acceptable LOS	AM Peak Hour			PM Peak Hour		
				V/C[2]	LOS	Warrant Met?[3]	V/C[2]	LOS	Warrant Met?[3]
1	SR 20/E. Street	TWSC	D	0.21	A	No	0.68	B	No
2	**SR 20/Old Highway 99W**	**TWSC**	**D**	**1.52**	**F**	**Yes**	**OVR**	**F**	**Yes**
3	**SR 20/I-5 SB Ramps**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
4	**SR 20/I-5 NB Ramps**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
5	**SR 20/Husted Rd./Freshwater Rd.**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
6	E Street/9th Street North	TWSC	D	0.23	A	No	0.38	A	No
7	E Street/9th Street South	TWSC	D	0.35	A	No	0.36	A	No
8	**E Street/7th Street**	**AWSC**	**D**	**1.43**	**F**	**Yes**	**1.87**	**F**	**Yes**
9	**E Street/5th Street**	**AWSC**	**D**	**1.39**	**F**	**Yes**	**1.71**	**F**	**Yes**
10	**E Street/I-5 SB Ramps**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
11	**E Street/I-5 NB Ramps**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
12	**E Street/Vann Street**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
13	**E Street/Husted Road**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
14	**Husted Road/Husted Rd Lateral**	**TWSC**	**D**	**1.95**	**F**	**Yes**	**OVR**	**F**	**Yes**
15	**Husted Road/Abel Road**	**TWSC**	**D**	0.90	D	No	**OVR**	**F**	**Yes**
16	**Husted Road/Crawford Road**	**TWSC**	**D**	0.60	A	No	**OVR**	**F**	**Yes**
17	**Husted Road/Old Highway 99W**	**TWSC**	**D**	**OVR**	**F**	**Yes**	**OVR**	**F**	**Yes**
18	Husted Road/I-5 NB Ramps	TWSC	D	0.77	C	No	0.73	C	No
19	**Husted Road/I-5 SB Ramps**	**TWSC**	**D**	0.34	A	No	**OVR**	**F**	**Yes**
20	**E Street/Marguerite Drive**	**TWSC**	**D**	**1.94**	**F**	**Yes**	**1.14**	**F**	**Yes**
21	**SR 20/Marguerite Drive**	**TWSC**	**D**	0.43	A	No	**1.74**	**F**	**Yes**

Notes:

1. TWSC = Two Way Stop Control; AWSC = All Way Stop Control

2. V/C = Volume to Capacity Ratio; V/C for TWSC = Ratio of "Worst Case Movement" at Intersection; OVR = V/C exceeds 2.0

3. Warrant = Based on California MUTCD Warrant 3, performed only when operating at unacceptable LOS

As presented in Table 4A, seventeen (17) of the twenty one (21) analyzed intersections were identified as deficient under *Buildout Conditions*. Mitigation measures that address these LOS deficiencies are discussed in a subsequent section of this report.

