Appendix C

Initial Corridor and Technology Screening Technical Memorandum

Initial Corridor and Technology Screening

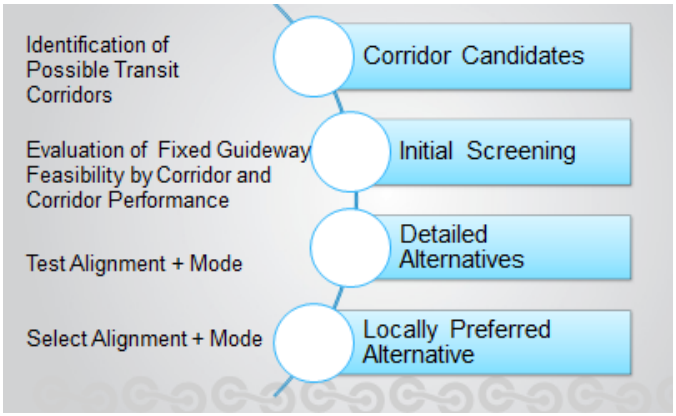
March 27, 2014

INTRODUCTION

The Utah Transit Authority (UTA) initiated an Alternatives Analysis Study for the Davis-SLC Corridor in February 2012. This study is being completed in partnership with the City of Salt Lake, Salt Lake County, North Salt Lake City, and the City of Bountiful. Woods Cross and the Wasatch Front Regional Council (WFRC) are also participants. The study evaluation process is shown in Figure 1. This memo summarizes the results of the initial screening phase.

The purpose of the initial screening process was to identify corridors with the greatest potential for successful transit investment, based on existing and future land use patterns, and also to screen potential technologies for further evaluation in the Detailed Alternatives stage of the study.

Figure 1. Evaluation Process



Six potential future transit corridors for the Davis-SLC Community Connector were screened, applying an initial level of evaluation criteria established in the Evaluation Criteria phase of the study. Evaluation criteria were established for two levels of analysis: Initial Screening and Detailed Evaluation. Initial Screening results summarized in this report provide a basis for further evaluation and refinement of alternatives.

Initial screening corridors were examined from a mode-neutral standpoint, focusing on service needs, connections, integration with other transportation systems in the region, and community objectives that could be accommodated by a number of viable technologies. However, sensitivity testing was also performed using WFRC's regional model, to help the project team understand relative differences in ridership that could be expected with different northern termini.

In order to identify full Alternatives (Corridor + Technology options), transit technologies appropriate for the corridors have also been studied. It should be noted that a previous Alternatives Analysis effort conducted several years prior also included most of the study area for this effort, however the previous study covered a much larger area and travel shed.

This technical memo provides a summary of findings from the initial corridor and technology screening process, along with recommendations for alternatives to be carried forward into the detailed evaluation process.

INITIAL CORRIDORS AND SCREENING CRITERIA

CORRIDORS

Figure 2 through Figure 7 show the corridors compared during initial screening. In the central portion of the study area (between the Victory Road/US89 junction and Center Street in North Salt Lake) all corridors followed the US89 corridor. Corridor variations listed in Table 1 were examined in the northern and southern portions of the study area. All corridors examined in the screening process traverse the area between downtown Salt Lake City and 500 South in Bountiful. The area of influence extending north to Farmington will be considered for impacts and future opportunities, but does not encompass defined corridors for this analysis. Extension into the area of influence is not a determined outcome of the current study.

At the southern end of the study area, initial corridors were assumed to provide a connection to a future Downtown Streetcar being considered under a separate study. A terminal near 200 South and State Street for the Davis-SLC Community Connector was determined to be more advantageous than other potential southern termini after discussions with agency staff and a visual scan of land uses and economic development opportunities in the southern part of the study area. Development of detailed alternatives during this study will need to consider how connections are made to the North Temple FrontRunner station and light rail, or the FrontRunner station 250 South 600 West.

In the northern portion of the study area, a variety of corridors were selected for screening based on discussions with the Stakeholder Advisory Committee, conversations with local agency land use staff, and a visual scan of existing land uses and assessment of future economic development opportunities.

Table 1. Corridors

Corridor Number	Southern Segment	Northern Segment and Communities Served
1	200 South, 300 West	Bountiful: US89, 500 West
2	State Street, Victory Road	Bountiful: US89, 500 West
3	200 South, 300 West	Bountiful: US89, Main Street
4	200 South, 400 West	Bountiful: US89, Main Street
5A	200 South, 300 West	North Salt Lake, Woods Cross, and West Bountiful: Center Street, Redwood Road, 500 South
5B	200 South, 300 West	North Salt Lake, Woods Cross, West Bountiful and Bountiful: Center Street, Redwood Road, 500 South, US89 (Loop Route)
6	200 South, 300 West	North Salt Lake, Woods Cross, West Bountiful and Bountiful: 1100 West, 500 South

Additional sensitivity testing was also performed with WFRC's regional travel demand model, to compare changes in ridership if the project terminated at the Woods Cross FrontRunner station vs. 500 South in Bountiful.

SCREENING CRITERIA

Criteria used for screening were outlined in the previous Evaluation Criteria tech memo. Table 2 shows the criteria, data sources and metrics used.

For some criteria, no differentiation between corridors was observed at this high-level screening stage. Where no differentiation was observed, findings are omitted from this summary. However, as detailed alternatives are developed later, corridor differentiation should become more evident for all of the criteria listed.

NO-BUILD BASELINE

Information developed for the screening corridors was compared to a 2016 No Build scenario. WFRC has developed a version of the regional travel demand model developed which includes land use and demographic projections for 2016, as well as funded transportation projects which are expected to be complete by 2016. As 2016 is the likely the earliest that any alternative recommended by this study could begin to be implemented, the year 2016 was selected as a reasonable baseline.

