CITY OF BOULDER
TRANSPORTATION ADVISORY BOARD
AGENDA ITEM

MEETING DATE: May 9, 2016

AGENDA TITLE: Staff briefing and TAB input regarding the Transportation Master Plan Progress Update – Focus on Complete Streets

PRESENTERS: Michael Gardner-Sweeney, Director of Public Works for Transportation
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I. EXECUTIVE SUMMARY

The Transportation Master Plan (TMP) is the city's policy document establishing the goals, objectives and investment priorities for transportation. Since 1989, the TMP has reflected a consistent policy direction of accommodating increased person travel, managing the impacts of automobile travel, and developing a multimodal transportation system with the pedestrian as the primary mode. The TMP aligns with the community's broader goals expressed in the Boulder Valley Comprehensive Plan (BVCP) and the city's Sustainability Framework. The 2014 TMP includes an extensive analysis of transportation's role and needed contributions for Boulder's Climate Commitment. The measurable objectives of the 2014 TMP support accommodating the increase in person trips while reflecting the reductions needed to reduce the impacts of automobile traffic in support of the community's sustainability and resiliency goals. The 2014 TMP also included a detailed Action Plan to guide work efforts in implementing the plan.

This update to the Transportation Advisory Board (TAB) on May 9 and upcoming City Council Study Session on May 31 provides an opportunity to check in with TAB and council regarding the progress to-date on the TMP since council acceptance of the plan in August 2014. This is the third study session on implementation, including the activities occurring since the last study session on the TMP on Aug. 25, 2015.

Transportation Division staff is sharing updates regarding pedestrian-related projects, plans and programs, as well as status report on core services in the areas of operations, maintenance, capital projects.

Staff is seeking input and guidance from TAB and City Council on several key areas of the TMP Complete Streets work program for 2016-17, including updates on the Canyon Corridor study and the Living Lab Phase II Folsom Street pilot project, as well as a check-in on next steps for the city's Renewed Vision for Transit.

Additional highlights are provided as information items regarding the other TMP focus areas of Regional Travel, Transportation Demand Management (TDM), Funding, and Integration with Sustainability Initiatives.

Future transportation study sessions in 2016 will focus on progress reports on transportation funding (June), Renewed Vision for Transit (September), the multi-departmental Access Management and Parking Strategy (October), and TMP progress on Complete Streets, Transportation Demand Management (TDM), and Funding (December). Prior to each of these council study sessions, TAB will have an opportunity to review and share feedback with staff and council.

II. QUESTIONS FOR TAB

1. Does TAB have questions and feedback regarding the overall TMP implementation to-date? As well as suggestions for next steps?
2. Does TAB have questions and feedback regarding the Canyon Corridor study goals, objectives, evaluation measures, and conceptual design options?
3. Does TAB have questions and feedback regarding the Living Lab Phase II Folsom Street pilot project update?
    i. Does TAB have questions and feedback on the national cities research and input to guide preparations for the proposed practitioners' panel planned for fall 2016?
4. Does TAB have input to guide next steps on the elements of the city's Renewed Vision for Transit 2016 work program items?

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III. BACKGROUND

Transportation Master Plan (TMP)

The TMP is the city's policy document establishing the goals, objectives and investment priorities based on the Boulder community's vision for a multimodal transportation system. The first TMP was developed in 1989 by a citizen taskforce and reflected the community's concern with the increasing growth and impacts of automobile traffic. Over the years, the following TMP updates have reflected the consistent policy direction of accommodating increased person travel, managing the impacts of automobile travel, and developing a complete multimodal transportation system in support of the community's overall sustainability goals, as reflected in the Boulder Valley Comprehensive Plan and the recent Climate Commitment.

Boulder's 2014 TMP builds upon this strong multimodal policy foundation and spirit of continuous improvement. The TMP is organized in five inter-related focus areas: Complete Streets, Regional Travel, Transportation Demand Management (TDM), Funding and Integration with Sustainability Initiatives.

The 2014 TMP also includes a detailed Action Plan reflecting an integrated, inter-disciplinary approach linking land use and transportation planning, and guiding the implementation work on the plan. This TMP Action Plan helps to guide the annual work program for the Transportation Division in concert with the City Council's annual work program and budget priorities.

The measurable objectives of the 2014 TMP form the basis of the city's transportation metrics program and support the increase in person trips while reflecting the reductions needed to reduce the impacts of automobile traffic and achieve the transportation sector reductions in greenhouse gas emissions to support Boulder's Climate Commitment goals.

Based on the findings from the *2016 Transportation Report on Progress*, the Boulder community is making good strides in some areas such as increase travel by walking, biking, and transit by Boulder residents. However, more work is needed to accelerate the pace of mode shift, and to continue to address regional travel, particularly opportunities to enhance options for non-resident employees.

As part of the 2014 TMP acceptance, Transportation staff committed to periodic check-ins with council to ensure implementation work continues to reflect the city's priorities. This study session is the third such check-in since the Aug. 2014 acceptance of the 2014 TMP with the previous check-in study sessions occurring on Feb. 24 and Aug. 25, 2015.

Future transportation related study sessions in 2016 will focus on Development Related Impacts Fees and Excise Taxes on June 14, 2016, the Renewed Vision for Transit scheduled for September 27, 2016, and the Access Management and Parking Strategy (AMPS) on October 10, 2016. The next full TMP progress update is scheduled for December 13, 2016 and will include highlights from all of the TMP focus areas, with an emphasis on Complete Streets, TDM, and Funding.

IV. ANALYSIS AND ISSUES

TMP Focus Area Progress

Complete Streets

The TMP Complete Streets Focus Area is one of the five, inter-related TMP focus areas, and includes the city's policies to accommodate people using all modes of transportation by including pedestrians, bicyclists, transit riders, and vehicle drivers as facilities are planned, designed, constructed, operated and maintained. This focus area recognizes the pedestrian as the primary mode and aims to develop the complete modal systems and programs needed to accommodate increased travel while moving a greater percentage of that travel away from single occupant vehicles (SOVs).

Putting People First: Pedestrian Projects, Plans, and Programs:

Walking is the fundamental way to travel and connects travel by all other modes. The 2014 TMP continues Boulder's long-standing policy to recognize the pedestrian as the primary mode of travel, and takes a "people first" approach to transportation, which is fundamental to achieving complete streets. Traditional transportation activities focus on the design and construction of facilities–yet travel behavior and mode choice are determined by a broader set of factors. The city enhances the safety and of transportation options by embracing a comprehensive approach utilizing the Five E's of Engineering, Encouragement, Education, Enforcement and Evaluation. The following sections highlight current pedestrian related initiatives in each of these areas.

Engineering for Pedestrians

Capital Enhancements

Providing places for people to walk and access transit through engineering treatments is key and the city prioritizes and supports pedestrian travel throughout the community and ensures adequate connections to public transit. An illustrative capital project underway includes the Diagonal Highway Reconstruction project, which is adding a new multi-use path for pedestrians, improved access and amenities to transit stops along the corridor, and medians offering refuge for people crossing the roadway. Public art, landscaping and rain gardens to catch and filter rainwater are being installed and will contribute to a memorable and enjoyable sense of place for people walking along the corridor. Currently scheduled to be completed in fall 2016, this $9.97 million project is also reconstructing the deteriorated pavement and providing new off-street bicycle lanes, called cycle tracks. Virtually all of the city's capital projects improve pedestrian infrastructure. More information is listed on the Transportation Projects web page.

The capital program dedicated to improving walking is Sidewalk Missing Links. This program identifies, prioritizes, and constructs missing sidewalk segments to provide a continuous pedestrian network and ensure a safe walking environment. Projects are identified by community members and then added to prioritized lists of "small" or "large" missing sidewalk links. Small projects cost less than $75,000 are completed using funds from the city's Pedestrian Facilities budget. Larger missing sidewalk link projects are prioritized and assessed for inclusion in the annual budget process. Projects are prioritized based on several factors, including existing utility and roadway conditions and are listed on the city Sidewalk Links. Recently completed missing

sidewalk projects funded by the recent bond program include the 2600 block of Mapleton Avenue, 2400 28th Street, Gillaspie Drive from Greenbriar to Juilliard and several sections along Spine Road.

The city's Sidewalk Repair programs address broken or damaged sidewalks as they are an eyesore, inconvenience, and safety hazard. The city offers two programs to help keep Boulder walkable. Each year, the *Annual Sidewalk Repair Program* targets a specific area in Boulder to repair sidewalks and install pedestrian access ramps. The city shares the cost of the sidewalk repairs with the adjacent property owners with a single-family residential property not being assessed more than $450 per property per year, no matter the total cost of the sidewalk repair. Property owners are responsible for additional costs associated with flagstone sidewalk repairs. The *Miscellaneous Sidewalk Repair Program* also shares in sidewalk repairs anywhere in the city. Property owners pay for half of the repair costs for sidewalks adjacent to their property. There is no out of pocket maximum for residential property owners. Work in the 2016 Sidewalk Repair Program area will begin in late May in the area bounded by Baseline Road, Broadway, University Avenue, 10th Street and Aurora Avenue.

While the sidewalk repair programs address spot improvement, the 19th Street Multimodal Connectivity Project is a more comprehensive effort to improve connections. Funded in part by a Colorado Safe Route to School (SRTS) grant, this project addresses incomplete and substandard facilities along 19th Street. The project responds to citizen requests to improve bicycling and walking facilities along 19th Street from Norwood to Yarmouth avenues with a focus on student travel. Total cost is estimated as $785,000, funded in part by a grant from the Transportation Alternatives Program administered by the Colorado Department of Transportation and an additional grant from the Safe Routes to School Program for $350,000. Staff plans to initiate project design and the public involvement processes in late 2016. Construction of the project is anticipated to begin in 2017/2018.

Operations & Maintenance for Pedestrians

A primary consideration for all roadway operational and maintenance is to provide safety and efficiency for people walking along and across our street system. The city identifies and prioritizes enhanced pedestrian crossing treatments and signal operations in favor of pedestrian crossing time improve access for people walking. A brief overview and update on each program is included below.

Enhanced Pedestrian Crossing Treatments are signed and marked crosswalks, crosswalks with centerline bollards, crosswalks with rectangular rapid flash beacons (RRFBs), traffic signals and underpasses. The City installs these treatments using a set of criteria outlined in the City's Pedestrian Crossing Treatment Installation Guidelines. These determine which treatment is appropriate to install based on crossing activity, motor vehicle traffic volume and speed, and the number of lanes being crossed. The number of children, elderly, or people with disabilities crossing the roadway at a location are also used to determine the demand for a treatment. Locations identified for a crossing treatment are prioritized for construction based on the number of people crossing, the conflicting traffic and the cost of the crossing treatment. The City installs pedestrian crossing treatments each year with the most recent being crosswalks at 9th and North

and Table Mesa and Yale. Crossing treatments planned for construction in 2016 include Pearl and 21st, Colorado and Monroe, and Broadway and Poplar.

Signal operations in favor of pedestrian crossing time are considered throughout the city's network of traffic signals. Separate pedestrian indications are provided at every traffic signal to provide specific information and control beyond the standard vehicular green/yellow/red indications. In addition, modifications to signal phasing and timing to enhance pedestrian safety and efficiency are used strategically in the system. For example, where high volumes of pedestrian crossings are in conflict with vehicular movements, pedestrians are provided with an exclusive pedestrian movement. This allows pedestrians to cross the intersection in any direction while all vehicular movements receive a red light. Some of the intersections where this phasing is used include Broadway and Iris, Colorado and Folsom, Pearl and 11th, Walnut and 11th, and Walnut & 15th. Where an identified pattern of conflict between pedestrians beginning their crossing and drivers turning without yielding to the entering pedestrians is identified, pedestrians are provided with a brief "advance ped" interval to enter the crosswalk prior to vehicular movements receiving a green light. This timing is provided at the Iris and 19th and Baseline and 20th intersections, and is scheduled to be installed in 2016 at the Broadway and Spruce intersection. The city also considers modifications to its laws to better facilitate efficient pedestrian movement. In 2014, the Boulder Revised Code was modified to allow pedestrians to enter signalized crosswalks equipped with countdown displays after the display has changed from the white walk "start crossing" display to the orange flashing hand "don't start" display if they can safely complete their crossing during the remaining pedestrian clearance time.

Sidewalk debris and snow removal maintenance activities are the responsibility of the adjacent property owner, including keeping sidewalks clear of snow; preventing vegetation from obstructing sidewalks; and keeping tree limbs at least eight feet above sidewalks. The city is working to increase property owner awareness of these requirements. Community members may report sidewalk maintenance concerns by calling please call 303-441-3266 or make a service request online using Inquire Boulder. In cases when the city is the adjacent property owner or access to transit is a priority, the city assumes responsibility of routine maintenance. A contract for maintenance services is in place to ensure that these locations are prioritized and in compliance with city code.

Encouragement Programs for Pedestrians

Boulder Walks

As a designated Gold-Level Walk Friendly Community, Boulder is a place where walking is both desirable and enjoyable. The city's Boulder Walks program began as an action item from the 2014 TMP and aims to celebrate and encourage walking as a travel choice for residents and employees.

In partnership with the Colorado-based Walk2Connect (W2C), Boulder Walks launched a new walking program in 2015 to celebrate the health and social benefits of walking and strengthen partnerships to improve walkability in Boulder. In 2016, the program is building on work completed in 2015 with the aim to create new opportunities for walk-friendly events and programming. A specific objective is to build a coalition of individuals and community

organizations that will work together in support of walk-friendly community design. In 2016, this will be achieved by implementing programming along two tracks guided by staff and coordinated by W2C.

Community Program Track

A series of events will be hosted beginning in May and continuing through the fall to increase walking opportunities for community members. Walks will be led by trained W2C Walking Movement Leaders and will follow monthly themes that emphasize one of the "Five Es" (Engineering, Encouragement, Education, Enforcement, Evaluation) identified in the TMP as a way to support walking as an active, fun travel option. Objectives of these walks are to:

- connect community members to each other and to the city's planning process;
- cultivate partnerships with the Boulder Valley School District, Growing Up Boulder and other partners;
- increase public engagement in walking and pedestrian-environment issues;
- support the development of complete streets; and,
- foster Boulder's leadership as a gold-level walk-friendly community.

W2C and GO Boulder will be leading neighborhood walkabouts in partnership with community leaders and experiential walk audits as part of planned corridor projects along East Arapahoe, Canyon Boulevard and 30th Street & Colorado Avenue.

Coalition-Building Track

In fall 2016, a walk-mode specific task force will be established to ensure that pedestrian issues remain balanced with other modes. The Task Force will help identify and prioritize initiatives to increase mobility for all, including people with disabilities. GO Boulder is working with W2C and Walk Denver to gather input from community partner organizations this spring through an online survey. The focus is to learn about opinions on walkability in Boulder today, what community organizations are currently working on related to walkability, and what walking-related issues are most important to them. This assessment will inform the early work items for the task force and additional coalition-building activities.

Education and Enforcement campaigns for Pedestrians

The city continues to inform community members about traffic user rights and responsibilities through outreach campaigns in support of the "Toward Vision Zero" objective of the TMP. Safe Streets Boulder program highlights include:

Heads Up Boulder - mind the crosswalk

Data analyzed by the Transportation Division shows that nearly half of all collisions within the city occur at intersections, with crosswalks being the most common locations for collisions between motor vehicles and bicyclists or pedestrians. The city launched the Heads Up crosswalk safety campaign to address this trend and inform community members about their rights and responsibilities as users of the transportation system, particularly at crosswalks. The campaign has grown to include Crosswalk Safety Weeks in an effort to raise public awareness of high collision locations and increase enforcement at these select intersections. For the second year, police from the City of Boulder and the University of Colorado-Boulder are partnering to step up

enforcement of traffic laws at the top locations these types of collisions. Education and outreach activities began in March 2016 to raise awareness of crosswalk related ordinances. These efforts supported heightened enforcement activities during the week of April 11 through April 15 at top accident locations in an effort to reduce traffic related injuries and fatalities. Another Crosswalk Safety Week is planned for early Sept. This program is funded by a federal grant and will be expanded in the fall to include restorative justice and ticket diversion activities, and introduce new messages in support of bicyclists knowing and complying with 8 mile per hour speed limit in crosswalks.

The Way of the Path campaign

Designed to improve the safety and experience of people using the city's multi-use paths, the Way of the Path campaign is in its second year. Throughout the summer, path users are asked to pledge to follow path rules and etiquette in order to ensure a safe and courteous atmosphere for everyone. This will be followed by an eight-week campaign in the fall with a focus on eight key messages, including appropriate ways to pass fellow path users, awareness of the 15 mile per hour (mph) speed limit on the paths and the need to pick up after dogs. This year, participants will continue receiving weekly blog posts with tips on the rules of the path, a survey and are entered in a random prize drawing. The campaign will also be expanded to include social media, advertisements and Karma cards.

Lighten Up Boulder

The Lighten Up Boulder program reminds bicyclists that riding at night without a light is illegal and unsafe. Each fall, the city teams up with CU-Boulder to encourage bike light use for nighttime riding by providing bike light accessories and lights to pedestrians walking at night. The program has expanded to include a partnership with Boulder Valley School District to provide lights to students biking and walking to and from school.

Evaluation and Planning for Pedestrians

Pedestrian Mode Plan and American's With Disabilities (ADA) Transition Plan

The city's original Pedestrian Mode and ADA Transition Plan were written in the mid and early 1990s. While many of the sections have not been formally updated since that time, the city has continued make progress on many pedestrian related initiatives. A plan update will assist in compliance with ADA requirements by 2018 for programs, activities and services and address broader pedestrian related topics to further support walking as the primary mode of travel for the Boulder community. In fall 2016, the Transportation Division is scheduled to begin an assessment of existing policies in preparation for updating the Pedestrian Mode Plan. This includes an inventory of policies, programs, planning, and maintenance practices to ensure the city is improving our public rights of way to provide physical access for people with disabilities. In early 2017, a self-evaluation of existing practices and procedures and the need to provide a compliant system will begin. This includes looking at facilities such as pedestrian signals, sidewalks, pedestrian curb access ramps, as well as public process and accessibility to provide input in a public process.

Safe Routes to School Planning

The Colorado Safe Routes to School Program (SRTS) was established in 2005 through federal legislation, which provided a dedicated federal funding stream in support of the SRTS program. Colorado was the first state in the nation to implement the program with federal dollars and is still considered a SRTS leader. Successful SRTS programs are designed around the 5 Es - engineering, education, encouragement, enforcement, and evaluation - to achieve the greatest gains. While recent federal legislation eliminated the dedicated funding for SRTS, the Colorado Department of Transportation (CDOT) Transportation Commission approved the continuation of the SRTS program in 2015 by committing $2 million for capital projects and $0.5 million for non-capital projects annually to fund the program, beginning in FY 2016. Funds are awarded through a statewide competitive process and it is anticipated that FY17 funding will be announced in October 2016. The city and BVSD have received more than $1.6 million in SRTS funds and will continue our partnership to identify and prioritize potential projects and programs to apply for future funds.

Evaluation

As part of the 2014 TMP update process, the city developed a new mapping tool to identify "15 minute neighborhoods". This neighborhood access tool helps the city assess which Boulder neighborhoods have access to basic services (schools, parks, shopping, transit, etc.) within a 15 minute walk. The mapping tool identifies areas with relatively high accessibility and those that do not based on either missing transportation facilities or missing land use destination. This new tool is helpful for integrating transportation and land use planning processes and is currently being used by an inter-departmental staff team working on the Boulder Valley Comprehensive Plan update to enhance walking opportunities for Boulder residents. The city's goal is to increase the number of walkable neighborhoods from the current level of approximately 26% to 80% as one of the TMP objectives.

General Operations & Maintenance Updates

The city's Transportation Division is responsible for the core services of operating and maintaining Boulder's transportation system to ensure safe and efficient travel year-round for people walking, biking, riding transit, and driving as well as the movement of goods and services. The following sections provide highlights regarding current maintenance initiatives, including the city's Snow and Ice Control Program, as well as System Preservation, including the city's Pavement Management Program and Bridge Asset Program:

Transportation Maintenance for 2016

Early this season, Transportation Maintenance staff reflected on 2015 and strategized a plan to align with our commitment to the community. This year our Street maintenance work group will operate the following three crews:

- Paving crew
- Pothole crew
- Alley crew

The intent of this structure is to enhance our level service to our customers and set budgetary goals that align with our available funding. Areas with active work can be viewed on the Cone Zones Web page.

Bikeways Maintenance

In support of the city's recent policy to allow people to ride e-bikes on multi-use paths, Open Space and Mountain Parks (OSMP) and Transportation staff have worked closely to identify concrete path locations that should be maintained by Public Works. Twenty locations have been identified and those concrete paths will soon become a part of the Bikeways maintenance program. Regarding the new US36 corridor bikeway, the City of Boulder is working jointly with Boulder County on a shared maintenance agreement for Boulder portions of the US 36 bikeway corridor that will go into effect on June 1, 2016.

Snow and Ice Control Program

The Snow and Ice Control Program goals, as related to the Transportation Master Plan, are to:

- Keep primary and secondary streets, on-street bike lanes and the off-street path system open.
- Respond with enhanced service levels when significant snowfall impedes public mobility on and around residential roads, sidewalks and bus shelters.
- Use materials and equipment efficiently and effectively to help reduce the dangers of traveling in inclement weather.
- Assist with enforcing the sidewalk snow removal regulations (Section 8-2-13, B.R.C. 1981), which require all private property owners and residents to clear ice and snow hazards from public sidewalks or walkways abutting their property no later than 24 hours after a snowfall stops.
- Communicate any delayed opening or early release decisions in advance of city functions before impending severe weather impacts the ability of residents or employees to safely arrive at their destination within the city.

Snow and Ice Control Program information is made available each year through news releases, printed materials, Channel 8 videos, social media, and online at Snow and Ice Webpage.

Snow Removal Analysis and Status

This section describes operational adjustments and changes from previous snow seasons that are part of an ongoing effort to improve the city's overall snow removal operations. The Public Works Department hired the consulting firm of CH2M to perform an analysis of the City of Boulder snowplowing and routing system. The results of the evaluation resulted in the following key findings:

- The Primary Snow Routes are in excellent condition, both from mileage and elapsed time evaluations.
- The Secondary Snow Routes demonstrated opportunities for improvement over the current state as there was an imbalance between mileage and elapsed time evaluations.
- Recommends continuing the recent Residential program changes.
- Maintain a proactive approach to staffing for snow events.

2015/2016 Snow season at a glance:

Summary results from the 2015/2016 snow season as of early April are:

- Snowfall recorded in Boulder as of April 26, 2016 by CU – 105.9" (Last year was 115")
- Street miles plowed – 65,000 (16 trips around the world)
- Ice slicer used on streets – 20% reduction in material usage from 2014/2015 season.
- Magnesium Chloride used on streets – 7% reduction in material usage from 2014/2015 season.

System Preservation

Pavement Management Program

In 2011, the Transportation Division established a Pavement Management Program (PMP) for Boulder's 300-mile street system, which includes inspecting and rating all streets on a three-year interval to maintain awareness of existing conditions and guide where pavement repairs will be made in future years. The goal of the PMP is to identify the optimal level of funding, timing, and renewal strategies that will keep the roadway network at or above a "Good" Overall Condition Index (OCI) rating, an average OCI rating of 75 to 80 for all streets in Boulder. The additional transportation funding provided by the 2011 Bond and 2013 sales tax ballot initiatives have supported progress toward meeting the city's PMP objective. The city's goal of a 75 to 80 OCI is consistent with other communities in the Denver metro area. The average OCI rating for City of Boulder roadways is currently 76.5. As highlighted at the Aug. 25, 2015 TMP study session, it is still early in the implementation of the PMP and it takes time for the program to mature and develop. As data collection improved and city staff gains better tools and best practices with pavement management, staff will be able to operate with a high level of informed decision making about how to maximize pavement condition quality for the least cost.

Bridge Asset Management Program

As a part of preserving the system, the Transportation Division has initiated efforts to develop and maintain a bridge asset management program that is on a level comparable to the PMP. The key elements of the bridge asset management program should include the following:

- Inventory/Inspection
    - Locating bridges that are part of inventory
    - Assessing bridges through inspection

- Maintenance
    - Perform necessary repairs to keep bridges in service
    - Extend the life of bridge as long as possible for least cost
    - Maintenance dollars should not be spent on bridges that are about to be replaced

- Capital
    - Complete replacement of bridges
    - Large rehabilitation projects to upgrade existing structures
    - Capital dollars are used to replace bridges that are beyond maintenance

It is vital to have an understanding of bridge conditions within the city as they are among the most expensive and complex assets being managed. In early 2016, staff completed the most extensive bridge inventory and inspection effort conducted in the city's history.

Some definitions are useful surrounding the terminology use in bridge asset management. The definition typically used by municipalities in Colorado for a bridge includes the following:

- A structure within the right-of-way that carries a roadway, pathway, railroad or waterway over a waterway, roadway or other feature
- The minimum opening on a structure is 48" (this can be a rectangular shape or a circular shape)
- The structure cannot be a confined space (must have openings on both ends nearby)

Two terms often reported by the media, but not meant to imply that a bridge is unsafe to remain in service, are Structurally Deficient and Functionally Obsolete.

- Structurally Deficient – there may be a load carrying capacity issue, usually caused by deterioration or construction in outdated standards
- Functionally Obsolete – may be a geometric or alignment issue, bridge does not meet current standards for roadway width or vertical clearance over another roadway

Both of these items are tracked by the Federal Highway Administration, but only major bridges are federally tracked or reported. More than 20 bridges on the Boulder inventory are structurally deficient or functionally obsolete.

It is a federal requirement to inspect the Major Bridges (span greater than 20') every two years, and this inspection of the major structures is conducted by CDOT. The City of Boulder has

chosen to inspect the Minor Bridges (span between 4' and 20') every four years as this is the typical national inspection frequency.

As of April 2016 the City of Boulder bridge inventory consists of the following:

- 41 Major Bridge Structures
- 270 Minor Bridge Structures (178 carry vehicular traffic, 92 are pedestrian bridges)
- 412 outstanding maintenance items identified during recent bridge inspections
- Estimated replacement value of entire inventory $250,000,000 (2016 dollars)

A conservative estimate for average bridge service life is 65 years (average of service life for all structure types), and with 311 total bridges, replacing 4.8 bridges per year is a sustainable rate. The average cost of replacing a bridge on the Boulder Inventory is approximately $650,000, which at 4.8 bridges per year that is $3.12 million per year in 2016 dollars.

Estimated Bridge Needs for the next 25 years are then:

- Bridge Maintenance funding - $25-$35 million dollars
- Capital (replacement/rehabilitation) – $75-$100 million

General Capital Project Updates

The Transportation Division is responsible for the multimodal capital projects as outline in the city's Capital Improvement Program. These projects are identified through the TMP planning process and prioritized in the three TMP investment program levels (current, action, and vision plans) based on a variety of criteria aligned with the TMP objectives and city's overall sustainability goals. As funding is identified for these projects, they move forward into the planning, design, and construction phases managed by Transportation's Capital Projects team.

There was an increased number of transportation improvements made from 2012-2015 due to the Capital Improvements Bond passed by voters in the November 2011 election and all of these projects were finished within the bond deadline. The majority of the bond funded transportation projects focused on infrastructure maintenance including the pavement reconstruction of Arapahoe Avenue from 15th to Folsom, increased resurfacing of collector and local streets, replacement of substandard signs and the irrigation system for the medians and landscape areas adjacent to Foothills Parkway. Funding was also spent to replace traffic signal incandescent lamps with LED lamps which used 80% less energy and went towards system enhancements additional pedestrian crossings, intersection improvements, new multi-use paths and sidewalks and improvements to the downtown Boulder transit station.

Following is a brief listing and status summary of current capital improvement projects for Transportation. A map showing the location of these projects is included in **Attachment A**.

28th Street
28th Street between Iris and Yarmouth avenues
Duration: Anticipated to be completed in spring, 2016
Description: Builds multi-use path, multi-use path bridge, bike lane and widens vehicular bridge

Diagonal Highway reconstruction

Diagonal Highway between 28th Street and Independence Road
Duration: Anticipated to be completed in fall, 2016
Description: Reconstructs vehicle traffic lanes, adds cycle track and multi-use paths

Andrus to Airport multi-use path
Between Andrus Road and Airport Road
Duration: Anticipated to begin construction in fall/winter, 2016
Description: Extends 63rd Street multi-use path to Airport Road and fills a gap between Gunbarrel and urban Boulder

Frontier Avenue bridge replacement
Frontier Avenue between Pearl Parkway and Pearl Street
Duration: Anticipated to be completed in spring 2106
Description: Replaces a deteriorated bridge with a new bridge and adds sidewalks.

Boulder Creek at Arapahoe Avenue pedestrian bridge replacement
Boulder Creek at Arapahoe Avenue
Duration: Anticipated to begin construction in summer, 2016
Description: Replaces a deteriorated pedestrian and bicycle bridge with a new bridge.

Baseline Underpass
Baseline Road between Broadway and 27th Way
Duration: Anticipated to begin construction spring 2016
Description: Builds an underpass to replace the current street-level pedestrian and bike crossing to improve safety.

Hanover Avenue multi-use path
Hanover Avenue between Broadway and 46th Street
Duration: Anticipated to begin construction June 2, 2016
Description: Builds a multi-use path and adds curb extensions and marked crosswalks.

Complete Streets Planning Activities

The TMP implementation work continues in the areas of corridor studies, including the Living Lab program.

Corridor Plans

The TMP identifies several types of corridor plans to enhance and refine Boulder's system of complete streets. The corridor planning process provides the opportunity for the city to work with the community and agency partners to identify the vision and future multimodal improvements (short-term and long-range) needed for each corridor. Improvements typically include opportunities to enhance facilities and safety for people using all modes of travel, as well as urban design and place making features.

The corridor plans vary by the context and complexity of the street, with the East Arapahoe Transportation Plan being an example of a large-scale, long-term corridor plan from downtown Boulder to 75th Street and tying into the regional SH7 corridor study to Brighton; while the Canyon Complete Streets Study is relatively smaller-scale corridor plan from 9th to 17thstreets.

The Living Lab pilot project along the Folsom Corridor from Valmont to Colorado is an example of a smaller scale, local project, primarily involving signing and striping rather than substantial capital construction.

The following sections provide updates on corridor plans currently underway and staff is seeking particular feedback from TAB and City Council regarding the Canyon Complete Streets Study as well as the Living Lab pilot project along the Folsom Street corridor.

East Arapahoe Transportation Plan

The East Arapahoe transportation planning process is currently in the visioning phase, asking the community what they would like East Arapahoe to be in the future and what types of transportation improvements could make this vision a reality. Since the last briefing to Council at the December 8, 2015 study session, staff has conducted a series of broad community outreach activities. Staff has gathered input from the community seeking:

1) Input and ideas about opportunities for transportation enhancements in the corridor;
2) Help identifying the appropriate range of transportation improvement alternatives to be considered; and,
3) Suggestions on the evaluation criteria by which they should be evaluated moving forward.

Over the past seven months, opportunities for public input have included an online questionnaire, public workshop, individual meetings with over 20 stakeholders along the corridor, and several small group outreach activities including pop-up events, presentations, open houses, and a focus group.

The following themes have been shared through the recent community outreach:

- *Conceptual Design Alternatives:* There is both concern and interest in the tradeoff between maintaining or expanding the number of vehicle travel lanes versus dedicating more street space to exclusive transit lanes, on-street bicycle facilities and landscaping. For example, of the 126 questionnaire respondents, 46 questionnaire respondents indicated the need for more general purpose lanes and 36 respondents indicated the need for improved bicycle infrastructure. At the public workshop held on November 2015, there was strong support expressed for completing and/or adding bike infrastructure along East Arapahoe. Conceptual design alternatives that included exclusive BRT lanes and on-street bicycle infrastructure were seen as strong in the way that they enhance both bus service and the pedestrian and bicycle environment. However, there was concern that repurposing vehicle travel lanes for other uses could create more congestion and the investment may not be worth the bus ridership that would result.
- *Additional Concepts:* Community members have requested that additional transportation improvement options be considered. Examples include carpool lanes, additional automobile lanes, light rail or streetcar, reversible general purpose lanes, exclusive BRT lanes only during peak travel hours, traffic circles and streetscape beautification.
- *Evaluation Criteria:* Evaluation criteria repeatedly cited through the public input process as important in comparing future transportation improvements options include: safety for

people using all modes of travel, perceived ease or comfort for walking and bicycling along/across the corridor, and transit travel time and reliability.

- *Regional Commuting:* In conversations with businesses along the corridor, it is apparent that the majority of employees do not live in Boulder, and drive in single-occupant vehicles from as far away as south Denver and Fort Collins. To attract and retain employees, businesses desire that commutes should be easy and inexpensive. Eliminating a general purpose lane would be extremely concerning to many businesses.
- *Transit Enhancements:* Much of the community input related to transit includes the need for higher frequency transit, extended transit service hours, enhanced bus stops and more direct and efficient bus connections.
- *Bicycle and Pedestrian Enhancements:* A common theme heard about the existing multiuse path is that it works for families but not for bicycle commuters. Many community members stated that it feels dangerous at driveways because drivers are not looking for pedestrians and cyclists and signage is lacking. Enhancement ideas suggested include an off-street bicycle path, improving bicycle and pedestrian travel along Arapahoe Avenue, as well as making direct connections to businesses and neighborhoods located off Arapahoe.
- *Land Use Planning:* Several community members stressed the need to plan future transportation improvements in coordination with land use planning.

Attachment B provides a summary of more detailed public input.

Many of the conversations staff had during these outreach activities pointed to the need and desire by community members for establishing an East Arapahoe Transportation Plan Community Working Group. The working group has been established with 22 participants representing diverse interests from along the corridor as well as from the community at-large. The working group will provide input and feedback from different interests and perspectives during the East Arapahoe planning process. The working group's input is helping staff explore future transportation improvement options serving the diverse interests in the community the best way possible. City staff will use the working group's feedback when developing recommendations and materials for consideration by boards and council.

In addition, Transportation staff is collaborating with the city's Comprehensive Planning staff to integrate transportation and land use planning for the East Arapahoe/SH 7 as part of the Boulder Valley Comprehensive Plan update.

Canyon Complete Street Study

The City initiated the Canyon Boulevard Complete Street Study to improve travel and the travel experience for pedestrians, bicyclists, transit users and drivers along and across Canyon Boulevard from 9th to 17th streets. This roadway is part of the SH119/CDOT State Highway System and is a principal arterial in the city with approximately 26,000 daily vehicles.

The Boulder Civic Area Plan, approved by City Council in 2013, envisioned improvements along and across the roadway to create greater connection and access to and through the area as well as better connections between the downtown, Civic Area and University Hill areas. The

2014 Transportation Master Plan also identified a corridor study for Canyon Boulevard to improve travel for all modes and integrate with adjacent planning efforts. The resulting improvements are intended to transform Canyon to a place people want to come to with urban design, placemaking and physical transportation facility improvements.

The Canyon Complete Street Study first phase is developing a vision and conceptual design options and evaluate the options to select a preferred conceptual design option.

The project staff team is composed of representatives from the city's transportation division and the community planning and sustainability, parks and recreation departments as well as CDOT and RTD staff representatives. Project staff team meetings began in late 2015 with a walk audit of the area and meetings to discuss and listen to the strengths, weaknesses, opportunities and constraints as identified by the project team members. From these meetings the team developed a Vision for the Canyon Boulevard Complete Street Study which is:

> ***Vision:***
> Canyon Boulevard will become a more accessible, safe, and inviting travel experience for pedestrians, bicyclists, transit and cars traveling across and along the corridor.
>
> Canyon Boulevard serves as a vital connection, a linkage between the natural landscape of Boulder Canyon and Civic Area and the urban activities of the City. It will continue to serve as a transportation nexus for Boulder, moving people to and through the area, serving as both an important destination and a connector. Canyon Boulevard will combine the location's history and natural elements with the contemporary need for equity and mobility, providing increasing transportation options into the future.

This vision developed into a set of Goals and Objectives to achieve to reach the above vision. The goals and objectives are reflected in the proposed measures to be used to evaluate the conceptual design options so that the recommended option best reaches the vision for Canyon Boulevard.

All of the conceptual design options are within the 130' Complete Streets planning width which reflects the space available on Canyon Boulevard form zoning setback requirements outlined in Ordinance 7813 which amended the Land Use Code. The 130' Complete Streets planning width also allows for all modal facilities and the urban design feature of a double row of trees amenity zone along the south side of Canyon Boulevard. Features of a Complete Street include:

- ***Gathering spaces*** – Parks, plazas, and courtyard creating destinations along the street and opportunities for organized events, space to celebrate nature and culture and places for rest from the surrounding urban environment.
- ***Accommodations for bicyclists*** – Appropriate bicycle facilities along Canyon Boulevard will accommodate a wide range of bicycling ages and abilities and could include multi-use paths, on-street protected bike lanes, conventional bike lanes and shared-lane bike routes.

- ***Efficient roadway*** – Proactive roadway operation and design allow people to predict traffic flow and understand how to safely and efficiently move by bus or car through the area.
- ***Enhanced intersections*** – Enhanced intersections create high visibility for all users and predictable actions for people crossing paths either in a vehicle, on a bicycle or on foot. Crosswalk design should provide safe and comfortable experience for non-motorized travelers to establish convenient walking and bicycling routes across and along Canyon Boulevard.
- ***Integrated transit*** – Transit offers a high capacity option for moving people to and along a street. A complete street considers every passenger's trip from start to finish. Transit stops enhance the public realm and activate the streetscape by providing passenger waiting areas that can include, bus shelters, way finding, lighting and public art.
- ***Active sidewalk*** – Sidewalks are central to pedestrian life. A complete street provides high quality spaces for people that feel safe, have natural features and have appropriate transitions to the streets, transit stops, and building entrances, making them easy places to walk, use a wheelchair or stop and observe street life and activity.

A brief description of the seven conceptual design options is included below and the images of these conceptual design options and their features are included in Attachment B.

- Option 1 includes a planted center median, multi-use path on the south side, sidewalks, and tree rows
- Option 2 includes multi-use path on both sides of the street, amenity zone, tree rows and intermitted planted median
- Option 3 includes a 2-way protected bike lane on the north side, sidewalks on both sides of street, tree rows and intermittent center median
- Option 4 includes a 2-way protected bike lane on the south side, sidewalks on both sides of street, tree rows and intermittent center median
- Option 5 includes conventional on-street bicycle lanes and sidewalks on both sides of street, tree rows, amenity zone and a continuous planted median.
- Option 6 includes a single direction protected bike lane on both sides of street with planted separation, north and south amenity zone, sidewalks, tree rows and a planted center median.
- Option 7 includes a buffered bike lane, sidewalk and amenity zone on both sides of street, tree rows, and planted center median.

Elements of each option may be "mixed and matched" depending on factors such as space or right-of-way availability, traffic conditions, and the land use character of sections along Canyon Boulevard. And, other variations on these alternatives are possible by block section too. It is possible that the design options will continue to evolve through the conceptual design phase of the planning process, based on community feedback and the evaluation measures assessment results

Staff is currently seeking TAB, council, and community feedback on the Canyon Boulevard Complete Street Study conceptual design options and proposed evaluation measures. Phase 1 includes the development of conceptual design options, evaluation of the design options and selection of a recommended option to complete further engineering design and cost estimation.

The second phase will complete additional engineering design, cost estimation for the Canyon between 9th and 17th Streets corridor and consider funding and phasing strategies to implement the design concept. Phase 1 began in late 2015 and is anticipated to be completed in late 2016. Phase II is anticipated to begin in late 2016 and continue into 2017.

See **Attachment C** for more details.

30th & Colorado corridor studies

The 30th Street and Colorado Avenue corridors provide travel options between key activity centers in Boulder including University of Colorado (CU), student housing at Williams Village, CU East Campus, Boulder Junction, and CU Main Campus. Today 30th Street from Baseline Road to Arapahoe Avenue has incomplete multimodal facilities and has experienced numerous vehicular, bicycle and pedestrian collisions including a fatality. Colorado Avenue is a major connection to campus, and will become an even more key transportation facility for students, faculty, and employees traveling between the main and east campuses as CU continues to implement its East Campus Master Plan.

30th Street from Baseline Road to Pearl Street and Colorado Avenue from Foothills Parkway to 18th Street were identified for a corridor study based on community feedback during the Transportation Master Plan Update process. These will each be studied together as a joint multi-year corridor planning process beginning in spring 2016 and starting with a review of existing conditions and future plans. The process will then develop and evaluate conceptual design options for improved bicycling, walking, transit and driving facilities. The study is not beginning from an approach of a particular or specific roadway cross-section design. The recommended multimodal improvements will come about through the planning process with extensive opportunities for community engagement throughout the process.

In addition, the City of Boulder applied for, and received, a federal Transportation Improvements Program (TIP) grant to design and construct the 30th Street and Colorado Avenue Bicycle and Pedestrian Underpass Project, including underpass lighting, multi-use path connections, signage/wayfinding and 20 bicycle parking spaces. This project will be planned in conjunction with the corridors study beginning in spring 2016 and in accordance with the federal funding requirements.

Living Lab Program

The Living Lab program is one of the TMP Complete Streets action items to test new street designs and community engagement processes. These pilot projects are intended to be experimental and allow city staff to gather technical, observational and community feedback as part of an ongoing evaluation process that assesses whether a pilot project is or is not a good fit for Boulder. The results and experiences from the Living Lab program are informing the larger scale corridor plans currently underway as well as future planning for city-wide network of low-stress bikeways, enhancing walk access to/from key transit corridors, and creating a more safe and pedestrian-friendly community.

Status of Remaining Living Lab Phase I Projects

Based on direction received at the January 19, 2016 City Council meeting, staff is modifying two of the Phase I projects:

1. University Avenue – west of Broadway, the parking protected bike lanes were converted back to the buffered bike lane treatment, with the addition of green pavement markings to enhance visibility and safety.

2. Baseline Road – the concrete blocks are being removed and the protected bike lanes will be extended east from 37th Street to Mohawk Drive. In February 2016, staff installed automated bicycle counters on Baseline Road in both the east and west direction near Inca Parkway which is not currently a protected bike lane facility. The bicycle volume data will be used to understand volume in the before and after condition along Baseline Road. Staff anticipates extending the protected bike lane facility from 37th Streets to Mohawk Drive in June 2016.

The remaining Living Lab phase I pilot projects include: Dashed Bike Lanes on Harvard Lane, a Bike Box facility on Folsom Street at Arapahoe Avenue, and two projects at Boulder Junction, the Multi-way Boulevard and Shared Street facilities. The following section describes the primary evaluation criteria, key findings, and proposed next steps for the remaining Phase I projects currently under evaluation. Staff will provide TAB and City Council a final evaluation update for the Bike Box, Multi-way Boulevard, Shared Street facility, and Back-In Angle Parking project in December 2016 to conclude the Living Lab program.

Dashed Bike Lanes on Harvard Lane

Dashed Bike Lanes provide designated space for bicyclists when conventional bike lanes will not fit due to constrained roadway width. They allow two-way vehicle movement and are intended to slow motor-vehicle speeds. As part of a federal research process, the city tested the Dashed Bike Lane on Harvard Lane between Dartmouth Avenue and the Bear Creek multi-use path at Table Mesa Drive, as this street is a well-used bicycle corridor with low traffic volume. Evaluation of the Dashed Bike Lanes occurred over the last year based on the approved performance measures from Federal Highway Administration (FHWA). This included community feedback, field observations, and "before" and "after" comparison of the performance objectives.

The FHWA experiment has concluded and the Dashed Bike Lanes did not impact traffic flow due to the low volume of vehicles, nor did it change total crashes or changes in vehicle speeds, or bicyclist demographics. The experiment did result in fewer people riding bicycles in the center of the road and vehicle drivers did continue to yield to vehicles and bicyclists. Community input regarding the dashed bike lane facility is mixed. Some people favor the facility and others did not see any value added.

Staff recommends keeping the dashed bike lanes in place as we consider other options for the Harvard Lane corridor in the future, and will potentially consider the Dashed Bike Lane treatment for other locations if applicable.

Bike Box on Folsom Street

A bike box is a designated area at the front of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. The facility also provides increased storage area for bicycles at an intersection, and is intended to help bicyclists avoid being hit by right turning vehicles. The bike box facility includes an advanced stop line, green colored pavement surface with a bicycle symbol, intersection striping, signal detection for bikes, and regulatory signage prohibiting motor vehicles from turning right during the red signal phase.

In the spring of 2015, the City of Boulder received permission from FHWA to experiment with a bike box on Folsom Street at the southbound approach to the Arapahoe Avenue intersection to enhance southbound bicycle travel along Folsom Street. Although the bike box is considered a Phase I project, it was installed during the overall Phase II Folsom Street project in July 2015.

Evaluation of the bike box is on-going based on the approved performance measures from FHWA. This included community feedback, field observations, and "before" and "after" comparison of the performance measures. The performance measures include observing bicycle use, the interaction between bicyclists and motorists, and motor vehicle positioning, right turn maneuvers, and yielding behavior. Preliminary observations are that a majority of motorists utilize the bike box appropriately, although most bicyclists do not use the full extent of the box and tend to utilize only the bike lane portion of the facility.

Staff will continue to evaluate the bike box facility through the end of 2016 in accordance with the federal requirements and will provide a recommendation for next steps as part of the next TMP progress update to City Council, currently scheduled for December 2016.

Status of Living Lab Phase II - Folsom Street Project

In July 2015, the Folsom Street pilot project was installed from Valmont to Taft, with a future extension planned to connect to Colorado Avenue when CU completes construction adjacent to this segment of Folsom Street. The purpose of the Folsom Street pilot project is to demonstrate a corridor approach to testing new street designs with the intent to increase safety and access for people using all modes of transportation. The Folsom Street pilot project included converting portions of the corridor from Valmont to Canyon from four vehicle travel lanes to three, adding center left turn lanes, and protected bike lanes. South of Canyon, the Folsom Street project included intersection restriping and other treatments, including buffered bike lanes to connect with the CU campus at Colorado. Feedback from the Boulder community is an important part of the Living Lab program and to address traffic congestion impacts experienced by the community after installing the pilot project, the center segment of the Folsom Street pilot project was modified in the fall 2015. These modifications included restoring the four vehicle travel lanes and removing a segment of protected bike lanes from Spruce Street to Canyon Boulevard in order to improve the flow of traffic.

Staff has been collecting data along the corridor before and after the initial project installment in July 2015. The evaluation criteria consist of both primary and secondary performance measures in order to understand the operational characteristics of the corridor. The primary performance measure data was collected on a weekly basis from July through October 2015 and then switched

to a monthly data collection schedule in November 2015 through March 2016. The primary data consists of the following criteria:

- weekday vehicle volume
- weekday bicycle volume
- vehicle travel time during the PM peak hour
- weekday vehicle speed
- traffic collisions
- number of male, female, and families (children and adults with children) riding bicycles during the AM, noon, and PM peak hours

In addition, more detailed technical transportation operations analysis was conducted along Folsom Street corridor, and at key intersections, and on side streets, as well as review of maintenance experience along the corridor during winter conditions.

The Summary Report, including the technical evaluation and community feedback, for the Folsom Street pilot project is provided as **Attachment D**. **T**he following section describes the key findings from the report:

- The initial conversion from four vehicle lanes to two lanes plus center turn lanes from Valmont Road to Canyon Boulevard resulted in considerable peak hour travel time delays and travel time variability along Folsom Street during the initial weeks of implementation, particularly in the section from Spruce Street to Canyon Boulevard. Average travel times during the evening peak hour measured between Valmont Road and Arapahoe Road were approximately 3.5 minutes before the project. During the first several months of the project the northbound average travel times increased to between 4 and 5 minutes and the southbound average travel times peaked at over 5 minutes. Since the four vehicle lanes were reinstalled between Spruce Street and Canyon Boulevard in the fall 2015, the travel times between Valmont and Arapahoe Road have returned to pre-project levels.
- Travel time data collected and public input all suggest that vehicular traffic operations on Folsom Street, particularly between Spruce Street and Canyon Boulevard, were impacted with the full implementation of the project as measured with travel times, queue lengths, signalized intersection Levels of Service, and side street delays. These impacts have been mitigated with the return to original lane geometry between Spruce Street and Canyon Boulevard.
- Traffic counts along Folsom Street throughout the project indicated that volumes were reduced by up to 15% during the implementation of the full project, indicating that is likely that traffic diverted off Folsom Street. The traffic volume decrease on Folsom has been reduced to approximately 4% after the segment of Folsom between Spruce Street and Canyon Boulevard was returned to the four lane condition.
- The project included two different treatments on intersection approaches along Folsom Street for vehicular right-turn interaction with bike lanes during the full implementation of the protected bike lanes. Field observations of the “transition” treatments at Pearl Street and Canyon Boulevard in September 2015 indicated that most right-turning motor vehicles complied with yielding requirements to bicyclists in the protected bike lane.

Based on evaluations of the "Skip Green Dash" treatment at Pine Street in September 2015 and March 2016, most vehicles observed turning right across bicycle lanes at these locations are not complying with the City ordinance requiring vehicles to move as close to the curb as possible (into the bicycle space) before turning right.

- Evaluation of motor vehicle travel speeds (as measured with the 85th-percentile speed at Bluff Street) have decreased by roughly 2-3 miles per hour (mph) during the course of the project, but these speeds are still approximately seven miles per hour above the posted speed limit of 30 mph.
- Analysis of side-street and parallel corridor traffic volumes, intersection peak hour turning movement volumes, intersection peak hour Levels of Service, and delay indicate that the reduction of traffic volumes on Folsom Street did not result in an identifiable pattern of diversion to any particular corridor. The analysis suggests that any diverted traffic that did occur was redistributed across the city roadway grid without identifiable impacts to any one corridor.
- Field observations in September 2015 indicate that was a reduction in traffic saturation flow rate (which is an indicator of how much traffic a travel lane can accommodate during peak conditions) in the section between Spruce Street and Canyon Boulevard. Possible factors that influenced the saturation rate in September 2015 are increased friction (from vertical bollards), visual elements (markings, signs, additional bicyclists), and the close proximity of signalized mid-block crossings (Spruce and Walnut Street). Field observations in March 2016 indicate that the saturation flow rate has increased by approximately 10% compared with September 2015, and are now consistent with estimated pre-project levels.
- Staff observed that the pedestrian crossings on Folsom Street at Spruce Street and Walnut Street caused congestion, delay, and increased travel time when this section of the project was reduced to a single through lane in each direction.
- Counts of bicycle volumes along Folsom Street showed an increase during the first three months (July through October) after initial installation, and have since decreased below initial levels. Based on cycling data from other sites, this is typical seasonal variation in bicycle travel. More data over a longer period of time is needed to determine if any changes in volume of bicycles is statistically significant.
- The frequency of collisions in the corridor each month after installation is following a similar monthly pattern to a three-year collision history (2012 – 2014) from before the project was implemented. The monthly number of collisions is at or below this historic pattern.
- There were no pedestrians involved in collisions during the first eight months of the project; however, on April 21, 2016, a pedestrian died from injuries sustained in a collision at the intersection of Folsom Street and Canyon Boulevard. The pedestrian was crossing Canyon Boulevard in the east crosswalk and was struck by a truck turning left from southbound Folsom Street onto eastbound Canyon Boulevard.

Community Feedback

An important component of the ongoing evaluation of Living Lab pilot projects is community and user feedback. Since installation, the city has hosted a number of opportunities for community input including bike audits (guided community bike rides), online surveys, in-person feedback at public events, and social media and Inspire Boulder posts.

In April 2016, staff hosted a public open house to present key findings of the ongoing evaluation and to gather additional community input. The Folsom Street Corridor was organized into four segments in order to best articulate specific facilities and modifications that have occurred since the installation of the project in July 2015. Community members were asked to provide comments under three topic headings: keep it, refine it, or remove it. Additionally, the city is offering an on-line survey to seek additional public input on the Folsom Street project. A complete summary of public feedback from the public open house and results from the survey can be found in the Complete Streets Open House Summary: **Attachment E**. (Results from the survey will be presented to the TAB May 9 meeting). Below is a brief summary of the public input from the April 2016 public open house event:

Most of the community feedback received at the Complete Streets Open House focused on the comments regarding the bicycle facility treatments along the corridor. Several people shared their desire for improved, physically separated north-south bicycle corridors. Overall, the current bicycle treatments along the corridor were well received. There was support for keeping the protected bike lane treatment between Valmont and Spruce Street citing improved safety, comfort, directness and separation between users. However, some bicyclists have expressed difficulty with executing left turns from the protected bike lanes. Some people requested the segment between Valmont Road and Spruce Street be returned back to the four-travel lane condition citing concerns with delay when turning left from side streets and aesthetic concerns regarding the bollards. Several comments expressed concern for the narrow width of the striped bike lanes between Spruce and Arapahoe. There was support for keeping the buffered bike lane treatment between Arapahoe and Colorado, though some comments expressed support making these protected bike lanes, including adding planters to improve separation from the adjacent travel lanes.

Preliminary Recommendations

Based on the technical key findings and community feedback to date, staff recommends continuing the Folsom Street pilot project in its current condition from Valmont Road to Colorado Avenue. Analysis of the corridor has been organized into four segments in order to best articulate specific facilities and modifications that have occurred since the installation of the project in July 2015.

Valmont Road to Spruce Street

This segment of the corridor currently consists of two travel lanes (one in each direction), a center left turn lane, and protected bike lanes using bollards. Other than thinning the number of bollards in the fall 2015, this segment has stayed intact since the initial project installation in July 2015. The protected bike lanes provide more perceived safety and comfort for bicyclists of different levels of confidence, particularly in this section of Folsom that includes a hill and curves in the roadway, which can cause some drivers to swerve into the bike lane without the bollards.

The technical evaluation indicates a minor drop in the 85th % of vehicle speed from 39 (mph) to 37 (mph). No significant operational impacts have been observed during the evaluation process concerning travel times, side-street delay, or visibility. The center left turn lane provides an

opportunity for left turning vehicles to more safely execute left turns along the corridor without blocking through traffic. As with the other segments of the corridor, bicycle volume, demographics, and collision data will need to be analyzed over a longer period of time to gauge any significant trends.

Spruce Street to Canyon Boulevard

Today, this segment of the corridor consists of four travel lanes and conventional bike lanes. During the initial project installation, two of the four travel lanes were repurposed to provide two travel lanes, center left turn lanes, and protected bike lanes. Due to community feedback, and impacts to traffic congestion and other operational issues, this segment was reverted back to the original condition, the same condition that exists today. Staff recommendation is to continue the existing configuration, without any further changes. Corridor travel times have returned to the before condition, side-street delay has subsided, long left turn lane queues have shortened, and traffic impacts at signalized intersections at Pearl Street and Canyon Boulevard no longer exist.

Canyon Boulevard to Arapahoe Avenue

No vehicle travel lane repurposing modifications were performed along this segment of the corridor during the initial project installation. Today, the corridor consists of four travel lanes and conventional, striped bike lanes. Staff recommends continuing the current striping configuration along this segment of the corridor.

Arapahoe Avenue to Colorado Avenue

This segment of the Folsom corridor consists of two travel lanes and buffered bike lanes from Arapahoe Avenue to Taft Drive. During the initial project installation, the conventional bike lanes were converted to buffered bike lanes by utilizing excess space from adjacent travel lanes. This striping configuration was recently continued to Colorado Avenue following the completion of the CU stadium project.

Living Lab Program – next steps

Staff recommends keeping the Folsom Street pilot project in the current configuration with on-going monitoring through fall 2016, along with the remaining Phase I projects. Staff will return to City Council in December 2016 with overall next steps for the Living Lab program. Staff does not intend to add additional projects to the Living Lab program. Since 2012, the program has helped the City of Boulder better understand and improve planning and public outreach processes, project implementation practices, and effective evaluation processes. Staff has adopted new street design techniques and has a better understanding of how innovative types of facilities operate in the real world context. With this information, staff is able to apply this knowledge toward existing and future corridor planning efforts while maintaining the spirit of innovation in order to create safe and comfortable travel conditions for all road users.

National Best Practices Interviews

As part of the discussions regarding the Living Lab program, City Council has expressed an interest in understanding how other cities are experiencing and managing complete streets projects, including pilot projects such as Boulder's Folsom Street corridor. A community's experience with implementing complete streets projects can vary based on diverse community perspectives and the length of time that the community has been developing and

implementing their multimodal transportation policies. Staff contacted a variety of cities to better understand the practitioner's perspective, that is, the city staff experience when planning, implementing, and evaluating their Complete Streets projects.

Utilizing the City of Boulder's current list of peer cities, platinum and gold-level Bicycle Friendly Communities, and member cities of the National Association of City Transportation Officials, staff selected and interviewed practitioners from thirteen cities to better understand different approaches and experiences. Each interview was divided into three parts: 1) public engagement & outreach processes, 2) evaluation criteria and decision making processes, and 3) overall lessons learned from implementing and evaluating complete streets pilot projects. Below is a list of the cities that were selected to participate in this interview process, and highlights and themes from the interviews.

