

**CITY OF BOULDER
TRANSPORTATION ADVISORY BOARD
AGENDA ITEM**

MEETING DATE: November 9, 2015

AGENDA TITLE: Staff briefing and TAB input on the East Arapahoe Transportation Plan

PRESENTERS: Michael Gardner-Sweeney, Acting Director of Public Works for Transportation
Kathleen Bracke, GO Boulder Manager
Jean Sanson, Senior Transportation Planner

EXECUTIVE SUMMARY

The purpose of this agenda item is to provide a briefing to the Transportation Advisory Board (TAB) on the status of the East Arapahoe Transportation Plan and to obtain TAB's input to develop materials for the upcoming community outreach process in November and the City Council Briefing scheduled for December 8, 2015.

TAB ACTION REQUESTED

Key Questions for the TAB:

1. Does TAB have any questions regarding the range of conceptual alternatives and evaluation criteria for the East Arapahoe corridor?
2. Does TAB have any suggestions for enhancing and/or clarifying the materials prior to the upcoming community outreach planned to begin in November and the City Council Briefing in December?

BACKGROUND

The East Arapahoe Transportation planning process is currently in the visioning phase of 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. As context, the East Arapahoe Transportation Plan grew out of the former Envision East Arapahoe Study that was put on hold in late-2014. While long-term land use planning for the East Arapahoe corridor was postponed, City Council supported moving forward with planning for transportation improvements in the corridor due to strong public interest, the desire to advance the goals of Boulder's Transportation Master Plan and the need to coordinate with the upcoming regional State Highway 7 (SH7) Bus Rapid Transit (BRT) Study that will be led by Boulder County and is expected to begin in early-2016. This regional SH7 study is intended to build upon the

analysis for SH7 BRT that is included in Regional Transportation District's (RTD) Northwest Area Mobility Study (NAMS). See Attachment A for a map of the geographic extent of the city's East Arapahoe Transportation Plan, shown as one segment of the larger regional BRT study.

Plan Purpose

The East Arapahoe Transportation Plan will be a long-range plan that advances a number of potential transportation improvements within the East Arapahoe corridor, including biking and walking enhancements, Bus Rapid Transit (BRT) and local bus service and automobile travel. The purpose of the plan is to:

- Address existing & future transportation needs, including local and regional travel. Travel demand in the East Arapahoe Corridor is continuing to increase – as motorists, bus riders, cyclists and pedestrians are seeking safe, and convenient ways to (1) access destinations within the corridor and (2) travel between Boulder and the growing communities to the east. Significant population growth to the east and employment growth in Boulder are projected to increase regional demand for travel to Boulder along Arapahoe Road.
- Facilitate safe travel and access by people using all modes, including pedestrians, bicyclists, transit riders, and vehicle drivers and passengers. This Complete Streets approach is a key tenet of Boulder's Transportation Master Plan (TMP).
- Support existing and future land use in the corridor. With over 54,000 jobs today in the area, the East Arapahoe corridor is a major employment center that is quickly transitioning with a number of major infill and redevelopment projects. That said, because the East Arapahoe Transportation planning process is taking place concurrent with the Boulder Valley Comprehensive Plan (BVCP) 2015 Update, future transportation scenarios will assume the continuation of current land use trends, or infill and redevelopment based on existing zoning along East Arapahoe.

Guiding Principles

A set of guiding principles for Boulder's East Arapahoe/SH7 corridor plan has been developed in response to community input on what is working in the East Arapahoe corridor and what could be improved for travel by foot, bicycle, bus or vehicle. These guiding principles were informed by input received by TAB at the prior meetings in 2014-15 <https://bouldercolorado.gov/goboulder/east-arapahoe-transportation-plan-additional-resources> and have been discussed with members of the community at several outreach events. These are the set of confirmed values that will help shape the East Arapahoe Transportation Plan.

- Accessible – Break up the super blocks. Establish a finer grained, multi-modal network of transportation connections “through and across” Arapahoe Avenue, linking residential and employment areas, commercial areas and major/emerging activity centers.
- Hierarchy of Access – Establish the pedestrian environment as the primary mode of travel, while also recognizing the importance of travel by all modes, including bicycling, transit, and driving.
- Safety – Create safe and convenient access to walk, bike, get to transit, and drive for people of all ages and stages of life.
- Integrated – Support City of Boulder integrated master planning such as the Boulder Valley Comprehensive Plan, Transportation Master Plan (TMP), Access Management and Parking

Strategy (AMPS), as well as CU's East Campus and Boulder County Transportation Master Plans, and RTD's Northwest Area Mobility Study.

- Sustainable and Resilient – Support Boulder's Sustainability Framework, including climate commitment, economic vitality, environmental stewardship, and social/community values.

These guiding principles are being used throughout the planning process described below.

Planning Process and Timeline

The East Arapahoe Transportation Plan builds on the robust outreach and analysis conducted for the Envision East Arapahoe project in 2014, including a number of walk and bike audits in the summer and fall of 2014 and listening sessions and interactive public workshops in the winter of 2014. In February 2015, as land use planning was paused and the project focus shifted to transportation, staff held the first transportation-focused interactive public workshop. Community members expressed their desires, values, and priorities for improving transportation conditions in the East Arapahoe corridor. Participants worked in groups to experiment with different types of transportation facilities (bike lanes, bus lanes, landscaping, sidewalks, etc.) and their potential configurations, both digitally and hands-on with physical "game pieces." Several themes emerged as community members expressed their vision for the future of East Arapahoe:

- *Street Design:* Most workshop participants would like to see enhanced landscaping and aesthetic improvements along Arapahoe Avenue. There was general support for transforming Arapahoe Avenue into a "boulevard" with more trees and a softer, less highway-like feel.
- *Pedestrian and Bicycle Facilities:* Each workshop group included some form of enhanced and protected on-street bike facility, as well as an off-street multi-use path. In a community with a strong culture of walking and cycling, there was general agreement among participants that bicycle facilities on Arapahoe Avenue should be improved, and missing links in the multi-use path completed to increase access and safety.
- *BRT:* Workshop participants generally supported BRT on Arapahoe Avenue, however there are many outstanding questions regarding how it would be designed and operated (exclusive lanes, side vs. center running, station locations, etc). Some participants would like to see the number of automobile travel lanes reduced and "repurposed" for bus-only lanes and on-street bike facilities. Other participants were concerned that reducing auto lanes would increase traffic congestion.

See [Feb. 24, 2015 City Council Study Session Memo](#) for a detailed summary of the workshop.

Since this time, staff has used the feedback provided by TAB at their January 12, 2015 meeting and by City Council at their February 24, 2015 Study Session, community ideas from the February 2015 interactive workshop, and technical inputs to (1) develop a range of transportation improvement alternatives to reflect the vision concepts expressed by the community and (2) refine the set of evaluation criteria and metrics by which the range of alternatives will be evaluated. Staff also rebranded the project the East Arapahoe Transportation Plan and launched a new web site with project information. At this point in the planning process, staff is launching broad community outreach activities to receive input and feedback on this work to inform next steps.

Based on the community, Board and City Council input and feedback received in Nov/Dec 2015, staff will confirm and/or further refine the range of alternatives and criteria and conduct a detailed

quantitative and qualitative evaluation of each alternative through 1st quarter 2016. This evaluation will provide an understanding of how the alternatives compare to each other, the relative benefits, impacts and tradeoffs of each and how each alternative helps to further the goals of the TMP. The results of this evaluation will be presented to the community for feedback; and staff will be seeking direction on a preferred alternative which can be carried forward for more conceptual design and refinements throughout 2016.

One outcome of the 2015-2016 planning process will be an action plan that identifies short and long term strategies to achieve the preferred alternative - realizing this will take time to accomplish (many years). So implementation strategies may be small steps that can be accomplished locally (like making safety improvements, developing an access control plan, and completing missing pedestrian and bicycle facility gaps), while others may be larger steps that will need to be done with regional partners (such as developing, financing, and implementing regional BRT).

