# LONGMONT BUS RAPID TRANSIT ALIGNMENT ANALYSIS

June 2016

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# ALIGNMENT ANALYSIS

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City of Longmont

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# I. INTRODUCTION

## *A. Background*

The Northwest Area Mobility Study (NAMS), completed in 2014, was a collaborative effort among the Regional Transportation District (RTD), Colorado Department of Transportation (CDOT), Denver Regional Council of Governments (DRCOG), and 16 northwest area stakeholders, including the City of Longmont. The purpose of the study was to develop a prioritized list of mobility improvements for the northwest part of the RTD service area.

The overall conclusion of the study is that the Northwest area remains committed to Northwest Rail as envisioned in FasTracks, but given the projected timing of Northwest Rail's implementation, Northwest stakeholders want to see mobility benefits sooner. Bus Rapid Transit (BRT) was identified as a transit solution that could be implemented sooner, with six corridors determined to be potentially viable for BRT:

- State Highway (SH) 119 (Diagonal Highway) between Boulder and Longmont
- US 287 between Longmont and Broomfield/US 36 Corridor
- 120th Avenue (East/West Connection: Broomfield to Thornton)
- South Boulder Road (includes Boulder System Improvements)
- Arapahoe/State Highway (SH 7) (East/West Connection: Boulder, Lafayette, and to Brighton)
- SH 42 (New Service)

The SH 119 corridor was selected as the first priority corridor and US 287 was identified as the second priority. SH 7 was later selected as a third candidate priority corridor. The following short-range steps were identified for the highest priority corridors:

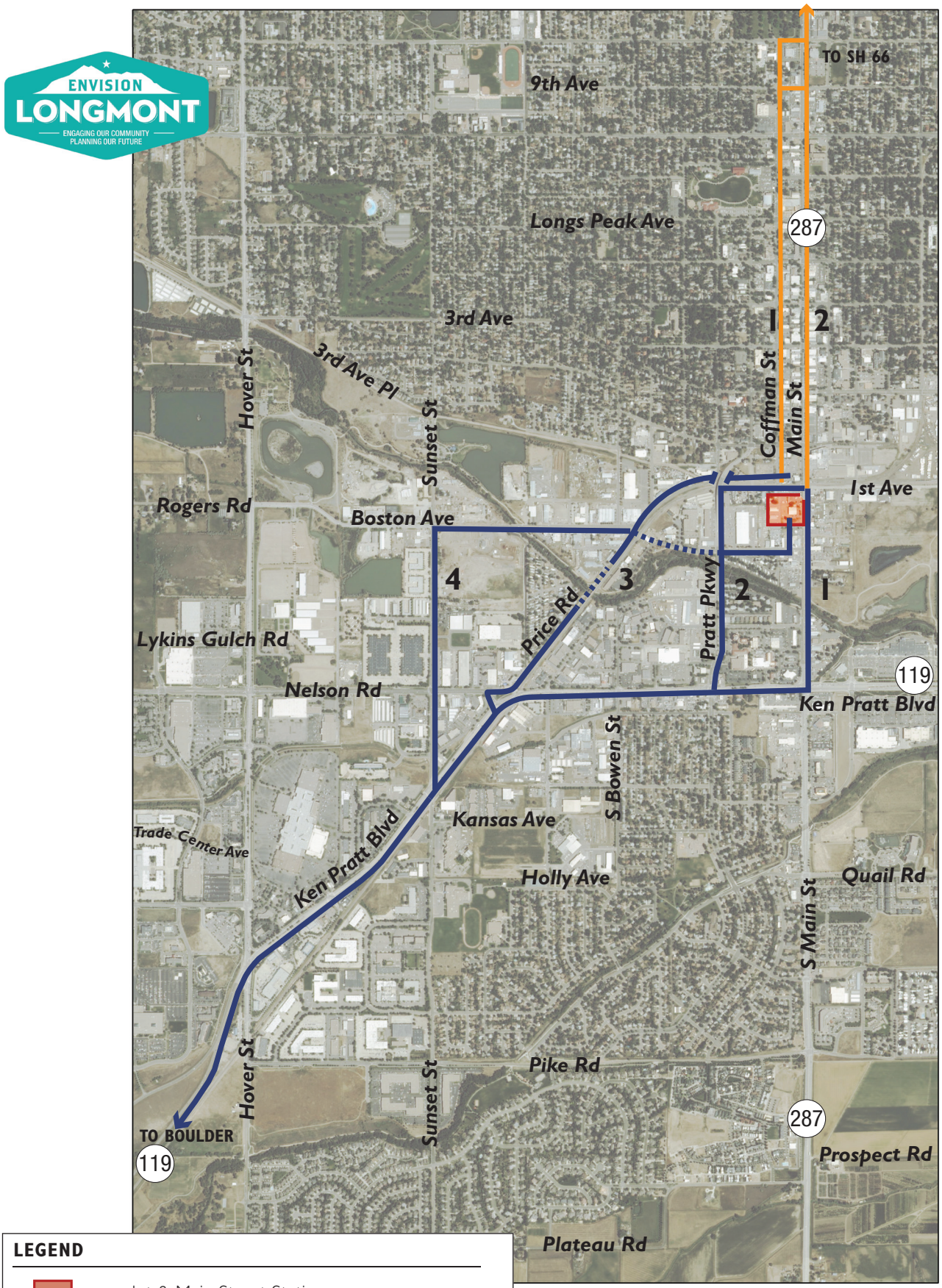
- Proceed into advanced planning/environmental/preliminary design.
- Implement one or both corridors after completing a study based on further refinement of regional priorities, project scopes, funding availability, and leveraging opportunities.
- Include anticipated bus ridership in Arterial BRT/Enhanced Bus Service station investments and station design features consistent with future rail service.

The DRCOG 2016–2021 Transportation Improvement Plan (TIP) includes a planning, environmental assessment and preliminary design study for the SH 119 BRT corridor, to be led by RTD in coordination with corridor cities and counties. The study is anticipated to begin in 2016. In addition, the TIP includes design and construction of the Longmont Station Transfer Center at 1st & Main in downtown Longmont.

### *B. Purpose of Study*

The City of Longmont has initiated this study as a supplement to the transportation planning work being conducted as part of the Envision Longmont comprehensive plan process. The study focuses on the future BRT alignment, lane configuration and traffic control options as the BRT enters Longmont from the southwest along SH 119 (Ken Pratt Boulevard) to the 1st & Main Station then proceeds along the Main Street corridor to SH 66. The study is intended to provide input to City staff and elected officials to support participation in the SH 119 BRT Planning, Environmental Assessment and Preliminary Design project and to help the City design improvements on Ken Pratt Boulevard that accommodate future Longmont traffic needs and that are compatible with future BRT alternatives.

**Figure 1** shows the focus area for this study. The map shows the four alignments that are analyzed to bring the BRT corridor from SH 119 southwest of Longmont to the 1st & Main Station: Main Street, South Pratt Parkway, Price Road, and Sunset Street. It also shows the two options that are analyzed to carry buses north of the 1st & Main Station to 11th Avenue: Main Street and Coffman Street. Main Street is the only street identified to carry the BRT north of 11th Avenue to the north terminus north of SH 66.