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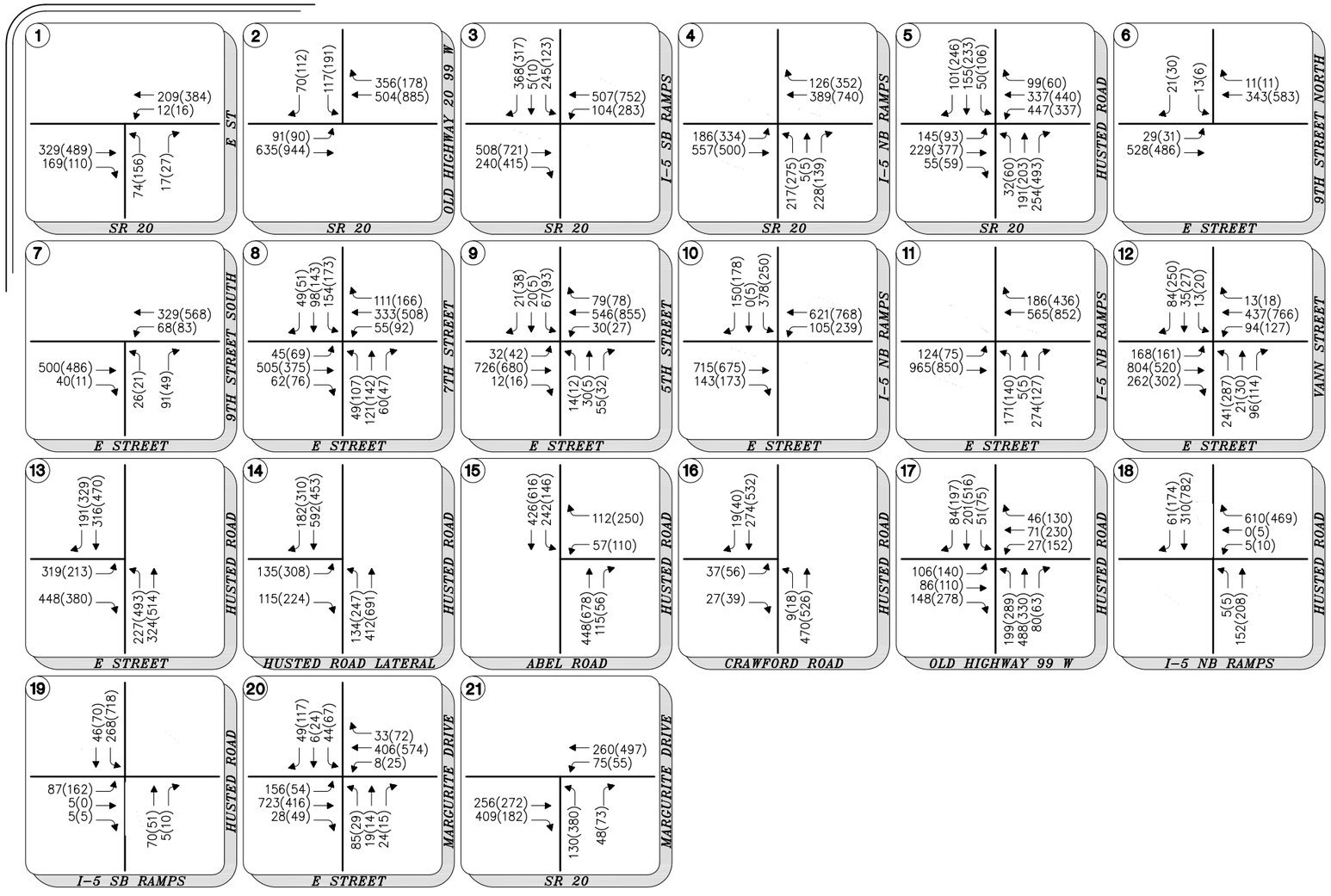

City of Williams On-Call Services

Figure 3

General Plan Buildout Peak Hour Intersection Volumes

TABLE 4B
GENERAL PLAN BUILDOUT CONDITIONS: ROADWAY LEVEL OF SERVICE

#	Roadway Segment	Capacity Configuration	Target LOS	Average Daily Traffic (ADT)	LOS
1	Freshwater Road from Freshwater Lateral to Husted Road	Two-Lane Collector	D	940	A
2	**Husted Road from Freshwater Road to E Street**	**Two-Lane Collector**	**D**	**15,550**	**F**
3	**Husted Road from E Street to Abel Road**	**Two-Lane Collector**	**D**	**17,780**	**F**
4	**Husted Road from Abel Road to I-5 SB Ramps**	**Two-Lane Collector**	**D**	**15,220**	**F**
5	**E Street from Husted Road to I-5 SB Ramps**	**Two-Lane Divided Arterial**	**D**	**17,470**	**E**
6	E Street from I-5 SB Ramps to 5th Street	Four-Lane Divided Arterial	D	18,080	A
7	E Street from 5th Street to 9th Street South	Four-Lane Divided Arterial	D	14,400	A
8	E Street from 9th Street South to SR 20	Two-Lane Collector	D	7,820	C
9	**SR 20 from E Street to I-5 NB Ramps**	**Two-Lane Undivided Arterial**	**D**	**15,310**	**F**
10	**SR 20 from I-5 NB Ramps to Husted Street**	**Two-Lane Undivided Arterial**	**D**	**13,850**	**E**
11	Old Highway 99W from SR 20 to E Street	Two-Lane Collector	D	7,440	B
12	Old Highway 99W from E Street to Thearter Road	Two-Lane Collector	D	6,070	B
13	**Old Highway 99W from Theatre Road to Husted Road**	**Two-Lane Collector**	**D**	**12,440**	**F**
14	9th Street from Theatre Road to E Street	Two-Lane Collector	D	1,640	A
15	12th Street from Hankins to E Street	Two-Lane Collector	D	710	A

Notes:

1. Bolded entries denote roadways operating at unacceptable LOS

2. Average Daily Traffic Volumes have been estimated from peak hour counts using a 10% peak hour volume factor

As presented in Table 4B, seven (7) of the fifteen (15) analyzed roadway segments were identified as deficient under *Buildout Conditions*.