It should be noted that multidepartment and multiagency coordination is also an important component of the planning process. Staff holds regular coordination meetings with local and regional agency partners, such as Colorado Department of Transportation (CDOT), RTD, and Boulder County, and will continue to do so through each phase of the planning process. The project staff is also involved in the Boulder County-led SH 7 BRT Study Transportation Advisory Committee (TAC) which is comprised of corridor communities between Brighton and Boulder, county governments, CDOT staff, RTD, DRCOG, the Federal Highways Administration (FHWA), and the Federal Transit Administration (FTA). The County-led study is expected to begin in early-2016 and the findings and recommendations of Boulder's East Arapahoe Transportation Plan will inform this larger regional transit study.

See Attachment B for a complete planning schedule.

STAFF ANALYSIS

New technical work since February 2015 has focused on developing (1) a range of conceptual complete street design alternatives for Arapahoe Avenue between Folsom and the eastern city limits, (2) enhanced transit/BRT operational and service characteristics, (3) potential on-street and off-street pedestrian and bicycle facility options, (4) transportation demand management and parking; and (4) refinements to the set of evaluation criteria by which the alternatives will be evaluated in the next phase of the planning process. Each of these is summarized below.

Range of Conceptual Design Alternatives

Based on the vision for East Arapahoe articulated by community members, staff has been developing 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 Baseline 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).

Each alternative is briefly described here:

- *Baseline (No-Build)*: 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 in each direction and a completed multi-use path for pedestrians and bicycles.
- *Alternative B*: Side-running BRT in semi-exclusive business-and-transit (BAT) lanes (allows right turns) with two general purpose lanes in each direction, an on-street bikeway, and a completed multi-use path.
- *Alternative C*: Center-running BRT in exclusive transit lanes with two general purpose lanes in each direction, an on-street bikeway, and a completed multi-use path.
- *Alternative D*: Center-running BRT in exclusive transit lanes with three general purpose lanes in each direction, an on-street bikeway, and a completed multi-use path.

See Attachment C for a complete list of conceptual design alternatives and features.

Elements of each alternative may be “mixed and matched” depending on factors such as right-of-way availability, traffic conditions, and the land use character of various segments along East Arapahoe (noting that the land use makeup and character of the corridor is not uniform, with widely varying conditions from west to east). And, other variations on these alternatives are possible. It is anticipated that the alternatives will continue to evolve through the conceptual design phase of the planning process, based on the technical evaluation results and public input.

Urban Design and Placemaking

As the range of conceptual transportation alternatives are considered, it will be important to illustrate those urban design features that work hand in hand with mobility improvements to truly transform a corridor. From comfortable and enhanced transit stations, to landscaped medians, street trees, and public art, placemaking elements can enhance the travel experience for all users of the corridor, whether by walking, bicycling, transit or car.

In preparation for the public meeting on November 18th, staff will be assembling photos and illustrations of urban design elements that exemplify how placemaking can help to create the vision for a complete street. As conceptual design alternatives are refined, staff will create visualizations along the East Arapahoe corridor itself.

Transit Facilities and Service

As a first step in further developing the characteristics of a complete street, staff has focused on those elements that complete a transit system, such as service and operations, station locations and routing, as described here:

BRT Operational Characteristics: In addition to conceptual design (or capital) alternatives, staff is also analyzing potential transit operating alternatives, which describe the frequency and hours of operation for existing transit routes and a higher frequency BRT service in the corridor. Today, JUMP bus service in the corridor provides a 10-minute all day frequency within Boulder. With the implementation of BRT, transit service frequencies could increase to one bus every 6-minutes in the morning and afternoon peak hours.

BRT Station Locations (between Folsom and 75th Streets): Staff conducted a high-level assessment of potential BRT station locations, considering major ridership generators, land use, right-of-way constraints, connectivity and access for people walking and riding bicycles to/from BRT stations, connections to other transit routes, and planned mobility hub locations. The assessment informed the development of three conceptual station spacing options, with potential stations preferably located no closer than a quarter-mile and between a third of a mile and a half-mile from adjacent stations.

- Scenario 1: Longer spacing – average of about 0.5 miles between stations (six total). Includes stations at 29th Street, 38th Street, 48th Street, 55th Street, Cherryvale Road, and either 63rd or 65th Streets.
- Scenario 2: Moderate spacing – average of about 0.4 miles between stations (eight total). Includes Scenario 1 stations plus stations at 32nd Street and both 63rd and 65th Streets.
- Scenario 3: Shorter spacing – average of about 0.3 miles between stations (eleven total). Includes Scenario 2 stations plus stations at Eisenhower Drive/Commerce Street, Flatirons Golf Course and Valtec Drive.

BRT Routing Options (between 28th Street and Downtown Boulder Transit Center): Given that the recommendations that come out of the East Arapahoe Transportation Plan will inform the larger SH 7 BRT Study between downtown Boulder and Brighton, it is important that consideration be given to BRT routing into the downtown area. Arapahoe Avenue is the only clear BRT alignment option between the eastern city limits and 28th Street. West of 28th Street however, a number of feasible options are being studied. The following BRT alignment options have been identified between 28th Street and the Downtown Boulder Transit Center:

- *Arapahoe:* Arapahoe Avenue, 14th Street (inbound), and 17th Street (outbound)
- *Canyon via 28th:* 28th Street and Canyon Boulevard
- *Canyon via Folsom:* Folsom Street and Canyon Boulevard
- *Canyon via 28th/Folsom:* 28th Street (inbound), Canyon Boulevard, and Folsom Street (outbound)

Pedestrian and Bicycle Facilities

Each of the conceptual design alternatives includes infrastructure enhancements within the East Arapahoe Corridor to support pedestrians and cyclists of all ages and abilities, but to varying degrees. Community members have expressed a desire for a complete street that prioritizes pedestrians and accommodates a range of cyclists such as commuters as well as those that can be characterized as interested but concerned (and may not be comfortable sharing the road with vehicles). Currently, pedestrian and bicycle facility options being considered along East Arapahoe include:

- *Multi-use paths:* Most of the multi-use path along the north side of Arapahoe Avenue has been completed, which represents a major investment in pedestrian infrastructure. On the south side however, several major gaps still exist. Staff will be analyzing the extent of the current gaps as well as the effectiveness of the multiuse path to safely serve both pedestrians and cyclists traveling through the corridor and to destinations along East Arapahoe.
- *On-street buffered and/or barrier-protected bikeway:* Bicycle facilities that provide greater physical separation from motorized traffic and improve visibility compared to a traditional on-street bicycle lane are increasingly the norm for bikeway design, and are currently being tested as part of the Living Lab project. Staff will be using lessons learned from the Living Lab project, as well as industry standards and best practices to assess the benefits and trade-offs of different on-street bicycle facilities, recognizing that features of each type of infrastructure can be mixed and matched. Some facility types may potentially be more appropriate in only certain segments of the corridor.
- *Pedestrian crossings:* The long distances between pedestrian crossings (particularly east of 30th Street) as well as the width of the pedestrian crossings themselves (often crossing six lanes of traffic) have been raised as concerns by community members throughout the planning process. Staff will be assessing the potential to create enhanced pedestrian crossings, pedestrian refuges in conjunction with transit stations and/or mid-block crossings, as well as potentially grade-separated crossings to improve pedestrian safety and comfort across Arapahoe Avenue.

It should be noted that, for each of these facility types, addressing potential conflict points at intersections, merge points, driveways, and transit stops will be an important dimension to providing safe and comfortable facilities.

Prior to the December 8th briefing to City Council, staff will be more fully analyzing and comparing the benefits and trade-offs of the pedestrian and bicycle facility options described above, as well as other options that might through more technical analysis.