**LEGEND**

- = 1st & Main Street Station
- = BRT Alignment Alternatives Entering Longmont
- = BRT Alignment Alternatives Downtown
- = New Road Connection

**Figure 1**
BRT Alignment Alternatives

### *C. BRT Definition*

BRT is becoming an increasingly popular option for cities throughout the U.S. as a means to provide high-quality transit service on busy corridors that provides many of the transit service qualities of light rail transit with a substantially lower capital cost. Following are six key characteristics for a BRT system to achieve the desired high-quality service:

- **Dedicated Lanes** – All or most of a BRT should provide dedicated lanes for buses to travel unimpeded by general traffic congestion. It may be necessary for buses to share lanes with some vehicles, such as right turners or carpools, but a majority of the corridor should have dedicated lanes to optimize bus speed and reliability.
- **Off Board Fare Collection** – Collecting fares before boarding, either through a barrier controlled or proof of payment method, is one of the most important factors in reducing station dwell time and therefore total travel time, thus improving the customer experience.


- **Intersection Treatments** – There are several ways to minimize bus delays through signalized intersections, including increasing green times, signal priority for buses, early green signals for buses (often referred to as "queue jumps"), or signal coordination conducive to bus flow.
- **Platform Level Boarding** – Having the bus-station platform level with the bus floor is one way to reduce boarding and alighting times per passenger. Reducing or eliminating the vehicle-to-platform gap is also key to customer safety and comfort. Additionally, a multiple door configuration on the buses allows shorter dwell times with quicker boarding and alighting of vehicles.
- **Station/Stop Amenities** – Major stations, transfer locations, and all stops to the extent possible, should have amenities such as shelters, adequate waiting areas, lighting, bike parking, and system information to provide passenger comfort and convenience.
- **Vehicle Comfort and Branding** – Buses should provide passenger comfort, efficient boarding, and amenities, and should be branded so that the BRT vehicles are recognizable to system users.

Longmont's goals for SH 119 BRT development should include optimizing the design to provide the characteristics associated with a high-quality BRT corridor. Additionally, Longmont's interests in the BRT design include:

- **Accessibility** – The BRT alignment should be selected to provide service to existing and planned transit supportive land uses.
- **Transit Oriented Development** – The investment in the BRT corridor and stations should be conducive to desired economic development in the larger corridor, particularly focused transit oriented development opportunities around transit stations.
- **Adaptability** – The BRT should be designed with an eye toward adaptability of BRT investments to the future Northwest Rail system in the SH 119 corridor.
- **Local Connections** – Convenient multimodal connections should be provided to BRT stations and stops, including local bus route, automobile, bicycle and pedestrian connections.

# II. CONNECTION FROM THE SOUTH

## *A. Existing and Future Conditions*

Weekday peak period traffic counts were obtained from the City's count data reflecting data for 2014 or 2015 at the following intersections:

- SH 119/Hover Street
- Ken Pratt Boulevard/Nelson Road
- Ken Pratt Boulevard/Bowen Street
- Ken Pratt Boulevard/South Pratt Parkway
- Ken Pratt Boulevard/Main Street
- 1st Avenue/Main Street
- Ken Pratt Boulevard/Sunset Street
- 3rd Avenue/Main Street

**Figure 2** shows AM and PM peak hour turning movement counts at these intersections. The figure also shows the existing lane configurations at these intersections. Ken Pratt Boulevard is a four lane roadway through Longmont with the exception of the segment between South Pratt Parkway and Main Street which has recently been widened to six lanes, accommodating three through lanes in each direction on Ken Pratt Boulevard approaching Main Street.

Traffic forecasts for the year 2040 were developed at these same intersections using the travel forecasts developed recently as part of the Envision Longmont transportation planning process and intersection turning movement techniques commonly used in the region and documented in National Cooperative Highway Research Program Publication 765. **Figure 3** shows forecasted 2040 peak hour turning movements at the eight study intersections.

Level of Service (LOS) is a commonly used measure of congestion levels at intersections and other transportation facilities. LOS is measured on a scale from A to F, with A representing free-flow conditions with no congestion and F representing traffic exceeding the intersection's design capacity and very high levels of congestion and delay. LOS D or better is typically considered a target for urban intersections during peak hours.

**Table 1** shows the AM and PM peak hour LOS and average delay at Ken Pratt Boulevard intersections for vehicles under different scenarios. The first set of results shows the 2015 LOS on the six signalized intersections on Ken Pratt Boulevard between Hover Street and Main Street. All intersections are currently operating at LOS D or better, with LOS D found during one or both peak hours at Hover Street, Bowen Street, and Main Street.

Future scenario analysis results provided in **Table 1** are discussed in the next section of the report.

