CITY OF BOULDER
TRANSPORTATION ADVISORY BOARD
AGENDA ITEM

MEETING DATE: January 12, 2015

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

PRESENTERS: Michael Gardner-Sweeney, Acting Director of Public Works for Transportation
Kathleen Bracke, GO Boulder Manager
Randall Rutsch, Senior Transportation Planner
Natalie Stiffler, Transportation Planner II

EXECUTIVE SUMMARY

The purpose of this agenda item is to provide a briefing to the Transportation Advisory Board (TAB) on the status of the Envision East Arapahoe corridor transportation analysis, to obtain TAB's input to develop materials for the upcoming community outreach process in February, and the City Council Study Session scheduled for February 24, 2015.

TAB ACTION REQUESTED

Key Questions for the TAB:

1. Does TAB have any questions regarding the initial transportation analysis for the EEA corridor?
2. Does TAB have any suggestions for enhancing and/or clarifying the materials prior to the upcoming community outreach planned in early February?

BACKGROUND

In 2014, the City of Boulder launched the Envison East Arapahoe (EEA) project with the community to reimagine East Arapahoe and develop an integrated land use and transportation plan for the corridor.

Staff from Community Planning & Sustainability (CP&S) and Transportation provided an in depth update to TAB regarding the EEA project in September 2014. At the September 2014 TAB meeting, information was shared regarding the Envision East Arapahoe project background, general planning approach, and project timeline. See the September 2014 TAB Agenda for more information at https://documents.bouldercolorado.gov/weblink8/0/doc/126973/Electronic.aspx.

The TAB was asked to provide feedback on the vision elements, indicators, concepts for scenarios, and the guiding principles for developing transportation connections.

Progress on the EEA project since Fall 2014 includes refining and testing the scenarios based upon technical analysis, board feedback, community input, and guidance provided by City Council at the October 2014 City Council Study Session.

The Envision East Arapahoe land use scenarios include:

- **Scenario A: Current Trends** – continuing to develop with current uses carrying forward
- **Scenario B: Districts** – looked at increasing services in strategic locations along the corridor to serve the existing industrial and office uses and substituting a small amount of the employment growth with residential
- **Scenario C1: Housing Choices** – explored increasing residential opportunities and supplementing services for office and industrial growth in strategic locations in varying degrees
- **Scenario C2**: **Housing Choices** – same as Scenario C1 with an increase in both jobs and housing options

Please see Attachment C for details of Envision East Arapahoe scenarios

STAFF ANALYSIS

New work since Fall 2014 includes refinement of the future land use scenarios, the initial transportation analysis associated with each future scenario, developing visualizations to show the potential land use and transportation options at key locations along the corridor, and incorporating community input from public meetings held in November and December 2014.

Staff is seeking input from TAB, Planning Board, and Boulder Design Advisory Board in January 2015 on this information and the board feedback will be used to refine the project information for the upcoming community outreach and City Council Study Session in February 2015.

Envision East Arapahoe Transportation Analysis

The transportation analysis is considered preliminary and in draft form. In summary, all of the future land use scenarios, noted above, are workable from a multimodal transportation perspective. Each of the scenarios can work with a variety of multimodal transportation options such as protected bikelanes, transit enhancements for bus rapid transit and local transit, as well as potential future street and multi-use path connections, including consideration of extending Walnut Street across Boulder Creek to connect with 48th Court. See Figure 1 included in Attachment A.

Scenarios C1 and C2 have varying degrees of change particularly on the east end of the corridor, with C2 reflecting more intense infill and redevelopment. There is very little change on the west end of the corridor for any of the future land use scenarios. Based on the initial analysis, each scenario can work with a potential repurposing of lanes and roadway width to accommodate arterial BRT (side or median running).

The EEA scenarios are also being evaluated based on the underlying principles and measurable objectives of the Transportation Master Plan (TMP) such as vehicle miles traveled (VMT), mode share goals, person miles traveled, and opportunities to enhance 15 minute walkable neighborhoods. More detailed analysis is underway regarding additional multimodal transportation operations and safety analysis.

The preliminary transportation analysis shows that for all future scenarios, there is an increase in the number of people moving through the corridor and internal to the study area using all modes, particularly increasing use of transit, walking, and biking as there are more opportunities to live, work, shop, and enjoy entertainment/recreation opportunities within the corridor area. The scenarios provide comparable levels of mode share for autos, transit, bike and walk among them, with C2 providing a larger increase of bike, walk, and transit. Attachment A provides more details of the initial transportation analysis developed by the city's consultant team, including Nelson Nygaard and Fox Tuttle Hernandez.

COMMUNITY ENGAGEMENT

A public workshop was held in October and two neighborhood listening sessions were held in November and December to gain additional feedback from the community on the scenarios. Community members discussed the type of housing, businesses, and transportation connections they would like to see in the future and expressed concerns about potential changes to the corridor. The majority of public comments regarding transportation included:

- Concerns with existing traffic congestion on East Arapahoe and other streets within the project area such as Cherryvale
- Concerns that future land use changes along the corridor will increase traffic on East Arapahoe as well as divert traffic to local side streets.
- Desire to slow vehicle speeds on Arapahoe
- Encourage BRT/transit, biking, and walking
- More frequent transit and better transit connections (locally and regionally)
- Opportunity for buffered bike lanes/bike improvements
- Move people not cars
- Neighborhood based Ecopass in East Arapahoe
- More B-cycle stations and bicycle connections
- Create more15-minute walkable neighborhoods by improving connections and/or adding neighborhood commercial destinations (shopping, dining, etc.)
- Needs big reduction in surface parking - major impediment to bikes and pedestrians
- Safety concerns at major intersections along corridor, including difficulties crossing Arapahoe as a pedestrian

Many of the public comments that staff heard resonate with the overall principles found in the Transportation Master Plan (TMP) and the transportation principles identified earlier as part of the EEA planning process. More detailed comments received through the Envision East Arapahoe community engagement process can be viewed at the project website: https://bouldercolorado.gov/pages/east-arapahoe-planning-project.

NEXT STEPS

- Board input from TAB, Planning Board, and BDAB (January 2015)
- Meetings with Colorado Department of Transportation, Boulder County, RTD, and other agency partners (January/February 2015)
- Envision East Arapahoe public meeting February 4th plus additional community outreach to neighborhoods, businesses/employers/employees as well as on-line/web based options (February)
- City Council Study Session (February 24, 2015)
- Staff will provide a follow-up briefing to TAB at the February board meeting to share feedback from the February 4th public meeting.
- Based on input from community, Boards, and City Council, staff will prepare draft plan recommendations and potential strategies/action items to advance the goals of the Envision East Arapahoe corridor, likely including a range of short-term and long-range action items regarding land use and transportation related elements.
- Results from the Envision East Arapahoe corridor plan will be used to inform the future regional SH7 BRT study in collaboration with Boulder County and other regional partners (TIP funding for the SH7 BRT corridor study pending approval by DRCOG).

BOARD ACTION REQUESTED

The TAB is requested to provide input on the EEA Transportation Analysis. Specifically:

1. Does TAB have any questions regarding the initial transportation analysis for the EEA corridor?
2. Does TAB have any suggestions for enhancing and/or clarifying the materials prior to the upcoming community outreach planned in early February?

Attachments:

A. Envison East Arapahoe Preliminary Transportation Analysis Materials (DRAFT)
B. Case Studies of Arterial Bus Rapid Transit
C. Envision East Arapahoe land use scenarios

Attachment A: Envision East Arapahoe Corridor – Transportation Analysis (Draft January 2015)

The preliminary transportation analysis shows that for all future scenarios, there is an increase in the number of people moving through the corridor and internal to the study area using all modes, particularly increasing use of transit, walking, and biking as there are more opportunities to live, work, shop, and enjoy entertainment/recreation opportunities within the corridor area. The scenarios provide comparable levels of mode share for autos, transit, bike and walk among them, with C2 providing a larger increase of bike, walk, and transit.

Multi-modal Transportation Projections:

Land Use and Travel Projection Modeling

- The project team has developed a series of multi-modal travel projections for the Envision East Arapahoe corridor. The study area was divided up into 17 transportation analysis zones (TAZs) and land use information (population and employment) for existing and future scenarios were developed for each TAZ.
- A trip generation model (previously utilized for the TMP update) was updated to project the multi-modal trips for each TAZ in the EEA study area.
- It is important to note that the travel projections for each future scenario have assumed that arterial bus rapid transit (BRT) has been implemented in the Arapahoe Avenue corridor by the year 2035. This assumption is consistent with the goals of Boulder's recent TMP update, and is also consistent with the recommendations of the recent RTD NAMS study.
- An automobile trip distribution and assignment model was developed to distribute the auto trips from each zone to the other TAZs in the study area and to the rest of Boulder and surrounding communities, and then assign those trip interchanges to the roadway links in the EEA corridor.

Key Findings – Transit, Bicycle, and Pedestrian Travel

- Transit
    - There is a 155% increase in transit ridership in the future business as usual scenario (A) relative to existing ridership, reflecting introduction of BRT service and other projected transit service improvements included in the TMP. This is a nearly 85% increase in transit mode *split* relative to existing (from less than 1.5% to under 2.5%).
    - In future scenarios B and C1, there is a 155% to 215% increase in transit ridership relative to existing. In C2, there is a 160% to 250% increase in ridership, reflecting the greater residential population and density in this scenario.
        - There is about a 65% to 125% increase in transit mode *split* (nearly 2.5% to 3.0%) relative to existing (depending on the scenario).
        - There is about a 20% increase in transit mode split relative to business as usual for Scenarios B, C1, and C2.
    - Scenario C1 has a slightly higher transit mode split than Scenarios B or C2.
    - The increase in transit mode split in the future scenarios reflects the planned opening of Boulder Junction and US 36 BRT service, new BRT service along Arapahoe, and other local transit service improvements recommended in the TMP.