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GENERAL PLAN BUILDOUT TRANSPORTATION IMPROVEMENT NEEDS

INTERSECTION BUILDOUT DEFICIENCY MITIGATIONS

Intersection deficiencies identified in Table 4A can be mitigated by installing the improvements identified in red in Figure 4. Roadway circulation system outside of the City of Williams were not studied within this memorandum. The proposed roadway circulation system identified within Figure 4 would accommodate the proposed General Plan buildout uses identified within Table 3B. Where new traffic signals are proposed, alternative roundabout improvements that would provide acceptable operations should be considered. Ensuing level of service operations following these improvements are provided in Table 5A.

TABLE 5A
MITIGATED GENERAL PLAN BUILDOUT CONDITIONS: INTERSECTION LEVEL OF SERVICE

#	Intersection	Control Type[1]	Acceptable LOS	AM Peak Hour			PM Peak Hour		
				V/C[2]	LOS	Warrant Met?[3]	V/C[2]	LOS	Warrant Met?[3]
1	SR 20/E. Street	TWSC	D	0.21	A	-	0.68	B	-
2	SR 20/Old Highway 99W	Signal	D	0.60	A	-	0.74	C	-
3	SR 20/I-5 SB Ramps	RDBT	D	22.2	C	-	16.4	C	-
4	SR 20/I-5 NB Ramps	RDBT	D	12.4	B	-	16.1	C	-
5	SR 20/Husted Rd./Freshwater Rd.	Signal	D	0.71	C	-	0.79	C	-
6	E Street/9th Street North	TWSC	D	0.23	A	-	0.38	A	-
7	E Street/9th Street South	TWSC	D	0.35	A	-	0.36	A	-
8	E Street/7th Street	Signal	D	0.78	C	-	0.68	B	-
9	E Street/5th Street	Signal	D	0.53	A	-	0.51	A	-
10	E Street/I-5 SB Ramps	Signal	D	0.77	C	-	0.80	C	-
11	E Street/I-5 NB Ramps	Signal	D	0.69	B	-	0.70	B	-
12	E Street/Vann Street	Signal	D	0.68	B	-	0.76	C	-
13	E Street/Husted Road	Signal	D	0.56	A	-	0.69	B	-
14	Husted Road/Husted Rd Lateral	Signal	D	0.57	A	-	0.67	B	-
15	Husted Road/Abel Road	Signal	D	0.50	A	-	0.58	A	-
16	Husted Road/Crawford Road	Signal	D	0.52	A	-	0.50	A	-
17	Husted Road/Old Highway 99W	Signal	D	0.49	A	-	0.80	C	-
18	Husted Road/I-5 NB Ramps	TWSC	D	0.77	C	-	0.74	C	-
19	Husted Road/I-5 SB Ramps	Signal	D	0.40	A	-	0.76	C	-
20	E Street/Marguerite Drive	Signal	D	0.46	A	-	0.48	A	-
21	SR 20/Marguerite Drive	Signal	D	0.39	A	-	0.53	A	-

Notes:

1. TWSC = Two Way Stop Control; AWSC = All Way Stop Control

2. V/C = Volume to Capacity Ratio; V/C for TWSC = Ratio of "Worst Case Movement" at Intersection; OVR = V/C exceeds 2.0

3. Warrant = Based on California MUTCD Warrant 3, performed only when operating at unacceptable LOS

SR 20 / Old Highway 99W

This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Eastbound Approach: Two through lanes and one left turn lane
- Westbound Approach: One through lane and one shared through-right lane

SR 20 / I-5 SB Ramps

This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

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- Construct a multilane roundabout or
- Traffic Signal

SR 20 / I-5 NB Ramps
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Construct a multilane roundabout or
- Traffic Signal

SR 20 / Husted Road
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left, one through, and one right turn lane
- Southbound Approach: One left, one through, and one right turn lane
- Eastbound Approach: One left, one through, and one right turn lane
- Westbound Approach: One left, one through, and one right turn lane

E Street / 7th Street
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left turn lane and one shared through-right lane
- Southbound Approach: One left turn lane and one shared through-right lane

E Street / 5th Street
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection

E Street / I-5 SB Ramps
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Eastbound Approach: One through lane and one shared through-right lane
- Westbound Approach: Two through lanes and one left turn lane

E Street / I-5 NB Ramps
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Eastbound Approach: Two through lanes and one left turn lane

