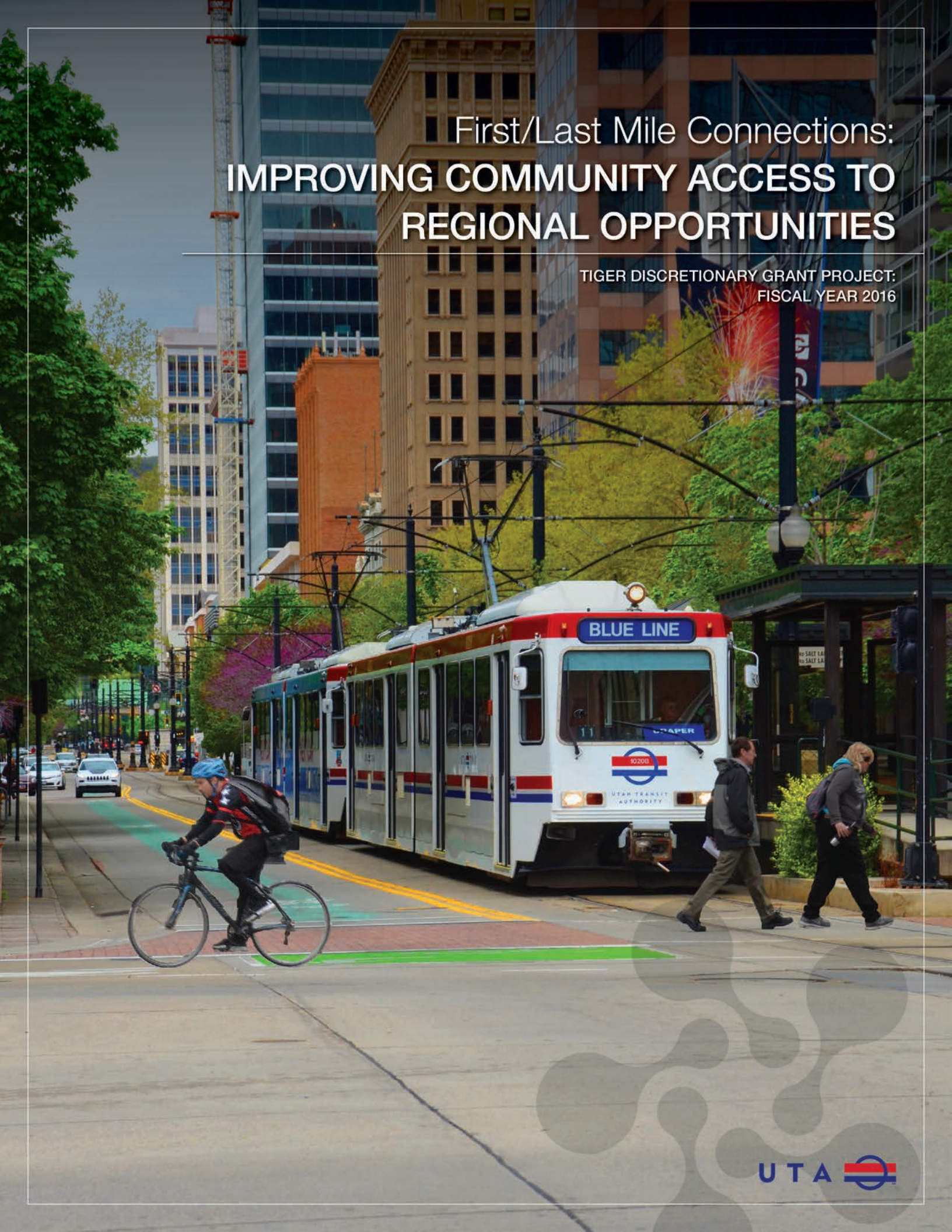

First/Last Mile Connections:
IMPROVING COMMUNITY ACCESS TO REGIONAL OPPORTUNITIES

TIGER DISCRETIONARY GRANT PROJECT:
FISCAL YEAR 2016

UTA

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Table of Contents

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Summary and Benefits

LOCATION
The project impacts six counties in the greater Salt Lake region: Weber, Davis, Salt Lake, Tooele, Utah, and Summit counties.

CONGRESSIONAL DISTRICTS
This project impacts Utah Congressional Districts 1, 2, 3, and 4 (all of Utah's congressional districts).

PROJECT CLASSIFICATION
Urban

ECONOMIC STATUS
123,774 households (approximately 23 percent of the total area population) in the project area live below the poverty line.

PROJECT LEAD
Utah Transit Authority

PROJECT FUNDING PARTNERS
- Utah Department of Transportation
- Wasatch Front Regional Council
- Mountainland Association of Governments
- Cities of: Pleasant View, Roy, Ogden, West Haven, Bountiful, Clearfield, Layton, Farmington, Woods Cross, Draper, Midvale, Murray, Salt Lake City, Sandy, South Jordan, South Salt Lake City, West Jordan, West Valley City, Provo, Lehi, American Fork, Orem, and Tooele
- Counties of: Salt Lake, Utah, Tooele, and Summit

PROJECT COST
$87,807,342

COMMITTED FUNDING
- $11,428,456 in local funding
- $34,881,032 in state funding
- $11,980,232 in reallocated federal funding

> "Utah Transit Riders Union advocates for transit users, statewide. We strive to make transit reliable, accessible, comfortable, efficient, and affordable for all. The projects represented in this application are critical needs to make transit more accessible to more people and increase ridership."
>
> *- Deb Henry, Vice President*
> *Utah Transit Riders Union*

TIGER FUNDING REQUEST
$28,228,031 which results in a 68 percent local match.

RESULTS OF BENEFIT-COST ANALYSIS (YR 2015)
- 2.04:1 at seven percent discount rate
- 2.99:1 at three percent discount rate

PROJECT DESCRIPTION
This regional, data-driven approach addresses first/last mile concerns throughout the Utah Transit Authority's 148 mile commuter rail and light rail system, improving transit access in 26 cities and around 36 stations.

PROJECT BENEFITS

SAFETY
- Fills in more than 79 miles of sidewalk, trail, and bike network gaps throughout UTA's system.

MULTI-MODALISM
- Is projected to increase UTA ridership by almost two percent, resulting in an approximate increase of 760,000 boardings annually.
- Encourages system users to get to the station by walking, biking, or taking transit, rather than driving.

ECONOMIC BENEFITS
- Helps communities connect planned or existing housing, commercial, and mixed-use developments to local transit stations.

Introduction

In the state of Utah, the Wasatch Front is defined by several unique geographic features, including the internationally famous, snow-covered Wasatch Range to the east and the expansive Great Salt Lake to the west. These beautiful yet imposing features pose a unique transportation and land use challenge for the counties that comprise the Wasatch Front: Weber, Davis, Salt Lake, Box Elder, Tooele, Utah, and Summit counties. The regional population is projected to grow 182 percent by 2050, bringing both new opportunities and challenges to the area.[1] There is significant interest from all of the regional planning partners and stakeholders in maximizing the world class transit system that operates along the Wasatch Front, to continue to foster economic growth, while managing the new trips and vehicle miles traveled (VMT) that a robust, growing economy brings.[2] In 2013 the Wasatch Front Regional Council (one of two metropolitan planning organizations serving the region) published a report titled "*2013-2018 Comprehensive Economic Development Strategy.*" This report identified the region's access to high quality transit service as one of its greatest benefits when vying to attract new businesses and young talent to the area.[3]

The Utah Transit Authority (UTA) operates all of the bus, rail and paratransit services along the Wasatch Front. Its service links seven counties through a network of 131 bus routes, 58 miles of light rail lines (TRAX) and a commuter rail line (FrontRunner) that extends 88 miles across four of the seven counties that comprise the Wasatch Front.

1 *"A Snapshot of 2050: An Analysis of Projected Population Change in Utah." Utah Foundation. Report # 720, April 2014. http://www.utahfoundation.org/uploads/rr720.pdf*

2 *"2013-2018 Comprehensive Economic Development Strategy." Wasatch Front Economic Development District. April 2013.*

3 *"2013-2018 Comprehensive Economic Development Strategy." Wasatch Front Economic Development District. April 2013.*

UTA'S MISSION

UTA strengthens and connects communities enabling individuals to pursue a fuller life with greater ease and convenience by leading through partnering, planning, and wise investment of physical, economic, and human resources.

UTA'S VISION

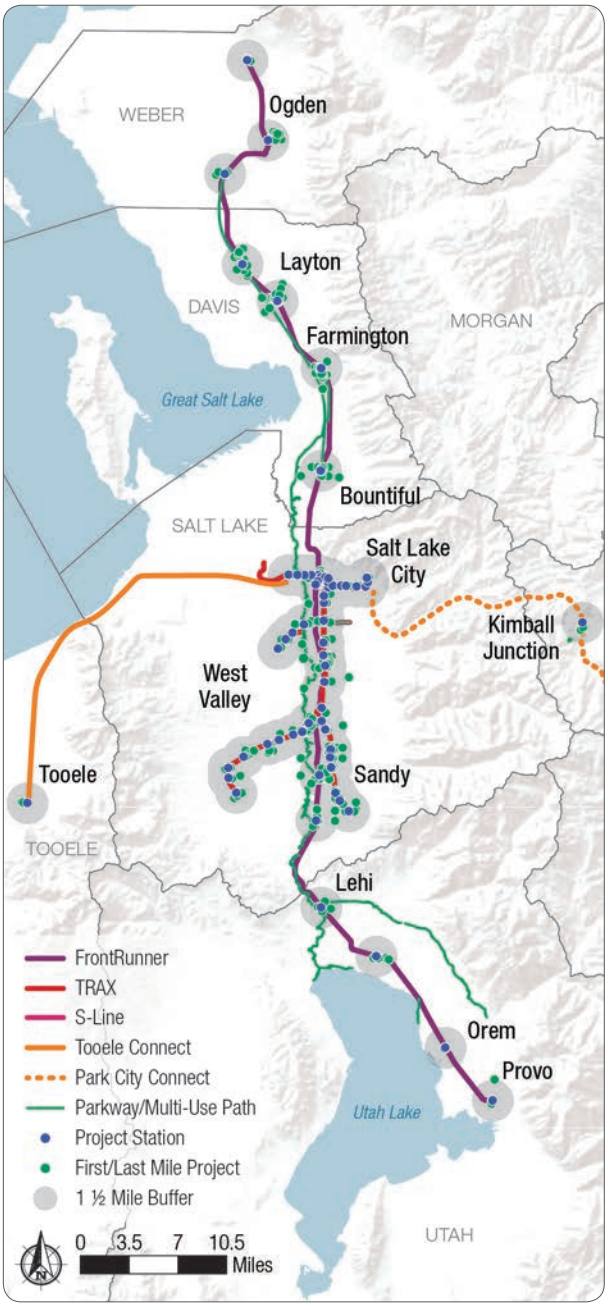
Provide an integrated system of innovative, accessible and efficient public transportation services that increase access to opportunities and contribute to a healthy environment for the people of the Wasatch region.

Families wait to board TRAX.

The total service area of UTA is over 1,600 square miles. The entire system serves more than 1.8 million people and represents one of the largest geographic service areas of any transit agency in the United States, providing more than 46 million rides in 2015.[4] A system this large requires an enormous amount of cooperation across the region. UTA works closely with the Wasatch Front Regional Council (WFRC) and Mountainland Association of Governments (MAG), the local metropolitan planning organizations along the Wasatch Front (both of which are funding partners of this project), as well as the seven county governments, 77 communities that

4 *"2013-2018 Comprehensive Economic Development Strategy." Wasatch Front Economic Development District. April 2013.*

Figure 1: *Total Project Area with Stations, Transit Lines, and Active Transportation Corridors*



make up the Wasatch Front, and the Utah Department of Transportation (UDOT). Through its Transportation and Land Use Connection program, UTA specifically provides technical assistance and training to support innovative land use planning among the communities that it serves, especially those communities with new rail stations who may not be familiar with the fundamental principles of transit-oriented development (TOD).

The projected population growth described above puts pressure on the area's transportation system to be ready to serve more residents, more trips, more freight and more traffic. UTA and its partners agree that transit is one of the best options to address this situation.

In October 2013 the UTA Board of Trustees adopted a "*2020 Strategic Plan.*"[5] This plan contains a vision that prepares the agency to meet its rapidly changing environment. One of the stated goals in this strategic plan is to double ridership by 2020. As part of the strategy to meet UTA's ridership objective, another related goal is to "*Develop a fully integrated first/last mile strategy.*" In 2014, UTA began working with the WFRC, MAG, and UDOT to produce a regional "*First/Last Mile Strategies Study*" (Appendix 1).[6] The goal of the study was to take a holistic approach in identifying effective first/last mile treatments throughout the regional rail system and create a toolbox to implement these improvements in order to provide safer and more convenient access to transit stations. The criteria by which the improvements were screened included (but were not limited to) adding ridership, improving health and safety, and improving accessibility for disadvantaged populations.

A senior woman rides FrontRunner.

5 *"UTA 2020 Strategic Plan." UTA Board. October 2013.*

6 *UTA, First/Last Mile Strategies Study, April 2015.*

The study looked at each TRAX and FrontRunner station in the system and identified all of the treatments that were necessary to improve access for all people who walk, bike, or take transit to these stations. Stations were then categorized (by typologies) and ridership benefits were analyzed based on future population and employment growth. Every rail station within the entire UTA system was surveyed, and the treatments considered included:

- eliminating specific sidewalk and trail network gaps;
- expanding bike share;
- sidewalk condition improvements;
- curb extensions and curb cuts;
- raised crosswalks;
- HAWK beacons (high intensity activated crosswalk beacons, for protected pedestrians in highly trafficked areas);
- detectable warnings;
- painted or protected bike lanes;
- improved wayfinding;
- street and station lighting;
- bus stop enhancements;
- bike parking; and
- bike maintenance stands.

Figure 2 summarizes the station typologies and provides a high level description of recommended treatments. It is these treatments, resulting from the *First/Last Mile Strategies Study*, which serve as the blueprint for UTA's proposed TIGER project.

Figure 2: *Station Typologies and Recommended Treatments*

TYPOLOGY	RECOMMENDED STRATEGIES	RAIL STATIONS
URBAN	• Wayfinding and Information • Bicycle Network Improvements • Bike Share Stations • Car Share Stations	• Planetarium • Arena • Temple Square • City Center • **Gallivan Plaza** • Courthouse • 900 South • **Library** • Trolley • **900 East**
MULTI-MODAL	• Wayfinding and Information • Bicycle Network Improvements • Access Connections • Pedestrian Network Improvements • Crossing Treatments • Rail/Bus Stop Enhancements	• 1940 W North Temple • **Power** • Fairpark • Jackson/Euclid • North Temple Bridge/Guadalupe • **North Temple** • Redwood Junction • **West Valley Central** • **Salt Lake Central** • Old Greektown • Ball Park • **Central Pointe** • Millcreek • **Sandy Expo**
INSTITUTIONAL	• Bicycle Network Improvements • Bike Share Stations	• **Orem** • **Stadium** • University South Campus • Fort Douglas • University Medical Center
SUBURBAN NON-RESIDENTIAL	• Wayfinding and Information • Bicycle Network Improvements • Bike Share Stations • Rail/Bus Stop Enhancements	• **Ogden** • **Meadowbrook** • Murray North • **Murray Central** • **Fashion Place West** • **Sandy Civic Center** • River Trail • Decker Lake • Draper
SUBURBAN	• Wayfinding and Information • Bicycle Network Improvements • Pedestrian Network Improvements • Crossing Treatments	• **Midvale Fort Union** • Midvale Center • **Historic Sandy** • Crescent View • Kimballs Lane • **Draper Town Center** • Bingham Junction • **Historic Gardner** • **West Jordan City Center** • **Jordan Valley** • **4800 W Old Bingham Hwy** • **Provo**
AUTO-DEPENDENT	• Wayfinding and Information • Bicycle Network Improvements • Access Connections • Pedestrian Network Improvements • Crossing Treatments	• **Pleasant View** • **Roy** • **Clearfield** • **Layton** • **Farmington** • **Woods Cross** • **Lehi** • South Jordan • **American Fork** • **2700 W Sugar Factory Road** • 5600 W Old Bingham Hwy • South Jordan Parkway • **Daybreak Parkway**

Note: bold stations are the 36 stations included in this TIGER project.

