Final Report

## Russell Street/South 3rd Street Environmental Impact Statement

# Russell Street Traffic Analysis Update

August 2009

Prepared for:


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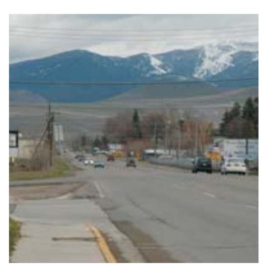

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

Russell Street/South 3rd Street
Environmental Impact Statement

# Russell Street Traffic Analysis Update

Missoula, Montana

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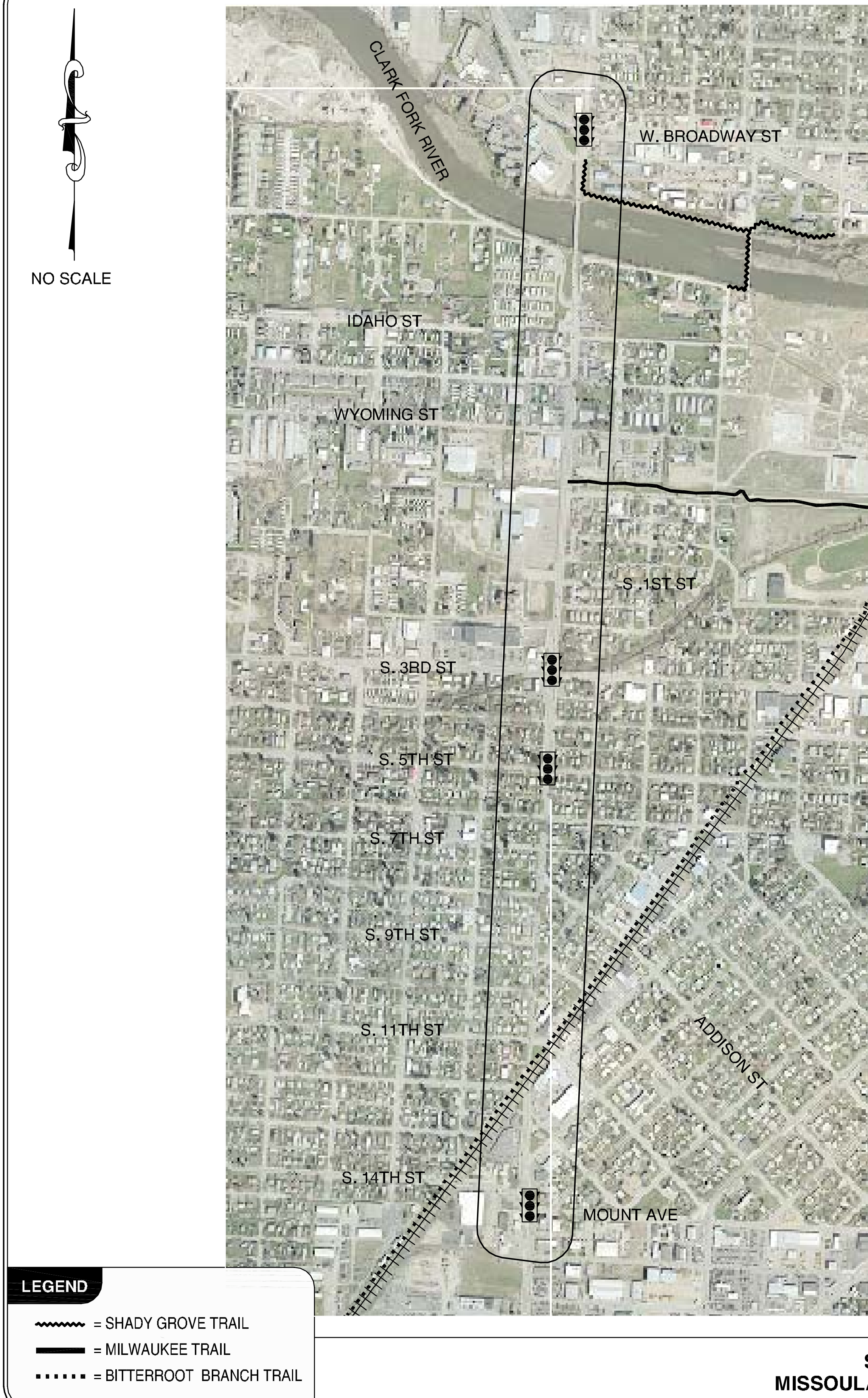
# Section 1
Executive Summary

# Executive Summary

The City of Missoula, Montana Department of Transportation (MDT), and FHWA completed a Draft Environmental Impact Statement (EIS) for the Russell Street/S. 3rd Street corridors in October 2008. The EIS was initiated in 2000 to evaluate alternatives to address the current and projected safety and mobility concerns on Russell Street and the connecting east-west corridor, S. 3rd Street As part of this DEIS, a traffic study was completed in 2005 and updated in 2007 prior to circulating the DEIS in July 2008 (Reference 1). The traffic study evaluated six alternatives under future traffic conditions and identified future capacity and level of service deficiencies for the corridor. However, due to the recent update of the regional travel demand model, the 2008 Missoula Long Range Transportation Plan (LRTP, Reference 2), and public comments, the City, MDT, and FHWA (referred to as project team in the remainder of the report) sponsored a peer review and Traffic Analysis Update (TAU) of the alternatives which is documented herein.

In March 2009, the TAU was initiated to perform a traffic operations, safety, and multimodal evaluation of Alternatives 1, 2, 3, 4, and 5-Refined and two additional options (referred to as Option 6 and 7) identified by the project team. The analysis was performed under year 2035 traffic conditions, which is consistent with the Missoula LRTP.

The study area included Russell Street between Mount Avenue/S. 14th Street and W. Broadway Street. Figure 1 illustrates the study area. Figure 2 illustrates the five alternatives and two options that were analyzed in the TAU. Table 1 summarizes the number of travel lanes and intersection control associated with the DEIS Alternatives and Options 6 and 7.




**STUDY AREA**
**MISSOULA, MONTANA**

FIGURE **1**

*H:\projfile\9887 - Russell Street EIS Traffic Update\dwgs\figs\Report\Draft\9887StudyAreaFigure.dwg Aug 10, 2009 - 2:53pm - acibor Layout Tab: FIG01 - STUDY AREA*


**RUSSELL STREET BUILD ALTERNATIVES AND OPTIONS**
**MISSOULA, MONTANA**

FIGURE 2

## Table 1 Description of Alternatives and Options

| Segment / Intersection | DEIS Alternatives | | | | | Option 6 | Option 7 |
|---|---|---|---|---|---|---|---|
| | Alt 1[1] | Alt 2 | Alt 3 | Alt 4 | Alt 5-R | | |
| W. Broadway | Signal | Signal | Signal | Signal | Signal | Signal | Signal |
| W. Broadway to Wyoming | 2+ Lanes [2] | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes |
| Wyoming | TWSC | ML rbt | ML rbt | Signal | Signal | SL rbt | Signal |
| Wyoming to S. 3rd | 2+ Lanes | 2+ Lanes | 2+ Lanes | 4+ Lanes | 4+ Lanes | 2+ Lanes | 4+ Lanes |
| S. 3rd | Signal | ML rbt | ML rbt | Signal | ML rbt | SL rbt | Signal |
| S. 3rd to S. 5th | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes | 2+ Lanes | 4+ Lanes |
| S. 5th | Signal | ML rbt | ML rbt | Signal | ML rbt | SL rbt | Signal |
| S. 5th to S. 6th | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes | 4+ Lanes | 2+ Lanes | 2+ Lanes |
| S 6th to S. 8th | 2 Lanes | 2+ Lanes | 2+ Lanes | 4+ Lanes | 4+ Lanes | 2+ Lanes [3] | 2+ Lanes |
| S. 8th to S. 11th-Knowles | 2 Lanes | 2 Lanes | 2+ Lanes | 4+ Lanes | 4+ Lanes | 2 Lanes | 2+ Lanes |
| S. 11th-Knowles | TWSC | SL rbt | SL rbt | TWSC | TWSC | SL rbt | TWSC |
| S. 11th- Knowles to S. 14th-Mount | 2 Lanes to 4 Lanes | 2 Lanes to 4+ Lanes | 2 Lanes to 4+ Lanes | 4+ Lanes | 4+ Lanes | 2+ Lanes | 2+ Lanes to 4+ Lanes |
| S. 14th-Mount | Signal | ML rbt | ML rbt | Signal | Signal | Signal | Signal |

| Symbol | Description | Symbol | Description |
|---|---|---|---|
| 2 Lanes | This symbol represents one travel lane in each direction and no median. | TWSC | This symbol represents an unsignalized intersection with two-way, stop control. |
| 4 Lanes | This symbol represents two travel lanes in each direction and no median. | Signal | This symbol represents an intersection with a traffic signal control. |
| 2+ Lanes | This symbol represents one travel lane in each direction with a raised or painted median. | SL rbt | This symbol represents an intersection with a single lane roundabout. |
| 4+ Lanes | This symbol represents two travel lanes in each direction with a raised or painted median. | ML rbt | This symbol represents an intersection with a multilane roundabout. |

[1]Alternative 1 has the same cross-section, lane configurations, and traffic control as existing conditions.
[2]The existing bridge is a two-lane bridge.
[3]In Option 6, two travel lanes are provided between 7th and 8th.

The key findings and recommended design enhancements of the TAU study are provided below.

## FINDINGS

### Year 2009 Existing Conditions

- Russell Street is a critical north-south transportation corridor serving as one of five bridge crossings over the Clark Fork River within the City, and provides access to downtown and several neighborhoods.
- Daily traffic volumes on the corridor range between 20,000 and 22,000 vehicles and include both local and regional trips across the bridge.
- Traffic on Russell Street has seen a steady growth rate of 0.7 percent per year over the past 30-years. Overall, traffic volumes in the study area (Russell Street, S. 3rd Street, and Wyoming Street) have seen a small change over the past 15 years but an increase of approximately 0.5-percent to 1.2-percent over the past 30 years.
- The existing weekday p.m. peak hour is between 4:30 p.m. and 5:30 p.m. Between 1:00 p.m. and 6:00 p.m. the hourly traffic volumes on Russell Street are within approximately 10-percent of the weekday p.m. peak hour. The weekday a.m. peak hour link volumes on Russell Street are approximately 25- to 33-percent lower than the weekday p.m. peak hour.
- The average travel time on Russell Street between W. Broadway Street and S. 14th Street-Mount Avenue in the northbound and southbound directions of travel is approximately 5 and 6 minutes, respectively during the weekday p.m. peak hour. The average weekday p.m. peak hour travel time on this section of Russell Street is approximately 45-60 seconds greater than the average daily travel time.
- Traffic counts and field observations revealed a fair amount of non-motorized traffic along the corridor in March 2009.
- There are currently four Mountain Line bus routes (Routes 2, 8, 9, and 10) that have scheduled stops on the study corridor. Mountain Line system-wide ridership has increased each of the past three fiscal years resulting in an annual growth rate of approximately 7.0-percent.
- Twelve of the study intersections do not currently meet the MDT LOS "C" threshold and eight of the study intersections do not currently meet the City LOS "D" threshold. All of these intersections are currently unsignalized, except for the W. Broadway Street/Russell Street and S. 3rd Street/Russell Street intersections.
- From the multimodal analysis, the pedestrian and transit LOS is "D" and the bicycle LOS is "F" for the Russell Street corridor under existing conditions. The bicycle LOS is poor due to the lack of bicycle facilities along the corridor.
- The corridor crash rate over the most recent four-year period is approximately 8.4 accidents per million vehicle miles. Intersections with the highest number of crashes on the corridor are W. Broadway Street, Wyoming Street, S. 3rd Street, S. 4th Street, and S. 14th Street-Mount

Avenue. The W. Broadway Street and Wyoming Street intersections have higher proportions of injury crashes.

- Over the past four years, 21 crashes were reported between bicyclists and automobiles and zero crashes were reported for pedestrians. Over seventy-five percent of the bicyclist crashes occurred on the segment between S. 3rd Street and W. Broadway Street.

### Development of Traffic Volumes

- Travel demand model traffic forecasts for the Year 2005 No Build, Year 2035 3-Lane Russell Street, and Year 2035 5-Lane Russell Street scenarios were obtained from MDT and Office of Planning and Grants (OPG) and used to develop forecast year 2035 traffic volumes at the study intersections. The NCHRP 255 methodology was used in the development of the year 2035 weekday p.m. peak hour traffic volumes.
- Two year 2035 traffic volume scenarios (3-lane Russell Street and 5-lane Russell Street) were developed and used in this analysis. Alternatives 1, 2, 3, and Option 6 were analyzed with the 3-lane volume scenario. Alternatives 4 and 5-Refined and Option 7 were analyzed with the 5-lane volume scenario.
- The forecast year 2035 weekday p.m. peak hour travel demand model volumes (3-lane section) result in an 5- to 15-percent reduction in traffic volumes along Russell Street in comparison to the model volumes with Russell Street as a five-lane corridor. The traffic reduction is due to rerouting to adjacent parallel facilities (i.e., Reserve Street and Orange Street).
- The projected growth rates assuming a 5-lane Russell Street corridor (2.3-percent) are approximately double the historical growth rate (1.2-percent) and the projected growth rates assuming a 3-lane Russell Street corridor is 1.9-percent. The overall regional growth rate is consistent under both scenarios.
- A higher growth rate is anticipated to occur over the next 30 years on Russell Street than over the past 30 years due to the corridor having available capacity versus other parallel transportation facilities and redevelopment of several large vacant properties near the corridor. However, under both the 3-lane and 5-lane scenario, traffic volumes are expected to be diverted to other transportation facilities due to the corridor being congested and drivers experiencing longer travel times.

### Evaluation of Alternatives and Options

- Intersection and corridor traffic operations analysis was performed using Synchro, 2000 Highway Capacity Manual (HCM), and draft methodologies (NCHRP 572) for roundabouts to be included in the 2010 HCM.
- The safety analysis was conducted using the procedures outlined in the draft Highway Safety Manual (HSM). The urban and suburban arterials methodology was applied to the analysis of Russell Street and provides a relative comparison between the different alternatives for Russell Street, since the analysis was not calibrated to local conditions.

- For the multimodal LOS analysis, the methodology from the NCHRP 3-70 was used as a basis for evaluating multiple modes of travel, such as bicyclists, transit, and pedestrians on the Russell Street corridor. It consists of a set of recommended procedures for predicting traveler perceptions of quality of service and performance measures for urban streets.

Table 2 provides a summary of the operations, safety, and multimodal analysis for the five alternatives and two options. If a performance measure is rated "Good," for a given alternative or option it can be concluded that the analysis found it to be relatively good or superior to other alternatives/options; however, it doesn't necessarily mean that it is absolutely good or acceptable per jurisdiction standards. Likewise, if a performance measure is rated "Poor," for a given alternative or option it can be concluded that the analysis found it to be relatively poor or inferior to other alternatives/options; however, it doesn't necessarily mean that it is absolutely poor or unacceptable per jurisdiction standards.

**Table 2 Performance Summary of Alternatives and Options**

| Performance Measure | | DEIS Alternatives | | | | | Options | |
|---|---|---|---|---|---|---|---|---|
| | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5-R | Option 6 | Option 7 |
| Major Intersections | Safety | ○ | ● | ● | ◐ | ● | ◐ | ◐ |
| | Automobile | ○ | ○ | ○ | ● | ◐ | ○ | ◐ |
| | Pedestrian | ○ | ◐ | ◐ | ● | ○ | ◐ | ● |
| | Bicycle | ○ | ○ | ○ | ● | ◐ | ○ | ● |
| Corridor Segments | Safety | ○ | ◐ | ◐ | ● | ● | ◐ | ◐ |
| | Automobile | ◐ | ○ | ○ | ● | ◐ | ○ | ● |
| | Pedestrian | ○ | ◐ | ◐ | ● | ● | ◐ | ◐ |
| | Bicycle | ○ | ◐ | ◐ | ● | ◐ | ◐ | ● |
| | Transit | ○ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |

● = Good ◐ = Fair ○ = Poor

### *Traffic Operations*

- Under Alternative 1, the intersection operations are projected to operate over capacity and at a LOS E or worse under year 2035 traffic conditions for both the 3-lane and 5-lane volume scenario. The travel time in the southbound and northbound directions of travel is approximately 7-½ and 6-½ minutes (3-lane volumes) and approximately 8-½ and 9 minutes (5-lane volumes), respectively, which is an increase by approximately 50-60 percent from the existing traffic conditions.

- The intersection of W. Broadway Street and Russell Street is projected to operate at a LOS "E" or worse and over capacity under all of the alternatives and options. Some lane enhancements can be provided at this intersection to improve the approach LOS, but not the overall intersection LOS.
- The intersections of W. Broadway Street/Russell Street and S. 14th Street-Mount Avenue/Russell Street are forecast to operate over capacity under year 2035 traffic conditions for all of the alternatives and options. It is expected that these intersections will meter the traffic able to access Russell Street during the weekday p.m. peak hour with the following results:
    - Russell Street may have a longer period of congestion.
    - Other corridors may see an increase in traffic volumes due to drivers avoiding Russell Street during the peak conditions.
    - Drivers may choose to use alternative modes of transportation, such as biking, transit, or walking to complete their trip, or choose to drive at other times of the day when the corridor is less congested.
- The other major intersections (Wyoming Street, S. 3rd Street, S. 5th Street, and S. 11th Street-Knowles Street) for Alternatives 2, 3, and Option 6 are all projected to operate over capacity and at a LOS "E" or worse under year 2035 traffic conditions. The travel time for these alternatives/options increase by several minutes over the no-build conditions.
- Alternative 4 has some intersections (W. Broadway Street, S. 3rd Street, and S. 14th Street-Mount Avenue) that are projected to operate at LOS "F" and over capacity under year 2035 traffic conditions. However, lane enhancements can be provided at all of the intersections to improve the LOS and achieve under capacity conditions (W. Broadway Street would be at a volume-to-capacity ratio of 1.03).
- Alternative 5-Refined has better intersection operations than Alternatives 2, 3, and Option 6. However, the multilane roundabout at the intersection of S. 3rd Street and Russell Street continues to operate over capacity and a LOS "F" as a roundabout.
- Option 7 has better intersection operations than Alternatives 2, 3, 5-Refined, and Option 6. However, the reduced through-lane capacity between S. 6th Street and S. Lawrence Street in conjunction with the over-capacity conditions and queue spillback at S. 3rd Street and S. 14th Street-Mount Avenue results in vehicle queues and congested operations on the southern section of the corridor.
- Alternative 4 and Option 7 are projected to generally operate acceptably on the corridor between S. 3rd Street and W. Broadway Street. Due to overcapacity conditions for the northbound left-turn lane at S. 3rd Street/Russell Street intersection and the southbound left-turn lane at S. 14th Street-Mount Avenue/Russell Street intersection, the alternative and option are anticipated to experience lengthy vehicle queues and congested operations over the peak hour. With the consistent two travel lanes in each direction under Alternative 4, it is expected that this alternative would result in a shorter duration of congested conditions than Option 7. However, as noted, both Alternative 4 and Option 7 are projected to both

breakdown operationally due to the projected traffic volumes and capacity deficiencies at the intersections of S. 3rd Street/Russell Street and S. 14th Street-Mount Avenue/Russell Street.

### Safety

- All of the alternatives and options provide a safety improvement over the no-build conditions.
- Alternatives 2 and 3 provide the greatest safety improvements over the no-build conditions (Alternative 1) 3-lane volume scenario (65-67 percent). Alternative 5-Refined provides the greatest safety improvements over the no-build conditions (Alternative 1) 5-lane volume scenario (63 percent).
- Key factors that improve safety along Russell Street include the implementation of raised medians that reduce the overall number of turning movement conflicts, the addition of left-turn lanes where left-turns are allowed, and the implementation of roundabouts at intersections. These three factors generally differentiate the alternatives.

### Multimodal Level of Service

- Alternative 4 and Option 7 achieve the overall highest bicycle LOS for the corridor with a LOS E.
- All of the alternatives and options perform better than the existing and no-build conditions for the pedestrian LOS at a LOS C. Option 6 operates worse than Alternatives 2 through 5-Refined due to the lack of boulevard treatment at the southern section of the corridor, between S. 7th Street and S. 11th Street. Option 7 operates worse than Alternative 4 due to the higher traffic volumes in the adjacent travel lane next to the sidewalk for pedestrians in the southern section of the corridor, between S. 6th Street and Lawrence Street.
- The transit LOS is projected at a LOS C for all of the alternatives and option.

### Lifespan Analysis

A lifespan analysis was performed for each alternative and option to identify the timeline that each alternative and option is projected to operate at an acceptable level of service and under capacity traffic conditions. The analysis provides a general understanding of the traffic volume reduction (i.e., drivers reroute to other facilities, people shift from auto trips to walking, biking, and transit trips, or change their commute/trips to a different time of the day) that would need to occur to provide acceptable traffic operations under that alternative or option in the year 2035. Table 3 summarizes the lifespan analysis for each alternative and option.

**Table 3 Lifespan Analysis Summary**

| Alternative / Option | Critical Intersection Level Of Service[1] | Last Year of Acceptable Operations | Year 2035 Traffic Demand Shift[1] | | |
|---|---|---|---|---|---|
| | | | PM Peak Link[2] | Daily Link[2] | Percent Change |
| Alternative 2 | S. 11th Street – Knowles Street | 2010[3] | -1,000 | -12,500 | -36% |
| Alternative 3 | S. 11th Street – Knowles Street | 2010[3] | -1,000 | -12,500 | -36% |
| Alternative 4 | W. Broadway Street | 2023 | -600 | -8,000 | -20% |
| Alternative 5-R | S. 3rd Street | 2012 | -1,200 | -15,000 | -39% |
| Option 6 | Wyoming Street, S. 3rd Street, & S. 5th Street | 2009 | -1,000 | -13,000 | -38% |
| Option 7 | W. Broadway Street | 2023 | -600 | -8,000 | -20% |

[1]The thresholds used in the analysis to determine acceptable traffic operations include: LOS D or better; volume-to-capacity ratio of 1.0 or less at traffic signals; and volume-to-capacity ratio of 0.85 or less at roundabouts.

[2]Alternatives 2 and 3, and Option 6 are based on the 3-lane traffic volume scenario. Alternatives 4, 5-Refined, and Option 7 are based on the 5-lane traffic volume scenario.

[3]For Alternatives 2 and 3, S.11th Street – Knowles Street intersection does not meet LOS and volume-to-capacity standards in the year 2011. If a roundabout traffic control was not included at this intersection, these two alternatives would operate acceptably until the year 2019.

## RECOMMENDED DESIGN ENHANCEMENTS

The following list provides a summary of intersection and roadway enhancements to improve the multimodal operations and safety of the corridor that could be considered as part of the preferred alternative in the FEIS.

- The pedestrian LOS and safety could be enhanced at the signalized intersections with the following treatments.
  - Stamped Concrete in Crosswalk: Provides drivers a visual cue to be aware of pedestrians.
  - Leading or Lagging Pedestrian Interval: Start the pedestrian phase a few seconds before the vehicle phase or end the pedestrian phase a few seconds after the vehicle phase to provide additional buffer between the vehicle and pedestrian phases.
  - Pedestrian Countdown Signals: Provides additional guidance to pedestrians on the amount of time that is available to cross the intersection before a vehicle phase begins.
  - Pedestrian Island Refuge: Provides pedestrians with a refuge while crossing a larger-sized intersection.
- The bicycle LOS and safety could be enhanced at the signalized intersections and along the corridor with the following treatments.
  - Bike Box: A 14-foot deep reservoir in front of vehicle stop bar used for locations with shared through-right turn lanes to improve awareness for motorists and bicyclists.

  - Inductive Loop Bicycle Detection: When a bicyclist pulls onto the bicycle stencil, inductance on loop changes and detects the presence of a bicycle and assists with reducing delay to bicyclists.
  - Colored/Outlined Bike Lanes: Coloring/outlining of bike lane enhances vehicular and bicycle awareness on the street.
- The transit LOS could be enhanced along the corridor with the following treatments.
  - Increase the service frequency of buses (i.e., move from 30-minute headways to 15-minute headways) on the existing routes for the northern section of the corridor.
  - Provide transit service to the southern section of the corridor.
  - Provide an accessible path between the stop area and the sidewalk.
- The automobile LOS and safety could be enhanced at the signalized intersections and along the corridor with the following treatments.
  - Develop coordinated signal timing plans for the signalized intersections based on the posted speed for the corridor.
  - W. Broadway Street/Russell Street - Extend the storage length for the northbound and westbound left-turn lanes to approximately 500 feet and add a 2nd eastbound right-turn lane. The addition of a second eastbound right-turn lane provides an additional three years of acceptable operations and a 5-percent (+230 p.m. peak hour vehicles) increase in total entering volume served at this intersection.
  - S. 3rd Street/Russell Street – Extend the storage length for the eastbound and southbound left-turn lanes to approximately 500 feet and 150 feet, respectively. Either, extend the storage length for the northbound left-turn lane to S. 5th Street or add a second northbound left-turn lane. The addition of a northbound left-turn lane provides an additional eight years of acceptable operations and a 20-percent (+840 p.m. peak hour vehicles) increase in total entering volume served at this intersection.
  - S. 11th Street-Knowles Street/Russell Street – Monitor the traffic volumes at this intersection for potential future signalization as it serves as the only east-west crossing of the railroad for the neighborhood between S. 6th Street and S. 14th Street-Mount Avenue. (Note: *The signal should be evaluated in conjunction with the existing railroad crossings on Russell Street and on S.11th Street-Knowles.*)
- S. 14th Street-Mount Avenue/Russell Street – Extend the storage length for the southbound left-turn lane up to Lawrence Street or add a second southbound left-turn lane. Add a northbound right-turn lane. Extend the storage lengths or add a second left-turn lane for the westbound and eastbound left-turn lanes. The addition of a southbound left-turn and northbound right-turn lanes provide an additional five years of acceptable operations and an 11-percent (+440 p.m. peak hour vehicles) increase in total entering volume served at this intersection.

Many of these enhancements could be considered at any of the alternatives or options evaluated as part of the TAU. Additional details of the study methodology, findings, and recommendations are provided within this report.

## Section 2
Introduction

# Introduction

## PROJECT BACKGROUND

The Russell Street corridor, defined for this project as Mount Avenue/S. 14th Street to W. Broadway Street, is a critical north-south transportation facility for the City of Missoula. As shown in Figure 1, Russell Street is one of five bridge crossings over the Clark Fork River within the City, and provides access to downtown and several neighborhoods. The transportation corridor includes both signalized and unsignalized intersection control with limited pedestrian and bicycle facilities (i.e., sidewalk, curb ramps, bike lanes, etc.). The corridor currently has capacity, safety, and accessibility deficiencies and the City is seeking to improve the corridor, in order to enhance this transportation facility and general livability of the surrounding neighborhoods.

An Environmental Impact Statement (EIS) was initiated in 2000 to evaluate alternatives to address the current and projected safety, mobility, and multimodal concerns on Russell Street and the connecting east-west corridor, S. 3rd Street. The Russell Street alternatives identified in the Draft EIS (DEIS) include Alternatives 1, 2, 3, 4, 5, and 5-Refined. Section 4 describes the alternatives in more detail and Figure 2 illustrates all of these alternatives, except for Alternative 5. These alternatives, except for the no-build alternative, include continuous sidewalks, curb/gutter, bike lanes, boulevard treatments, illumination, and bus pullouts.

As part of this EIS, a traffic study was completed in 2005 and updated in 2007 prior to circulating the DEIS in August 2008. The traffic study evaluated the six alternatives under existing and future traffic conditions and identified existing and future capacity and level of service deficiencies for the corridor. However, due to the recent update of the regional travel demand model, the 2008 Missoula LRTP, and public comments, the City, MDT, and FHWA (referred to as project team in the remainder of the report) sponsored a peer review and Traffic Analysis Update (TAU) of the alternatives to be included in the Final EIS.

## TRANSPORTATION ANALYSIS UPDATE (TAU) OVERVIEW

The TAU includes a detailed traffic operations, safety, and multimodal analysis of the existing and future (year 2035) traffic conditions of Alternatives 1, 2, 3, 4, 5-Refined and two additional options (called Options 6 and 7). Alternative 5-Refined was analyzed in the TAU, as it was identified to take the place of Alternative 5 in the DEIS. The two options were identified by the project team and combine elements from the alternatives outlined in the DEIS. Through this work effort, the project team will gain an understanding of the traffic, safety, and multimodal elements for each alternative and option under year 2035 conditions, as well as the timeline for acceptable operations of the alternatives and options. The resultant analysis should assist the project team with the update of the transportation section in the FEIS and moving towards a Record of Decision.

## STUDY PROCESS

This study process is broken up into four distinct portions, each correlating to a specific technical deliverable. The four major portions of the study include:

- Data collection and development of traffic volumes (Stage 1);
- Future year 2035 operational, safety, and multimodal alternatives analysis (Stage 2);
- Corridor operational alternatives analysis (Stage 3); and
- Project summary (Stage 4).

Stage 1 involved the coordination of the transportation data needed to complete the TAU and the development of the existing and future year 2035 traffic volumes. This stage included the following key items: a field visit, Team Meeting #1 and presentation with the project team, conference calls with the project team, and the development of Draft and Final Technical Memorandum #1. Final Technical Memorandum #1 presents a summary of the data collection efforts and development of traffic volumes (Reference 3).

Stage 2 involved an intersection-level traffic operations analysis for the existing and future year 2035 traffic conditions. In addition, a safety and multi-modal level of service analysis was completed for the alternatives and options. This stage included Team Meeting #2 and a presentation with the project team, conference calls with the project team, and the development of Draft and Final Technical Memorandum #2. Final Technical Memorandum #2 presents a summary of methodology and results from the year 2035 operational, safety, and multimodal analysis of the DEIS Alternatives 1, 2, 3, 4, and 5-Refined and Options 6 and 7 (Reference 4).

Stage 3 involved a more detailed operations analysis of Russell Street using a micro-simulation model and the development of a visualization video for Alternative 4 and Option 7. Alternative 4 and Option 7 were identified to be carried forward to simulation by the project team based on the analysis findings presented in Technical Memorandum #2. It should be noted that Alternative 4 is the preferred alternative in the DEIS. This stage included conference calls with the project team, the development of Draft and Final Technical Memorandum #3, and two visualization videos of Alternative 4 and Option 7. Final Technical Memorandum #3 presents a summary of the VISSIM simulation models for Alternative 4 and Option 7 (Reference 5). *Technical Appendices were developed and finalized as part of Stages 1, 2, and 3 for Technical Memoranda #1, #2, and #3. No new analysis was generated for this report, so the technical appendix only includes the meeting minutes from conference calls and meetings.*

Stage 4 includes the development of this report and final presentation to the project team. The report provides an overall project summary of the findings of the three technical memoranda and recommended design enhancements for use in developing the FEIS.

## PROJECT TEAM INVOLVEMENT

The TAU project team is comprised of staff from the following agencies and firms:

- City of Missoula (staff and Council)
- Montana Department of Transportation (MDT), Missoula District and Headquarters
- Federal Highway Administration (FHWA)
- Missoula Office of Planning and Grants
- DOWL HKM
- Kittelson & Associates, Inc. (KAI)
- Gallatin Public Affairs

In addition to providing oversight and review in the development of the TAU Study, the project team participated in the following project meetings and conference calls:

- April 2, 2009 – Conference Call
- April 13, 2009 – Team Meeting #1 at MDT Missoula District Offices
- May 21, 2009 – Conference Call
- June 4, 2009 –Conference Call
- June 15, 2009 – Meeting #2 at MDT Missoula District Offices
- June 25, 2009 – Conference Call
- July 9, 2009 – Conference Call
- July 23, 2009 – Conference Call
- August 6, 2009 – Conference Call
- August 17, 2009 – Meeting #3 at MDT Missoula District Offices
- August 20, 2009 - Conference Call

The TAU has been an open forum for individuals outside of the project team to participate and provide feedback. As such, representatives from the Missoula Institute for Sustainable Transportation (MIST) and Bike-Walk Alliance for Missoula (BWAM) have also participated in the effort. The TAU did not include a formal public involvement process, but members of these groups have participated in the team meetings and provided comments on the technical memoranda. The project team has addressed questions and provided responses to the technical memoranda comments from these groups. Before the EIS is finalized, it is anticipated that the findings of this report and additional work will be incorporated into the EIS. The Final EIS will be presented to the general public for comment and input. *Appendix "A" includes the meeting minutes for each of the project team conference calls and meetings.*

# Section 3
Existing Conditions

# Existing Conditions

The existing conditions analysis identifies the current geometric, operational, and safety characteristics of the Russell Street corridor area. These conditions represent how the corridor functions today and will be compared with future conditions later in this report.

The Russell Street corridor was visited, inventoried, and observed throughout the course of a typical weekday with sunny and school-in-session conditions in April 2009. At that time, information regarding corridor conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area was collected. An additional visit to the study corridor was completed in June 2009.

## STUDY AREA CHARACTERISTICS

Russell Street is a two- to five-lane roadway with a posted speed of 30 miles-per-hour between S. 14th Street-Mount Avenue and W. Broadway Street. This roadway is classified by MDT as a (non-Interstate) Principal Arterial (Reference 6) and a Principal Arterial by the City. Russell Street is one of five roadways in the City that crosses the Clark Fork River and does so with a two-lane bridge. Land uses in the study area consist of a mix of residential, retail, and industrial.