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- Westbound Approach: One through lane and one shared through-right lane

E Street / Vann Street
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Southbound Approach: One right turn lane and one shared through-left lane
- Eastbound Approach: One left turn lane, two through lanes, and one right turn lane
- Westbound Approach: One left turn lane, one through lane, and one shared through-right lane

E Street Husted Road
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left turn lane, two through lanes, and one right turn lane
- Southbound Approach: One left turn lane, one through lane, and one shared through-right lane
- Eastbound Approach: One left turn lane and one shared through-right lane

Husted Road / Husted Road Lateral
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left, one through, and one shared through-right lane
- Southbound Approach: One left, one through, and one shared through-right lane
- Eastbound Approach: One left turn lane and one shared through-right lane
- Westbound Approach: One left turn lane and one shared through-right lane

Husted Road / Abel Road
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: Two through lanes and one left turn lane
- Southbound Approach: One through lane and one shared through-right lane

Husted Road / Crawford Road
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left, one through, and one shared through-right lane
- Southbound Approach: One left, one through, and one shared through-right lane
- Eastbound Approach: One left turn lane and one shared through-right lane
- Westbound Approach: One left turn lane and one shared through-right lane

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Husted Road / Old Highway 99W
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left, one through, and one shared through-right lane
- Southbound Approach: One left, one through, and one shared through-right lane
- Eastbound Approach: One left turn lane and one shared through-right lane
- Westbound Approach: One left turn lane and one shared through-right lane

Husted road / I-5 SB Ramps
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection

E Street / Marguerite Drive
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left and one shared through-right lane
- Southbound Approach: One left and one shared through-right lane
- Eastbound Approach: One left turn lane, one through lane, and one shared through-right lane
- Westbound Approach: One left turn lane, one through lane, and one shared through-right lane

SR 20 / Marguerite Drive
This intersection is expected to operate at unacceptable LOS F during peak hour buildout conditions. The following improvements are recommended:

- Signalize the intersection
- Northbound Approach: One left and one right turn lane
- Eastbound Approach: One through lane and one right turn lane
- Westbound Approach: One through lane and one left turn lane

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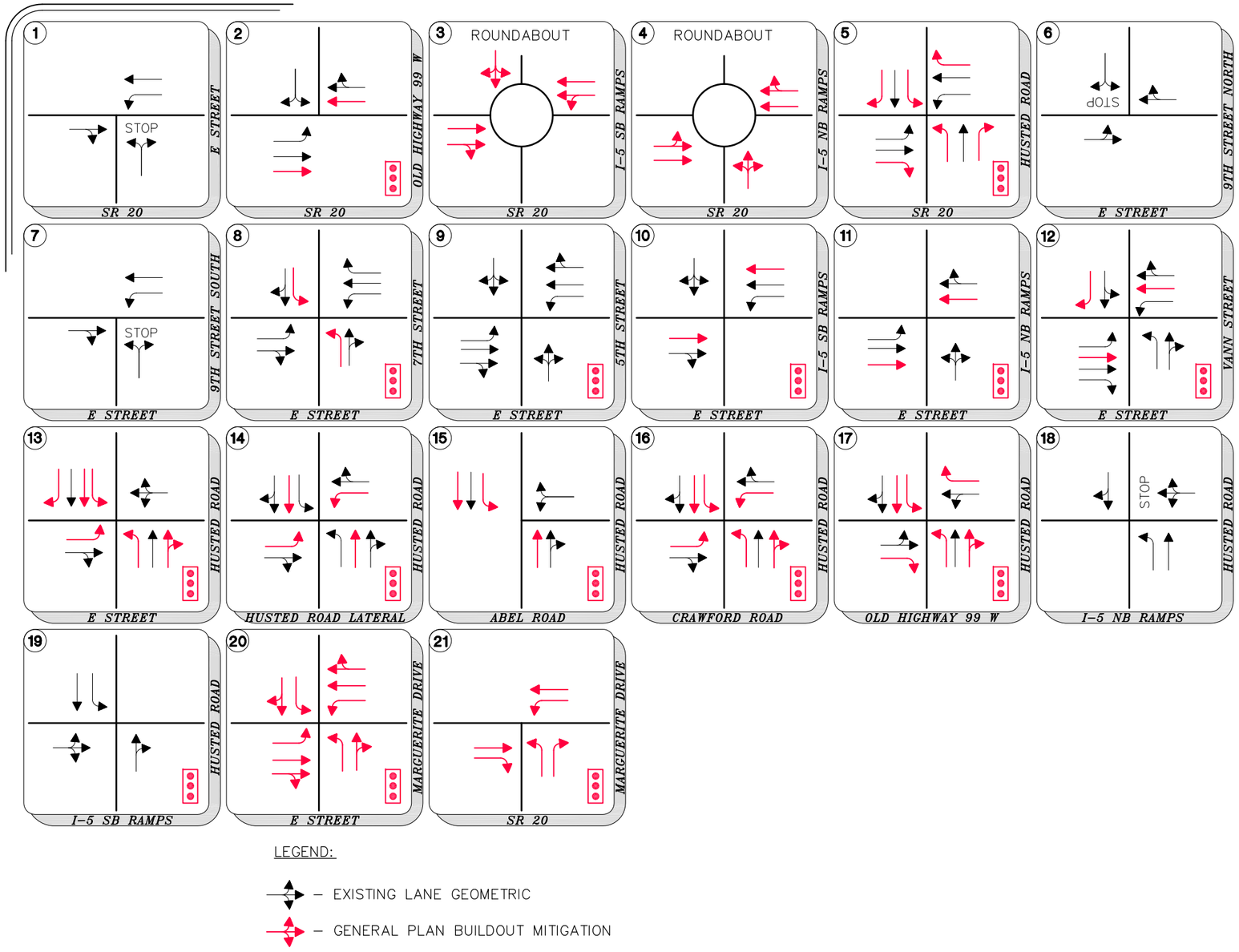