Ann Arbor, MI
Bloomington, IN
Cambridge, MA
Davis, CA
Denver, CO
Eugene, OR
Fort Collins, CO
Greeley, CO
Madison, WI
Portland, OR
Pueblo, CO
Salt Lake City, UT
Tempe, AZ

Public engagement & outreach processes:

Through our interviews, staff learned that public outreach varies among the cities based on the complexity of the project and community norms. Typically, cities use traditional means of outreach including public meetings, board and commission reports and presentations, websites, and responses to individual inquiries. Some cities have developed innovative ways to garner public input such as deploying street teams to canvas affected stakeholders along a project corridor, including exciting marketing appeal to "pop-up" events, and in some cases, have provided large floor maps of the project area in public plazas to encourage community members to interact by identifying local landmarks while they gain an understanding of the project area and current/planned conditions from an aerial perspective. Others choose "tactical urbanism" projects that demonstrate facets of a project by temporarily displaying features of a project, such as, a pop up bike lane, traffic circle, or the use of colored pavement markings to highlight specific facilities for a short duration of time (day/weekend). In most cities, the intensity and frequency of the public outreach depends upon the controversial nature of the project. Some cities are just starting out on their journey to implement complete streets, and some of their projects involved low or few tradeoffs, so the public engagement process was more limited/traditional. The more tradeoffs that are involved, leads to more controversial projects, and then need longer and more intense public engagement processes. Transportation staff identified additional important takeaways from the interviews:

- Developing a citizen's advisory committee was helpful for more complex projects.
- Focusing on stakeholders and spending ample time with them goes a long way to clear misconceptions, build on-going and/or early relationships with stakeholders

so people can candidly express concerns and public become more knowledgeable about project and help shape the project from the beginning.

- Developing focus groups in advance to provide diverse input at the start of the public process helps to identify project strengths, weakness, opportunities, and threats/risks
- Provide creative, interactive opportunities for people to talk about the project location near, or on-site.
- Some cities have had to modify and/or scale back their pilot projects due to community feedback either before and/or after the installation. Community concern has typically been expressed regarding the pilot projects removing on-street parking in business districts, rather than concern with reducing the number of travel lanes.

Evaluation criteria and decision making processes:

Based on the interviews, the evaluation process varies from city to city and depends upon the magnitude and complexity of a project. Practitioners shared that developing project goals and objectives in advance helps to shape what defines success and helps to create a shared vision of the project. The technical evaluation criteria used in other cities are similar to the City of Boulder's criteria, and in some cases, less extensive. Salt Lake City also includes tracking sales tax revenue along their pilot project street corridors before and after the installation of the project though it is difficult to attribute the increase solely to the new street design, it could be due to a variety of factors. Interviewees shared that an important component of the evaluation process is the need to interpret the data in an organized and easy to understand format both for internal staff as well as for policy makers and the public. Additionally, some noted the importance of clarifying the methodology of a project's evaluation process and providing a schedule for the public to understand when information will be updated at key milestones is helpful.

Lessons Learned:

Lessons learned are numerous. The list below provides a snapshot of what other cities have learned from their experiences implementing complete streets projects and these mirror the lessons learned by the City of Boulder's Transportation Division:

- Be strategic, context and timing is important, and consider other major private and public projects in the project area
- Plan for a robust public engagement process, particularly if the project will have tradeoffs, need to scale the process based on the level of complexity of the project and potential for community concern.
- Tread carefully and systematically, do not be overly ambitious with project scope
- Develop a shared project vision (goals, objectives, and evaluation criteria)
- Do not underestimate public dissatisfaction, most of the cities have experienced significant community reaction to their projects, unless the project did not involve significant tradeoffs.
- Be prepared for evolving and changing sentiment within the community
- Consider options of implementing "pilot" or "permanent" projects
- Don't underestimated time needed for installation

- Provide preliminary data early on and perform frequent information updates
- Quickly respond to community concerns
- Be prepared for adaptive management measures following installation, including off-ramps to change or end project earlier than anticipated if needed
- Gather robust before data if the project involves tradeoffs
- Prepare solid FAQs in advance of project
- Use both traditional and social media during the entire length of the project, work proactively with the media
- Spend the time needed to meet with people in-person and it is good to have strong community relations in advance of the project.
- Vocabulary – word choice matters, though some cities continue to use project names such as "road diets" and have not experienced negative reaction. Again, it depends on community context and level of tradeoffs/risks associated with the project.

This interview process has been very helpful to better understand that many cities are advancing new street designs and processes similar to Boulder's Living Lab program and they are experiencing similar challenges and learning opportunities. Each of the cities contacted expressed appreciation for City of Boulder staff reaching out to them, and they are all interested in continuing an open dialogue to learn from our shared experiences as we all strive to create more walkable and bike-able streets within our communities.

The Transportation Division staff is planning to host a Complete Streets "national practitioners' panel" in the fall 2016 and will feature a subset of community representatives from the national complete streets interview research conducted by staff this spring. Staff will use the information from the event to help shape recommendations for future Complete Streets innovations; including options for enhancing city's corridor planning processes, 2.0 network planning,, and other potential pedestrian, bicycle, and transit related projects and programs. In addition, staff will establish a methodology to assess multi-modal "level of service" in an approach that emphasizes people moving capacity, low stress, quality of experience, along with safety and efficiency for people using all modes of travel. This will guide next steps for a city-wide 2.0 network planning work item, proposed to begin in 2017.

Renewed Vision for Transit

The 2014 TMP created a Renewed Vision for Transit and includes a comprehensive set of strategies identified in the TMP Action Plan to enhance local and regional transit service, capital improvements, policies and programs. Major accomplishments include the opening of US 36 Flatiron Flyer Bus Rapid Transit (BRT) as well as the new inter-regional FLEX service from Fort Collins to Boulder in January 2016. Progress in each of Renewed Vision for Transit areas is discussed in the following section and staff is seeking input from TAB and City Council in May to help guide the transit work program in 2016-17. Staff will be presenting a council study session focusing on a more in-depth check-in on the Renewed Vision for Transit on September 27, 2016.

Planning Studies

HOP Transit Study

Boulder is celebrating 21 years of the city's flagship Community Transit Network (CTN) route, the HOP. City staff kicked off the first phase of the HOP Transit Study in October 2015 with a week-long HOP 21st birthday campaign. The week-long campaign provided an opportunity to engage with current riders and agency partners to celebrate the accomplishments of the HOP over the last two decades. It also provided information that the HOP Transit Study would begin in 2016 to explore opportunities to improve the HOP for the future.

The purpose of the second phase of the HOP Transit Study is to build upon the success of the HOP by enhancing the customer experience and addressing changes in land use and transportation options over the last two decades. Based on the operational analysis and public engagement, the HOP study planning process may lead to a route and service redesign, enhanced wayfinding and branding, and other potential refinements. The HOP Transit Study will build on the tradition of a community driven process that the city's relied upon over the years to design the CTN. The study is an opportunity to revisit the goals and objectives of the service, ensure the alignment of these goals with community objectives, and the ability to accommodate important activity centers over the next few years as well as for the longer term future. This will help maintain and enhance the HOP as a cornerstone of the CTN in service for the Boulder community.

The HOP Transit Study will be based on robust transportation planning process, including extensive public outreach and stakeholder engagement as well as collaboration with agency partners, including Via Mobility Services, Regional Transportation District (RTD), University of Colorado Boulder (CU), and Boulder County. City staff is organizing a group of stakeholders that will include representatives from the University Hill Business District, Downtown Development Authority/Downtown Business Inc., Downtown Management Commission/Downtown Business Association, Boulder Chamber, Boulder Junction Access District, 29th St. Mall, Google, CU Student Government, Chautauqua Neighborhood, Boulder Housing Partners, and Boulder County's Local Coordinating Council. Three stakeholder workshops are anticipated in the planning process, as well as public meetings at key milestones. Staff is also participating as part of the Chautauqua Access Management Plan (CAMP) to help identify potential transit service opportunities to serve this area and mitigate traffic and parking impacts to the adjacent neighborhoods.

Mobility Hubs

Mobility hubs are a new concept that came about through the 2014 TMP update process and are envisioned to enhance first and final mile connections with major transit stations throughout the community. Mobility hubs combined transit stations with bike share, car share, rideshare, and park and rides/satellite parking sites and are intended to be integrated with the surrounding land use to provide a more convenient and welcoming experience for people accessing transit. Staff from multiple city departments and agency partners has begun exploring mobility hubs concepts in North Boulder, as well as looking for opportunities to enhance the Table Mesa park and ride.

North Boulder Mobility Hub

Conceptual planning for the North Boulder mobility hub continues. This mobility hub would provide a combined set of transportation services on one site; including a transit station, bus turnaround, Boulder B-cycle bike share, a Bike-n-Ride shelter, and car share services. The site under consideration for the North Boulder mobility hub is located at the southeast quadrant of the US 36/Broadway intersection and is currently owned and used by CDOT for material storage. Staff continues to work with CDOT to relocate the use of sand/material storage to another site.

Staff presented preliminary design concepts for the North Boulder mobility hub to City Council at its TMP February 25, 2015 study session. In response to council comments that the concepts looked too suburban and needed a more urban design and attractive gateway features, staff has been working with consultants and RTD to refine the design concepts, incorporating design principles such as iconic roof structures, streetscape elements, landscaping and paving materials that frame and define spaces and a large sculptural gateway element. The potential for public/private partnerships to provide shared "edge" parking on properties adjacent to the site is also being explored.

Table Mesa

Table Mesa Station (pnR) is an important connection to regional and local transit in the city and is identified as a mobility hub in the Renewed Vision for Transit. In early 2016, staff submitted an application for CDOT FASTER funds to make multi-use path improvements to enhance bike and pedestrian access to the Table Mesa Station (PnR) and staff is coordinating with Boulder County and RTD to identify funding for a Bike and Ride facility at Table Mesa for 2017 implementation. Staff continues to identify funding for other mobility hub improvements such as electric vehicle charging stations, car-sharing locations, and a B-Cycle station.

Joint Maintenance Facility Planning

In February 2016, the City of Boulder convened a group of agencies, including CU, RTD, Via, BVSD, Boulder County and CDOT to understand respective transit and vehicle maintenance facility needs and to discuss potential opportunities for partnering on a joint maintenance facility. At a time when several agencies are outgrowing current facilities or embarking on plans to build new transit and vehicle maintenance facilities, it is an opportune time to start this discussion. At the kick-off meeting, it was determined that a number of mutual needs exist and potential opportunities to co-locate facilities should be further explored. To date, the agencies are drafting their lists of needs and ideas and the group will reconvene in late 2nd quarter.

First and Final Mile –US36 wayfinding study

In November 2015, 36 Commuting Solutions, in partnership with local jurisdictions, was awarded a DCROG Urban Center/STAMP grant to fund final design and construction drawings for unified corridor-wide signage along the US 36 Bikeway and at US 36 BRT stations, including the downtown Boulder, Boulder Junction and Table Mesa transit centers. Branded wayfinding signage will help users locate multimodal access points and direct travelers to and from destinations within the first and final mile of station areas and to the US 36 Bikeway. The Northwest Corridor Bicycle and Pedestrian Wayfinding Plans and Site Design project is expected to kick off in late-spring/early-summer 2016.

Real time information update/status

Implementing real-time passenger information is one of the top priorities in the Renewed Vision for Transit. In 2015, CU implemented real-time information for the HOP and Buff Bus that can be accessed via www.boulderbustracker.com and via the CU Bus Tracker smartphone application. In 2016, RTD implemented a beta real-time information system for local buses that can be accessed via the Transit App smartphone application. RTD is continuing to test and improve their real-time information data. Next steps for RTD include implementing real-time tracking for regional buses and light rail by the end of 2016. The City in partnership with CU is working with RTD to integrate HOP data into the district-wide real-time information system. This is expected to be implemented by fall 2016.

What's Next for 2016 - 2017

Transit Service Delivery Model Analysis

The TMP identifies the need to explore models for delivering local and regional transit service consistent with implementing the Renewed Vision for Transit. City staff is working with local and regional partners to scope a study that will explore the most effective and efficient transit service delivery and governance options for implementing the Renewed Vision for Transit.

A detailed analysis is required to fully explore service delivery options, such as evaluating costs, benefits, opportunities, and challenges associated with potential service delivery options. With the future of BRT service implementation and other Community Transit Network (CTN) enhancements, there is significant opportunity to explore different types of service delivery models with agency partners including Via Mobility Services, RTD, and others. The potential service delivery models range from maintaining the status quo, to developing new partnerships for future transit service delivery. Funding and legislative issues associated with service delivery options would be significant and will require extensive study. A draft scope for the study will be presented to council at the September 27, 2016 study session focused on the TMP's Renewed Vision for Transit.

Eastside Circulator study

As one of the TMP action items, the City of Boulder and University of Colorado (CU) have been working jointly to define elements of an Eastside Circulator project. This City-CU partnership is intended to leverage the regional US 36 BRT investment and advance the goals of the University and the City's Renewed Vision for Transit. This project will connect the CU main and east campuses, Williams Village, and Boulder Junction to the US 36 Bus Rapid Transit (BRT). Technical work for this project will resume in late-2016 and will be informed by the recommendations that come out of the HOP Transit Study.

Strategic planning with Via Mobility Services

A successful process will examine and make informed projections about trends and opportunities that will likely continue to shape and evolve Via's services and create possibilities to strengthen the city's partnership and goals regarding the HOP and future transit services. The goal of the process will be to articulate specific goals for an ongoing partnership and describe the action steps and resources needed to accomplish them over the next 5-10 years.

Through the combined short-term and long-range initiatives of the TMP's Renewed Vision for Transit, the city is continuing to work collaboratively with our agency partners to strengthen local and regional transit connections for the Boulder community.

Regional Travel

Regional Travel is another of the inter-related TMP Focus Areas and provides policies to guide collaboration with local and regional partners to enhance multimodal transportation options for people traveling to/from Boulder and the surrounding region. Of particular importance is developing and implementing transportation options for Boulder's non-resident employees to support the community's Economic Vitality goals as part of the overall Sustainability Framework. The following highlights showcase progress to-date in the TMP area of Regional Travel:

US 36 Flatiron Flyer

RTD's new US 36 Flatiron Flyer service began on January 3, 2016. The service provides all-station and express service between Denver and Boulder. US 36 Flatiron Flyer service originates from Boulder Junction at Depot Square Station during morning and evening rush hour and Downtown Boulder Station all day on weekdays and weekends. Over the first three months of service, RTD has seen a 45% increase in ridership over what previously existed on the US 36 corridor bus routes in August 2015. The majority of passenger trips still occur during rush hour. Overall, the Flatiron Flyer's operation is performing 90% as scheduled, with the remaining service being over 5 min late. It is noteworthy that ridership in all time periods, including midday for January 2016 compared to January 2012 has increased significantly.

FLEX

The new FLEX service to Boulder began on January 18, 2016. City of Boulder staff worked with Boulder County, Longmont, RTD, CU, Colorado State University (CSU), Loveland, and Fort Collins/Transfort to extend interregional transit service to/from Boulder on the FLEX route along US 287 and SH 119. The service is made possible by a DRCOG grant award of $1.15 million. This service provides five trips each weekday, two in the morning and three in the afternoon/early evening. A one-way trip takes approximately 1 hour 30 minutes. After the first month of service, with 5 trips per day, Transfort is seeing about 170 daily riders on the FLEX to Boulder. More information about the service can be found by visiting the FLEX Website.

Regional Corridor Studies

In 2014, RTD completed the Northwest Area Mobility Study (NAMS) which identifies a system of regional BRT corridors along state highways, including SH119, SH7, US287, South Boulder Road, and SH42. While each of these corridors are important individually, together they form a system of mobility to serve the current and future travel needs of people living and working in RTD's northwest region. Staff from the city, Boulder County, RTD, CDOT, and other regional communities are continuing to work together to advance the NAMS BRT corridors. The following provides highlights from the first two corridor studies underway:

East Arapahoe (SH 7)

The State Highway (SH) 7 BRT Study is the next step in advancing arterial BRT between Boulder and Brighton and is being led by Boulder County with the support and involvement of all jurisdictions along SH 7 including the City of Boulder. The 12-month study, which is expected to begin in spring 2016, will:

- build on the 2014 SH 7 Planning and Environmental Linkages (PEL) Study by extending the PEL further west to 75th Street, and
- study the feasibility, operations and cost of BRT on SH 7 between Brighton and downtown Boulder incorporating findings from the East Arapahoe Transportation Plan.

A Policy Advisory Committee (PAC) composed of elected leaders from the US36 Mayors and Commissioners Coalition and representatives from CDOT, RTD, and Denver Regional Council of Governments (DRCOG) has been formed. The PAC is supported by a Technical Advisory Committee (TAC) made up of planning staff from the involved agencies and both committees are meeting quarterly.

Diagonal (SH 119)

In April 2015, DRCOG funding was also awarded for the State Highway (SH) 119 BRT Study between Boulder and Longmont. The $3.5 million study will be led by RTD with the support and involvement of all jurisdictions along the corridor, including the City of Boulder, and is scheduled to begin in summer/fall 2016. The purpose of the study is to conduct preliminary engineering and environmental work for the project and receive National Environmental Policy Act (NEPA) clearance. RTD is showing a demonstrated funding commitment for this project by including it as a 2021 construction project (pending matching funds) in its adopted Strategic Business Plan.

Transportation Demand Management (TDM)

The Transportation Demand Management (TDM) Focus Area of the TMP includes a variety of projects and programs designed to increase the efficiency of our current transportation system. Two projects currently underway as part of the 2014-2016 Action Plan include the Community-Wide Eco Pass and TDM Plan Ordinance for New Developments.

Community-Wide Eco Pass Study

To advance the city's TMP goals for enhancing transit options for residents and non-resident employees, the city is continuing to partner with Boulder County to explore a community wide Eco Pass. In the first quarter of 2016, Boulder County conducted a poll of residents on the use of property taxes to fund a community-wide Eco Pass program. While the idea was supported in Boulder, the rest of the county showed a low level of support. Following the results of the polling, the Policy Advisory Committee (PAC) decided that the focus of a community-wide Eco Pass program should shift to the city with either a program for all residents and employees or an employee-only program. The PAC wrote a letter to RTD asking for estimated costs of those two program options. At the time of memo submission, a response has not yet been received.

Following the 2015 fare increases, RTD has initiated a Pass Program Working Group that will examine all pass programs including the Eco Pass and the Community Pass concept that will

begin work in the fall. The city and county hope to have staff appointed to serve on that committee. In the meantime, the Technical Advisory Committee (TAC) will continue to work with RTD on pricing methodologies and estimates of induced transit service demand. Staff will continue to keep council updated when RTD responds to the PAC letter and as they initiate the Pass Program Working Group.

TDM Plan Ordinance for New Developments

In 2016, as part of the Access Management and Parking Strategy (AMPS) work program, staff from Transportation and Community Planning, Housing + Sustainability continues to work on the design of a potential TDM Plan ordinance for new developments in conjunction with proposed changes to the parking code. Work on the TDM Plan ordinance will also be included in the second part of the transportation component of the Impact Fee Study as staff shifts to the evaluation of funding options for on-going Operations and Maintenance (O&M), which includes funding for TDM programs for existing and new developments.

During the second quarter, the project team is collecting data and evaluating the effectiveness of current TDM Plans of 14 developments, seven residential and seven commercial. The evaluations will include a parking supply and demand analysis, an interview with the employer or property manager, and a travel behavior survey of residents or employees. The analysis of the TDM Plans will be used by the project team to further refine vehicle trip/single-occupant vehicle targets and other components of the TDM Plan ordinance for new developments.

Staff will continue to update council on progress towards designing a TDM Plan ordinance for new developments as the evaluation is completed and staff refines the policies and strategies with TAB and Planning Board.

Funding

The use of transportation funds is guided by the investment priorities outlined in the TMP. The highest priority is funding system operations, maintenance and safety. Next is improving the operational efficiency of our multimodal system and improving quality of life. The lowest priority is adding additional auto capacity. In 2016, an interdepartmental team is conducting an Impact Fee Study which includes a transportation component. The transportation element of the fee study addresses how to fund capital improvements related to new growth as well as on-going funding for operations and maintenance.

Transportation Funding Analysis

On April 12, city council held a study session with council on the impact fee study including the transportation component. Staff received feedback from council on the plan-based approach that will be used to assess new growth's fair share of capital improvement costs. As staff prepares for the June study session with council and recommended fee or tax rates for the capital side, the project team and the working group will shift focus to transportation funding options of on-going operations and maintenance. Due to the complexity and wide ranging impacts of this phase of the impact fee study, staff anticipates that this work will continue into 2017. As part of the evaluation of funding options, staff will include the potential uses of a head tax to fund on-going transportation operations and TDM programs.

Integration with other Sustainability Initiatives

The 2014 TMP added a fifth Focus Area of 'Integration with Sustainability Initiatives" to identify policies and opportunities for integrated, inter-departmental efforts. These activities continue on an on-going basis in a number of work areas to ensure collaboration with transportation and land use planning, all in service of the broader community goals for sustainability and resiliency. 2016-17 initiatives include the following:

Boulder Valley Comprehensive Plan Update (BVCP)

Transportation staff members are part of the core team for the BVCP update and participated in developing the trends reports and the first phase public outreach effort. Staff and transportation consultants will be closely involved in the next phase of scenario development and evaluation. Staff has also continued developing the 15 minute Neighborhood Access Tool created during the TMP process and this tool will be used in the scenario process.

Climate Commitment

Transportation staff is participating in the on-going development of the Climate Commitment, including the interdepartmental implementation group and the Whole Systems Energy Change workshop at Chautauqua in Feb. 2016.

AMPS – Coordination with Civic Area and Chautauqua Plans

The multi-departmental initiative to create an Access Management and Parking Strategy is continuing in 2016, with a focus on collaboration with key work program items such as the Civic Area and Chautauqua Access Management Plan.

To reduce city employee parking demand in the Civic Area lots, staff initiated two new transportation demand management (TDM) programs and revised an existing one. The two new programs include Satellite Parking and a Parking Cash Out program (PCO). The city's Employee Transportation Coordinator (ETC) also rebranded individual outreach and assistance into a Concierge Program for transportation options. The new programs were piloted in November and December 2015 and based on those results the city implemented a formal PCO program for Civic Area employees and satellite parking at the former Boulder Community Hospital site on Broadway. In the first quarter, the single-occupant vehicle (SOV) mode share for downtown city employees is down to 46 percent from 51 percent in 2014 and approximately half of downtown city employees are qualifying for the parking cash out benefit for 3 out of the 5 days in a work week. Program evaluations will continue to be conducted quarterly throughout 2016 and results used in the site planning and phasing process for the Civic Area improvements.

The lease between the City of Boulder and the Colorado Chautauqua Association (CCA) was renegotiated in 2015and requires the development of a Chautauqua Access Management Plan (CAMP). The CAMP is intended to be a tailored access management strategy to balance the access of the variety of users and modes while also maintaining the natural, built, and historic environments. Issues that need to be addressed include auto use, parking and circulation; noise and fumes from existing bus service and pedestrian crossing and safety issues. After discussions with the City Council at the February 9, 2016 Study session, city staff identified the following actions to incorporate into the 2016 work plan for development of the CAMP:

- Develop a data collection/evaluation plan and a public process plan for Council's review prior to this summer
- Gather data including parking utilization and duration and an updated user intercept survey this summer
- Work with OSMP to coordinate data collection and outreach and to understand data and system-wide options
- Explore transit options and other ideas for Baseline as part of CAMP development.

The CAMP process has kicked off with a community open house on Apr, 28, 2016 with results expected in 2017.

Bee friendly Median Maintenance

The city is on a campaign to use less neonicotinoid pesticides and is researching ways to improve habitats for pollinators. Transportation staff is working with local experts to create biodiverse habitats that create safe and healthy lives for local pollinators along our right of way areas and medians. One area under review for habitat improvements are the parkway strip and medians located along 28th Street. Discussions on this concept began in April and a plan will be developed later this year.

Metrics Program

The Transportation Metrics Program is a comprehensive data collection and evaluation effort to monitor the performance of the transportation system and assess progress toward the measurable objectives of the TMP. This program was discussed in detail as part the Aug. 25, 2015 TMP study session. The results of this program were used to establish the work areas of the 2014 TMP planning process and inform the work of the Transportation Division.

Transportation Report on Progress

The 2016 *Transportation Report on Progress* (RoP) was released to the community in March, 2016. It is the third RoP prepared by Transportation and is intended to present all the activities of Transportation to the community in an attractive and accessible way. The major 2016 RoP findings are consistent with the 2014 TMP in that the community needs to accelerate the rate of mode shift for Boulder residents and we need to accomplish mode shift for the increasing number of non-resident employees coming into Boulder.

Safe Streets Boulder Report

The City of Boulder seeks to provide a safe and efficient transportation system for people using all modes of travel. Transportation safety has always been a priority for the city. The 2014 Transportation Master Plan (TMP) affirmed the city's commitment to safety by establishing a new objective: "Toward Vision Zero" to eliminate fatalities and serious injuries from future traffic collisions. This objective reflects a national and worldwide movement to innovate and use a data-driven, interdisciplinary approach to improving safety across the city's transportation systems. It is now one of the TMP's nine measureable objectives.

The Safe Streets Boulder report is an important step in meeting that objective. The 2016 Safe Streets Boulder report includes an evaluation of traffic collisions and establishes a baseline for

tracking progress and a plan for future action to achieve traffic collision reduction goals. It builds upon a previous report, published in 2012, that provided an analysis of motor vehicle collisions involving a bicyclist or pedestrian and identified safety improvements to address these causal factors of these collisions.

A primary purpose of the evaluation efforts for the Safe Streets Boulder initiative is to identify overall trends and guide strategies for mitigating future collisions, particularly those that result in serious injuries and fatalities. The data presented in the 2016 Safe Streets Boulder report shows that the city's fatal collision rate is well below the national average and the lowest among Colorado cities with comparable populations. However, during the six years between 2009 and 2014, an average of three people lost their lives and more than 60 people sustained serious injuries each year as a result of traffic collisions. Key findings from the data analysis include:

- Between 2009 and 2014, an average of 3,275 collisions were reported to the Boulder Police Department each year.
- The percentage of collisions that resulted in a serious injury or fatality has been relatively flat at 2 percent of all collisions during this six-year span.
- A disproportionate number of bicyclists and pedestrians are involved in collisions that result in serious injuries or fatalities. While only 8 percent of all traffic collisions in the City of Boulder involve a bicyclist or pedestrian, these collisions account for approximately 60 percent of serious injuries and fatalities.
- A disproportionate number of impaired person traffic collisions, especially those involving bicyclists or pedestrians, result in serious injuries or fatalities. While approximately 3 percent of total collisions involve an impaired person, 12 percent of serious injuries and 38 percent of fatalities involve an impaired person.

2015 Travel Diary Survey

The Travel Diary survey has been conducted since 1990 to collect travel information from Boulder residents and is a one data source used for understanding travel behavior and for evaluating progress toward the city's TMP objectives. The Travel Diary survey is currently conducted every three years with the aim of recording all travel for a 24 hour period for approximately 1,000 Boulder households. The 2015 Travel Diary provided three ways for residents to respond; the traditional paper travel log, a web-based travel log, and for the first time a smart phone app. Results from the travel diary surveys since 1990 are compiled and discussed in the *Mode Shift Report* prepared by the National Research Center (NRC), a professional survey research firm.

Staff is currently reviewing the draft Mode Shift Report from NRC and will provide more details on the results at the TAB meeting and as part of the City Council Study Session materials. Result from the 2015 Travel Diary survey generally show continued progress by Boulder residents in reducing the SOV mode share of all trips.

The Transportation Metrics Program is an on-going effort, with traffic counts, bicycle counts and signalized intersection analysis occurring every year. The Boulder Valley Employee Survey and Downtown Employee Survey are scheduled for the fall of 2017. Staff and consultants have

continued development of the smartphone survey app that was piloted with the 2015 Travel Diary and anticipate using the app extensively in upcoming survey efforts.

V. PUBLIC PROCESS

On April 21, the Transportation Division hosted a Complete Streets Open House at the Boulder Chamber of Commerce to share information on how the city is improving the transportation system to meet the safety and sustainability goals of the community and for the community to provide feedback on current projects. Approximately 75 community members attended. The open house provided information on the following projects:

- Canyon Corridor Complete Streets Study
- 30th and Colorado Boulevard Complete Streets Study
- East Arapahoe Transportation Plan
- Living Lab Phase I Pilot Projects and Phase II Folsom Street Pilot Project
- Boulder Walks program
- HOP Transit Study
- North Boulder (NOBO) Mobility Hub
- Baseline Underpass

The open house featured key findings from the Living Lab Folsom Street Pilot Project over the last year and serve as an opportunity to gather community feedback about the project's next steps. Community feedback will help guide next steps on whether to continue, refine or remove the street design treatments currently being tested.

The open house was also an opportunity for the East Arapahoe Transportation Plan project staff to share community feedback collected over the last several months related to conceptual design alternatives under consideration, the criteria by which alternatives are evaluated and next steps in the planning process. Comments on the East Arapahoe Transportation Plan showed most people were new to the project and requested an overview of the planning process and conceptual design alternatives. Additional ideas suggested varied from creating directional lanes that change direction in the a.m. and p.m. hours, to narrowing the traffic lanes on Arapahoe and painting a green bike lane, to adding more auto lanes.

The HOP Transit Study project information and schedule were displayed to give the community an opportunity to learn about a new transit project that is beginning this spring. Individuals were interested in the project and offered comments on ways to improve route productivity, efficiency, and driver customer service.

In addition, city staff presented information regarding RTD's proposed service changes for January 2017. Overall, individuals did not have comments about the specific changes, but offered comments regarding timing of transfers at the Downtown Boulder Station, requests for other Boulder bus routes and for special event service for CU athletic events.

Comments from TAB

Comments from the May 9 TAB meeting regarding the TMP progress update will be shared with City Council as part of the May 31 Study Session.

VI. NEXT STEPS

The TMP implementation continues to be guided by the *TMP Action Plan* in alignment with the annual City Council work program and city budgeting process, and guided by input from TAB and council provided through these periodic study sessions**.** Staff continues work in all of the TMP focus areas with a 2016 emphasis on the pedestrian following council's direction from its annual retreat. The fundamental policy direction and strategies of the TMP are being integrated with other city-wide planning initiatives, including coordination with the development impact fee analysis, BVCP update, AMPS, CAMP, and the Climate Commitment. Staff continues with the ongoing community engagement and will be returning to discuss key milestones on major project with the boards and council.

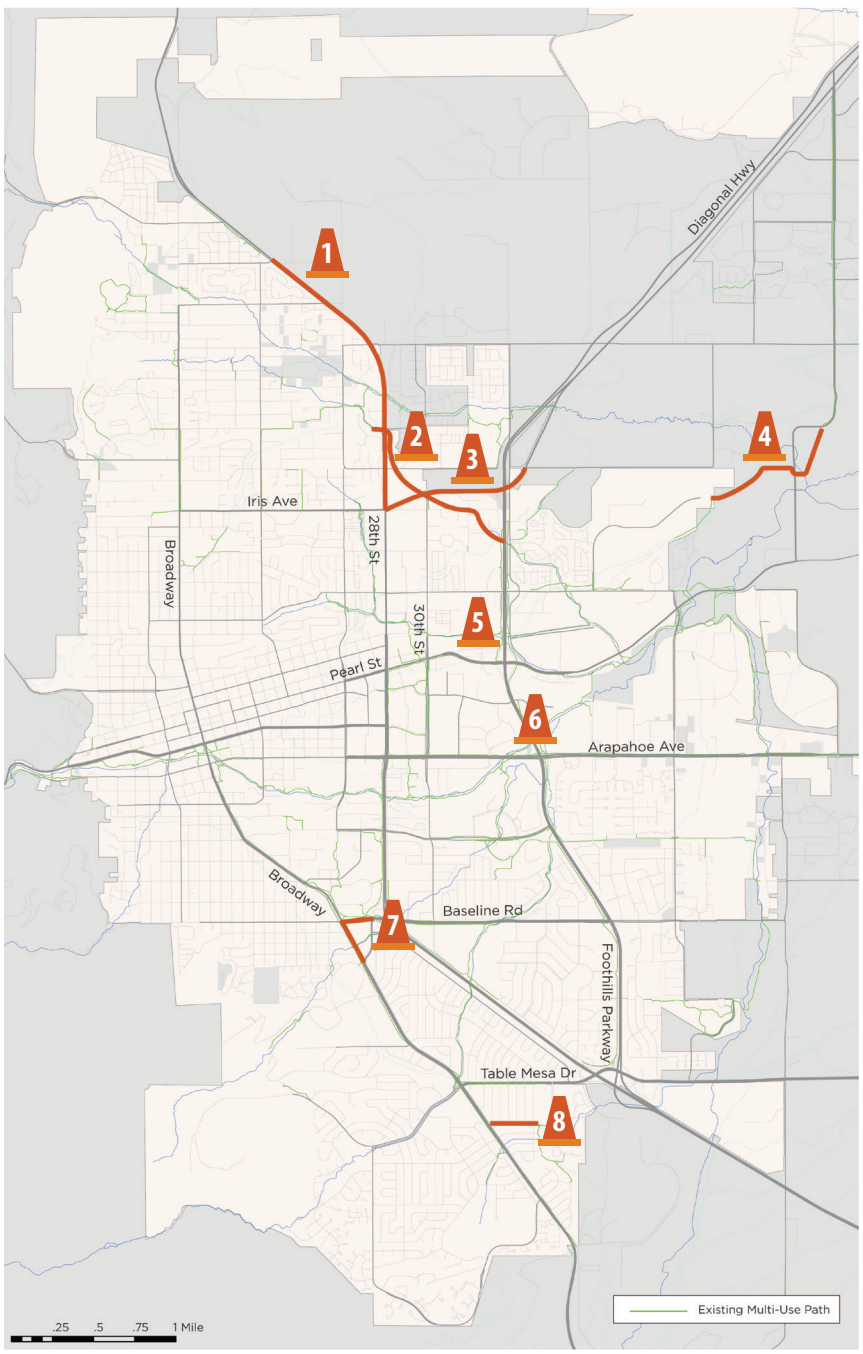
For more information and updates regarding the 2014 Transportation Master Plan, please visit: www.bouldertmp.net

ATTACHMENTS

A. 2016 Transportation CIP Projects Map
B. East Arapahoe Transportation Plan Summary
C. Canyon Complete Streets Study Summary
D. Living Lab Program Summary Report
E. Complete Streets Open House Summary

BOULDER CONE ZONES MAJOR CONSTRUCTION, SPRING/SUMMER 2016

These current and upcoming City of Boulder construction projects are making Boulder's roads, multi-use paths, greenways and other infrastructure safer and last longer. Visit **bouldercolorado.gov/transportation** for more information about these and more upcoming projects in and around Boulder and check **BoulderConeZones.net** for the latest construction updates.



Visit **CoTrip.org** for information about Colorado Department of Transportation projects or **bouldercounty.org/roads/construction/pages/default.aspx** for Boulder County projects.

Please note that start and completion dates could change due to things such as weather.

1 28th Street
28th Street between Iris and Yarmouth avenues
- **Duration:** Ongoing through spring
- **Description:** Builds multi-use path, pedestrian and bikebridge, bike lane and widens vehicular bridge
- **Impact:** Pedestrian detours around closed multi-use path and sidewalk

2 Wonderland Creek greenway improvement project
Wonderland Creek from Winding Trail to Foothills Parkway
- **Duration:** Ongoing through early 2018
- **Description:** Flood mitigation project that includes construction of multi-use paths and underpasses
- **Impact:** Intermittent road and path closures that could cause detours

3 Diagonal Highway reconstruction
Diagonal Highway between 28th Street and Independence Road
- **Duration:** Ongoing through fall 2016
- **Description:** Reconstructs vehicle traffic lanes, adds bicycle and multi-use paths
- **Impact:** Lane closures during off-peak hours

4 Andrus to Airport multiuse path
Between Andrus Road and Airport Road
- **Duration:** Summer 2016
- **Description:** Builds trail to fill gap between existing paths
- **Impact:** Minimal, as construction is off road

5 Frontier Avenue bridge replacement
Frontier Avenue between Pearl Parkway and Pearl Street
- **Duration:** Ongoing through spring 2016
- **Description:** Replaces old bridge, adds sidewalks
- **Impact:** Occasional single-lane closures

6 Boulder Creek at Arapahoe Avenue pedestrian bridge replacement
Boulder Creek at Arapahoe Avenue
- **Duration:** Summer
- **Description:** Builds new pedestrian and bike bridge
- **Impact:** Minimal, with no detours necessary

7 Baseline Underpass
Baseline Road between Broadway and 27th Way
- **Duration:** Spring 2016 through spring 2017
- **Description:** Builds underpass to replace current street-level pedestrian and bike crossing to improve safety
- **Impact:** Lane closures in each direction. Crosswalk will be closed. Bus stop and business access will remain open

8 Hanover Avenue multiuse path
Hanover Avenue between Broadway and 46th Street
- **Duration:** Spring to summer
- **Description:** Builds multi-use path along roadway, adds curb extensions and marked crosswalks
- **Impact:** Lane narrowing, occasional lane closures. Pedestrian detours

Attachment B

East Arapahoe
Transportation Plan

CITY OF BOULDER

EAST ARAPAHOE TRANSPORTATION PLAN
Public Input Summary

November 2015 to April 2016 – DRAFT

(4.26.2016)

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SUMMARY OF PUBLIC INPUT

1. DOCUMENT OVERVIEW

This document is a summary of public input received by the East Arapahoe Transportation Plan project team as of March 1, 2016. It highlights major themes, ideas, concerns and suggestions raised by members of the public through a series of public engagement activities conducted over a five month period between November 2015 and March 2016. Opportunities for public input included the following:

- An online questionnaire was launched on the project web site on November 19, 2015. The online questionnaire was publicized at the public workshop, through a series of email blasts, social media pushes, via postcards that were hand delivered to businesses along the East Arapahoe corridor and through stakeholder meetings and pop-up events held along the corridor. 126 people completed the questionnaire.
- A public workshop was held on November 19, 2015. Approximately 30 community members attended the interactive public workshop during which they had a chance to review the range of transportation improvement alternatives being considered and to discuss the strengths and weaknesses of each. Participants also provided feedback on a set of evaluation criteria by which to evaluate potential improvements.
- Between November 2015 and March 2016, the project team held individual meetings with over 15 stakeholder groups along the corridor to present project information and receive input.
- In February 2016, the project team held a number of small group outreach activities, including two pop-up events at the BVSD administrative office and bus drivers lounge, an open house for residents of the Peloton, a focus group for Boulder Community Health employees, and a presentation and workshop at Connect Boulder luncheon.
- A Complete Streets open house was held on April 21, 2016 to highlight projects and programs within the Complete Streets focus area of the Transportation Master Plan (TMP). Over 70 community members attended. East Arapahoe Transportation Plan staff provided information about the project, shared public input and feedback hear to-date and received additional community input and feedback.
- The project team has also been receiving public comments and feedback via direct email.

2. SUMMARY OF ONLINE QUESTIONNAIRE RESULTS

The online questionnaire asked a range of questions to assess the primary concerns of those who use Arapahoe Avenue, to gauge reaction to a variety of potential transportation improvement alternatives and to understand what is most important to travelers. There were 126 responses, most of which were complete. The following is a summary of responses to each question.

Question 1. As we plan for the future, what would make it easier for you to travel within the East Arapahoe corridor?

This was an open ended question, and the responses varied widely. What follows is a snapshot of the most common themes in these responses. As shown in Figure 1, the need for more general purpose lanes received the most responses, followed by improved bicycle infrastructure, a better pedestrian environment, bus frequency, safety, completing the multi-use paths, and adding more bus destinations.

Note that these responses were cross tabulated with Question 4 in the questionnaire that asks respondents where they live. This gives some indication of what improvements are most important to residents, and what are most important to daily in-commuters. The results of this cross-tabulation show that those respondents who would like more general purpose lanes are evenly distributed between people who live within Boulder and those who in-commute. However, respondents who live in the City of Boulder were most likely to ask for bicycle, pedestrian, and transit improvements.

Figure 1: "As we plan for the future, what would make it easier for you to travel within the East Arapahoe corridor?"

40 responses mentioned another 14 more potential improvements, including:

- Changes to traffic signals
- Make no changes
- Aesthetics
- Land-use matters
- Bus system amenities
- Park-n-Rides
- Auto congestion
- Streetcar or light rail
- Side-running BRT
- Roadway connections
- Center-running BRT
- Wider lanes
- Street drainage
- Express lanes

Questions 2 & 3. What are the strengths and weaknesses of the preliminary corridor alternatives?

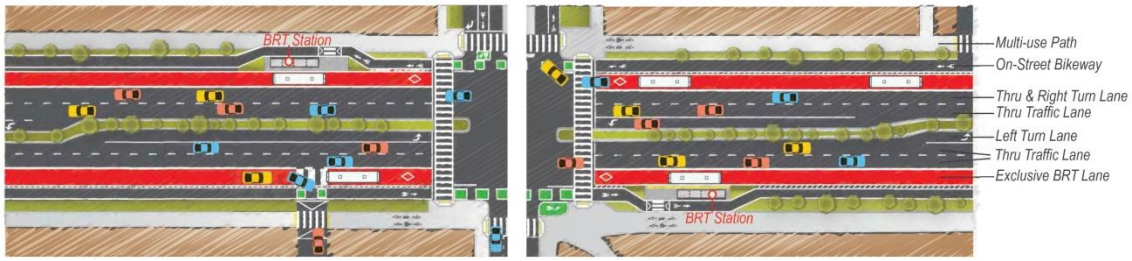
Based on the vision for East Arapahoe articulated by community members, staff developed a range of potential design alternatives that incorporate complete street elements, in various combinations. These alternatives are intended to illustrate a range of potential complete street design options for East Arapahoe, from a No Change Alternative whereby no transportation improvements are made, to Alternative A, which represents the most minimal investment in complete street features (like completing gaps in the multiuse path and adding more transit vehicles and enhancing stops, but not changing the current roadway design) to Alternative D which represents the largest investment in complete street features (like maintaining current general purpose lanes and widening the street to add exclusive BRT lanes and on-street bicycle facilities and pedestrian treatments).

Respondents were asked to provide feedback on the following Conceptual Design Alternatives:

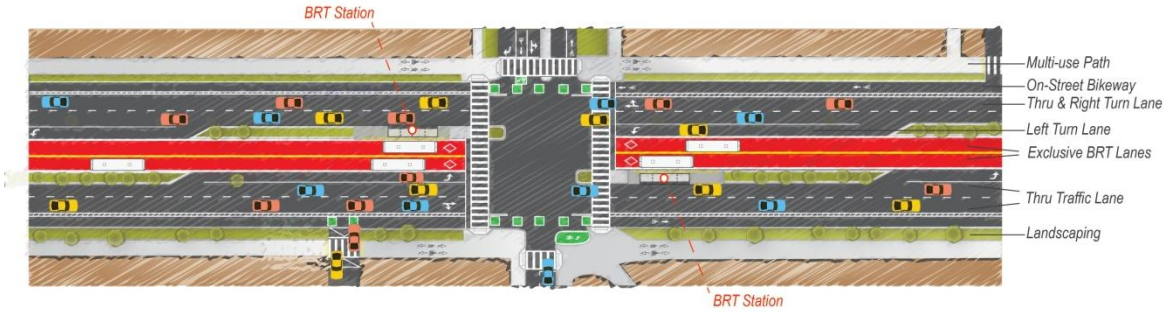
No Change: Side-running bus with three general purpose lanes in each direction and existing pedestrian and bicycle facilities and landscaping

Alternative A: Enhanced bus in mixed-traffic with three general-purpose lanes and a completed multi-use path for pedestrians and bicycles

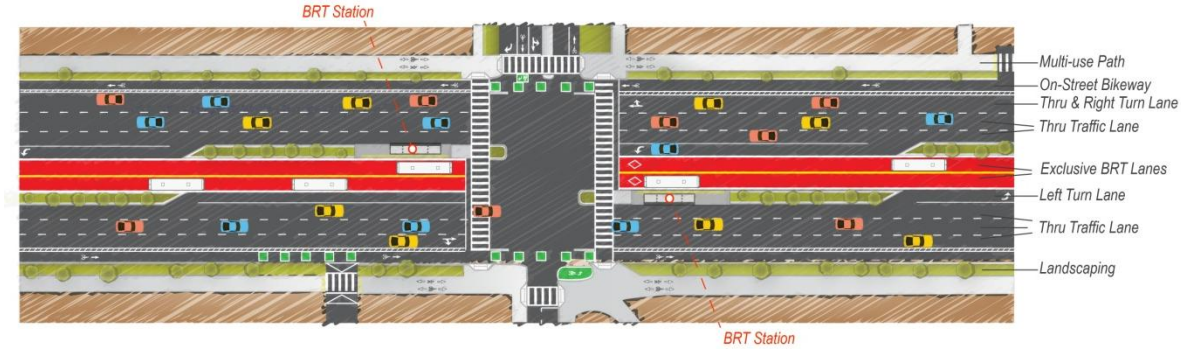
Alternative B: Side-running BRT in a semi-exclusive business-and-transit (BAT) lane (allows right turns) with two general purpose lanes, an on-street bikeway, and a completed multi-use path



Alternative C: Center-running BRT in an exclusive transit lane with two general purpose lanes, an on-street bikeway, and a completed multi-use path



Alternative D: Center-running BRT in an exclusive transit lane with three general purpose lanes, an on-street bikeway, and a completed multi-use path



The two open ended questions related to the strengths and weaknesses of each alternative allowed respondents to answer differently. Some respondents gave pros and cons for all alternatives, while others specifically cited a specific alternative as being either positive or negative. In tandem, the two questions related to strengths and weaknesses tell a similar story about respondent's general thoughts on the alternatives, as summarized here:

- Alternative A: Cited as a positive most often by those who prefer the lowest-impact option. When Alternative A was mentioned for its weaknesses, it has mostly to do with the minimal investment in transit and on-street bike facilities.
- Alternatives B and C: Those respondents generally in support of changes gravitate to either Alternative B or C, with various justifications given for side vs. center-running BRT. Alternatives B and C were cited as being weak primarily by respondents who do not want to see any automobile lanes repurposed for other uses.
- Alternative D: Most respondents who mentioned Alternative D expressed skepticism about the alternative because it is perceived as too wide.

Question 4. Do the preliminary alternatives presented represent a good range of transportation improvement options? If not, what other alternatives should be studied?

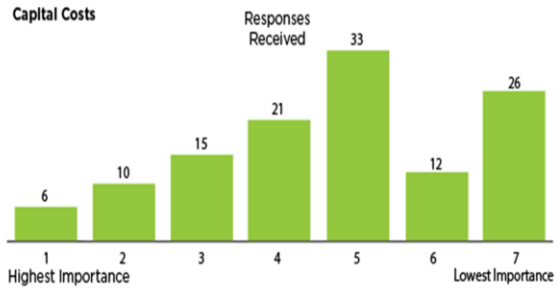
Some chose to answer simply that yes, this is a good range of alternatives. Other responses to this question answered that no, there are other transportation improvements that should be looked at, and these revealed several new ideas. These are listed below.

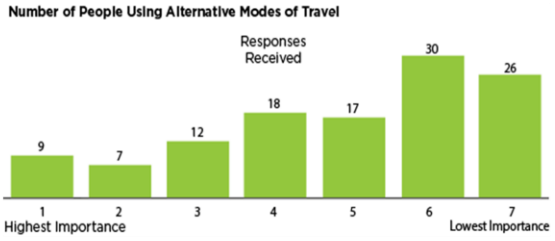
- Carpool lanes
- Additional automobile lanes
- Light rail or streetcar
- New exclusive off-street bike path
- Reversible general purpose lanes, with more lanes coming into Boulder in the morning and leaving in the afternoon
- Exclusive BRT lanes only during peak travel hours
- Traffic circles to replace traditional intersections
- Streetscape beautification as part of each alternative

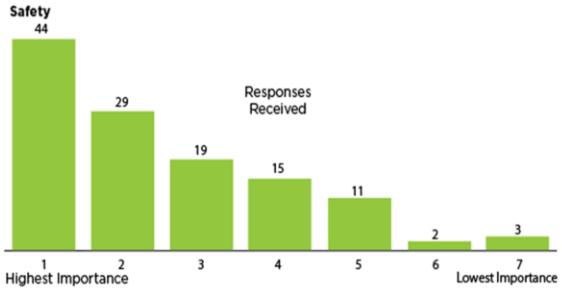
Question 5. In your opinion, which criteria are most important to evaluate the range of alternatives? (Please rank 1 - 7, with 1 being most important)

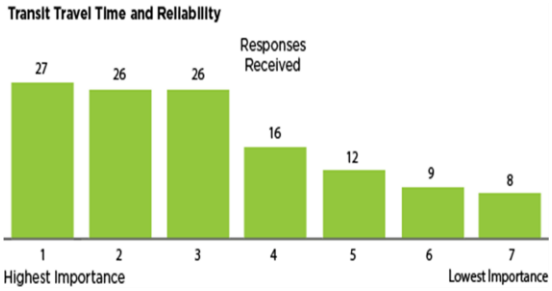
Respondents were asked to rank the following criteria on a scale of 1-7. The following series of graphs provide an idea of what was important to questionnaire respondents.

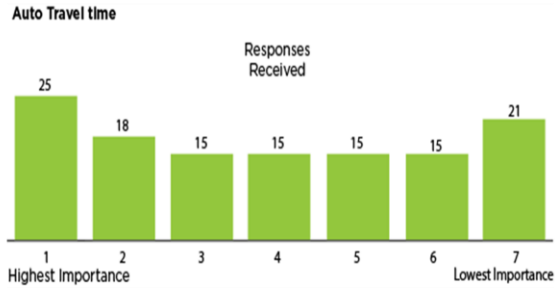
Figure 2: "In your opinion, which criteria are most important to evaluate the range of alternatives?"

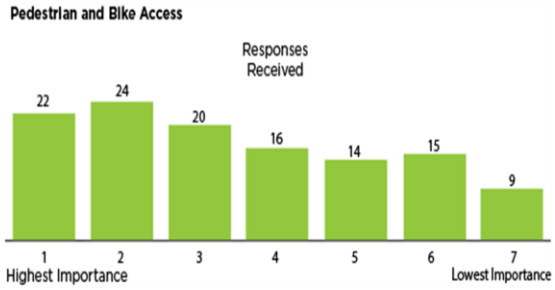


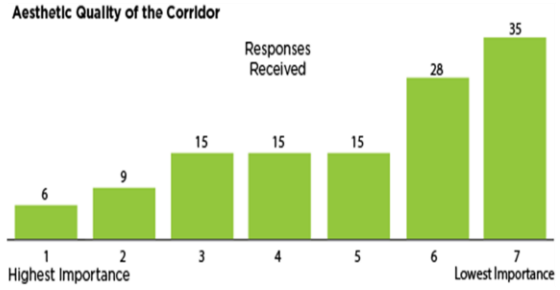










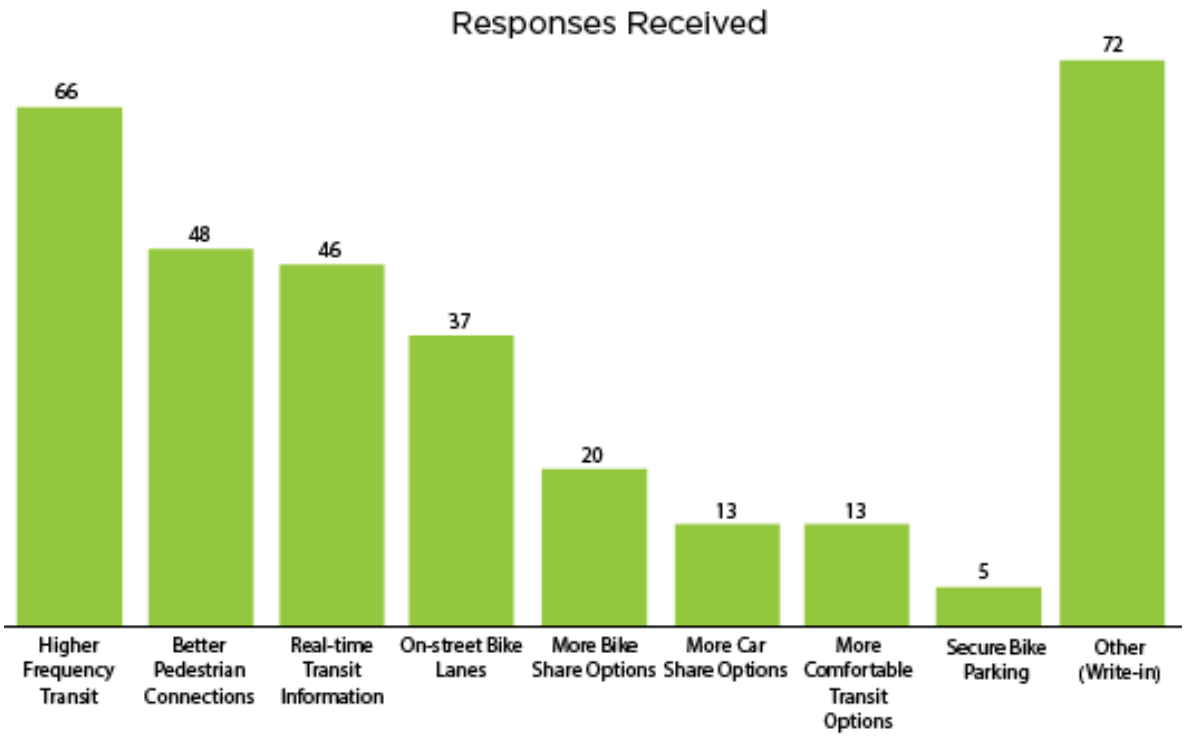


Question 6. What enhancements would allow you to consider other modes of travel than driving alone?

Respondents could choose as many of these options as they desired. They could also click "other" and write-in an answer. As shown in Figure 3, higher frequency transit is an enhancement that was valued by a majority of respondents. Other write-in responses generally reflected some of the other feedback the team has been receiving, including:

- Extending transit service hours
- Fixing the first and last-mile connections
- More transit destinations
- Pedestrian friendly infill
- More off-street bike infrastructure
- Park-n-Rides
- Bike parking
- More north-south bus routes connecting to other destinations

Figure 3: "What enhancements would allow you to consider other modes of travel than driving alone?"



Questions 7 through 10. Where do you live? What is your primary mode of travel? Do you work in Boulder? What is your age?

Figures 4 through 7 illustrate a number of characteristics about quesitionnaire respondents. For example, while most respondents live somewhere in Boulder, with the highest number living near East Arapahoe, the questionairre also attracted a relatively high number of people who live outside of Boulder. As shown in Figures 5 and 6, automobile use as a primary mode of travel is very high for those who responded to the questionnaire, as is the number of people who work inside Boulder. And, the majority of respondents to this online questionnaire were between 37 and 74 years old.

Figure 4: Respondent's Place of Residence

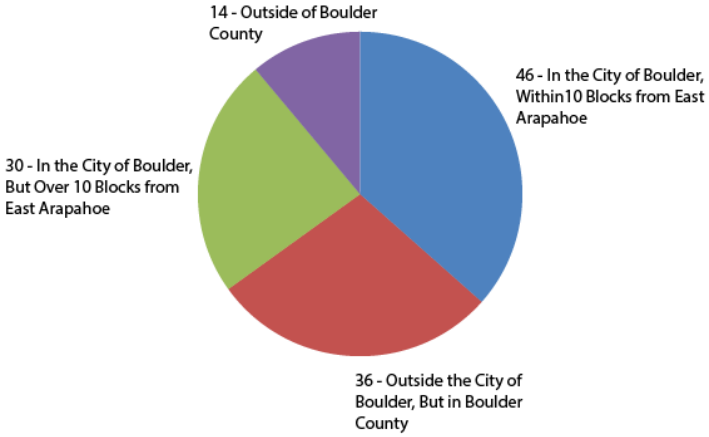


Figure 5: Respondent's Primary Mode of Travel

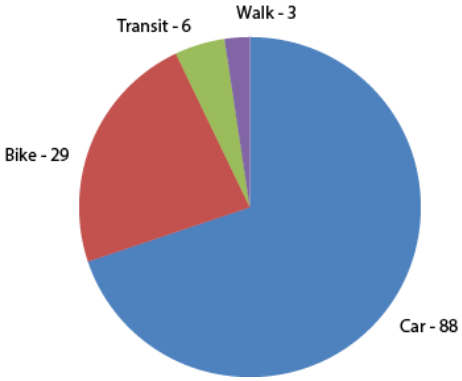


Figure 6: Respondent's Place of Work

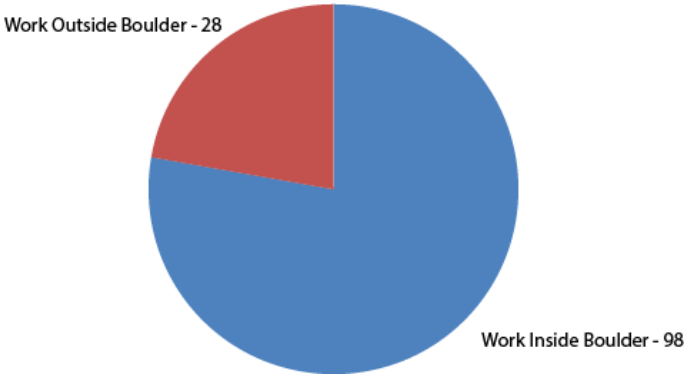
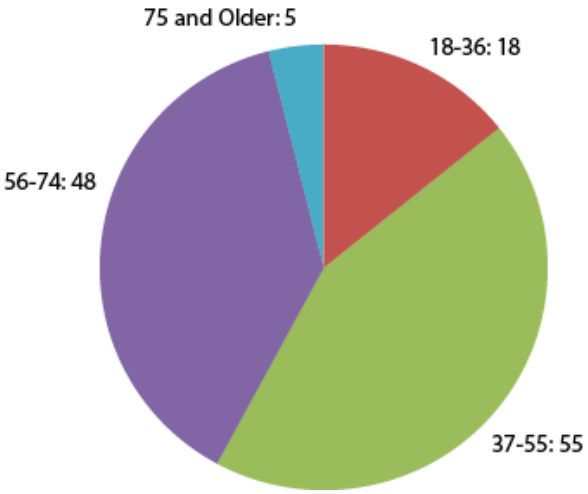
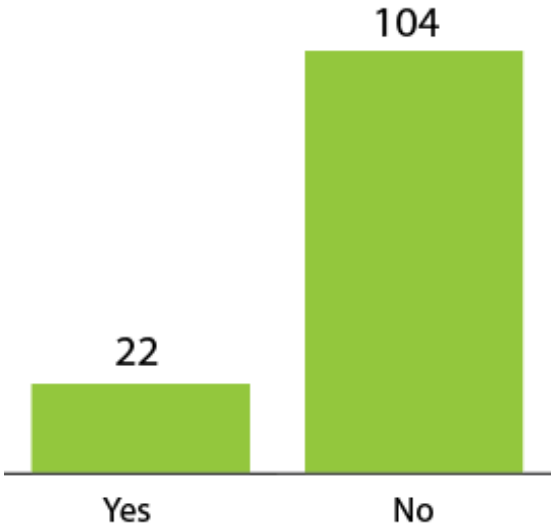


Figure 7: Respondent's Age



Question 11. Did you attend the East Arapahoe Transportation Plan Public Workshop on Thursday, Nov. 19?