Project Description

Improving Community Access to Regional Opportunities (ICARO), is UTA's Phase I First/Last Mile Strategy Implementation plan. It includes 466 treatments at 36 transit stations, focused on improving access, safety, and connectivity to the UTA network. The project is unique because it results from a system-wide solution foundation (the regional *First/Last Mile Strategies Study*), not the cobbling together of disparate station area plans. The goal of the project is to increase transit ridership by implementing the supported strategies identified in the study, and to work with municipalities and other stakeholders to provide a safer, more convenient travel environment in which residents from across the region can feel more comfortable, and confident walking, biking, or taking transit to access the TRAX or FrontRunner stations.

Safe access to various transit modes.

The *First/Last Mile Strategies Study* estimates that the entire set of improvements identified in the study is projected to result in a 3-6 percent increase in the number of riders on the UTA transit system. The specific stations and treatments identified in the ICARO project are estimated to have a ridership impact of approximately two percent, adding more than 760,000 new annual boardings to the UTA system. In addition to the clear ridership impacts, this far-ranging, multi-modal, regional project will:

- Build more than 79 miles of network connections, including cross-walks, trail connections, sidewalks, and bike lanes, filling sidewalk and network gaps along commuting trails; and
- Implement 203 separate "spot treatments" such as bus shelters and ADA accessible pads, sidewalk condition improvements, curb extensions and curb cuts, raised crosswalks, HAWK beacons, detectable bicycle and pedestrian warnings, painted or protected bike lanes, improved wayfinding, additional bike share stations, street and station lighting, bike parking, and bike maintenance kiosks.

These Phase I investments were selected from the *First/Last Mile Strategies Study* because they were judged by the UTA and its partners to have the most significant ridership and safety impacts and broadest support—including significant local financial support. By implementing these 466 project elements, ICARO will:

- provide better connectivity and access to UTA's transit network for the more than 89,000 people with disabilities, 191,000 people of color, and nearly 389,000 low-income residents who live within 1.5 miles of the 36 ICARO stations;
- link transit stations and downtowns with active transportation corridors;
- increase safety for people walking to transit, by adding 154 pedestrian safety treatments within 1.5 miles of UTA's stations;
- ensure that buses, vanpools, and other transit vehicles have safe and efficient access to UTA's rail stations;
- encourage more residents to incorporate physical activity into their daily lives;
- expand bike share to two other communities; and

- improve air quality by reducing particulate matter emissions from auto trips.

> "Our coalition's mission is to advance energy, economic, and environmental security through the support of locally-based initiatives that work to reduce our dependency on petroleum in the transportation sector using advanced technology and alternative solutions. UTA has been a local leader in this field working with stakeholders in the community."
>
> *- Robin Erickson, Executive Director*
> *Utah Clean Cities Coalitions*

ICARO's total cost is $87,807,342 million. UTA and its partners are providing a 68 percent local match, so the final TIGER request is $28,228,031 million. This is a large request for the TIGER program, but it leverages an incredible community match that combines funding contributions from fifteen public agencies and local governments and will change communities and commutes across an 148 mile system. This project is also inherently scalable; Appendix 2 details each component and its cost estimate. While the components are intended to work together as a whole, and while the greatest benefit is gained by doing so, specific stations and projects can be prioritized based on funding availability.

The ICARO project represents a structured, prioritized approach to making connectivity improvements, focusing in areas where significant growth is projected or where treatments help traditionally underserved populations. It allows for a regionally collaborative, data-driven, results-oriented approach to a project that would otherwise be handled in a piecemeal fashion and dependent on local governments, funding, and political winds.

Project Location

AREA CHARACTERISTICS

The rail stations included in the ICARO project are located at various points along an 88-mile stretch of the Wasatch Front. The communities range in size from Pleasant View, a small town of 8,000 people in a low-density rural suburban environment just north of Ogden to Provo City in southern Utah County, the third largest city in Utah with a population of 116,000, to Salt Lake City, the state capitol and largest city in Utah with a population of 191,000.

The significant geographic, typological, and socioeconomic variation throughout this region are what make this project so compelling. The population of the six counties is expected to double by 2040.[7] Job growth is expected to grow in a similar fashion. Careful planning by MAG and WFRC has helped communities understand the relationship between transportation issues, housing, and TOD. As populations and job centers grow and as available land becomes more and more scarce in the region, there will be an even greater need to facilitate the efficient movement of people from their home to their school to their job to their doctor's office and elsewhere. Nearly every low-income census tract in the region is located within 1.5 miles of the 36 transit stations that make up this project. (Figures 3, 4, 5, 6, and 7 demonstrate the clustering of low-income census tracts around some of the station areas.) At the same time, UTA serves some of the most affluent census tracts in the state. This income disparity emphasizes the need to approach first and last mile access regionally; otherwise the low-income areas, where arguably the need is greatest, may struggle to provide the funding for needed improvements.

7 *"Visioning Wasatch Choices 2040 Population Demographics. WFRC.*

Figure 3: *Poverty/Minority Map: Ogden/Roy*

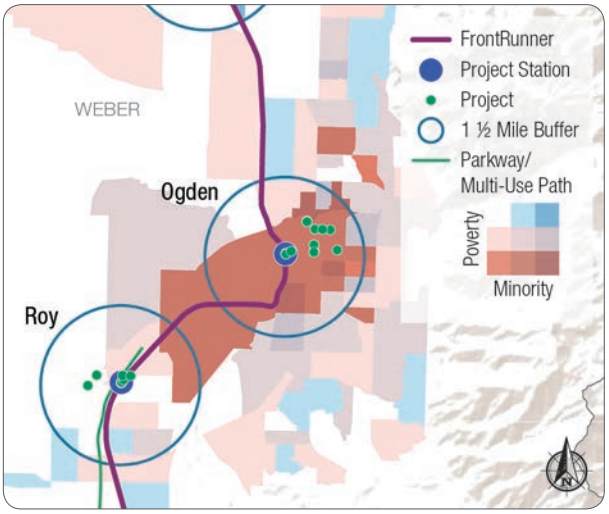


Figure 4: *Poverty/Minority Map: Salt Lake City*

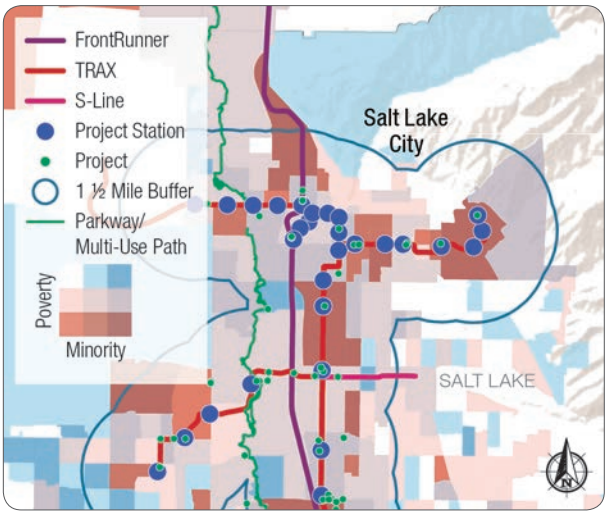


Figure 5: *Poverty/Minority Map: Orem/Provo*

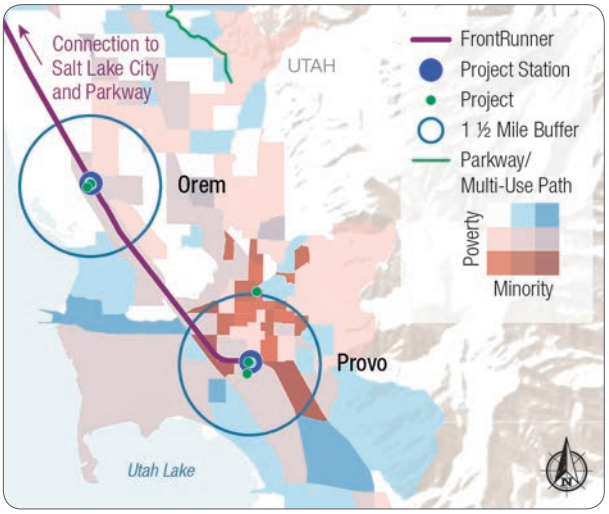


Figure 6: *Poverty/Minority Map: Tooele*

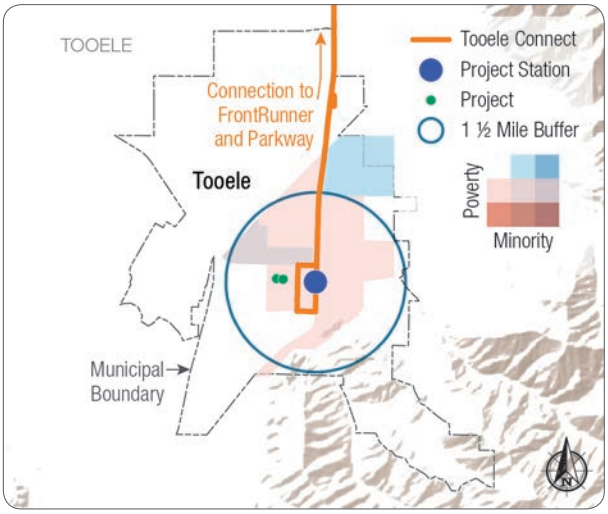
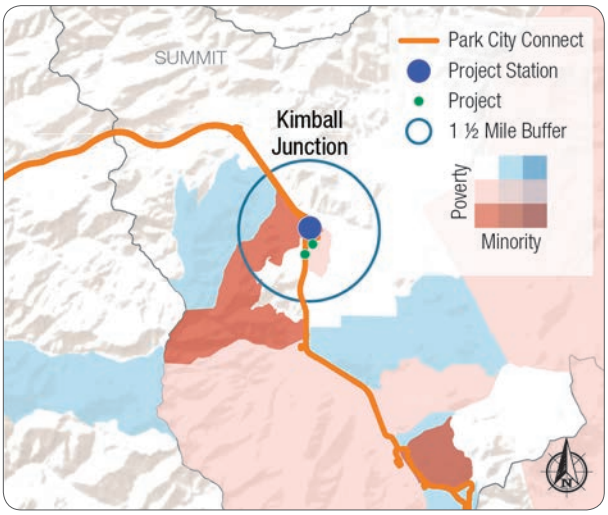


Figure 7: *Poverty/Minority Map: Kimball Junction*



Notes:

Light red: *21-50% of households in the block group are at or below the poverty level.*

Dark red: *more than 50% of households in the block group are at or below the poverty level.*

Light blue: *11-29% of people living in the block group are non-white.*

Dark blue: *more than 29% of people living in the block group are non-white.*

THE TRANSPORTATION NETWORK

As a combined system, the FrontRunner commuter rail line and the TRAX light rail line carry more than 81,000 riders per day. The total transit system, including buses and van pools, moves approximately 45 million people a year throughout the Wasatch Front. UTA also operates a two mile long streetcar system in Salt Lake City (the S-Line), which carries about 1,300 daily riders and is connected to all three TRAX light rail lines. The Salt Lake Central Station in the heart of downtown Salt Lake City is a multi-modal stop for FrontRunner, TRAX and dozens of bus lines. It is also a station stop for Amtrak, which runs four different passenger rail lines through Salt Lake City, Ogden and Provo. Greyhound provides long-distance connections throughout Utah, and has stations in Provo, Ogden, and Salt Lake City (the Greyhound Terminal in Salt Lake City is located at the Salt Lake Central Station). In addition to UTA's rail system, the agency operates 131 bus routes, which run a total of 508 buses per day, along with 488 vanpools, providing rides to 65,000 people and 5,000 people per day respectively. Over the next ten years, UTA proposes to increase levels of bus service by 50 percent.

Salt Lake City's GREENbike bike sharing system, started in 2013, has many stations near the TRAX and bus system. It provided over 106,000 rides in 2015 and was recognized as one of the fastest growing bike share systems (in terms of ridership) in the country. The system, which has 24 private sponsors, five strategic sponsors, and over 200 bikes at 33 stations, is in high demand. ICARO will expand GREENbike bike sharing in Salt Lake City and bring new bike share programs to Ogden City (Weber County) and Summit County.

There are six regional, multi-use paths that run parallel to the FrontRunner and TRAX transit corridors. The Denver & Rio Grande trail in Weber County, the Legacy Parkway in Davis County, the Jordan River Parkway in Salt Lake County, the Provo River Trail in Provo, the Ogden River Parkway in Ogden and the Murdock Canal Trail in Utah County make up what is known collectively as "the Parkway." These six paths collectively extend for 115 miles, and connect to the transit network at various points along the route. The Murdock Canal Trail includes bike ridership counters and averaged around 5,100 riders a day in its first year. Much of the ICARO project is focusing on making sure there are safe, accessible connections for people walking and biking between these multi-use paths and transit stations.

Local team utilizes a multi-use path along the S-Line.

ICARO is focused on leveraging the area's transit and active transportation rich system to connect modes, provide people with transportation options, improve safety, and serve as a model for other transit agencies operating in regionally and geographically diverse areas looking to improve ridership and make their stations more accessible.

STATION SPECIFIC NEEDS

The UTA system serves over 1,600 square miles that includes a geographically and socioeconomically diverse set of communities and riders. The supporting infrastructure for a TRAX light rail station in downtown Salt Lake City is vastly different than a FrontRunner commuter rail station in Pleasant

View or a connector bus station in Tooele County. The *First/Last Mile Strategies Study* took each of the stations in the rail network and categorized them into six station typologies: urban, multi-modal, institutional, suburban, suburban non-residential, and auto-dependent and recommended treatments for those stations that reflected the unique needs of the typology (see Figure 1). Each of these typologies is described below, along with a specific example of the impact ICARO will have on a station that is part of the typology. For a complete list of every station and its anticipated improvements, please see the table in Appendix 2.

AUTO-DEPENDENT STATIONS

Auto-dependent stations tend to cluster along the further reaches of the FrontRunner line (far north and far south). These stations have poor to medium walk access scores, a very low active transportation mode split, and a majority of their riders who reach the station by car. To improve access for these stations, the *First/Last Mile Strategies Study* recommended focusing on basic pedestrian network improvements (sidewalks and crosswalks), crossing treatments – particularly those in and around parking lots – rail and bus stop enhancements, and wayfinding treatments. For the ICARO project, the specific treatments proposed at this station are focused on improving comfort and security for passengers (as less frequent schedules mean that riders often face longer waits) and improving basic connectivity to the station through crosswalks and sidewalk construction.