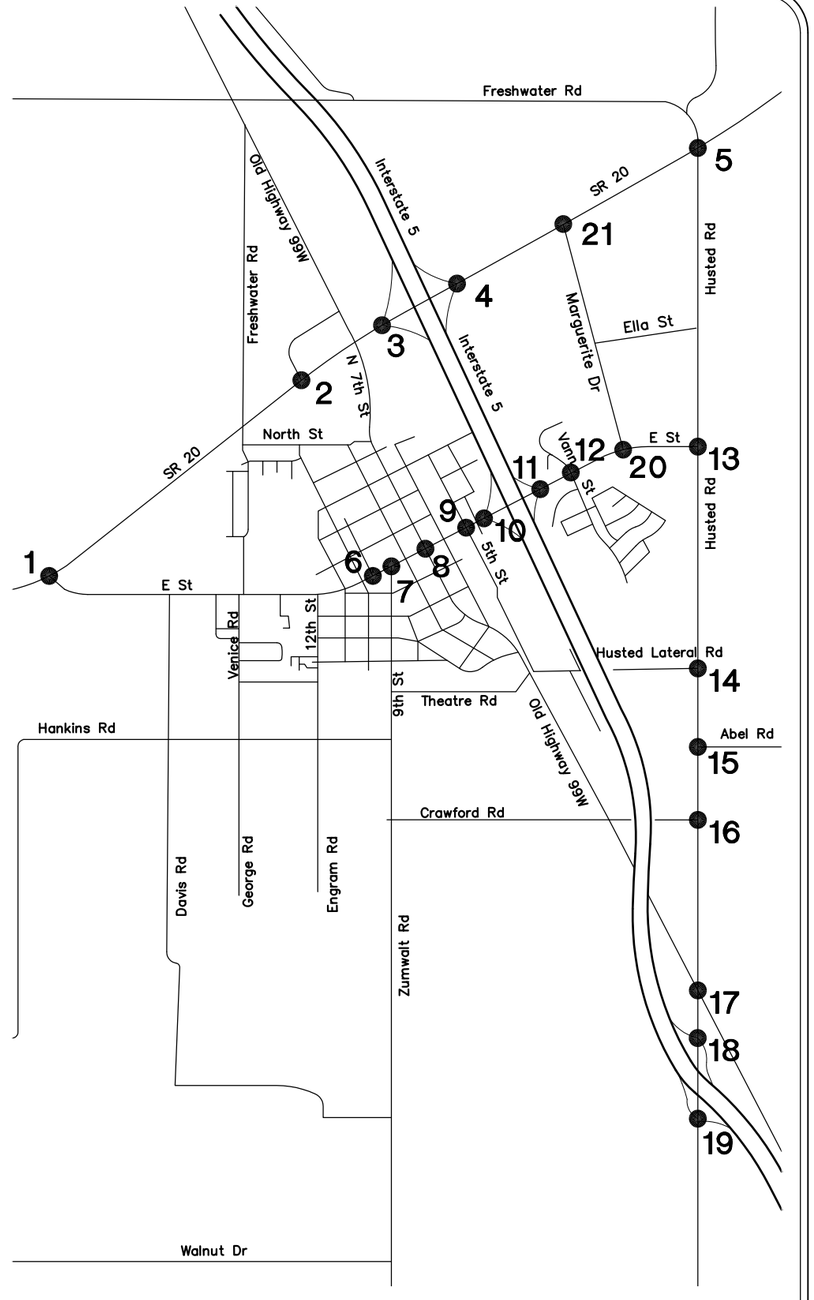

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Figure 4

Mitigated General Plan Buildout Lane Geometrics and Control

ROADWAY BUILDOUT DEFICIENCY MITIGATIONS
Roadway deficiencies identified in Table 4B can be mitigated with the following improvements.

E Street between Husted Road and I-5 NB Ramps
From a peak hour segment capacity standpoint, between Husted Road to I-5 NB Ramps, the roadway requires widening from a two lane to a four lane arterial.

SR 20 from E Street to Husted Road
From a peak hour segment capacity standpoint, between Husted Road to E Street, the roadway requires widening from a two lane major highway to a four lane expressway.

Husted Road from Freshwater Road to I-5 SB Ramps
From a peak hour segment capacity standpoint, between Freshwater Road to I-5 SB Ramps, the roadway requires widening from a two lane collector to a four lane arterial.

Old Highway 99W from Theater Road to Husted Road
From a peak hour segment capacity standpoint, between Theater Road and Husted Road, the roadway requires widening from a two lane collector to a two lane arterial.

The ensuing level of service operations following these roadway improvements are provided in Table 5B.

TABLE 5B
MITIGATED GENERAL PLAN BUILDOUT CONDITIONS: ROADWAY LEVEL OF SERVICE

#	Roadway Segment	Capacity Configuration	Target LOS	Average Daily Traffic (ADT)	LOS
1	Freshwater Road from Freshwater Lateral to Husted Road	Two-Lane Collector	D	940	A
2	Husted Road from Freshwater Road to E Street	Four-Lane Undivided Arterial	D	15,550	A
3	Husted Road from E Street to Abel Road	Four-Lane Undivided Arterial	D	17,780	A
4	Husted Road from Abel Road to I-5 SB Ramps	Four-Lane Undivided Arterial	D	15,220	A
5	E Street from Husted Road to I-5 SB Ramps	Four-Lane Divided Arterial	D	17,470	A
6	E Street from I-5 SB Ramps to 5th Street	Four-Lane Divided Arterial	D	18,080	A