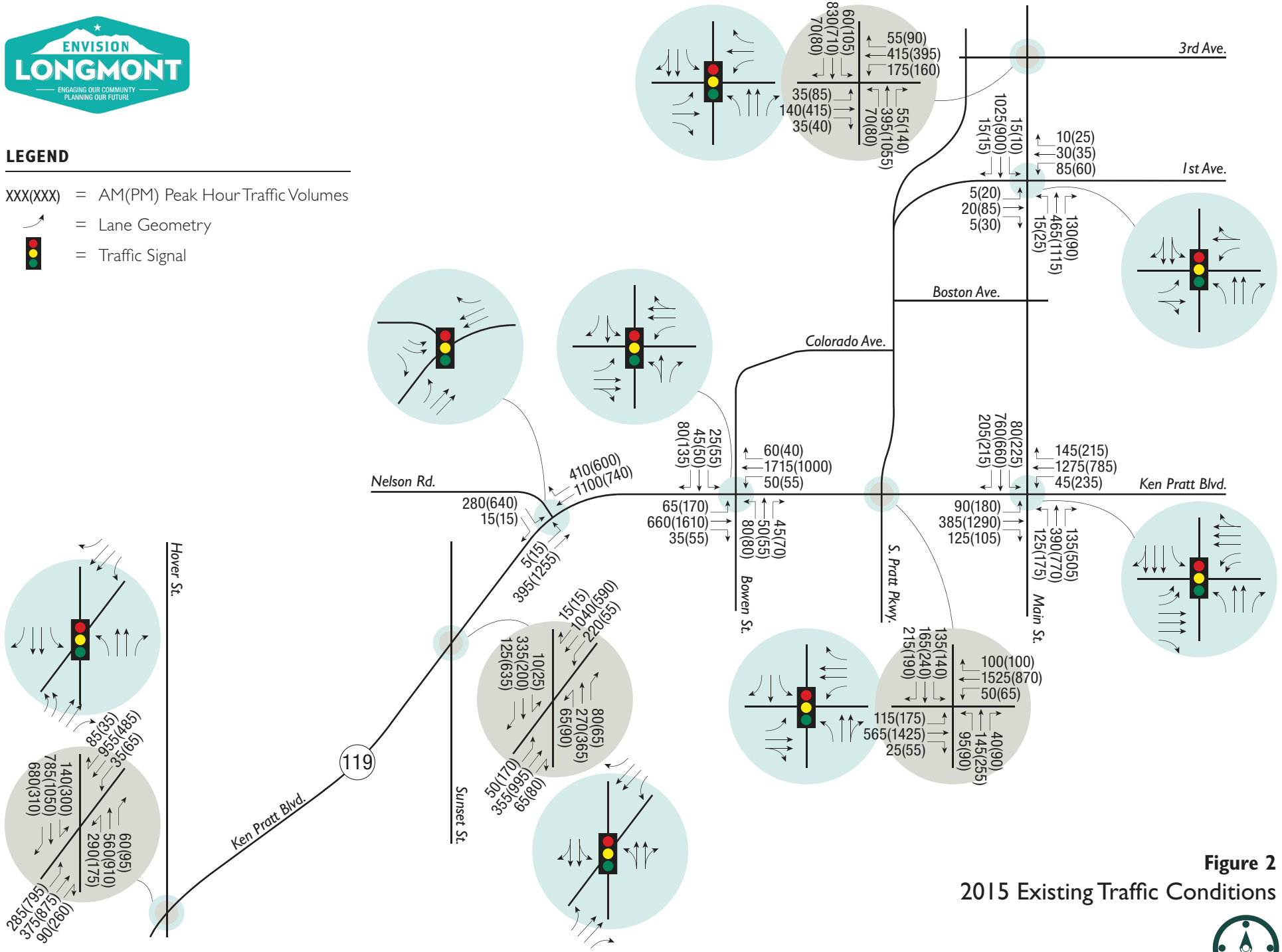



**Figure 2**
2015 Existing Traffic Conditions

ENVISION LONGMONT
ENGAGING OUR COMMUNITY PLANNING OUR FUTURE

## LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

= Lane Geometry

= Traffic Signal

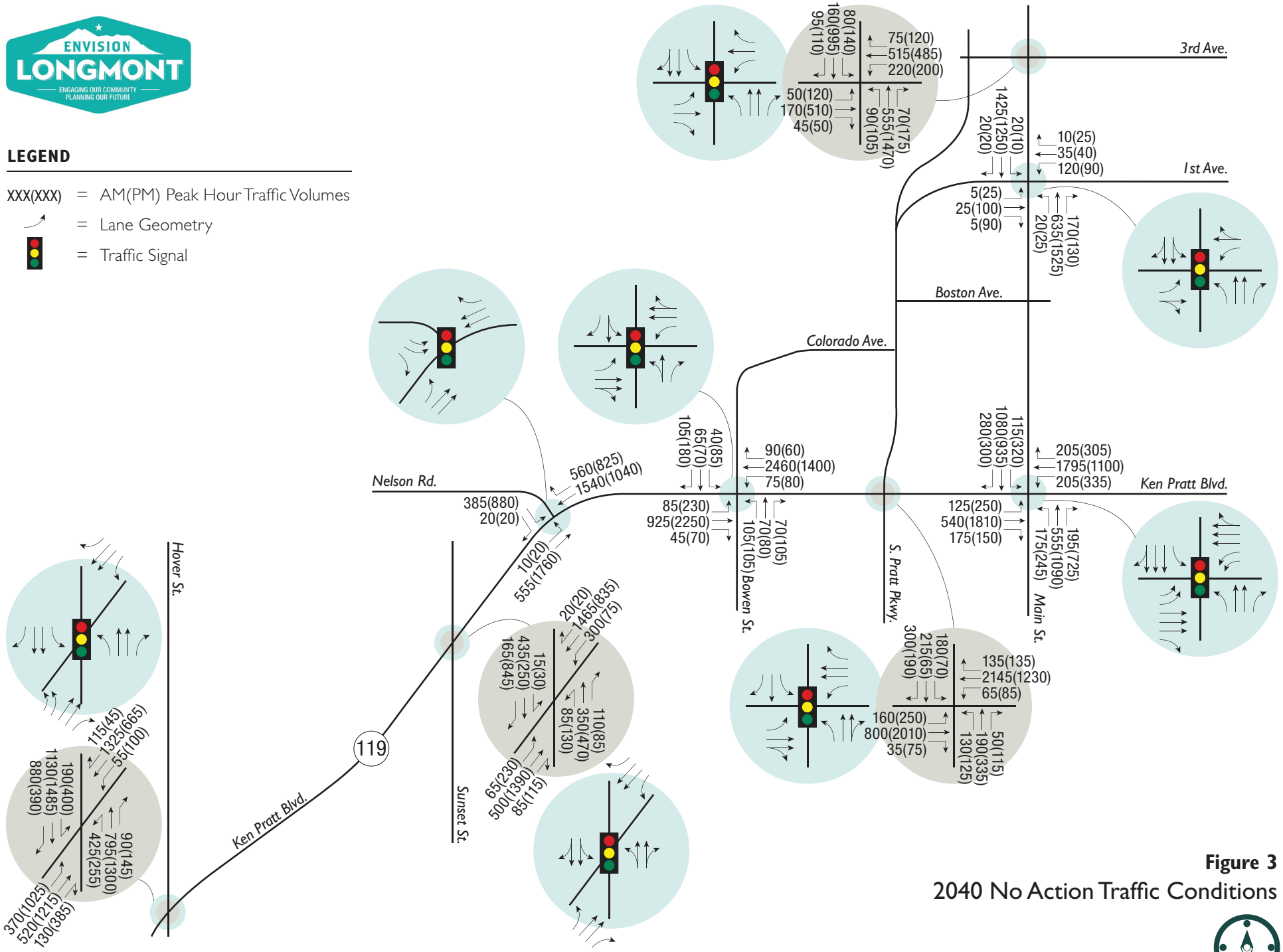



**Figure 3**
2040 No Action Traffic Conditions

**Table 1. Intersection Operations Comparison**

| Intersection with Ken Pratt Boulevard | Peak Hour Level of Service (Average Delay in Seconds) | | | | | |
|---|---|---|---|---|---|---|
| | 2015 | | 2040 | | | |
| | No Action | | 4 Through Lanes 2 Bus/Right-turn Lanes (Fig. 4 Option A) | | 6 Through Lanes (Fig 4 Option B Buses in Mixed Traffic or Option C with 7th/8th lanes for buses) | |
| | AM | PM | AM | PM | AM | PM |
| Hover Street | D (41) | D (48) | F (137) [1] | F (156) [1] | F (113)[1] | F (134)[1] |
| Sunset Street | C (24) | C (26) | C (26) | D (48) | C (22) | D (42) |
| Nelson Street | A (8) | B (18) | B (12) | C (21) | A (9) | B (19) |
| Bowen Street | C (26) | D (38) | E (62) | D (48) | A (9) | B (18) |
| Pratt Parkway | C (25) | C (23) | E (65) | C (30) | C (25) | C (27) |
| Main Street | C (21) | D (49) | D (54)[2] | F (90) [2] | D (47) | F (90) |
| [1]Hover Street intersection operations with the planned improvement of eastbound triple left-turn lanes, three northbound through lanes, and a 2nd northbound and southbound left-turn lane on Hover Street | | | F (128) | F (124) | F (97) | E (77) |
| [2] Assumes existing 6 through lanes on Main Street | | | | | | |

### *B. Lane Configuration Alternatives*

**Figure 4** shows three different methods of incorporating BRT on Ken Pratt Boulevard:

- **Option A – 4 Through Lanes and 2 Bus Lanes** – Complete the widening of Ken Pratt Boulevard to six through lanes between Nelson Road and Main Street. Convert existing auxiliary lanes to BRT/turn lanes between Hover Street and Nelson Road. The outside (3rd) lanes in each direction would be assigned to buses and vehicles making right-turns at the upcoming intersection.