Figure 8: Attendance at Public Workshop

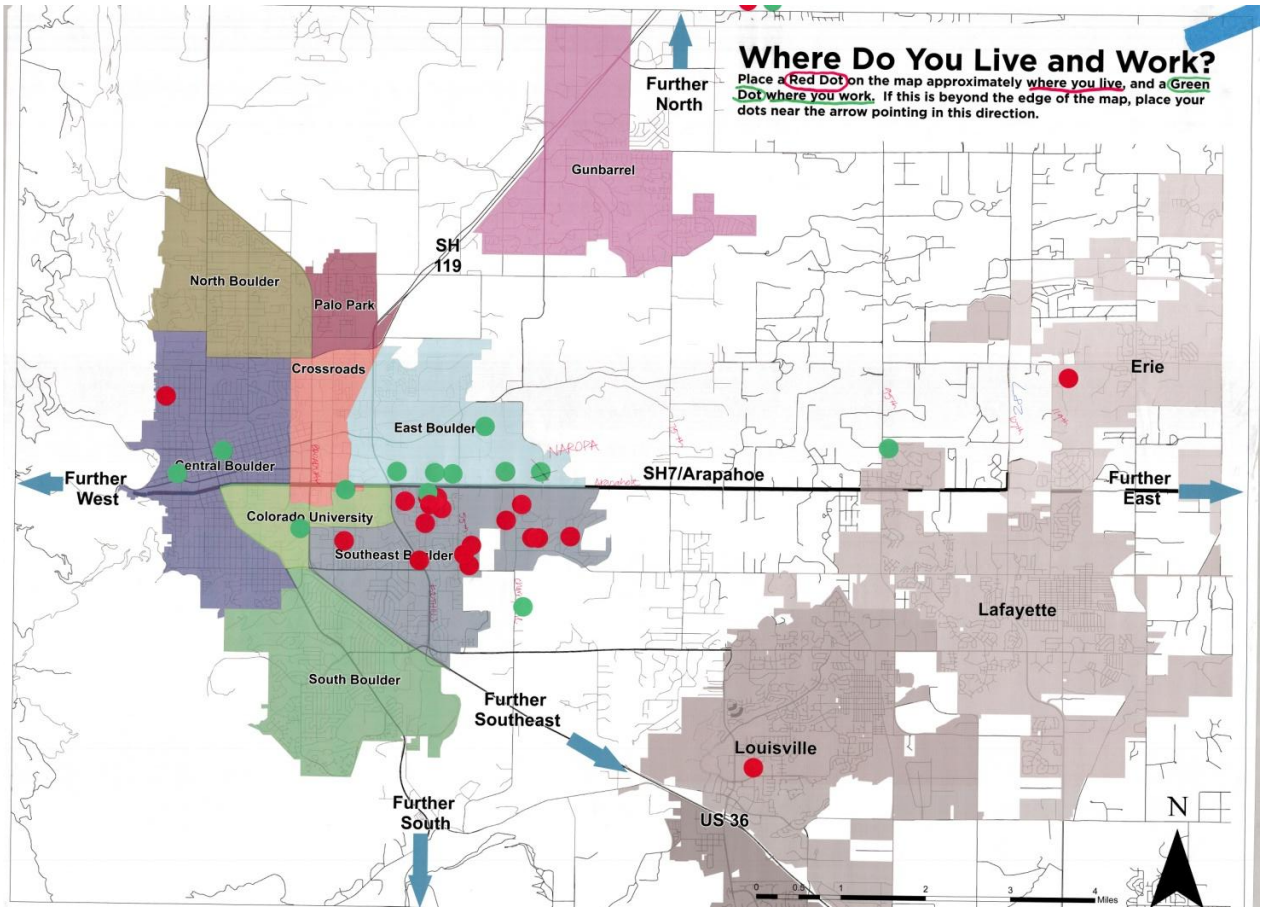


This question reveals that the majority of people who took the online questionnaire did *not* attend the public meeting in November, and this may have been their only method of feedback.

3. SUMMARY OF PUBLIC WORKSHOP INPUT

The project team held a public workshop at Naropa's Nalanda Campus on November 19, 2015. Approximately 30 people were in attendance. As shown in Figure 9, most meeting attendees either live or work in the East Arapahoe corridor, with red dots indicating where participants work and green dots indicating where they live.

Figure 9: Geographic Representation of Workshop Attendees



Participants at the workshop were given a brief overview of the status of the East Arapahoe Transportation Plan and a chance to view the preliminary conceptual design alternatives. Participants then broke into tables and discussed the opportunities and challenges associated with each alternative. Finally, all meeting attendees were asked to weigh in on what evaluation criteria are the most important to them.

Feedback on Conceptual Design Alternatives

The results from the small group discussions on design alternatives are shown in Figure 10. Generally, the following themes emerged from the conversations:

- No Change: Current conditions were called out as being unpleasant and aesthetically unpleasing.
- Alternative A: Those who would like to see minimal disruption to the corridor see strength Alternative A. Participants generally agreed that multi-use paths need to be completed as shown in Alternative A.
- Alternatives B and C: Seen as strong in the way that they enhance both bus service and the pedestrian and bicycle environment. Weaknesses seen in these two alternatives are their potential to create congestion, and skepticism that the investment will be worth the bus ridership that will result.
- Alternative D had the most weaknesses called out. Though Alternative D offers separated space for every mode of travel, it generated a negative reaction. Many people disliked its sheer width, and the potential impacts to private property.

Figure 10: Responses to Strengths and Weaknesses of Alternatives

Conceptual Design Alternatives

Baseline (No-Build)

Side-running bus with three general purpose lanes in each direction and existing pedestrian and bicycle facilities and landscaping.

Description	Level of New Investment	Lane Repurposing	Roadway Widening (Right-of-Way Expansion)	Bike/Ped Facility Design Treatment	Exclusive BRT Lane	Other BRT Elements	Streetscape Elements
3 general traffic lanes + multi-use path	None	No	No	Off-street: existing multi-use path (with gaps)	No	Existing buses, stops, and shelters	Existing landscaping

Strengths	Weaknesses
Table 2: • Good views • Efficiency (LOS) • Save Money	Table 2: • Safety • Ugly • Limited bike (ped) • Bottleneck at 63rd • Crossing as ped is difficult • Too many driveways Table 3: • No improvement to bike facility

Alternative A

Enhanced bus in mixed-traffic with three general-purpose lanes and a completed multi-use path for pedestrians and bicycles

Description	Level of New Investment	Lane Repurposing	Roadway Widening (Right-of-Way Expansion)	Bike/Ped Facility Design Treatment	Exclusive BRT Lane	Other BRT Elements	Streetscape Elements
3 general traffic lanes + side running Enhanced Bus in mixed traffic + multiuse path	Low	No	No	Off-street: complete gaps in multi-use path	No	Off-board fare payment, high-quality shelters, stylized vehicles with multiple door boarding, branded vehicles and stations	Existing landscaping

Strengths	Weaknesses
Table 1: • Maintains Capacity and Additional Capacities • All modes - completes multi-use path • Inexpensive Table 2: • Complete bike-ped gaps • Enhance bus stops Table 3: • Finish multi-use path • Keeps autos moving	Table 1: • Need buses to come by more often than the current schedule • Doesn't allow for modal shift • Can't deal with increased trip making • Doesn't support transit, bike use - or expansion of that (too car-centric in future) Table 2: • Short-sighted • Does not address growth • No dedicated lane for transit • Doesn't improve capacity • No separation of bike-ped Table 3: • Requires ROW which will impact businesses - Loss of FAR

Alternative B

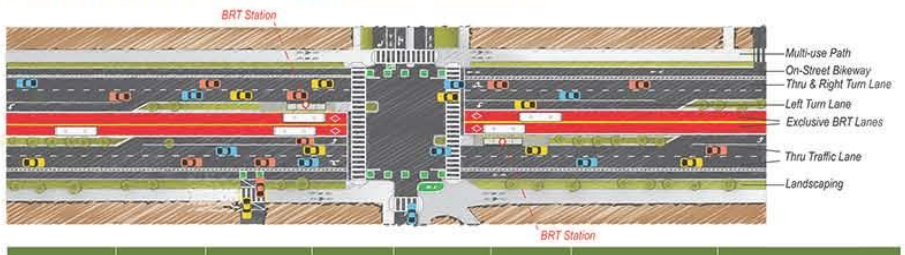
Side-running BRT in a semi-exclusive business-and-transit (BAT) lane (allows right turns) with two general-purpose lanes, an on-street bikeway, and a completed multi-use path

Description	Level of New Investment	Lane Repurposing	Roadway Widening (Right-of-Way Expansion)	Bike/Ped Facility Design Treatment	Exclusive BRT Lane	Other BRT Elements	Streetscape Elements
2 general traffic lanes + side running BAT lane + on-street bike facility + multi-use path	Medium	Partial (outside lane becomes BRT + right turn only lane)	Yes	On-street + off-street	Semi-exclusive	Same as Alternative A	Enhanced landscaping in median and along both sidewalks

Strengths	Weaknesses
Table 1: • Congestion leads to mode shift Table 2: • Trees • Dedicated bus lane • Ped refuge in center • Promote transit use Table 3: • Bus lanes can be shared with cars some times of day Table 4 (individual responses, no facilitator): • Prefer on street bike lane to multi-use paths - would be so FAST to get downtown with on street bike lane • 1 less vehicle lane incentives bike and bus use	Table 1: • Congestion is politically challenging • Two lanes not enough for cars (specifically hospital traffic) Table 2: • Loss of view • Loss of car through lanes • More congestion • Concern about snow removal • Redundancy of cycling facilities Table 3: • Requires ROW which will impact businesses - Loss of FAR • Requires investment by other communities (Park-N-Ride, last mile solutions to the east) Table 4 (individual responses, no facilitator): • Not psyched about right-of-way expansion - street is already huge

Alternative C

Center-running BRT in an exclusive transit lane with two general-purpose lanes, an on-street bikeway, and a completed multi-use path



Description	Level of New Investment	Lane Repurposing	Roadway Widening (Right-of-Way Expansion)	Bike/Ped Facility Design Treatment	Exclusive BRT Lane	Other BRT Elements	Streetscape Elements
2 general traffic lanes + center running BRT lane + on-street bike facility + multi-use path	High	Yes	Yes	On-street + off-street	Yes	Same as Alternative A	Enhanced landscaping in median (and along both sidewalks)

Strengths	Weaknesses
Table 1: • Good transit Table 2: • "Light-Rail feel" - Pleasing to the eye • No conflict with transit for right turning vehicles • Reduce conflict Table 3: • Best aesthetics	Table 1: • Bus in middle needs a huge mind shift • Challenges at unsignalized intersections • 2 vehicle lanes not enough • Buses in center lane requires strange turns Table 2: • Access of peds to BRT • More congestion • No landscaping in center Table 3: • Requires ROW which will impact businesses - Loss of FAR • Cost • Business Access - Left turns

Alternative D

Center-running BRT in an exclusive transit lane with three general-purpose lanes, an on-street bikeway, and a completed multi-use path

Description	Level of New Investment	Lane Repurposing	Roadway Widening (Right-of-Way Expansion)	Bike/Ped Facility Design Treatment	Exclusive BRT Lane	Other BRT Elements	Streetscape Elements
3 general traffic lanes + center running BRT lane + on-street bike facility + multi-use path	Highest	No	Yes	On-street + off-street	Yes	Same as Alternative A	Enhanced landscaping in median (and along both sidewalks)

Strengths	Weaknesses
Table 1: • Good balance Table 2: • Highest capacity • Multi-modal function • Green pavement marking Table 3: • Best aesthetics Table 4 (individual responses, no facilitator): • Excellent traffic flow • "Bikeability" • reduced car traffic from commuters thanks to bus option and bike option	Table 1: • Feasible? • Expensive! • Significant impact to property owners • Not good for neighbors - noise Table 2: • Cost • Wide ROW • Big city feel • Disruption of businesses during construction • Crossing distance increased • Left turning vehicle is difficult • Signal timing investment Table 3: • Requires ROW which will impact businesses - Loss of FAR • Cost • Business Access - Left turns Table 4 (individual responses, no facilitator): • Cost, presumably • Challenges with ROW expansion (private landowners)

Input of Evaluation Criteria

Workshop participants were asked to choose their top five evaluation criteria from a draft list of criteria, or suggest new criteria. The most highly rated criteria were:

- Perceived Ease or Comfort for Bicycling Along/Across the Corridor
- Transit Travel Time and Reliability.

Other criteria scoring highly at this meeting were auto travel time, transit ridership, capital costs, and GhG emissions. Economic Vitality was a new criteria suggested by workshop participants.

4. SUMMARY OF STAKEHOLDER & SMALL MEETING INPUT

The project team has held several one-on-one stakeholder meetings and more organized small group presentations and discussions between November 2015 and March 2016. Figure 11 lists these meetings and outreach events.

Figure 11: List of Stakeholder Outreach Meetings

Date	Organization
11/2/2015	Boulder Chamber
11/3/2015	Naropa (East Campus)
11/5/2015	University of Colorado
11/5/2015	BVSD
11/9/2015	Boulder Community Health
11/9/2015	Transportation Advisory Board
11/12/2015	Western Disposal
11/19/2016	Public Workshop
12/8/2016	City Council Study Session
12/10/2016	Transit Open House
12/14/2016	Premiere Credit Union
12/16/2015	Schacht Spindle
1/18/2016	ReSource
1/25/2016	BVSD
1/26/2016	Peloton
1/27/2016	Ball Aerospace
2/9/2016	BVSD Bus Drivers
2/11/2016	Fisher Auto
2/17/2016	Boulder Community Health
2/18/2016	Boulder Transportation Connections
2/16/2016	EcoCycle

The following is a summary of ideas, concerns and suggestions raised through these one-on-one conversations and small group meetings:

- **Eastern gateway concept:** Several businesses and organizations at the eastern end of the corridor consider themselves the eastern gateway into Boulder and see opportunities to identify the area as such, through streetscape improvements, public art and transportation amenities like enhanced bus stops.
- **Transit connections:** Direct and efficient bus connections for students and employees between CU East campus and main campus are extremely important. Similarly, frequent bus connections between activity centers along Arapahoe Avenue and downtown Boulder or the 29th Street Mall would provide a convenient option for employees to run errands or grab a bite to eat.
- **Daytime driving within the corridor:** Employees in the corridor express that mid-day travel is a major consideration for them. Destinations like lunchtime food options can be out of range without a car, and can become inundated with automobile traffic certain times of day. The shopping center and intersection at Conestoga in specific have been mentioned as a problem spot.
- **Regional commuting:** In conversations with businesses along the corridor, it was apparent that the majority of employees do not live in Boulder, but come from as far away as south Denver and Fort Collins. Most travel by single occupant vehicles to and from work. To attract and retain employees, commutes should be easy and inexpensive. Eliminating a general purpose lane would be extremely concerning to many businesses.
- **Bicycle travel:** While improving bicycle and pedestrian travel on Arapahoe Avenue is important, making direct connections to businesses located off Arapahoe is just as important. Improved bicycle access is important for businesses, but not at the expense of reducing vehicle access.
- **Multiuse path:** The existing multiuse path works for families, but not for commuters. It feels dangerous at driveways because drivers are not looking for pedestrians and cyclists and signage is lacking. More education is also needed for motorists and cyclists.
- **Large vehicle travel:** Businesses and organizations that rely on truck and bus access prioritize minimizing congestion and providing as much separation between large vehicles and bicyclists/pedestrians as possible.
- **Speed limit:** The idea of reducing the speed limit on Arapahoe was mentioned by residents and employees alike. It feels like a highway and is not conducive to walking or bicycling.
- **Parking:** Managing parking will be key to considering any of the conceptual design alternatives that reduce general purpose lanes and enhance transit service.
- **Access on to Arapahoe:** Turning onto and off of Arapahoe can be problematic without a traffic signal. Many drivers in the area will cut through private properties in order to reach a traffic signal, and then these access points can become backed-up as a result.
- **Large institutional master plans:** Many institutions have expansion plans over time. Coordination with both their neighbors and the city will be essential.

5. SUMMARY OF COMPLETE STREETS OPEN HOUSE COMMENTS

The project team held an open house at the Boulder Chamber on April 21, 2016. Over 70 people attended and most people were new to the project and requested an overview of the planning process and conceptual design alternatives. Ideas suggested varied from creating directional lanes that change direction in the a.m. and p.m. hours, to narrowing the traffic lanes on Arapahoe and painting a green bike lane to adding more auto lanes.

6. SUMMARY OF EMAIL COMMENTS

Several emails have been sent directly to the East Arapahoe Transportation Plan project team to date. They generally reflect some of the other feedback the team has been receiving via in-person meetings. The following is a summary of email comments received:

- Auto travel: There is concern about (1) doing nothing, (2) adding general-purpose lanes, and (3) removing existing general purpose lanes.
- Transit travel: Bus service hours and frequency continue to be mentioned as a major obstacle for those who would like to ride the bus. Bus service directly to CU or other major destinations is also important to people; and transfers can be a major inhibitor to bus use. Nicer bus stations and shelters are another improvement cited by respondents.
- Bicycle travel: The existing bike infrastructure causes a lot of frustration. Multi-use paths and bike lanes that simply end are seen to be dangerous, and a major inhibiter to bike use.

7. NEXT STEPS

Moving forward, there will be a number of ways to provide input into the East Arapahoe planning process. Future and on-going opportunities for community input include:

- The formation of an East Arapahoe Transportation Plan Community Working Group. The purpose of the working group will be to provide input and feedback, from different interests and perspectives, to the city staff during the planning process.
- Staff is available for one-on-one meetings to present project information and receive input. Staff is also available to conduct ongoing small group outreach activities, like information tables, focus groups and small group presentations to neighborhoods, businesses and community organizations.
- Future public meetings will be held in the spring/summer 2016.
- Public comments and feedback can be emailed directly to the project manager, Jean Sanson at SansonJ@bouldercolorado.gov

For more information regarding the East Arapahoe Transportation Plan, detailed community input, and future opportunities to get involved, visit www.EastArapahoeTransportationPlan.net

C I T Y O F B O U L D E R
JOINT ADVISORY BOARDS MEETING MEMORANDUM

TO: Members of Transportation Advisory Board, Parks and Recreation Advisory Board, Landmarks Board, Design Advisory Board, Planning Board, Downtown Management Commission, Library Commission

FROM: Michael Gardener-Sweeney, Director of Public Works for Transportation
Gerrit Slatter, Principal Engineer for Capital Projects
Bill Cowern, Acting Traffic Engineer
Kathleen Bracke, GO Boulder Manager
Noreen Walsh, Senior Transportation Planner
Dave Kemp, Senior Transportation Planner
Natalie Stiffler, Transportation Planner II
Jeff Haley, Parks Planning Manager
James Hewat, Senior Historic Preservation Planner

DATE: May 9, 2016

SUBJECT: Joint Advisory Board meeting to discuss and provide feedback on the Canyon Boulevard Complete Street Study conceptual design options and the proposed evaluation measures.

EXECUTIVE SUMMARY:

The purpose of the May 18 Joint Boards meeting is to gain feedback from the seven related Boards and Commissions to this study on the Canyon Boulevard conceptual design options developed to improve travel and the travel experience along and across Canyon Boulevard from 9th to 17th streets. This feedback will be summarized and presented at the May 31 City Council Study Session on Canyon Boulevard Complete Street Study. The feedback will also be considered during the design options assessment work to be conducted this summer which will help to create a recommended design option for Canyon Boulevard.

The Boulder Civic Area Plan process envisioned improvements along and across the roadway to create greater connection and access to and through the area as well as better connections between the downtown, Civic Area and University Hill areas. The 2014 Transportation Master Plan (TMP) update also identified Canyon Boulevard for a corridor study which is an integrated planning effort coordinating with other plans and work efforts including the Civic Area Master Plan, East Arapahoe Transportation Study, FasTracks Local Optimization Downtown Transit Station study, potential historic resources, landmark designation and landmark alteration certificate review processes, downtown design guidelines, floodplain regulations and the goals and the goals of the TMP.

The Canyon Boulevard Complete Street Study has been underway since late 2015 and work completed so far includes:

- assemblage of the project staff team and an understanding of the existing conditions
- interviews with project staff team stakeholders to identify Canyon Boulevard's strengths, weaknesses, opportunities and constraints
- development of a Vision for Canyon Boulevard as well as a set of goals and objectives to reach to achieve the vision
- development of seven conceptual design options with different combinations of the complete streets features, and
- creation of measures which reflect the Study's Goals and Objectives upon which to evaluate the conceptual design options so that the study can arrive at a recommended design option

This memorandum is organized with the following sections of information to allow an understanding of the study, existing conditions and the conceptual design options and proposed evaluation measures developed to date:

1. Background
2. Description of the Conceptual Design Options
3. Proposed Evaluation Measures
4. Community Feedback
5. Next Steps

BACKGROUND:

The City of Boulder has initiated the Canyon Boulevard Complete Street Study to improve travel and the travel experience for pedestrians, bicyclists, transit users and drivers along and across Canyon Boulevard from 9th to 17th streets. The study and potential improvements to Canyon Boulevard have been identified through previous planning efforts including the Civic Area Plan and the TMP update.

This section of roadway is part of the SH119/CDOT State Highway System and is classified as a principal arterial roadway in the City of Boulder with vehicle volumes ranging from approximately 11,000 vehicles at 9th Street to over 20,000 at 17th Street as well as pedestrians, bicyclists and transit users. Locally, Canyon Boulevard serves people traveling to and through the City by all modes and regionally it links Boulder to the Town of Nederland to the west.

This study is an integrated planning effort coordinating with other plans and work efforts including the Civic Area Master Plan, East Arapahoe Transportation Study, FasTracks Local Optimization Downtown Transit Station study, historic resources and landmark preservation processes, downtown design guidelines, floodplain regulations and the 2014 Transportation Master Plan.

The project staff team is composed of representatives from the city's transportation division and the community planning and sustainability, parks and recreation departments as well as CDOT and RTD staff representatives. Project staff team meetings began in late 2015 with a walk audit of the area and meetings to discuss and listen to the strengths, weaknesses, opportunities and constraints as identified by the project team members. From these meetings the team developed a Vision for the Canyon Boulevard Complete Street Study which is:

> ***Vision:***
> Canyon Boulevard will become a more accessible, safe, and inviting travel experience for pedestrians, bicyclists, transit and cars traveling across and along the corridor.

> Canyon Boulevard serves as a vital connection, a linkage between the natural landscape of Boulder Canyon and Civic Area and the urban activities of the City. It will continue to serve as a transportation nexus for Boulder, moving people to and through the area, serving as both an important destination and a connector. Canyon Boulevard will combine the location's history and natural elements with the contemporary need for equity and mobility, providing increasing transportation options into the future.

This vision developed into a set of Goals and Objectives to achieve to reach the above vision. The goals and objectives are reflected in the proposed measures to be used to evaluate the conceptual design options so that the recommended option best reaches the vision for Canyon Boulevard. Further information on the proposed measures will be included later in this memorandum.

The project team has also been reviewing the existing conditions which included gathering information about the travel modes as well as an understanding of the urban design and planning contexts, and environmental considerations. A summary of the strengths, weaknesses, opportunities and constraints (SWOT) derived from the project staff team stakeholder interviews is also included in the Existing Conditions Summary. Some of the most commented-on features of the corridor were the mid-block pedestrian crossings, Glen Huntington Band Shell and the Downtown Boulder Station.

Within the existing conditions summary is a description of the transportation facilities which notes that Canyon Boulevard is a four-lane, divided arterial with two lanes of traffic in each direction, a posted speed limit of 35 miles per hour, six signalized intersections and left-turn storage bays at all nine intersections. Transit service within Canyon Boulevard is provided by RTD and the Downtown Boulder Station is within the Study area. On-street bicycling occurs within a shared-use facility within the roadway and the Boulder Creek Path provides a nearby off-street facility. Pedestrian facilities include sidewalks on both sides of Canyon Boulevard and all but one intersection has pedestrian facilities across Canyon Boulevard including traffic signals and rapid flashing beacons, painted marking and vehicle yield signs.

The planning context includes the plans listed above as well as improvements in the near term to redevelop Civic Area. The urban design context includes information about the zoning setback requirements and existing adjacent land uses such as the Civic Area Park on the south side and its historic resources including the Glen Huntington Band Shell (1938) and the Municipal Building (1952).

Attachment A contains the draft Existing Conditions Summary with additional details on each of the existing conditions topics.

DESCRIPTION OF THE CONCEPTUAL DESIGN OPTIONS:

The development of the conceptual design options was informed by the Civic Area Plan, TMP and other related planning work as well as the findings from the SWOT interviews and collection of existing conditions information.

All of the conceptual design options are within the 130' Complete Streets planning width which reflects the space available on Canyon Boulevard form zoning setback requirements outlined in Ordinance 7813 which amended the Land Use Code. The 130' Complete Streets planning width also allows for all modal facilities and the urban design feature of a double row of trees amenity zone along the south side of Canyon Boulevard. Features of a Complete Street include:

- ***Gathering spaces*** – Parks, plazas, and courtyard creating destinations along the street and opportunities for organized events, space to celebrate nature and culture and places for rest from the surrounding urban environment.
- ***Accommodations for bicyclists*** – Appropriate bicycle facilities along Canyon Boulevard will accommodate a wide range of bicycling ages and abilities and could include multi-use paths, on-street protected bike lanes, conventional bike lanes and shared-lane bike routes.
- ***Efficient roadway*** – Proactive roadway operation and design allow people to predict traffic flow and understand how to safely and efficiently move by bus or car through the area.
- ***Enhanced intersections*** – Enhanced intersections create high visibility for all users and predictable actions for people crossing paths either in a vehicle, on a bicycle or on foot. Crosswalk design should provide safe and comfortable experience for non-motorized travelers to establish convenient walking and bicycling routes across and along Canyon Boulevard.
- ***Integrated transit*** – Transit offers a high capacity option for moving people to and along a street. A complete street considers every passenger's trip from start to finish. Transit stops enhance the public realm and activate the streetscape by providing passenger waiting areas that can include, bus shelters, way finding, lighting and public art.
- ***Active sidewalk*** – Sidewalks are central to pedestrian life. A complete street provides high quality spaces for people that feel safe, have natural features and have appropriate transitions to the streets, transit stops, and building entrances, making them easy places to walk, use a wheelchair or stop and observe street life and activity.

A brief description of the seven conceptual design options is included below and the images of these conceptual design options and their features are included in Attachment B.

- Option 1 includes a planted center median, multi-use path on the south side, sidewalks, and tree rows
- Option 2 includes multi-use path on both sides of the street, amenity zone, tree rows and intermitted planted median
- Option 3 includes a 2-way protected bike lane on the north side, sidewalks on both sides of street, tree rows and intermittent center median
- Option 4 includes a 2-way protected bike lane on the south side, sidewalks on both sides of street, tree rows and intermittent center median
- Option 5 includes conventional on-street bicycle lanes and sidewalks on both sides of street, tree rows, amenity zone and a continuous planted median.
- Option 6 includes a single direction protected bike lane on both sides of street with planted separation, north and south amenity zone, sidewalks, tree rows and a planted center median.
- Option 7 includes a buffered bike lane, sidewalk and amenity zone on both sides of street, tree rows, and planted center median.

Elements of each option may be "mixed and matched" depending on factors such as space or right-of-way availability, traffic conditions, and the land use character of sections along Canyon Boulevard. And, other variations on these alternatives are possible by block section too. It is possible that the design options will continue to evolve through the conceptual design phase of the planning process, based on community feedback and the evaluation measures assessment results. The community feedback includes the May 18 Joint Boards meeting where there will be discussions and feedback activities focusing on people's individual preferences on key choices of the options.

The seven conceptual design options have a variety of combinations for creating a complete street to improve travel and the travel experience along Canyon Boulevard from 9th to 17th streets. Options 1-4, 6 and 7 preserves the Glen Huntington Band Shell in its existing location and it is part of the amenity zone

and gathering space experience for pedestrians and possibly bicyclists along the south side of Canyon Boulevard. In Option 5, the relocation of the Glen Huntington Band Shell would occur. A brief description of this process to consider that is included below.

Process for considering relocation of the Glen Huntington Band Shell

Should an option be selected that proposes the relocation of the Band Shell, a conceptual Landmark Alteration Certificate (LAC) request would be submitted (likely in the fall of 2016) for review by the Landmarks Board before going to the City Council with a recommended Complete Streets design. The LAC application would need to outline the rationale for the move, identify the proposed new location and status of the Band Shell seating, along with approximate new landmark boundary within the Civic Area.

- Review of an LAC for moving the Band Shell will require a Landmarks Board public hearing as prescribed in 9-11-15, B.R.C. and a request to amend the designating ordinance showing a new landmark boundary. Staff's recommendation and the Landmarks Board decision would be based upon the standards set forth in 9-11-18, B.R.C.
- A Landmarks Board decision can be called up for review by the City Council. If the City Council calls up the Board's decision, a subsequent City Council public hearing will be scheduled for its review in a quasi-judicial public hearing. If the Cit Council does not call up the Landmarks Board's decision, the Board's decision is final.
    - If a decision is made by the Landmarks Board to move the Band Shell, there would need to be subsequent review and approval of any conditions (usually by the Landmarks design review committee).
    - If the Landmarks Board were to deny a Landmark Alteration Certificate to relocate the Band Shell, a substantially similar application cannot be submitted for one year.
    - If the Landmarks Board approves an LAC, it is valid for 180 days, with the possibility to extend it 1 time for an additional 180 days.
- Also, if the Landmarks Board approves an LAC and request to amend the designating ordinance, City Council must approve the ordinance change in a subsequent step.

PROPOSED EVALUATION MEASURES:

An evaluation of the conceptual design options will be conducted over the summer of 2016 to assess their ability to fulfill the goals and objectives of the Canyon Boulevard Complete Street Study. Included in Attachment B is a compilation of the Goals and Objectives from which the measures to be used will reflect an assessment of the specific objective. At the May 18 Joint Boards meeting, there will be an exercise for the board attendees to gain feedback on the proposed measures.

COMMUNITY FEEDBACK:

It is important that the study is conducted with the community and that feedback received from multiple project stakeholders is incorporated throughout the planning process. There was a public open-house meeting on April 27, 2016 which shared the seven conceptual design options, proposed evaluation measures and other project background information. Notification of the study and public meeting was distributed to over 5,800 households by mail and a press release was issued. Digital outreach included promotion through the Civic Area email group of over 700 interested community members, the initial Canyon Study email group which is composed of 45 interested community members as well as social

media promotion through the city's social media accounts. At the public meeting, there were feedback activities to gain feedback on the proposed evaluation measures, key choices of a complete street design and the ability to detail why these were key choices.

NEXT STEPS:

The next public engagement period will be in the fall of 2016 and will include a community meeting, Board and Commission feedback and recommendations and City Council consideration of a recommendation. The fall public engagement period will focus on the evaluation of the conceptual design options and the community feedback will assist in the selection of a conceptual design option. The selected conceptual design option will be presented to City Council for their consideration of recommendation.

ATTACHMENTS

A – draft Existing Conditions Summary for the Canyon Boulevard Complete Street Study
B – proposed Goals, Objectives and Evaluation Measures for the Canyon Boulevard Complete Street Study
C - Canyon Boulevard Complete Street Study Conceptual Design Options 1-7

A - draft Existing Conditions Summary for the Canyon Boulevard Complete Street Study

Canyon Boulevard Complete Streets

Existing Conditions Summary

City of Boulder

February 11, 2016

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1. Overview

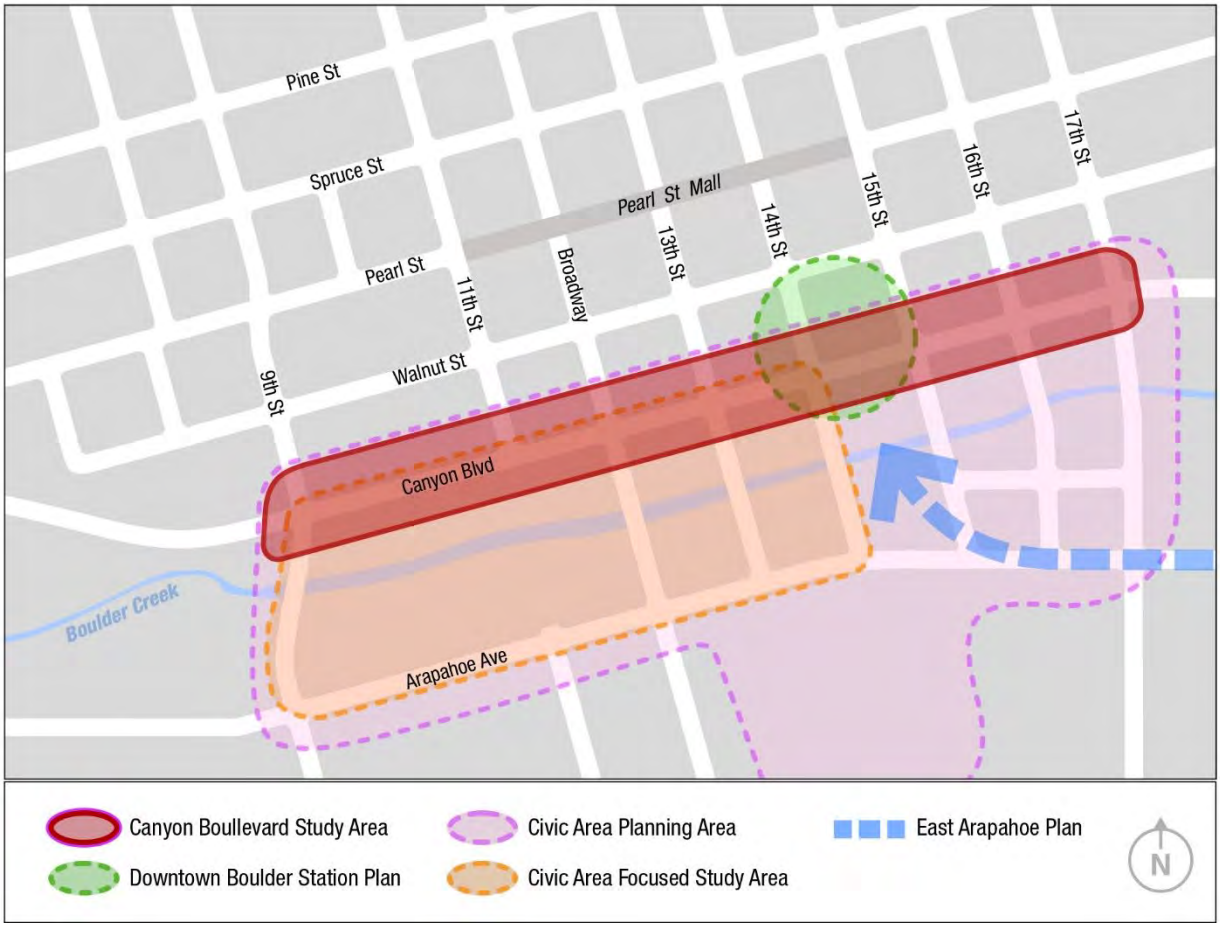
Canyon Boulevard, also designated as State Highway 119 (SH 119), is a major east-west roadway connection through the City of Boulder, Colorado (City). Regionally, it links Boulder to the Town of Nederland to the west and is a major facility for moving people between the downtown area and other parts of the Boulder area via cars, trucks, and transit. Locally, the corridor serves people traveling to and through the City by car, bike, bus, and on foot. The land uses directly surrounding the corridor consist of urban development with a mix of residential and service-oriented businesses to the north, and the 27-acre Civic Area to the south. As a result of the recently completed Civic Area Master Plan (June 2015), Canyon Boulevard was identified as a key improvement project for the area.

The primary focus of the Canyon Boulevard Complete Streets Study is to develop design options that complement and support existing and planned improvements in the area, incorporating Complete Streets concepts into the design of the corridor stretching from 9th Street to 17th Street in downtown Boulder. This means ensuring adequate space for all users and modes of transportation, including pedestrians, bicyclists, cars, and transit vehicles. This Existing Conditions Summary discusses the current state of several aspects of Canyon Boulevard, including the range of issues identified by key stakeholders through a strengths, weaknesses, opportunities, and threats (SWOT) analysis; the historic, current, and planned urban design context of the area; transportation elements, including an analysis of all modes of travel; and the environmental considerations in the area. This report will be used as a baseline to understand the impacts (both positive and negative) of design options developed for the corridor in the future.

1.1. Relevant Planning Context

Several current planning studies impact the decisions that are made throughout the Canyon Boulevard study area. Although many City-wide plans generally support the development of Complete Streets, several plans are directly related to the study area for Canyon Boulevard or have direct design and functional implications for the ultimate design of the corridor. The study area for Canyon Boulevard as well as the study area extents of each of related plans are shown in Figure 1 and discussed in detail below.

Figure 1. Study area map



1.1.1. Civic Area Master Plan

The Civic Area Master Plan created a new vision for the area south of, and including, Canyon Boulevard. Stretching from 9th Street to 14th Street, this land is envisioned as an active public space with a variety of civic buildings, natural environments, and displays of art interconnected by a modern downtown park. Canyon Boulevard is expected to play a major part in this vision. As the northern edge of the Civic Area, the Master Plan calls for a new, continuous greenway promenade along Canyon Boulevard between 9th Street and 14th Street.

To complement this promenade, the Master Plan calls for improving connections across Canyon Boulevard to downtown Boulder and the Pearl Street Mall. On the west end of the Civic Area, a new pedestrian corridor is planned to connect 11th Street through the Civic Area, bridging the gap between Pearl Street and University Hill. A gateway into the Civic Area is planned at 11th Street and Canyon Boulevard. On the east side of the Civic Area, between 13th Street and 14th Street, new high-density development is envisioned. Along Canyon Boulevard, the plan calls for buildings up to four stories, creating a more urban character, compared to the existing low-density development.

Additionally, the plan describes removing the existing surface parking from its current location in front of the Boulder Public Library between Arapahoe Road and Canyon Boulevard, and replacing it with parking structures at either end of the Civic Area. These new, underground structures would be located near Arapahoe Road and 9th Street on the west end of the Civic Area, and near or along 14th Street on the east end of the Civic Area.

1.1.2. East Arapahoe Transportation Plan

The East Arapahoe Transportation Plan is currently in the preliminary phases of development. The plan calls for the addition of bus rapid transit (BRT) service along Arapahoe Road between downtown Boulder and I-25. The East Arapahoe Transportation Plan is a collaboration between the City of Boulder, the Colorado Department of Transportation (CDOT), and the Regional Transportation District (RTD), the local transit agency. The west end of this project is intended to connect into the Downtown Boulder Station located at 14th Street and Canyon Boulevard. Preliminarily plans suggest that East Arapahoe BRT service will use Canyon Boulevard to access the Downtown Boulder Station. During peak periods, bus service is expected to run between six- and seven-minute headways, with off-peak headways of 15 minutes. Consideration should be given to the design of Canyon Boulevard to ensure potential future BRT uses are not precluded.

1.1.3. Downtown Boulder Station Plan

As part of the FasTracks Local Optimization (FLO) program, the City of Boulder is partnering with Boulder County and RTD to improve transit access across Boulder. This has resulted in a plan to expand the Downtown Boulder Station. The final report, *FasTracks Local Optimization Facilities Study*, was published in June 2007 and identifies three alternatives. Each of these options calls for at least some new bus bays along Canyon Boulevard and would affect the bus circulation around the station. Additionally, the most dramatic alternative would move the station from its current location at 14th Street and Walnut Street and replace it with a new facility on the south side of Canyon Boulevard between 14th Street and 15th Street. The ultimate goal of the expansion is to increase capacity at the station, which is currently over capacity during the peak hours.

2. SWOT Analysis

To better understand the existing conditions of the corridor and help create a vision for the future of Canyon Boulevard, SWOT analysis was conducted. Data were collected from key stakeholders involved in the project including:

- City of Boulder Department of Parks and Recreation
- City of Boulder Department of Community Sustainability and Planning
- City of Boulder Department of Transportation
- CDOT
- RTD
- Go Boulder

The SWOT analysis resulted in a variety of comments and concerns about the existing corridor, as well as potential needs and opportunities. Some of the most commented-on features of the corridor were the mid-block pedestrian crossings between 9th Street and Broadway Street, the historic band shell at the corner of Broadway Street and Canyon Boulevard, and the Downtown Boulder Station. The specific concerns are discussed in greater detail below. Figure 2 shows all of the comments received during the SWOT analysis and the related location of that comment, if applicable.

2.1. Mid-Block Crossings

The two mid-block pedestrian crossings near the Boulder Public Library and 11th Street were brought up during multiple SWOT meetings. They received both positive and negative comments. Some of the positive comments concerned the perceived effectiveness of the signing and striping on the roadway at the crossings. Agency comments lauded the crossings' success in effectively reducing the pedestrian barrier created by Canyon Boulevard. Conversely, some comments also noted the safety concerns with the unsignalized crossings, and the increased possibility of drivers not properly yielding to crosswalk users.

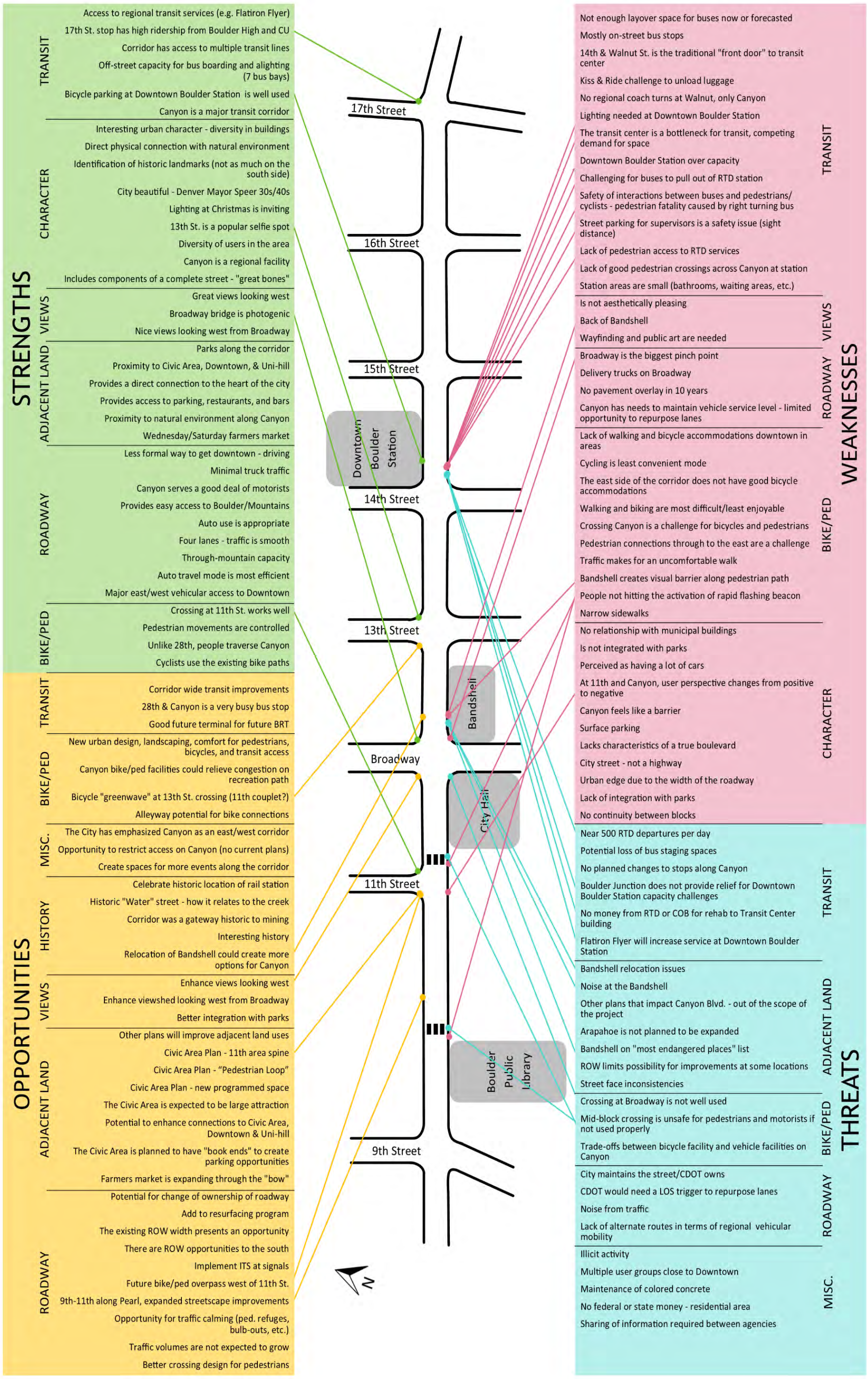
2.2. Historic Band Shell

Located at the corner of Broadway Street and Canyon Boulevard, the band shell is listed as a historic landmark. The primary concern with the band shell, as it currently exists today, is that it creates a blank wall facing Canyon Boulevard. This was noted both as being unsightly and as reflecting the noise of the street, creating an uncomfortably loud environment. Additionally, the band shell sits within the 65-foot envelope envisioned as part of Canyon Boulevard's future footprint.

2.3. Downtown Boulder Station

Currently over capacity, the Downtown Boulder Station was listed multiple times as both a weakness, threat, and opportunity for the project. Major concerns include the limited space to expand capacity within the existing station footprint, safety and access concerns for pedestrians and bicyclists traveling to and from the station, and bus circulation around the station. Stakeholders involved in the SWOT process noted the desire to improve the station and allow it to keep up with the increasing transit demand within the City of Boulder.

Figure 2. SWOT Analysis Summary



3. Urban Design Context

3.1. Historic Context

The Canyon Boulevard corridor has a long history dating back to the City of Boulder's founding in 1871. Originally known as Water Street and sometimes Railroad Street, it was subject to periodic flooding from Boulder Creek and served as the major rail corridor to downtown for passengers and freight, as well as being a starting point for narrow-gauge rail traveling west up Boulder Canyon. The Boulder Depot building, now at Boulder Junction, was originally located at 14th Street and Canyon Boulevard, roughly the site of the Downtown Boulder Station at 14th Street and Walnut Street. In 1962, the City Council officially change the name of Water Street to Canyon Boulevard at the request of the Chamber of Commerce. Today, the corridor includes multiple buildings and neighborhoods that have received, or potentially could receive, historic designation. Historic properties are further identified in Section 5.3.

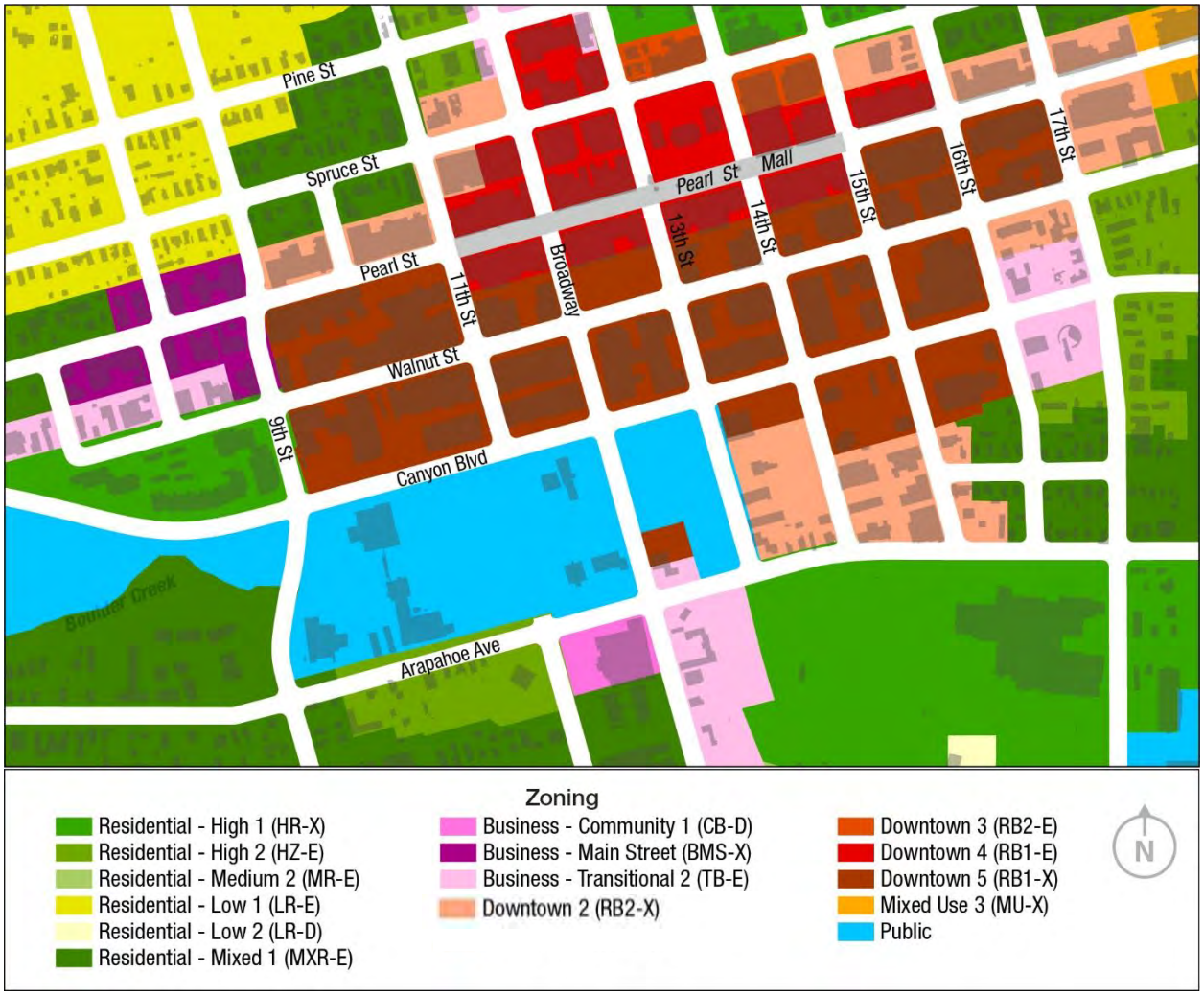
3.2. Current Conditions

Existing conditions surveyed include land use and zoning, "street wall" massing and character, hardscape design and sight furnishings, and landscape design. Generally, from north to south, the street is defined by an urban character on the north side of the street transitioning to downtown, and a park-like setting on the southern side leading to Boulder Creek. From 17th Street headed west, the street begins to gain its urban form, transitioning from smaller lot, single-family, and office uses to larger urban and municipal uses and forms.

Within the study area, land use is mixed with the north side of Canyon populated with urban office, residential, hospitality, and religious uses. The Downtown Boulder Station, between 14th and 15th streets, is a major activity center on the corridor. The south side of Canyon has a significant number of government uses within and around Central Park such as the library, municipal building, and the atrium. Light commercial uses (banks, a gas station, liquor store, etc.) line the eastern portion of the southern right-of-way. Figure 3 shows the existing zoning districts surrounding Canyon Boulevard.

The corridor is primarily surrounded by public land to the southwest and "Downtown 5" to the north and southeast. Downtown 5 is described in the City code as a higher intensity land use and as having the greatest potential for new development and redevelopment within the downtown core. In 2011, this district code was amended to include 65 foot setback from the centerline of Canyon Boulevard from 9th to 16th Street. This setback serves the urban design vision for Canyon Boulevard, as stated in the City of Boulder Downtown Urban Design Guidelines, to create better separation from traffic for pedestrians and improved streetscaping. The area of Business Transitional 2, at the east end of the study area, allows commercial and complimentary residential uses, generally serving as a buffer for residential uses.

Figure 3. Current Zoning



The corridor has generous setbacks ranging from 78 feet from the right-of-way centerline to 25 feet from a property's lot line adjoining the right of way, whichever is greater. Current conditions exhibit curb-to-building-face setbacks ranging from 25 feet to 60 feet. The north side of Canyon Boulevard generally is lined by an urban wall with buildings ranging from one to four stories. Buildings constructed after 2000 are characterized by a significant amount of articulation and architectural detail and step back in a "wedding cake" manner at the third or fourth floor. The south side is characterized by a park-like or suburban setting with one- to two-story buildings sited within Central Park or in a more suburban manner with large setbacks and landscaped buffers. Many surface parking lots line the southern right of way.

The cross-section of the corridor changes from block to block. Figure 4 shows typical dimensions for blocks along Canyon Boulevard. Pedestrian zone conditions vary from five- to six-foot-wide, curb-attached sidewalks to nine-foot-wide paths with six to eight-foot tree lawns and larger expanses of hardscape at newer developments. Hardscape treatment changes from block to block in layout and materiality. The pedestrian realm is mostly poured-in-place concrete, with interludes of brick and stone paving at entrances to newer buildings. The north side exhibits a formal, urban character while the south side is more informal with, at times, a meandering path. Multiple vertical design details exist within and out of the right-of-way line on the northern side of the street: picket fences within the Chamberlain neighborhood, a wooden fence with brick piers at the First Presbyterian Church, raw cast-in-place (CIP) concrete retaining walls a the Downtown Boulder Station, painted CIP planter walls with stone caps from 14th Street to Broadway Street, and large, round planter pots

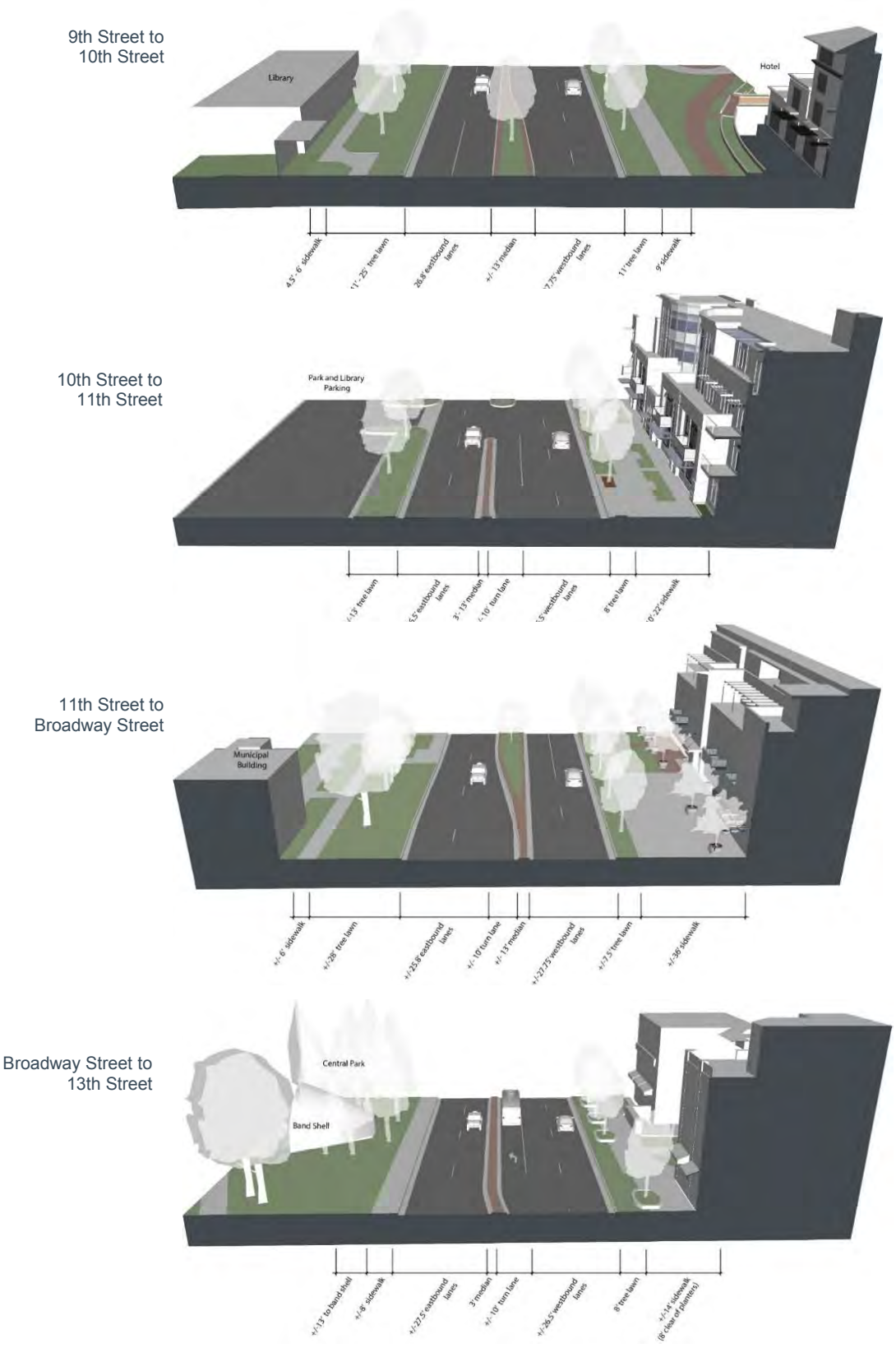
between Broadway Street and 11th Street. In addition, various corner markers appear at major intersections (sandstone markers at Broadway Street and brick markers at 13th Street) and monument signage is located at multiple commercial sites and institutions. Street lighting shows consistency throughout the corridor, with a typical “hockey puck” style roadway light. Pedestrian scale lighting, where present, is a typical 12-foot-tall globe fixture. Site furniture varies by property owner with a consistent use of wood slat and steel tube, steel strap and tube, and recycled plastic benches.