### *Roadway Facilities*

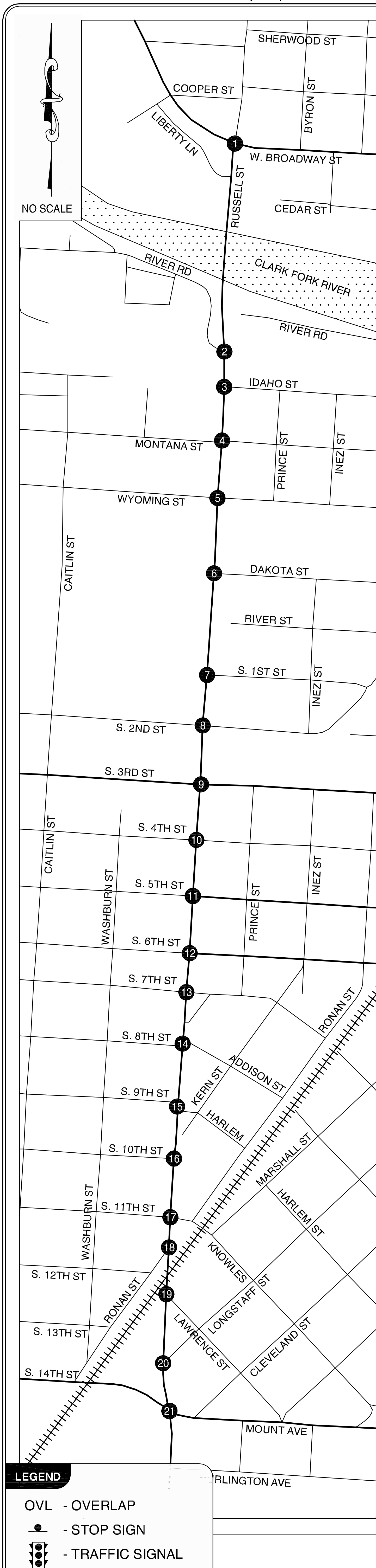
Figure 3 illustrates the existing lane configurations and traffic control devices at the 21 study intersections. As illustrated in Figure 1, currently four of the study intersections (W. Broadway Street, S. 3rd Street, S. 5th Street, and S. 14th Street-Mount Avenue) are signalized and the remaining intersections operate with stop control on the minor approaches. In addition to the unsignalized study intersections along the corridor, there are approximately 70 access points (i.e., alleys, commercial driveways, and residential driveways) also along the study corridor.

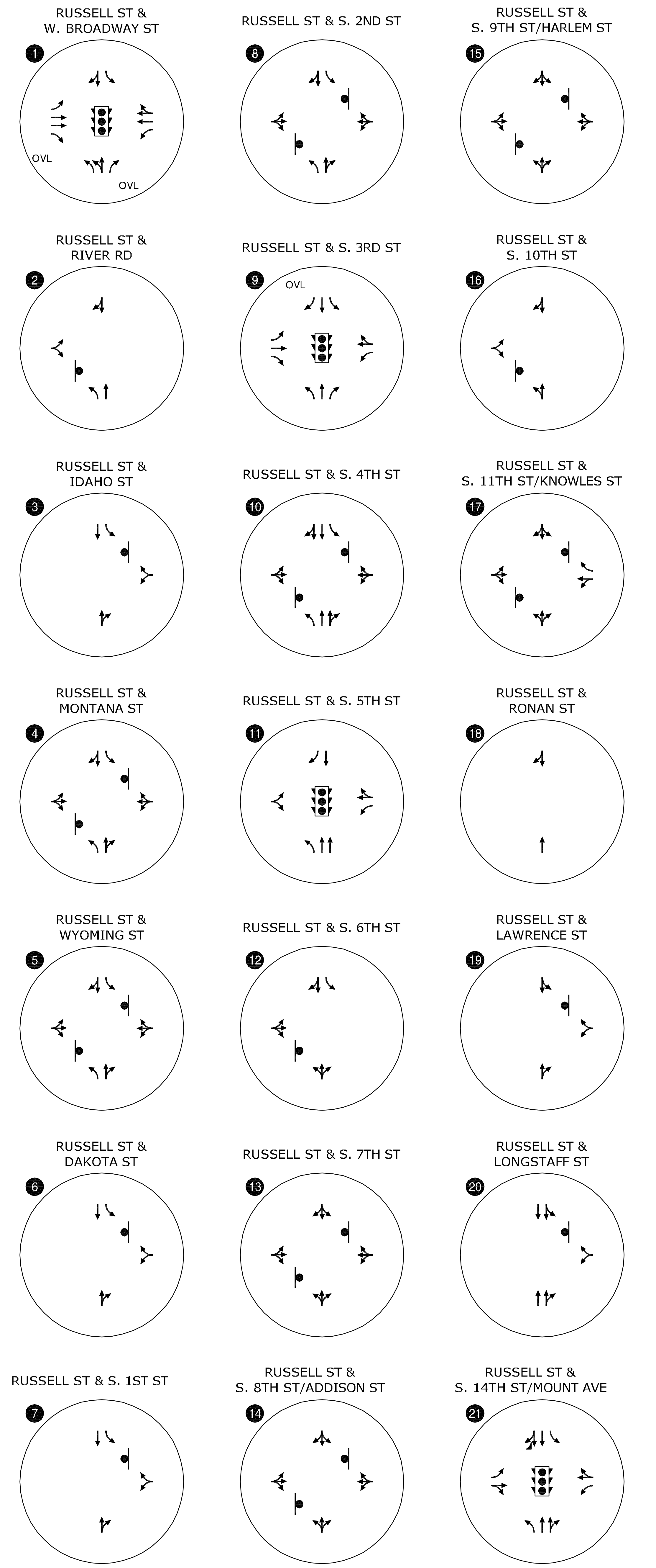
### *Pedestrian and Bicycle Facilities*

Sidewalks exist intermittently along the corridor and Russell Street is signed as a bicycle route; however, no bike lanes are currently provided.

### *Transit Facilities*

There are currently four Mountain Line bus routes that have scheduled stops along the Russell Street corridor. All of the bus stops are located between S. 5th Street and W. Broadway Street (no stops exist between S. 14th Street-Mount Avenue and S. 5th Street in the study area). Figure 4 illustrates the existing Mountain Line transit service routes that have scheduled stops in the study area and the location of the existing bus stops and their amenities. Table 4 summarizes the approximate hours of service that each of these four transit routes provide service to the Russell Street corridor and the approximate headways of each route.




NOTES:

1. Existing lane configurations and traffic control devices per April 2009 corridor visit and field observations.
2. Intersection #1 has split phasing for the north/south approaches and protected-permissive phasing for the east and west left turns.
3. Intersections #'s 9 and 21 have protected-permissive phasing for all left turns.
4. Intersection # 11 has permissive phasing on all approaches.
5. Private driveway present on fourth leg at intersection #'s 3, 7, and 16.
6. Left-turns were observed at intersection # 20; however, the left-turn movements are not legally permitted at this intersection.
7. Intersection #'s 14 and 15 are modeled as two intersections in SYNCHRO with close offsets, but are shown as one intersection in this figure.

EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES
MISSOULA, MONTANA

FIGURE 3

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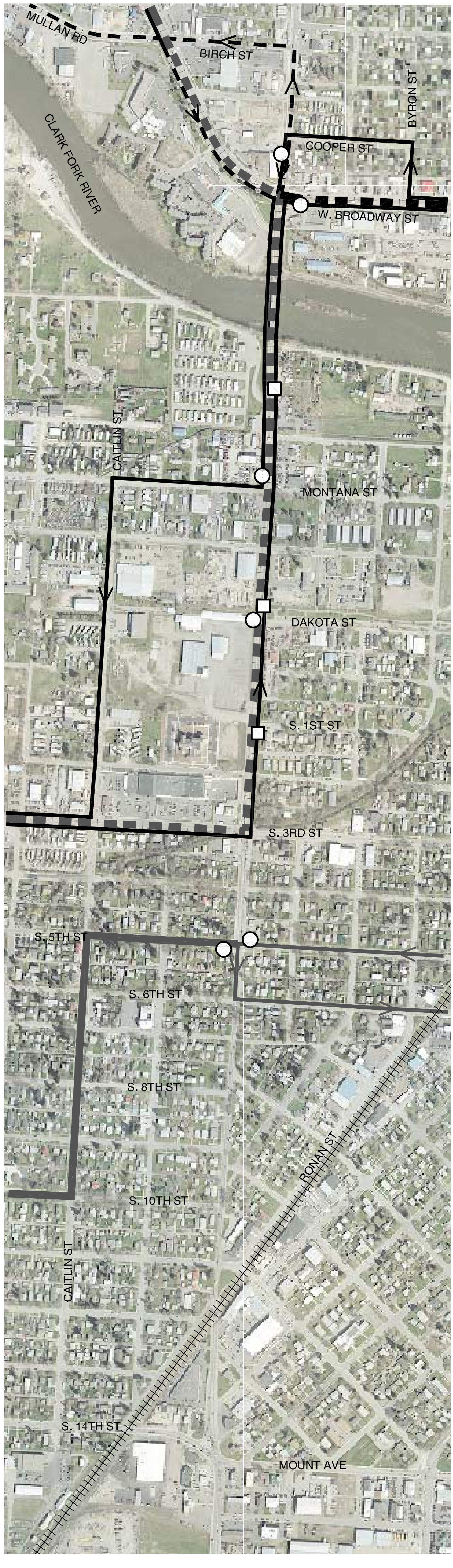
NO SCALE




NOTE:

- Wide route lines symbolize bidirectional travel and narrow route lines symbolize directional travel.

**LEGEND**

- = ROUTE 2 (30-60 MINUTE HEADWAYS)
- = ROUTE 8 (30-60 MINUTE HEADWAYS)
- = ROUTE 9 (60-120 MINUTE HEADWAYS)
- = ROUTE 10 (1-4 HOUR HEADWAYS)
- ○ = BUS STOP WITH SIGN
- □ = BUS STOP WITH SIGN AND BENCH

**EXISTING MOUNTAIN LINE TRANSIT SERVICE ON RUSSELL STREET**
**MISSOULA, MONTANA**

FIGURE
**4**

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**Table 4 Existing Transit Service Times and Headway Summary[1]**

| Mountain Line Bus Route | Weekday | | Saturday[2] | |
|---|---|---|---|---|
| | Approximate Hours of Service | Approximate Headways | Approximate Hours of Service | Approximate Headways |
| Route 2 | 6:45 a.m. – 7:15 p.m. | 30 minutes during a.m. and p.m. peak periods<br>60 minutes during non peak periods | 10:00 a.m. – 5:45 p.m. | 60 minutes |
| Route 8 | 7:00 a.m. – 7:00 p.m. | 30 minutes during midday and p.m. peak periods<br>60 minutes during non peak periods | 10:00 a.m. – 6:00 p.m. | 60 minutes |
| Route 9 | 6:30 a.m. – 7:15 p.m. | 60 minutes | 10:00 a.m. and 6:00 p.m. | Two hours |
| Route 10 | 7:00 a.m. – 7:00 p.m. | One to four hours | No Service | No Service |

1 – Information taken from the Mountain Line bus route schedule (Reference 7).
2 - Mountain Line does not provide service on Sundays.

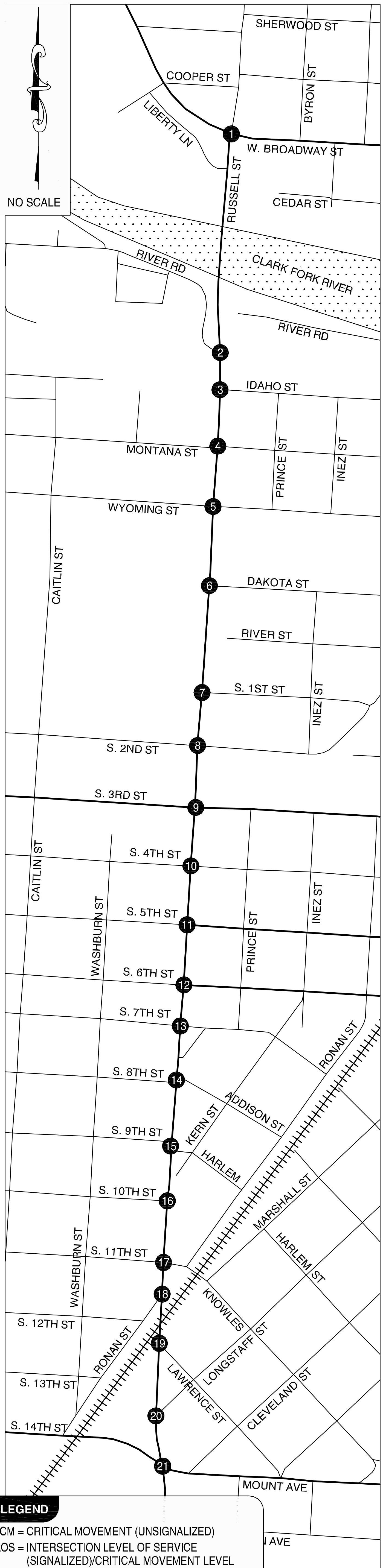
## TRAFFIC VOLUMES

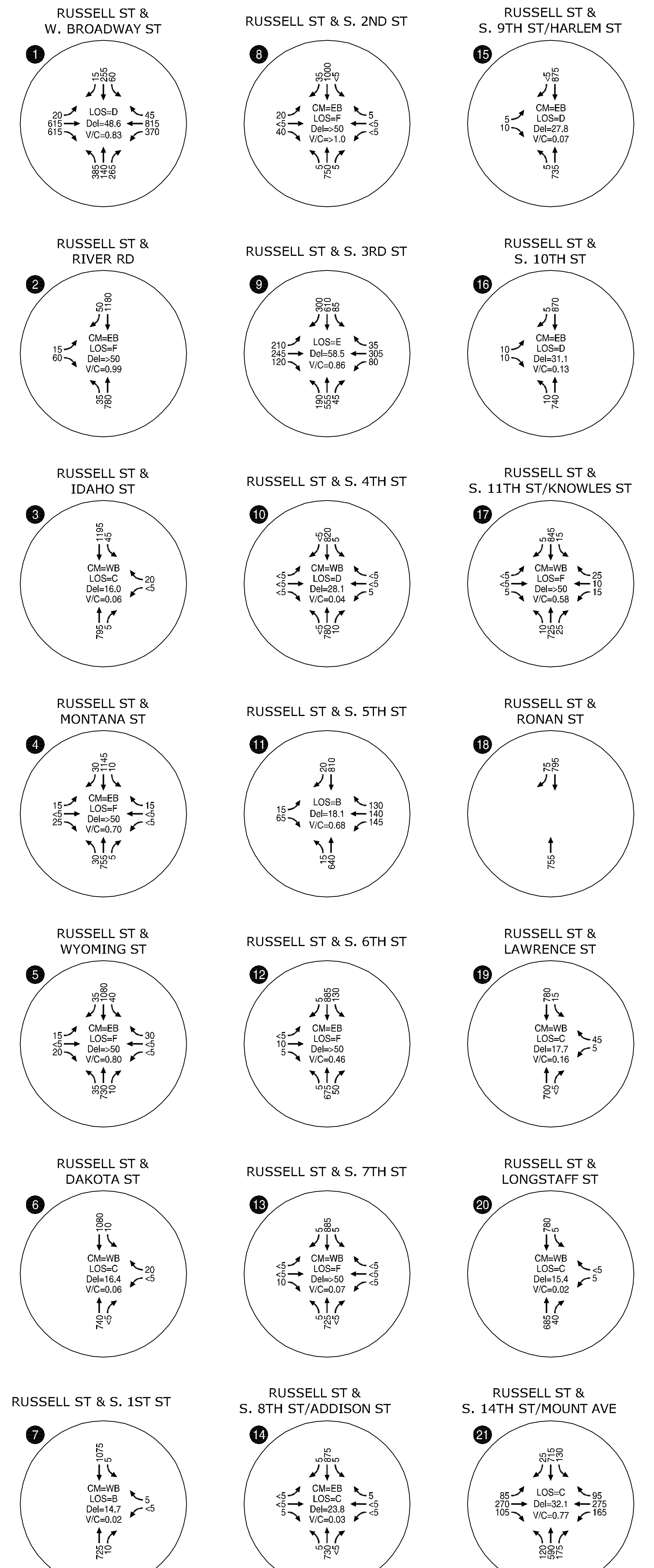
### *Automobile*

In March 2009, manual turning-movement counts were obtained for the 21 existing study intersections. All the counts used in this analysis were conducted on a typical mid-week day in March 2009 during the evening (4:00 to 6:00 p.m.) peak time period. A review of historical counts revealed that the month of March is representative of an average month of a typical year (Reference 8). The corridor weekday evening peak hour was found to occur between 4:30 and 5:30 p.m. Figure 5 provides a summary of the year 2009 weekday p.m. peak hour turning-movement counts, which are rounded to the nearest five vehicles per hour.

#### 24-Hour Traffic Volume Profiles

Figures 6 and 7 illustrate the existing 24-hour traffic profiles that were counted along Russell Street south of the bridge and north of S. 6th Street in March 2009. The 24-hour traffic profiles collected on Russell Street revealed a daily traffic volume of approximately 20,600 (south of bridge) to 21,700 (north of S. 6th Street) and that the weekday p.m. peak hour represents the peak traffic levels over the course of a typical weekday. As aforementioned, the traffic volumes along Russell Street are highest between 4:30 p.m. and 5:30 p.m.; however, the traffic on Russell Street remains within a range of about 10-percent of the peak hour traffic volumes between approximately 1:00 p.m. and 6:00 p.m. The weekday a.m. peak hour link volumes are approximately 25- to 33-percent lower than the weekday p.m. peak hour.




**LEGEND**

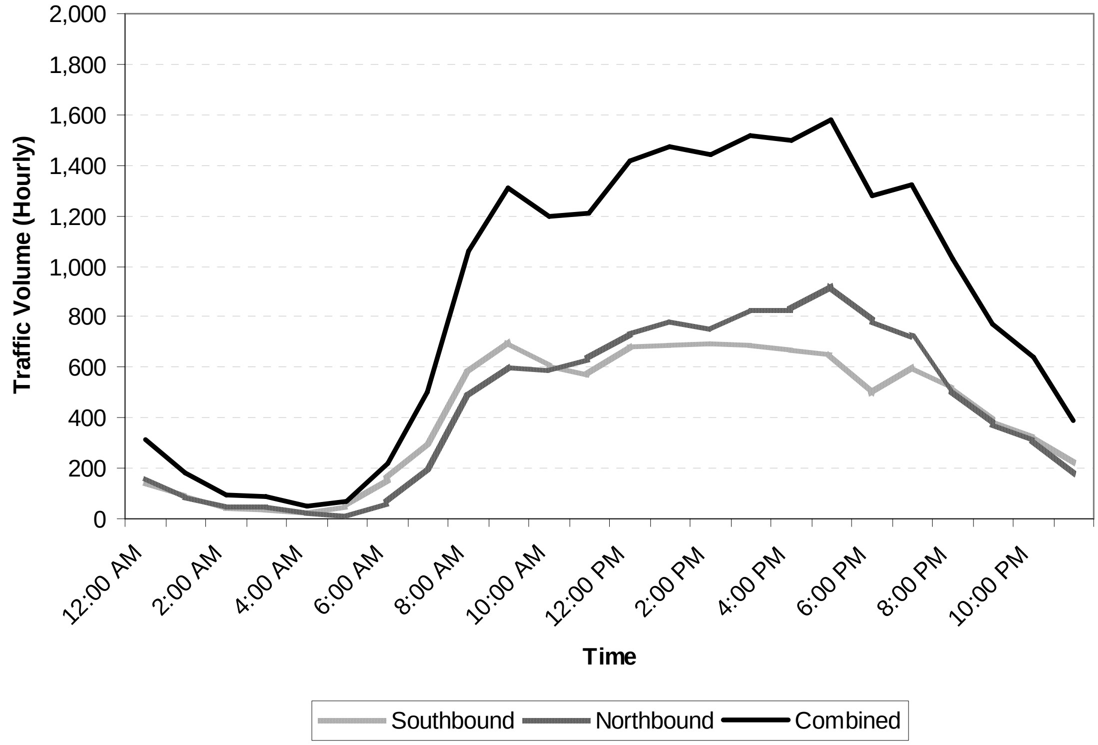
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

NOTES:
1. Existing intersection turning movement traffic counts conducted by DOWL HKM and Miovision Technologies Inc. in March 2009.
2. The Russell Street corridor's weekday p.m. peak hour is between 4:30 and 5:30 p.m.
3. Some traffic counts have been adjusted to account for balancing between intersections.
4. Volumes are rounded to the nearest five.
5. Intersection #'s 14 and 15 are modeled as two intersections in SYNCHRO with close offsets, but are shown as one intersection in this figure.

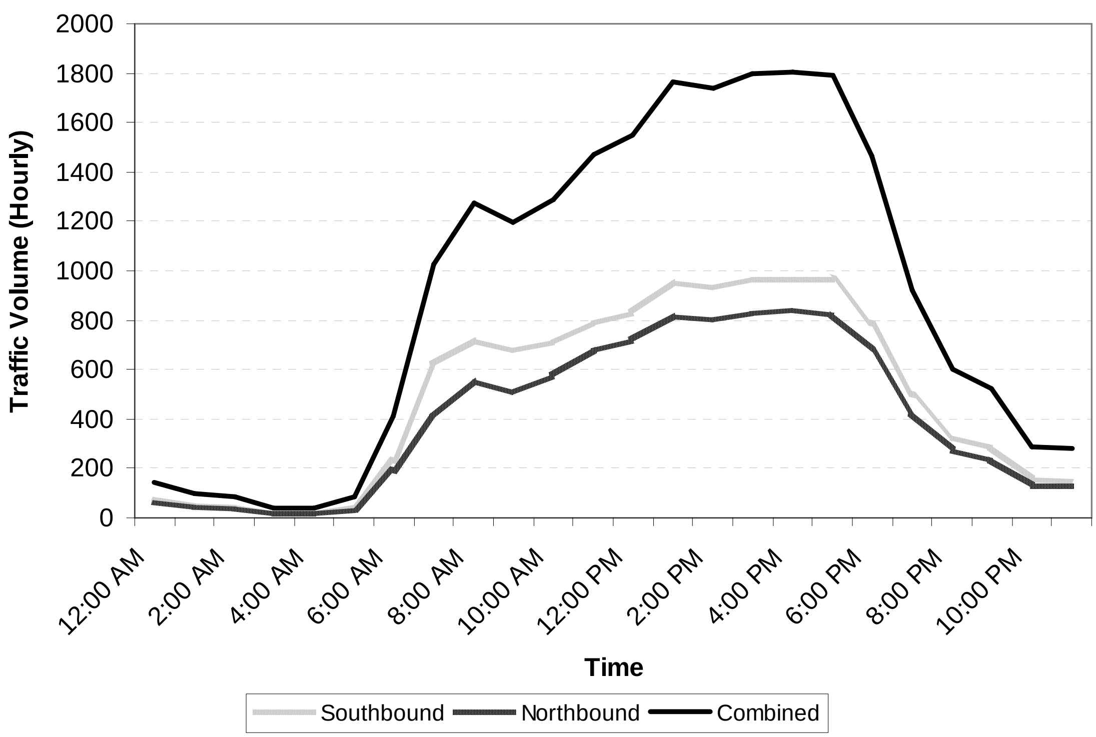
YEAR 2009 EXISTING TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
MISSOULA, MONTANA

FIGURE 5

## Figure 6 Existing Russell Street 24-Hour Traffic Volume Profile (South of Bridge)




## Figure 7 Existing Russell Street 24-Hour Traffic Volume Profile (North of S. 6th Street)



### Historical Traffic Volumes

Historical annual average daily traffic (AADT) counts were evaluated in the study area. Table 5 summarizes the average annual growth rate for the available links on Russell Street, S. 3rd Street, and in the study area (Reference 9).

**Table 5 Historical Link AADT Growth Summary**

| Time Frame | | Average Growth Rate | | |
|---|---|---|---|---|
| Number of Years | Years Measured[1] | Russell Street | S. 3rd Street | Study Area[2] |
| 10 | 1998-2008 | 0.5% | -4.7% | -1.2% |
| 15 | 1993-2008 | 0.3% | -0.1% | 0.2% |
| 20 | 1988-2008 | 0.6% | N/A | 0.6% |
| 25 | 1983-2008 | 0.7% | 1.2% | 0.9% |
| Most Available[3] | Variable | 0.7% | 0.9% | 1.2% |

1 – Not all link locations have AADT data for each period.
2 – Study area includes data points on Russell Street, S. 3rd Street, and Wyoming Street.
3 – Includes the longest time span of available data for each link location.

As summarized in Table 5, traffic has grown at a relatively steady rate of 0.7-percent per year on the Russell Street corridor over the past 30-plus years. However, traffic growth on S. 3rd Street has not been as steady. S. 3rd Street has experienced a negative growth rate over the past 15 years and a positive growth rate of approximately one-percent over a longer time period. Within the overall study area, traffic has changed minimally over the past 15 years but has experienced a growth trend of approximately 0.5-percent to 1.2-percent over the past 30-plus years. The slower growth rate over the last 15 years on Russell Street could be attributable to traffic volumes using Reserve Street, due to the major roadway widening that occurred in 1990s on this facility.

## *Pedestrian and Bicycle*

Pedestrians and bicyclists were counted at some of the study intersections. Traffic counts and field observations revealed a fair amount of non-motorized traffic along the corridor, especially on the north end of the corridor. Table 6 summarizes some of the pedestrian and bicycle weekday p.m. peak hour counts collected in March 2009 in addition to some historical counts.

**Table 6 Existing and Historical Pedestrian and Bicycle Count Summary**

| Intersection[2] | Historical Counts[1] | | | | March 2009 Counts | |
|---|---|---|---|---|---|---|
| | AM Peak Hour | | PM Peak Hour | | PM Peak Hour | |
| | Pedestrian | Bike | Pedestrian | Bike | Pedestrian | Bike |
| W. Broadway Street | 3 | 3 | 19 | 10 | 27 | 15 |
| Wyoming Street | 2 | 8 | 7 | 12 | 31 | N/A |
| Dakota Street | N/A | N/A | N/A | N/A | 33 | N/A |
| S. 3rd Street | 10 | 10 | 11 | 17 | 15 | 2 |
| S. 4th Street | N/A | N/A | N/A | N/A | 27 | N/A |
| S. 5th Street | 5 | 9 | 5 | 13 | 23 | N/A |
| S. 6th Street | 1 | 11 | 2 | 12 | 2 | 4 |
| S. 14th Street–Mount Avenue | 7 | 11 | 19 | 14 | 24 | 11 |

1 – Historical counts as summarized in the Russell Street and South 3rd Street Reconstruction Project June 2002 Technical Memorandum T-1 (Reference 1)

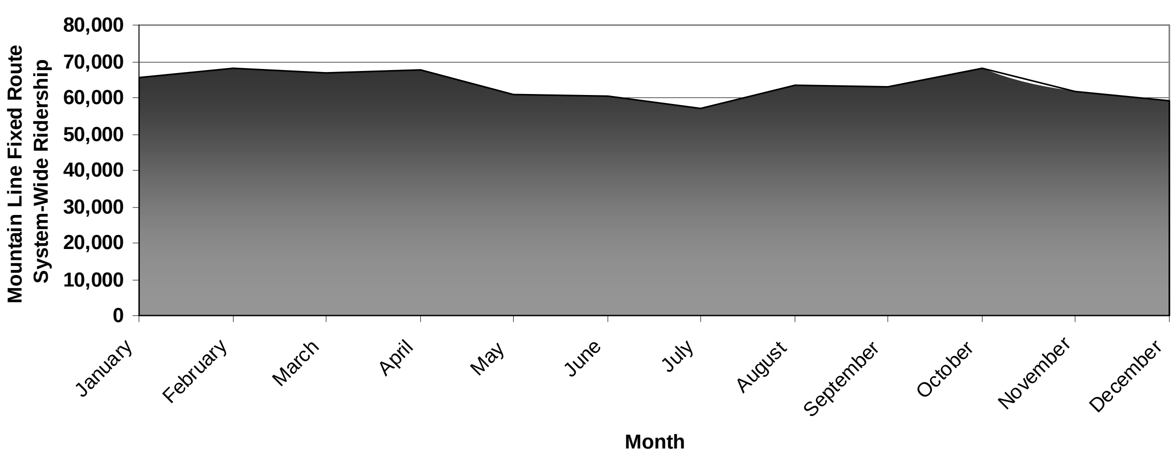
2 – Intersections not included in this table reflect pedestrian and bicycle counts of less than 15 counted during the peak hour.

### *Transit*

Average monthly Mountain Line system-wide ridership in 2008 was approximately 70,000 patrons. Specific to the Russell Street corridor, information regarding current and future transit ridership and mode split is not available at this time.

Mountain Line system-wide ridership has increased each of the past three fiscal years resulting in an annual growth rate of approximately 7.0-percent (data prior to 2006 was not provided). In addition to the annual growth trend, transit ridership in Missoula fluctuates seasonally. As illustrated in Figure 8, transit ridership is most impacted by the University of Montana academic school year (i.e., transit ridership increases during the academic school year) and is secondarily impacted by weather (i.e., transit ridership decreases during inclement weather conditions, Reference 10).

**Figure 8 Average Monthly System-Wide Ridership (Past 3 Years)**



# CURRENT LEVELS OF SERVICE

## *Automobile LOS*

All signalized and stop controlled level-of-service (LOS) analyses described in this report were performed in accordance with the procedures stated in the 2000 *Highway Capacity Manual* (HCM, Reference 11). Intersection LOS is analogous to the letter grades in a school report card. Motorists using an intersection that operates at LOS "A" experience very little delay, while those using an intersection that operates at LOS "F" will experience intolerably long delays. The City of Missoula considers LOS "D" acceptable and MDT considers LOS "C" acceptable along Russell Street. Figure 5 summarizes the LOS analysis for the study intersections under the weekday p.m. peak hour existing traffic conditions. Table 7 summarizes all of the study intersections that do not meet the City of Missoula and/or MDT LOS standards during the weekday p.m. peak hour.

**Table 7 Existing Intersections That Do Not Operate Acceptably**

<table>
<tr><th>Unacceptable Intersection Operations<br>MDT LOS Standard<br>(LOS"C" or better)</th><th>Unacceptable Intersection Operations<br>City LOS Standard<br>(LOS "D" or better)</th></tr>
<tr><td>W. Broadway Street</td><td>-</td></tr>
<tr><td colspan="2">River Road[1]</td></tr>
<tr><td colspan="2">Montana Street[1]</td></tr>
<tr><td colspan="2">Wyoming Street[1]</td></tr>
<tr><td colspan="2">S. 2nd Street[1]</td></tr>
<tr><td colspan="2">S. 3rd Street</td></tr>
<tr><td>S. 4th Street[1]</td><td>-</td></tr>
<tr><td colspan="2">S. 6th Street[1]</td></tr>
<tr><td colspan="2">S. 7th Street[1]</td></tr>
<tr><td>S. 9th Street-Harlem Street[1]</td><td>-</td></tr>
<tr><td>S. 10th Street[1]</td><td>-</td></tr>
<tr><td colspan="2">S. 11th Street-Knowles Street[1]</td></tr>
</table>

1 – Unsignalized Intersection. The major delay occurs on the side street and not on Russell Street.

As summarized in Figure 5 and Table 7, twelve of the study intersections do not currently meet the MDT LOS threshold and eight of the study intersections do not currently meet the City LOS threshold. All of the intersections that do not meet the LOS standards are currently unsignalized intersections, except for the signalized intersection of W. Broadway Street and Russell Street.

## *Non-Automobile LOS*

For the multimodal level of service (MMLOS) analysis, the methodology from the NCHRP Report 3-70 (Reference 12) was used as a basis for evaluating multiple modes of travel on the Russell Street corridor. NCHRP 3-70 provides a scientific basis for evaluating multimodal level of service on urban streets, like the Russell Street corridor. The MMLOS analysis method for urban streets consists of a set of recommended procedures for predicting traveler perceptions of quality of service and performance measures for urban streets. From the analysis, a combined intersection and segment LOS for transit, bicycle, and pedestrian mode is derived based on several inputs for the existing conditions for the Russell Street corridor. Safety is indirectly considered in the MMLOS analysis in that the letter ratings are based in large part on the comfort levels of bicyclists and pedestrians and one factor in comfort levels is the safety of the facility perceived by the user. Table 8 summarizes the existing MMLOS for the corridor.