Figure 2. Screening Corridor 1

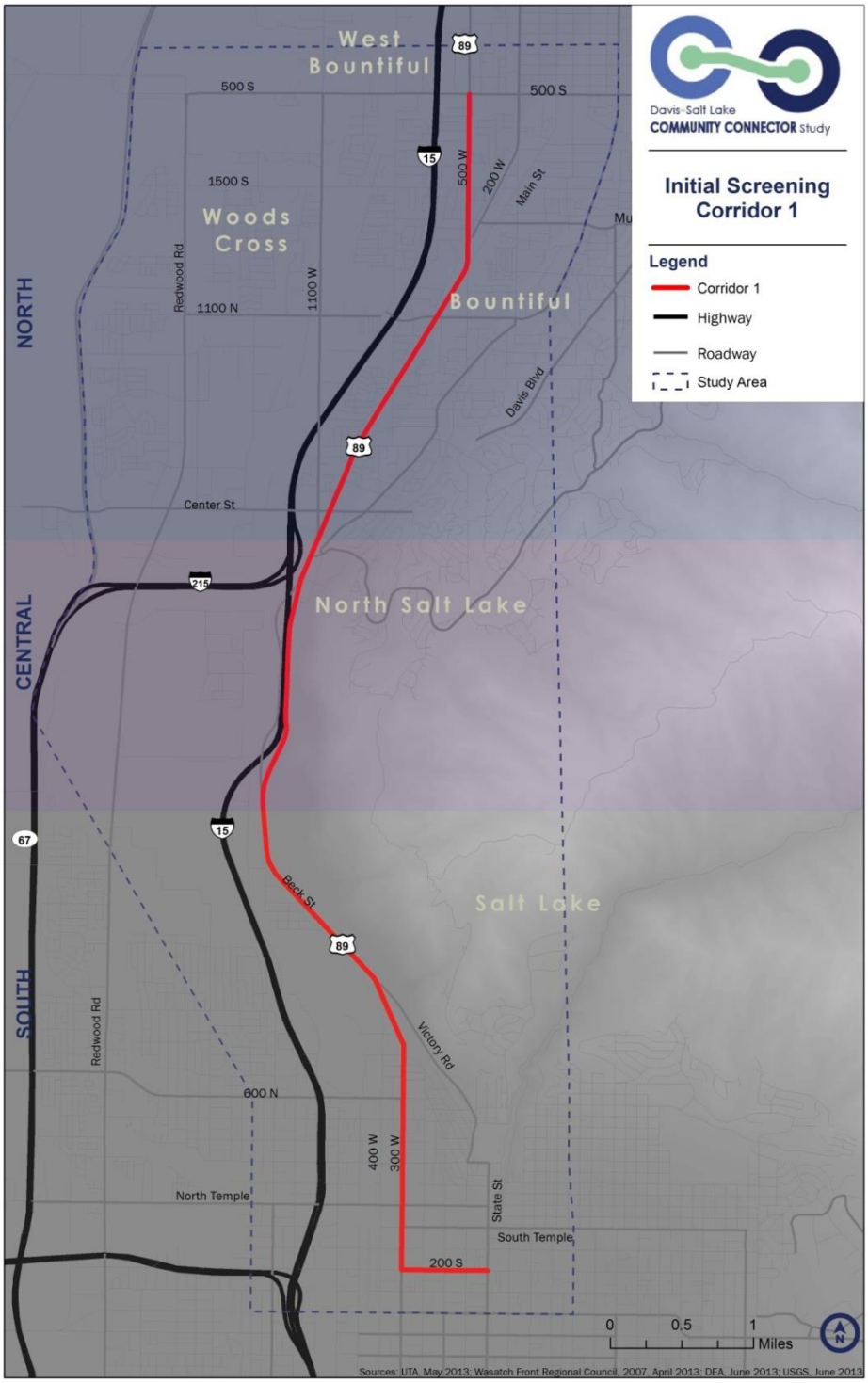


Figure 3. Screening Corridor 2

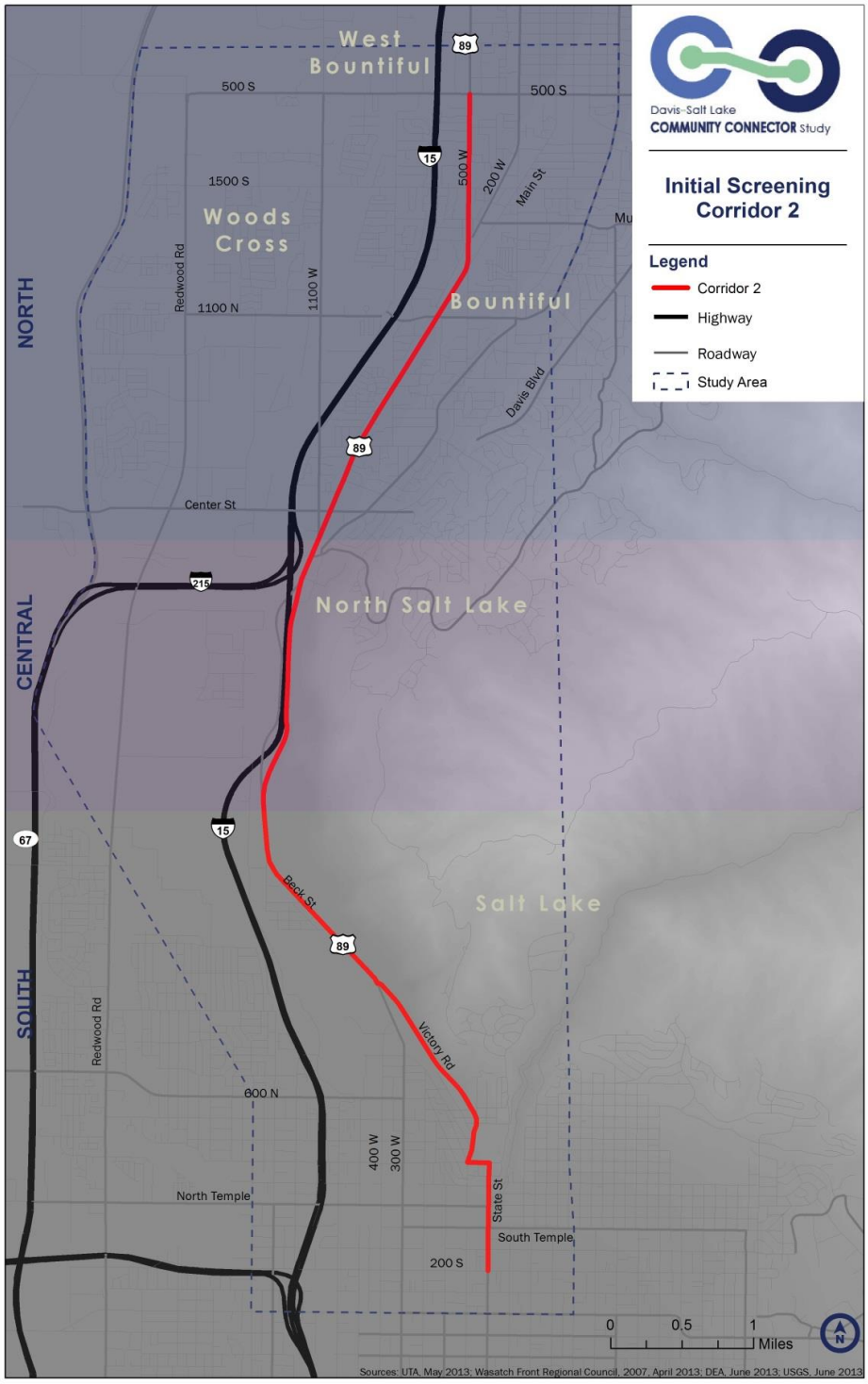


Figure 4. Screening Corridor 3

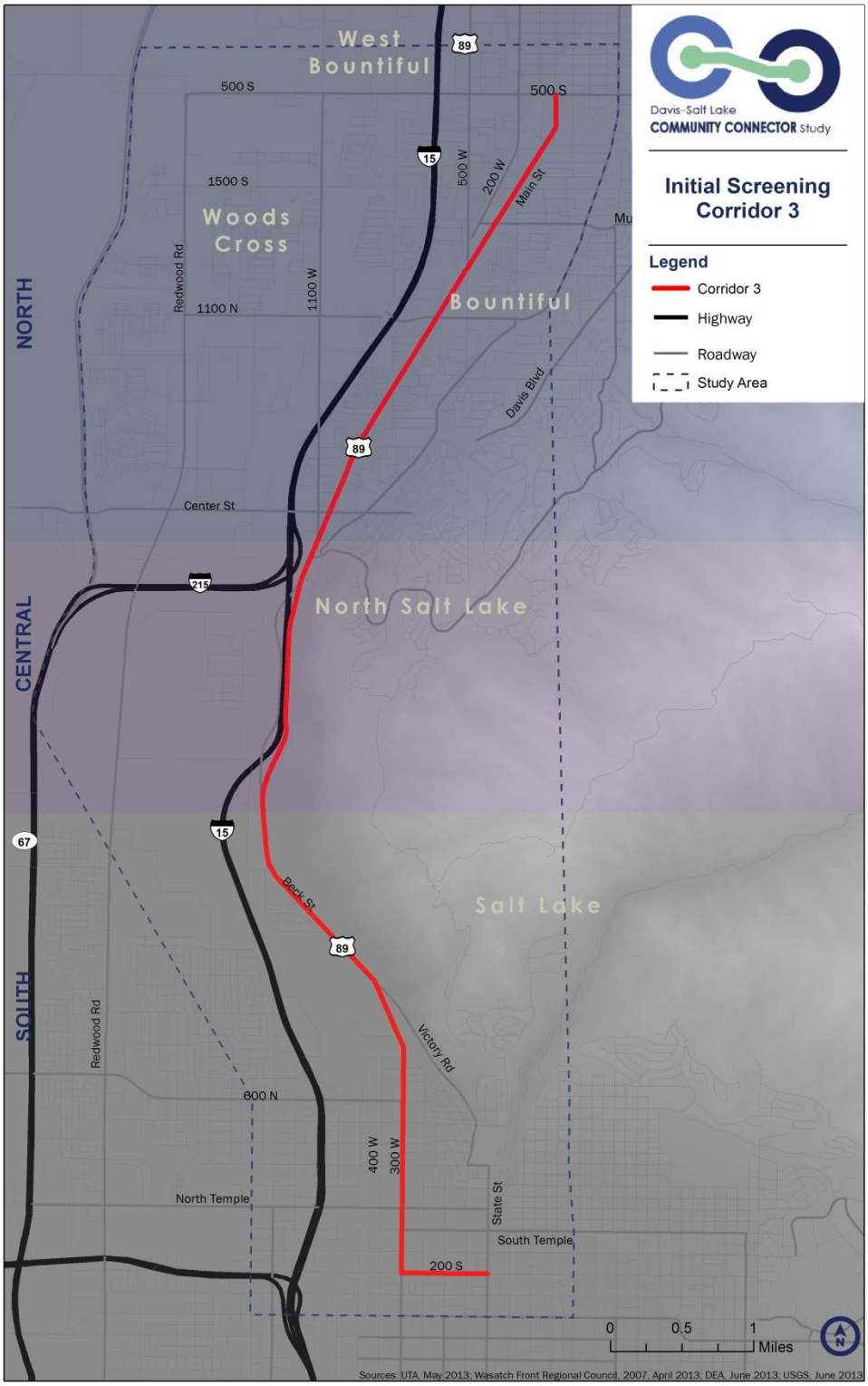


Figure 5. Screening Corridor 4

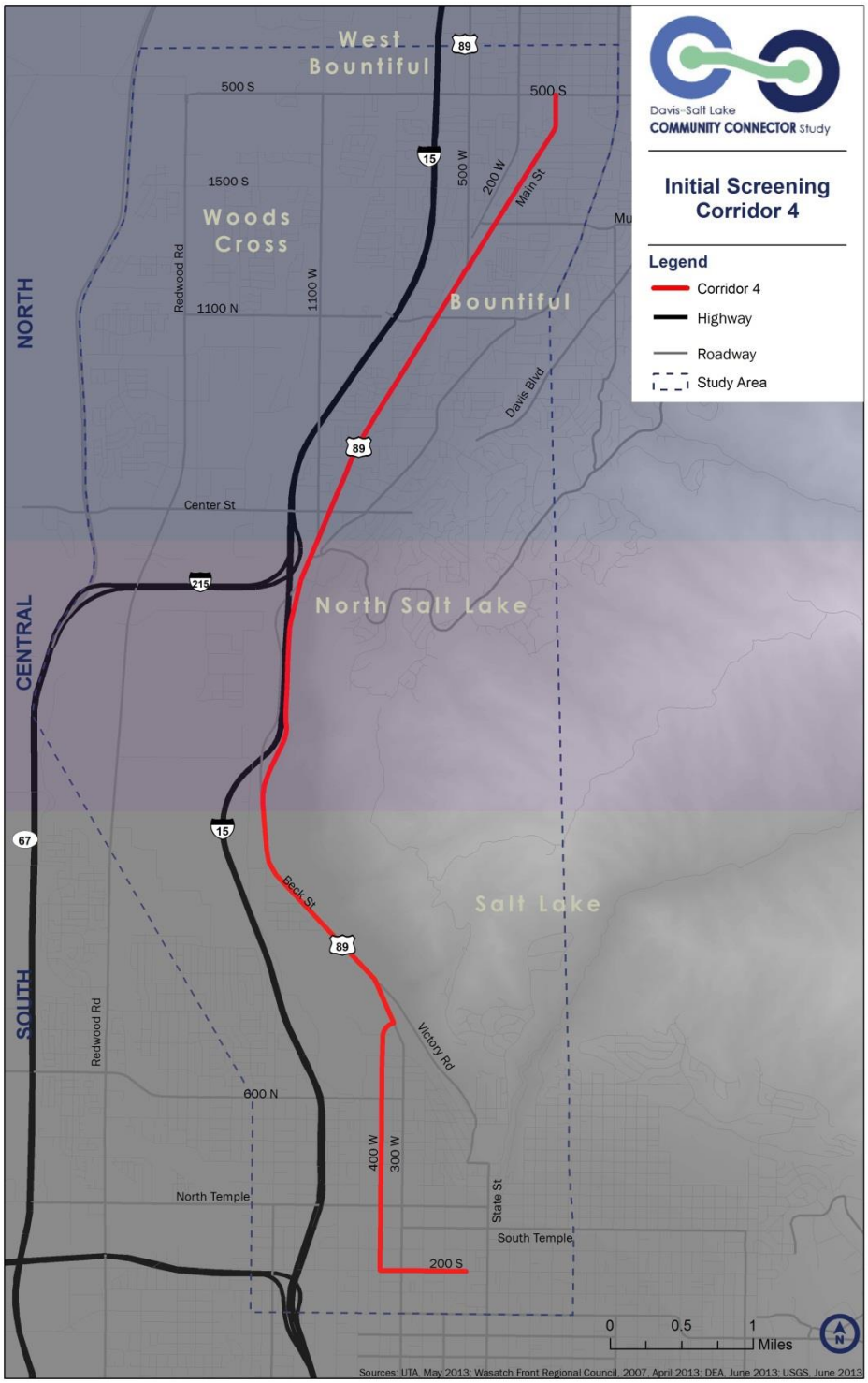


Figure 6. Screening Corridor 5A

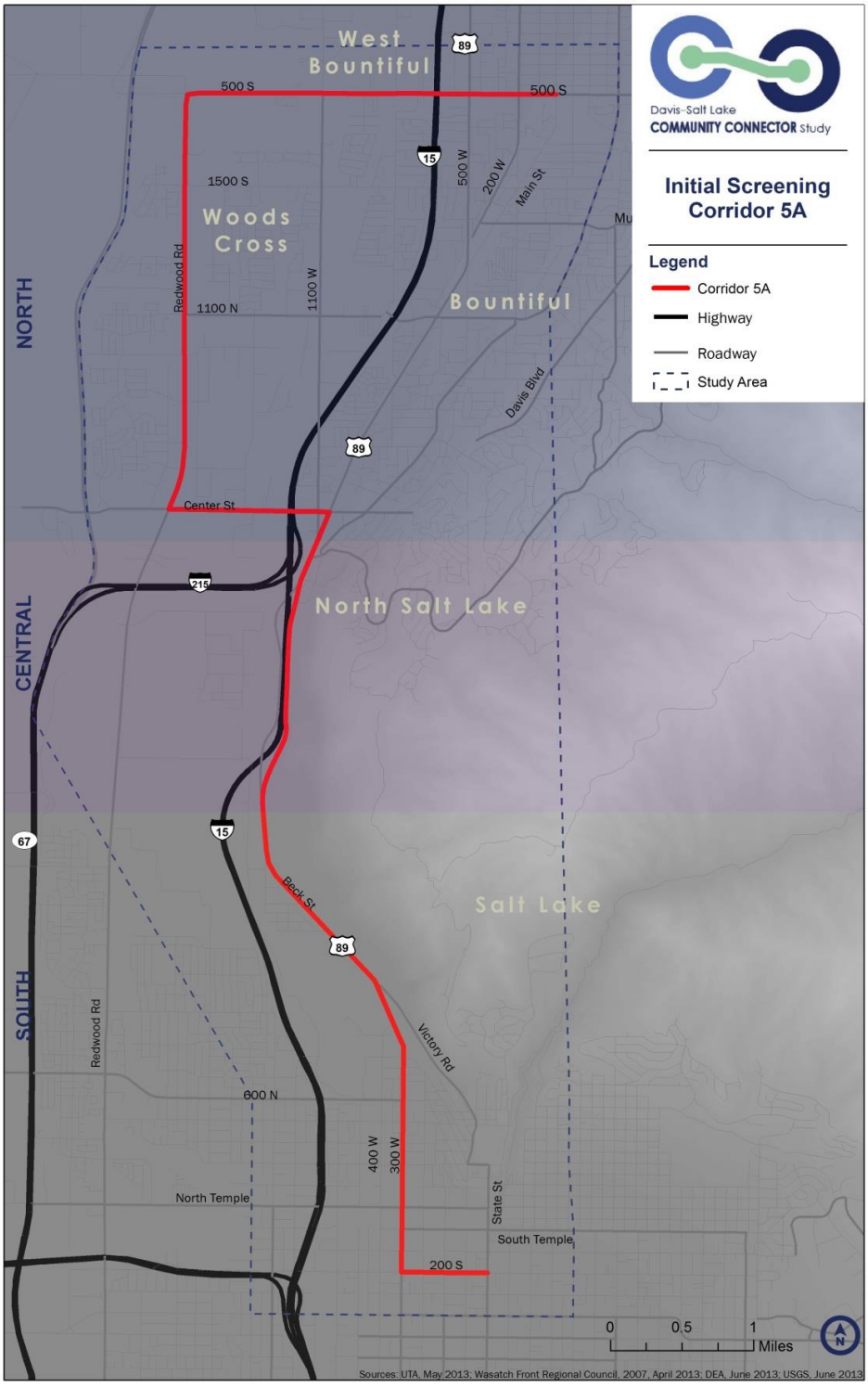


Figure 7. Screening Corridor 5B

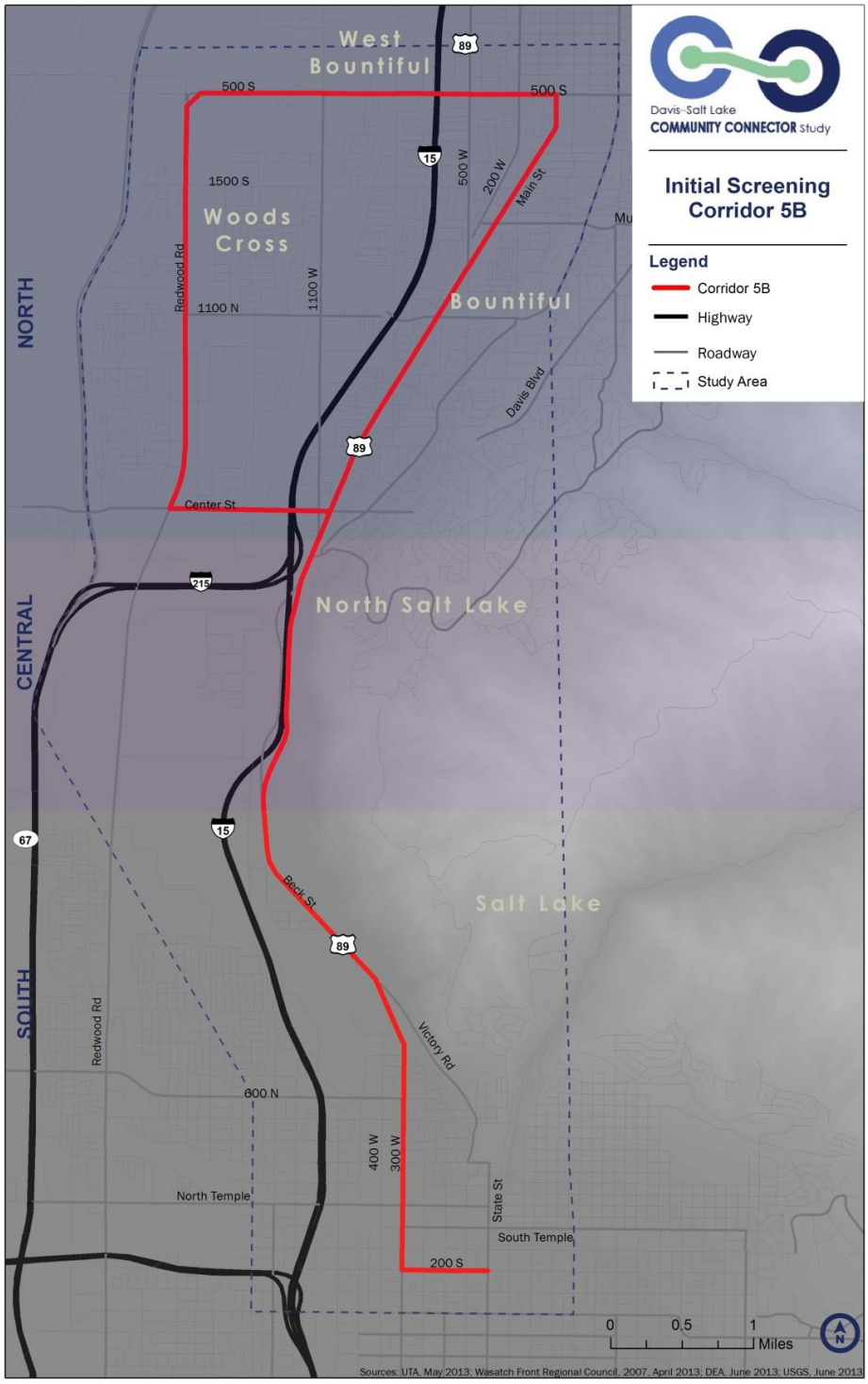


Figure 8. Screening Corridor 6

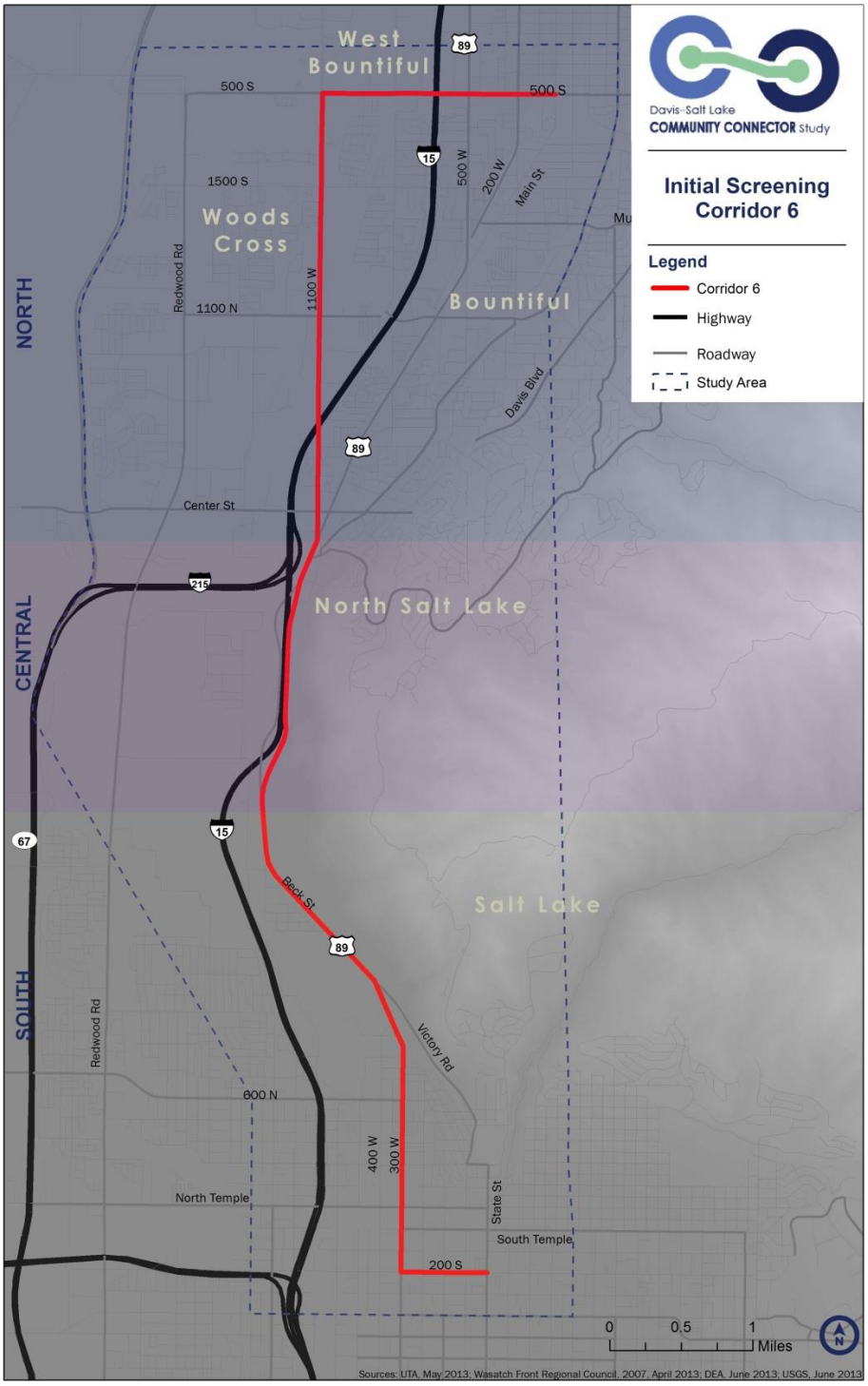


Table 2. Screening Criteria Considered

CRITERIA	QUANTITATIVE	QUALITATIVE	STUDY GOALS SUPPORTED									Corridor Differentiation Observed During Screening? (Y/N)	DATA SOURCE	METRIC
			Improve Regional Connectivity	Increase Bike-Ped Mode Share	Balance E-W/N-S Needs	Match Solutions to Potential Markets	Revitalize Corridors	Create Jobs	Improve Travel Through the Study Area	Identify Viable Solutions	Support Wasatch Choice 2040 Growth Principles			
For shaded criteria, no differentiation between corridors was observed during initial screening, so findings are not reported at this screening level. These criteria will be revisited during detailed alternative evaluation.														
Percent of current study area households served by transit	■		■			■					■	Y	2016 WFRC demographic data by TAZ	Percent of households in study area within 1/2 mile buffer of corridor
Percent of future study area households served by transit	■		■			■					■	Y	2040 WFRC demographic data by TAZ	Percent of households in study area within 1/2 mile buffer of corridor
Percent of current study area employment served by transit	■		■			■		■			■	Y	2016 WFRC demographic data by TAZ	Percent of jobs in study area within 1/2 mile buffer of corridor
Percent of future study area employment served by transit	■		■			■		■			■	Y	2040 WFRC demographic data by TAZ	Percent of jobs in study area within 1/2 mile buffer of corridor
Per-mile densities of combined households and employment served	■					■		■			■	Y	2016 WFRC demographic data by TAZ	Number of jobs plus households within ½ mile of corridor divided by total length of corridor in miles.
Current 20-minute connections to employment centers	■		■			■			■			N	20-minute accessibility to employment opportunities in 2016, calculated using WFRC transit access script	Percent increase or decrease in employment opportunities accessible in 20 minutes by transit from study area
Current 40-minute connections to employment centers	■		■			■			■			N	40-minute accessibility to employment opportunities in 2016, calculated using WFRC transit access script	Percent increase or decrease in employment opportunities accessible in 40 minutes by transit from study area
Future 20-minute connections to employment centers	■		■			■			■			N	20-minute accessibility to employment opportunities in 2040, calculated using WFRC transit access script	Percent increase or decrease in employment opportunities accessible in 20 minutes by transit from study area
Future 40-minute connections to employment centers	■		■			■			■			N	40-minute accessibility to employment opportunities in 2040, calculated using WFRC transit access script	Percent increase or decrease in employment opportunities accessible in 40 minutes by transit from study area

CRITERIA	QUANTITATIVE	QUALITATIVE	STUDY GOALS SUPPORTED									Corridor Differentiation Observed During Screening? (Y/N)	DATA SOURCE	METRIC
			Improve Regional Connectivity	Increase Bike-Ped Mode Share	Balance E-W/N-S Needs	Match Solutions to Potential Markets	Revitalize Corridors	Create Jobs	Improve Travel Through the Study Area	Identify Viable Solutions	Support Wasatch Choice 2040 Growth Principles			
For shaded criteria, no differentiation between corridors was observed during initial screening, so findings are not reported at this screening level. These criteria will be revisited during detailed alternative evaluation.														
Percent of transit-dependent populations served by alternative within the study area	■		■						■			Y	US Census data for 2011	Percent of study area transit dependents within 1/2 mile buffer of potential corridor.
Per-mile densities of transit dependents served	■		■						■			Y	US Census data for 2011	Number of transit dependents within ½ mile of potential corridor divided by length of corridor in miles.
Current transit-dependents with 20-minute access to employment opportunities	■								■			N	WFRC transit access script output applied to TAZ's selected by project team for high concentrations of transit dependents.	Percent increase or decrease in number of jobs with 20 minute accessibility from high transit dependent TAZ's
Current transit-dependents with 40-minute access to employment opportunities	■								■			N	WFRC transit access script output applied to TAZ's selected by project team for high concentrations of transit dependents.	Percent increase or decrease in number of jobs with 40 minute accessibility from high transit dependent TAZ's
Future transit-dependents with 20-minute access to employment opportunities	■								■			N	WFRC transit access script output applied to TAZ's selected by project team for high concentrations of transit dependents.	Percent increase or decrease in number of jobs with 20 minute accessibility from high transit dependent TAZ's
Future transit-dependents with 40-minute access to employment opportunities	■								■			N	WFRC transit access script output applied to TAZ's with higher concentrations of transit dependents.	Percent increase or decrease in number of jobs with 40 minute accessibility from high transit dependent TAZ's
Current ridership potential	■					■				■		N	Transit linked trips from 2016 regional travel demand model	Additional daily regional linked trips over no-build
						■				■		Y	Daily boardings for the potential corridor from 2016 regional model	Daily boardings on the potential corridor
Future Ridership potential	■					■				■		N	Transit linked trips from 2040 regional travel demand model	Additional daily regional linked trips over no-build
						■				■		Y	Daily boardings for the potential corridor from 2040 regional model	Daily boardings on the potential corridor