Transportation Demand Management and Parking

Staff is closely coordinating with the Access Management and Parking Study (AMPS) project team and will be using the initial recommendations of that study to further explore opportunities to establish Transportation Demand Management (TDM) measures along East Arapahoe. TDM could include the use of a variety of programs, policies, and initiatives customized for the East Arapahoe corridor. For example, mobility hubs could be developed at key locations to provide seamless mobility between the transit network and pedestrian and bicycle facilities, car/ridesharing, and context-appropriate parking supply. Staff will be working closely city partners and community stakeholders to more fully assess potential mobility hub locations and priorities. Another example of a TDM measures currently being evaluated along East Arapahoe is satellite parking lots, which would be used by employees driving into the city and finishing their trip by transit, carpool, biking, and/or walking. In certain locations, satellite parking may be incorporated into a mobility hub. To date, AMPS has identified two locations along East Arapahoe that could provide satellite parking, one of which is the city-owned EcoCycle/resource yard and the other is Boulder Community Health.

In the next phase of the East Arapahoe planning process, staff will be more fully detailing these TDM opportunities, as well as measures such as managed parking districts and business EcoPasses.

Alternatives Evaluation Criteria

In the next phase of the planning process beginning in January 2016, staff will evaluate the range of alternatives described in the previous sections. The draft criteria and measures relate directly to the goals of the TMP and are very similar to the evaluation criteria that have previously been reviewed by the community, TAB and City Council as part of the Envision East Arapahoe project. Staff has made minor refinements to the original set of criteria based on a more focused analysis of transportation impacts and relevant data sources. Categories of evaluation criteria include: pedestrian and bicycle access and comfort, transit operations, vehicle operations, capital cost and implementation, and community sustainability.

See Attachment D for a complete list of criteria and measures.

NEXT STEPS

- Continue on-going coordination with Boulder County, CDOT, RTD, and other agency partners.
- East Arapahoe Transportation Plan public meeting November 19th plus additional community outreach to neighborhoods, businesses/employers/employees as well as on-line/web/social media based options (November/December 2015).
- City Council Briefing (December 8, 2015).
- Staff will provide a follow-up briefing to TAB during the first quarter of 2016 to share community feedback.
- Based on input from community, TAB, and City Council, staff will (1) confirm and/or refine the range of conceptual design and operating alternatives and draft evaluation criteria and (2) conduct a technical analysis of all alternatives per the criteria for a comparison of benefits, impacts and tradeoffs.
- Results from the technical analysis will be shared with the community, TAB, City Council and agency partners in the first quarter of 2016.

TAB ACTION REQUESTED

The TAB is requested to provide input on the East Arapahoe Transportation Plan analysis. Specifically:

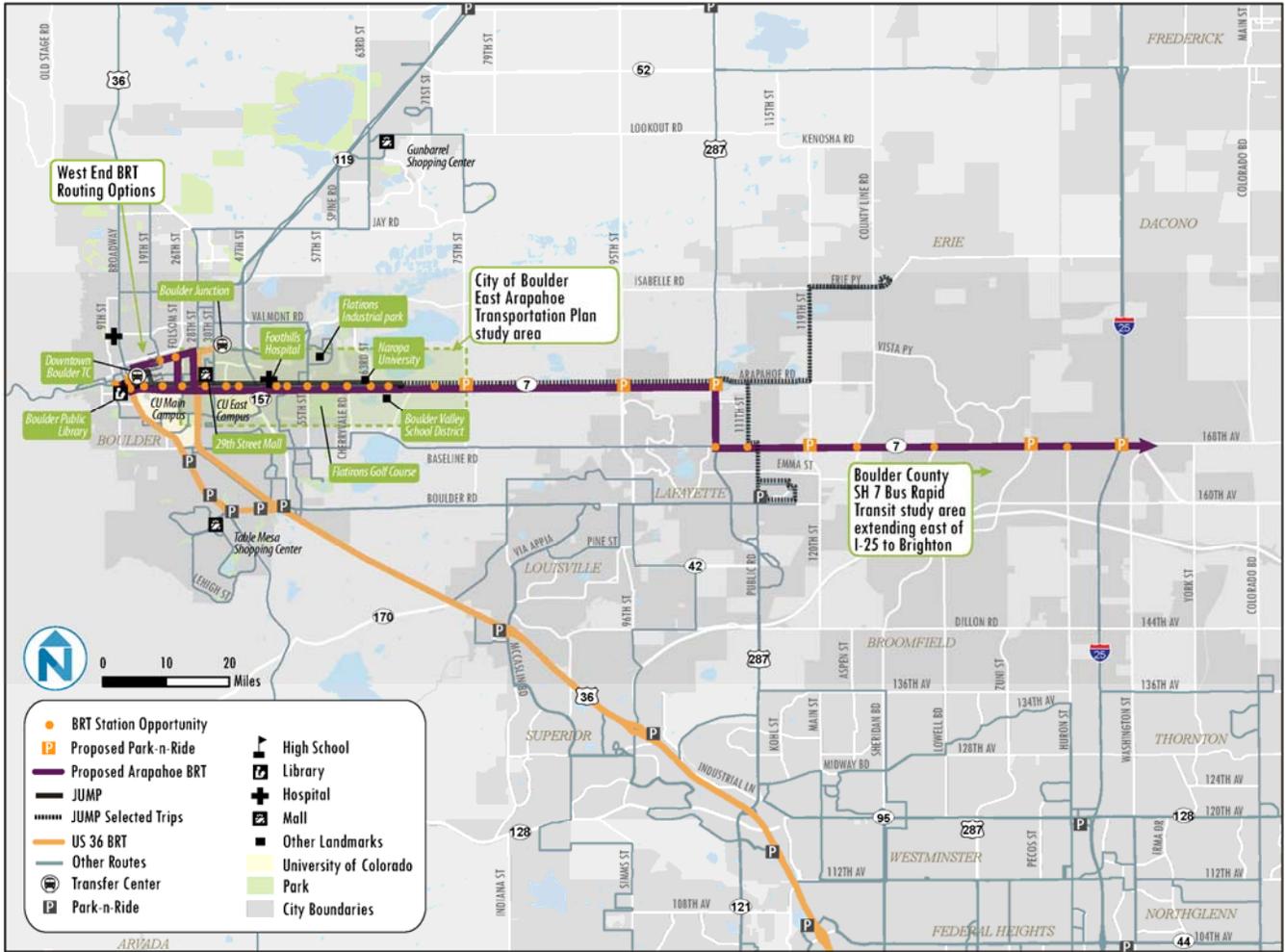
1. Does TAB have any questions regarding the range of alternatives under consideration for the East Arapahoe corridor?
2. Does TAB have any suggestions for enhancing and/or clarifying the materials prior to the upcoming community outreach planned in November/December?

Attachments:

- A. Map of East Arapahoe Transportation Plan and SH 7 BRT Study Extent
- B. East Arapahoe Transportation Plan Process and Timeline
- C. Range of Conceptual Design Alternatives
- D. Proposed Evaluation Criteria and Measures
- E. East Arapahoe Transportation Plan Handout: Planning Update, November 2015 (DRAFT)