**Table 8 Existing Multimodal Level of Service**

| Segment / Intersection | Pedestrian | | Bicycle | | Transit | |
|---|---|---|---|---|---|---|
| | Northbound | Southbound | Northbound | Southbound | Northbound | Southbound |
| W. Broadway Street | D | N/A | C | N/A | N/A | N/A |
| W. Broadway Street to S. 3rd Street | F | F | D | F | C | C |
| S. 3rd Street | C | B | C | D | N/A | N/A |
| S. 3rd Street to S. 5th Street | D | C | D | D | C | C |
| S. 5th Street | B | B | C | C | N/A | N/A |
| S. 5th Street to S. 14th Street-Mount Avenue | E | F | F | F | F | F |
| S. 14th Street-Mount Avenue | N/A | B | N/A | D | N/A | N/A |
| **Overall** | **D** | **D** | **F** | **F** | **D** | **D** |

As summarized in Table 8, the overall corridor pedestrian and transit LOS is "D" and the bicycle LOS is "F". Generally, the pedestrian LOS is better at the signalized intersections due to the presence of pedestrian facilities, such as sidewalks and marked crossings. On the corridor, sidewalks are limited and the buffer between pedestrians and the travel lanes is minimal resulting in a poorer LOS. The transit LOS is better in the northern portion of the corridor due to service being provided by Mountain Line. The bicycle LOS is poor due to the lack of bicycle facilities along the corridor.

## TRAFFIC SAFETY

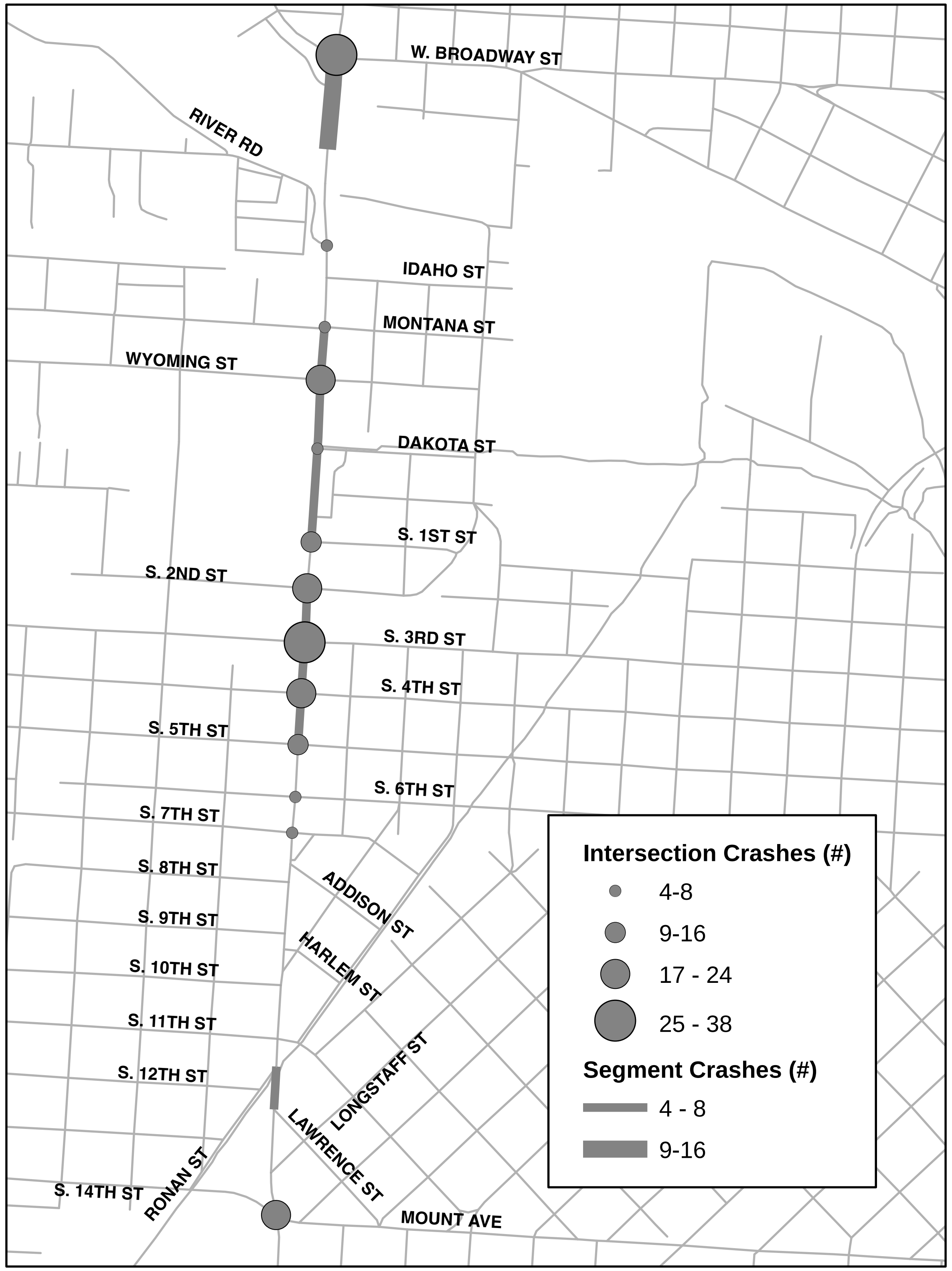
The crash history at the study intersections and along the study corridor was reviewed to identify potential safety issues. MDT provided crash records from the study intersections and study corridor for the most recent four-year period (July 2004 - June 2008). The corridor crash rate over the most recent four-year period is approximately 8.4 accidents per million vehicle miles. Figure 9 illustrates the existing crash densities on the corridor for the most recent four-year period. Figure 9 summarizes the following crash patterns for the Russell Street corridor:

- Intersections with the highest number of crashes on the corridor are W. Broadway Street, Wyoming Street, S. 3rd Street, S. 4th Street, and S. 14th Street-Mount Avenue.
- The intersections of W. Broadway Street/Russell Street and Wyoming Street/Russell Street in particular have higher proportions of injury crashes.

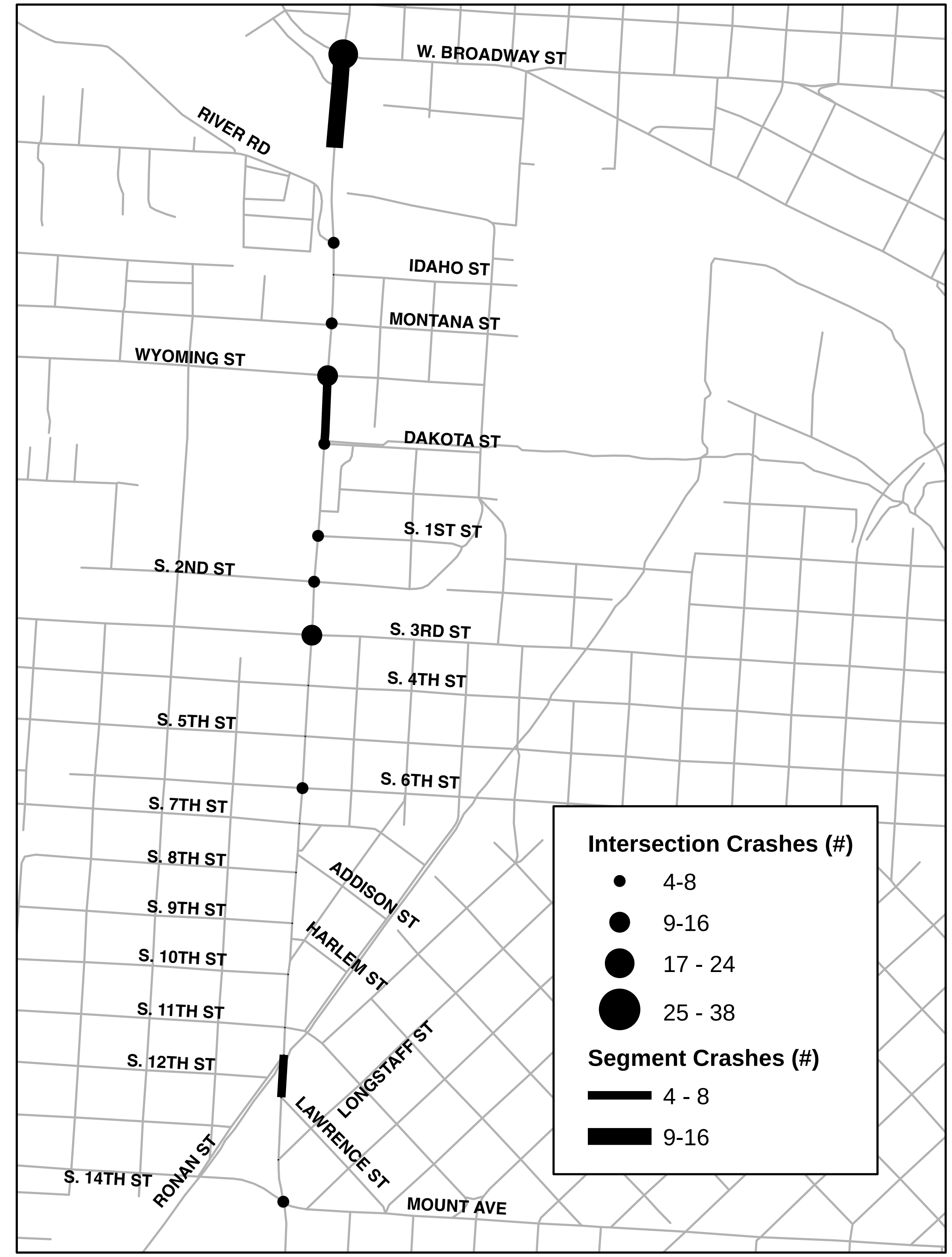
- The segments from W. Broadway Street to the bridge, from Montana Street to S. 1st Street, from S. 2nd Street to S. 5th Street, and the area around the railroad tracks and multiuse path crossing exhibited the highest number of segment crashes. With the exception of the railroad tracks/multiuse path crossing area, these segments are generally in the same area as the higher-crash intersections. The crashes in the vicinity of the railroad tracks and the multi-use path crossing are typically rear-end crashes.

Additionally, over the past four years, 21 crashes were reported between bicyclists and automobiles and zero crashes were reported for pedestrians. Over seventy-five percent of the bicyclist crashes occurred on the segment between S. 3rd Street and W. Broadway Street.

## PROPERTY DAMAGE ONLY CRASHES (7/04-6/08)




## INJURY CRASHES (7/04-6/08)




**EXISTING INTERSECTION AND SEGMENT CRASHES**
**MISSOULA, MONTANA**

FIGURE 9

# Section 4
Description of Alternatives and Options

# Description of Alternatives and Options

The TAU was initiated to perform a traffic operations, safety, and multimodal evaluation of Alternatives 1, 2, 3, 4, and 5-Refined from the DEIS and Options 6 and 7 identified through this work effort by the project team. Alternative 5-Refined was analyzed in the TAU, as it was identified to take the place of Alternative 5 in the DEIS. Option 6 was developed in response to City advocacy groups with oversight from the project team. Option 7 was developed to explore a reduced cross-section with oversight from the project team. Both options combine elements from the alternatives included in the DEIS. A description and graphical layout of the DEIS Alternatives 1, 2, 3, 4, and 5-Refined and Options 6 and 7 is presented in this section.

## ALTERNATIVE 1: NO BUILD

Alternative 1 is the no-build alternative and would provide no improvements to Russell Street or the existing Russell Street Bridge (Reference 1). Figure 10 illustrates Alternative 1.

## ALTERNATIVE 2: 2-PLUS LANES WITH ROUNDABOUTS

Alternative 2 includes a mix of two travel lanes with and without a raised, landscape median between S. 14th Street-Mount Avenue and Wyoming Street. In the north section of the corridor, four travel lanes with a median are provided between Wyoming Street and W. Broadway Street. This includes one single-lane roundabout, four multi-lane roundabouts, and one traffic signal for traffic control at the major intersections along the corridor. Figure 11 illustrates Alternative 2.

## ALTERNATIVE 3: 2-PLUS LANES WITH MEDIANS AND ROUNDABOUTS

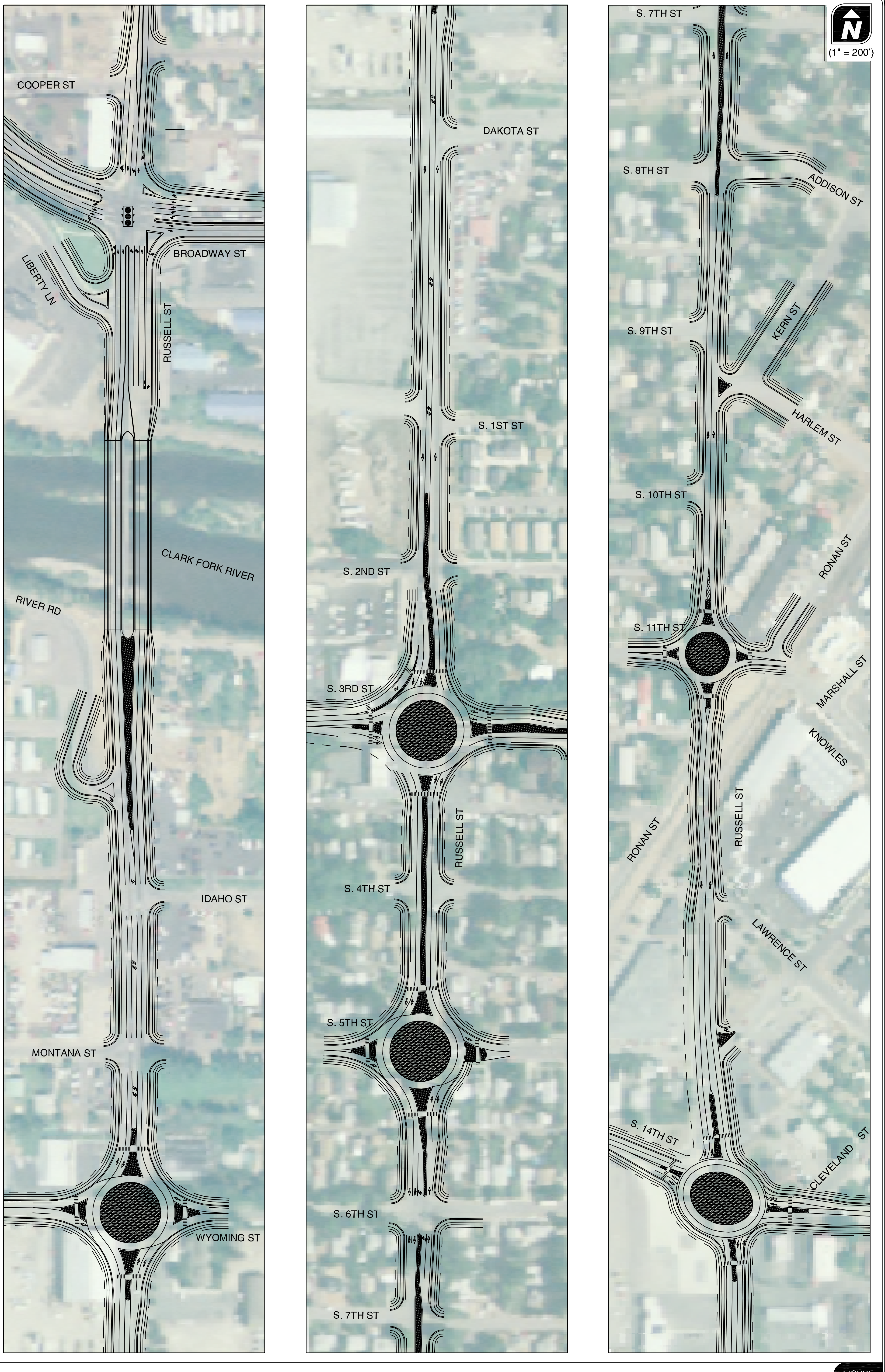
Alternative 3 includes a mix of two travel lanes with a raised, landscape median in place the majority of the distance between S. 14th Street-Mount Avenue and Wyoming Street. In the north section of the corridor, four travel lanes with a raised, landscape median are provided between Wyoming Street and W. Broadway Street. Specifically, a raised, landscape median is provided in the following sections: W. Broadway Street to Idaho Street, Dakota Street to S. 1st Street, S. 2nd Street to S. 11th Street-Knowles Street and Lawrence Street to S. 14th Street-Mount Avenue. Alternative 3 includes one single-lane roundabout, four multi-lane roundabouts, and one traffic signal for traffic control at the major intersections along the corridor. Figure 12 illustrates Alternative 3.

## ALTERNATIVE 4: 4-PLUS LANES WITH TRAFFIC SIGNALS

Alternative 4 includes four continuous travel lanes with median (both raised, landscaped and striped) between S. 14th Street-Mount Avenue and W. Broadway Street. Alternative 4 includes five traffic signals for traffic control at the major intersections along the corridor. Figure 13 illustrates Alternative 4.


ALTERNATIVE 1: NO BUILD
MISSOULA, MONTANA

FIGURE 10




ALTERNATIVE 2: 2-PLUS LANES WITH ROUNDABOUT
MISSOULA, MONTANA

FIGURE 11

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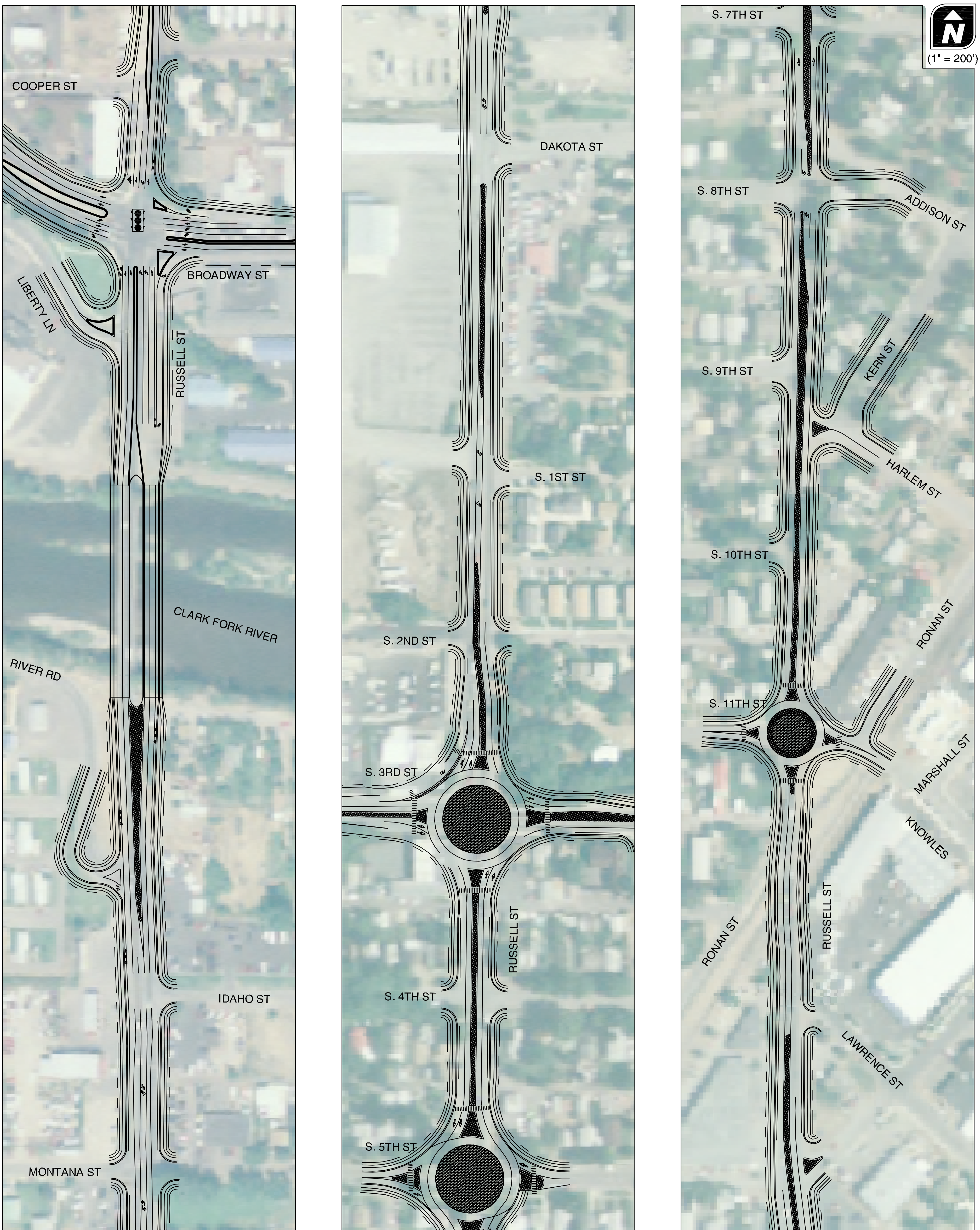
Kittelson & Associates, Inc.
Transportation Engineering / Planning




ALTERNATIVE 3: 2-PLUS LANES WITH MEDIANS AND ROUNDABOUTS
MISSOULA, MONTANA

FIGURE 12

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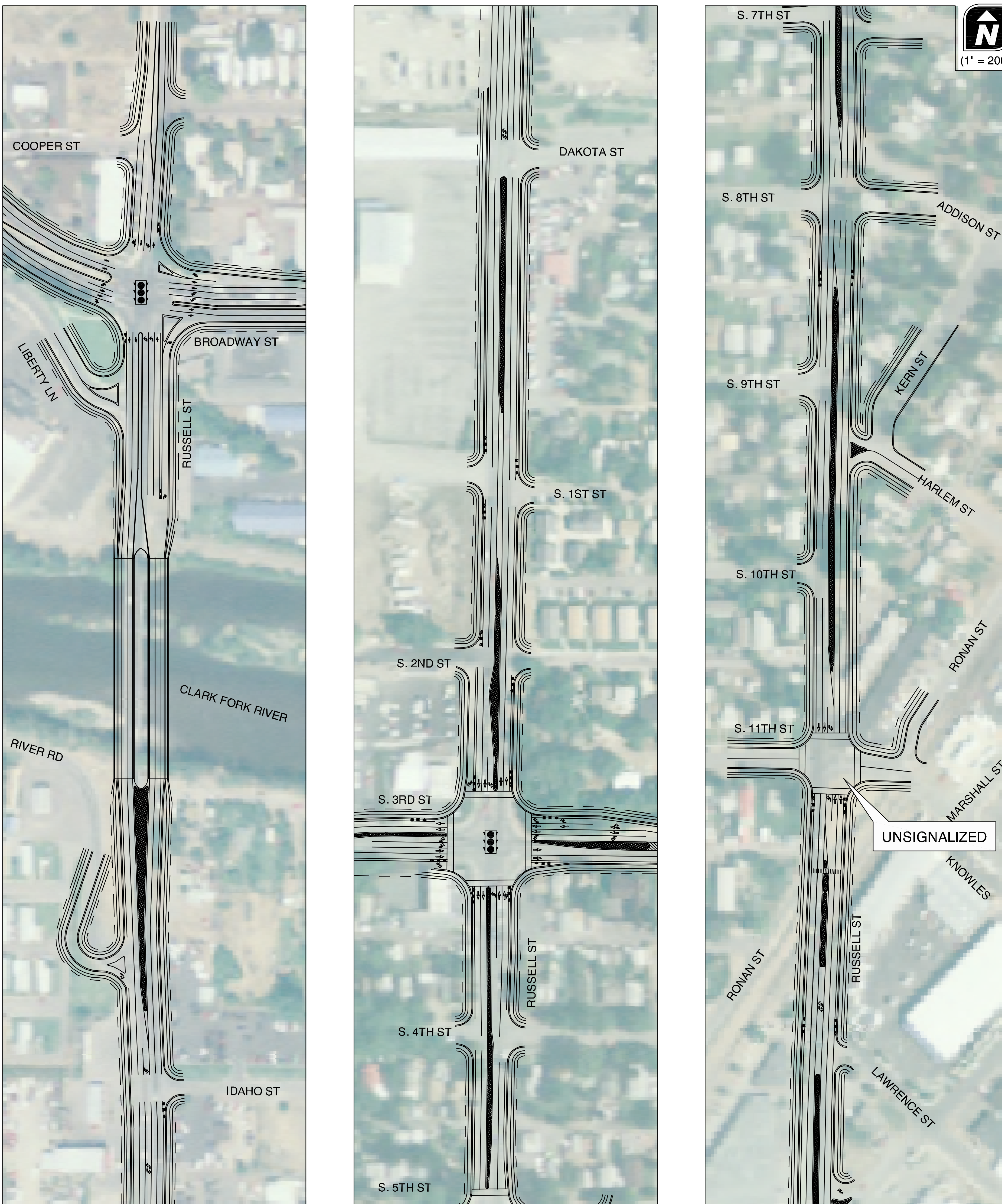


ALTERNATIVE 4: 4-PLUS LANES WITH SIGNALS
MISSOULA, MONTANA

FIGURE 13

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TRANSPORTATION ENGINEERING / PLANNING

## ALTERNATIVE 5-REFINED: 4-PLUS LANES WITH ROUNDABOUTS

Alternative 5-Refined includes four travel lanes with median (both raised, landscaped and striped) between S. 14th Street-Mount Avenue and W. Broadway Street. Alternative 5-Refined includes two multi-lane roundabouts and three traffic signals for traffic control at the major intersections along the corridor. Figure 14 illustrates Alternative 5-Refined.

## OPTION 6: 2/2-PLUS LANES WITH SINGLE-LANE ROUNDABOUTS

Option 6 includes a mix of two travel lanes with and without a raised, landscaped median between S. 14th Street-Mount Avenue and Wyoming Street. In the north section of the corridor, four travel lanes with a median are provided between Wyoming Street and W. Broadway Street. Option 6 includes four single-lane roundabouts along the corridor and a traffic signal at both of the corridor's termini. Figure 15 illustrates Option 6.

## OPTION 7: 3-PLUS LANES WITH TRAFFIC SIGNALS

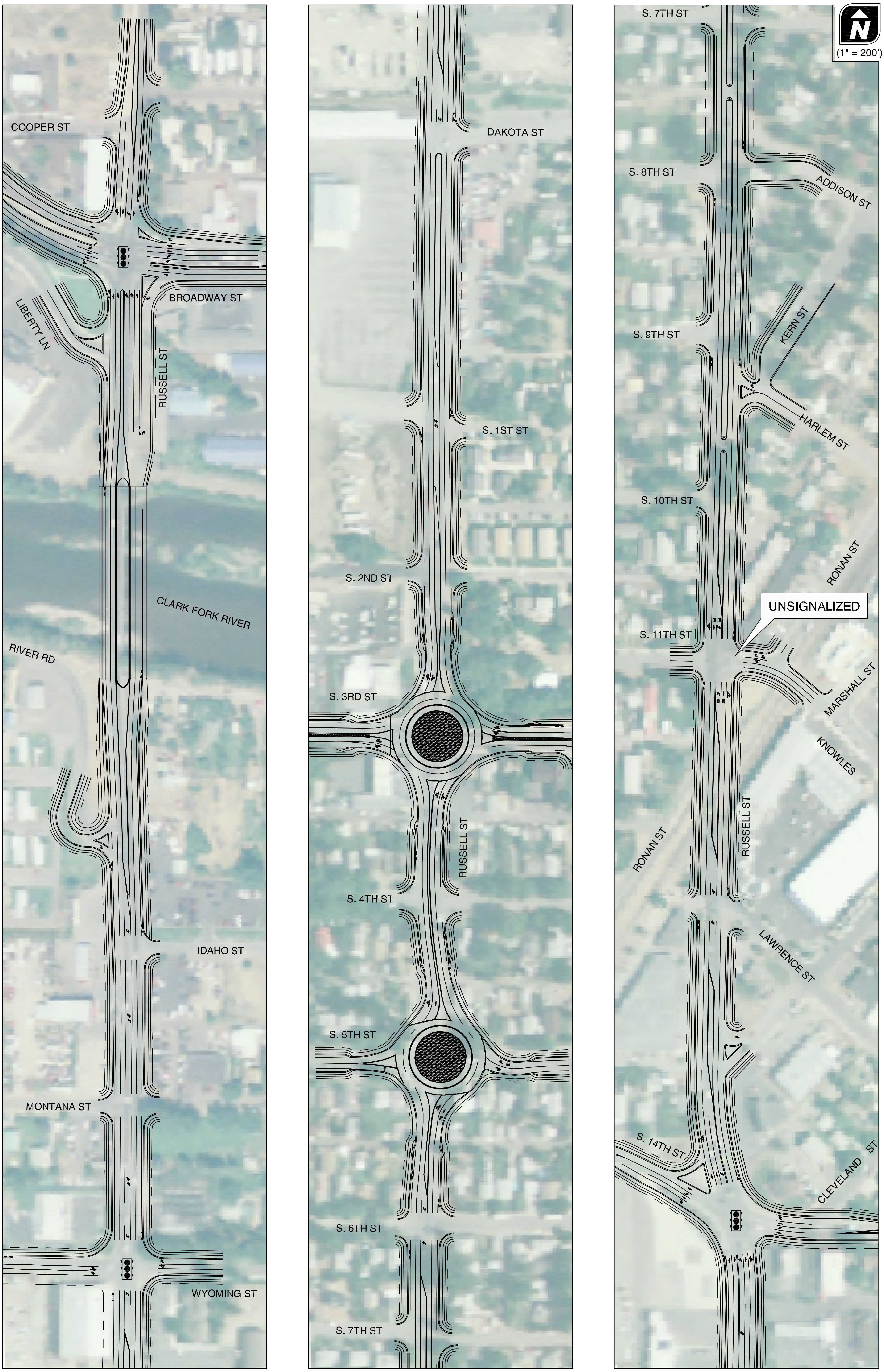
Option 7 includes two continuous travel lanes with median (both raised, landscaped and striped) between S. 14th Street-Mount Avenue and S. 5th Street and four continuous travel lanes with median (both raised/landscaped and striped) between S. 5th Street and W. Broadway Street. Five traffic signals are identified for traffic control at the major intersections along the corridor. The lane transitions between two and four travel lanes occur at S. 5th Street and S. 6th Street on the north section and at Lawrence Street (south of the railroad tracks) on the south section of the corridor. Figure 16 illustrates Option 7.

Table 9 provides an overview of the general design elements associated with the alternatives and options included in the TAU.

**Table 9 General Design Elements Russell Street Alternatives and Options**

| Design Element | DEIS Alternatives | | | | | Options | |
|---|---|---|---|---|---|---|---|
| | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5-R | Option 6 | Option 7 |
| Design Speed (mph) | 30[1] | 35 | 35 | 35 | 35 | 35 | 35 |
| Travel Lane (feet) | 11-12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Median (feet) | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Sidewalks (feet) | 0-4 | 5 | 5 | 5 | 5 | 5 | 5 |
| Bike Lanes (feet) | - | 5.5 | 5.5 | 5.5 | 5.5 | 6.5 | 5.5 |
| Boulevards (feet) | - | 7 | 7 | 7 | 7 | 7 | 7 |
| Curb/Gutter (feet) | - | 2 | 2 | 2 | 2 | 2 | 2 |
| Lighting | Some | Yes | Yes | Yes | Yes | Yes | Yes |
| Bus Pullouts | Some | Yes | Yes | Yes | Yes | Yes | Yes |

[1]This is the current posted speed on the corridor. It is not the intent of this project to change the posted speed.