Stations: Pleasant View (FrontRunner), Roy (FrontRunner), Woods Cross (FrontRunner), Clearfield (Woods Cross), Layton (FrontRunner), Farmington (FrontRunner), American Fork (Front Runner), Daybreak Parkway (FrontRunner), Sugar Factory (FrontRunner)

Farmington (Auto-Dependent Typology):
Farmington is at the intersection of both the Denver & Rio Grande and Legacy Parkway multi-use paths, and consequently sees significant numbers of transit riders accessing the station by bike. Their needs are focused on leveraging current ridership and with these improvements, encouraging more potential transit riders to take advantage of this connection:

- message board and bus shelter to increase comfort and reliability for transit users and improve communication to passengers;
- improved bike parking and a repair stand for short-term bicycle repairs;
- secure bike parking alongside the FrontRunner station;
- ADA ramps to allow access onto the Legacy and Denver & Rio Grande trail at the State Street intersection;
- 11,000 feet of sidewalk along the frontage road;
- bike lanes along Glovers Lane to connect State Street (the major connection to downtown) with the Legacy and Denver & Rio Grande Trails (48,059 feet in both directions);
- 675 feet of sidewalk along North Main Street;
- crosswalk and rapid flashing beacons to help pedestrians cross from the north sidewalk to the pedestrian bridge to the FrontRunner station;
- secure bike parking at two bus stop locations located within 1.5 miles of FrontRunner station;
- four rectangular rapid flashing beacons installed at intersections to allow pedestrians to cross road safely;
- 100 feet of sidewalk installation along Station Parkway (which goes to the FrontRunner station) alongside a mixed-use development;
- crosswalk and pedestrian crosswalk signs to improve pedestrian safety crossing the roadway in front of the FrontRunner station;

- bike detection and two-way left turn box to allow bikes to turn safely from State Street;
- re-alignment and improvement of switchbacks for quicker and more ADA-friendly access between Farmington FrontRunner station and Park Lane path (600 feet);
- 6,200 feet of bike lane (3100 feet in each direction) on State Street; and
- bike and pedestrian connection between Tippetts Lane and Legacy Parkway (190 feet).

Cost: $1,424,348

SUBURBAN (NON-RESIDENTIAL) STATIONS

Suburban non-residential stations are located in primarily suburban areas (in terms of density, auto-use, etc.), but serve as more of an employment draw than a population draw. This could be because the station is located close to several major office parks, or a shopping center, or in a downtown area where there is limited residential housing. Consequently, transit use tends to cluster at certain times, and first and last mile access needs to be approached with specific employment needs in mind. Interestingly, these stations have the highest mode share for transit-to-transit connections among all of the typology groups. For most of these stations, basic pedestrian access is already sufficient, and their improvements are focused on connecting various multi-modal networks (for example, making sure that a nearby multi-use path connects to the transit station), improving bus stop connections and enhancements, adding bike share near major employment centers, and improving secure bike parking options (in this typology, stations with sufficient and convenient bike parking facilities see higher ridership than those without). It is also worth noting that many of the stations that fall in this category have ambitious housing development strategies in place, often clustered around the current FrontRunner and TRAX stations.

Stations: Ogden (FrontRunner), Lehi (FrontRunner), Murray Central (FrontRunner), Fashion Place West (TRAX), Sandy Civic Center (TRAX), Meadowbrook (TRAX)

Grant Avenue Promenade in Ogden.

Ogden (Suburban Non-Residential Typology):

Ogden is the seventh fastest growing city in the United States, according to Forbes Business Insider. Once a sleepy Western town, Ogden is growing rapidly due to its residential feel, proximity to Salt Lake City, and location right along the Wasatch Front. Ogden is also focusing on encouraging active tourism; it is launching a bike share system (which will connect with GREENbike), has twenty miles of paved trail in the surrounding area, and just completed a showcase Complete Streets project on Grant Avenue, which took a former four lane road through the City's downtown and installed ten foot sidewalks and protected bike lanes, planted over fifty trees, and reduced speeds to 25mph. The completed project enjoys significant support from the local community, as well as the Church of Jesus Christ of Latter-Day Saints, which built its newest temple alongside the Complete Streets project. Given all of this, it's not a surprise that Ogden was prioritized in the First/Last Mile Strategies Study as a town where the proposed treatments will have a big impact on ridership. To ensure that an increasing number of families moving to Ogden have access to the FrontRunner

station and the intercity connections provided by the adjacent Greyhound station, Ogden's station improvements are:

- message board and bus shelter to increase comfort and reliability for transit users and improve communication to people waiting;
- improved bike parking and a repair stand for short-term bicycle repairs;
- a north-south bike lane connecting the station with 23rd Street to Ogden's new Complete Streets showcase on Grant Avenue (1,600 feet, 800 in each direction);
- a bike share station at the FrontRunner platform and five additional stations in downtown Ogden;
- bike lane striping on Grant Avenue;
- a buffered bike lane on Washington Boulevard to connect the transit station with the downtown main street, as well as the 23rd Avenue Complete Street (3,600 feet long, 1,800 in each direction);
- a class II extension of the above buffered lane to complete the bike lane; and
- Madison Avenue bike improvements including:
  - » signage and sharrows between 20th Avenue and 26th Avenue on Jefferson Avenue Class II bike lanes on Adams Avenue between 20th and 27th Avenue.
- Note: all bike projects are part of the Ogden Bike Master Plan.

Cost: $4,592,100

SUBURBAN (RESIDENTIAL) STATIONS

The UTA suburban stations are similar to the suburban non-residential stations in that they typically have low housing density, a wide range of mode splits (some have relatively high active transportation mode splits, others are fairly low), and they offer varying numbers of parking spaces. This typology differs from the suburban non-residential typology because they serve more residential neighborhoods than employment clusters. This means that in addition to supporting people getting to work, they also serve an important role in helping people run errands, get to school, and manage other daily life tasks.

Stations: Midvale Fort Union (TRAX), Draper Town Center (TRAX), Historic Sandy (TRAX), Jordan Valley (TRAX), Old Bingham Highway (TRAX), Provo (FrontRunner), West Jordan City Center (TRAX)

Stationary freight train blocks access to Provo FrontRunner Station (photo courtesy of bikeprovo.org).

Provo (Suburban Residential Typology):

Provo's FrontRunner station is located alongside a freight rail line, which means that it is frequently impossible for residents to access the FrontRunner station from the north. The freight trains can block the station for up to an hour, leaving FrontRunner users with the choice of walking an extra half mile around to the nearest crossing, moving between stationary freight trains and running across active freight tracks, or not taking the FrontRunner at all. The ICARO project includes funding to build a bike and pedestrian overpass to allow for a safe crossing over the freight rail tracks and to the FrontRunner station.

Cost: $1,900,080

INSTITUTIONAL STATIONS

Institutionalized stations are stations which exist primarily to serve one large entity. While the other typologies are determined by a variety of factors – including mode share, parking availability, demographic characteristics and whether they are primarily residential, industrial, or mixed-use – these stations have a single land use and one major user. Improving bike and pedestrian access in these areas means working closely with the major institutions and focusing on the specific routes that get the most use to and from these institutions.

Stations: Orem (FrontRunner), Stadium (TRAX)

Orem (Institutional Station Typology):

Known as "Family City USA," Orem is also home to Utah Valley University and Broadview University. Many students and university employees also commute to Orem for work. The first/last mile improvements focus on enhancing access to the rail station to and from the university, and making it comfortable for transit users to use the train station:

- message board and bus shelter to increase comfort and reliability for transit users and to improve communication to people waiting;
- improved bike parking and a repair stand for short-term bicycle repairs; and
- 600 feet of sidewalk to connect Utah Valley University to the west side of the UTA transit station.

Cost: $59,000

MULTI-MODAL STATIONS

The multi-modal stations are characterized by a medium to high active mode split, a medium to high transit mode split, and few parking spaces. One unique characteristic of the six counties that UTA serves is that there are significant multi-use paths and trails intersecting the entire area; ridership data suggests that these trails are used by commuters and recreational riders. Thus, many of these multi-modal stations have active transportation numbers that other, larger cities can only dream of. Improving first and last mile access for these stations is focused on connectivity between the nearby multi-use paths and the stations, safety treatments for people walking between local bus stops and the train stations, and ensuring safe connections between local streets and the station itself.

Stations: North Temple (TRAX and FrontRunner), Ballpark (TRAX), West Valley Central (TRAX), Salt Lake Central (TRAX), Central Pointe (TRAX), Sandy Expo (TRAX)

GREENbike parked on future Folsom Trail connection.

Existing access barrier to Ballpark Station.

North Temple (Multi-modal Station Typology):

North Temple Station, which serves both FrontRunner and TRAX, is one of the busiest stations in the UTA system, with over 2,100 people per day visiting the station. It's also adjacent to several tracts of land, which will add 497 residential units within the next two years. While both FrontRunner and TRAX are technically at-grade level, their roadways are grade-separated and they are connected to each other by stairs. In addition to the multiple transit options at this station, it also includes a GREENbike station and is just a block away from the eastern termination point of the proposed Folsom Trail. One of the current safety concerns at North Temple is its location near West High School and Jackson Elementary School; children frequently cross the tracks at unsafe locations in this area. The safety improvements in ICARO would allow UTA and the City of Salt Lake to build a designated grade-separated bike-ped bridge over the tracks. In addition, the improvements projected for this station are:

- message board and bus shelter to increase comfort and reliability for transit users and improve communication to people waiting and
- extending the Folsom Trail one mile to connect to the Jordan River Parkway to the North Temple Station.

Cost: $6.5 million

URBAN STATIONS

UTA's urban stations are primarily located in Salt Lake City itself. One of the fastest growing cities in the United States, Salt Lake City has a robust transit system, with over 100 bus lines, 22 light rail and commuter rail stations, and a bike share system (GREENbike) with 33 stations. These stations are mostly accessed by people walking or biking to them, and provide no parking. They are located in areas with high numbers of employment centers and high population density. Improvements at these stations are focused on spot treatments for safety and comfort, making sure that the connections to the city bike network are robust, and expanding the bike share system.

Stations: 900 East (TRAX), Library (TRAX), Gallivan Plaza (TRAX), Salt Lake Central (TRAX and FrontRunner)

Gallivan Plaza (Urban Station):

Gallivan Plaza, located in the southern half of Salt Lake's downtown, is served by the Blue and Green TRAX lines, with 5,000 boardings per day. It is part of UTA's "Free Fare Zone," which is intended to encourage circulation throughout the downtown area. The station is in the middle of Main Street, and while it has a lot of pedestrian activity, all of the pedestrian signals are "beg signals," which mean that people end up waiting for long periods and often end up crossing against the light. As part of ICARO, Salt Lake City would replace all of the pedestrian signals within three blocks of the station (approximately 40 signals at five intersections).

Cost: $200,000

In addition to the 34 stations prioritized in the *First/Last Mile Strategies Study*, the first phase of ICARO includes a bus transit station in Tooele County and one in Summit County. These two bus stations are both a significant distance from UTA's main transit line, and are located near the region's famous ski and outdoor recreation opportunities. These locations pose a transportation and affordability challenge for many reasons, but main among them is that many of the service workers who keep the resorts functioning cannot afford to live in the towns themselves. Without sufficient transit service (which has to cover a wide range of work hours), workers are left with long drives, often in challenging weather situations, or are unable to get to their job at all. In addition, for the residents or

workers in these communities, human service amenities and educational opportunities are usually far outside of the community. People end up driving significant distances for classes, dentist appointments, daycare, and government services. Environmental protection concerns limit the ability to add significant housing and commercial stock to the existing communities, so in the short term UTA is focusing on improving transit access to these communities for workers.

REMOTE STATIONS

Treatments:

These bus stops need improved protection and shelter for waiting riders. In addition, Summit County has a planned bike share system with 112 bikes and eight stations. This proposal would allow it to provide 14 bikes at the Kimball Junction bus stop with others located throughout the community at employment centers.

Stations: Kimball Junction and Tooele

SYSTEM-WIDE IMPROVEMENTS

In addition to the improvements discussed above, each FrontRunner station included in this phase will receive new bus shelters, updated bike parking racks, bike repair stands, and new message boards. The message boards are intended to alert riders about when their train will arrive at the station and will also coordinate with the Valley's Clear the Air program to educate riders about air pollution levels and how they can minimize their exposure and contribution to dangerous levels of particulate matter. They can also be used to inform riders about potential emergencies or delays. The bike parking racks will be located directly adjacent to the station platform, rather than in the parking lots as a few of the existing racks are. The bike repair stands will allow for some basic bike repairs, as UTA data suggest many riders are coming from a significant distance (greater than three miles).

Project Parties

The UTA is the lead agency for this project, however, the project's regional nature requires significant coordination and partnership with local governments and other community partners. Acknowledging that, one of the factors that moved proposed components and stations into the first phase of the First/Last Mile Strategy is whether or not there was significant community and political support for transportation improvements around the station. Every city that is part of this project is a partner; some are contributing specific funds in addition to coordinating and supporting implementation. The list below separates funding partners, project partners (who are involved in managing specific components but were not able to contribute additional funds), and general project supporters. To see the letters of support and letters of commitment, please see Attachments 1 and 2.

FUNDING PARTNERS

WASATCH FRONT REGIONAL COUNCIL
MOUNTAINLAND ASSOCIATION OF GOVERNMENTS
FARMINGTON
BOUNTIFUL EST. 1847
Clearfield City
UDOT Keeping Utah Moving
Ogden UTAH
Layton City
MIDVALE CITY
MURRAY
SOUTH SALT LAKE CITY ON THE MOVE
SUMMIT COUNTY UTAH
GREENbike SLC BIKE SHARE
WEST VALLEY CITY Utah

PROJECT PARTNERS

Supporting the project by managing construction components and coordinating engineering and outreach, but unable to contribute additional funds at this time.

- Pleasant View City
- Roy City
- West Haven City
- Woods Cross City
- Draper City
- Millcreek City
- Lehi City
- Sandy City
- South Jordan City
- Tooele County
- Jordan River Commission

PUBLIC AGENCY AND COMMUNITY SUPPORTERS

- Senator Orrin Hatch
- Congressman Rob Bishop
- Congresswoman Mia Love
- Congressman Chris Stewart
- Utah Office of Energy Development
- Utah Office of Outdoor Recreation
- Bike Utah
- Utah County
- State of Utah Resource Coordinator
- Weber Pathways
- Transit Riders Union
- Utah Clean Air (UCAIR)
- Utahans for Better Transit
- Weber County
- Weber County Active Transportation Committee
- Davis County Active Transportation Committee
- National Parks Service
- Parley's Rails Trails and Tunnels Coalition
- Utah Clean Cities
- Weber-Morgan Health Department
- Wasatch Front Regional Council Active Transportation Council

Senator Mike Lee as a rule does not support TIGER grants but has submitted a letter supporting UTA's work and the importance of transit throughout the region, and acknowledging this grant's role in that work. That letter can also be found in the Letters of Support attachment.

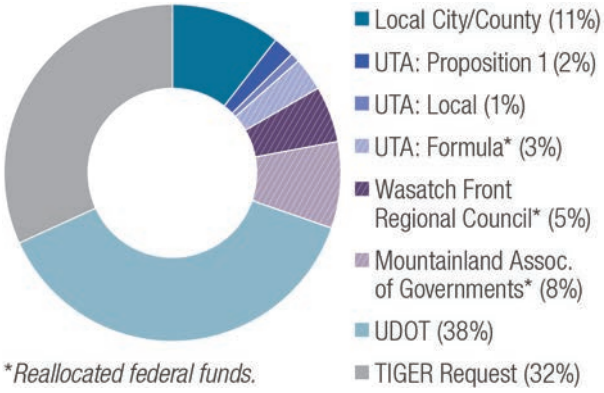
As the lead agency for the project, the UTA has a long history of successfully delivering federally funded projects on time and under budget. It was named the 2014 Outstanding Public Transit System by the American Public Transit Association (APTA) and is certified in the ISO 9001 (Quality Management), ISO 14001 (Environmental Management) and ISO 18001 (Safety Management), one of a few agencies in the transit industry that holds these three international certifications.

