FINAL REPORT

IDAHO 55, MARSING TO NAMPA, ACCESS MANAGEMENT PLAN

PROJECT NO. A009(967), KEY NO. 09967

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With Cooperation from:

Canyon County

Canyon Highway District No. 4

City of Caldwell

City of Nampa

COMPASS

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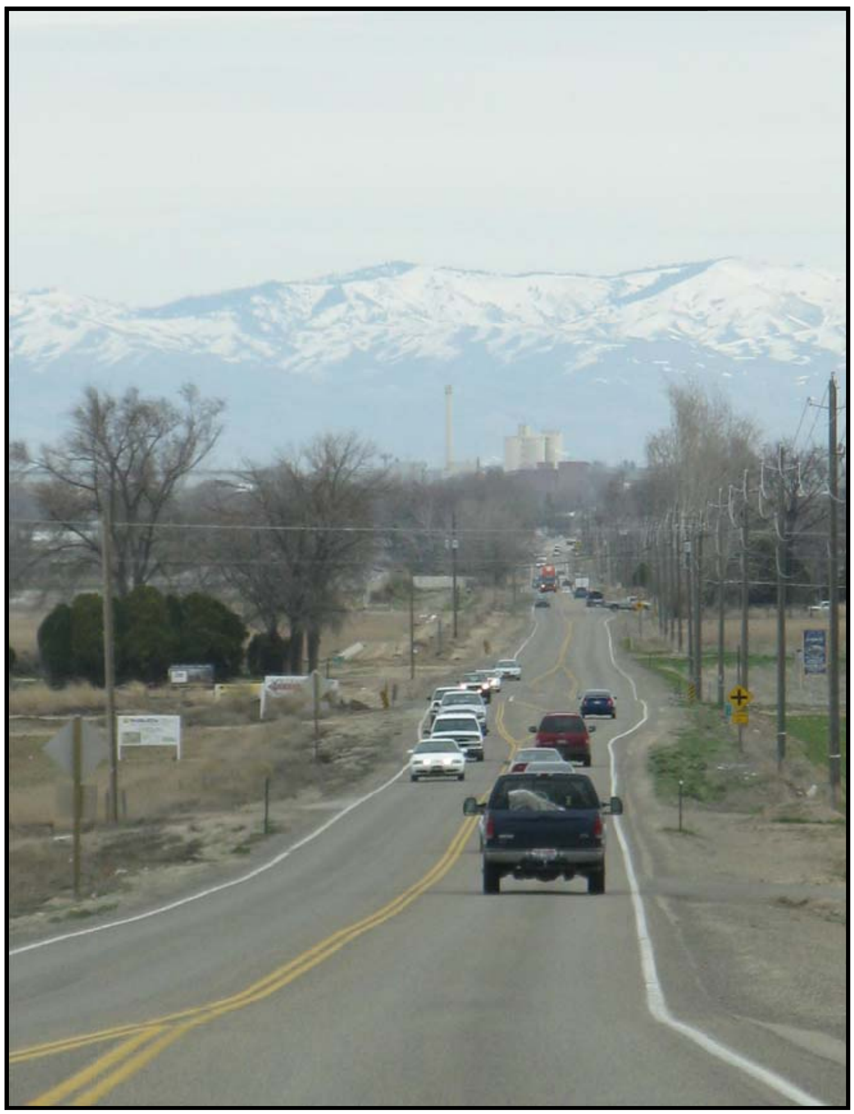
April 2011



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INTRODUCTION

The Idaho Transportation Department (ITD) retained Six Mile Engineering, P.A. to develop an access management plan for Idaho 55 from the Snake River Bridge east of Marsing (Milepost 2.65) to the intersection of Caldwell Boulevard in Nampa (Milepost 16.15). The project study area is shown in Figure 1.

Figure 1. Study area of Idaho 55 Access Management Plan

PLAN SUMMARY

This access management plan is part of ITD's larger corridor planning effort for Idaho 55 that extends from Marsing to New Meadows. It was initiated by ITD to address the following key components of the Idaho 55 corridor plan:

- Safety – Crash frequency and severity can be reduced by managing access. According to the *Access Management Manual,* published by the Transportation Research Board in 2003, well-managed arterials are often 40 to 50 percent safer than poorly managed routes.
- Mobility – Access management increases the ability of passenger vehicles and commercial vehicles to travel efficiently through the corridor. Travel times and delays are reduced, which translates to greater fuel efficiency and less vehicle emissions. Driver frustration is also

reduced. Transit users, pedestrians, and bicyclists are also better served with more convenient access and increased connectivity.

- Sustainability – A formal access management plan adopted by the local transportation and land use agencies will preserve right of way for the future vision of the corridor and establish consistent access standards for development.

An evaluation was conducted of the existing roadway, existing traffic conditions and the anticipated 20-year planning horizon traffic conditions to develop recommended access management improvements to be implemented by the year 2030. The plan recommends:

- Locations of full-access (signalized and unsignalized) intersections
- Lane configurations at full-access intersections
- Minimum spacing between intersections and limited-access approaches
- Minimum spacing between limited-access approaches
- Turn lanes at intersections and approaches
- Non-traversable median locations
- Vehicle access limitations
- Roadway cross-sections
- Right-of-way widths

This access management plan is intended to be used by:

- ITD to program highway improvement projects
- Local agencies to coordinate development plans with property owners and developers
- Developers, engineers and planners to design access to homes and businesses when future re-development and/or corridor improvements occur

PARTICIPATING AGENCIES

ITD is the lead agency for this study. The local agencies participating in the planning effort are:

- Canyon County
- Canyon Highway District No. 4
- City of Caldwell
- City of Nampa
- Community Planning Association of Southwest Idaho (COMPASS)

Key staff members from ITD and the participating agencies provided data, input, concerns, and ideas for the development and implementation of this access management plan.

WHAT IS ACCESS MANAGEMENT?

The *Access Management Manual* defines access management as:

> *"…the systematic control of the location, spacing, design and operation of driveways, median openings, interchanges and street connections to a roadway... to provide vehicular access to land development in a manner that preserves the safety and efficiency of the transportation system."*

Access management balances the needs for traffic movement (mobility) and safety with property access. The balance is different for every type of roadway. Figure 2 illustrates the ideal relationship between mobility and access as a function of roadway type (known as "functional class" or "design class"). Idaho 55 functions as a strategic arterial, which is second to the freeway design class in the emphasis on mobility as compared to access.

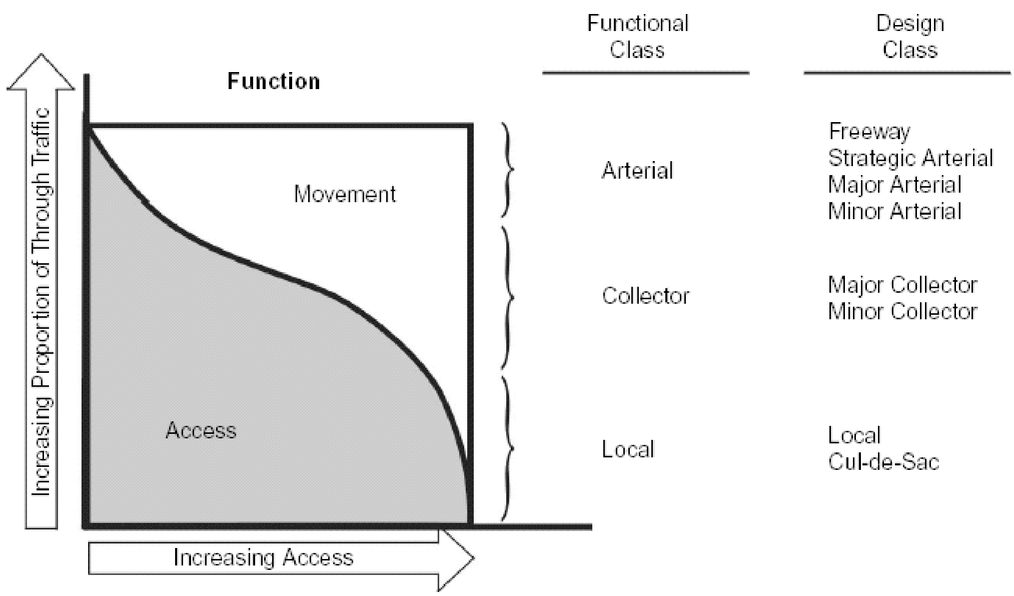

Figure 2. Access versus mobility according to roadway type (Figure 8-1 from *Access Management Manual*)

EXAMPLES OF ACCESS-MANAGED FACILITIES

Existing access-managed roadways are present throughout the Treasure Valley:

- Interstate 84 and Interstate 184 – The function of an interstate is to provide high-speed mobility. As a result, interstates have full access control with access limited to interchanges that are typically located at a minimum spacing of two miles.
- Idaho 55 from Idaho 44 to Beacon Light Road – The access on this section of Idaho 55 is limited to public street approaches located at approximately one-mile spacing. The median is painted (traversable) but no access is allowed between traffic signals.

- Parkcenter Boulevard – This principal arterial in southeast Boise has two or three lanes in each direction with a raised median to prohibit left-turn access at selected driveways.
- Idaho 55 (Eagle Road) from I-84 to Franklin Road – This section of Idaho 55 was reconstructed in 2006 to widen the roadway to three lanes northbound and two lanes southbound separated by a raised (non-traversable) median as shown in Figure 3. The median limits access and enhances mobility. The number of reported crashes decreased by 23 percent for the three years following its installation.

Figure 3. Raised median on Eagle Road from I-84 to Franklin Road

ACCESS MANAGEMENT BENEFITS

Over the past five years, ITD has spent over $900 million for roadway improvements in District 3, which includes the Treasure Valley. With such high expenditures, the management of these facilities has a greater importance to ensure that the facilities provide the longest service life possible. Managing roadway access is a tool to extend the service life of transportation facilities, increase public safety and reduce congestion. The beneficiaries of access management are roadway users, businesses, and transportation and land use agencies.

> *"An effective access management program can reduce crashes as much as 50%, increase roadway capacity by 23% to 45%, and reduce travel time and delay as much as 40% to 60%."*
> Transportation Research Board
> *Access Management Manual*

For Roadway Users **–** Motorists benefit from access management by experiencing fewer crashes. Reducing the number of decision points and potential vehicle conflicts simplifies the driving task and studies have shown that with fewer demands placed on drivers, crash frequency, and severity are reduced.

Motorists on access-managed facilities also experience fewer traffic delays and shorter travel times. This translates to greater fuel efficiency and less vehicle emissions. Transit users, pedestrians, and bicyclists are better served with more convenient access and increased connectivity.

For Businesses **–** Businesses benefit from access management even though, generally, one of the results of access management is a reduction in the number of direct access points on a corridor. This causes concern among business owners who anticipate negative impacts; however, the Federal Highway Administration has compiled the following information to support the benefits of access management to businesses:

> *"Well-managed arterials can operate at speeds well above poorly managed roadways – up to 15 to 20 miles per hour faster. This means more traffic past the door and better exposure for businesses. It also means a more convenient shopping experience for customers."*
> Federal Highway Administration
> *Safe Access is Good for Business*

- Medians result in safer approaches. Medians can be hardscaped or landscaped to make business areas more attractive.
- Managing access can result in better traffic flow, fewer crashes, and a better experience for customers, which means that businesses can capture a larger market area.
- Studies show the vast majority of businesses do as well or better after access management projects are completed.
- Business customers surveyed in three states overwhelmingly supported access management projects because their drives became quicker, safer, and easier.

For Transportation and Land Use Agencies **–** Access management extends the useful life of a roadway by accommodating more traffic at higher speeds and results in safer roadways compared to non-access-managed facilities. Well-conceived plans identify right of way needed to preserve the future vision of the corridor, which protects the public investment in the roadway system. It also helps preserve property values and the economic viability of abutting development, which results in higher property tax receipts. The net effect of access management is that it reduces the capital improvement costs over the life of a roadway. The *Access Management Manual* lists the following additional benefits for government agencies:

- Lower cost of delivering an efficient and safe transportation system
- Improved internal and intergovernmental coordination
- Greater effectiveness in accomplishing their transportation objectives

WHY ACCESS MANAGEMENT IS NEEDED ON IDAHO 55

Safety is the highest priority for ITD and the local agencies participating in this plan development. Intersections and roadway segments on this state highway are some of the highest crash locations in District 3. Access management was identified as a strategy for this corridor to improve corridor safety and enhance mobility. An evaluation of the existing conditions on Idaho 55 was conducted to quantify the current safety and traffic operations on the corridor. The findings of the evaluation supported the need for access management.

SAFETY

Crash History

Five years of crash data on Idaho 55, from 2005 to 2009, were evaluated to calculate the existing crash rate. The crash rate was then compared to the "base" crash rate, which is the crash rate for similar roadways with similar traffic volumes in Idaho. Key statistics from the five-year crash history include:

> *"I personally avoid Highway 55 just because it's a dangerous highway. I tell my family to avoid it."*
> Chris Smith
> Canyon County Sheriff
> *Idaho Press-Tribune*
> September 16, 2009

- 664 total crashes
- 12 fatalities
- 483 injuries
- Crash rates for the majority of roadway segments on Idaho 55 exceed the base rate, except for the section from Marsing Road to True Road and the recently widened section from True Road to Beet Road. Nine out of 13.5 miles exceed the base rate.
- The segment of Idaho 55 from milepost 15.14 to milepost 15.99 (west of Middleton Road to east of Sundance Road) is the second highest ranked non-interstate crash segment in the state.
- Six intersections have been ranked in the top 30 on ITD's statewide list of high crash locations as shown in Table 1. Intersection crash occurrences from 2005 to 2009 are displayed in Figure 4 on the following page.

Table 1. Rankings of Idaho 55 intersection high crash locations

	Year[1]			
Intersection	**2005**	**2007**	**2008**	**2009**
Farmway Road	18	22	22	n/a[2]
Indiana Avenue	22	16	16	14
Lake Avenue	16	5	5	6
Midway Road	23	7.5[3]	7.5[3]	10
Middleton Road	n/a[2]	23	23	18
Caldwell Boulevard	9	n/a[2]	n/a[2]	1.5[3]

[1]2006 high crash locations are unavailable
[2]not ranked in top 30 for the year
[3]half rankings indicate a tie with another intersection in Idaho

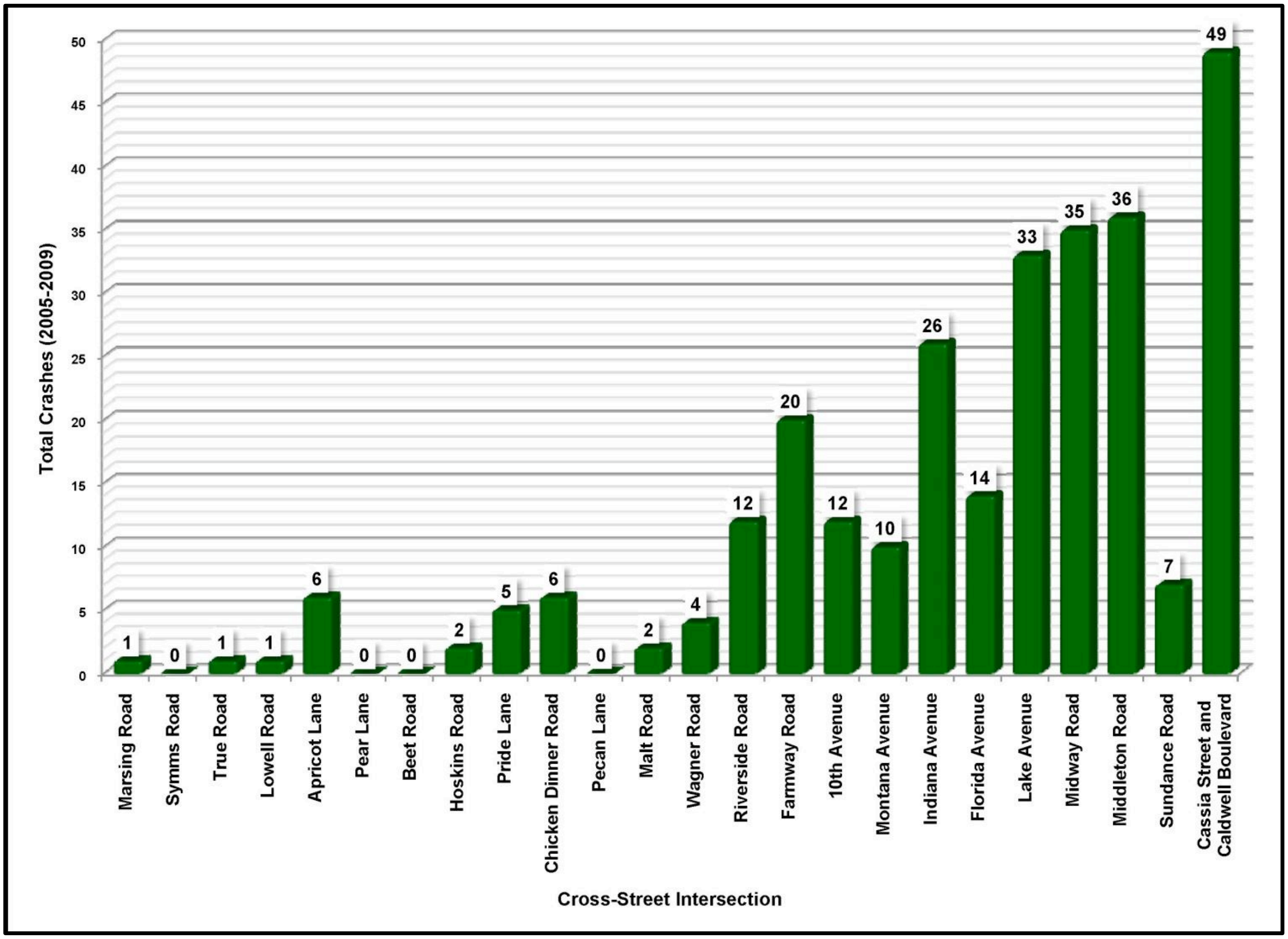

Figure 4. Crash occurrences from 2005 to 2009 at Idaho 55 intersections

Potential Crash Reductions

The *Highway Safety Manual*, published by AASHTO in 2010, outlines a method to predict the expected number of crashes on a roadway segment or at an intersection after an improvement or series of improvements are implemented. The method applies crash modification factors (CMF) to the average crash frequency (crashes/year) that have occurred at the transportation facility to determine the expected number of crashes per year after the proposed improvement is implemented.

The CMFs are changes to the crash rate for different types of roadway and intersection improvements. They are based on empirical data from nationwide independent studies and are available online at the Crash Modification Factors Clearinghouse. Each CMF is assigned a quality rating to indicate the confidence of the study results. A local calibration factor is applied to adjust the crash frequency to local conditions. With the local calibration factor, the actual number of crashes can be predicted for each improvements or set of improvements at a transportation facility; however, local calibration factors have not been developed for the Treasure Valley. With the CMF alone, the expected number of crashes can only be compared between two alternatives, and the conclusions from the comparison are limited to whether one option will likely reduce crashes compared to the other option. Table 2 summarizes the CMFs that potentially apply to the proposed Idaho 55 improvements.

Table 2. Highway Safety Manual crash modification factors for Idaho 55

Improvement	Crash Type	Crash Modification Factor (CMF)	Crash Reduction	Quality Rating
Change driveway density from 23 to 10 (driveways/mile for segment)	All Crash Types	0.74	26%	3
Provide a median	Serious, Minor Injury, Fatality	0.88	12%	5
	Property Damage Only	0.82	18%	5
Widen shoulder (initially less than or equal to 4 feet)	All Crash Types	0.80	20%	not rated

As a comparison, the crash reduction factors recommended by ITD that apply to Idaho 55 are shown in Table 3. The ITD recommended crash reduction factors are applied to the existing crash rate (crashes per million-vehicle-miles) to determine the expected crash rate after roadway improvements are constructed. The factors are based upon extensive accident studies and are available in Appendix A of the ITD *Safety Evaluation Manual*.

Table 3. ITD recommended crash reduction factors on Idaho 55

Improvement	ITD Recommended Crash Reduction Factors	Crash Reduction
Lane/shoulder widening	0.20	20%
Acceleration/deceleration lane	0.10	10%
Close median openings	0.30	30%

The data shows that with the *Highway Safety Manual* and ITD methods, widening the shoulder provides similar crash reduction factors. Restricting access, providing a median, and providing acceleration/deceleration lanes also result in significant crash reduction factors. Applying any one of these improvements will likely result in crash reductions on Idaho 55, and a combination of these improvements will likely further reduce crashes on Idaho 55.

MOBILITY

Existing Roadway Characteristics

Within the study area, Idaho 55 is predominantly a two-lane rural roadway with short sections of five-lane and three-lane roadway widths. The original alignment was constructed in 1931 with one lane in each direction. The current roadway has been updated to include turn lanes at major cross-street intersections and widening at select locations. The two-lane sections of roadway generally have 12-foot travel lanes, 2-foot shoulders, and 66 feet of right of way. The five-lane section on Sunnyslope Road has 12-foot travel lanes, 8-foot shoulders, a 14-foot center turn lane, and 120 feet of right of way. Figure 5 summarizes the general characteristics of the existing roadway segments.

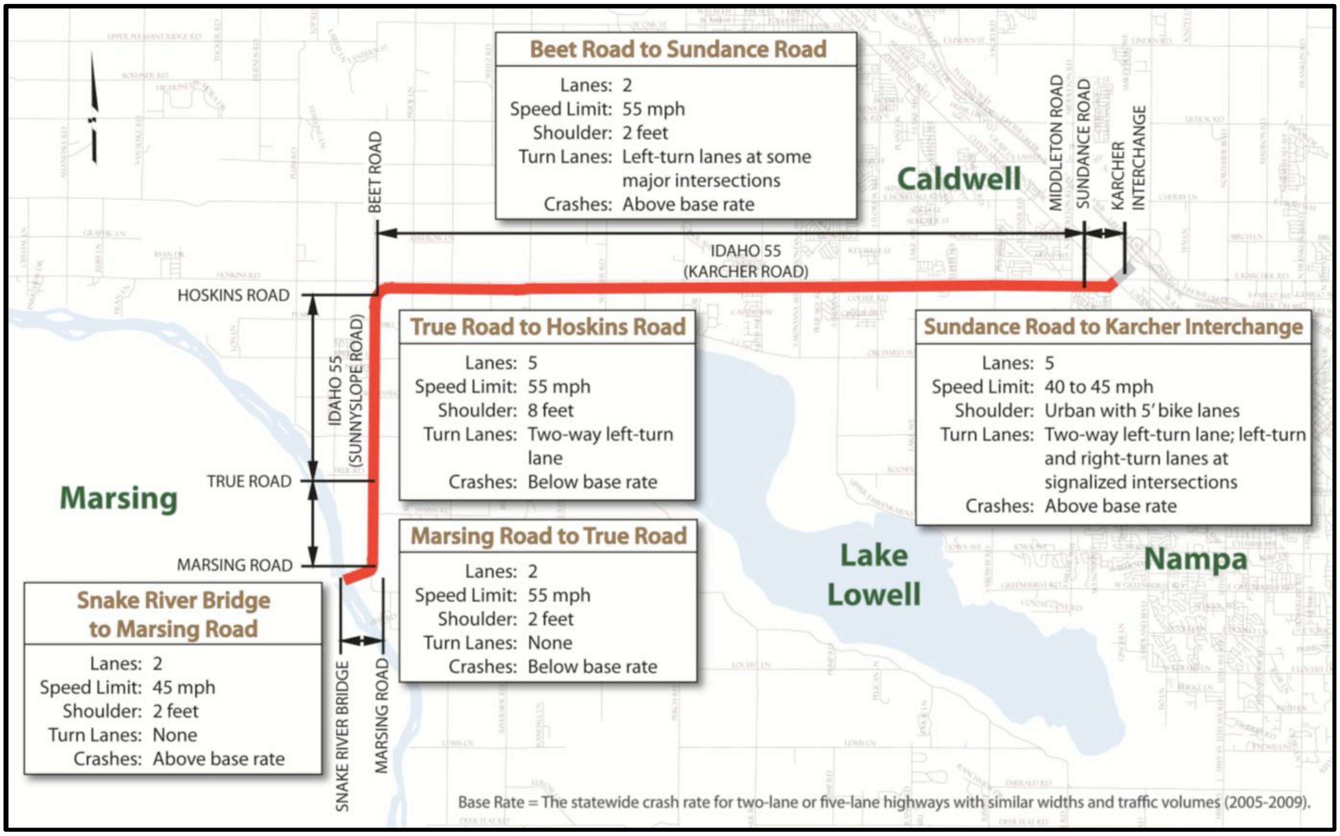

Figure 5. Existing study area roadway characteristics

The two-lane section begins at the Snake River Bridge east of Marsing and continues north to True Lane where the roadway widens to a five-lane section. The five-lane roadway continues north to Pear Lane where it reduces to a three-lane roadway, with two northbound lanes and one southbound lane. The three-lane section continues north to the Hoskins Road/Beet Road intersection. Shortly following the intersection, the highway turns east where the second eastbound lane is dropped, and the roadway returns to a two-lane rural section.

The two-lane rural roadway continues east until Midway Road, with left-turn lanes at the intersections with Malt Road, Farmway Road, 10th Avenue, Montana Avenue, Indiana Avenue, Florida Avenue, and Lake Avenue. At Midway Road a left-turn lane is added and continues through the intersection as a two-way left turn lane. The two-way left turn lane extends past North Pelican Butte Drive, and then the typical section is reduced back to a two-lane rural section. At Middleton Road the roadway is widened for a left-turn lane and then reduced back to the two-lane section.

The two-lane section is widened to a five-lane urban section with sidewalks and bike lanes approximately 1,500 feet east of Middleton Road to Sundance Road. At the Caldwell Boulevard intersection the roadway widens to seven lanes, consisting of two through lanes in each direction, dual left-turn lanes and right-turn lanes. The roadway transitions from a six-lane to a five-lane roadway at the Karcher Road Interchange.

ITD provided an inventory of the existing access on Idaho 55 in Canyon County. A total of 309 access points are located on 13.5 miles of roadway from the Snake River Bridge east of Marsing to Caldwell Boulevard, which is an average of 23 access points per mile. Figure 6 illustrates the distribution of access types on the corridor.

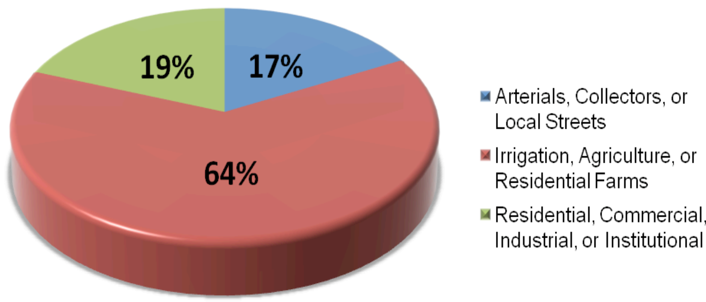

Figure 6. Percentage of access types on Idaho 55

Existing Traffic

As summarized in Table 4, the existing traffic operations for all three signalized and five major unsignalized intersections on Idaho 55 in Canyon County were analyzed to quantify their performance. Intersection performance is quantified with measures of effectiveness that include average control delay, intersection level of service (LOS), and intersection volume-to-capacity (v/c) ratio. The analysis follows the *2000 Highway Capacity Manual* methodology. Refer to Appendix B for details of the traffic analysis.

Table 4. Existing AM and PM peak-hour intersection capacity analysis results

Intersection		Control Type	AM			PM		
			LOS	Delay (seconds)	v/c Ratio[1]	LOS	Delay (seconds)	v/c Ratio[1]
Caldwell Boulevard		signal	C	27	0.55	C	35	0.84
Middleton Road		signal	C	33	0.73	D	49	0.95
Midway Road	northbound	two-way stop	D	30	n/a	F	>2.5 min	n/a
	southbound		D	31	n/a	F	>2.5 min	n/a
Florida Avenue	northbound	two-way stop	C	20	n/a	D	29	n/a
	southbound		E	36	n/a	F	105	n/a
10th Avenue		signal	C	28	0.46	C	30	0.57
Farmway Road	northbound	two-way stop	C	18	n/a	C	21	n/a
	southbound		C	17	n/a	C	20	n/a
Hoskins Road	southbound	two-way stop	B	11	n/a	B	12	n/a
Marsing Road	southbound	two-way stop	B	11	n/a	B	12	n/a

[1]v/c ratio does not apply at two-way stop-controlled intersections

All signalized and unsignalized intersections in the study area operate with a LOS D or better during the AM and PM peak hours except for Midway Road and Florida Avenue, which are both two-way stop controlled. These two intersections experience a LOS of F in the PM peak hour for one or both directions, and the Florida Avenue southbound approach experiences a LOS of E in the AM peak hour. The high volume of through traffic on Idaho 55 results in insufficient gaps for the relatively low volumes of cross-street traffic. This causes excessive delay for the northbound and southbound approaches during the peak periods. The Middleton Road intersection is nearing capacity in the PM peak hour and long eastbound and westbound queues were observed during peak periods.

Land Use

GIS land use zoning data was provided in 2008 and 2009 by Canyon County Assessors, Canyon County Development Services, the City of Caldwell, and the City of Nampa. As shown in Figure 7, the land uses were condensed to major land use types, including proposed subdivisions which are in platting or have approved conditional use permits. The land use trends immediately adjacent to Idaho 55 can be summarized as follows:

- The majority of property with frontage on Idaho 55 is zoned residential.
- Pockets of commercial zoning, currently undeveloped, are present around the Florida Avenue intersection and between Lake Avenue and Midway Road.
- Commercial development is located east of Middleton Road.
- Commercial land uses are planned between Midway Road and Middleton Road.

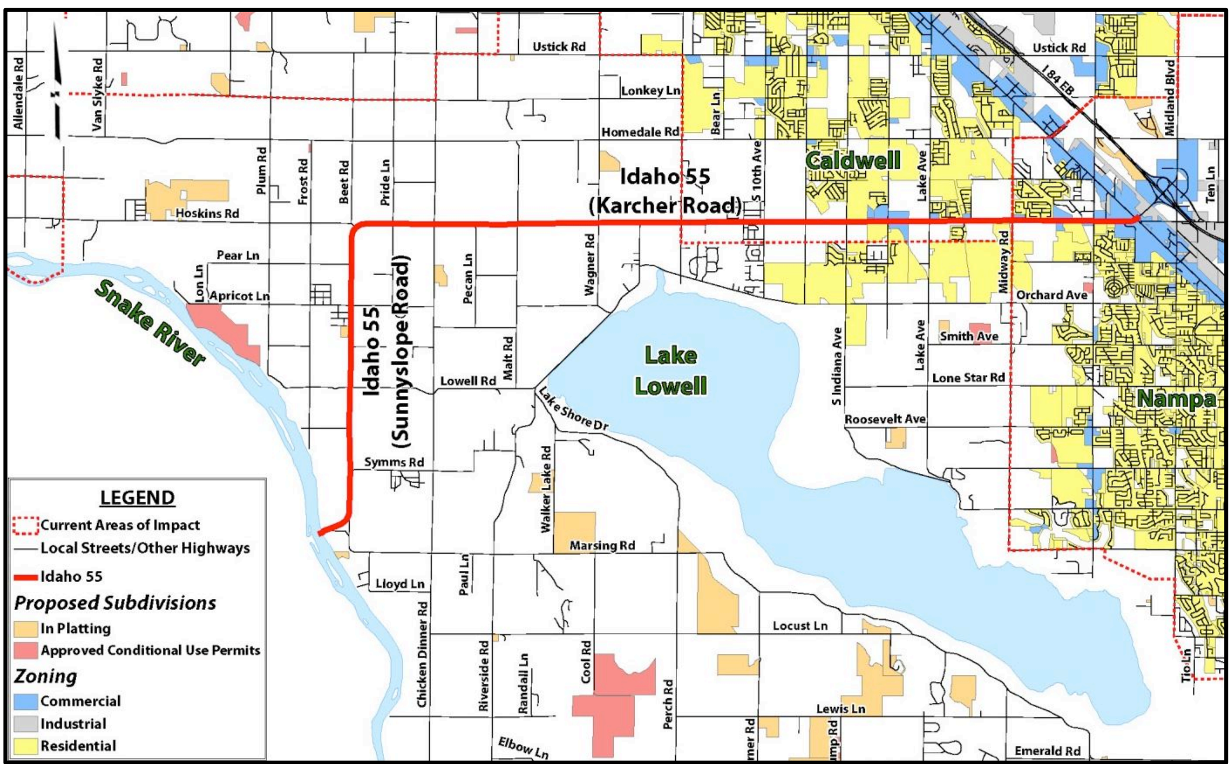

Figure 7. Canyon County zoning and proposed subdivisions

Forecasted Traffic

Forecasted traffic for 2015 and 2030 was based on data obtained from the COMPASS regional travel-demand forecast model. The models are based on the existing roadway network which is modified to incorporate regionally significant roadway improvements expected to occur by 2015 and 2030. A detailed discussion of the existing and forecasted traffic is included in Appendix B.

Improvements to Enhance Mobility

Figure 8 lists the 2008, 2015, and 2030 average daily traffic in vehicles per day and the estimated number of travel lanes that are needed each year.