ALTERNATIVE 5-REFINED: 4-PLUS LANES WITH ROUNDABOUTS
MISSOULA, MONTANA

FIGURE 14

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Transportation Engineering / Planning

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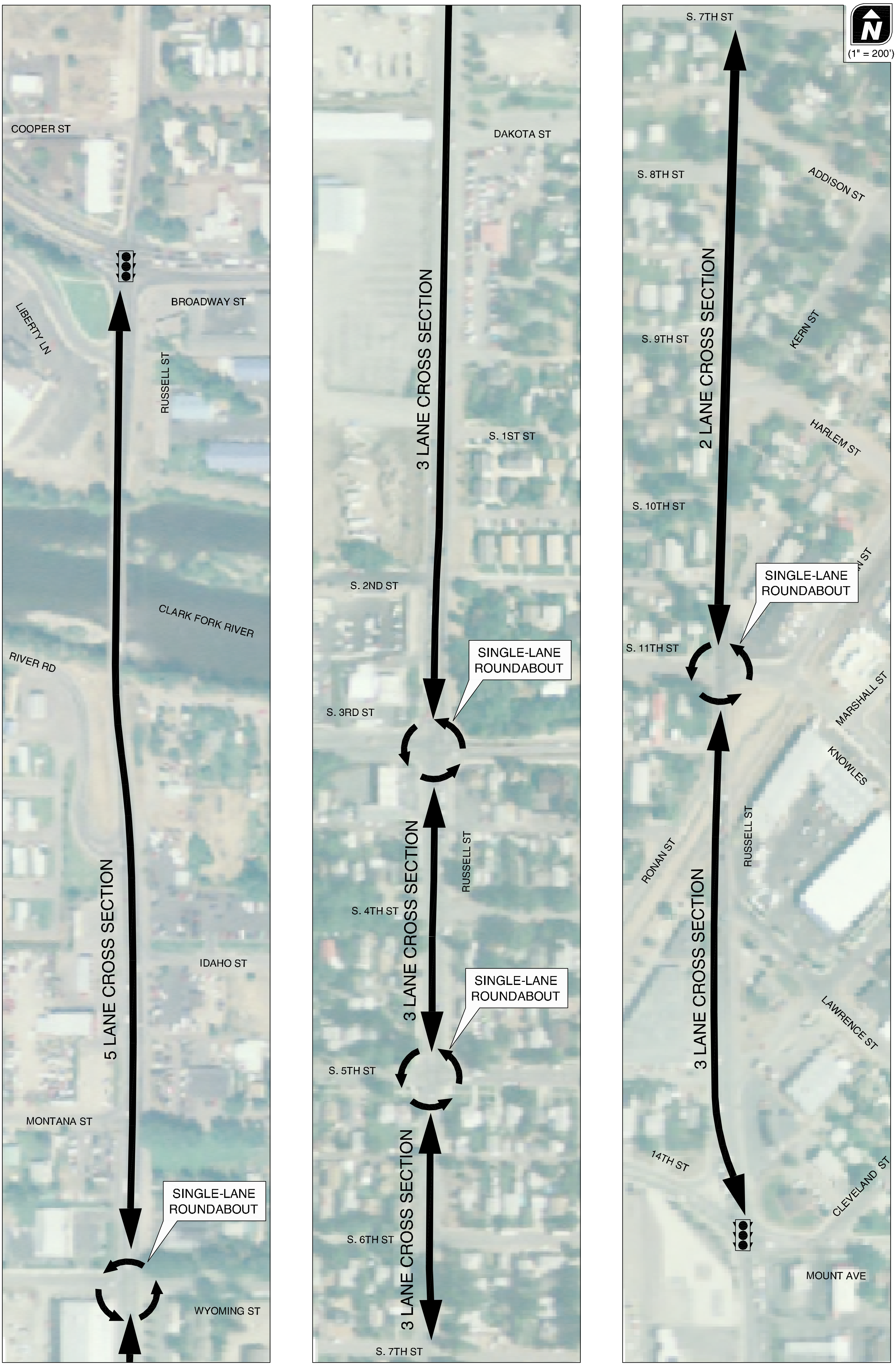
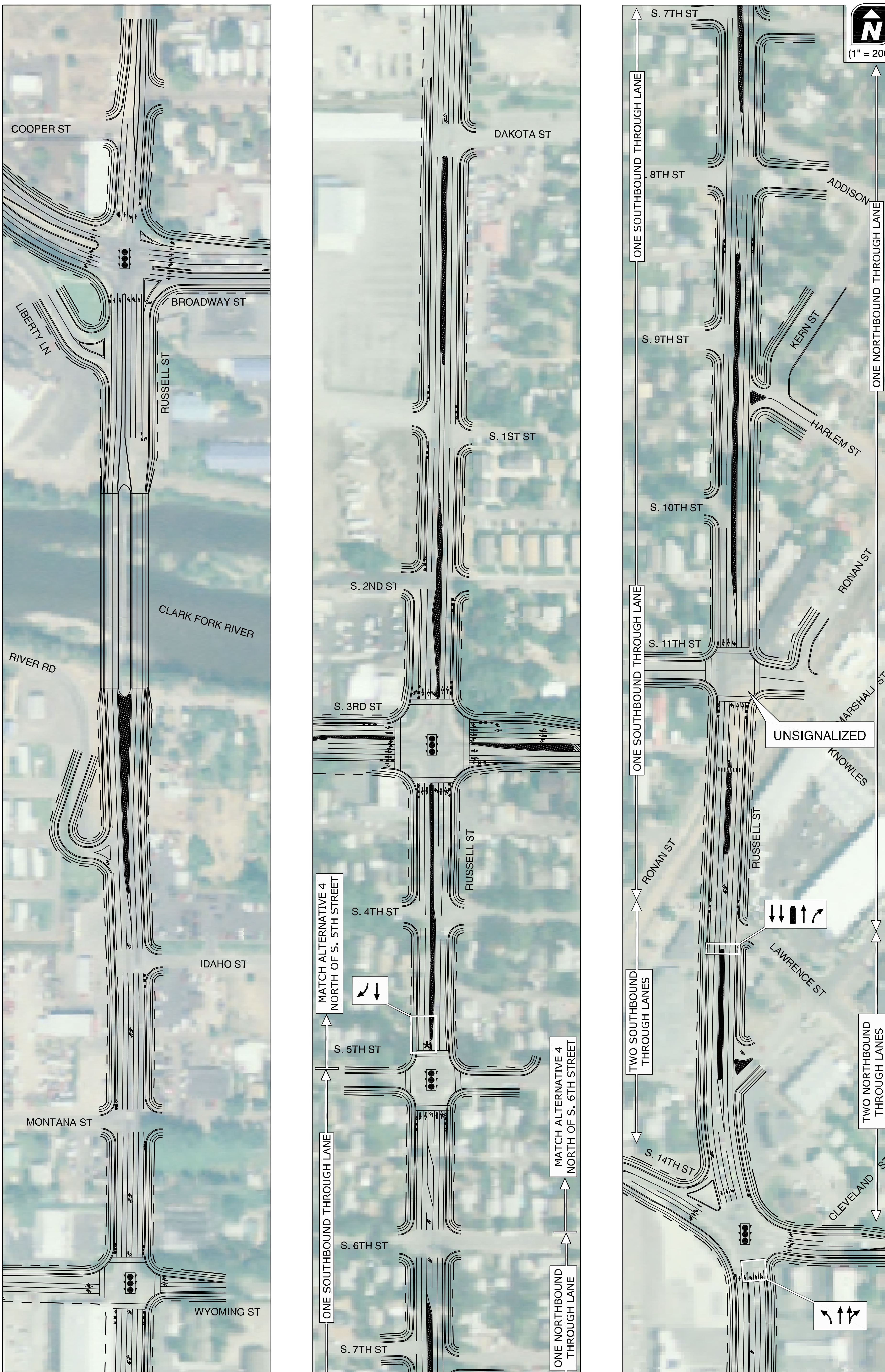



OPTION 6: 2-PLUS LANES WITH SINGLE-LANE ROUNDABOUTS
MISSOULA, MONTANA

FIGURE 15

H:\projfile\9887 Russell Street EIS Traffic Update\dwgs\figs\Final Draft Report Figures\9887Fig-15.dwg Aug 10, 2009 - 10:45am - jsommerville Layout Tab: Fig16




OPTION 7: 3-PLUS LANES WITH SIGNALS
MISSOULA, MONTANA

FIGURE 16

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# Section 5
Evaluation of Alternatives and Options

# Evaluation of Alternatives and Options

The TAU included a traffic operational analysis using Synchro and the 2000 HCM, a safety analysis using the procedures outlined in the recently developed Highway Safety Manual (HSM), and a multimodal level-of-service (LOS) analysis for bicyclists, pedestrians, and transit under future year 2035 traffic conditions for the DEIS Alternatives 1, 2, 3, 4, and 5-Refined and Options 6 and 7. This section provides an overview of the traffic volumes, methodology, and results from analyzing the alternatives and options.

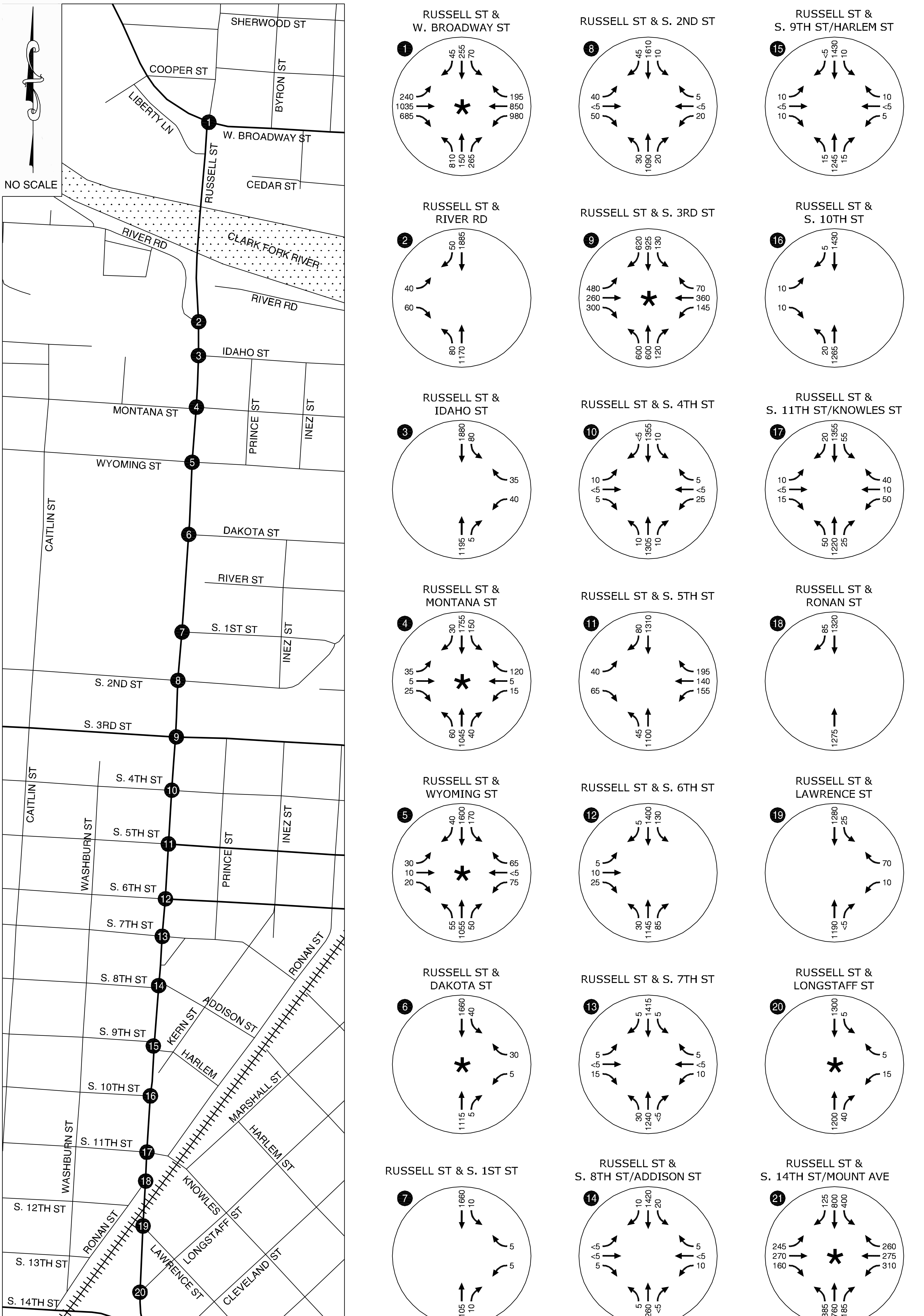
## TRAFFIC VOLUMES

As presented in Technical Memorandum #1, two traffic volume scenarios were developed that reflect year 2035 forecast travel demand for the Russell Street corridor assuming a 3-lane and 5-lane roadway cross-section. MDT provided the following travel demand models to assist in the development of the future traffic volume scenarios:

- Year 2005 No Build
- Year 2035 3-Lane Russell Street
    - This is a special request model that is based on the recommendations in the (LRTP); however, it is modified such that Russell Street has the capacity of a three-lane facility between S. 14th Street-Mount Avenue and Wyoming Street.
- Year 2035 5-Lane Russell Street
    - This model reflects the transportation improvements and land use forecasts recommended in the 2008 Missoula LRTP.

Caution is advised when using a regional travel demand model like this one to conduct a subarea corridor transportation study, in as much as it is primarily used for air quality analysis and the transportation and land use components can be relatively coarse. The result is a generalized forecast of travel demand that is suitable at a regional level, but must be interpreted for use at the subarea level. The year 2035 regional travel demand model is used in this study as it contains the latest land use assumptions approved by the City and County, transportation improvements that are planned and funded, and is the adopted travel demand model from the LRTP.

From these travel demand model runs, the traffic volume scenarios were post-processed per the methodology described in NCHRP Report 255 (Reference 13). Alternatives 1, 2, 3, and Option 6 utilize the 3-lane volume scenario. Alternatives 1, 4, 5-Refined, and Option 7 utilize the 5-lane volume scenario. Figures 17 and 18 illustrate the year 2035 weekday p.m. peak hour 3-lane and 5-lane intersection turning movement volumes utilized in the TAU, respectively. Table 10 provides a summary of the projected growth rates for the 3-lane and 5-lane Russell Street scenarios and compares them to the historical growth rate.




NOTES:
1. Adjusted year 2035 weekday p.m. peak hour intersection turning movement traffic counts were developed by adjusting irregular results of the NCHRP 255 methodology and providing reasonably balanced traffic volumes between study intersections. Key locations include intersections #'s 1, 4, 5, 6, 9, 20, and 21. These intersections are identified by an asterisk (*).
2. Between the year existing year 2009 traffic volumes summarized in Figure 5 and 2035 traffic volumes summarized in this figure, the average weekday p.m. peak hour intersection total entering volume annual growth rate is approximately 1.9%.
3. Volumes are rounded to the nearest five.

YEAR 2035 WEEKDAY PM PEAK HOUR
3-LANE INTERSECTION TURNING MOVEMENT VOLUMES
MISSOULA, MONTANA

FIGURE 17

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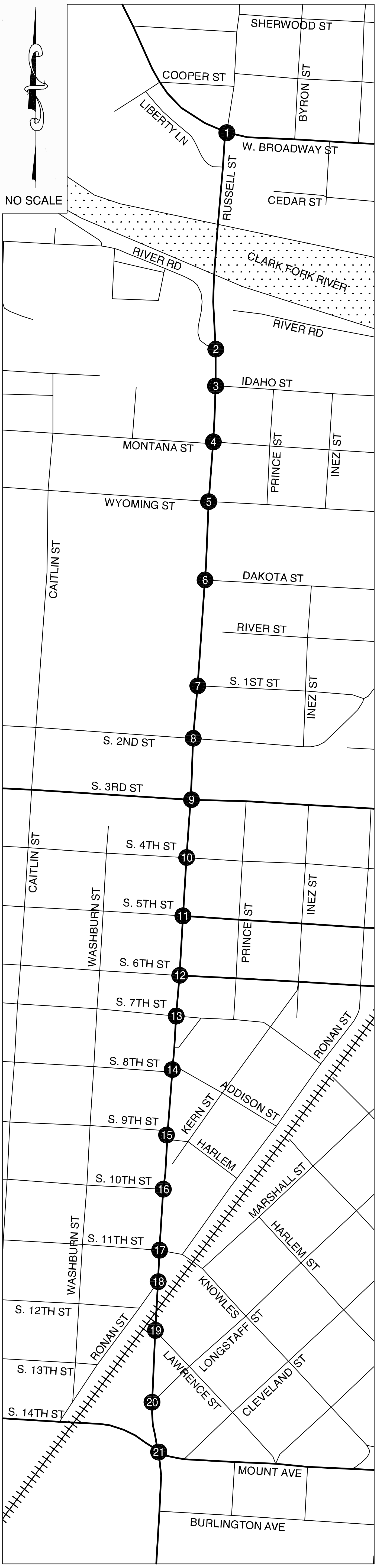


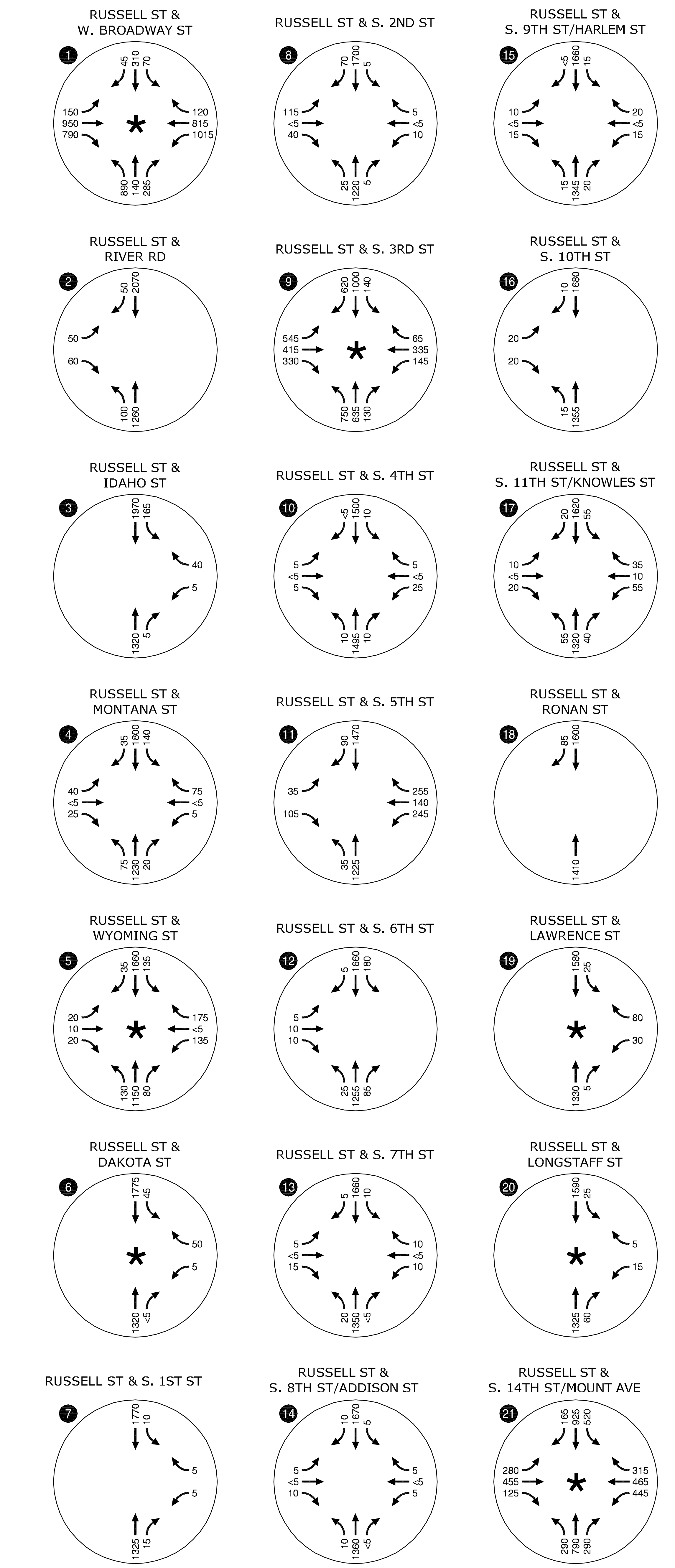


NOTES:

1. Adjusted year 2035 weekday p.m. peak hour intersection turning movement traffic counts were developed by adjusting irregular results of the NCHRP 255 methodology and providing reasonably balanced traffic volumes between study intersections. Key locations include intersections #'s 1, 5, 6, 9, 19, 20, and 21. These intersections are identified by an asterisk (*).
2. Between the year existing year 2009 traffic volumes summarized in Figure 5 and 2035 traffic volumes summarized in this figure, the average weekday p.m. peak hour intersection total entering volume annual growth rate is approximately 2.3%.
3. Volumes are rounded to the nearest five.

YEAR 2035 WEEKDAY PM PEAK HOUR
5-LANE INTERSECTION TURNING MOVEMENT VOLUMES
MISSOULA, MONTANA

FIGURE 18

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**Table 10 Growth Rate Comparison**

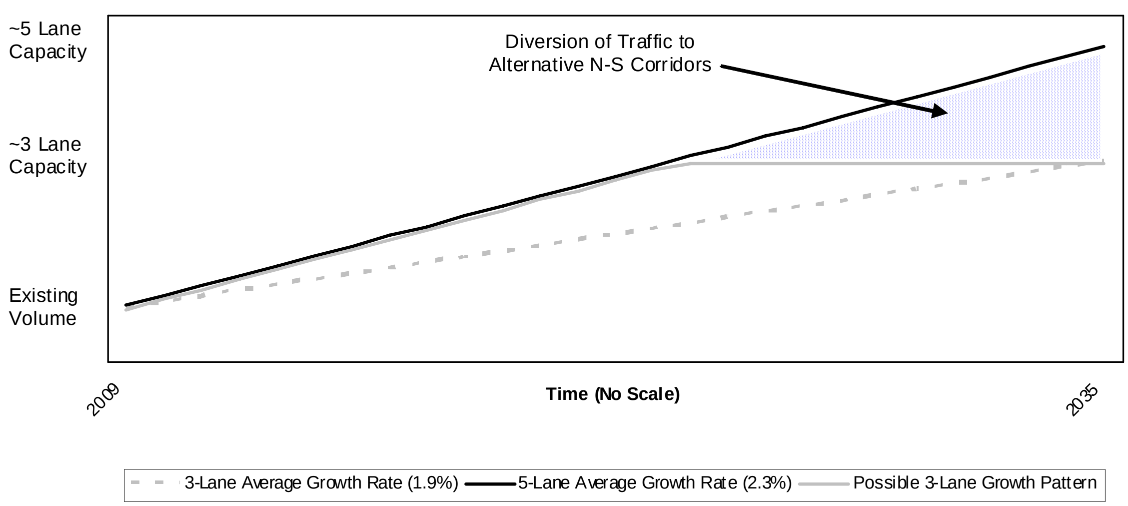
| Traffic Volume Data | Time Frame | Annual Growth Rate |
|---|---|---|
| Study Area Historical AADT Link Volumes | ~1980-2008 | 1.2% |
| 5-Lane Russell Street Intersection TEV | 2009-2035 | 2.3% |
| 3-Lane Russell Street Intersection TEV | 2009-2035 | 1.9% |

As summarized in Table 10, the projected growth rates assuming a five-lane Russell Street corridor are approximately double the historical growth rate. The projected growth rate under the three-lane Russell Street corridor is between the historical and five-lane Russell Street growth rates. The growth rate on Russell Street is estimated to be higher over the next 30 years than the historical growth rate due to the following factors:

- Russell Street has available capacity in the model as opposed to other transportation facilities (i.e., Reserve Street, Orange Street, Arthur Avenue-Madison Street, and most of Brooks Street-Higgins Avenue) that cross river. This results in more regional traffic choosing to use this corridor under the 5-lane facility over the next 30 years.
- Several larger, vacant parcels near the corridor are planned to be redeveloped over the next 30 years. These redeveloped properties will add new trips to the corridor under both the 3-lane and 5-lane scenarios.

Figure 19 conceptually illustrates the growth over time for the three-lane and five-lane Russell Street scenario and the resultant reroute of traffic volumes to other facilities.

**Figure 19 Possible 3-Lane & 5-Lane Roadway Forecast Growth Patterns**




As illustrated in Figure 19, the traffic volume on Russell Street is expected to be higher as a five-lane arterial than as a three-lane arterial due to the additional capacity available with five lanes. The growth pattern of Russell Street may be similar under both the three- and five-lane lane facilities until the traffic volumes reach the capacity of a three-lane arterial. As the roadway reaches capacity as a three-lane facility, it is anticipated that traffic volume on Russell Street will reroute to other north-south arterials (i.e., Reserve Street, Orange Street, etc.) due to improved travel times to cross the river.

Table 11 summarizes the weekday p.m. peak hour and daily link traffic volumes at key locations on the corridor for year 2035 traffic conditions and for comparable purposes to existing conditions.

**Table 11 Summary of Existing and Year 2035 Link Traffic Volumes**

| Segment Location on Russell Street | Existing Traffic Volumes | | Year 2035 Traffic Volumes (3-Lane) | | Year 2035 Traffic Volumes (5-Lane) | |
|---|---|---|---|---|---|---|
| | PM Peak Hour | Daily | PM Peak Hour | Daily | PM Peak Hour | Daily |
| North of S. Broadway Street | 535 | 6,580 | 955 | 11,800 | 835 | 10,300 |
| S. Broadway Street and River Road | 2,025 | 24,900 | 3,145 | 38,700 | 3,430 | 42,200 |
| S. 2nd Street and S. 3rd Street | 1,800 | 22,200 | 2,820 | 34,700 | 3,000 | 36,900 |
| S. 3rd Street and S. 5th Street | 1,625 | 19,800 | 2,710 | 33,300 | 3,045 | 37,300 |
| S. 11th Street and Ronan Street | 1,625 | 20,000 | 2,715 | 33,200 | 3,110 | 38,200 |
| South of S. 14th Street-Mount Avenue | 1,870 | 22,900 | 2,600 | 32,000 | 2,865 | 35,200 |

As shown in Table 11, the year 2035 travel demand is projected to be lower south of S. 14th Street-Mount Avenue than the rest of the corridor due to more vehicles entering and leaving Russell Street via Mount Avenue and S. 14th Street. Additionally, a higher relative traffic demand is projected to enter and leave the corridor via S. 5th Street for the 5-lane scenario than the 3-lane scenario. The year 2035 traffic volumes represent forecast traffic demand per the travel demand model and may differ from the actual traffic volumes that will come to be on the corridor. One of the potential causes of this difference is that if critical road segments and/or intersections do not supply sufficient capacity for the forecast demand some traffic may divert to other corridors or they will travel during time periods with less demand. For example, if the Russell Street/W. Broadway Street intersection is projected to operate over capacity during the weekday p.m. peak hour not all of the traffic demand will be able to pass through the intersection during the course of an hour and it will limit or meter the amount of traffic that can travel on Russell Street during that time period.

### *Mode Split Shift*

The non-automobile mode (i.e., bicycle, pedestrian, and transit) split was evaluated to identify if a reduction can be applied to the forecast traffic volumes to account for an increase in the non-automobile modes on the Russell Street corridor. A potential range for non-automobile mode trends over the next 30 years was estimated after review of several national and local resources and past census data for the City and the area surrounding the Russell Street corridor (Reference 4). Table 12 illustrates the estimated growth range for non-automobile travel modes.

**Table 12 Potential Percent Shift in Non-Automobile Mode Split (2009 to 2035)**

| | |
|---|---|
| Low | 0% |
| Medium | 3-4% |
| High | 8% |

As shown in Table 12, the increase in non-automobile mode split could range between zero- and eight-percent. The medium estimate of three- to four-percent is based on current trends for the City and Russell Street corridor. The high estimate of eight-percent is based on the potential of increased pedestrian and bicycle ridership resulting from improved bicycle and pedestrian facilities along the corridor and enhanced transit service and amenities to the corridor.

With the information presented in Table 12, a sensitivity analysis was performed for all of the alternatives and options to assess the changes in traffic operations that might result from this level of traffic reduction on the corridor. No substantial change in traffic operations occurred between the alternatives and options, other than lower traffic volumes and the intersection of W. Broadway Street/Russell Street projected to operate under capacity. Therefore, the sensitivity analysis detailed results are not presented in this report. For further discussion on the sensitivity analysis, refer to Technical Memorandum #2.

## ANALYSIS METHODOLOGIES

### *Traffic Operations*

A traffic operational analysis was performed to evaluate the DEIS Alternatives 1, 2, 3, 4, and 5-Refined and Options 6 and 7 under year 2035 weekday p.m. peak hour traffic conditions. This analysis included an intersection analysis to assess level of service and capacity and a corridor-level analysis to assess travel times for each alternative and option.

The operational results from the Highway Capacity Manual (HCM) reports in Synchro were reported for signalized and unsignalized intersections. The draft 2010 HCM methodology was used to perform the roundabout intersection operational analysis for Alternatives 2, 3, 5-Refined, and Option 6. The proposed HCM methodologies are based on the findings presented in National Cooperative Highway Research Program (NCHRP) Report 572: *Roundabouts in the United States* (Reference 14), which is based on the most current and complete U.S. data available. A corridor-level analysis was performed using both the Synchro model and operational results from the intersection analysis for roundabouts. Travel time results were estimated for each direction of travel under year 2035 traffic conditions.

### *Safety*

The safety analysis was conducted using the procedures outlined in the draft Highway Safety Manual (HSM), expected to be published by AASHTO in late 2009/early 2010 (Reference 15). The HSM is similar to the HCM in that it is definitive, science-based, and created from widely accepted analysis procedures. The primary benefit of the HSM is that it allows for quantitative, predictive analysis of expected average crashes (e.g., it is expected that the average crash frequency for this alternative is X crashes per year), as opposed to the qualitative, descriptive-based analysis of historical crash data (e.g., there are more rear-end crashes at location Y than location Z), which makes up much of existing practice in safety analysis.

The HSM provides separate predictive methods for rural two-lane highways, rural multi-lane highways, and urban and suburban arterials. The urban and suburban arterials methodology was applied for the analysis of Russell Street and provides a relative comparison between the different alternatives/options for Russell Street. A relative comparison is made because the analysis is not calibrated to local conditions. In order to calibrate the safety predictive functions, the HSM recommends that data be analyzed for the most recent two- to three-year period for a minimum of 30 to 50 sites of the facility type being analyzed (e.g. four-lane divided roadway), or the total number of available sites, within the jurisdiction for which the calibration is being performed. This calibration effort would typically be performed on a jurisdiction-wide level.

### *Multimodal Level of Service (MMLOS)*

As identified under the existing conditions analysis for the MMLOS analysis, the methodology from the NCHRP Report 3-70 was used as a basis for evaluating multiple modes of travel on the Russell Street corridor. From the analysis, a combined intersection and segment LOS for transit, bicycle, and pedestrian mode is derived based on several inputs for the no-build and build conditions for the Russell Street corridor. The resultant LOS corresponds to the advantages and disadvantages that travelers perceive of roundabouts and traffic signal control, sidewalk and bike lane widths, buffers between the travel lane and bike paths and sidewalks, and other characteristics found on an urban roadway. The MMLOS analysis was applied to the different alternatives and options on Russell Street to assess the multimodal performance of each alternative and option.

### *Operational Performance Measures*

Several performance measures were evaluated at the intersections and for the corridor as part of the TAU. Table 13 summarizes the performance measures for the operational and safety analysis.

**Table 13 Year 2035 Performance Measures For The Operational And Safety Analysis**

| Technical Area | Intersection Performance Measures[1] | Corridor Performance Measures[2] |
|---|---|---|
| Traffic Operations | Delay and Level of Service | Vehicle Travel Time, Arterial Speed, LOS |
| | Volume-to-Capacity Ratio | Multimodal Level of Service[3] |
| | 95th Percentile Queues | |
| Safety | Expected Average Crash Frequency | Expected Average Crash Frequency |
| | Crash Severity | Crash Severity |

[1]Intersection performance measures will be applied at unsignalized (i.e., two-way stop-controlled or roundabouts) and signalized intersections in the study area.

[2]Corridor performance measures will be applied for specific segments (i.e., S. 14th Street-Mount Avenue to S. 3rd Street) in the study area.

[3]Mulitmodal level of service represents a level of service for each mode (i.e., pedestrians, bicyclists, and transit) of travel on the study corridor.

## OPERATIONAL AND SAFETY ANALYSIS SUMMARY

This section presents the results from the operational and safety analysis of Alternatives 1, 2, 3, 4, and 5-Refined and Options 6 and 7 under year 2035 traffic conditions. A discussion of the quantitative and qualitative measures of the analysis is provided for the alternatives and options. The following major intersections are addressed in this discussion:

- W. Broadway Street,
- Wyoming Street,
- S. 3rd Street,
- S. 5th Street,
- S. 11th Street-Knowles Street, and
- S. 14th Street-Mount Avenue.

### *Performance Measure Results*

Table 14 summarizes the traffic operations, safety, and MMLOS for the alternatives and options. The performance results are summarized by the major intersections and the corridor segments using a relative ranking system of "Good," "Fair," and "Poor." If a performance measure is rated "Good," for a given alternative or option it can be concluded that the analysis found it to be relatively good or superior to other alternatives/options; however, it doesn't necessarily mean that it is absolutely good or acceptable per agency standard. Likewise, if a performance measure is rated "Poor," for a given alternative or option it can be concluded that the analysis found it to be relatively poor or inferior to other alternatives/options; however, it doesn't necessarily mean that it is absolutely poor or unacceptable per agency standards.

**Table 14 Performance Summary of Alternatives and Options**

| Performance Measure | | DEIS Alternatives | | | | | Options | |
|---|---|---|---|---|---|---|---|---|
| | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5-R | Option 6 | Option 7 |
| Major Intersections | Safety | ○ | ● | ● | ◐ | ● | ◐ | ◐ |
| | Automobile | ○ | ○ | ○ | ● | ◐ | ○ | ◐ |
| | Pedestrian | ○ | ◐ | ◐ | ● | ○ | ◐ | ● |
| | Bicycle | ○ | ○ | ○ | ● | ◐ | ○ | ● |
| Corridor Segments | Safety | ○ | ◐ | ◐ | ● | ● | ◐ | ◐ |
| | Automobile | ◐ | ○ | ○ | ● | ◐ | ○ | ● |
| | Pedestrian | ○ | ◐ | ◐ | ● | ● | ◐ | ◐ |
| | Bicycle | ○ | ◐ | ◐ | ● | ◐ | ◐ | ● |
| | Transit | ○ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ |

● = Good ◐ = Fair ○ = Poor

As summarized in Table 14, Alternative 1 has the most "Poor" ratings and Alternative 4 has the most "Good" ratings of all the analyzed alternatives and options. In addition, Alternatives 2 and 3 and Option 6 have more "Poor" ratings than "Good ratings; whereas, Alternative 5-Refined and Option 7 have more "Good" ratings than "Poor" ratings.

All of the build alternatives and options are anticipated to be improvements over the no build scenario. Generally, the alternatives and options with roundabouts do not rate as well as those with traffic signals for automobiles, bicycles, and pedestrians at the major intersections; however, they operate better in regards to safety. In addition, the alternatives and options with three lanes do not rate as well as those with five lanes along the corridor segments.

A brief discussion of the above performance measures summary is provided below for each alternatives and option.