> "One of our priorities is ensuring that our population has access to safe and reliable transit, as well as active transportation that supports healthy lifestyles. To this end, we have collaborated and will continue to collaborate with UTA to improve such opportunities for our residents. We strongly feel that a regional network that would include improvements to the first/last miles of our stations in Roy and Ogden would increase opportunities for our residents, particularly those who are disadvantaged."
>
> *- Brian Bennion, Executive Director Weber-Morgan Health Department*

Project Funding

The total estimated cost for this project is $87,804,342 which will allow construction of more than 466 treatments. UTA and its 20 funding partners are contributing 68 percent of the total project cost. A portion of the $58,289,720 in local funds for the project comes from three sales tax measures passed by Tooele, Davis, and Weber counties in 2015. The local match dollars are also coming from the municipal governments themselves and UDOT.

Figure 8: *Project Funding Sources*



**Reallocated federal funds.*

In addition, WFRC and MAG are committing federal formula funds. To leverage this strong commitment from local partners, UTA is requesting $28,228,031 from the TIGER grant program.

The commute on the FrontRunner line.

Selection Criteria

PRIMARY SELECTION CRITERIA

SAFETY

Between 2010 and January 2016, a total of 187,505 crashes occurred within three miles of UTA Transit stations; 576 of which resulted in someone being killed. Specifically:

- within the 1.5 mile pedestrian walkshed, 2,047 crashes involving people walking. 1,818 of those crashes resulted in injury and 90 of them resulted in a fatality;
- within a three mile bikeshed, 3,160 crashes involved a person on a bike; 2,878 of those crashes resulted in an injury and 19 of them resulted in a fatality.

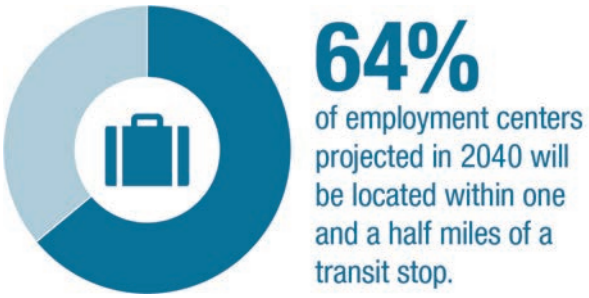
These numbers are much higher than other communities with similar levels of bike and pedestrian modeshare; Salt Lake City is in the top thirty U.S. cities for fatalities for people biking and walking per 10,000 commuters.[8] ICARO components each have safety as a primary objective and purpose. While the key focus area of the *First/Last Mile Strategies Study* was increased ridership, a secondary focus of that study was, "what will make it safer to get to and from and dwell at UTA's stations?" Many of the treatments are basic safety treatments such as high-visibility crosswalks, flashing beacons, or new sidewalks. Others treatments are more innovative, integrating multiple trail systems with a roadway or connect two off-street paths to allow people safe, convenient passage to a near-by transit station. While most of the treatments are specifically focused on improving safety for the most vulnerable road users (i.e. people walking and biking), they will also improve safety by slowing down traffic throughout the corridors, improving safety for people driving as well as those walking and biking.

8 "Alliance for Biking and Walking Benchmark Report 2016." Alliance for Biking and Walking. February 2016.

Arrow denotes the pedestrian crossing through a stopped train to avoid waiting or taking a lengthy detour.

ECONOMIC COMPETITIVENESS

In 2015, the Salt Lake City region was the fourth fastest growing in the U.S., with the gross domestic product growing by 6.9 percent while the Ogden-Clearfield area's growth was even higher, at 7.2 percent. In 2014, the Milken Institute summed up the area as a "financial center with a highly skilled workforce," and predicts ten year job growth to be higher than 43 percent.[9] Economic growth is occurring, the question is whether or not it provides opportunities for all residents, and whether it happens in a sustainable way.



Current plans by WFRC and MAG have prioritized job growth within 1.5 miles of UTA transit stations; 64 percent of the new jobs in the region by 2040 are projected to be within 1.5 miles of a transit stop that make up this project, and 39 percent of new job centers (places where job growth is estimated to be greater than 20 percent) are within 1.5 miles

Figure 9: *Ladders of Opportunity: Increasing Connectivity to Employment, Education, Services, and Opportunities*

of the same transit stops. This is because employers and employees prefer being close to transit, but also because WFRC and MAG have assisted communities in implementing land use and zoning policies that incentivize dense, mixed-use growth near transit. In order to provide ***ladders of opportunity*** to current and future residents, there must be safe, affordable access to the transit stations where this significant growth is expected.

While there are significant service center industries, manufacturing facilities, and agricultural production centers along parts of the transit corridor, there are also world-renowned medical research centers (Huntsman Cancer Institute), western headquarters for major banking institutions (Wells Fargo), and the state capital.

9 *2013 Best-Performing Cities. (n.d.). Retrieved April 21, 2016, from http://www.best-cities.org/best-performing-cities.html*

41%
of health services are located within one and a half miles of a transit stop.

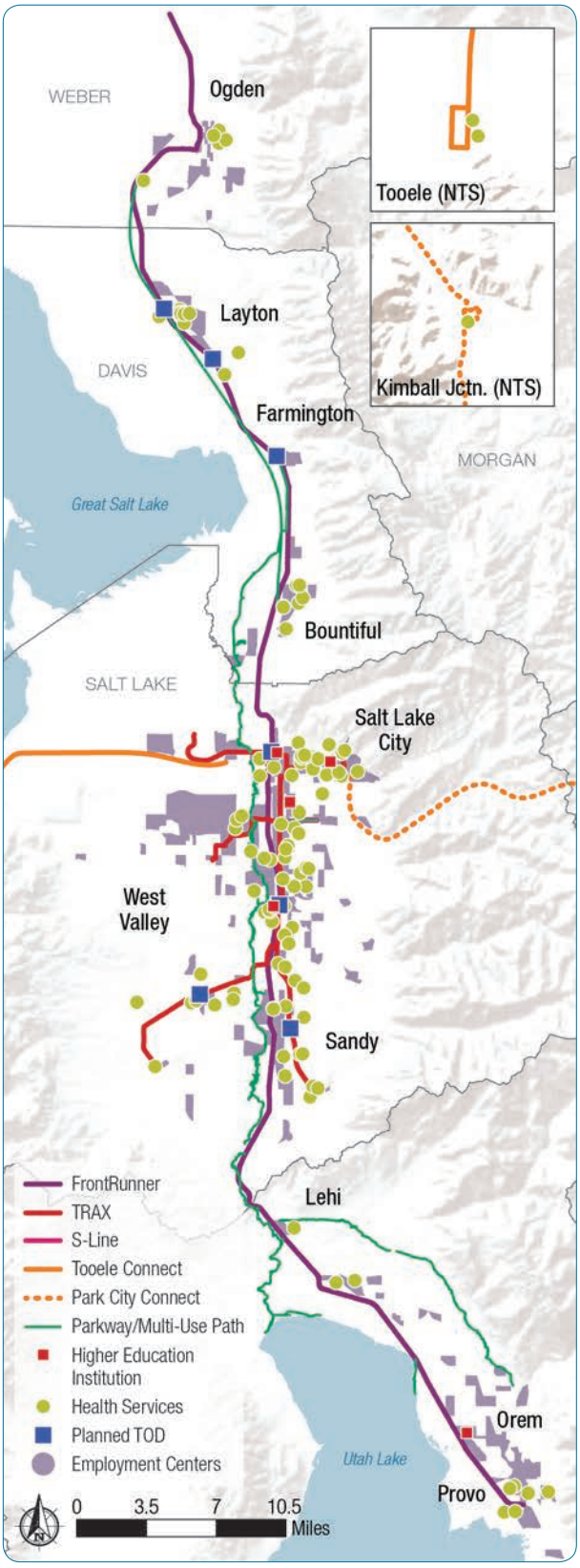
Circulation throughout the region is what will allow it to remain vibrant, affordable, and sustainable. Focusing development next to or near transit is critical to supporting that economic development, providing opportunities to residents, providing affordable options for families, reducing VMT, and reducing mobile emissions of criteria pollutants. Improving first/last mile access gives both residents and businesses options as to where they can locate along the transit corridor, allowing them to make choices based on factors other than immediate proximity to a transit line. This kind of mobility is critical for families and individuals trying to access ***ladders of opportunity*** and depending upon transit service to improve their daily lives.

> "One of UDOT's organizational emphasis areas [is] Integrated Transportation, underscoring the Department's commitment to identifying transportation solutions that take cars off the road and improve mobility across modes. To this end, the suite of improvement[s] identified in this TIGER grant application will greatly improve safety and access around transit stations, and are in line with UDOT's Active Transportation Policy."
>
> *- Carlos Braceras, Executive Director UDOT*

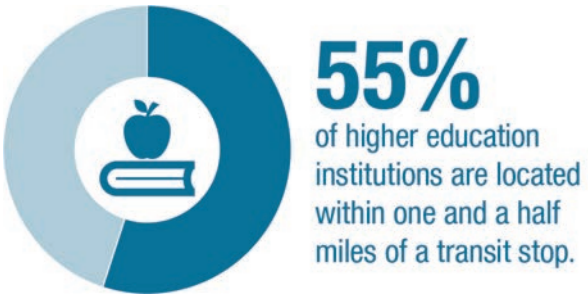
QUALITY OF LIFE

ICARO will help improve access to human and education services throughout the region, improves mobility, and gives people transportation options throughout the region.

Figure 10: *Human Services and Planned Development Areas in the Project Area*

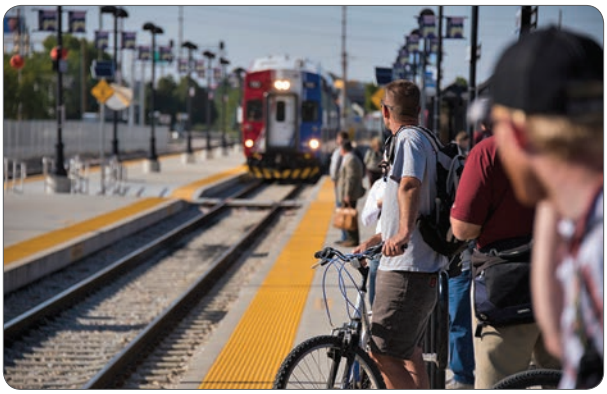


The Salt Lake City region has 10 percent more families living in poverty than the national average, so UTA is focused on finding ways to reduce their transportation costs and ensure that the UTA system as a whole provides families with mobility options. As shown in Figure 10 and discussed in the Economic Competitiveness section above, every significant employment growth center that is anticipated to develop in the next thirty years is located within 1.5 miles of a transit station. Fifty-five percent of the area's education centers (colleges, universities, apprenticeship programs and job training centers) in the region are within this same 1.5 mile buffer of a transit station (60 percent if you discount the headquarters of online-only universities); 64 percent of the area's employment centers are located within the same radius.



Further underscoring the importance of transit within the region, 14.5 percent of households within a 1.5 mile of each station are car-free or car-lite , indicating a fairly high level of transit dependency for an area with a large proportion of suburban geography. Thousands of people depend on UTA service to move throughout the region, and deserve safe and efficient ways to reach stations.

The expected growth within the region also emphasizes the need to improve mobility throughout the corridor. While Tooele and Summit counties are extreme examples of limited housing near significant job centers, it is unrealistic to expect housing and job opportunities to be balanced evenly throughout the entire UTA service area. UTA service is a critical way to help residents and employers take advantage of the myriad of opportunities the region offers, without requiring employees to live in the exact community where their job, school, or needed service is located (something that can be impossible due to concerns such as housing costs and school requirements).



Passengers await FrontRunner's arrival.

Finally, this project will significantly enhance active transportation opportunities throughout the region. This gives people a healthy way to incorporate walking or biking into their daily lives through their commute or daily errands. In addition, connecting transit to the 115 miles of local trails provides easy access to an incredible beautiful local resource that encourages people to be physically active.

The benefits of approaching these types of first/last mile problems from a regional perspective is that the improvements are leveraged to improve the overall sense of connectivity of the network. If UTA were to simply make small, incremental changes at discreet locations, patrons of the system may not feel that they can get to or from the transit system once arriving at their destinations. This would fail the ***ladders of opportunity*** test, because benefits are more likely to accrue in areas based on funding availability, rather than need. That traditional approach is in contrast to ICARO's regional one, which considers the needs of the region as a whole, so that ridership and mobility benefits are regionally cumulative rather than geographically isolated. A regional

approach also allows UTA to engage with third parties whose mission is to help disadvantaged populations along the Wasatch Front and demonstrate benefits to a larger population.

Increasing access to the transit line as a whole gives people options to live, work, learn, and play where they want.

STATE OF GOOD REPAIR

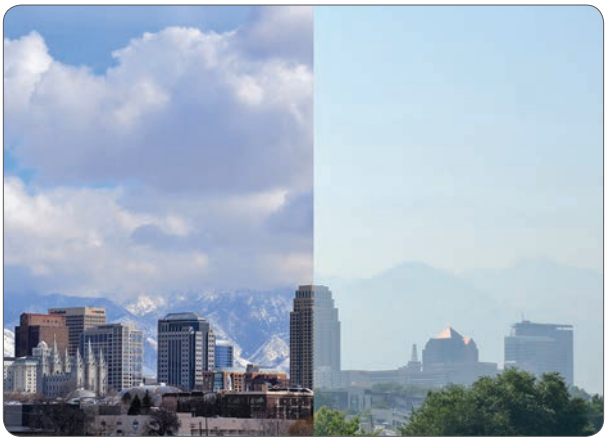
The First/Last Mile Strategy is focused on maximizing UTA's existing transit system. UTA has built more than 70 miles of new light rail and commuter rail line within the last seven years. While this investment represents significant capital improvements to the transit system, there has been a shift within the region and at UTA away from capital expansion to a focus on leveraging this new infrastructure. The ICARO project represents the first significant investment toward maximizing this new rail investment and broadening its impact through targeted improvements around the infrastructure itself. This allows UTA to extend or improve their surface area without significant capital expansion.

While the system has made significant gains in ridership over the past ten years, those gains have mostly come as the system expanded. UTA is now focusing on increasing ridership with the system they have; making stations accessible and safe for people who reach them on foot, by bike, or on a bus. Many of these components will bring current networks up to current standards, including installing curb ramps and crosswalks at intersections that are currently not accessible, or providing ADA landing pads at bus stops.

Encouraging people to reach the station by walking, biking or taking transit could result in decreased maintenance demand for UTA, which currently spends more than $8 million a year operating and maintaining 16,000 surface area parking spaces. For stations such as Clearfield, Layton, and South Jordan, reducing the number of parking spaces UTA maintains will allow them to reallocate those resources to other operations and maintenance needs, and provide for TOD opportunities.

ENVIRONMENTAL SUSTAINABILITY

This project is estimated to reduce VMT by 22,352,126 miles per year (after the entire project is completed), resulting in an average annual reduction of 5,016 tons of greenhouse gas emissions. More critically for the Salt Lake region, which is the seventh most polluted region in the United States (based on short-term particular matter), increasing ridership by two percent will take thousands of cars off the road, reducing particulate matter and precursor particulate matter by 1.6 tons per year.



Good/bad air quality days comparison in Salt Lake City (no photo manipulation).

UTA has long been seen as part of the solution to improving Salt Lake's air quality. Due in part to the geography of the region and its frequent winter inversions, the air quality in and around Salt Lake can be truly dangerous; it's considered the sixth worst region in the country for air quality. In January and February 2016, the region had 34 days where the air quality was considered "dangerous (above the 35 ppm threshold) and three days in a row where the concentration of particulate

matter 2.5 was greater than 70.[10] The benefit-cost analysis (BCA) for this project shows that ICARO will conservatively result in a reduction of 1.6 tons of particulate matter and precursor particulate matter per year (for the first twenty years of the project). The Utah Division of Air Quality has failed to meet their deadline to improve air quality in Salt Lake City and Provo, and is currently rewriting their plan in order to meet that goal; it is expected that shifting more riders to transit will be part of that plan. In addition to its role in reducing air pollution, UTA works closely with the Clear the Air campaign to educate residents, spreading information to riders and potential users, and using their trains as mobile air quality testing units, allowing for a region wide data set throughout the course of the day.