Forecasted ADTs were compared to roadway planning thresholds from the Florida Department of Transportation (FDOT) to provide a planning-level estimate of the number of lanes required to accommodate forecasted traffic in 2015 and 2030. The FDOT threshold capacity is not the actual capacity of roadway as determined by standard engineering practice. With standard engineering practice, the roadway capacity is determined by the intersection capacity, which is calculated using the *2000 Highway Capacity Manual* methodology. Note that a five-lane or seven-lane roadway indicates two or three through lanes in each direction plus left-turn lanes. Key findings of the planning-level analysis indicates the following:

- Five lanes are currently needed from Caldwell Boulevard to west of Florida Avenue.
- Five lanes may be needed from west of Florida Avenue to the Snake River Bridge by 2015.
- At least five lanes will be needed on the entire corridor by 2030.
- Average daily traffic on Idaho 55 ranges from 17,000 to 52,000 by 2030.

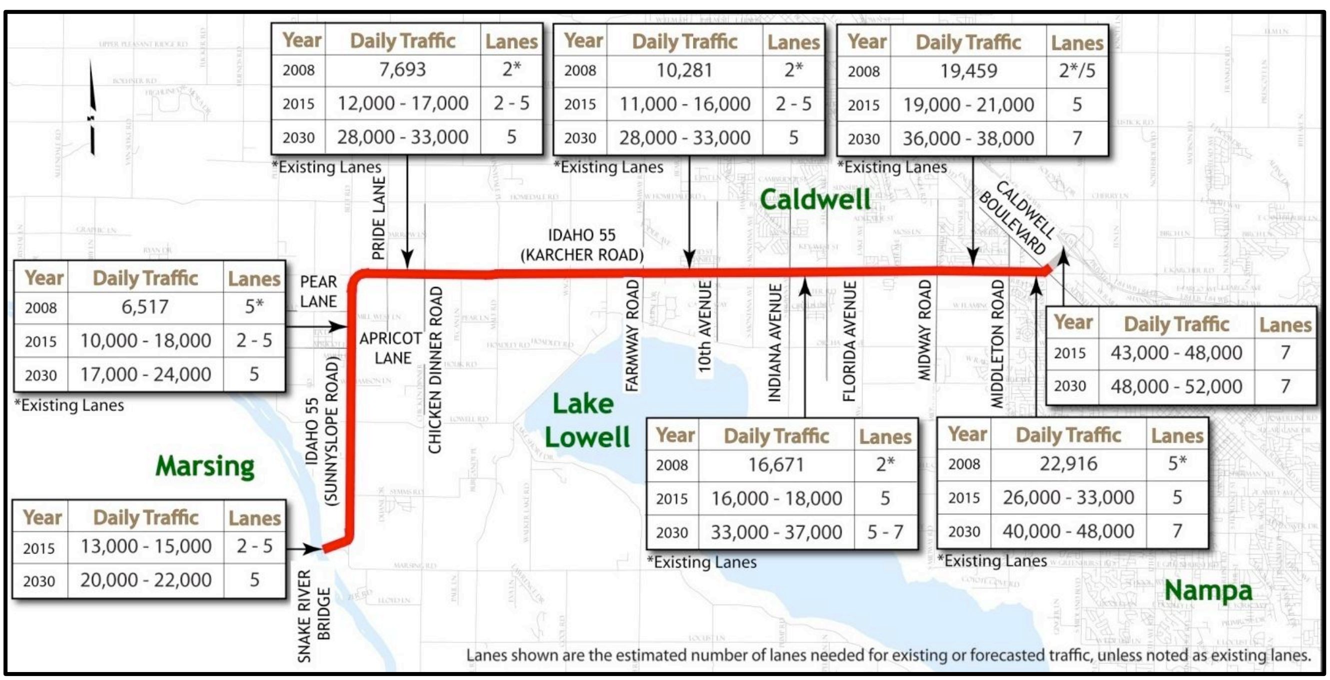

Figure 8. Existing and forecasted traffic on Idaho 55

Peak-hour intersection analysis of the forecasted traffic demand indicates that traffic signals are likely needed by 2030 at the following two-way stop-controlled intersections:

- Midway Road
- Lake Avenue
- Indiana Avenue
- Farmway Road
- Hoskins Road
- Marsing Road

IDAHO 55 ACCESS MANAGEMENT PLAN

One of the first tasks the project team accomplished was defining a planning vision for Idaho 55. The vision defined the type of transportation facility that the corridor should become by the 20-year planning horizon year of 2030 and beyond. Various highway types were considered, from restricted access freeways to multi-lane arterials with unlimited access. The participating agencies concluded that Idaho 55 should:

- Be a multi-lane, divided highway where access is managed to emphasize mobility and safety. Property along the roadway segment between the Snake River Bridge east of Marsing and Farmway Road was anticipated to remain rural, and property along the roadway segment between Farmway Road and Caldwell Boulevard was anticipated to develop with urban land uses.
- Have corridor speeds consistent with the existing posted speed limits on Idaho 55:
    - 55 miles per hour from the Snake River Bridge to Middleton Road
    - 40 to 45 miles per hour from Middleton Road to Caldwell Boulevard

PLAN OVERVIEW

The access management plan was divided into three segments based on the expected land use:

- Rural Segment – Snake River Bridge to 10th Avenue
- Urban/Suburban Segment – 10th Avenue to Middleton Road
- Urban Segment – Middleton Road to Caldwell Boulevard

Plans for each segment were developed in coordination with ITD and the local agencies participating in the plan development. Table 5 highlights the main features of the access management plan for the three roadway segments on Idaho 55.

Table 5. Proposed 2030 Access Management Plan highlights

		Rural	Urban/ Suburban	Urban
Segment		Snake River Bridge to 10th Avenue	10th Avenue to Middleton Road	Middleton Road to Caldwell Boulevard
Posted Speed		55 mph	55 mph	40 to 45 mph
Travel Lanes		Two 12-foot lanes in each direction	Two 12-foot lanes in each direction	Two to three 12-foot lanes in each direction
Deceleration Lanes		All intersections and accesses	All intersections and accesses	All intersections and accesses
Right of Way		140 feet	140 feet	140 feet
Medians	**Width**	30 feet desired, 14-foot existing median for Sunnyslope segment	30 feet	30 feet desired; actual available width is less in this segment
	Type	Divided roadway or non-traversable median	Divided roadway or non-traversable median	Non-traversable median
Access	**Full-Access Intersections**	1-mile intersection spacing	1-mile intersection spacing	Middleton Road Cassia Street Caldwell Boulevard
	Limited-Access Approaches	1/4-mile (1,320 feet) right-in/right-out driveway spacing between full-access intersections	1/6-mile (880 feet) right-in/right-out driveway spacing between full-access intersections	Approximately 1/6-mile (880 feet) to 1/8-mile (550 feet) right-in/right-out driveway spacing at Sundance Road and business approaches
	Median U-Turns	1/6-mile downstream from right-in/right-out driveways	1/8-mile downstream from right-in/right-out driveways	Not applicable
Parallel Collectors		1/8-mile to 1/2-mile parallel roadways, Beet Road to 10th Avenue only	1/8-mile to 1/2-mile parallel roadways	Not applicable

ROADWAY CROSS-SECTION

Figure 9 illustrates the typical roadway cross-section proposed for Idaho 55, from the Snake River Bridge to Middleton Road, consisting of 140 feet of right of way with two 12-foot travel lanes in each direction and a 30-foot median. The 30-foot median will accommodate dual left-turns at intersections and passenger car median U-turns. Shoulders are shown for illustration purposes, and their widths will be determined during design.

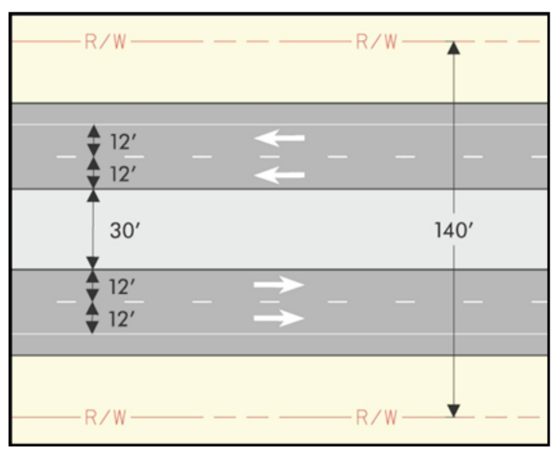

Figure 9. Proposed Idaho 55 cross-section

ACCESS SPACING

The proposed access spacing is a combination of two components: full-access intersections and limited-access approaches. Full-access intersections are the intersections on Idaho 55 with arterial or collector cross-streets at selected locations. They can be signalized or unsignalized, but most are anticipated to be signalized by 2030. Limited-access approaches allow access between the full-access intersections to residential and commercial developments and local streets, collectors, and arterials. Different driveway access spacing configurations were developed for each of the three corridor segments based on the anticipated land use development, existing access locations, and parcel boundaries.

The 30-foot median prohibits left-turn movements in and out of the limited-access approaches; therefore, the access is limited to right-in/right-out movements. The median also prohibits access to public streets located one-half mile from the full-access intersections. This will require converting public street approaches between the full-access intersections to limited-access, right-in/right-out approaches.

Full-Access Intersections

A minimum spacing of one mile between full-access intersections is identified for the entire Idaho 55 corridor from the Snake River Bridge to Middleton Road. The roadway segment between Middelton Road and Caldwell Boulevard has a specific plan for the full-access intersection spacing, which is discussed below. Table 6 lists the full-access intersections and the likely locations of future traffic signals.

Table 6. Existing and future traffic signals at full-access intersections at one-mile locations

Cross-street	Existing Traffic Signal	Traffic Signal Likely Warranted by 2030
Marsing Road	no	yes
Symms Road	no	no
Lowell Road	no	no
Apricot Lane	no	no
Hoskins Road	no	yes
Chicken Dinner Road	no	no
Malt Road	no	no
Wagner Road	no	no
Farmway Road	no	yes
10th Avenue	yes	yes
Indiana Avenue	no	yes
Lake Avenue	no	yes
Midway Road	no	yes
Middleton Road	yes	yes
Cassia Street	yes	yes
Caldwell Boulevard	yes	yes

Limited-Access Approaches

Rural Segment – Snake River Bridge to 10th Avenue

Figure 10 illustrates the access spacing on a typical rural one-mile segment of roadway from the Snake River Bridge to 10th Avenue. Limited-access approach spacing is 1/4-mile (1,320 feet) upstream and downstream of full-access intersections and between limited-access approaches. The segment between Farmway Road and 10th Avenue is anticipated to be developed as urban/suburban land uses; however, the rural access spacing is more accommodating to the existing local approaches and therefore has less potential for property impacts.

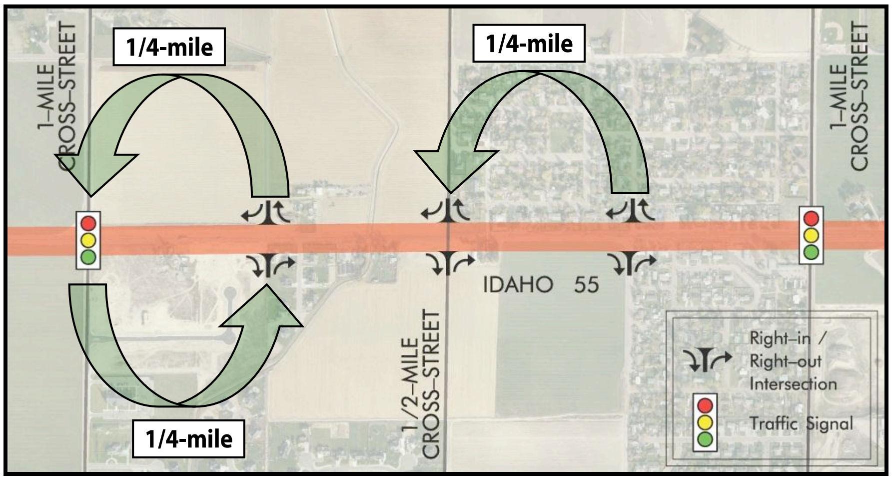

Figure 10. Typical one-mile rural segment – Snake River Bridge to 10th Avenue

Urban/Suburban Segment – 10th Avenue to Middleton Road

Figure 11 illustrates the access spacing on a typical urban/suburban one-mile segment of roadway from 10th Avenue to Middleton Road. Limited-access approach spacing is 1/3-mile (1,760 feet) upstream of a full-access intersection, 1/6-mile (880 feet) downstream of a full-access intersection, and 1/6-mile between limited-access approaches.

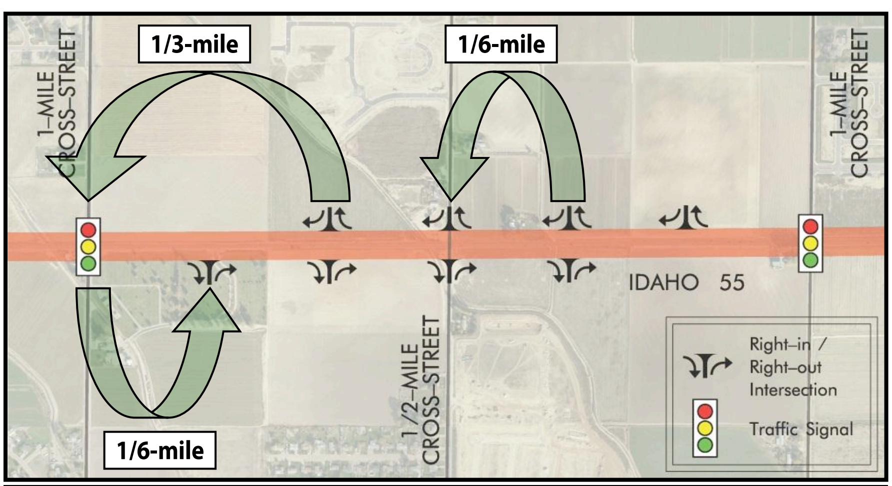

Figure 11. Typical one-mile urban/suburban segment – 10th Avenue to Middleton Road

Urban Segment – Middleton Road to Caldwell Boulevard

Figure 12 illustrates the access spacing on the urban segment from Middelton Road to Caldwell Boulevard. Access and land uses are more established in this 1/2-mile segment. Three traffic signals currently exist at Middleton Road, Cassia Street, and Caldwell Boulevard. The proposed limited-access approaches are limited to Sundance Road and an existing approach to a development located 1/8-mile east of Sundance Road.

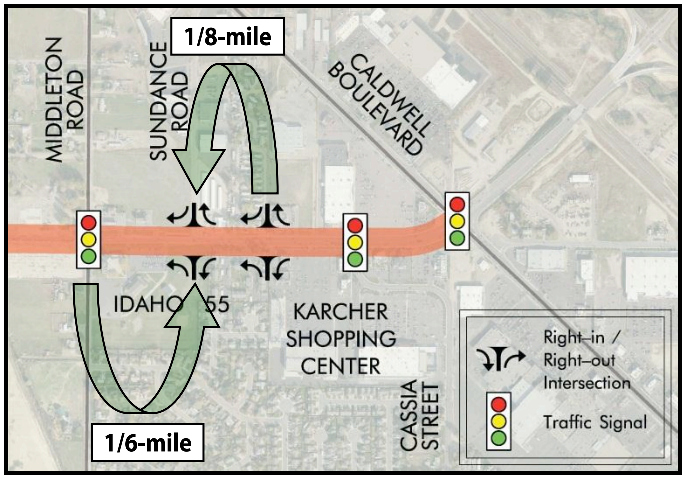

Figure 12. Urban segment – Middleton Road to Caldwell Boulevard

Median U-Turn Openings

The right-in/right-out driveways prohibit left turns to and from Idaho 55; therefore, median breaks for directional U-turns are included to allow access to driveways or travel lanes on Idaho 55. Midblock median U-turn openings allow indirect left turns and are located approximately 1/8-mile to 1/6-mile downstream of limited-access approaches. The U-turns occur at regular intervals from the Snake River Bridge to Middleton Road. Rural and urban/suburban U-turn opening spacing are illustrated in Figure 13 and Figure 14.

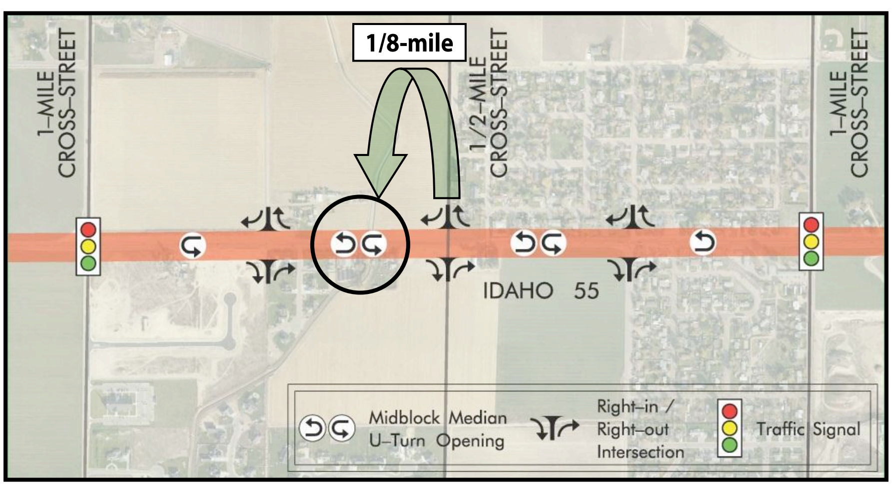

Figure 13. Rural median U-turn opening spacing – Snake River Bridge to 10th Avenue

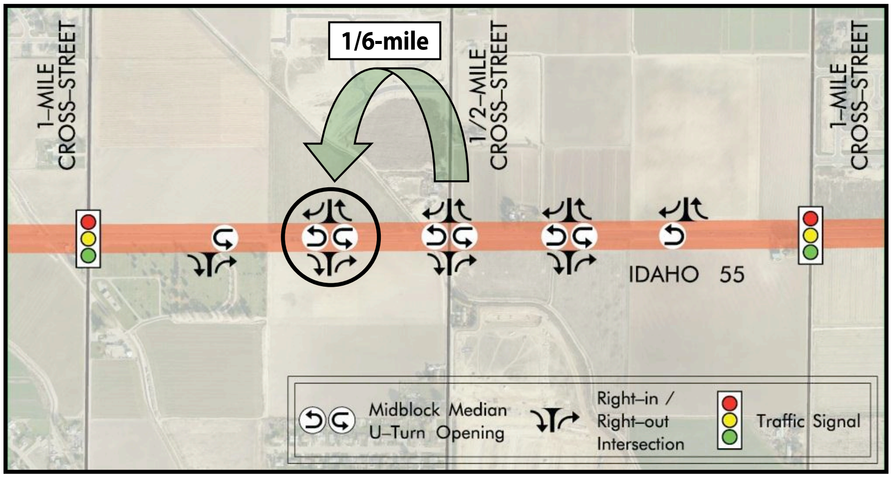

Figure 14. Urban/suburban median U-turn opening spacing – 10th Avenue to Middleton Road

Travelers who desire to make a left turn into or out of a limited-access approach will use the nearest downstream median U-turn opening to complete their turn as illustrated in Figure 15. To turn left from a limited-access approach, travelers make a right-turn-to-U-turn maneuver. Conversely, to turn left into a limited-access approach, travelers make a U-turn-to-right-turn maneuver. Upstream traffic signals create gaps in traffic to allow motorists to make the U-turn on Idaho 55.

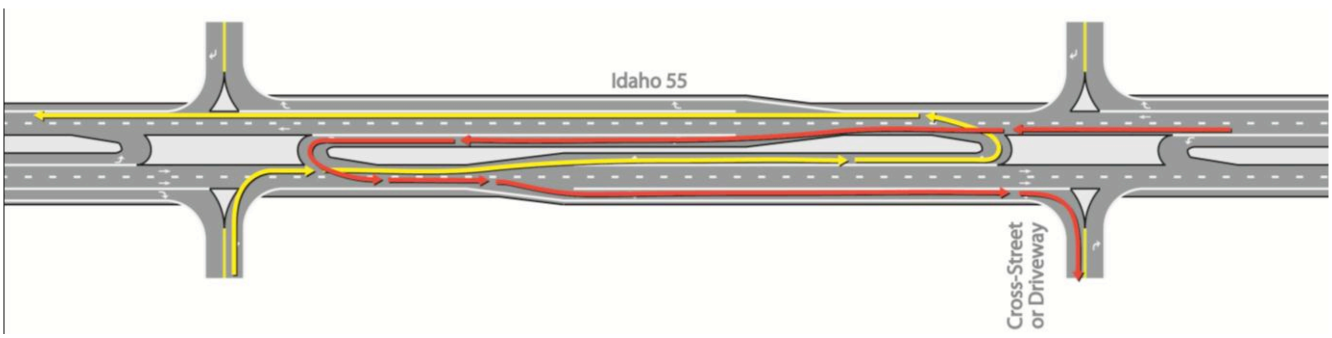

Figure 15. Indirect left-turn maneuvers to and from a limited-access approach

PREFERRED INTERSECTION ALTERNATIVE – MEDIAN U-TURN INTERSECTION

The preferred alternative for signalized full-access intersections is the median U-turn (MUT) intersection (refer to Appendix A for details of the preferred intersection alternative selection). The MUT intersection, shown in Figure 16, removes all left-turn movements from the intersection and replaces them with indirect left-turn movements, which increases capacity and reduces crashes. Indirect left-turns are performed by using directional median U-turn openings located 660 to 880 feet (1/8- to 1/6-mile) downstream from the full-access intersection, making them consistently spaced with the midblock median U-turn openings.

Figure 16. Preferred intersection alternative – median U-turn (MUT) intersection

Motorists making a left turn at the MUT will utilize the nearest downstream median U-turn opening to complete their turn, similar to the limited-access approaches. However, unlike the approaches, cross-street through movements are allowed. To complete a left turn at the MUT, the following movements are required:

- Motorists from cross-streets make a right turn at the traffic signal and proceed to the nearest downstream median U-turn opening and make a U-turn to complete their turn.
- Motorists from Idaho 55 proceed through the traffic signal to the nearest downstream median U-turn opening and make a U-turn to complete their turn. Gaps in traffic from the upstream traffic signals allow drivers to make a U-turn on to Idaho 55. If U-turn or through traffic volumes on Idaho 55 increase to levels which result in unacceptable delays or vehicle queuing, a traffic signal can be installed at the median U-turn, which would be coordinated with the traffic signal at the full-access intersection to minimize unnecessary stops on Idaho 55.

Large vehicles – including interstate semi-trucks (WB-62), buses, agricultural vehicles, and recreational vehicles – are accommodated with “loons” or “bulb-outs” at the median U-turn openings, as discussed in Appendix A. The loons will be located within the 140-foot right of way.

MUTs perform well when implemented at isolated intersections; however, their benefits are maximized when used as a corridor-wide treatment. Therefore, MUT’s are proposed at all full-access intersections where traffic signals are located from Marsing Road to Midway Road. The Middleton Road, Cassia Street, and Caldwell Boulevard intersections are not good candidates for MUTs because they do not operate as efficiently as conventional signalized intersections and because the existing roadway constraints limit the feasibility of MUTs.

PEDESTRIAN AND BICYCLE FACILITIES

When traffic signalization is warranted, the full-access intersections will have signalized crossings with crosswalks. Between the full-access intersections, pedestrians and bicycles will be accommodated outside of roadway right of way on separate facilities. The locations of these facilities are not shown on the plan exhibits but will be included as future roadway improvements are constructed.

PARALLEL COLLECTOR ROADWAYS

Where feasible, parallel collector roadways should be considered as redevelopment occurs along the east-west portion of Idaho 55 from Hoskins Road/Beet Road to Middleton Road. Parallel collector roadways spaced 1/8-mile to 1/2-mile from Idaho 55 are desirable to provide additional access for businesses and traffic circulation for motorists. Intersections of parallel collectors with the cross-street should be located a sufficient distance away from Idaho 55 to maintain the minimum functional intersection area (explained in the Access Management Plan Development in Appendix A) from the Idaho 55 intersection, which will vary with the posted speed limit and expected queues.

2030 ACCESS MANAGEMENT PLAN

To develop the 2030 Access Management Plan, the access management plan elements – signal spacing, driveway spacing, cross-section, median, median U-turns, etc. – were applied to Idaho 55 from the Snake River Bridge to Caldwell Boulevard. The minimum limited-access approach spacing was applied to Idaho 55 and considered the existing accesses and topography. Several access locations are not included because parcel access is not necessary or topological constraints exist.

The locations of parallel collector roadways are conceptual and are only shown for illustrative purposes. The final location of parallel collector roadways will be determined as redevelopment occurs.

The following figures illustrate the 2030 Access Management Plan:

- Figure 17. 2030 Access Management Plan (1 of 6) – Snake River Bridge to north of Williamson Lane
- Figure 18. 2030 Access Management Plan (2 of 6) – south of Apricot Lane to east of Pride Lane
- Figure 19. 2030 Access Management Plan (3 of 6) – west of Chicken Dinner Road to east of Wagner Road
- Figure 20. 2030 Access Management Plan (4 of 6) – west of Riverside Road to east of 10th Avenue
- Figure 21. 2030 Access Management Plan (5 of 6) – Montana Avenue to east of Celeste Way
- Figure 22. 2030 Access Management Plan (6 of 6) – west of Midway Road to Caldwell Boulevard

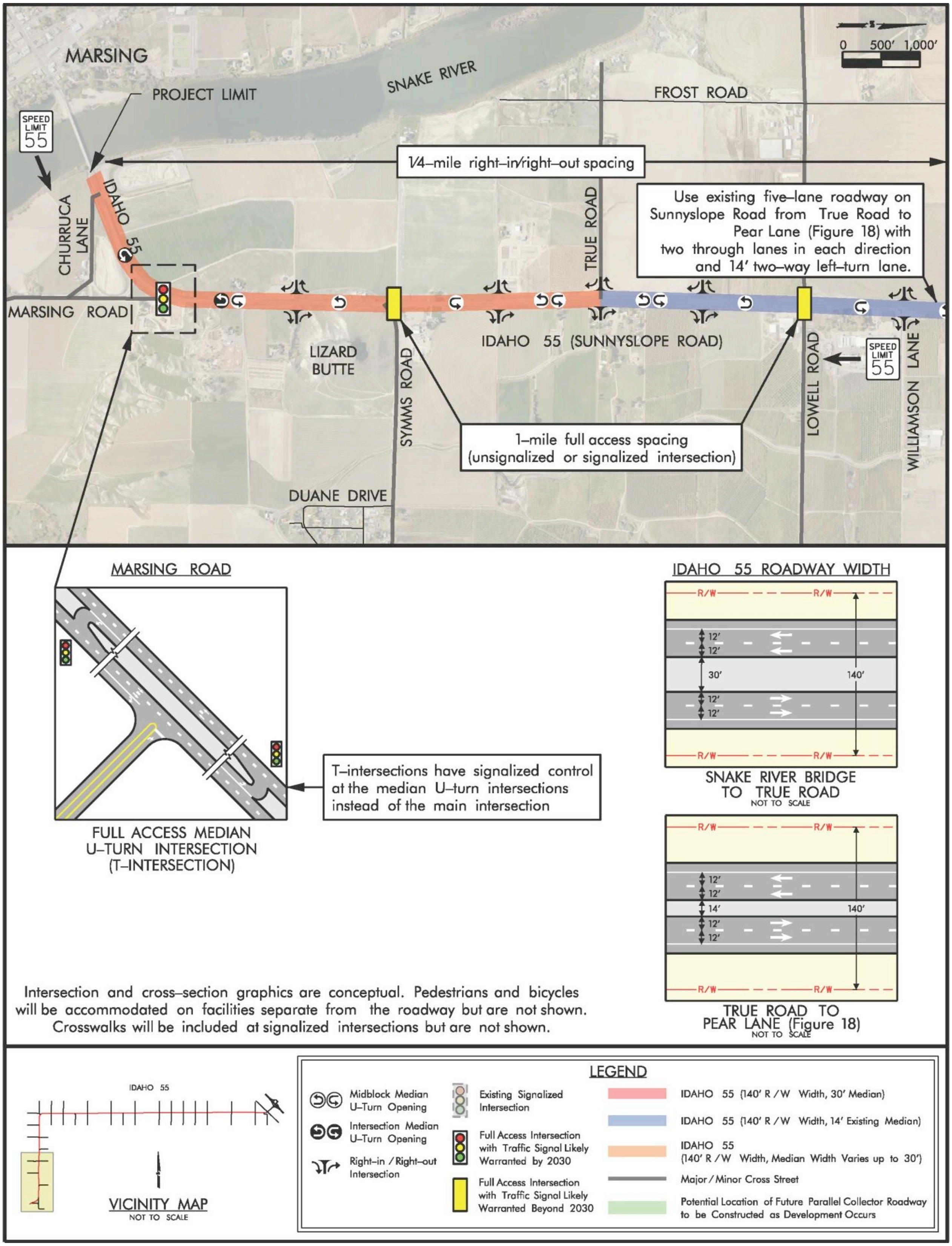

Figure 17. 2030 Access Management Plan (1 of 6) – Snake River Bridge to north of Williamson Lane

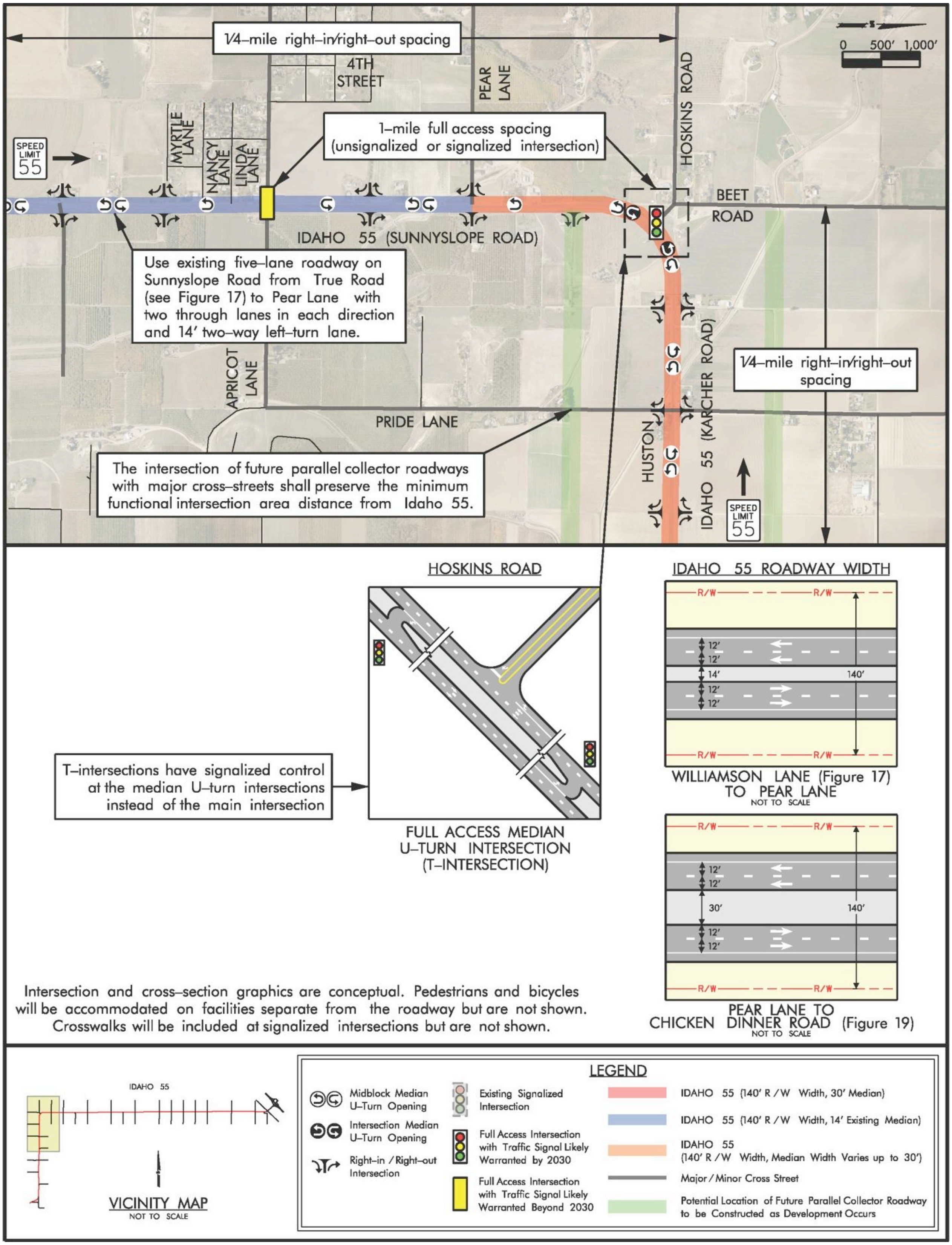

Figure 18. 2030 Access Management Plan (2 of 6) – south of Apricot Lane to east of Pride Lane