### Safety

The safety performance measure was determined by analyzing the proportion of predicted motor vehicle average crash frequency for the alternative/option compared to the predicted motor vehicle average crash frequency for the respective no-build alternative (e.g., Alternative 2 is predicted to have 67 percent of the average crash frequency of Alternative 1 [3-lane]). Table 15 summarizes the safety analysis results for the Russell Street corridor combining intersection and segment safety.

**Table 15 Safety Summary for Future Traffic Conditions**

| | 3-Lane Volume Scenario | | | | 5-Lane Volume Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Alt 1 | Alt 2 | Alt 3 | Option 6 | Alt 1 | Alt 4 | Alt 5-R | Option 7 |
| Percentage of Crashes Compared to No-Build Scenario (Alternative 1) | 100% | 67% | 65% | 85% | 100% | 70% | 63% | 73% |

Table 15 shows that on a relative basis, Alternatives 2, 3, and 5-Refined would yield the largest reduction in crash frequency as compared to the base prediction. Given that traffic volumes are lower (approximately 3,000 to 5,000 vehicles per day) under the 3-lane alternatives, Alternatives 2 and 3 are predicted to have lower absolute average crash frequencies then Alternatives 4, 5-Refined, and Option 7. However, with traffic diverted to other routes in Missoula (e.g. Reserve Street, Orange Avenue) it is possible that crashes will migrate to other locations on the system.

### Automobile

The automobile performance was determined by analyzing the intersection traffic operations per the HCM and draft HCM procedures. The results summarized above in Table 14, focus solely on the major intersections and are determined by the number of major intersections that are expected to operate at LOS "C" or better. All of the minor intersections operate with two-way stop control and were not considered in this summary as they do not impose significant delay to the Russell Street corridor and most of them have sufficient capacity on Russell Street. Most of the delay, queues, and capacity issues that arise at the two-way stop controlled intersections will be noticed on the side-streets. The automobile intersection "Good" rating corresponds to a scenario with two major intersections operating at LOS "C" or better, the "Fair" rating corresponds to a scenario with one major intersection operating at LOS "C" or better, and the "Poor" rating corresponds to a scenario where no major intersections operate acceptably. Figure 20 illustrates the resultant year 2035 traffic operations at the major intersections on the corridor for all of the alternatives and options.

The segment performance measure rating is based upon the sum of the expected corridor travel time in the northbound and southbound directions. If the summed travel time is less than 11 minutes the alternative/option is considered "Good," if the travel time is greater than 11 minutes but less than 18 minutes the alternative/option is considered "Fair," and if the travel time is greater than 18 minutes the alternative/option is considered "Poor." Table 16 summarizes the corridor travel times for each alternative and option.

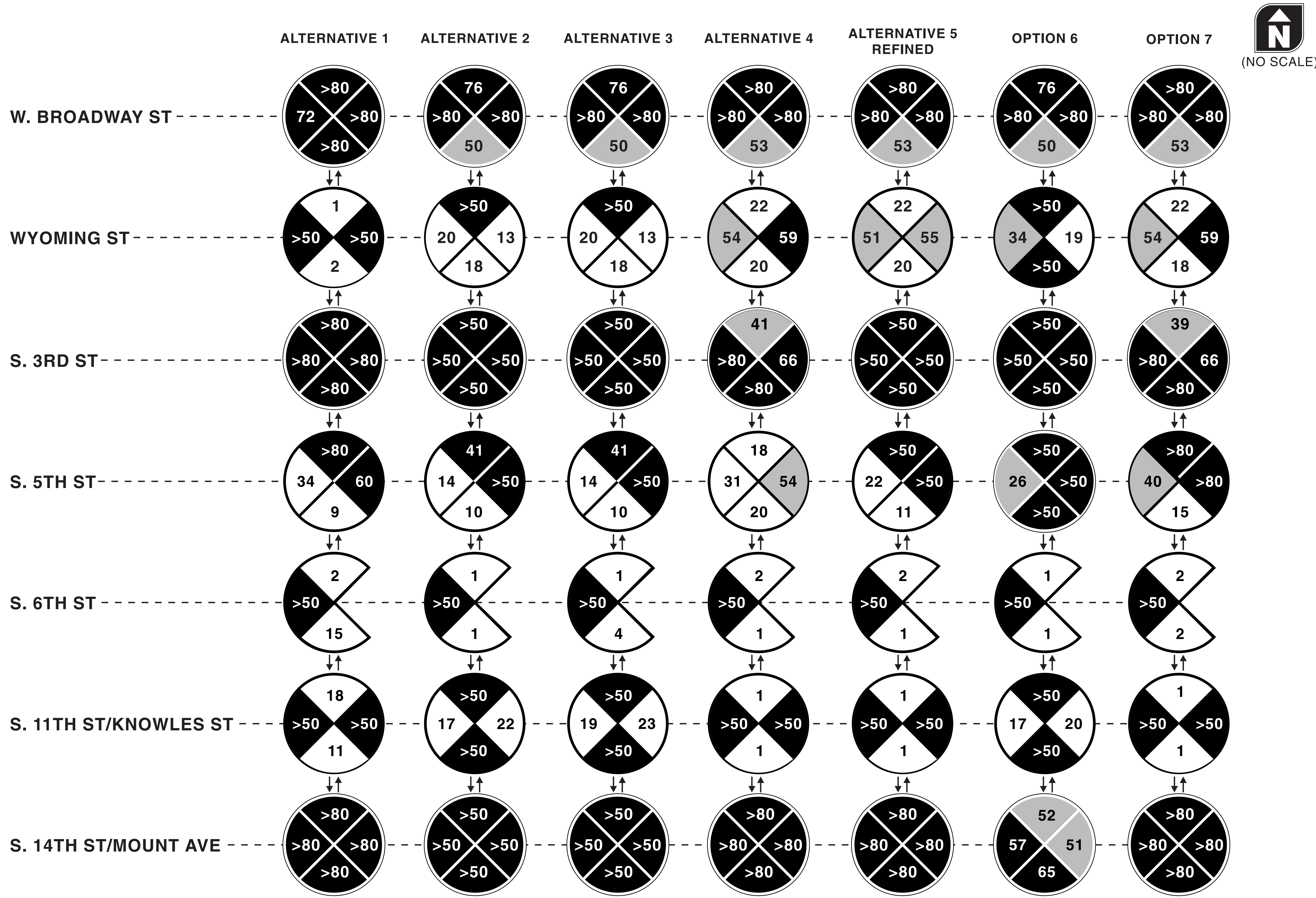
**Table 16 Travel Time Summary for Existing and Future Traffic Conditions**

| Direction of Travel | Analysis Scenario | DEIS Alternatives | | | | | | Options | |
|---|---|---|---|---|---|---|---|---|---|
| | | Alt 1 (No Build) | | | | | | | |
| | | 3 Lane Volumes | 5 Lane Volumes | Alt 2 | Alt 3 | Alt 4 | Alt 5-R | Option 6 | Option 7 |
| Northbound (Minutes: Seconds) | 2035 Volumes | 7:35 | 8:35 | 8:35 | 8:50 | 4:20 | 9:40 | >15:00 | 4:05 |
| Southbound (Minutes: Seconds) | 2035 Volumes | 6:35 | 8:55 | 12:30 | 13:05 | 5:10 | 13:40 | >15:00 | 6:43 |

### Pedestrian, Bicycle, and Transit

The pedestrian, bicycle, and transit performance measure ratings were determined by the values calculated from the methodology identified in the NCHRP Report 3-70. The values of each alternative and option were averaged in each direction of travel, summed, and compared relatively to each other. Similar values were grouped together and threshold levels were created for each mode of travel at the intersection and segment level. If no significant differences were found, the alternatives and options receive the same rating. For example, all the build alternatives and options are rated "Fair" for transit because the values are similar. NCHRP Report 3-70 does not calculate values for transit at the intersection level.

Final Technical Memoranda #2 and #3 provide a more thorough summary of the performance measures for each alternative and option.




**Notes:**

1. Mainline through traffic has no intersection delay at two-way stop controlled intersections with exclusive mainline through lane.

2. Alternative 1 traffic conditions reflect five-lane volume scenario.

**LEGEND**

- \# - APPROACH DELAY (SECONDS)
- LOS "A," "B," OR "C"
- LOS "D"
- LOS "E" OR "F"

YEAR 2035 INTERSECTION APPROACH TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
MISSOULA, MONTANA

FIGURE 20

Kittelson & Associates, Inc.
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### Lifespan Analysis

As summarized in the performance measure result summary, some of the build alternatives and options are anticipated to operate better than others. However, none of the alternatives and options are expected to operate acceptably under year 2035 traffic conditions and meet the City and MDT's operation standards per the projected traffic volumes summarized in Figures 17 and 18. As such, a lifespan analysis was performed for each build alternative/option to identify the timeline that each is projected to operate at an acceptable level of service and under capacity traffic conditions. Table 17 summarizes the lifespan analysis for each build alternative and option.

**Table 17 Lifespan Analysis Summary**

| Alternative / Option | Critical Intersection Level Of Service[1] | Last Year of Acceptable Operations[1] | Year 2035 Traffic Demand Shift | | |
|---|---|---|---|---|---|
| | | | PM Peak Link[2] | Daily Link[2] | Percent Change |
| Alternative 2 | S. 11th Street – Knowles Street | 2010[3] | -1,000 | -12,500 | -36% |
| Alternative 3 | S. 11th Street – Knowles Street | 2010[3] | -1,000 | -12,500 | -36% |
| Alternative 4 | W. Broadway Street | 2023 | -600 | -8,000 | -20% |
| Alternative 5-R | S. 3rd Street | 2012 | -1,200 | -15,000 | -39% |
| Option 6 | Wyoming Street, S. 3rd Street, & S. 5th Street | 2009 | -1,000 | -13,000 | -38% |
| Option 7 | W. Broadway Street | 2023 | -600 | -8,000 | -20% |

[1]The thresholds used in the analysis to determine acceptable traffic operations include: LOS D or better; volume-to-capacity ratio of 1.0 or less at traffic signals; and volume-to-capacity ratio of 0.85 or less at roundabouts.

[2]Alternatives 2 and 3, and Option 6 are based on the 3-lane traffic volume scenario. Alternatives 4, 5-Refined, and Option 7 are based on the 5-lane traffic volume scenario.

[3]For Alternatives 2 and 3, S.11th Street – Knowles Street intersection does not meet LOS and volume-to-capacity standards in the year 2010. If a roundabout traffic control was not included at this intersection, these two alternatives would operate acceptably until the year 2019.

As summarized in Table 17, Alternative 4 and Option 7 have the longest acceptable lifespan (year 2023) and Option 6 has the shortest acceptable lifespan. The lifespan of each alternative and option may be extended if the traffic projections are not realized as anticipated per the local travel demand model and LRTP. For a reduction in traffic projections to occur, changes in current land use, mode split, population growth, and/or culture would need to occur. In addition, enhancements can be made to each of the build alternatives and options to increase their acceptable lifespan. For example, as designed in the DEIS, Alternatives 2 and 3 are anticipated to operate acceptably through year 2010 however, if a single-lane roundabout is not built at the S. 11th Street-Knowles Street intersection it would be expected to operate through year 2019.

## TRADEOFFS

The Russell Street TAU analyzes and summarizes traffic operations and safety for seven design alternatives and options. The seven alternatives and options are unique to each other; however, there are only a couple major differences between each of them (i.e., traffic control and cross-section.) Each of these differences has their own trade-offs which is summarized below.

### Intersection Traffic Control

One of the significant differences between the alternatives and options is the type of intersection traffic control utilized at the major Russell Street intersections. The seven alternatives and options assume a mix of roundabouts, traffic signals, and two-way stop-controlled intersection traffic control devices at the major intersections.

Research has found that roundabouts generally have a lower number of collisions and less severe collisions than traffic signals and stop-controlled intersections. In addition, when operating efficiently, roundabouts can experience less delay than traffic signals because they utilize yield control rather than stop control (red light) and they provide more capacity to the minor-street approaches than two-way stop-controlled intersections. Roundabouts do not have protected crossings for pedestrians; however, splitter islands do provide the opportunity for two-stage crossings. Bicyclists can not travel through a roundabout in their exclusive right-of-way but they have the opportunity to behave as a vehicle at nearly identical speeds or use the pedestrian facilities depending on their comfort level. Roundabouts require a significant amount of right-of-way at the intersection location but sometimes are able to reduce roadway width when turn-lanes are not required. Depending on the roundabout design, it can be difficult to enhance a roundabout or provide additional capacity without needing to reconstruct the entire intersection. As noted earlier, Alternatives 2, 3, 5-Refined, and Option 6 include several locations with roundabouts and resulted in a better safety performance at these intersections. However, a major disadvantage with the roundabouts as configured is that they lacked the capacity to accommodate the year 2035 traffic volumes, which resulted in lengthy vehicle delays and queue spillback between intersections.

Traffic signals tend to experience a higher number of collisions than roundabouts and stop-controlled intersections; however, they can provide more capacity to an intersection. Depending on the intersection design, exclusive bicycle and pedestrian facilities can be provided at a signalized intersection and a protected phase can assist with their travel through the intersection. Traffic signals can be retrofitted more easily than roundabouts to provide additional capacity but these improvements can create a large right-of-way footprint. All of the alternatives and options have at least one traffic signal at an intersection on the corridor. As noted earlier in the analysis, the travel time and intersection operations were generally better at the signalized intersections. However, some of these intersections continue to not meet the LOS standards for the City or MDT under year 2035 traffic conditions. An advantage of having a traffic signal system on the corridor is that the traffic signals can be coordinated to assist with managing traffic flow, vehicle queues, and vehicle emissions.

Two-way stop controlled intersections provide free flow capacity to the major street's through movements; however, the minor streets have limited capacity and may not be able to access the major street easily. Crosswalks are provided for pedestrians but it can be difficult for pedestrians and bicyclists to cross the uncontrolled main road's travel lanes. Similar to signalized intersections, additional lanes can be added to a two-way stop controlled intersection but that increases the intersections footprint and provides minimal additional capacity for the minor street approaches.

### Roadway Cross-Section

Another significant difference between the alternatives and options is the roadway cross-section along the Russell Street corridor. Between the alternatives and options the roadway cross-section ranges from having two travel lanes to five travel lanes. A wider roadway cross-section has different impacts than a narrower cross-section.

The Missoula LRTP identifies Russell Street as a five-lane facility for the entirety of the study corridor. As a result, the travel demand model and planned system-wide traffic levels and transportation improvements assume Russell Street is a five-lane facility. As a five-lane facility, Russell Street provides additional capacity to the area's transportation system. The additional capacity is significant when noting the expected congestion of the other parallel roadway facilities that cross the Clark Fork River. A narrower Russell Street facility decreases the capacity of Russell Street and may cause traffic to reroute to other facilities (e.g., Reserve Street and Orange Street) causing a system-wide impact not currently planned for in the LRTP or other transportation studies. The three-lane facility has its advantages with a skinnier street and lower costs, but it is projected to result in a congested environment during the year 2035 peak hour traffic conditions.

A five-lane facility obviously requires additional right-of-way than a two- or three-lane facility. Additional right-of-way has a monetary cost and potentially an environmental cost. A wider roadway cross-section may require the displacement of additional buildings than a narrower cross-section and/or a greater impact to existing property boundaries. The reciprocal of the higher costs associated with additional travel lanes is the benefit associated with additional automobile capacity. More travel lanes generally provide additional capacity which in turn can reduce vehicle queues, delay, and travel times. In addition, a roadway with only one through travel lane in each direction is generally limited to having one exclusive right-turn and/or left-turn lane; whereas, a roadway with multiple through travel lanes can accommodate multiple turn lanes to enhance intersection capacity. For example, the intersections of W. Broadway Street/Russell Street, S. 3rd Street/Russell Street, and S. 14th Street-Mount Avenue are projected to operate over capacity in year 2035. Lane enhancements, such as, adding a second left-turn lane or right-turn lane were identified in the analysis to improve the year 2035 traffic operations. For these improvements to occur, Russell Street would need to have two receiving lanes to accommodate a second turn lane at the intersection.

The roadway cross-section consists of more than automobile travel lanes. For instance, the alternatives and options include raised, landscaped and striped medians, bicycle lanes, sidewalks, landscaped boulevards, and bus pull-outs for transit service. The raised, landscaped (non-traversable) medians provide several safety and operational benefits to the corridor, including:

- access management via restricting certain access locations to right-in/right-out movements (i.e., some of the alternatives/options include this treatment between S. 3rd Street and S. 14th Street-Mount Avenue),
- a separation between vehicles traveling in opposite directions assists with reducing the potential for head-on collisions,
- positive guidance to motorists on the roadway,

- left-turn vehicular conflict reduction with pedestrians and bicyclists, and
- aesthetic enhancements to the roadway (Reference 16).

As noted in the TRB Access Management Manual (Reference 16), non-traversable medians should be considered when traffic volumes exceed 24,000 to 28,000 vehicles per day. The year 2035 traffic projections exceed this traffic volume threshold for the corridor.

Pedestrian treatments, such as sidewalks, marked crossings at the signalized and roundabout intersections, and landscaped boulevard between the curb and sidewalk are generally included with the alternatives and options. All of these treatments will provide major enhancements to the corridor for the pedestrian experience.

Bicycle lanes at approximately 5.5 feet are identified for all of the build alternatives and options. The bike lanes are proposed to be delineated with a solid white painted stripe and bike symbols to clearly identify the lane as a bike lane.

Bus pull-outs are identified for all of the build alternatives and options and would be coordinated with Mountain Line for location of the stops. Bus pull-outs provide several safety and operational benefits that include:

- Patrons are able to board and alight out of the travel lane,
- A protected area away from the moving vehicles for both the stopped bus and the bus patrons, and
- An opportunity for bus operators to exit the travel lane, stop and pick-up any riders with minimal delay to the traffic flow, and with their use of turn signal/automated signs to easily enter into the traffic flow when vehicles yield to the buses per the City's new ordinance.

# **Section 6** Simulation Model Observations and Design Enhancements

# Simulation Model Observations and Design Enhancements

This section presents a summary of the methodology and observations of the simulation models for Alternative 4 and Option 7. The alternative and option were carried forward to the simulation model based on the analysis findings presented in Technical Memorandum #2 and oversight from the project team. It should be noted that Alternative 4 is the preferred alternative in the DEIS. Additionally, this section summarizes several design enhancements for the alternatives and options based on the analysis findings and review of the alternatives and options.

## SIMULATION MODEL OBSERVATIONS

### *Description of Simulation Model*

VISSIM was used to develop the simulation models for Alternative 4 and Option 7. VISSIM is a microscopic, behavior-based multi-purpose traffic simulation program capable of modeling individual vehicle interactions on complex roadway networks. VISSIM requires inputs such as lane assignments and geometries, intersection turning movement volumes, pedestrian and bicyclist volumes, transit vehicles and services, vehicle speeds, percentages of vehicles by type, and pre-timed and/or actuated signal timing. Model output is produced that contains measures of effectiveness commonly used in traffic engineering profession, including delay, travel time, queue lengths, and traffic volumes (Reference 18).

A primary reason VISSIM was chosen for this project is the ability to develop three-dimensional visualization. As illustrated in Figure 21, VISSIM is able to graphically illustrate traffic conditions through animation that can provide a sophisticated, realistic portrayal of the future traffic conditions.


**Figure 21. VISSIM Model at the W. Broadway Street/Russell Street Intersection**

In developing the Alternative 4 and Option 7 models, several features were used in VISSIM to capture the vehicle-to-vehicle interaction, multimodal uses, and general layout of the corridor. The development of the VISSIM models consisted of the following general process:

- Synchro models for Alternative 4 and Option 7 were converted to VISSIM.
- Bike lanes, pedestrian crossings, multiuse paths, and transit routes were added to the VISSIM models. Figure 22 illustrates some bicyclists and pedestrians in the model.
- The signal timing parameters, all left-turn phasing, and right-turn-vehicles-on-red were coded and checked at each signalized intersection.
- The priority rules and conflict areas for pedestrians, bicyclists, transit vehicles, and vehicles were coded and verified in the models.
- Initial simulation runs were performed for each model to assess the traffic conditions, priority rules, and multimodal elements on the corridor.
- The simulation models were calibrated using the delay, vehicle queues, and travel times obtained from the Synchro models of Alternative 4 and Option 7. For instance, the average travel times between S. 3rd Street and W. Broadway Street are approximately 2 ½ minutes in each direction in the VISSIM Model and are comparable to the travel time reported in Synchro. South of S. 3rd Street, the intersections are more congested and so the travel times are different from Synchro. This is due to VISSIM being able to capture the vehicle queue spillback at the S. 3rd Street/Russell Street and S. 14th Street-Mount Avenue intersections. By using the simulation model, the metering of traffic volumes is captured at the W. Broadway Street, S.3rd Street, and S. 14th Street-Mount Avenue intersections.

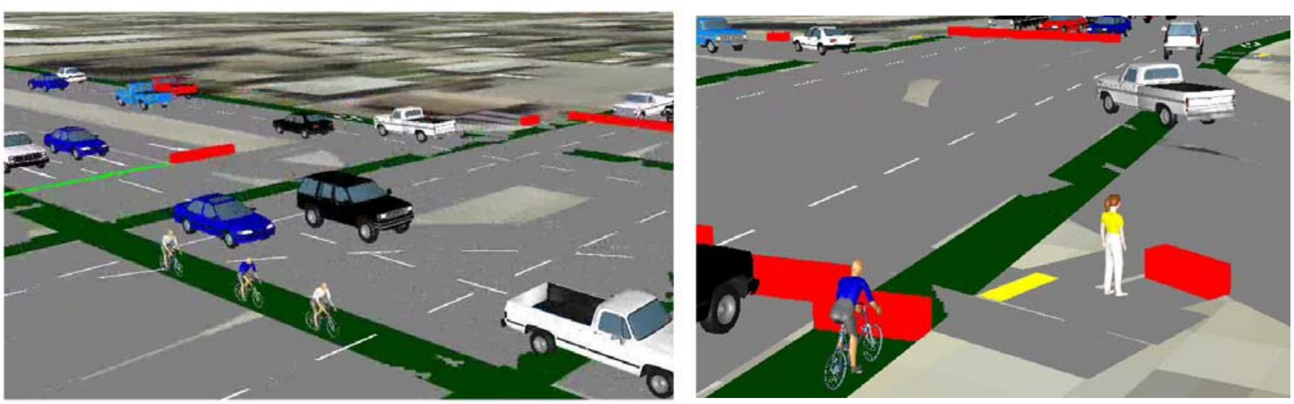

**Figure 22. Bicycle and Pedestrian Interaction at the S. 3rd Street/Russell Street Intersection**

After this initial model development, each of the simulation models were analyzed under ten distinct simulation runs to collect the performance measures. The ten runs were compiled and averaged to obtain a summary of performance measures for Alternative 4 and Option 7. Several intersection and corridor performance measures were collected and reviewed as part of the simulation model development and analysis. This included vehicle/transit delay and level of service, average approach queues, vehicle/transit travel time, and metering of traffic volumes on the corridor.

## Corridor Operations Summary

This section presents the observations and results from the corridor operations analysis of Alternative 4 and Option 7 under year 2035 traffic conditions. The graphics presented are taken from the simulation model at about thirty minutes of the year 2035 peak hour traffic conditions.

### Visual Observations for Alternative 4

In Alternative 4, the provision of two continuous through lanes provides additional capacity and queue management opportunities on the corridor in comparison to the current conditions. In the model, it was observed that vehicles traveling in the southbound direction from the W. Broadway Street/Russell Street intersection traverse the corridor with minimal vehicle queues, except at the S. 14th Street-Mount Avenue/Russell Street intersection. Over the duration of the peak hour, the overcapacity conditions of the southbound left-turn movement at the S. 14th Street-Mount Avenue/Russell Street intersection causes queue spillback that impacts the traffic flow between S. 3rd Street and S. 14th Street-Mount Avenue. Figure 23 illustrates the southbound left-turn vehicle queue at the S. 14th Street-Mount Avenue/Russell Street intersection.

**Figure 23. Southbound Left-Turn Vehicle Queue at S. 14th Street-Mount Avenue/Russell Street Intersection (Alternative 4)**

Vehicles traveling in the northbound direction from the S. 14th Street-Mount Avenue/Russell Street intersection experience lengthy delays due to lengthy vehicle queues from the northbound left-turn movement at the S. 3rd Street/Russell Street intersection. The overcapacity conditions of this northbound left-turn movement causes vehicle queues to spillback to S. 8th Street over the duration of the peak hour. Figure 24 illustrates the northbound left-turn vehicle queue at the S. 3rd Street/Russell intersection.

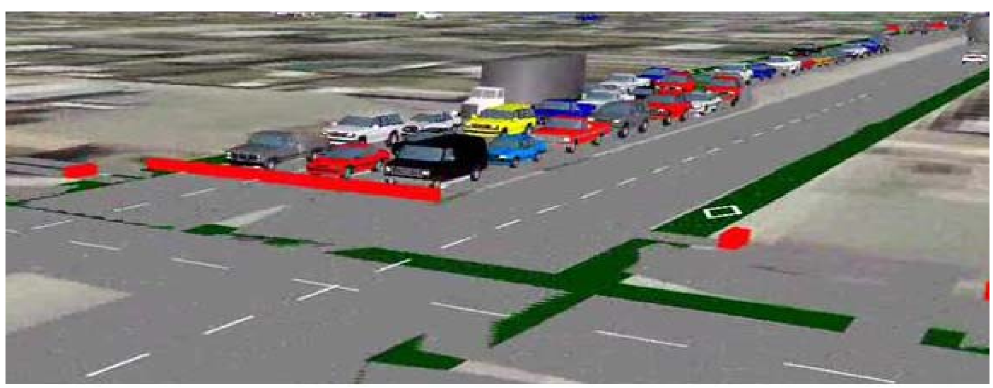

**Figure 24. Northbound Left-Turn Vehicle Queue at S. 3rd Street/Russell Street Intersection (Alternative 4)**

### Visual Observations for Option 7

In Option 7, the section of Russell Street between S. 6th Street and S. 14th Street-Mount Avenue has a single through lane in each direction. It was observed that this section of the corridor is operating under slow-moving, congested traffic conditions. In the southbound direction, vehicle queues spill back to S. 7th Street from the intersection of S. 14th Street-Mount Avenue over the duration of the peak hour. The traffic flow was observed to be a slow-moving single-lane of traffic between S. 3rd Street and S. 14th Street-Mount Avenue with less friction between vehicles due to only having a single lane in this section. Figure 25 illustrates the southbound left-turn vehicle queue at the S. 14th Street-Mount Avenue intersection.

**Figure 25. Southbound Left-Turn Vehicle Queue at S. 14th Street-Mount Avenue/Russell Street Intersection (Option 7)**

In the northbound direction, vehicle queues are lengthy and spill back to S. 8th Street from the intersection of S. 3rd Street. The vehicle queues at S. 3rd Street and S. 5th Street are slightly better than Alternative 4 because more green time is provided for the northbound through movement at S. 5th Street. The additional green time is due to the southbound direction of travel having a single through lane and that the northbound and southbound through movements operate under one signal phase. Figure 26 illustrates the northbound left-turn vehicle queue at the S. 3rd Street/Russell Street intersection.

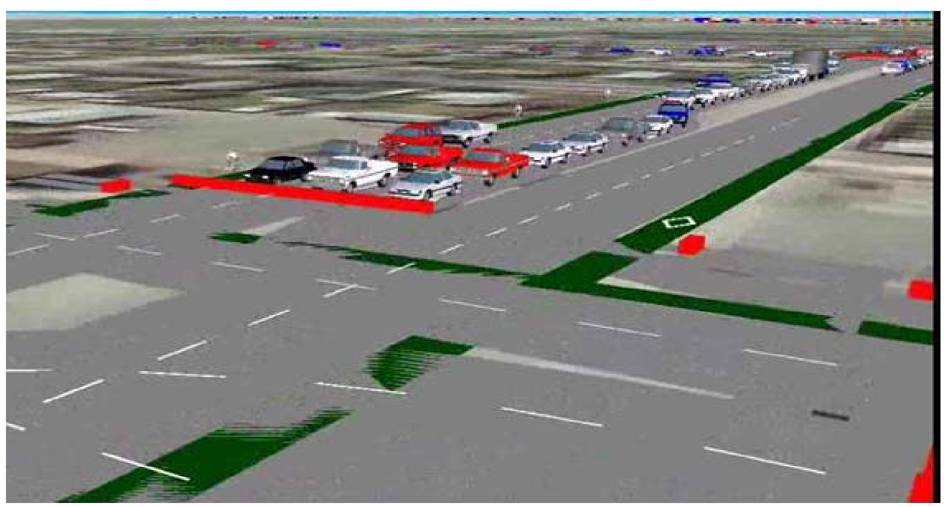

**Figure 26. Northbound Left-Turn Vehicle Queue at S. 3rd Street/Russell Street Intersection (Option 7)**

Vehicles at the unsignalized intersections on the northern section of the corridor were observed to find adequate gaps to make a right or left-turn onto Russell Street. However, it was observed that finding gaps in the traffic stream were difficult and resulted in lengthy queues on the side streets in the southern section of the corridor due to high level of congestion. As shown in Figures 25 and 26, the heavy traffic flow on Russell Street makes it difficult for vehicles to turn from S. 11th Street-Knowles Street onto Russell Street. This results in lengthy queues on the side-street approaches. Option 7 was observed to have worse operations and longer vehicle queues on the minor street approaches, in particular at S. 5th Street and 11th Street-Knowles Avenue than Alternative 4, due to the heavy traffic flow in the single through lane in Option 7.

### Similar Visual Observations for Alternative 4 and Option 7

At the W. Broadway Street/Russell Street intersection, the traffic conditions are very similar between the alternative and option. The north and south approaches operate acceptably with queues clearing on each cycle length. The westbound left-turn lane and eastbound through lane at W. Broadway Street/Russell Street intersection have lengthy queues during the duration of the peak hour.

In both Alternative 4 and Option 7, it was observed that the transit routes and associated travel time are expected to be similar to today's conditions, given that the transit routes operate on the northern section of the corridor, where the queues and overall delays are better for the system. The City recently passed an ordinance that motorists must yield to buses when buses are trying to enter back into a travel lane after being stopped. This application was modeled for buses in VISSIM. Figure 27 illustrates the interaction between buses and traffic on the northern section of the corridor.

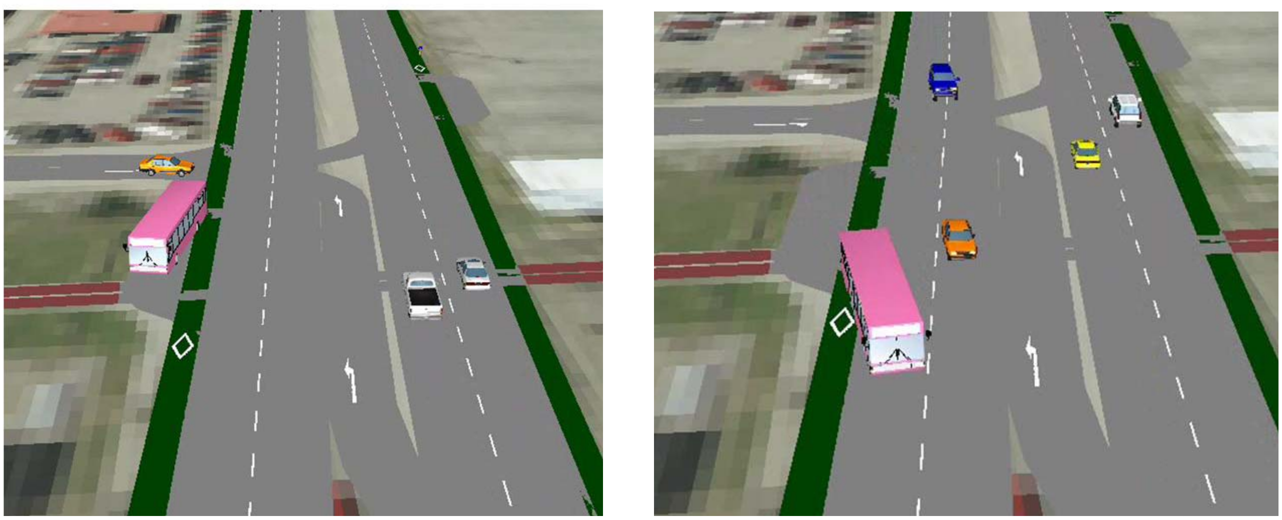

**Figure 27. Route #2 Bus at a Bus Stop Pull-Out Area on the Northern Section of Russell Street**

Pedestrians and bicyclists are modeled in the simulation. The trails that cross the corridor are shown in the simulation with varying volume and speed parameters for bicyclists and pedestrians. It was observed that pedestrians and bicyclists crossed at intersections and utilized the trails on the corridor.

### Impact of Metered Traffic Demand

As discussed in Technical Memoranda #2 and #3, the intersections of W. Broadway Street/Russell Street and S. 14th Street-Mount Avenue/Russell Street are projected to operate over capacity and therefore, result in metering traffic volumes on the corridor. The metering characteristics of these intersections were observed in the simulation model, as well as recorded using traffic volume counters on Russell Street, just south of W. Broadway Street and just north of S. 14th Street-Mount Avenue. Table 18 summarizes the peak hour traffic volumes counted in VISSIM and those developed from the 2035 travel demand model for Alternative 4 and Option 7.