The ripple effects that will come from both increasing transit ridership and shifting first and last mile connections to active transportation modes will help thousands more people breathe more easily in the area around Salt Lake.

> "These connections are needed to increase transit use that will help decrease Utah's Wasatch Front very troubling air quality, as each year the State exceeds Environmental Protection Agency standards for both ozone and particulate matter. In addition, the connections we are working on with UTA will provide more access to urban trails connections with transit, which will increase physical activity helping to address the troubling rise in obesity rates."
>
> *- Alan Ragins, Intermountain Regional Program Mgr. National Parks Service*

10 *Most Polluted Cities. American Lung Association. Retrieved April 21, 2016, from http://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/most-polluted-cities.html*

SECONDARY SELECTION CRITERIA

INNOVATION

Approaching first and last mile concerns regionally is inherently an innovative way of looking at the issue. Traditionally, transit agencies have worked with local governments to improve first and last mile access when other projects are being built; this results in a piecemeal approach where benefits and investments are not prioritized, nor focused on improving ridership or safety. In this case, the UTA has used systematic data collection and analysis to identify the strategies that will have the most effect on ridership, and the locations where they will have the most impact. This approach means that UTA can also prioritize investment where it is likely to produce stronger benefits for those reliant on transit by making sure that stations with human services (education, job-training centers, and health care support) have strong first/last mile access and provide ***ladders of opportunity***. This approach acknowledges that first/last mile access is regional in nature, and by using data to drive the investment, rather than opportunity, UTA is focused on improvements that will produce the most benefit.

PARTNERSHIP

The nature of the ICARO project depends upon intense collaboration with local and regional governments. The *First/Last Mile Strategies Study*, the baseline for this project, was first commissioned as a partnership between UTA, UDOT, MAG, and WFRC. In order for elements to be included in ICARO, they needed to have full support from the local government. This is intended to make sure that the ICARO components can move forward immediately upon being funded, but also so that supportive land use and zoning policies can accompany the first/last mile access improvements. For a full list of the 31

partners and more than 20 supporters of the project, please see the Project Parties section.

> "We are particularly interested in promoting active transportation in a coordinated manner with transportation agencies. This application will further our efforts as we continue to promote the benefits of active transportation."
>
> *- Nicole Bissonette, Program Director Utah Department of Health, Healthy Living through Environment, Policy, and Improved Clinical Care*

DISCIPLINARY INTEGRATION

The multi-modal and regional nature of this project requires disciplinary integration. The *First/Last Mile Strategies Study* prioritized stations where the region is focusing housing and commercial growth. The MAG and WFRC have both assisted communities in adapting inclusionary zoning and mixed-use requirements for new developments, which were developed in cooperation with the local housing authorities and economic development centers. Thus, the prioritized ICARO stations are anticipated to not only have significant growth in terms of housing options and economic opportunities, but also for human services. For several of those stations, such as Bingham Junction and Clearfield, that includes the redevelopment of former brownfields. At stations closely linked with a particular institution (including Stadium station and Provo), the major institutional stakeholders were consulted and brought in to help finalize the list of project elements.

Benefit-Cost Analysis

UTA's ICARO project is part of the first phase of their First and Last Mile Strategy[11] to improve access to their stations throughout the greater Salt Lake region. It is made up of 36 top-priority stations, and 466 project elements chosen based on their ability to increase ridership and improve safety, and associated treatments, based on the *First/Last Mile Strategies Study*. The goal is to make safety and comfort improvements to encourage residents to access the light rail and commuter rail systems, with the particular goal of increasing the number of people who access the system on foot or by bike. The final BCA numbers demonstrate a BCA ratio of 2.04:1 with a seven percent discount rate and 2.99:1 with a three percent discount rate.

Teenagers board FrontRunner.

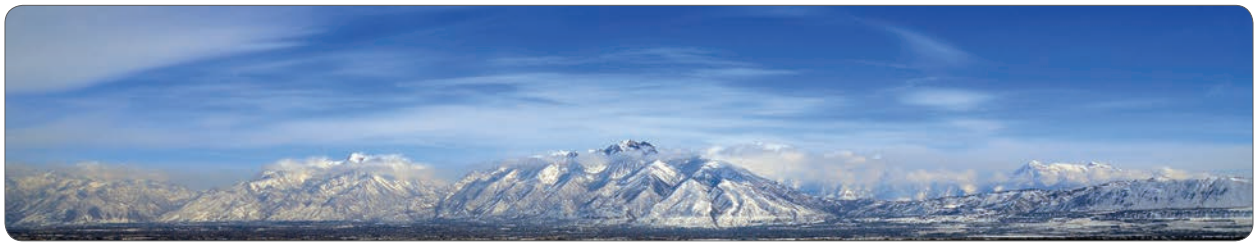
A BCA was conducted for the ICARO application. The analysis was prepared for submission to the U.S. Department of Transportation (U.S. DOT) as a requirement of a discretionary grant application for the

11 *UTA, First/Last Mile Strategies Study, April 2015.*

***Table 1:** BCA Summary Results*

Scenario	Net Present Value (2015 $)	B/C Ratio Base Case	B/C Ratio Sensitivity[A]
Assuming a 7% discount rate	$ 70,096,064	2.04	3.57
Assuming a 3% discount rate	$ 149,620,860	2.99	5.39

[A] *Sensitivity test includes benefits associated to projected increases in cycling as a result of bike lane improvements that provide connections to the regional trail network.*



The Wasatch Front.

TIGER 2016 program. The analysis was conducted in accordance with the benefit-cost methodology as recommended by the U.S. DOT in its 2016 TIGER BCA Guidance.[12] The period of analysis corresponds to 26 years and includes six years of construction and 20 years of benefits after full completion of all the identified projects is assumed to begin in 2022. Prior to 2022 incremental benefits have been monetized for projects as they are completed.

UTA has identified the ICARO project as a priority improvement investment for the region. UTA is requesting $28 million in TIGER Grant funding to match existing UTA and regional commitments of federal and state funding to complete all of the projects included in the $87.8 million plan. The ICARO projects will not only provide safe and convenient access to public transit throughout the region but will also provide local communities and municipalities with improved connections to other regional facilities including multi-use paths such as the Denver & Rio Grande Western Rail Trail, Jordan River Parkway, Ogden River Parkway, Provo River Trail, Murdock Canal Trail and Legacy Parkway. Based on the projects included in the ICARO plan, the following variables were monetized for the BCA:

- reductions in vehicle operations and maintenance costs, pavement damage, and noise with reduced vehicle miles traveled attributed to mode shift from driving to transit;
- safety benefits due to a reduction in crash rates with reduced vehicle miles traveled attributed to mode shift from driving to transit;
- safety benefits for the general communities around the planned improvements;
- health benefits attributed to people accessing transit stations by walking or cycling and;
- emissions reductions associated with reduced vehicle miles traveled attributed to mode shift from driving to transit.

Offsetting the above benefits, the monetized dis-benefit attributed to greater travel times as a result of mode shift from personal vehicles to transit has also been considered. Based on regional information on travel times by mode a 2.012 factor was applied to average vehicle travel time based on weighted average travel time using the number of new trips generated per transit station and the corresponding average travel time for vehicle and transit during rush hour. In addition to the travel time between origin and destination station the factor includes the average time it takes for users to access the station from their home or place of work and time spent waiting at the station, which was derived using the average headway divided by two. This is a conservative approach considering the strong reliability of the current transit system which allows users to adjust their departure time to reduce waiting time at the station.

Based on the above benefits, Table 1 shows the overall base case results of the BCA. In 2015 dollars, the project benefits will lead to an overall net present value of $70.5 million and a benefit cost ratio (BCR) of 2.05 with a seven

12 *U.S. Department of Transportation. BCA Guidance for TIGER Applicants. 2016. https://www.transportation.gov/policy-initiatives/tiger/tiger-bca-guidance*

Table 2: *Project Impacts and Benefits Summary, Monetary Values in Millions of 2015 Dollars*

Current Status/ Baseline and Problem to be Addressed	Change to Baseline/ Alternatives	Type of Impact	Population Affected by Impact	Economic Benefit (dis-benefit)	Summary of Results (at 7% discount rate)	Summary of Results (at 3% discount rate)
Limited station access, safety concerns, and lack of connectivity to the UTA network	Improved station access through infrastructure enhancements around 37 UTA stations providing safe access and allowing for enhanced connectivity to the UTA network	Commuters switching from driving to transit	Auto commuters switching to transit	Travel time increase (dis-benefit)	($44.7 million) decrease	($76.3 million) decrease
		Commuters switching from driving to transit	Auto drivers switching to transit	Fuel savings	$15.2 million in savings	$26.2 million in savings
		Commuters switching from driving to transit and safety enhancements	Drivers and society within the vicinity of station improvements	Reduced fatalities and injuries	$99.4 million in savings	$165.5 million in savings
		Commuters switching from driving to transit	Society and surrounding communities	Reductions in emissions	$4.6 million in savings *	$4.7 million in savings
		Commuters switching from driving to transit	Auto drivers switching to transit	Reduction in driver O&M costs, non-fuel	$59.7 million in savings	$99.5 million in savings
		Commuters switching from driving to transit	Society and surrounding communities	Reduction in noise	$231,000 in savings	$385,000 in savings
		Commuters switching from driving to transit	Government and society	Reduction in pavement damage	$231,000 in savings	$385,000 in savings
		Commuters accessing transit by cycling or walking	Transit riders accessing stations through cycling and walking	Lower healthcare costs	$3.1 million in savings	$5.1 million in savings

** The social cost of carbon was discounted at a three percent discount rate, consistent with the U.S. DOT's guidance.*

percent discount rate. Using a three percent discount rate the BCR increases to 3.00. The base case analysis includes the benefits listed above, capital costs and future offsets for the residual value of those improvements calculated using straight line depreciation, and increases in projected routine operations and maintenance and periodic repair and replacement costs attributed to the project improvements. The base case excludes benefits that would be attributed to increased cycling and walking as a result of improved access to the regional trail networks. Using the methodology presented in the National Cooperative Highway Research Program (NCHRP) report 522, *Guidance for Analysis of Investments in Bicycle Facilities* (2006)[13] as the sensitivity case the BCR increases to 3.57 using a seven percent discount rate and 5.4 using a three percent discount rate.

The overall project benefit matrix can be seen in Table 2.

For the full BCA, please see Appendix 3.

A rider awaits TRAX.

13 *Transportation Research Board, NCHRP Report 552: Guidelines for Analysis of Investments in Bicycle Facilities, Washington D.C. 2006.*

Project Readiness

The level of detail in the component list highlights UTA and its partner's readiness to move forward quickly. The granularity of identified needs (example: rectangular flashing beacon at 5000 Parkway in both directions) and the support and cooperation of the local governments means that for the majority of project elements included within the ICARO scope, additional planning or approvals will not be necessary. Among the larger project elements, many are already planned, including the location and permitting for the bike share stations in Salt Lake City. Many of these components have also been included in previous regional plans, such as the *Utah Collaborative Active Transportation Study*, or local Master Plans; these projects are noted in the spreadsheet in their title (see Appendix 2).

There are a few improvements that will need additional planning or review. They are:

- 300 North Bridge: engineering, design, and environmental clearance will all need to be done for this project; the city expects the project to be a categorical exclusion.
- Murray Bridge: this pedestrian overpass will connect the Murdock Canal Trail and the FrontRunner station. The city has done some environmental planning, but will need to finish the environmental documents and finalize engineering as appropriate. The project is expected to be a categorical exclusion.
- Summit Bike Share: Summit County is currently finalizing the station locations, and anticipates that the planning process will be wrapped up January 2017.
- Provo: The pedestrian and bike bridge over the current freight lane lines has undergone preliminary planning, but the city intends to move quickly once funded. They expect the project will be a categorical exclusion.

- Right of Way Acquisition: There are three projects that will require right of way acquisition. Two projects to connect Kay's Creek trail to the Layton FrontRunner station (approximately 1,000 feet) and one to connect the 10000 S trail to the Sandy Expo FrontRunner station (approximately 965 feet). The Kay's Creek projects are connected to TOD developments occurring along the trail, and preliminary agreements with the developer involve the developer donating the right of way for the trail. The Sandy project will cross public land and discussions are underway which suggest that easements for the connection are fully supported.

The nature of the first/last mile treatments means that, on their own, they are technically straightforward. UTA staff implementing this project have significant experience planning and constructing projects with federal funds attached. Many members of the staff were part of the team that completed UTA's FrontLines 2015 projects, a massive program constructing 70 miles of rail in seven years. This involved contracting and managing construction of three locally funded projects, and two federally funded New Starts projects. UTA completed these projects two years ahead of schedule and $300 million under budget. Also, staff for these improvements are already using FTA grant funds to construct other ADA compliant bus stops in our system. The grant development and management teams at UTA successfully managed the federal requirements for the grants that helped fund these projects.

PROJECT SCHEDULE

ICARO project components have been grouped into four implementation phases, dependent on their readiness to move forward immediately, their urgency, and if any other projects are dependent on them being done. For example, crosswalks and sidewalk construction projects are in Phase I, given both their obvious safety connection and the straightforward engineering and construction needs. Similarly the improved bike racks, bus shelters, and message board are also Phase I. Many of the trail connections are Phase II, as they are connecting to sidewalks that will be built in Phase I. Larger projects, such as the Murray and North bridges, are Phase III or Phase IV.

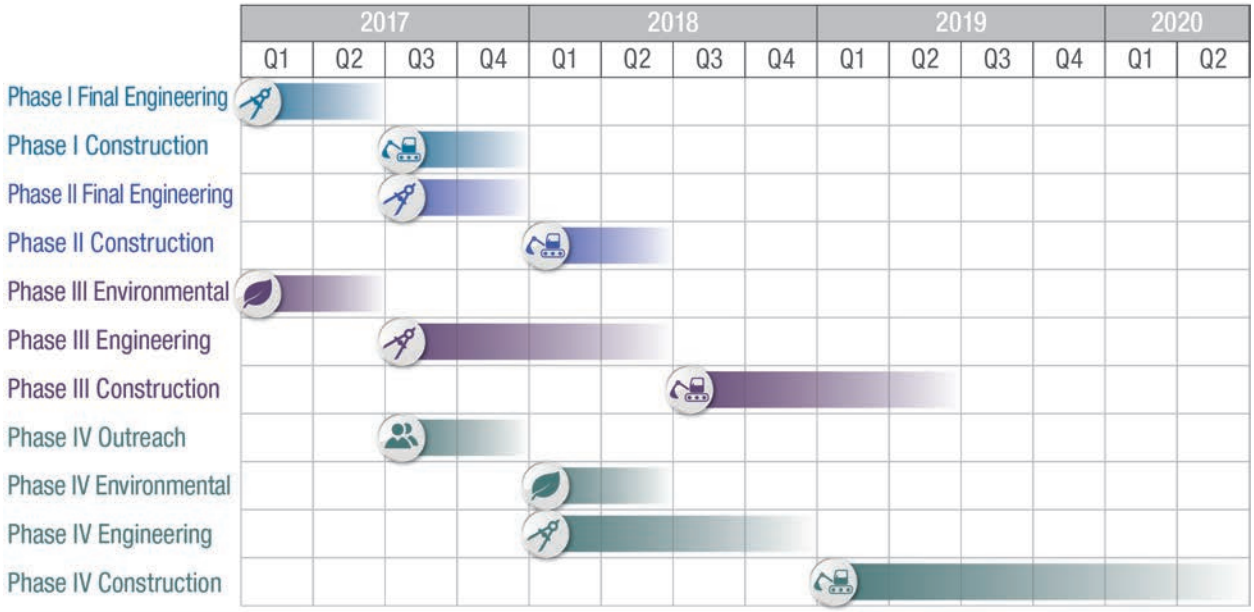
A schedule for each phase follows, for each individual component's phasing please see the project spreadsheet (Appendix 2). Of the 466 project elements, 75 percent of them will be finished by the end of 2017. Of the remaining 112 components, all but 22 will be completely finished by the end of 2019. The last 22 components (which include the ones discussed in Project Readiness above), have longer construction timelines and will begin construction in 2019, but won't be fully built until 2020.