- Bicycle and Pedestrian
    - There is a nearly 30% increase in bike/ped mode split relative to existing conditions in the business as usual future year scenario (from 18% to 23%).
    - The bike/ped mode split increases to up to 30% in the other future year scenarios (B, C1, and C2). Relative to the future business as usual scenario, this is about a 20% increase for Scenario B and C1 and about a 25% increase for Scenario C2.
    - Scenario C2 has a slightly higher bike/ped mode split than Scenarios B or C1.
    - The increase in bicycle and pedestrian mode split in the future scenarios reflects an increase in relatively short trips (for example, biking or walking to lunch or an errand) within the study area. These types of trips are typical of a balanced mix of diverse uses that attracts walking and neighborhood activity.

	Estimated Mode Split		Change from Existing		Change from A	
	Transit	Bike Ped	Transit	Bike Ped	Transit	Bike Ped
Existing	1.3%	18%	-	-	-	-
2035 Scenario A	2.4%	23%	84%	28%	-	-
2035 Scenario B	2.3 - 2.9%	28 - 29%	76 - 118%	52 - 55%	19%	19 - 22%
2035 Scenario C1	2.4 - 3.0%	28%	81 - 123%	52 - 55%	21%	19 - 21%
2035 Scenario C2	2.2 - 2.9%	29 - 30%	63 - 119%	58 - 62%	19%	24 - 27%

Key Findings – Automobile Travel

Volume and Capacity

- Existing and projected daily automobile traffic has been illustrated at 19 roadway links in the EEA study area on Figure 2.
- Daily traffic on Arapahoe currently ranges between 31,000 vehicles per day (vpd) on the west end of the corridor (near 28th Street) to approximately 20,000 vpd on the east end (east of 63rd Street)
- Currently the level of service (LOS) during the AM and PM peak hours for the east-west through lanes on Arapahoe Avenue are in the B through D range, depending on the intersection and peak travel direction. This level of congestion is typically considered to be good and acceptable for travel during peak periods of the day.
- The city has an on-going program to monitor travel times across Boulder in key arterial roadway corridors during peak hour traffic conditions. Currently it takes approximately 8 minutes and 15 seconds to drive on Arapahoe through the study area between Folsom Street and 65th Street. This information is detailed in Table XX. Travel times in the Arapahoe Avenue corridor have been relatively stable (little change from year to year) since the city began monitoring this corridor in 1987 (excluding years influenced by construction activity).
- A tabular subset of this information is included in Table QQ, which also includes the percent change in traffic relative to today, and relative to the "business as usual" Scenario A.

- Currently in the majority of the EEA corridor, Arapahoe Avenue has three through travel lanes in each direction, plus turn lanes at intersections.
- It is assumed that when BRT service is implemented, one of the existing through travel lanes in each direction will be dedicated to the BRT operations. It is not clear yet whether the BRT service will be "side running" along the outer edges of the roadway, or "center running" along the middle of the roadway (or some combination), and there are many details to be worked out regarding stop placement, interaction with automobile turning traffic, etc. What is clear, however, is that the automobile portion of the corridor would be reduced to two through lanes in each direction for most of the corridor. This will in effect make Arapahoe Avenue a 4-lane arterial roadway for automobiles.
- An exception is between 55th Street and Cherryvale Road where there are currently three westbound lanes, but only two eastbound lanes. This segment will require careful consideration with BRT implementation, and some widening may be required.
- Depending on the segment within the corridor, Arapahoe Avenue currently carries daily traffic in the 20,000 to 32,000 vehicles per day (vpd) range.
- It can be seen in Table C and on Figure 2 that the projected Year 2035 daily traffic volume on portions of Arapahoe Avenue range between 26,000 and 40,000 vehicle trips per day depending upon the scenario and segment, with Scenario C2 being the highest in all cases.

Automobile Vehicle Miles of Travel and Person Miles of Travel in Automobiles

- Currently there are approximately 89,000 automobile vehicle miles of travel (VMT) occurring daily on Arapahoe Avenue between Folsom Street and 65th Street (both directions combined) as detailed in Table B. It is projected that the year 2035 VMT in the corridor will increase by 25% in Scenario A, 17.5% in Scenario C1, and nearly 32% in Scenario C2 relative to existing traffic.
- By comparing corridor VMT between the future year scenarios, it can be seen that Scenario B will generate approx. 97% of the VMT in the "business as usual" Scenario A. Scenario C1 would generate approx. 93% and Scenario C2 would generate approx. 105% of the VMT in Scenario A.
- Person miles of travel in automobiles (APMT) have also been calculated in Table YY by using an average auto occupancy factor of 1.4 persons per vehicle. This calculation, when combined with the pedestrian, bicycle and transit travel estimates that are being prepared, will allow a true measure of multi-modal mobility in the East Arapahoe corridor.

Level of Service and Travel Time

- Studies are on-going to evaluate the peak hour intersection operation and level of service (LOS) at key corridor intersections for the various land use scenarios and BRT combinations. These calculations will allow detailed conversations between city transportation planners, RTD, CDOT, etc. as planning for future BRT implementation proceeds.
- When the LOS calculations are complete, the end-to-end automobile travel time will be calculated for each scenario and compared to the existing travel times illustrated in Table A.

- The daily traffic capacity of a four lane urban arterial roadway is generally considered by traffic engineers to be approximately 35,000 vehicle trips per day (8,500 to 9,000 vehicle trips per day per lane); although there are many examples throughout the region where 4-lane arterials carry more traffic. For comparison, in Boulder, 28th Street south of Iris currently carries over 30,000 vehicles per day on four through lanes, and 28th Street in the vicinity of Colorado (with two northbound lanes and three southbound lanes) currently carries nearly 45,000 vpd. These examples illustrate per lane traffic volumes in the approximate range projected on Arapahoe Avenue for the scenarios being considered.
- Note that the planned center running BRT service on Van Ness Avenue in San Francisco is projected to also carry 42,000 vpd on four general purpose automobile lanes when completed.

Walnut Street Extension Across Boulder Creek and Connection to 48th Street

- Currently the east end of Walnut Street extends beneath Foothills Parkway (no access) and terminates in a "dead end" on the west side of Boulder Creek. There is no outlet to the south for at least 1/3 mile back to 38th Street, and no outlet to the north back ¾ mile to 30th Street. This results in very inefficient access to the businesses in this area today.
- Local access would be greatly improved on both sides of Boulder Creek if Walnut Street were extended east across Boulder Creek and then south to connect with the northern terminus of 48th Ct, just north of the Boulder Community Hospital site. The increased connectivity in the area would result in a reduction in local VMT, shorter and quicker emergency access for some areas of the City, and a reduction in traffic that currently must negotiate the busy Foothills/Arapahoe intersection.
- This connection would facilitate the expanding need for medical office space in the area in support of the relocation of the main Boulder Community Hospital to this eastern medical campus if the current land use and environmental obstacles can be overcome.
- A previous study had projected that this connection would serve 4,200 vehicle trips per day. A review of the land use projections utilized in that analysis indicate that the anticipated future housing and employment is in the range of the current land use projections in Scenarios A though C2 currently being considered.
- Given the current medical office use need and the current housing and employment projections, it is estimated that the new Walnut Street extension to 48th Ct. would carry 4,000 to 6,000 vehicle trips per day. All of these trips would be traveling on a more efficient route than exists today.
- The new connection across Boulder Creek would provide for more efficient on-street bicycle connections in the area, and would also be available to serve future expansion in local transit service.
- While this connection would provide definite local travel efficiency improvements, it is not anticipated that it will serve or attract regional cut-through traffic, given that the travel speeds will be low and the connection is circuitous between the Walnut St. /30th St. and Arapahoe/48th Ct. intersections. Regional or non-local traffic will remain on the arterial roadway network.

- Other non-transportation related impacts associated with the extension of Walnut Street will be addressed through separate analysis.

In the next phase of the project a technical memorandum will be prepared to detail all key assumptions and methodologies relating to this multi-modal transportation analysis for the EEA project.

Table A

Envision East Arapahoe

Automobile Travel Time and Delay Comparison On Arapahoe Avenue

Folsom Street to 65th Street (Both Directions Averaged)

Year	Development Scenario	Corridor Length	Drive Time	Average Travel Speed	Average Time Stopped	Travel Time Comparison to Existing (% increase)	Travel Time Comparison to Scenario A (% increase)
2010	Existing	3.3 miles	8 min. 15 sec.	24.2 mph	2 min 37 sec	n/a	n/a
2035*	A						n/a
2035*	B						
2035*	C1						
2035*	C2						

* The Year 2035 travel times in this table all assume that arterial Bus Rapid Transit (BRT) has been implemented in the corridor

Table B

Envision East Arapahoe

Automobile Vehicle Miles of Travel (VMT) in the Arapahoe Corridor

AND

Person Miles of Travel in Automobiles (APMT)in the Arapahoe Corridor

Folsom Street to 65th Street (Both Directions Combined)

Year	Development Scenario	Vehicle Miles of Travel (VMT)	Average Auto Occupancy**	Person Miles of Travel in Automobiles (APMT)	Automobile Person Miles of Travel Comparison to Existing (% increase)	Automobile Person Miles of Travel Comparison to Scenario A (% increase)
2010	Existing	89,241	1.4	124,937	n/a	n/a
2035*	A	112,233	1.4	157,126	25.8%	n/a
2035*	B	108,746	1.4	152,244	21.9%	-3.1%
2035*	C1	104,859	1.4	146,803	17.5%	-6.6%
2035*	C2	117,633	1.4	164,686	31.8%	4.8%