**Table 18 Alternative 4 and Option 7, Year 2035 Weekday PM Peak Hour Travel Demand Model and VISSIM Peak Hour Traffic Volumes Summary**

| Location on Russell Street | Alternative / Option | 2035 Peak Hour Travel Demand | VISSIM Peak Hour Traffic Counters | Peak Hour Traffic Volume Change | Percent Change |
|---|---|---|---|---|---|
| South of W. Broadway Street | Alternative 4 | 3,430 | 2,815 | -615 | -18% |
| | Option 7 | 3,430 | 2,690 | -740 | -22% |
| North of S. 14th Street-Mount Avenue | Alternative 4 | 2,990 | 2,155 | -835 | -28% |
| | Option 7 | 2,990 | 2,055 | -935 | -31% |

As shown in Table 18, the simulation model accounts for the overcapacity conditions at these two intersections and the resultant metering of traffic volumes onto Russell Street. With the overcapacity conditions at these two intersections, a combination of the following elements will likely occur with no capacity improvements to the intersections:

- Russell Street may have a longer period of congestion.
- Other corridors may see an increase in traffic volumes due to drivers avoiding Russell Street during the peak conditions.
- Drivers may choose to use alternative modes of transportation, such as biking, transit, or walking to complete their trip.
- Drivers may choose to travel at other times of the day when the corridor is less congested.

Also, if improvements were made at these two intersections, in particular the S. 14th Street-Mount Avenue intersection, Alternative 4 has available capacity in the southern section of the corridor to accommodate a higher level of entering peak hour traffic volume on the corridor.

As shown in Table 18, Alternative 4 results in processing more traffic over the duration of the peak hour. From the simulation models, it was observed that Alternative 4 is processing more of the side-street traffic volumes due to the ability for motorist to negotiate a gap in the section between S. 3rd Street and S. 14th Street-Mount Avenue.

## Intersection Operations

The intersection approach delay, intersection delay, and level of service were observed and summarized within each simulation model. Table 19 summarizes the traffic operations under year 2035 traffic conditions for Alternative 4 and Option 7.

**Table 19 Intersection Operations for Alternative 4 and Option 7, Year 2035 Traffic Conditions Weekday PM Peak Hour (Simulation Model)**

| Intersection | Alternative 4 | | | | | Option 7 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Intersection LOS | Approach LOS | | | | Intersection LOS | Approach LOS | | | |
| | | NB | SB | EB | WB | | NB | SB | EB | WB |
| W. Broadway Street | 76 | 50 | 153 | 76 | 78 | 78 | 51 | 152 | 82 | 78 |
| Wyoming Street | 19 | 19 | 15 | 40 | 32 | 20 | 18 | 17 | 41 | 34 |
| S. 3rd Street | 51 | 37 | 32 | 99 | 73 | 57 | 42 | 36 | 103 | 97 |
| S. 5th Street | 30 | 22 | 26 | 24 | 50 | 53 | 17 | 111 | 92 | 133 |
| S. 14th Street-Mount Avenue | 74 | 87 | 83 | 73 | 54 | 73 | 88 | 76 | 88 | 49 |

Level of Service C or Better | Level of Service D | Level of Service E or F

[1]All numbers represent the average delay in seconds reported from the simulation model.

As shown in Table 19, all of the intersections have very similar intersection operations between Alternative 4 and Option 7, except at the intersection of S. 5th Street/Russell Street. Option 7 has very high delay on the eastbound, westbound, and southbound approaches. The southbound movement is a very heavy volume movement under both Alternative 4 and Option 7, but Option 7 has only a single through lane and operates over capacity during the duration of the peak hour. The eastbound and westbound approaches have less green time than Alternative 4 and results in lengthy delays and queues under Option 7. The less green time is due to an increase of green time being provided for the northbound and southbound approaches associated with the change in number of travel lanes. Similar operations were observed at the north end of the corridor for Alternative 4 and Option 7, given the same cross section. Overall, the intersection operations are not exceptional for Alternative 4 or Option 7 during the year 2035 traffic conditions. Both Alternative 4 and Option 7 could benefit from certain enhancements at the intersections of W. Broadway Street/Russell Street, S. 3rd Street/Russell Street, and S. 14th Street-Mount Avenue/Russell Street, such as adding a turn lane or extending the turn lane storage length.

## Corridor Operations

### *Auto Travel Time*

Travel times were observed and reported from the simulation models for both Alternative 4 and Option 7. The travel times include running time, intersection delay, and delay associated with queues on the corridor between W. Broadway Street and S. 14th Street-Mount Avenue. Table 20 provides a summary of the auto travel times for Alternative 4 and Option 7 under year 2035 traffic conditions.

**Table 20 Average Auto Travel Time Summary for Alternative 4 and Option 7, Year 2035 Traffic Conditions Weekday PM Peak Hour**

| Corridor Segment | Alternative 4 | | Option 7 | |
|---|---|---|---|---|
| | Northbound | Southbound | Northbound | Southbound |
| W. Broadway Street and Wyoming Street | 2:03 | 1:00 | 2:03 | 1:06 |
| Wyoming Street and S. 3rd Street | 0:51 | 1:24 | 0:51 | 1:29 |
| S. 3rd Street and S. 5th Street | 0:36 | 0:41 | 0:42 | 1:08 |
| S. 5th Street and S. 14th Street-Mount Avenue | 1:39 | 3:36 | 1:43 | 3:28 |
| W. Broadway Street and S. 14th Street-Mount Avenue | 5:09 | 6:41 | 5:19 | 7:11 |

[1]Travel time reported based on recordings from the simulation models over the peak hour.

[2]Travel time is reported in minutes and seconds (minutes:seconds).

As shown in Table 20, Alternative 4 is projected to have slightly better average auto travel times than Option 7. The reduced segment capacity between S. 5th Street and S. Lawrence Street results in longer vehicle queues and a longer duration of congested conditions. It was observed that the maximum travel times for Alternative 4 were 5-½ and 8 minutes for the northbound and southbound directions of travel, respectively. The maximum travel times for Option 7 were 6 and 8-½ minutes in the northbound and southbound directions of travel, respectively.

*Transit Travel Time*

Transit travel times were observed and reported from the simulation models for both Alternative 4 and Option 7. Routes #2 and #9 travel between S. 3rd Street and W. Broadway Street and include several stops on Russell Street. The transit travel time includes the running time, intersection delay, and stopped delay at the bus stops. The transit travel times are not comparable to the average auto travel times because they cover different segments of Russell Street in addition to eastbound and westbound approach delay on S. 3rd Street and W. Broadway Street. Table 21 provides a summary of average transit travel times for Routes #2 and #9.

**Table 21 Average Transit Travel Time Summary for Alternative 4 and Option 7, Year 2035 Traffic Conditions Weekday PM Peak Hour**

| Direction of Travel | Alternative 4 | | Option 7 | |
|---|---|---|---|---|
| | Route #2 Travel Time | Route #9 Travel Time | Route #2 Travel Time | Route #9 Travel Time |
| Inbound (Minutes:Seconds) | 10:46 | 10:54 | 11:51 | 12:18 |
| Outbound (Minutes:Seconds) | 6:21 | 6:20 | 7:59 | 6:30 |

As shown in Table 21, transit travel times are better for Alternative 4 than Option 7. The longer travel times for Option 7 are mostly due to slightly higher delays at the S. 3rd Street/Russell Street intersection.

## DESIGN ENHANCEMENTS

Through the review of the alternatives and options and analysis findings, several design enhancements were identified that could be carried forward for the preferred alternative in the FEIS. These enhancements include improvements for all transportation modes on the corridor. This section provides an overview of some enhancements for the project team to consider for the preferred alternative in the FEIS.

### *Pedestrian Treatments*

There are several treatments available that can enhance the overall environment for pedestrians in the alternatives and options. At signalized intersections, the following treatments could be explored to improve the operations and safety for pedestrians.

Stamped concrete in crosswalk provides drivers with a visual cue to be aware of pedestrians. The stamped concrete can also be installed to indicate a gateway to a specific historic or neighborhood area. Stamped concrete is used in many cities in the U.S., including Hollywood, CA, Boise, ID, Portland, OR. Figure 28 illustrates an application of stamped concrete in Hollywood, CA.


**Figure 28. Stamped Concrete Used in a Cultural District in Hollywood, CA**

Specific technology at the signalized intersections, such as leading or lagging the pedestrian interval or pedestrian countdown signals, could be implemented to improve the safety and guidance to pedestrians. The pedestrian interval could start a few seconds before the vehicle phase or end the pedestrian phase a few seconds after the vehicle phase to provide additional buffer between the vehicle and pedestrian phases at the crosswalk. The pedestrian countdown signals provide additional guidance to pedestrians on the amount of time that is available to cross the intersection before a vehicle phase begins. Figure 29 illustrates an application of a pedestrian countdown signal and stamped concrete on an arterial in Boise, ID.

**Figure 29. Countdown Pedestrian Signal and Stamped Concrete on an Arterial in Boise, ID**

Pedestrian island refuges can be installed to provide pedestrians with a refuge while crossing a larger-sized intersection. The pedestrian islands could be explored at locations, such as W. Broadway Street, S. 3rd Street, and S. 14th Street-Mount Avenue as part of a raised median to separate the opposing travel lanes.

### *Bicycle Treatments*

There are several treatments available that can enhance the overall environment for bicyclists in the alternatives and options. The following treatments could be explored at intersections and on the corridor to improve the operations and safety for bicyclists.

The bike box is an intersection safety design to prevent bicycle/car collisions, especially those between drivers turning right and bicyclists going straight. It is a green box on the road with a white bicycle symbol inside. It includes green bicycle lanes approaching and leading from the box, as well as signing for vehicles about no right-turns on red. The bike box is a 14-foot deep reservoir in front of the vehicle stop bar used for locations with shared through-right turn lanes. Figure 30 illustrates a bike box at an intersection in Portland, OR.

**Figure 30. Bike Box at an Intersection in Portland, OR**

The bike boxes provide additional visibility and awareness of bicyclists at the intersection. At a red light, cyclists are more visible to motorists by being in front of them. At a green light, the green bike lane through the intersection reminds motorists and cyclists to watch for each other. A research project, titled *Evaluation of Bike Boxes at Signalized Intersection* is currently being done by Portland State University to evaluate the twelve bike boxes in Portland, OR.

Additional bicyclist treatments include inductive loop bicycle detection at signalized intersections, which provides bicyclists with an opportunity to be detected at the intersection to reduce delay to loop bicyclists. With detection in place, when a bicycle pulls onto the bicycle stencil, inductance on changes and detects the presence of bicycle and assists with reducing delay to bicyclists at the intersection. Colored or outlined bike lanes on the corridor can enhance the vehicular and bicycle awareness on the street. Figure 31 illustrates two applications in Salt Lake City, UT and New York City, NY.


**Figure 31. Colored Bikes Lanes in New York City, NY and Salt Lake City, UT**

As shown in Figure 31, the colored bike lanes (green and blue) have been implemented in several cities as part of demonstration projects with the FHWA.

### *Transit Treatments*

There are several treatments available that can enhance the overall environment for transit in the alternatives and options. The following treatments could be explored at intersections and on the corridor to improve the operations and safety for transit.

The transit LOS could be enhanced along the corridor with an increase of the bus service frequency (i.e., move from 30-minute headways to 15-minute headways) on the existing routes for the northern section of the corridor. Additionally, exploring adding transit service to the southern section of the corridor would be beneficial to the transit operations and overall corridor operations.

In addition to service plan enhancements, the following treatments should be explored at the bus stop pull-out areas for the alternatives and options. At the bus stop pull-out areas, an accessible path should be provided between the stop area and the sidewalk with the use of some of the following applications:

- The path and bus stop area should be clear of snow, ice and other debris.

- The accessible travel path should be located with the shortest distance between the bus stop area and sidewalk, or accessible building.
- The surface of the bus stop area should be distinguishable from the surrounding areas to accommodate persons with visual impairments. The use of different textures, such as concrete, paving stone, contrasting colors, tactile strips and curbs help to delineate pathways.

Other amenities, such as, shelters, benches, trash bins, route map and schedule, etc. are beneficial to enhancing the overall experience of the users.

### *Automobile Treatments*

There are several treatments available that can enhance the traffic operations and safety for automobiles on the corridor in the alternatives and options. The treatments presented in this section are focused at the intersections of W. Broadway Street/Russell Street, S. 3$^{rd}$ Street/Russell Street, S. 11$^{th}$ Street-Knowles Street/Russell Street, and S. 14$^{th}$ Street-Mount Avenue/Russell Street.

With Alternative 4 and Option 7, the traffic signals should be coordinated between W. Broadway Street and S. 14$^{th}$ Street-Mount Avenue to improve the travel time and management of queues on the corridor. Additionally, traffic signal coordination provides opportunities for reducing vehicle emissions, improving safety, and managing vehicle speeds on the corridor.

At the W. Broadway Street/Russell Street intersection, the following intersection improvements should be considered as part of the alternatives and options.

- Extend the storage length for the northbound and westbound left-turn lanes to approximately 500 feet, and
- Add a 2$^{nd}$ eastbound right-turn lane.

With these improvements in place, the northbound left-turn and eastbound right-turn storage lengths can accommodate the projected 95$^{th}$ percentile vehicle queues. The eastbound right-turn lane movement volume-to-capacity ratio improves from 0.91 to 0.52 and the 95$^{th}$ percentile queue is reduced from 675 feet to 200 feet.

At the S. 3rd Street/Russell Street intersection, the following intersection improvements should be considered as part of Alternative 4 and Option 7.

- Extend the storage length for the eastbound and southbound left-turn lanes to approximately 500 feet and 150 feet, respectively.
- At a minimum for the northbound left-turn, extend the storage length to S. 5$^{th}$ Street for improving the queue management in this section. The traffic volumes projected for this northbound left-turn movement warrant the addition of a second northbound left-turn lane. The 2$^{nd}$ left-turn lane should be evaluated to identify any improvements that would need to occur on S. 3$^{rd}$ Street to accommodate two receiving lanes.

With these improvements in place, the northbound left-turn movement volume-to-capacity ratio improves from 1.42 to 0.93 and the 95$^{th}$ percentile queue is reduced from approximately 1,200 feet to

600 feet. This improvement also provides substantial benefit to the intersection, reducing the volume-to-capacity ratio from 1.24 to 0.96.

The S. 11th Street-Knowles Street/Russell Street intersection should be evaluated for potential future signalization as it serves as the only east-west crossing of the railroad for the neighborhood between S. 6th Street and S. 14th Street-Mount Avenue. The intersection traffic volumes and crash history should be monitored to assess if signal warrants are met in the future. The signal should be evaluated in conjunction with the existing railroad crossings on Russell Street and on S.11th Street-Knowles Street, due to their close proximity.

At the S. 14th Street-Mount Avenue/Russell Street intersection, the following intersection improvements should be considered as part of the signalized intersection alternatives and options.

- At a minimum for the southbound left-turn, extend the storage length to Lawrence Street for improving the queue management in this section. The traffic volumes projected for this movement warrant the addition of a second southbound left-turn lane. The 2nd left-turn lane should be evaluated to identify any improvements that would need to occur on Mount Avenue to accommodate the two receiving lanes.
- Add a northbound right-turn lane.
- Extend the storage lengths or add a second left-turn lane for the westbound and eastbound left-turn lanes.

With the southbound left-turn lane improvement in place, the southbound left-turn movement volume-to-capacity ratio improves from 1.45 to 1.06 and the 95th percentile queue is reduced from approximately 775 feet to 375 feet. This improvement also provides substantial benefit to the intersection, reducing the intersection volume-to-capacity ratio from 1.39 to 1.16. The addition of the northbound right-turn lane provides benefit to reducing the 95th percentile queue for the northbound through lanes from 675 to 400 feet.

An analysis was performed to evaluate the operational benefit from implementing the above improvements at the W. Broadway Street/Russell Street, S. 3rd Street/Russell Street, and S. 14th Street-Mount Avenue/Russell Street intersections for Alternative 4 and Option 7. The evaluation provides the following elements:

- Acceptable operations without improvements and with improvements (i.e., the acceptable year of operations and the overall intersection p.m. peak total entering volume of this forecast year), and
- Overall benefit (i.e., additional years of acceptable operations and traffic volumes served at the intersection with the improvements in place).

Table 22 provides a summary of this evaluation at the three intersections for Alternative 4 and Option 7.

**Table 22 Lifespan Analysis with Intersection Improvements (Alternative 4 and Option7)**

| Intersection with Russell Street | Intersection Improvements | Acceptable Operations Without Improvements[1] | | Acceptable Operations With Improvements[1] | | Overall Benefit | |
|---|---|---|---|---|---|---|---|
| | | Year | Intersection PM Peak TEV | Year | Intersection PM Peak TEV | Added Years | Intersection PM Peak TEV |
| W. Broadway Street | Add 2nd Eastbound Right-Turn Lane | 2023 | 4,660 | 2026 | 4,890 | 3+ | +230 (+5%) |
| S. 3rd Street | Add 2nd Northbound Left-Turn Lane | 2025 | 4,200 | 2033 | 5,040 | 8+ | +840 (+20%) |
| S. 14th Street-Mount Avenue | -Add 2nd Southbound Left-Turn Lane<br>-Add Northbound Right-Turn Lane | 2024 | 4,080 | 2029 | 4,520 | 5+ | +440 (+11%) |

[1]The thresholds used in the analysis include: LOS D or better and volume-to-capacity ratio of 1.0 or less at traffic signals.

As shown in Table 22, all of the improvements provide some level of benefit to the intersection operations. The improvements at the S. 3rd Street/Russell Street and S. 14th Street-Mount Avenue/Russell Street intersections are anticipated to provide the most benefit to the intersection and corridor operations. These improvements provide major benefits to the vehicle queues, LOS, and volume-to-capacity ratio at the two intersections.

# Section 7
Conclusions and Recommendations

# Conclusions and Recommendations

Based on the Russell Street TAU, the following key findings and recommended design enhancements were identified to support the development of the Russell Street/South 3rd Street EIS.

## FINDINGS

### *Year 2009 Existing Conditions*

- Russell Street is a critical north-south transportation corridor serving as one of five bridge crossings over the Clark Fork River within the City, and provides access to downtown and several neighborhoods.
- Daily traffic volumes on the corridor range between 20,000 and 22,000 vehicles and include both local and regional trips across the bridge.
- Traffic on Russell Street has seen a steady growth rate of 0.7 percent per year over the past 30-years. Overall, traffic volumes in the study area (Russell Street, S. 3rd Street, and Wyoming Street) have seen a small change over the past 15 years but an increase of approximately 0.5-percent to 1.2-percent over the past 30 years.
- The existing weekday p.m. peak hour is between 4:30 p.m. and 5:30 p.m. Between 1:00 p.m. and 6:00 p.m. the hourly traffic volumes on Russell Street are within approximately 10-percent of the weekday p.m. peak hour. The weekday a.m. peak hour link volumes on Russell Street are approximately 25- to 33-percent lower than the weekday p.m. peak hour.
- The average travel time on Russell Street between W. Broadway Street and S. 14th Street-Mount Avenue in the northbound and southbound directions of travel is approximately 5 and 6 minutes, respectively during the weekday p.m. peak hour. The average weekday p.m. peak hour travel time on this section of Russell Street is approximately 45-60 seconds greater than the average daily travel time.
- Traffic counts and field observations revealed a fair amount of non-motorized traffic along the corridor in March 2009.
- There are currently four Mountain Line bus routes (Routes 2, 8, 9, and 10) that have scheduled stops on the study corridor. Mountain Line system-wide ridership has increased each of the past three fiscal years resulting in an annual growth rate of approximately 7.0-percent.
- Twelve of the study intersections do not currently meet the MDT LOS "C" threshold and eight of the study intersections do not currently meet the City LOS "D" threshold. All of these intersections are currently unsignalized, except for the W. Broadway Street/Russell Street and S. 3rd Street/Russell Street intersections.
- From the multimodal analysis, the pedestrian and transit LOS is "D" and the bicycle LOS is "F" for the Russell Street corridor under existing conditions. The bicycle LOS is poor due to the lack of bicycle facilities along the corridor.

- The corridor crash rate over the most recent four-year period is approximately 8.4 accidents per million vehicle miles. Intersections with the highest number of crashes on the corridor are W. Broadway Street, Wyoming Street, S. 3rd Street, S. 4th Street, and S. 14th Street-Mount Avenue. The W. Broadway Street and Wyoming Street intersections have higher proportions of injury crashes.
- Over the past four years, 21 crashes were reported between bicyclists and automobiles and zero crashes were reported for pedestrians. Over seventy-five percent of the bicyclist crashes occurred on the segment between S. 3rd Street and W. Broadway Street.

### Development of Traffic Volumes

- Travel demand model traffic forecasts for the Year 2005 No Build, Year 2035 3-Lane Russell Street, and Year 2035 5-Lane Russell Street scenarios were obtained from MDT and Office of Planning and Grants (OPG) and used to develop forecast year 2035 traffic volumes at the study intersections. The NCHRP 255 methodology was used in the development of the year 2035 weekday p.m. peak hour traffic volumes.
- Two year 2035 traffic volume scenarios (3-lane Russell Street and 5-lane Russell Street) were developed and used in this analysis. Alternatives 1, 2, 3, and Option 6 were analyzed with the 3-lane volume scenario. Alternatives 4 and 5-Refined and Option 7 were analyzed with the 5-lane volume scenario.
- The forecast year 2035 weekday p.m. peak hour travel demand model volumes (3-lane section) result in an 5- to 15-percent reduction in traffic volumes along Russell Street in comparison to the model volumes with Russell Street as a five-lane corridor. The traffic reduction is due to rerouting to adjacent parallel facilities (i.e., Reserve Street and Orange Street).
- The projected growth rates assuming a 5-lane Russell Street corridor (2.3-percent) are approximately double the historical growth rate (1.2-percent) and the projected growth rates assuming a 3-lane Russell Street corridor is 1.9-percent. The overall regional growth rate is consistent under both scenarios.
- A higher growth rate is anticipated to occur over the next 30 years on Russell Street than over the past 30 years due to the corridor having available capacity versus other parallel transportation facilities and redevelopment of several large vacant properties near the corridor. However, under both the 3-lane and 5-lane scenario, traffic volumes are expected to be diverted to other transportation facilities due to the corridor being congested and drivers experiencing longer travel times.

### Evaluation of Alternatives and Options

- Intersection and corridor traffic operations analysis was performed using Synchro, 2000 HCM, and draft methodologies (NCHRP 572) for roundabouts to be included in the 2010 HCM.
- The safety analysis was conducted using the procedures outlined in the draft HSM. The urban and suburban arterials methodology was applied to the analysis of Russell Street and

provides a relative comparison between the different alternatives for Russell Street, since the analysis was not calibrated to local conditions.

- For the multimodal LOS analysis, the methodology from the NCHRP 3-70 was used as a basis for evaluating multiple modes of travel, such as bicyclists, transit, and pedestrians on the Russell Street corridor. It consists of a set of recommended procedures for predicting traveler perceptions of quality of service and performance measures for urban streets.

### Traffic Operations

- Under Alternative 1, the intersection operations are projected to operate over capacity and at a LOS E or worse under year 2035 traffic conditions for both the 3-lane and 5-lane volume scenario. The travel time in the southbound and northbound directions of travel is approximately 7-½ and 6-½ minutes (3-lane volumes) and approximately 8-½ and 9 minutes (5-lane volumes), respectively, which is an increase by approximately 50-60 percent from the existing traffic conditions.
- The intersection of W. Broadway Street and Russell Street is projected to operate at a LOS "E" or worse and over capacity under all of the alternatives and options. Some lane enhancements can be provided at this intersection to improve the approach LOS, but not the overall intersection LOS.
- The intersections of W. Broadway Street/Russell Street and S. 14th Street-Mount Avenue/Russell Street are forecast to operate over capacity under year 2035 traffic conditions for all of the alternatives and options. It is expected that these intersections will meter the traffic able to access Russell Street during the weekday p.m. peak hour with the following results:
  - Russell Street may have a longer period of congestion.
  - Other corridors may see an increase in traffic volumes due to drivers avoiding Russell Street during the peak conditions.
  - Drivers may choose to use alternative modes of transportation, such as biking, transit, or walking to complete their trip, or choose to drive at other times of the day when the corridor is less congested.
- The other major intersections (Wyoming Street, S. 3rd Street, S. 5th Street, and S. 11th Street-Knowles Street) for Alternatives 2, 3, and Option 6 are all projected to operate over capacity and at a LOS "E" or worse under year 2035 traffic conditions. The travel time for these alternatives/options increase by several minutes over the no-build conditions.
- Alternative 4 has some intersections (W. Broadway Street, S. 3rd Street, and S. 14th Street-Mount Avenue) that are projected to operate at LOS "F" and over capacity under year 2035 traffic conditions. However, lane enhancements can be provided at all of the intersections to improve the LOS and achieve under capacity conditions (W. Broadway Street would be at a volume-to-capacity ratio of 1.03).

- Alternative 5-Refined has better intersection operations than Alternatives 2, 3, and Option 6. However, the multilane roundabout at the intersection of S. 3rd Street and Russell Street continues to operate over capacity and a LOS "F" as a roundabout.
- Option 7 has better intersection operations than Alternatives 2, 3, 5-Refined, and Option 6. However, the reduced through-lane capacity between S. 6th Street and S. Lawrence Street in conjunction with the over-capacity conditions and queue spillback at S. 3rd Street and S. 14th Street-Mount Avenue results in vehicle queues and congested operations on the southern section of the corridor.
- Alternative 4 and Option 7 are projected to generally operate acceptably on the corridor between S. 3rd Street and W. Broadway Street. Due to overcapacity conditions for the northbound left-turn lane at S. 3rd Street/Russell Street intersection and the southbound left-turn lane at S. 14th Street-Mount Avenue/Russell Street intersection, the alternative and option are anticipated to experience lengthy vehicle queues and congested operations over the peak hour. With the consistent two travel lanes in each direction under Alternative 4, it is expected that this alternative would result in a shorter duration of congested conditions than Option 7. However, as noted, both Alternative 4 and Option 7 are projected to both breakdown operationally due to the projected traffic volumes and capacity deficiencies at the intersections of S. 3rd Street/Russell Street and S. 14th Street-Mount Avenue/Russell Street.

### Safety

- All of the alternatives and options provide a safety improvement over the no-build conditions.
- Alternatives 2 and 3 provide the greatest safety improvements over the no-build conditions (Alternative 1) 3-lane volume scenario (65-67 percent). Alternative 5-Refined provides the greatest safety improvements over the no-build conditions (Alternative 1) 5-lane volume scenario (63 percent).
- Key factors that improve safety along Russell Street include the implementation of raised medians that reduce the overall number of turning movement conflicts, the addition of left-turn lanes where left-turns are allowed, and the implementation of roundabouts at intersections. These three factors generally differentiate the alternatives.

### Multimodal Level of Service

- Alternative 4 and Option 7 achieve the overall highest bicycle LOS for the corridor with a LOS E.
- All of the alternatives and options perform better than the existing and no-build conditions for the pedestrian LOS at a LOS C. Option 6 operates worse than Alternatives 2 through 5-Refined due to the lack of boulevard treatment at the southern section of the corridor, between S. 7th Street and S. 11th Street. Option 7 operates worse than Alternative 4 due to the higher traffic volumes in the adjacent travel lane next to the sidewalk for pedestrians in the southern section of the corridor, between S. 6th Street and Lawrence Street.
- The transit LOS is projected at a LOS C for all of the alternatives and option.

## RECOMMENDED DESIGN ENHANCEMENTS

The following list provides a summary of intersection and roadway enhancements to improve the multimodal operations and safety of the corridor that could be considered as part of the preferred alternative in the FEIS.

- The pedestrian LOS and safety could be enhanced at the signalized intersections with the following treatments.
  - Stamped Concrete in Crosswalk: Provides drivers a visual cue to be aware of pedestrians.
  - Leading or Lagging Pedestrian Interval: Start the pedestrian phase a few seconds before the vehicle phase or end the pedestrian phase a few seconds after the vehicle phase to provide additional buffer between the vehicle and pedestrian phases.
  - Pedestrian Countdown Signals: Provides additional guidance to pedestrians on the amount of time that is available to cross the intersection before a vehicle phase begins.
  - Pedestrian Island Refuge: Provides pedestrians with a refuge while crossing a larger-sized intersection.
- The bicycle LOS and safety could be enhanced at the signalized intersections and along the corridor with the following treatments.
  - Bike Box: A 14-foot deep reservoir in front of vehicle stop bar used for locations with shared through-right turn lanes to improve awareness for motorists and bicyclists.
  - Inductive Loop Bicycle Detection: When a bicyclist pulls onto the bicycle stencil, inductance on loop changes and detects the presence of a bicycle and assists with reducing delay to bicyclists.
  - Colored/Outlined Bike Lanes: Coloring/outlining of bike lane enhances vehicular and bicycle awareness on the street.
- The transit LOS could be enhanced along the corridor with the following treatments.
  - Increase the service frequency of buses (i.e., move from 30-minute headways to 15-minute headways) on the existing routes for the northern section of the corridor.
  - Provide transit service to the southern section of the corridor.
  - At the bus stop pull-out areas, provide an accessible path between the stop area and the sidewalk.
- The automobile LOS and safety could be enhanced at the signalized intersections and along the corridor with the following treatments.
  - Develop coordinated signal timing plans for the signalized intersections based on the posted speed for the corridor.
  - W. Broadway Street/Russell Street - Extend the storage length for the northbound and westbound left-turn lanes to approximately 500 feet and add a $2^{nd}$ eastbound

right-turn lane. The addition of a second eastbound right-turn lane provides an additional three years of acceptable operations and a 5-percent (+230 p.m. peak hour vehicles) increase in total entering volume served at this intersection.

- S. 3rd Street/Russell Street – Extend the storage length for the eastbound and southbound left-turn lanes to approximately 500 feet and 150 feet, respectively. Either, extend the storage length for the northbound left-turn lane to S. 5th Street or add a second northbound left-turn lane. The addition of a northbound left-turn lane provides an additional eight years of acceptable operations and a 20-percent (+840 p.m. peak hour vehicles) increase in total entering volume served at this intersection.
- S. 11th Street-Knowles Street/Russell Street – Monitor the traffic volumes at this intersection for potential future signalization as it serves as the only east-west crossing of the railroad for the neighborhood between S. 6th Street and S. 14th Street-Mount Avenue. (Note: *The signal should be evaluated in conjunction with the existing railroad crossings on Russell Street and on S.11th Street-Knowles, due to their close proximity.*)
- S. 14th Street-Mount Avenue/Russell Street – Extend the storage length for the southbound left-turn lane up to Lawrence Street or add a second southbound left-turn lane. Add a northbound right-turn lane. Extend the storage lengths or add a second left-turn lane for the westbound and eastbound left-turn lanes. The addition of a southbound left-turn and northbound right-turn lanes provide an additional five years of acceptable operations and an 11-percent (+440 p.m. peak hour vehicles) increase in total entering volume served at this intersection.

## Section 8
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# References


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# Appendix A

## Minutes from Project Team Conference Calls and Meetings

# MEMORANDUM

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To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: April 20, 2009

**Subject: Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 4-2-09**

The following is a summary of the team meeting on April 2, 2009 to discuss these agenda items:

- Kittelson Update
- Section 4(f) Coordination/review Update

The following were in attendance:

| | |
|---|---|
| Jason Wiener | City Council Representative |
| Steve King | City of Missoula Public Works Director |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Doug Moeller | MDT – Missoula District |
| Ben Nunnallee | MDT – Missoula District |
| Miki Lloyd | MDT – Consultant Design |
| Al Vander Wey | MDT – Transportation Planning |
| Sheila Ludlow | MDT – Transportation Planning |
| Gene Kaufman | FHWA |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Phil Odegard | DOWL HKM – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andy DeLeiden | Kittelson – Project Manager |

The meeting was held via conference call and began at 2:00 p.m.

## Kittelson Update

Phil began the meeting by describing DOWL HKM's recent work with the project. Over the last four weeks DOWL HKM has been working on data collection to provide Kittelson the information they will need for a peer review and traffic study. This field data includes peak hour counts and 24-hour counts. Phil added that Kittelson has been coordinating with the City for some signal timing data at the study intersections. DOWL HKM is still waiting on some accident data at the intersections and has coordinated this with MDT. Miki noted that she had seen the cover letter for this information and therefore DOWL HKM should be receiving it soon.

Andy gave an overview of Kittelson's efforts to date and the direction they are headed with the traffic study. Andy reiterated that they have the majority of traffic data they were seeking from the data collection efforts. Kittelson is going forward with Task 3—traffic volumes development for existing. For the April 13th meeting, their intent is to have a discussion of volumes and growth projections that they have estimated based on information from travel demand model and historic counts on the corridor. Kittelson is currently moving forward with Task 4—future year operations analysis and existing conditions in terms of generating a base model in Syncro. They will be conducting a field review April 13th and 14th to collect their calibration measurements to use within Syncro and the VISSIM model.

Steve asked if Kittelson is using seasonal adjustments in their data collection counts because this is not the peak season for non-motorized. Andy replied that they can use an adjustment factor or look at historical counts that the City might have to assist with adjustments for non-motorized usage. Andy added that they currently have some information on transit ridership from Mountain Line which could help to come up with an adjustment factor associated with the transit conditions on the corridor.