CRITERIA	QUANTITATIVE	QUALITATIVE	STUDY GOALS SUPPORTED: Improve Regional Connectivity	Increase Bike-Ped Mode Share	Balance E-W/N-S Needs	Match Solutions to Potential Markets	Revitalize Corridors	Create Jobs	Improve Travel Through the Study Area	Identify Viable Solutions	Support Wasatch Choice 2040 Growth Principles	Corridor Differentiation Observed During Screening? (Y/N)	DATA SOURCE	METRIC
For shaded criteria, no differentiation between corridors was observed during initial screening, so findings are not reported at this screening level. These criteria will be revisited during detailed alternative evaluation.														
Connection to regional transit service		■	■						■	■		Y	Evaluation of connection opportunities at corridor limits based on UTA existing and future system maps	Best/good/fair/poor
Potential access to transit for bicycles and pedestrians		■	■	■					■			Y	Assessment of service to bike/ped activity centers	Best/good/fair/poor
Support of Wasatch Choices 2040 objectives		■						■			■	Y	Review of Wasatch Choice applicability	Best/good/fair/poor
Revitalization opportunities		■					■	■			■	Y	Assessment based on potential service to URA's and land development discussions with agency staff	Best/good/fair/poor
Markets served		■				■				■		Y	Assessment based on markets identified in Purpose and Need	Best/good/fair/poor
Potential expansion to area of influence		■	■			■			■	■		Y	Assessment of future expandability and capacity	Best/good/fair/poor
Economic development opportunities		■					■	■			■	Y	Assessment based on discussions with agency land use staff	Best/good/fair/poor
Environmental Flaws		■								■	■	N	Scan using Utah Department of Transportation uPEL tool and field review.	Best/good/fair/poor

SUMMARY OF FINDINGS

Table 3 provides a summary of advantages for each initial screening corridor when compared to the no-build baseline. Detailed screening results are attached as Appendix A.

Table 3. Summary of Initial Screening Results

INITIAL CORRIDOR SCREENING SUMMARY							
CRITERIA	Summary of Advantage Ratinges						
	Alignment 1 300W, US89, 500W	**Alignment 2** Victory Rd; US89, 500 W	**Alignment 3** 300 W, US89, Main St	**Alignment 4** 400 W, US89, Main St	**Alignment 5A** 300 W, US89, Center, Redwood, 500 S	**Alternative 5B (Loop)** 300 W, US89, Center, Redwood, 500 S, Main St, US89	**Alignment 6** 300W, US89, Main/1100 W, 500S
Percent of current households served by transit	●	●	▲	●	●	★	●
Percent of future households served by transit	●	●	▲	●	▲	★	▲
Percent of current employment served by transit	▲	●	▲	●	▲	★	●
Percent of future employment served by transit	▲	●	▲	●	▲	★	▲
Per-mile combined households and employment served	★	▲	★	▲	●	●	▲
Transit-dependent populations served within the study area	▲	▲	▲	▲	▲	★	▲
Per-mile density of transit dependents served	▲	★	★	▲	●	●	●
Current ridership potential	●	●	●	●	●	▲	●
Future Ridership potential	●	●	●	●	●	▲	●
Connection to regional transit service	▲	●	▲	★	★	★	★
Potential access to transit for bicycles and pedestrians	●	●	▲	▲	▲	★	▲
Support of Wasatch Choices 2040 objectives	●	●	▲	▲	★	★	★
Revitalization opportunities	▲	●	▲	●	★	★	▲
Markets served	▲	▲	▲	▲	●	★	▲
Potential expansion to area of influence	▲	▲	★	★	★	–	★
Economic development opportunities	▲	●	▲	★	▲	▲	▲
KEY TO ADVANTAGE RATINGS:	★ *Best*	▲ *2nd*	● *3rd*	– *No significant advantage*		✖ *Potential fatal flaw*	

QUANTITATIVE CRITERIA

A quantitative analysis was performed of ridership and demographic capture areas for each screening corridor.

Regional Ridership

Based on regional travel demand model runs provided by WFRC, all corridors examined in the screening process could provide an additional 2,000 linked transit trips per day. At the screening level, total linked trips by transit is therefore not a differentiating criteria.

Daily Boardings

Total daily boardings and boardings per mile of corridor were compared. Corridors were screened from a mode-neutral standpoint, and ridership information presented below was provided by WFRC based on model test runs using Mode 5 (BRT). This information is provided only for the purpose of gauging a comparison of relative ridership capture for the screening corridors, and further refinement of model coding to gauge specific mode performance will be done later as detailed alternatives are developed. In general, corridors using 500 West (Corridors 1 and 2) and Main Street in Bountiful (Corridors 3 and 4) in the northern portion of the analysis area performed the best on these indicators. (Further analysis to differentiate performance indicators for the northern segments is provided later in this report)

Analysis Year	Screening Corridor	Projected Daily Boardings*	Projected Daily Boardings per Mile of Corridor
2016	1,2,3, and 4	3,900	390 - 420
	5A	3,500	270
	5B	4,600	280
	6	3,600	330
2040	1,2,3, and 4	4,200	420 - 450
	5a	3,900	300
	5b	5,100	310
	6	4,000	370

* Source: WFRC

Households and Employment Served by Transit

Figure 9, shows where people live, work and shop, relative to initial screening corridors. A numerical comparison of households and jobs proximate to a ½ mile buffer around each initial corridor was also performed. The project team analyzed percent of households and jobs in the study area served, as well as per-mile densities served by each corridor.

Table 4. Households and Employment Served shows a comparison of households and employment located within ½ mile of each initial corridor. Corridor buffer maps graphically depicting these findings are provided in Appendix B.

- Corridor 5B, the loop corridor, serves the greatest percent of households and jobs of all initial corridors screened.
- Considering the length of each corridor, Alternatives 3 and 1 serve the highest number of households and jobs per mile, respectively.
- Corridors using 300 West in the south end of the study area exhibit higher densities of proximate households and jobs than other southern segments under consideration.
- In the northern portion of the study area, corridors using 500 West or Main Street in Bountiful have approximately twice the combined household and employment densities per mile as corridors using Redwood Road.