Landscape conditions, too, vary from block to block with the blocks between 9th Street and Broadway Street showing the most consistency. The north side of Canyon Boulevard has, for the most part, regularly spaced street trees in fair to good condition. The tree lawn, or street tree planting zone, is a largely consistent six- to eight-foot width with slightly narrower dimensions east of 15th Street. The south side of the street houses many mature large-canopy trees within the park and eastern commercial properties planted in an informal manner on both sides of the meandering sidewalk. Tree species within the corridor are diverse and generally show good health, though a number of ash trees are in danger of the oncoming emerald ash borer epidemic. Understory planting is mixed, with perennials, groundcover, evergreen and deciduous shrubs, though the majority of understory along the corridor is lawn or mulch. The center median is planted with a variant of shade and ornamental, flowering trees, perennials and shrubs in a legible rhythm highlighting key pedestrian and vehicular crossing points. Two old-growth trees west of 11th Street show signs of struggle.

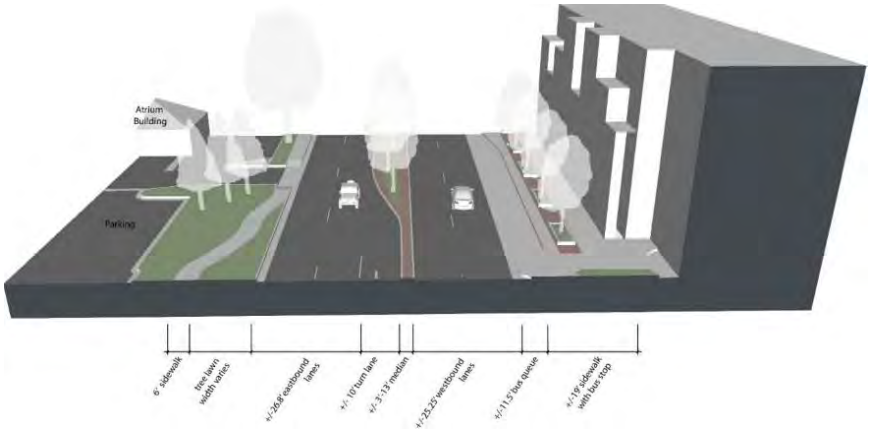
3.3. Planned Improvements

As mentioned in Section 1.1.1, major planned improvements along the corridor include a renovation and redevelopment of the Civic Area. The Master Plan calls for a new park design with increased access, public gathering spaces and plazas, visual and performance art restoration, and maintaining riparian vegetation along the creek, food vendors, and other amenities, as well as increased visual and physical access to Boulder Creek. Along Canyon Boulevard, the Master Plan calls for a pedestrian promenade with an allée of trees similar to the Champs-Élysées in Paris with multimodal, non-vehicular paths. The plan also calls for the redevelopment of the southern block between 13th and 14th Streets into a series of new buildings ranging from two to four stories with an expanded farmers market and possible development of the Civic Use Pad to the east of the Hotel St. Julien into a civic use building (conference space or event center) with a better formal relation in mass and scale to the hotel.

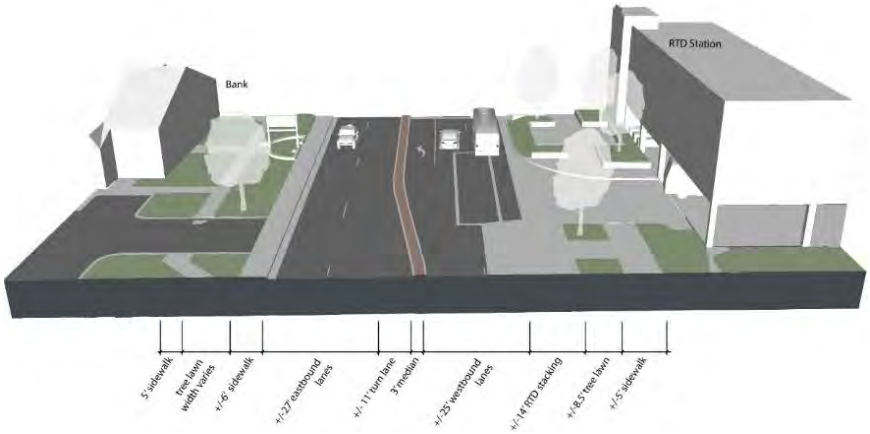
Figure 4. Canyon Boulevard Typical Cross-section (shown West to East)



13th Street to 14th Street



14th Street to 15th Street



15th Street to 17th Street

4. Transportation Elements

Canyon Boulevard, designated as SH 119 by CDOT, currently functions as a major east-west arterial connecting the City of Boulder to the nearby mountains. The roadway is a four-lane, divided arterial with two lanes of traffic in both the eastbound and westbound directions. Within the study area, the roadway has a consistent posted speed limit of 35 miles per hour (mph). Every intersection along the corridor has left-turn storage bays, but lacks right-turn lanes. Currently, there are no on-street parking areas or dedicated bicycle facilities along Canyon Boulevard.

4.1. Vehicular Traffic

The latest traffic count data collected within the study area, taken in January 2016, shows the average daily traffic (ADT) ranging from around 11,000 vehicles per day (vpd) at 9th Street to almost 20,500 vpd at 17th Street. Heavy vehicles, which includes any vehicle with three or more axles, comprise between 2 percent and 3.5 percent of the average daily traffic volume. Table 4-1 shows the ADT and percent of heavy vehicles for each data collection location.

Table 4-1. Average daily traffic

Location	ADT	Percent Heavy Vehicles
West of 9th Street	11,025	3.53%
East of 11th Street	14,596	1.79%
East of 13th Street	15,574	2.69%
East of 17th Street	20,468	2.10%

The daily traffic pattern shows a morning peak between 7:00 a.m. and 8:00 a.m., and an evening peak between 5:00 p.m. and 6:00 p.m. West of Broadway Street, traffic volume decreases after the morning peak through the mid-day period and rises again during the evening peak period before tapering off over night. East of Broadway Street, traffic drops after the morning peak period, but then rises steadily again through the mid-day and evening periods. These locations show a much greater difference between the morning and evening peak periods than the locations west of Broadway Street. There is not a strong directional peak flow along the corridor. The daily directional traffic data at the count locations are shown in Figure 5 through Figure 8.

Figure 5. Canyon Boulevard West of 9th Street ADT

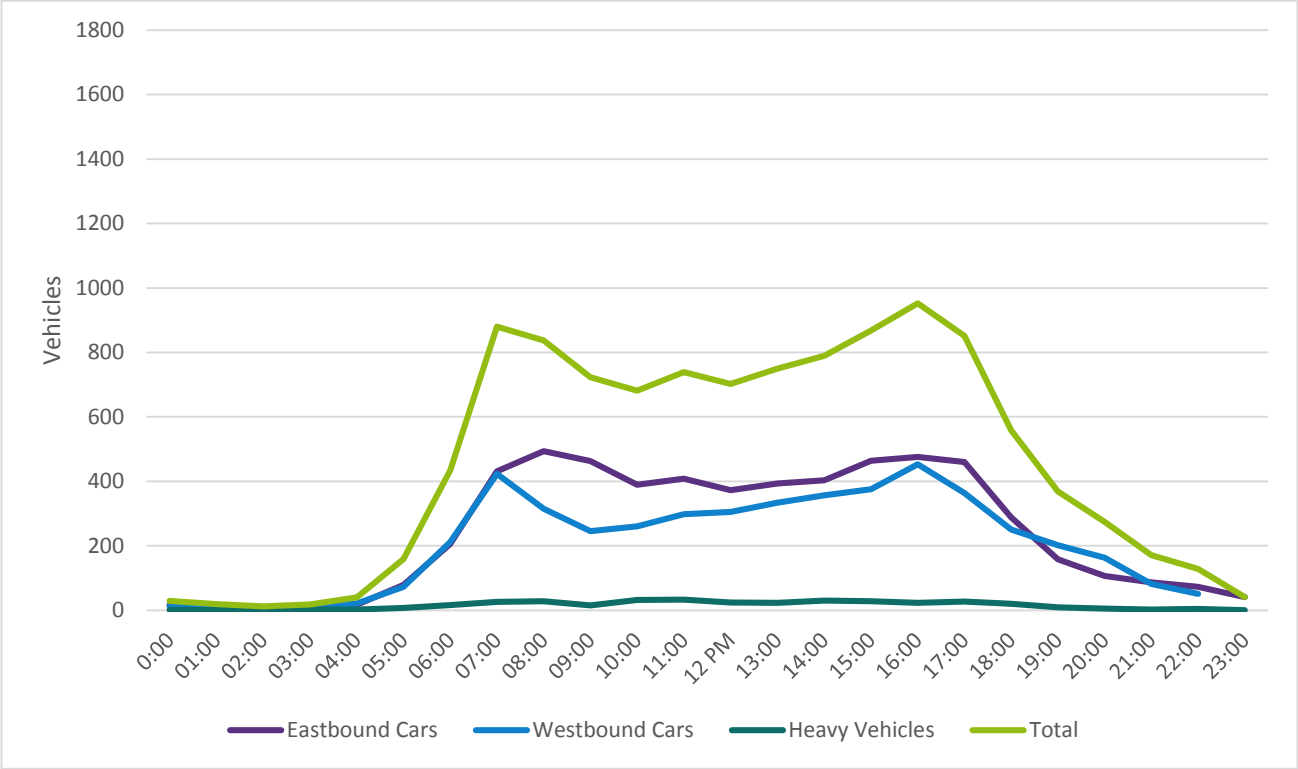


Figure 6. Canyon Boulevard East of 11th Street ADT

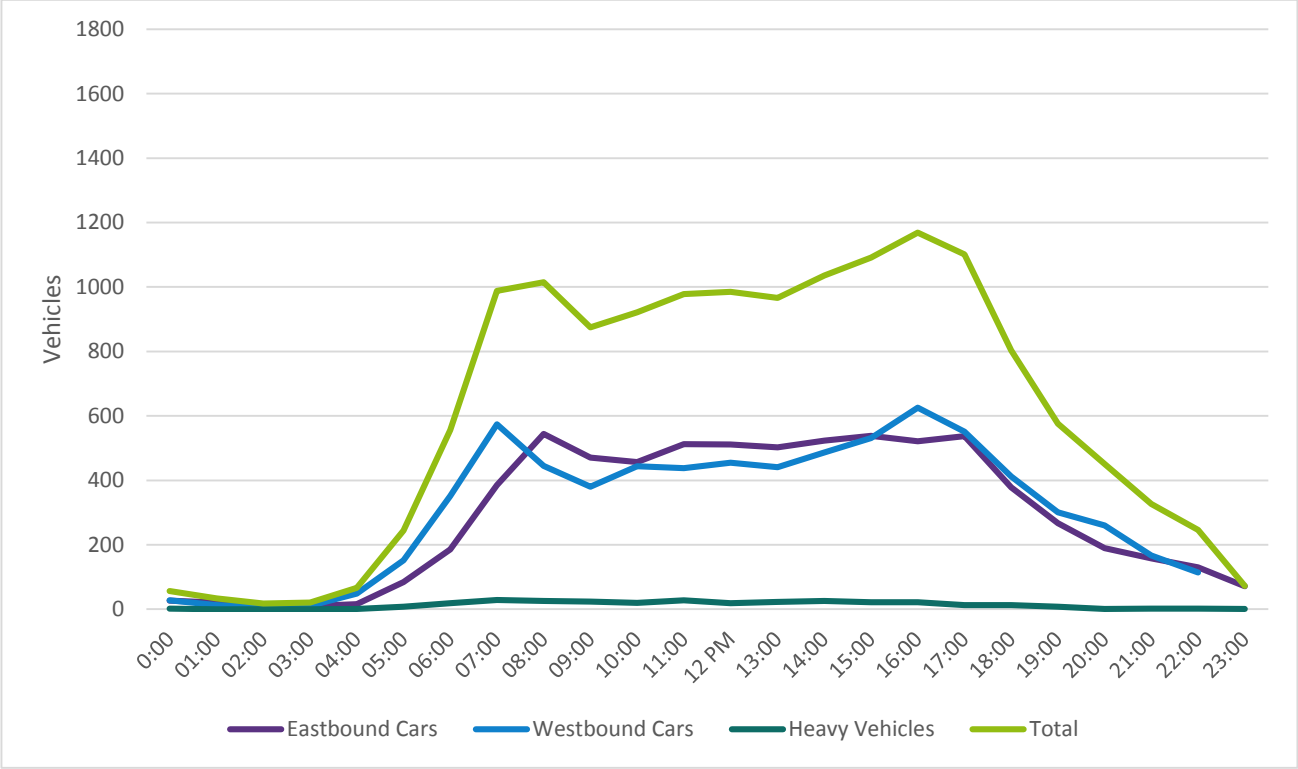


Figure 7. Canyon Boulevard East of 13th Street ADT

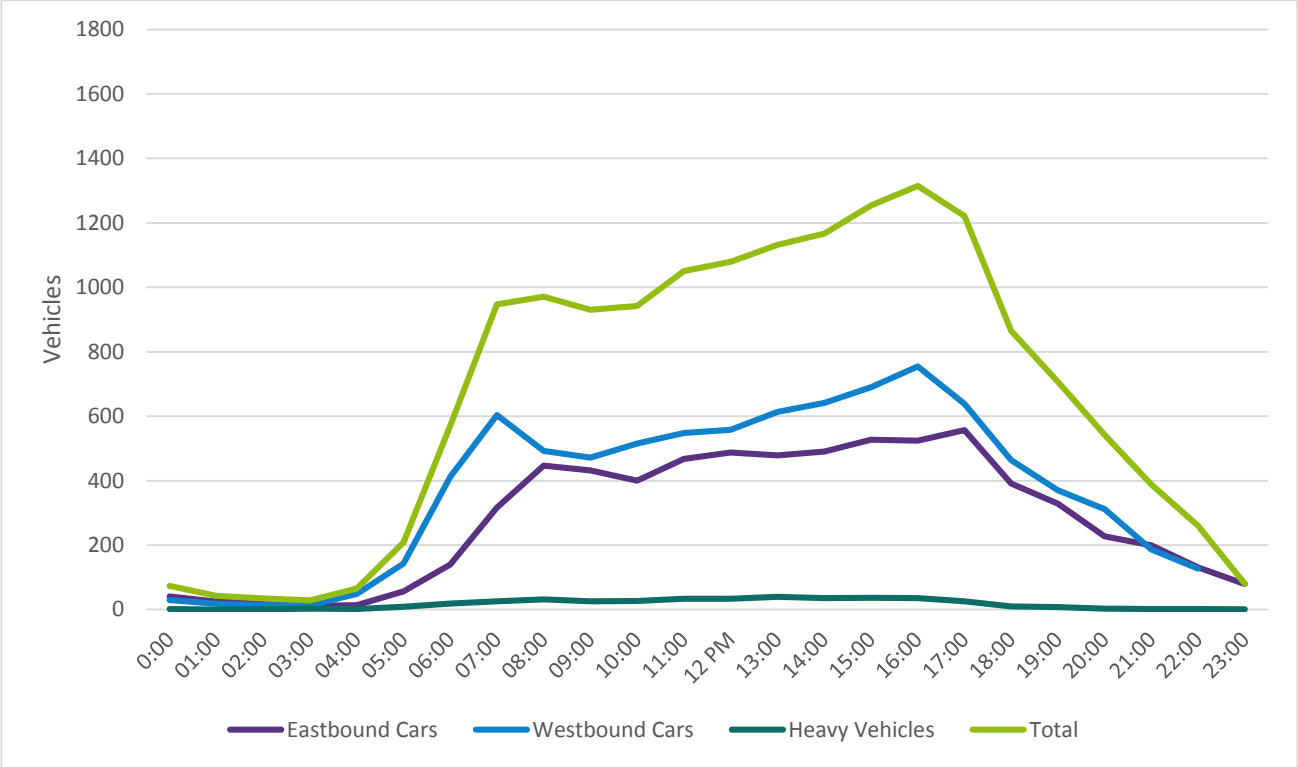
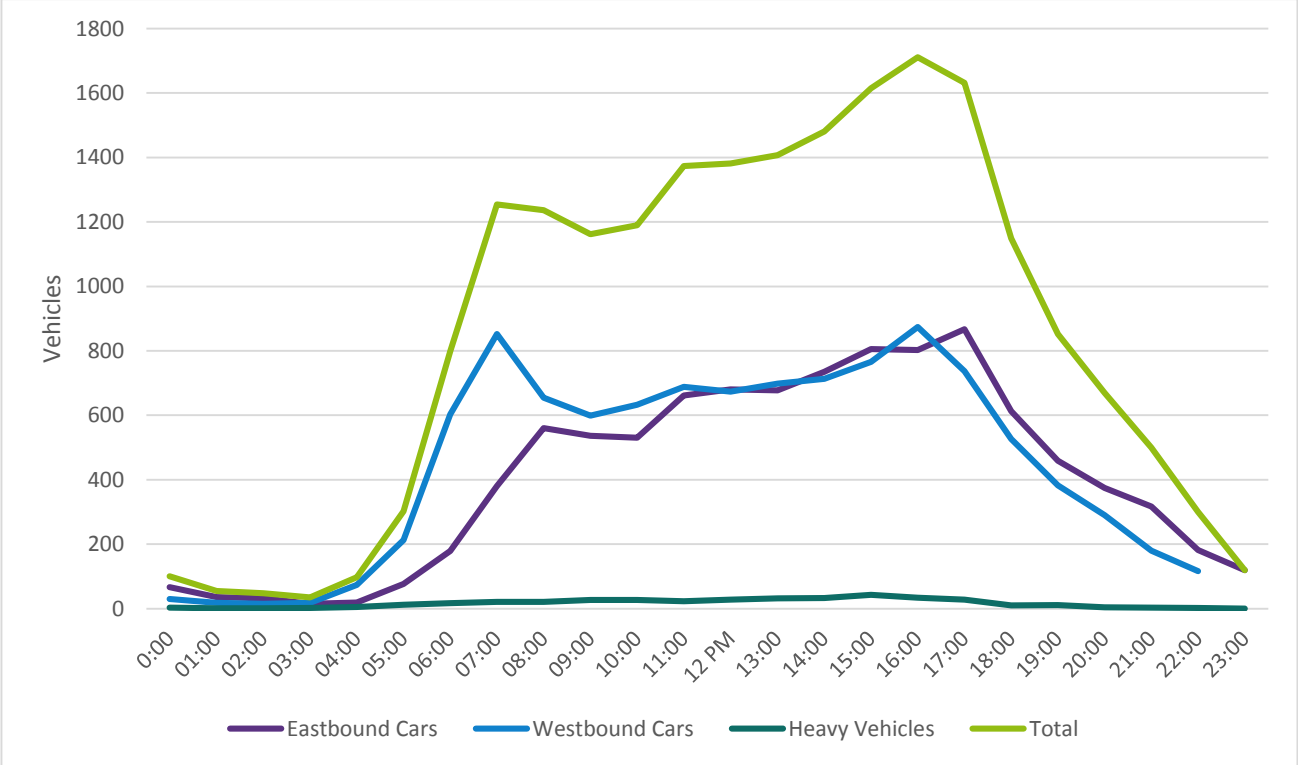


Figure 8. Canyon Boulevard East of 17th Street ADT



In total, there are six signalized intersections; one two-way, stop-controlled intersection; and two mid-block crossings along Canyon Boulevard within the study area. The busiest intersection within the study area is Broadway Street. Also designated as SH 93, Broadway Street has an ADT of 24,560 vpd where it crosses Canyon Boulevard. Each intersection within the study area is listed in Table 4-2.

Table 4-2. Study area intersections

Intersection	Control Type
9th Street	Signalized
Boulder Public Library Pedestrian Crossing	Yield (mid-block)
11th Street with Pedestrian Crossing	Stop controlled (side-street only), pedestrian crossing is yield controlled
Broadway Street	Signalized
13th Street	Signalized
14th Street	Signalized (north side is restricted to RTD vehicles only)
15th Street	Signalized
16th Street	Two-way stop controlled
17th Street	Signalized

4.2. Existing Vehicle Level of Service

To evaluate the vehicle travel conditions along Canyon Boulevard, the Highway Capacity Manual (HCM) Level of Service (LOS) methodology was used. The LOS is a measurement of the average delay per vehicle at an intersection. Based on this delay, a score of A through F is assigned, with A representing the best conditions, or smallest delay, and F reflecting the worst conditions, or greatest delay.

Synchro 9 software was used to analyze the existing congestion along the corridor. Synchro models were provided by the City of Boulder and were updated and used to evaluate the morning peak period (7:00 a.m. to 8:00 a.m.), the mid-day period (12:00 p.m. to 1:00 p.m), and the evening peak period (5:00 p.m. to 6:00 p.m.). The *2010 Highway Capacity Manual* (2010 HCM) methodology was used to calculate the level of service (LOS) for the 9th Street and Broadway Street intersections. This methodology was unable to produce LOS for the other intersections due to its limited applications; therefore, the *2000 Highway Capacity Manual* (2000 HCM) methodology was used to evaluate all other intersections. The results of this analysis are shown in

Figure 9 through Figure 11.

During the morning peak period, all intersections operate at LOS C or better. The intersection with Broadway Street experiences the most congestion, with some approaches operating at LOS D. During the mid-day peak, the corridor operates slightly better than the morning peak with all intersections operating at LOS C or better. The evening peak period is the most congested time for the corridor. During this period, the intersection at Broadway Street degrades to LOS E, with all approaches operating at LOS D or worse. Because of this delay, both the northbound and southbound approaches queue to the adjacent streets. On the northbound approach, the queue was observed at 550 feet, south to Arapahoe Road. Similarly, on the southbound approach, the queue extends north past Walnut Street to Pearl Street. The eastbound and westbound approaches along Canyon Boulevard do not experience the same queue length as the northbound and southbound approaches. On the westbound approach, queues reach back to 13th Street and, on the eastbound approach, they reach 11th Street. These queues do not cause 11th Street or 13th Street to queue significantly.

Figure 9. AM Peak Period LOS

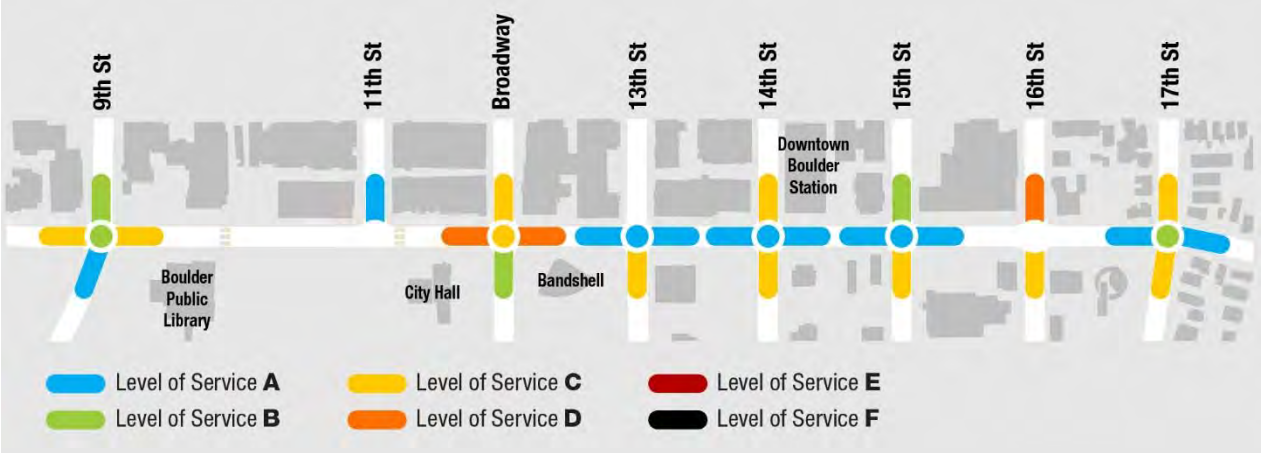


Figure 10. Mid-Day LOS

Figure 11. PM Peak Period LOS

4.3. Vehicular Travel Time

In addition to the LOS, SimTraffic 9 simulation software was used to model the corridor travel times during the morning, mid-day, and evening peak periods. The results are shown in Table 4-3. The longest travel time is experienced in the evening westbound direction, with a trip from 17th Street to 9th Street taking nearly three minutes to travel the 0.6-mile corridor. This translates to an average travel speed of 12 mph. The primary delay occurs on the western portion of the corridor between 9th Street and 13th Street. This represents half of the travel distance, but accounts for nearly 70 percent of the travel time delay. This is due to the congestion at the Broadway Street intersection, and the delay at the mid-block pedestrian crossings. The mid-block pedestrian crossings add an additional 11 seconds of travel time per vehicle in the eastbound direction and nearly 21 seconds of delay in the westbound direction during the evening peak period. Additionally, the westbound direction experiences longer travel times by about 30 seconds per vehicle compared to the eastbound direction during all three time periods. This is likely caused by slightly higher westbound vehicle volumes on the corridor.

Table 4-3. Corridor travel times

Time of Day	Direction	Travel Time (min)
Morning Peak Period	Eastbound	1.91
	Westbound	2.44
Mid-Day Period	Eastbound	2.07
	Westbound	2.51
Evening Peak Period	Eastbound	2.53
	Westbound	2.97

4.4. Transit Service

Transit service within this corridor is provided by RTD. RTD provides extensive bus service through the corridor, and operates the Downtown Boulder Station, a regional bus depot. Handling both local and regional buses, Canyon Boulevard is the primary access road into and out of the Downtown Boulder Station. Additionally, there are currently two bus storage bays along Canyon Boulevard. Located between 13th Street and 15th Street, these bays are used by RTD for bus storage during off-peak times. Figure 12 shows the local, regional, and

SkyRide routes around the study area, as well as the combined boardings and alightings at each station. The highest ridership activities are concentrated along Broadway Street and the Downtown Boulder Station. The most-used transit stop along Canyon Boulevard is the Downton Boulder Station, which services more than 5,200 users per day.

Correlated with the high ridership, the highest concentration of bus routes are along Broadway Street and Canyon Boulevard. Figure 13 shows the individual bus routes near the study corridor, as well as which routes service each stop. Although local, regional, and SkyRide routes travel along Canyon Boulevard, the street-side bus stops on Canyon Boulevard primarily are serviced only by the local routes.

Figure 12. Existing Transit Network

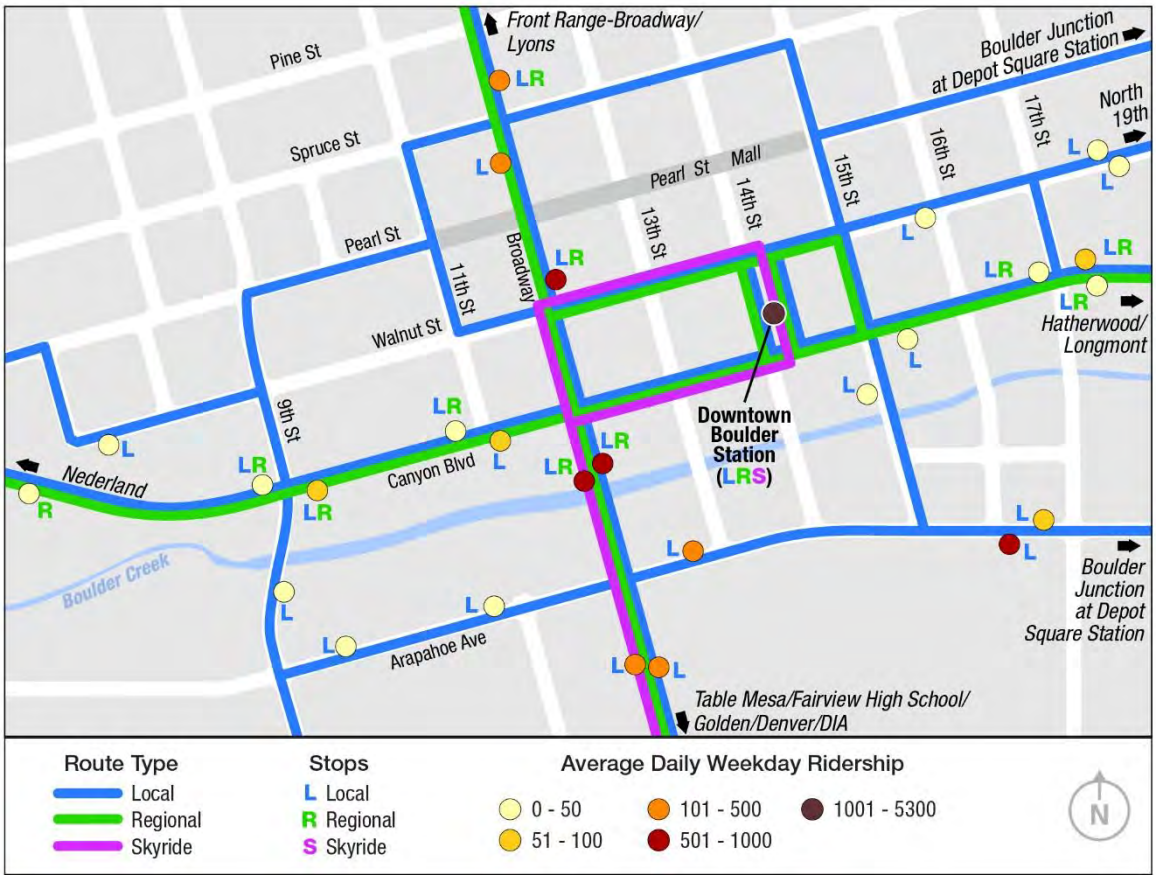
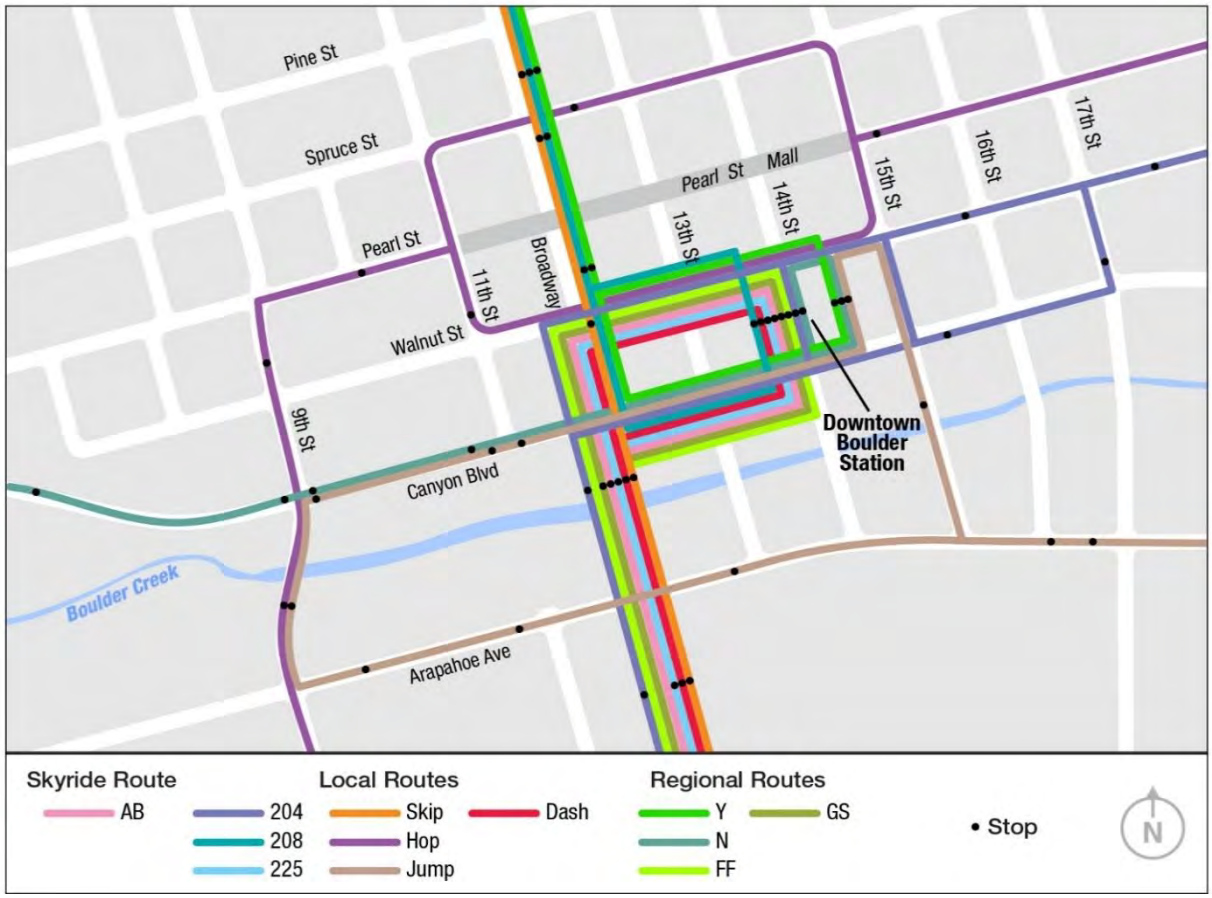


Figure 13. Individual Bus Routes Within the Study Area



Typical street-side transit stops in the area include a posted sign and bench, although in a few cases, such as at the Broadway Street and Canyon Boulevard stop, transit facilities include a shelter as well. Bus stops along Canyon Boulevard do not have pull-outs. The only place where buses stop outside the travel lanes are the two bus layover spaces near the Downtown Boulder Station.

4.5. Bicycle Facilities

Along Canyon Boulevard—and for many of the surrounding streets to the north—bicyclist are not allowed to ride on the sidewalk. Currently, there are shared-use bicycle facilities along Canyon Boulevard within the study area. The roadway network surrounding Canyon Boulevard includes roads with and without designated bicycle facilities. East-west bicycle facilities are provided one block north and south of Canyon Boulevard along Walnut Street, and the Boulder Creek Greenway. The Boulder Creek Greenway also provides regional bicycle connections to the Boulder Foothills and the Denver metropolitan region. North-south bicycle facilities exist along 9th Street, 13th Street, 15th Street, and 17th Street. Table 4-4 lists each bicycle facility by type, and Figure 14 shows a map of existing bicycle facilities within the study area. It should be noted that Walnut Street, 15th Street, Spruce Street, and 11th Street are one way, and, therefore, only provide a directional connection for bicycles as well as vehicles. This is discussed further in Section 4.7.

4.5.1. Bicycle Parking

Bicycle parking is provided on and near to the corridor, with most parking associated with businesses, the Downtown Boulder Station, the 13th Street cylcetrack, and near to public building entrances in the Civic Area. Rack types range from ground-mounted U-racks; to serpentine racks; to large scale parking shelters, such as the “Bus Then Bike” parking at the Downtown Boulder Station. Additional bicycle parking options at the

Downtown Boulder Station include 140 secure spots available for registered users, several bike lockers, and outdoor covered parking.

4.5.2. Bicycle Sharing

Boulder B-Cycle has six active stations within one-quarter mile of the study area; three locations north of Canyon Boulevard surrounding the Pearl Street Mall and three locations within Central Park. There is one station located on Canyon Boulevard within the study area at the Downtown Boulder Station.

Table 4-4. Bicycle Facilities within the Study Area

Road	Facility Type	Direction
9th Street	Paved shoulder	Northbound
9th Street	On-street bike lane	Southbound
13th Street	Shared-use route	Northbound
13th Street	Contra-flow bike lane	Southbound
15th Street	Shared-use route	Northbound/Southbound
17th Street	On-street bike lane	Northbound/Southbound
Walnut Street	Shared-use route	Eastbound/Westbound
Boulder Creek Greenway	Multi-use path	Eastbound/Westbound

Figure 14. Existing Bicycle Network

4.6. Bicycle Counts

Bicycle counts were collected from the turning movement count data at intersections, provided by the City of Boulder, and ADT data collected along Canyon Boulevard. Bicycle volumes, where available, are summarized in Table 4-5. This table shows a compilation of data collected over multiple days representing a large temperature range from winter months to summer months. Therefore, the volumes cannot be directly compared to each other because temperature is known to affect the volumes of bicyclists on any given day. Additional data along the Boulder Creek Greenway were collected from a permanent bike counter located along the pathway near 13th Street. This counter recorded the Boulder Creek Greenway's bicycle volume as being between 100 and 1,300 bicycles per day, depending on the time of the year. Most intersections along Canyon Boulevard experience lower volumes compared to this facility. This is likely a reflection of the facilities provided at each location.

Table 4-5. Bicycle Volumes on Canyon Boulevard

Location	Morning Peak	Mid-day Peak	Evening Peak
West of 9th Street along Canyon Boulevard	3	8	8
9th Street and Canyon Boulevard	56	37	38
Between 9th Street and Broadway Street	1	1	5
Broadway Street and Canyon Boulevard	27	33	41
Between 13th Street and 14th Street along Canyon Boulevard	5	6	7
13th Street and Canyon Boulevard	112	68	137
14th Street and Canyon Boulevard	14	28	43
15th Street and Canyon Boulevard	26	22	10
17th Street and Canyon Boulevard	42	18	48
East of 17th Street along Canyon Boulevard	2	8	8

4.7. Bicycle Network Service Level

To determine the existing user experience for bicyclists traveling along Canyon Boulevard, it is important to not only understand the existing service provided directly along the corridor, but also the service provided by the surrounding roadway and bicycle facility network. This analysis will determine the function of the surrounding network in accommodating varying cycling abilities. The Level of Traffic Stress (LTS) was used for this analysis because it determines cycling comfort for a particular user group.

The LTS approach recognizes that traffic stress—a combination of several negative experience traffic stressors, such as exhaust fumes, noise, and perceived danger—is the greatest deterrent to cyclists. The LTS approach to evaluating bicycle facilities focuses on the segment of the population that would likely ride bicycles if they were separated from automobile traffic. LTS is defined as:

LTS 1: A level of traffic stress tolerable by most children

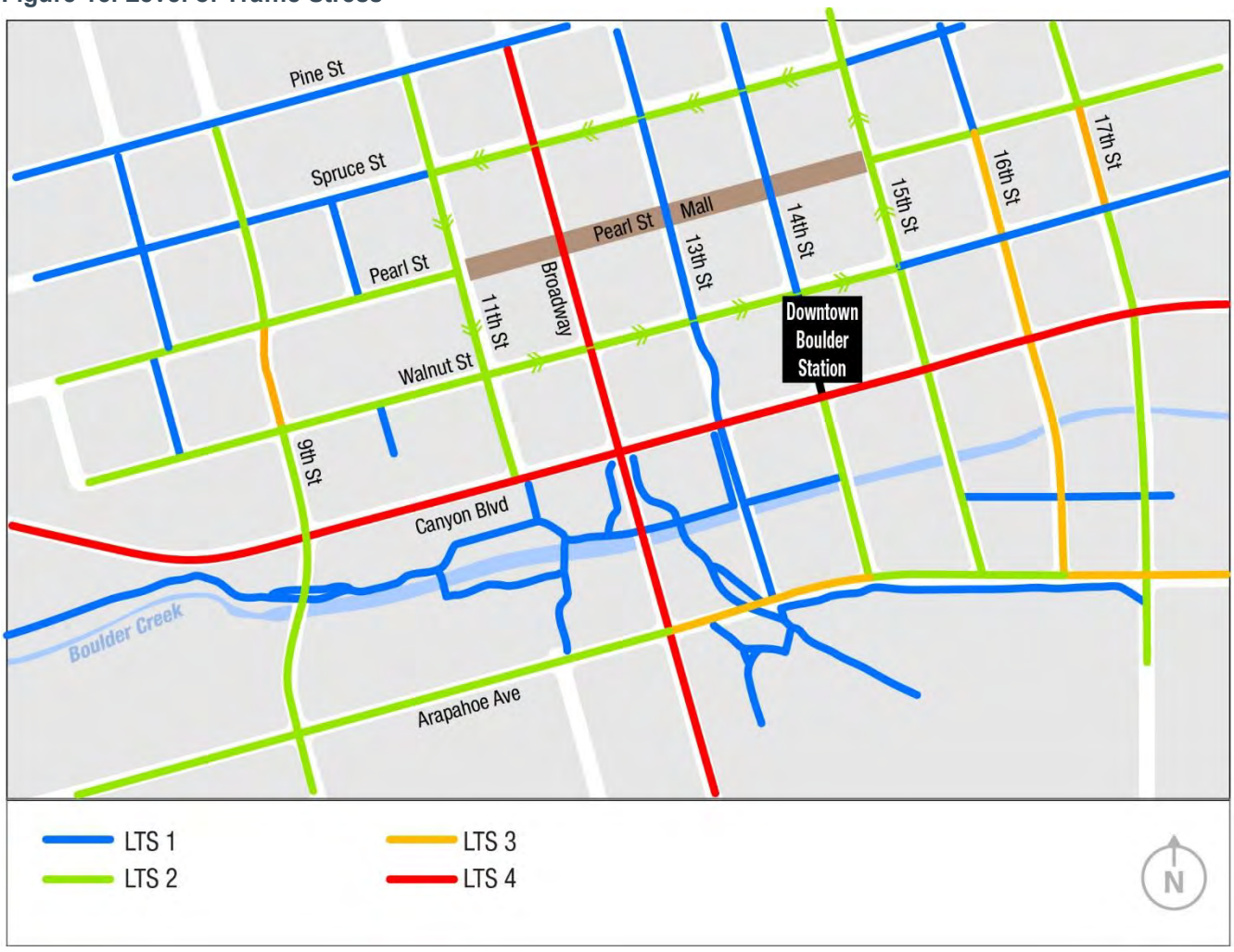
LTS 2: A level of traffic stress tolerable by the mainstream adult population

LTS 3: A level of traffic stress tolerable by a smaller portion of the adult population who are confident in their abilities, but who would prefer separation from traffic

LTS 4: A level of traffic stress tolerable by the most confident riders; these riders are comfortable mixing with heavy traffic and at higher speeds

Figure 15 shows the LTS for the network surrounding Canyon Boulevard. Several blocks north of Canyon were included in this analysis to understand the function of the one-way loop formed by Walnut Street, 15th Street, Spruce Street, and 11th Streets. Also, for the purposes of this study the Boulder Creek Greenway was included as a connection in the bicycle network.

Figure 15. Level of Traffic Stress



Because of the lack of dedicated bicycle facilities, speeds of 35 miles per hour and greater, and four lanes of traffic, Canyon Boulevard received an LTS 4, only providing a connection for the most experienced cyclist. A majority of the network received an LTS 2, with speeds on many of the roads between 20 and 25 miles per hour, no more than two lanes of vehicular traffic, and varying accommodations for cyclists provided. The cycletrack on 13th Street and the Boulder Creek Trail received an LTS 1 because of the separation from traffic provided by those facilities.

4.8. Pedestrian Facilities

There is an extensive existing pedestrian network within the study corridor. Canyon Boulevard has sidewalks in both the eastbound and westbound directions and all intersecting streets have sidewalks. Additionally, there is an existing network of off-street pedestrian facilities within the Civic Area and along Boulder Creek. Sidewalks on

the north side of Canyon Boulevard generally are about 10 feet in width, with the narrowest section being four feet near 17th Street. Along the south side of Canyon Boulevard, the pedestrian facilities are considerably narrower, ranging between four feet and eight feet.

For a majority of the corridor, the sidewalks have a buffer between the vehicle travel lanes and the pedestrian walkway. This buffer varies, from a simple three-and-a-half foot grass strip to larger raised planters. However, some sections of sidewalk are not detached from the street and do not have a significant barrier between cars and pedestrians. This occurs in multiple places on the south side of the street, including sections between Broadway Street and 14th Street, as well as on the north side near 17th Street.

Each intersection, with the exclusion of 16th Street, has existing pedestrian facilities across Canyon Boulevard, including crosswalk striping and ramps. 16th Street has ramps, but does not have a formal, striped crosswalk. Based on a visual inspection, all ramps within the study area appear to meet the most recent Americans with Disabilities Act (ADA) design standards. Additionally, there are two mid-block pedestrian crossings located between Broadway Street and 9th Street. Both share similar designs with rapid flashing beacons, painted markings, and vehicle yield signs.

4.8.1. Pedestrian Counts

Pedestrian counts were gathered from the turning movement count data collected at each intersection. For the two mid-block crossings—at the Boulder Public Library and 11th Street—data were provided by the City of Boulder from counts taken in July 2009 at the Boulder Public Library crossing, and in June 2012 at the 11th Street crossing. These counts are shown in Table 4-6. The most pedestrian movements take place between Broadway Street and 14th Street and range from around 130 to 400 pedestrian crossings during a peak period. The high number of crossings at these locations, as compared to the eastern or western ends of the study area, is likely a result of the intersections' proximity to the Downtown Boulder Station and Broadway Street and Canyon Boulevard bus stops.

Table 4-6. Pedestrian Volumes

Location	Morning Peak	Mid-day Peak	Evening Peak
9th Street and Canyon Boulevard	75	77	122
Boulder Public Library mid-block crossing	26	69	59
11th Street and Canyon Boulevard	120	152	192
Broadway Street and Canyon Boulevard	255	308	361
13th Street and Canyon Boulevard	126	252	230
14th Street and Canyon Boulevard	147	215	412
15th Street and Canyon Boulevard	116	181	254
17th Street and Canyon Boulevard	120	93	107

4.8.2. Pedestrian Level of Service

To better understand the existing pedestrian facilities, the Pedestrian Performance Measures (PPM) model methodology was used to score each sidewalk segment. This points-based-model assigns a score for certain features of the pedestrian infrastructure and, based on the total score, assigns a pedestrian level of service to the facility.

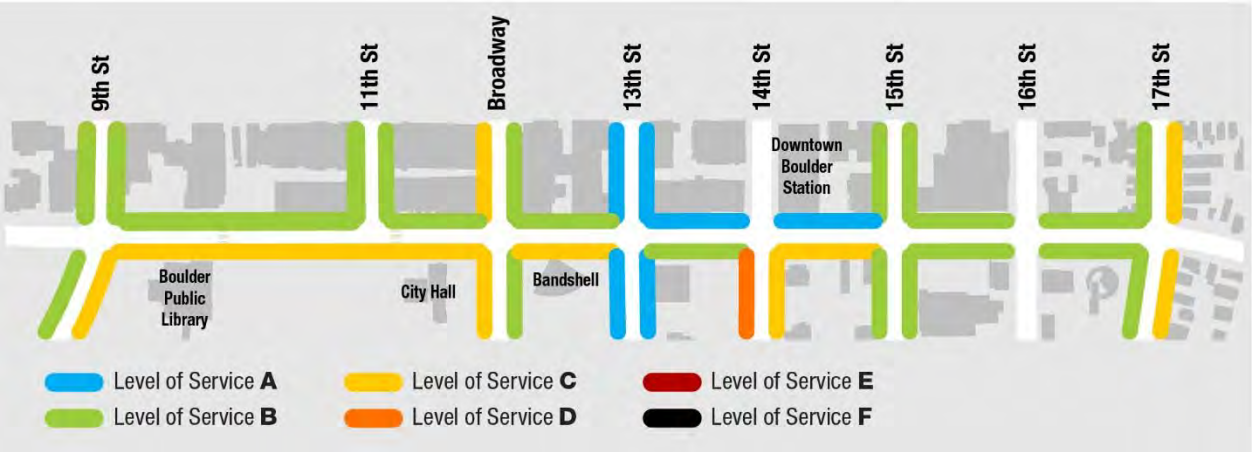
The main criteria evaluated include:

- Continuity of facility
- Width of facility
- Conflicts with motor vehicles
- Amenities and user comfort
- Maintenance
- Support of alternative transportation options, such as bicycling and public transit

Originally developed for the City of Gainesville, Florida, by the University of Florida, this methodology was chosen over others, such as the Highway Capacity Manual's Pedestrian Level of Service model, because of its ability to evaluate the corridor on a block-by-block basis and capture elements of the pedestrian experience beyond a simple point-to-point travel evaluation. The points-based methodology of the PPM model was reviewed by the Sacramento Area Council of Governments' study entitled, *Application of New Pedestrian Level of Service Measures*. The study compared the PPM model to the HCM's Pedestrian Level of Service (PLOS) model and determined them to be equally useful in their ability to evaluate pedestrian facilities. Additionally, the criteria evaluated in the PPM model, summarized above, are very similar to those evaluated by many civic pedestrian planning documents, including the City of Seattle, Washington's *Pedestrian Master Plan,* and the City of San Francisco, California's *Better Streets Plan.* Although neither of these documents specifically utilizes the PPM scoring model, they place importance on the same aspects the model evaluates. The PPM model simply gives the ability to consistently measure the features and amenities that are widely accepted to be a necessary part of a vibrant pedestrian facility.

To fully capture the pedestrian experience across the corridor, two pedestrian level of service analyses were conducted. The first, using the standard PPM methodology was applied to a corridor-wide analysis. This resulted in an overall pedestrian LOS B for the corridor. A second, modified PPM methodology then was applied to individual segments of the roadway. A modification was required to the original PPM model because it does not traditionally distinguish between the different conditions on each side of a street. Because of the variability in sidewalk characteristics between the north and south side of Canyon Boulevard, the PPM model was modified to supplement the analysis. It was determined that this modification would be applicable for use on this project as long as the modification was applied consistently to both existing conditions and any future considered alternatives. The results of the modified segment analysis are shown in Figure 16. The individual scoring tables, included as Appendix XX, show the points each segment received for each criterion evaluated. The appendix also shows the original and modified scoring tables used for this analysis.

Figure 16. Pedestrian LOS



In general, the existing pedestrian facilities are adequate for transportation purposes, but do not always provide a comfortable experience. The best-scoring pedestrian facilities are those located around 13th Street and near

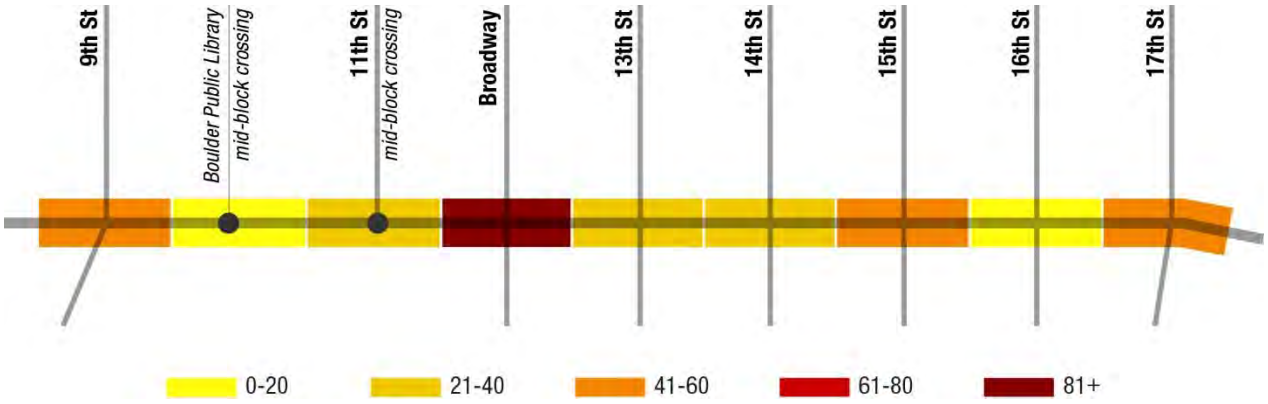
the Downtown Boulder Station. These segments scored better than the others due to the increased separation from vehicle traffic and presence of human-scaled amenities. The worst performing pedestrian facility is the southbound 14th Street sidewalk south of Canyon Boulevard. This section scored poorly due to the narrow sidewalk, lack of amenities, and high volume of driveways.

4.9. Transportation Safety

Five years of crash data (January 2010 to December 2014) were collected from crash records maintained by CDOT, the City of Boulder, and available from the Pedestrian and Bicycle Crash Analysis Tool (PBCAT). It was necessary to rectify information from all sources to ensure completeness of the information, since none of the sources was deemed to be complete on its own. Self-reported crash records were not included in the study.

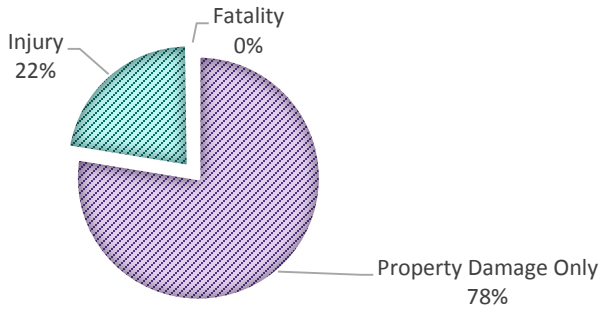
Because most crashes were reported in conjunction with an intersection, vehicle crashes were identified by roadway segment in the study area and aggregated around each intersection. Figure 17 shows the number of crashes for each segment of roadway within the study area. The highest number of vehicular crashes were located at Broadway Street, which had 117 crashes recorded. This is more than twice as many accidents as recorded at any other intersection and represents more than one-third of all crashes within the study area. Of the remaining intersections, the crashes are more evenly spread across the corridor, with 9th Street, 15th Street, and 17th Street intersections experiencing the next highest volume of crashes, ranging between 40 and 60.

Figure 17. Vehicle Crashes



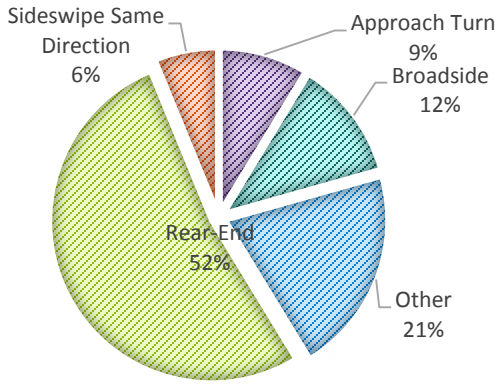
Most crashes along the corridor are minor and do not result in injuries. Injuries represent only 22 percent of all accidents. There was only one fatality in the corridor. This fatality occurred near the 14th Street intersection. Non-injury and injury crashes were evenly spread across the corridor, with each intersection having about the same percentage of non-injury and injury crashes. Figure 18 shows the percentage of each crash type within the corridor.

Figure 18. Vehicle Crashes by Type of Damage



The largest number of crashes within the study area are rear-end collisions. These types of crashes represent more than half of all crashes on the corridor, which is typical for signalized intersections. Sideswipes, approach turns, and broadsides represent an additional 30 percent of the crashes, with the remaining crashes being a combination of other crash types, including utility pole collisions, barrier collisions, and collisions with parked cars. Figure 19 shows percentage of crashes by type.

Figure 19. Vehicle Crashes by Type



Bicycle and pedestrian crashes also were recorded and analyzed for the same period and for the same segments as the vehicle crashes. The results of this analysis are shown in Table 4-7. The highest number of pedestrian crashes occurred at 15th Street and Broadway Street. Additionally, Broadway Street has the highest number of reported bicycle crashes. In general, most bicycle and pedestrian incidents within the study area occur between 11th Street and 15th Street. These are also the locations with the highest volumes of bicyclists and pedestrians. On January 20 and 21, 2016, between the hours of 6:00 a.m. and 6:00 p.m., video traffic detection devices recorded more than 75 illegal pedestrian movements crossing Canyon between 14th Street and 15th Street. Many of these crossings were related to making connections with the Downtown Boulder Station.

Table 4-7. Bicycle and Pedestrian Crashes

Location	Pedestrian Crashes	Bicycle Crashes
9th Street and Canyon Boulevard	1	1
Boulder Public Library mid-block crossing	0	0
11th Street and Canyon Boulevard	3	4
Broadway Street and Canyon Boulevard	4	6
13th Street and Canyon Boulevard	0	1
14th Street and Canyon Boulevard	2	3
15th Street and Canyon Boulevard	5	1
16th Street and Canyon Boulevard	0	0
17th Street and Canyon Boulevard	2	4

5. Environmental Considerations

5.1. Methods of Environmental Analysis

A desktop review of environmental resource data was completed to record existing environmental resources and land uses within the study area. The goal was to determine if the resources currently presented would affect the implementation of the project. Data were obtained from the City of Boulder and aerial maps from Google and ESRI ArcMap.

5.2. Socioeconomics and Environmental Justice

The study area generally is characterized as a mixed urban corridor. The west side of the corridor is zoned as downtown land use and consists of mostly commercial businesses on the north side. Businesses include restaurants, retail shops, and banks. Boulder Creek Greenway and Central Park are located south of Canyon Boulevard between 9th Street and 13th Street.