Steve noted that the entire Russell corridor is not currently covered by bus service. He asked what Kittelson would do as far as looking at transit serving the entire corridor in the future. Jason added that there are also no bike lanes on Russell. These are questions that may come up at the April 13th meeting.

Steve asked for Andy's objective observation and if he was there during the traffic counts. Andy replied that some counts are from video some are electronic counts. He has not yet been to the corridor but will make sure he is familiar with different elements and characteristics of the corridor during their field review.

Phil thought that from the 2005 ADT counts until now, there has been approximately three percent increase in traffic volumes. Andy noted that they do not have that specific number but they are generating information right now.

## Section 4(f) Coordination/review Update

Gregg noted that he had forwarded questions that he had received. Susan Kilcrease and Jon Axline are working on educational information. Gregg confirmed that everyone is available for April 13th meeting. He put out a general agenda but will get a more specific agenda out this week. Miki noted that Susan is currently on vacation, but if anyone would like additional information to be included in the packet, let her know.

Miki asked if Kittelson was waiting on anything from MDT other than crash data from Pierre Jomini. Andy asked for some follow-up related to one of the intersection on Russell Street with regard to model data and they had not received any specific model volumes for the intersections at Lawrence Street. Miki and Al noted that they were not aware they needed to gather this information but Al will get it out.

Gene noted that he and Craig Genzlinger would attend the April 13th 4(f) meeting and Gene would attend the 2:00 Kittelson meeting. Location specifics for the meetings were discussed.

Steve asked for a more structured agenda for the 4(f) meeting. Steve noted that Gregg would be working with Susan to put that together. Steve thought it would beneficial to have a program that talked about the 4(f) law and purpose of the law as well as a comprehensive presentation format with a question/answer for follow-up. It should be more than experts showing up to answer questions.

Gregg noted that MDT is working on having an educational/informational packet to present as a starting point. Miki confirmed that MDT was putting together the packet for discussion purposes but there is no presentation at this point.

Gregg noted that the next team meeting is set for April 16th but there is a TTAC/TPCC meeting at that time, so this team will need to be rescheduled. Darryl and Gregg will get together to confirm meeting date opportunities and the team can select a date then.

Miki requested that when Kittleson sends deliverables, they give MDT a week's notice. This will allow her to update appropriate personnel so they can allocate review time as necessary. Andy volunteered to put together a schedule of their tech memo deliverables for the next three months. Darryl, Phil, and Andy will get together to put out an updated schedule. Gregg and Darryl will get together to discuss and subsequently get concurrence from team members for the next team meeting date.

cc: Meeting attendees
file

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# April 13, 2009 Meeting Minutes

## Russell Street/South 3rd Environmental Impact Statement Project

### Traffic Analysis Update

### MDT District 1 Conference Room, Missoula

**Table 1 Meeting Attendees**

| Name | Representing | Email Address |
|---|---|---|
| Ed Childers | City of Missoula City Council | echilders@ci.missoula.mt.us |
| Bob Jaffe | City of Missoula City Council | bjaffe@ci.missoula.mt.us |
| Stacy Rye | City of Missoula City Council | srye@ci.missoula.mt.us |
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| Phil Odegard | DOWL HKM | podegard@hkminc.com |

## ITEM 1 - INTRODUCTIONS

- DOWL HKM introduced the project, project team, and meeting overview.
- Attendees present at the time introduced themselves.

## ITEM 2 - OVERVIEW OF PROJECT

- Kittelson & Associates, Inc. (KAI) provided an overview of the meeting and handouts.
- The City and MDT provided a brief overview of their meeting and field visit earlier in the day related to the 4(f) properties.

## ITEM 3 - PRESENTATION BY KAI

- KAI gave a presentation on the data collection effort, regional travel demand model, forecast traffic volumes, key findings of these items, additional information needs, and next steps within the project schedule. For more information on the presentation, please refer to the handouts of the presentation and traffic volumes figures (Figures 1-6). During the presentation, several questions or comments were raised that are briefly summarized below:
    - *Duration of the afternoon peak hour* - The peak hour is 4:30 to 5:30 p.m.; however, the traffic levels remain high for the period between approximately 1:00 and 6:00 p.m.
    - *9.6-percent commuter transit ridership is high for the corridor* - This information is provided to give the project team some context regarding mode split in the area.
    - *Existing and future ridership information at the bus stops* – If available, the ridership information specific to the Russell Street corridor will be reviewed as part the alternatives traffic analysis.
    - *Existing and future pedestrian and bicycle volumes*
    - *MAC Readers, data points that are outliers (i.e., jogger, bicyclist, or transit rider), and use for this study*
    - *Given that the model growth rate is much higher than the historical growth rate on the corridor, why would we not use the historical growth rate?* Historical rates represent past changes to land use and transportation facilities. The forecast model provides the best estimate based on the expected changes to land use and transportation facilities. The growth rate and travel demand model results, in context to this corridor and the alternatives will be presented in Technical Memorandum #1.
    - *LRTP projects included in the travel demand model are based on the "recommended" scenario.*

- *3-lane and 5-lane analysis for the corridor* - The traffic update will use traffic volumes specific to those forecast with a 3-lane and 5-lane corridor. It will be noted that the 5-lane corridor is the current plan from the LRTP and that a 3-lane corridor causes rerouting of traffic to adjacent facilities.

## ITEM 4 - DISCUSSION TOPICS

- KAI brought up several discussion topics with the group related to this project. These included the following:
  - What additional alternatives should be evaluated in the traffic analysis?
  - How does the 3rd Street project relate to the updated traffic analysis for Russell Street?
  - What performance measures should be addressed in the study?
  - What performance measure for Level of Service should be compared and mitigated to on Russell Street?
  - Travel demand model and the mode split component
- Based on the above presentation and discussion topics during the meeting, a discussion topic and decision matrix is provided in Table 2 to assist with the next steps and future meetings on the project.

**Table 2 Russell Street EIS Traffic Analysis Update – Project Topics and Decision Summary**

| Date | Topic | Discussion Summary | Outcome | Resolved |
|---|---|---|---|---|
| April 13, 2009 | Alternatives Evaluated in Traffic Analysis | Alternatives 1-5 and 5-Refined are included in DEIS. The Alternatives 5 and 5-refined are similar and 5-Refined should be carried forward in the traffic analysis. Two additional alternatives should be included in the traffic analysis. | KAI will evaluate Alternatives 1-4, 5-Refined, and two additional alternatives (see below for Alternative 6). Alternative 7 will include discrete modifications to the existing alternatives that are found to either improve overall operations/safety or further minimize impacts. | Yes on April 13, 2009 via meeting. |
| April 13, 2009 | Additional Alternatives for Evaluation in Traffic Analysis | The additional alternatives should include components of previously evaluated alternatives from the DEIS. The Alternative 6 should be based on Alternative 2 and the Russell Street Citizens' Plan. | KAI/DOWL HKM will provide a conceptual layout of Alternative 6 to project committee for review and comment. | Pending distribution and committee review. |
| April 13, 2009 | 3rd Street and Updated Traffic Analysis | The 3rd Street preferred alternative presented in the DEIS was not included as part of the PEER review based upon comments received. The 3rd Street & Russell Street intersection is the only 3rd Street intersection included in the traffic analysis for Russell Street. Volumes at this intersection may differ from the DEIS because the study years are different. | No analysis should be performed for 3rd Street, except at the 3rd Street/Russell Street intersection. | Yes on April 13, 2009 via meeting. |
| April 13, 2009 | Performance Measures For Traffic Analysis | A traffic analysis can include many performance measures to evaluate alternatives. For Russell Street, the performance measures will include intersection and corridor measures for both traffic operations (i.e., volume-to-capacity ratio, delay, level of service, arterial speed and travel time, queuing, etc.) and safety (i.e., intersection and corridor crash total and crash severity) of the alternatives. | KAI will provide a summary of the performance measures via email to the project committee for review and comment. | Pending distribution and committee review. |
| April 13, 2009 | Level of Service for Russell Street | The targeted Level of Service for intersections, according to MDT, is C for urban principal (Russell Street) and minor arterials and D for collectors (South 3rd Street). The City and Missoula Office of Planning and Grants identify a Level of Service D for Russell Street. | MDT confirmed their standard Level of Service to be used for Russell Street is "C"; however, the Level of Service results will be evaluated on a case-by-case basis for Russell Street. | Yes on April 14, 2009 via email. |
| April 13, 2009 | Traffic Volume Projections for 3-Lane and 5-Lane Roadway on Russell Street | The traffic volume projections are different for a 3-lane and 5-lane roadway on Russell Street. Two volume scenarios can be used in the alternatives evaluation as a part of the traffic analysis update. A note will be provided on the figures and within the traffic analysis regarding the different volume scenarios. | KAI will summarize the two traffic volume scenarios as part of Technical Memorandum #1. It will be noted that the 5-lane Russell Street corridor is the current plan as identified in the LRTP and that the 3-lane scenario shifts traffic to other adjacent facilities. | Pending distribution and committee review of the TM #1. |

| Date | Topic | Discussion Summary | Outcome | Resolved |
|---|---|---|---|---|
| April 13, 2009 | Traffic Volume Reductions Due to Non-Auto Travel Modes | Non-auto travel mode split changes should be accounted for in the traffic volume projections. This information should be identified through comparable transit agencies and historical data for Russell Street. | KAI will review the non-auto travel modes and identify potential changes in the mode split and the potential resulting reductions in vehicular traffic for use in the traffic analysis. This information will be provided as part of Technical Memorandum #1 or via email to the project committee for review and comment. | Pending distribution and committee review of the TM #1. |

DOWL HKM

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# MEMORANDUM

To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: June 4, 2009

**Subject:** **Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 5-21-09**

The following is a summary of the team meeting on May 21, 2009 to discuss these agenda items related to the Traffic Analysis:

- Comments Received to Date on Draft Technical Memorandum (TM) #1
- Operational Analysis – Initial Findings
- Multimodal and Safety Analysis
- Update on Draft TM #2
- Next Conference Call/Meeting

The following were in attendance:

| | |
|---|---|
| Jason Wiener | City Council Representative |
| Steve King | City of Missoula Public Works Director |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Susan Kilcrease | MDT – Transportation Planning |
| Miki Lloyd | MDT – Consultant Design |
| Sheila Ludlow | MDT – Transportation Planning |
| Al Vander Wey | MDT – Transportation Planning |
| Ivan Ulberg | MDT – Traffic Safety |
| Gene Kaufman | FHWA |
| Lloyd Rue | FHWA |
| Marcee Allen | FHWA |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Phil Odegard | DOWL HKM – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andy Daleiden | Kittelson – Project Manager |
| Andrew Cibor | Kittelson |
| Nick Foster | Kittelson |

The meeting was held via conference call and began at 2:00 p.m.

## Traffic Analysis Update

Phil began the meeting with agenda items, all centered on the traffic analysis done by Kittelson. Phil asked if June 10, 2009 from 9-11a.m. in Missoula was an acceptable time for the next face-to-face team meeting to go through draft Technical Memorandum #2 and present details of Kittelson's findings. Schedules were discussed. In order to incorporate council representatives, this meeting will need to be rescheduled. Andy Daleiden will work with Gregg to match calendars. Gregg will work with Miki to coordinate FHWA and MDT availability.

### *Comments Received to Date on Draft Technical Memorandum #1*

Andy mentioned that Kittelson received comments from MDT. Kittelson will incorporate those comments into the first tech memo and issue the final version next week. Andy asked if there were any more comments to address before release of the final draft. FHWA asked if the issue of proximity of the railroad to the 11th/Knowles intersection was addressed. This will be incorporated into the alternatives analysis. Some members of the group had not seen a copy of the report and still needed to review and comment on it. Kittelson originally scheduled one week to incorporate comments but could receive additional comments as long as they had a few days to respond to comments and still deliver the electronic document by May 25th.

### *Update on Operational Analysis*

Kittelson has completed the preliminary analysis of the 2035 traffic conditions for all alternatives and Option 6. With regard to intersections and corridors, Kittelson used Syncro7 to perform analysis and used the draft procedures from the highway capacity manual for roundabouts.

Alternatives 2 and 3 as well as Option 6 are three-lane traffic volume scenarios as previously discussed with the group and described in Tech Memo1. Realizing that roundabout configurations are different for the alternatives versus Option 6, general results for the intersections range from LOS C to LOS E or F under the 2035 traffic volume scenario.

These results do not include sensitivity analysis yet. Kittelson is still looking to perform sensitivity analysis to get better comparisons at what the intersections would look like. Kevin asked if Kittelson currently has the information from Mountain Line on their mode share and if Kittelson has done this analysis yet. Kittelson is in the process of calculating those numbers because information they received from Mountain Line provided some projections of what could occur with respect to capacity on Russell Street, but Mountain Line acknowledged that they have no plans at this time to improve service or to extend routes to the entire corridor. Therefore, Kittelson will have to make assumptions to show that if there are no overall improvements but improvements to certain elements of the alternatives (e.g. signal timing on the corridor), some of the service would be enhanced in terms of reliability but Mountain Line does not have a future service plan. Tech Memo 1 shows raw growth without sensitivity analysis in order to provide a baseline from which future refinements can be made. Andy noted there are limited procedures available in terms of generating mode split for existing conditions and future conditions. FHWA noted that this needs to be consistent with Long Range Transportation Plan. Alternatives 2 and 3 and Option 6 are not being thrown out because of intersection LOS E or F. These alternatives and option are being evaluated in order to determine which alternatives to simulate.

Kittelson continued the meeting by describing Alternative 4 and 5R as five-lane under the 2035 traffic volume scenario. The intersections of these two alternatives range from LOS C or D condition by approach and then project up to LOS E or F. With 4 and 5R there is a little more leeway for adding turn lanes as part of mitigation to that alternative and get to LOS C or D.

FHWA noted that Alternatives 2 and 3 were originally eliminated as not meeting purpose and need. The peer review is to see if these two alternatives should be brought back into the fold. Steve mentioned the lane imbalance with multi-lane roundabouts due to downstream lane drops. Kittelson took this into account especially with 3rd and 5th Street. The single-lane roundabout at Knowles is one location where it is just a function of not enough capacity to accommodate the volumes at this location. Steve mentioned the observation in the DEIS of 85/15 lane imbalance. Kittelson used 53/47 based on data collected at the existing multi-lane roundabouts throughout the United States where there is a mixture of single-lane and multi-lane approaches downstream. Darryl added that Missoula has witnessed a huge imbalance in the upstream traffic due to lane drops within a few hundred feet. Steve mentioned that they did local observations because they could not find national standards with configurations that they were designing to with Alternatives 2 and 3.

Lloyd pointed out the non-intersection piece. What is the measure of effectiveness along the 2-lane segment for certain parameters such as speed, densities, and headways? Kittelson noted that if they have the data to support making modifications within city of Missoula, they will look to apply them within a certain level. Ivan pointed out that MDT traffic performed those counts in Missoula and at other locations in MT and they did see 85%. The 45/55 is similar to what is used in a signalized intersection with the same conditions, but we do not see that in MT. Steve asked Kittelson to review page 2-33 of DEIS. Ivan noted that Kittelson said even if a 45/55 split is used, it still fails. Andy said Kittelson would make a note in the tech memo to say it was evaluated in a more conservative manner. It would be beneficial to go more conservative reflect the conditions and put some discussion to rest. Steve mentioned that these were very valid points but the reason everyone is interested in Kittelson's observations is to validate or challenge what was in the DEIS. Kittelson was hired for an independent analysis.

Kittelson's next step in the analysis is to move forward with the sensitivity analysis to evaluate each alternative and the option in terms of level of growth along the corridor. Andy continued the discussion by summarizing performance measures related to travel times. Alternatives 2 and 3 and 5R are very similar with respect to travel time. You can see a difference in Alternatives 2 and 3 as opposed to 5R when you provide a southbound right-turn bypass lane at 3rd/Russell. This shows substantial benefit in 5R.

Option 6 is over capacity resulting in lengthier delay and 2-3 times longer travel time than any other alternative. Alternative 4 with signals shows the best travel time in each direction. Steve asked Kittelson to quantify displaced traffic not served by the arterial. Andy recalled a 5 to 15 percent reduction in volumes and there is a breakdown of where it does reroute in terms of percentage based on the travel demand model. Page 30 of Tech Memo 1 illustrates reduction in volumes by a length basis.

Specificity of rerouted traffic was discussed. Steve did not think it was necessary to quantify specific impacts to off streets, but it would be reinforcement for eliminating alternatives if it does not meet purpose and need that just displace traffic and does not serve traffic on the arterial. FHWA noted that if this project starts to look at different alternatives, the document would have to address them.

Kittelson is working with MDT to obtain bridge information. Andy noted that there is a substantial increase of volumes for Russell Street given the substantial increase in capacity on the bridge. This is being reflected under the three and five-lane scenarios compared to growth shown on other bridge crossings.

***Multimodal and Safety Analysis***

Kittelson is using upcoming procedures in the Highway Capacity Manual and looking at the LOS of each alternative on the corridor for bicycle, pedestrian, and transit. Kittelson is also utilizing operations results to round out multimodal LOS analysis. They are incorporating the highway safety manual to establish a baseline condition and evaluate the alternatives and the option related to safety. This information will be pulled together for Technical Memorandum #2. The safety analysis includes all modes.

***Update on Technical Memorandum #2***

Kittelson is still on target to submit the second technical memorandum to the group on June 2, 2009. This submittal will contain an introduction and overview of the methodologies used for operations, multi-modal and safety analysis. The document will then move toward a presentation of results in tabular and graphical format. There is a two-week review for agencies/groups. Once a team meeting date is established, one of the topics for that meeting was to present information from Tech Memo #2 to the group and give them an opportunity to provide insights. Kevin asked if pedestrian and bicycle safety analysis included crossings both longitudinally and perpendicularly. Andy deferred to another staff member Nick Foster who mentioned two different predictive models for crashes. Kevin pointed out that one of the comments by the citizens related to the size of the intersection and the ability of pedestrians to cross the sea of asphalt at intersections.

Andy confirmed that Kittelson would submit the final version of Technical Memorandum #1 after all were comments received. This likely means it will be submitted next week one or two days late if Kittelson receives comments late. Technical Memorandum #2 is still targeted for June 2. The next team meeting will be held June 4, 2009.

cc: Meeting attendees
file

DOWL HKM

# MEMORANDUM

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To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: June 24, 2009

**Subject:** **Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 6-4-09**

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The following is a summary of the team meeting on June 4, 2009 to discuss Kittelson's progress, the upcoming meetings, and schedule.

The following were in attendance:

| | |
|---|---|
| Jason Wiener | City Council Representative |
| Steve King | City of Missoula Public Works Director |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Shane Stack | MDT – Missoula District |
| Ben Nunnallee | MDT – Missoula District |
| Susan Kilcrease | MDT – Transportation Planning |
| Miki Lloyd | MDT – Consultant Design |
| Sheila Ludlow | MDT – Transportation Planning |
| Al Vander Wey | MDT – Transportation Planning |
| Ivan Ulberg | MDT – Traffic Safety |
| Lloyd Rue | FHWA |
| Marcee Allen | FHWA |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andy Daleiden | Kittelson – Project Manager |
| Andrew Cibor | Kittelson |

The meeting was held via conference call and began at 2:00 p.m.

## Kittelson Progress

Andy Daleiden started the meeting with an update on Kittelson's Technical Memos. Andy reported that the Final Technical Memo #1 was posted on their ftp site on May 28th. Technical Memo # 2 was provided to DOWL HKM and Gregg for internal review prior to sending it to the whole team for review. Andy proceeded with a summary of key elements and results of Technical Memo #2.

At the request of the City, Andy explained crash rates and volumes. Kittelson looked at existing conditions to establish a baseline and then applied crash modification factors to the alternatives. Kittelson noted differences in the severity of motor vehicle crashes but this information is not currently in the Tech Memo. Pedestrian safety level of service looks into quality of service and overall experience of bicyclist, pedestrian, or transit rider based on surveys associated with individual users. Kevin brought up the concern of the public with regard to safety of pedestrians crossing multiple lanes of traffic. Kittelson needs to be prepared to answer these types of questions. Ivan noted that the public may not fully understand the issues regarding pedestrian crossing times and speeds or the issues related to pedestrian safety at roundabouts. Lloyd was asked if there is any literature or research about safety of pedestrians for multi-lane roundabouts. Lloyd would have to dig to find any information. It is a worthwhile discussion to have when talking about the relative merits of safety of Alternative 4 versus 5R. Steve noted that if this discussion is not included in the Tech Memos, the FEIS could discuss possible mitigation such as design features to protect pedestrians. The City Parks Department had commented on possible enhancements to minimize crossing distances. Andy noted that an ongoing research project, NCHRP 3-78, is evaluating possible pedestrian treatments at multilane roundabouts. Darryl restated that additional research could be done for the FEIS instead of the Tech Memos.

## Upcoming Meetings

Darryl noted the second meeting with Kittelson to discuss the Tech Memos is set for 9:00 a.m. at MDT in Missoula on June 15th. The team decided to cancel the conference call on June 18th. Gregg noted that Tech Memo #2 should be out for distribution Friday or Monday, which is when the MDT review period starts.

## Schedule

Miki mentioned her concerns regarding the overall schedule. By reducing MDT's review time for the Tech Memos to 10 days, it is difficult to give other MDT staff sufficient notice. Miki thought that the group was going to do joint reviews and if not, she was concerned that the added reviews would impact the overall schedule. Gregg noted review time starts when MDT gets them. Gregg also noted that the City was reviewing the memos first in order to try to eliminate prior issues experienced with the DEIS regarding MDT thinking the information they received was not sufficient. With Kittelson being a new consultant, the City was attempting to ensure MDT received a quality report that MDT did not have to spend two weeks determining if it was worth looking at. Miki wanted to make sure everyone is watching the overall schedule. Lloyd noted that they are getting hammered from leadership to keep on schedule. Lloyd had a comment on page 12. He noted 12-foot travel lanes when Option 6 is described. Lloyd asked Kittelson to include a brief explanation of why 12-foot lanes are shown and how it affects the operational analysis with the roundabouts when 12-foot lanes are not used at the entry points. Andy noted this is in Tech Memo #1. If further discussion is needed, Kittelson can do this.

cc: Meeting attendees
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# June 15, 2009 Meeting Minutes

## Russell Street / South 3rd Environmental Impact Statement Project

### Traffic Analysis Update

### MDT District 1 Conference Room, Missoula

**Meeting Attendees**

| Name | Representing | Email Address |
|---|---|---|
| Stacy Rye | City of Missoula City Council | srye@ci.missoula.mt.us |
| Jason Wiener | City of Missoula City Council | jwiener@ci.missoula.mt.us |
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## ITEM 1 - INTRODUCTIONS

- DOWL HKM introduced the project, project team, and meeting overview.
- Attendees present at the time introduced themselves.
- The meeting started just at 9:00 a.m. and ended at 12:30 p.m.

## ITEM 2 - PRESENTATION BY KAI

- Kittelson & Associates, Inc. (KAI) provided an overview of the meeting and handouts.
- KAI gave a presentation highlighting some key findings from Technical Memorandum #1 and provided an overview of Technical Memorandum #2. The Technical Memorandum #2 overview focused on a review of the alternatives and options evaluated, the analysis methodology and findings, and the operational and safety analysis summary. Throughout the presentation there was a healthy discussion regarding several topics some of which are briefly summarized below:
    - *5-Lane and 3-Lane Russell Street Volume Comparison* – There is a 5 to 15 percent displacement in traffic volumes for 3-lane volume scenario on Russell Street during the weekday p.m. peak hour. There is minimal displacement to Reserve Street during the weekday p.m. peak hour; in fact volumes on the Reserve Street bridge are lower under the 3-lane scenario than the 5-lane scenario. A vehicle miles traveled (VMT) comparison for the 5- and 3-lane volume scenarios has not been performed. Additional topics included the travel demand model, historical growth rate on the corridor and growth in non-automobile mode split, project traffic volumes, and non-auto mode split used in the sensitivity analysis. The discussion centered on how to present technical assumptions and data that appear counterintuitive given the evidence at hand. For example, why does the project assume traffic volumes increase when they have been decreasing on Russell Street for at least ten years? The traffic volumes used in the traffic analysis were derived based on existing traffic count data, historical traffic counts in the study area, and the approved regional travel demand model developed as part of the Missoula 2035 Long Rang Transportation Plan. The regional travel demand model is the approved model for the region and includes the future land use and funded transportation facilities for the area. Several areas adjacent and near the corridor are identified for future development in the travel demand model and will add new trips to the transportation system. It should be noted that over the last 10 years, the traffic volumes on Russell Street have mostly increased and the traffic volumes on Third Street have decreased based on the data collected and presented in Technical Memorandum #1.
    - *Alternative posted/targeted speed* – Russell Street is currently a 30 mph facility and as proposed in the DEIS the build alternatives assume Russell Street as a 35 mph facility. The TAU assumes Alternative 1 is 30 mph and the remaining alternatives and options are 35 mph.
    - *General Design Widths* – All of the build alternatives and options assume 12-foot lanes, 5-foot sidewalks, and 7-foot boulevards. The build alternatives assume 5.5-

**Deleted:**

foot bike lanes and Option 6 assumes a 6.5-foot bike lane. Similar to the DEIS, the bike lane width is measured from face-of-curb to the travel lane. It was noted that City of Missoula standards call for 6-foot sidewalks and 10-foot boulevards and the project cross section needs to be revised accordingly. It was also noted that 11-foot lanes meet AASHTO standards and should be considered. The sidewalk and boulevard widths have been discussed at previous meetings with this group outside of the traffic analysis update. These design widths will be addressed by the project team at a later date prior to publication of the FEIS.

- *Metering Impact* – Overcapacity intersections may meter/limit the amount of traffic volume that is able to access Russell Street during peak time periods. Metered or reduced traffic volumes have not been specifically accounted for in the traffic analysis, but could be revisited as part of the simulation analysis.
- *Sensitivity Analysis* – The year 2035 traffic volumes were developed based on information from the travel demand model, current trends in non-automobile mode splits on the corridor, and existing traffic volumes. From this information, a sensitivity analysis was performed that assumes an approximate 10% reduction in traffic volume which resembles approximate 2029 traffic conditions (20-year analysis) or a shift in non-automobile (transit, pedestrian, and bicycle) mode split under year 2035 traffic conditions. The non-automobile mode split assumes an increase of these modes by 10-percent, which accounts for a 10-percent reduction in traffic volumes under the year 2035 traffic conditions. It is anticipated that the current increase in transit ridership will plateau if service is not expanded. A sensitivity analysis was not conducted for each alternative and option to determine the necessary reduction in traffic volumes required to achieve an acceptable level of service.
- *Presentation of Level of Service* – The summary tables illustrate the overall intersection level of service for the signalized intersections and the critical lane/movement's level of service for the unsignalized intersections (two-way stop control and roundabout control). The table should note where uncontrolled intersections exist in some alternatives that are controlled in others. Otherwise it doesn't match up well with the travel time table.
- *Option 7* – The TAU scope of work includes an option for one additional hybrid option to be analyzed as a part of Technical Memorandum #2. A 3-lane section between 14th Street and near 5th or 6th Street, and 5-lane section from this location to Broadway Street. Road width is a key element for this option. KAI to develop an Option 7 and provide to the group.
- *Multimodal Level of Service (MMLOS)* – The bicyclist, pedestrian, and transit elements of the MMLOS analysis and results were presented for the alternatives and option. Several types of pedestrian and bicyclist treatments were discussed with the group and a summary of these items will be provided to the group.
- *Roundabouts versus Signals* – The analysis currently shows that signals perform better for multimodal operations (bike, pedestrian, and auto), primarily due to the high volumes on the corridor. Also, it would be helpful to identify what can be done at signalized intersection to enhance them for bicyclists and pedestrians

**Comment [r1]:** This would be a very good thing to do.

**Comment [ajd2]:** KAI has completed this analysis and will include it in the Final TM #2.

and to help reduce crash frequencies. The traffic operations and capacity of roundabouts was discussed related to this corridor and why roundabouts do not always work under the larger traffic conditions.

- *Highway Safety Manual (HSM)* – A brochure was provided during the meeting on the HSM. KAI to send the brochure to the City and MDT to pass along to the group.
- *Organization of Presentation* – The discussion first focused on the traffic operations analysis, then the multi-modal level of service analysis, and finally the safety analysis. For future presentations, the order of these topics could be swapped to have the MMLOS and safety discussion first.

## ITEM 3 - DISCUSSION TOPICS

- KAI identified some discussion topics for the group to focus on throughout the presentation. The discussion topics are important to resolve in order for KAI to continue moving forward with the traffic analysis update (TAU). Due to the healthy discussion that occurred throughout the presentation and the identification of an additional option (Option 7) the discussion topics were not able to be resolved at the meeting. The discussion topics included the following:
  - **Level of Service** – How does this impact the selection of a simulation scenario?
  - **Sensitivity Analysis** – Should this be used for selection of a simulation scenario?
  - **Performance Measures** – Should these be weighted in the TAU for use in selecting a simulation scenario?
  - **Selection of Simulation Scenario** – Which two scenarios should be carried forward for the modeling in VISSIM? Should these scenarios be modeled with any of the lane additions identified in the TAU?
- Based on the above presentation and discussion topics during the meeting, a discussion topic and decision matrix is provided in Table 1 to assist with the next steps and future meetings on the project.

**Table 1 Russell Street EIS Traffic Analysis Update – Project Topics and Decision Summary**

| Date | Topic | Discussion Summary | Outcome | Resolved |
|---|---|---|---|---|
| June 15, 2009 | 5-Lane and 3-Lane Russell Street Volume Scenarios | There is a 5 to 15 percent displacement in traffic volumes for 3-lane volume scenario on Russell Street during the weekday p.m. peak hour. There is minimal displacement to Reserve Street during the weekday p.m. peak hour. | The 5-lane and 3-lane Russell Street volume scenarios were developed and summarized as a part of Technical Memorandum #1. | Yes, on June 15, 2009 via meeting. |
| June 15, 2009 | Alternative posted/targeted speed | Russell Street is currently a 30 mph facility and as proposed in the DEIS the build alternatives assume Russell Street as a 35 mph facility. | The TAU assumes Alternative 1 is 30 mph and the remaining alternatives and options are 35 mph. | Yes, on June 15, 2009 via meeting. |
| June 15, 2009 | General Design Widths | The current sidewalk standard width is 6 feet and the standard boulevard width is 10 feet. The city is tending to build 11 foot lanes in urban areas. | As identified in the DEIS, all of the build alternatives and options assume 12-foot lanes, 5-foot sidewalks, and 7-foot boulevards. The build alternatives assume 5.5-foot bike lanes and Option 6 assumes a 6.5-foot bike lane. Similar to the DEIS, the bike lane width is measured from face-of-curb to the travel lane. | Yes, on June 15, 2009 via meeting. |
| June 15, 2009 | Metering Impact | Overcapacity intersections may meter/limit the amount of traffic volume that is able to access Russell Street during peak time periods. | Metered or reduced traffic volumes have not been specifically accounted for in the traffic analysis. The upcoming VISSIM analysis will be able to evaluate the metering that occurs. | Yes, on June 15, 2009 via meeting. |
| June 15, 2009 | Sensitivity Analysis | The sensitivity analysis assumes an approximate 10% reduction in traffic volume which resembles approximate 2029 traffic conditions (20-year analysis) or a shift in non-automobile (transit, pedestrian, and bicycle) mode split under year 2035 traffic conditions. The non-automobile mode split assumes an increase of these modes by 10-percent, which accounts for a 10-percent reduction in traffic volumes under the year 2035 traffic conditions. | A sensitivity analysis was not conducted for each alternative and option to determine the necessary reduction in traffic volumes required to achieve an acceptable level of service as that is not identified in the project's scope of work. However, KAI will analyze the intersections under all of the alternatives and option to determine how long the operations will meet the LOS standard and targeted volume-to-capacity ratios. | Yes, on June 15, 2009 via meeting. |
| June 15, 2009 | Presentation of Level of Service | The summary tables illustrate the overall intersection level of service for the signalized intersections and the critical lane/movement's level of service for the unsignalized intersections (two-way stop control and roundabout control). | KAI will update the presentation of the traffic operations to include delay, LOS, and v/c by movement to assist in the review process. Additionally, the illustration of queues will be explored. | Yes, on June 15, 2009 via meeting. |

**Comment [r3]:** These issues were not resolved!

**Comment [ajd4]:** See earlier response in body of minutes.

**Comment [r5]:** I don't think this is resolved either. How about a 10% reduction in volume AND a shift in non-auto mode split?