Table 4. Households and Employment Served

Corridor	Corridor Length (miles)	Percent of Households and Employment Served within the Study Area				No. of Households and Jobs Served per Mile of Corridor			
		2016 HH	2040 HH	2016 Emp	2040 Emp	2016 HH	2040 HH	2016 Emp	2040 Emp
1	9.5	53.62%	56.16%	77.63%	75.55%	1824	2473	**8643**	**9119**
2	9.3	51.29%	50.30%	69.65%	67.75%	1783	2263	7922	8354
3	9.8	56.91%	58.46%	77.87%	75.64%	**1877**	**2495**	8404	8851
4	10.0	53.33%	55.93%	75.30%	73.44%	1723	2340	7964	8422
5A	12.8	54.48%	58.98%	78.53%	78.03%	1376	1927	6490	6991
5B	16.7	**67.12%**	**69.56%**	**87.43%**	**86.27%**	1299	1742	5538	5924
6	10.9	54.15%	57.67%	76.21%	74.62%	1606	2213	7395	7851

*Source: WFRC Demographic Data

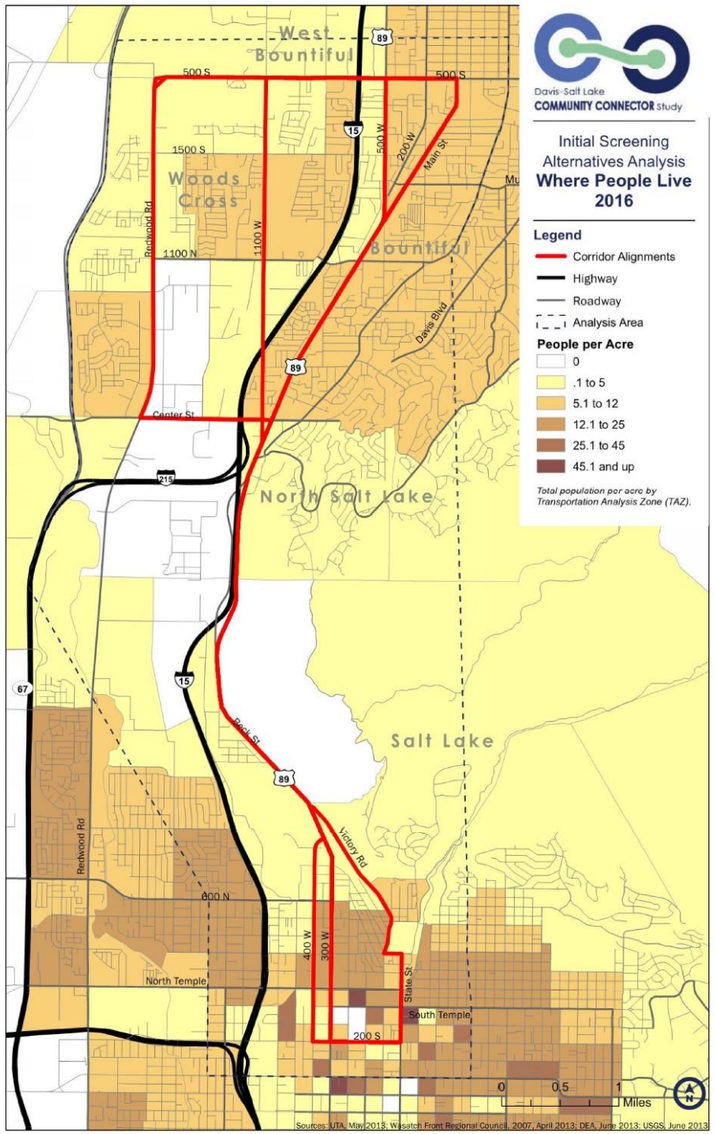
Transit-Dependent Populations Served

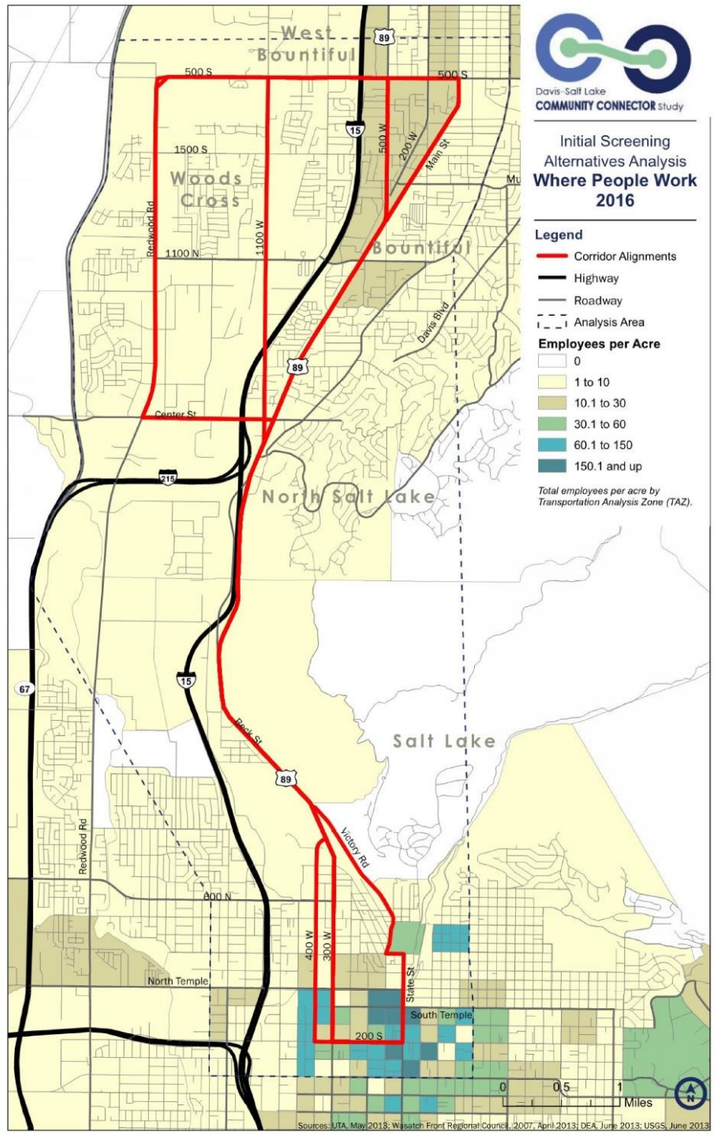
For the initial screening analysis, transit dependents were identified as elderly, youth and low-income populations. A comparison of spatial data found that the location of transit dependent populations also coincides with the locations of households without automobiles. Figure 10 shows the location of transit-dependent populations within the study area.

Consistent with households and employment, a ½ mile buffer was defined around each corridor to numerically compare transit-dependent populations proximate to each corridor. The analysis included both percent of transit dependents in the study area served by each corridor, as well as per-mile densities. Maps showing transit dependent populations captured by each corridor are provided in Appendix C.

Table 5 shows a comparison of existing transit-dependent populations served by each corridor. Corridor 5B (the loop corridor) captures the highest overall percentage of transit dependents in the study area. Corridors 2 and 3 have the highest densities of transit dependents adjacent per mile.

Figure 9. Where People Live, Work and Shop





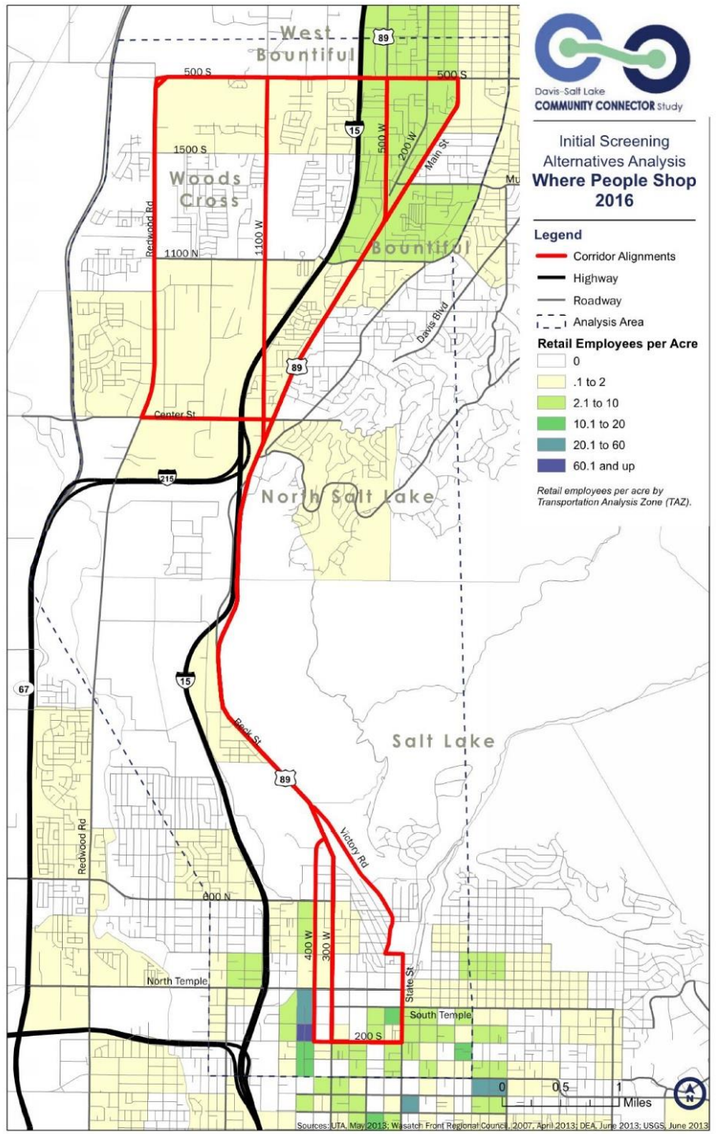


Figure 10. Location of Transit-Dependent Populations

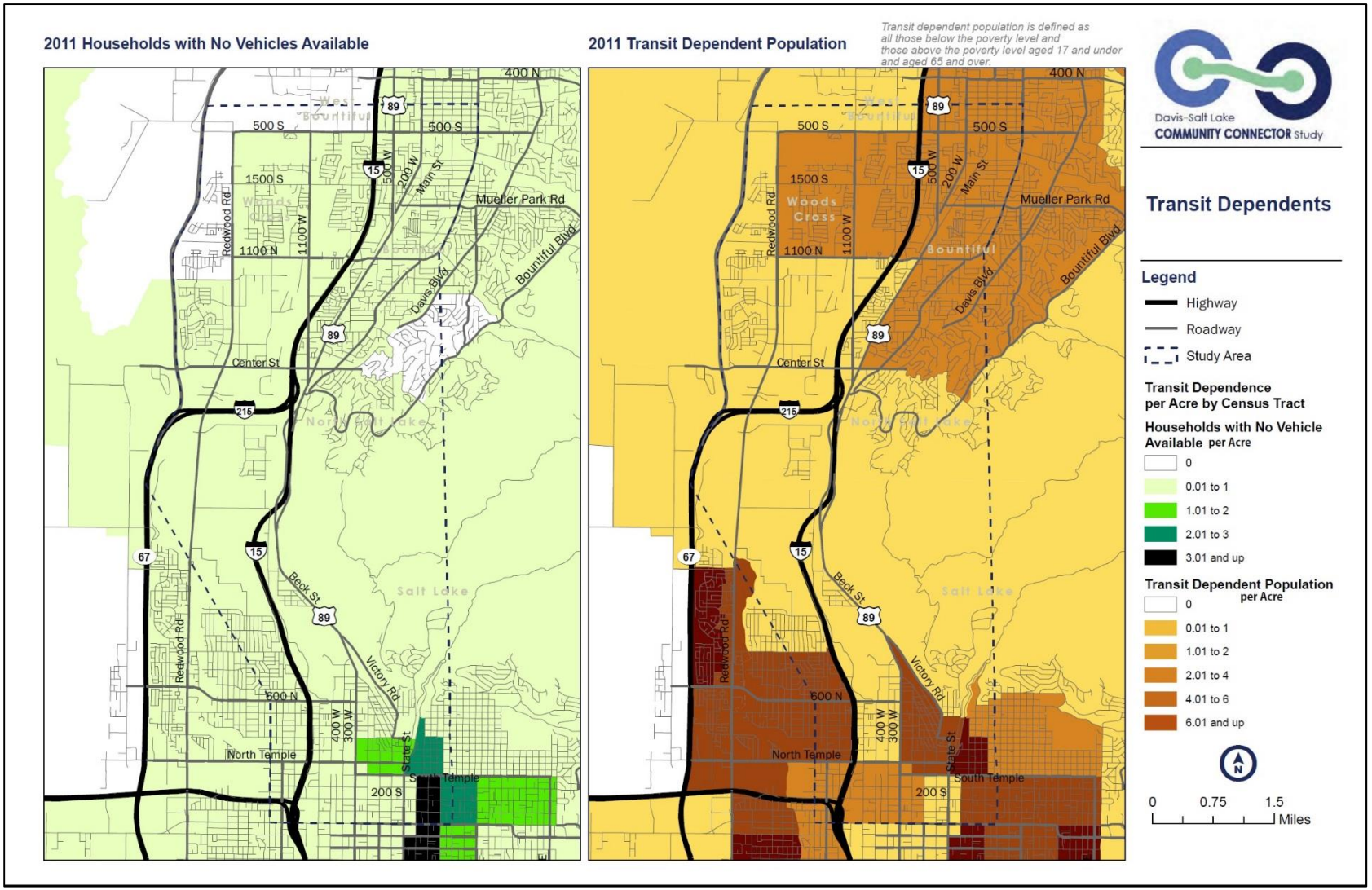


Table 5. Transit Dependent Populations Served

Corridor	% of Study Area Transit Dependents Served	No. of Transit-Dependents Served per Mile
1	42%	1286
2	45%	1378
3	45%	1337
4	43%	1263
5A	43%	956
5B	59%	1026
6	42%	1116

Employment Access

The number of jobs in the region that are accessible from each traffic analysis zone in the regional model, within a specified transit trip time, was analyzed using WFRC's customized access script. Twenty (20) and Forty (40)-minute employment access times were examined. (Walk and drive times to access transit for initial boarding and final alighting are excluded from the analysis, however transfer wait times for linked trips are included.)

The analysis found that neither test case provided an advantage for job accessibility in the study area when compared to a no-build scenario.

East-West Circulation

A stated goal of this study is to balance east-west and north-south travel needs. East-west circulation was also a desire specifically expressed by attendees at a public open house held in December 2013.

Additional WFRC model runs were performed to gauge the potential advantages of the Corridor 5B northern loop route, operating either as an extension of the primary north-south corridor, or as a separate transit circulator requiring a transfer to the primary corridor. Continuing the primary service onto the loop corridor increased boardings by approximately 15%, but adds six miles to the corridor. Modeling a separate local bus circulator service on the loop increased boardings by 7%.

While adding east-west circulation may help to increase ridership, the primary north-south corridor does stand on its own. A supporting circulator concept could be included as an LPA element, however this would add considerable complexity to the Alternatives Analysis process. Alternatively, UTA may wish to explore potential circulators outside the AA process. Further review of development densities in the loop area indicates that the loop corridor could be adjusted to increase ridership capture. Initially, there may be opportunities to enhance or expand local bus service to support a new primary corridor. Local service enhancements could transition to a new circulator over time as demand increases. Ultimately, future extension of the primary corridor into eastern portions of North Salt Lake and Woods Cross could be considered, if warranted by land use densities and travel demand at some point.

QUALITATIVE CRITERIA

Tabulated qualitative findings for the factors summarized below are included in the initial screening information in Appendix A.

Connections to Regional Transit Service

Corridors 4, 5A, 5B and 6 were found to have superior opportunities for regional transit connections to TRAX, Woods Cross FrontRunner Station and to planned transit with the downtown street car, and Redwood Road Enhanced Bus.