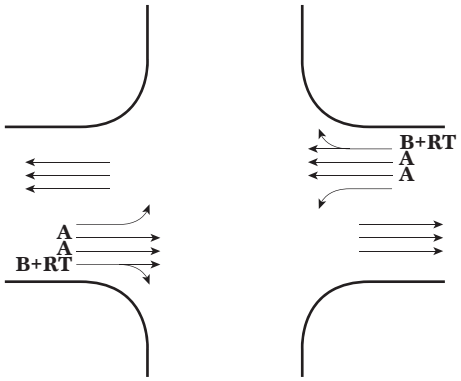
  With BRT using the right-hand lane, eastbound buses would have difficulty weaving across traffic to make left turns onto the path to the north, at Sunset Street, Nelson Street, South Pratt Parkway, or Main Street for each respective alignment alternative. The bottom diagram under Option A on **Figure 4** illustrates a bus priority signal to allow buses to merge into the left-hand through lane at the intersection prior to the intersection where buses would make left turns.

- **Option B – Buses in Mixed Traffic** – Complete the widening of Ken Pratt Boulevard to six through lanes. In this scenario buses would not have dedicated lanes but would use the outside (3rd) through lanes mixing with general traffic. With buses in mixed traffic, they would be subject to Ken Pratt Boulevard congestion and delays, so this option would not provide buses with a significant travel time advantage with a bus priority (preemption) for all traffic.
- **Option C – 6 General Traffic Lanes and Buses/Right-Turns in Outside Lanes** – Complete the widening of Ken Pratt Boulevard to six through lanes and add a 4th lane in each direction at major intersections. Two potential methods to allow buses in the 4th lane to pass the intersection and merge into the through (3rd) lane are shown on **Figure 4**: The lane dedicated to buses could be provided with a special signal ahead of general traffic allowing them to merge into the 3rd lane beyond the intersection (shown in brown dashed) or a 4th receiving lane could be provided allowing buses to cross the intersection then merge into the 3rd lane past the intersection (shown in blue dashed).

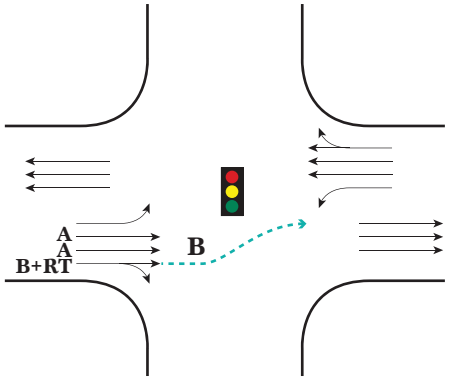
  Right-turning vehicles could share the outside lanes with buses if right-turning volume is low or an additional right-turn lane could be provided outside the BRT if warranted by high right-turning volume. At the intersection where eastbound buses would turn left from Ken Pratt Boulevard, a signal to allow merging at the prior intersection would be provided similar to Option A.

## A 4 THROUGH LANES 2 BUS LANES

Buses/Right-Turns Only in Outside Lanes



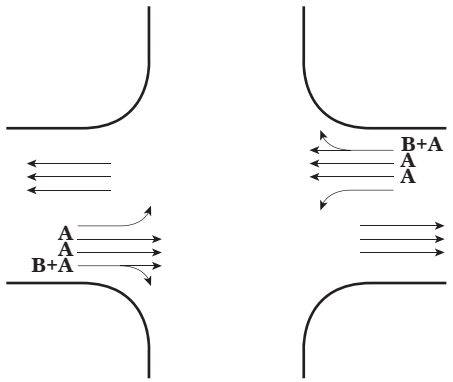

**Typical Ken Pratt Intersection**




**Priority Signal to Allow Buses to Merge Left at Intersection Prior to Left Turn**

## B 6 THROUGH LANES

Buses in Mixed Traffic



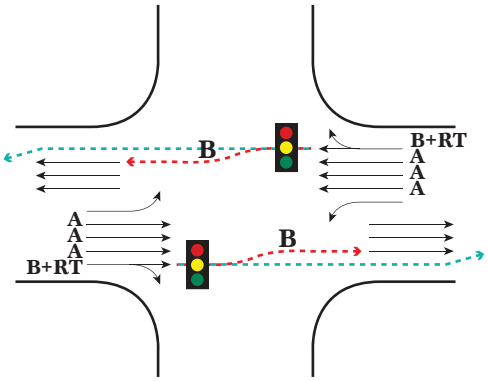

**Typical Ken Pratt Intersection**

**LEGEND**

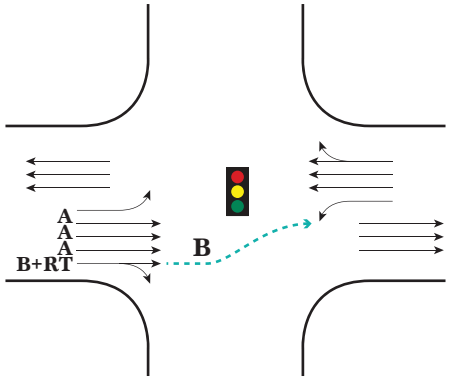
- **A** = Auto, General Lane
- **B** = Bus
- **RT** = Right Turn
- = Special Signal Phase

## C 6 GENERAL TRAFFIC LANES

Buses/Right-Turns Only in Lanes 7 & 8




**Typical Ken Pratt Intersection**




**Priority Signal to Allow Buses to Merge Left at Intersection Prior to Left Turn**

**Figure 4**

BRT Lane Configurations

### *C. Traffic Operational Analysis*

The second set of intersection operation results shown on **Table 1** represents projected 2040 LOS with Option A and the third set represents operations results with Options B or C.

Traffic delays would be greatest with four through lanes and outside lanes dedicated to buses and right turns only (Option A). LOS F is projected at Hover Street in the AM and PM peak hours and at Main Street in the PM peak hour and LOS E is projected in the morning peaks at the Bowen Street and South Pratt Parkway intersections.

Six through lanes would be available for general traffic with either Option B or Option C, so LOS results shown on the right hand columns of **Table 1** generally apply to either of these options. Compared with Option A, operations would be improved and delays would be reduced at all Ken Pratt Boulevard intersections, but LOS F is still projected at the Hover Street intersection in the AM and PM peak hours and at Main Street in the PM peak hour. Other intersections are all projected to operate at LOS D or better with this six general traffic lane configuration.

Hover Street/Ken Pratt Boulevard intersection operations could be improved with additional turn lanes as indicated at the bottom of **Table 1** but LOS F conditions are still projected for 2040 peak hours.

### *D. Lane Configuration Alternatives Assessment*

Following is a summary of the comparative assessment of lane configuration alternatives A, B, and C.

**Option A – Buses/Right-Turns Only in Outside Lanes** – This configuration would provide buses with dedicated lanes on Ken Pratt Boulevard and would provide the opportunity for an efficient and reliable BRT corridor. Bus priority signals such as special signal phases to allow buses to merge to the left at intersections prior to where eastbound buses would turn to the north and additional right-turn lanes outside the BRT lanes where warranted by turning volumes could be designed to optimize BRT operations with this option.

**Option B – Buses in Mixed Traffic** – With buses operating in mixed traffic in a high traffic congested corridor, this would not be a viable BRT option for the entire Ken Pratt Boulevard corridor. However, this configuration could be considered at a specific location as a temporary or longer term measure if traffic congestion were to reach an intolerable level at one or more intersections with Option A.