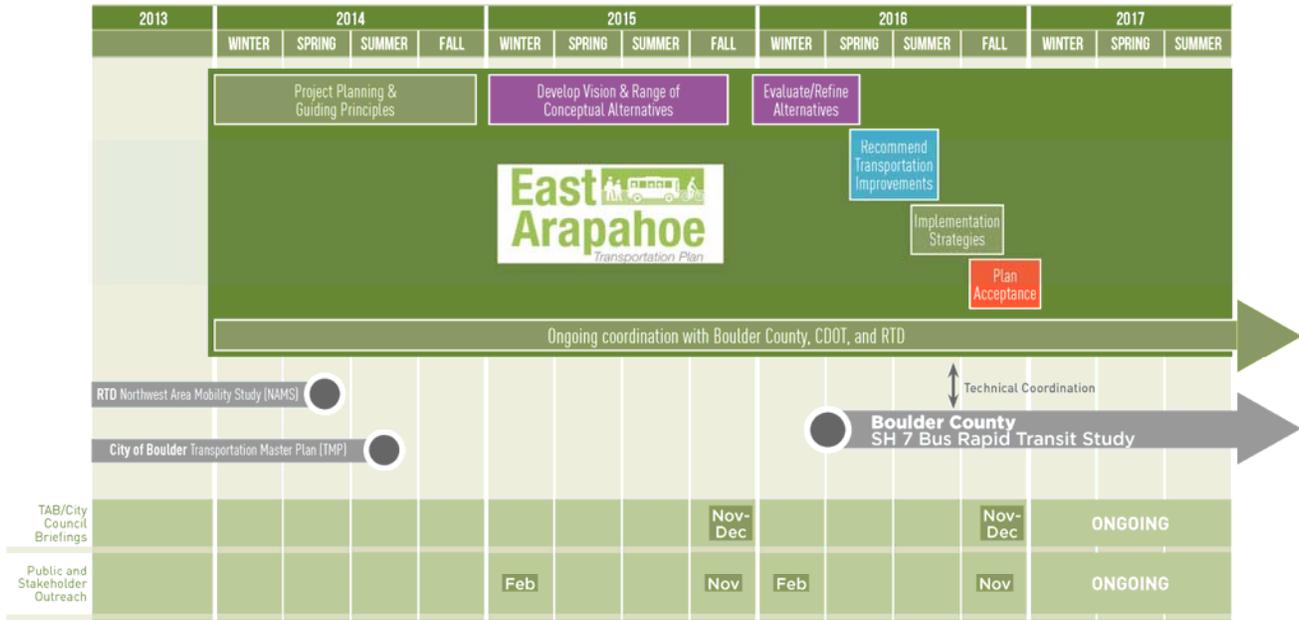
Attachment A

Map of East Arapahoe Transportation Plan and SH 7 BRT Study Extents



Attachment B

East Arapahoe Transportation Plan Process and Timeline



Attachment C Range of Conceptual Design Alternatives

Alt.	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
No Build/Baseline Alternative								
Baseline	3 GP* lanes + multiuse path	None	No	No	Off-street: existing multi-use path (with gaps)	No	Existing buses, stops, and shelters	Existing landscaping
Build Alternatives								
A.	3 GP lanes (with 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 level, multiple door boarding, branded vehicles and stations	Existing landscaping
B.	2 GP lanes + side running Business-Access and Transit lanes + on-street bike facility + multiuse path	Medium	Partial (outside GP lane becomes BRT + right turn only lane)	Yes	On-street + off-street	Semi-exclusive	Same as A	Enhanced landscaping in median and on street edge
C.	2 GP lanes + center running BRT lanes + on-street bike facility + multiuse path	High	Yes	Yes	On-street + off-street	Yes	Same as A	Enhanced landscaping in median and on street edge
D.	3 GP lanes + center running BRT lanes + on-street bike facility + multiuse path	Highest	No	Yes	On-street + off-street	Yes	Same as A	Enhanced landscaping in median and on street edge

*GP lanes refer to traffic lanes that accommodate all vehicles.

Attachment D Proposed Evaluation Criteria and Measures

Evaluation Measures	
Pedestrian & Bike Comfort and Access	
Ease of Access or Comfort for Walking Along or Across the Corridor	Sidewalk coverage Number of protected crossings Frequency/spacing of crossings Change in number of network connections
Ease or Comfort for Bicycling along/across the Corridor	Change in miles of bike facilities Level of facility protection from traffic Number of protected or separated crossings Frequency/spacing of crossings Change in number of network connections
Transit Operations	
Transit Travel Time	Adjusted transit travel time
Transit Service Reliability	Adjusted transit travel time
Transit Ridership in Corridor	Total transit ridership New transit trips
Transit Mode Share	Transit mode share at key "screenlines"
Transit Operating Costs	Total and net new operating cost
Vehicle Operations	
Auto Travel Time and Level of Service (LOS)	Average AM and PM auto travel time PM Peak Level of Service (LOS) letter grade and average delay (seconds/vehicle)
Auto VMT Corridor	Auto VMT in corridor
Auto Mode Share in Corridor	Trips by people in autos at key "screenlines"
Freight Impacts	Qualitative assessment based traffic analysis
Capital Costs / Implementation	
Capital Costs	Total capital costs
Cost-Effectiveness	Lifecycle operating & capital cost per user
Ability to Phase Improvements / Complexity of Implementation	Qualitative assessment
Community Sustainability	
Streetscape Quality	Increase in public space and street trees/landscaping
GhG Emissions from Transportation	GhG emissions in corridor Progress toward city goals

Evaluation Measures	
Safety	Qualitative assessment of anticipated increase or decrease in traffic crashes
Restrictions on Access	Restrictions on turning movements and business access

Attachment E

**East Arapahoe Transportation Plan Handout: Planning Update,
November 2015**

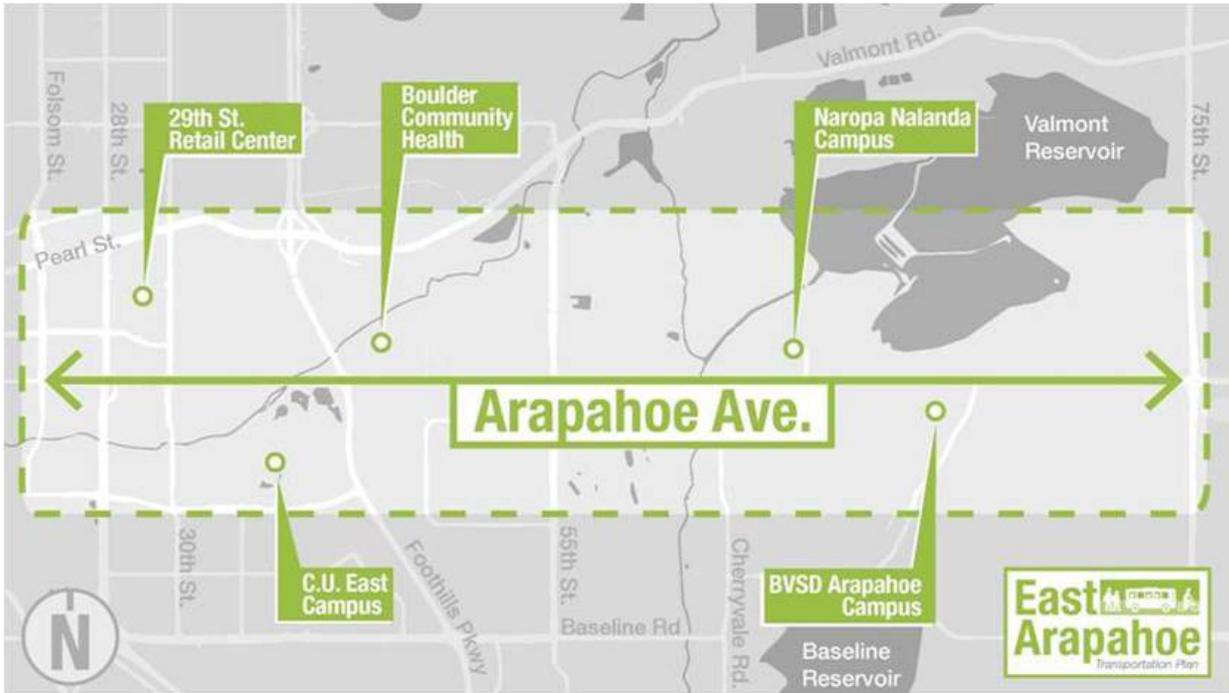


Planning Update



November 2015

Plan Overview



Plan Purpose

The **East Arapahoe Transportation Plan** is founded in the goals and Complete Streets approach of Boulder's Transportation Master Plan (TMP). Complete streets accommodate all modes of transportation by planning, designing, and building facilities for pedestrians, bicyclists, transit riders, and vehicle drivers and passengers.

The **Plan's purpose** is to address existing and future transportation needs in the East Arapahoe Corridor, including local and regional travel, and facilitate safe travel and access by people using all modes—walk, bike, transit, and auto.

The **Plan will address in-commuting in a key regional corridor.** Significant population growth to the east and employment growth in Boulder are projected to increase regional demand for travel to Boulder.