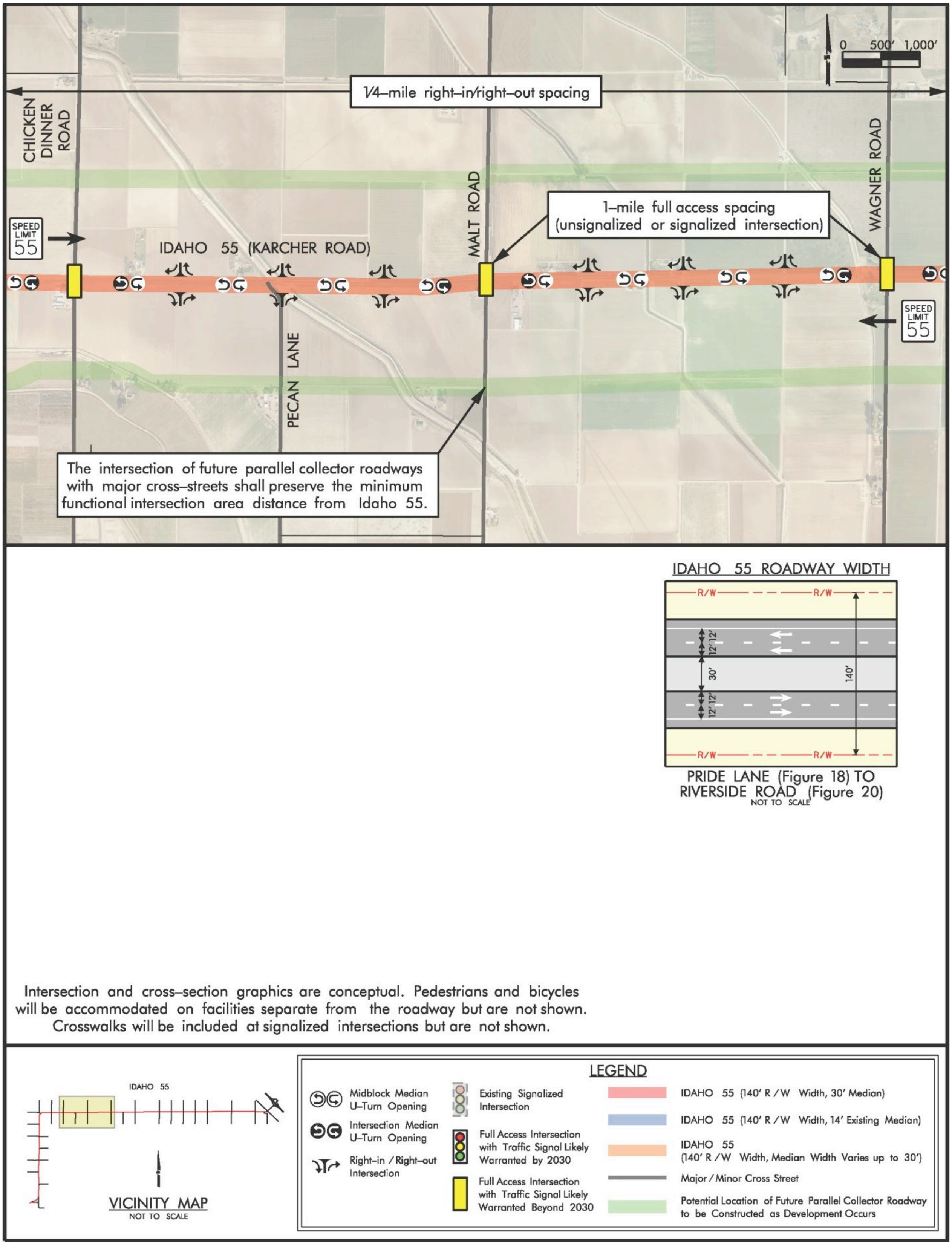

Figure 19. 2030 Access Management Plan (3 of 6) – west of Chicken Dinner Road to east of Wagner Road

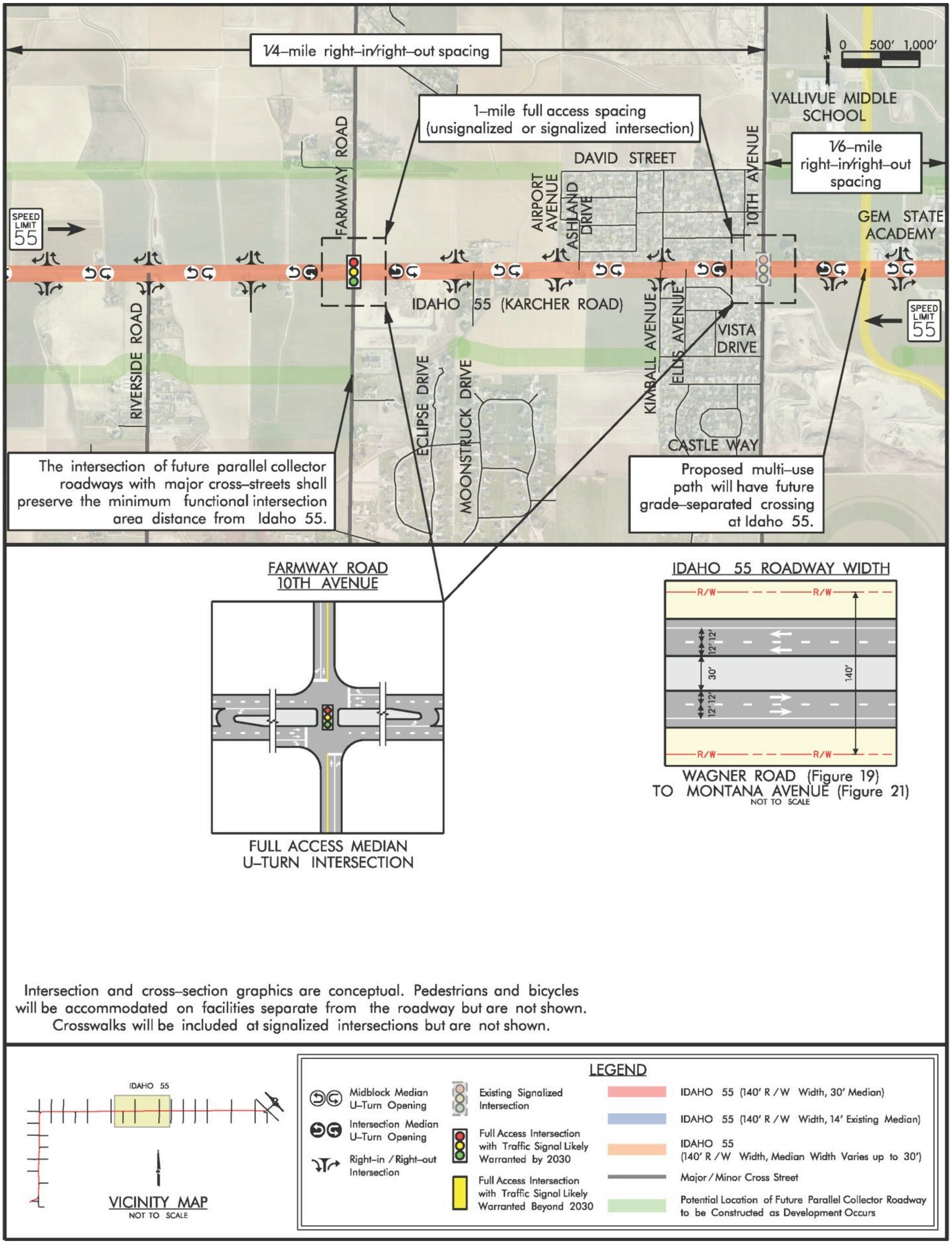

Figure 20. 2030 Access Management Plan (4 of 6) – west of Riverside Road to east of 10th Avenue

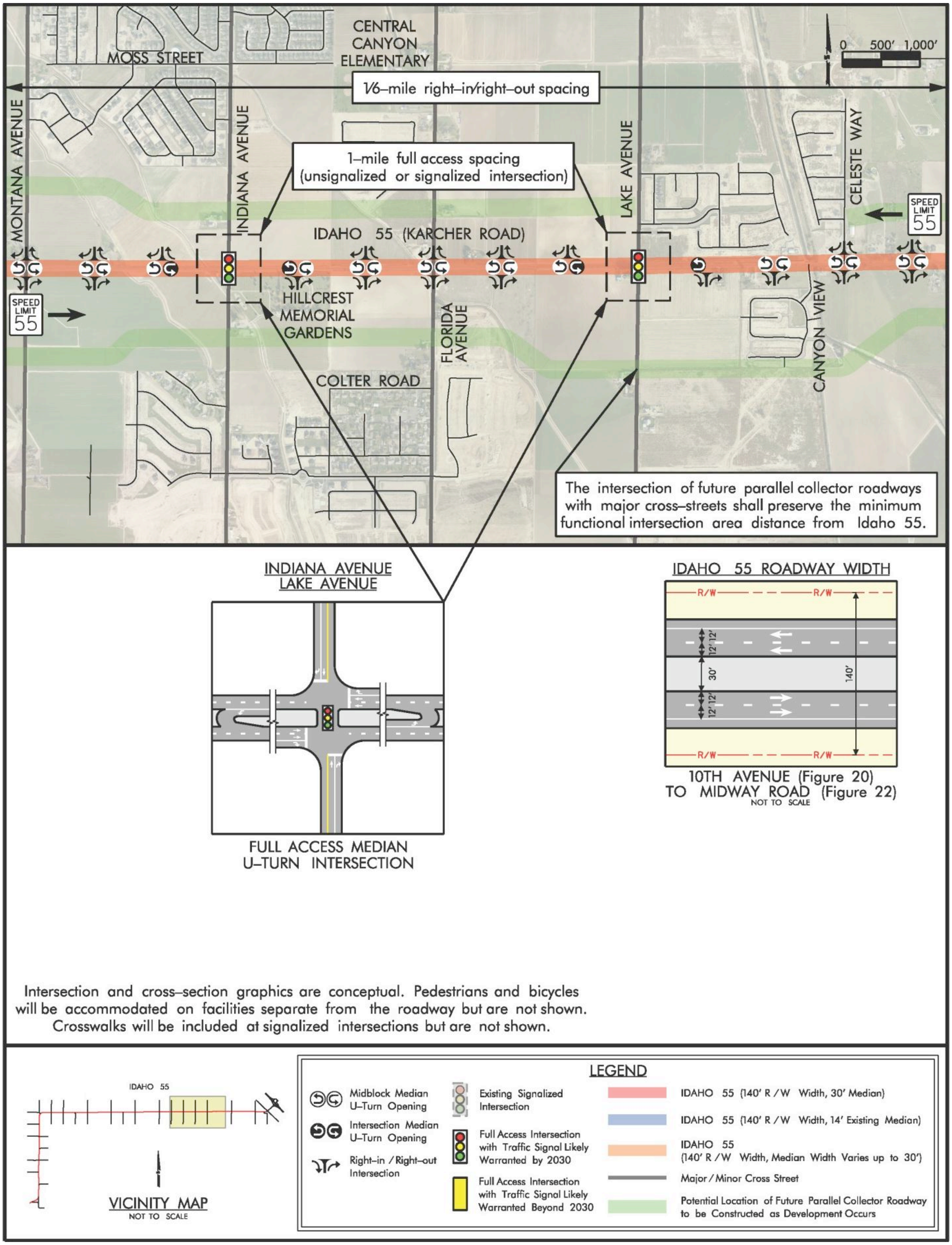

Figure 21. 2030 Access Management Plan (5 of 6) – Montana Avenue to east of Celeste Way

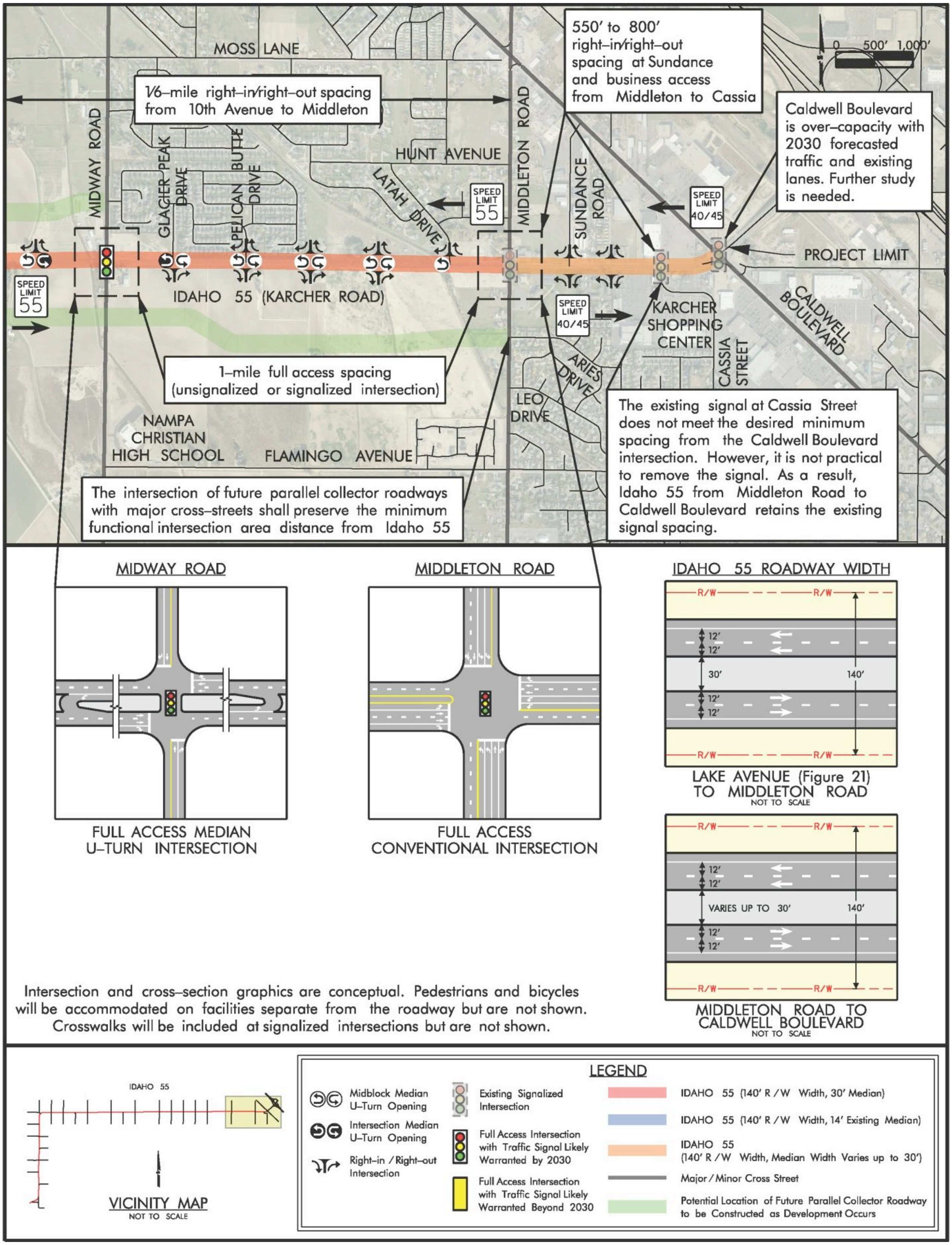

Figure 22. 2030 Access Management Plan (6 of 6) – west of Midway Road to Caldwell Boulevard

HOW WILL THE ACCESS MANAGEMENT PLAN BE IMPLEMENTED?

PLAN IMPLEMENTATION

ITD will present the Idaho 55 2030 Access Management Plan to Canyon County, City of Caldwell, City of Nampa, Canyon Highway District No. 4 and COMPASS for inclusion of some or all plan elements into the agencies' comprehensive plans and other planning and development policies and processes.

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GLOSSARY

Acceleration Lane – A speed-change lane, including tapered areas, that enables a vehicle entering a roadway to increase its speed to a rate that enables it to safely merge with through traffic. (3)

Access Management – The systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway, as well as roadway design applications that affect access, such as median treatments and auxiliary lanes, and the appropriate separation of traffic signals. (3)

Auxiliary Lane – A lane striped for use, but not for through traffic. (3)

Base Rate – The statewide crash rate for two-lane or five-lane roadways with similar widths and traffic volumes.

Crash Modification Factor (CMF) – A multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. A CMF under 1.0 will reduce the number of expected crashes, whereas a CMF over 1.0 will increase the number of expected crashes. (1)

Conflict Point – An area where intersecting traffic either merges, diverges, or crosses. (3)

Control Delay – The component of delay that results when a traffic signal causes traffic to reduce speed or to stop; it is measured by comparison with the uncontrolled condition. (4)

Cross-Section – The profile of the road, perpendicular to the direction of travel and extending to the limits of the right of way. Cross-section elements may include driving lanes, auxiliary lanes, bicycle/pedestrian lanes, shoulders, medians, barriers, and cross slopes for drainage.

Deceleration Lane – A speed-change lane, including tapered areas, that enables a turning vehicle to exit a through lane and slow to a safe speed to complete its turn. (3)

Delay – The additional travel time experienced by a driver, passenger, or pedestrian. (4)

Design Vehicle – The largest vehicle that the roadway is designed to accommodate. At full-access intersections the design vehicle is a WB-62 semi-trailer (15-foot tractor with 48-foot trailer). At midblock median U-turns the design vehicle is a passenger car (includes SUVs and pickup trucks).

Driveway – The physical connection for vehicular traffic between a roadway and abutting land. (3)

FDOT Planning Threshold – A daily traffic volume, developed by the Florida Department of Transportation (FDOT), which represents the maximum threshold volume for a desired level-of-service on a specific roadway type (i.e. arterial, state highway, freeway). Used to estimate the number of through lanes required to accommodate traffic demand.

Functional Classification – A system used to group public roadways into classes according to their purpose in moving vehicles and providing access. (3)

Functional Intersection Area – The area beyond the physical intersection of two controlled access facilities that comprises decision and maneuver distance, plus any required vehicle storage length, and is protected through corner clearance standards and connection spacing standards. (3)

Frontage Road – An access road that generally parallels a major public roadway between the right of way of the major roadway and the front building setback line; provides access to private properties while separating them from the principal roadway. (3)

Full-access Intersection – An intersection on Idaho 55 with a major cross-street, spaced at one-mile intervals, where all turning and crossing movements are allowed.

Fully-actuated Signal – A signal operation in which vehicle detectors at each approach to the intersection control the occurrence and length of every phase. (2)

Land Use Agency – An agency that establishes and regulates land use development policies. The City of Caldwell, City of Nampa, Canyon County and Canyon Highway District No. 4 are land use agencies for the segment of Idaho 55 in Canyon County.

Level of Service (LOS) – A qualitative measure describing the operational conditions within a stream of traffic with factors that include speed, travel time, ability to maneuver, traffic interruptions, safety, waiting time periods (delay), and driver comfort and convenience. Level is represented by letters A through F, with A for the freest flow and F for the least free flow. (3)

Limited-access Approach – An approach that restricts all turning movements to right-in/right-out, and includes major cross-streets located one-half mile between full-access intersections, driveways, and local streets on Idaho 55.

Measures of Effectiveness– A quantitative parameter indicating the performance of a transportation facility or service. Measures of effectiveness at intersections include delay (unsignalized) or control delay (signalized), level-of-service, and v/c ratio (signalized intersections only). (4)

Median U-turn – An opening in the median that allows uncontrolled midblock U-turns for passenger vehicles on Idaho 55.

Median U-turn Intersection (MUT) – A non-conventional intersection treatment applied to full-access intersections on Idaho 55 where all left-turn movements are removed from the main intersection and redirected to median U-turn openings located 1/8-mile or 1/6-mile downstream. MUTs increase capacity and safety while reducing delays at intersections. The downstream median U-turns can be signalized to reduce delays and queues, if necessary. Passenger vehicles and WB-62 semi-trucks are accommodated at MUTs.

Non-traversable Median – A physical barrier in the roadway that separates traffic traveling in opposite directions, such as a concrete barrier or landscaped island. (3)

Parallel Collector Road – An access road, similar to a frontage road, that generally parallels a major public roadway; however, it is set back from the major roadway right of way a sufficient distance to allow development on both sides. Typically serves non-residential developments and are less costly and more functional than frontage roads.

Peak Hour – The largest number of vehicles passing over a designated section of a street during the busiest 60-minute period within a 24-hour period. (3)

Quality Rating – rating (1, least reliable, to 5, most reliable) that indicates the quality or confidence in the results of the study that produced the crash modification factor. (1)

Right of Way – A strip of land occupied or intended to be occupied by a road, sidewalk, crosswalk, railroad, electric transmission line, oil or gas pipeline, water line, sanitary storm sewer, and other similar uses; the right of one to pass over the property of another. (3)

Strategic Arterial – A designation used for planning purposes for an arterial roadway that has strategic importance to the statewide transportation network. (3)

T-intersection (Three-leg Intersection) – An intersection with only three approaches where the minor street does not have crossing movements and is typically stop-controlled if a traffic signal is not present.

Vehicle Progression – The ability for platoons, or groups of vehicles, to travel through a roadway without interruption.

Volume-to-Capacity Ratio (v/c Ratio) – The ratio of flow rate (traffic demand) to capacity for a transportation facility. (4)

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(1) Crash Modification Factors Clearinghouse. Federal Highway Administration. 6 July 2010 <http://www.cmfclearinghouse.org>

(2)Koonce, Peter, et al. Traffic Signal Timing Manual. McLean, VA, Federal Highway Administration, 2008

(3)Transportation Research Board of the National Academies. Access Management Manual. Washington, DC: Transportation Research Board, 2003.

(4)Transportation Research Board of the National Academies. Highway Capacity Manual. Washington DC: National Research Council, 2000

APPENDIX A – ACCESS MANAGEMENT PLAN DEVELOPMENT

APPENDIX B – TRAFFIC ANALYSIS

APPENDIX A
ACCESS MANAGEMENT PLAN DEVELOPMENT

IDAHO 55, MARSING TO NAMPA,
ACCESS MANAGEMENT PLAN
PROJECT NO. A009(967), KEY NO. 09967

Prepared for:

Mark Wasdahl,

ITD District 3

With Cooperation from:

Canyon County

Canyon Highway District No. 4

City of Caldwell

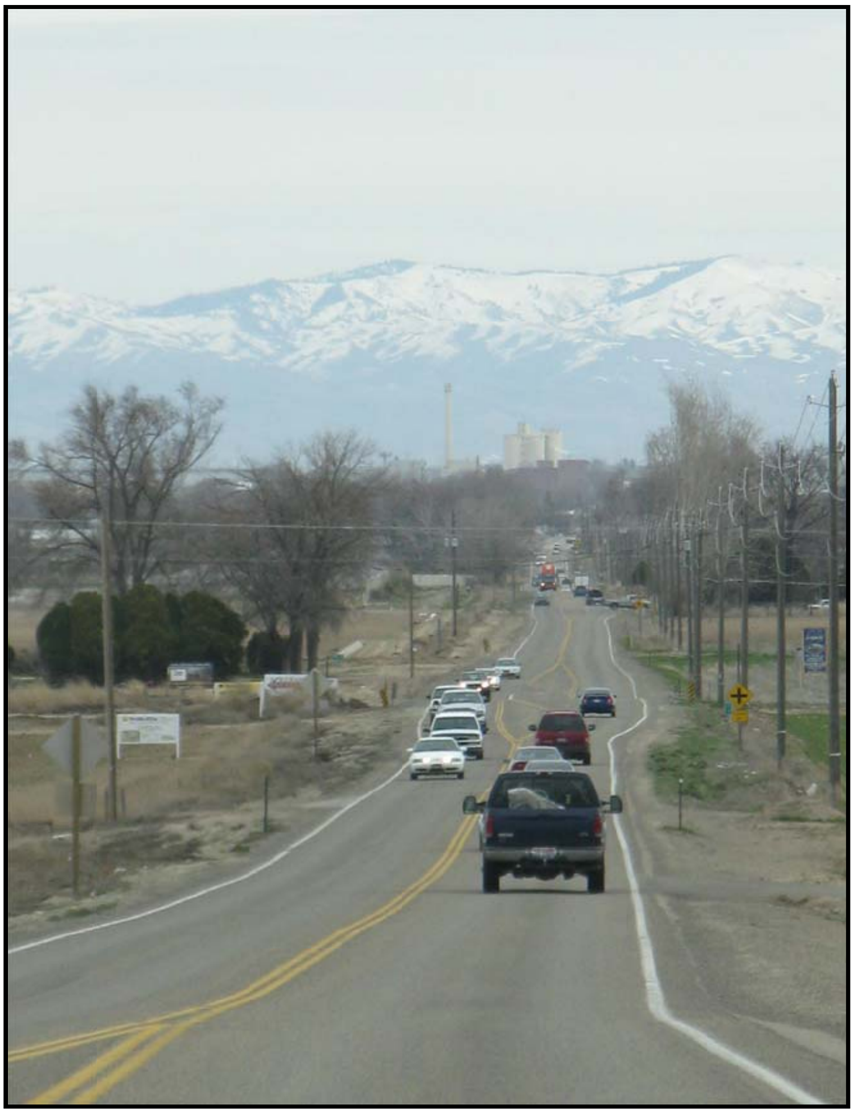
City of Nampa

COMPASS

Prepared by:

Six Mile Engineering, P.A.

April 2011



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LIST OF FIGURES AND TABLES

PRINCIPLES OF ACCESS MANAGEMENT

This document summarizes the development of the access management plan. Throughout the development process, the following ten "Principles of Access Management" from the *Access Management Manual,* published by the Transportation Research Board in 2003, were used as a foundation for the plan concepts:

1. **Provide a specialized roadway system.** Design and manage roads according to their functional classification.
2. **Limit direct access to major roadways.** Roadways that serve higher volumes of regional through traffic need more access control to preserve their function.
3. **Promote intersection hierarchy.** An efficient transportation network provides appropriate transitions from one classification of roadway to another. For example, freeways connect to arterials at interchanges.
4. **Locate signals to favor through movements.** Long, uniform spacing of intersections and signals on major roadways enhances the ability to coordinate signals and ensure continuous movement of traffic at the desired speed.
5. **Preserve the functional area of intersections and interchanges.** The functional area is the area that is critical to its function. It is the area where motorists are responding to the intersection, decelerating, and maneuvering into the appropriate lane to stop or complete a turn. Access too close to intersections can cause serious traffic conflicts that impair the function of the facility.
6. **Limit the number of conflict points.** Simplifying the driving task contributes to improved traffic operations and fewer crashes. A less complex environment is created by limiting the number and type of conflicts.
7. **Separate conflict areas.** Drivers need sufficient time to address one potential set of conflicts before facing another. Separating conflict areas helps to simplify the driving task and contributes to improved traffic operations and safety.
8. **Remove turning vehicles from through lanes.** Turning lanes allow drivers to decelerate gradually out of the through lane and wait in a protected area for an opportunity to complete a turn, thereby reducing the severity and duration of conflict between turning vehicles and through traffic.
9. **Use non-traversable medians to manage left-turn movements.** Medians channel turning movements to designated locations. Therefore, non-traversable medians and other techniques that minimize left turns or reduce the driver workload can be especially effective in improving roadway safety.
10. **Provide a supporting street and circulation system.** Well-planned communities provide a supporting network of local and collector streets to accommodate development. Alternatively, commercial trip development with separate driveways for each business forces even short trips onto arterial roadways, thereby impeding safety and mobility.

ACCESS MANAGEMENT PLAN COMPONENTS

ROADWAY FUNCTIONAL CLASSIFICATION

> Access Management Principle No. 1: "Provide a specialized roadway system. Design and manage roads according to their functional classification".
> *Access Management Manual*

The foundation of an access management plan begins with establishing a well-conceived functional classification. Idaho 55 is a federally designated National Highway System route functionally classified as a principal arterial by the Idaho Transportation Department (ITD) and COMPASS. A principal arterial classification in the Treasure Valley includes a broad spectrum of roadway types, ranging from lower-speed urban boulevards to high-capacity, high-speed state highways. Therefore, a more specific classification is needed to characterize Idaho 55.

Idaho 55 is an important route for regional commuters and interstate commerce and has been functionally classified as a "strategic arterial" for the purposes of this access management plan. The *Access Management Manual* elaborates on the definition of an "arterial" and a "strategic arterial":

- **Arterial:** A major roadway intended primarily to serve through traffic, where access is carefully controlled; generally roadways of regional importance, intended to serve moderate to high volumes of traffic traveling relatively long distances and at higher speeds.
- **Strategic Arterial:** A designation used for planning purposes for an arterial roadway that has strategic importance to the statewide transportation network.

TRAVEL LANES

Based on the forecasted traffic analysis (refer to Appendix B), two travel lanes in each direction are needed by 2030 from the Snake River Bridge to Middleton Road.

DESIRED SPEED

Because of its statewide importance and designation as a strategic arterial, mobility is emphasized on Idaho 55 which prompts the need for a highway-level desired speed. The *ITD Design Manual* states:

> *"Minimum design speed should only be used … when there are topographic constraints or other restrictions. Otherwise, the highest design speed that is compatible with the topography and project economics should be adopted (Section 335.07)."*

By establishing a desired speed for Idaho 55, minimum standards for other access management plan components are established such as signal spacing, driveway spacing and median opening spacing.

The existing posted speed limits on Idaho 55 are 55 miles per hour from the Snake River Bridge to Middleton Road and 40 to 45 miles per hour from Middleton Road to Caldwell Boulevard. The existing speed limits remained unchanged for the access management plan.

ROADWAY MEDIAN TYPE

Managing left-turn movements is important for the safety and operation of a corridor because more than two-thirds of all access-related collisions involve left-turning vehicles, as shown in Figure A-1 from the *Access Management Manual*. A variety of median applications are used on arterial roadways which have varying restrictions for left-turn access. Examples include:

- Undivided roadway (no median)
- Two-way left-turn lane (TWLTL)
- Non-traversable median
- Divided roadway

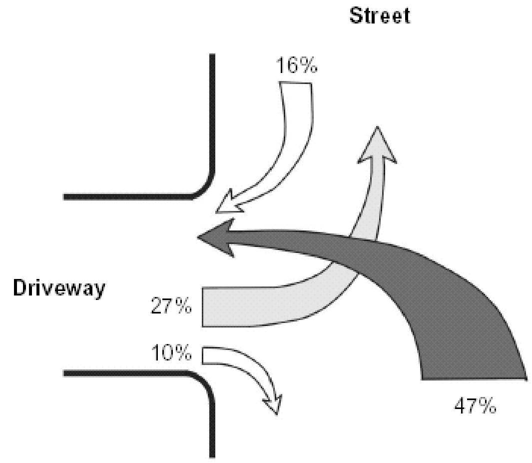


Figure A-1. Percentage of driveway crashes per movement (Figure 1-6 from *Access Management Manual*)

Several national publications provide statistics and guidance regarding the safety of left turns and medians.

- NCHRP 420, *Impacts of Access Management Techniques*, notes:
  - Non-traversable medians reduce accident rates compared with undivided or TWLTLs in both urban and rural locations.
  - Eliminating direct left turns from driveways and replacing them with indirect U-turn maneuvers results in a **20 percent reduction** in the accident rate.
  - U-turn crossovers were found to have roughly **50 percent** of the accident rates of roads with TWLTLs.
  - Case studies on several arterials throughout the U.S. show replacing TWLTLs with raised medians can reduce accidents from **15 percent to 57 percent**.
- NCHRP 524, *Safety of U-turns at Unsignalized Median Openings*, notes:
  - For urban arterial corridors, average median opening accident rates for directional three-leg median openings (with U-turns and/or directional left turns) are about 48 percent lower than accident rates for conventional three-leg openings.
  - Crash rates normally combine U-turns and directional left turns so studies have not been able to compare crash statistics for the two movements.

> Access Management Principle No. 9:
> "Use non-traversable medians to manage left-turn movements".
> *Access Management Manual*

One of the principles of access management is to limit vehicle conflict points, which is accomplished with a median. Removing direct left turns reduces the total number of vehicle conflict points along highway segments. In addition,

> Access Management Principle No. 6:
> "Limit the number of conflict points".
> *Access Management Manual*

crossing conflicts are removed, which generally cause more severe crashes. To minimize vehicle conflict points on Idaho 55 and because of the high potential for crashes associated with direct left turns, both left turns into an approach and left turns out of an approach are prohibited by a non-traversable median or divided roadway. The proposed 30-foot median width is discussed in the next section of the report.

U-TURNS, DESIGN VEHICLE AND ROADWAY MEDIAN WIDTH

Prohibiting left turns at driveways with a non-traversable median or divided roadway prompts the need to make U-turns between full-access intersections or signalized intersections. The type of vehicle the U-turns can accommodate depends on the median width. Establishing a design vehicle is critical in determining the median width and, therefore, the roadway right of way.

ITD's U-turn design requirements in *ITD Policy – 555.02 Intersection Design for Oversize Vehicles*, states:

> *"Intersections on the State Highway System should be designed using the WB-62 truck and 48 feet semitrailer. All moves should be possible without running over curbs, edge of pavement, or encroaching into conflicting traffic lanes."*

Additionally, NCHRP 524, *Safety of U-turns at Unsignalized Median Openings*, notes:

- At rural, four-leg unsignalized intersections, accident frequency decreases as median width increases.
- At urban/suburban, four-leg unsignalized intersections, accident frequency increases as median width increases.
- Median widths at suburban unsignalized intersections generally should be as narrow as possible while providing sufficient space in the median for the appropriate left-turn treatment and to accommodate U-turn maneuvers by a selected design vehicle.

According to the minimum design guidelines for U-turns presented in the 2004 edition of *A Policy on Geometric Design of Highways and Streets* by AASHTO, a 30-foot median is required for a passenger car to turn from the median U-turn lane to the outside (curbside) travel lane, as shown in Figure A-2, and a 71-foot median is required for a WB-62 to turn from the median U-turn lane to the outside travel lane (a WB-62 is not listed in the figure but requires the same median width as WB-60).

For this access management plan, ITD approved a passenger car design vehicle for all midblock median U-turns which requires a 30-foot median. Rather than providing a larger median and larger right-of-way width, U-turns for the WB-62 design vehicle will be accommodated at full-access intersections with the assistance of a loon. A loon is an expanded area opposite a median U-turn that provides pavement surface to accommodate large vehicles turning paths. The median U-turns with loons will be located immediately downstream of a full-access intersection.

Maintaining a 30-foot median along the corridor allows for a consistent right-of-way width and travel lane alignment through the full-access intersections.