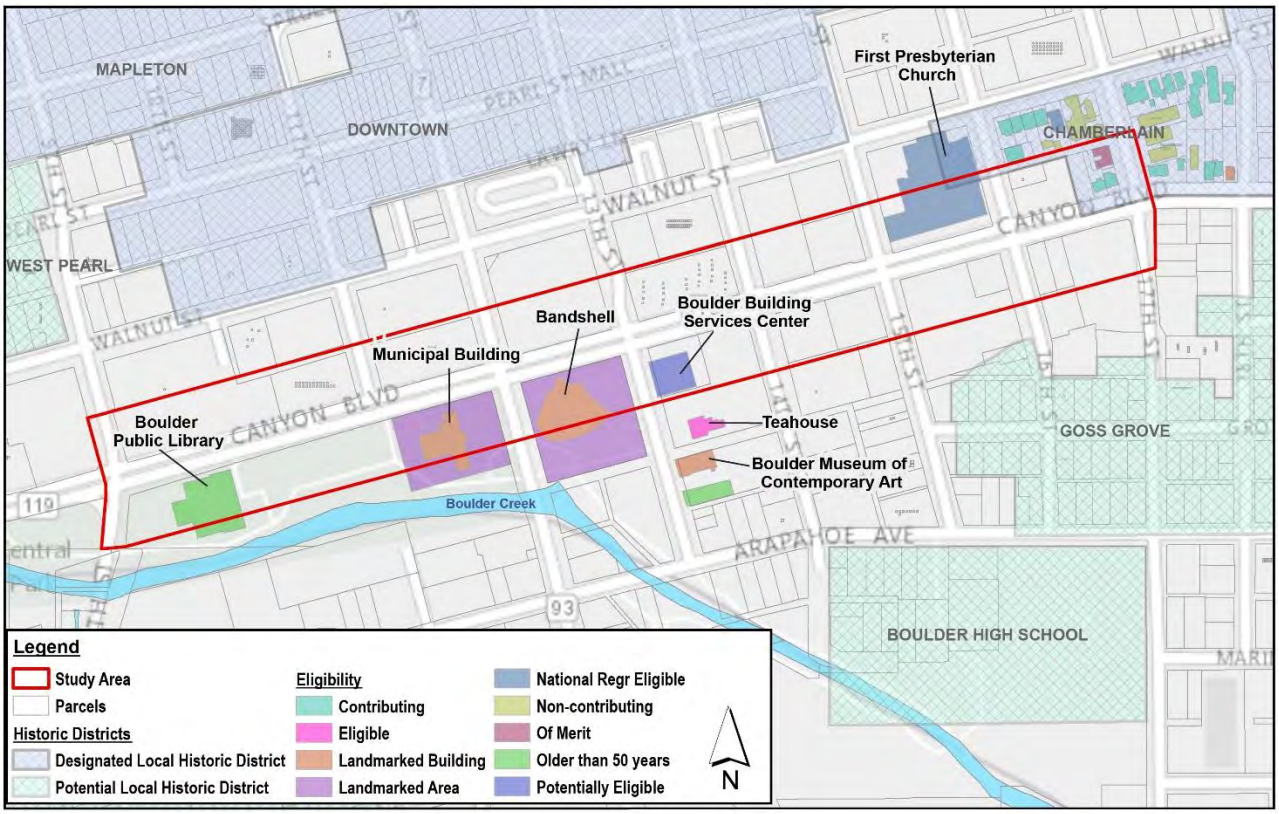
It is unlikely that minority and low-income communities exist within the study area. Currently, the Census data for the City of Boulder indicates that the minority population of the city is 12.0 percent and the low-income population is 22.8 percent (referring to the number of individuals living below the poverty level) (Census, 2010). These percentages are well below the 50-percent minority and low-income environmental justice thresholds.

5.3. Historic, Paleontological/Archaeological

Data records show there are a total of seven potential historic structures in the study area, three of which are located in the Chamberlin Historic District. The historic district is located north of Canyon Boulevard, between 15th Street and 17th Street. The district primarily contains older residential buildings that have been converted to small businesses or serve as dual purpose buildings (residential and small business) and the First Presbyterian Church. Only a portion of the First Presbyterian Church is included in the Chamberlain Historic District. It should be noted that the land surrounding both the band shell and the Municipal Building have been classified as Landmarked Areas. In addition, the Boulder Building Services Center is another potentially eligible historic

structure that is located within the study area. Figure 20 shows the designated or potential historic districts within and near to the study area, along with each potential historic structure. There were no paleontological or archaeological areas identified within the study area.

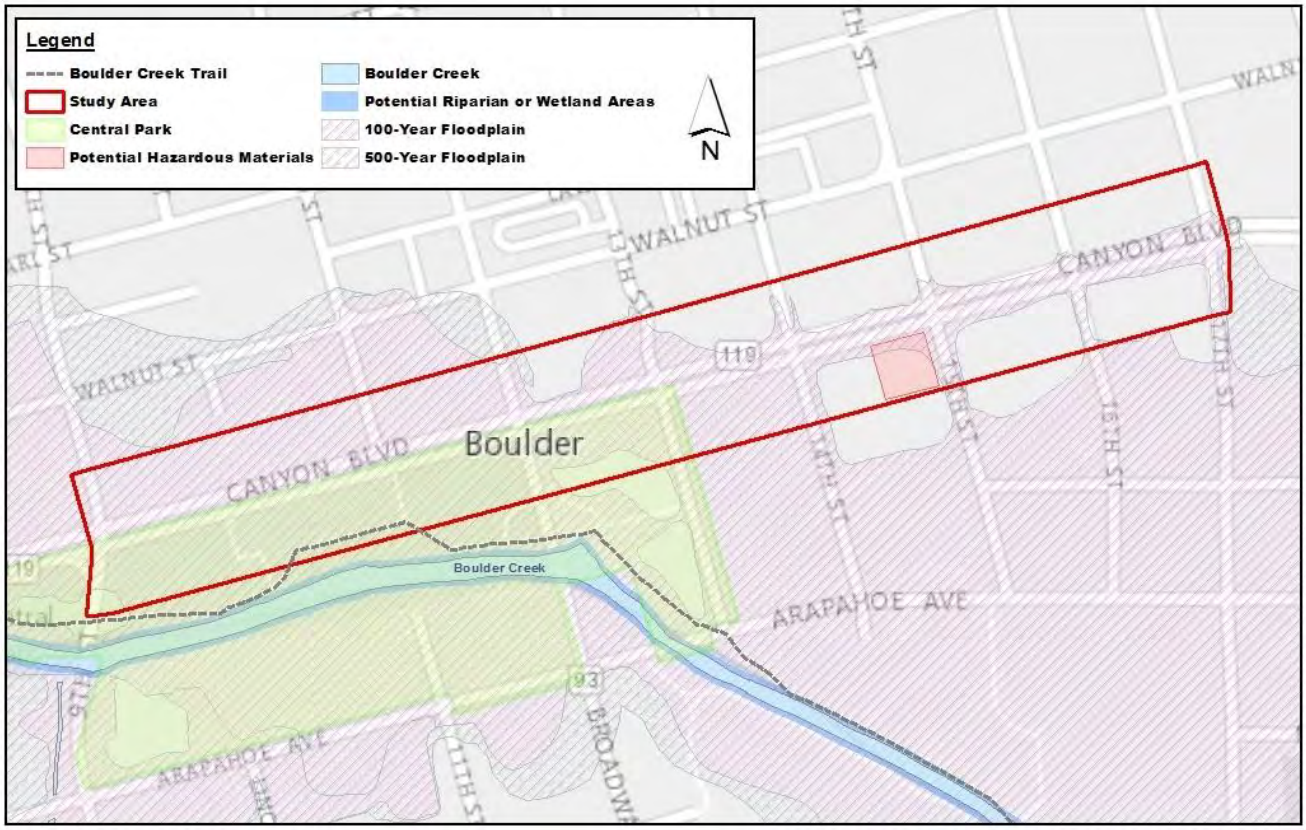
Figure 20. Potential Historic Structures



5.4. Parks and Recreation

There is one park located within the study area. Central Park (see Figure 21) is located between 9th Street and 13th Street. The park incorporates the Boulder Creek Path and Greenway, along with many other recreation opportunities.

Figure 21. Environmental Areas of Concern



5.5. Wildlife, Vegetation, and Wetlands and Waters of the United States

The study area was run through the U.S. Fish and Wildlife Service Information for Planning and Conservation database. Results show numerous resources, including 25 migratory bird species, that could be present within the study area. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA). Any person or organization planning or conducting activities that may result in the taking of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures. Small trees, shrubs, and brush provide potential habitat for smaller migratory birds and larger birds, such as raptors, have the potential to nest in the taller trees, especially near Boulder Creek. A site visit to provide observations was not performed as part of this study.

Within the study area, 11 proposed, candidate, threatened, and endangered species managed by the Endangered Species Program of the U.S. Fish and Wildlife Services may occur or could potentially be affected by activities. Three of the 11 listed species are associated with riparian habitat. These listed species include the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), the Ute ladies'-tresses orchid (*Spiranthes diluvialis*), and the Colorado butterfly plant (*Gaura neomexicana ssp. coloradensis*). Riparian areas (see Figure 21), where these species are most likely to exist, are located adjacent to the study area; however, any activity could potentially cause indirect effects. A field study to determine if populations for these three species exist in the study area is recommended prior to any construction.

Habitat for the eight other listed species is limited within the study area. Five species are listed because they occur downstream of the project area along the South Platte River and could be impacted by projects that would result in water depletions, including: the Least Tern (*Sterna antillarum*), the pallid sturgeon (*Scaphirhyncus albus*), the Piping Plover (*Charadrius melodus*), the Western prairie-fringed orchid (*Platanthera praeclara*), and

the Whooping Crane (*Grus americana*). There is no suitable habitat for the remaining four species. The Canada lynx (*Lynx canadensis*) occurs in high elevation spruce-fir forests. The greenback cutthroat trout (Oncorhynchus clarki stomias) occupies cold, clear streams of moderate gradient in the mountains and foothills. The Mexican Spotted Owl (*Strix occidentalis lucida*) occurs in mixed conifer forests and rocky canyons.

Wetland mapping received from the City of Boulder shows that any wetlands present will be associated with Boulder Creek and will exist on the south side of Canyon Boulevard between 9th Street and 13th Street. Vegetation in the study area appears to be mostly landscaped, but wetlands could potentially be present within the study area. A site visit is recommended for wetland and biological resources.

In terms of forestry, a landscaping plan will identify any effects to existing trees in the study area. Prior to removing or relocating trees within any public right of way, the City of Boulder requires an approved landscaping plan and a right-of-way permit. Furthermore, tree removal or relocation will be done in accordance with Section 3.04 of the City of Boulder *Design and Construction Standards*. If the City finds a tree in any public right of way to be desirable, protection procedures will be followed, as detailed in Section 3.05 of the City of Boulder *Design and Construction Standards*.

5.6. Floodplains and Water Quality

The study area is within the Boulder Creek floodplain (see Figure 21). Both 100-year and 500-year floodplains are mapped within the study area. The City of Boulder uses Canyon Boulevard as a method for controlling flood waters during high flows. Any work in a conveyance zone within public right of way or land owned or controlled by the government will comply with all necessary FEMA requirements and obtain a Floodplain Development Permit from the City Manager. In some cases, the City Manager may require a floodplain analysis by a Colorado registered professional engineer. Additional regulations for development in a floodplain are detailed in Section 9-3 of the City of Boulder *Municipal Code*.

5.7. Farmlands

Because there are no farmlands identified within the study area, this resource is not applicable for this study.

5.8. Hazardous Materials

There is a potential for hazardous materials to occur in the study area based on current and historical uses. There was one gas station identified along the corridor as a Potential Hazardous Material (see Figure 21). The use, storage, and disposal of hazardous materials associated with this facility may have the potential to impact soils and water within the study area. According to the Colorado Department of Public Health and Environment (CDPHE), this location is no longer generating hazardous waste.

5.9. Noise

The study area contains multiple noise receptors, including the band shell, the Saint Julien Hotel and Spa, and numerous downtown businesses on the west side of the corridor, multiple government buildings along the south side of Canyon Boulevard in the Central Park area, and residential and mixed-use properties along the east end of corridor. Impacts for the corridor on the activities that occur at and around the band shell have been specifically identified as an issue.

5.10. Air Quality

The criteria pollutants of concern for transportation projects in the Denver Metro region, which includes the study area, are particulate matter (PM_{10}), carbon monoxide (CO), and ground-level ozone (O_3) because these are pollutants for which the Front Range/Denver has been classified as being either a nonattainment or a maintenance area. Based on air quality monitoring data, regions are designated as having either “attainment” or “nonattainment” status for the criteria pollutants based on the National Ambient Air Quality Standard (NAAQS). Nonattainment status means that a region is not compliant with NAAQS. When a nonattainment area achieves

compliance with the NAAQS, the area is considered an air quality "attainment/maintenance" area until the standard has been maintained for 10 years and a long-term maintenance plan has been approved by the United States Environmental Protection Agency (USEPA). The Denver-metropolitan and Northern Front Range area is currently designated as attainment/maintenance for CO and PM_{10}, and nonattainment for the 8-hour O_3 standard.

If the project became identified as part of the Denver Regional Council of Government's (DRCOG) fiscally constrained long-range plan, the project would need to demonstrate regional and local conformity.

5.10.1. Climate Change

Currently, Boulder's Climate and Sustainability Division provides leadership to achieve goals of sustainability, resilience, and environmental quality. To supplement to existing programs, the City of Boulder is making commitments to reduce energy-related emissions by implementing strategies in target action areas, including energy, resources, and ecosystems. The goals are to:

- Reduce the amount of energy consumed by implementing energy-efficient methods
- Identify local renewable sources to improve sustainability
- Use natural resources more wisely
- Restore the health of the various ecosystems that help sustain the Boulder community and ensure climate stability

For more information, please see the draft Boulder's Climate Commitment (Draft October 2015).

5.11. Environmental Summary

In summary, this environmental considerations section includes a preliminary environmental analysis of resources within the Canyon Boulevard study area (see Figure 22. Environmental Considerations Matrix. Of the resource subjects analyzed, historic landmarks and landmark areas, floodplains, water quality, forestry, and noise were observed to have the most potential for impacts by transportation improvement activities with the study area. The City of Boulder has regulations and permitting processes that must be pursued in the event of anticipated impacts to several of these resources. Once design options are identified for the study area, a detailed analysis can provide further information about environmental considerations.

Figure 22. Environmental Considerations Matrix

Resource	Corridor Location	
	North of Canyon Boulevard	South of Canyon Boulevard
Environmental Justice	Low-income or minority community unlikely	Low-income or minority community unlikely
Land Use	Downtown—Commercial businesses, residential, mixed use	Downtown—Park, residential, mixed use
Historic Preservation	The Chamberlain Historic District on the east end of the corridor	Landmarked area (includes Boulder Band Shell and Municipal Building); Boulder Building Services Center
Paleontological/Archaeological	Paleontological and archaeological resources unlikely	Paleontological and archaeological resources unlikely
Parks and Recreation	No parks or recreational facilities identified	Central Park (Civic Area) and Boulder Creek Greenway
Wildlife	Potential migratory bird nesting areas	Potential migratory bird nesting areas
Vegetation/Forestry	Mixed grasses and shrubs; landscaped areas	Mixed grasses and shrubs, small, and large trees; landscaped areas

Resource	Corridor Location	
	North of Canyon Boulevard	South of Canyon Boulevard
Wetlands/Waters of the US	Resource not present in the area	Potential wetlands near Boulder Creek
Floodplains	100-year and 500-year floodplains identified	100-year and 500-year floodplains identified
Water Quality	Boulder Creek	Boulder Creek
Farmlands	No Prime Farmlands of national importance identified	No Prime Farmlands of national importance identified
Hazardous Materials	No hazardous materials generators identified	Shell gas station
Noise	Residential and church receptors	Residential and Landmarked area

5.12. Environmental References

Boulder County, Colorado, 2016. "Geographical Information Systems (GIS) Downloadable Data." http://www.bouldercounty.org/gov/data/pages/gisdldata.aspx, website accessed January 2016.

City of Boulder, Colorado, 2015. "Draft Boulder's Climate Commitment." https://bouldercolorado.gov/climate

Google Maps, 2016. Canyon Boulevard, Boulder, Colorado. Retrieved from https://www.google.com/maps/@40.0155786,-105.2761052,16.75z

U.S. Fish & Wildlife Service, 2016. "Information for Planning and Conservation." https://ecos.fws.gov/ipac/, website accessed January 2016.

United States Census Bureau, 2016. "Boulder County, Colorado Quick Facts." http://quickfacts.census.gov/qfd/states/08/08013.html, website accessed January 2016.

Appendix A: Pedestrian Performance Measures

Subject: Canyon Boulevard Complete Streets Study, Existing Conditions Summary

Background

The Pedestrian Performance Measures (PPM) model methodology was used to score each sidewalk segment for pedestrian comfort and facility performance. This points-based-model assigns a score for certain features of the pedestrian infrastructure and, based on the total score, assigns a pedestrian level of service to the facility.

Originally developed by the University of Florida, this methodology was chosen over others, such as the Highway Capacity Manual's (HCM) Pedestrian Level of Service model, because of its ability to evaluate the corridor on a block-by-block basis and capture elements of the pedestrian experience beyond a simple point-to-point travel evaluation. The points-based methodology of the PPM model was reviewed by the Sacramento Area Council of Governments' study entitled, *Application of New Pedestrian Level of Service Measures.* The study compared the PPM model to the HCM's Pedestrian Level of Service (PLOS) model and determined them to be equally useful in their ability to evaluate pedestrian facilities. Additionally, the criteria evaluated in the PPM model, summarized above, are very similar to those evaluated by many civic pedestrian planning documents, including the City of Seattle, Washington's *Pedestrian Master Plan,* and the City of San Francisco, California's *Better Streets Plan.* Although neither of these documents specifically utilizes the PPM scoring model, they place importance on the same aspects the model evaluates. The PPM model gives the ability to consistently measure the features and amenities that are widely accepted to be a necessary part of a vibrant pedestrian facility. The PPM is also evaluated in the *Transportation Research Record: Journal of the Transportation Research Board 2014,* Volume 1538, pp.1-9. Table 1 and Table 2 show the categories, criterion, and points available per criterion of the PPM as well as the scoring ranges.

Table 1. PPM Criteria

Category	Criterion	Points
Facility (Max. possible value = 10)	Not continuous or non-existent	0
	Continuous on one side	4
	Continuous on both sides	6
	Min. 5-feet wide & barrier free	2
	Sidewalk width > 5-feet	1
	Off-street/parallel alternative facility	1
Conflicts (Max. possible value = 4)	<22 driveways and side streets per mile	1
	Ped. Signal delay of 40 sec. or less	0.5
	Reduced turn conflict implementation	0.5
	Crossing width 60-feet or less	0.5
	Posted speed <= 35 mph	0.5
	Median present	1

Appendix A: Pedestrian Performance Measures

Category	Criterion	Points
Amenities (Max possible value = 2)	Buffer not less than 3.5-feet	1
	Benches or pedestrian scale lighting	0.5
	Shade trees	0.5
Motor Vehicle LOS (Max. possible value = 2)	E or F OR 6+ travel lanes	0
	D and <6 travel lanes	1
	A, B, or C and <6 travel lanes	2
Maintenance (Max. possible value = 2)	Major or frequent problems	-1
	Minor or infrequent problems	0
	No problems	2
TDM/Multi Modal (Max. possible value = 1)	No support	0
	Support exists	1
Maximum possible score = 21		

Table 2. PPM LOS Scoring Ranges

21-17	A
14-16.9	B
11-13.9	C
7-10.9	D
3-6.9	E
≤ 3	F

To fully capture the pedestrian experience across the corridor, two pedestrian level of service analyses were conducted. The first, using the standard PPM methodology was applied to a corridor-wide analysis. These are presented in the results summary tables. This resulted in an overall pedestrian LOS B for the corridor. A second, modified the PPM methodology to determine pedestrian conditions on each side of the street. Because of the variability in sidewalk characteristics between the north and south side of Canyon Boulevard, the PPM model was modified determine how well each side of Canyon meets the needs of pedestrians. The modification did not impact the tool's core assumptions, and therefore it was determined that this modification would be applicable for use on this project. The individual scoring tables, included as an attachment to this Appendix, show the points each segment received for each criterion evaluated. The attachment also shows the original and modified scoring tables used for this analysis.

Modeling Assumptions, specifications, and methodology

The following are assumptions, specifications, or modifications to the PPM as it was presented in the original model by the University of Florida.

Appendix A: Pedestrian Performance Measures

PPM LOS Assumptions (on Canyon)

1. Intersection delay
   a. Always taken as the worst intersection on either side of the segment
   b. Taken as ½ the time from the beginning of yellow to the next green phase
2. LOS
   a. Taken as the worst-case (AM/PM) approach LOS for the far-side signal
3. Crossing Distance
   a. Taken as the longest crossing at either intersection

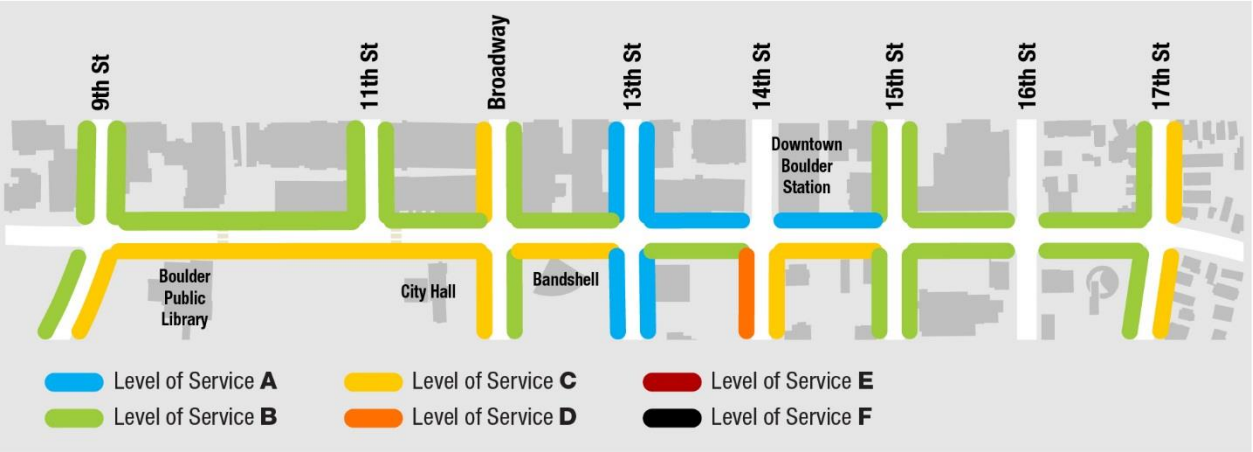
PPM LOS Assumptions for cross streets

1. Intersection delay
   a. Taken at the intersection with Canyon
   b. Taken as ½ the time from the beginning of yellow to the next green phase
2. LOS
   a. Always reported at the intersection with Canyon

The original PPM was modified to create directional functionality. This was accomplished by removing the “Continuous on both sides” criterion from the Facilities category and increasing the possible points in the “Continuous” criterion from 4 to 5 points. This eliminates the only criterion that looks at both sides of the street, and re-balances the points to maintain the validity of the final LOS scoring table.

Figure 1 shows the results of the modified PPM conducted for the existing facilities along Canyon Boulevard. In general, the existing pedestrian facilities are adequate for transportation purposes, but do not always provide a comfortable experience. The best-scoring pedestrian facilities are those located around 13th Street and near the Downtown Boulder Station. These segments scored better than the others due to the increased separation from vehicle traffic and presence of human-scaled amenities. The worst performing pedestrian facility is the sidewalk west of 14th Street and south of Canyon Boulevard. This section scored poorly due to the narrow sidewalk, lack of amenities, and high volume of driveways.

Figure 1. PPM Results



Corridor wide		Points		Eastbound	Points		Existing	Westbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous		5		Continuous		5	
	Continuous on both sides	6	6								
	Min. 5' wide and barrier free	1	2	Min. 5' wide and barrier free		2		Min. 5' wide and barrier free		2	
	Sidewalk width > 5'	0.75	1	Sidewalk width > 5'		1		Sidewalk width > 5'		1	
	Off-street/parallel alternative facility	0	1	Off-street/parallel alternative facility		1		Off-street/parallel alternative facility		1	
Conflicts (max 4)	< 22 driveways and side streets/mile	1	1	<22 driveways and side streets/mile (dpm)		1		< 22 driveways and side streets/mile		1	
	Ped. Signal delay 40 seconds or less	0.5	0.5	Ped. Signal delay 40 seconds or less		0.5		Ped. Signal delay 40 seconds or less		0.5	
	Reduced turn conflict implementation	0	0.5	Reduced turn conflict implementation		0.5		Reduced turn conflict implementation		0.5	
	Crossing width 60' or less	0.5	0.5	Crossing width 60' or less		0.5		Crossing width 60' or less		0.5	
	Posted speed <= 35mph	0.5	0.5	Posted speed <= 35mph		0.5		Posted speed <= 35mph		0.5	
	Median present	1	1	Median present		1		Median present		1	
Amenities (max 2)	Buffer not less than 3'5"	0.75	1	Buffer not less than 3'5"		1		Buffer not less than 3'5"		1	
	Benches or pedestrian scale lighting	0	0.5	Benches or pedestrian scale lighting		0.5		Benches or pedestrian scale lighting		0.5	
	Shade trees	0.25	0.5	Shade trees		0.5		Shade trees		0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes	1.5	2	A, B, or C and <6 travel lanes		2		A, B, or C and <6 travel lanes		2	
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems	2	2	No problems		2		No problems		2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists	0.5	1	Support exists		1		Support exists		1	
PPM LOS	**B**	**16.25**	**21**			**21**				**21**	

9th Street to Broadway		Points		Eastbound	Points		Existing	Westbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	3	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	1	2		Min. 5' wide and barrier free	2	2	
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	1	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	5 dpm	< 22 driveways and side streets/mile	1	1	5 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	27.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	27.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0.5	0.5	60'	Crossing width 60' or less	0.5	0.5	50'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	35 mph	Posted speed <= 35mph	0.5	0.5	35 mph
	Median present		1	Median present	1	1		Median present	1	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	20'	Buffer not less than 3'5"	1	1	10'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.25	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes	0	0	LOS E	E or F OR 6 or more travel lanes	0	0	LOS E
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes		2	LOS C	A, B, or C and <6 travel lanes		2	
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	0.5	1		Support exists	0.5	1	
PPM LOS		**0**	**21**	**C**	**12.25**	**21**		**B**	**15.5**	**21**	

Broadway to 13th Street		Points		Eastbound	Points		Existing	Westbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	0	2		Min. 5' wide and barrier free	2	2	
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	< 22 driveways and side streets/mile	1	1	0 dpm	< 22 driveways and side streets/mile	1	1	0 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	37.1 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	32.6 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0.5	0.5	53'	Crossing width 60' or less	0.5	0.5	53'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	35 mph	Posted speed <= 35mph	0.5	0.5	35 mph
	Median present		1	Median present	1	1		Median present	1	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	1	1	6'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0.5	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes	0	0	LOS E	E or F OR 6 or more travel lanes	0	0	LOS E
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes		2		A, B, or C and <6 travel lanes		2	
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists		1		Support exists	0	1	
PPM LOS			**21**	**C**	**12**	**21**		**B**	**15.5**	**21**	

13th Street to 14th Street		Points		Eastbound	Points		Existing	Westbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	5'	Min. 5' wide and barrier free	2	2	8'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	< 22 driveways and side streets/mile	1	1	18 dpm	< 22 driveways and side streets/mile	1	1	18 drm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	17.6 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	17.6 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0.5	0.5	40'	Crossing width 60' or less	0.5	0.5	40'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	35 mph	Posted speed <= 35mph	0.5	0.5	35 mph
	Median present		1	Median present	1	1		Median present	1	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0.5	1	0'-15'	Buffer not less than 3'5"	1	1	9'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0.5	0.5		Benches or pedestrian scale lighting	0.5	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support	0	0		No support		0	
	Support exists		1	Support exists		1		Support exists	1	1	
PPM LOS			**21**	**B**	**16**	**21**		**A**	**18.5**	**21**	

14th Street to 15th Street		Points		Eastbound	Points		Existing	Westbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	5'	Min. 5' wide and barrier free	2	2	5'-10'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	0.5	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	< 22 driveways and side streets/mile	0	1	36.2 dpm	< 22 driveways and side streets/mile	0	1	37.7 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	33.3 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	33.3 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation		0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0.5	0.5	40'	Crossing width 60' or less	0.5	0.5	45'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	35 mph	Posted speed <= 35mph	0.5	0.5	35 mph
	Median present		1	Median present	1	1		Median present	1	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	1	1	18'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0.5	0.5	
	Shade trees		0.5	Shade trees	0.2	0.5		Shade trees	0.25	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	0	1		Support exists	1	1	
PPM LOS			**21**	**C**	**13.7**	**21**		**A**	**16.75**	**21**	

15th Street to 17th Street		Points		Eastbound	Points		Existing	Westbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	5'	Min. 5' wide and barrier free	1.5	2	4'-6'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	0.25	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	< 22 driveways and side streets/mile	0	1	24 dpm	< 22 driveways and side streets/mile	1	1	16 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	16.2 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	16.2 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0.5	0.5	50'	Crossing width 60' or less	0.5	0.5	45'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	35 mph	Posted speed <= 35mph	0.5	0.5	35 mph
	Median present		1	Median present	1	1		Median present	1	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	5'-12'	Buffer not less than 3'5"	0.5	1	0'-5'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS A	A, B, or C and <6 travel lanes	2	2	LOS A
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support	0	0		No support	0	0	
	Support exists		1	Support exists		1		Support exists		1	
PPM LOS			**21**	**B**	**14.5**	**21**		**B**	**15.25**	**21**	

9th Street South of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	0	2	4'	Min. 5' wide and barrier free	2	2	5'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	0	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	9 dpm	< 22 driveways and side streets/mile	1	1	0 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	27.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	27.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	75'	Crossing width 60' or less	0	0.5	67'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS C	A, B, or C and <6 travel lanes	2	2	LOS C
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	0	1		Support exists	1	1	
PPM LOS				**C**	**11.5**	**21**		**B**	**14.5**		

9th Street North of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	8.5	Min. 5' wide and barrier free	2	2	6'
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	0 dpm	< 22 driveways and side streets/mile	1	1	0 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	27.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	27.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	75'	Crossing width 60' or less	0	0.5	67'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	3.5'	Buffer not less than 3'5"	1	1	5'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS C	A, B, or C and <6 travel lanes	2	2	LOS C
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	1	1		Support exists	1	1	
PPM LOS				**B**	**16.5**	**21**		**B**	**16.5**	**21**	

11th Street North of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	10'	Min. 5' wide and barrier free	2	2	10'
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	8 dpm	< 22 driveways and side streets/mile	1	1	8 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	0 sec	Ped. Signal delay 40 seconds or less	0	0.5	
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0.25	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0.5	0.5	28'	Crossing width 60' or less	0	0.5	
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS A	A, B, or C and <6 travel lanes	2	2	LOS C
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support	0	0		No support	0	0	
	Support exists		1	Support exists		1		Support exists		1	
PPM LOS				**B**	**14.75**	**21**		**B**	**14**		

Broadway Street South of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	10'	Min. 5' wide and barrier free	2	2	10'
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	1	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	0 dpm	< 22 driveways and side streets/mile	1	1	0 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	35.3 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	35.3 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	70'	Crossing width 60' or less	0	0.5	70'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	30 mph	Posted speed <= 35mph	0.5	0.5	30 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0.25	0.5		Benches or pedestrian scale lighting	0.25	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes	0	0	LOS E	E or F OR 6 or more travel lanes	0	0	LOS E
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes		2		A, B, or C and <6 travel lanes		2	
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	1	1		Support exists	1	1	
PPM LOS				**B**	**14.75**	**21**		**C**	**13.75**		

Broadway Street North of Canyon	Pedestrian LOS Inputs	Points Total	Points out of	Northbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition	Southbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	10' +	Min. 5' wide and barrier free	2	2	10' +
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	0 dpm	< 22 driveways and side streets/mile	1	1	19 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	35.3 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	35.3 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	70'	Crossing width 60' or less	0	0.5	70'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	10'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0.5	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes	0	0	LOS E	E or F OR 6 or more travel lanes	0	0	LOS E
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes		2		A, B, or C and <6 travel lanes		2	
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support	0	0		No support	0	0	
	Support exists		1	Support exists		1		Support exists	1	1	
PPM LOS				**B**	**14**	**21**		**C**	**13.5**		

13th Street South of Canyon	Pedestrian LOS Inputs	Points Total	Points out of	Northbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition	Southbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	10'	Min. 5' wide and barrier free	2	2	8'
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	1	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	9 dpm	< 22 driveways and side streets/mile	1	1	0 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	35.7 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	37.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	65'	Crossing width 60' or less	0	0.5	65'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0.5	1	4'	Buffer not less than 3'5"	1	1	5'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0.5	0.5		Benches or pedestrian scale lighting	0.5	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	1	1		Support exists	1	1	
PPM LOS				**A**	**16.5**	**21**		**A**	**18**		

13th Street North of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	10'+	Min. 5' wide and barrier free	2	2	10'
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	0 dpm	< 22 driveways and side streets/mile	1	1	0 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	37.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	35.3 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	65'	Crossing width 60' or less	0	0.5	65'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	1	1		Median present	1	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1		Buffer not less than 3'5"	1	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0.5	0.5		Benches or pedestrian scale lighting	0.5	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems	0	0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	1	1		Support exists	1	1	
PPM LOS				**A**	**17**	**21**		**A**	**18**		

14th Street South of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	5'	Min. 5' wide and barrier free	0	2	4'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	0	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	0	1	26 dpm	< 22 driveways and side streets/mile	0	1	44 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	38.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	38.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	70'	Crossing width 60' or less	0	0.5	70'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support	0	0		No support	0	0	
	Support exists		1	Support exists		1		Support exists		1	
PPM LOS				**C**	**12**	**21**		**D**	**10.5**		

15th Street South of Canyon	Pedestrian LOS Inputs	Points Total	Points out of	Northbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition	Southbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	10'	Min. 5' wide and barrier free	2	2	10'
	Sidewalk width > 5'		1	Sidewalk width > 5'	1	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	0	1	26 dpm	< 22 driveways and side streets/mile	0	1	26 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	39 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	39 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	65'	Crossing width 60' or less	0	0.5	65'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	0	1	0'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0.5	0.5		Benches or pedestrian scale lighting	0.5	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support	0	0	
	Support exists		1	Support exists	0	1		Support exists		1	
PPM LOS				**B**	**14**	**21**		**B**	**14**		

15th Street North of Canyon	Pedestrian LOS Inputs	Points Total	Points out of	Northbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition	Southbound Pedestrian LOS Inputs	Points Total	Points out of	Existing Condition
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	2	2	5'	Min. 5' wide and barrier free	2	2	6'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	1	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	1	1	19 dpm	< 22 driveways and side streets/mile	1	1	19 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	39 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	39 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	65'	Crossing width 60' or less	0	0.5	65'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	12'	Buffer not less than 3'5"	1	1	10'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support	0	0		No support	0	0	
	Support exists		1	Support exists		1		Support exists		1	
PPM LOS				**B**	**14.5**	**21**		**B**	**15.5**		

17th Street South of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	1	2	4'-5'	Min. 5' wide and barrier free	2	2	5-6'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	0.5	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	0	1	37 dpm	< 22 driveways and side streets/mile	1	1	18 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	37.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	37.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	65'	Crossing width 60' or less	0	0.5	65'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	3.5'	Buffer not less than 3'5"	0	1	0'
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	1	1		Support exists	1	1	
PPM LOS				**C**	**13.5**	**21**		**B**	**15**		

17th Street North of Canyon		Points		Northbound	Points		Existing	Southbound	Points		Existing
	Pedestrian LOS Inputs	**Total**	**out of**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**	**Pedestrian LOS Inputs**	**Total**	**out of**	**Condition**
Facility (max 10)	Not continuous or non-existent		0	Not continuous or non-existent		0		Not continuous or non-existent		0	
	Continuous on one side		4	Continuous	5	5		Continuous	5	5	
	Continuous on both sides		6								
	Min. 5' wide and barrier free		2	Min. 5' wide and barrier free	1	2	4'-5'	Min. 5' wide and barrier free	2	2	5'
	Sidewalk width > 5'		1	Sidewalk width > 5'	0	1		Sidewalk width > 5'	0	1	
	Off-street/parallel alternative facility		1	Off-street/parallel alternative facility	0	1		Off-street/parallel alternative facility	0	1	
Conflicts (max 4)	< 22 driveways and side streets/mile		1	<22 driveways and side streets/mile (dpm)	0	1	57 dpm	< 22 driveways and side streets/mile	1	1	19 dpm
	Ped. Signal delay 40 seconds or less		0.5	Ped. Signal delay 40 seconds or less	0.5	0.5	37.5 sec	Ped. Signal delay 40 seconds or less	0.5	0.5	37.5 sec
	Reduced turn conflict implementation		0.5	Reduced turn conflict implementation	0	0.5		Reduced turn conflict implementation	0	0.5	
	Crossing width 60' or less		0.5	Crossing width 60' or less	0	0.5	65'	Crossing width 60' or less	0	0.5	65'
	Posted speed <= 35mph		0.5	Posted speed <= 35mph	0.5	0.5	25 mph	Posted speed <= 35mph	0.5	0.5	25 mph
	Median present		1	Median present	0	1		Median present	0	1	
Amenities (max 2)	Buffer not less than 3'5"		1	Buffer not less than 3'5"	1	1	8'	Buffer not less than 3'5"	1	1	10' +
	Benches or pedestrian scale lighting		0.5	Benches or pedestrian scale lighting	0	0.5		Benches or pedestrian scale lighting	0	0.5	
	Shade trees		0.5	Shade trees	0.5	0.5		Shade trees	0.5	0.5	
Motor Vehicle LOS (max 2)	E or F OR 6 or more travel lanes		0	E or F OR 6 or more travel lanes		0		E or F OR 6 or more travel lanes		0	
	D and <6 travel lanes		1	D and <6 travel lanes		1		D and <6 travel lanes		1	
	A, B, or C and <6 travel lanes		2	A, B, or C and <6 travel lanes	2	2	LOS B	A, B, or C and <6 travel lanes	2	2	LOS B
Maintenance (max 2)	Major or frequent problems		-1	Major or frequent problems		-1		Major or frequent problems		-1	
	Minor or infrequent problems		0	Minor or infrequent problems		0		Minor or infrequent problems		0	
	No problems		2	No problems	2	2		No problems	2	2	
TDM/Multi Modal (max 1)	No support		0	No support		0		No support		0	
	Support exists		1	Support exists	1	1		Support exists	1	1	
PPM LOS				**C**	**13.5**	**21**		**B**	**15.5**		

Design Option Evaluation Criteria

Document Overview

This memo identifies the proposed evaluation criteria for the Canyon Boulevard Complete Streets Study. This document describes the analysis metric, purpose of including the metric, data source/year, and any additional details or assumptions made for each analysis topic. These analysis topics are organized by goal and objective of the study. Goals for the project include:

1. **Complete street -** Provide and/or enhance facilities for walking, bicycling, transit riding and driving, connecting people to destinations safely and conveniently
2. **Design Excellence** - Enhance visual interest, legibility, and wayfinding for visitors
3. **Preserve heritage** - Foster a greater understanding of the historic significance of the corridor and the surrounding area
4. **With nature** - Minimize negative impacts to natural systems and consider ways in which the infrastructure of the corridor can be designed to better interact with these systems
5. **Plan accordingly -** Incorporate the intentions of related plans into the options for Canyon Boulevard

These evaluation criteria will be presented to the public during a project open house on April 27, 2016, at the May 18, 2016 Joint Boards meeting and at the May 31 City Council Study Session. Public feedback will be used to confirm and refine these criteria for the use of evaluating design options for Canyon Boulevard.

Design Option Evaluation Criteria

1. Complete street

The objectives of the "Complete street" goal are to:

- Increase safety for people traveling in the corridor (1.1)
- Improve the walking and bicycling experience along the corridor and at crossings (1.2)
- Maintain Canyon Boulevard's function as a cross-connector for vehicular through-traffic (1.3)
- Accommodate existing and future plans for transit service on the corridor and operations at the Downtown Transit Station (1.4)
- Integrate walking and bicycling with transit at the Downtown Transit Station and throughout the corridor (1.5)

These objectives are measured independently using both quantitative and qualitative metrics.

1.1. Multimodal safety evaluation

Planning Objective: Increase safety for people traveling in the corridor

Multimodal safety Evaluation	
Metric	Qualitative estimation of increase or decrease in exposure to transportation conflicts
Purpose	To describe how the alternatives affect the safety for pedestrian, bicycle, transit, and auto travelers and impact the City's *Vision Zero* goal of moving toward no crashes leading to a fatality or serious injury
Analysis Methodology	Conduct a high-level safety analysis of existing conditions along Canyon Boulevard and perform a qualitative assessment of anticipated safety impacts of the alternatives
Data Source	Historic crash patterns identified in the Existing Conditions Summary; geometric configuration and operations for design options
Additional Details	See Existing Conditions Summary; the Safe Streets Boulder report will be used for additional assessment information about existing conditions on the corridor and city-wide

Design Option Evaluation Criteria

1.2. Pedestrian and Bicycle Access and Comfort

Planning Objective: Improve the walking and bicycling experience along the corridor and at crossings

Access and comfort for pedestrians

Metric	Pedestrian Performance Measures (PPM)
Purpose	To systematically assess and compare pedestrian facilities within the study area for pedestrians of all ages and abilities
Analysis Methodology	Corridor blocks and adjacent side streets are scored based on criteria established in the PPM
Data Source	Tertiary and primary observations of existing conditions - Google Earth and Streetview (January, 2016); on-site measurements gathered during walk audit (November, 2015)
Additional Details	Tool adapted from the University of Florida PPM; see Appendix B; the study area was expanded to include adjacent sidewalk facilities of crossing streets (Canyon Boulevard corridor including approximately 40 feet on side streets north and south)

Access and comfort for cyclists

Metric	Level of Traffic Stress (LTS)
Purpose	To describe how the alternatives may affect the ease of access or perceived comfort of bicycling along and across Canyon Boulevard and adjacent facilities, expanding the safety and appeal of cycling for all ages and abilities.
Analysis Methodology	LTS analysis as developed in “Low Stress Bicycling Network Connectivity”, Mineta Transportation Institute, Report 11-19, May 2012
Data Source	Adapted from People for Bikes LTS analysis conducted in 2014; LTS analysis of design options
Additional Details	The People for Bikes analysis was adapted to show the influence of directional travel on Walnut, this method will be repeated in design option analysis; the study area was extended to include the roadway/bike network north and south of Canyon Boulevard between Boulder Creek Path and Pine Street

Design Option Evaluation Criteria

1.3. Transit integration

Planning Objective: Integrate walking and bicycling with transit at the Downtown Transit Station and throughout the corridor

Multimodal transit connectivity

Metric	Provision of bicycle and pedestrian facilities and amenities in proximity to transit service connections
Purpose	To systematically assess how transit users beginning and ending their trip in the study area will be provided a safe, secure, convenient, and comfortable transfer between modes
Analysis Methodology	Each design option will be scored by how well it provides accommodations to pedestrians and cyclists at transit stops on the corridor
Data Source	Design option configuration at existing transit stops locations

1.4. Future transit needs

Planning Objective: Accommodate existing and future plans for transit service on the corridor and operations at the Downtown Transit Station

Future transit service assessment

Metric	Average delay at intersections
Purpose	To determine how well transit can achieve headways
Analysis Methodology	Highway Capacity Manual (2010)
Data Source	City of Boulder Synchro 9 model (2015)

Future transit service needs

Metric	Bus loading and layover capacity
Purpose	To determine how well design options achieve needed space for carriage loading and layover
Analysis Methodology	Qualitative analysis to determine if design options increase or decrease space for carriage loading and storage
Data Source	RTD and information gathered during the walking audit (November, 2015)

Design Option Evaluation Criteria

1.5. Vehicular Traffic Analysis

Planning Objective: Maintain Canyon Boulevard's function as a cross-connector for vehicular through-traffic

Travel Time

Metric	Travel time delay (in seconds) for a vehicle to travel from one side of the corridor to the other
Purpose	To compare the difference between the free-flow travel time and the peak hour travel times to understand the congestion within the corridor
Analysis Methodology	Vehicle travel times are estimated from the simulation model based on a block by block vehicle delay within the corridor; estimated differences between exiting conditions and design options will be documented.
Data Source	SimTraffic 9 simulation software; Acyclica data to verify existing model
Additional Details	This will be supplemented with Acyclica data once it is available

Side Street Vehicle Delay

Metric	Side street delay (seconds/vehicle)
Purpose	To describe the impact of the alternatives on delay to vehicles at intersections along the corridor and the level of congestion that can be expected
Analysis Methodology	Synchro 9 model uses the *Highway Capacity Manual* (2010) methodology to calculate delay
Data Source	City of Boulder Synchro 9 model (2015)
Additional Details	Additional information was added to the existing Synchro model include all modes (bike, pedestrian, transit), parking, and 16th Street traffic

Design Option Evaluation Criteria

2. Design excellence

The objectives of the "Design excellence" goal include the following:

- Increase quality of streetscaping
- Increase directional information provided to travelers
- Identify locations/space for flood and historic interpretation
- Reduce Canyon Boulevard as a barrier through urban design

These objectives are measured qualitatively.

Objective	Criteria	Metric
2.1. Quality of streetscaping	How well does the design option incorporate high quality urban design and placemaking features into the overall design concept?	Subjective assessment
2.2. Wayfinding	How well does the design option incorporate opportunities for wayfinding?	Subjective assessment
2.3. Flood and historic interpretation	How well does the design option incorporate opportunities for flood and historic interpretation?	Subjective assessment
2.4. Reduce perceived urban barrier	How well does the design diminish the perceived barrier effect of Canyon Boulevard?	Subjective assessment

3. Preserve heritage

The objectives of the "Preserve heritage" goal include the following:

- Protect and enhance historic resources through careful treatment of designated sites, ensuring work is consistent with the Historic Preservation code
- Make a careful consideration of changes near landmark buildings
- Promote a new understanding of historic significance

These objectives are measured qualitatively.

Objective	Criteria	Metric
3.1. Protection and enhancement of historic features	How well does the design option use careful treatment of designated historic sites, so as to be consistent with the Historic Preservation Code?	Subjective assessment
3.2. Design changes adjacent to historic features	How well does the design option reflect adjacent historic structures/properties?	Subjective assessment
3.3. Historic significance	How well does the design option promote historic significance of the area?	Subjective assessment

Design Option Evaluation Criteria

4. With nature

The objectives of the "With nature" goal include the following:

- Meet or exceed existing flood standards and include information about flood safety
- Use landscaping and street trees to help define the edges to Civic Area park, reduce effects of vehicular street noise to pedestrians, bicyclists and park users
- Investigate opportunities for stormwater management and water quality features
- Promote the shifting of travel preference from single occupancy vehicles to reduce greenhouse gas emissions

Objective	Criteria	Metric
4.1. Flood Standards	Does the design option meet or exceed flood standards?	Meet or Exceed
4.2. Natural features	How well does the design option incorporate landscaping to reduce the effects of street activity on park users?	Subjective assessment
4.3. Stormwater management	Does the design option create an opportunity for innovative stormwater management features?	Yes or No
4.4. Promote mode shift	How well does the design option include facilities that will promote a shift from the use of single occupancy vehicles and VMT reductions to meet climate change commitments stated in the City of Boulder Transportation Master Plan	Subjective assessment

Design Option Evaluation Criteria

5. Plan accordingly

The objectives of the "Plan accordingly" goal include the following:

- Accommodate changes to the Civic Area with new urban design and streetscape character that is more comfortable for pedestrians, bicyclists and accessible by transit
- Accommodate all modes by planning, design and building facilities for pedestrians, bicyclists, transit riders and drivers that can support users of all ages and abilities
- Accommodate preferred multimodal improvements of East Arapahoe Plan where identified for Canyon Boulevard or at the Downtown Transit Station
- Consider preferred transit center options identified in the FasTracks Local Optimization Facilities Study and acknowledge the additional transit vehicle spaces needed as identified in the Northwest Area Mobility Study

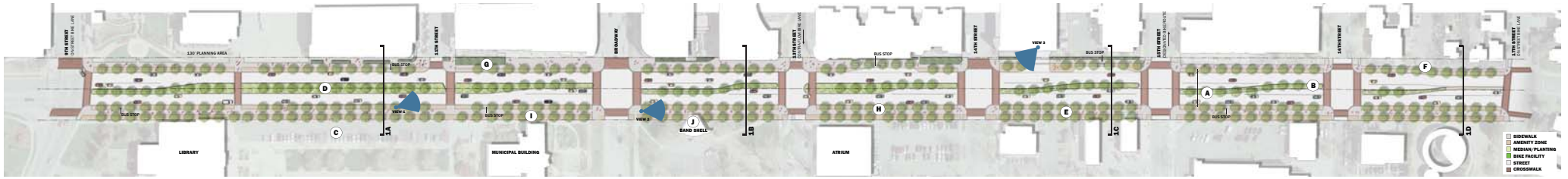
Objective	Criteria	Metric
5.1. Civic Area Plan	The design option does not propose any features or functions that are inconsistent with the relevant planning documents.	Yes or No
5.2. City of Boulder Transportation Master Plan		
5.3. East Arapahoe Plan		
5.4. Northwest Area Mobility Study		
5.5. FasTracks Local Optimization Facilities Study		

Attachment C

C - Canyon Boulevard Complete Street Study Conceptual Design Options 1-7

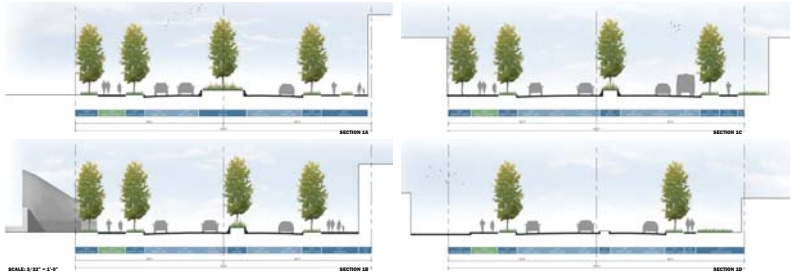
Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS



FOR DIAGRAMATIC PURPOSES

1" = 40'-0"

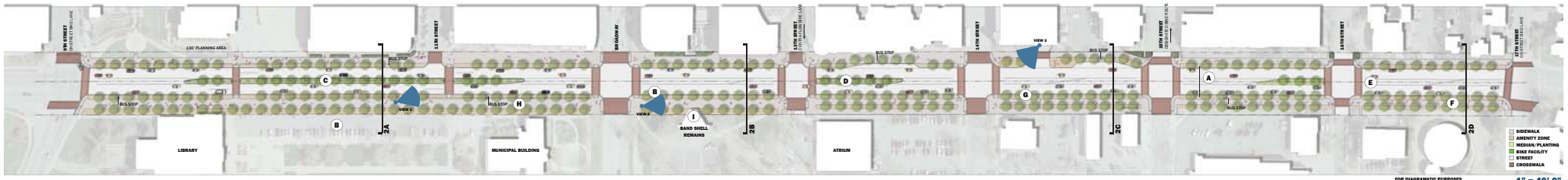


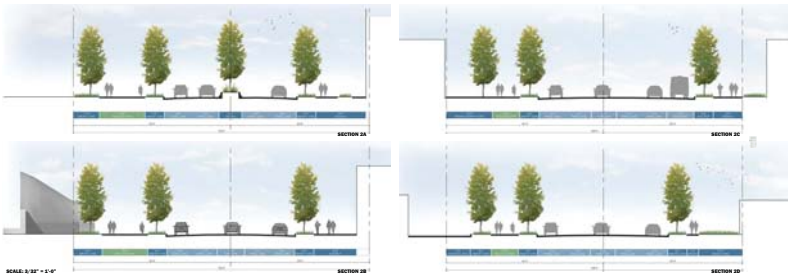
A 68-foot curb to curb roadway width with 11 foot travel lanes
B Continuous planted center median (8-feet wide where turn lanes are present, 20-feet where no turn lane is present)
C This assumes city surface parking lots at Canyon North will be removed
D Turning/access into city surface parking lots and private property lots along south side of Canyon removed
E 12-foot wide multi-use path on south side of Canyon Boulevard
F East of 16th street: 5-foot sidewalk on north side
G West of 16th street, 8-foot minimum sidewalk on north side
H Continuous 8-foot amenity zone (tree planting strip) behind curb (both sides of street)
I Alike condition on south side (a row of trees on both sides of the multi-use path)
J Band Shell remains in current location

OPTION 1: PLANTED CENTER MEDIAN, MULTI-USE PATH ON THE SOUTH, SIDEWALK ON NORTH, AND TREE ROWS

Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS



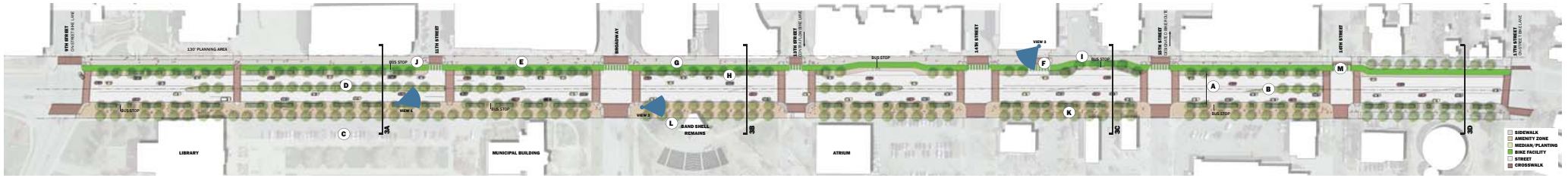


A 58-foot wide curb to curb dimension roadway width
B This assumes city surface parking lots at Canyon North to be removed
C Turning/access into city surface parking lots and private property lots along south side of Canyon removed
D 12-foot wide planted median where no turn lane is present
E No pedestrian refuge at intersections
F 12-foot-wide wide multi-use path on both sides of street for use by pedestrians and bicyclists and no sidewalks for pedestrian use only
G Continuous 8-foot amenity zone (tree planting strip) behind curb (both sides of street)
H Allée condition on south side (a row of trees on both sides of the multi-use path)
I Band Shell remains in current location

OPTION 2: MULTI-USE PATH ON NORTH AND SOUTH, AMENITY ZONE, TREE ROWS, AND INTERMITTENT PLANTED MEDIAN

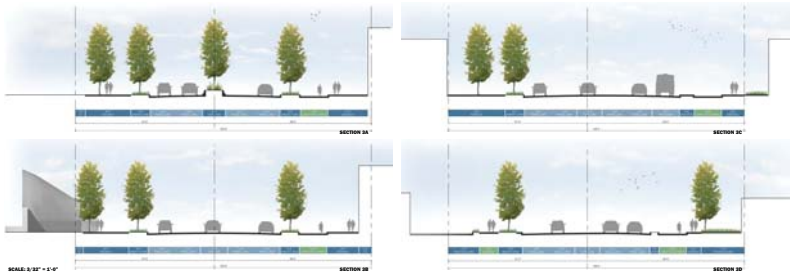
Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS



FOR DIAGRAMATIC PURPOSES

1" = 40'-0"



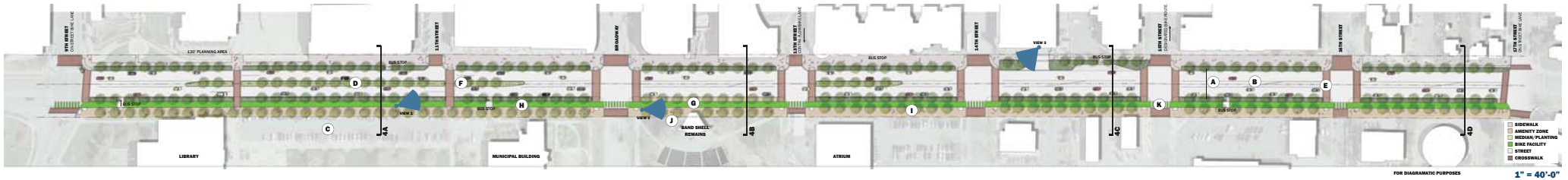
SCALE: 3/32" = 1'-0"

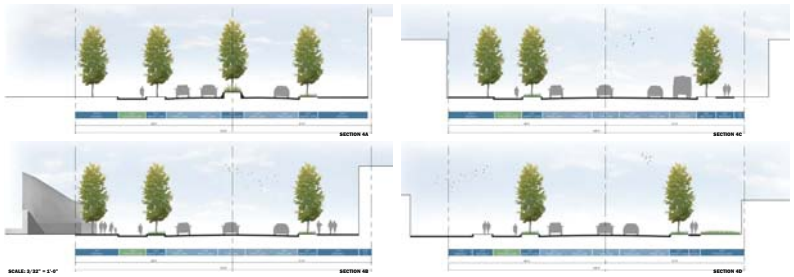
A 58-foot wide curb to curb roadway with 11-foot travel lanes
B No continuous planted center median; 12-foot-wide planted median where no turn lane is necessary
C This assumes city surface parking lots at Canyon North will be removed
D Turning/access into City surface parking lots and private property lots along south side of Canyon will be removed
E 12-foot-wide two- way, protected bike lane on north side of Canyon Boulevard
F Two-way bicycle facility creates conflict points with vehicles at driveways and intersections, as well as at the Downtown Boulder Station
G Protetted bike lane conflicts with pedestrian environment sidewalk width reduced
H Amenity zone varies in width from 8 feet to 10 feet and is not present on the north side in the 1400 block of Canyon Boulevard
I Sidewalks of varying widths on both sides
J Pedestrian connections across bike lane necessary at bus stop locations
K Allée condition on south side (a row of trees on both sides of the pedestrian path) except for 1600 block of Canyon
L Band Shell remains in current location with plaza treatment
M Intersection design requires exclusive bicycle phase and may impact traffic operations

OPTION 3: NORTH SIDE 2-WAY PROTECTED BIKE LANE AND SIDEWALKS ON BOTH SIDES OF STREET, TREE ROWS, AND INTERMITTENT CENTER MEDIAN

Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS



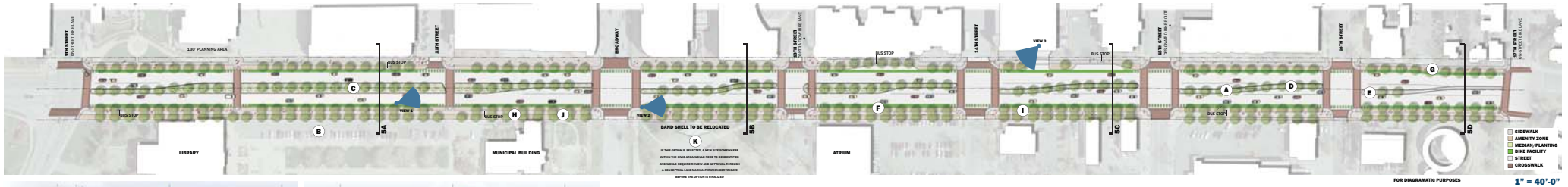


A 58-foot-wide curb to curb roadway width with 11-foot travel lanes
B No continuous planted center median; 12-foot-wide planted median where no turn lane is present
C This assumes City surface parking lots at Canyon North to be removed
D Turning/access into City surface parking lots and private property lots along south side of Canyon Boulevard will be removed
E No pedestrian refuge at intersections
F Pedestrian refuge at mid-block crossings
G 12-foot-wide two-way protected bike lane on south side of Canyon Boulevard
H Pedestrian connections across bike lane necessary at bus stop locations
I Allée condition on south side (a row of trees on both sides of the pedestrian path) except for 1600 block of Canyon Boulevard
J Band Shell remains in current location with shared pedestrian/cyclist plaza treatment
K Intersection design requires exclusive bicycle phase and may impact traffic operations

OPTION 4: SOUTH SIDE 2-WAY PROTECTED BIKE LANE, SIDEWALKS ON BOTH SIDES OF STREET, TREE ROWS, AND INTERMITTENT CENTER MEDIAN

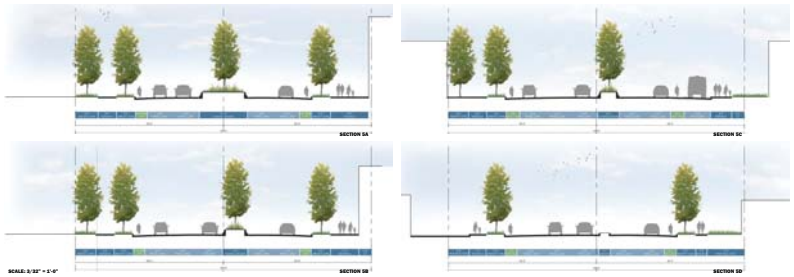
Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS



FOR DIAGRAMATIC PURPOSES

1" = 40'-0"



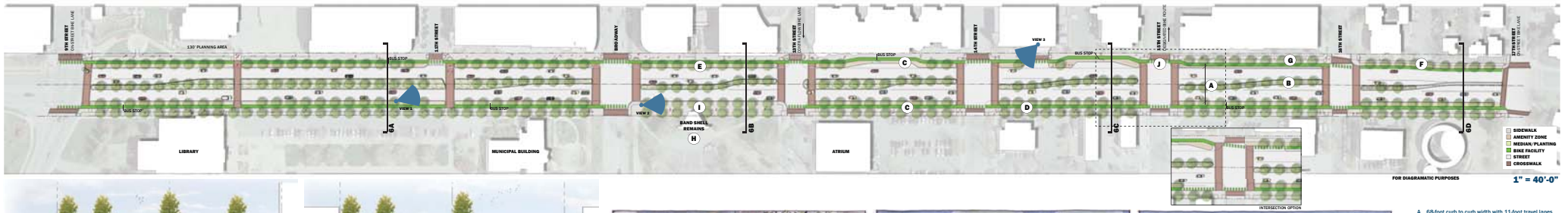
SCALE: 1/32" = 1'-0"

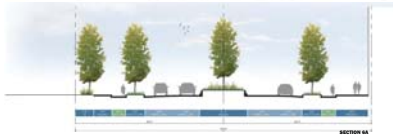
A 78-foot curb to curb width with 11-foot travel lanes
B This assumes city surface parking lots at Canyon North to be removed
C Turning/access into city surface parking lots and private property lots along south side of Canyon removed
D Continuous planted center median (8-feet wide where turn lanes are present, 20-feet where no turn lane is present)
E Pedestrian refuge at intersections and mid-block crossings
F 5-foot on-street bike lane exclusive of gutter pan, on north and south sides of street; no separation provided
G 5-foot sidewalk east of 16th Street
H 8-foot minimum sidewalks west of 16th Street
I Continuous 8-foot amenity zone (tree planting strip) behind curb on both sides of street
J Allée condition on south side (a row of trees on both sides of the pedestrian path)
K Band Shell relocated

OPTION 5: ON-STREET BIKE LANES ON BOTH SIDES OF STREET, SIDEWALKS, AMENITY ZONE, TREE ROWS, CONTINUOUS PLANTED MEDIAN

Canyon Boulevard
Complete Streets

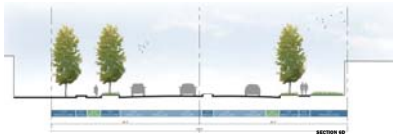
4.27.2016 studioINSITE ATKINS




SECTION 6A


SECTION 6C


SCALE: 3/32" = 1'-0"
SECTION 6B


SECTION 6D


VIEW 1


VIEW 2

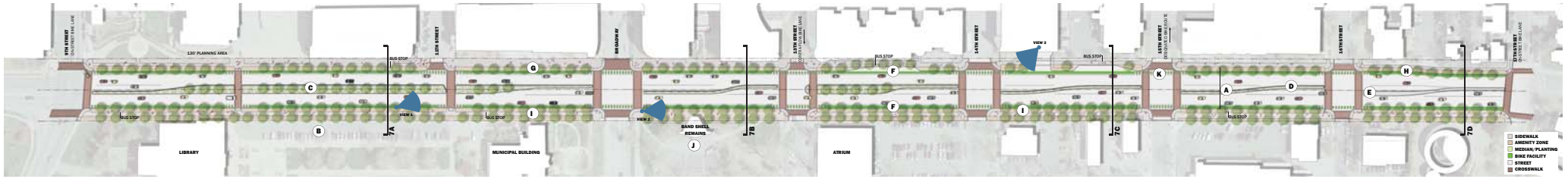

VIEW 3

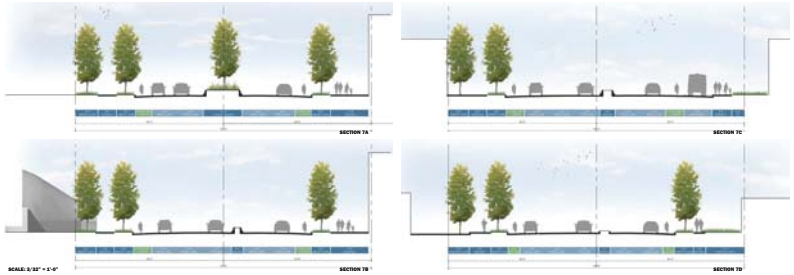
A 68-foot curb to curb width with 11-foot travel lanes
B Continuous planted center median (8-feet wide where turn lanes are present, 20-feet where no turn lane is present)
C 6-foot wide protected bike lanes on both sides of Canyon Boulevard
D Bike paths separated by 8-foot wide planted median
E Continuous 8-foot amenity zone (tree planting strip) behind curb (both sides of street)
F 5-foot wide sidewalks east of 16th street and conventional bike lanes
G Minimum 6'-3" sidewalk west of 16th Street (8-foot wide, typical)
H Band Shell remains
I Shared pedestrian/cyclist plaza treatment at Band Shell
J Intersection design requires exclusive bicycle phase and may impact traffic operations

OPTION 6: SINGLE DIRECTION PROTECTED BIKE LANES ON BOTH SIDES OF STREET WITH PLANTED SEPARATION, NORTH AND SOUTH AMENITY ZONE, SIDEWALKS, TREE ROWS, PLANTED CENTER MEDIAN

Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS



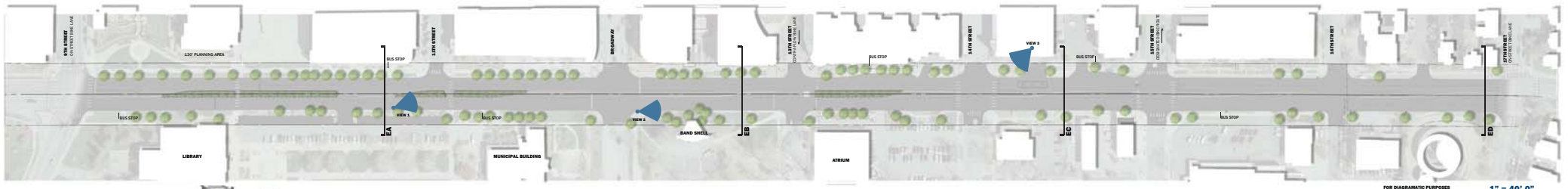


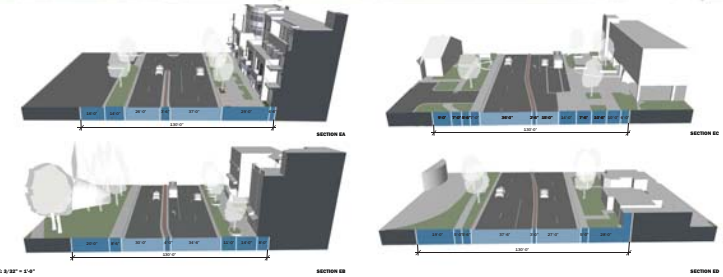
A 78-foot curb to curb roadway width with 11-foot travel lanes
B This assumes City surface parking lots at Canyon North will be removed
C Turning/access into City surface parking lots and private property lots along south side of Canyon Boulevard will be removed
D Intermittent planted center median (4-feet-wide where turn lanes are present, 16 -feet-wide where no turn lane is present)
E Pedestrian refuge at intersections and mid-block crossings
F 5-foot-wide buffered bike lane (two-foot buffer; bike lane width is exclusive of gutter pan) on both sides of Canyon Boulevard
G Continuous 8-foot amenity zone (tree planting strip) behind curb on both sides of street
H 5-foot-wide sidewalks east of 16th Street
I Allée condition on south side (a row of trees on both sides of the pedestrian path)
J Band Shell remains
K Intersection design requires exclusive bicycle phase and may impact traffic operations

OPTION 7: BUFFERED BIKE LANE ON BOTH SIDES OF STREET, NORTH AND SOUTH AMENITY ZONE, SIDEWALKS, TREE ROWS, PLANTED CENTER MEDIAN

Canyon Boulevard
Complete Streets

4.27.2016 studioINSITE ATKINS






VIEW 1


VIEW 2


VIEW 3

- 65-foot-wide curb to curb roadway width with 12-foot to 14-foot travel lanes
- Annual daily traffic on Canyon Boulevard is 11,000 to 25,000 vehicles
- 2-foot center median (for access control)
- Intermittent tree row on north side
- No continuous sidewalk on the south side; sidewalk width varies on the north side (5 feet to 14 feet)
- No existing bike lanes
- Speed limit 35 miles per hour

EXISTING CONDITIONS

Living Lab Phase II Folsom Street Pilot Project

Summary Report

April 27, 2016
Draft

Project Purpose and Background

The vision of the city's Transportation Master Plan (TMP) is to create and maintain a safe and efficient multimodal transportation system that meets the sustainability goals of the community. A focus area of the TMP is to provide "Complete Streets," that offer safe and comfortable access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. This approach emphasizes the value of a balanced and complete multimodal transportation system to enhance safety and increase access, while shifting trips away from single-occupant vehicles. The TMP Complete Streets vision includes developing streets that encourage walk and bike trips for women, older adults and families.

The Living Lab program is a Complete Streets action item that installs pilot projects to test new street designs and community engagement processes. The projects are experimental and allow city staff to gather technical, observational and community feedback as part of an ongoing evaluation process that assesses whether a pilot project treatment achieves the intended benefits of complete streets and is a good fit for Boulder. The results inform the development of a network of low-stress bicycle routes, enhance transit access and create a more pedestrian-friendly community.

The purpose of the Folsom Street pilot project is to demonstrate a corridor approach to testing new street designs with the intent to increase safety and access for people using all modes of transportation. The Folsom Street pilot project included converting portions of the corridor from Valmont to Canyon from four vehicle travel lanes to three, adding center left turn lanes, and protected bike lanes. South of Canyon, the Folsom Street pilot project included intersection restriping and other treatments, including buffered bike lanes to connect with the CU campus at Colorado.

Feedback from the Boulder community is an important part of the Living Lab program and to address traffic congestion impacts experienced by the community after installing the pilot project, the center segment of the Folsom Street pilot project was modified in the fall 2015. These modifications included restoring the four vehicle travel lanes and removing a segment of protected bike lanes from Spruce Street to Canyon Boulevard in order to improve the flow of traffic.

The following graphic is a map of the Folsom Street corridor illustrating the extent of the original installation in July 2015 and modifications that were performed in October 2015. The Folsom Street pilot project limits extend from Valmont Road to Colorado Avenue.


Valmont Rd
Valmont Rd - Spruce St
Protected Bike Lane
Spruce St
Pearl St
Spruce St - Canyon Blvd
4-Lanes Restored
Canyon Blvd
Canyon Blvd - Arapahoe Ave
Unchanged
Arapahoe Ave
Arapahoe Ave - Taft Dr
Buffered Bike Lane
Taft Dr
Taft Dr - Colorado Ave
Future Buffered Bike Lane
Colorado Ave

Project Evaluation Overview

The City of Boulder and the Fox Tuttle Hernandez Transportation Group have completed an evaluation of the primary and secondary performance measures for the Folsom Street pilot project. Using the results of the evaluation and community feedback from the public, the City's Transportation Staff has developed recommendations for the pilot project. This report discusses the key findings of the evaluation and outlines the recommendations for the pilot project by roadway segment.

Staff has been collecting multimodal data along the corridor before and after the initial project installment in July 2015. The evaluation criteria consist of both primary and secondary performance measures in order to understand the operational characteristics of the corridor. The primary performance measure data was collected on a weekly basis from July through October 2015 and then switched to a monthly data collection schedule in November 2015 through March 2016.

The primary data consists of the following criteria:

- weekday vehicle volume
- weekday bicycle volume
- vehicle travel time during the PM peak hour
- weekday vehicle speed
- traffic collisions
- number of male, female, and families (children and adults with children) riding bicycles during the AM, noon, and PM peak hours

In addition, more detailed technical transportation operations analysis was conducted along Folsom Street corridor, and at key intersections, and on side streets, as well as review of maintenance experience along the corridor during winter conditions.

Secondary performance measures include:

- peak hour vehicle turning movement counts
- level of service (LOS) and delay calculations
- side street daily vehicle volumes
- right-turn treatment evaluations
- mid-block pedestrian crossing information
- side street delays observed
- left-turn vehicle queue observations
- vehicle saturation flow rate calculations
- "cycle failure" observations
- maintenance practices

This report builds on the "3 Month Update" memorandum (dated January 7, 2016) with additional performance measure data collected through March 2016. Throughout the duration of project,

staff has reported the results of the data collection beginning with a weekly reporting schedule from July through October 2015 and later switching to a monthly reporting schedule from November through March 2016. In order to convey the results of the evaluation process for the primary performance measures, staff created an infographic to illustrate the changing conditions along the Folsom corridor. Staff has refined the infographic based on the Transportation Advisory Board's input and can be found on the Living Lab Folsom Street pilot project website.

Based on a review of the primary and secondary performance measure evaluations to date, the following comprise key findings for the Folsom Street Pilot Project:

Primary Measures Key Findings

- The initial conversion from four vehicle lanes to two lanes plus center turn lanes from Valmont Road to Canyon Boulevard resulted in considerable peak hour travel time delays and travel time variability along Folsom Street during the initial weeks of implementation, particularly in the section from Spruce Street to Canyon Boulevard. Average travel times during the evening peak hour measured between Valmont Road and Arapahoe Road were approximately 3.5 minutes before the project. During the first several months of the project the northbound average travel times increased to between 4 and 5 minutes and the southbound average travel times peaked at over 5 minutes. Since the four vehicle lanes were reinstalled between Spruce Street and Canyon Boulevard in the fall 2015, the travel times between Valmont and Arapahoe Road have returned to pre-project levels.

- Traffic counts along Folsom Street throughout the project indicated that volumes were reduced by up to 15% during the implementation of the full project, indicating that is likely that traffic diverted off Folsom Street. The traffic volume decrease on Folsom has been reduced to approximately 4% after the segment of Folsom between Spruce Street and Canyon Boulevard was returned to the four lane condition.

- Counts of bicycle volumes along Folsom Street showed an increase during the first three months (July through October) after initial installation, and have since decreased below initial levels. Based on cycling data from other sites, this is typical seasonal variation in bicycle travel. More data over a longer period of time is needed to determine if any changes in volume of bicycles is statistically significant.

- Evaluation of motor vehicle travel speeds (as measured with the 85th-percentile speed at Bluff Street) have decreased by roughly 2-3 miles per hour (mph) during the course of the project, but these speeds are still approximately seven miles per hour above the posted speed limit of 30 mph.

- The frequency of collisions in the corridor each month after installation is following a similar monthly pattern to a three-year collision history (2012 – 2014) from before the project was implemented. The monthly number of collisions is at or below this historic pattern.

- There were no pedestrians involved in collisions during the first eight months of the project; however, on April 21, 2016, a pedestrian died from injuries sustained in a collision at the intersection of Folsom Street and Canyon Boulevard. The pedestrian was crossing Canyon Boulevard in the east crosswalk and was struck by a truck turning left from southbound Folsom Street onto eastbound Canyon Boulevard.

- The number of male, female, and families riding bicycles in the corridor during the AM, noon, and PM peak hours varied throughout the implementation of the project with no clear trend. There's a high ratio of males to females currently bicycling the corridor, although the ratio was lower at the time of project installation. This ratio fluctuation may be seasonally related.

Secondary Measures Key Findings

- Analysis of side-street and parallel corridor traffic volumes, intersection peak hour turning movement volumes, intersection peak hour Levels of Service, and delay indicate that the reduction of traffic volumes on Folsom Street did not result in an identifiable pattern of diversion to any particular corridor. The analysis suggests that any diverted traffic that did occur was redistributed across the city roadway grid without identifiable impacts to any one corridor.

- Travel time data collected and public input all suggest that vehicular traffic operations on Folsom Street, particularly between Spruce Street and Canyon Boulevard, were impacted with the full implementation of the project as measured with travel times, queue lengths, signalized intersection Levels of Service, and side street delays. These impacts have been mitigated with the return to original lane geometry between Spruce Street and Canyon Boulevard.

- Staff observed that the pedestrian crossings on Folsom Street at Spruce Street and Walnut Street caused congestion, delay, and increased travel time when this section of the project was reduced to a single through lane in each direction.

- The project included two different treatments on intersection approaches along Folsom Street for vehicular right-turn interaction with bike lanes during the full implementation of the protected bike lanes. Field observations of the "transition" treatments at Pearl Street and Canyon Boulevard in September 2015 indicated that most right-turning motor vehicles complied with yielding requirements to bicyclists in the protected bike lane. Based on evaluations of the "Skip Green Dash" treatment at Pine Street in September 2015 and March 2016, most vehicles observed turning right across bicycle lanes at these locations are not complying with the City ordinance requiring vehicles to move as close to the curb as possible (into the bicycle space) before turning right.

- Field observations in September 2015 indicate that was a reduction in traffic saturation flow rate (which is an indicator of how much traffic a travel lane can accommodate during

peak conditions) in the section between Spruce Street and Canyon Boulevard. Possible factors that influenced the saturation rate in September 2015 are increased friction (from vertical bollards), visual elements (markings, signs, additional bicyclists), and the close proximity of signalized mid-block crossings (Spruce and Walnut Street). Field observations in March 2016 indicate that the saturation flow rate has increased by approximately 10% compared with September 2015, and are now consistent with estimated pre-project levels.

- Maintenance practices along the Folsom Street corridor, particularly in the segment between Valmont Road and Spruce Streets have increased due to the protected bike lane configuration. Snow removal and street sweeping practices have been modified to address the maintenance needs of the corridor. Additionally, staff has identified increased maintenance costs pertaining to the cleaning and replacement of the flexible bollards, as needed.

Community Feedback

An important component of the ongoing evaluation of Folsom Street pilot project is community and user feedback. Since installation, the city has hosted a number of opportunities for community input including bike audits (guided community bike rides), online surveys, in-person feedback at public events, and social media and Inspire Boulder posts.

In April 2016, staff hosted a public open house to present key findings of the ongoing evaluation and to gather additional community input. The Folsom Street Corridor was organized into four segments in order to best articulate specific facilities and modifications that have occurred since the installation of the project in July 2015. Community members were asked to provide comments under three topic headings: keep it, refine it, or remove it. Additionally, the city administered a survey to seek additional public input on the Folsom Street pilot project and to supplement the public feedback from the open house event. The survey was open to the public from April 29 through May 9, 2016. Preliminary results of the survey will be presented to the Transportation Advisory Board at the May meeting. The results of the survey will be added to the Summary Report prior to the May 31 City Council Study Session.

Below is a brief summary of the public input from the public open house event. A complete summary of public feedback from the public open house can be found in Section 1.0 of this report.

Most of the community feedback received at the Complete Streets Open House focused on the comments regarding the bicycle facility treatments along the corridor. Several people shared their desire for improved, physically separated north-south bicycle corridors. Overall, the bicycle treatments along the corridor were well received. There was support for keeping the protected bike lane treatment between Valmont and Spruce Street citing improved safety, comfort, directness and separation between users. However, some bicyclists have expressed difficulty with executing left turns from the protected bike lanes. Some people also preferred the segment between Valmont Road and Spruce Street be returned back to the four-travel lane condition citing concerns with delay when executing turns from side streets and aesthetic concerns presented by

the bollards. Several comments expressed concern for the width of the conventional bike lanes between Spruce and Arapahoe. There also was support for keeping the buffered bike lane treatment between Arapahoe and Colorado; though some comments expressed support for making them protected bike lanes, including planters to improve separation from the adjacent travel lane.

Preliminary Recommendations

Based on the technical key findings and community feedback to date, staff recommends continuing the Folsom Street pilot project in its current condition from Valmont Road to Colorado Avenue. Analysis of the corridor has been organized into four segments in order to best articulate specific facilities and modifications that have occurred since the installation of the project in July 2015.

Valmont Road to Spruce Street

This segment of the corridor currently consists of two travel lanes (one in each direction), a center left turn lane, and protected bike lanes using bollards. Other than thinning the number of bollards in the fall 2015, this segment has stayed intact since the initial project installation in July 2015. The protected bike lanes provide more perceived safety and comfort for bicyclists of different levels of confidence, particularly in this section of Folsom that includes a hill and curves in the roadway, which can cause some drivers to swerve into the bike lane without the bollards.

The technical evaluation indicates a minor drop in the 85th % of vehicle speed from 39 (mph) to 37 (mph). No significant operational impacts have been observed during the evaluation process concerning travel times, side-street delay, or visibility. The center left turn lane provides an opportunity for left turning vehicles to more safely execute left turns along the corridor without blocking through traffic. As with the other segments of the corridor, bicycle volume, demographics, and collision data will need to be analyzed over a longer period of time to gauge any significant trends.

Spruce Street to Canyon Boulevard

Today, this segment of the corridor consists of four travel lanes and conventional bike lanes. During the initial project installation, two of the four travel lanes were repurposed to provide two travel lanes, center left turn lanes, and protected bike lanes. Due to community feedback, and impacts to traffic congestion and other operational issues, this segment was reverted back to the original condition, the same condition that exists today. Staff recommendation is to continue the existing configuration, without any further changes. Corridor travel times have returned to the before condition, side-street delay has subsided, long left turn lane queues have shortened, and traffic impacts at signalized intersections at Pearl Street and Canyon Boulevard no longer exist.

Canyon Boulevard to Arapahoe Avenue

No vehicle travel lane repurposing modifications were performed along this segment of the corridor during the initial project installation. Today, the corridor consists of four travel lanes and conventional, striped bike lanes. Staff recommends continuing the current striping configuration along this segment of the corridor.

Arapahoe Avenue to Colorado Avenue

This segment of the Folsom corridor consists of two travel lanes and buffered bike lanes from Arapahoe Avenue to Taft Drive. During the initial project installation, the conventional bike lanes were converted to buffered bike lanes by utilizing excess space from adjacent travel lanes. This striping configuration was recently continued to Colorado Avenue following the completion of the CU stadium project.

Living Lab Program Next Steps

Staff recommends keeping the Folsom Street pilot project in the current configuration with on-going monitoring through fall 2016, along with the remaining Phase I projects. Staff will return to City Council in December 2016 with overall next steps for the Living Lab program. Staff does not intend to add additional projects to the Living Lab program. Since 2012, the program has helped the City of Boulder better understand and improve planning and public outreach processes, project implementation practices, and effective evaluation processes. Staff has adopted new street design techniques and has a better understanding of how innovative types of facilities operate in the real world context. With this information, staff is able to apply this knowledge toward existing and future corridor planning efforts while maintaining the spirit of innovation in order to create safe and comfortable travel conditions for all road users.

Detailed Summary of the Folsom Street Pilot Project Performance Measures

Contents

1.0 Complete Streets Open House Community Feedback (4/21/16)

Folsom - Valmont to Spruce

The current configuration consists of two travel lanes, a center turn lane, protected bike lanes and the green dash right turn treatment.

- Improve/extend. Bikers, like drivers, have jobs/deadlines/places to be. We need complete, safe, direct routes.
- When it snows, this is the best bike lane in town to the point that pedestrians use it.
- Extend protection separation. Build north-south bike path.
- Build dedicated bike paths. Do not try to mix cars and bikes.
- Protected bike lanes offer more protection area for pedestrians crossing the road.
- With delineators cars aren't drifting into the bike lane.
- Buffered/Protected bike lanes north of spruce have seriously reduced my near collisions with vehicles. Especially at the n-bound intersection with Valmont where right-turning cars cross bike lane.

Keep it	Refine it	Remove it
√		√

Folsom - Spruce to Canyon

The current configuration consists of four travel lanes, conventional bike lanes and concrete / landscape medians with left turn lanes at intersections and some driveways.

- Buffered bike lanes please.
- Improve. Add planters. Extend protected bike lanes.
- Go back to the protected bike lanes. This is a dangerous stretch. Cars can use alternates. Cares have plenty of N-S roads; bikes have no safe north-south corridor.
- Worst stretch of Folsom bike commute especially with bus stops and potholes. Please refine.
- Variable. Too narrow and potholed. Will not ride it with my kids. Proper lane width needed. Buffered or protected.
- Enforce the 3' rule.
- Conventional bike lanes from Arapahoe to Spruce are seriously inadequate. Too narrow and ill repaired. In this region I am often (1-3 times a week) nearly hit/cut-off by vehicles turning onto Folsom across the bike lane.

Keep it	Refine it	Remove it
√	√	

Folsom - Canyon to Arapahoe

The current configuration consists of four travel lanes, conventional bike lanes and concrete/landscape medians with left turn lanes at intersections and some driveways, and a bike box at southbound Folsom and Arapahoe.

- Love the bike box.
- Got hooked and ended up on sidewalk.

Keep it	Refine it	Remove it
√		

Folsom - Arapahoe to Colorado

The current configuration includes two travel lanes, a center turn lane, and buffered bike lanes.

- These are fine. Protected would be nice, or a rumble strip. But they feel safe enough
- Can we add planters to make more safe separation

Keep it	Refine it	Remove it
√		

General comments

- We should study projects sufficiently so we do not put bike protection in then take them out i.e. Folsom & Baseline Rd.
- Great work. We need safer n-bound and s-bound bike routes… keep this strong and growing.
- I like protected bike lanes. The conventional bike lanes on Folsom are *narrow*. I ride Harvard Road a lot and I am not sure what best solution is. Keep working on TMP, would LOVE city eco-pass (I do not have one) would love "4 bike, walk transit cars." (confusing script)
- For Folsom to be truly accessible to all levels of bicycle there have to be protected, physically separated lanes. We do not currently have any complete streets. We need to do one (or more) REALLY WELL so the community sees what is possible.
- It is not enough. Have some vision in Boulder. We need a complete, direct N/S route from Iris to CU. Buffered or protected. Cars have 30th/28th/Foothills. Let us make Folsom different. People do not go to Pearl St. because it is full of cars. They go because it is 'pedestrianized,' different & beautiful. I cannot see business owners complaining if we make Folsom a somewhat new, but more functional version of Pearl, with reduced car traffic and lots of bikers and pedestrians. Honestly depressed right now. Tired of dragging kids and myself to meetings, repeating the same obvious arguments and seeing nothing change. Soon I will run out of steam but I guess that is what the car-driving mob in Boulder wants... This is not an optional extra for this city. As Boulder gridlocks and the air quality approaches that of Beijing we will realize we have made a mistake and it will be too late.
- During big snowstorms, the posts were not comfortable for driving. First choice is to remove, but if stays, please remove the posts. Please remove posts from Baseline. Bollards are visually distracting.

2.0 Vehicle Travel Time

The average travel time it takes to drive the Folsom corridor end-to-end from Valmont to Arapahoe in the northbound and southbound directions during the PM peak hour on a weekday was measured by driving the corridor before the installation and the first ten weeks after the installation of the protected bike lanes. During this time the average variability, including the shortest and longest travel times were also recorded. Beginning in mid-October 2015 through March 2016, the average travel time was measured using Acyclica Wi-Fi sensors in the corridor. The project team used the before travel time measurements to help calibrate the VISSIM modeling software, and then to forecast the expected travel time after the installation. The tables below report the travel time and variability for the PM peak hour during the project.

Table 1: Average PM Peak Hour Travel Times (in minutes: seconds)

Evaluation Period	PM Northbound	PM Southbound
Before (Nov. 2014)	3:32	3:20
Modeled	4:47	4:30
July 27 – Aug. 9, 2015	4:15	5:36
Aug. 10 – 16, 2015	4:02	4:41
Aug. 24 – 30, 2015	4:37	4:52
Aug. 31 – Sept. 6, 2015	4:13	5:19
Sept. 7 – 13, 2015	4:13	4:52
Sept. 14 – 20, 2015	3:05	4:36
Sept. 21 – 27, 2015	4:00	3:55
Sept. 28 – Oct. 4, 2015	3:24	4:21
Oct. 5 – 11, 2015	3:48	4:18
Oct. 12 – 25, 2015	N/A	
Oct. 26 – Nov. 1, 2015	3:38	3:35
November, 2015	3:36	3:34
December, 2015	3:33	3:45
January, 2016	3:27	3:37
February, 2016	3:28	3:46
March, 2016	3:24	3:32

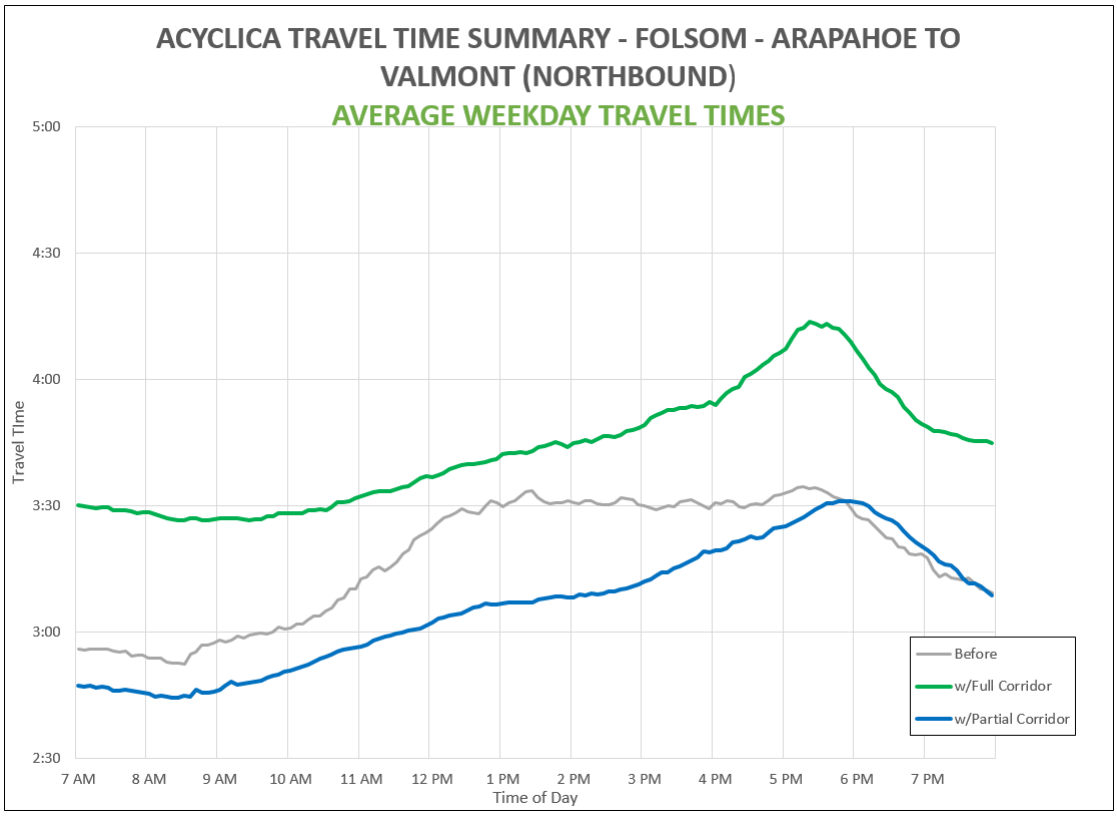
Table 2: Northbound PM Peak Hour Travel Time Variability (in minutes: seconds)

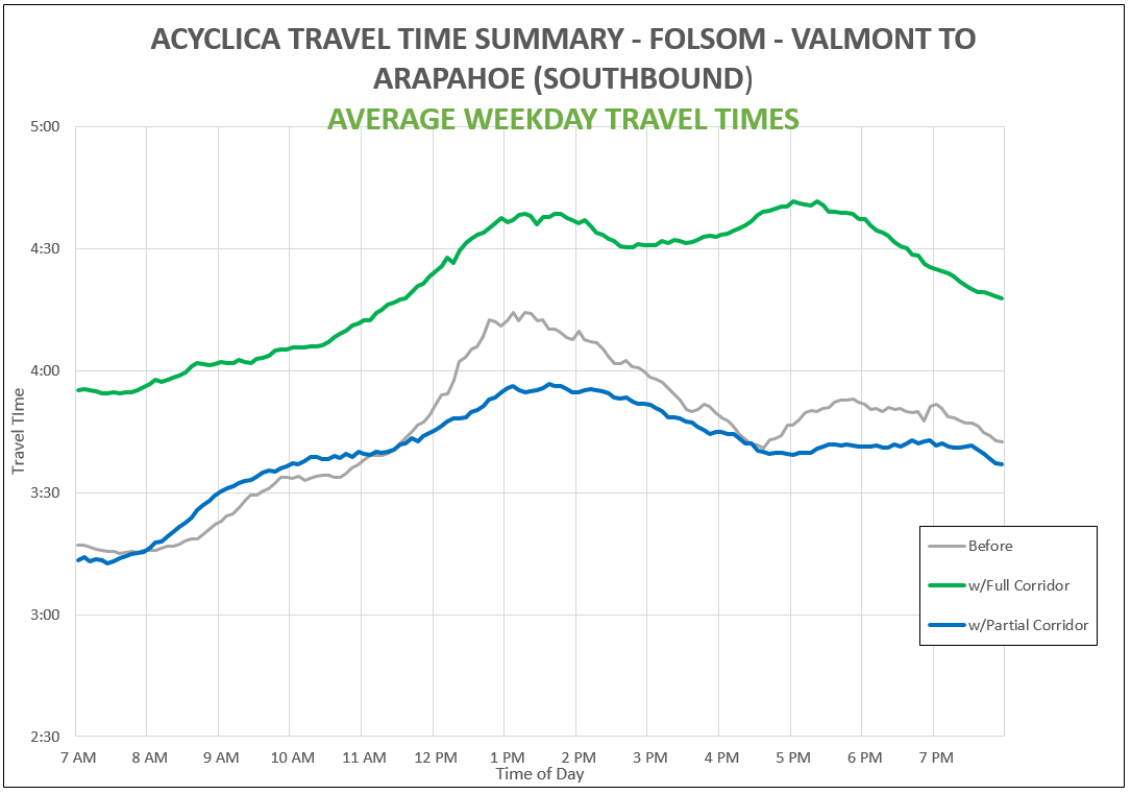
Evaluation Period	Average	High	Low	Variability
Before	3:32	4:52	2:46	2:06
July 27 – Aug. 9, 2015	4:15	6:48	2:40	4:08
Aug. 10 – 16, 2015	4:02	5:15	2:49	2:26
Aug. 24 – 30, 2015	4:37	6:33	2:57	3:36
Aug. 31 – Sept. 6, 2015	4:13	6:47	2:38	4:07
Sept. 7 – 13, 2015	4:13	5:25	3:03	2:22
Sept. 14 – 20, 2015	3:05	5:01	2:40	2:39
Sept. 21 – 27, 2015	4:00	4:57	2:39	2:36
Sept. 28 – Oct. 4, 2015	3:24	4:41	2:37	2:04
Oct. 5 – 11, 2015	3:48	N/A		
Oct. 12 – 25, 2015	N/A			
Oct. 26 – Nov. 1, 2015	3:38	N/A		
November, 2015	3:36	N/A		
December, 2015	3:33	N/A		
January, 2016	3:27	N/A		
February, 2016	3:28	N/A		
March, 2016	3:24	N/A		

Table 3: Southbound PM Peak Hour Travel Time Variability (in minutes: seconds)

Evaluation Period	Average	High	Low	Variability
Before	3:20	3:44	2:13	1:31
July 27 – Aug. 9, 2015	5:36	8:14	3:53	4:21
Aug. 10 – 16, 2015	4:41	5:58	3:35	2:23
Aug. 24 – 30, 2015	4:52	6:15	3:53	2:22
Aug. 31 – Sept. 6, 2015	5:19	7:50	3:52	3:58
Sept. 7 – 13, 2015	4:52	7:31	3:43	4:12
Sept. 14 – 20, 2015	4:36	7:28	3:33	3:55
Sept. 21 – 27, 2015	3:55	5:29	2:08	3:21
Sept. 28 – Oct. 4, 2015	4:21	5:47	3:12	2:35
Oct. 5 – 11, 2015	4:18	N/A		
Oct. 12 – 25, 2015	N/A			
Oct. 26 – Nov. 1, 2015	3:35	N/A		
November, 2015	3:34	N/A		
December, 2015	3:45	N/A		
January, 2016	3:37	N/A		
February, 2016	3:46	N/A		
March, 2016	3:32	N/A		

Acyclica readers record travel times through the day. The figures below illustrate the travel time variability before the project was installed (June through late July), from installation through October 18, 2015 when the full corridor was installed, and after the modifications from October 26, 2015 through April 8, 2016. The graphs of daily average travel time illustrate the variance during the day and the longer travel times experienced during the PM peak while the project was installed between Spruce and Canyon. The graphs also show that the travel times today are consistent, and sometimes lower, than the travel times before the project was installed.


ACYCLICA TRAVEL TIME SUMMARY - FOLSOM - ARAPAHOE TO VALMONT (NORTHBOUND)
AVERAGE WEEKDAY TRAVEL TIMES
Travel Time
5:00
4:30
4:00
3:30
3:00
2:30
7 AM
8 AM
9 AM
10 AM
11 AM
12 PM
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
Time of Day
Before
w/Full Corridor
w/Partial Corridor


ACYCLICA TRAVEL TIME SUMMARY - FOLSOM - VALMONT TO ARAPAHOE (SOUTHBOUND)
AVERAGE WEEKDAY TRAVEL TIMES
Travel Time
5:00
4:30
4:00
3:30
3:00
2:30
7 AM
8 AM
9 AM
10 AM
11 AM
12 PM
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
Time of Day
Before
w/Full Corridor
w/Partial Corridor

3.0 Motor Vehicle Volume and Speed

The city has been collecting average weekday traffic volume and speed at two locations along Folsom Street, north of Bluff Street and north of Canyon Boulevard. The data is recorded for a three-day period, and reported as the average of the three days, or average daily traffic (ADT). Note that Boulder Valley School District (BVSD), University of Colorado –Boulder (CU) and Naropa schools have been in session during some, but not all, of the before and after data collection periods (noted in the tables below). Week 11 after data may not be typical as work to return Folsom to a four-lane cross section between Spruce and Canyon began on October 8, 2015. **Table 4** summarizes the volume and speed during the project collected north of Bluff Street and **Table 5** summarizes the volume and speed collected north of Canyon Boulevard.

Table 4: Folsom Street north of Bluff Street – Posted Speed Limit = 30 mph

Evaluation Period	Date Collected	ADT-Weekday (vpd)	Average Speed (mph)	85th Percentile Speed (mph)	School In Session
Before	4/27-5/1/15	15,780	35	39	Yes
After-Week 2	8/5-8/7/15	13,790	33	37	No
After-Week 3	8/12-8/14/15	13,930	33	37	No
After-Week 5	8/26-8/28/15	14,310	32	36	Yes
After-Week 6	9/2/15-9/4/15	14,100	32	36	Yes
After-Week 7	9/8/15-9/11/15	14,210	32	36	Yes
After-Week 8	9/15/15-9/17/15	13,570	33	36	Yes
After-Week 9	9/22/15-9/24/15	13,750	33	36	Yes
After-Week 10	9/29-15-10/1/15	14,170	33	36	Yes
After-Week 11	10/6/15-10/8/15	13,960	33	36	Yes
After-Week 12	N/A				
After-Week 13	N/A				
After-Week 14	10/27/15-10/29/15	14,350	33	37	Yes
After-Month 4	11/17/15-11/19/15	14,140	33	37	Yes
After-Month 5	12/8/15-12/10/15	14,650	33	36	Yes
After-Month 6	1/12-16-1/14/16	14,060	33	37	Yes
After-Month 7	2/9/16 -2/11/16	14,120	33	37	Yes
After-Month 8	3/8/16-3/10/16	14,470	33	37	Yes

Table 5: Folsom Street north of Canyon Blvd. – Posted Speed Limit = 30 mph

Evaluation Period	Date Collected	ADT-Weekday (vpd)	Average Speed (mph)	85th Percentile Speed (mph)	School in Session
Before	6/30-7/2/15	18,970	29	34	No
After-Week 2	8/3-8/5/15	15,790	25	30	No
After-Week 3	8/10-8/12/15	16,480	24	29	No
After-Week 5	8/25-8/26/15	16,500	24	29	Yes
After-Week 6	9/2/15-9/4/15	15,960	24	29	Yes
After-Week 7	9/9/15-9/11/15	16,590	26	30	Yes
After-Week 8	9/16/15-9/17/15	16,200	26	30	Yes
After-Week 9	9/22/15-9/24/15	15,760	26	30	Yes
After-Week 10	9/29-15-10/1/15	16,520	25	30	Yes
After-Week 11	10/6/15-10/8/15	15,920	27	32	Yes
After-Week 12	N/A				
After-Week 13	N/A				
After-Week 14	10/27/15-10/29/15	17,780	30	35	Yes
After-Month 4	11/17/15-11/19/15	17,580	31	35	Yes
After-Month 5	12/8/15-12/10/15	18,200	30	35	Yes
After-Month 6	1/12/16-1/14/16	17,450	30	35	Yes
After-Month 7	2/9/16 -2/11/16	17,620	30	35	Yes
After-Month 8	3/8/16-3/10/16	18, 160	31	35	Yes

- ADT = Average Daily Traffic
- VPD = Vehicles per Day
- MPH = Miles per Hour

4.0 Bicycle Volume

Daily bicycle volumes are being collected at three locations along Folsom using permanent 24-hour counters: Boulder Creek, South Street, and Pine Street. Boulder Valley School District (BVSD), Colorado University (CU), and Naropa were not in session during the before data collection period. "Before" and "after" volumes at Boulder Creek were collected by a permanent 24-hour counter. The "before" volumes are an average of weekday volumes from the last week of July and first two weeks of August from 2012 to 2014. The before volumes at South and Pine Streets were collected from 6 a.m. to 9 p.m. on June 30, 2015, and after volumes are being collected by permanent 24-hour counters installed in late July 2015. The after volumes are an average of daily volumes on Tuesday, Wednesday, and Thursday during the corresponding week. The after data includes bicycle volumes while BVSD, CU and Naropa were both in and out of session. Note that the validation of the counters is currently in progress, and volumes may later be adjusted to account for potential variances.

Bicycle volumes at all three locations increased during Weeks 4 and 5 from before conditions and Week 3 volumes. BVSD classes started during Week 4 and CU and Naropa classes started during Week 5. The increase in bike volume from Week 4 to Week 5 is attributed to school in session. The increases in this volume along this corridor so far are consistent with the increases the city

typically sees when school is back in session. Bicycle volumes have since decreased below initial levels. It is unknown yet if this decrease is simply due to seasonal variation in bicycle travel.

Table 6: Daily Weekday Average Bicycle Volumes Along Folsom Street at Pine Street

Evaluation Period	Northbound	Southbound	Total	School in Session	Inclement weather
Before	437	440	877	No	
July 27 – Aug. 2, 2015	620	655	1,275	No	
Aug. 3 – 9, 2015	551	625	1,176	No	
Aug. 10 – 16, 2015	554	616	1,170	No	
Aug. 17 – 23, 2015	603	651	1,254	No	
Aug. 24 – 30, 2015	705	766	1,471	Yes	
Aug. 31 – Sept. 6, 2015	684	748	1,432	Yes	
Sept. 7 – 13, 2015	754	766	1,520	Yes	
Sept. 14 – 20, 2015	681	713	1,393	Yes	
Sept. 21 – 27, 2015	676	713	1,389	Yes	
Sept. 28 – Oct. 4, 2015	643	681	1,324	Yes	
Oct. 5 – 11, 2015	546	568	1,113	Yes	
Oct. 12 – 18, 2015	581	639	1,220	Yes	
Oct. 19 – 25, 2015	279	292	571	Yes	X
Oct. 26 – Nov. 1, 2015	440	477	917	Yes	
November, 2015	290	284	574	Yes	
December, 2015	176	169	346	Yes	
January, 2016	254	268	522	Yes	
February, 2016	260	250	510	Yes	
March, 2016	253	264	516	Yes	

Table 7: Daily Weekday Average Bicycle Volumes Along Folsom Street at South Street

Evaluation Period	Northbound	Southbound	Total	School in Session	Inclement weather
Before	388	389	777	No	
July 27 – Aug. 2, 2015	497	578	1,075	No	
Aug. 3 – 9, 2015	512	556	1,068	No	
Aug. 10 – 16, 2015	406	500	906	No	
Aug. 17 – 23, 2015	570	600	1,169	No	
Aug. 24 – 30, 2015	706	791	1,497	Yes	
Aug. 31 – Sept. 6, 2015	725	799	1,524	Yes	
Sept. 7 – 13, 2015	730	813	1,543	Yes	
Sept. 14 – 20, 2015	692	769	1,461	Yes	
Sept. 21 – 27, 2015	695	761	1,456	Yes	
Sept. 28 – Oct. 4, 2015	653	729	1,382	Yes	
Oct. 5 – 11, 2015	552	618	1,170	Yes	
Oct. 12 – 18, 2015	N/A				
Oct. 19 – 25, 2015	N/A				X
Oct. 26 – Nov. 1, 2015	N/A				
November, 2015	277	306	583	Yes	
December, 2015	161	202	363	Yes	
January, 2016	259	272	530	Yes	
February, 2016	251	268	519	Yes	
March, 2016	247	273	521	Yes	

Table 8: Daily Weekday Average Bicycle Volumes Along Folsom Street at Boulder Creek

Evaluation Period	Northbound - Adjusted	Southbound – Adjusted	Total - Adjusted	School in Session	Inclement weather
Before	592	483	1,076	No	
July 27 – Aug. 2, 2015	683	521	1,204	No	
Aug. 3 – 9, 2015	607	497	1,104	No	
Aug. 10 – 16, 2015	603	478	1,081	No	
Aug. 17 – 23, 2015	782	602	1,384	No	
Aug. 24 – 30, 2015	1,060	880	1,940	Yes	
Aug. 31 – Sept. 6, 2015	1,226	855	2,081	Yes	
Sept. 7 – 13, 2015	1,212	945	2,157	Yes	
Sept. 14 – 20, 2015	1,248	926	2,174	Yes	
Sept. 21 – 27, 2015	1,096	904	2,000	Yes	
Sept. 28 – Oct. 4, 2015	1,055	856	1,911	Yes	
Oct. 5 – 11, 2015	967	769	1,736	Yes	
Oct. 12 – 18, 2015	1002	816	1,819	Yes	
Oct. 19 – 25, 2015	547	429	976	Yes	X
Oct. 26 – Nov. 1, 2015	879	695	1573	Yes	
November, 2015	444	370	814	Yes	
December, 2015	263	203	466	Yes	
January, 2016	412	322	733	Yes	
February, 2016	402	324	725	Yes	
March, 2016	419	338	757	Yes	

5.0 Collisions

Collision data for the Folsom corridor from Valmont to Colorado is being compiled from police reports. The totals include all crashes at the intersections and in segments along the corridor. The following tables summarize the before collision frequency from 2012 to 2014 and weekly collision totals since installation for vehicle-vehicle, vehicle-bicycle, and vehicle-pedestrian collisions.

Table 9: Before Collisions Along Folsom Street from Valmont to Colorado from 2012-2014

Before Time Period	Vehicle-Vehicle	Vehicle-Bike	Vehicle-Pedestrian	Total
2012-2014	212	34	7	253
Average per Year	70.6	11.3	2.3	84.3
Average per Month	5.9	0.9	0.2	7.0

The frequency of collisions in the corridor is following a similar monthly pattern to the three-year collision history from before the project was implemented. It should be noted that the collision frequency shown in **Table 10** below is based on a small sample and additional data/time is needed to determine if the project will have a measurable long-term impact on collisions.

Table 10: Before Collisions Along Folsom Street from Valmont to Colorado from 2012-2014

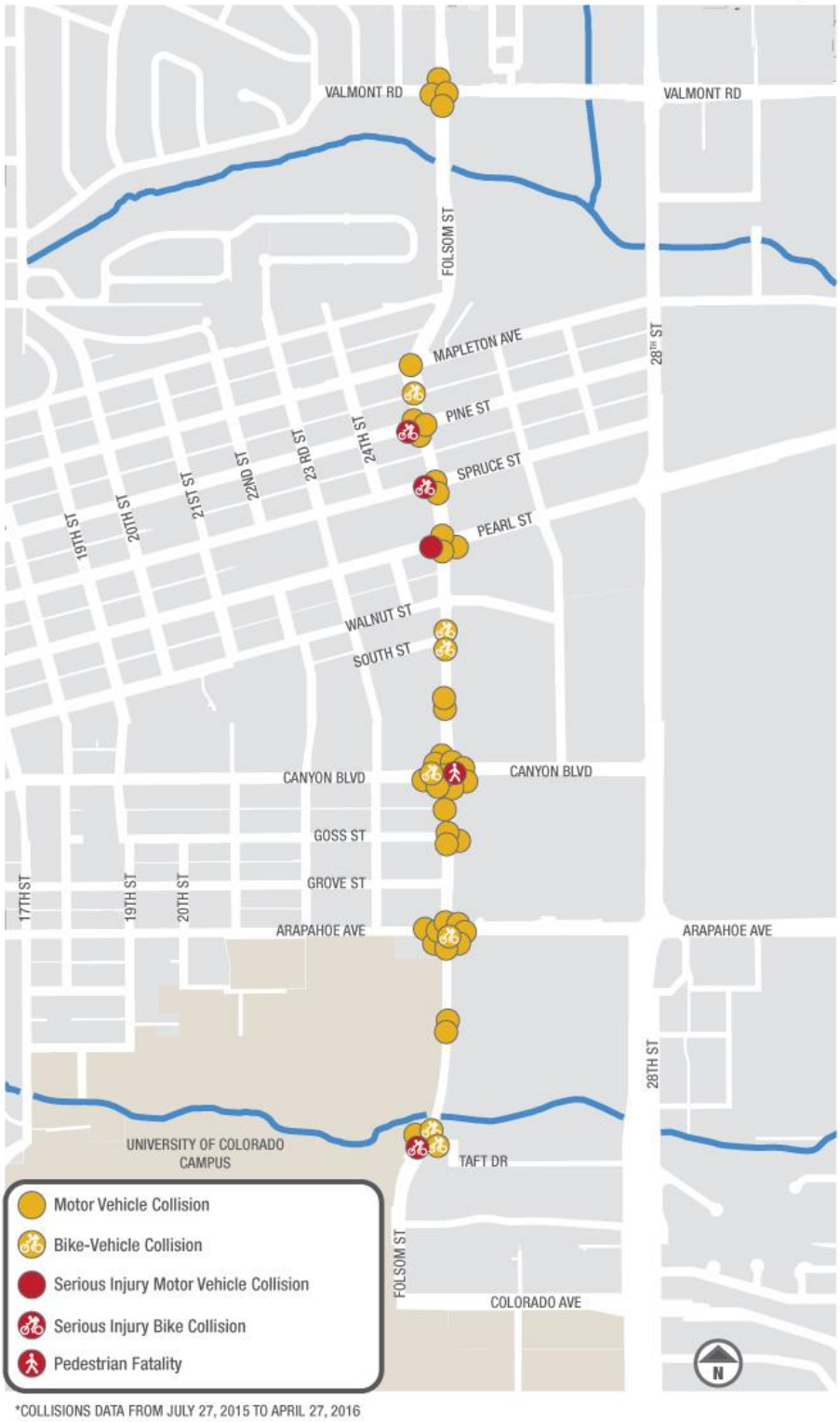
After Time Period	Vehicle-Vehicle	Vehicle-Bike	Vehicle-Pedestrian	Total
7/27/15 – 4/3/16	39	11	0	51
Average per Month	4.8	1.25	0	6.4

Table 11: After Collisions Along Folsom Street from Valmont to Colorado

After Evaluation Period	Vehicle-Vehicle	Vehicle-Bike	Vehicle-Pedestrian	Total
July 27 – Aug. 9, 2015	1	1	0	2
Aug. 10 – 16, 2015	1	0	0	1
Aug. 17 – 23, 2015	1	1	0	2
Aug. 24 – 30, 2015	0	0	0	0
Aug. 31 – Sept. 6, 2015	0	0	0	0
Sept. 7 – 13, 2015	1	0	0	1
Sept. 14 – 20, 2015	1	1	0	2
Sept. 21 – 27, 2015	3	0	0	3
Sept. 28 – Oct. 4, 2015	2	0	0	2
Oct. 5 – 11, 2015	2	1	0	3
Oct. 12 – 18, 2015	1	1	0	2
Oct. 19 – 25, 2015	1	0	0	1
Oct. 26 – Nov. 1, 2015	1	1	0	2
Nov. 2 – 8, 2015	1	0	0	1
Nov. 9 – 15, 2015	1	1	0	2
Nov. 16 – 22, 2015	1	0	0	1
Nov. 23 – 29, 2015	0	0	0	0
Nov. 30 – Dec. 6, 2015	1	0	0	1
Dec. 7 – 13, 2015	1	0	0	1
Dec. 14 – 20, 2015	3	0	0	3
Dec. 21 – 27, 2015	1	0	0	1
Dec. 28, 2015 – Jan. 3, 2016	0	0	0	0
Jan. 4 – 10, 2016	2	0	0	2
Jan. 11 – 17, 2016	1	0	0	1
Jan. 18 – 24, 2016	3	1	0	4
Jan. 25 – 31, 2016	1	1	0	2
Feb. 1 – 7, 2016	1	0	0	1
Feb. 8 – 14, 2016	1	0	0	1
Feb. 15 – 21, 2016	1	0	0	1
Feb. 22 – 28, 2016	1	0	0	1
Feb. 29 – Mar. 6, 2016	1	1	0	2
Mar. 7 – 13, 2016	2	0	0	2
Mar. 14 – 20, 2016	1	1	0	2
Mar. 21 – 27, 2016	0	0	0	0
Mar. 28 – Apr. 3, 2016	1	0	0	6
Total	**40**	**11**	**0**	**51**

The location, type, and severity of collisions along the corridor during the pilot project are illustrated in the following map. The majority of collisions, including all collisions that have resulted in serious injuries or fatalities, have occurred at intersections.

Folsom Street Collisions Overview Map



*COLLISIONS DATA FROM JULY 27, 2015 TO APRIL 27, 2016

6.0 Bicyclist Demographics

Bicycle demographic data has been observed and recorded along the Folsom corridor before and after the installation of pilot project. The before data was collected on April 28, 2015, for two hours. Observations have been taken during weekday AM, noon, and PM rush hours. Observers record the total number of male and female bicycle riders on the roadways. In addition, the number of children and adults riding with children is recorded and comprises the "family" category (see table below).