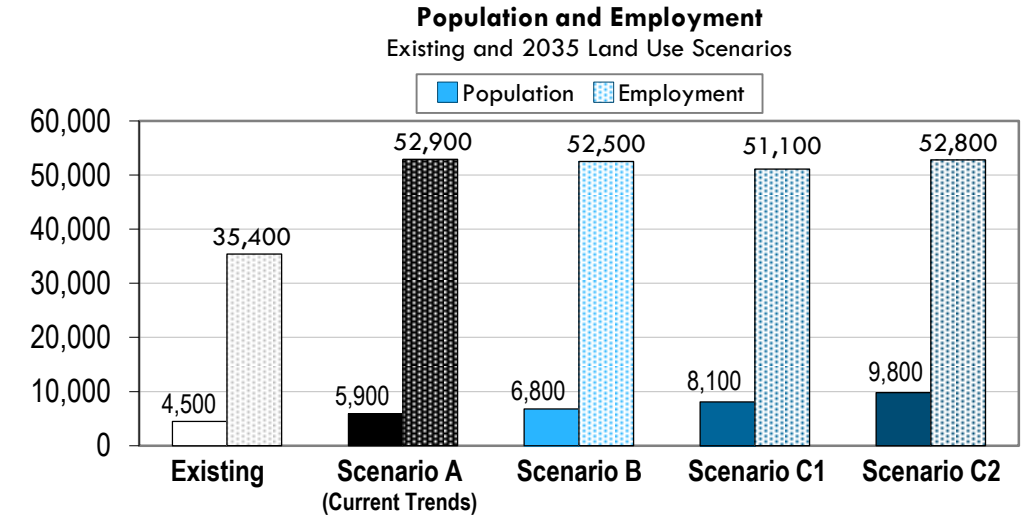
* The Year 2035 travel times in this table all assume that arterial Bus Rapid Transit (BRT) has been implemented in the corridor

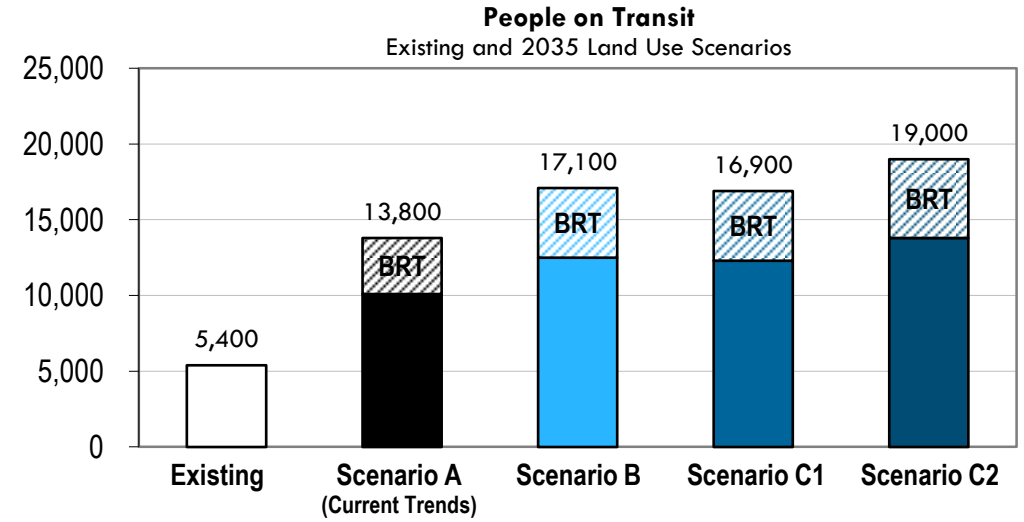
** Source: Estimate based on recent Boulder Valley Travel Surveys with resident non-work travel at 1.5 persons per auto and employee travel with 1.1 persons per auto

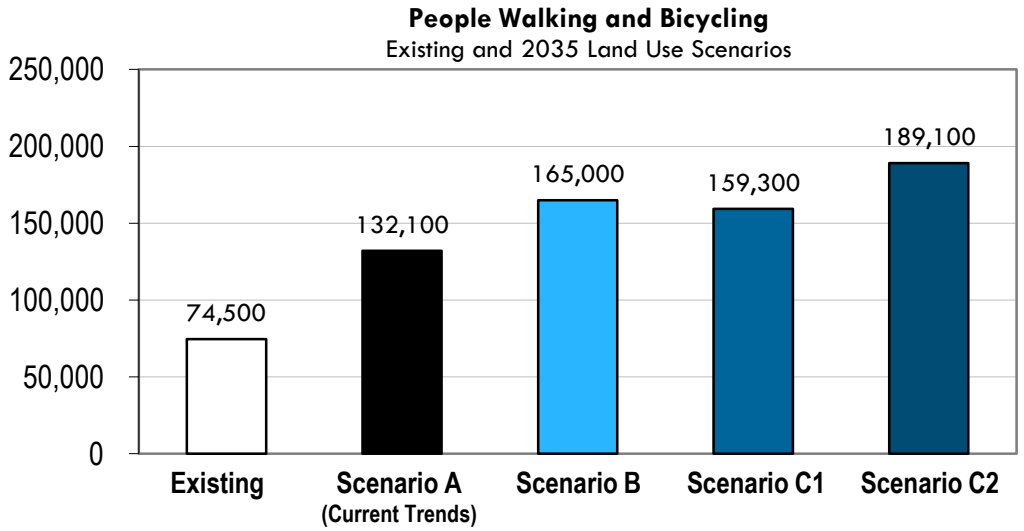
Table C
Envision East Arapahoe
Existing and Projected Daily Automobile Traffic Volumes at Select Corridor Links

Node / Location:	4 / Arapahoe East of 28th St.			8 / Arapahoe West of Foothills Parkway			15 / Arapahoe E. of 55th St.		
	Average Daily Traffic (ADT)	ADT Comparison to Existing (% Increase)	ADT Comparison to Scenario A (% Increase)	Average Daily Traffic (ADT)	ADT Comparison to Existing (% Increase)	ADT Comparison to Scenario A (% Increase)	Average Daily Traffic (ADT)	ADT Comparison to Existing (% Increase)	ADT Comparison to Scenario A (% Increase)
Existing Traffic:	31,000	n/a	n/a	32,100	n/a	n/a	26,200	n/a	n/a
Year 2035 Scenario A:	35,800	15%	n/a	37,100	16%	n/a	35,600	36%	n/a
Year 2035 Scenario B:	35,500	15%	-1%	37,100	16%	0%	33,500	28%	-6%
Year 2035 Scenario C1:	34,800	12%	-3%	36,200	13%	-2%	31,900	22%	-10%
Year 2035 Scenario C2:	36,800	19%	3%	38,100	19%	3%	38,000	45%	7%

Figure 1


Population and Employment
Existing and 2035 Land Use Scenarios
Population
Employment
60,000
50,000
40,000
30,000
20,000
10,000
0
4,500
35,400
5,900
52,900
6,800
52,500
8,100
51,100
9,800
52,800
Existing
Scenario A (Current Trends)
Scenario B
Scenario C1
Scenario C2


People on Transit
Existing and 2035 Land Use Scenarios
25,000
20,000
15,000
10,000
5,000
0
5,400
13,800
BRT
17,100
BRT
16,900
BRT
19,000
BRT
Existing
Scenario A (Current Trends)
Scenario B
Scenario C1
Scenario C2


People Walking and Bicycling
Existing and 2035 Land Use Scenarios
250,000
200,000
150,000
100,000
50,000
0
74,500
132,100
165,000
159,300
189,100
Existing
Scenario A (Current Trends)
Scenario B
Scenario C1
Scenario C2