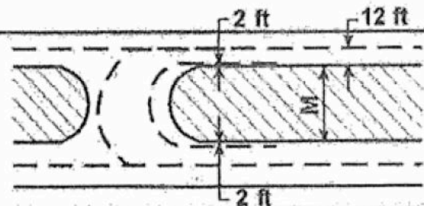
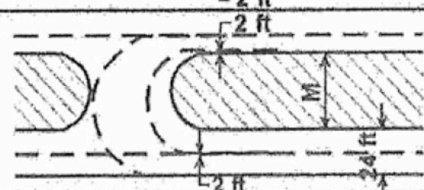
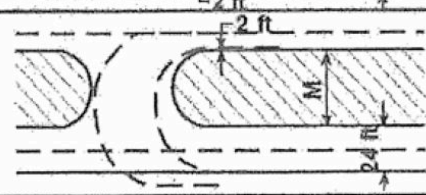
TYPE OF MANEUVER		M - MIN. WIDTH OF MEDIAN (ft) FOR DESIGN VEHICLE						
		P	WB-40	SU	BUS	WB-50	WB-60	TDT
		LENGTH OF DESIGN VEHICLE (ft)						
		19	50	30	40	55	65	118
INNER LANE TO INNER LANE		30	61	63	63	71	71	101
INNER LANE TO OUTER LANE		18	49	51	51	59	59	89
INNER LANE TO SHOULDER		8	39	41	41	49	49	79

Figure A-2. Median widths for U-turns (Exhibit 9-92 from A Policy on Geometric Design of Highways and Streets, AASHTO; P=passenger car; SU=single-unit truck; BUS=bus; WB=semi-trailer)

RIGHT-OF-WAY

The proposed right-of-way width is 140 feet and includes two travel lanes in each direction, a 30-foot median, and a 31-foot setback from the travel lanes for shoulders, clear zones, drainage and cross-slopes. At 55 miles per hour, a minimum clear zone distance of 22 to 32 feet is required – depending on foreslope grade – on roadways exceeding 6,000 vehicles per day according to the 2002 edition of the AASHTO *Roadside Design Guide*.

The median U-turn loons located downstream from the full-access intersections will be accommodated within the 140-foot right of way.

ACCESS SPACING

Balancing access and mobility, while maximizing safety and functionality, is the critical challenge in establishing access spacing standards for Idaho 55. Limiting access points is a key component to increasing safety and improving travel for Idaho 55 traffic. As shown in Figure A-3, crashes increase as the number of access points per mile increases.

> Access Management Principle No. 2: "Limit direct access to major roadways".
> *Access Management Manual*

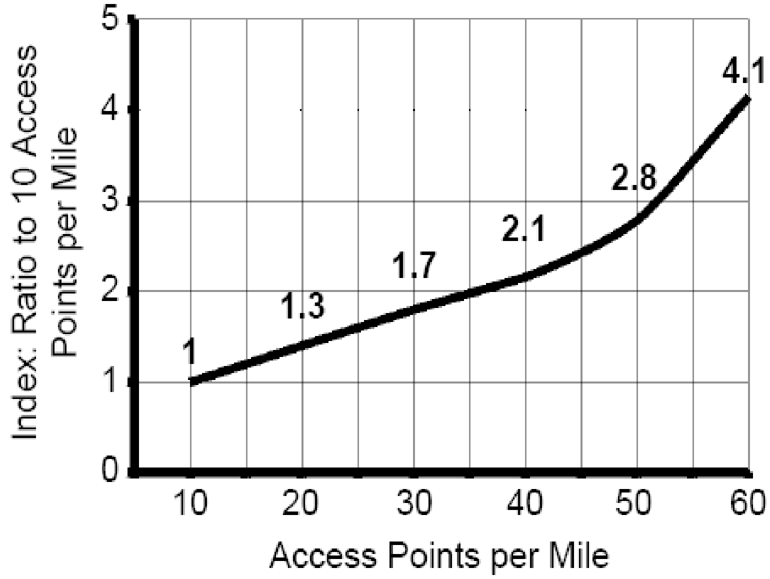


Figure A-3. Ratio of access points per mile versus crash index ratio (Figure 2-1 from Access Management Manual)

Signalized Access Spacing

Traffic demand will require traffic signals at many locations on Idaho 55 by 2030; as a result, a consistent traffic signal spacing is required. Traffic signals provide more convenient access to and from cross-streets, but at the expense of maintaining a consistent and higher travel speed on the major roadway. Therefore, the goal for signalized access spacing on Idaho 55 is to provide adequate cross-street access while minimizing traffic signals to maintain a higher progression speed.

One key element to desirable corridor operations is long, uniform signal spacing. The *Access Management Manual* notes the following benefits of long, uniform signal spacing:

- Improves traffic flow capacity
- Increases progression speed
- Reduces crash rates
- Improves fuel efficiency
- Reduces emissions

> Access Management Principle No. 4: "Locate signals to favor through movements".
> *Access Management Manual*

The ideal traffic signal spacing is primarily a function of progression speed and traffic signal cycle lengths. The cycle length required on Idaho 55 will be at least 120 seconds to accommodate minimum pedestrian clearances with an eight-phase signal. As shown in Figure A-4, the traffic signal spacing for a progression speed of 55 miles per hour and 120-second cycle length is 4,840 feet, which exceeds one-half mile; therefore, one-mile spacing is required.

Cycle Length (s)	Speed (mph) 25	30	35	40	45	50	55
	Signal Spacing (ft)						
60	1100	1320	1540	1760	1980	2200	2420
70	1280	1540	1800	2050	2310	2570	2820[a]
80	1470	1760	2050	2350	2640	2930	3230
90	1630	1980	2310	2640	2970	3300	3630
120[b]	2200	2640	3080	3520	3960	4400	4840

[a] Distances below the line are undesirably long spacings.
[b] Longest recommended cycle length.

Figure A-4. Spacing of signalized intersections for various progression speeds and cycle lengths (Table 9-1 from Access Management Manual)

Note that Figure A-4 indicates that traffic signal spacing in excess of one-half mile is undesirable. This can be true because platoons of vehicles can dissipate over long distances and negatively impact progression; however, locally, this trend has not been observed on signalized state highways with high proportions of through traffic such as Eagle Road, Idaho 44, and U.S. 20/26. One-mile traffic signal spacing is required to achieve a traffic progression speed closest to the desired speed of 55 miles per hour. As shown in Figure A-5, the trend is that progression speed increases as signal spacing increases and, therefore, the longest possible signal spacing is desired on Idaho 55.

Cycle Length (s)	Spacing 1/8 mi (660 ft)	1/4 mi (1,320 ft)	1/3 mi (1,760 ft)	1/2 mi (2,640 ft)
	Progression Speed (mph)			
60	15	30	40	60
70	13	26	34	51
80	11	22	30	45
90	10	20	27	40
100	9	18	24	36
110	8	16	22	33
120	7.5	15	20	30

Figure A-5. Progression speed as a function of signal cycle lengths (Table 9-2 from Access Management Manual)

The plan recommends a maximum of one traffic signal per mile on Idaho 55 from the Snake River Bridge to Middleton Road; however, traffic signals should only be installed where warranted (refer to the 2030 Access Management Plan for a list of signalized intersections likely needed by 2030). All other cross-streets that fall on the one-mile mark can remain as full-access, two-way stop-controlled intersections until traffic signalization is warranted. Additionally, the existing three traffic signals between Middleton Road and Caldwell Boulevard will remain because the signalized intersections, accesses, land uses, and roadway networks are established in this segment and changes were deemed impractical. Other than this segment of Idaho 55, any deviation from the proposed signal spacing is not recommended.

Unsignalized Access (Limited-Access Approach) Spacing

Access Management Principle No. 5: "Preserve the functional area of intersections".
Access Management Manual

Unsignalized access spacing – which is composed of limited-access driveway approaches and limited-access cross-streets (both are also referred to as "limited-access approaches" for this report and are also right-in/right-out approaches) – depends on sight distances and operating speeds. AASHTO guidelines recommend that access connections should be separated by a distance not less than the functional area of intersections. The functional area extends upstream and downstream of an intersection and is the area reserved for queue storage, deceleration and maneuvering as shown in Figure A-6.

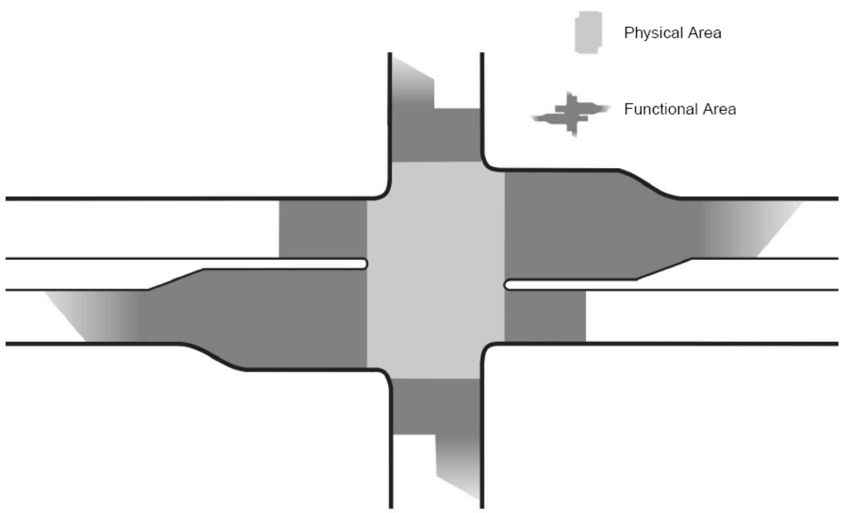


Figure A-6. Functional intersection area (Figure 8-12 from Access Management Manual)

As illustrated in Figure A-7, the upstream distance of the functional area is where motorists are responding to the intersection, decelerating, and maneuvering into the appropriate lane to stop or complete a turn (perception-reaction time distance (d_1) + distance traveled to maneuver laterally and decelerate (d_2) + queue storage (d_3)). The downstream functional area is the same, minus the queue length.

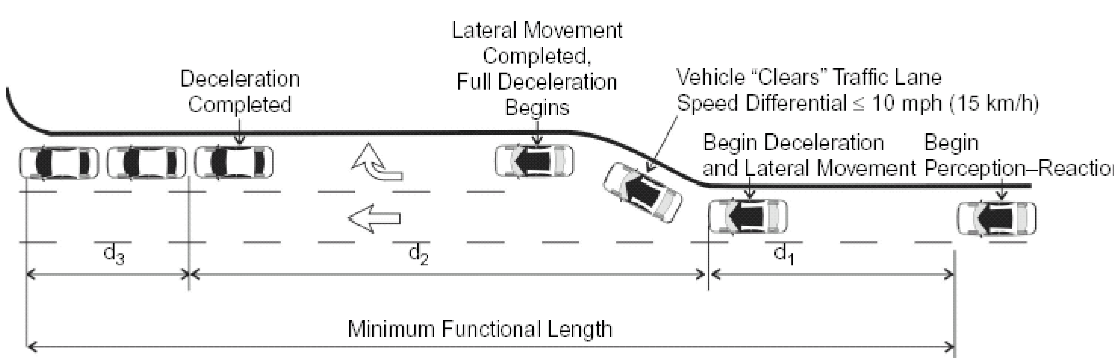


Figure A-7. Functional intersection area components (Figure 8-13 from Access Management Manual)

Table A-1 summarizes the distances for the minimum functional intersection areas on Idaho 55.

Table A-1. Minimum functional intersection areas on Idaho 55

Posted Speed	Roadway Segment	Location	Perception-Reaction Distance[1] d_1 (ft)	Lateral and Deceleration Distance[2] d_2 (ft)	Queue Storage[3] d_3 (ft)	Minimum Functional Intersection Area Total (ft)
55 mph	Rural	Upstream	220	605	300	1,125
		Downstream	220	605	n/a	825
	Urban/Suburban	Upstream	135	605	300	1,040
		Downstream	135	605	n/a	740
40 to 45 mph	Urban	Upstream	100	350	300	750
		Downstream	100	350	n/a	450

[1]Access Management Manual (drivers are more alert on urban or urban/suburban roadways versus rural roadways resulting in a smaller perception-reaction distance)
[2]Access Management Manual
[3]Assumed Value

The limited-access approach locations were determined using the functional intersection areas on Idaho 55. The minimum functional distance controls the maximum number of limited-access approaches between full-access intersections. The distances between the limited-access approaches and full-access intersections were based on both the upstream and downstream minimums. Whereas, the distances between limited-access approaches were based on the downstream minimums, which do not include queue storage length. Consistent limited-access approach spacing was determined using logical fractions of one mile (5,280 feet).

Based on the minimum distances and logical approach locations, limited-access approaches shall be located at 1/4-mile spacing for rural segments, 1/6-mile spacing for urban/suburban segments, and 1/10-mile spacing for urban segments, as summarized in Table A-2. Note that for urban/suburban segments, the upstream limited-access approach distance from a full-access intersection is 1/3-mile instead of 1/6-mile because more distance (1,760 feet) is required for the functional intersection area.

Table A-2. Limited-access approach spacing on Idaho 55

		Minimum Distance from Full-Access Intersection			
		Upstream Distance		Downstream Distance and Between Limited-Access Approaches	
Posted Speed	Roadway Segment	Feet	Mile	Feet	Mile
55 mph	Rural	1,320	1/4-mile	1,320	1/4-mile
	Urban/Suburban	1,760	1/3-mile	880	1/6-mile
40 to 45 mph	Urban	880	1/6-mile	550	1/10-mile

Median U-turn Spacing

The limited-access approach spacing controls the required median U-turn spacing. The goal in establishing the median U-turn spacing is to ensure consistent median U-turn openings that will meet driver expectations. The proposed spacing provides indirect left-turn access for all limited-access approaches and ensures that out-of-direction travel distance to a median U-turn is consistent for all limited-access approaches. Table A-3 summarizes the spacing between median U-turn openings and from a limited-access right-in/right-out approach to the nearest downstream median U-turn.

Table A-3. Median U-turn spacing on Idaho 55

Roadway Segment	Distance Between Median U-Turns		Downstream Distance from Limited-Access Approach	
	Feet	Mile	Feet	Mile
Rural	1,320	1/4-mile	660	1/8-mile
Urban/Suburban	880	1/6-mile	880	1/6-mile
Urban	n/a	n/a	n/a	n/a

AUXILIARY LANES

Auxiliary lanes are additional roadway lanes that serve as transition zones for turning or weaving traffic. Examples of auxiliary lanes include acceleration/deceleration lanes at freeway ramps and continuous or non-continuous arterial acceleration/decelerations at intersections or driveways.

Different auxiliary lane types were considered on Idaho 55 to promote safety and maximize progression of through traffic, including separate acceleration and deceleration lanes and a continuous right-turn lane. Several publications provide guidance regarding the appropriateness of these lanes as summarized below.

Acceleration and Deceleration Lanes

A Policy on Geometric Design of Highways and Streets (referred to as “Green Book”), published by AASHTO in 2004, provides the following guidance regarding acceleration and deceleration lanes on highways:

> *“**Deceleration lanes are always advantageous**, particularly on high-speed roads… **Acceleration lanes are not always desirable at stop-controlled intersections** where entering drivers can wait for an opportunity to merge without disrupting through traffic. Acceleration lanes are advantageous on roads without stop control and on all high-volume roads even with stop control where openings between vehicles in the peak-hour traffic streams are infrequent and short (pg. 689).”*

Deceleration lanes are recommended for Idaho 55 because they remove turning traffic from the through traffic. By removing turning traffic, the traffic progression is maximized and vehicle speed differentials are minimized on the main roadway. Smaller speed differentials between vehicles results in lower crash severity; therefore, deceleration lanes increase safety. Acceleration lanes are not recommended for Idaho 55 because they are not always beneficial at stop-controlled intersections and have the potential to increase merging crashes because drivers will not wait for adequate gaps in traffic. In addition, gaps in traffic from the upstream traffic signals will allow vehicles to access Idaho 55; therefore, acceleration lanes are not necessary to improve driveway operations.

Continuous Right-Turn (Combined Acceleration/Deceleration) Lanes

Continuous right-turn lanes are a consideration when multiple driveways exist along arterial roadways. Similarly to deceleration lanes, the continuous right-turn lane removes turning traffic from the through traffic to maximize vehicle progression. The lane is also used for acceleration into the travel lane, which would reduce delay at the driveways but introduces conflicts with decelerating vehicles. To reduce the potential for vehicle conflicts, the spacing between limited-access approaches needs to be long enough to accommodate the acceleration distance plus the deceleration distance.

Table A-4 summarizes the required limited-access approach spacing to accommodate a combined acceleration/deceleration lane on Idaho 55 without overlap. At 55 mph, a total distance of 1,700 feet is needed for an acceleration and deceleration lane, which would require a limited-access approach spacing greater than 1/4-mile; however, the largest recommended limited-access approach spacing is 1/4-mile.

Table A-4. Acceleration and deceleration lane length requirements

Posted Speed	Deceleration Lane Distance[1] (ft)	Acceleration Lane Distance[1] (ft)	Total Distance Required for a Continuous Right-Turn Lane (ft)
55 mph	500	1,200	1,700
40 to 45 mph	350	560	910

[1]AASHTO, level grade and 15 mph turning speed

In addition, the *Access Management Manual* states that continuous right-turn lanes should be avoided unless all of the following conditions exist:

- A non-traversable median is present with **no** median openings.
- The continuous right-turn lane is discontinuous between signalized intersections.
- The maximum length of the turn lane is 1/2 mile.
- All approaches have low volumes.

All of the above conditions cannot exist because the other access management plan elements preclude them; therefore, a continuous right-turn lane is not recommended on Idaho 55. Median openings for U-turns would conflict with the continuous right-turn lane. Traffic signals spaced at one-mile intervals would require continuous right-turn lane lengths greater than 1/2 mile, which is undesirable. In addition, the continuous right-turn lane may be used for site circulation between driveways, which would discourage use of parallel collector roadways and increase unnecessary conflicts on Idaho 55.

PARALLEL COLLECTOR ROADWAYS

Where feasible, parallel collector roadways should be considered as redevelopment occurs along the east-west portion of Idaho 55 from Hoskins Road/Beet Road to Middleton Road. A parallel collector system will reduce traffic demands at limited-access approaches and at full-access intersections, which will improve operations on Idaho 55 and the overall efficiency of the transportation system.

Parallel collector roadways spaced 1/8-mile to 1/2-mile from Idaho 55 are desirable. Intersections of the parallel collector roadways with the cross-streets shall be located to maintain the minimum functional intersection area from the Idaho 55 intersection, which will vary with the cross-street speed limit and expected queues.

Parallel collector roadways are similar to frontage roads except parallel collector roadways are offset from the main roadway a greater distance. Therefore, frontage roads are not recommended because of the inefficient use of roadway frontage where only one half of the collector roadway is utilized for access. Rather, a parallel collector roadway is desired where both sides of the roadway are utilized.

TYPICAL ONE MILE ROADWAY SEGMENTS

Figure A-8 shows the typical one-mile roadway segments for the minimum recommended access spacing on rural and urban/suburban strategic arterials. These segments combine signalized and unsignalized access spacing elements and median U-turns.

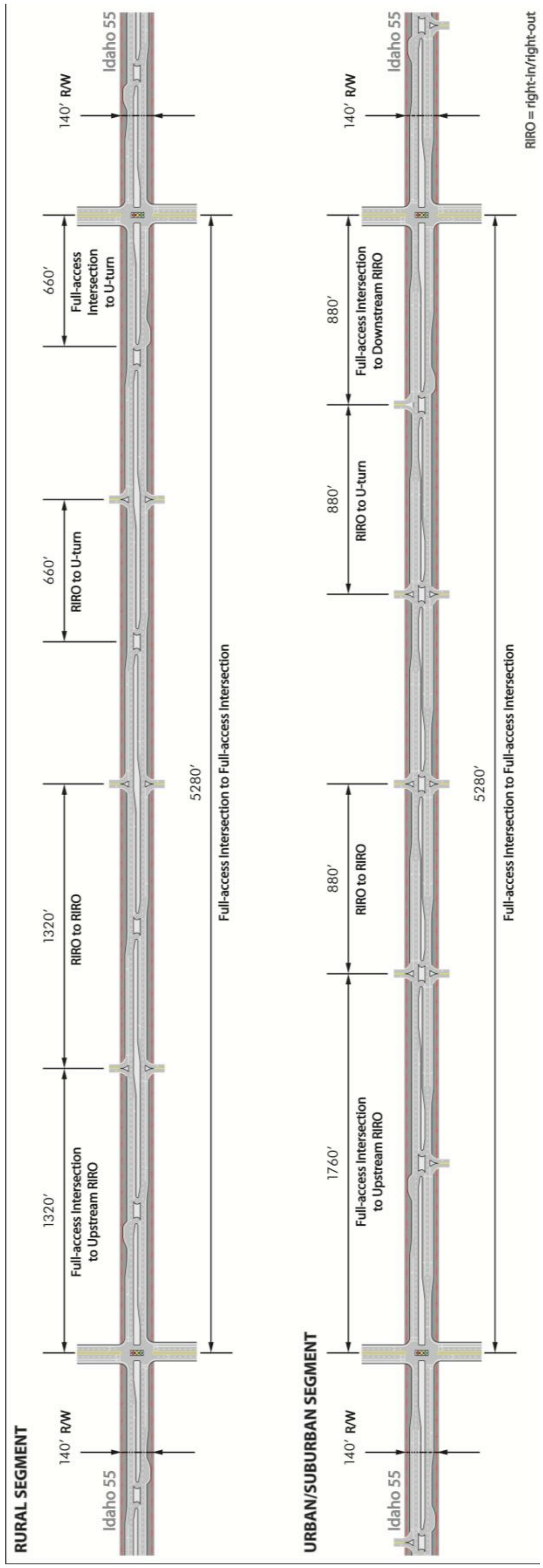


Figure A-8. Typical one-mile segments – minimum recommended access spacings on rural and urban/suburban segments

INTERSECTION ALTERNATIVES

Two intersection options were evaluated for the full-access intersections. The two options consist of the conventional intersection and median U-turn intersection. A median U-turn intersection is considered a non-conventional, high-capacity, high-efficiency intersection treatment. Both options complement the access management plan and can be interchanged without impacts to the proposed right of way on Idaho 55 or cross-streets. Additionally, these intersection options are considered "corridor-wide" treatments, where all full-access intersections would have one option – as opposed to intermixing different options at each individual intersection – to ensure a homogenous corridor that meets driver expectations. To provide the most benefit to a corridor, median U-turn intersections should be used as a corridor-wide treatment.

The two options were the primary options investigated for this study because of their interchangeability and similar right-of-way impacts. Additional non-conventional intersection options such as a continuous flow intersection or quadrant intersection were not carried forward because most are not considered corridor-wide treatments; rather, they are generally isolated intersection treatments and have relatively larger right-of-way impacts. Finally, grade-separated intersections were not considered because the traffic demands do not warrant them and they do not complement the future corridor vision.

OPTION 1 – CONVENTIONAL INTERSECTION

The conventional intersection option, shown in Figure A-9, is currently located at most signalized intersections in the Treasure Valley. The intersection option can be used at unsignalized and signalized full-access intersections. Depending on the cross-street traffic demand and turning movements, the capacity of a conventional intersection with traffic signal control is approximately 41,000 to 52,000 vehicles per day with two travel lanes on Idaho 55.

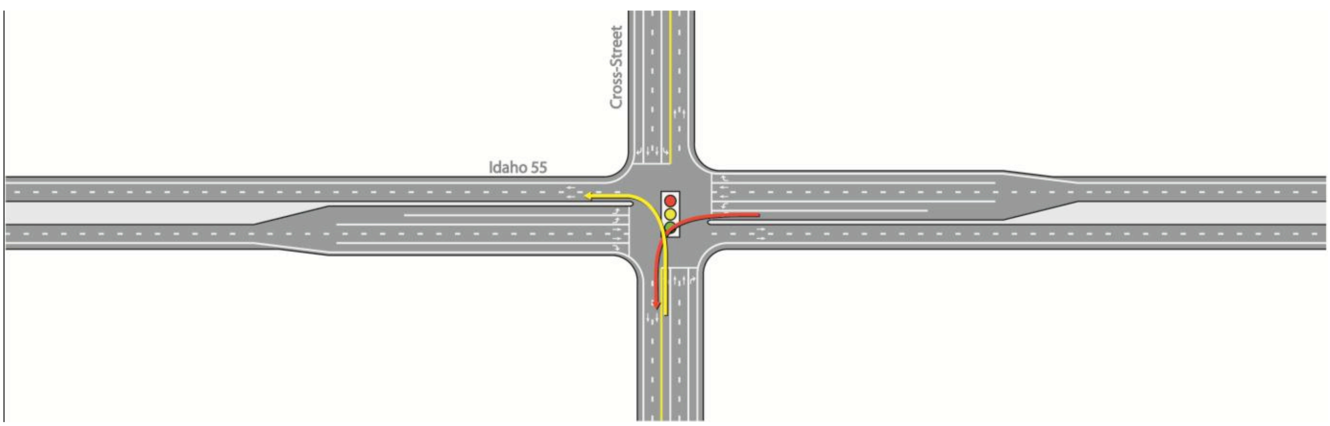


Figure A-9. Option 1 – conventional intersection

OPTION 2 – MEDIAN U-TURN INTERSECTION

> Access Management Principle No. 6:
> "Limit the number of conflict points".
> *Access Management Manual*

The Median U-turn (MUT) option, shown in Figure A-10, is a concept that removes some or all of the left-turn movements at the intersection. Indirect left turns are accomplished by making U-turns at downstream median openings on Idaho 55. This concept can be used for both unsignalized and signalized intersections; however, for this plan, this concept is recommended to be implemented only when signalized control is needed. By removing direct left turns at the signalized intersection, traffic at the intersection experiences less delay, through traffic progresses more quickly, and vehicle conflicts are reduced which improves safety. Depending on the cross-street traffic demand and turning movements, the capacity of a MUT intersection with traffic signal control is approximately 53,000 to 60,000 vehicles per day with two travel lanes on Idaho 55.

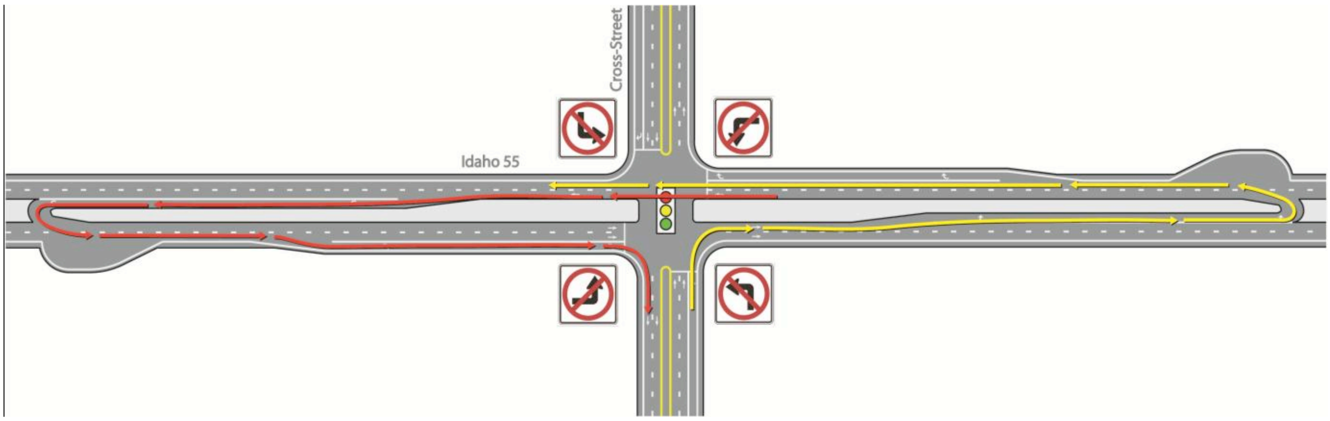


Figure A-10. Option 2 – median U-turn (MUT) intersection

The MUT intersection concept was proposed because of its many benefits and because it perpetuates the indirect left-turn concept that is identified for limited-access approach access in the access management plan. When implemented along two miles or more, Idaho 55 is expected to produce consistent driver expectations and greater operating efficiency.

Directional median openings are located downstream from the main intersections approximately 660 feet (1/8-mile) for the urban/suburban roadway section and approximately 880 feet (1/6-mile) for the rural section. Both scenarios have the potential to provide vehicle storage for approximately 20 to 30 passenger cars. Similarly to the midblock median U-turn openings, all MUT intersections include deceleration lanes for all U-turn movements. The MUT intersection U-turns are also spaced consistently with the midblock median U-turn openings. If left-turn traffic volumes or traffic volumes on Idaho 55 increase to levels which result in unacceptable delays or vehicle queuing, a traffic signal can be installed to improve operations at the median U-turn. The median U-turn traffic signal would be coordinated with the traffic signal at the full-access intersection to minimize stops to travelers on Idaho 55.

As detailed in the U-turns, Design Vehicle and Roadway Median Width section of the Appendix A starting on page A-4, large vehicles – including interstate semi-trucks (WB-62), buses, agricultural vehicles, and recreational vehicles – are accommodated by a MUT intersection with “loons” at the median U-turn openings. Loons will be accommodated within the 140-foot right of way.

MUT Intersection Locations and Performance

A detailed traffic analysis of forecasted 2030 PM peak-hour traffic was conducted on Idaho 55 (refer to Appendix B for details). Based on the analysis, MUTs are recommended at all one-mile full-access intersections from Marsing Road to Midway Road. MUTs are not recommended at Middleton Road or Caldwell Boulevard because the high left-turn movements and high through movements on Idaho 55 result in less efficient operations than a conventional intersection. In addition, the existing median width and proximity to the Karcher Interchange prohibit a MUT intersection at Caldwell Boulevard.

At the two locations where intersections are located on horizontal curves – Marsing Road and Hoskins Road – traffic signal control is proposed at the median U-turn openings instead of the main intersection. These are both three-leg T-intersections and traffic signal control would not be effective at the main intersection because only the cross-street right-turn traffic would be served by the traffic signal. Left-turn movements from Idaho 55 and from the cross-streets are the primary intersection movements; therefore, they require signalized control when warranted. The median U-turn opening will be approximately located at the beginning of the horizontal curve; as a result, sight distance and safety will be maximized.

All Idaho 55 intersections identified for MUT intersections will operate with a LOS D or better, which is a full grade improvement when compared to the conventional intersection operations.

Where are Examples of MUT Intersections?

Median U-turn intersections have been a common intersection and corridor treatment in Michigan since the 1960s. They have become part of standard design practice in Michigan in urban areas as well as on rural, high-speed highways. They are generally applied on roadways with median separation. More than 425 miles of MUT corridors currently exist in Michigan. Since their introduction, many other states have implemented the MUT intersection concept including Maryland, Missouri, Florida, New Jersey and Louisiana.

More recently, a MUT corridor treatment is in the process of design on Grant Road in Tucson, Arizona. The project includes approximately five miles of urban roadway in a highly developed area. Partial MUTs, with indirect left turns on the major street and direct left turns on the minor street, will be installed at seven full-access intersections. The project also includes access management elements such as non-traversable medians, turn lanes and driveway consolidation.

In 2008, the Maricopa Department of Transportation in Arizona developed standard design guidelines for a MUT corridor they have termed the “Arizona Parkway”. After an extensive study, they identified a need for a new type of facility to handle traffic demands and developed guidelines for implementation of the MUT facility in the future. The guidelines include cross-sectional elements, access management guidelines and median opening geometrics.

INTERSECTION OPTIONS COMPARISON

The most comprehensive compilation of MUT intersection data is contained in *Synthesis of Median U-turn Intersection Treatment, Safety, and Operational Benefits,* published by the Federal Highway Administration. Historical and current research with a variety of study criteria were compiled to compare the advantages and disadvantages of MUT intersections to conventional signalized intersections with left turns permitted on all approaches. Primarily safety and operation criteria were evaluated with the following results favoring MUTs:

- Faster travel time and better progression of traffic on the major street
- Less overall delay at intersections
- Fewer crashes and injuries
- Fewer and more separated vehicle conflicts
- Increased fuel efficiency

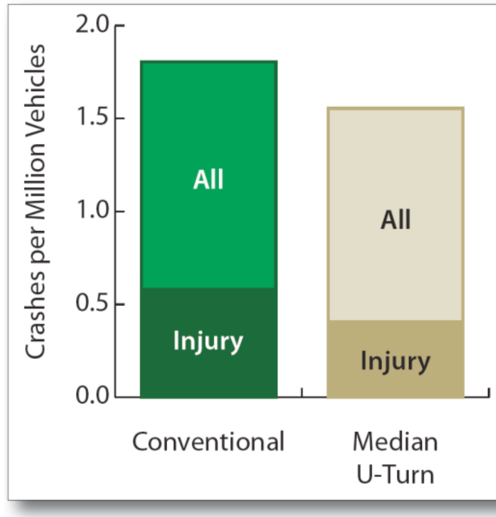


Figure A-11. Mean crash rate comparison

The following pages briefly highlight the key safety and operational differences between conventional intersections and MUT intersections (or indirect left turns). The data is based on research results or estimates from Idaho 55 traffic.

Safety

Figure A-11 shows that MUT intersections have been shown to reduce crashes by 16 percent and total injuries by 30 percent compared to conventional intersections.

Figure A-12 shows that vehicle conflicts at MUT intersections are reduced from 32 to 16 which reduces the potential for accidents. In addition, much of the vehicle conflict reductions are crossing vehicle conflicts, which tend to cause more severe accidents and injuries.