Table 12: Bicycle Weekday Demographic Along Folsom Street

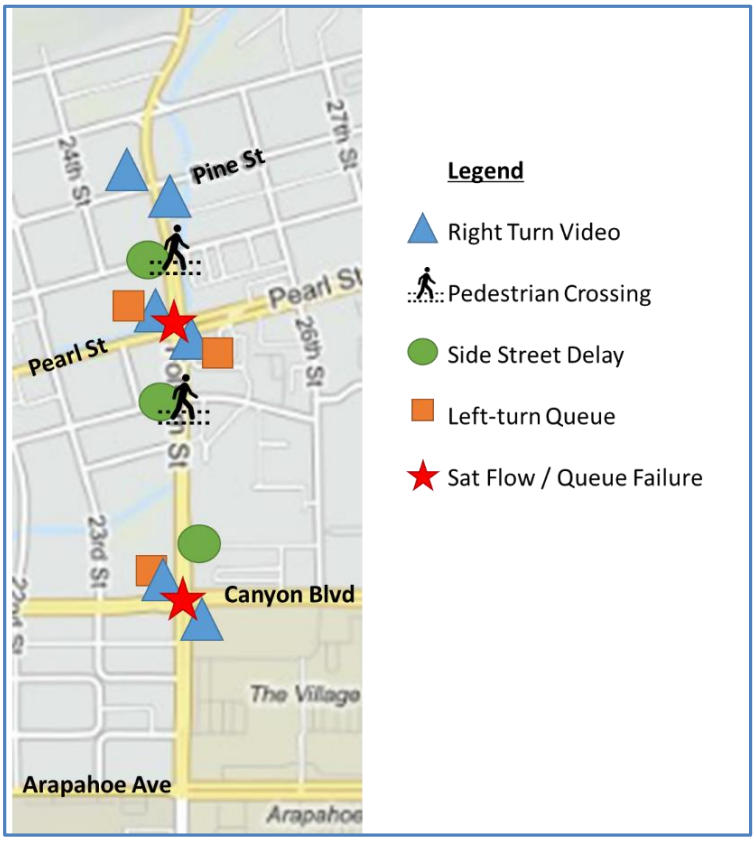
Evaluation Period	Male	Female	Family
Before	72%	28%	4%
July 27 – Aug. 9, 2015	78%	22%	6%
Aug. 10 – 16, 2015	67%	33%	5%
Aug. 24 – 30, 2015	66%	34%	4%
Aug. 31 – Sept. 6, 2015	66%	34%	4%
Sept. 7 – 13, 2015	67%	33%	2%
Sept. 14 – 20, 2015	70%	30%	1%
Sept. 21 – 27, 2015	69%	31%	2%
Sept. 28 – Oct. 4, 2015	70%	30%	2%
Oct. 5 – 11, 2015	73%	27%	1%
Oct. 12 – 18, 2015	66%	34%	0%
Oct. 19 – 25, 2015	72%	28%	1%
Oct. 26 – Nov. 1, 2015	65%	35%	0%
November, 2015	66%	34%	1%
December, 2015	89%	11%	0%
January, 2016	70%	30%	1%
February, 2016	76%	24%	1%
March, 2016	84%	16%	0%

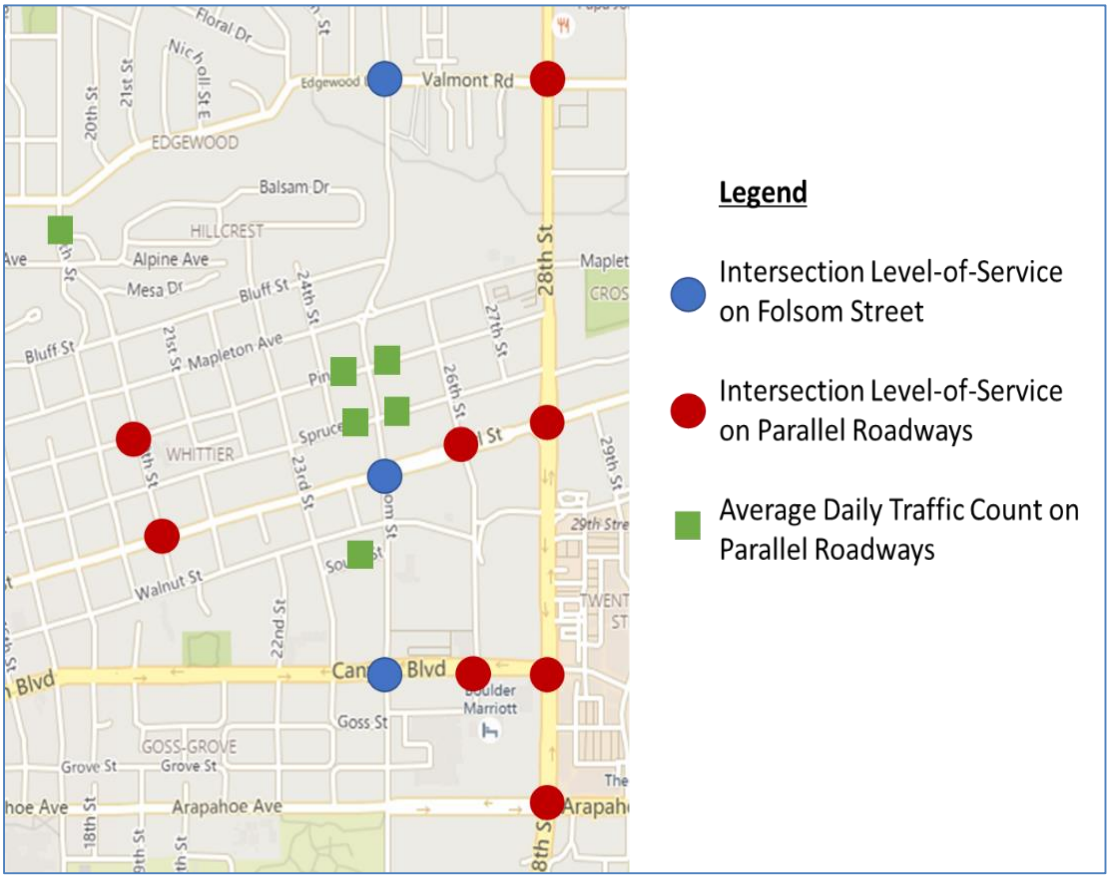
7.0 Overview of Secondary Performance Measures

The secondary performance measures evaluated in this report include:

- Peak hour turning movement counts (TMCs) at select signalized locations, with comparison to pre-project TMC data
- Level of Service (LOS) and delay calculations at select signalized locations, with comparison to pre-project LOS data. This includes intersections with potential diverted traffic from the Folsom Street corridor.
- Daily traffic data on select side streets, with comparison to available pre-project data
- Right-turn treatment evaluations and turning movement conflicts
- Mid-Block pedestrian crossing volumes and compliance at the Walnut Street/Folsom Street and Spruce Street/Folsom Street crossings, with comparison to pre-project data
- Peak hour side-street delay observations at Spruce Street (EB), Walnut Street (EB), and the commercial alley (WB) just north of Canyon Boulevard
- Left-turn queue observations (PM peak) on Folsom Street approaching Pearl Street (SB and NB) and on Folsom (SB) approaching Canyon Boulevard
- Saturation flow rate calculations (PM peak) on Folsom Street approaching Pearl Street (SB and NB) and on Folsom (SB) approaching Canyon Boulevard
- "Cycle failure" observations at the Folsom Street/Pearl Street and Folsom Street/Canyon Boulevard intersections during the PM peak hour

The map to the right and on the following page depict locations where secondary performance measure data collection was performed.



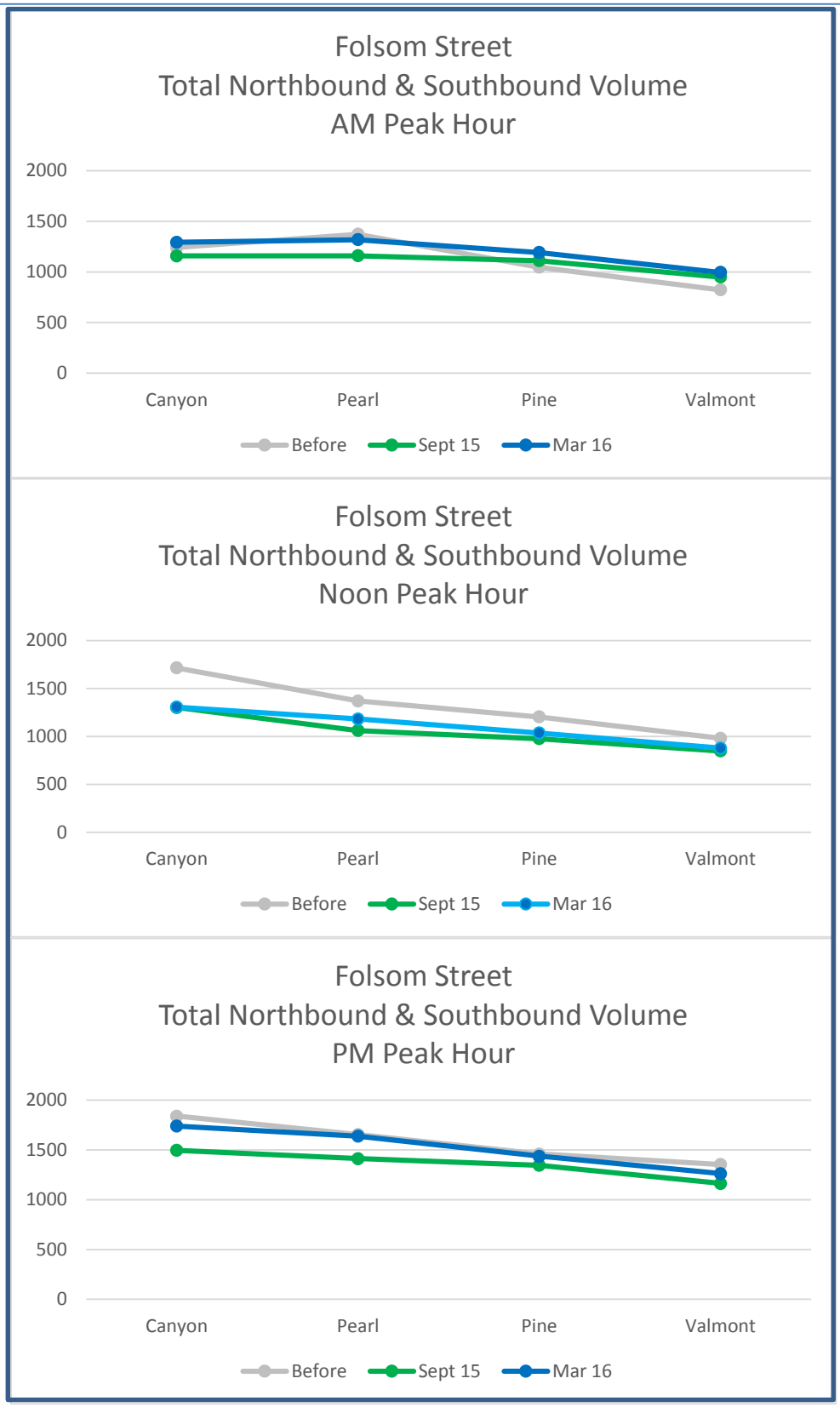


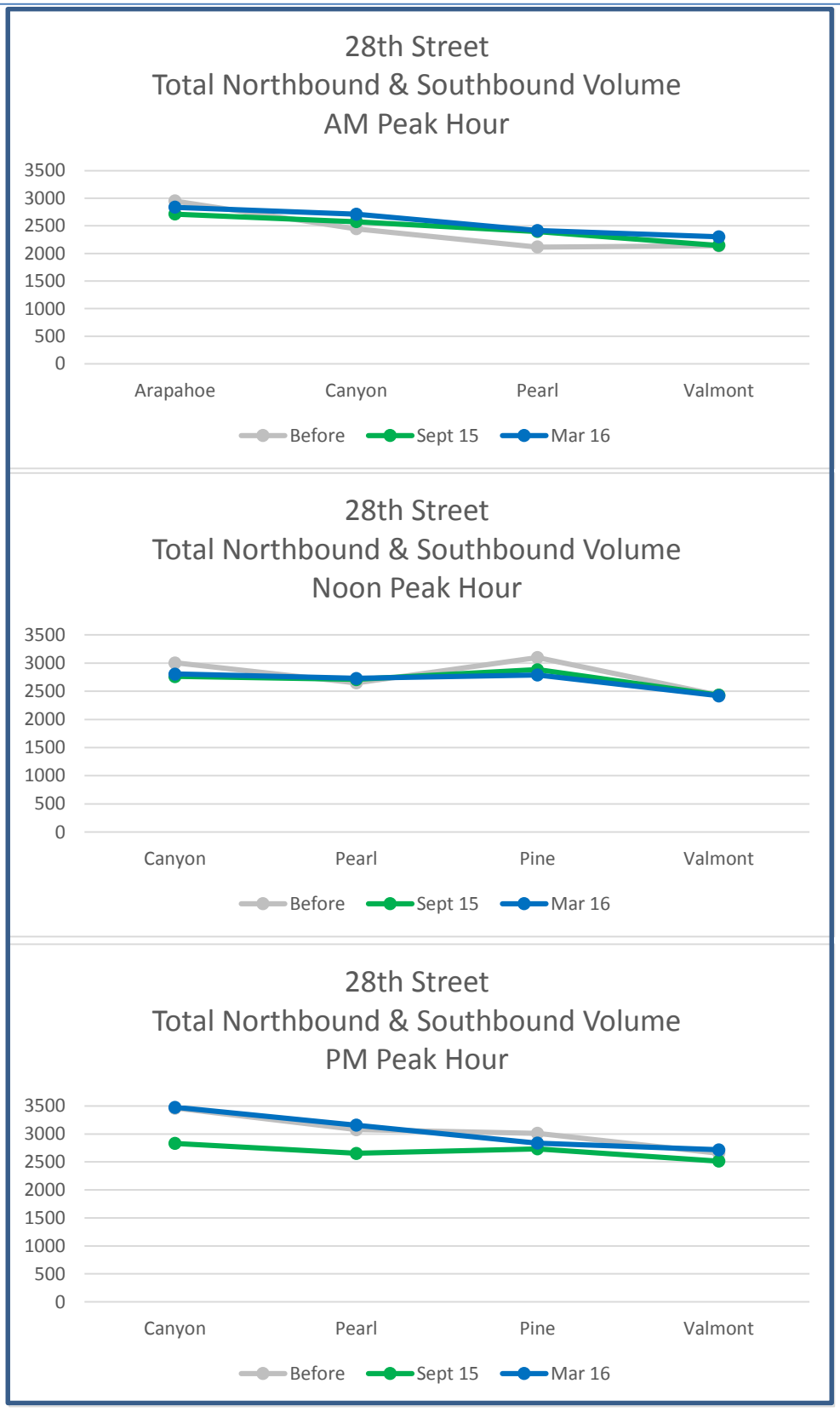
The following text, tables, and figures summarize the analysis for each of these secondary performance measures.

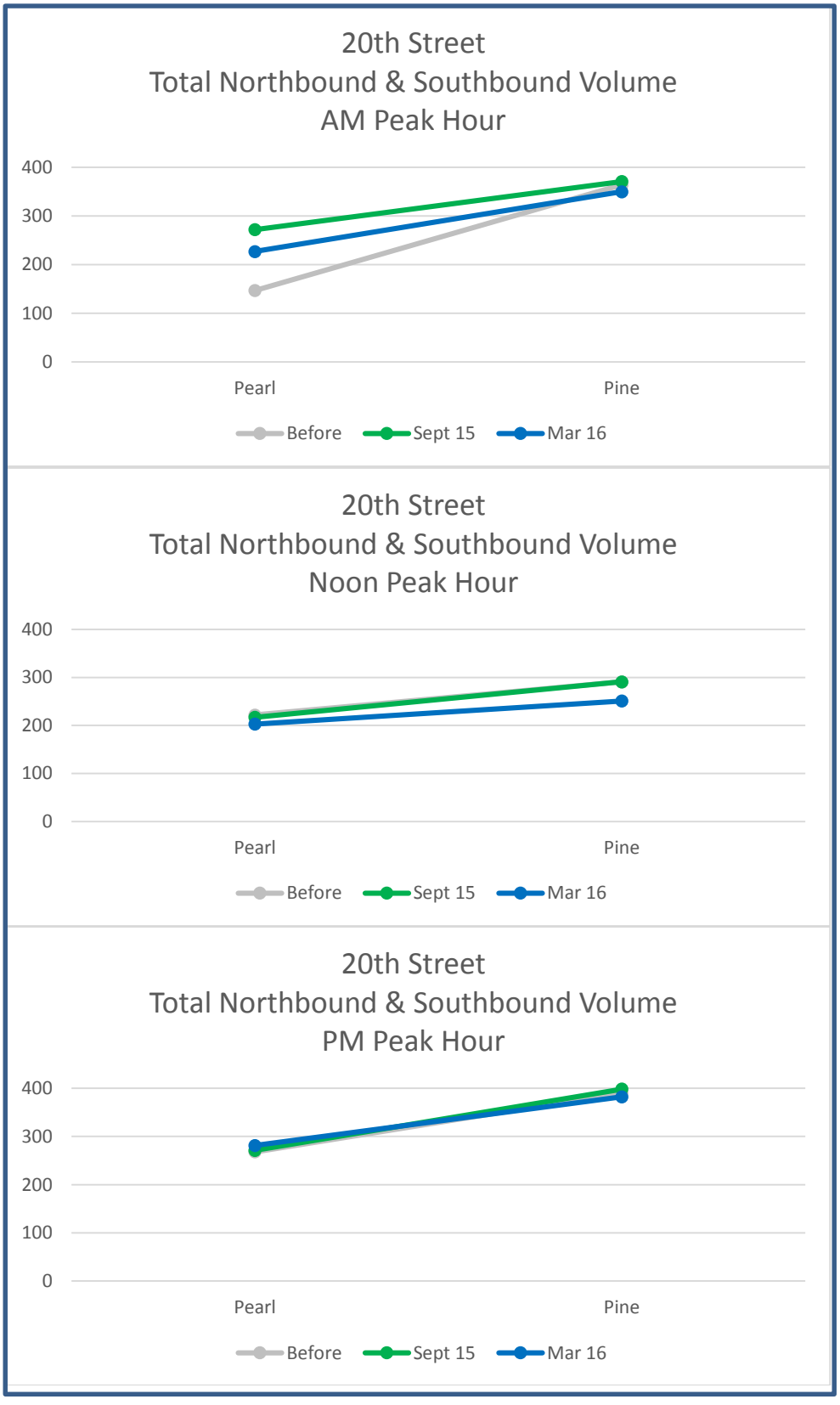
9.0 Peak Hour Turning Movement Counts

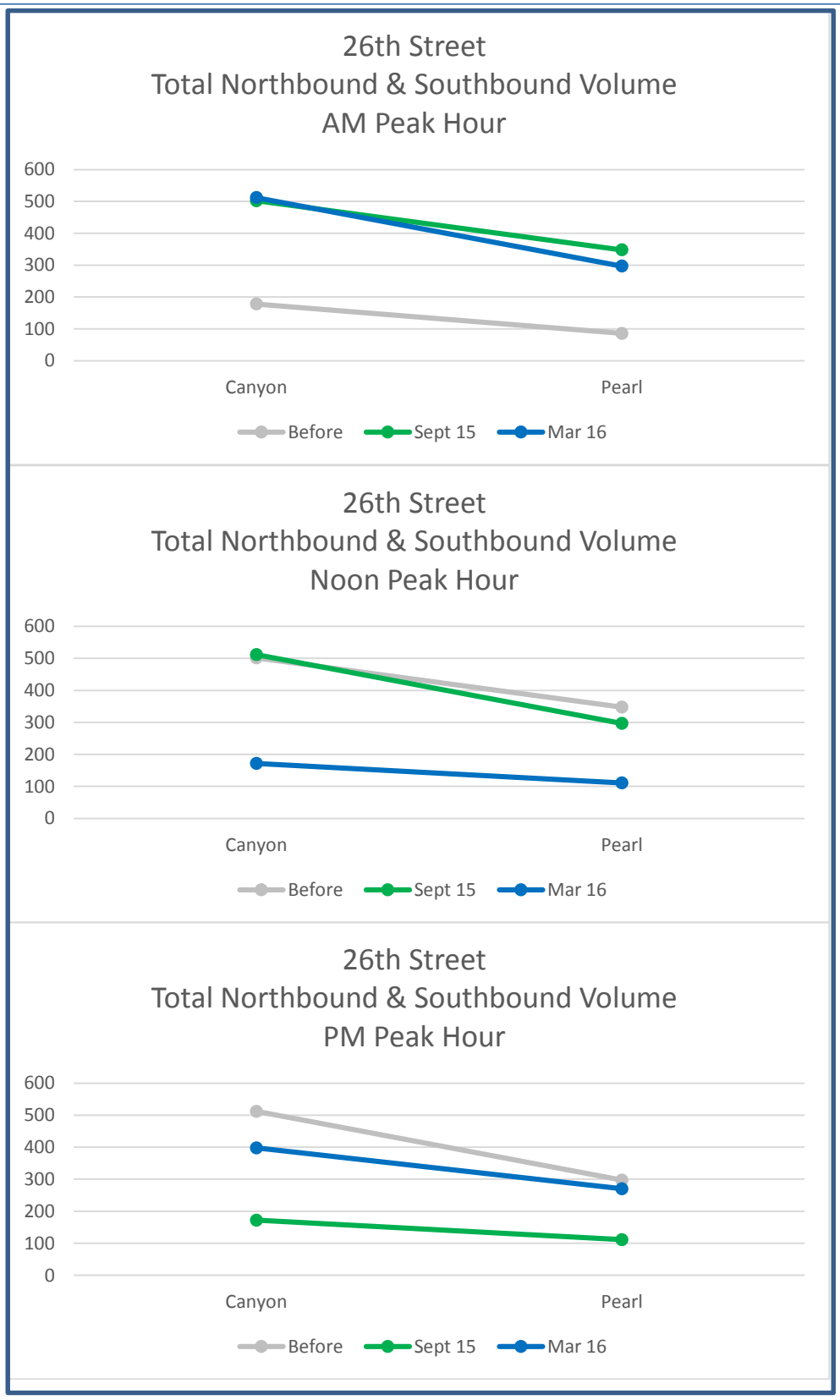
Vehicular turning movement counts were collected on September 15, 2015 and March 8, 2016 at four (4) signalized intersections along the Folsom Street and at eight (8) signalized intersections along adjacent corridors at locations that could experience potential diverted traffic as a result of the pilot project. Volumes were collected during the weekday AM (7:45-8:45am), noon (12-1pm) and PM (4:45-5:45pm) peak hours. The September 15, 2015 volumes were collected prior to the conversion of a section of the project back to two through lanes in each direction between Canyon Boulevard and Spruce Street.

The volumes are summarized in the Appendix for each intersection, along with a comparison to the most recent pre-project counts collected by the City as part of their regular count program. A summary of the pre-project, September 2015, and March 2016 northbound and southbound *combined* turning movement volumes are provided on the following charts for each peak hour for the Folsom Street, 28th Street, 20th Street, and 26th Street corridors within the project study area.


Folsom Street
Total Northbound & Southbound Volume
AM Peak Hour
2000
1500
1000
500
0
Canyon
Pearl
Pine
Valmont
Before
Sept 15
Mar 16
Folsom Street
Total Northbound & Southbound Volume
Noon Peak Hour
2000
1500
1000
500
0
Canyon
Pearl
Pine
Valmont
Before
Sept 15
Mar 16
Folsom Street
Total Northbound & Southbound Volume
PM Peak Hour
2000
1500
1000
500
0
Canyon
Pearl
Pine
Valmont
Before
Sept 15
Mar 16


28th Street
Total Northbound & Southbound Volume
AM Peak Hour
3500
3000
2500
2000
1500
1000
500
0
Arapahoe
Canyon
Pearl
Valmont
Before
Sept 15
Mar 16
28th Street
Total Northbound & Southbound Volume
Noon Peak Hour
3500
3000
2500
2000
1500
1000
500
0
Canyon
Pearl
Pine
Valmont
Before
Sept 15
Mar 16
28th Street
Total Northbound & Southbound Volume
PM Peak Hour
3500
3000
2500
2000
1500
1000
500
0
Canyon
Pearl
Pine
Valmont
Before
Sept 15
Mar 16


20th Street
Total Northbound & Southbound Volume
AM Peak Hour
400
300
200
100
0
Pearl
Pine
Before
Sept 15
Mar 16
20th Street
Total Northbound & Southbound Volume
Noon Peak Hour
400
300
200
100
0
Pearl
Pine
Before
Sept 15
Mar 16
20th Street
Total Northbound & Southbound Volume
PM Peak Hour
400
300
200
100
0
Pearl
Pine
Before
Sept 15
Mar 16


26th Street
Total Northbound & Southbound Volume
AM Peak Hour
600
500
400
300
200
100
0
Canyon
Pearl
Before
Sept 15
Mar 16
26th Street
Total Northbound & Southbound Volume
Noon Peak Hour
600
500
400
300
200
100
0
Canyon
Pearl
Before
Sept 15
Mar 16
26th Street
Total Northbound & Southbound Volume
PM Peak Hour
600
500
400
300
200
100
0
Canyon
Pearl
Before
Sept 15
Mar 16

The tabular summary in the Appendix and charts on the preceding pages illustrate that there is some variability between pre-project and post-project counts at many locations, likely due to a combination of factors, including: daily variation, seasonal variation, construction and maintenance projects, and events. Given this context, the following general observations were made:

- Northbound and southbound peak hour volumes on Folsom Street experienced roughly 0%-20% reductions with initial installation of the project, depending upon the peak hour time and location. This is consistent with the daily roadway counts performed as part of the Primary Performance measures evaluation. With the conversion of the segment from Spruce to Canyon back to pre-project lane geometry, volumes have increased to near pre-project volumes in most instances.

- The 20th Street and 26th Street northbound + southbound combined volumes show an increase in AM volumes but do not indicate diversion to this corridor during the noon or PM peak hours when potential traffic congestion along Folsom Street would be highest.

- 28h Street northbound + southbound combined volumes show post-project counts similar to or less than pre-project conditions. This indicates that any potential diversion of traffic from Folsom Street to 28th Street was not observed and that any variations were due to the other, non-project factors listed above.

10.0 Level of Service Calculations

Using the pre-project and post-project turning movement counts, peak hour intersection Levels of Service were performed for the four (4) signalized intersections along the Folsom Street and at eight (8) signalized intersections along adjacent corridors at locations that could experience potential diverted traffic as a result of the pilot project.

In determining the operational characteristics of an intersection, "Levels of Service" (LOS) A through F are applied, with LOS A indicating very good operations and LOS F indicating congested operations. The intersection LOS is represented as a delay in seconds per vehicle for the intersection as a whole and for each turning movement. A more detailed discussion of LOS methodology is contained in the Appendix for reference. Criteria contained in the Highway Capacity Manual (HCM) was applied for these analyses in order to determine pre-project and post-project levels of service during peak hour periods.

The pre-project and post-project LOS results are provided in a table in the Appendix. The results are summarized as follows:

Folsom Street Corridor Intersections: The LOS results do not indicate any new capacity issues associated with the project, though observations at the Canyon Boulevard, Pearl Street, and Pine Street intersections had indicated greater congestion during the peak

times of the noon and PM peak hours with the initial full project installation from Valmont Road to Canyon Boulevard. The City signalized intersection Synchro analysis does not factor in unsignalized side street and access traffic, mid-block pedestrian impacts, and compounding/cycle failures (spillback), all of which are believed to have an impact on delays during peak times in this area.

Parallel and Adjacent Corridors: The LOS results for 28th Street, 20th Street, and 26th Street intersections analyzed do not indicate any increased delays versus pre-project LOS calculations that would be outside of the typically expected daily and seasonal variation or due to non-project factors.

11.0 Side street Volumes

Daily traffic volumes and traffic speeds were collected along select side streets intersecting Folsom Street and along 20th Street parallel to Folsom Street, in order to evaluate potential diversion impacts. This data was compared to pre-project data, where available. This data is provided in the following **Table 13** and **Table 14** for the September 2015 and March 2016 data, respectively. Available historic data is also provided, for comparison and context.

Table 13: Side street Volume and Speed Comparison (Sept. 2015)

	"Before"(1) Data			"After"(2) Data - September 2015						
	Daily Roadway Volume			Daily Roadway Volume			Vehicular Speeds			
							NB or EB		SB or WB	
Roadway Count Location	NB or EB	SB or WB	Total	NB or EB	SB or WB	Total	Avg	85th%	Avg	85th%
Spruce Street west of Folsom	1,466	2,066	3,532	1,406	1,795	3,201	25 mph	29 mph	24 mph	28 mph
Spruce Street east of Folsom	*no data*			893	741	1,634	20 mph	27 mph	21 mph	28 mph
Pine Street west of Folsom	*no data*			3,148	2,916	6,064	24 mph	29 mph	26 mph	29 mph
Pine Street east of Folsom	1,595	2,218	3,813	1,512	1,549	3,061	27 mph	32 mph	27 mph	31 mph
South Street west of Folsom	*no data*			334	386	720	21 mph	25 mph	23 mph	28 mph
19th Street south of Edgewood	2,212	2,371	4,583	2,193	2,712	4,905	21 mph	25 mph	23 mph	28 mph

(1) October 28-30, 2014 Average
(2) September 15-17, 2015 Average

Table 14: Side street Volume and Speed Comparison (March 2016)

Roadway Count Location	"Before"(1) Data			"After"(3) Data - March 2016						
	Daily Roadway Volume			Daily Roadway Volume			Vehicular Speeds			
							NB or EB		SB or WB	
	NB or EB	SB or WB	Total	NB or EB	SB or WB	Total	Avg	85th%	Avg	85th%
Spruce Street west of Folsom	1,466	2,066	3,532	1,492	1,952	3,445	22 mph	28 mph	27 mph	33 mph
Spruce Street east of Folsom	*no data*			775	655	1,430	18 mph	24 mph	20 mph	26 mph
Pine Street west of Folsom	*no data*			3,506	3,015	6,521	22 mph	27 mph	28 mph	33 mph
Pine Street east of Folsom	1,595	2,218	3,813	1,421	1,576	2,997	31 mph	37 mph	22 mph	24 mph
South Street west of Folsom	*no data*			228	345	573	18 mph	23 mph	18 mph	23 mph
19th Street south of Edgewood	2,212	2,371	4,583	2,243	2,474	4,717	21 mph	28 mph	19 mph	24 mph

(1) October 28-30, 2014 Average
(2) September 15-17, 2015 Average
(3) March 8-10, 2016 Average

Historic Data for Comparison (from 2005 Spruce Street Improvements Project):

	Daily Roadway Volume			Vehicular Speeds			
				NB or EB		SB or WB	
	NB or EB	SB or WB	Total	Avg	85th%	Avg	85th%
Spruce Street west of Folsom	1,170	1,555	2,725	29 mph	32 mph	30 mph	33 mph
Spruce Street east of Folsom	1,080	1,505	2,585	19 mph	25 mph	25 mph	28 mph
Pine Street west of Folsom	3,742	3,203	6,945	26 mph	29 mph	28 mph	31 mph
Pine Street east of Folsom	1,417	1,660	3,077	29 mph	32 mph	28 mph	31 mph
19th Street south of Pine	2,372	2,942	5,314	18 mph	24 mph	20 mph	24 mph

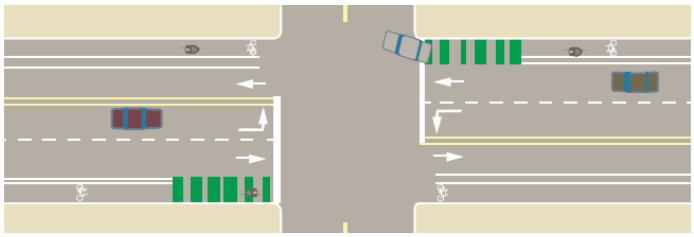
The data in **Table 13** and **Table 14** indicate some variation in volumes and speeds between the existing and two after studies. In many cases, volumes on these corridors decreased with the project or remained relatively steady through the project.

Along Pine Street west of Folsom Street, volumes have increased by almost 500 vpd (+8%) between counts taken in September 2015 and March of 2016. Roughly, 400 vpd of this growth is on Pine Street in the eastbound direction (towards the project area) with a roughly even split of traffic turning north (into the existing project) and south along Folsom Street based on peak hour counts. As half of this traffic is turning into the project, at least half of the growth along Pine Street eastbound towards Folsom Street cannot be attributed to diversion.
Volumes along 19th Street south of Edgewood indicated 7% growth with the full installation of the project in September 2015 and a 3% increase for the March 2016 data. This indicates that there may have been some diversion to 19th Street (up to approximately 300 vpd) occurring during the initial installation but that any diversion has since subsided.

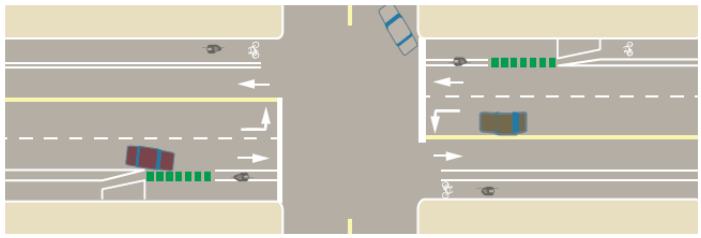
12.0 Right-Turn Treatment Evaluations

Two new right-turn treatments, the Skip Dashed Green and Transition, were installed along Folsom Street in July 2015. The Transition right-turn treatments were removed in October when the section of Folsom Street from Spruce Street to Canyon Boulevard was changed back to the original five-lane cross-section. Skip Dashed Green treatments remained installed in the section from Valmont Street to Spruce Street.

- In the Skip Dashed Green treatment, dashed green lines signify the area where right-turning motor vehicles and bicyclists share the right lane. This treatment advises motorists and bicyclists of proper lane positioning. It maintains bicyclist safety in the absence of a dedicated bicycle through lane. This treatment is used when there is a relatively low volume of right-turning vehicles.



- In the Transitions treatment, upon approaching an intersection, the bike lane transitions from next to the curb into the street while maintaining a designated lane between the vehicle travel lane and right turn lane. A green skip marking indicates the area where motor vehicles pass across the bike lane into the right turn lane. This type of intersection increases the visibility of bicyclists and motorists in advance of the intersection and mitigates the risk of "right-hook" crashes with turning motorists. This treatment is used when there is a high volume of right-turning vehicles.



Video data was collected on September 24th, 29th, and 30th, 2015 during the AM and PM peak hour for six locations that had the new right-turn designs. Note that the Transition design installed at southbound Folsom and Canyon Boulevard includes buffers between the bicycle lane and travel lane at the intersection. This treatment is referred to as "Buffered Transition" in the tables and text below.

1. Northbound right-turn at Pine Street (Skip Dashed Green)
2. Southbound right-turn at Pine Street (Skip Dashed Green)
3. Northbound right-turn at Pearl Street (Transition)
4. Southbound right-turn at Pearl Street (Skip Dashed Green)

5. Southbound right-turn at Canyon Boulevard (Buffered Transition)
6. Northbound right-turn at Canyon Boulevard (Transition)

Below are examples of the various field installations for right-turn treatments along Folsom Street:

Video data was also collected on March 17, 2016 during the AM and PM peak hour at the two Pine Street locations.

The videos were reviewed and interactions between bicyclists, pedestrians, and vehicles approaching and within the right-turn treatment were documented. The yield compliance of motorists to bicyclists within the bike lane or pedestrians within the crosswalk were recorded. In addition, the right-turning motorists' compliance with the signing and roadway markings was documented. **Table 15** summarizes the data collected in September 2015 for the pedestrians/bicyclists within the crosswalks per intersection and peak period at all six locations.

Table 15: Right-Turn Yield Compliance for Pedestrians/Bicyclists in Crosswalks (Sept. 2015)

Intersection	Approach	Right-Turn Treatment	Peak Period	Volume			Required Yield (NBR/SBR)	Yield Compliance	
				Total	Bicyclist	Pedestrian		Yes	No
Folsom Street at Pine Street	NB	Skip Dashed Green	AM	26	7	19	0	0	0
					27%	*73%*	*0%*	*N/A*	*N/A*
			PM	25	8	17	0	0	0
					32%	*68%*	*0%*	*N/A*	*N/A*
	SB	Skip Dashed Green	AM	10	5	5	0	0	0
					50%	*50%*	*0%*	*N/A*	*N/A*
			PM	31	13	18	5	5	0
					42%	*58%*	*16%*	*100%*	*0%*
Folsom Street at Pearl Street	NB	Transition	AM	21	7	14	2	2	0
					33%	*67%*	*10%*	*100%*	*0%*
			PM	61	16	45	9	9	0
					26%	*74%*	*15%*	*100%*	*0%*
	SB	Skip Dashed Green	AM	28	9	19	1	0	1
					32%	*68%*	*4%*	*0%*	*100%*
			PM	64	19	45	2	2	0
					30%	*70%*	*3%*	*100%*	*0%*
Folsom Street at Canyon Blvd	NB	Transition	AM	46	5	41	8	8	0
					11%	*89%*	*17%*	*100%*	*0%*
			PM	67	20	47	18	17	1
					30%	*70%*	*27%*	*94%*	*6%*
	SB	Buffered Transition	AM	57	6	51	25	25	0
					11%	*89%*	*44%*	*100%*	*0%*
			PM	131	69	62	25	24	1
					53%	*47%*	*19%*	*96%*	*4%*

Table 16 summarizes the data collected in March 2016 for the pedestrians/bicyclists within the crosswalks per intersection and peak period at Pine Street.

Table 16: Right-Turn Yield Compliance for Pedestrians/Bicyclists in Crosswalks (March 2016)

Intersection	Approach	Right-Turn Treatment	Peak Period	Volume			Required Yield (NBR/SBR)	Yield Compliance	
				Total	Bicyclist	Pedestrian		Yes	No
Folsom Street at Pine Street	NB	Skip Dashed Green	AM	10	2	8	0	0	0
					20%	*80%*	*0%*	*N/A*	*N/A*
			PM	17	3	14	1	1	0
					18%	*82%*	*6%*	*100%*	*0%*
	SB	Skip Dashed Green	AM	7	0	7	2	2	0
					0%	*100%*	*29%*	*100%*	*0%*
			PM	24	2	22	3	3	0
					8%	*92%*	*13%*	*100%*	*0%*

Table 17 summarizes the data collected September 2015 for the bicyclists within the protected bike lane per intersection and peak period.

Table 17: Right-Turn Yield Compliance for Bicyclists in Protected Bike Lane (September 2015)

Intersection	Approach	Right-Turn Treatment	Peak Period	Bicyclist Volume	Direction		Traveled in...			Required Yield (SBR)	Yield Compliance	
					Through	Right	Bike Lane	Buffer	Travel Lane		Yes	No
Folsom Street at Pine Street	NB	Skip Dashed Green	AM	19	18	1	19	0	0	0	0	0
					95%	*5%*	*100%*	*0%*	*0%*	*0%*	*0%*	*0%*
			PM	82	78	4	82	0	0	4	2	2
					95%	*5%*	*100%*	*0%*	*0%*	*5%*	*50%*	*50%*
	SB	Skip Dashed Green	AM	106	80	26	105	1	0	3	2	1
					75%	*25%*	*99%*	*1%*	*0%*	*3%*	*67%*	*33%*
			PM	53	44	9	53	0	0	4	3	1
					83%	*17%*	*100%*	*0%*	*0%*	*8%*	*75%*	*25%*
Folsom Street at Pearl Street	NB	Transition	AM	15	14	1	14	0	1	2	1	1
					93%	*7%*	*93%*	*0%*	*7%*	*13%*	*50%*	*50%*
			PM	118	118	0	118	0	0	8	7	1
					100%	*0%*	*100%*	*0%*	*0%*	*7%*	*88%*	*13%*
	SB	Skip Dashed Green	AM	100	100	0	91	9	0	6	6	0
					100%	*0%*	*91%*	*9%*	*0%*	*6%*	*100%*	*0%*
			PM	35	30	5	33	2	0	1	1	0
					86%	*14%*	*94%*	*6%*	*0%*	*3%*	*100%*	*0%*
Folsom Street at Canyon Blvd	NB	Transition	AM	16	15	1	15	1	0	1	1	0
					94%	*6%*	*94%*	*6%*	*0%*	*6%*	*100%*	*0%*
			PM	90	84	6	83	6	0	5	5	0
					93%	*7%*	*92%*	*7%*	*0%*	*6%*	*100%*	*0%*
	SB	Buffered Transition	AM	96	95	1	94	2	0	25	25	0
					99%	*1%*	*98%*	*2%*	*0%*	*26%*	*100%*	*0%*
			PM	33	30	3	31	2	0	7	5	2
					91%	*9%*	*94%*	*6%*	*0%*	*21%*	*71%*	*29%*

Table 18 summarizes the data collected March 2016 for the bicyclists within the protected bike lane per intersection and peak period.

Table 18: Right-Turn Yield Compliance for Bicyclists in Protected Bike Lane (March 2016)

Intersection	Approach	Right-Turn Treatment	Peak Period	Bicyclist Volume	Traveled in...			Required Yield (NBR/SBR)	Yield Compliance	
					Bike Lane	Buffer	Travel Lane		Yes	No
Folsom Street at Pine Street	NB	Skip Dashed Green	AM	6	6	0	0	0	0	0
					100%	*0%*	*0%*	*0%*	*0%*	*0%*
			PM	32	32	0	0	0	0	0
					100%	*0%*	*0%*	*0%*	*0%*	*0%*
	SB	Skip Dashed Green	AM	30	28	0	0	5	3	2
					93%	*0%*	*0%*	*17%*	*60%*	*40%*
			PM	15	2	0	0	1	1	0
					13%	*0%*	*0%*	*7%*	*100%*	*0%*

Table 19 summarizes the September 2015 data for the compliance of the pavement markings by right-turning motorists.

Table 19: Right-Turning Vehicle Compliance with Pavement Markings (September 2015)

Intersection	Approach	Right-Turn Treatment	Peak Period	Right-Turn Volume	Turned from…			Entered Right-Turn Lane…		
					Through Lane	Right-Turn Lane	Both	Before Dash	Within Dash	After Dash
Folsom Street at Pine Street	NB	Skip Dashed Green	AM	8	5 *63%*	3 *37%*	0 *0%*	0 *0%*	3 *100%*	0 *0%*
			PM	13	11 *85%*	2 *15%*	0 *0%*	2 *100%*	0 *0%*	0 *0%*
	SB	Skip Dashed Green	AM	63	49 *78%*	6 *10%*	8 *13%*	2 *33%*	4 *67%*	0 *0%*
			PM	74	52 *70%*	16 *22%*	6 *8%*	4 *25%*	12 *75%*	0 *0%*
Folsom Street at Pearl Street	NB	Transition	AM	55	1 *2%*	48 *87%*	6 *11%*	36 *75%*	11 *23%*	1 *2%*
			PM	108	2 *2%*	106 *98%*	0 *0%*	69 *65%*	30 *28%*	7 *7%*
	SB	Skip Dashed Green	AM	42	25 *60%*	8 *19%*	9 *21%*	2 *25%*	6 *75%*	0 *0%*
			PM	31	25 *81%*	5 *16%*	1 *3%*	1 *20%*	4 *80%*	0 *0%*
Folsom Street at Canyon Blvd	NB	Transition	AM	32	0 *0%*	29 *91%*	3 *9%*	22 *76%*	5 *17%*	2 *7%*
			PM	48	0 *0%*	48 *100%*	0 *0%*	24 *50%*	15 *31%*	9 *19%*
	SB	Buffered Transition	AM	225	0 *0%*	221 *98%*	4 *2%*	110 *50%*	103 *46%*	8 *4%*
			PM	145	2 *1%*	142 *98%*	1 *1%*	65 *46%*	73 *51%*	4 *3%*

Table 20 summarizes the March 2016 data for the compliance of the pavement markings by right-turning motorists.

Table 20: Right-Turning Vehicle Compliance with Pavement Markings (March 2016)

Intersection	Approach	Right-Turn Treatment	Peak Period	Right-Turn Volume	Turned from…			Entered Right-Turn Lane…		
					Through Lane	Right-Turn Lane	Both	Before Dash	Within Dash	After Dash
Folsom Street at Pine Street	NB	Skip Dashed Green	AM	3	0 *0%*	3 *100%*	0 *0%*	3 *100%*	0 *0%*	0 *0%*
			PM	6	2 *33%*	2 *33%*	2 *33%*	2 *100%*	0 *0%*	0 *0%*
	SB	Skip Dashed Green	AM	61	26 *43%*	24 *39%*	11 *18%*	2 *8%*	22 *92%*	0 *0%*
			PM	42	25 *60%*	13 *31%*	4 *10%*	6 *46%*	7 *54%*	0 *0%*

Based on the secondary performance measure evaluations of the Skip Dashed Green treatment at Pine St. in September 2015 and March 2016, almost 75% vehicles observed turning right across bicycle lanes at these locations are not complying with the City ordinance requiring vehicles to move into the bicycle space toward the curb before turning right. As such, this treatment, independent of the Folsom protected bicycle lane project, does not adequately address the mitigation of potential "right hook" collisions. In the Transition treatments, motor vehicles transition from the through to a right turn lane and bicyclists transition to a bike lane between the through and right turn vehicle lanes. The potential for "right hook" collisions is mitigated. In the Transition treatment, 85% of motor vehicles were observed yielding to bicyclists in the protected bike lane.

Additional observations are as follows:

- Pedestrians/Bicyclists within Crosswalks
    - 70% of those in the crosswalk were pedestrians and 30% were bicyclists
    - 87% of the pedestrians crossed during the Walk phase, 10% during the Flashing Don't Walk phase, and 3% during the Don't Walk phase
- Right-Turn Vehicles
    - Skip Dashed Green Treatments:
        - 64% turned from the through lane, 24% turned from the right-turn green dashed pocket, and 12% straddled the through and right-turn lanes.
        - Of those that utilized the right-turn pocket, 27% entered before the green dash began and 73% entered within the green dash.
    - Transition Treatments:
        - 1% turned from the through lane, 96% turned from the right-turn green dashed area, and 3% turned from the bike lane.
        - Of those that utilized the right-turn pocket, 60% entered before the green dash began, 33% entered within the green dash, and 7% entered after the green dash.
- Motorist Yield Compliance
    - Crosswalk
        - All Right-Turn Treatments: 88% yielded to pedestrians/bicyclists within a crosswalk that required yielding
        - Skip Dashed Green Treatments: 96% yielded to pedestrians/bicyclists within a crosswalk that required yielding

- Transition Treatments: 98% yielded to pedestrians/bicyclists within a crosswalk that required yielding

- Protected Bike Lane
  - All Right-Turn Treatments: 75% yielded to bicyclists in the protected bike lane that required yielding
  - Skip Dashed Green Treatments: 69% yielded to bicyclists in the protected bike lane that required yielding
  - Transition Treatments: 85% yielded to bicyclists in the protected bike lane that required yielding

13.0 Mid-Block Pedestrian Crossings

Observations were conducted during the AM, noon and PM peak hours on September 22, 2015 and March 15, 2016 at the Walnut Street and Spruce Street mid-block pedestrian crossings at Folsom Street. These observations documented pedestrian and bicycle crossing volumes and driver compliance with the state law yielding requirements when a vehicle approached with a pedestrian or bicycle present. The results are summarized in the following tables.

Table 21: Mid-Block Crossing on Folsom Street at Spruce Street –September 2015

	Tuesday, September 22, 2015							
Study Period	Driver Yields	Driver Fails to Yield	% Compliance	Total Pedestrians Observed	# Peds that Required Yield	% Peds that Required Yield	# Peds that Crossed while Flashing	% Peds that Crossed While Flashing
7:30AM - 8:30AM	21	10	68%	29	22	76%	24	83%
12:00PM - 1:00PM	40	16	71%	45	38	84%	38	84%
4:30PM - 5:30PM	51	24	68%	58	53	91%	50	86%
Overall (All Periods)	**112**	**50**	**69%**	**132**	**113**	**86%**	**112**	**86%**

- AM = 7 peds, 22 bikes
- Midday = 14 peds, 31 bikes
- PM = 12 peds, 46 bikes

Table 22: Mid-Block Crossing on Folsom Street at Spruce Street – March 2016

Study Period	Tuesday, March 15, 2016							
	Driver Yields	Driver Fails to Yield	% Compliance	Total Pedestrians Observed	# Peds that Required Yield	% Peds that Required Yield	# Peds that Crossed while Flashing	% Peds that Crossed While Flashing
7:30AM - 8:30AM	21	3	88%	21	18	86%	19	90%
12:00PM - 1:00PM	20	6	77%	23	18	78%	18	78%
4:30PM - 5:30PM	76	14	84%	54	46	85%	48	89%
Overall (All Periods)	**117**	**23**	**84%**	**98**	**82**	**84%**	**85**	**84%**

- AM = 13 peds, 8 bikes
- Midday = 10 peds, 13 bikes
- PM = 30 peds, 24 bikes

Table 23: Mid-Block Crossing on Folsom Street at Walnut Street – September 2015

Study Period	Tuesday, September 22, 2015							
	Driver Yields	Driver Fails to Yield	% Compliance	Total Pedestrians Observed	# Peds that Required Yield	% Peds that Required Yield	# Peds that Crossed while Flashing	% Peds that Crossed While Flashing
7:30AM - 8:30AM	35	12	74%	42	37	88%	40	95%
12:00PM - 1:00PM	61	6	91%	64	57	89%	60	94%
4:30PM - 5:30PM	62	6	91%	62	60	97%	54	87%
Overall (All Periods)	**158**	**24**	**87%**	**168**	**154**	**92%**	**154**	**92%**
July 2009 Data	***139***	***53***	***72%***	***152***	---	---	---	---

- AM = 16 peds, 26 bikes
- Midday = 24 peds, 40 bikes
- PM = 27 peds, 35 bikes

Table 24: Mid-Block Crossing on Folsom Street at Walnut Street – March 2016

Study Period	Tuesday, September 22, 2015							
	Driver Yields	Driver Fails to Yield	% Compliance	Total Pedestrians Observed	# Peds that Required Yield	% Peds that Required Yield	# Peds that Crossed while Flashing	% Peds that Crossed While Flashing
7:30AM - 8:30AM	34	6	85%	34	25	74%	33	97%
12:00PM - 1:00PM	62	14	82%	51	42	82%	46	90%
4:30PM - 5:30PM	107	16	87%	80	71	89%	78	98%
Overall (All Periods)	**203**	**36**	**85%**	**165**	**138**	**84%**	**157**	**84%**
July 2009 Data	***139***	***53***	***72%***	***152***	---	---	---	---

- AM = 17 peds, 17 bikes
- Midday = 36 peds, 15 bikes
- PM = 48 peds, 32 bikes

At the Spruce Street midblock crossing, crosswalk compliance was higher (84%) during the March 2016 study than during the September 2015 study. Bikes and pedestrian volumes were lower in March (98) vs. September (132).

July 2009 volume and compliance data at the Walnut Street mid-block crossing was also reviewed. At that time, 28, 46, and 78 total pedestrians/bikes were observed crossing in the AM, noon, and PM peak periods, with 72% overall driver compliance. The 2015 data shows an increase in both crossing volume (158 vs. 152 total) and in driver compliance (87% vs. 72%). The March 2016 data indicates that compliance at Walnut Street is roughly the same (85%) as in September 2015, with the same total crossing volumes (152 bikes and pedestrians).

Based on the compliance and crossing volume data to date, there are no identifiable impacts of the project on the performance of the midblock crossings at these locations.

14.0 Side-Street Delays

Video observations were collected on September 22nd and 23rd, 2015 and March 9th, 2016 during the AM and PM peak hours to document the delay for vehicles turning from three side streets onto Folsom Street. The locations included were:

1. Eastbound Spruce Street
2. Eastbound Walnut Street
3. Westbound REMAX Alley (just north of Canyon)

The delay was recorded for each side street vehicle to determine the average and maximum delay on each side street. On average, the side streets operate at LOS C or better in both peak periods. The maximum delays ranged from 10 seconds (LOS A) to 120 seconds (LOS F). **Table 24** summarizes the side street average and maximum delays per intersection and peak period observed in September 2015.

Table 25: Average and Maximum Side Street Delay (September 2015)

Intersection	Peak Period	Volume	Average		Maximum	
			Delay (sec)	LOS	Delay (sec)	LOS
Folsom Street at Walnut Street	AM	53	10	A	54	F
	PM	187	24	C	120	F
Folsom Street at Remax Alley	AM	10	4	A	10	A
	PM	21	19	C	85	F
Folsom Street at Spruce Street	AM	63	12	B	40	E
	PM	123	12	B	60	F

Table 25 summarizes the side street average and maximum delays per intersection and peak period observed in March 2016.

Table 25: Average and Maximum Side Street Delay (March 2016)

Intersection	Peak Period	Volume	Average		Maximum	
			Delay (sec)	LOS	Delay (sec)	LOS
Folsom Street at Walnut Street	AM	67	9	A	39	E
	PM	185	12	B	55	F
Folsom Street at Remax Alley	AM	2	2	A	2	A
	PM	24	11	B	47	E
Folsom Street at Spruce Street	AM	67	10	B	46	E
	PM	161	10	B	83	F

Based on the video observations and LOS calculations, average side street delays at these locations were at LOS C or better in September 2015, indicating good operation during most of the peak hours. These locations experienced LOS F at the highest periods of traffic, but within typical ranges for unsignalized approaches to arterial roadways (two minutes or less). The average side street delays at the locations on March 2016 were at LOS B or better. For context, the typical traffic signal in Boulder operates on a two-minute cycle length in the PM peak hour.

15.0 Left-Turn Queue Observations

Video observations were collected on September 23, 2015 during the PM peak hour for three locations:

1. Southbound Folsom Street at Pearl Street
2. Northbound Folsom Street at Pearl Street
3. Southbound Folsom at Canyon Boulevard

The data was reviewed to determine the average and maximum left-turn queue length as well as the number of times the queue blocks the through lane. **Table 26** summarizes the left-turn queue observations in September 2015 and **Table 27** summarizes the left-turn queue observations in March 2016. **Table 28** provides a comparison to pre-project data, collected in April 2015.

Table 26: Average and Maximum Left-Turn Queue (September 2015)

Intersection	Direction	Left-Turn Lane					Through Lane
		Average Queue (veh)	Maximum Queue (veh)	Blocked Thru Lane (% of cycle)	Cleared in Prot. Phase (% of veh)	Cleared in Cycle (% of veh)	Blocked Left-Turn Lane (% of cycle)
Folsom Street at Pearl Street	NB	1.60	5	0%	96%	94%	88%
Folsom Street at Pearl Street	SB	5.50	10	27%	70%	80%	21%
Folsom Street at Canyon Blvd	SB	2.70	8	3%	47%	84%	72%

The data in **Table 26** shows that the southbound left-turn storage and/or protected left-turn phase green time on Folsom Street at Pearl Street was insufficient to service all demand during the full project implementation. This resulted in the southbound through lane being blocked for some period during 27% of the signal cycles during the PM peak hour. The data also shows that 20% of these southbound left-turning vehicles would not be serviced during the first cycle. This would be expected to contribute to observed increases in travel time southbound on Folsom Street at Pearl Street.

Table 27: Average and Maximum Left-Turn Queue (March 2016)

Intersection	Direction	Left-Turn Lane					Through Lane
		Average Queue (veh)	Maximum Queue (veh)	Blocked Thru Lane (% of cycle)	Cleared in Prot. Phase (% of veh)	Cleared in Cycle (% of veh)	Blocked Left-Turn Lane (% of cycle)
Folsom Street at Pearl Street	NB	2.50	7	0%	85%	94%	39%
Folsom Street at Pearl Street	SB	5.10	10	31%	52%	77%	0%
Folsom Street at Canyon Blvd	SB	3.30	7	3%	57%	82%	9%

The field observations in March 2016 summarized in **Table 27** show that left-turn queues have returned to the pre-project conditions, as shown in **Table 28**.

Table 28: Left-Turn Queue (Before Data, April 2015)

Intersection	Direction	Left-Turn Lane				
		Average Queue (veh)	Maximum Queue (veh)	Blocked Thru Lane (% of cycle)	Cleared in Prot. Phase (% of veh)	Cleared in Cycle (% of veh)
Folsom Street at Pearl Street	NB	2.29	8	3%	94%	100%
Folsom Street at Pearl Street	SB	4.57	9	17%	87%	50%
Folsom Street at Canyon Blvd	SB	3.73	9	17%	63%	83%

16.0 Saturation Flow Rate Calculations

Field observations were performed on September 22nd and 29th, 2015 and March 9th and 28th, 2016 at three locations during the PM peak period to measure the saturation flow rate with the installation of the protected bike lane on Folsom Street:

1. Southbound Folsom Street at Pearl Street
2. Northbound Folsom Street at Pearl Street
3. Southbound Folsom at Canyon Boulevard

The methodology set forth by the *Highway Capacity Manual (HCM)* to calculate the saturation flow rate was utilized for the through lane at each location. The methodology is as follows:

1. Note these items before the green signal:
    a. The last vehicle in the stopped queue when the signal turns green
    b. Heavy vehicles
    c. Vehicles turning left or right
2. Record:
    a. Start time at beginning of green.
    b. When front axle crossing the stop bar for the 4th, 10th, and last vehicle in the stopped queue (the last vehicle may be a vehicle that joined the queue during green).
        i. If queued vehicles do not get through the intersection, record the last vehicle # and time.
    c. For a minimum of 15 signal cycles (each with more than 8 vehicles in the initial queue).

The average saturation flow rate along Folsom Street in September 2015 was measured at 1,582 vehicles per hour of green (vphg). **Table 29** summarizes the left-turn queue observations.

Table 29: Average Saturation Flow Rate (September 2015)

Intersection	Direction	Average Saturation Flow Rate
Canyon	SB	1647
Pearl	NB	1548
	SB	1552
Overall Average		**1582**

The observed average 1,582 vphg saturation flow-rate in September 2015 is lower than the standard HCM 1,900 vphg and what has been previously calculated for previous projects in Boulder (as high as 2,100 vphg on average). This would indicate that driver's behavior is more cautious in this corridor with longer headways and distances between vehicles than typical conditions. This might be indicative of the unfamiliarity of many drivers with the project (striping, signage, and delineators), but may also be related to congestion that appeared to be related to motorists yielding to pedestrians and bikes crossing Folsom at Spruce and Walnut Streets. For context, the difference between 1,582 vphg and 1,900 vphg saturation flows results in roughly one letter grade worse in Level of Service (LOS C to LOS D at Pearl Street & Folsom Street in the PM peak hour, for example).