Potential Transit Access for Bicycles and Pedestrians

Corridor 5B, was determined to provide the greatest connection opportunities to existing and planned bicycle and pedestrian facilities, based on a visual comparison of corridors to existing bike routes, as well as the Utah Collaborative Active Transportation Study (UCATS) unbuilt backbone and top 25 projects. Corridors 3, 4, 5A and 6 also provide good opportunities for transit/bike/ped interface.

Support of Wasatch Choices 2040 Objectives

Corridors 5A, 5B and 6 were rated as best supporting overall Wasatch Choices 2040 Objectives, based on their potential interface with Wasatch Vision for 2040 Centers including Salt Lake Metropolitan Center, North Salt Lake Station Community, West Bountiful Station Community, Bountiful Urban Center and Main Street Community.

Revitalization Opportunities

Based on proximity to designated urban renewal areas in the region, Corridors 5A and 5B were rated the highest for this criteria. This was based on proximity to Salt Lake City Redevelopment Areas (Central Business District, North Temple Viaduct, West Capitol Hill); North Salt Lake City Redevelopment Areas (Eaglewood Village, Redwood Road); and Bountiful's Historic Downtown Redevelopment Area.

Economic Development Opportunities

Compared to "Revitalization Opportunities", assessment of "Economic Development Opportunities" was expanded to designated urban renewal areas in the region. The team performed a general scan of potential economic development advantages based on local knowledge and discussions with local land use agency staff. Corridor 4 appears to generally support the greatest number of sites with potential economic development opportunity in the study area, considering anticipated developments such as 101 Tower, Plaza at State, Utah Preforming Arts Center, 24 story office tower, 800 room hotel, Broadway Park Lofts, Hyatt House, Marriott Courtyard, Marmalade Block, and Eaglewood CDA.

Markets Served

While quantitative findings for transit dependents were described previously, the "Markets Served" criterion allowed a general qualitative assessment of overall service to target markets outlined in the study's purpose and need document. Corridor 5B appears to offer the greatest opportunities to collectively support these markets, which include low income households, fewer autos per

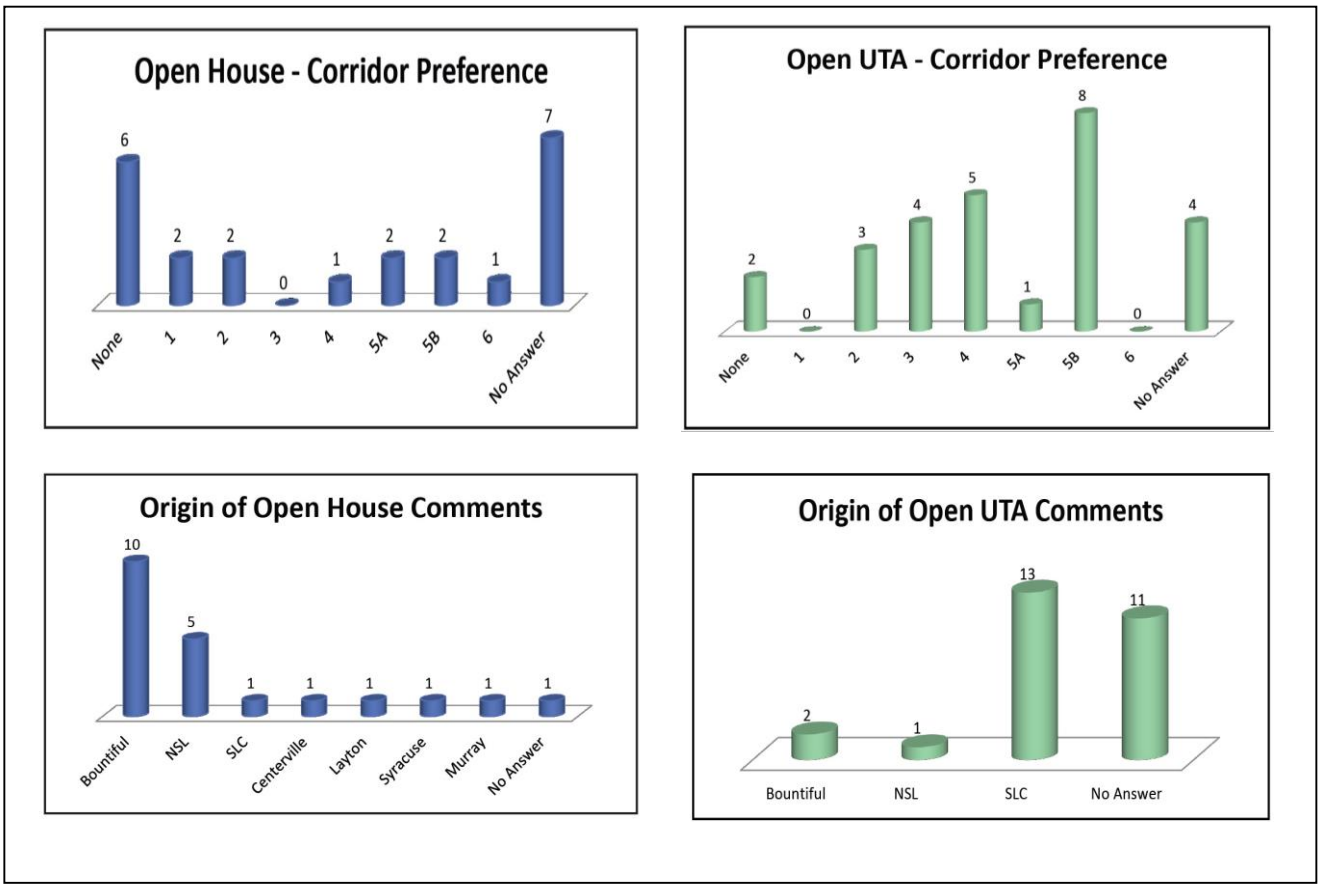
household, high youth and elderly population, and areas of higher growth in population and employment densities.

Potential Expansion to Area of Influence

Corridors terminating on 1100 West in North Salt Lake (Corridor 6) and Main Street in Bountiful (Corridors 3, 4 and 5A) were considered to offer the most advantageous terminals for future extension north into the area of influence. Corridor 5B, the loop alternative, was considered to pose the greatest operational challenges for future expansion; however opportunities to interline the loop route with a future extension of high capacity service could be evaluated.

Public Preferences

Figure 11. Public Input on Screening Corridors



Public input on the screening corridors was solicited at a public open house held on December 11, 2013, and also through UTA's website via "Open UTA". A summary of expressed corridor preferences is provided in Figure 11. The majority of feedback received at the public open house pertained to concern about potential modes. Because screening corridors were mode-neutral, feedback on the actual corridor locations was less fervent. Among open house participants, there was little differentiation in corridor preference. Among comments offered via "Open UTA", Corridor

5B was perceived to serve the largest number of people and preferred by 8 on-line participants. A complete summary of public involvement on the screening corridors is provided in Appendix F.

NORTHERN SEGMENTS

A comparison of only the northern segments of the screening alternatives was performed to assess which route had the highest potential capture. The northern segments compared in this exercise are shown in Figure 12.

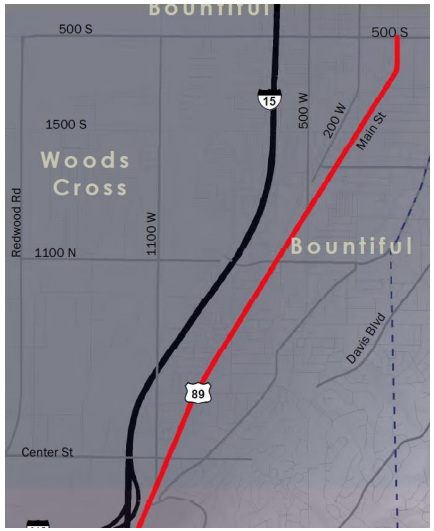
Figure 13 shows a comparison of households within a ½ mile capture area for each northern segment, per mile. (Per mile indicators offer the best comparison of performance.) Additional detail on total households served can be found in Appendix D.

Figure 14 shows a comparison of jobs accessible within a ½ mile buffer of each northern segment, per mile.

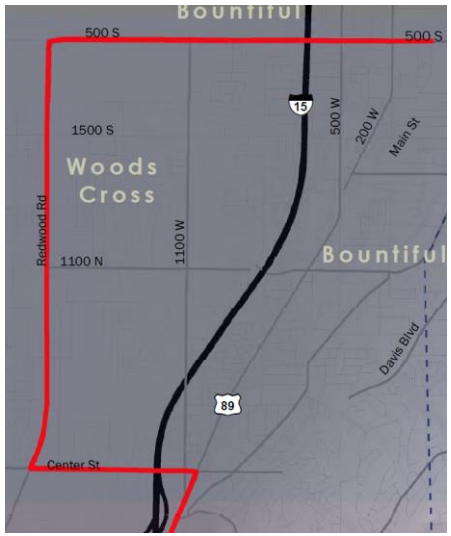
Figure 15 and Figure 16 show a comparison of transit dependents located within a ½ mile buffer of each northern segment.

Figure 12. Northern Segments Compared

500 W
Screening Corridors 1 and 2



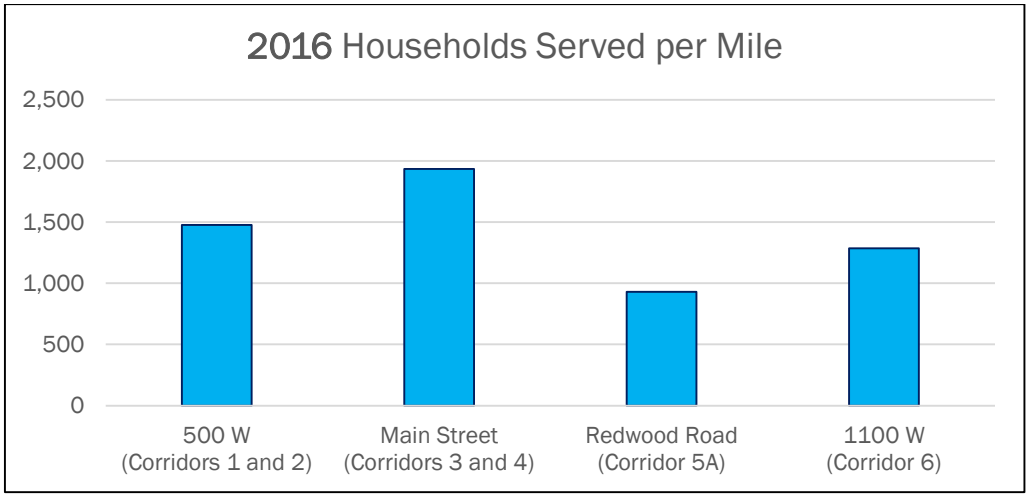
Main Street, Bountiful
Screening Corridors 3 and 4



Redwood Road
Screening Corridor 5A

1100 W/Main Street, North Salt Lake
Screening Corridor 6

Figure 13. Households Served by Northern Segments



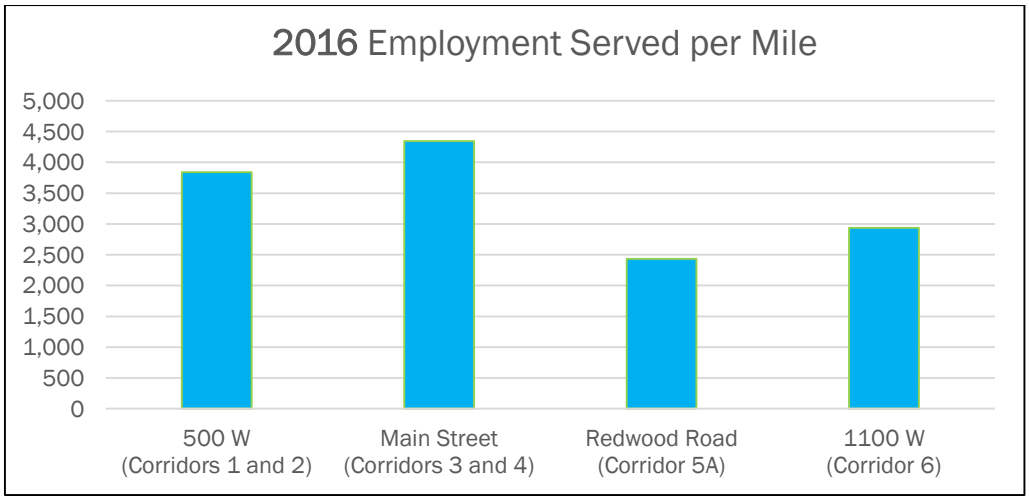
The Main Street screening segment serves:

31% more households per mile than 500 W

108% more households per mile than Redwood Road

50% more households per mile than 1100 W

Figure 14. Employment Served on Northern Segments



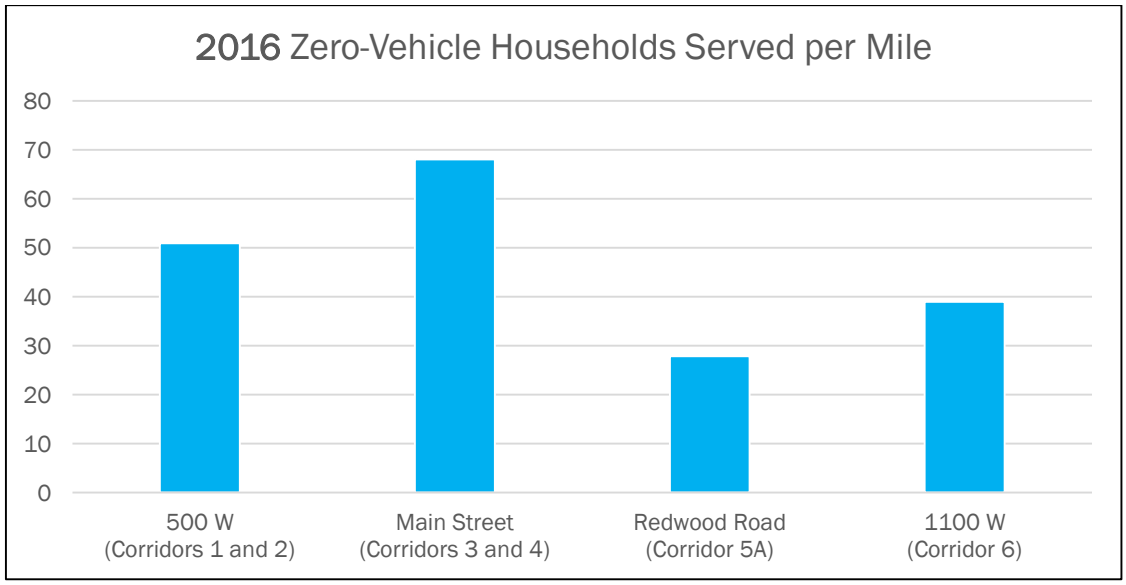
The Main Street screening segment serves:

13% more jobs per mile than 500 W

79% more jobs per mile than Redwood Road

48% more jobs per mile than 1100 W

Figure 15. Zero Vehicle Households Served on Northern Segments



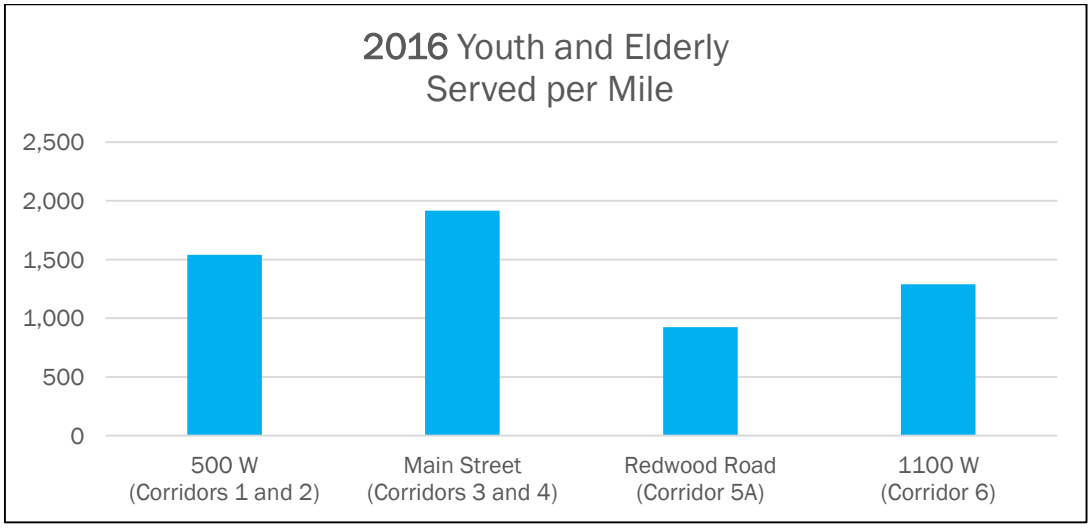
The Main Street screening segment serves:

34% ***more zero-vehicle households per mile than 500 W***

144% ***more zero-vehicle households per mile than Redwood Road***

75% ***more zero-vehicle households per mile than 1100 W***

Figure 16. Youth and Elderly Populations Served by Northern Segments



The Main Street screening segment serves:

24% ***more youth and elderly per mile than 500 W***

107% ***more youth and elderly per mile than Redwood Road***

49% ***more youth and elderly per mile than 1100 W***

NORTHERN TERMINUS

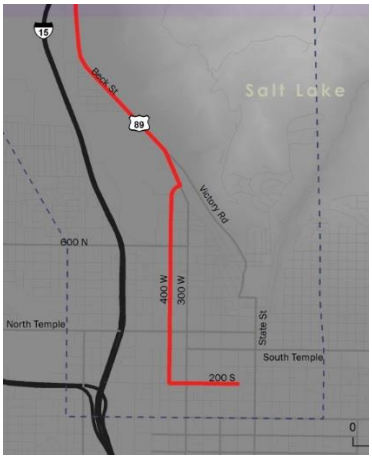
WFRC model runs were performed to compare corridors that terminated at 500 South and Main Street in Bountiful with an optional extension to the west, to terminate at the Woods Cross FrontRunner station. Model output indicates that terminating the corridor at the Woods Cross FrontRunner station would increase boardings by 20%. This is an advantage in ridership capture for the corridor, so the FrontRunner station is recommended as the northern terminus for alternatives moving into the detailed evaluation phase.

SOUTHERN SEGMENTS

Figure 17 shows the southern segments of screening corridors examined. All alternatives terminated at State Street and 200 South in downtown Salt Lake City, in anticipation of a future connection in this vicinity with a future Downtown Streetcar project currently under evaluation. Between this point and the Beck Street/Victory Road junction, three different route variations were examined.

Figure 17. Southern Segments

300 W
Corridors 1, 3, 5A, 5B and 6



400 W
Corridor 4

Victory Road
Corridor 2

Figure 18 shows a comparison of households within ½ mile of the southern corridor segments, per mile. The Victory Road corridor serves a slightly higher number of households than the 300 West segment. It should be noted that 2016 demographic estimates used in WFRC's regional travel demand model were the basis for this indicator. By 2040, demographic projections indicate that increases in residential densities downtown would make this indicator higher for 300 West than the Victory Road segment.

Figure 19 shows the jobs accessible within ½ mile of the southern corridor segments, per mile. 300 West out-performs 400 West and Victory Road for this indicator.

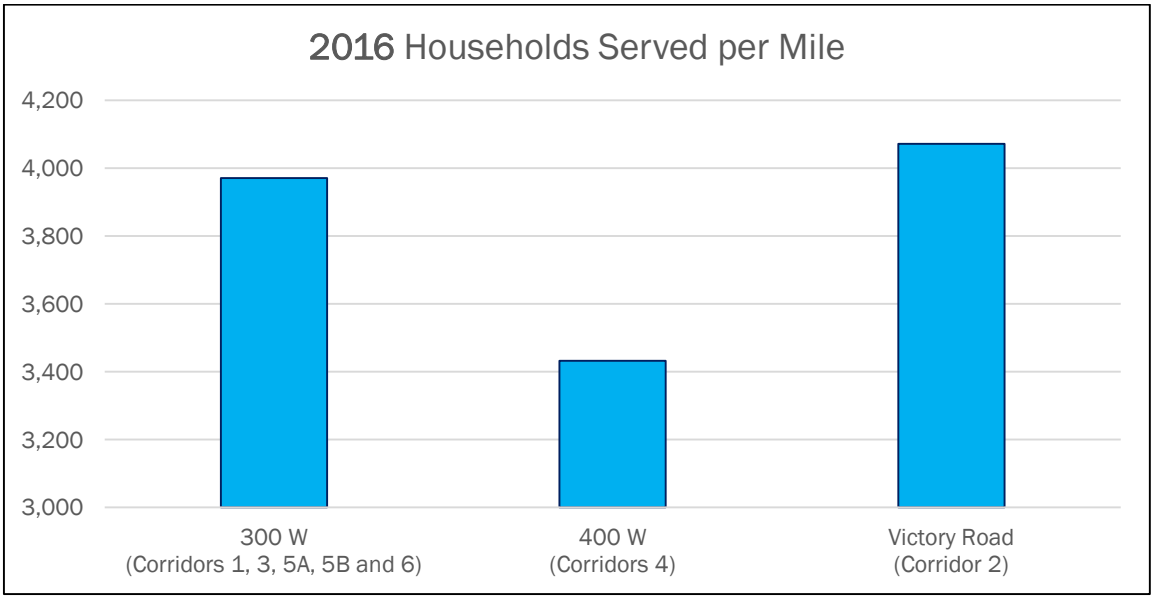
Figure 20 and Figure 21 indicate the performance of the southern segments with respect to zero-car households and youth and elderly populations. Victory Road out-performs the other two southern

segments on these indicators of transit dependence. However, the likelihood of residents along Victory Road to travel north into Davis County for essential services, and the availability of other existing transit services to transit dependents in the Victory Road area must also be considered.

While 300 West appears to have the best overall performance, there are reasons to keep the other two southern segments under consideration during the detailed evaluation phase:

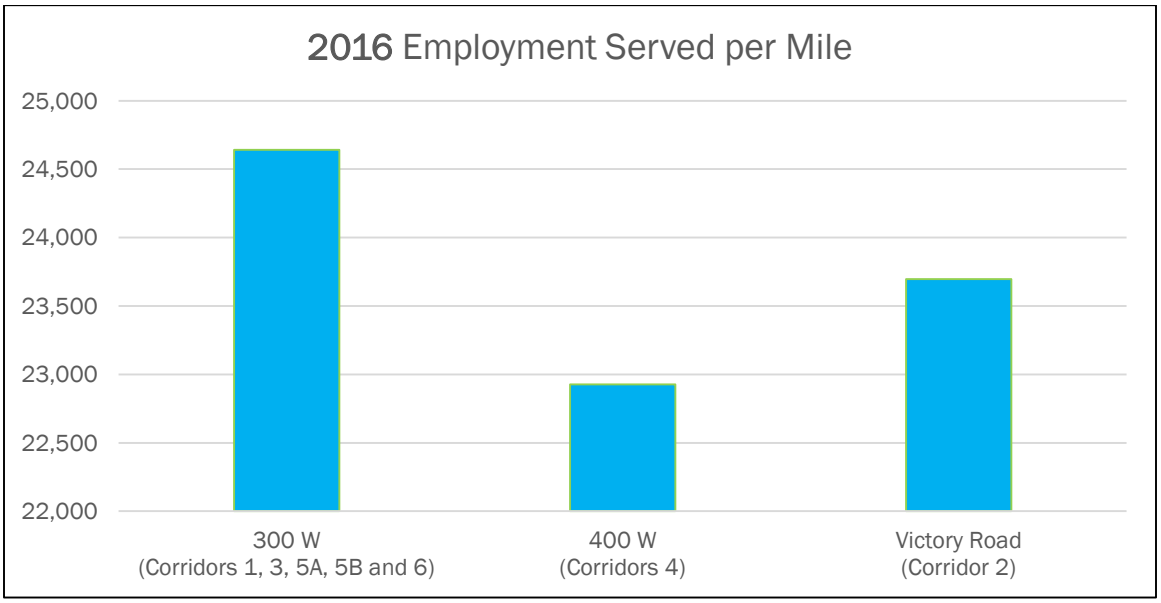
- 300 West is under UDOT jurisdiction, and also poses challenges for transit corridor development, including geometric factors at 300 West and South Temple, and bicycle accommodation.
- During the screening process, stakeholders in downtown Salt Lake City expressed interest in economic development opportunities along 400 West. This corridor currently serves both light rail and vehicular traffic. If a bus-technology alternative is selected for the Davis-SLC project, the addition of a third motorized mode could pose safety and access concerns for pedestrians in this busy downtown corridor. Special strategies to mitigate safety concerns, or potential conversion of 400 West to a transit mall could be considered.
- Victory Road, while perhaps providing fewer economic development opportunities than the two downtown Salt Lake City corridor, serves a higher number of transit dependents. This may be a good option for low/moderate investment alternatives, such as an enhanced bus corridor.

Figure 18. Households Served on Southern Segments



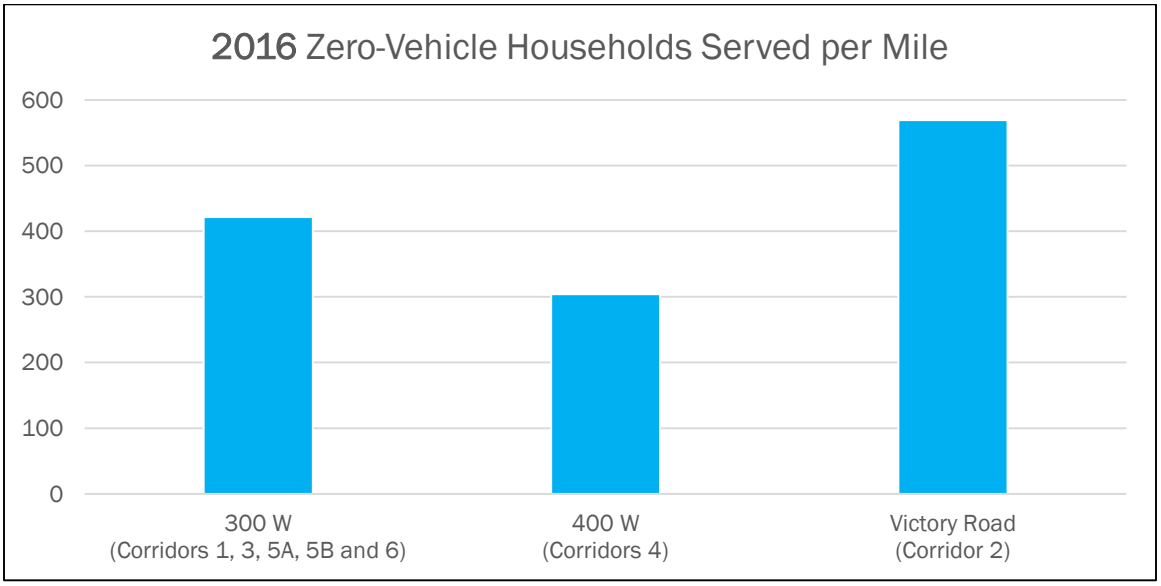
The 300 West segment serves
16% more households per mile than 400 W
2% fewer households per mile than Victory Road

Figure 19. Employment Served by Southern Segments



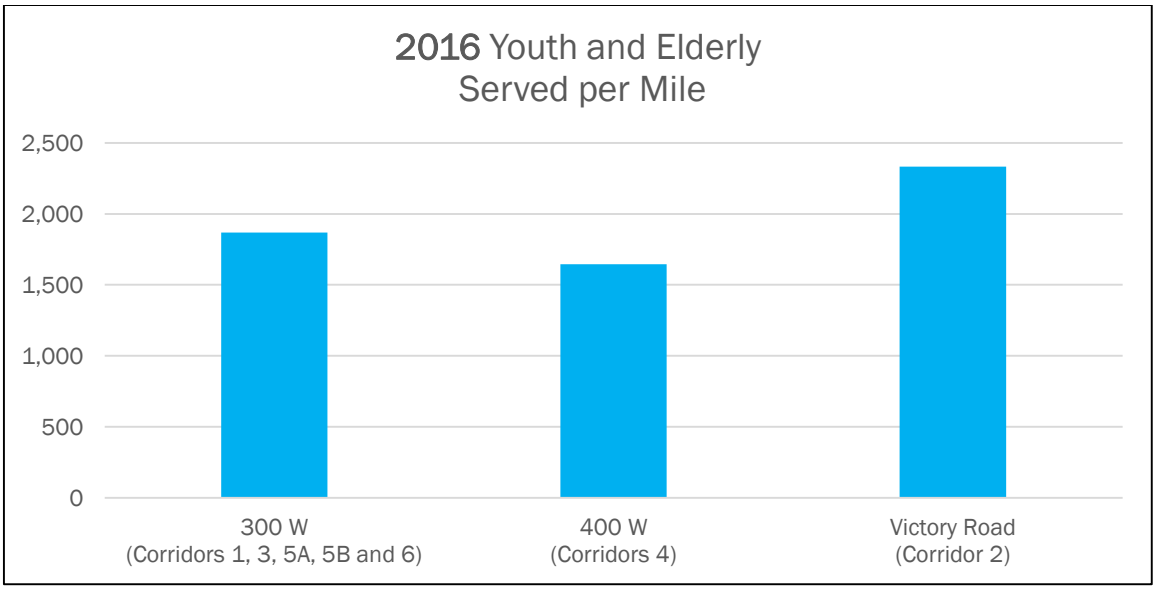
The 300 West segment serves
7% more jobs per mile than 400 W
4% more jobs per mile than Victory Road