Plan Background

The East Arapahoe Transportation Plan grew out of the former Envision East Arapahoe (EEA) Study. While long-term land use planning for the East Arapahoe corridor was postponed in 2014, City Council supported moving forward with planning for transportation improvements in the corridor. This decision was based on:

- **Strong public interest** in addressing existing and future transportation needs in the East Arapahoe Corridor.
- **Advancing the goals** of Boulder's Transportation Master Plan.
- **Forwarding the recommendations of RTD's Northwest Area Mobility Study (NAMS)**, which identified the Arapahoe/State Highway 7 Corridor between Boulder, Lafayette, and Brighton as a strong candidate for an arterial BRT line. The State Highway 119 corridor between Boulder and Longmont was also identified as a priority in both the TMP and NAMS.
- **Coordinating with the future State Highway 7 Bus Rapid Transit Study** that will be led by Boulder County and is expected to begin in early 2016.

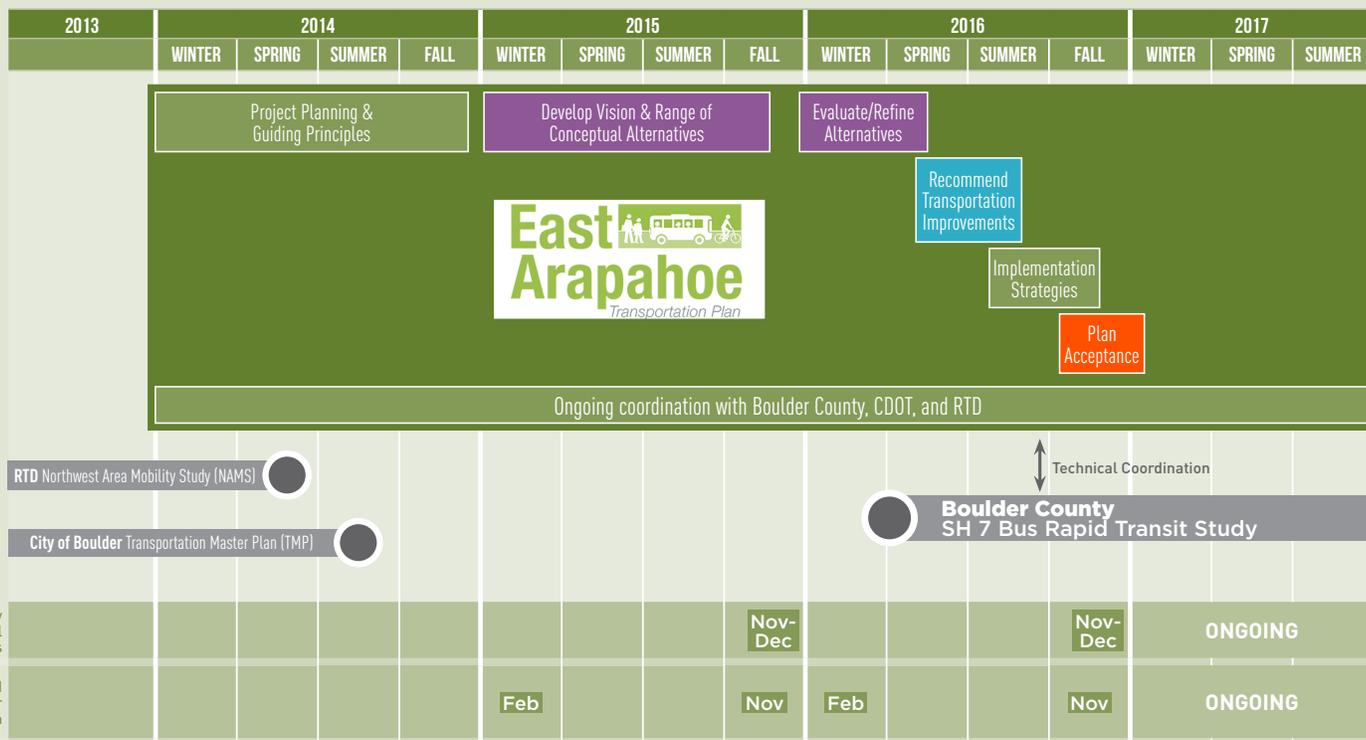
Planning Timeline

The East Arapahoe Transportation Plan is an early phase of a multi-stage planning process for developing a BRT project that will seek federal funding.

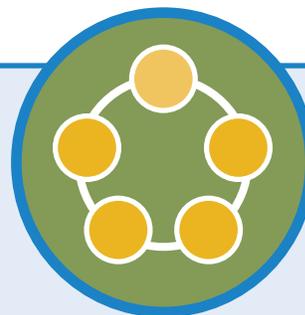
The project team held an interactive public workshop in February 2015 to obtain community input on BRT and other complete street design elements for East Arapahoe in Boulder.

Since then, the project team has been working to further define the ideas proposed by the workshop participants.

Starting in November 2015, the project team will solicit input from the public on conceptual alternatives for East Arapahoe. The alternatives will then be refined and evaluated in more detail.



Integrated/Coordinated Planning Initiatives



The East Arapahoe Transportation Plan is being closely coordinated with other concurrent local and regional initiatives, including:

- Boulder Valley Comprehensive Plan Update (2015-2016)
- Canyon Corridor Study (beginning early-2016)
- Access Management and Parking Strategy (AMPS) (2014-ongoing)
- Climate Commitment (update in 2015+)
- Boulder County SH 7 BRT Study (beginning early-2016)

Defining Characteristics of BRT/Complete Streets

The City is investigating a variety of potential transportation features within the East Arapahoe Corridor. These potential improvements are based on public feedback and known best practices from other

communities in Colorado, around the United States, and abroad. These improvements may include the elements described on this set of pages.



Bus Rapid Transit (BRT) is a rubber-tired bus transit mode that provides many of the advantages of rail service—capacity, speed, and quality—at a fraction of the cost. BRT typically includes exclusive lanes or queue jumps and coordinated traffic signals with transit priority to provide fast travel times, attracting transit riders to use the service. These features are important even along arterial streets and through urban centers to realize the full travel time benefit of BRT.



Streetscape/Urban Design. Complete street improvements could enhance the street environment with landscaping and street trees, pedestrian-scale street lighting, street furniture, and public spaces.

Eugene, OR: EmX BRT



Source: Nelson\Nygaard



Bicycle/Pedestrian Facilities. Complete street improvements could enhance the existing multi-use path, complete current gaps, and develop a buffered or barrier-protected on-street bikeway.

Multi-Use Path

Portland, OR: Orange Line



Source: Nelson\Nygaard

Los Angeles: Orange Line BRT

Buffered Bike Lane

Santa Clara County, CA: El Camino Real BRT



Source: VTA

Source: City of Boulder

Boulder: Baseline Road

Protected Bike Lane

Chicago: Central Loop BRT (Planned)