Table 30: Average Saturation Flow Rate (March 2016)

Intersection	Direction	Average Saturation Flow Rate
Canyon	SB	N/A
Pearl	NB	1,719
	SB	N/A

In March 2016, only northbound Folsom at Pearl had more than 15 signal cycles with more than eight vehicles in the initial queue during the PM peak period. The observed average saturation flow rate was 1,719 vphg. The March 2016 vs. September 2015 saturation flow rate calculations indicated that the impact of the protected bike lanes and modified geometry prior to conversion of Folsom Street for this approach back to pre-project conditions resulted in a reduction of approximately 10% in saturation flow rate and lane capacity.

Southbound Folsom at Canyon was observed to have 13 cycles with greater than eight vehicles in the initial queue, and southbound Folsom at Pearl was observed to have 3 cycles with greater than eight vehicles in the initial queue. These observations were not sufficient to calculate saturation flow, and as such indicate a reduction in congestion at these intersections when comparing March 2016 to September 2015.

17.0 "Cycle-Failure" Observations

Field observations were performed on September 22nd and 29th, 2015 and March 9th and 28th, 2016 at two intersections to determine if there is cycle failure due to congestion on Folsom Street:

1. Folsom Street at Pearl Street
2. Folsom Street at Canyon Boulevard

During the PM peak hour in September 2015, the number of cycles that experienced queue failure during the green signal for Folsom Street were documented. There were approximately 30 cycles per peak hour. The following information was recorded:

- When the northbound and/or southbound through is stopped and the queue fails to make it through on the next green
- When the northbound and/or southbound vehicles have the green signal, but there is no receiving room for them to proceed beyond the intersection
- When the eastbound and/or westbound left-turning vehicles have a green signal, but there is no receiving room for them to proceed through the intersection onto Folsom Street

- When the eastbound and/or westbound right-turning vehicles has a green signal, but there is no receiving room for them to proceed through the intersection onto Folsom Street

Field observations were performed again in March 2016 during the PM peak hour. No cycle failures were observed at any the intersections.

Table 31 summarizes the observations of the cycle failure in September 2015.

Table 31: Cycle Failure Summary (September 2015)

Intersection	Variable	Northbound		Southbound		Eastbound		Westbound	
		Green / No Receiving Room	Queue Did Not Clear	Green / No Receiving Room	Queue Did Not Clear	Left-Turn Could not Turn	Right-Turn Could not Turn	Left-Turn Could not Turn	Right-Turn Could not Turn
Folsom Street at Canyon Boulevard	Number of Cycles	0	0	0	12	2	0	0	0
	Percent of Cycles	0%	0%	0%	40%	7%	0%	0%	0%
Folsom Street at Pearl Street	Number of Cycles	0	17	0	4	0	1	0	0
	Percent of Cycles	0%	57%	0%	13%	0%	3%	0%	0%

Appendix

Peak Hour Turning Movement Count (TMC) Summaries

Level of Service Definitions

Signalized Intersection Level of Service Summary

Peak Hour Turning Movement Count (TMC) Summaries

Valmont & Folsom

Movement	"Before" 7/9/2013 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	18	53	45	33	44	46	26	30	56
EB Through	290	291	398	421	304	407	446	273	416
EB Right	36	54	54	52	49	44	60	31	64
WB Left	132	181	182	148	136	180	171	149	173
WB Through	289	320	350	336	284	402	335	265	397
WB Right	42	59	76	72	84	90	50	52	89
NB Left	36	77	119	24	72	90	34	69	98
NB Through	158	378	591	197	284	536	212	324	573
NB Right	111	158	229	106	114	170	115	129	168
SB Left	45	42	42	67	60	45	61	51	57
SB Through	437	282	328	508	278	289	537	267	319
SB Right	36	43	45	47	41	34	36	38	47
EB TOTAL	**344**	**398**	**497**	**506**	**397**	**497**	**532**	**334**	**536**
WB TOTAL	**463**	**560**	**608**	**556**	**504**	**672**	**556**	**466**	**659**
NB TOTAL	**305**	**613**	**939**	**327**	**470**	**796**	**361**	**522**	**839**
SB TOTAL	**518**	**367**	**415**	**622**	**379**	**368**	**634**	**356**	**423**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+162**	**-1**	**+0**	**+188**	**-64**	**+39**
Change in WB Approach Volume (vph)				**+93**	**-56**	**+64**	**+93**	**-94**	**+51**
Change in NB Approach Volume (vph)				**+22**	**-143**	**-143**	**+56**	**-91**	**-100**
Change in SB Approach Volume (vph)				**+104**	**+12**	**-47**	**+116**	**-11**	**+8**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+47%**	**-0%**	**+0%**	**+55%**	**-16%**	**+8%**
% Change in WB Approach Volume				**+20%**	**-10%**	**+11%**	**+20%**	**-17%**	**+8%**
% Change in NB Approach Volume				**+7%**	**-23%**	**-15%**	**+18%**	**-15%**	**-11%**
% Change in SB Approach Volume				**+20%**	**+3%**	**-11%**	**+22%**	**-3%**	**+2%**

20th & Pine

Movement	"Before" 8/26/2014 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	18	13	36	21	14	24	11	12	34
EB Through	181	213	283	194	192	267	193	179	276
EB Right	25	29	29	23	43	23	25	33	37
WB Left	6	8	8	7	8	16	7	9	12
WB Through	173	184	218	167	169	222	176	158	215
WB Right	23	27	40	13	40	42	17	29	53
NB Left	2	7	8	7	7	15	5	4	10
NB Through	82	84	160	81	99	151	68	78	148
NB Right	13	8	14	22	6	12	28	3	13
SB Left	41	31	31	33	27	24	48	27	29
SB Through	199	138	152	195	132	176	183	129	163
SB Right	27	23	25	33	20	20	18	10	19
EB TOTAL	**224**	**255**	**348**	**238**	**249**	**314**	**229**	**224**	**347**
WB TOTAL	**202**	**219**	**266**	**187**	**217**	**280**	**200**	**196**	**280**
NB TOTAL	**97**	**99**	**182**	**110**	**112**	**178**	**101**	**85**	**171**
SB TOTAL	**267**	**192**	**208**	**261**	**179**	**220**	**249**	**166**	**211**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+14**	**-6**	**-34**	**+5**	**-31**	**-1**
Change in WB Approach Volume (vph)				**-15**	**-2**	**+14**	**-2**	**-23**	**+14**
Change in NB Approach Volume (vph)				**+13**	**+13**	**-4**	**+4**	**-14**	**-11**
Change in SB Approach Volume (vph)				**-6**	**-13**	**+12**	**-18**	**-26**	**+3**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+6%**	**-2%**	**-10%**	**+2%**	**-12%**	**-0%**
% Change in WB Approach Volume				**-7%**	**-1%**	**+5%**	**-1%**	**-11%**	**+5%**
% Change in NB Approach Volume				**+13%**	**+13%**	**-2%**	**+4%**	**-14%**	**-6%**
% Change in SB Approach Volume				**-2%**	**-7%**	**+6%**	**-7%**	**-14%**	**+1%**

28th & Valmont

Movement	"Before" 10/18/2012 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	64	85	156	60	76	139	60	94	114
EB Through	404	340	385	470	329	467	493	336	464
EB Right	91	98	102	100	109	98	114	87	101
WB Left	110	191	187	115	173	159	116	187	191
WB Through	373	331	479	380	365	507	414	366	508
WB Right	106	262	280	139	246	289	111	277	314
NB Left	96	122	118	89	123	150	102	112	126
NB Through	608	981	1262	654	1030	1134	711	992	1229
NB Right	112	184	101	89	194	156	121	219	168
SB Left	193	194	166	207	185	174	249	191	200
SB Through	1076	883	916	1032	831	803	1057	846	932
SB Right	53	69	95	74	69	99	62	59	63
EB TOTAL	**559**	**523**	**643**	**630**	**514**	**704**	**667**	**517**	**679**
WB TOTAL	**589**	**784**	**946**	**634**	**784**	**955**	**641**	**830**	**1013**
NB TOTAL	**816**	**1287**	**1481**	**832**	**1347**	**1440**	**934**	**1323**	**1523**
SB TOTAL	**1322**	**1146**	**1177**	**1313**	**1085**	**1076**	**1368**	**1096**	**1195**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+71**	**-9**	**+61**	**+108**	**-6**	**+36**
Change in WB Approach Volume (vph)				**+45**	**+0**	**+9**	**+52**	**+46**	**+67**
Change in NB Approach Volume (vph)				**+16**	**+60**	**-41**	**+118**	**+36**	**+42**
Change in SB Approach Volume (vph)				**-9**	**-61**	**-101**	**+46**	**-50**	**+18**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+13%**	**-2%**	**+9%**	**+19%**	**-1%**	**+6%**
% Change in WB Approach Volume				**+8%**	**+0%**	**+1%**	**+9%**	**+6%**	**+7%**
% Change in NB Approach Volume				**+2%**	**+5%**	**-3%**	**+14%**	**+3%**	**+3%**
% Change in SB Approach Volume				**-1%**	**-5%**	**-9%**	**+3%**	**-4%**	**+2%**

Pine & Folsom

Movement	"Before" 6/10/2014 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM	
EB Left	37	128	154	47	49	107	63	62	110	32
EB Through	46	86	86	74	91	107	62	76	99	-35
EB Right	100	50	119	115	97	145	128	106	153	30
WB Left	8	13	15	7	8	14	7	10	12	
WB Through	70	62	95	72	77	104	87	75	82	
WB Right	21	25	40	20	35	37	30	30	46	
NB Left	73	118	123	78	99	129	82	112	142	
NB Through	255	504	685	281	378	636	284	446	682	
NB Right	4	17	9	2	12	14	10	15	14	
SB Left	12	24	15	34	17	28	16	16	28	
SB Through	641	488	573	639	416	470	738	406	505	
SB Right	61	52	55	77	54	69	61	41	67	
EB TOTAL	**183**	**264**	**359**	**236**	**237**	**359**	**253**	**244**	**362**	
WB TOTAL	**99**	**100**	**150**	**99**	**120**	**155**	**124**	**115**	**140**	
NB TOTAL	**332**	**639**	**817**	**361**	**489**	**779**	**376**	**573**	**838**	
SB TOTAL	**714**	**564**	**643**	**750**	**487**	**567**	**815**	**463**	**600**	
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**	
Change in EB Approach Volume (vph)				**+53**	**-27**	**+0**	**+70**	**-20**	**+3**	
Change in WB Approach Volume (vph)				**+0**	**+20**	**+5**	**+25**	**+15**	**-10**	
Change in NB Approach Volume (vph)				**+29**	**-150**	**-38**	**+44**	**-66**	**+21**	
Change in SB Approach Volume (vph)				**+36**	**-77**	**-76**	**+101**	**-101**	**-43**	
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**	
% Change in EB Approach Volume				**+29%**	**-10%**	**+0%**	**+38%**	**-8%**	**+1%**	
% Change in WB Approach Volume				**+0%**	**+20%**	**+3%**	**+25%**	**+15%**	**-7%**	
% Change in NB Approach Volume				**+9%**	**-23%**	**-5%**	**+13%**	**-10%**	**+3%**	
% Change in SB Approach Volume				**+5%**	**-14%**	**-12%**	**+14%**	**-18%**	**-7%**	

20th & Pearl

Movement	"Before" 6/4/2014 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	11	19	28	17	18	25	9	18	25
EB Through	160	291	485	187	315	468	195	278	514
EB Right	5	10	3	4	14	6	5	9	3
WB Left	16	23	25	13	26	25	15	27	23
WB Through	341	454	417	310	372	339	335	368	383
WB Right	31	48	73	39	62	72	44	53	66
NB Left	5	2	3	5	5	2	1	2	2
NB Through	19	21	33	33	27	26	26	16	32
NB Right	4	12	18	23	6	22	8	17	21
SB Left	58	108	120	107	112	133	109	102	142
SB Through	39	41	63	57	34	57	37	33	47
SB Right	22	38	31	47	33	31	46	33	37
EB TOTAL	**176**	**320**	**516**	**208**	**347**	**499**	**209**	**305**	**542**
WB TOTAL	**388**	**525**	**515**	**362**	**460**	**436**	**394**	**448**	**472**
NB TOTAL	**28**	**35**	**54**	**61**	**38**	**50**	**35**	**35**	**55**
SB TOTAL	**119**	**187**	**214**	**211**	**179**	**221**	**192**	**168**	**226**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+32**	**+27**	**-17**	**+33**	**-15**	**+26**
Change in WB Approach Volume (vph)				**-26**	**-65**	**-79**	**+6**	**-77**	**-43**
Change in NB Approach Volume (vph)				**+33**	**+3**	**-4**	**+7**	**+0**	**+1**
Change in SB Approach Volume (vph)				**+92**	**-8**	**+7**	**+73**	**-19**	**+12**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+18%**	**+8%**	**-3%**	**+19%**	**-5%**	**+5%**
% Change in WB Approach Volume				**-7%**	**-12%**	**-15%**	**+2%**	**-15%**	**-8%**
% Change in NB Approach Volume				**+118%**	**+9%**	**-7%**	**+25%**	**+0%**	**+2%**
% Change in SB Approach Volume				**+77%**	**-4%**	**+3%**	**+61%**	**-10%**	**+6%**

28th & Pearl

Movement	"Before" 7/17/2012 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	72	187	226	68	137	217	61	130	226
EB Through	323	568	628	343	468	659	388	441	660
EB Right	107	163	184	117	188	218	113	177	215
WB Left	127	319	272	138	254	246	150	247	269
WB Through	452	590	557	453	485	518	519	509	596
WB Right	55	156	169	56	160	161	68	138	156
NB Left	178	238	216	201	261	242	196	243	207
NB Through	728	1089	1188	764	1043	1153	819	1015	1103
NB Right	151	366	301	179	337	342	203	348	272
SB Left	112	261	217	156	253	240	144	251	226
SB Through	856	1028	1004	985	860	646	955	837	944
SB Right	92	116	87	111	131	111	97	95	86
EB TOTAL	**502**	**918**	**1038**	**528**	**793**	**1094**	**562**	**748**	**1101**
WB TOTAL	**634**	**1065**	**998**	**647**	**899**	**925**	**737**	**894**	**1021**
NB TOTAL	**1057**	**1693**	**1705**	**1144**	**1641**	**1737**	**1218**	**1606**	**1582**
SB TOTAL	**1060**	**1405**	**1308**	**1252**	**1244**	**997**	**1196**	**1183**	**1256**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+26**	**-125**	**+56**	**+60**	**-170**	**+63**
Change in WB Approach Volume (vph)				**+13**	**-166**	**-73**	**+103**	**-171**	**+23**
Change in NB Approach Volume (vph)				**+87**	**-52**	**+32**	**+161**	**-87**	**-123**
Change in SB Approach Volume (vph)				**+192**	**-161**	**-311**	**+136**	**-222**	**-52**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+5%**	**-14%**	**+5%**	**+12%**	**-19%**	**+6%**
% Change in WB Approach Volume				**+2%**	**-16%**	**-7%**	**+16%**	**-16%**	**+2%**
% Change in NB Approach Volume				**+8%**	**-3%**	**+2%**	**+15%**	**-5%**	**-7%**
% Change in SB Approach Volume				**+18%**	**-11%**	**-24%**	**+13%**	**-16%**	**-4%**

AM Peak Hour: 7:45am-8:45am, Noon Peak Hour: 12pm-1pm; PM Peak hour: 4:45pm-5:45pm

Note: All "change" in approach volumes relative to "before" counts.

(1) "After" study conducted with full pilot project in place along Folsom from Canyon to Valmont, prior to reinstallation of second north-south general purpose lanes between Canyon and Spruce

(2) "After" study conducted with with partial pilot project in place after reinstallation of second north-south general purpose lanes between Canyon and Spruce

Peak Hour Turning Movement Count (TMC) Summaries

Pearl & Folsom

Movement	"Before" 4/28/2015 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	22	61	114	25	50	97	31	42	100
EB Through	278	424	593	297	416	597	307	386	628
EB Right	45	67	75	31	51	68	40	58	104
WB Left	97	114	117	99	137	132	113	130	142
WB Through	384	390	416	345	407	400	376	393	424
WB Right	166	184	239	138	162	253	158	182	265
NB Left	55	110	85	57	58	94	61	88	107
NB Through	321	433	644	300	337	494	313	411	626
NB Right	70	91	117	47	98	127	71	120	119
SB Left	205	184	208	170	167	233	196	158	242
SB Through	632	493	564	530	360	427	629	356	504
SB Right	89	59	37	56	42	38	48	49	41
EB TOTAL	**345**	**552**	**782**	**353**	**517**	**762**	**378**	**486**	**832**
WB TOTAL	**647**	**688**	**772**	**582**	**706**	**785**	**647**	**705**	**831**
NB TOTAL	**446**	**634**	**846**	**404**	**493**	**715**	**445**	**619**	**852**
SB TOTAL	**926**	**736**	**809**	**756**	**569**	**698**	**873**	**563**	**787**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+8**	**-35**	**-20**	**+33**	**-66**	**+50**
Change in WB Approach Volume (vph)				**-65**	**+18**	**+13**	**+0**	**+17**	**+59**
Change in NB Approach Volume (vph)				**-42**	**-141**	**-131**	**-1**	**-15**	**+6**
Change in SB Approach Volume (vph)				**-170**	**-167**	**-111**	**-53**	**-173**	**-22**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+2%**	**-6%**	**-3%**	**+10%**	**-12%**	**+6%**
% Change in WB Approach Volume				**-10%**	**+3%**	**+2%**	**+0%**	**+2%**	**+8%**
% Change in NB Approach Volume				**-9%**	**-22%**	**-15%**	**-0%**	**-2%**	**+1%**
% Change in SB Approach Volume				**-18%**	**-23%**	**-14%**	**-6%**	**-24%**	**-3%**

26th & Pearl

Movement	"Before" 4/5/2012 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	11	42	25	10	31	30	11	31	15
EB Through	484	712	898	466	619	896	489	603	920
EB Right	33	55	74	32	55	73	46	51	85
WB Left	90	109	102	92	107	124	112	101	89
WB Through	639	725	812	583	569	685	624	659	742
WB Right	30	47	20	39	38	32	33	45	30
NB Left	18	64	57	13	42	92	14	62	65
NB Through	4	51	38	12	28	45	17	31	40
NB Right	24	103	89	22	67	122	27	57	104
SB Left	12	65	55	32	70	69	22	52	35
SB Through	10	24	22	17	31	66	11	29	27
SB Right	18	41	36	15	32	30	20	33	41
EB TOTAL	**528**	**809**	**997**	**508**	**705**	**999**	**546**	**685**	**1020**
WB TOTAL	**759**	**881**	**934**	**714**	**714**	**841**	**769**	**805**	**861**
NB TOTAL	**46**	**218**	**184**	**47**	**137**	**259**	**58**	**150**	**209**
SB TOTAL	**40**	**130**	**113**	**64**	**133**	**165**	**53**	**114**	**103**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**-20**	**-104**	**+2**	**+18**	**-124**	**+23**
Change in WB Approach Volume (vph)				**-45**	**-167**	**-93**	**+10**	**-76**	**-73**
Change in NB Approach Volume (vph)				**+1**	**-81**	**+75**	**+12**	**-68**	**+25**
Change in SB Approach Volume (vph)				**+24**	**+3**	**+52**	**+13**	**-16**	**-10**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**-4%**	**-13%**	**+0%**	**+3%**	**-15%**	**+2%**
% Change in WB Approach Volume				**-6%**	**-19%**	**-10%**	**+1%**	**-9%**	**-8%**
% Change in NB Approach Volume				**+2%**	**-37%**	**+41%**	**+26%**	**-31%**	**+14%**
% Change in SB Approach Volume				**+60%**	**+2%**	**+46%**	**+33%**	**-12%**	**-9%**

28th & Canyon

Movement	"Before" 10/31/2012 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	139	315	339	214	325	324	225	344	315
EB Through	151	274	329	150	297	320	166	277	306
EB Right	245	383	602	253	389	455	290	343	490
WB Left	50	153	180	51	147	165	42	158	188
WB Through	98	198	210	131	213	236	129	203	202
WB Right	23	85	78	18	104	83	35	84	86
NB Left	446	335	336	425	301	326	449	318	378
NB Through	874	946	1141	971	1056	1156	1066	1083	1182
NB Right	60	109	126	91	103	123	80	102	125
SB Left	56	169	139	52	184	133	74	206	154
SB Through	821	842	1043	847	849	568	809	825	1048
SB Right	189	248	292	188	217	349	233	196	271
EB TOTAL	**535**	**972**	**1270**	**617**	**1011**	**1099**	**681**	**964**	**1111**
WB TOTAL	**171**	**436**	**468**	**200**	**464**	**484**	**206**	**445**	**476**
NB TOTAL	**1380**	**1390**	**1603**	**1487**	**1460**	**1605**	**1595**	**1503**	**1685**
SB TOTAL	**1066**	**1259**	**1474**	**1087**	**1250**	**1050**	**1116**	**1227**	**1473**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+82**	**+39**	**-171**	**+146**	**-8**	**-159**
Change in WB Approach Volume (vph)				**+29**	**+28**	**+16**	**+35**	**+9**	**+8**
Change in NB Approach Volume (vph)				**+107**	**+70**	**+2**	**+215**	**+113**	**+82**
Change in SB Approach Volume (vph)				**+21**	**-9**	**-424**	**+50**	**-32**	**-1**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+15%**	**+4%**	**-13%**	**+27%**	**-1%**	**-13%**
% Change in WB Approach Volume				**+17%**	**+6%**	**+3%**	**+20%**	**+2%**	**+2%**
% Change in NB Approach Volume				**+8%**	**+5%**	**+0%**	**+16%**	**+8%**	**+5%**
% Change in SB Approach Volume				**+2%**	**-1%**	**-29%**	**+5%**	**-3%**	**-0%**

Canyon & Folsom

Movement	"Before" 8/7/2014 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	98	156	162	126	131	167	133	135	167
EB Through	453	792	763	498	629	723	541	605	676
EB Right	104	178	225	132	157	229	155	159	178
WB Left	25	71	76	49	101	148	33	79	102
WB Through	696	638	775	625	543	650	634	536	601
WB Right	35	72	46	34	63	63	47	61	54
NB Left	418	521	478	172	222	225	147	153	201
NB Through	262	489	517	294	342	456	345	421	532
NB Right	32	94	63	30	89	70	42	100	83
SB Left	75	55	73	105	168	168	147	150	196
SB Through	266	375	516	366	348	457	413	339	595
SB Right	189	181	193	191	133	121	199	143	133
EB TOTAL	**655**	**1126**	**1150**	**756**	**917**	**1119**	**829**	**899**	**1021**
WB TOTAL	**756**	**781**	**897**	**708**	**707**	**861**	**714**	**676**	**757**
NB TOTAL	**712**	**1104**	**1058**	**496**	**653**	**751**	**534**	**674**	**816**
SB TOTAL	**530**	**611**	**782**	**662**	**649**	**746**	**759**	**632**	**924**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+101**	**-209**	**-31**	**+174**	**-227**	**-129**
Change in WB Approach Volume (vph)				**-48**	**-74**	**-36**	**-42**	**-105**	**-140**
Change in NB Approach Volume (vph)				**-216**	**-451**	**-307**	**-178**	**-430**	**-242**
Change in SB Approach Volume (vph)				**+132**	**+38**	**-36**	**+229**	**+21**	**+142**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+15%**	**-19%**	**-3%**	**+27%**	**-20%**	**-11%**
% Change in WB Approach Volume				**-6%**	**-9%**	**-4%**	**-6%**	**-13%**	**-16%**
% Change in NB Approach Volume				**-30%**	**-41%**	**-29%**	**-25%**	**-39%**	**-23%**
% Change in SB Approach Volume				**+25%**	**+6%**	**-5%**	**+43%**	**+3%**	**+18%**

26th & Canyon

Movement	"Before" 7/31/2012 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	20	74	86	31	55	66	39	56	65
EB Through	564	957	999	564	818	877	618	773	909
EB Right	14	29	42	26	32	36	28	32	30
WB Left	68	137	141	79	113	160	85	131	136
WB Through	688	678	766	654	590	708	663	545	632
WB Right	51	73	63	47	47	67	57	57	75
NB Left	17	41	39	13	36	20	20	35	15
NB Through	21	63	62	9	61	57	15	52	49
NB Right	55	155	145	48	124	83	60	109	84
SB Left	19	74	95	32	55	145	24	56	128
SB Through	27	77	69	22	61	104	23	57	40
SB Right	39	92	102	48	61	133	48	93	106
EB TOTAL	**598**	**1060**	**1127**	**621**	**905**	**979**	**685**	**861**	**1004**
WB TOTAL	**807**	**888**	**970**	**780**	**750**	**935**	**805**	**733**	**843**
NB TOTAL	**93**	**259**	**246**	**70**	**221**	**160**	**95**	**196**	**148**
SB TOTAL	**85**	**243**	**266**	**102**	**177**	**382**	**95**	**206**	**274**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**+23**	**-155**	**-148**	**+87**	**-199**	**-123**
Change in WB Approach Volume (vph)				**-27**	**-138**	**-35**	**-2**	**-155**	**-127**
Change in NB Approach Volume (vph)				**-23**	**-38**	**-86**	**+2**	**-63**	**-98**
Change in SB Approach Volume (vph)				**+17**	**-66**	**+116**	**+10**	**-37**	**+8**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**+4%**	**-15%**	**-13%**	**+15%**	**-19%**	**-11%**
% Change in WB Approach Volume				**-3%**	**-16%**	**-4%**	**-0%**	**-17%**	**-13%**
% Change in NB Approach Volume				**-25%**	**-15%**	**-35%**	**+2%**	**-24%**	**-40%**
% Change in SB Approach Volume				**+20%**	**-27%**	**+44%**	**+12%**	**-15%**	**+3%**

28th & Arapahoe

Movement	"Before" 4/30/2013 AM	Noon	PM	"After"(1) 9/15/2015 AM	Noon	PM	"After"(2) 3/8/16 AM	Noon	PM
EB Left	83	181	199	61	180	221	89	181	222
EB Through	510	658	825	515	663	819	587	682	805
EB Right	212	279	399	170	228	407	204	252	389
WB Left	176	263	429	176	288	456	151	298	467
WB Through	671	767	840	676	767	830	713	715	810
WB Right	194	397	293	252	314	284	222	362	282
NB Left	301	269	270	240	212	249	248	225	254
NB Through	1301	1030	1239	1195	971	1142	1295	1022	1215
NB Right	137	166	149	131	145	145	159	153	150
SB Left	207	401	320	210	339	205	179	365	287
SB Through	934	981	1391	872	963	1045	881	893	1446
SB Right	69	159	95	65	133	46	75	149	126
EB TOTAL	**805**	**1118**	**1423**	**746**	**1071**	**1447**	**880**	**1115**	**1416**
WB TOTAL	**1041**	**1427**	**1562**	**1104**	**1369**	**1570**	**1086**	**1375**	**1559**
NB TOTAL	**1739**	**1465**	**1658**	**1566**	**1328**	**1536**	**1702**	**1400**	**1619**
SB TOTAL	**1210**	**1541**	**1806**	**1147**	**1435**	**1296**	**1135**	**1407**	**1859**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
Change in EB Approach Volume (vph)				**-59**	**-47**	**+24**	**+75**	**-3**	**-7**
Change in WB Approach Volume (vph)				**+63**	**-58**	**+8**	**+45**	**-52**	**-3**
Change in NB Approach Volume (vph)				**-173**	**-137**	**-122**	**-37**	**-65**	**-39**
Change in SB Approach Volume (vph)				**-63**	**-106**	**-510**	**-75**	**-134**	**+53**
				AM	**Noon**	**PM**	**AM**	**Noon**	**PM**
% Change in EB Approach Volume				**-7%**	**-4%**	**+2%**	**+9%**	**-0%**	**-0%**
% Change in WB Approach Volume				**+6%**	**-4%**	**+1%**	**+4%**	**-4%**	**-0%**
% Change in NB Approach Volume				**-10%**	**-9%**	**-7%**	**-2%**	**-4%**	**-2%**
% Change in SB Approach Volume				**-5%**	**-7%**	**-28%**	**-6%**	**-9%**	**+3%**

Note: "Before" volumes likely impacted by Arapahoe Ave construction (high NB LT volumes)

AM Peak Hour: 7:45am-8:45am, Noon Peak Hour: 12pm-1pm; PM Peak hour: 4:45pm-5:45pm

Note: All "change" in approach volumes relative to "before" counts.

(1) "After" study conducted with full pilot project in place along Folsom from Canyon to Valmont, prior to reinstallation of second north-south general purpose lanes between Canyon and Spruce

(2) "After" study conducted with with partial pilot project in place after reinstallation of second north-south general purpose lanes between Canyon and Spruce

LEVEL OF SERVICE DEFINITIONS

In rating roadway and intersection operating conditions with existing or future traffic volumes, "Levels of Service" (LOS) A through F are used, with LOS A indicating very good operation and LOS F indicating poor operation. Levels of service at signalized and unsignalized intersections are closely associated with vehicle delays experienced in seconds per vehicle. More complete level of service definitions and delay data for signal and stop sign controlled intersections are contained in the following table for reference.

Level of Service Rating	Delay in seconds per vehicle *(a)*		Definition
	Signalized	Unsignalized	
A	0.0 to 10.0	0.0 to 10.0	Low vehicular traffic volumes; primarily free flow operations. Density is low and vehicles can freely maneuver within the traffic stream. Drivers are able to maintain their desired speeds with little or no delay.
B	10.1 to 20.0	10.1 to 15.0	Stable vehicular traffic volume flow with potential for some restriction of operating speeds due to traffic conditions. Vehicle maneuvering is only slightly restricted. The stopped delays are not bothersome and drivers are not subject to appreciable tension.
C	20.1 to 35.0	15.1 to 25.0	Stable traffic operations, however the ability for vehicles to maneuver is more restricted by the increase in traffic volumes. Relatively satisfactory operating speeds prevail, but adverse signal coordination or longer vehicle queues cause delays along the corridor.
D	35.1 to 55.0	25.1 to 35.0	Approaching unstable vehicular traffic flow where small increases in volume could cause substantial delays. Most drivers are restricted in ability to maneuver and selection of travel speeds due to congestion. Driver comfort and convenience are low, but tolerable.
E	55.1 to 80.0	35.1 to 50.0	Traffic operations characterized by significant approach delays and average travel speeds of one-half to one-third the free flow speed. Vehicular flow is unstable and there is potential for stoppages of brief duration. High signal density, extensive vehicle queuing, or corridor signal progression/timing are the typical causes of vehicle delays at signalized corridors.
F	> 80.0	> 50.0	Forced vehicular traffic flow and operations with high approach delays at critical intersections. Vehicle speeds are reduced substantially and stoppages may occur for short or long periods of time because of downstream congestion.

(a) Delay ranges based on 2010 Highway Capacity Manual criteria.

Signalized Intersection Level of Service Summary

Intersection and Lane Movements	"Before" Level of Service						"After"[1] Level of Service - September 2015						"After"[2] Level of Service - March 2016					
	AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour	
28th St. & Arapahoe Rd.	**29.8**	**C**	**34.2**	**C**	**41.4**	**D**	**26.7**	**C**	**32.6**	**C**	**42.0**	**D**	**26.3**	**C**	**33.1**	**C**	**39.2**	**D**
EBL	34.6	C	31.1	C	37.0	D	32.4	C	27.6	C	35.1	D	34.2	C	32.5	C	35.4	D
EBT	16.6	B	19.5	B	35.5	D	15.2	B	16.6	B	44.0	D	18.2	B	20.2	C	30.0	C
EBR																		
WBL	39.3	D	48.8	D	102.5	F	34.7	C	59.1	E	70.7	E	35.9	D	69.7	E	97.3	F
WBT	42.2	D	42.2	D	48.5	D	39.9	D	40.7	D	46.3	D	43.4	D	38.9	D	45.0	D
WBR	60.7	E	55.8	E	61.0	E	53.3	D	73.5	E	64.2	E	58.8	E	59.4	E	71.7	E
NBL	55.9	E	65.9	E	67.1	E	56.6	E	61.6	E	66.6	E	56.8	E	61.5	E	66.4	E
NBT	16.5	B	25.8	C	26.1	C	15.4	B	24.2	C	26.1	C	15.2	B	24.3	C	26.0	C
NBR																		
SBL	92.4	F	60.3	E	47.6	D	69.5	E	39.8	D	48.1	D	44.9	D	45.4	D	38.4	D
SBT	20.1	C	22.3	C	28.1	C	15.7	B	21.2	C	32.9	C	15.4	B	20.2	C	27.9	C
SBR																		
28th St. & Canyon Blvd.	**29.4**	**C**	**34.7**	**C**	**55.0**	**D**	**29.5**	**C**	**32.1**	**C**	**56.8**	**E**	**30.5**	**C**	**33.5**	**C**	**45.5**	**D**
EBL	34.2	C	55.9	E	76.6	E	35.9	D	56.0	E	84.0	F	40.6	D	60.5	E	74.7	E
EBT	19.2	B	37.0	D	64.3	E	18.6	B	37.9	D	67.0	E	18.8	B	36.4	D	60.8	E
EBR	0.2	A	0.3	A	120.1	F	0.2	A	0.4	A	116.4	F	0.3	A	0.4	A	88.8	F
WBL	49.1	D	49.1	D	57.1	E	49.1	D	47.4	D	54.9	D	48.7	D	47.7	D	60.9	E
WBT	30.9	C	35.3	D	42.8	D	33.1	C	35.6	D	43.4	D	32.5	C	35.0	C	43.1	D
WBR	30.3	C	32.4	C	38.0	D	31.1	C	32.5	C	38.0	D	31.3	C	32.3	C	38.1	D
NBL	29.9	C	32.4	C	32.1	C	30.1	C	27.6	C	28.6	C	30.3	C	30.5	C	33.1	C
NBT	10.9	B	9.7	A	7.4	A	11.8	B	8.8	A	7.1	A	11.6	B	10.1	B	6.7	A
NBR																		
SBL	36.4	D	53.0	D	105.7	F	36.5	D	47.5	D	45.5	D	37.8	D	58.7	E	45.6	D
SBT	42.0	D	40.0	D	52.9	D	44.9	D	40.1	D	37.5	D	44.5	D	40.9	D	47.4	D
SBR	97.5	F	124.8	F	95.8	F	90.6	F	115.2	F	198.8	F	99.0	F	111.9	F	112.0	F
28th St. & Pearl St.	**15.2**	**B**	**27.6**	**C**	**32.4**	**C**	**19.1**	**B**	**21.9**	**C**	**33.0**	**C**	**16.3**	**B**	**21.1**	**C**	**32.9**	**C**
EBL	23.2	C	28.2	C	28.2	C	22.3	C	23.8	C	22.2	C	20.8	C	24.2	C	22.9	C
EBT	25.5	C	35.9	D	51.6	D	24.5	C	28.8	C	58.8	E	23.5	C	28.9	C	55.2	E
EBR																		
WBL	12.2	B	28.9	C	30.3	C	11.9	B	23.4	C	29.7	C	12.5	B	23.1	C	29.8	C
WBT	12.6	B	15.0	B	40.4	D	13.0	B	14.4	B	37.7	D	14.0	B	14.6	B	39.4	D
WBR	27.0	C	3.7	A	98.2	F	27.0	C	3.9	A	93.6	F	27.1	C	5.5	A	91.9	F
NBL	15.9	B	22.0	C	23.7	C	20.1	C	18.1	B	13.7	B	19.1	B	18.1	B	20.7	C
NBT	11.9	B	24.9	C	21.8	C	14.9	B	20.4	C	22.9	C	15.0	B	21.1	C	22.9	C
NBR	5.3	A	11.3	B	9.2	A	8.1	A	12.5	B	10.0	A	7.6	A	12.6	B	8.8	A
SBL	9.6	A	23.1	C	22.9	C	10.5	B	20.8	C	24.5	C	10.6	B	21.1	C	21.8	C
SBT	14.0	B	36.6	D	27.6	C	16.7	B	25.2	C	23.6	C	15.9	B	24.7	C	26.2	C
SBR	19.9	B	82.6	F	18.4	B	103.8	F	53.9	D	24.1	C	19.8	B	24.1	C	30.0	C

Signalized Intersection Level of Service Summary

Intersection and Lane Movements	"Before" Level of Service						"After"[1] Level of Service						"After"[2] Level of Service - March 2016					
	AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour	
28th St. & Valmont Rd.	**22.2**	**C**	**32.7**	**C**	**44.0**	**D**	**20.0**	**B**	**27.1**	**C**	**35.3**	**D**	**23.7**	**C**	**25.9**	**C**	**45.0**	**D**
EBL	17.3	B	17.4	B	27.9	C	17.5	B	16.2	B	24.7	C	13.6	B	18.5	B	23.4	C
EBT	19.1	B	17.2	B	21.8	C	23.9	C	15.6	B	25.3	C	19.4	B	17.9	B	24.7	C
EBR																		
WBL	20.1	C	135.4	F	52.4	D	22.6	C	37.9	D	44.0	D	27.9	C	50.7	D	55.5	E
WBT	16.2	B	20.4	C	35.5	D	16.5	B	20.7	C	36.6	D	18.5	B	21.7	C	36.1	D
WBR	4.0	A	10.8	B	40.2	D	4.0	A	10.4	B	40.6	D	3.4	A	11.8	B	41.2	D
NBL	50.5	D	35.1	D	37.3	D	48.5	D	27.9	C	29.7	C	45.7	D	19.8	B	33.7	C
NBT	9.5	A	20.3	C	72.6	E	8.7	A	27.4	C	47.7	D	11.2	B	18.2	B	73.4	E
NBR																		
SBL	17.0	B	99.2	F	59.7	E	19.7	B	91.4	F	62.6	E	70.8	E	103.4	F	76.4	E
SBT	33.4	C	27.4	C	23.1	C	26.2	C	25.4	C	18.0	B	28.0	C	24.6	C	20.9	C
SBR																		
20th St. & Pearl St.	**9.6**	**A**	**10.9**	**B**	**14.5**	**B**	**10.7**	**B**	**10.4**	**B**	**11.4**	**B**	**10.6**	**B**	**10.2**	**B**	**11.7**	**B**
EBL	2.8	A	2.3	A	7.8	A	4.3	A	2.0	A	4.8	A	3.8	A	2.0	A	4.9	A
EBT	3.6	A	3.6	A	16.8	B	5.4	A	3.7	A	12.4	B	5.2	A	3.4	A	13.1	B
EBR																		
WBL	3.8	A	4.7	A	8.4	A	5.0	A	4.7	A	6.2	A	5.1	A	4.7	A	6.1	A
WBT	6.3	A	8.3	A	15.1	B	8.2	A	7.2	A	9.3	A	8.6	A	7.1	A	9.5	A
WBR																		
NBL																		
NBT	13.9	B	24.5	C	10.5	B	12.0	B	24.7	C	12.6	B	11.7	B	24.2	C	12.7	B
NBR																		
SBL																		
SBT	20.2	C	26.3	C	12.2	B	16.8	B	26.7	C	15.0	B	17.3	B	27.3	C	14.1	B
SBR	68.0	E	25.6	C	9.6	A	34.5	C	26.5	C	8.4	A	33.8	C	27.9	C	12.6	B
20th St. & Pine St.	**19.7**	**B**	**14.7**	**B**	**23.7**	**C**	**18.3**	**B**	**14.6**	**B**	**27.6**	**C**	**18.7**	**B**	**14.5**	**B**	**24.3**	**C**
EBL																		
EBT	7.5	A	6.3	A	34.5	C	6.2	A	5.6	A	40.3	D	6.4	A	5.2	A		
EBR																	35.8	D
WBL																		
WBT	7.1	A	6.1	A	27.7	C	5.8	A	5.4	A	40.5	D	6.3	A	5.1	A	29.0	C
WBR																		
NBL																		
NBT	25.3	C	28.1	C	11.3	B	26.8	C	28.9	C	7.9	A	26.6	C	34.0	C	10.1	B
NBR																		
SBL																		
SBT	37.6	D	29.4	C	11.2	B	37.5	D	28.2	C	7.9	A	37.7	D	28.1	C	10.5	B
SBR	24.5	C	23.3	C	9.4	A	26.9	C	24.1	C	6.6	A	25.9	C	24.4	C	8.7	A

Signalized Intersection Level of Service Summary

Intersection and Lane Movements	"Before" Level of Service						"After"[1] Level of Service						"After"[2] Level of Service - March 2016					
	AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour	
Folsom Ave. & Canyon Blvd	**65.4**	**E**	**64.4**	**E**	**54.6**	**D**	**34.2**	**C**	**33.3**	**C**	**43.4**	**D**	**34.2**	**C**	**30.3**	**C**	**36.2**	**D**
EBL	30.1	C	45.7	D	46.3	D	35.1	D	31.0	C	42.2	D	41.3	D	30.2	C	40.4	D
EBT	32.2	C	36.2	D	53.7	D	33.6	C	37.5	D	54.0	D	31.5	C	34.3	C	45.9	D
EBR	27.7	C	27.6	C	36.1	D	28.1	C	29.0	C	36.9	D	26.4	C	28.6	C	34.5	C
WBL	39.7	D	31.9	C	24.6	C	38.6	D	34.0	C	29.2	C	38.9	D	30.2	C	18.8	B
WBT	62.5	E	41.2	D	49.7	D	52.9	D	43.8	D	39.0	D	55.4	E	42.2	D	34.9	C
WBR																		
NBL	223.2	F	262.9	F	166.6	F	48.4	D	62.9	E	66.6	E	47.8	D	59.3	E	66.0	E
NBT	17.9	B	23.7	C	30.1	C	21.9	C	25.2	C	42.1	D	20.3	C	23.2	C	38.1	D
NBR							17.9	B	39.7	D	158.2	F						
SBL	19.3	B	12.3	B	17.2	B	17.4	B	10.4	B	33.1	C	18.4	B	11.9	B	32.6	C
SBT	22.5	C	15.6	B	21.9	C	25.6	C	16.7	B	24.2	C	21.8	C	15.4	B	21.4	C
SBR							15.9	B	5.1	A	11.2	B						
Folsom Ave. & Pearl St.	**23.4**	**C**	**36.6**	**D**	**31.4**	**C**	**25.8**	**C**	**34.7**	**C**	**33.0**	**C**	**26.1**	**C**	**32.1**	**C**	**37.4**	**D**
EBL	31.7	C	23.8	C	45.5	D	30.5	C	22.9	C	34.6	C	31.5	C	23.8	C	45.5	D
EBT	31.2	C	29.4	C	37.0	D	30.9	C	28.2	C	42.5	D	31.1	C	29.7	C	43.4	D
EBR																		
WBL	45.6	D	31.9	C	22.9	C	42.2	D	25.7	C	39.0	D	44.5	D	26.2	C	98.7	F
WBT	49.5	D	44.7	D	38.3	D	50.1	D	39.5	D	40.5	D	49.2	D	38.1	D	39.3	D
WBR	74.3	E	89.9	F	12.7	B	94.0	F	79.4	E	19.2	B	104.3	F	78.2	E	8.8	A
NBL	7.4	A	21.8.	F	21.1	C	6.6	A	17.2	B	17.1	B	7.9	A	16.6	B	22.7	C
NBT	6.5	A	36.6	D	35.8	D	7.0	A	30.0	C	35.4	D	6.4	A	28.3	C	39.4	D
NBR							4.0	A	66.9	E	39.8	D						
SBL	8.3	A	29.4	C	47.5	D	9.2	A	18.1	B	28.9	C	8.9	A	18.3	B	47.3	D
SBT	7.2	A	29.3	C	16.9	B	10.6	B	28.8	C	19.2	B	8.0	A	25.1	C	18.5	B
SBR							6.6	A	22.2	C	18.3	B						
Folsom Ave. & Pine St.	**13.1**	**B**	**13.5**	**B**	**20.5**	**C**	**13.4**	**B**	**13.9**	**B**	**20.9**	**C**	**14.8**	**B**	**13.1**	**B**	**18.5**	**B**
EBL																		
EBT	40.3	D	43.0	D	72.0	E	40.2	D	41.7	D	64.9	E	41.6	D	42.0	D	57.8	E
EBR	37.2	D	37.7	D	38.7	D	37.4	D	37.1	D	39.2	D	37.4	D	37.2	D	40.4	D
WBL																		
WBT	38.5	D	38.0	D	39.2	D	38.4	D	38.8	D	39.5	D	38.7	D	38.3	D	40.3	D
WBR	36.3	D	35.8	D	36.3	D	36.4	D	36.2	D	36.8	D	36.3	D	36.1	D	38.0	D
NBL							3.3	A	3.7	A	6.5	A	5.5	A	3.3	A	6.0	A
NBT	3.4	A	4.4	A	7.5	A	3.2	A	3.6	A	7.7	A	4.1	A	3.5	A	8.1	A
NBR							3.9	A	3.0	A	5.3	A	6.2	A	2.2	A	4.0	A
SBL							2.2	A	2.9	A	8.9	A	2.5	A	2.2	A	8.0	A
SBT	5.3	A	5.4	A	11.1	B	4.1	A	4.7	A	12.3	B	8.3	A	3.2	A	11.6	B
SBR							2.6	A	2.6	A	11.4	B	2.6	A	1.5	A	9.4	A

Signalized Intersection Level of Service Summary

Intersection and Lane Movements	"Before" Level of Service						"After"[1] Level of Service						"After"[2] Level of Service - March 2016					
	AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour		AM Peak Hour		Noon Peak Hour		PM Peak Hour	
Folsom Ave. & Valmont Rd.	**27.6**	**C**	**24.3**	**C**	**31.4**	**C**	**27.1**	**C**	**26.3**	**C**	**34.9**	**C**	**32.0**	**C**	**24.8**	**C**	**34.5**	**C**
EBL	32.1.	F	34.9	C	42.2	D	32.6	C	33.7	C	50.4	D	32.0	C	32.6	C	52.9	D
EBT	35.7	D	36.0	D	46.2	D	36.2	D	35.8	D	43.3	D	38.2	D	34.8	C	44.7	D
EBR																		
WBL	48.7	D	40.4	D	49.8	D	45.8	D	40.8	D	48.3	D	86.7	F	42.3	D	51.8	D
WBT	47.3	D	42.8	D	52.4	D	46.4	D	45.5	D	61.7	E	46.5	D	45.0	D	62.8	E
WBR																		
NBL	9.5	A	8.9	A	13.1	B	9.1	A	8.9	A	12.0	B	9.8	A	8.6	A	11.6	B
NBT	10.2	B	10.6	B	19.7	B	9.5	A	9.6	A	18.1	B	10.1	B	9.6	A	19.6	B
NBR	9.6	A	6.0	A	14.7	B	6.1	A	8.5	A	11.6	B	8.6	A	7.5	A	10.5	B
SBL	11.7	B	11.8	B	16.5	B	11.2	B	11.1	B	14.8	B	11.2	B	11.1	B	16.1	B
SBT	12.6	B	10.5	B	15.2	B	15.8	B	11.5	B	16.3	B	15.7	B	11.6	B	16.0	B
SBR							12.1	B	22.2	C	16.5	B	11.8	B	24.0	C	16.3	B
26th St. & Pearl St.	**5.2**	**A**	**10.0**	**A**	**10.2**	**B**	**5.4**	**A**	**8.0**	**A**	**12.4**	**B**	**5.4**	**A**	**8.4**	**A**	**9.4**	**A**
EBL	3.2	A	7.5	A	4.8	A	2.6	A	3.7	A	4.4	A	3.5	A	5.2	A	4.0	A
EBT	3.2	A	7.5	A	6.1	A	2.7	A	3.7	A	5.1	A	3.9	A	5.1	A	5.0	A
EBR																		
WBL	2.2	A	2.7	A	9.0	A	2.0	A	2.4	A	7.3	A	2.4	A	1.9	A	7.1	A
WBT	2.4	A	1.1	A	3.5	A	2.1	A	1.6	A	1.9	A	1.9	A	1.2	A	2.7	A
WBR																		
NBL	32.6	C	34.6	C	40.1	D	32.3	C	33.4	C	43.7	D	32.4	C	34.5	C	40.3	D
NBT	32.2	C	34.4	C	39.6	D	32.3	C	33.1	C	41.7	D	32.5	C	32.9	C	40.0	D
NBR																		
SBL	33.1	C	36.6	D	41.1	D	33.5	C	35.6	D	46.6	D	33.4	C	34.7	C	39.6	D
SBT	32.5	C	32.9	C	38.4	D	32.9	C	32.8	C	40.1	D	32.3	C	32.9	C	38.6	D
SBR																		
26th St. & Canyon Blvd.	**7.6**	**A**	**12.6**	**B**	**21.6**	**C**	**6.8**	**A**	**10.0**	**A**	**12.4**	**B**	**7.3**	**A**	**10.2**	**B**	**11.8**	**B**
EBL	0.5	A	3.0	A	3.9	A	0.5	A	1.6	A	4.4	A	1.0	A	1.6	A	3.3	A
EBT	2.2	A	5.2	A	3.5	A	2.0	A	4.3	A	5.1	A	2.9	A	4.4	A	3.2	A
EBR																		
WBL	3.6	A	9.0	A	18.4	B	3.4	A	5.0	A	7.3	A	3.9	A	4.9	A	5.4	A
WBT	3.5	A	3.0	A	2.9	A	3.0	A	2.7	A	1.9	A	3.4	A	2.3	A	1.1	A
WBR																		
NBL	33.4	C	36.5	D	42.8	D	33.2	C	34.6	C	43.7	D	33.5	C	34.5	C	39.2	D
NBT	33.9	C	38.0	D	46.1	D	33.2	C	35.9	D	41.7	D	33.6	C	35.5	D	40.9	D
NBR																		
SBL	34.1	C	53.4	D	238.6	F	34.2	C	36.5	D	46.6	D	33.7	C	35.9	D	63.6	E
SBT	33.8	C	36.8	D	44.9	D	33.8	C	35.6	D	40.1	D	33.7	C	35.4	D	41.4	D
SBR																		

(1) "After" study conducted with full pilot project in place along Folsom from Canyon to Valmont, prior to reinstallation of second north-south general purpose lanes between Canyon and Spruce

(2) "After" study conducted with with partial pilot project in place after reinstallation of second north-south general purpose lanes between Canyon and Spruce

Public Comments from May 26, 2016 Complete Streets Open House

What elements of Complete Streets are important to you?

As a person socializing

- Small building frontages with doors closer to road. Mix of goods/services/housing
- Folsom is quieter where the protected lanes are
- Protected Bike lanes allow 2 a breast riding!

As a person biking

- Avoid buses blocking bike lanes at bus stops. Minimize driveways crossing lanes of paths
- Separate the pedestrians from the cyclists (Don't want to hit anyone.)
- Separate bike lanes and sidewalks
- *Slow car speeds *protected bike lanes, wide bike lanes *bike paths, ideally separate from pedestrians

As a person driving

- I did not notice much difference as a driver when the full distance of protected bike lanes were installed at Folsom
- Folsom is much better before "right-sizing"
- It's good to have safe bike lanes but not impede traffic
- The lights are poorly timed so you do not have to stop so much

As a person using transit

- Need better transit to all the office parks and industrial areas east of Foothills. 206 no longer goes downtown but originates at East Pearl Parkway for example
- Wish Baseline bus ran later at night during week (Stampede too)
- Option to not be stuck in traffic + I agree
- Bring back (?) 1/2 of (?) bus stops in (?) that were cut from the Flatiron Flyer routes
- *Schedule improvements *better signage and facilities!
- (?) of the (?) when boarding/de-boarding
- Let RTD (?) We have (?) Let's use them and not eliminate them and have stops (?) no PNR
- *Frequent buses *room to sit *on time
- The same improvements geared for bikes + pedestrians will help transit users once they descend from bus

As a person walking

- Pedestrian experience is MUCH worse east of 17th. Sidewalks are small, haphazardly laid out, and there is a QUARTER-MILE (!) between crosswalks. Please extend the study area east to Folsom
- Protection from car/bike traffic - buffers & plantings
- We need a much better pedestrian access + experience east of Folsom, all over but especially around 29th St Mall. Too much parking
- Seating 2) Separation from bikes 3) Separation from cars 4) Easy transit access
- Sidewalks separated (buffered) from streets

Complete Streets Comment Sheets Transcribed

Living Lab Projects of interest

Persons	Project
6	protected bike lanes
6	conventional bike lanes
6	dashed green stripe
5	conventional bike lanes/bike box
6	buffered bike lanes
5	protected cycle tracks
5	dashed bike lanes

How do you travel along Folsom Street?

	Daily	Once a week	Once a month	Never
Walk		1	2	1
Bicycle	5	1		2
Riding Transit			1	3
Drive Automobile	1	3		1

Folsom - Valmont to Spruce

The current configuration consists of two travel lanes, a center turn lane, protected bike lanes and the green dash right turn treatment.

- Improve/extend. Bikers, like drivers, have jobs/deadlines/places to be. We need complete, safe, direct routes.
- When it snows, this is the best bike lane in town to the point that pedestrians use it.
- Extend protection separation. Build north-south bike path.
- Build dedicated bike paths. Do not try to mix cars and bikes.
- Protected bike lanes offer more protection area for pedestrians crossing the road.
- With delineators cars aren't drifting into the bike lane.
- Buffered/Protected bike lanes north of spruce have seriously reduced my near collisions with vehicles. Especially at the n-bound intersection with Valmont where right-turning cars cross bike lane.

Keep it	Refine it	Remove it
√		√

Folsom - Spruce to Canyon

The current configuration consists of four travel lanes, conventional bike lanes and concrete / landscape medians with left turn lanes at intersections and some driveways.

- Buffered bike lanes please.
- Improve. Add planters. Extend protected bike lanes.
- Go back to the protected bike lanes. This is a dangerous stretch. Cars can use alternates. Cares have plenty of N-S roads; bikes have no safe north-south corridor.
- Worst stretch of Folsom bike commute especially with bus stops and potholes. Please refine.
- Variable. Too narrow and potholed. Will not ride it with my kids. Proper lane width needed. Buffered or protected.
- Enforce the 3' rule.
- Conventional bike lanes from Arapahoe to Spruce are seriously inadequate. Too narrow and ill repaired. In this region I am often (1-3 times a week) nearly hit/cut-off by vehicles turning onto Folsom across the bike lane.

Keep it	Refine it	Remove it
√	√	

Folsom - Canyon to Arapahoe

The current configuration consists of four travel lanes, conventional bike lanes and concrete/landscape medians with left turn lanes at intersections and some driveways, and a bike box at southbound Folsom and Arapahoe.

- Love the bike box.
- Got hooked and ended up on sidewalk.

Keep it	Refine it	Remove it
√		

Folsom - Arapahoe to Colorado

The current configuration includes two travel lanes, a center turn lane, and buffered bike lanes.

- These are fine. Protected would be nice, or a rumble strip. But they feel safe enough
- Can we add planters to make more safe separation

Keep it	Refine it	Remove it
√		

General comments

- We should study projects sufficiently so we do not put bike protection in then take them out i.e. Folsom & Baseline Rd.
- Great work. We need safer n-bound and s-bound bike routes… keep this strong and growing.

- I like protected bike lanes. The conventional bike lanes on Folsom are *narrow*. I ride Harvard Road a lot and I am not sure what best solution is. Keep working on TMP, would LOVE city eco-pass (I do not have one) would love "4 bike, walk transit cars." (confusing script)
- For Folsom to be truly accessible to all levels of bicycle there have to be protected, physically separated lanes. We do not currently have any complete streets. We need to do one (or more) REALLY WELL so the community sees what is possible.
- It is not enough. Have some vision in Boulder. We need a complete, direct N/S route from Iris to CU. Buffered or protected. Cars have 30th/28th/Foothills. Let us make Folsom different. People do not go to Pearl St. because it is full of cars. They go because it is 'pedestrianized,' different & beautiful. I cannot see business owners complaining if we make Folsom a somewhat new, but more functional version of Pearl, with reduced car traffic and lots of bikers and pedestrians. Honestly depressed right now. Tired of dragging kids and myself to meetings, repeating the same obvious arguments and seeing nothing change. Soon I will run out of steam but I guess that is what the car-driving mob in Boulder wants... This is not an optional extra for this city. As Boulder gridlocks and the air quality approaches that of Beijing we will realize we have made a mistake and it will be too late.
- During big snowstorms, the posts were not comfortable for driving. First choice is to remove, but if stays, please remove the posts. Please remove posts from Baseline. Bollards are visually distracting.
- My comment is mainly with regard to bike/ped access along Colorado. A more streamlined path from East Campus (N of Colorado) to main campus (mostly S of Colorado) for bike/peds would benefit from maintenance partnerships between CU, the city, possibly property owners. The current sidewalk/MUP is almost always un-shoveled, if it is shoveled by RTD/property owners, snow gets deposited in the bike lane. An improved set of facilities would need to address this issue to be fully effective year-round. (Sunlight on e-bound lane is shaded - very slow natural melting/evaporation.)
- What about considering the needs of older, non-bike riders?

East Arapahoe Transportation Plan

The project team provided an overview of the East Arapahoe planning process, conceptual design alternatives and a summary of community input received to-date. New ideas suggested varied from creating directional lanes that change direction in the a.m. and p.m. hours, to narrowing the traffic lanes on Arapahoe and painting a green bike lane to adding more auto lanes.

East Arapahoe Comments Transcribed

- Narrow lanes and paint green bike lane
- More auto lanes (2 comments)
- Multi-use path on north is only adequate
- Directional lanes that change direction during rush hour
- I don’t want to change things. Not at all!
- Bus access needed to Seventh Day Baptist Church warming shelters on Sunday nights
- Don’t narrow below six lanes of general traffic