Figure 20. Zero-Vehicle Households Served by Southern Segments



The 300 West segment serves
39% more zero-vehicle households per mile than 400 W
26% fewer zero-vehicle households per mile than Victory Road

Figure 21. Youth and Elderly Served by Southern Segments



The 300 West segment serves

14% more youth and elderly populations per mile than 400 W

20% fewer youth and elderly populations per mile than Victory Road

RECOMMENDED CORRIDORS FOR DETAILED EVALUATION

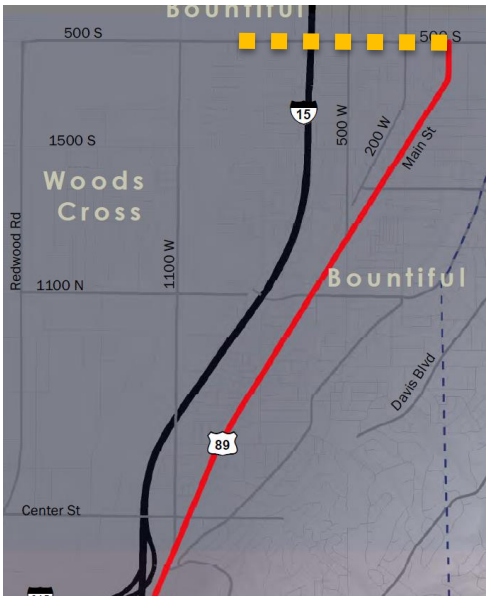
Key findings from Initial Corridor Screening include:

- Bountiful's Main Street outperformed other northern segments in the initial screening process. Bountiful's Main Street has also been identified for transit investment in the City's general plan, so other segments at the north end are less desirable from an overall service and land use standpoint.
- Performance of corridors which connect to the Woods Cross FrontRunner station provide higher mobility benefits.
- While adding additional east-west circulation opportunities may help to bolster ridership, the north-south primary corridor does stand on its own. A supporting circulator concept could be included as an LPA element (which adds complexity to the Alternatives Analysis process), or explored by UTA outside this study process.
- In the southern portion of the corridor, 300 W performed well with respect to screening criteria and is recommended for detailed evaluation.

- Further analysis of 400 W in the southern portion of the corridor is also recommended in consideration of economic development goals in downtown Salt Lake City. A future 400 West transit mall between 200 South and 600 North may be warranted.
- Terminating in downtown Salt Lake City near the area of 200 South and State Street is recommended, to afford connection opportunities to a future downtown streetcar.
- Detailed alternatives should also consider links to FrontRunner at south end of the study area.

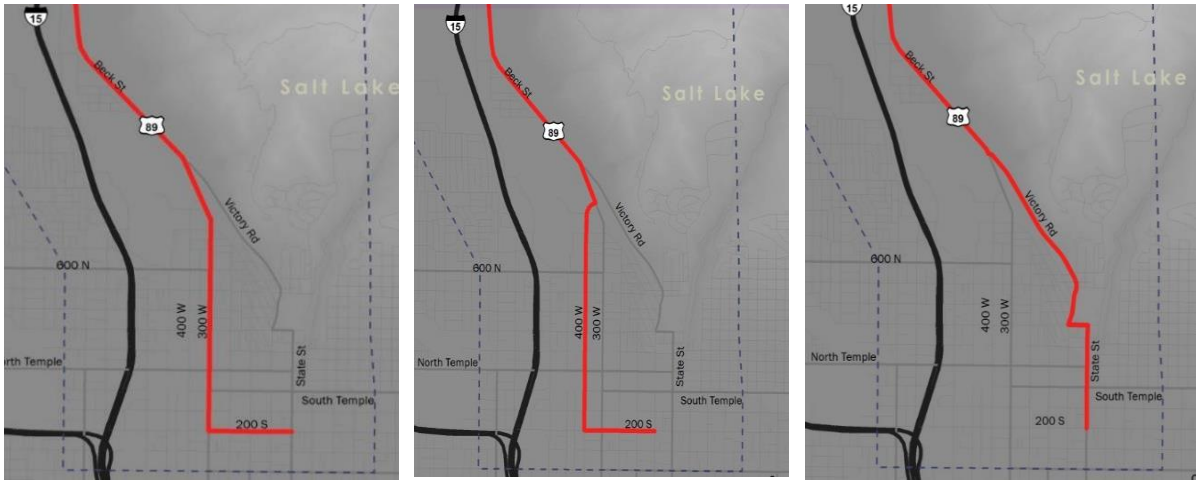
Based on the initial corridor screening results, Figure 22 and Figure 23 show northern and southern corridor segments respectively that are recommended for further study in the Detailed Alternatives phase.

Figure 22. Recommended Northern Segment for Detailed Analysis



Main Street Corridor with Extension to Woods Cross Frontrunner Station

Figure 23. Recommended Southern Segments for Detailed Evaluation



300 West 400 West Victory Road

TECHNOLOGY SCREENING

The alternatives analysis process begins by examining *where* transit investments would best serve the study area purpose and need, before determining *how* service should be provided. Mode selection is tied to the context and character of the corridor to be served. So identifying potential routes first allows responsible decisions about modes.

While initial screening corridors were evaluated from a mode-neutral standpoint, mode selection now moves to the forefront at this point in the study. Community input from an open house in December 2013 along with modal information developed for a previous South Davis Alternatives Analysis and other studies across the country will help to inform the technology evaluation. Ultimately, recommended corridor segments will be combined with technology recommendations to create a set of detailed alternatives for further evaluation.

TECHNOLOGY REQUIREMENTS FOR ALTERNATIVES ANALYSIS

The current effort underway is a formal Alternatives Analysis process. It is an initial phase of study. According to Federal Transit Administration Guidance, there are several areas of attention required which are discussed below to provide context for this study and process.

Appropriate level of detail is necessary

The alternatives should not be defined in the detail required to advance them into final design and construction, nor to complete the environmental analysis. These tasks are left to preliminary engineering, when detailed specifications for the preferred alternative and the Final EIS are typically developed. Unnecessary work may be avoided in project planning with a clear understanding of the difference between issues key to the selection of an alternative and issues related to its ultimate

construction. In reviewing technologies, we have honed in on particular options that were evaluated and discussed during earlier planning efforts, and that support the desirable characteristics of a proposed transit system within the study area.

Alternatives should tie to environmental, community and transportation needs

A key principle in the identification of alternatives is that they directly address the stated problems in the corridor. The identification of promising alternatives entails an understanding of the underlying causes of the problems in the corridor, and the potential of particular types of transportation investments to solve those problems. In evaluating technology as well as corridor options, stated transportation problems derived from the earlier Purpose and Need effort are considered.

Alternatives should include reasonable modes

In an effort to determine reasonable modes, a Technology Review has been conducted to assure that alternatives (Corridors + Modes) meet necessary objectives.

This consideration, founded on Council on Environmental Quality regulations (40 CFR Part 1502.14), addresses both the addition and deletion of alternatives. It requires the addition of alternatives that make technical sense in terms of addressing the corridor's transportation problems, even where those alternatives may not be consistent with pre-existing notions of the desired project. Equally important, it provides a basis for excluding alternatives that are simply not appropriate for the setting. Local officials should avoid carrying clearly uncompetitive options through project planning simply because their elimination might be opposed by a few individuals or groups. The postponement of this decision to the end of project planning is unlikely to make it easier, and will increase the time and cost of the analysis. Where sound technical information indicates, and a majority of technical and policy participants agree that an option is undesirable, every effort should be made to eliminate it.

Alternatives must address the stated Purpose and Need

Established Purpose and Need elements not only apply to Corridor and later Alignment selections, but also influence choice of technology. For the Davis-SLC corridor, purpose and need elements are shown in Table 6.

Table 6. Purpose and Need Elements

PURPOSE	NEED
• Increase mobility, connectivity and travel choices • Support local and regional land use initiatives • Promote economic development • Improve environmental quality	• Projected growth • Service gaps • Access and mobility barriers • Bicycle and pedestrian facilities • Revitalization (deteriorating neighborhoods and corridors) • Air quality mitigation • Markets not served

Alternatives designed to address differing goals and objectives should be included

The study area includes a number of goals and values that relate to the Purpose and Need. Some may stress the achievement of mobility goals, while others may emphasize the need for environmental quality or fiscal responsibility. By including alternatives that respond to these different goals, the trade-offs inherent in choosing a preferred alternative that responds to these different goals can be made more explicit, and citizens of varying viewpoints can be brought into the process.

Similarly, the corridor includes many travel markets, such as travel by particular population subgroups, travel within or between specific geographic areas, or travel for particular purposes. No one alternative is likely to serve all of these markets well; so different alternatives should be defined for different travel markets. For example, a bus line with closely spaced stations may be included in corridors with a large number of relatively short trips. A second alternative, perhaps using the same technology and alignment, might be developed with fewer stations to better serve longer distance trips.

Based on prior studies and current study outreach that has included Focus Groups and Telephone Surveys, the modes under consideration and detailed in this document do address divergent needs. However clear patterns were discerned that show consistency within the study area in terms of technology choices. This input is strongly considered by the study team in defining technologies that are recommended for official alternatives.

The set of alternatives should include all options that have a reasonable chance of becoming the Locally Preferred Alternative (LPA)

A Locally Preferred Alternative emerges from the evaluation of mode and alignment options in project planning. The initial definition of alternatives is developed with care. For this reason, we are not advancing technology options into the Detailed Evaluation that do not and have not been shown to effectively serve both corridor and community needs.

The alternatives should encompass an appropriate range of options without large gaps in the costs of the alternatives.

Financial aspects (capital, operating and maintenance) should be considerations in assessing the reasonableness of an alternative. Where the resources needed to build and operate an alternative greatly exceeds the amount of funding that can realistically be anticipated, that alternative may be eliminated despite its potential transportation or other merits. At this early stage, technology costs were evaluated at a high level, to gauge the likelihood of anticipated ridership in the corridor to support the potential technologies under consideration. However, detailed costs will be a primary decision factor in the next phase of the study.

For the next phase of analysis (Detailed Evaluation of Alternatives), the set of alternatives should include a reasonable cost continuum. For this reason, technologies which are dramatically different in cost can be eliminated at this stage, especially if transportation needs and community desires do not supports their advancement to further levels of study.

TECHNOLOGIES CONSIDERED

As a starting point, the following technologies were considered. The project is branded as the Davis –SLC community connector to reflect identified needs within the study area. Based on this foundation, proven technologies that could provide community connections for north-south and east-west travel were identified.

All four of these technologies were also evaluated in prior AA study efforts, which provided some insight into viable technologies.

- Streetcar;
- Light Rail;
- Bus; and
- Bus Rapid Transit

Commuter Rail already exists within the area and was not considered as an option to serve urban connectivity, however connections to Commuter Rail services in the study area are key to objectives of the project.

Figure 24. Technology/Mode Types

Figure 25. Comparison of Typical Vehicle Size for Technologies

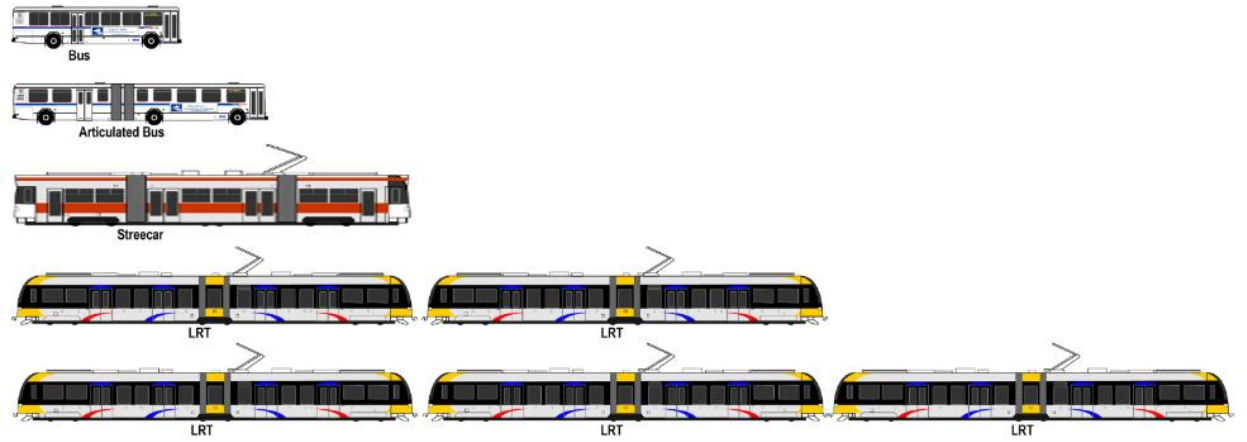


Figure 26. BRT Definition

Figure 27. LRT Definition

Figure 28. Streetcar Definition

Figure 29. Enhanced Bus Definition

Premium transit features, such as special branding and operational features that improve travel time and rider convenience are commonly applied to both BRT and Streetcar/LRT applications as shown in Table 7.

Table 7. Premium Transit Elements

	ITS	Branding	Exclusive Lanes	Off-Board Fare Collection	High Frequency of Service	Travel Time Reliability
Streetcar or Light Rail	Yes	Yes	Yes	Yes	Yes	Yes
Bus	Not typically	Not typically	No	No	Not typically	No
Bus Rapid Transit	Yes	Yes	Yes	Yes	Yes	Yes

For the purposes of this study, Streetcar and LRT technology/modes were consolidated. Nationally, definitions of streetcar v. LRT vary, depending on the vehicle selection, station spacing, and desired branding of the system, but are both similar or in some cases, the same rail technology.

The following tables illustrate findings from the Technology Assessment based on factors that are specific to this study area and make a difference in terms of identified transit priorities and needs. A detailed evaluation of technology performance characteristics is preserved for the next phase of analysis once desired technologies have been clearly established. Technology characteristics have been previously studied through earlier planning efforts in study area. The results of earlier studies are efforts that provided much education of stakeholders and residents in the study area, but the findings are not being used as a basis for selection of technology during this effort in order to provide a fresh look at needs, opportunities, and desires.