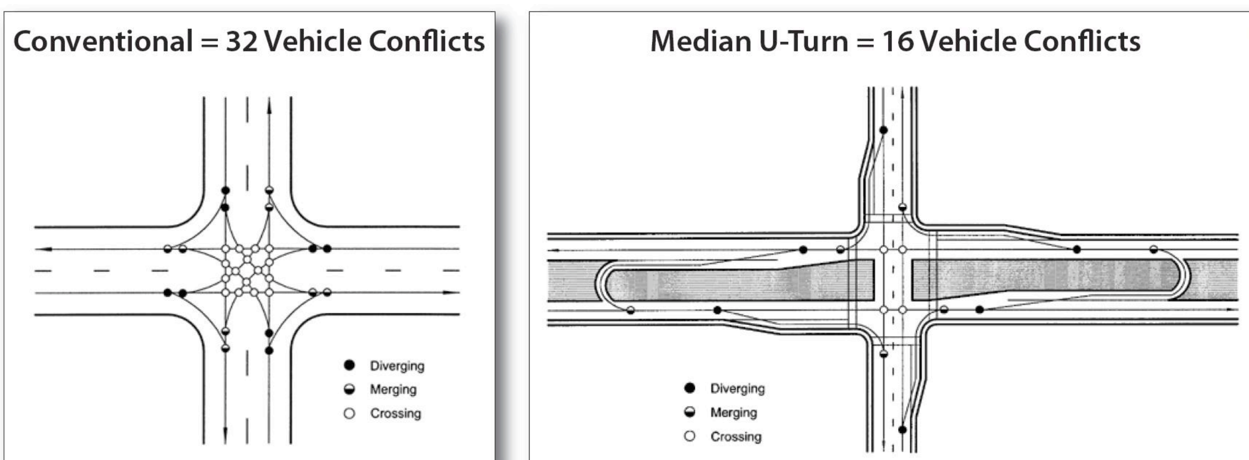


Figure A-12. Vehicle conflict comparison – conventional intersection versus median U-turn intersection

Mobility

For a signalized corridor, larger amounts of green time given to the main street movements will increase mobility and reduce travel time for the through traffic. Analysis of forecasted 2030 traffic volumes on

Idaho 55 at signalized intersections determined the percentages of green time allocated to left-turn movements and through movements for conventional intersections and MUT intersections, as shown in Figure A-13. The green time for through traffic at a MUT intersection is increased from 48 percent to 65 percent, which increases vehicle progression on Idaho 55.

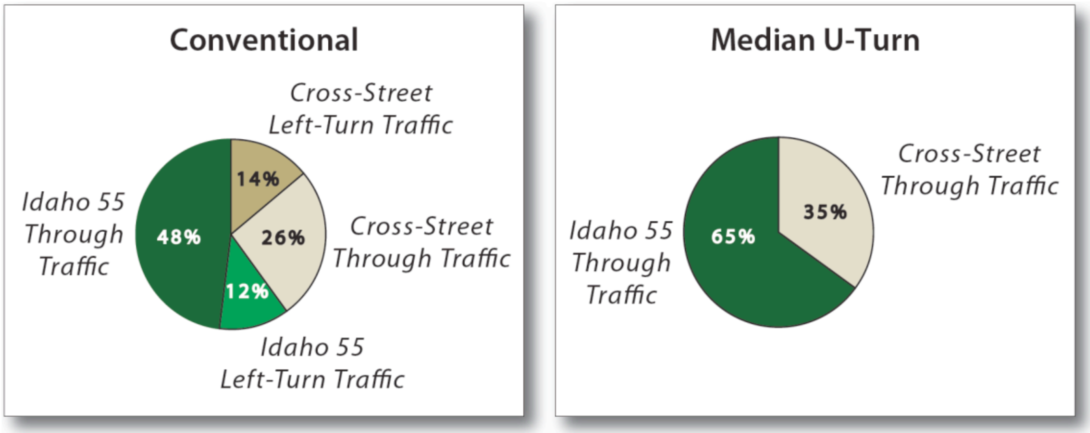


Figure A-13. Percentage of traffic signal green time comparison

Capacity

Capacity is generally increased by 20 to 50 percent with a MUT intersection. Greater capacity means that the facility will sustain increasing traffic volumes further into the future. Additionally, the traffic analysis results from the "Arizona Parkway" study showed that a 4-lane parkway with indirect left turns has a greater capacity than a 6-lane parkway with direct left turns. If fewer travel lanes are needed, the right-of-way impacts are also reduced.

Analysis of forecasted 2030 traffic volumes on Idaho 55 at signalized intersections showed that MUT intersections can accommodate 3,500 to 10,000 more vehicles per day, depending on cross-street traffic demands, as shown in Figure A-14.

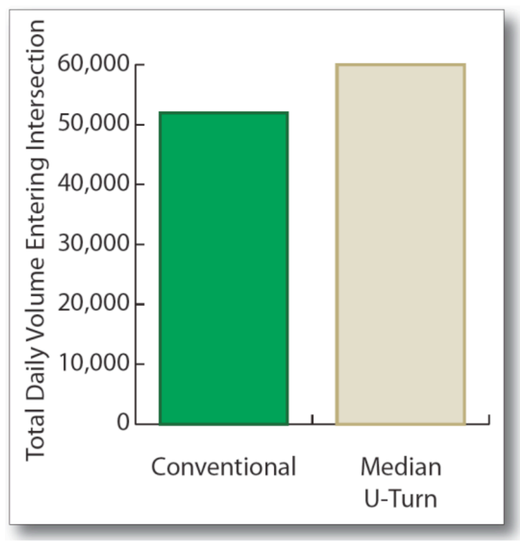


Figure A-14. Total daily volume entering intersection comparison

Efficiency

Analysis of forecasted 2030 traffic volumes on Idaho 55 at signalized intersections showed that MUT intersections reduce wait time at traffic signals by up to 50 percent and improve the level of service (LOS) at the intersection by a full grade, as shown in Figure A-15. The LOS is a measure of the operations of an intersection, where LOS A represents ideal conditions with little delay and LOS F represents failing and unstable conditions with excessive delay.

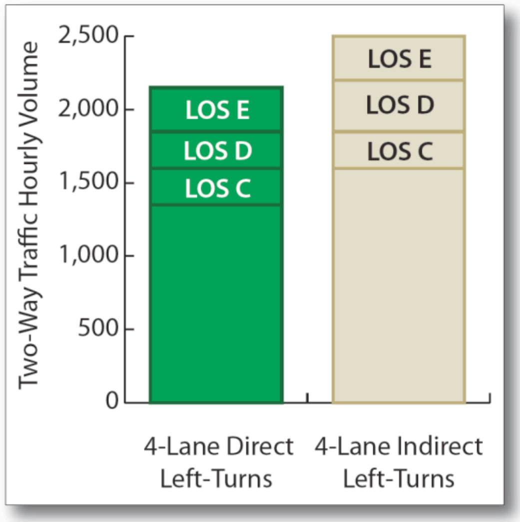


Figure A-15. Level of service comparison for divided highways

PHASING OF INTERSECTION OPTIONS

Transitioning the existing two-way stop-controlled intersections to signalized intersections – with the conventional or MUT intersection option – could be accomplished over several phases as shown in Appendix A1. Modifications would likely take place during development or when capacity improvements are need. The Appendix figure illustrates an example of how these phases could be tied to traffic volume capacity thresholds. A typical intersection in Idaho 55 was used to establish the thresholds. Actual thresholds will vary depending on future traffic demands.

PUBLIC INVOLVEMENT

Two Public Involvement Meetings (PIMs) were conducted in Canyon County over the course of the project. Members of ITD and the participating local agencies presented information in an open house format where the public was invited to review the material, ask questions and provide written comments. A consulting firm, RBCI, conducted public involvement for the project.

The following includes a general summary of the PIMs:

- First PIM, October 15, 2008
  - Topic: Existing Conditions and Needed Improvements
    - 51 people attended the meeting
    - 27 returned comment forms
- Second PIM, September 16, 2009
  - Topic: Draft 2030 Access Management Plan
    - 111 people attended the meeting
    - 43 returned comment forms

FIRST PIM RESULTS

The first PIM presented the results of the data collection – traffic volumes, crash history, and forecasted traffic on the corridor – and gathered the public questions, concerns and ideas for Idaho 55. As highlighted in the abbreviated summary prepared by RBCI, the public's main concerns were:

- Widen the highway to four or five lanes
- Widen the highway for turn lanes
- Implement traffic signals

SECOND PIM RESULTS

The second PIM presented the draft 2030 access management plan for public comment. Supporting exhibits were also presented that detailed the proposed intersection options and the goals and benefits of the proposed plan. The public was asked specifically if they generally supported the access management plan and which intersection option they preferred. As highlighted in the abbreviated summary prepared by RBCI, the public responses were:

- *"Do you generally support the access management plan proposal?"*
  - 21 – Yes
  - 6 – No
- *"Which intersection option do you prefer?"*
  - 13 – Conventional Intersection
  - 13 – Median U-turn Intersection

APPENDIX A1 - INTERSECTION PHASING

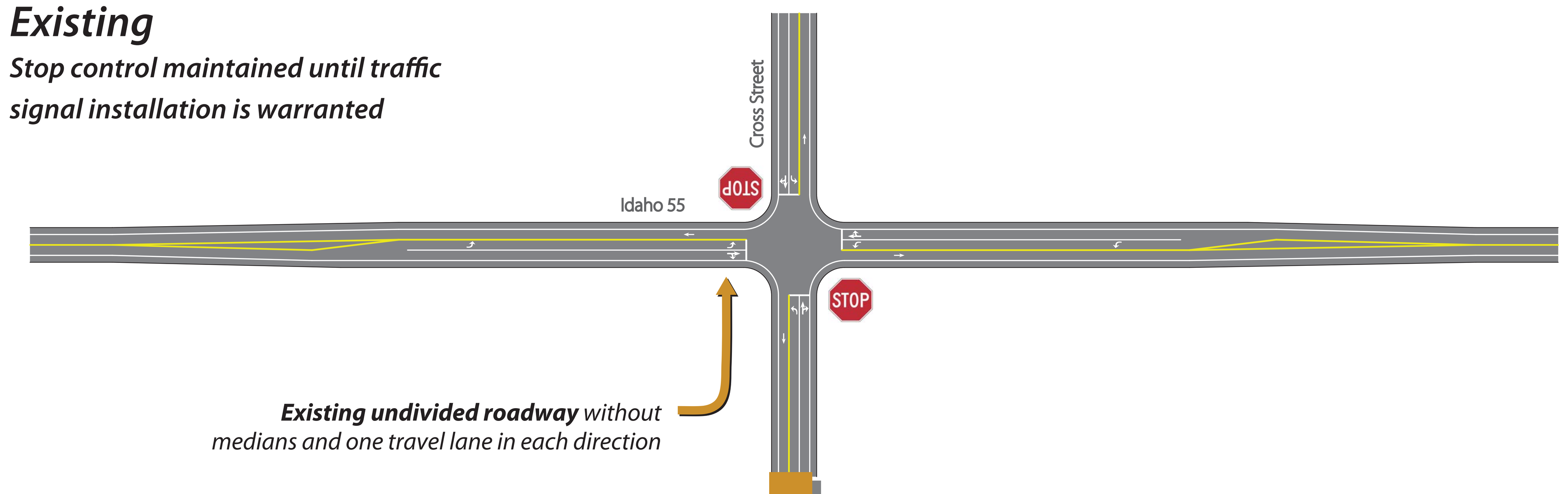
INTERSECTION PHASING

Transition From Existing to Ultimate Full Access Intersection

INTERSECTION OPTION 1 CONVENTIONAL INTERSECTION

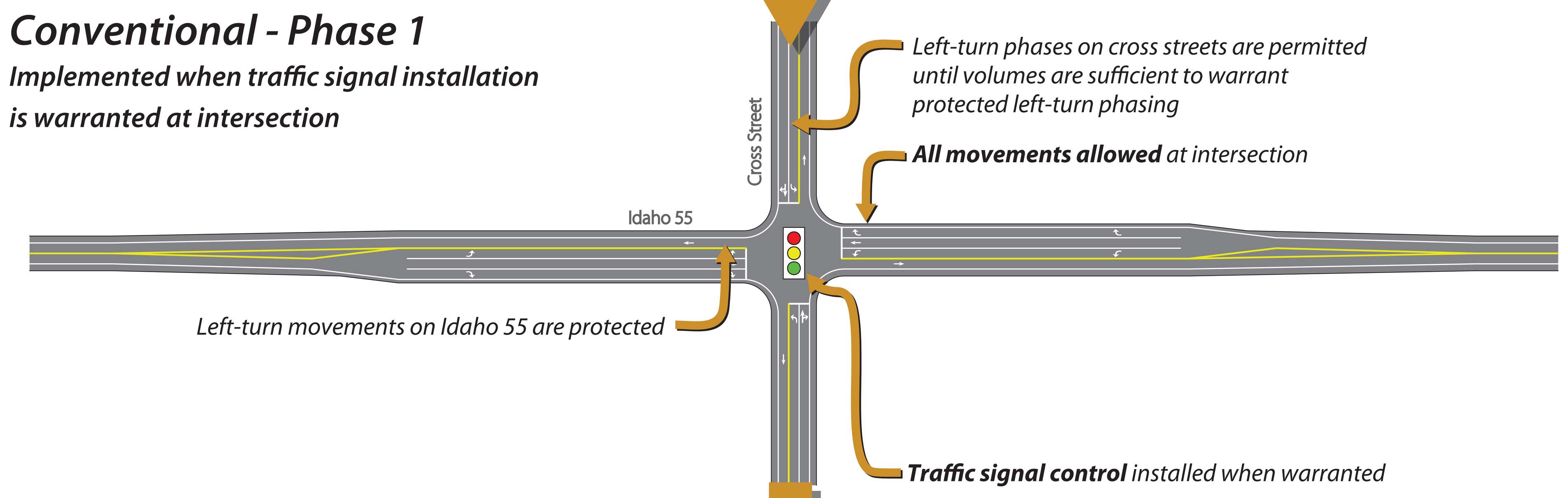
Existing

Stop control maintained until traffic signal installation is warranted



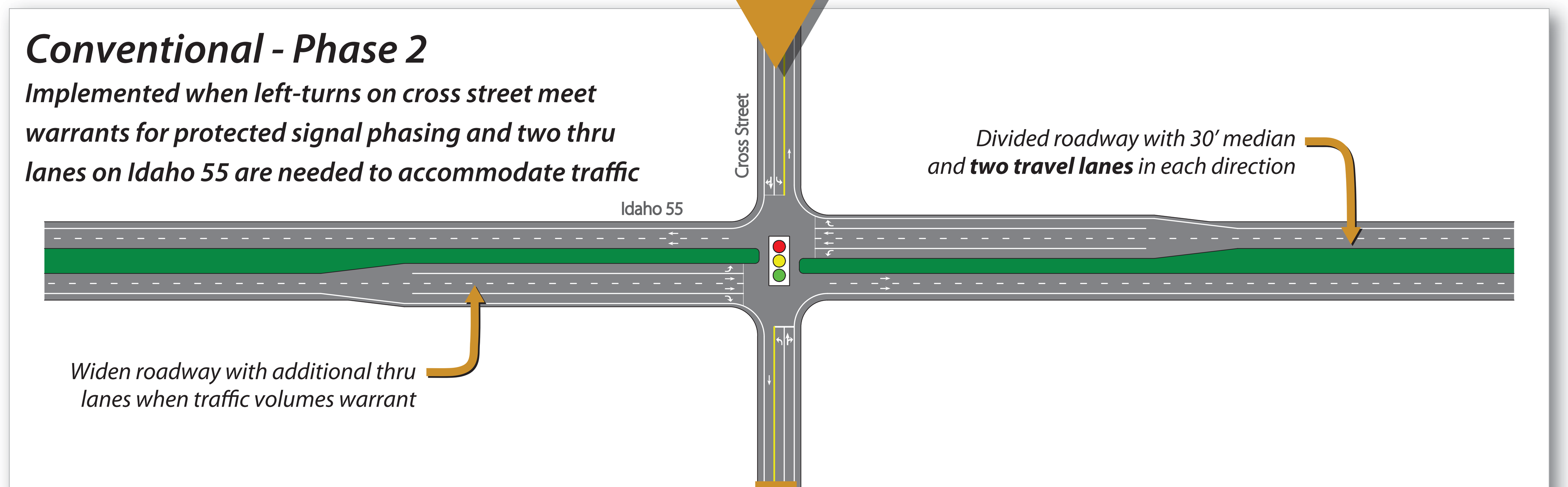
Conventional - Phase 1

Implemented when traffic signal installation is warranted at intersection



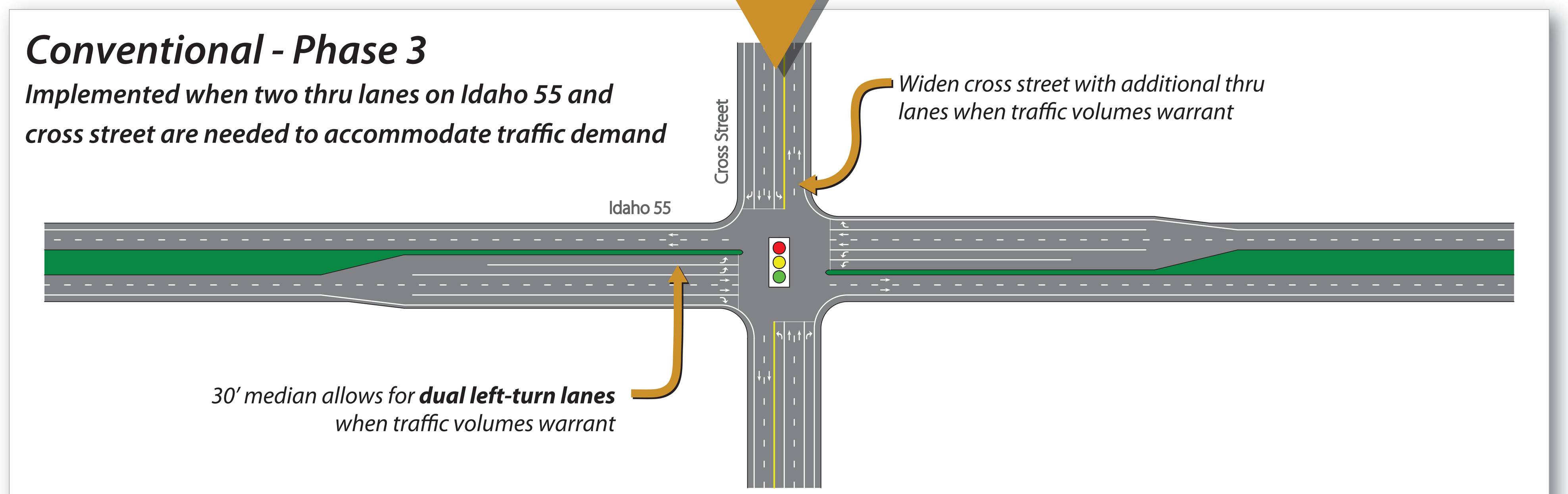
Conventional - Phase 2

Implemented when left-turns on cross street meet warrants for protected signal phasing and two thru lanes on Idaho 55 are needed to accommodate traffic



Conventional - Phase 3

Implemented when two thru lanes on Idaho 55 and cross street are needed to accommodate traffic demand



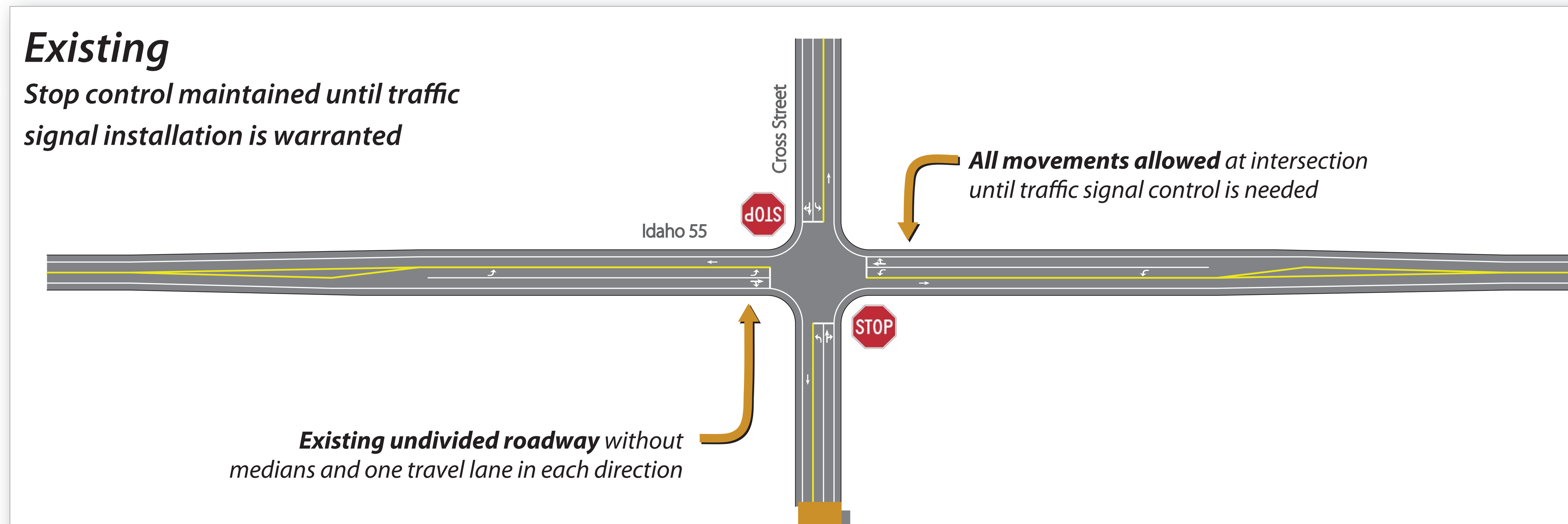
TYPICAL DAILY MAXIMUM CAPACITY*

	Conventional	*Median U-Turn*
Existing		
IDAHO 55	**11,700**	**11,700**
CROSS STREET	**4,700**	**4,700**
Phase 1		
IDAHO 55	**17,800**	**19,500**
CROSS STREET	**11,000**	**11,000**
	(Level of Service = E)	(Level of Service = D)
Phase 2		
IDAHO 55	**29,500**	**38,000**
CROSS STREET	**11,800**	**15,200**
	(Level of Service = E)	(Level of Service = D)
Phase 3		
IDAHO 55	**37,000**	**43,000**
CROSS STREET	**15,000**	**17,000**
	(Level of Service = E)	(Level of Service = D)

INTERSECTION OPTION 2 MEDIAN U-TURN INTERSECTION

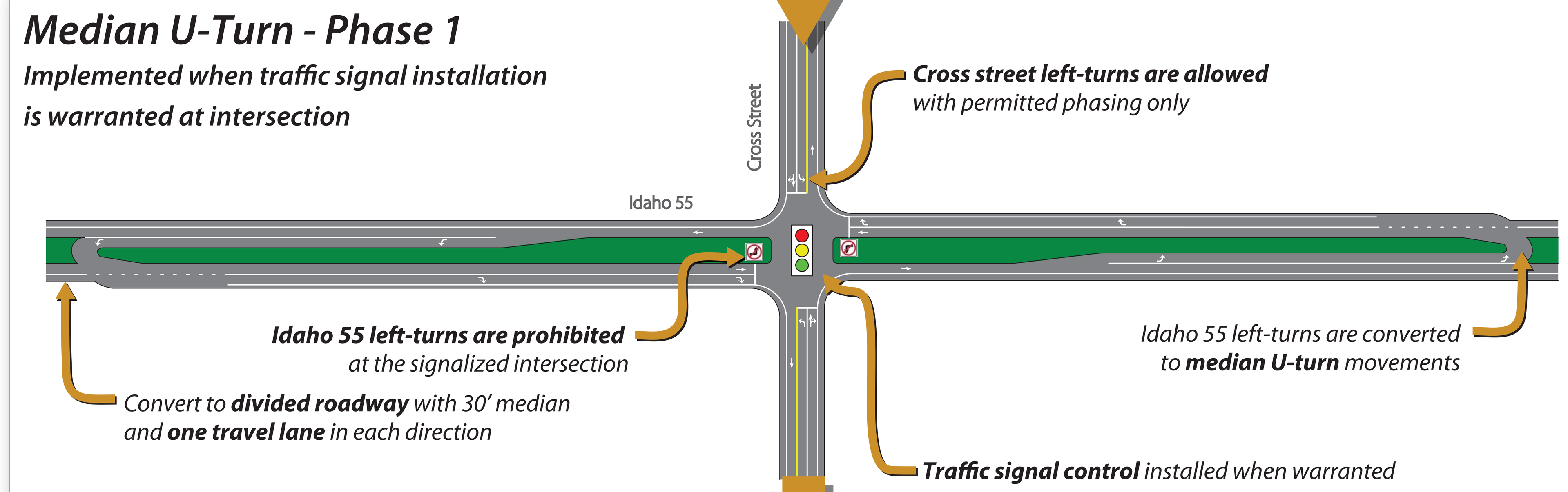
Existing

Stop control maintained until traffic signal installation is warranted



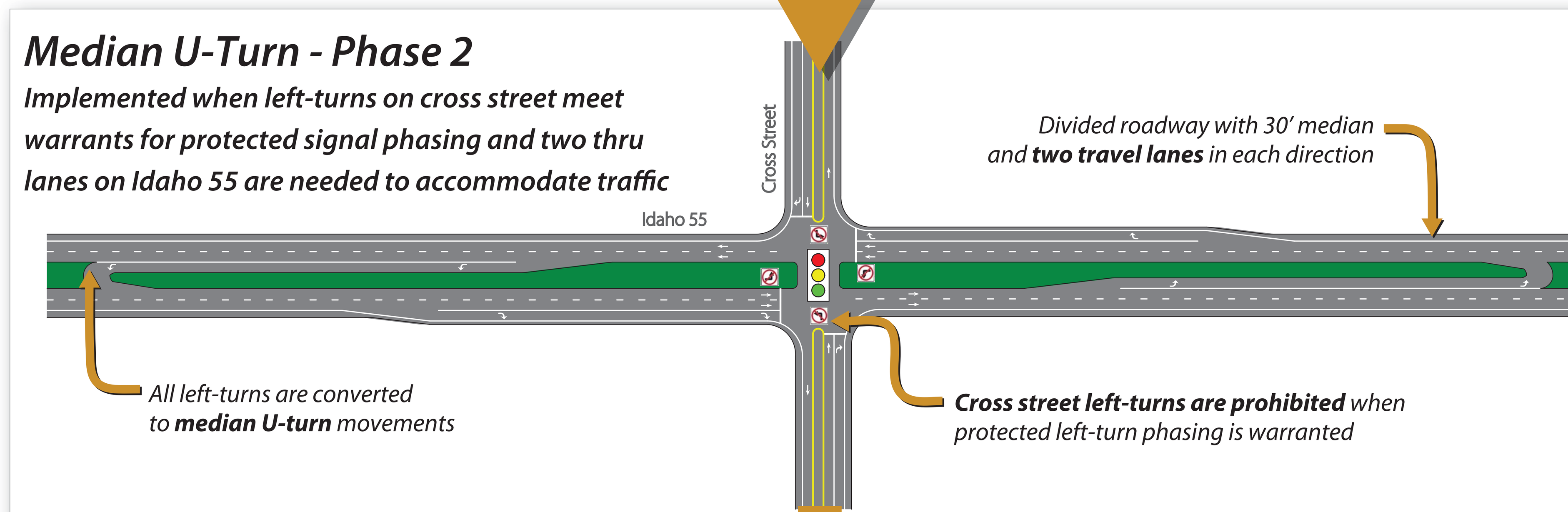
Median U-Turn - Phase 1

Implemented when traffic signal installation is warranted at intersection



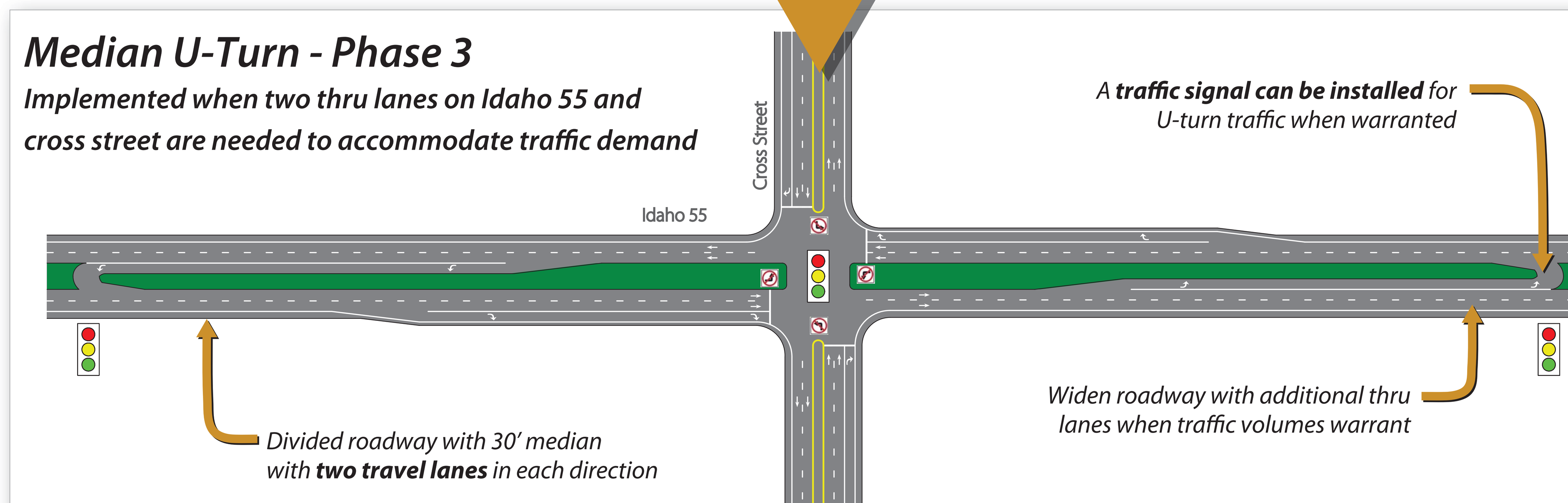
Median U-Turn - Phase 2

Implemented when left-turns on cross street meet warrants for protected signal phasing and two thru lanes on Idaho 55 are needed to accommodate traffic



Median U-Turn - Phase 3

Implemented when two thru lanes on Idaho 55 and cross street are needed to accommodate traffic demand



*Based on volume-to-capacity ratio greater than 0.99. Estimated volumes and lane configurations from Farmway Road/Idaho 55 intersection. Other intersections on Idaho 55 will have varying results due to traffic trends.

APPENDIX B
TRAFFIC ANALYSIS

IDAHO 55, MARSING TO NAMPA, ACCESS MANAGEMENT PLAN
PROJECT NO. A009(967), KEY NO. 09967

Prepared for:

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ITD District 3

With Cooperation from:

Canyon County

Canyon Highway District No. 4

City of Caldwell

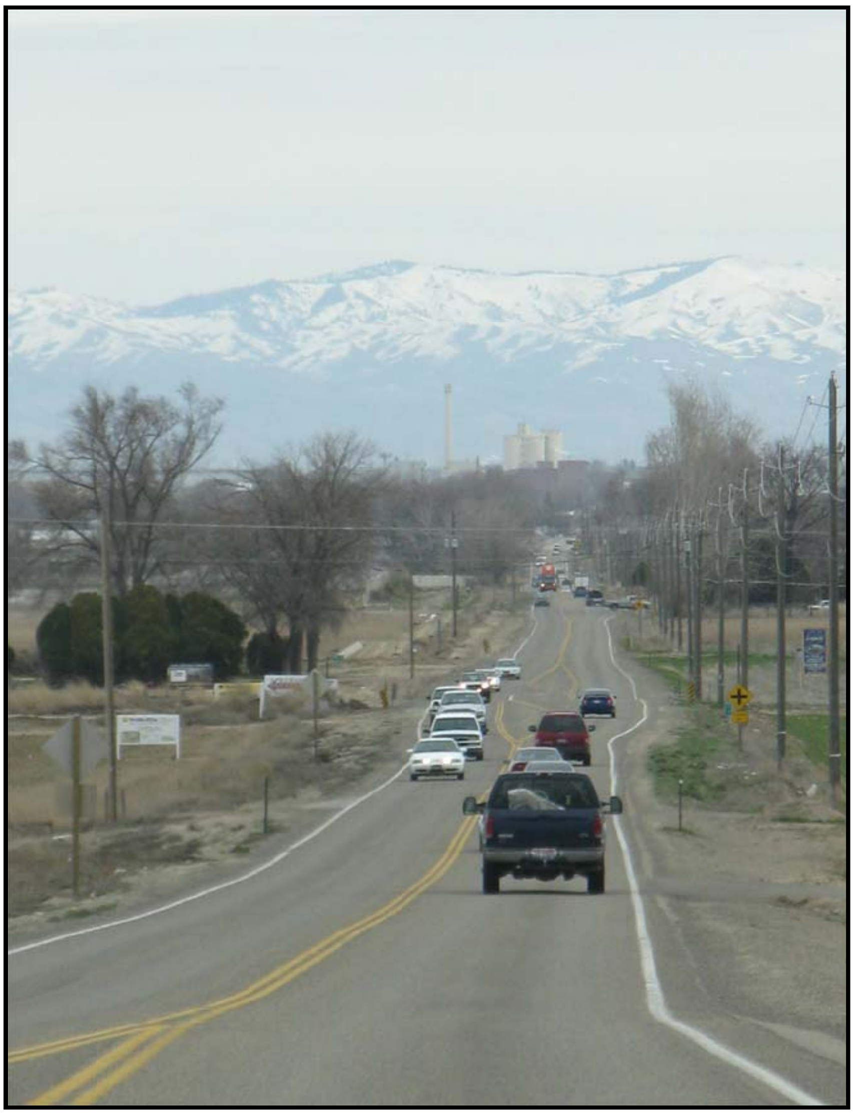
City of Nampa

COMPASS

Prepared by:

Six Mile Engineering, P.A.