**Option C – 6 General Traffic Lanes and Buses/Right-Turns in Outside Lanes** – Option C is another alternative if Option A is implemented and traffic congestion reached an intolerable level at one or more intersections. The third lane at a selected location could be opened to general traffic and a fourth eastbound or westbound lane could be constructed to accommodate buses and right turns, implementing Option C on part of the corridor. Implementation of Option C should carefully consider the effect on pedestrian crossing distances.

### *E. Alignment Alternatives*

**Figure 5** shows the four SH 119 BRT alignment alternatives evaluated from the south entry to Longmont to the 1st & Main Station. The BRT would accommodate the service currently provided by the BOLT and J bus routes as well as any other express and local bus routes that could be routed to use part of the BRT facility. It is estimated that approximately four to six buses per hour in each direction would use the SH 119 BRT during peak periods.

The four alignment options evaluated include:

**Main Street** – This alignment would follow Ken Pratt Boulevard from the southwest entry into Longmont to Main Street and follow Main Street to the 1st & Main Station.

**Pratt Parkway** – This alignment would follow Ken Pratt Boulevard to South Pratt Parkway and use either Boston Avenue or 1st Avenue to reach the 1st & Main Station.

**Price Road** – The Price Road alignment would depart from Ken Pratt Boulevard at Nelson Road and jog onto Price Road. Because Price Road currently terminates as a street with only a trail connection across St. Vrain Creek, a new BRT bridge would be required over the creek. At the Price Road/Boston Avenue intersection, this alignment would have two options. The first option would use the planned Boston Avenue railroad crossing and extension to reach the 1st & Main Station via Boston Avenue and Coffman Street. The second option would use the existing Price Road to Pratt Street and then use a new east-west connection between 1st Avenue and 2nd Avenue to reach an interim 1st & Main Station location north of 1st Avenue and the railroad. The advantage of this second option and interim station location is that the entire BRT alignment would remain west/north of the railroad with no crossing necessary.

**Sunset Street** – This alignment would depart from Ken Pratt Boulevard at Sunset Street and use Sunset Street and Boston Avenue to reach the Price Road/Boston Avenue intersection. From that point to the east, the Sunset Street alignment would have the same two options to reach the 1st & Main Station as Price Road, again with the north station entry option providing the advantage of eliminating railroad crossings.

**Figure 5** also provides a preliminary representation of where BRT stops would be provided for each alignment. The precise stop locations would be determined in the more detailed BRT environmental assessment and design study, but preliminary stop locations were needed to allow a comparative evaluation of the four alignment alternatives. Three stops were assumed (not including 1st & Main) for each alignment to provide consistency for travel time comparisons.

### *F. Bus Travel Time Comparison*

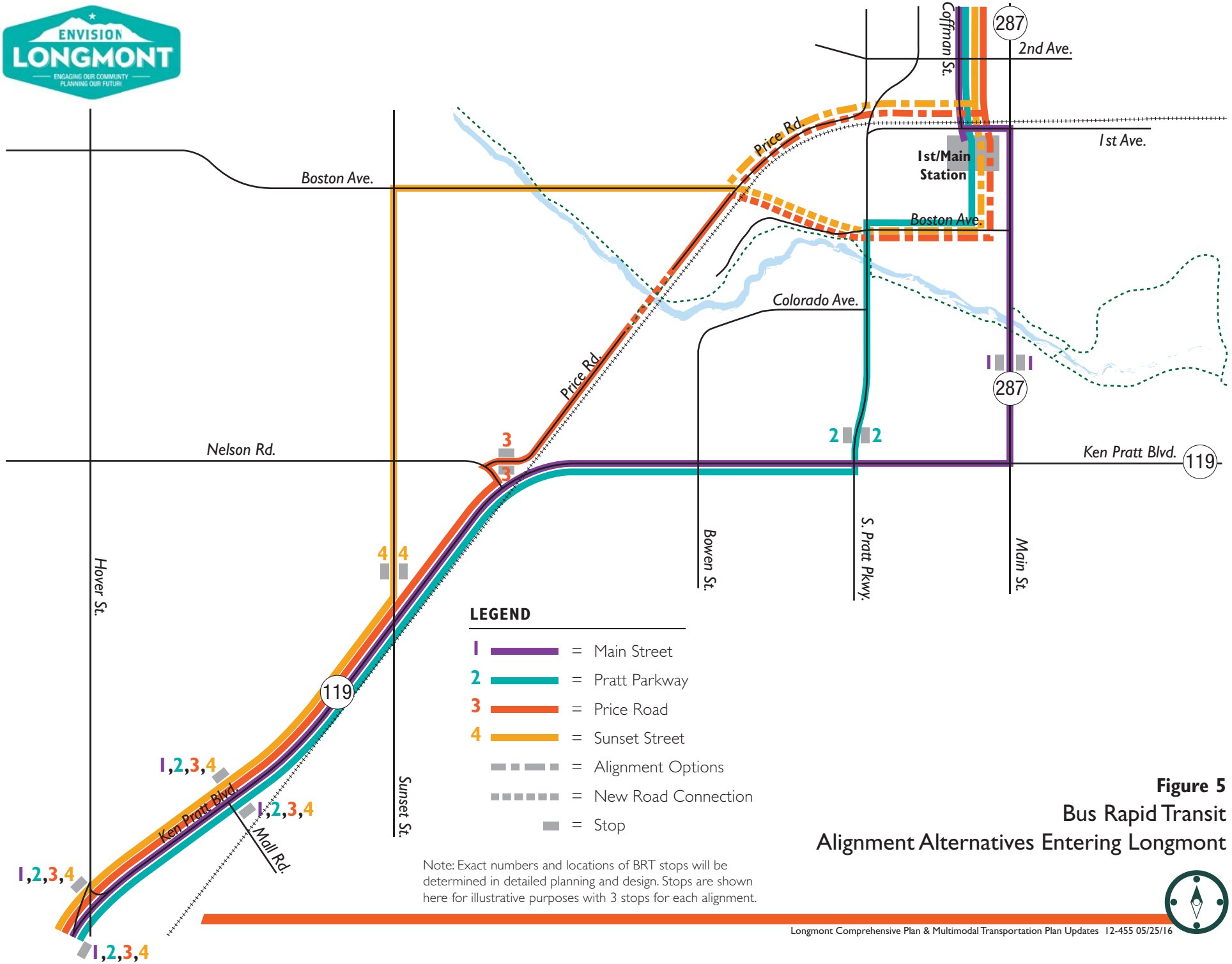
**Table 2** provides a comparison of the estimated bus travel times from the Ken Pratt Boulevard/ Hover Street intersection to the 1st & Main Station with the four alignment alternatives. The comparison uses several assumptions intended to provide a reasonable travel time comparison among alignment alternatives:

- Buses in dedicated bus/right-turn lanes
- Bus running speed at posted speed limit
- Stop locations as shown on **Figure 5**
- 45 second pick-up/drop-off and acceleration/deceleration time at each station/stop
- Calculated estimate of peak period bus delay time at Ken Pratt Boulevard signalized intersections analyzed
- 12 second bus delay at other signalized intersections

The calculations use the southern of the two 1st & Main Station location and access options for the Price Road and Sunset Street alignments discussed earlier, but a comparison of the two options shows similar travel distances and time for either of the two options.