7	E Street from 5th Street to 9th Street South	Four-Lane Divided Arterial	D	14,400	A
8	E Street from 9th Street South to SR 20	Two-Lane Collector	D	7,820	C
9	SR 20 from E Street to I-5 NB Ramps	Four-Lane Expressway	D	15,310	A
10	SR 20 from I-5 NB Ramps to Husted Street	Four-Lane Expressway	D	13,850	A
11	Old Highway 99W from SR 20 to E Street	Two-Lane Collector	D	7,440	B
12	Old Highway 99W from E Street to Thearter Road	Two-Lane Collector	D	6,070	B
13	Old Highway 99W from Theatre Road to Husted Road	Two-Lane Undivided Arterial	D	12,440	D
14	9th Street from Theatre Road to E Street	Two-Lane Collector	D	1,640	A
15	12th Street from Hankins to E Street	Two-Lane Collector	D	710	A

Notes:
1. Bolded entries denote roadways operating at unacceptable LOS
2. Average Daily Traffic Volumes have been estimated from peak hour counts using a 10% peak hour volume factor

CICRULATION MAP AND ROADWAY CLASSIFICATION SYSTEM

The proposed circulation map, as presented in Figure 5, reflects the circulation improvements required to achieve a mitigated circulation plan.

Additionally, the City of Williams Transportation and Circulation Element does not have cross-sections or construction standards for the roadway facilities. It is recommended that the following roadway classification and cross-sections be adopted by City of Williams. Figure 6 provides a schematic of the roadway functional classifications.

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Freeway – Characterized by high speeds and limited controlled access, freeways primarily serve regional and long distance travel. I-5 is the only freeway through the City of Williams.

Expressway – A highway with restricted driveway access, but with a mix of grade-separated interchanges and at-grade intersections. SR 20 is the only expressway in Williams.

Major Arterial – These streets are generally higher speed, higher capacity transportation corridors that link the community with highways and freeways.