April 2011



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INTRODUCTION

This document summarizes the traffic analysis task which is included in the overall project development effort for the 2030 Access Management Plan. This traffic analysis analyzed existing and forecasted traffic conditions. It was completed prior to the access management plan development and does not evaluate the recommended access management plan components, except for median U-turn intersections. Therefore, the future lane configurations shown are the improvements needed to accommodate the forecasted traffic and may differ from the final 2030 Access Management Plan recommendations.

TRAFFIC ANALYSIS APPROACH

This traffic analysis evaluates the existing traffic, future year 2015, and future year 2030 traffic to recommend roadway cross-section elements, determine intersection lane configurations, and identify areas of concern for access and land use. The existing peak-hour traffic, future year 2015 traffic and future year 2030 traffic were analyzed at nine study area intersections along Idaho 55 to determine the lane configurations required to accommodate traffic demand. The nine study area intersections include the following eight intersections, shown in Figure B-1, as well as a “typical low-volume” intersection:

- Caldwell Boulevard
- Middleton Road
- Midway Road
- Florida Avenue
- 10th Avenue
- Farmway Road
- Hoskins Road/Beet Road
- Marsing Road

The number of travel lanes on the cross-streets were developed with input from the local agencies participating in the access management study and the COMPASS functional classifications. Peak-hour turning movement counts were not collected at every study area intersection. The lane configurations for the 10th Avenue, Farmway Road and a “typical low-volume” intersection were applied to the other cross-streets with similar classifications instead of developing lane configurations for all key intersections on the corridor.

STUDY AREA

As shown in Figure B-1, the study area on Idaho 55 extends from the Snake River Bridge east of Marsing to the Karcher Road Interchange at I-84. Within the study area, Idaho 55 is predominantly a two-lane rural roadway with short sections of five-lane and three-lane roadway widths. Refer to the Access Management Plan Report for a detailed description of the existing roadway.

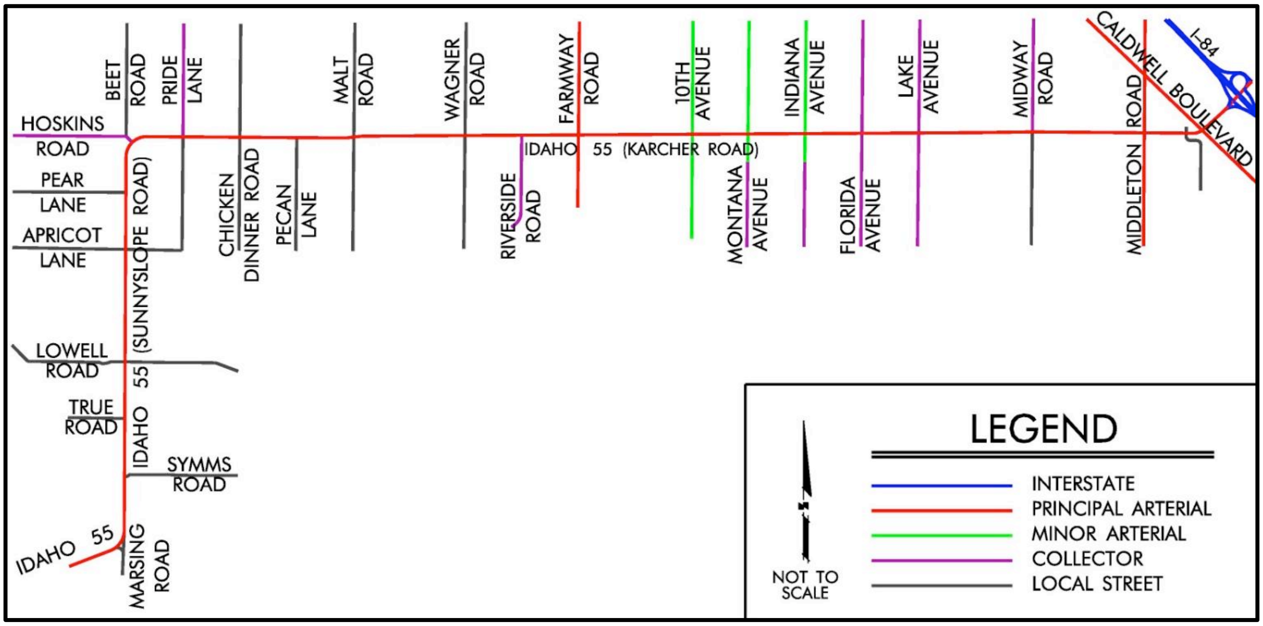


Figure B-1. Study area

EXISTING TRAFFIC

The existing peak-hour turning movement traffic counts were collected in 2008. Figure B-2 and Figure B-3 summarize the existing AM and PM peak-hour traffic and current lane configurations at the intersections. The directional average daily traffic (ADT) counts were taken in 2006 and 2008. The existing ADT counts are summarized in the Forecasted Design Year Traffic section of the report starting on page B-5.

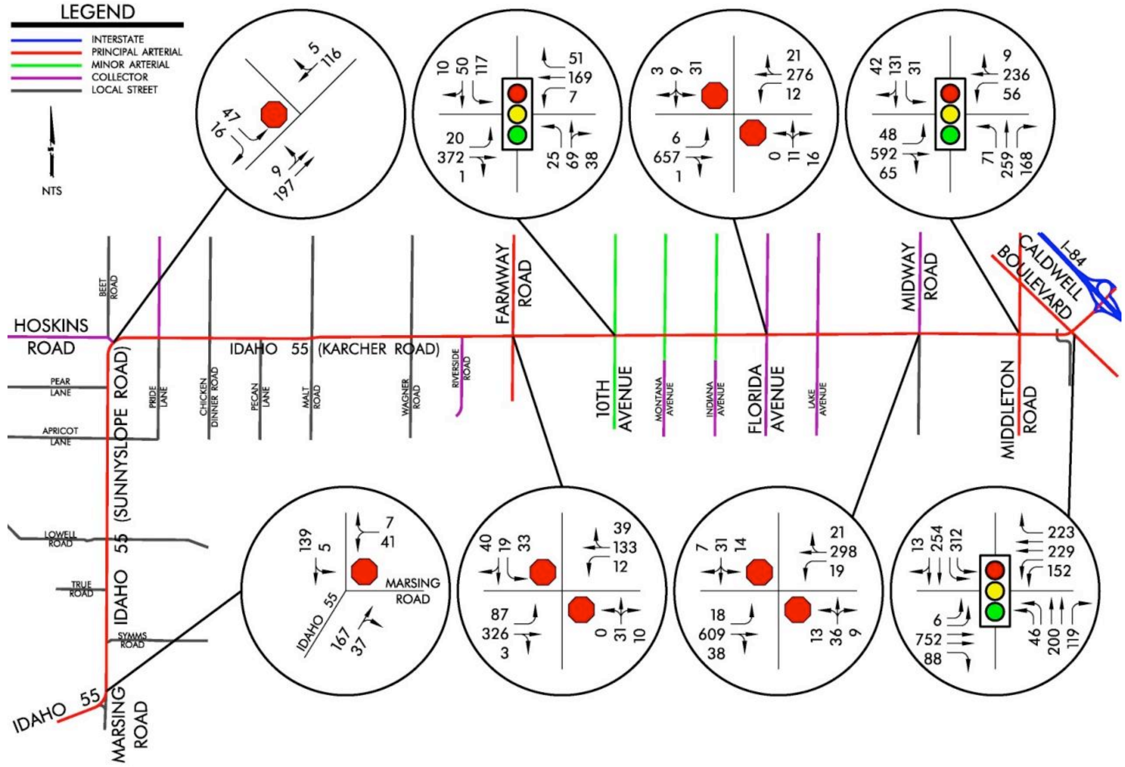


Figure B-2. Existing AM peak-hour traffic and current lane configurations

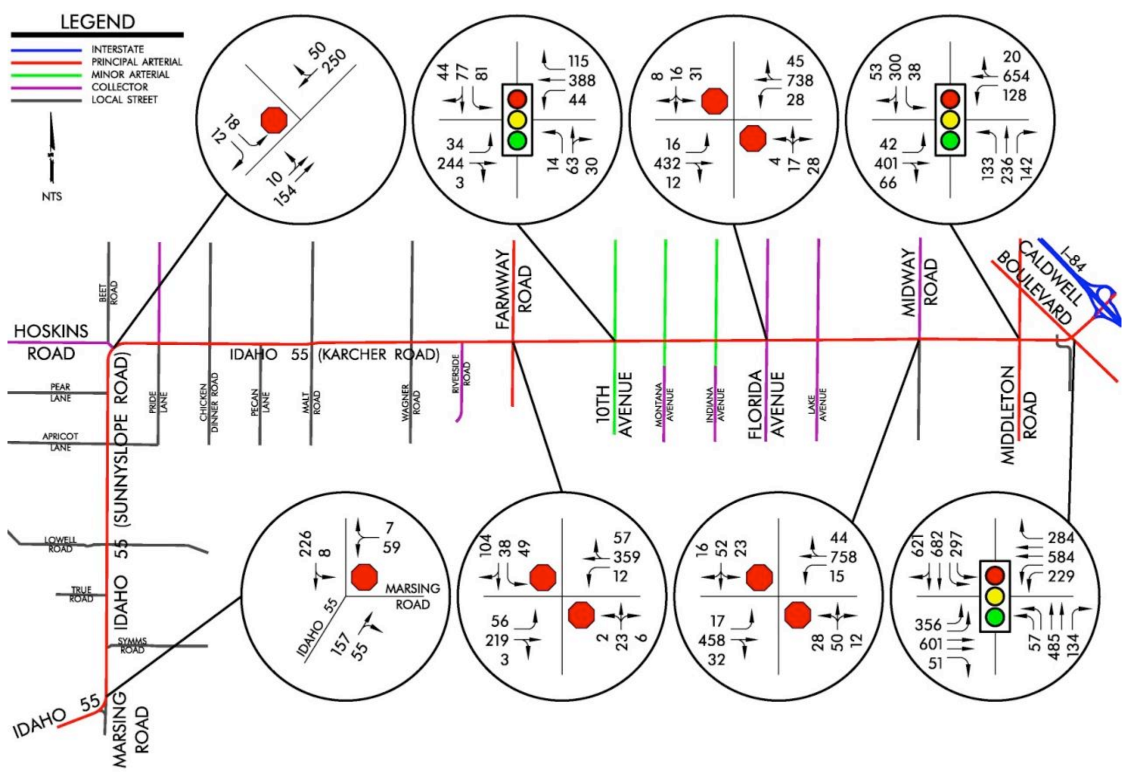


Figure B-3. Existing PM peak-hour traffic and current lane configurations

EXISTING TRAFFIC ANALYSIS

The existing traffic operations for the three signalized and five unsignalized intersections were analyzed to determine the existing intersection performance.

The existing traffic operations at the three signalized intersections were analyzed with Synchro 7, which follows the *2000 Highway Capacity Manual* methodology for signalized intersections. Measures of effectiveness included average control delay, intersection level of service (LOS) and intersection volume-to-capacity (v/c) ratio. The intersections were analyzed with optimized signal timings using assumed cycle lengths of 90 seconds.

The five unsignalized intersections were analyzed using Highway Capacity Software, which follows the *2000 Highway Capacity Manual* methodology for unsignalized intersections. Measures of effectiveness for unsignalized intersections include average control delay and intersection LOS.

The signalized and unsignalized intersection capacity analysis results for the existing peak-hour traffic conditions are presented in Table B-1.

Table B-1. Existing AM and PM peak-hour intersection capacity analysis results

Intersection		Control Type	AM			PM		
			LOS	Delay (seconds)	v/c Ratio[1]	LOS	Delay (seconds)	v/c Ratio[1]
Caldwell Boulevard		signal	C	27	0.55	C	35	0.84
Middleton Road		signal	C	33	0.73	D	49	0.95
Midway Road	northbound	two-way stop	D	30	n/a	F	>2.5 min	n/a
	southbound		D	31	n/a	F	>2.5 min	n/a
Florida Avenue	northbound	two-way stop	C	20	n/a	D	29	n/a
	southbound		E	36	n/a	F	105	n/a
10th Avenue		signal	C	28	0.46	C	30	0.57
Farmway Road	northbound	two-way stop	C	18	n/a	C	21	n/a
	southbound		C	17	n/a	C	20	n/a
Hoskins Road	southbound	two-way stop	B	11	n/a	B	12	n/a
Marsing Road	southbound	two-way stop	B	11	n/a	B	12	n/a

[1]v/c ratio does not apply at two-way stop-controlled intersections

All signalized and unsignalized study area intersections operate with a LOS D or better during the AM and PM peak hours except for Midway Road and Florida Avenue, which are both two-way stop controlled. These two intersections experience a LOS of F in the PM peak hour for one or both directions, and the Florida Avenue southbound approach experiences a LOS of E in the AM peak hour. The high volume of traffic on Idaho 55 creates insufficient gaps for the relatively low volume cross-street traffic, causing excessive delay for the northbound and southbound approaches during the peak periods. The Middleton Road intersection is nearing capacity, and long eastbound and westbound queues were observed during peak periods.

FORECASTED TRAFFIC

This section summarizes the travel demand forecasts for the design year, planned roadway improvements incorporated in the COMPASS travel demand model, the results of the model review, the modifications made to the model and the conclusions made from the final model results.

As determined in the scoping phase of the project, the design year is 2030. Forecast year 2015 was also evaluated to determine intermediate traffic impacts in the study area.

The COMPASS Community Choices demographics model was used for the analysis and is based on the existing roadways modified to incorporate regionally significant planned roadway improvements expected to occur by the forecast year.

The COMPASS Community Choices demographics were reviewed and modified to better represent anticipated growth. These changes were based on revised demographics developed by the City of Nampa, which include adjustments to the 15 traffic analysis zones within one mile north and south of Idaho 55. Adjustments were also made to include impacts from several planned developments including Polo Cove, a proposed planned community located northeast of the Hoskins Road and Idaho 55 intersection. Special model runs with revised demographics were generated, which are not endorsed by COMPASS.

FORECASTED TRAVEL DEMAND

The travel demand forecasts in the 2015 and 2030 special model runs were further adjusted according to methods outlined in *NCHRP 255 – Highway Traffic Data for Urbanized Area Project Planning and Design*. These methods compare existing traffic volumes with the model output volumes for the calibration year and adjust the forecasted design year volumes accordingly. Table B-2 and Table B-3 summarize the existing ADTs, 2015 adjusted forecasts, and 2030 adjusted forecasts on Idaho 55 and cross-streets.

Table B-2. Existing ADT, 2015 adjusted ADT, and 2030 adjusted ADT on Idaho 55

Idaho 55 Location		Existing ADT	2015 Adjusted ADT	2030 Adjusted ADT
Caldwell Boulevard	e/o		52,200	57,800
	w/o		37,400	55,700
Middleton	e/o	22,916	31,500	54,900
	w/o	19,459	21,800	37,200
Midway	e/o	19,459	19,100	35,900
	w/o		17,500	33,600
Lake Avenue	e/o		15,100	29,200
	w/o		17,600	33,700
Florida Avenue	e/o		17,700	33,900
	w/o	16,671	16,200	35,300
Indiana Avenue	e/o	16,671	16,200	35,300
	w/o		16,200	35,500
Montana Avenue	e/o		16,200	35,500
	w/o		14,700	32,100
10th Avenue	e/o		14,700	32,100
	w/o	10,281	11,800	26,300
Farmway	e/o	10,281	11,300	25,300
	w/o		13,100	29,000
Riverside Drive	e/o		13,100	29,000
	w/o	7,693	11,700	24,500
Pride Lane	e/o	7,693	11,200	23,300
	w/o		12,200	20,700
Hoskins Road	e/o		10,800	18,100
	s/o		9,400	13,500
between Apricot & Pear		6,517	9,400	13,500
Marsing Road	n/o		10,200	15,500
	w/o		14,600	21,900

Table B-3. 2015 adjusted ADT, and 2030 adjusted ADT on cross-streets

Cross-Street Location		2015 Adjusted ADT	2030 Adjusted ADT
Caldwell Boulevard	n/o Idaho 55	51,700	44,400
	s/o Idaho 55	38,000	40,500
Middleton Road	n/o Idaho 55	5,800	13,500
	s/o Idaho 55	9,500	15,800
Midway Road	n/o Idaho 55	12,200	9,600
	s/o Idaho 55	17,500	12,300
Lake Avenue	n/o Idaho 55	3,600	4,600
	s/o Idaho 55	4,100	10,300
Florida Avenue	n/o Idaho 55	7,100	5,000
	s/o Idaho 55	8,700	8,700
Indiana Avenue	n/o Idaho 55	1,800	3,000
	s/o Idaho 55	400	1,500
Montana Avenue	n/o Idaho 55	1,900	3,900
	s/o Idaho 55	200	400
10th Avenue	n/o Idaho 55	5,900	8,100
	s/o Idaho 55	2,700	2,900
Farmway Road	n/o Idaho 55	6,100	4,800
	s/o Idaho 55	1,000	1,500
Riverside Drive	s/o Idaho 55	7,200	5,400
Pride Lane	n/o Idaho 55	4,700	7,900
Hoskins Road	w/o Idaho 55	5,900	18,400
Marsing Road	s/o Idaho 55	2,800	4,100

FORECASTED INTERSECTION TRAFFIC ANALYSIS

The intersection traffic analysis determined the type of intersection control, the number of through lanes on Idaho 55, and the turn lanes required to accommodate the forecasted year 2015 and year 2030 peak-hour traffic. The maximum number of through lanes on Idaho 55 was limited to two lanes in each direction. Middleton Road was analyzed with four/five lanes south of Idaho 55 with 2030 traffic. Signal warrant analyses were not performed as a part of this study.

The forecasted traffic operations at the signalized intersections were analyzed with Synchro 7, which follows the *2000 Highway Capacity Manual (HCM)* methodology for signalized intersections. Measures of effectiveness include average control delay, intersection level of service (LOS) and intersection volume to capacity (v/c) ratio. The intersections were analyzed with optimized signal timings, fully-actuated signal control, and assumed cycle lengths of 90, 120 or 180 seconds.

The unsignalized intersections were analyzed using Highway Capacity Software, which follows the *2000 Highway Capacity Manual (HCM)* methodology for unsignalized intersections. Measures of effectiveness for unsignalized intersections include average control delay and intersection LOS.

From the existing traffic analysis, the PM peak hour was determined as the critical period for traffic impacts; therefore, the AM peak hour was not analyzed. Figure B-4 and Figure B-5 summarize the 2015 and 2030 PM peak-hour forecasted turning movements, the required lane configurations and required intersection control at the key study area intersections.

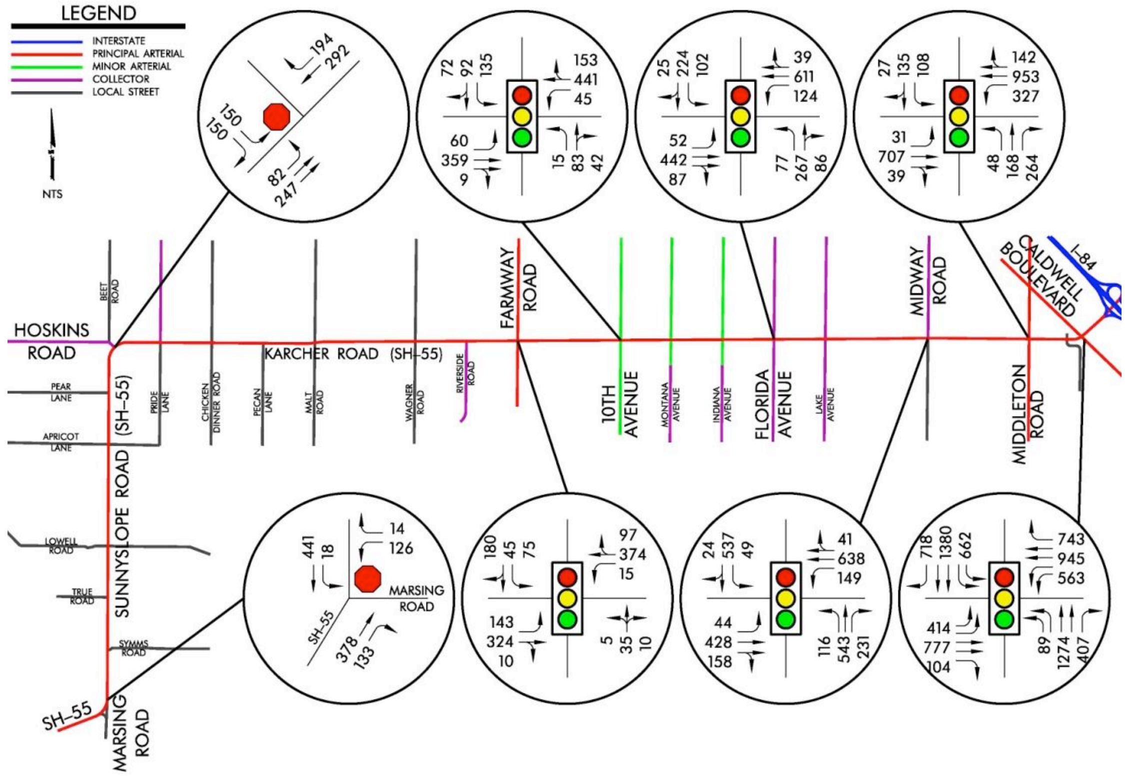


Figure B-4. 2015 PM peak-hour traffic

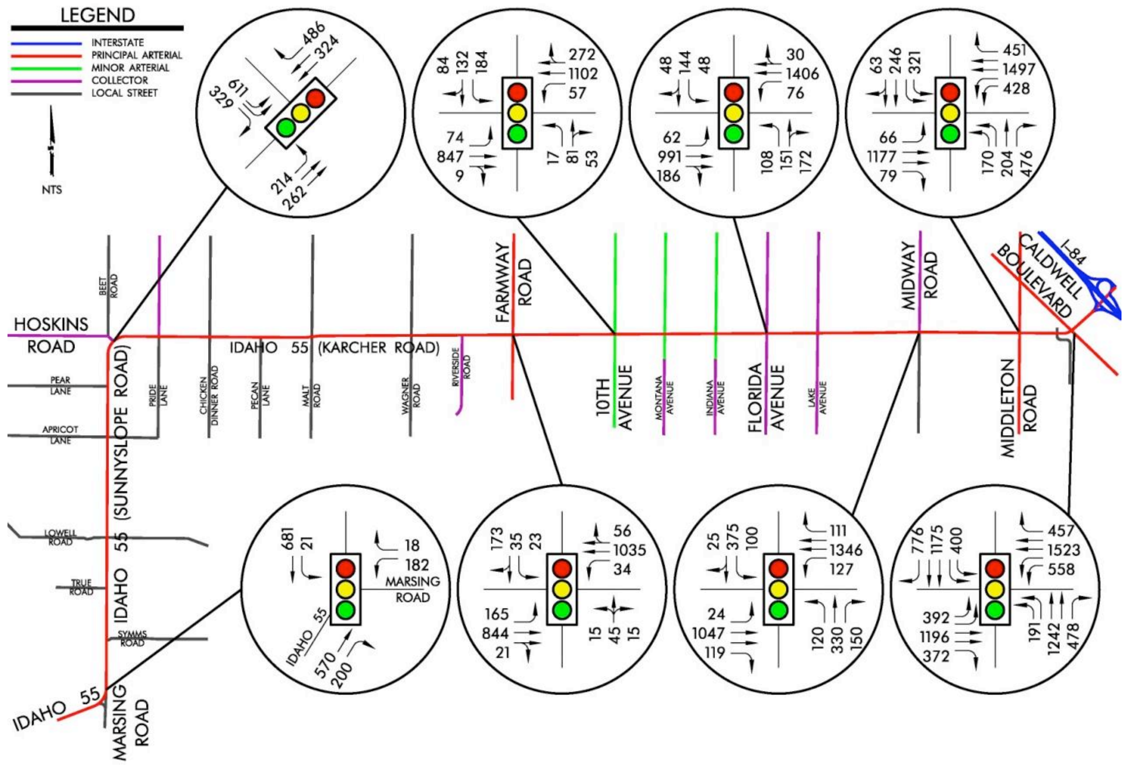


Figure B-5. 2030 PM peak-hour traffic

Table B-4 summarizes the measures of effectiveness during the 2015 and 2030 PM peak hours at the key study area intersections.

Table B-4. 2015 and 2030 PM peak-hour intersection capacity analysis results

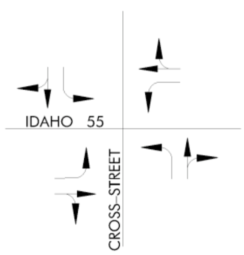
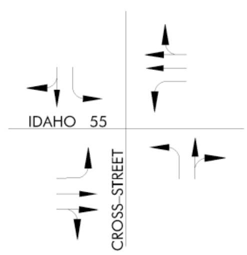
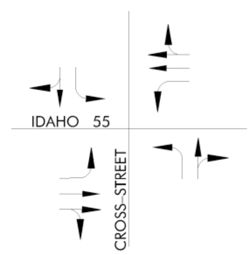
	2015				2030			
Intersection	Cycle Length (seconds)	LOS	Delay	v/c Ratio	Cycle Length (seconds)	LOS	Delay	v/c Ratio
Caldwell Boulevard	180	F	136	1.30	180	F	146	1.32
Middleton Road	120	C	33	0.76	120	D	53	0.94
Midway Road	120	D	45	0.99	120	D	48	0.95
Florida Avenue	120	C	35	0.70	120	D	41	0.91
10th Avenue	90	C	30	0.65	120	D	44	0.78
Farmway Road	90	C	21	0.60	120	C	25	0.60
Hoskins Road	n/a	C (SB)	20 (SB)	n/a	90	C	21	0.60
Marsing Road	n/a	D (SB)	32 (SB)	n/a	90	B	15	0.66

With 2015 and 2030 traffic and the recommended intersection improvements, all study area intersections operate at LOS D or better with a v/c ratio less than 1.00, with the exception of the Caldwell Boulevard intersection. Due to the large turning and through volumes at the Caldwell Boulevard intersection, three through lanes on Caldwell Boulevard and/or Idaho 55 may not achieve acceptable operations during the PM peak hour; however, a non-conventional intersection alternative may be necessary to accommodate the forecasted PM peak-hour traffic. A detailed intersection analysis that evaluates potential intersection treatments and their impacts is recommended.

TYPICAL LOW-VOLUME INTERSECTION LANE CONFIGURATIONS

Typical intersection lane configuration scenarios were developed for the remainder of the cross-streets along the corridor. Forecasted ADT, functional classification and input from agencies were considered when applying the scenarios to the specific cross-streets. A list of cross-streets and corresponding lane configurations for 2015 and 2030 are summarized in Table B-5. Note that the lane configurations below may differ from the final 2030 Access Management Plan recommendations. The traffic analysis was conducted prior to the access management plan development and the lane configurations below are the minimum intersection lane configurations needed for traffic; however, the plan may recommend additional turn lanes or through lanes to enhance safety and mobility.

Table B-5. 2015 and 2030 low-volume intersection lane configurations

2015		2030
Two/Three Lanes on Idaho 55	**Four/Five Lanes on Idaho 55**	**Four/Five Lanes on Idaho 55**
		
Cross-streets	**Cross-streets**	**Cross-streets**
Symms Road	True Road	Symms Road
Pride Lane	Lowell Road	True Road
Chicken Dinner Road	Apricot Lane	Lowell Road
Pecan Lane	Pear Lane	Apricot Lane
Malt Road	Beet Road	Pear Lane
Wagner Road	Montana Avenue	Beet Road
Riverside Road	Indiana Avenue	Pride Lane
	Lake Avenue	Chicken Dinner Road
		Pecan Lane
		Malt Road
		Wagner Road
		Riverside Road
		Montana Avenue
		Indiana Avenue
		Lake Avenue

PLANNING-LEVEL ARTERIAL ANALYSIS AND POTENTIAL INTERSECTION CONTROL

A planning-level arterial capacity analysis was conducted for different segments of Idaho 55. In addition, the forecasted ADTs at the typical low-volume intersections were compared with forecasted ADTs at the eight key study area intersections to determine the potential intersection control.

Forecasted ADTs were compared to roadway planning thresholds from the Florida Department of Transportation (FDOT) to provide a planning-level estimate of the number of lanes required to accommodate forecasted traffic in 2015 and 2030. The FDOT threshold capacity is not the actual capacity of the roadway as determined by standard engineering practice. In standard engineering practice, the roadway capacity is determined by the intersection capacity, which is calculated using *2000 Highway Capacity Manual* methodology. A summary of the planning-level comparison is shown in Table B-6.

Table B-6. 2015 and 2030 planning-level arterial analysis and potential intersection control

Idaho 55 Segment	Intersection	2015						2030					
		Idaho 55 ADT (high)	Cross-Street ADT (high)	Lanes	FDOT Planning Threshold (LOS D)	v/c Ratio	Potential Int. Control**	Idaho 55 ADT (high)	Cross-Street ADT (high)	Lanes	FDOT Planning Threshold (LOS D)	v/c Ratio	Potential Int. Control**
Sunnyslope Road (Rural)	Marsing Road	14,600	2,800	2-Lane	13,700	1.07	U	21,900	4,100	4-Lane	34,200	0.64	S*
	Symms Road	10,200		2-Lane	13,700	0.74	U	15,500		4-Lane	34,200	0.45	U
	True Road	10,200		4-Lane	34,200	0.30	U	15,500		4-Lane	34,200	0.45	U
	Lowell Road	10,200		4-Lane	34,200	0.30	U	15,500		4-Lane	34,200	0.45	U
	Apricot Lane	9,400		4-Lane	34,200	0.27	U	13,500		4-Lane	34,200	0.39	U
	Pear Lane	9,400		4-Lane	34,200	0.27	U	13,500		4-Lane	34,200	0.39	U
	Beet Road	9,400		4-Lane	34,200	0.27	U	13,500		4-Lane	34,200	0.39	U
Karcher Road (Rural)	Hoskins Road	10,800	5,900	2-Lane	13,700	0.79	U	18,100	14,800	4-Lane	34,200	0.53	S*
	Pride Lane	15,100	4,700	2-Lane	13,700	1.10	U or S*	23,300	7,900	4-Lane	34,200	0.68	S*
	Chicken Dinner Road	11,200		2-Lane	13,700	0.82	U	23,300		4-Lane	34,200	0.68	U
	Pecan Lane	11,200		2-Lane	13,700	0.82	U	23,300		4-Lane	34,200	0.68	U
	Malt Road	11,200		2-Lane	13,700	0.82	U	23,300		4-Lane	34,200	0.68	U
	Wagner Road	13,100		2-Lane	13,700	0.96	U	24,500		4-Lane	34,200	0.72	U
	Riverside Road	13,100	7,200	2-Lane	13,700	0.96	U or S*	24,500	5,400	4-Lane	34,200	0.72	S
Karcher Road (Urban or Urban/Suburban)	Farmway Road	13,100	6,100	2-Lane	13,700	0.96	S*	29,000	4,800	4-Lane	32,700	0.89	S*
	10th Avenue	14,700	5,900	4-Lane	32,700	0.45	S	32,100	8,100	4-Lane	32,700	0.98	S
	Montana Avenue	16,200	1,900	4-Lane	32,700	0.50	U	35,500	3,900	4-Lane	32,700	1.09	U or S*
	Indiana Avenue	16,200	1,800	4-Lane	32,700	0.50	U	35,500	3,000	4-Lane	32,700	1.09	U or S*
	Florida Avenue	17,700	8,700	4-Lane	32,700	0.54	S*	35,300	8,700	4-Lane	32,700	1.08	S*
	Lake Avenue	17,600	4,100	4-Lane	32,700	0.54	S*	33,700	10,300	4-Lane	32,700	1.03	S*
	Midway Road	19,100	17,500	4-Lane	32,700	0.58	S*	35,900	12,300	4-Lane	32,700	1.10	S*
	Middleton Road	31,500	9,500	4-Lane	32,700	0.96	S	54,900	15,800	6-Lane	49,200	1.12	S
	Caldwell Boulevard	52,200	51,700	6-Lane	49,200	1.06	S	57,800	44,400	6-Lane	49,200	1.17	S

Operational Analysis Performed

S=signalized; U=unsignalized, two-way stop controlled

***Traffic signal warrants should be evaluated in the future**

****Traffic signal spacing may not meet final spacing recommendations**

Currently, Idaho 55 is a five-lane roadway between True Road and Beet Road.

By 2015, a two/three-lane roadway is required to accommodate forecasted traffic between Marsing Road and True Lane and between Hoskins/Beet Road and 10th Avenue. By 2015, a four/five-lane roadway is required to accommodate forecasted traffic between 10th Avenue and Middleton Road. With 2015 forecasted traffic east of Middleton Road and a four/five-lane and six/seven-lane roadway, the v/c ratio will exceed 1.00.

By 2030, a four/five-lane roadway is required to accommodate forecasted traffic between Marsing Road to Midway Road and a minimum six/seven-lane roadway is required between Middleton Road and Caldwell Boulevard. However, the capacity of the roadway between Middleton Road and Caldwell Boulevard is controlled by the signalized intersection capacity. The Caldwell Boulevard intersection is severely overcapacity with 2030 PM peak-hour turning movement traffic, three lanes on Idaho 55 or Caldwell Boulevard may not be required if a non-conventional intersection treatment is applied at this intersection, with the exception of a median U-turn intersection, as shown below.