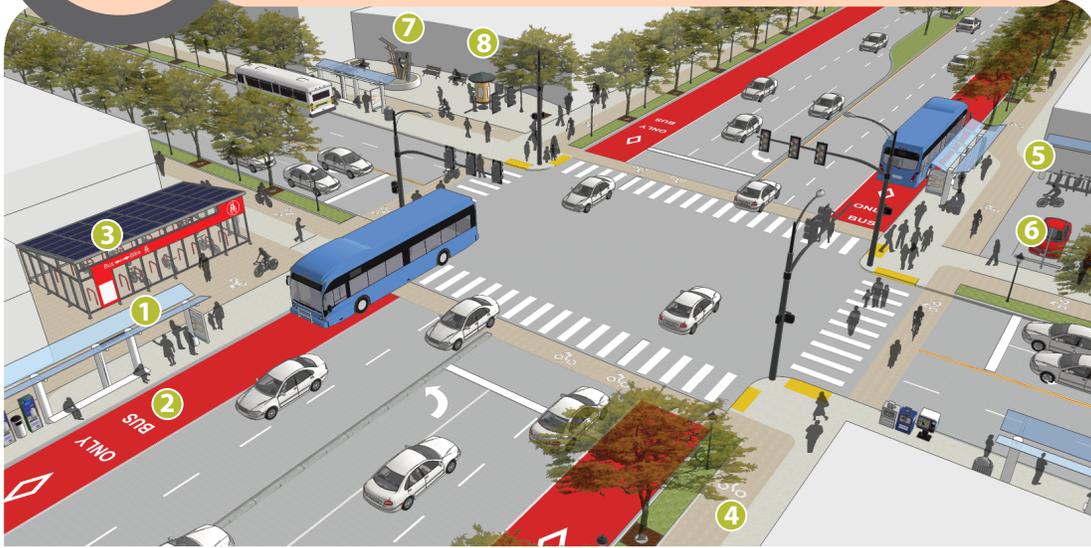
Source: City of Chicago

Source: Nelson\Nygaard

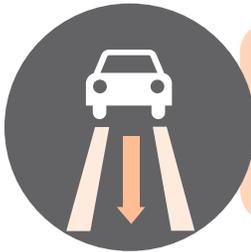
Seattle: RapidRide



Mobility Hubs provide seamless mobility between the transit network and pedestrian and bicycle facilities, car/ridesharing, and context-appropriate parking supply, including excellent pedestrian infrastructure and connections to the bicycle network.



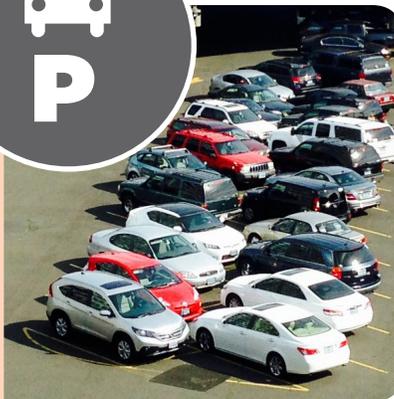
- 1 Enhanced bus stops with real-time information
- 4 Off-street bike path
- 7 Public art
- 2 Designated bus lanes and priority signals
- 5 Bike parking
- 8 Transit and community information kiosk
- 3 Secure bike parking
- 6 Car sharing



General Traffic Lanes. There could be two or three general traffic lanes in each direction on East Arapahoe, depending on the street design and the land use context. General traffic lanes could potentially be “repurposed” for transit lanes or on-street bike facilities, or additional right-of-way could be required.



Transportation Demand Management and Parking. This Plan will explore opportunities to establish Transportation Demand Management (TDM) measures along East Arapahoe. TDM provides convenient and easy to use travel options for Boulder residents, employees and visitors and could include a variety of programs, policies, and initiatives customized for the East Arapahoe corridor. For example, mobility hubs could be developed at key locations to provide seamless mobility between the transit network and pedestrian and bicycle facilities, car/ridesharing, and context-appropriate parking supply. Other examples of TDM in the East Arapahoe corridor might include business EcoPasses and satellite parking for in-commuters.



Transit Lanes. BRT could operate in shared lanes (mixed-traffic) with queue jumps and/or signal priority, or a semi-exclusive business-access-and-transit (BAT) lane along the curb, which all vehicles could use to make right-turns. Center-running BRT would have an exclusive transit lane in the street median.

Shared Lane



Boulder, JUMP

Business-Access-and-Transit (BAT) Semi-Exclusive Lane



Seattle, RapidRide

Exclusive Lane



San Francisco: Van Ness BRT (Planned)

Source: SFTA

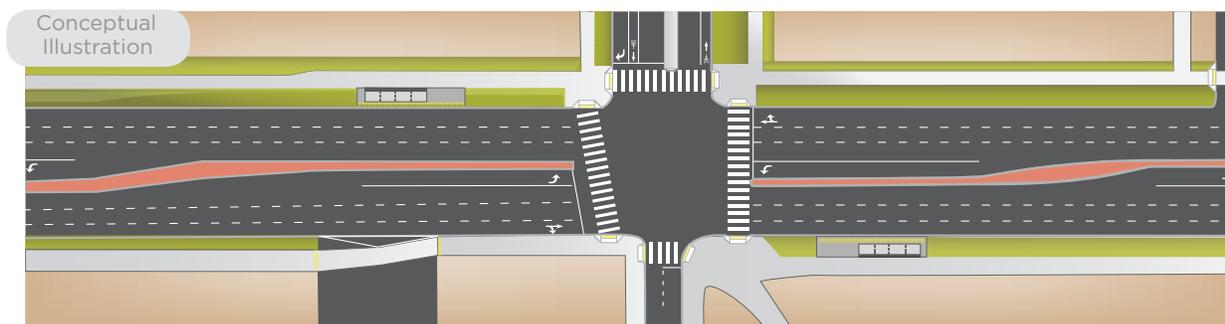
Conceptual Design Alternatives

These tables and concept diagrams identify a range of alternatives that incorporate the potential BRT/complete street elements in various combinations. These alternatives are intended to illustrate a range of potential complete street design options for Arapahoe Avenue.

Other variations on these alternatives are possible. It is anticipated that the alternatives will continue to evolve through the conceptual design phase of the project, based on the evaluation results and public input. Elements of each concept may be “mixed and matched” depending on factors such as right-of-way availability, traffic conditions, and the character of various segments of East Arapahoe.

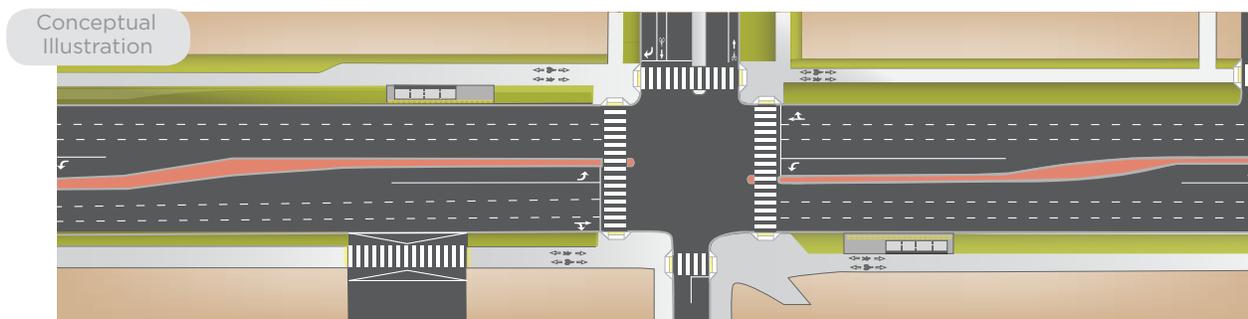
Baseline (No-Build): Side-running bus with three general traffic lanes in each direction and existing pedestrian and bicycle facilities and landscaping

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



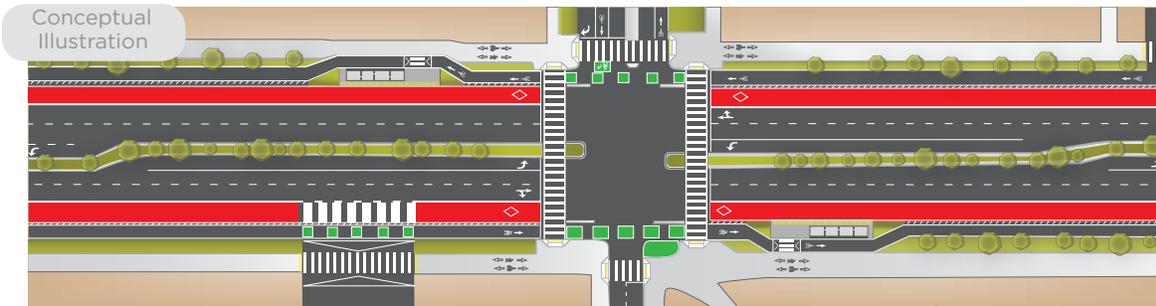
Alternative A: Enhanced bus in mixed-traffic with three general-purpose lanes and a completed multi-use path for pedestrians and bicycles