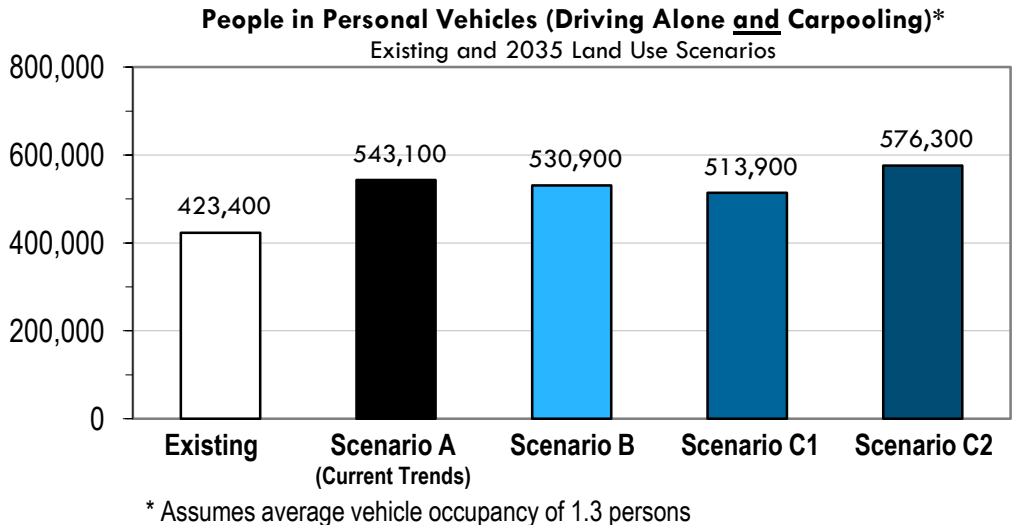
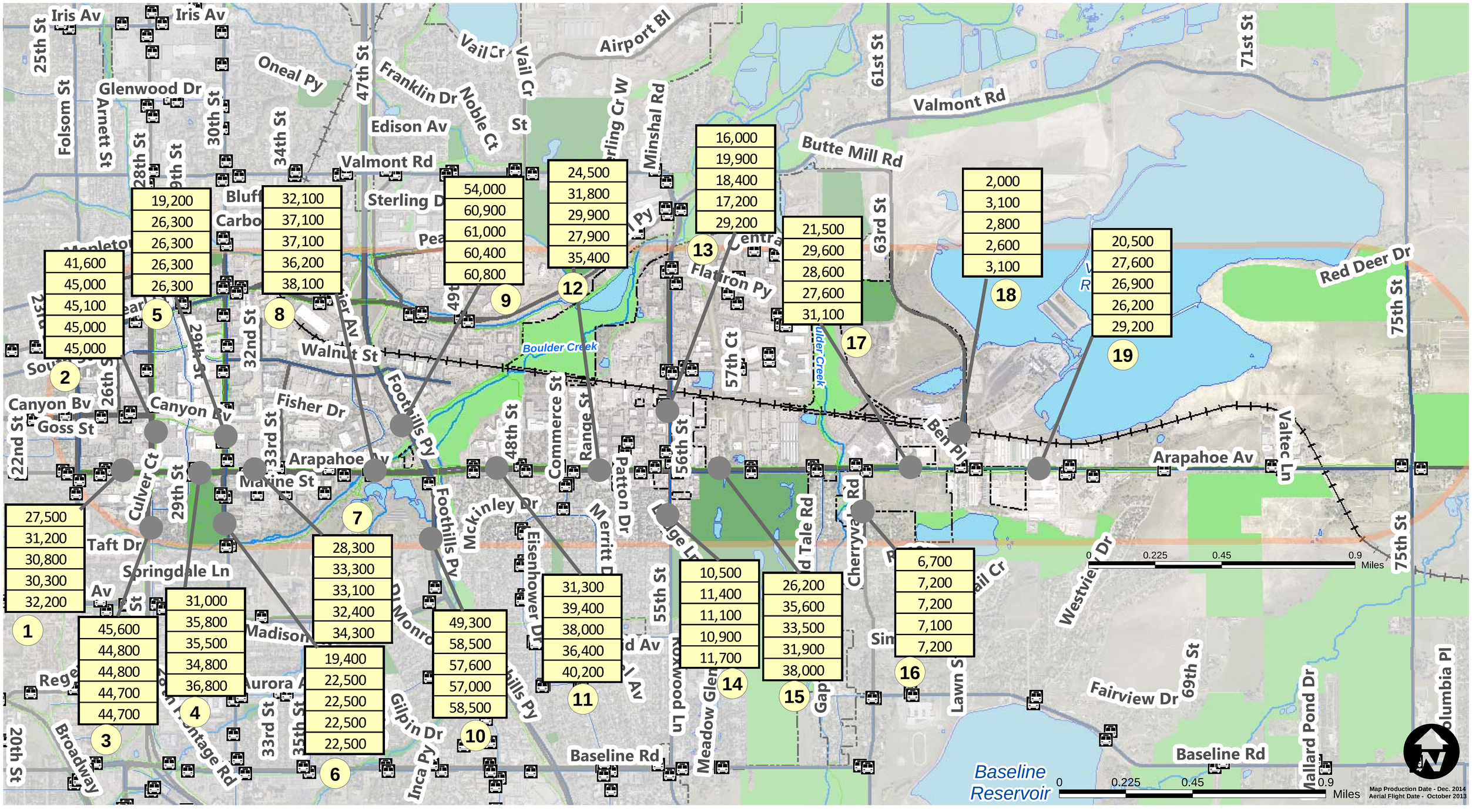

People in Personal Vehicles (Driving Alone and Carpooling)*
Existing and 2035 Land Use Scenarios
800,000
600,000
400,000
200,000
0
423,400
543,100
530,900
513,900
576,300
Existing
Scenario A
(Current Trends)
Scenario B
Scenario C1
Scenario C2
* Assumes average vehicle occupancy of 1.3 persons

Figure 2



Key:

Existing
2035 Scenario A
2035 Scenario B
2035 Scenario C1
2035 Scenario C2

Node # 1

Daily Automobile Traffic Map
East Arapahoe Corridor

Envision East Arapahoe

CASE STUDIES OF BRT ON MAJOR ARTERIAL STREETS

BRT Development in San Francisco, CA

- San Francisco is developing two major BRT corridors along Van Ness Ave. and Geary Blvd.
- Voters mandated BRT on Van Ness and Geary in 2003
- Both projects will incorporate all-door boarding, pre-paid fares, dedicated transit lanes, and signal priority

Van Ness Corridor

Corridor Description:

- **Length/Extent**: Two miles, Mission to Lombard Streets
- **Current Average Daily Traffic (**2009 observed): Van Ness corridor carries 38,000 - 55,000 vehicles per day
- **2015 Average Daily Person Trips (without project)**:
  - Van Ness @ McAllister: 68,722 auto-person trips and 16,560 transit-person trips
- **2035 Average Daily Person Trips (with project)**:
  - 2035 LPA Van Ness @ McAllister: 82,343 auto-person trips and 18,166 transit-person trips
- **Street Characteristics**: Six lanes with a planted median and on-street parking along sections
- **Existing Transit**: Muni local routes 47 and 49 and Golden Gate Transit commuter routes carry 43,000 daily riders including 16,000 within the project area
- **BRT Design:** Hybrid of median and side-running, with two traffic lanes converted to bus-only operations
- **Jurisdiction**: Van Ness Avenue is State Highway 101 requiring coordination with CalTrans
- **Estimated Cost**: $162 M (core BRT project); $250 M (including separate but related projects)
- **Project Status**: Completed environmental review in 2013 and currently moving into the design and implementation phase

Project Benefits/Impacts:

- **Transit Travel Time and Reliability:** Travel time reduced by 32% and up to 50% reduction in travel time variability
- **Projected Ridership:** Greater than 60,000 daily rides (2035)
- **Bicycle and Pedestrian Improvements:** No bike facilities on Van Ness; Polk Street protected bicycle lanes are one block to the east (related project). Safety and aesthetic upgrades
- **Parking:** Loss of about 100 parking spaces along the corridor
- **Traffic:** SFGo real-time signal optimization to improve traffic flow for all users

Image source: SFCTA

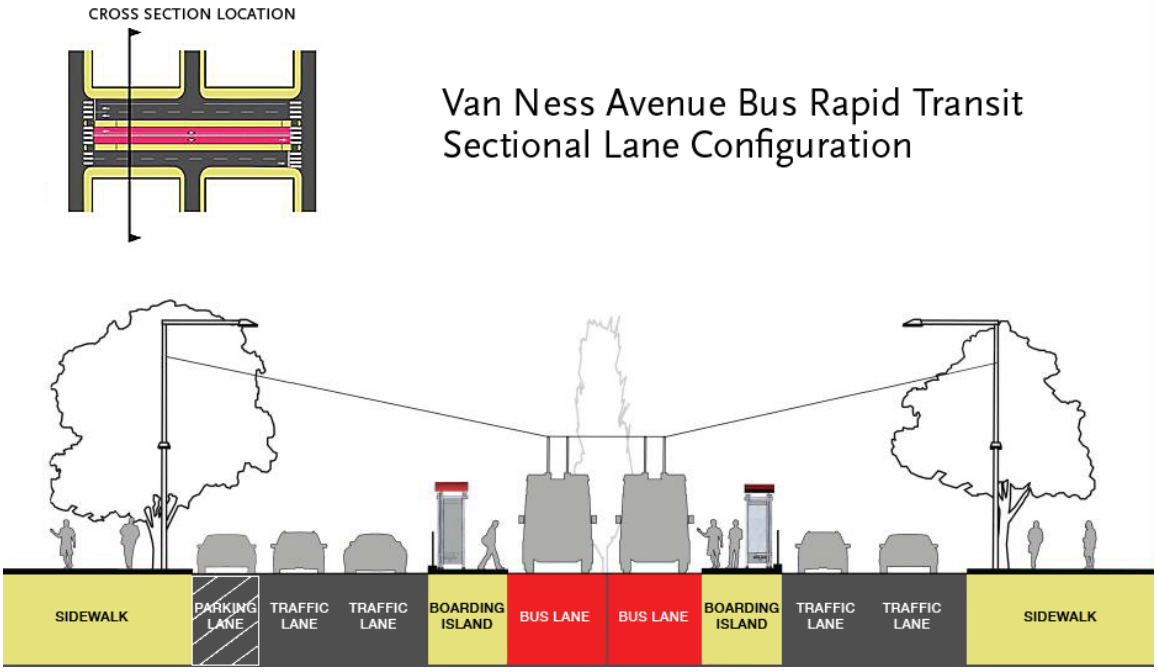


Image source: SFCTA

Image source: SFCTA

Image source: SFCTA

Geary Boulevard Corridor

Corridor Description:

- **Length/Extent**: 6.5 miles, Market Street to 48th Avenue (western edge of the city)
- **Current Average Daily Traffic**: 32,900 – 43,200 (2009)
- **2035 Average Daily Traffic**: Geary @ Lyon:
  - No-Build (without project): 54,300
  - Alternatives range from 30,100 to 45,600
- **Street Characteristics**: Western section: six lanes to eight lanes with a planted median, on-street parking, and underpasses; eastern/downtown section: three lanes and on-street parking on one or both sides in sections. Bus-only lane in downtown section.
- **Existing Transit:** Muni routes 38, 38L, 38AX, 38 BX, NX, 31AX, and 66 and Golden Gate Transit commuter route 92 carry about 80,000 daily riders
- **BRT Design:** Center or side-running, in dedicated lanes or mixed-traffic, depending on the segment
- **Jurisdiction**: City
- **Projected Cost**: $225M - $260M
- **Project Status**: Planning phase with the project team working to identify a staff-recommended alternative to present for community feedback. Projected opening 2020 or later