MEDIAN U-TURN INTERSECTION ANALYSIS

Median U-turn intersections were evaluated with forecasted 2030 PM peak-hour traffic at all the key study area intersections, with the exception of the Caldwell Boulevard intersection. The extremely large turning and through movements, existing median width, and proximity to the Karcher Interchange prohibit a median U-turn intersection at Caldwell Boulevard.

The median U-turn intersections consist of a main intersection – where traffic is limited to through and right-turn movements – and two median openings located downstream of the main intersection that facilitate indirect left-turns for Idaho 55 and the cross-streets. Traffic signals were evaluated at the main intersection on Idaho 55 with the cross-street with the exception of the Hoskins Road and Marsing Road intersections. These are both three-leg T-intersections and traffic signal control would not be effective at the main intersection because only the cross-street right-turn traffic would be served by the traffic signal. Left-turn movements from Idaho 55 and from the cross-streets are the primary intersection movements; therefore, they were analyzed with signalized control.

Table B-7 summarizes the signalized intersection measures of effectiveness for the 2030 PM peak hour for the median U-turn option at the key study area intersections. The conventional intersection operations are also shown for comparison. The through lanes on Idaho 55 remain consistent between the conventional and median U-turn options. Right-turn lanes were assumed at all approaches for the median U-turn option.

A median U-turn intersection results in more favorable operations at the key study area intersections with the exception of Middleton Road. The large left-turn movements require traffic signals at the main intersection and both median U-turn intersections which, in this case, result in an overall increase in delay for traffic at the Middleton Road intersection.

Table B-7. 2030 PM peak-hour median U-turn intersection analysis results

	Conventional				Median U-Turn											
	Main Intersection				Main Intersection				West/South U-Turn				East/North U-Turn			
Intersection	Cycle Length (seconds)	LOS	Delay (seconds)	v/c Ratio	Cycle Length (seconds)	LOS	Delay (seconds)	v/c Ratio	Cycle Length (seconds)	LOS	Delay (seconds)	v/c Ratio	Cycle Length (seconds)	LOS	Delay (seconds)	v/c Ratio
Middleton Road	120	D	53	0.94	120	D	38	0.99	120	C	22	0.74	120	C	33	0.97
Midway Road	120	D	48	0.95	90	B	18	0.83	U	D	26	n/a	U	D	30	n/a
Florida Avenue	120	D	41	0.91	90	B	15	0.79	U	C	19	n/a	U	D	30	n/a
10th Avenue	120	D	44	0.78	90	B	18	0.74	U	C	20	n/a	U	C	20	n/a
Farmway Road	120	C	25	0.60	90	B	16	0.60	U	B	14	n/a	U	C	21	n/a
Hoskins Road	90	C	21	0.60	U	C	16	n/a	90	B	10	0.50	90	B	10	0.53
Marsing Road	90	B	15	0.66	U	C	24	n/a	U	B	12	n/a	U	B	14	n/a

U=unsignalized, two-way stop controlled

SUMMARY

EXISTING TRAFFIC ANALYSIS

All signalized and unsignalized study area intersections operate with a LOS D or better during the AM and PM peak hours except for Midway Road and Florida Avenue, which are both two-way stop controlled. These two intersections experience a LOS of F in the PM peak hour for one or both directions, and the Florida Avenue southbound approach experiences a LOS of E in the AM peak hour. The Middleton Road intersection is nearing capacity and long eastbound and westbound queues were observed during peak periods.

FORECASTED INTERSECTION TRAFFIC ANALYSIS

With 2015 and 2030 traffic and the recommended intersection improvements, all study area intersections operate at LOS D or better with a v/c ratio less than 1.00, with the exception of the Caldwell Boulevard intersection. Due to the large turning and through volumes, three through lanes on Caldwell Boulevard and/or Idaho 55 may not achieve acceptable operations during the PM peak hour; however, a non-conventional intersection alternative may be necessary to accommodate the forecasted PM peak-hour traffic. A detailed intersection analysis of potential intersection treatments and their impacts is not included in this project but is recommended.

PLANNING-LEVEL ARTERIAL ANALYSIS

By 2015, a two/three-lane roadway is required to accommodate forecasted traffic between Marsing Road and True Lane and between Hoskins/Beet Road and 10th Avenue. By 2015, a four/five-lane roadway is required to accommodate forecasted traffic between 10th Avenue and Middleton Road. With 2015 forecasted traffic east of Middleton Road and a six/seven-lane roadway, the v/c ratio will exceed 1.00 as shown in Table B-6.

By 2030, a four/five-lane roadway is required to accommodate forecasted traffic between Marsing Road and Middleton Road. With 2030 forecasted traffic east of Middleton Road and a six/seven-lane roadway, the v/c ratio will exceed 1.00 as shown in Table B-4.

MEDIAN U-TURN INTERSECTION ANALYSIS

A median U-turn intersection results in more favorable operations versus a conventional signalized intersection at the key study area intersections, with the exception of Caldwell Boulevard and Middleton Road.

Traffic signals at the U-turn intersections (as opposed to the main intersections) are recommended at the Hoskins Road and Marsing Road intersections because these are T-intersections with large turning volumes and no through volumes on the cross-streets.

APPENDIX B1 – TRAFFIC ANALYSIS DATA

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	6	752	88	152	229	223	312	254	13	46	200	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3513		3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3513		3433	3539	1583
Peak-hour factor, PHF	0.93	0.93	0.93	0.80	0.80	0.80	0.94	0.94	0.94	0.86	0.86	0.86
Adj. Flow (vph)	6	809	95	190	286	279	332	270	14	53	233	138
RTOR Reduction (vph)	0	0	64	0	0	163	0	4	0	0	0	103
Lane Group Flow (vph)	6	809	31	190	286	116	332	280	0	53	233	35
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8						2
Actuated Green, G (s)	0.7	28.7	28.7	8.6	36.6	36.6	12.3	32.2		2.2	22.1	22.1
Effective Green, g (s)	0.7	28.7	28.7	8.6	36.6	36.6	12.3	32.2		2.2	22.1	22.1
Actuated g/C Ratio	0.01	0.33	0.33	0.10	0.42	0.42	0.14	0.37		0.03	0.25	0.25
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	27	1158	518	337	1477	661	481	1290		86	892	399
v/s Ratio Prot	0.00	c0.23		c0.06	0.08		c0.10	0.08		0.02	c0.07	
v/s Ratio Perm			0.02			0.07						0.02
v/c Ratio	0.22	0.70	0.06	0.56	0.19	0.18	0.69	0.22		0.62	0.26	0.09
Uniform Delay, d1	43.2	25.7	20.2	37.8	16.2	16.1	35.9	19.1		42.3	26.3	25.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.1	1.9	0.0	2.2	0.1	0.1	4.2	0.4		12.4	0.7	0.4
Delay (s)	47.4	27.6	20.3	39.9	16.3	16.2	40.1	19.5		54.8	27.0	25.5
Level of Service	D	C	C	D	B	B	D	B		D	C	C
Approach Delay (s)		27.0			22.2			30.6			30.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	26.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	592	65	56	236	9	71	259	168	31	131	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1835		1770	1853		1770	1863	1583	1770	1795	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1835		1770	1853		1770	1863	1583	1770	1795	
Peak-hour factor, PHF	0.96	0.96	0.96	0.89	0.89	0.89	0.87	0.87	0.87	0.84	0.84	0.84
Adj. Flow (vph)	50	617	68	63	265	10	82	298	193	37	156	50
RTOR Reduction (vph)	0	5	0	0	2	0	0	0	132	0	12	0
Lane Group Flow (vph)	50	680	0	63	273	0	82	298	61	37	194	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	3.2	34.2		4.4	35.4		5.9	25.9	25.9	2.1	22.1	
Effective Green, g (s)	3.2	34.2		4.4	35.4		5.9	25.9	25.9	2.1	22.1	
Actuated g/C Ratio	0.04	0.41		0.05	0.43		0.07	0.31	0.31	0.03	0.27	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	69	760		94	794		126	584	496	45	480	
v/s Ratio Prot	0.03	c0.37		c0.04	0.15		0.05	c0.16		c0.02	0.11	
v/s Ratio Perm									0.04			
v/c Ratio	0.72	0.90		0.67	0.34		0.65	0.51	0.12	0.82	0.40	
Uniform Delay, d1	39.3	22.5		38.4	15.8		37.3	23.2	20.2	40.1	24.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	31.2	13.1		17.2	0.3		11.4	3.2	0.5	70.2	2.5	
Delay (s)	70.4	35.6		55.5	16.1		48.8	26.3	20.7	110.2	27.4	
Level of Service	E	D		E	B		D	C	C	F	C	
Approach Delay (s)		38.0			23.4			27.7			40.0	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	82.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	372	1	7	169	51	25	69	38	117	50	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1862		1770	1863	1583	1770	1763		1770	1817	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1862		1770	1863	1583	1770	1763		1770	1817	
Peak-hour factor, PHF	0.84	0.84	0.84	0.79	0.79	0.79	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	24	443	1	9	214	65	28	78	43	131	56	11
RTOR Reduction (vph)	0	0	0	0	0	47	0	18	0	0	6	0
Lane Group Flow (vph)	24	444	0	9	214	18	28	103	0	131	61	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	1.7	20.7		0.6	19.6	19.6	1.7	24.8		8.5	31.6	
Effective Green, g (s)	1.7	20.7		0.6	19.6	19.6	1.7	24.8		8.5	31.6	
Actuated g/C Ratio	0.02	0.29		0.01	0.28	0.28	0.02	0.35		0.12	0.45	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	43	546		15	517	439	43	619		213	813	
v/s Ratio Prot	c0.01	c0.24		0.01	0.11		0.02	c0.06		c0.07	0.03	
v/s Ratio Perm						0.01						
v/c Ratio	0.56	0.81		0.60	0.41	0.04	0.65	0.17		0.62	0.07	
Uniform Delay, d1	34.1	23.2		34.9	20.8	18.6	34.2	15.8		29.5	11.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	14.8	9.0		51.0	0.5	0.0	30.2	0.6		5.2	0.2	
Delay (s)	48.8	32.2		85.9	21.4	18.7	64.3	16.4		34.7	11.3	
Level of Service	D	C		F	C	B	E	B		C	B	
Approach Delay (s)		33.0			22.8			25.4			26.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	70.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*L. Kelsey*
Agency/Co.	*Six Mile Engineering, P.A.*
Date Performed	*November 2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Midway Road and Idaho 55*
Jurisdiction	*Canyon County*
Analysis Year	*2008*

Project Description *Idaho 55, Marsing to Nampa, Access Management Plan*

East/West Street: *Idaho 55* North/South Street: *Midway Road*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	18	609	38	19	298	21
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	18	641	40	20	323	22
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	13	36	9	14	31	7
Peak-hour factor, PHF	0.85	0.85	0.85	0.72	0.72	0.72
Hourly Flow Rate (veh/h)	15	42	10	19	43	9
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
Volume, v (vph)	18	20		67			71	
Capacity, c_m (vph)	1225	921		211			208	
v/c ratio	0.01	0.02		0.32			0.34	
Queue length (95%)	0.04	0.07		1.30			1.43	
Control Delay (s/veh)	8.0	9.0		29.8			31.0	
LOS	A	A		D			D	
Approach delay (s/veh)	--	--	29.8			31.0		
Approach LOS	--	--	D			D		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*L. Kelsey*
Agency/Co.	*Six Mile Engineering, P.A.*
Date Performed	*November 2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Florida Avenue and Idaho 55*
Jurisdiction	*Canyon County*
Analysis Year	*2008*

Project Description

East/West Street: *Idaho 55* North/South Street: *Florida Avenue*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	6	657	1	12	276	21
Peak-hour factor, PHF	0.85	0.85	0.85	0.86	0.86	0.86
Hourly Flow Rate (veh/h)	7	772	1	13	320	24
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	11	16	31	9	3
Peak-hour factor, PHF	0.75	0.75	0.75	0.77	0.77	0.77
Hourly Flow Rate (veh/h)	0	14	21	40	11	3
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
Volume, v (vph)	7	13		35			54	
Capacity, c_m (vph)	1226	851		282			168	
v/c ratio	0.01	0.02		0.12			0.32	
Queue length (95%)	0.02	0.05		0.42			1.30	
Control Delay (s/veh)	8.0	9.3		19.6			36.3	
LOS	A	A		C			E	
Approach delay (s/veh)	--	--		19.6			36.3	
Approach LOS	--	--		C			E	

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Farmway Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*AM Peak Hour*		

Project Description	
East/West Street: *Idaho 55*	North/South Street: *Farmway Road*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*87*	*326*	*3*	*12*	*133*	*39*
Peak-hour factor, PHF	*0.92*	*0.92*	*0.92*	*0.64*	*0.64*	*0.64*
Hourly Flow Rate (veh/h)	*94*	*354*	*3*	*18*	*207*	*60*
Proportion of heavy vehicles, P_{HV}	*0*	--	--	*0*	--	--
Median type	*Undivided*					
RT Channelized?			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*0*	*31*	*10*	*33*	*19*	*40*
Peak-hour factor, PHF	*0.79*	*0.79*	*0.79*	*0.79*	*0.79*	*0.79*
Hourly Flow Rate (veh/h)	*0*	*39*	*12*	*41*	*24*	*50*
Proportion of heavy vehicles, P_{HV}	*0*	*0*	*0*	*0*	*0*	*0*
Percent grade (%)	*0*			*0*		
Flared approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized?			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration		*LTR*		*L*		*TR*

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*		*LTR*		*L*		*TR*
Volume, v (vph)	*94*	*18*		*51*		*41*		*74*
Capacity, c_m (vph)	*1308*	*1213*		*320*		*234*		*507*
v/c ratio	*0.07*	*0.01*		*0.16*		*0.18*		*0.15*
Queue length (95%)	*0.23*	*0.05*		*0.56*		*0.62*		*0.51*
Control Delay (s/veh)	*8.0*	*8.0*		*18.4*		*23.6*		*13.3*
LOS	*A*	*A*		*C*		*C*		*B*
Approach delay (s/veh)	--	--	*18.4*			*17.0*		
Approach LOS	--	--	*C*			*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Farmway Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*AM Peak Hour*		

Project Description

East/West Street: *Idaho 55*	North/South Street: *Farmway Road*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	87	326	3	12	133	39
Peak-hour factor, PHF	0.92	0.92	0.92	0.64	0.64	0.64
Hourly Flow Rate (veh/h)	94	354	3	18	207	60
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	31	10	33	19	40
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79
Hourly Flow Rate (veh/h)	0	39	12	41	24	50
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	1	0	1	1	0
Configuration		LTR		L		TR

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L		TR
Volume, v (vph)	94	18		51		41		74
Capacity, c_m (vph)	1308	1213		320		234		507
v/c ratio	0.07	0.01		0.16		0.18		0.15
Queue length (95%)	0.23	0.05		0.56		0.62		0.51
Control Delay (s/veh)	8.0	8.0		18.4		23.6		13.3
LOS	A	A		C		C		B
Approach delay (s/veh)	--	--	18.4			17.0		
Approach LOS	--	--	C			C		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*L. Kelsey*
Agency/Co.	*Six Mile Engineering, P.A.*
Date Performed	*November 2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Intersection	*Hoskins Road and Idaho 55*
Jurisdiction	*Canyon County*
Analysis Year	*2008*

Project Description

East/West Street: *Idaho 55* North/South Street: *Hoskins Road*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	9	197	0	0	116	5
Peak-hour factor, PHF	0.87	0.87	1.00	1.00	0.80	0.80
Hourly Flow Rate (veh/h)	10	225	0	0	145	6
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	2	0	0	1	0
Configuration	LT	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	47	0	16
Peak-hour factor, PHF	1.00	1.00	1.00	0.73	1.00	0.73
Hourly Flow Rate (veh/h)	0	0	0	64	0	22
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
Volume, v (vph)	10						86	
Capacity, c_m (vph)	1442						727	
v/c ratio	0.01						0.12	
Queue length (95%)	0.02						0.40	
Control Delay (s/veh)	7.5						10.6	
LOS	A						B	
Approach delay (s/veh)	--	--				10.6		
Approach LOS	--	--				B		

HCS2000™ Version 4.1d

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Hoskins Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*AM Peak Hour*		

Project Description	
East/West Street: *Idaho 55*	North/South Street: *Hoskins Road*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	9	197	0	0	116	5
Peak-hour factor, PHF	0.87	0.87	1.00	1.00	0.80	0.80
Hourly Flow Rate (veh/h)	10	225	0	0	145	6
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	2	0	0	1	0
Configuration	LT	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	47	0	16
Peak-hour factor, PHF	1.00	1.00	1.00	0.73	1.00	0.73
Hourly Flow Rate (veh/h)	0	0	0	64	0	22
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
Volume, v (vph)	10						86	
Capacity, c_m (vph)	1442						727	
v/c ratio	0.01						0.12	
Queue length (95%)	0.02						0.40	
Control Delay (s/veh)	7.5						10.6	
LOS	A						B	
Approach delay (s/veh)	--	--				10.6		
Approach LOS	--	--				B		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Marsing Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*AM Peak Hour*		

Project Description *Idaho 55, Marsing to Nampa, Access Management Plan*	
East/West Street: *Idaho 55*	North/South Street: *Marsing Road*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*167*	*37*	*0*	*5*	*139*
Peak-Hour Factor, PHF	*0.75*	*0.75*	*0.91*	*0.91*	*0.69*	*0.69*
Hourly Flow Rate, HFR	*0*	*222*	*40*	*0*	*7*	*201*
Percent Heavy Vehicles	*0*	*--*	*--*	*0*	*--*	*--*
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*			*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*41*	*0*	*7*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.91*	*0.91*	*0.91*	*0.91*	*0.91*	*0.91*
Hourly Flow Rate, HFR	*45*	*0*	*7*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration				*LR*				
v (vph)				*52*				
C (m) (vph)				*668*				
v/c				*0.08*				
95% queue length				*0.25*				
Control Delay				*10.8*				
LOS				*B*				
Approach Delay	--	--		*10.8*				
Approach LOS	--	--		*B*				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	356	601	51	229	584	284	297	682	621	57	485	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3286		3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3286		3433	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.92	0.92	0.92	0.96	0.96	0.96
Adj. Flow (vph)	391	660	56	241	615	299	323	741	675	59	505	140
RTOR Reduction (vph)	0	0	42	0	0	240	0	178	0	0	0	92
Lane Group Flow (vph)	391	660	14	241	615	59	323	1238	0	59	505	48
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8						2
Actuated Green, G (s)	11.9	21.6	21.6	8.0	17.7	17.7	13.0	40.6		3.1	30.7	30.7
Effective Green, g (s)	11.9	21.6	21.6	8.0	17.7	17.7	13.0	40.6		3.1	30.7	30.7
Actuated g/C Ratio	0.13	0.24	0.24	0.09	0.20	0.20	0.15	0.45		0.03	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	457	856	383	308	701	314	500	1494		119	1217	544
v/s Ratio Prot	c0.11	c0.19		0.07	0.17		c0.09	c0.38		0.02	0.14	
v/s Ratio Perm			0.01			0.04						0.03
v/c Ratio	0.86	0.77	0.04	0.78	0.88	0.19	0.65	0.83		0.50	0.41	0.09
Uniform Delay, d1	37.9	31.5	25.9	39.8	34.7	29.8	36.0	21.3		42.3	22.4	19.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.5	4.3	0.0	12.2	12.0	0.3	2.9	5.4		3.2	1.0	0.3
Delay (s)	52.4	35.9	25.9	52.0	46.7	30.1	38.8	26.8		45.6	23.5	20.2
Level of Service	D	D	C	D	D	C	D	C		D	C	C
Approach Delay (s)		41.2			43.5			29.0			24.7	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	89.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	401	66	128	654	20	133	236	142	38	300	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1823		1770	1855		1770	1863	1583	1770	1821	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1823		1770	1855		1770	1863	1583	1770	1821	
Peak-hour factor, PHF	0.94	0.94	0.94	0.90	0.90	0.90	0.83	0.83	0.83	0.93	0.93	0.93
Adj. Flow (vph)	45	427	70	142	727	22	160	284	171	41	323	57
RTOR Reduction (vph)	0	7	0	0	1	0	0	0	118	0	7	0
Lane Group Flow (vph)	45	490	0	142	748	0	160	284	53	41	373	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	2.9	30.1		9.6	36.8		9.0	28.3	28.3	2.9	22.2	
Effective Green, g (s)	2.9	30.1		9.6	36.8		9.0	28.3	28.3	2.9	22.2	
Actuated g/C Ratio	0.03	0.33		0.11	0.40		0.10	0.31	0.31	0.03	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	56	604		187	751		175	580	493	56	445	
v/s Ratio Prot	0.03	0.27		c0.08	c0.40		c0.09	0.15		0.02	c0.20	
v/s Ratio Perm									0.03			
v/c Ratio	0.80	0.81		0.76	1.00		0.91	0.49	0.11	0.73	0.84	
Uniform Delay, d1	43.7	27.8		39.5	27.0		40.6	25.4	22.3	43.6	32.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	55.1	8.2		16.1	31.6		43.9	2.9	0.4	38.7	17.0	
Delay (s)	98.8	36.0		55.7	58.5		84.5	28.4	22.7	82.3	49.7	
Level of Service	F	D		E	E		F	C	C	F	D	
Approach Delay (s)		41.2			58.1			41.4			52.9	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM Average Control Delay	49.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	90.9	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	244	3	44	388	115	14	63	30	81	77	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97		1.00	0.95		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1860		1770	1799		1770	1773		1770	1761	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1860		1770	1799		1770	1773		1770	1761	
Peak-hour factor, PHF	0.90	0.90	0.90	0.88	0.88	0.88	0.81	0.81	0.81	0.72	0.72	0.72
Adj. Flow (vph)	38	271	3	50	441	131	17	78	37	112	107	61
RTOR Reduction (vph)	0	1	0	0	13	0	0	16	0	0	19	0
Lane Group Flow (vph)	38	273	0	50	559	0	17	99	0	112	149	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.0	26.8		3.0	26.8		1.3	21.4		7.7	27.8	
Effective Green, g (s)	3.0	26.8		3.0	26.8		1.3	21.4		7.7	27.8	
Actuated g/C Ratio	0.04	0.36		0.04	0.36		0.02	0.29		0.10	0.37	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	71	666		71	644		31	507		182	654	
v/s Ratio Prot	0.02	0.15		c0.03	c0.31		0.01	0.06		c0.06	c0.08	
v/s Ratio Perm												
v/c Ratio	0.54	0.41		0.70	0.87		0.55	0.19		0.62	0.23	
Uniform Delay, d1	35.3	18.1		35.5	22.4		36.5	20.2		32.2	16.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.6	0.4		27.1	11.8		18.4	0.9		6.1	0.8	
Delay (s)	42.8	18.5		62.6	34.2		54.9	21.1		38.2	17.0	
Level of Service	D	B		E	C		D	C		D	B	
Approach Delay (s)		21.5			36.5			25.4			25.5	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM Average Control Delay	29.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	74.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Midway Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*PM Peak Hour*		

Project Description *Idaho 55, Marsing to Nampa, Access Management Plan*

East/West Street: *Idaho 55*	North/South Street: *Midway Road*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	17	458	32	15	758	44
Peak-hour factor, PHF	0.93	0.93	0.93	0.98	0.98	0.98
Hourly Flow Rate (veh/h)	18	492	34	15	773	44
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	28	50	12	23	52	16
Peak-hour factor, PHF	0.75	0.75	0.75	0.73	0.73	0.73
Hourly Flow Rate (veh/h)	37	66	16	31	71	21
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
Volume, v (vph)	18	15		119			123	
Capacity, c_m (vph)	820	1051		110			121	
v/c ratio	0.02	0.01		1.08			1.02	
Queue length (95%)	0.07	0.04		7.27			6.92	
Control Delay (s/veh)	9.5	8.5		183.7			155.2	
LOS	A	A		F			F	
Approach delay (s/veh)	--	--	183.7			155.2		
Approach LOS	--	--	F			F		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	L. Kelsey	Intersection	Florida Avenue and Idaho 55
Agency/Co.	Six Mile Engineering, P.A.	Jurisdiction	Canyon County
Date Performed	November 2010	Analysis Year	2008
Analysis Time Period	PM Peak Hour		

Project Description
East/West Street: Idaho 55 | North/South Street: Florida Avenue
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	16	432	12	28	738	45
Peak-hour factor, PHF	0.93	0.93	0.93	0.87	0.87	0.87
Hourly Flow Rate (veh/h)	17	464	12	32	848	51
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	4	17	28	31	16	8
Peak-hour factor, PHF	0.72	0.72	0.72	0.69	0.69	0.69
Hourly Flow Rate (veh/h)	5	23	38	44	23	11
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
Volume, v (vph)	17	32		66			78	
Capacity, c_m (vph)	764	1097		213			104	
v/c ratio	0.02	0.03		0.31			0.75	
Queue length (95%)	0.07	0.09		1.26			4.02	
Control Delay (s/veh)	9.8	8.4		29.3			105.2	
LOS	A	A		D			F	
Approach delay (s/veh)	--	--		29.3			105.2	
Approach LOS	--	--		D			F	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	L. Kelsey	Intersection	Farmway Road and Idaho 55
Agency/Co.	Six Mile Engineering, P.A.	Jurisdiction	Canyon County
Date Performed	November 2010	Analysis Year	2008
Analysis Time Period	AM Peak Hour		

Project Description	
East/West Street: Idaho 55	North/South Street: Farmway Road
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	87	326	3	12	133	39
Peak-hour factor, PHF	0.92	0.92	0.92	0.64	0.64	0.64
Hourly Flow Rate (veh/h)	94	354	3	18	207	60
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	31	10	33	19	40
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79
Hourly Flow Rate (veh/h)	0	39	12	41	24	50
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	1	0	1	1	0
Configuration		LTR		L		TR

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L		TR
Volume, v (vph)	94	18		51		41		74
Capacity, c_m (vph)	1308	1213		320		234		507
v/c ratio	0.07	0.01		0.16		0.18		0.15
Queue length (95%)	0.23	0.05		0.56		0.62		0.51
Control Delay (s/veh)	8.0	8.0		18.4		23.6		13.3
LOS	A	A		C		C		B
Approach delay (s/veh)	--	--	18.4			17.0		
Approach LOS	--	--	C			C		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Hoskins Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*AM Peak Hour*		

Project Description	
East/West Street: *Idaho 55*	North/South Street: *Hoskins Road*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	9	197	0	0	116	5
Peak-hour factor, PHF	0.87	0.87	1.00	1.00	0.80	0.80
Hourly Flow Rate (veh/h)	10	225	0	0	145	6
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	2	0	0	1	0
Configuration	LT	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	47	0	16
Peak-hour factor, PHF	1.00	1.00	1.00	0.73	1.00	0.73
Hourly Flow Rate (veh/h)	0	0	0	64	0	22
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
Volume, v (vph)	10						86	
Capacity, c_m (vph)	1442						727	
v/c ratio	0.01						0.12	
Queue length (95%)	0.02						0.40	
Control Delay (s/veh)	7.5						10.6	
LOS	A						B	
Approach delay (s/veh)	--	--				10.6		
Approach LOS	--	--				B		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Marsing Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*AM Peak Hour*		

Project Description *Idaho 55, Marsing to Nampa, Access Management Plan*

East/West Street: *Idaho 55*	North/South Street: *Marsing Road*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*167*	*37*	*0*	*5*	*139*
Peak-Hour Factor, PHF	*0.75*	*0.75*	*0.91*	*0.91*	*0.69*	*0.69*
Hourly Flow Rate, HFR	*0*	*222*	*40*	*0*	*7*	*201*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*			*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*41*	*0*	*7*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.91*	*0.91*	*0.91*	*0.91*	*0.91*	*0.91*
Hourly Flow Rate, HFR	*45*	*0*	*7*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration				*LR*				
v (vph)				*52*				
C (m) (vph)				*668*				
v/c				*0.08*				
95% queue length				*0.25*				
Control Delay				*10.8*				
LOS				*B*				
Approach Delay	--	--		*10.8*				
Approach LOS	--	--		*B*				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	414	777	104	563	945	743	662	1380	718	89	1274	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	450	845	113	612	1027	808	720	1500	780	97	1385	442
RTOR Reduction (vph)	0	0	45	0	0	183	0	0	161	0	0	109
Lane Group Flow (vph)	450	845	68	612	1027	625	720	1500	619	97	1385	333
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			2
Actuated Green, G (s)	18.0	39.0	39.0	29.0	50.0	50.0	29.0	82.0	82.0	6.0	59.0	59.0
Effective Green, g (s)	18.0	39.0	39.0	29.0	50.0	50.0	29.0	82.0	82.0	6.0	59.0	59.0
Actuated g/C Ratio	0.10	0.22	0.22	0.16	0.28	0.28	0.16	0.46	0.46	0.03	0.33	0.33
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	343	767	343	553	983	440	553	1612	721	114	1160	519
v/s Ratio Prot	0.13	0.24		c0.18	0.29		c0.21	0.42		0.03	c0.39	
v/s Ratio Perm			0.04			c0.39			0.39			0.21
v/c Ratio	1.31	1.10	0.20	1.11	1.04	1.42	1.30	0.93	0.86	0.85	1.19	0.64
Uniform Delay, d1	81.0	70.5	57.7	75.5	65.0	65.0	75.5	46.3	43.8	86.6	60.5	51.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	159.8	64.0	0.3	70.9	41.1	202.4	148.7	11.0	12.7	42.1	96.0	6.0
Delay (s)	240.8	134.5	58.0	146.4	106.1	267.4	224.2	57.4	56.5	128.6	156.5	57.5
Level of Service	F	F	E	F	F	F	F	E	E	F	F	E
Approach Delay (s)		162.3			169.4			97.2			132.3	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	135.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	112.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	707	39	327	953	142	48	168	264	108	135	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3471		1770	1863	1583	1770	1817	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3471		1770	1863	1583	1770	1817	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	768	42	355	1036	154	52	183	287	117	147	29
RTOR Reduction (vph)	0	0	30	0	10	0	0	0	240	0	6	0
Lane Group Flow (vph)	34	768	12	355	1180	0	52	183	47	117	170	0
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	3.2	29.9	29.9	25.1	51.8		6.3	16.9	16.9	11.1	21.7	
Effective Green, g (s)	3.2	29.9	29.9	25.1	51.8		6.3	16.9	16.9	11.1	21.7	
Actuated g/C Ratio	0.03	0.29	0.29	0.24	0.50		0.06	0.16	0.16	0.11	0.21	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	55	1027	460	431	1746		108	306	260	191	383	
v/s Ratio Prot	0.02	c0.22		c0.20	0.34		0.03	c0.10		c0.07	c0.09	
v/s Ratio Perm			0.01						0.03			
v/c Ratio	0.62	0.75	0.03	0.82	0.68		0.48	0.60	0.18	0.61	0.45	
Uniform Delay, d1	49.3	33.1	26.1	36.9	19.3		46.8	39.9	37.1	43.9	35.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.9	3.0	0.0	12.1	1.1		3.4	3.1	0.3	5.7	0.8	
Delay (s)	68.2	36.1	26.2	48.9	20.3		50.1	43.0	37.4	49.6	36.2	
Level of Service	E	D	C	D	C		D	D	D	D	D	
Approach Delay (s)		36.9			26.9			40.7			41.6	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	33.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	103.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	428	158	149	638	41	116	543	231	49	537	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3396		1770	3507		1770	1863	1583	1770	1851	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3396		1770	3507		1770	1863	1583	1770	1851	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	48	465	172	162	693	45	126	590	251	53	584	26
RTOR Reduction (vph)	0	32	0	0	4	0	0	0	65	0	1	0
Lane Group Flow (vph)	48	605	0	162	734	0	126	590	186	53	609	0
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	4.6	24.3		13.2	32.9		11.2	48.8	48.8	4.6	42.2	
Effective Green, g (s)	4.6	24.3		13.2	32.9		11.2	48.8	48.8	4.6	42.2	
Actuated g/C Ratio	0.04	0.21		0.11	0.29		0.10	0.42	0.42	0.04	0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	71	718		203	1004		173	791	672	71	680	
v/s Ratio Prot	0.03	c0.18		c0.09	c0.21		c0.07	c0.32		0.03	c0.33	
v/s Ratio Perm									0.12			
v/c Ratio	0.68	0.84		0.80	0.73		0.73	0.75	0.28	0.75	0.90	
Uniform Delay, d1	54.4	43.5		49.6	37.0		50.4	27.8	21.5	54.6	34.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	22.5	8.9		19.3	2.8		14.2	3.9	0.2	34.2	14.3	
Delay (s)	77.0	52.4		68.8	39.8		64.6	31.7	21.8	88.8	48.6	
Level of Service	E	D		E	D		E	C	C	F	D	
Approach Delay (s)		54.1			45.0			33.4			51.8	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM Average Control Delay	44.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	36.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	442	87	124	611	39	77	267	86	102	224	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3452		1770	3508		1770	1795		1770	1835	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3452		1770	3508		1770	1795		1770	1835	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	480	95	135	664	42	84	290	93	111	243	27
RTOR Reduction (vph)	0	16	0	0	5	0	0	9	0	0	3	0
Lane Group Flow (vph)	57	559	0	135	701	0	84	374	0	111	267	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.8	22.1		11.6	29.9		7.2	25.6		9.6	28.0	
Effective Green, g (s)	3.8	22.1		11.6	29.9		7.2	25.6		9.6	28.0	
Actuated g/C Ratio	0.04	0.24		0.12	0.32		0.08	0.28		0.10	0.30	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	72	821		221	1129		137	495		183	553	
v/s Ratio Prot	0.03	0.16		c0.08	c0.20		0.05	c0.21		c0.06	0.15	
v/s Ratio Perm												
v/c Ratio	0.79	0.68		0.61	0.62		0.61	0.75		0.61	0.48	
Uniform Delay, d1	44.2	32.2		38.5	26.7		41.5	30.8		39.8	26.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	43.3	2.3		4.9	1.1		7.9	6.4		5.6	0.7	
Delay (s)	87.4	34.5		43.4	27.8		49.4	37.2		45.4	27.2	
Level of Service	F	C		D	C		D	D		D	C	
Approach Delay (s)		39.3			30.3			39.4			32.5	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM Average Control Delay	34.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	92.9	Sum of lost time (s)	24.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	359	9	45	441	153	15	83	42	135	93	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.95		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3526		1770	1863	1583	1770	1768		1770	1741	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3526		1770	1863	1583	1770	1768		1770	1741	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	390	10	49	479	166	16	90	46	147	101	78
RTOR Reduction (vph)	0	2	0	0	0	103	0	21	0	0	33	0
Lane Group Flow (vph)	65	398	0	49	479	63	16	115	0	147	146	0
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)	4.1	29.6		2.9	28.4	28.4	0.6	11.1		7.7	18.2	
Effective Green, g (s)	4.1	29.6		2.9	28.4	28.4	0.6	11.1		7.7	18.2	
Actuated g/C Ratio	0.05	0.39		0.04	0.38	0.38	0.01	0.15		0.10	0.24	
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	96	1386		68	703	597	14	261		181	421	
v/s Ratio Prot	c0.04	0.11		0.03	c0.26		0.01	c0.06		c0.08	0.08	
v/s Ratio Perm						0.04						
v/c Ratio	0.68	0.29		0.72	0.68	0.10	1.14	0.44		0.81	0.35	
Uniform Delay, d1	35.0	15.6		35.8	19.7	15.2	37.4	29.3		33.1	23.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	17.3	0.1		31.1	2.7	0.1	291.3	1.2		23.4	0.5	
Delay (s)	52.2	15.7		66.9	22.4	15.3	328.6	30.4		56.5	24.1	
Level of Service	D	B		E	C	B	F	C		E	C	
Approach Delay (s)		20.8			23.8			61.8			38.7	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	75.3	Sum of lost time (s)	24.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	143	324	10	15	374	97	5	35	10	75	45	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.97		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	1854		1770	1805			1803		1770	1639	
Flt Permitted	0.95	1.00		0.95	1.00			0.94		0.72	1.00	
Satd. Flow (perm)	1770	1854		1770	1805			1701		1345	1639	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	155	352	11	16	407	105	5	38	11	82	49	196
RTOR Reduction (vph)	0	1	0	0	10	0	0	9	0	0	165	0
Lane Group Flow (vph)	155	362	0	16	502	0	0	45	0	82	80	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	8.6	34.7		0.6	26.7			10.0		10.0	10.0	
Effective Green, g (s)	8.6	34.7		0.6	26.7			10.0		10.0	10.0	
Actuated g/C Ratio	0.14	0.55		0.01	0.42			0.16		0.16	0.16	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	240	1016		17	761			269		212	259	
v/s Ratio Prot	c0.09	0.20		0.01	c0.28						0.05	
v/s Ratio Perm								0.03		c0.06		
v/c Ratio	0.65	0.36		0.94	0.66			0.17		0.39	0.31	
Uniform Delay, d1	25.9	8.0		31.3	14.7			23.0		23.9	23.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	5.9	0.2		188.5	2.1			0.3		1.2	0.7	
Delay (s)	31.8	8.2		219.9	16.7			23.3		25.1	24.3	
Level of Service	C	A		F	B			C		C	C	
Approach Delay (s)		15.3			22.9			23.3			24.5	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	63.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*L. Kelsey*
Agency/Co.	*Six Mile Engineering, P.A.*
Date Performed	*November 2010*
Analysis Time Period	*2015 PM*