Minor Arterial – Medium speed and medium capacity, these roads are principally for travel between larger land uses within the community.

Major Collector – Facilities that may be upgraded to an arterial in the future and usually limit on-street parking to maintain smooth flow.

Collector Street – Relatively low speed and low capacity, collector streets are generally two lanes connecting neighborhoods with other neighborhoods as well as with the arterial system.

Local Street – Local Streets are low speed, low capacity street that provide direct access to adjacent land uses and are typically meant only for local, as opposed to through traffic.

This classification system is consistent with national standards, and provides a good framework for the planning of a citywide, or area wide transportation systems. The Freeways and Expressways fall under the jurisdiction of Caltrans and hence their construction standards are dictated by the policies and standards of Caltrans.

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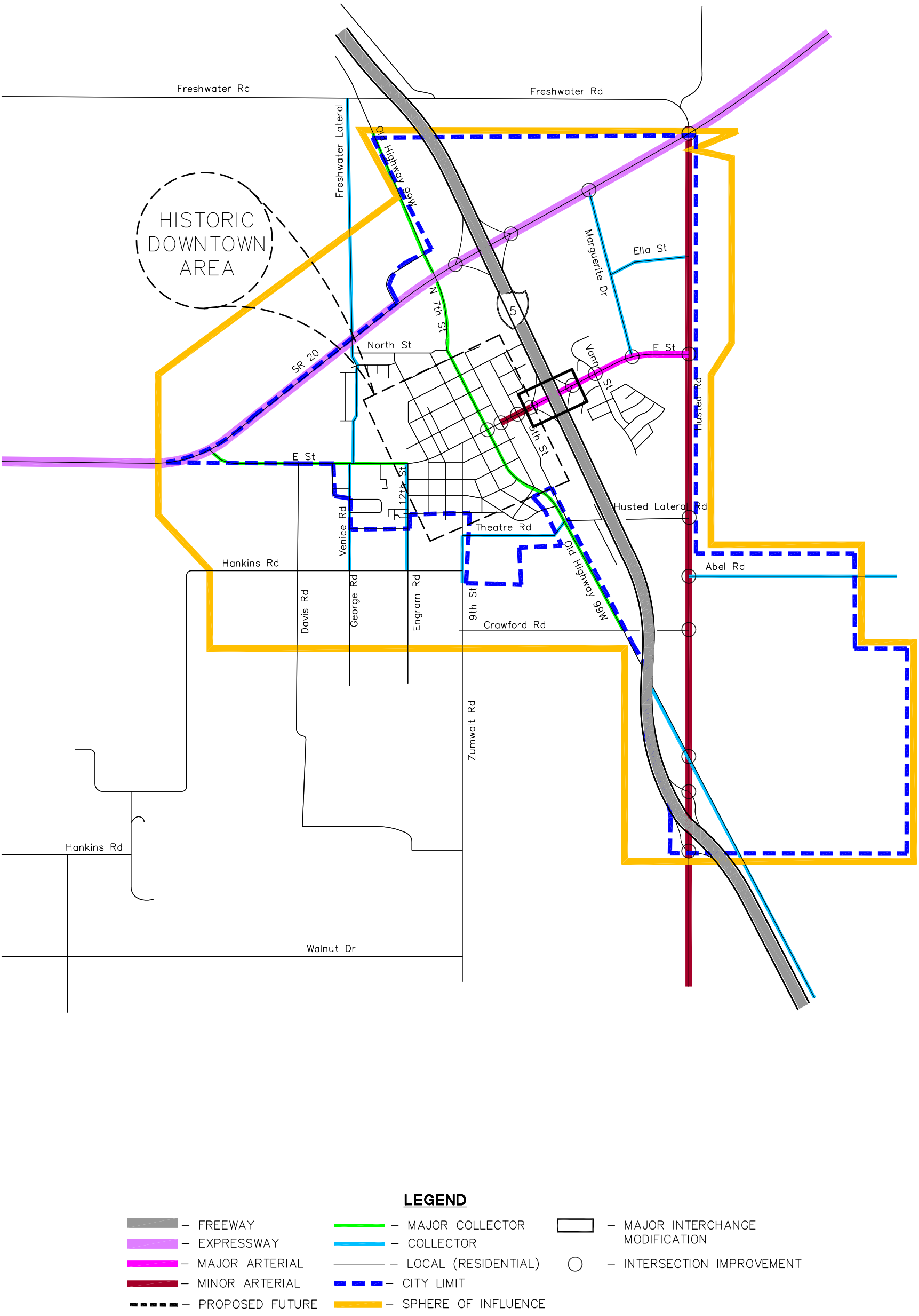