**Table 2** comparisons show that:

- Distances are similar for the four alignments, between 2.1 and 2.5 miles.
- Estimated travel times range from 7.4 minutes to 9.1 minutes.
- The Main Street alignment has the highest estimated travel time (9.1 minutes), and its travel time is most unpredictable due to traffic conditions along Main Street, including the effect of potential railroad crossing backups.
- Price Road has the lowest estimated travel time (7.4 minutes) due to its more direct route and reduced intersection delay compared with other alternatives.
- The Sunset Street or the Price Road alignments with the option that remains west and north of the railroad would have improved travel time reliability by eliminating the at-grade railroad crossings present with other alignments and options.




Note: Exact numbers and locations of BRT stops will be determined in detailed planning and design. Stops are shown here for illustrative purposes with 3 stops for each alignment.

**Figure 5**
Bus Rapid Transit
Alignment Alternatives Entering Longmont

**Table 2. Estimated Bus Travel Time – Hover/Ken Pratt to 1st/Main**

| Street Segment | Length (Miles) | Bus Running Speed (MPH) | Running Time (Minutes) | Bus Stops (Use 45 Sec/Stop) | Traffic Signal Delay | | Total Travel Time |
|---|---|---|---|---|---|---|---|
| | | | | | Intersection | Delay (Min) | |
| **Alternative 1 – Main Street** | | | | | | | |
| Ken Pratt | 1.8 | 45 | 2.4 | 3 Stops | Ken Pratt/Hover | 0.4 | |
| Main | 0.5 | 35 | 0.9 | | Ken Pratt/Mall | 0.2 | |
| 1st Avenue | 0.1 | 30 | 0.1 | | Ken Pratt/Sunset | 0.2 | |
| | | | | | Ken Pratt/Nelson | 0.3 | |
| | | | | | Ken Pratt/Bowen | 1.0 | |
| | | | | | Ken Pratt/Pratt | 0.3 | |
| | | | | | Main/Ken Pratt | 0.5 | |
| | | | | | Main/Boston | 0.5 | |
| **Total** | **2.4** | | **3.4** | **2.3** | | **3.4** | **9.1** |
| **Alternative 2 – Pratt Parkway** | | | | | | | |
| Ken Pratt | 1.6 | 45 | 2.1 | 3 Stops | Ken Pratt/Hover | 0.4 | |
| Platt Parkway | 0.5 | 35 | 0.9 | | Ken Pratt/Mall | 0.2 | |
| 1st Avenue | 0.2 | 30 | 0.3 | | Ken Pratt/Sunset | 0.2 | |
| | | | | | Ken Pratt/Nelson | 0.3 | |
| | | | | | Ken Pratt/Bowen | 1.0 | |
| | | | | | Ken Pratt/Pratt | 0.4 | |
| | | | | | Pratt/Boston | 0.2 | |
| **Total** | **2.3** | | **3.3** | **2.3** | | **2.7** | **8.3** |
| **Alternative 3 – Price Road** | | | | | | | |
| Ken Pratt | 1.0 | 45 | 1.3 | 3 Stops | Ken Pratt/Hover | 0.4 | |
| Price | 0.8 | 35 | 1.4 | | Ken Pratt/Mall | 0.2 | |
| Boston | 0.4 | 35 | 0.6 | | Ken Pratt/Sunset | 0.2 | |
| Coffman | 0.2 | 30 | 0.4 | | Ken Pratt/Nelson | 0.5 | |
| | | | | | Price/Boston | 0.2 | |
| | | | | | Pratt/Boston | 0.2 | |
| **Total** | **2.1** | | **3.4** | **2.3** | | **1.7** | **7.4** |
| **Alternative 4 – Sunset Street** | | | | | | | |
| Ken Pratt | 0.7 | 45 | 0.9 | 3 Stops | Ken Pratt/Hover | 0.4 | |
| Sunset | 0.7 | 35 | 1.2 | | Ken Pratt/Mall | 0.2 | |
| Boston | 1.0 | 35 | 1.6 | | Ken Pratt/Sunset | 0.2 | |
| Coffman | 0.2 | 30 | 0.4 | | Sunset/Nelson | 0.2 | |
| | | | | | Sunset/Boston | 0.2 | |
| | | | | | Price/Boston | 0..2 | |
| | | | | | Pratt/Boston | 0.2 | |
| **Total** | **2.5** | | **4.1** | **2.3** | | **1.6** | **8.0** |

### *G. Alignment Alternatives Assessment*

The four alignment alternatives were evaluated comparatively based on four criteria:

- **Transit Accessibility** – How well the alignment serves existing and potential future land that would benefit most by enhanced transit access. Emphasis on transit oriented development (TOD) with convenient walk and bicycle access to transit. This criterion may not be weighted as heavily as the following three criteria because the 1st & Main Station that is common to all alternatives is planned to be the primary TOD site for the BRT and future commuter rail.
- **Bus Travel Time** – The comparative estimated bus travel time based on the comparisons provided on **Table 2,** along with at-grade railroad crossings and other factors that could affect travel time and reliability. Reduced bus travel time entering and exiting Longmont from the south will encourage ridership to and from the 1st & Main Station and stops and stations along the Coffman Street/Main Street corridor north of 1st/Main.
- **Effect on General Traffic** – A measure of the effect that a dedicated BRT would have on general traffic congestions, primarily seen on Ken Pratt Boulevard and Main Street.
- **Construction Costs and Impacts** – Cost of new roadway connections that would be required to complete the BRT alignments would add cost and potential impacts.

**Table 3** summarizes key points and relative ratings of each alignment for each of these criteria, showing big pluses, small pluses, small negative, and big negative scores.

The **Main Street alignment** would provide the best transit access by serving both the Ken Pratt Boulevard corridor to Main Street and the Main Street corridor. However, major negatives are the bus delays due to the BRT operating on high traffic portions of both Ken Pratt Boulevard and Main Street and the lack of travel time reliability due its railroad crossing on Ken Pratt Boulevard and its proximity to the Main Street railroad crossing. Additionally, the inclusion of BRT on Ken Pratt Boulevard would limit the ability to provide needed general purpose capacity improvements.

The **South Pratt Parkway alignment** would avoid the bus delays and traffic effects on Main Street, but it would be subject to traffic effects through several Ken Pratt Boulevard intersections. It would also limit the ability to provide needed general purpose capacity improvements on Ken Pratt Boulevard for most of its length west of Main Street.

The **Price Road alignment** rates the best of the alternatives for bus travel distance and time. It also rates well for effects on traffic because it avoids Main Street and much of the Ken Pratt Boulevard corridor. Also its northern 1st & Main Station access option would avoid railroad crossings. Its primary disadvantage is that it requires the most additional street construction of all alignments, requiring extension of Price Road over St. Vrain Creek, likely reconfiguration of the Price Road/Nelson Street intersection area and completion of the planned Boston Street connection across the BNSF railroad or a new access street into an interim northern station location.

The **Sunset Street alignment** path is the longest of all alternatives, but it would avoid most of the congested roadways in the area. Like the Price Road alignment, its northern 1st & Main Station access option would avoid railroad crossings.