Site Information

Intersection	*Hoskins Road and Idaho 55*
Jurisdiction	*Canyon County*
Analysis Year	*2008*

Project Description *Idaho 55, Marsing to Nampa, Access Management Plan*

East/West Street: *Idaho 55* North/South Street: *Hoskins Road*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	82	247	0	0	292	194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	89	268	0	0	317	210
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	2	0	0	1	0
Configuration	LT	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	0	150	0	150
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate (veh/h)	0	0	0	163	0	163
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)	0			0		
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	1	0	1
Configuration				L		R

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT					L		R
Volume, v (vph)	89					163		163
Capacity, c_m (vph)	1050					329		586
v/c ratio	0.08					0.50		0.28
Queue length (95%)	0.28					2.62		1.13
Control Delay (s/veh)	8.7					26.2		13.5
LOS	A					D		B
Approach delay (s/veh)	--	--				19.9		
Approach LOS	--	--				C		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*L. Kelsey*	Intersection	*Marsing Road and Idaho 55*
Agency/Co.	*Six Mile Engineering, P.A.*	Jurisdiction	*Canyon County*
Date Performed	*November 2010*	Analysis Year	*2008*
Analysis Time Period	*2015 PM*		

Project Description	
East/West Street: *Marsing Road*	North/South Street: *Idaho 55*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*378*	*133*	*18*	*441*	*0*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR	*0*	*410*	*144*	*19*	*479*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*126*	*0*	*14*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR	*136*	*0*	*15*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*		*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*19*		*151*				
C (m) (vph)		*1026*		*282*				
v/c		*0.02*		*0.54*				
95% queue length		*0.06*		*2.93*				
Control Delay		*8.6*		*31.6*				
LOS		*A*		*D*				
Approach Delay	--	--	*31.6*					
Approach LOS	--	--	*D*					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	392	1196	372	558	1523	457	400	1175	776	191	1242	478
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	426	1300	404	607	1655	497	435	1277	843	208	1350	520
RTOR Reduction (vph)	0	0	81	0	0	2	0	0	1	0	0	2
Lane Group Flow (vph)	426	1300	323	607	1655	495	435	1277	842	208	1350	518
Turn Type	Prot		Perm	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	1	6	7	5	2	3
Permitted Phases			4			8			6			2
Actuated Green, G (s)	18.0	59.0	59.0	23.0	64.0	81.0	17.0	65.0	83.0	9.0	57.0	80.0
Effective Green, g (s)	18.0	59.0	59.0	23.0	64.0	81.0	17.0	65.0	83.0	9.0	57.0	80.0
Actuated g/C Ratio	0.10	0.33	0.33	0.13	0.36	0.45	0.09	0.36	0.46	0.05	0.32	0.44
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	343	1160	519	439	1258	765	324	1278	783	172	1121	756
v/s Ratio Prot	0.12	0.37		c0.18	c0.47	0.06	c0.13	0.36	0.11	0.06	c0.38	0.09
v/s Ratio Perm			0.20			0.25			0.42			0.24
v/c Ratio	1.24	1.12	0.62	1.38	1.32	0.65	1.34	1.00	1.08	1.21	1.20	0.68
Uniform Delay, d1	81.0	60.5	51.1	78.5	58.0	38.4	81.5	57.5	48.5	85.5	61.5	39.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	131.2	66.1	2.3	185.9	147.7	1.9	173.5	24.8	54.3	136.0	100.6	2.6
Delay (s)	212.2	126.6	53.4	264.4	205.7	40.3	255.0	82.3	102.8	221.5	162.1	42.5
Level of Service	F	F	D	F	F	D	F	F	F	F	F	D
Approach Delay (s)		129.9			188.9			118.5			138.1	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	145.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.32		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	119.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	66	1177	79	428	1497	451	170	204	476	321	246	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	1.00	1.00	0.97	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	1863	1583	3433	3431	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	3433	1863	1583	3433	3431	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	72	1279	86	465	1627	490	185	222	517	349	267	68
RTOR Reduction (vph)	0	0	50	0	0	223	0	0	6	0	19	0
Lane Group Flow (vph)	72	1279	36	465	1627	267	185	222	511	349	316	0
Turn Type	Prot		Perm	Prot		Perm	Prot		pm+ov	Prot		
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	5.0	45.0	45.0	17.0	57.0	57.0	11.0	26.0	43.0	12.0	27.0	
Effective Green, g (s)	5.0	45.0	45.0	17.0	57.0	57.0	11.0	26.0	43.0	12.0	27.0	
Actuated g/C Ratio	0.04	0.38	0.38	0.14	0.48	0.48	0.09	0.22	0.36	0.10	0.22	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	74	1327	594	486	1681	752	315	404	633	343	772	
v/s Ratio Prot	0.04	0.36		0.14	c0.46		0.05	0.12	c0.11	c0.10	0.09	
v/s Ratio Perm			0.02			0.17			0.21			
v/c Ratio	0.97	0.96	0.06	0.96	0.97	0.35	0.59	0.55	0.81	1.02	0.41	
Uniform Delay, d1	57.4	36.7	24.0	51.1	30.6	19.9	52.3	41.8	34.7	54.0	39.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	94.8	16.7	0.0	29.8	14.9	0.3	2.8	5.3	7.4	53.1	1.6	
Delay (s)	152.2	53.4	24.0	80.9	45.5	20.2	55.1	47.1	42.2	107.1	41.3	
Level of Service	F	D	C	F	D	C	E	D	D	F	D	
Approach Delay (s)		56.6			47.1			45.9			74.9	
Approach LOS		E			D			D			E	

Intersection Summary			
HCM Average Control Delay	52.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	1047	119	127	1346	111	120	330	150	100	375	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1845	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1845	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1138	129	138	1463	121	130	359	163	109	408	27
RTOR Reduction (vph)	0	0	32	0	0	23	0	0	68	0	2	0
Lane Group Flow (vph)	26	1138	97	138	1463	98	130	359	95	109	433	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	2.3	43.6	43.6	12.1	53.4	53.4	10.0	29.4	29.4	9.6	29.0	
Effective Green, g (s)	2.3	43.6	43.6	12.1	53.4	53.4	10.0	29.4	29.4	9.6	29.0	
Actuated g/C Ratio	0.02	0.37	0.37	0.10	0.45	0.45	0.08	0.25	0.25	0.08	0.24	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	34	1300	581	180	1592	712	149	461	392	143	451	
v/s Ratio Prot	0.01	0.32		c0.08	c0.41		c0.07	0.19		0.06	c0.23	
v/s Ratio Perm			0.06			0.06			0.06			
v/c Ratio	0.76	0.88	0.17	0.77	0.92	0.14	0.87	0.78	0.24	0.76	0.96	
Uniform Delay, d1	57.9	35.0	25.3	51.9	30.6	19.1	53.7	41.6	35.7	53.4	44.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	66.1	6.9	0.1	17.6	8.8	0.1	39.0	8.1	0.3	21.0	31.7	
Delay (s)	124.0	41.9	25.5	69.5	39.5	19.2	92.7	49.7	36.0	74.5	76.0	
Level of Service	F	D	C	E	D	B	F	D	D	E	E	
Approach Delay (s)		41.9			40.4			54.9			75.7	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	47.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	118.7	Sum of lost time (s)	24.0
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	991	186	76	1406	30	108	151	172	48	144	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	0.92		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3455		1770	3528		1770	1714		1770	1793	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3455		1770	3528		1770	1714		1770	1793	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	1077	202	83	1528	33	117	164	187	52	157	52
RTOR Reduction (vph)	0	13	0	0	1	0	0	34	0	0	10	0
Lane Group Flow (vph)	67	1266	0	83	1560	0	117	317	0	52	199	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.5	50.5		7.9	53.9		10.5	27.0		3.7	20.2	
Effective Green, g (s)	4.5	50.5		7.9	53.9		10.5	27.0		3.7	20.2	
Actuated g/C Ratio	0.04	0.45		0.07	0.48		0.09	0.24		0.03	0.18	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	70	1543		124	1681		164	409		58	320	
v/s Ratio Prot	0.04	0.37		c0.05	c0.44		c0.07	c0.18		0.03	0.11	
v/s Ratio Perm												
v/c Ratio	0.96	0.82		0.67	0.93		0.71	0.77		0.90	0.62	
Uniform Delay, d1	54.2	27.3		51.3	27.8		49.8	40.2		54.5	42.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	91.8	3.6		12.9	9.3		13.7	8.9		80.9	3.7	
Delay (s)	146.0	31.0		64.2	37.1		63.5	49.1		135.4	46.7	
Level of Service	F	C		E	D		E	D		F	D	
Approach Delay (s)		36.7			38.5			52.7			64.3	
Approach LOS		D			D			D			E	

Intersection Summary			
HCM Average Control Delay	41.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	113.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	847	9	57	1102	272	17	81	53	184	132	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97		1.00	0.94		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3534		1770	3434		1770	1752		1770	1754	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3534		1770	3434		1770	1752		1770	1754	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	921	10	62	1198	296	18	88	58	200	143	91
RTOR Reduction (vph)	0	1	0	0	18	0	0	19	0	0	18	0
Lane Group Flow (vph)	80	930	0	62	1476	0	18	127	0	200	216	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	7.8	55.5		6.8	54.5		2.0	19.7		16.0	33.7	
Effective Green, g (s)	7.8	55.5		6.8	54.5		2.0	19.7		16.0	33.7	
Actuated g/C Ratio	0.06	0.45		0.06	0.45		0.02	0.16		0.13	0.28	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	113	1608		99	1534		29	283		232	485	
v/s Ratio Prot	c0.05	0.26		0.04	c0.43		0.01	0.07		c0.11	c0.12	
v/s Ratio Perm												
v/c Ratio	0.71	0.58		0.63	0.96		0.62	0.45		0.86	0.45	
Uniform Delay, d1	56.0	24.6		56.4	32.7		59.6	46.2		51.9	36.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.3	0.5		11.7	14.9		34.8	5.1		26.4	2.9	
Delay (s)	74.3	25.1		68.1	47.6		94.4	51.3		78.3	39.4	
Level of Service	E	C		E	D		F	D		E	D	
Approach Delay (s)		29.0			48.4			56.0			57.3	
Approach LOS		C			D			E			E	

Intersection Summary			
HCM Average Control Delay	43.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	844	21	34	1035	56	15	45	15	23	35	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.97		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3526		1770	3512			1795		1770	1630	
Flt Permitted	0.95	1.00		0.95	1.00			0.92		0.76	1.00	
Satd. Flow (perm)	1770	3526		1770	3512			1662		1408	1630	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	179	917	23	37	1125	61	16	49	16	25	38	188
RTOR Reduction (vph)	0	2	0	0	3	0	0	7	0	0	141	0
Lane Group Flow (vph)	179	938	0	37	1183	0	0	74	0	25	85	0
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	15.4	55.1		3.3	43.0			24.5		24.5	24.5	
Effective Green, g (s)	15.4	55.1		3.3	43.0			24.5		24.5	24.5	
Actuated g/C Ratio	0.15	0.55		0.03	0.43			0.24		0.24	0.24	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	270	1925		58	1497			404		342	396	
v/s Ratio Prot	c0.10	0.27		0.02	c0.34						c0.05	
v/s Ratio Perm								0.04		0.02		
v/c Ratio	0.66	0.49		0.64	0.79			0.18		0.07	0.22	
Uniform Delay, d1	40.3	14.2		48.2	25.0			30.3		29.4	30.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	6.0	0.2		20.8	2.9			1.0		0.4	1.2	
Delay (s)	46.3	14.4		69.0	27.9			31.3		29.9	31.8	
Level of Service	D	B		E	C			C		C	C	
Approach Delay (s)		19.5			29.1			31.3			31.6	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Volume (vph)	611	329	214	262	324	486
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	694	374	243	298	368	552
RTOR Reduction (vph)	0	264	0	0	0	428
Lane Group Flow (vph)	694	110	243	298	368	124
Turn Type		Perm	Prot			Perm
Protected Phases	6		7	4	8	
Permitted Phases		6				8
Actuated Green, G (s)	20.0	20.0	14.6	35.8	15.2	15.2
Effective Green, g (s)	20.0	20.0	14.6	35.8	15.2	15.2
Actuated g/C Ratio	0.29	0.29	0.22	0.53	0.22	0.22
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1013	467	381	1869	793	355
v/s Ratio Prot	c0.20		c0.14	0.08	c0.10	
v/s Ratio Perm		0.07				0.08
v/c Ratio	0.69	0.24	0.64	0.16	0.46	0.35
Uniform Delay, d1	21.1	18.1	24.2	8.2	22.8	22.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.3	3.5	0.0	0.4	0.6
Delay (s)	23.1	18.4	27.7	8.3	23.2	22.7
Level of Service	C	B	C	A	C	C
Approach Delay (s)	21.4			17.0	22.9	
Approach LOS	C			B	C	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	67.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	182	18	570	200	21	681
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	1863	1583	1770	1863
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	207	20	648	227	24	774
RTOR Reduction (vph)	0	16	0	119	0	0
Lane Group Flow (vph)	207	4	648	108	24	774
Turn Type		Prot		Perm	Prot	
Protected Phases	2	2	8		7	4
Permitted Phases				8		
Actuated Green, G (s)	13.0	13.0	29.2	29.2	1.4	36.6
Effective Green, g (s)	13.0	13.0	29.2	29.2	1.4	36.6
Actuated g/C Ratio	0.21	0.21	0.47	0.47	0.02	0.59
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	334	883	750	40	1107
v/s Ratio Prot	c0.12	0.00	0.35		0.01	c0.42
v/s Ratio Perm				0.07		
v/c Ratio	0.55	0.01	0.73	0.14	0.60	0.70
Uniform Delay, d1	21.7	19.2	13.1	9.1	29.8	8.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	0.0	3.2	0.1	21.9	2.0
Delay (s)	23.5	19.2	16.3	9.2	51.7	10.6
Level of Service	C	B	B	A	D	B
Approach Delay (s)	23.1		14.4			11.9
Approach LOS	C		B			B

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱		↑↑	↱		↑↑	↱
Volume (vph)	0	1564	507	0	2095	517	0	204	646	0	246	384
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		0.91	1.00		0.91	1.00		0.95	1.00		0.95	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)		5085	1583		5085	1583		3539	1583		3539	1583
Flt Permitted		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)		5085	1583		5085	1583		3539	1583		3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1700	551	0	2277	562	0	222	702	0	267	417
RTOR Reduction (vph)	0	0	280	0	0	182	0	0	3	0	0	1
Lane Group Flow (vph)	0	1700	271	0	2277	380	0	222	699	0	267	416
Turn Type			Perm			Perm			Perm			Perm
Protected Phases		4			8			2			6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)		54.0	54.0		54.0	54.0		54.0	54.0		54.0	54.0
Effective Green, g (s)		54.0	54.0		54.0	54.0		54.0	54.0		54.0	54.0
Actuated g/C Ratio		0.45	0.45		0.45	0.45		0.45	0.45		0.45	0.45
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2288	712		2288	712		1593	712		1593	712
v/s Ratio Prot		0.33			c0.45			0.06			0.08	
v/s Ratio Perm			0.17			0.24			c0.44			0.26
v/c Ratio		0.74	0.38		1.00	0.53		0.14	0.98		0.17	0.58
Uniform Delay, d1		27.3	21.9		32.9	23.9		19.4	32.5		19.6	24.6
Progression Factor		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		1.3	0.3		17.6	0.8		0.0	28.9		0.1	1.2
Delay (s)		28.6	22.2		50.4	24.7		19.4	61.4		19.7	25.9
Level of Service		C	C		D	C		B	E		B	C
Approach Delay (s)		27.0			45.3			51.3			23.5	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	37.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	0	0	0	2376	236	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				3539	1770	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				3539	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	2583	257	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	2583	257	0
Turn Type						
Protected Phases	4			8	2	
Permitted Phases						
Actuated Green, G (s)				89.0	18.8	
Effective Green, g (s)				89.0	18.8	
Actuated g/C Ratio				0.74	0.16	
Clearance Time (s)				6.0	6.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				2629	278	
v/s Ratio Prot				c0.73	c0.15	
v/s Ratio Perm						
v/c Ratio				0.98	0.92	
Uniform Delay, d1				14.7	49.8	
Progression Factor				1.00	1.00	
Incremental Delay, d2				13.6	34.4	
Delay (s)				28.3	84.2	
Level of Service				C	F	
Approach Delay (s)	0.0			28.3	84.2	
Approach LOS	A			C	F	

Intersection Summary			
HCM Average Control Delay	33.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	119.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	1322	0	0	749	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	
Lane Util. Factor		0.95			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3539			3433	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3539			3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1437	0	0	814	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1437	0	0	814	0
Turn Type						
Protected Phases		4	8			
Permitted Phases					6	
Actuated Green, G (s)		48.1			28.4	
Effective Green, g (s)		48.1			28.4	
Actuated g/C Ratio		0.54			0.32	
Clearance Time (s)		6.0			6.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		1923			1102	
v/s Ratio Prot		c0.41				
v/s Ratio Perm					c0.24	
v/c Ratio		0.75			0.74	
Uniform Delay, d1		15.5			26.7	
Progression Factor		1.00			1.00	
Incremental Delay, d2		1.6			2.6	
Delay (s)		17.2			29.4	
Level of Service		B			C	
Approach Delay (s)		17.2	0.0		29.4	
Approach LOS		B	A		C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	88.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1147	246	0	1593	135	0	330	270	0	375	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Lane Util. Factor		0.95	1.00		0.95	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85		1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)		3539	1583		3539	1583		1863	1583		1863	1583
Flt Permitted		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)		3539	1583		3539	1583		1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1247	267	0	1732	147	0	359	293	0	408	136
RTOR Reduction (vph)	0	0	78	0	0	32	0	0	41	0	0	12
Lane Group Flow (vph)	0	1247	189	0	1732	115	0	359	252	0	408	124
Turn Type			Perm			Perm			Perm			Perm
Protected Phases		4			8			2			6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)		45.6	45.6		45.6	45.6		22.2	22.2		22.2	22.2
Effective Green, g (s)		45.6	45.6		45.6	45.6		22.2	22.2		22.2	22.2
Actuated g/C Ratio		0.57	0.57		0.57	0.57		0.28	0.28		0.28	0.28
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2022	905		2022	905		518	440		518	440
v/s Ratio Prot		0.35			c0.49			0.19			c0.22	
v/s Ratio Perm			0.12			0.07			0.16			0.08
v/c Ratio		0.62	0.21		0.86	0.13		0.69	0.57		0.79	0.28
Uniform Delay, d1		11.3	8.3		14.4	7.9		25.8	24.7		26.6	22.6
Progression Factor		0.94	0.98		0.97	0.97		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.6	0.1		3.8	0.1		4.0	1.8		7.8	0.4
Delay (s)		11.2	8.3		17.7	7.7		29.7	26.5		34.4	22.9
Level of Service		B	A		B	A		C	C		C	C
Approach Delay (s)		10.7			16.9			28.3			31.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1101	262	0	1545	92	0	151	280	0	144	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frt		0.97			0.99			1.00	0.85		1.00	0.85
Flt Protected		1.00			1.00			1.00	1.00		1.00	1.00
Satd. Flow (prot)		3437			3509			1863	1583		1863	1583
Flt Permitted		1.00			1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)		3437			3509			1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1197	285	0	1679	100	0	164	304	0	157	104
RTOR Reduction (vph)	0	22	0	0	5	0	0	0	56	0	0	18
Lane Group Flow (vph)	0	1460	0	0	1774	0	0	164	248	0	157	86
Turn Type									Perm			Perm
Protected Phases		4			8			2			6	
Permitted Phases									2			6
Actuated Green, G (s)		44.4			44.4			17.0	17.0		17.0	17.0
Effective Green, g (s)		44.4			44.4			17.0	17.0		17.0	17.0
Actuated g/C Ratio		0.60			0.60			0.23	0.23		0.23	0.23
Clearance Time (s)		6.0			6.0			6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		2079			2123			431	367		431	367
v/s Ratio Prot		0.42			c0.51			0.09			0.08	
v/s Ratio Perm									c0.16			0.05
v/c Ratio		0.70			0.84			0.38	0.68		0.36	0.24
Uniform Delay, d1		10.0			11.6			23.8	25.7		23.7	22.9
Progression Factor		0.96			0.95			1.00	1.00		1.00	1.00
Incremental Delay, d2		1.1			3.0			0.6	4.9		0.5	0.3
Delay (s)		10.6			14.1			24.3	30.5		24.2	23.2
Level of Service		B			B			C	C		C	C
Approach Delay (s)		10.6			14.1			28.4			23.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	73.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1105	66	0	1176	346	0	81	70	0	132	268
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0	6.0		6.0	6.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frt		0.99			0.97			1.00	0.85		1.00	0.85
Flt Protected		1.00			1.00			1.00	1.00		1.00	1.00
Satd. Flow (prot)		3509			3419			1863	1583		1863	1583
Flt Permitted		1.00			1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)		3509			3419			1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1201	72	0	1278	376	0	88	76	0	143	291
RTOR Reduction (vph)	0	5	0	0	33	0	0	0	50	0	0	42
Lane Group Flow (vph)	0	1268	0	0	1621	0	0	88	26	0	143	249
Turn Type									Perm			Perm
Protected Phases		4			8			2			6	
Permitted Phases									2			6
Actuated Green, G (s)		46.0			46.0			25.2	25.2		25.2	25.2
Effective Green, g (s)		46.0			46.0			25.2	25.2		25.2	25.2
Actuated g/C Ratio		0.55			0.55			0.30	0.30		0.30	0.30
Clearance Time (s)		6.0			6.0			6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1940			1890			564	479		564	479
v/s Ratio Prot		0.36			c0.47			0.05			0.08	
v/s Ratio Perm									0.02			c0.16
v/c Ratio		0.65			0.86			0.16	0.05		0.25	0.52
Uniform Delay, d1		13.0			15.8			21.2	20.6		21.9	24.0
Progression Factor		0.93			0.96			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.8			4.1			0.6	0.2		1.1	4.0
Delay (s)		12.9			19.3			21.8	20.8		23.0	28.0
Level of Service		B			B			C	C		C	C
Approach Delay (s)		12.9			19.3			21.3			26.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	0	0	0	810	214	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				3539	1770	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				3539	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	880	233	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	880	233	0
Turn Type						
Protected Phases	4			8	2	
Permitted Phases						
Actuated Green, G (s)				19.0	11.7	
Effective Green, g (s)				19.0	11.7	
Actuated g/C Ratio				0.44	0.27	
Clearance Time (s)				6.0	6.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				1575	485	
v/s Ratio Prot				c0.25	c0.13	
v/s Ratio Perm						
v/c Ratio				0.56	0.48	
Uniform Delay, d1				8.8	13.0	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.4	0.8	
Delay (s)				9.2	13.7	
Level of Service				A	B	
Approach Delay (s)	0.0			9.2	13.7	
Approach LOS	A			A	B	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	42.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	611	0	0	476	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0			6.0		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3433			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3433			3539		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	664	0	0	517	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	664	0	0	517	0	0
Turn Type						
Protected Phases	4			2	6	
Permitted Phases						
Actuated Green, G (s)	13.4			11.9		
Effective Green, g (s)	13.4			11.9		
Actuated g/C Ratio	0.36			0.32		
Clearance Time (s)	6.0			6.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	1233			1129		
v/s Ratio Prot	c0.19			c0.15		
v/s Ratio Perm						
v/c Ratio	0.54			0.46		
Uniform Delay, d1	9.5			10.1		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.5			0.3		
Delay (s)	9.9			10.4		
Level of Service	A			B		
Approach Delay (s)	9.9			10.4	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	37.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	0	0	0	1584	144	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1722	157	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		861	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		861	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		47	100
cM capacity (veh/h)			1622		295	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	0	0	861	861	157
Volume Left	0	0	0	0	157
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	295
Volume to Capacity	0.00	0.00	0.51	0.51	0.53
Queue Length 95th (ft)	0	0	0	0	73
Control Delay (s)	0.0	0.0	0.0	0.0	30.2
Lane LOS					D
Approach Delay (s)	0.0		0.0		30.2
Approach LOS					D

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	1166	0	0	227	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1267	0	0	247	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0				634	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				634	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				40	100
cM capacity (veh/h)	1622				412	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	634	634	0	0	247
Volume Left	0	0	0	0	247
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	412
Volume to Capacity	0.37	0.37	0.00	0.00	0.60
Queue Length 95th (ft)	0	0	0	0	95
Control Delay (s)	0.0	0.0	0.0	0.0	26.0
Lane LOS					D
Approach Delay (s)	0.0		0.0		26.0
Approach LOS					D

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	0	0	0	1466	171	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1593	186	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		797	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		797	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		43	100
cM capacity (veh/h)			1622		324	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	0	0	797	797	186
Volume Left	0	0	0	0	186
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	324
Volume to Capacity	0.00	0.00	0.47	0.47	0.57
Queue Length 95th (ft)	0	0	0	0	84
Control Delay (s)	0.0	0.0	0.0	0.0	30.0
Lane LOS					D
Approach Delay (s)	0.0		0.0		30.0
Approach LOS					D

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	1239	0	0	124	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1347	0	0	135	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0				673	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				673	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				65	100
cM capacity (veh/h)	1622				388	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	673	673	0	0	135
Volume Left	0	0	0	0	135
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	388
Volume to Capacity	0.40	0.40	0.00	0.00	0.35
Queue Length 95th (ft)	0	0	0	0	38
Control Delay (s)	0.0	0.0	0.0	0.0	19.1
Lane LOS					C
Approach Delay (s)	0.0		0.0		19.1
Approach LOS					C

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	
Volume (veh/h)	0	0	0	1431	91	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1555	99	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		778	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		778	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		70	100
cM capacity (veh/h)			1622		333	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	0	0	778	778	99
Volume Left	0	0	0	0	99
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	333
Volume to Capacity	0.00	0.00	0.46	0.46	0.30
Queue Length 95th (ft)	0	0	0	0	30
Control Delay (s)	0.0	0.0	0.0	0.0	20.3
Lane LOS					C
Approach Delay (s)	0.0		0.0		20.3
Approach LOS					C

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	930	0	0	241	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1011	0	0	262	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0				505	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				505	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				47	100
cM capacity (veh/h)	1622				496	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	505	505	0	0	262
Volume Left	0	0	0	0	262
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	496
Volume to Capacity	0.30	0.30	0.00	0.00	0.53
Queue Length 95th (ft)	0	0	0	0	76
Control Delay (s)	0.0	0.0	0.0	0.0	20.1
Lane LOS					C
Approach Delay (s)	0.0		0.0		20.1
Approach LOS					C

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰	
Volume (veh/h)	0	0	0	1125	180	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1223	196	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			0		611	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		611	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		54	100
cM capacity (veh/h)			1622		425	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	0	0	611	611	196
Volume Left	0	0	0	0	196
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	425
Volume to Capacity	0.00	0.00	0.36	0.36	0.46
Queue Length 95th (ft)	0	0	0	0	59
Control Delay (s)	0.0	0.0	0.0	0.0	20.5
Lane LOS					C
Approach Delay (s)	0.0		0.0		20.5
Approach LOS					C

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	1030	0	0	57	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1120	0	0	62	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0				560	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				560	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				86	100
cM capacity (veh/h)	1622				458	1084

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	560	560	0	0	62
Volume Left	0	0	0	0	62
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	458
Volume to Capacity	0.33	0.33	0.00	0.00	0.14
Queue Length 95th (ft)	0	0	0	0	12
Control Delay (s)	0.0	0.0	0.0	0.0	14.1
Lane LOS					B
Approach Delay (s)	0.0		0.0		14.1
Approach LOS					B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	1087	324	700	0	940
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1182	352	761	0	1022
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1113				943	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1113				943	176
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	0
cM capacity (veh/h)	623				261	837

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1	SB 2
Volume Total	591	591	176	176	761	511	511
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	761	511	511
cSH	1700	1700	1700	1700	1700	837	837
Volume to Capacity	0.35	0.35	0.10	0.10	0.45	0.61	0.61
Queue Length 95th (ft)	0	0	0	0	0	106	106
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	15.8	15.8
Lane LOS						C	C
Approach Delay (s)	0.0		0.0			15.8	
Approach LOS						C	

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	200	570	221	0	884
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	227	648	251	0	1005
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			439			492
pX, platoon unblocked						
vC, conflicting volume	1150	648			899	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1150	648			899	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	45			100	
cM capacity (veh/h)	192	413			751	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	227	648	251	502	502
Volume Left	0	0	0	0	0
Volume Right	227	0	251	0	0
cSH	413	1700	1700	1700	1700
Volume to Capacity	0.55	0.38	0.15	0.30	0.30
Queue Length 95th (ft)	81	0	0	0	0
Control Delay (s)	23.9	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	23.9	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	182	0	0	0	0	702
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	198	0	0	0	0	763
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	382	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	382	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	67	100			100	
cM capacity (veh/h)	594	1084			1622	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	198	0	0	382	382
Volume Left	198	0	0	0	0
Volume Right	0	0	0	0	0
cSH	594	1700	1700	1700	1700
Volume to Capacity	0.33	0.00	0.00	0.22	0.22
Queue Length 95th (ft)	36	0	0	0	0
Control Delay (s)	14.1	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	14.1	0.0		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

22: Marsing Median U-Turn South & Idaho 55

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	21	0	0	770	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	0	0	837	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	418	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	418	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	563	1084	1622			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	23	418	418	0	0
Volume Left	23	0	0	0	0
Volume Right	0	0	0	0	0
cSH	563	1700	1700	1700	1700
Volume to Capacity	0.04	0.25	0.25	0.00	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	11.7	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	11.7	0.0		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		