**Comment [ajd6]:** See earlier response related to the lifespan analysis and resultant traffic volumes for acceptable operations.

| Date | Topic | Discussion Summary | Outcome | Resolved |
|---|---|---|---|---|
| June 15, 2009 | Option 7 | The TAU scope of work includes an option for one additional option to be analyzed as a part of Technical Memorandum #2. | Option 7 will be developed and incorporated into the final version of Technical Memorandum #2. Findings associated with Option 7 are planned to be discussed in a conference call on Thursday, June 25, 2009. | No, Pending City, MDT, and FHWA review. |
| June 15, 2009 | Multimodal Level of Service | Treatments, such as bike boxes, pedestrian refuges, painted bike lanes, which enhance the safety performance and overall experience for pedestrians and bicyclists was discussed with the group. | KAI to prepare a summary of these treatments and send to the group. | No, KAI working on this item |
| June 15, 2009 | Highway Safety Manual | A brochure was handed out during the presentation. We had limited copies of the brochure. | KAI to send to the City and MDT an electronic copy of the brochure to share with the group. | Yes, on June 18, 2009 |
| June 15, 2009 | Organization of Presentation | The discussion first focused on the traffic operations analysis, then the multi-modal level of service analysis, and finally the safety analysis. | Future presentations will first focus on the multi-modal and safety analysis and then the traffic operations analysis. | Yes, on June 15, 2009 via meeting. |
| June 15, 2009 | Posed Discussion Topics/Questions | See four questions identified in Item 3. | To be discussed during project team conference call on Thursday, June 25, 2009. | No, To be discussed on June 25, 2009. |
| - | Project Schedule | The project schedule was not discussed during the June 15, 2009 project team meeting. | To be discussed during project team conference call on Thursday, June 25, 2009. | No, To be discussed on June 25, 2009. |

DOWL HKM

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# MEMORANDUM

To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: July 9, 2009

**Subject:** **Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 6-25-09**

The following is a summary of the team meeting on June 25, 2009 to discuss the following agenda items:

- Right-of-way Depictions in DEIS
- Speed Limits in DEIS
- Kittelson Continuation of Traffic Analysis Meeting #2
- Simulation Scenarios

The following were in attendance:

| | |
|---|---|
| Jason Wiener | City Council Representative |
| Steve King | City of Missoula Public Works Director |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Roger Millar | Missoula OPG Director |
| Ann Cundy | Missoula OPG Senior Transportation Planner |
| Doug Moeller | MDT – Missoula District Administrator |
| Susan Kilcrease | MDT – Missoula District Transportation Planning |
| Sheila Ludlow | MDT – Transportation Planning |
| Al Vander Wey | MDT – Transportation Planning |
| Ivan Ulberg | MDT – Traffic Safety |
| Gene Kaufman | FHWA – Project Operations Engineer, Missoula District |
| Marcee Allen | FHWA – Safety/Traffic/Design Engineer |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Phil Odegard | DOWL HKM – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andy Daleiden | Kittelson – Project Manager |
| Andrew Cibor | Kittelson – Engineering Associate |

The meeting was held via conference call and began at 2:00 p.m.

## Right-of-Way Depictions in DEIS

The group discussed the email chain regarding right-of-way depictions in the DEIS. The City was concerned that the graphics misrepresent the true intent with regard to certain properties, primarily the Pink Grizzly shed. Graphics imply more of a take than there actually is. Also, conversations with landowners differ from what is portrayed in the graphic. Darryl cautioned that the same methodology needs to be used for every property. Darryl noted that they have the Klauss written letter in the record. The best option is to write a response letter to the family outlining the specific methodology and how it was used to compare the alternatives. Gene agreed with Darryl's approach and noted that at this stage of the process it is about full disclosure of all impacts. Right-of-way is not purchased until NEPA is completed and the design is only 30 percent right now. Steve asked Gregg to schedule a meeting with the Klauss family, the Mayor, and the City. The group agreed to leave the graphics in the DEIS as they currently stand and maintain the methodologies used. Steve asked for the DEIS to more fully explain that what is shown is the maximum impact not necessarily the most probable impact. Darryl will put together some text for the City.

## Speed Limits Portrayed in the DEIS

The group agreed that there was no intent to change the posted speed limit of 30 mph. They noted that 35 mph was used as an analytical tool. The DEIS was analyzed under a 35 mph design speed, but this should not be understood as an operating speed. The group asked Kittelson to explain the effects of using a 35 mph design speed versus the posted 30 mph speed limit. Kittelson noted that because most of corridor is at capacity, peak hour speeds would not reach 35 mph except in locations where traffic is freeflow. The speed is based on the input which was 35 mph. For the most part, traffic is not reaching 30 mph during peak flow, and the issue is therefore irrelevant. The difference may be a few seconds with a 5 mph change in speed. Gregg thought the speed limit question arose from Table 2.5 of DEIS, which the group recalled originated from the previous subconsultant. Kittelson offered to clarify their analysis in both their Tech Memo and final report by referring to 35 mph as a design speed included from the DEIS but posted speed would not change from what it is today. Gene noted that they have that language in other documents. Steve noted the importance of clarity in the FEIS, especially Table 2.5 and the section titled Maintaining Community Character. It should mention the intent to maintain the existing posted speed. Kittelson will continue to use a 35 mph design speed.

## Kittelson Continuation of Traffic Analysis Meeting #2

Andy provided a recap of Option 7 and its configuration, including the lane drop at the traffic signal to allow for a cleaner 3-lane cross section as you travel between $5^{th}$ and $14^{th}$. This is an opportunity to begin moving southbound through traffic into single lane. Andy also mentioned the intersection at Mount that provides an opportunity for a continuous 3-lane section between $14^{th}$ and $5^{th}$. The group asked for explanations of transitions at Mount and $5^{th}$. Kittelson had not planned on any changes south of Mount. North of $14^{th}$ Street traveling southbound, there would be a taper to develop into two southbound through lanes at the $14^{th}$ Street signal. Kittelson was asked if it was operationally better to drop a lane at a signal or to merge lanes. Andy noted that there seems to be a lack of vehicles using the second through lane. Steve noted the conflicting interests but the City wants the analysis to be fair. Andy noted it is a balancing act in managing different queues.

The group discussed the throttling effect of the congestion at Broadway, Mount, and $3^{rd}$. Andy noted that 3rd acts as a metering location. The group discussed the functionality of the second through lane south of the railroad tracks. The group asked to have the lane drop/addition at Lawrence, i.e. have a multi-lane south to Mount and lane drop north of Mount. Andy noted Kittelson would be adjusting lane utilization for lane imbalance that would occur. City added that there has to be a 3-lane section across the tracks. Andy will make some slight adjustments to the analysis.

Andy summarized the multi-modal LOS and traffic operations related to the comparison of Option 7 and Alternative 4. Option 7 has a slightly higher predicted average crash frequency than Alternative 4. Overall the bicycle, pedestrian, and transit LOS of Option 7 is similar to Alternative 4.

Andy summarized traffic operations for Option 7. The 5th Street intersection for Option 7 is projected to be over capacity with lengthier queues than Alternative 4. LOS is still sub-par for Option 7 as it is for other alternatives and options. Roger noted that someone ought to look into relative differences between Alternative 4 and Option 7 in terms of east/west pedestrian and bicycle movements, community character, right-of-way, construction costs, etc. because this just focuses on traffic and multi-modal operations. Does Option 7 work well enough to move it forward? When the traffic information is presented, these other items should be presented as well.

Steve asked about the scope of work and sensitivity analysis. Jason noted his disappointment in the level of sophistication in the sensitivity analysis. He suggested a figure that shows travel times for a given traffic volume. It is a good idea to see where marginal benefit is the highest. The scope of work refers to Kittelson performing a sensitivity analysis for each alternative projected to operate at an acceptable LOS or under capacity. He does not feel that the work product matches the scope of work. At what level does a 3-lane work? Ivan thought it was based on construction and projected dates of failure. To project what you need to do in 2035 from a multi-modal standpoint when you are having difficulties accomplishing goals right now with today's volumes may be beyond difficult. Andy noted Kittelson could give a threshold year when an approach would exceed volume-to-capacity ratio at LOS D or greater. Kittelson did this for Alternative 3 and 5R at each intersection. Behavioral shift is not quantifiable other than stating only this number of cars can fit through this intersection. Some DOT's and communities implement transportation demand management strategies. If a community knows raw numbers for capacity, they could have discussions on options to do with additional traffic if they in fact want to keep a certain alternative. The group asked for volumes anticipated at 2035 and volumes Option 7 can handle without failing, and then they can derive how much traffic to get rid of. Steve noted that Kittelson was also hired to look at reality and attainability of goals. Andy asked for direction to use as boundaries; do they still use LOS C and D? Steve noted that the City is advocating for LOS D which is in their traffic plan. MDT cautioned that when v/c ratios fail, then the system falls apart completely so stay away from the point where the v/c ratio fails.

## Simulation Scenarios

The group decided to move Alternative 4 and Option 7 forward for simulation. Alternative 4 is the highest-ranked and is the Preferred Alternative, and Option 7 is motivated by the exercise of looking for alternatives with neighborhood interest.

Gene questioned the purpose and venue of the simulation. It will be presented to the council because they requested it and possibly at a Public Works Department meeting. Gene cautioned that the simulation needs to be nothing more than a visualization tool. Because the simulation is only used on two alternatives, the group needs to be very cautious on how the information is used. This simulation is getting close to the bounds of NEPA regarding treating all alternatives the same. Decisions cannot be made based on the simulation effort and it cannot act as a screening tool or a way of obtaining new information. It was noted that the simulation is visual animation of all the charts and tabular information already presented. Andy will proceed with Alternative 4 and Option 7 and video output for use by the group.

The purpose and quality of meeting minutes were discussed. As part of the administrative record, there was concern regarding leaving open-ended questions without discussion backing up decisions made during the meeting. The meeting minutes should accurately reflect the discussion during the meeting. It was suggested that a disclaimer be added to each subsequent set of meeting minutes noting that the minutes only reflected what happened at the meeting and are not intended to imply comprehensive resolution. Phil said DOWL HKM would draft up a disclaimer to be discussed at the next meeting.

Susan asked how much of the peer review process will be incorporated into the FEIS. Gene anticipated that the peer review would be used as a supplement for responses to comments. The group discussed how the tech memos would be included in the FEIS. No decision was made because there is still a long way to go before the FEIS is ready.

cc: Meeting attendees
file

DOWL HKM

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# MEMORANDUM

To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: July 20, 2009

**Subject:** **Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 7-9-09**

The following is a summary of the team meeting on July 9, 2009 to discuss the following agenda items:

- Additional Kittelson On-site Meeting
- Additions to Kittelson's Work and Effect on Schedule
- Technical Memorandum # 2
- VISSIM Simulation Model
- Meeting Minute Disclaimer

The following were in attendance:

| | |
|---|---|
| Steve King | City of Missoula Public Works Director |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Doug Moeller | MDT – Missoula District Administrator |
| Ben Nunnallee | MDT – Missoula District |
| Susan Kilcrease | MDT – Missoula District Transportation Planning |
| Miki Lloyd | MDT – Consultant Design |
| Sheila Ludlow | MDT – Transportation Planning |
| Al Vander Wey | MDT – Transportation Planning |
| Ivan Ulberg | MDT – Traffic Safety |
| Gene Kaufman | FHWA – Project Operations Engineer, Missoula District |
| Marcee Allen | FHWA – Safety/Traffic/Design Engineer |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Phil Odegard | DOWL HKM – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andy Daleiden | Kittelson – Project Manager |

The meeting was held via conference call and began at 2:00 p.m.

Phil began the meeting by reviewing the agenda items.

## Additional Kittelson On-site Meeting

The City and Public Works Department thought it is essential to provide the City Council with a presentation of the simulation and have someone answering questions other than the City and Public Works Department. In keeping with the independent peer review process, it is important that the City Council hears answers from the people who did the analysis. Phil had asked Andy to put together a cost for the additional meeting. Andy mentioned adding an open house for the public to give them a chance to see the simulation and answer questions prior to the meeting with the City Council. Steve asked to have a separate meeting with the City Council instead of presenting the simulation as part of one of their regular Monday night meetings. Steve thought the meeting would be similar to the meetings regarding the tech memos with a roundtable discussion format, not like the formal public hearing. This would allow for more dialogue with the Council members and help minimize cost. Gregg envisioned Andy bringing a laptop and CD, explaining the major elements of the simulation, and answering questions. The City would like a cost estimate and schedule before the logistics are planned. The group decided to replace conference call #4 with the additional on-site meeting.

## Schedule

Darryl gave a recap of the schedule he submitted prior to the meeting. Due to the addition of Option 7, everything through Task 6.4 will be pushed out by about a week. Andy noted that Draft Tech Memo #3 is anticipated to go out July 20th. Due to the focus on simulation model output and assumptions for development of the model, this report is a much smaller document. Andy did not anticipate any change in the final report deliverable date. Gregg noted that Tech Memo #3 could be sent to the whole group.

Gene noted that there seems to be some redundancy from E4 thru C13. Darryl will look at the schedule again and make sure tasks are not being repeated.

## Tech Memo #2

Andy noted the addition of the following items to Tech Memo #2: Option 7, technical appendix, lifespan analysis of each alternative and option, figures indicating 95th percentile queues. With all these changes, Kittelson asked if a second review was warranted before Tech Memo #2 was finalized. The group decided to finalize the memo instead of going through another review. Andy agreed to finalize and post it after the call.

## VISSIM Analysis for Alternative 4 and Option 7

Andy summarized the VISSIM results for Alternative 4 and Option 7. There are substantial vehicle queues at 3rd Street for northbound left-turn and those queues spill back to 7th Street. Over the course of the hour, those queues spill back to 14th Street. With Option 7, there is only a single northbound through lane, which means it will be worse at 14th Street. Andy asked if he should continue to move forward with developing the Option 7 simulation model, or explore lane enhancements identified in Tech Memo #2 relating to Alternative 4 improvements to individual intersection operations at 3rd Street and adding a second northbound left turn lane. Steve thought that Kittelson should just model it because the latter would mean significant changes to the DEIS scope. He would rather preserve right-of-way and acknowledge the future potential defect and plan for that, but not try to remedy it with this project. Miki thought it would be best to take Option 7 all the way through the analysis and other intersection changes for Alternative 4 could be done after the traffic analysis. Steve noted that it is Kittelson’s job to articulate if Option 7 does not work; it is not their job to fix it. Andy noted that the corridor operations would work until about 2025 for Alternative 4, but then it starts to breakdown at some of the intersections. Steve noted the irony in that the purpose of the peer review was to reduce footprint, but it seems that Kittelson’s observation is to increase the footprint. Gene thought that maybe in Kittelson’s final report they could give minimal design recommendations, without analysis, based on observations for further review in the FEIS.

Steve asked how sensitivity fit into the animation. Andy noted that sensitivity is documented in Tech Memo 2, but not carried forward in the simulation model. The simulation is 2035 full build conditions without 10 percent reduction for sensitivity.

## Disclaimer

Phil summarized the disclaimer. The group had no objections to the disclaimer. This disclaimer will be attached to this current and all future meeting minutes.

The next team meeting conference call will be July 23, 2009.

cc: Meeting attendees
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*Meeting minutes are not intended to serve as a transcript, but are meant to capture the general content of meeting discussions and to document decisions made by the working group. Meeting minutes may include opinions provided by attendees; no guarantees are made as to the accuracy of these statements and no fact checking of specific statements is provided or implied from the publishing of final meeting minutes. Prior to publishing final meeting minutes, draft meeting minutes will be made available to attendees for review and comment.*

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# MEMORANDUM

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To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: August 6, 2009

**Subject:** **Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 7-23-09**

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The following is a summary of the team meeting on July 23, 2009 to discuss the following agenda items:

- Schedule
- Draft Tech Memo # 3
- Miscellaneous

The following were in attendance:

| | |
|---|---|
| Jason Wiener | City Council Representative |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Roger Millar | Missoula OPG Director |
| Doug Moeller | MDT – Missoula District Administrator |
| Shane Stack | MDT – Missoula District |
| Susan Kilcrease | MDT – Missoula District |
| Miki Lloyd | MDT – Consultant Design |
| Al Vander Wey | MDT – Transportation Planning |
| Ivan Ulberg | MDT – Traffic Safety |
| Gene Kaufman | FHWA – Project Operations Engineer, Missoula District |
| Michael Kulbacki | FHWA – Lead Field Operations Engineer |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andy Daleiden | Kittelson – Project Manager |

The meeting was held via conference call and began at 2:00 p.m.

## Schedule

Darryl explained that FHWA's prior confusion with certain task descriptions in the schedule was due to an error in input but the overall schedule and deliverables did not change.

## Draft Tech Memo #3

Andy provided an explanation of the deliverables uploaded to Kittelson's ftp site including Draft Tech Memo #3 and draft simulation videos for Alternative 4 and Option 7. Andy added that due to the large simulation file size, he would be willing to burn the seven minute videos to a DVD if requested. Options for expanding the simulations for the presentation were discussed.

Andy clarified that Kittelson did 10 different iterations and the video portrays the average of the 10 runs and represents the travel times shown in Table 8 of the tech memo. Kittelson used the same travel volumes in both videos to be consistent. In either the three-lane or five-lane volume scenarios, the intersections of Broadway and 14th do not have enough capacity to allow traffic demand for 2035 to process within the hour and therefore a metering effect occurs under either scenario. Tables 5 and 6 of the tech memo show the volume at which the metering effect begins. Recommendations for intersection improvements to specific intersections were also identified in the tech memo. The simulation informs the viewer of how much volume the footprint can process; volumes are not manually adjusted by Kittelson. A few scenarios could result from metering at the intersections. You could see longer periods of congestion or longer durations of the peak hour, you could see drivers choosing to utilize another route or choosing to shift their mode of transportation, or people may shift their travel patterns as far as what time they use the corridor.

Due to some uncertainty within the tech memo, Andy will note that everything related to performance, travel times, and LOS are all related to the year 2035.

## Miscellaneous

Kevin and Andy discussed the travel times noted in Tech Memo #2. Kevin noted that if optimization is based on the number of lanes and there is more green time for a certain alternative, it seems that that alternative is better. If there is more green time added to one leg, green time will be reduced for those entering the system. The team requested that Kittelson add a footnote somehow to account for delaying side street traffic because there is no mention of side street traffic getting onto the system. Andy agreed and suggested that this should be noted within the methodology and can be accounted for within the final report.

Jason expressed his concern that the scope of work for the sensitivity analysis is still not being met. Both Alternative 4 and Option 7 fail to meet LOS C and there is no indication of by how many vehicles a day it fails. Andy noted that this analysis was rolled into Final Tech Memo #2; predominately into Table 3. Jason suggested that this be carried through. Jason noted that the extra turn lane could be a future sticking point. Trying to build a system big enough to accommodate the traffic is not Jason's sense of what the policy makers would like to see. Rather, they would like to see the volume to be eliminated to make the system work. Andy was asked to calculate how many fewer people would have to make the left turn movement from Russell Street to 3rd Street in order for the stacking to be at the same capacity as it is in the preferred alternative.

Ivan and Jason agreed that an evenly distributed and proportionate reduction of traffic at the intersections from all directions is what Jason is looking for. Roger thought it would be useful to have the growth rate at which the alternatives work in 2035. For example, if policies were written to hold growth to 1 percent or 1.5 percent, would the corridor work? Ivan cautioned that the group needs to be specific on what Kittelson is to do as to avoid an iterative process.

Roger questioned why one extra block of four-lane footprint provides so much difference in queue lengths. Andy explained that the constraint in the system is the north bound left turn lane at 3rd Street and Alternative 4 has an extra block of storage while Option 7 has less capacity. Ivan noted that lane configuration was based on neighborhood continuity instead of operations. Andy noted that over the course of the hour, both Alternative 4 and Option 7 break down. Kittelson can provide simulations at different intersections as well as segments over different time periods. The group requested a simulation of 3rd Street to Lawrence over the length of the simulation in order to view traffic patterns. Andy will take the aerial out of the simulation to reduce the file size and provide this simulation.

Roger asked if the reason for queues on Russell Street was due to worse congestion everywhere else. Andy noted that the model only looks at the corridor and travel demand model. Ivan thought that volumes and the framework for the simulation were provided to Kittelson. Roger asked the group to think about if it is worth the money and the impacts to get the incremental operational efficiency out of the section between the Bitterroot Branch and 7th Street. Ivan noted that if the system is not sized to accommodate capacity, it could lead to making vehicles choose between staying in congestion and choosing another mode of transportation.

Kevin thought it would be worthwhile to put a second lane on Russell to show not only the Russell Street Corridor travel time but also the travel time within community. Gregg wanted to make sure the group did not forget that there are impacts to the south end of Option 7 even under a three-lane alternative. Susan noted that the cumulative impacts analysis in the FEIS will be heftier than they are used to doing due to the qualitative choice between whom and when you impact and the different tradeoffs the group is willing to make. Roger would like to see some sort of compromise to get the project built. There may be compromises from 6th to 14th instead of an all or nothing situation.

Gene noted that right now, the group is just trying to get through NEPA to determine impacts. Roger understood that this process is clearing a corridor, but the community does not understand. He suggested noting in the EIS that this is just a clearing of a five-lane section but the community will only build a three-lane section until some trigger point occurs at which time the community will build more. Susan noted that the EIS would have to do a complete analysis of impacts and right now the group is just looking into the traffic aspect. Darryl noted that this can cause concern with property owners because they are then forced into real estate limbo. The importance of working together to get the document signed was stressed along with the realization that final design will come after this.

Kevin noted that there is currently no funding for the southern part of the corridor. The southern portion of the corridor can be revisited later through an Addendum to the FEIS once funding becomes available. The ultimate goal is to get improvements in the north segment as soon as possible. Gene noted that whatever the Preferred Alternative is in the Record of Decision (ROD), it needs to be fiscally constrained for FHWA to sign. The City can do segments as long as the whole corridor remains committed. Gene also noted that reevaluations are a part of NEPA and sometimes FHWA requires reevaluation. Darryl noted that the DEIS currently mentions reevaluation. Also, it is not a NEPA or Kittelson decision on what needs to take place; it is a local policy decision. Gene added that lawsuits are only on the defensibility of the document and if the process was followed correctly. If the document gets sued, the process stands still until suits get resolved. The group needs to move forward to an alternative that meets the Purpose and Need and proceed with the proper thing to do. Choosing to spend or not spend taxpayer dollars regarding a potential lawsuit is not the role of civic people. Gregg noted that some citizens in the southern corridor are more interested in resolution whether they have to sell or not.

Darryl noted that unless there is a strong operational argument, he does not see how you can prove necessity in one part of the corridor and not the other. The group talked about cumulative impacts and evaluation, both quantifiable and qualitative impacts. Decisions need to be made based on sound analysis rather than public perception and pressure.

Kevin asked that if at the end of the peer review there is no consensus, how does the group move forward with a decision as far as the Preferred Alternative in the FEIS. Susan responded that the peer review process is trying to determine if another option or alternative needs to be included in FEIS. Darryl added that the peer review was not intended to promote or suggest an alternative, but to say if the analysis done is fair, accurate, defensible, and complete. Gregg added the importance of Kittelson's validity of the analysis that was already done. Kevin asked if the analysis was in fact correct, how do you get people off the three-lane alternative and onto the five-lane? Gene answered that NEPA is not about what individuals want or do not want. It is about going through impacts to get to a ROD for the impacts to get to an action. Kevin suggested finding a way to get everyone on the same page because if people do not get what they want, they will sue or hold up the project in some way. Gene noted that no one can control whether or not they get sued. Roger suggested presenting a public forum to explain what happens with a three-lane alternative and show them it has been looked at. A huge part of project development is to get local government buy-in. The peer review was to get that.

Roger brought up the City Council's perception that the scope of work is not being met in order to achieve local government buy-in. Gene mentioned previous discussions about what in the peer review was federal-aid reimbursable. Roger discussed how the scope of work was not met as far as the method in which the information was presented as well as the sensitivity analysis. Gene cautioned that all alternatives need to be treated the same, which was Tech Memo #2. The group agreed to move on to Tech Memo #3 for simulation only. If alternatives were treated differently, then the team would have to go back to Tech Memo #2. Jason noted that he is held accountable as an elected official for trying to get the best idea of what the road has to be. Jason will go back to Tech Memo #2 to see if the information is portrayed in a manner suitable to the needs of the scope of work.

Gregg thought these conversations are post peer review. Kevin asked how the group gets to a single Preferred Alternative for the FEIS with two seemingly similar options/alternatives with negatives and positives of each. Darryl mentioned that NEPA and MEPA are a decision making process about providing objective analysis to address a stated Purpose and Need. This particular Purpose and Need was determined in the LRTPU. Changing growth rate is a policy decision not a corridor or project decision. The MPO estimates future traffic demand. Once you get the Purpose and Need you come up with a reasonable range of alternatives that can be funded and constructed. NEPA and MEPA help to identify constraints and what is permissible by regulatory agencies. They are disclosure processes. They are not intended to project a magic answer. Roger noted that Option 7 has not been through analysis in the DEIS whereas Alternative 4 has. If Option 7 is chosen, there would need to be a supplemental DEIS to bring the document up to the same level of analysis for that alternative. Another possibility is to proceed with Alternative 4 and put phasing and staging options in the FEIS as a response to comments received on the DEIS and put it in the ROD. Outside NEPA but within development process is getting local government onboard with the strategy to move forward.

Darryl noted that there was previously a detailed discussion of construction phasing and funding strategies as well as a detailed outline of what chunks would go in what order and at what cost. All the detail was stripped out but there is still a brief discussion in the DEIS about construction phasing and funding as well as thresholds. Darryl thought the holdup is philosophical opinion that there should not be five lanes. Roger noted the greatest objection was and is still between 6th and 14th, which is a later phase. He encouraged the inclusion of construction sequencing and funding and thresholds to build some consensus in the community. Jason agreed and asked for the inclusion of some kind of community flexibility to negate the perceived absolutism. Roger noted that if it is in the document and has been discussed at multiple meetings, maybe it has not been communicated clearly enough. Susan asked if the inclusion of the peer review process with its final presentation will provide enough information to sway some of the people that were adamant i.e. more information is better information to make a decision. Roger thought there needed to be better communication with the perceived project proponents. If MDT came in and said that they need to environmentally clear five lanes but will only build as needed, explain the modeling, and that they are sensitive to the community's concerns and will revisit the southern portion before anything is built since it will have to do be done anyway. It is perceived as the city and MDT pushing a project forward.

Gene noted that in the current LRTP, the project is called Russell from Mount to Broadway. Once we get to a ROD, we will be able to do individual projects. It was mentioned that the fear is that the process is flawed and that we will be sued. Roger thought that what we have not been able to articulate to people's satisfaction is how this document will be used and how the project will be developed. The team should tell them it will be revisited. Kevin asked if the group on the phone could come to a consensus that the Preferred Alternative to move forward is Alternative 4 and make sure the team commits to communication with the public and revisit it again in the future. Roger still needed assurance in the document of some process to revisit south of 3rd Street if the project moves forward. The question was posed if you can build one section and analyze another. Gene noted that this can happen only if the whole preferred alternative and what comes out of ROD is planned for in the MPO and is fiscally constrained. Roger asked what can be put in the ROD that can give City Council reassurance that before the southern end of the project is constructed, it will be reevaluated. Darryl noted that comments asked for a specific threshold, which is not viable to determine what a future threshold will be.

Susan noted that a change of conditions constitutes reevaluation. There are numerous reasons to reevaluate. Susan noted that the FEIS can include the relevant CFR. Gene noted that there will be new laws in the future and additional things to assess. Susan summarized the main action item as the need to get through peer review and through a working group to decide how to respond to comments and get consent on how to move forward. Roger thought the team needs to communicate with the Mayor and City Council and figure out and fine tune the approach.

Jason requested that Table 8 of Tech Memo #3 be expanded to include intersection to intersection numbers.

Michael agreed with Darryl with regard to how the document will be structured with regard to breaking out the corridor into logical sections where those sections could be addressed to be completed in a reasonable fashion within the environmental document, funding permitted and meeting all the fiscal constraints. Michael also mentioned the possibly of creating a ROD that allows for development of triggers for future analysis that fully discloses when future analysis can occur based on possible operations of the corridor.

Darryl recalled that team comments on Tech Memo #3 are due on August 3rd or 4th. The next team meeting conference call will be August 6, 2009. Andy discussed the schedule of the presentation to city council as sometime in the third or fourth week in August. Andy also noted that Gregg has the contract modification and discussion needs to happen regarding this. The team will discuss the content of the presentation during the next conference call.

Darryl will send out text currently in the DEIS to the group for their feedback.

cc: Meeting attendees
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*Meeting minutes are not intended to serve as a transcript, but are meant to capture the general content of meeting discussions and to document decisions made by the working group. Meeting minutes may include opinions provided by attendees; no guarantees are made as to the accuracy of these statements and no fact checking of specific statements is provided or implied from the publishing of final meeting minutes. Prior to publishing final meeting minutes, draft meeting minutes will be made available to attendees for review and comment.*

**DOWL HKM**

# MEMORANDUM

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To: Gregg Wood
Project Development Coordinator

From: Jamie Jespersen
Project Planner

Date: August 25, 2009

**Subject: Meeting Minutes**
**Russell / South 3rd EIS**
**Team Meeting on 8-20-09**

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The following is a summary of the team meeting on August 20, 2009.

The following were in attendance:

| | |
|---|---|
| Jason Wiener | City Council Representative |
| Steve King | City of Missoula Public Works Director |
| Kevin Slovarp | Missoula City Engineer |
| Gregg Wood | Missoula Project Development Coordinator |
| Shane Stack | MDT – Missoula District |
| Ben Nunnallee | MDT – Missoula District |
| Susan Kilcrease | MDT – Missoula District |
| Miki Lloyd | MDT – Consultant Design |
| Sheila Ludlow | MDT – Transportation Planning |
| Gene Kaufman | FHWA – Project Operations Engineer, Missoula District |
| Darryl James | Gallatin Public Affairs – Project Manager |
| Phil Odegard | DOWL HKM – Project Manager |
| Jamie Jespersen | DOWL HKM – Project Planner |
| Andrew Cibor | Kittelson – Engineering Associate |

The meeting was held via conference call and began at 2:00 p.m.

Andrew started the meeting with an overview of Kittelson's recent submittals. Kittelson submitted Tech Memo #3 and the Draft Final Report prior to the meeting. Kittelson is waiting to receive comments by August 26, 2009 and will submit the Final Report by Aug 31, 2009.

Kevin asked how Roger's queuing comment had been resolved. Gregg noted that Andy sent out an email that summarized some issues when the models exceeded capacity. Kittelson updated the model and Roger seemed satisfied at the presentation with the new simulation results. Andrew discussed the details of the new simulation queuing. Jason added that when comparing Table 7 and Table 8 between Tech

Memo #3 and the Draft Final Report, it shows the difference in corridor travel times. Steve noted there was more green time given for Option 7 at 5th Street, but this is no longer noted or explained anywhere; the footnote seems to have been lost. Andrew will check on the status of the footnote and include an explanation of why green time makes a difference at 5th Street between Option 7 and Alternative 4.

Darryl brought up the possibility of imminent project needs based on updating the traffic section of the EIS and its implications on other analyses. Darryl suggested scheduling a working meeting to hammer through these needs. Steve noted the importance of working through any remaining issues in order to get the FEIS document completed. Darryl noted that the comment/response matrix is approximately 85 percent complete and is therefore on schedule with the existing data. Darryl posed the question of how much of Kittelson's traffic data should be incorporated into the FEIS. There is also EPA's letter to consider. Gregg mentioned the possibility of using the September 3rd conference call time to have a working group meeting. The City has something scheduled for 11:00 on September 3rd and would therefore not be able to meet sooner. Gregg noted his intent for the meeting was to transition from the peer review into the FEIS and comment/response matrix. In doing so, the group needs to discuss issues that will need to be tackled in the near future. Gregg noted the importance of the meeting to resolve issues in order to have steady progress moving forward. Darryl added that the meeting was not to sit down to go through individual responses to comments.

Gene asked to discuss current design year numbers for 3rd Avenue South in the September 3rd meeting. Kevin added that City Public Works wants to recommend certain section lane widths and would like to discuss if these recommendations would require reanalysis. Gene mentioned that FHWA has come up with minimum widths and the importance of incorporating these minimum widths into the document so that the public is able to see the minimum footprint. Miki suggested that the group send any items they would like to resolve to Darryl. Darryl agreed to circulate discussion items to the group and they can add items to the current list. Kevin asked to include the City's proposed phasing discussion language for the FEIS to the agenda items.

Darryl noted the first version of the comment/response matrix appendix is scheduled to go out September 18th. Darryl asked if there were any issues that could be handled before September 3rd to keep the process moving. Gregg responded that if the issues were schedule-critical, the group could do their best to resolve any schedule-critical issues before the September 3rd working meeting. The group decided that weekly conference calls on Thursdays at 2:00 p.m. should be initiated with the first one starting August 27, 2009.

Miki concluded with a summary of the action items. There will be a conference call next week at 2:00 p.m. and weekly calls thereafter. Darryl will get a preliminary list of agenda items for the September 3rd working meeting out tomorrow and will in turn incorporate the group's additional items and get a final list out by next Wednesday. Miki will set up a calendar appointment for conference calls and for the September 3rd meeting in the Missoula District Office from 2-5 p.m. It should be noted that the conference call originally scheduled for August 27th has been cancelled due to MDT scheduling conflicts.

cc: Meeting attendees
file

*Meeting minutes are not intended to serve as a transcript, but are meant to capture the general content of meeting discussions and to document decisions made by the working group. Meeting minutes may include opinions provided by attendees; no guarantees are made as to the accuracy of these statements and no fact checking of specific statements is provided or implied from the publishing of final meeting minutes. Prior to publishing final meeting minutes, draft meeting minutes will be made available to attendees for review and comment.*