TECHNOLOGY RELATION TO PURPOSE AND NEED ELEMENTS

Table 8. Transit Technologies - Relation to Purpose Elements

	Potential to Increase mobility, connectivity, and travel choices?	Supports local and regional land use Initiatives?	Promotes Economic Development?	Improves Environmental Quality?
Streetcar or Light Rail	Yes	Possibly*	Yes	Possibly
Bus	Yes	Yes	Not Likely	Possibly
Bus Rapid Transit	Yes	Yes	Yes	Possibly
*Rail is not supported by Bountiful's land use goals for Main Street corridor				

Table 9. Transit Technologies - Relation to Need Elements

	Serves projected growth?	Serves identified service gaps in existing services?	Addresses access and mobility barriers?	Serves bike and pedestrian deficiencies?	Stimulates revitalization	Improves Air Quality?	Addresses markets not served?
Streetcar or Light Rail	Yes	Yes	Yes	Possibly	Yes	Possibly	Yes
Bus	Possibly	Possibly	Yes	Possibly	No	Possibly	Possibly
Bus Rapid Transit	Yes	Yes	Yes	Possibly	Yes	Possibly	Yes

COST CONSIDERATIONS

There are specific instances when LRT or Streetcar applications may offer a capital cost advantage over BRT -- for example, where tunnels or elevated structures are involved. Typically, however, projects across the nation indicate that rail installations cost almost 3 times more than comparative BRT solutions, as shown in Table 10. Within the Salt Lake Region, trends are similar. This does not necessarily indicate that Light Rail/Streetcar are not warranted, however the choice for these modes has to be heavily justified by factors in addition to cost.

Table 10. Comparison of LRT and BRT Capital Costs

Project	Opened	Length (mi)	Capital Cost/Mile ($Millions in 2012 dollars)
ELECTRIC LRT PROJECTS			
Houston MetroRail	2004	7.5	$56.9
Memphis Madison Ave Medical Center Streetcar Extension	2004	2	$38.2
Portland MAX Yellow Line	2004	5.8	$73.5
Minneapolis Hiawatha LRT	2004	11.6	$79.1
San Diego Mission Valley East Extension	2005	5.9	$109.2
Denver Southeast LRT	2006	19.1	$54.8
Charolotte Lynx Green Line	2007	9.6	$52.8
Phoenix Metro	2008	19.6	$82.0
Seattle Link LRT South	2009	15.6	$182.6
Portland MAX Green Line	2009	8.3	$76.9
Los Angeles Gold Line	2009	5.9	$168.9
Norfolk The Tide	2011	7.4	$44.5

Project	Opened	Length (mi)	Capital Cost/Mile ($Millions in 2012 dollars)
LRT AVERAGE:			**$85.0**
BRT PROJECTS			
Los Angeles Orange Line Busway	2005	14	$29.4
Eugene Oregon Emerald Express	2007	2.5	$11.7
Cleveland HealthLine-Euclid Avenue	2008	4.4	$51.4
BRT AVERAGE:			**$30.8**
Source: Henry, Lyndon and Dobbs, Dave, "Comparative Examination of New Start Light Rail Transit, Light Railway and Bus Rapid Transit Services Opened from 2000", Transporation Research Circular Number E-C177, November 2013			

A comparison of operating expense data from National Transit Database data is provided in Table 11, and shows that UTA's per mile operating costs for LRT are comparable to BRT applications in other areas of the country. Based on this, capital cost is likely to be a greater differentiator than operating costs.

Table 11. Comparison of LRT and BRT Operating Costs

Transit Agency	Mode	2012 Total Reported Operating Expenses by Mode	Miles	2012 Operating Expenses per Mile
Utah Transit Authority	LRT	$42,177,868	71.2	**$592,385.79**
Lane Transit District	BRT	$5,533,908	10.1	**$547,911.68**
Central Florida Regional Transportation Authority	BRT	$1,786,821	2.5	**$714,728.40**
The Greater Cleveland Regional Transit Authority	BRT	$6,514,207	28.3	**$230,183.99**
Los Angeles County Metropolitan Transportation Authority dba: Metro	BRT	$22,550,664	35.4	**$637,024.41**
Source: Derived from National Transit Database 2012 Data				

RIDERSHIP CONSIDERATIONS

With higher capital costs, higher ridership is necessary for a successful rail technology project. Ridership estimates prepared during the initial screening process indicate a maximum of 500 boardings per mile could be anticipated on the Davis-SLC corridor. Table 12 shows the projected boardings per mile used to justify other streetcar and LRT projects around the country. Anticipated per-mile boardings on the Davis-SLC corridor are lower than those typically needed for a successful LRT installation.

Table 12. Representative Streetcar and LRT Boardings per Mile

Transit System	City	Length of System	Boardings Per Mile
MAX Light Rail	Portland	52.4 miles	2,298
Denver RTD	Denver	47 miles	1,717
TRAX (UTA)	Salt Lake City	44.8 miles	1,424
MetroLink	St. Louis	46 miles	1,257
Sacramento RT Light Rail	Sacremento	38.6 miles	1,140
Santa Clara VTA Light Rail	San Jose	42.2 miles	836
Link Light Rail Tacoma Link and Central Link	Tacoma and Seattle	17.3 miles	2,006
METRO Blue Line	Minneapolis	12.3 miles	2,724
Baltimore Light Rail	Baltimore	33 miles	821
RTA Streetcars	New Orleans	22.3 miles	934
Newark Light Rail	Newark	7.0 miles	2,764
Portland Streetcar	Portland	7.35 miles	1,794
LYNX Rapid Transit Services Light Rail	Charlotte	9.6 miles	1,677

TECHNOLOGY RECOMMENDATIONS

Although Streetcar was recommended in the prior study, and rail solutions could generally meet Purpose and Need Elements; LRT and Streetcar are not recommended for further evaluation based on the following findings:

- Existing and forecast ridership does not support a rail investment
- A primary goal is to allow flexibility of service, especially to the area of influence
- Highly notable opposition to rail solutions in the corridor was evidenced during the previous study
- Based on public comments received, and input from study partner agencies, support for rail solutions during the current study effort is not prevalent
- Support for bus based technologies has been expressed by partner agencies and stakeholders at the northern end of the corridor
- Integration with regional services and connections to major activities will not be limited for this corridor by not selecting a rail option
- Funding for a rail option could be secured for a rail solution with significant effort; however no funds are reasonably available at this stage to support rail investments

- Finally, a large difference in alternatives, where higher costs or significant environmental impacts and public acceptance are not accompanied by higher benefits, might suggest that the more expensive and/or impacting option be eliminated.

Recommended technologies for the Davis-SLC Community Connector include:

- **Enhanced Bus; and**
- **Bus Rapid Transit**

The range of solutions between Enhanced Bus and BRT are wide. Generally they are categorized as High End BRT and Low End BRT. This range will need to be further evaluated in Detailed Evaluation. Figure 30 shows typical features associated with BRT applications, and Table 13 highlights some of the differing characteristics between high and low/moderate investment levels.

Table 13. Fixed Characteristics of High-End BRT and Low/Moderate BRT

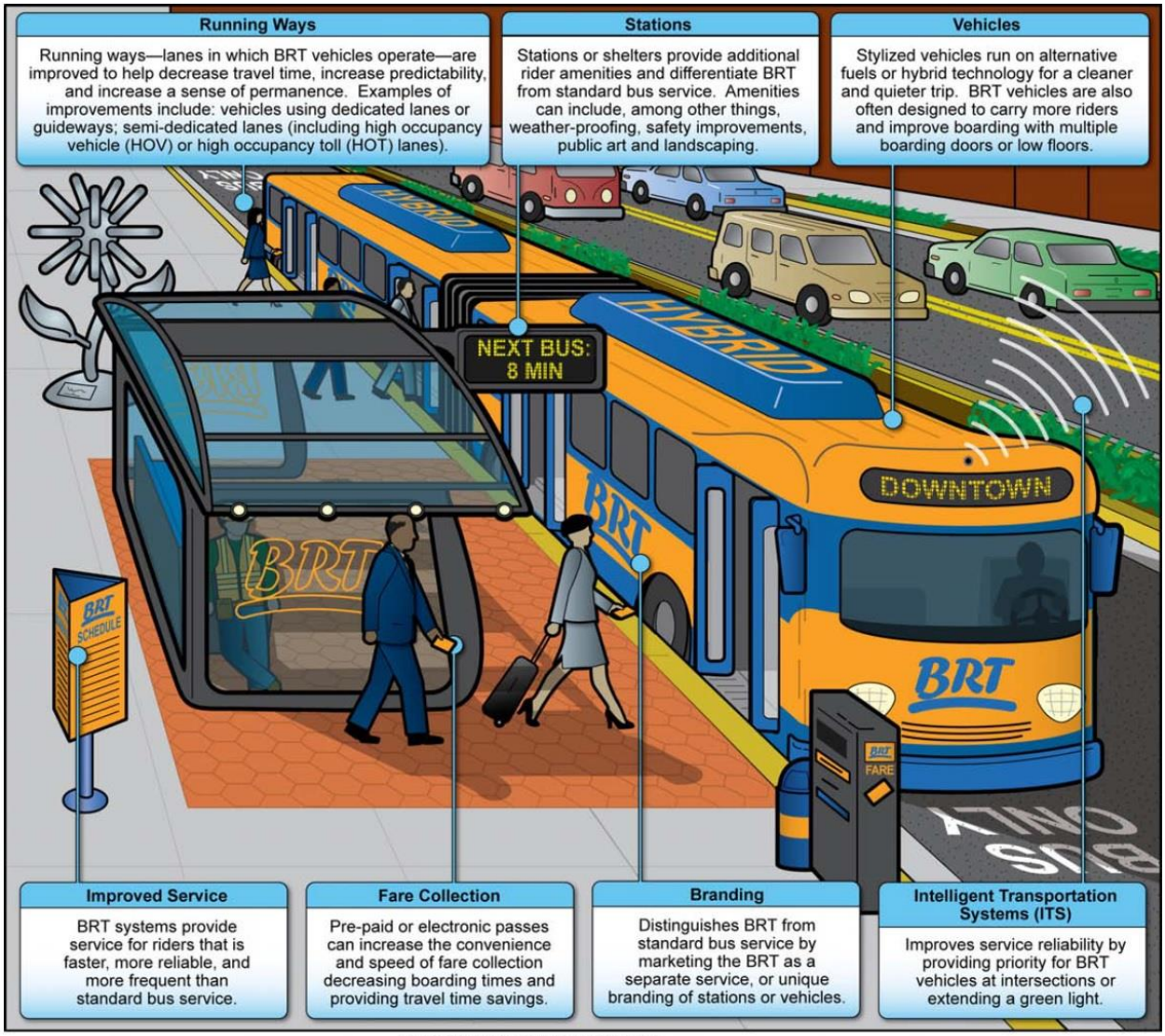
	High-End BRT/Full Service	Low-End BRT/BRT "Lite" / Moderate-Service
Running Ways	Exclusive transit-ways; dedicated bus lanes; some grade separation	Mixed traffic
Stations/Stops	Station amenities range from enhanced shelters to large temperature controlled transit centers	Stops with shelters. May include seating, lighting and passenger information
Service Design	Frequent services, integrated local and express services, timed transfers	More traditional service designs
Fare Collection	Off-vehicle collection, smart cards; multi-loading door	More traditional fare media
Technology	Automated Vehicle Location (AVL); passenger information systems; traffic signal preferences; vehicle docking/guidance systems	More limited technological applications
Source: SAG Report 20: Bus Rapid Transit (BRT)		

Service plans will be evaluated to identify the type of preferred service:

- *BRT Spine Services* are all-stops routes that run entirely on the guideways, providing a very high-frequency core
- *Mainline routes* travel across the region and may use portions of the guideway for part of their route.

Local feeder buses connect neighborhoods with guideway stations. Some offer connecting service in non-peak hours (during peak hours, Express services operate as local feeders, then continue through a possible future transitway in downtown), whereas others operate all day.

Figure 30. Typical BRT Features



Source: GAO analysis of bus rapid transit research.

RECOMMENDED ALTERNATIVES FOR DETAILED EVALUATION

Based on findings from the initial corridor and technology screening, two alternatives have been identified for detailed evaluation as summarized below and shown in Figure 31 and Figure 32.

ALTERNATIVE "A" – ENHANCED BUS

General Description

- New north-south primary service using branded buses.
- 15 minute peak hour and mid-day headways; 20 minute evening headways. (May be refined after analysis.)
- Traffic signal priority to keep the light green for approaching buses.
- May include "queue jump" opportunities at select intersections to allow the bus to move to the front of the line at red lights.
- Optional branded bus circulator serving Bountiful, Woods Cross and North Salt Lake to support the new BRT alignment. (This option would be an enhancement to, and not part of, an LPA.) Circulator may add to or supplant existing service.

Stop Configuration and Amenities

- Passenger amenities at all stop locations such as:
  - Shelters with night time lighting
  - Informational and ticket purchase kiosks at all stop locations.
  - Real-time bus arrival information on electronic reader-boards.
- No major roadway geometric improvements at stop locations under this alternative.

Non-Motorized Improvements and Other Assumed Strategies

- Bicycle network improvements in Bountiful, North Salt Lake and Downtown Salt Lake City (as identified in City plans) to connect surrounding neighborhoods to key stop locations.
- Pedestrian access improvements within a ¼ mile walk buffer of all stop locations.

ALTERNATIVE "B" – BUS RAPID TRANSIT

General Description

- New north-south primary service using branded special vehicles including, level boarding and on-board bicycle accommodation.
- 10 minute peak hour headways; 15 minute headways all other times. (May be refined after analysis.)
- Traffic signal priority to keep the light green for approaching buses and "queue jump" opportunities at congested intersections to allow the bus to move to the front of the line at red lights.
- Higher level roadway improvements to improve bus travel time, such as roadway reconfiguration at station locations, and possible reconfiguration of US89/Main Street junction in Bountiful. Possible transit mall for segments where BRT may be combined with an existing LRT corridor.
- Optional branded bus circulator serving Bountiful, Woods Cross and North Salt Lake to support the new BRT alignment. (This option would be an enhancement to, and not part of, an LPA.) Circulator may add to or supplant existing service.
- Potential for some exclusive lane segments, depending on TOD potential.

Station Configuration and Amenities

- Possible center platform station configuration in key locations, as suggested in North Salt Lake's Transportation Plan.
- Passenger amenities at all stop locations such as:
  - Platforms with shelters and bike racks at all station locations.
  - Informational and ticket purchase kiosks at all station locations.
  - Real-time bus arrival information on electronic reader-boards.
  - Night-time platform lighting.
- Higher level of operational technology such as computer alignment of BRT vehicles at platforms to reduce boarding times and facilitate ADA access.
- Optional park and ride at 2600 S Bountiful / 1100 N North Salt Lake with enhanced amenities such as bike lockers, bike rentals. Potential co-location point for Vanpool, Zipcar and/or EV charging stations.

Non-Motorized Improvements and Other Assumed Strategies

- Bicycle network improvements in Bountiful, North Salt Lake and Downtown Salt Lake City (as identified in City plans) to connect surrounding neighborhoods to key stop locations. Pedestrian access improvements within a ¼ mile walk buffer of all stations.
- Land use policy changes to encourage TOD at select stations.

Figure 31. Detailed Alternative A - Enhanced Bus

Figure 32. Detailed Alternative B - BRT