RISK MITIGATION

While every project contains elements of risk, UTA is considered the gold standard among U.S. Transit Agencies when it comes to delivering projects ahead of schedule and below budget. In addition, the nature of this project means that significant cost overruns are unlikely, as it is not one large keystone project but a series of smaller ones, which typically are more cost and time efficient. However, UTA has identified three possible risks that would impact the scope and delivery of the project. These risks, and the processes UTA has in place to mitigate them, are described below:

Cost Overrun: UTA is subject to extensive financial audits and reviews by the Federal Transit Administration (FTA). Both the May 2010 and November 2013 FTA triennial reviews verified that UTA has the technical, legal, and financial capacity to implement projects in accordance with grant agreements, master agreements, and all

Figure 11: *Project Schedule*



applicable laws and regulations using sound management practices.

The FTA audits mentioned above found that UTA has the ability to match and manage DOT grant funds, cover cost increases and operating deficits, finance maintenance and operate DOT-funded facilities and equipment, and conduct and respond to applicable audits. UTA funds for this project will be supplied and budgeted from UTA's General Fund. Revenues for this fund come mainly from the share of local sales tax revenues the authority is designated to receive. Long range financial modeling (using UTA's Transit Development Plan) has shown that UTA will be able to budget the funds needed to continue operations over the long term while keeping UTA's debt ratio at an acceptable level.

As further evidence of UTA's technical and finance abilities, the American Public Transportation Association's named the authority the 2014 Outstanding Public Transportation System in North America. This is the fourth time that UTA has been awarded this distinction.

Coordination with Local Governments: Almost every UTA project requires intense coordination with the local government. The diverse nature of the communities they work with, from a city the size of Salt Lake City to a community like Tooele, means that the UTA begins with a bottom-up approach that divides responsibility and management according to capacity. Local Memorandums of Understanding will be written with each municipality, in order to make sure responsibilities and obligations are clear and understood.

Maintenance: Many of these components will require ongoing maintenance. For each municipality UTA drafts agreements for ongoing maintenance responsibilities and funding, based on the location. For example, anything directly on a UTA platform or property is assumed to be under UTA's care. Connecting elements are typically the responsibility of the city or county. UTA has both verbal and contractual agreements to make improvements and designate maintenance with all of the municipalities in this proposal.

Conclusion

There are few projects that will have the magnitude of regional impact that ICARO will. ICARO's impact will make it possible for hundreds of thousands of people to access their transit station in a safe, efficient way, encouraging them to bike, walk, or take transit to begin and end their transit trip, rather than drive. It will maximize community benefit for a 148 mile transit system that touches more than 77 communities, both through its transportation impacts, and its impact in supporting economic growth around transit stations, and ensuring that the growth is accessible to all users. It improves environmental quality, and supports public health by encouraging people to be physically active as part of their commute, and reducing air pollution. ICARO accomplishes all of this because it comes from a data-driven, regional study that focuses on where the need and potential benefits are greatest.

Bicyclist rides on the Denver & Rio Grande Western Trail in Davis County.

Glossary

First/Last Mile Strategies Study: A joint Utah Transportation Authority, WFRC, and MAG study to identify what treatments would be most effective at increasing ridership along the UTA corridor and where those treatments are most needed.

FrontRunner: UTA's 88 mile long commuter passenger rail line, which runs from Pleasant View (in the north) to Ogden (in the south).

GREENbike: Salt Lake City's bike share program, which would be expanded to three communities with the funding of this proposal.

ICARO: Improving Community Access to Regional Opportunities (this project), which is the first implementation phase of the *First/Last Mile Strategies Study.*

SummitConnector: UTA's current bus service connecting Summit County with Salt Lake City

TRAX: Transit Express, UTA's light rail line

Mountainland Association of Governments: the metropolitan planning organization for the Utah, Summit, and Wasatch counties and a funding supporter of this proposal.

Wasatch Front Regional Council: the metropolitan planning organization for Box Elder, Salt Lake, Weber, Davis, Jordan River, and Tooele counties.

Federal Wage Rate Certification

CERTIFICATION

TIGER Discretionary Grants
Subchapter IV of Chapter 31 of Title 40, United States Code
As Required By the FY 2015 Appropriations Act

Name of Applicant: Utah Transit Authority

Authorized Representative: Jayme L. Blakesley, General Counsel

The Utah Transit Authority hereby certifies that it will comply with requirements of United States Code Title 40, Chapter 31, Subchapter IV, Federal Wage Rate Requirements.

This certification is made pursuant to TIGER 2016 Discretionary Grant (National Infrastructure Investments) requirements found in the Federal Register, Vol. 81, No. 38, Friday, February 26, 2016, on page 9935.

Date: 25 April 2016

Signature: _____

Name: Jayme L. Blakesley

Title: General Counsel

Federal Wage Rate Certification

The Utah Transit Authority certifies that it will ensure compliance with the requirements of Subchapter VI of Chapter 31 of Title 40, United States Code (federal wage rate requirements), as required by the Consolidated Appropriations Act, 2016 for any projects that will receive federal funding under the 2016 TIGER VIII program.

_____ 4-26-16

Jerry Benson,
President / CEO
Utah Transit Authority

Date

Appendices and Attachments

Supporting documentation may be found in the following appendices and at the following website links.

Appendix 1: First/Last Mile Strategies Study
http://www.rideuta.com/~/media/Files/Tiger-VIII/UTAFirst_LastMileFINALCOMP1.ashx?la=en

Appendix 2: ICARO Project Elements Table
http://www.rideuta.com/~/media/Files/Tiger-VIII/UTA_Clean_Master_List_20160426.ashx?la=en

Appendix 3: ICARO Full Benefit-Cost Analysis
http://www.rideuta.com/~/media/Files/Tiger-VIII/ICARO_BCA_Report.ashx?la=en

Additional supporting documentation may be found at the following website links.

Attachment 1: Letters of Support
http://www.rideuta.com/~/media/Files/Tiger-VIII/Combined_TIGER_VIII_Letters_of_Support.ashx?la=en

Attachment 2: Letters of Commitment
http://www.rideuta.com/~/media/Files/Tiger-VIII/Combined_TIGER_VIII_Letters_of_commitment.ashx?la=en

Attachment 3: UTA 2020 Strategic Plan
http://www.rideuta.com/~/media/Files/Tiger-VIII/2020StrategicPlanFinalWebVersion.ashx?la=en

Attachment 4: WFRC Regional Transportation Plan
http://www.rideuta.com/~/media/Files/Tiger-VIII/WFRC_RTP_2015_FINAL.ashx?la=en

Attachment 5: MAG General Plan
http://www.rideuta.com/~/media/Files/Tiger-VIII/TransPlan40_MAG_RTP.ashx?la=en

Attachment 6: Utah Unified Transportation Plan
http://www.rideuta.com/~/media/Files/Tiger-VIII/Utah_Unified_Transportation_Plan_Booklet_Version_Final_6_Aug_2013.ashx?la=en

APPENDIX 1:
FIRST/LAST MILE STRATEGIES STUDY

FIRST/LAST MILE CONNECTIONS:
IMPROVING COMMUNITY ACCESS TO REGIONAL OPPORTUNITIES

UTA

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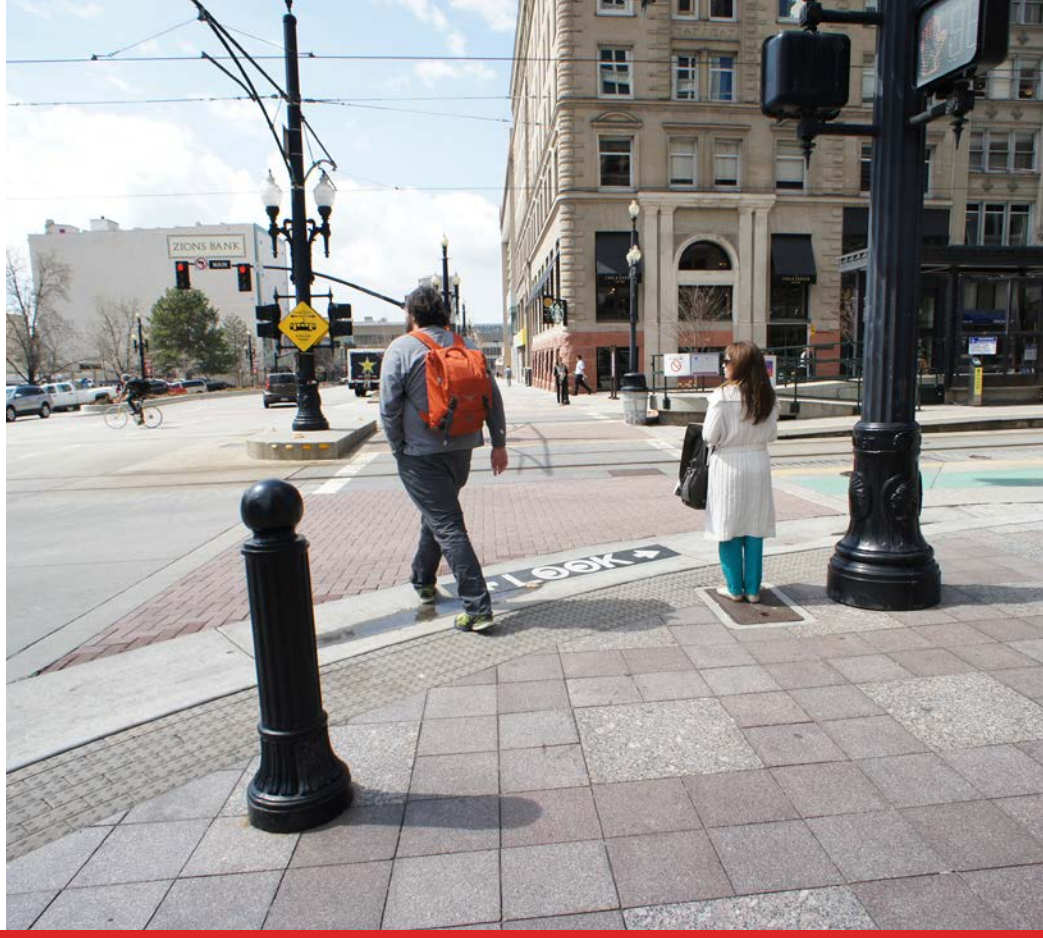

UTA

FIRST/LAST MILE STRATEGIES STUDY

APRIL 2015

FEHR PEERS

NELSON NYGAARD


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Acknowledgments

The First/Last Mile Strategies Study was sponsored by the Utah Transit Authority, the Utah Department of Transportation, Wasatch Front Regional Council, and the Mountainland Association of Governments. This study owes much to the participation and dedication of its Steering Committee and Stakeholder Group members, as identified below. Thanks to everyone who contributed time and energy, and to those that share the vision of a connected Wasatch Front.

STEERING COMMITTEE

- Utah Transit Authority: Jennifer McGrath and Hal Johnson
- Utah Department of Transportation : Angelo Papastamos and Jeff Harris
- Mountainland Association of Governments: Jim Price and Shawn Seager
- Wasatch Front Regional Council: Ted Knowlton and Ned Hacker
- University of Utah Traffic Lab: Cathy Liu, Richard J. Porter, Milan Zlatkovic, Jem Locquiao, and Jeffery Taylor

STAKEHOLDER GROUP

- The First/Last Mile Strategies Study Steering Committee
- Utah Transit Authority: G.J. LaBonty, Richard Brockmyer, Jan Maynard, and Matt Sibul (staff team); and Keith Bartholomew and Necia Christensen (Board of Trustees)
- Bike Utah: Phil Sarnoff
- Davis County Health Department: Isa Perry
- Enterprise Car Share: Jamie Clark and James Crowder
- GREENbike: Ben Bolte and Will Becker
- Salt Lake City Mayor's Accessibility Council: Todd Claflin
- Salt Lake County: Wilf Sommerkorn
- University of Utah Commuter Services: Alma Allred
- Utah Department of Health: Brett McIff

CONSULTANT TEAM

- Fehr & Peers: Bob Grandy, Maria Vyas, Kyle Cook, Julie Bjornstad, Alex Roy, and Summer Dong
- Nelson\Nygaard: Linda Rhine, Terra Curtis, and Adina Ringler


Please Consider Others
NO SMOKING

Table of Contents

Table of Figures

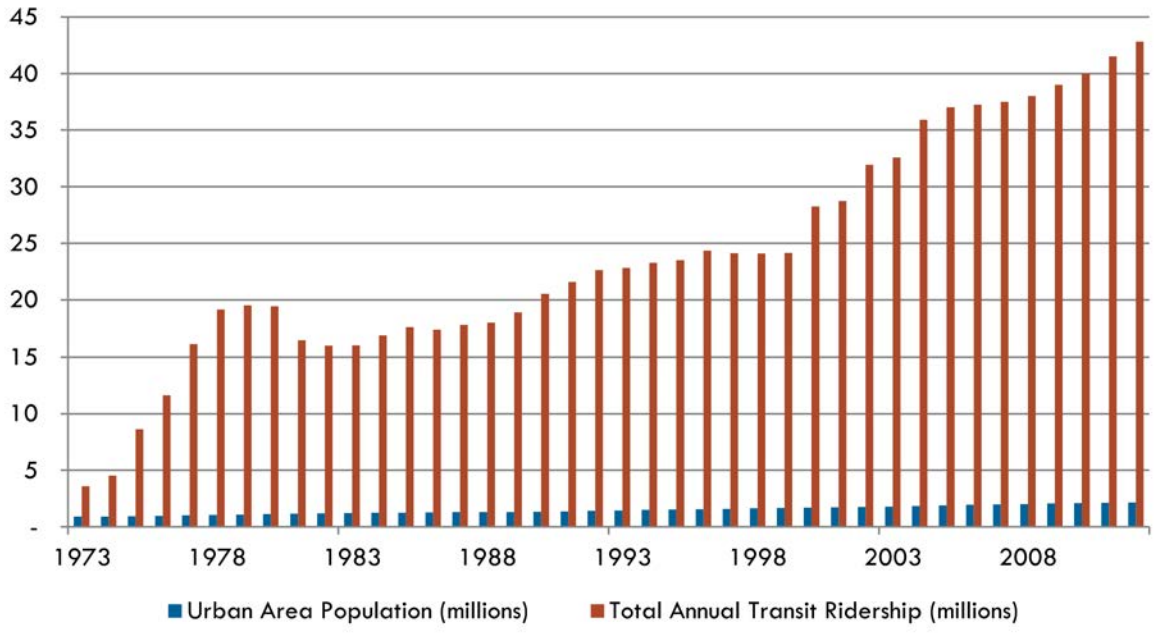
All images courtesy of Fehr & Peers or Nelson\Nygaard, except as noted.

Executive Summary

In 2014, the Utah Transit Authority Board of Trustees set a goal of developing a comprehensive first/last mile strategy to improve access to transit stations throughout the agency's service area. This goal is related to an overall effort to double UTA's ridership by 2020. The Utah Transit Authority and the Utah Department of Transportation, with support from the Wasatch Front Regional Council and the Mountainland Association of Governments, initiated and developed this First/Last Mile Strategies Study, which identifies a short list of strategies to prioritize those that would be most effective in increasing system ridership.

The Utah Transit Authority was incorporated in 1970 to provide transit service to local communities. Historic annual transit ridership (compared to the population of the urban area counties) for the last four decades of UTA's history is summarized in the chart below.