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



Alternative B: Side-running BRT in a **semi-exclusive business-and-transit (BAT) lane** (allows right turns) with **two** general traffic 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



Alternative C: Center-running BRT in an **exclusive transit lane** with **two** general traffic 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)



Alternative D: Center-running BRT in an **exclusive transit lane** with **three** general traffic 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)

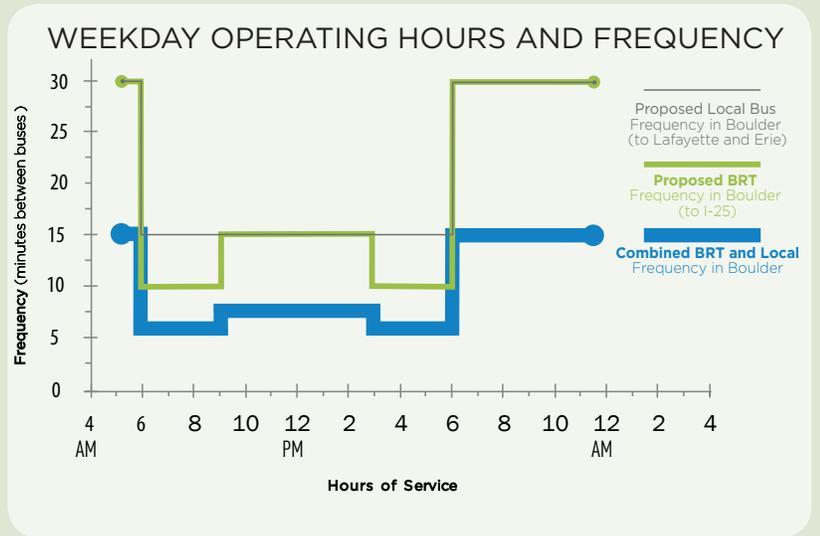


Potential BRT Operating Plan

OPERATING HOURS AND FREQUENCY

Existing JUMP bus service in the Arapahoe/SH 7 corridor within Boulder runs every 10 minutes during peak hours and midday and every 30 minutes in the evenings. Service operates for approximately 18 to 19 hours per weekday, between approximately 5/6 AM and 11/11:45 PM (depending on travel direction).

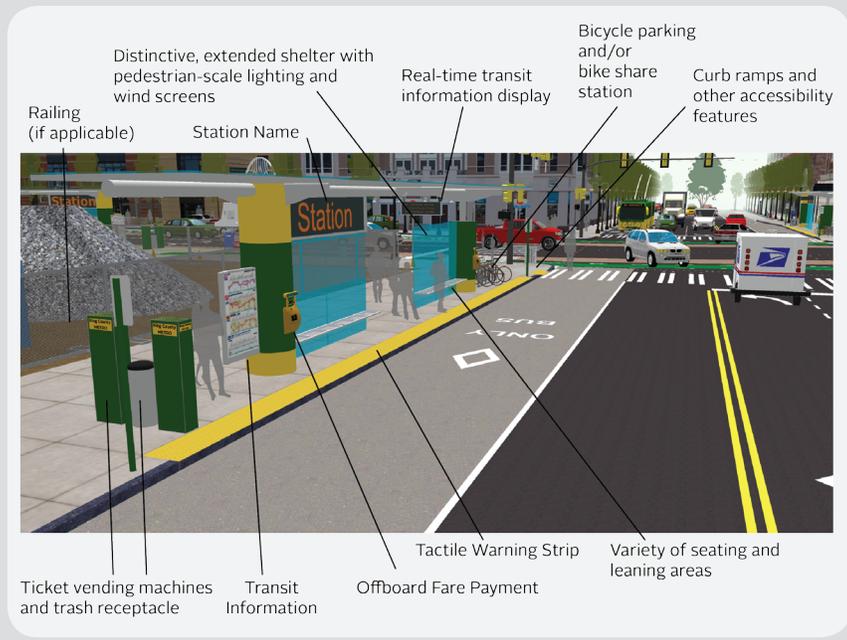
The graphic at right illustrates a proposed weekday operating plan for BRT in the Arapahoe corridor, connecting the Downtown Boulder Transit Center on the west end with I-25 and Brighton on the east end. BRT and local buses would run every 6 to 7.5 minutes (combined) during the day and every 15 minutes (combined) in the early morning and evenings.



POTENTIAL BRT STATION LOCATIONS

The project team conducted a high-level assessment of potential BRT station locations that would be located at least a quarter-mile apart and preferably between a third of a mile and a half-mile from adjacent stops. General station areas were identified along the corridor that would be important to serve based on

the presence of major generators (such as the 29th Street Mall) and important transit and multimodal connections (such as US 36 BRT). More specific station locations were identified considering factors such as land use, right-of-way feasibility, existing ridership, and stop spacing considerations.



The station spacing scenario incorporates a minimum half-mile distance between stations that includes six stations between Folsom and 75th:

- 29th Street
- 38th Street
- 48th Street
- 55th Street
- Cherryvale Road
- Either 63rd Street or 65th Street

Additional BRT stations would exist between Folsom Street and the Downtown Boulder Transit Center (depending on the BRT routing).

Potential stations were also identified for consideration at:

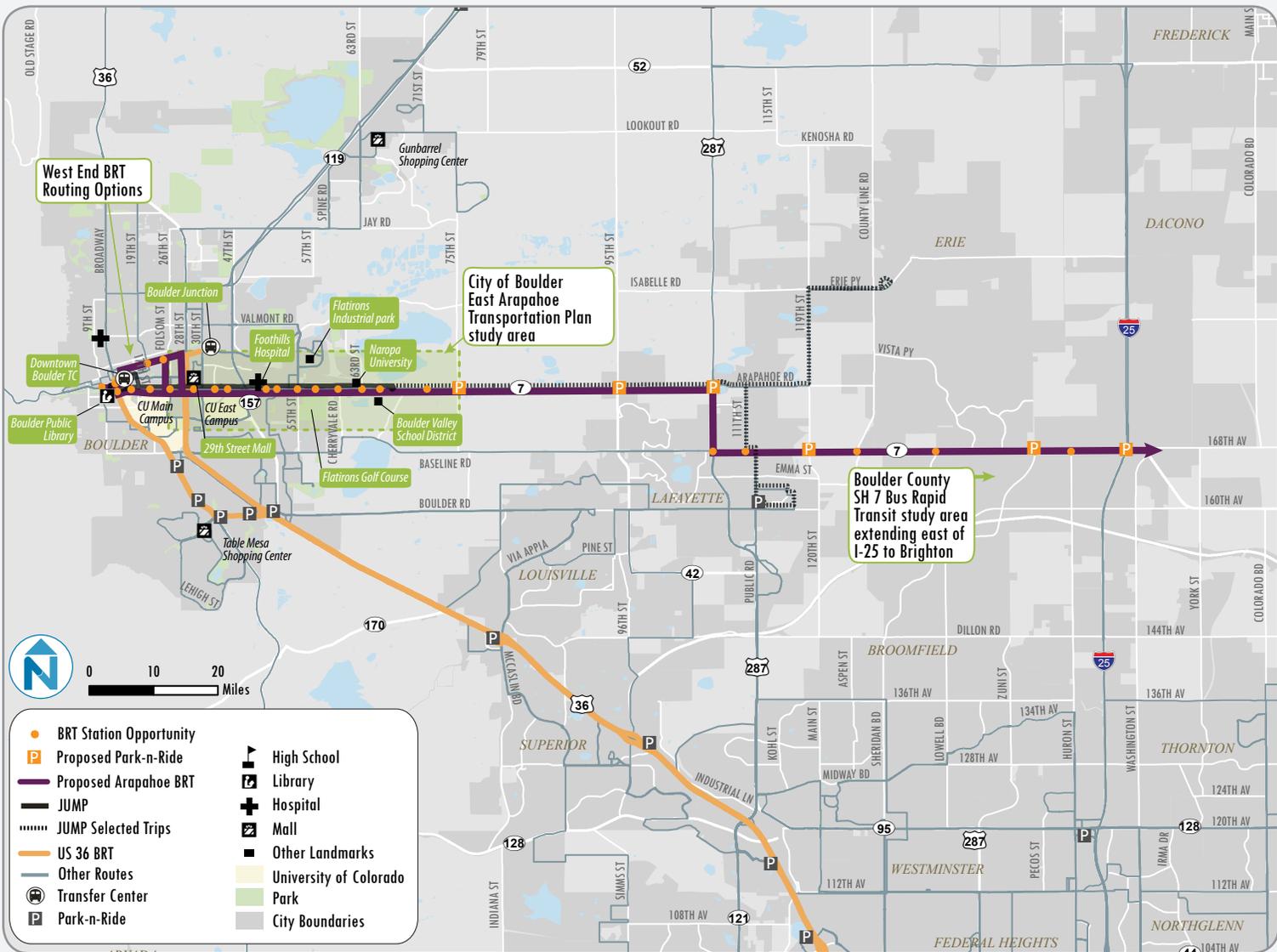
- 32nd Street
- 38th Street
- Eisenhower Drive/Commerce Street
- Flatirons Golf Course
- Both 63rd Street and 65th Street
- Valtec Drive