**Alignment Evaluation Summary** – Based on this initial comparison of alternative alignments, the Sunset Street alignment appears to be a promising alignment. It offers a competitive travel time for buses with good reliability because it avoids railroad crossings and the most congested part of Ken Pratt Boulevard as well as easier NB left turns and SB right turns for buses. With the north station location, this alternative requires a new street connecting from Price Road to the station, but it saves capital costs compared with alignment alternatives that require more widening of Ken Pratt Boulevard. Additionally, by departing from Ken Pratt Boulevard the soonest, it would cause the least effect on Ken Pratt Parkway general traffic.

Both the Price Road and Pratt Parkway alternatives offer some advantages, with the Price Road alignment providing the best bus travel time and the Pratt Parkway alignment offering an opportunity for a BRT stop in the commercial part of the Ken Pratt Parkway corridor. These two alternatives should be further evaluated along with the Sunset Street alignment during the more detailed RTD study. It should be noted that both Ken Pratt Boulevard and Main Street would still be served by non-BRT bus service.

**Table 3. Alignment Alternatives Entering Longmont**

| Alignment | Transit Accessibility | | Bus Travel Time | | Effect on General Traffic | | Construction Cost and Impacts | |
|---|---|---|---|---|---|---|---|---|
| Main Street | + | Best access for commercial parts of Ken Pratt and Main | - | Buses subject to Main S congestion, RR crossing back-ups | - | BRT impacts the most Ken Pratt intersections including Main Street | + | Uses existing streets |
| South Pratt Parkway | + | Access to much of Ken Pratt commercial | + | Relatively direct route Avoids Main St congestion | - | BRT impacts several Ken Pratt intersections No impact to Main Street | + | Uses existing streets |
| Price Road | - | Misses most of Ken Pratt commercial | + | Added movements at Nelson (-) Avoids Main St & Ken Pratt congestion and railroad crossing on Ken Pratt (+) | + | BRT impacts less Ken Pratt intersections New Price Rd crossing improves local circulation | - | Requires new St. Vrain bridge and Nelson intersection improvements Adds buses to minor streets |
| Sunset Street | - | Least access to Ken Pratt commercial | + | Moderately direct route Avoids Main Street and Ken Pratt congestion and railroad crossing on Ken Pratt (+) | + | BRT impacts fewest Ken Pratt intersection | + | One option relies on planned Boston RR crossing |

### *H. Park-n-Ride Locations*

Potential park-n-ride locations, sizes and configurations will be explored in the upcoming RTD SH 119 BRT planning, environmental, and design study. A southwest Longmont park-n-ride is recommended to be established in the general 2-mile segment of the Ken Pratt Boulevard/ SH 119 corridor between Airport Road and Mall Road, focusing on locations in the median of or adjacent to Ken Pratt Boulevard/SH 119. Following are some key considerations for this park-n-ride:

- **Multimodal Accessibility** – A park-n-ride location should be selected to provide a convenient location for west Longmont residents to access by auto, bike, or local bus to access the BRT to travel quickly to Boulder and surrounding communities.
- **TOD Potential** – An Envision Longmont planning goal is to locate and plan stations to fulfill the TOD potential of the BRT. A station in the vicinity of Hover Street would have high potential for TOD in the immediate vicinity and adjacent access for a future rail station. The park-n-ride could be incorporated with a Hover Street area station/TOD area, or a park-n-ride location near Airport Road could be established as an automobile oriented station with a Hover Street area station as a distinct more pedestrian/bicycle oriented TOD area. Considerations for assessing TOD potential include consistency with Envision Longmont land use plans and multimodal accessibility.
- **Land Availability** – The park-n-ride can be established using currently vacant space such as land in the Ken Pratt Boulevard median or re-use/shared parking arrangement with existing land uses in the area, some of which may currently have excess parking based on current parking ratio requirements.

  **Commuter Rail Adaptability** – The park-n-ride location should be adaptable for use not only for the BRT in the short term but also for the long-range Northwest Rail corridor.

## III. MAIN STREET CORRIDOR OPTIONS

Two options have been identified to carry the BRT between the 1st & Main Station and the northern 9th Avenue/Main Street: Main Street or Coffman Street, which is one block west of Main Street. Because Coffman does not continue north of 11th Avenue, Main Street is the only option that is being considered for the BRT from 11th Avenue to the north. For the Coffman Street alternative, the BRT connection to Main Street could occur at either 9th Avenue or 11th Avenue where the street terminates at a cemetery.

Main Street is a four-lane regional arterial that is also US 287. It currently carries between 26,000 and 30,000 vehicles per day between 1st and 9th Avenues. This corridor is the heart of downtown Longmont, and widening or removing existing on-street parking is not viewed as being a viable option, nor is converting existing traffic lanes for BRT use. Therefore, the BRT option on Main Street would consist of buses operating in mixed traffic and stopping either in the 2nd northbound or southbound lane or in bus stops created in the parking lanes.

Coffman Street is a two-lane collector street carrying between 6,000 and 7,000 vehicles per day between 1st and 9th Avenues. The existing right-of-way and lane configurations on Coffman Street differ on different subsegments between 1st and 9th Avenues. **Figure 6** shows three typical cross sections in the southern, middle, and northern segments of the street. The figure also shows potential cross sections if the BRT corridor were to be introduced. Coffman's traffic levels are moderate enough that buses could stop outside the through traffic lanes and generally be able to merge back into traffic without major delays. However, in the detailed BRT design process, it is possible that some special signal preemption for buses could be considered at selected locations to facilitate bus merges into traffic. There is currently a bus stop on the west side of Coffman Street south of 8th Avenue adjacent to Roosevelt Park. With a BRT on Coffman Street, a stop would be developed on the east side of the street to serve northbound buses, possible by replacing on-street parking spaces with a bus stop in the segment of Coffman Street between the offset east and west legs of 8th Avenue.

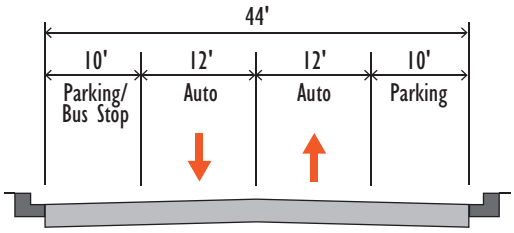
Similar criteria were used to compare the Main Street versus Coffman Street alignments as were presented for the southern BRT alignment alternatives. **Table 4** provides the results of this comparison.

The primary advantage of the Main Street option is that it would provide direct transit accessibility to the busy Main Street commercial corridor. While the Coffman Street alternative would add a one-block walk distance between bus stops and Main Street, it would also provide immediate access to the commercial, office and recreational development along Coffman Street including Roosevelt Park.

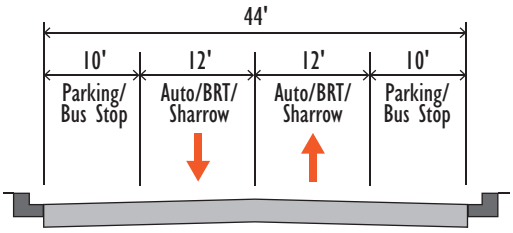
Because both alternatives would generally use existing infrastructure, construction cost differential is not a major factor in selection.