Figure ES-1 Annual UTA Transit Ridership, 1973-2008



As shown in the chart, total annual ridership is approaching 45 million, as the population of the four urban counties of the Wasatch Front grows beyond 2.1 million people. Nearly 23 million of those annual transit trips occur on UTA's rail network: the TRAX light rail system and the FrontRunner commuter rail line. The 63 stations on these rail lines represent an opportunity for UTA to capture even greater ridership through first/last mile solutions. First/last mile strategies for the rail stations were identified and prioritized using the following process:

- Research best practices for first/last mile strategies nationally and internationally, including interviews with peer transit agencies and inventory of UTA's current practices;
- Develop a First/Last Mile Strategies Toolbox;
- Organize TRAX and FrontRunner stations into typologies based on access and station characteristics;
- Analyze ridership patterns on UTA's TRAX and FrontRunner networks to assess the success of first/last mile strategies in adding riders to the system;
- Rank strategies in the Toolbox based on traits like ease of implementation, relative cost, and ability to improve safety;
- Collaborate with stakeholders to refine and develop a shortlist of recommended strategies; and
- Identify which strategies would be most effective at which stations.

Strategy recommendations by station are provided in the table on the next page.

Figure ES-2 Strategy Recommendations

Station Typology	Stations	Recommended Strategies
Urban	Planetarium, Arena, Temple Square, City Center, Gallivan Plaza, Courthouse, 900 South, Library, Trolley, 900 East	Wayfinding and information, bicycle network improvements, bike sharing, car sharing
Multi-modal	1940 W North Temple, Power, Fairpark, Jackson/ Euclid, North Temple Bridge/Guadalupe, North Temple, Redwood Junction, West Valley Central, Salt Lake Central, Old Greektown, Ball Park, Central Pointe, Millcreek, Sandy Expo	Wayfinding and information, bicycle network improvements, access connections, pedestrian network improvements, crossing treatments, rail and bus stop enhancements
Institutional	Orem, Stadium, University South Campus, Fort Douglas, University Medical Center	Bicycle network improvements, bike sharing
Suburban Non-residential	Ogden, Lehi, Meadowbrook, Murray North, Murray Central, Fashion Place West, Sandy Civic Center, River Trail, Decker Lake, Draper	Wayfinding and information, bicycle network improvements, bike sharing, rail and bus stop enhancements
Suburban	Midvale Fort Union, Midvale Center, Historic Sandy, Crescent View, Kimballs Lane, Draper Town Center, Bingham Junction, Historic Gardner, West Jordan City Center, Jordan Valley, 4800 W Old Bingham Hwy, Provo	Wayfinding and information, bicycle network improvements, pedestrian network improvements, crossing treatments
Auto-dependent	Pleasant View, Roy, Clearfield, Layton, Farmington, Woods Cross, South Jordan, American Fork, 2700 W Sugar Factory Road, 5600 W Old Bingham Highway, South Jordan Parkway, Daybreak Parkway	Wayfinding and information, bicycle network improvements, access connections, pedestrian network improvements, crossing treatments

Analysis conducted for this study (and described in Chapter 6) indicated that ridership on the rail network could increase 3-6% if the proposed recommendations were to be implemented. Implementation of the recommended first/last mile solutions in locations where these solutions are currently lacking could result in a ridership increase of between 2,100 – 4,300 riders per day (or 1.3 – 2.7 million riders per year) throughout the rail network.

These strategies will generally require collaboration between a wide range of partners including the Utah Transit Authority, the Utah Department of Transportation, local jurisdictions with land use and roadway authority at transit stations, the GREENbike bike sharing program, Enterprise Car Share, and private institutions in addition to others. While first/last mile strategy recommendations are provided by station typology and not typically by individual station, previous work efforts (such as the Utah Collaborative Active Transportation Study) identified conceptual-level recommendations for some transit stations within the UTA network. These recommendations are provided in the Appendix.

As demonstrated in the table above, the recommended strategies encompass a range of elements. Each strategy has associated capital construction costs along with annual operations and maintenance costs. Estimates for capital improvements on a per-station basis could range from $1.7M - $2.5M, depending on the elements requiring construction (and in some cases, estimates could be much more or much less). Operation and maintenance costs associated with the first/last mile strategies could range from $75,000 - $135,000 per station per year, depending on the improvements needed. Planning-level cost estimates for individual first/last mile strategies are provided in Appendix E of this report.

1 INTRODUCTION

BRIDGING THE FIRST/LAST MILE GAP

A first or last mile gap is a barrier that discourages potential riders from using transit because a station cannot be easily accessed from home, work, or other destinations. The gap can be created by elements of geography, topology, street network and design, or a lack of available transportation options. All transit riders must contend with the first/last mile challenge; the easier it is to access the system, the more likely people are to use it.

Improving access starts with creating urban environments with cohesive pedestrian and bicycle networks that are inviting and safe, with multiple transportation options available including shared transport systems, and with a comprehensive transit system. As such, best practice is to pursue multiple strategies that increase the number of transit access points and options.

PURPOSE OF STUDY

The Utah Transit Authority (UTA) has constructed an impressive and effective fixed-rail network in the Salt Lake City urban area, with a combination of commuter rail, light rail, and streetcar lines. While the agency continues to identify routes and location for future network extensions, enhancing the first- and last-mile connections to the existing network could bring new riders to the system. In 2014, the UTA Board of Trustees set a goal of developing first/last mile recommendations that could be applied throughout UTA's service area, as part of an overall effort to double ridership by 2020. The purpose of this First/Last Mile Strategies Study is to identify a short list of strategies to prioritize that would be most effective in increasing system ridership.

Outside of increasing the number of transit riders on the system, improving first/last mile solutions has other benefits as well. The connectivity of the existing street and pathway network surrounding UTA's rail stations has long been known as a barrier for those trying to access the stations. Many of the strategies discussed through this study would be effective improvements on the connectivity of this network. Making better connections for transit users accessing the stations would also improve the safety for transit users as well as others who live and work in the station catchment areas, by providing separated pathways, better visibility, or more direct routes to the stations.

While ultimately first/last mile solutions must be applied broadly to all of the geographic transit service area, UTA elected to begin with its fixed rail network. For the purposes of this study, analysis and recommendations are specific to rail stations on FrontRunner and TRAX; the "Recommendations" section of this study addresses the transferability of these recommendations to Bus Rapid Transit (BRT) and bus networks.

STAKEHOLDER ENGAGEMENT

The project team engaged many stakeholders in the process of identifying and prioritizing first/last mile strategies. In September 2014, stakeholders came together to discuss the "universe of alternatives" for first/last mile strategies, and to learn about national and international best practices as well as "lessons learned" from peer agencies. In November 2014, stakeholders regrouped to share their own experiences using first/last mile strategies and to prioritize a short list of strategies for UTA's focused implementation. Stakeholders represented a range of agencies and organizations, including:

- Bike Utah
- Davis County Health Department
- Enterprise Car Share
- GREENbike
- Mountainland Association of Governments (MAG)
- Salt Lake City Accessibility Council
- University of Utah
- Utah Department of Health
- Utah Department of Transportation (UDOT)
- UTA staff and Board of Trustees
- Wasatch Front Regional Council (WFRC)

Minutes and materials from the stakeholder meetings are included in Appendix A.

2 DATA COLLECTION

Data collection for the First/Last Mile Strategies Study encompassed a range of types and sources, including ridership and station characteristics as well as survey information solicited online and from on-board riders. Data sources are identified in the following section.

STATION CHARACTERISTICS

Understanding the effectiveness of current first/last mile strategies requires that an agency take stock of what is currently implemented. This study included audits of stations on the UTA fixed rail network; assessments of connectivity around the station areas; inventory of vehicle and bicycle parking; future projections for population and employment growth around station areas; and review of station area plans and transit-oriented-development efforts at stations.

Station Area Audits

Station area audits were conducted by University of Utah Traffic Lab staff members in late summer 2014 at all TRAX and FrontRunner stations. The audits were used by the team to create station typologies and develop first/last mile recommendations. The audits included qualitative information on stations, as well as adjacent roadway and intersection conditions. This included but was not limited to the following:

- Audit date, time, location, weather conditions, and number of transit users observed;
- Presence of station characteristics such as amenities, drop-off/pick-up areas, user information, security, lighting, bicycling parking, accessibility, and signage;
- Traffic speeds and volumes, as well as presence of multi-modal accommodations, lighting, and signage on adjacent streets; and
- Intersection control type (for instance, signalized, four-way stop, etc.), number of travel lanes, and accessibility features at adjacent intersections.

Observers compiled a spreadsheet database to house the data. The database along with the associated field notes sheets are housed at the partner agencies (UTA, UDOT, WFRC and MAG).

Station Area Connectivity

The Utah Collaborative Active Transportation Study (UCATS) evaluated network connectivity around the FrontRunner and TRAX stations in 2013. Connectivity is a measurement of how many different routes are available to get between two points – the greater the connectivity, the higher the number of potential routes and intersections that could be used to get from point to point. For example, a street network with very small blocks in a grid pattern would have high connectivity, because there are many different ways to connect from one location to

another. The UCATS study measured network connectivity by identifying the percent of land area within a one-mile radius of each TRAX and FrontRunner station that could actually be accessed by walking on available routes for one mile from the station. These calculations were used to develop a "walk access" or "walkability" index for each station; stations with low scores had correspondingly low network connectivity and low walkability or walk access to the surrounding areas, and stations with high scores had a high degree of connectivity and walkability. The "walk access" ratings for TRAX and FrontRunner, respectively, are shown in the figures below; stations shown in green have high accessibility, whereas those shown in red have low accessibility.

Figure 2-1 Walk Access for TRAX Stations

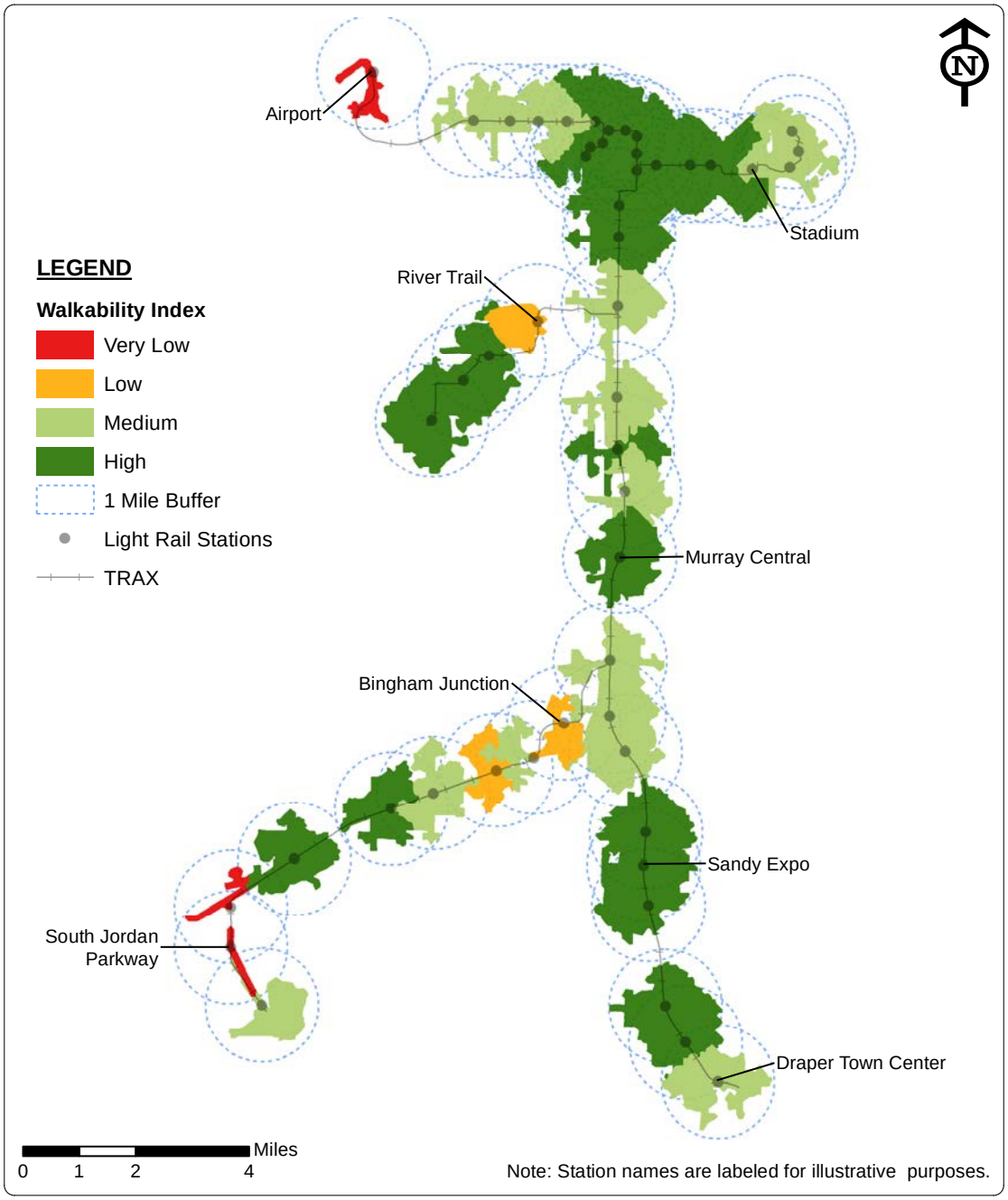
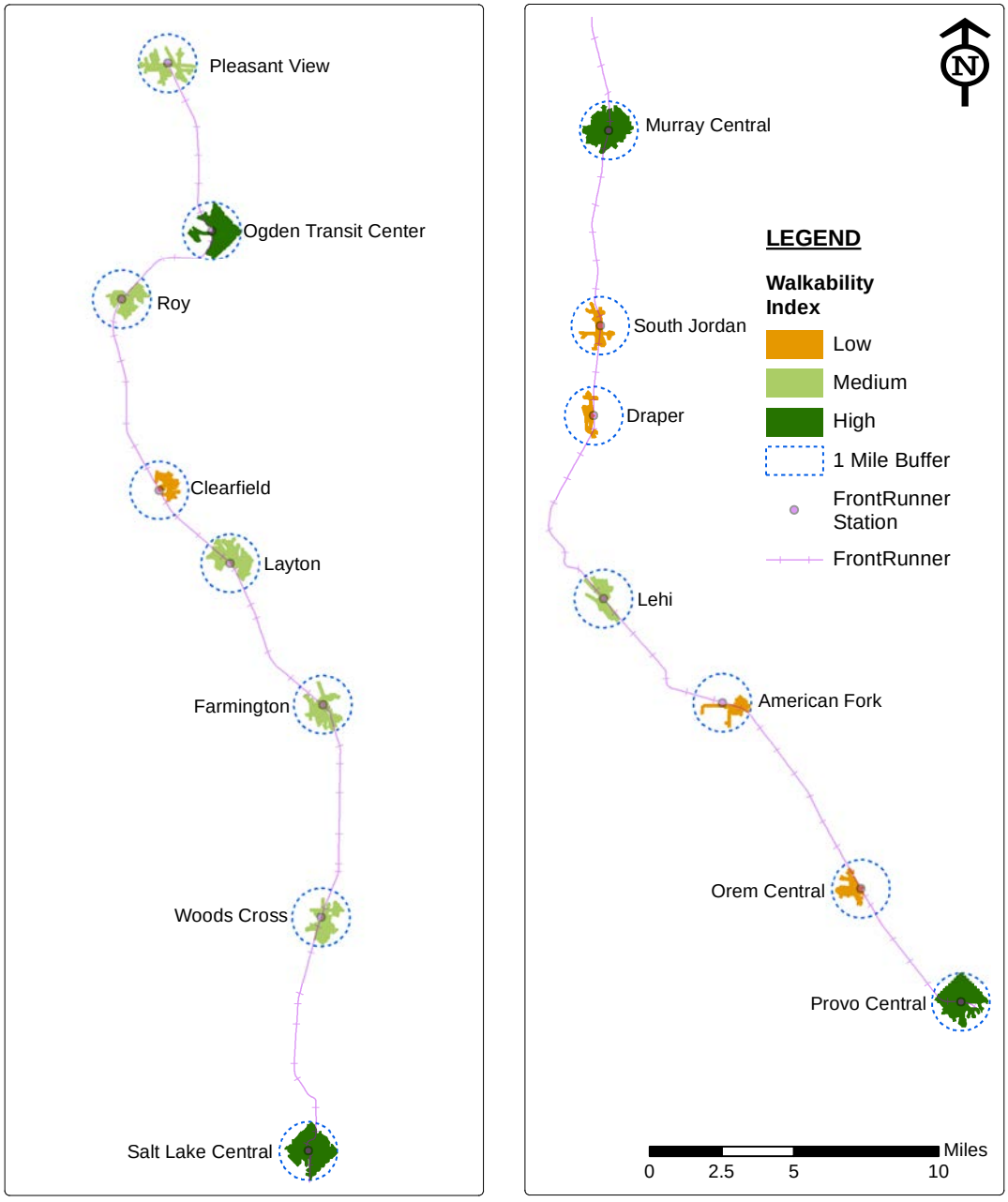