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Figure 5

Circulation Map

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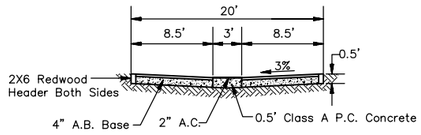
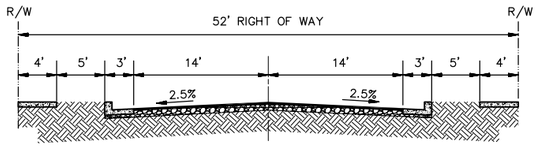
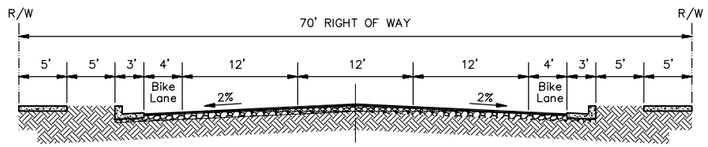


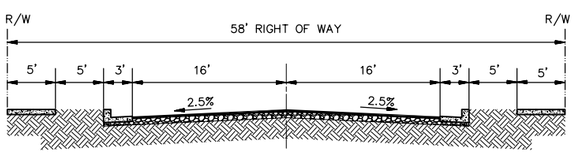
Alley Detail



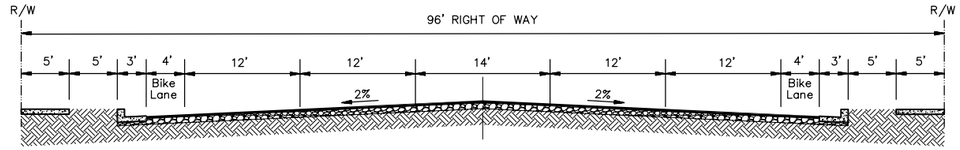
Local Street (Residential)



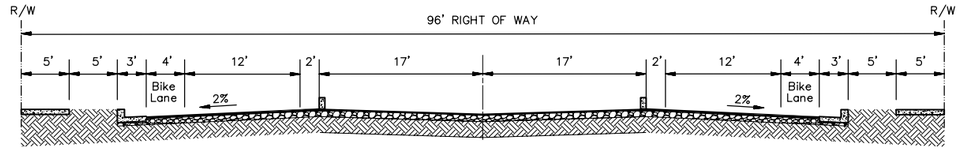
Major Collector
(Industrial Street)



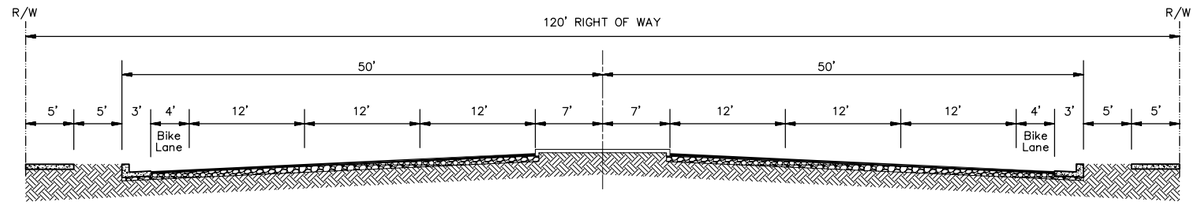
Minor Collector



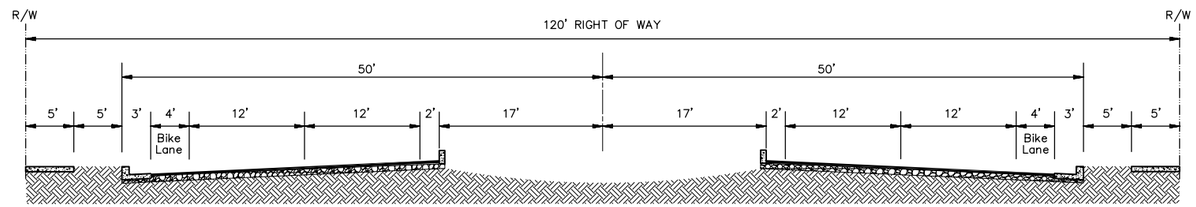
Minor Arterial (Full Width)



Minor Arterial (Partial Width)



Major Arterial (Full Width)



Major Arterial (Partial Width)

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Figure 6

Roadway Functional Classifications

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