The Coffman Street option would perform considerably better than the Main Street option relative to a combination of bus travel time and effect on general traffic. On Main Street, bus stops in the outside travel lane would effectively block half of the northbound or southbound street capacity and would cause safety concerns due to automobiles changing lanes to avoid buses. If bus pullouts were used for stops, bus travel times would suffer from the need to merge back into travel lanes. Buses on Coffman Street would have significantly better travel times and would not create a major impact on traffic due to Coffman Street's moderate traffic volumes.

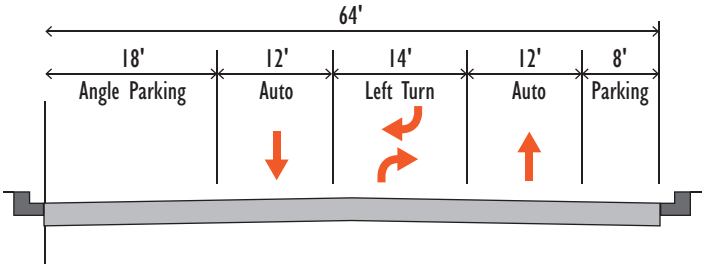
## EXISTING TYPICAL SECTION

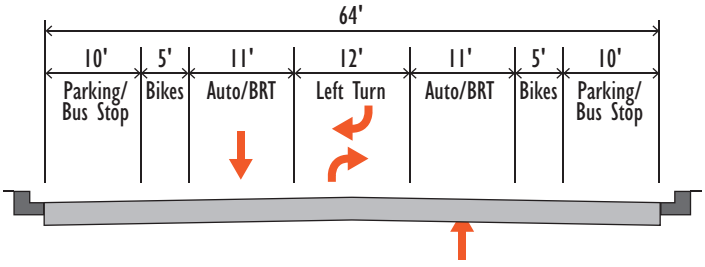



## TYPICAL SECTION with BRT

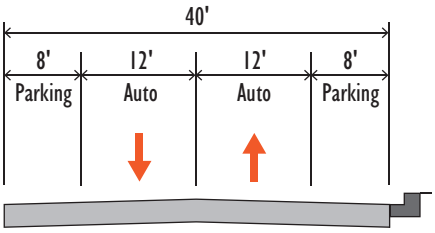


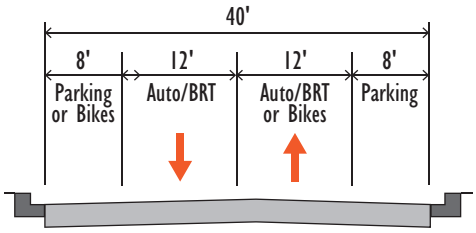

**Coffman Street: Longs Peak Avenue to 8th Avenue (North Half of Block)**




**Coffman Street: 3rd Avenue to 6th Avenue**




**Coffman Street: 1st Avenue to 2nd Avenue**

*NOTE: All typical sections looking north*

**Figure 6**

Coffman Street BRT Cross Section Alternatives

**Table 4. Alignment Alternatives 1st Avenue to 9th Avenue**

| Alignment | Transit Accessibility | | Bus Travel Time | | Effect on General Traffic | | Construction Cost and Impacts | |
|---|---|---|---|---|---|---|---|---|
| Main Street | + | Direct access for Main Street commercial | - | Buses subject to Main Street congestion Delays if buses pull out at stops | - | Major impacts to traffic if buses stop in travel lane | + | Low to moderate costs |
| Coffman Street | + | One block walk to Main Street commercial Direct access to Coffman Street commercial and Roosevelt Park | + | Coffman Street traffic is relatively uncongested Reduced delay if buses pull out at stops | + | Reduced impact if buses stop in travel lane | + | Low to moderate costs |

# IV. SUMMARY OF CONCLUSIONS

**Purpose of the Study** – A planning, environmental assessment and preliminary design study for the SH 119 BRT corridor, to be led by RTD in coordination with corridor cities and counties, will be initiated in 2016. The purpose of this study is to help shape Longmont's policies and desires for the SH 119 BRT in advance of the larger regional study.

**Longmont Goals for BRT** – Longmont's goals for SH 119 BRT development should include optimizing the design to provide the characteristics associated with a high-quality, high-speed and reliable BRT service. Additionally, Longmont's interests in the BRT design include:

- **Accessibility** – The BRT alignment should be selected to provide service to existing and planned transit supportive land uses.
- **Transit Oriented Development** – The investment in the BRT corridor and stations should be conducive to TOD opportunities around transit stations.
- **Adaptability** – The BRT should be designed with an eye toward its adaptability to the future Northwest Rail system in the SH 119 corridor.

**Alignment Entering Longmont** – Based on this initial comparison of alternative alignments, the Sunset Street alignment appears to be a promising alignment. It offers a competitive travel time for buses with good reliability because it avoids railroad crossings and the most congested part of Ken Pratt Boulevard and provides easier NB left turns and SB right turns for buses. With the north station location, this alternative requires a new street connecting from Price Road to the station, but it saves capital costs compared with alignment alternatives that require more widening of Ken Pratt Boulevard. Additionally, by departing from Ken Pratt Boulevard the soonest, it would cause the least effect on Ken Pratt Parkway general traffic.

Both the Price Road and Pratt Parkway alternatives offer some advantages, with the Price Road alignment providing the best bus travel time and the Pratt Parkway alignment offering an opportunity for a BRT stop in the commercial part of the Ken Pratt Parkway corridor. These two alternatives should be further evaluated, along with the Sunset Street alignment, during the more detailed RTD study.

**Ken Pratt Boulevard Lane Configuration** – Three lane configurations for Ken Pratt Boulevard were evaluated. Option A, with Buses/Right-Turns Only in Outside Lanes is the preferred option for initial BRT implementation. It would provide the opportunity for an efficient and reliable BRT corridor. Treatments such as signal priority for buses merging left at intersections prior to left-turns to the north and additional right-turn lanes outside the BRT lanes where warranted by turning volumes could be designed to optimize BRT operations with this option. If Option A is implemented and traffic congestion were to reach an intolerable level at one or more intersections, two options could be considered:

- Option B – The third lane at a selected location could be opened to general traffic with the BRT sharing the lane with general traffic.
- Option C – A fourth eastbound or westbound lane could be constructed to accommodate buses and right turns, implementing Option C on part of the corridor; however, overall costs to the community, both fiscally and physically, would need to be carefully evaluated if this option is considered.

**Alignments 1st Avenue to 9th or 11th Avenue** – The Coffman Street option is preferred for the BRT corridor segment north of the 1st & Main Station, with the BRT connect to Main Street at 9th Avenue or 11th Avenue. This would perform considerably better than the Main Street option relative to a combination of bus travel time and effect on general traffic. Buses on Coffman Street would have significantly better travel times and would not create a major impact on traffic due to Coffman Street's moderate traffic volumes.

**Park-n-Ride Locations** – Potential park-n-ride locations, sizes, and configurations will be explored in the upcoming RTD SH 119 BRT planning, environmental, and design study. A southwest Longmont park-n-ride is recommended to be established in the general 2-mile segment of the Ken Pratt Boulevard/SH 119 corridor between Airport Road and Mall Road, focusing on locations in the median of or adjacent to Ken Pratt Boulevard/SH 119. Key considerations for this park-n-ride include multimodal accessibility, TOD potential, land availability, and adaptability to the future Northwest Corridor commuter rail.