Project Benefits/Impacts:

- **Travel Time and Reliability:** Up to 25% faster and 20% reduction in travel time variability
- **Projected Ridership**: Increase of over 10%
- **Bicycle and Pedestrian Improvements:** Bus bulbs and sidewalks/crossings. No bicycle improvements currently included in design
- **Parking:** About 20% reduction corridor-wide, less in key neighborhood centers

Image source: SFCTA

Image source: SFCTA

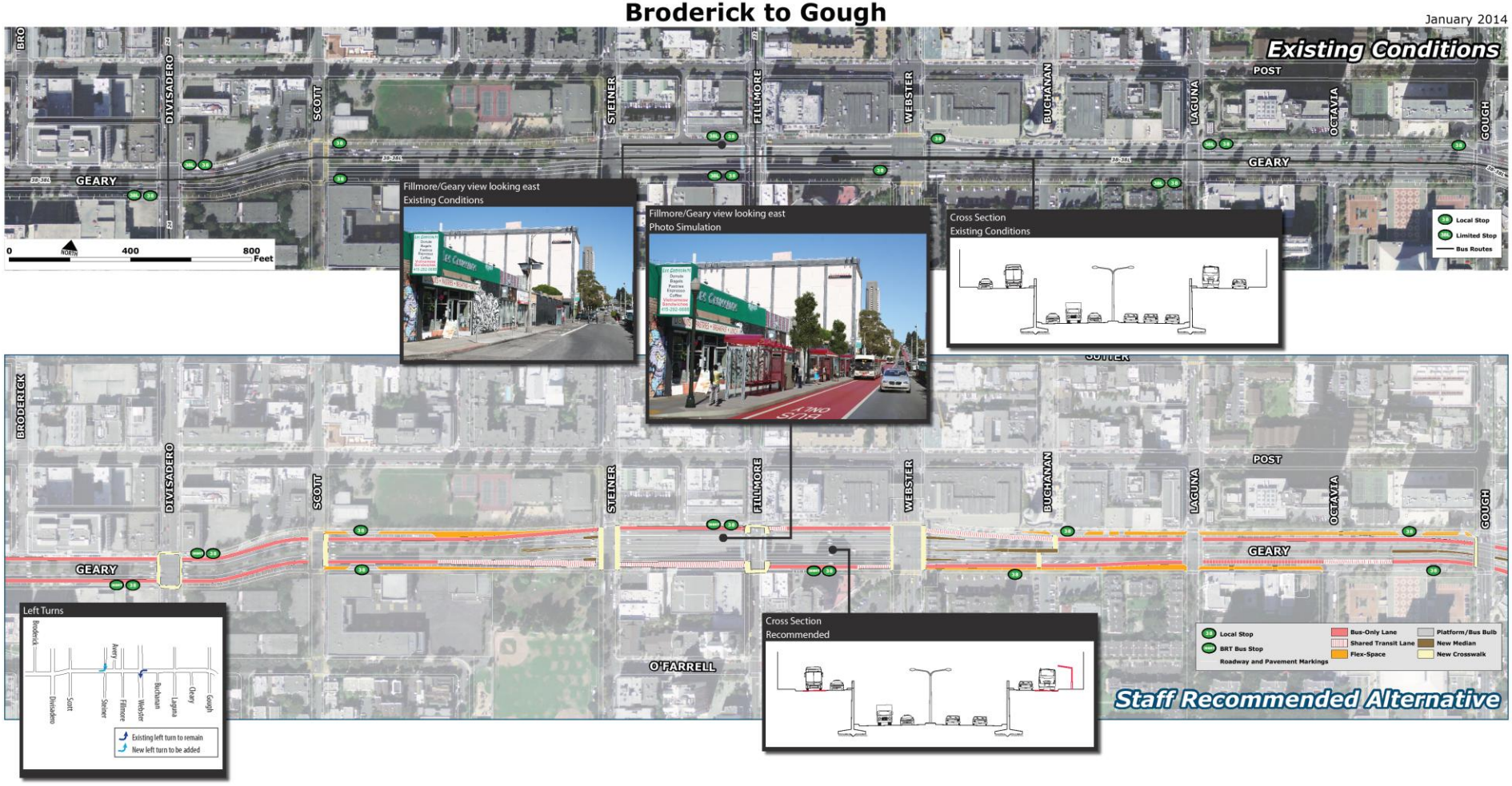


Image source: SFCTA

Fort Collins: TransFort MAX - Mason Corridor

Corridor Description:

- **Length/Extent**: 5 miles along Mason, from the Downtown Transit Center to the South Transit Center
- **Average Daily Traffic**: Before project, about 3,000 vehicles per day on sections with roads; about 30,000 ADT on nearby College Ave.
- **Street Characteristics**: BRT runs along Mason, two-lane concrete transit street built along rail corridor. One block from College Ave., a six-lane arterial with planted median. Northern section of College Ave. is four lanes with diagonal parking in the median and pull-in diagonal parking in both directions along the curb
- **Previous Transit:** No transit on Mason.
- **BRT Design:** 1.2 miles of mixed traffic operation to northern edge of Colorado State University and 3.8-miles of exclusive right-of-way to South Transit Center. Includes 250 park-and-ride spaces.
- **Jurisdiction**: City
- **Projected Cost**: $87 M
- **Project Status**: In operation

Project Benefits/Impacts:

- **Transit Travel Time and Reliability**: To be added
- **Projected Ridership**: 3,882 average weekday boardings
- **Bicycle and Pedestrian Facilities/Improvements:** multi-use trail included in project

Image source: Transfort

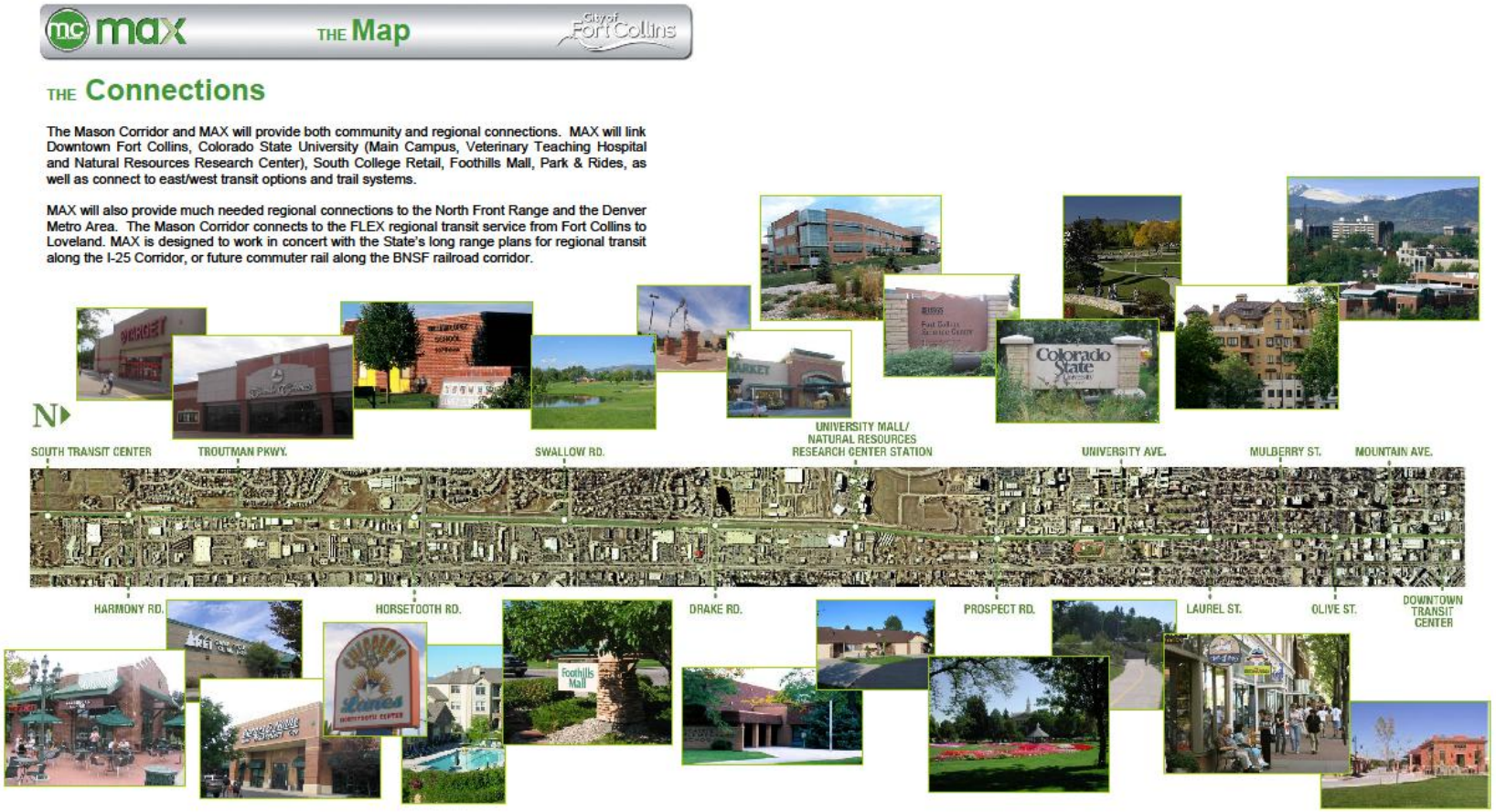


Image source: City of Fort Collins

Eugene, OR: Lane Transit EmX BRT - Franklin Corridor

Corridor Description:

- **Length/Extent**: Phase 1 (2007): 4 miles on Franklin Blvd., connecting Eugene and Springfield and serving the University of Oregon campus
- **Average Daily Traffic:** Before project - approximately 30,000 vehicles (2006). With project: approximately 22,000 vehicles (2012).
- **Street Characteristics**: Six lanes with a planted median in sections; BRT runs in median along Franklin Blvd.
- **Previous Transit Service**: LTD Route 11, with an average weekday daily ridership of 2,667 people
- **BRT Design:** Hybrid of median bus-only and mixed traffic operation with two traffic lanes converted to bus-only operations in sections
- **Jurisdiction**: Franklin is OR-99 and OR-126, requiring coordination with Oregon Department of Transportation
- **Cost**: Phase 1 (Franklin Blvd.) cost $24.5 M
- **Project Status**: Phase 1 and Phase 2 complete, Phase 3 in planning process

Project Benefits/Impacts:

- **Transit Travel Time:** Reduced average travel time by 1 minute and improved schedule reliability and on-time performance. About 60% of existing riders and former drivers perceived service as being faster.
- **Ridership**: Corridor ridership doubled (100% increase from previous service) within first year of operation. 2009 ridership: 37,137 passengers per weekday
- **Bicycle and Pedestrian Improvements:** Upgraded sidewalks and crossings near stations, improved bicycle access and faster loading/unloading on vehicles

Image source: Wikipedia

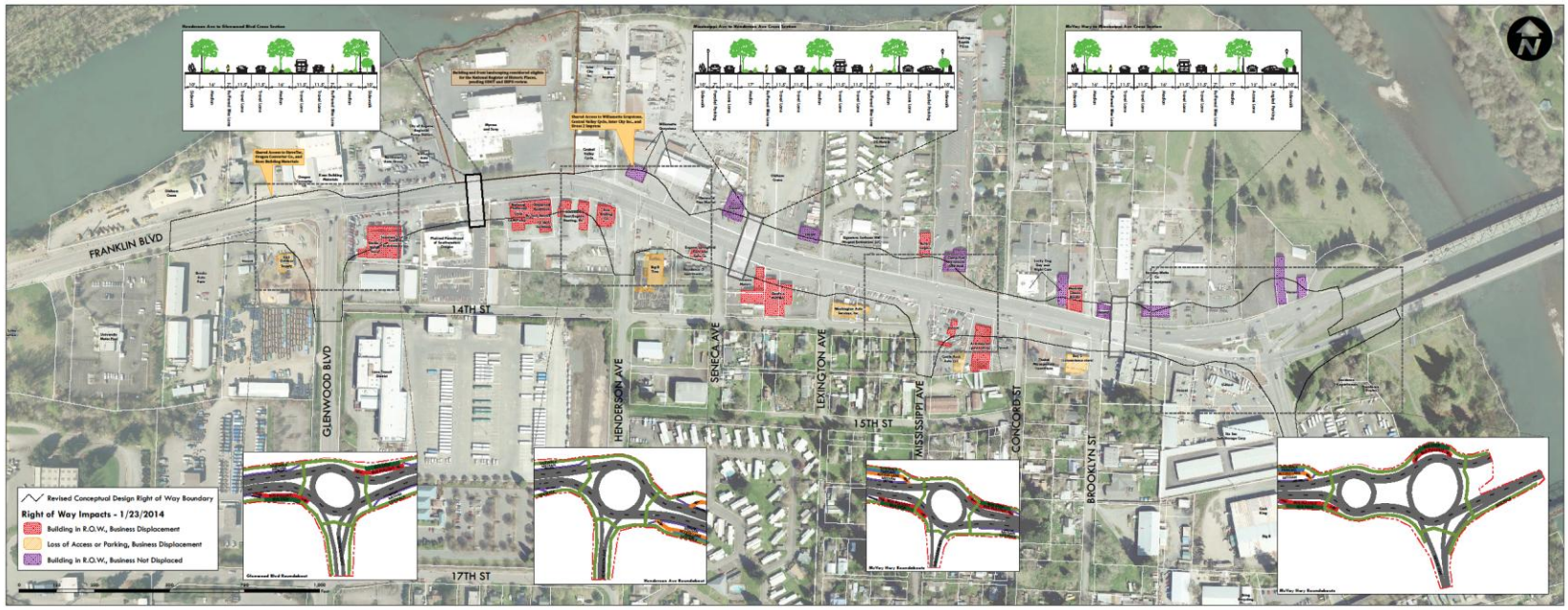


Image source: City of Springfield, OR

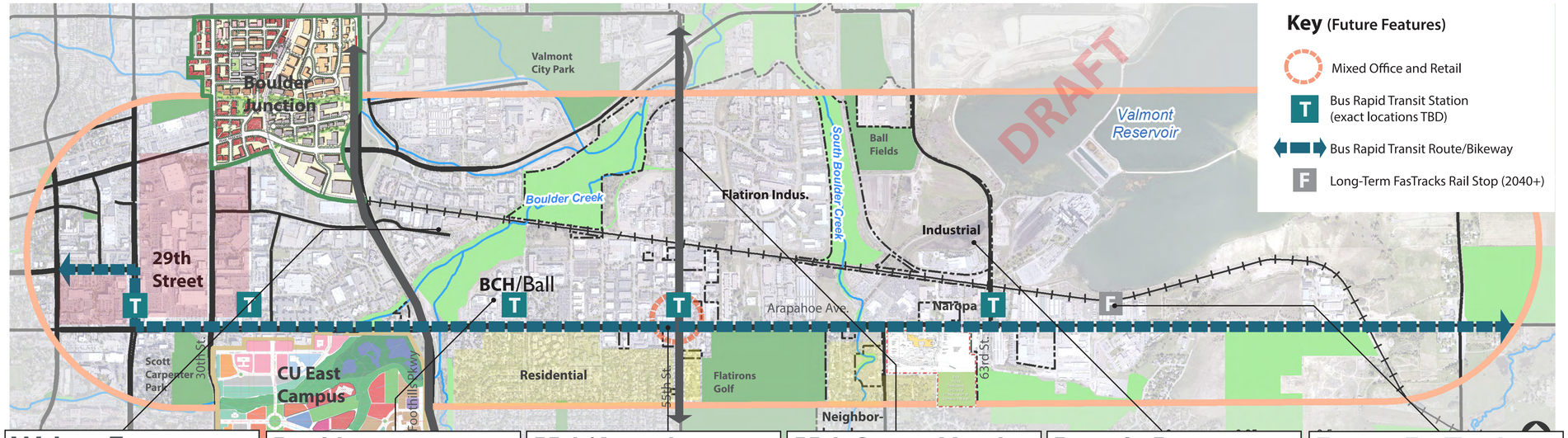
A. Current Trends Scenario

Continues the predominant light industrial trend with little change to infrastructure.

What are Key Features?

1. Light industry, low rise, suburban patterns of development with surface parking lots
2. Affordable service industrial, and places for storage units
3. Few places to eat or shop
4. No new housing on the north side of Arapahoe and south of Boulder Creek (between Foothills Parkway, city limits)
5. Low level of pedestrian and bicycle activity
6. People must drive to get around for daily needs
7. Few nearby outdoor public spaces to relax or recreate, except open space trails
8. Disconnected from other parts of the city

New land use potential is approx. 80% light industry (of potential 4,300 jobs).

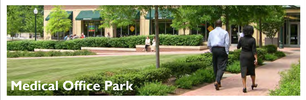


Walnut East

- Office Park

Boulder Community Health/ Ball

- Office
- Surface Parking

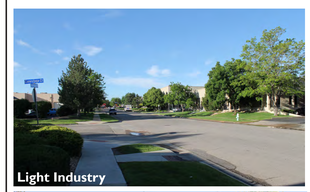


55th/Arapahoe

- Some Retail
- Light Industry
- Mobility Hub

55th Street North:

- Light Industry



Recycle Row

- Trucks and Industry

Future FasTracks (Long Term)

- Little to No Change

What other choices would you like to see?

B. Districts Scenario

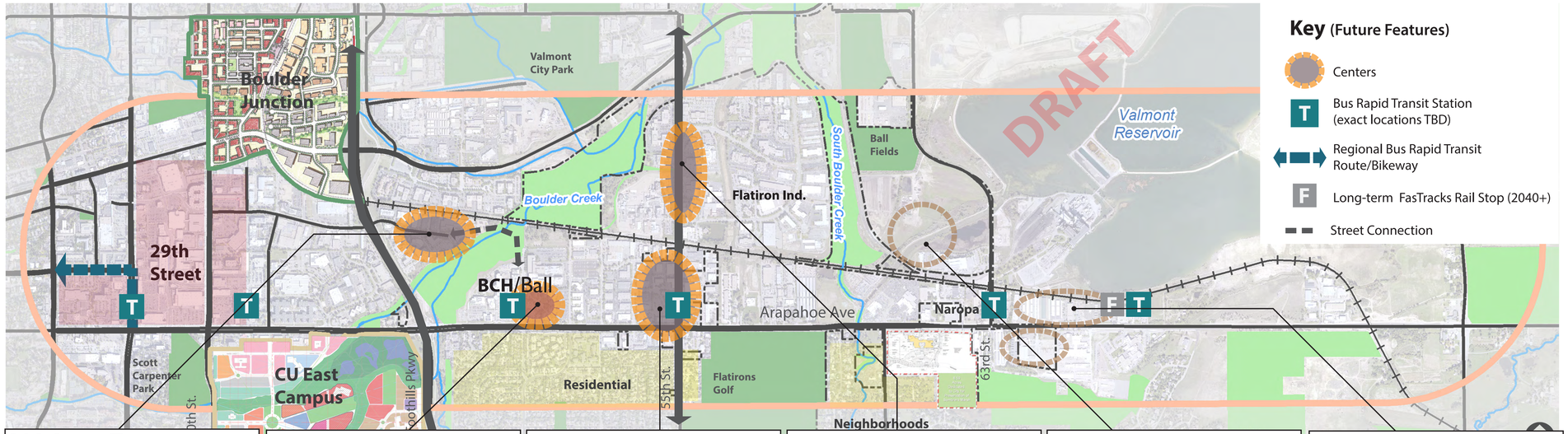
Becomes a place where existing organizations, industry, and business thrive, arts and entertainment are a destination, and neighborhood residents can access their daily needs. Has high level of street improvements at Arapahoe Ave. Intersections and possible new road connections and net zero energy districts.