Corridor Map

City of Boulder East Arapahoe Transportation Plan & Boulder County SH 7 BRT Study

The City of Boulder East Arapahoe Transportation Plan study area is primarily focused on the State Highway 7 (SH 7) corridor between Folsom Street and 75th Street. On the west end, BRT is assumed to connect to the Downtown Boulder Transit Center using either Arapahoe or Canyon.

In 2016, Boulder County is initiating the State Highway 7 Bus Rapid Transit study between downtown Boulder and I-25, potentially extending east of I-25 to Brighton. The findings from the city's East Arapahoe Transportation Plan will inform this larger study.



POTENTIAL TRADEOFFS BETWEEN CONCEPTUAL DESIGN ALTERNATIVES

The table below provides preliminary observations of the key tradeoffs between the conceptual design alternatives, based on both local knowledge of corridor conditions and national experience with implementation of BRT and other bus corridor projects. The alternatives will be analyzed in detail following public input on the evaluation criteria and the conceptual design alternatives and operating plan.

PRELIMINARY OBSERVATIONS OF CONCEPTUAL DESIGN TRADEOFFS	
PEDESTRIAN & BIKE COMFORT AND ACCESS	<ul style="list-style-type: none"> • All alternatives complete gaps in the multi-use path • Alternatives B, C, and D reduce potential conflicts between pedestrian, bicycle, and auto modes • Alternative D has longest pedestrian crossing distance
TRANSIT RIDERSHIP	<ul style="list-style-type: none"> • All alternatives likely to make transit travel faster and increase ridership • Alternatives B, C, and D likely to increase ridership the most • Alternatives C and D (center-running BRT) likely to be the fastest and most reliable for transit
TRAFFIC OPERATIONS	<ul style="list-style-type: none"> • Future baseline auto travel times and congestion may increase based on regional traffic projections • Alternatives A, B, and D likely to have lowest impact on traffic • Alternative C likely to have the highest impact on traffic • Alternatives B, C, and D could affect business access (driveways) • Alternatives C and D could require left-turn restrictions
TRANSIT OPERATING COSTS	<ul style="list-style-type: none"> • All alternatives would cost more to operate than existing transit, due to more frequent BRT service that also extends east beyond the current JUMP route • Alternatives B, C, and D would potentially cost slightly less to operate than BRT in mixed-traffic, due to fewer buses and operators required
CAPITAL COSTS	<ul style="list-style-type: none"> • Alternative A likely to require no/limited right-of-way and have lowest capital cost • Alternatives B, C, and D require expanding right-of-way and are likely to be more complex to implement • Alternative D requires the most right-of-way and likely has the highest capital cost
COMMUNITY SUSTAINABILITY	<ul style="list-style-type: none"> • Alternative B, C, and D would expand space for landscaping/street trees and potentially for other public space • All alternatives could potentially increase safety (reduce number of crashes)

Evaluation of Conceptual Alternatives

The tables below summarize the conceptual design alternatives and provide the draft criteria that have been developed to evaluate the alternatives. The alternatives will be evaluated in the next stage of this planning process.

SUMMARY OF DESIGN ALTERNATIVES

	 Future Baseline (No-Build)	 Alternative A	 Alternative B	 Alternative C	 Alternative D
TRANSIT OPERATIONS	Side-running Bus (Mixed-Traffic)	Enhanced Bus (Mixed-Traffic)	Side-Running BRT (Semi-Exclusive BAT Lane)	Center-Running BRT (Exclusive Lane)	Center-Running BRT (Exclusive Lane)
GENERAL TRAFFIC LANES / LANE REPURPOSING	3 (per direction) / None	3 (per direction) / None	2 (per direction) / Partial	2 (per direction) / Yes	3 (per direction) / None
PEDESTRIAN AND BICYCLE FACILITIES	Existing Multi-Use Path with Gaps	Gaps Filled in Multi-Use Path	On-Street Bikeway and Multi-Use Path	On-Street Bikeway and Multi-Use Path	On-Street Bikeway and Multi-Use Path
ROADWAY WIDENING / RIGHT-OF-WAY EXPANSION	None	None / Limited	Yes	Yes	Yes (Most Expansion)

DRAFT EVALUATION CRITERIA

CRITERIA	EVALUATION MEASURES
PEDESTRIAN & BIKE COMFORT AND ACCESS	
Perceived Ease of Access or Comfort for Walking Along or Across the Corridor	<ul style="list-style-type: none"> Sidewalk coverage, Number of protected crossings, Frequency/spacing of crossings, Change in number of network connections
Perceived Ease or Comfort for Bicycling Along/Across the Corridor	<ul style="list-style-type: none"> Change in miles of bike facilities, Level of facility protection from traffic, Number of protected or separated crossings, Frequency/spacing of crossings, Change in number of network connections
TRANSIT OPERATIONS	
Transit Travel Time and Service Reliability	<ul style="list-style-type: none"> Adjusted transit travel time
Transit Ridership	<ul style="list-style-type: none"> Total and new transit trips
Transit Mode Share in Corridor	<ul style="list-style-type: none"> Transit mode share at key "screenlines"
Transit Operating Costs	<ul style="list-style-type: none"> Total and net new operating cost
VEHICLE OPERATIONS	
Auto Travel Time and Level of Service (LOS)	<ul style="list-style-type: none"> Average AM and PM auto travel time PM Peak Level of Service (LOS) letter grade and average delay (seconds/vehicle)
Auto VMT and Mode Share	<ul style="list-style-type: none"> Auto VMT in corridor
Auto Mode Share in Corridor	<ul style="list-style-type: none"> Person trips in autos at key "screenlines" along Arapahoe
Freight Impacts	<ul style="list-style-type: none"> Qualitative assessment based on traffic analysis
CAPITAL COSTS / IMPLEMENTATION	
Capital Costs	<ul style="list-style-type: none"> Total capital costs
Cost-Effectiveness	<ul style="list-style-type: none"> Lifecycle operating & capital cost per user
Ability to Phase Improvements / Complexity	<ul style="list-style-type: none"> Qualitative assessment
COMMUNITY SUSTAINABILITY	
Streetscape Quality	<ul style="list-style-type: none"> Increase in public space and street trees/landscaping
GhG Emissions from Transportation	<ul style="list-style-type: none"> GhG emissions in corridor, Progress toward city goals
Safety	<ul style="list-style-type: none"> Qualitative assessment of anticipated increase or decrease in traffic crashes
Restrictions on Access	<ul style="list-style-type: none"> Restrictions on turning movements and business access



For more information about the East Arapahoe Transportation Plan, please contact:

Jean Sanson | Senior Transportation Planner
303.441.4106
email: sansonj@bouldercolorado.gov