What Are Key Features?

1. Health district around Boulder Community Health – medical-related office spaces
2. Arts and entertainment near 55th/Arapahoe – Dinner theater
3. Mixed retail, dining, office at 55th/ Arapahoe and along 55th Street
4. Improvements to sidewalks and intersections so people can walk safely and conveniently
5. Public spaces for people to recreate and relax (pocket parks, plazas, interior streets)
6. East/west connecting street (Walnut /48th St.)
7. Affordable service industrial along Arapahoe at the east end
8. More activity on the street as it is easier to travel by foot, bike, transit
9. Recycle Row more of a destination, location for energy generation, net zero (earth and sun power energy replaces fossil fuels)
10. Improved eastern gateway

New land use mix shifts from light industry to retail, office, and small amount of housing (<20%).

Most of the area will continue according to existing trends.



Walnut East

- Street Connection
- Medical related offices expand

Medical Offices


Medical Offices

Boulder Community Health/ Ball

- Medical Office, Retail
- Shared parking & amenities


Medical Offices

BCH/Ball Shared Amenities


Office/Retail

55th/Arapahoe

- Retail
- Services
- Some housing
- Arts and Culture
- Mobility Hub

Walkable Retail


Enhanced Ped Environment


Mobility Hub (Car/Bike Share)

55th Street North

- Office
- Retail to serve industrial park


Manufacturing/Retail


Manufacturing/Retail


Retail Reuse of Existing Structures

Recycle Row

- Ecodistrict
- Energy Generation
- Trucks and Industry


Recycling Center


Ecodistrict


Clean Energy Generation

Future FasTracks (Long Term)

- Future Gateway
- Mixed-use
- Edge parking

What other choices would you like to see?

CITY OF BOULDER

C. Housing Choices Scenario

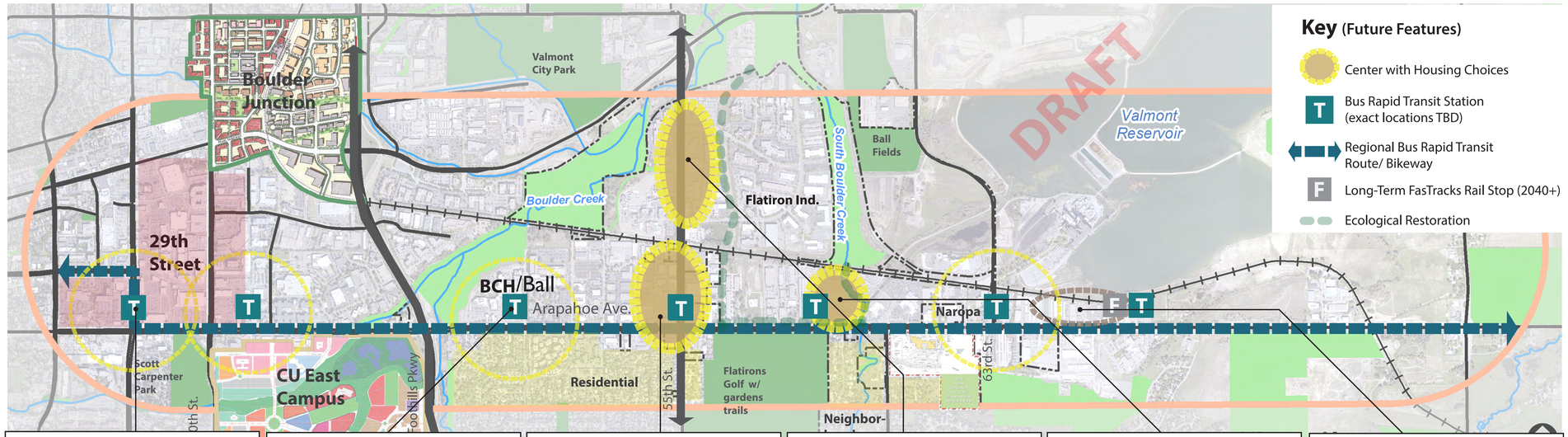
Becomes a place with new workforce and affordable housing in centers north of Arapahoe Ave., plus dining, shopping, arts and entertainment are within easy walking distance. Includes highest level of street improvements, beautification, and ecological restoration and connections to open space.

What Are Key Features?

1. Housing within a short (15-minute or less) walking distance from shops, dining, everyday needs and work (e.g., mixed districts with retail, dining, housing, and some offices
2. Affordable and workforce housing at 55th and Arapahoe and near South Boulder Creek
3. Housing intertwined with natural systems, with rain and snow melt feeding trees, landscapes, gardens, and ecological restoration
4. Golf course adds trails and community gardens
5. More public spaces for residents, inclusive for all
6. Boulevard with street trees, noise buffering, slower speeds (safe and friendly)
7. Many ways to get around easily
8. "Gateway" beatification east end of city
9. Net zero energy neighborhoods (renewable energy replaces fossil fuels)
10. City services in neighborhoods (e.g., parks access to nature)

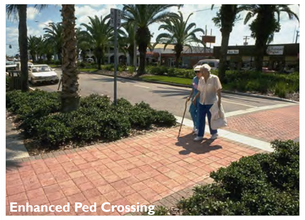
New land use mix shifts to housing (approx. 40-50% of the mix), some office and retail, with light industry (about 25%).

Most of the area will continue according to existing trends.



15-Minute Walk

- Enhanced pedestrian safety and connections


Enhanced Ped Crossing


Enhanced Ped Environment

Boulder Community Health/ Ball

- Office, Retail
- Shared parking & amenities


Medical &/or Tech Offices


BCH/Ball Shared Parking & Amenities


Food

55th/Arapahoe

- New housing in select locations
- Dinner theater and other businesses become part of an art center
- Mobility hub
- Shops and restaurants


Mixed Housing/Retail/Arts


Office/Retail


Arapahoe/55th Complete Street

55th Street North:

- Live-work mixed with offices
- Retail


Live/Work


Manufacturing/Retail

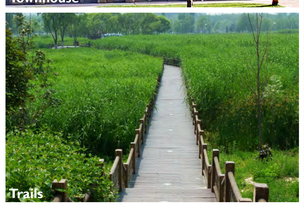
Manufacturing/Retail

South Boulder Creek

- Housing
- Greenway Enhancements


Greenway


Townhouse


Trails

Future FasTracks (Long Term)

- Mixed-use
- Edge parking

What other choices would you like to see?

BRT ON MAJOR ARTERIAL STREETS

CASE STUDY

Van Ness BRT | San Francisco, CA

in 2003 San Francisco voters mandated BRT on Van Ness Avenue (US 101) through the City's Civic Center district. The project will incorporate all-door boarding, pre-paid fares, dedicated transit lanes, and signal priority.

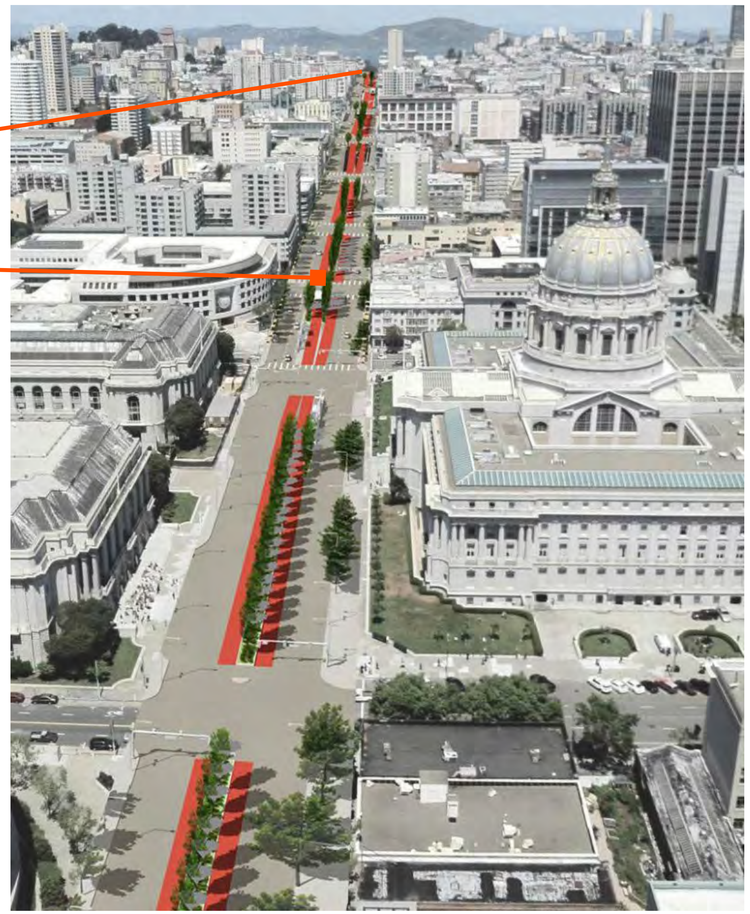
Van Ness Corridor

Length/Extent
Two miles, Mission to Lombard Streets

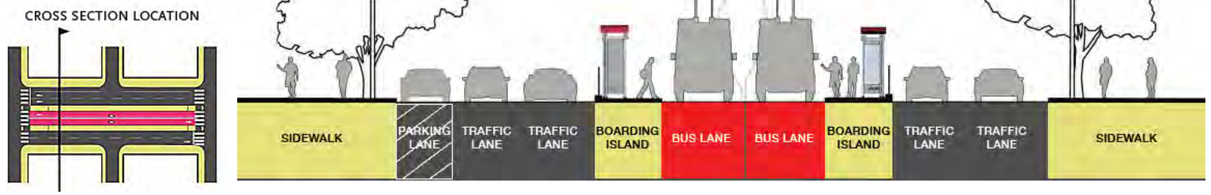
Street Characteristics
Six lanes with a planted median and on-street parking along sections

Carries 38,000 - 45,000 vehicles per day

Existing Transit
Muni local routes 47 and 49 carry 43,000 daily riders



All images courtesy of SFCTA



Van Ness Avenue Bus Rapid Transit Sectional Lane Configuration

Daily Person Trips in Corridor* without Project (2015)

130,000 person trips in autos
22,000 person trips on transit

** At average "screenline" including five parallel streets*

Daily Person Trips in Corridor* with BRT (2015)

120,000 person trips in autos
24,000-28,000 person trips on transit

** At average "screenline" including five parallel streets*

Estimated Cost

$162M
core BRT project

$250M
including separate but related projects

BRT Design
Hybrid of median and side-running, with two traffic lanes converted to bus-only operations

PROJECT BENEFITS/IMPACTS

- **Transit Travel Time and Reliability:** Travel time reduced by 32% and up to 50% reduction in variability
- **Projected Ridership:** 28% to 35% increase
- **Bicycle and Pedestrian Improvements:** No bike facilities on Van Ness; Polk Street protected bicycle lanes are one block to the east (related project). Safety and aesthetic upgrades
- **Parking:** Loss of about 100 parking spaces along the corridor
- **Traffic:** SFGo real-time signal optimization to improve traffic flow for all users

Project Status
Completed environmental review in 2013, currently moving into the design and implementation phase

BRT ON MAJOR ARTERIAL STREETS

CASE STUDY

Geary BRT | San Francisco, CA

San Francisco voters mandated BRT on Geary Boulevard in 2003, a corridor connecting downtown with the western edge of the city. The project will incorporate all-door boarding, pre-paid fares, dedicated transit lanes, and signal priority.

Geary Corridor

Length/Extent
6.5 miles, Market Street to 48th Avenue

Street Characteristics
Western section: six lanes to eight lanes with a planted median, on-street parking, and underpasses.

Eastern/Downtown section: three lanes and on-street parking on one or both sides in sections. Bus-only lane in downtown section.

Average Daily Vehicle Traffic: Carries 43,200 vehicles per day at Lyon Street (2009)

Existing Transit
Over 50,000 daily riders including on Muni routes 38/38L

2035 Average Daily Vehicle Traffic*
No Build (without project): 54,300
BRT Alternatives: 30,100-45,600
** Geary @ Lyon*

All images courtesy of SFCTA

Estimated Cost*
Approx $240M
** Staff recommended alternative*

BRT Design
Center or side-running, in dedicated lanes or mixed-traffic, depending on the segment

PROJECT BENEFITS/IMPACTS

- **Transit Travel Time and Reliability:** 25% faster and 20% reduction in travel time variability
- **Projected Ridership:** Increase of 10% to 20%
- **Bicycle and Pedestrian Improvements:** Bus bulbs, sidewalks/crossings, and other safety improvements. No bicycle improvements currently included in design
- **Parking:** About 20% reduction corridor-wide, less in key neighborhood centers

Project Status
Environmental review phase.
Projected opening 2018 or later.

BRT ON MAJOR ARTERIAL STREETS

CASE STUDY

MAX BRT | Fort Collins, CO

MAX BRT began service in Spring 2014. It features a dedicated transitway and parallel multiuse path along an old freight corridor located one block to the west of College Ave., a major north-south arterial. The route runs through Colorado State University and connects major destinations throughout the city.

Image courtesy of TransFort

TransFort MAX - Mason Corridor

Length/Extent
5 miles along Mason, from the Downtown Transit Center to the South Transit Center

Street Characteristics
MAX BRT runs along Mason, a two-lane concrete transit street built along a rail corridor.

Image courtesy of City of Fort Collins

Estimated Cost
$87M

BRT Design
1.2 miles of mixed traffic operation to northern edge of Colorado State University and 3.8-miles of exclusive right-of-way to South Transit Center. Includes 250 park-and-ride spaces

PROJECT BENEFITS/IMPACTS

- **Projected Ridership:** 3,900 average weekday boardings.
- **Bicycle and Pedestrian Improvements:** multi-use trail included in project

Project Status: In operation

BRT ON MAJOR ARTERIAL STREETS

CASE STUDY

EmX BRT | Eugene/Springfield, OR

Lane Transit District's Emerald Express (EmX) began service along Franklin Boulevard, a state highway, in January 2007. The service operates between downtown Eugene and downtown Springfield, connecting the University of Oregon, employment, and residential centers. The service operates on bus-only lanes, shared travel lanes, and dedicated median transitway.

Image from Wikipedia

Lane Transit EmX BRT - Franklin Corridor

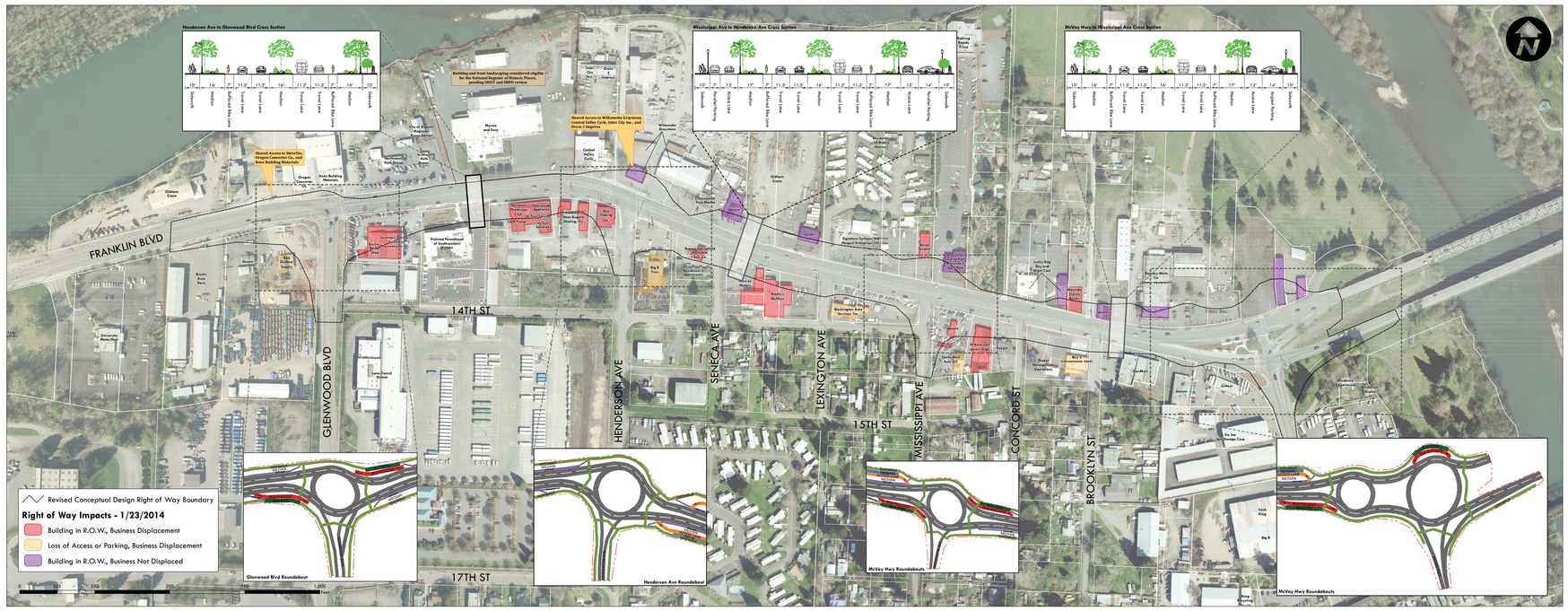


Image from City of Springfield, OR

Length/Extent
Phase 1 (2007):
4 miles on Franklin Blvd., connecting Eugene and Springfield and serving the University of Oregon campus

Street Characteristics
Six lanes with a planted median in sections; BRT runs in median along Franklin Blvd. Carried about 30,000 vehicles in 2006 (before BRT) and 22,000 vehicles today.

Previous Transit
LTD Route 11, with an average weekday daily ridership of 2,667 people

Phase I Cost
(Franklin Blvd.)
$24.5M

BRT Design
Hybrid of median bus-only and mixed traffic operation with two traffic lanes converted to bus-only operations in sections

PROJECT BENEFITS/IMPACTS

- **Transit Travel Time and Reliability:** Reduced average travel time by 1 minute and improved schedule reliability and on-time performance. About 60% of existing riders and former drivers perceived service as being faster.
- **Projected Ridership:** EmX increased ridership in the corridor to about 4,000 daily riders in February 2007 (EmX opening), to 5,400 in April 2008, and to over 6,600 riders in October 2008. In 2013, daily ridership was 10,400 with the Gateway extension (phase 2).
- **Bicycle and Pedestrian Improvements:** Upgraded sidewalks and crossings near stations, improved bicycle access and faster loading/unloading on vehicles

Project Status:
Phase 1 & 2 complete,
Phase 3 in planning process

CITY OF BOULDER

SUSTAINABILITY IN ACTION
TRANSPORTATION MASTER PLAN
CITY OF BOULDER