Figure 2-2 Walk Access for FrontRunner Stations



Vehicle and Bicycle Parking Supply

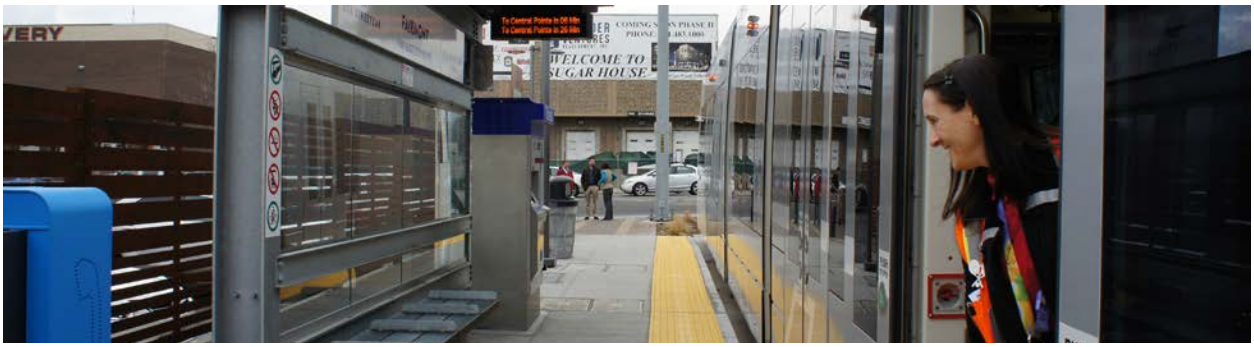
The availability of parking supply (both for vehicles and bicycles) can influence riders' decisions on how they get to the transit station (and sometimes whether they use transit at all). Transit stations outside the immediate urban area generally have at least a moderate amount of free vehicle parking. Some stations have hundreds of spaces constructed and available for use. Similarly, some transit users who cycle to the rail station may wish to store their bicycle at that station, rather than bring it on the train with them for the duration of their journey. Accessible bicycle lockers in a highly-visible location which can be rented for appropriate lengths of time are valuable to these riders. UTA conducted an inventory in 2014 of all bicycle racks and lockers at its stations, which was incorporated into this study.

Future Population and Employment Growth

While it is important to understand how stations currently function within the system, it is also important to recognize that the future is constantly evolving before our eyes; stations that look and behave a certain way now are practically guaranteed to be different at some point. Future population and employment projections, from the WFRC/MAG travel demand model, provided insights on where growth might occur in significant amounts between now and 2040. This allowed the team to identify which stations that currently had low degrees of ridership and access might potentially have higher demand and need for first/last mile solutions in the future.

Future TOD Plans

The degree of planning and development activity taking shape around rail stations was evaluated through this study. UTA's transit-oriented development specialists provided information on current station area plans, known development projects, and the intensity of development activity at rail stations throughout the service area. This information is provided in Section 7 of this report.



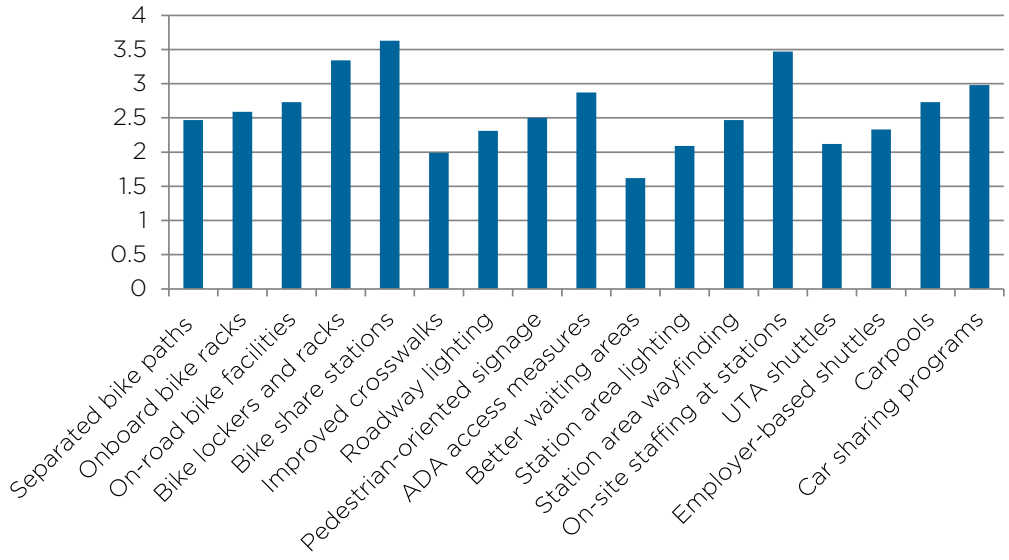
PASSENGER SURVEYS

Surveys provided valuable insights into the needs and behaviors of UTA transit riders. The Open UTA survey was conducted specifically for the First/Last Mile Strategies Study, while the on-board origin-destination survey was completed in 2013 as a broader look at rider trip patterns.

Open UTA Survey

In mid-2014, UTA posted a brief survey on its Open UTA public engagement website and received 526 responses to the survey. The survey focused on preferred methods for riders to get to and from transit stations, using questions on a rating scale as well as open-ended responses. Survey respondents were asked to rank a range of strategies, across several categories, from 1 to 4 (the lower the score, the more attractive the strategy). Results from the survey are summarized in the figure below. They indicated that respondents preferred separated pathways to/from transit stations as the most important bicycle-related amenity; improved crosswalks as the most highly preferred pedestrian amenity; improved passenger waiting areas as the most preferred station feature; and UTA shuttles as the most preferred shuttle option.

Figure 2-3 Average Amenity Score



Comments in the open-ended responses frequently referred to the need for safe bicycle and pedestrian facilities accessing stations. Comments also often centered on the need for better bus and shuttle connections to and from TRAX and FrontRunner stations, including the pick-up/drop-off timing schedules of the routes already in place. It is beyond the scope of this study to comprehensively evaluate the timing of bus connections at TRAX and FrontRunner stations; however, it is recommended that UTA delve into this issue further to resolve some of the problems identified in the survey.

The full responses to the survey are provided in Appendix B.

2013 ON-BOARD ORIGIN-DESTINATION SURVEY

The 2013 survey, conducted by RSG on behalf of UTA, measured key rider and trip characteristics for transit users throughout the UTA system for a six-month period. This survey gathered demographic data such as access to vehicles, home zip code, employment status, education levels, disability, and other factors. The survey also asked respondents questions about where their trips began and ended (which TRAX/FrontRunner station), and which mode of transportation they used to arrive and depart from the stations at either end of their trip. This information was critical for the First/Last Mile Strategies Study, as it allowed the project team to assess mode of access splits for each individual TRAX and FrontRunner station, and compare them to the range of first/last mile strategies available at each station.

RIDERSHIP CHARACTERISTICS

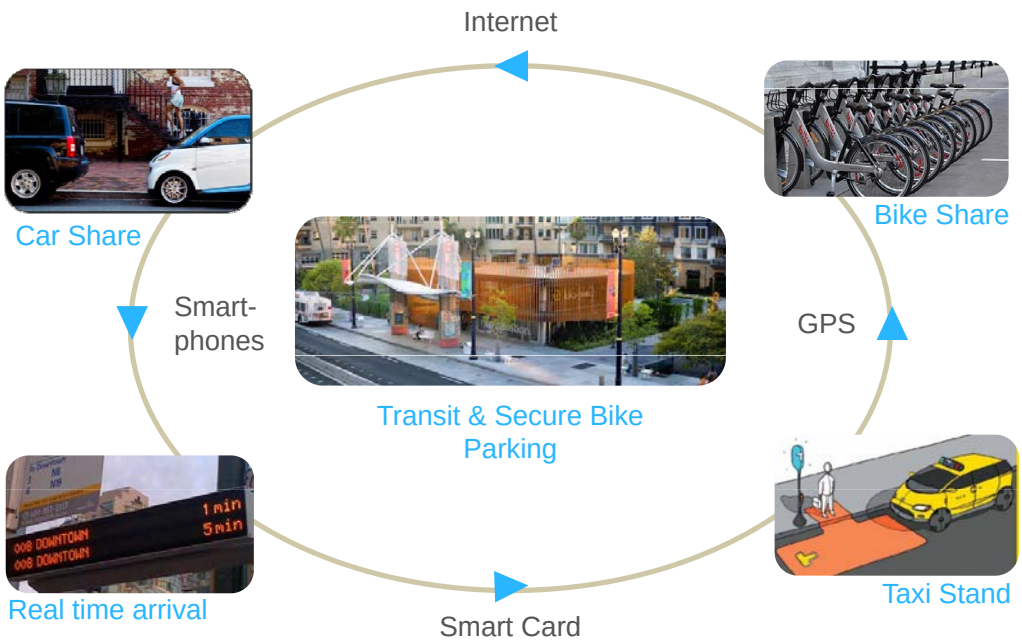
A major component of analysis for this study was to understand the relationship between UTA's first/last mile strategies currently in place and their effect on ridership. Average daily boardings and alightings data was provided by UTA for all TRAX, FrontRunner, and MAX BRT stations, for the period of August 2013 through April 2014. This was supplemented with additional information on ridership characteristics from the on-board survey.

3 State of the Practice for First/Last Mile Strategies

FIRST/LAST MILE STRATEGY TOOLBOX

First Mile/Last Mile strategies can be classified into 5 category types: Bicycle, Pedestrian, Transit, Auto, and Transportation Demand. Within this universe of First Mile/Last Mile strategies there is a great deal of variation on the target user type and where they are appropriate. No one strategy fully addresses first and last mile gaps. Implementing these solutions is part of building an ecosystem of supportive options, information, and technologies. This ecosystem increases both the accessibility and attractiveness of transit and helps build a culture of transit use over time; an example of such an ecosystem is shown in the figure below.

Figure 3-1 First/Last Mile Strategies Ecosystem



The following Transit Access Toolbox provides brief descriptions of the wide range of first/last mile solutions considered by the project team.

Figure 3-2 First/Last Mile Toolbox

PEDESTRIAN TOOLS

Streetscape Improvements

Streetscapes essentially define the character of the street. Everything between buildings on each side of the street can be considered part of the streetscape realm. Providing street trees, landscape improvements and street furniture along the sidewalks contribute to a successful streetscape.

Sidewalks

The sidewalk zone is the portion of the street right-of-way between the curb and building front. There are four distinct areas that serve different organizational purposes: edge/curb zone, furnishing zone, throughway zone, and frontage zone.

Access Connections

Some stations may have limited pedestrian/bicycle access, often via the main vehicular access points. This may require out-of-direction travel for pedestrians or bicyclists. Access connections create neighborhood-oriented connections for easier access to stations. For example, providing walkways from dead-end roads to stations or providing access along publicly owned easements. Network connectivity may also be improved to provide more and shorter options for people walking and bicycling to transit stations.

Curb Extensions

Also known as a pedestrian bulb-out, this traffic-calming measure is meant to slow traffic and increase driver awareness of pedestrians. It consists of an extension of the curb into the street, making the pedestrian space (sidewalk) wider and reducing roadway crossing distances.

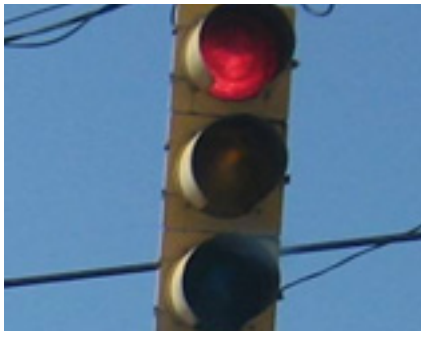
PEDESTRIAN TOOLS

Reduced Curb Radii

Reducing turning radii fosters compact intersection design and improves sight distance. A large turning radius (generally 30 feet or greater) allows vehicles to turn at high speeds. Reducing the radius forces approaching vehicles to slow down, thus reducing the frequency and severity of pedestrian collisions at intersections. On-street parking should be restricted in advance of crosswalks, to improve visibility for pedestrians..

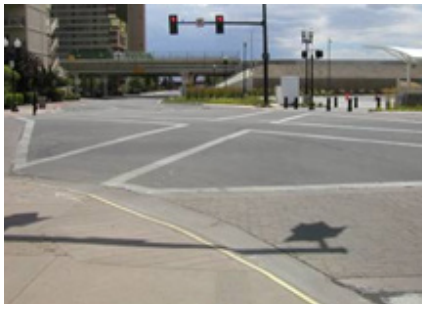
Pedestrian Refuge Islands

An island located in the middle of the street where pedestrians can wait, allowing them to cross half the distance of the street at a time. The minimum recommended width for a median island is 5-6 feet in order to accommodate bicyclists. The refuge island can be extended if there are higher amounts of pedestrian activity or additional travel lanes.



Traffic Signal or All-Way Stop

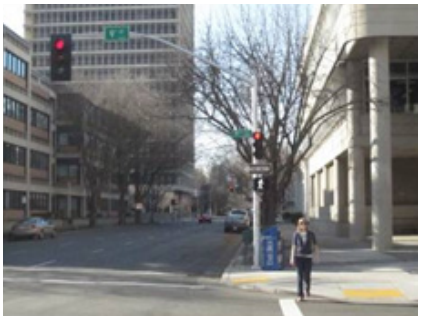
Conventional traffic control devices with warrants for use based on the Manual on Uniform Control Devices (MUTCD).



Pedestrian Scramble

Pedestrians are permitted to cross in all directions at an intersection, including diagonally, during an exclusive pedestrian phase. During the time when the diagonal crosswalk pedestrian indication permits pedestrians to cross, the vehicle indications display red on all approaches of the intersection.

PEDESTRIAN TOOLS



Leading Pedestrian Signal Intervals

Pedestrians are permitted to cross in all directions at an intersection, including diagonally, during an exclusive pedestrian phase. During the time when the diagonal crosswalk pedestrian indication permits pedestrians to cross, the vehicle indications display red on all approaches of the intersection.

Advanced Limit Lines

Standard white STOP or limit lines are placed preferably at least 4 feet in advance of marked crosswalks at signalized intersections.

Pedestrian Signal Countdown Timers

The countdown timer starts either at the beginning of the pedestrian phase or at the onset of the pedestrian clearance interval. The timer continues counting down through the pedestrian clearance interval. At the end of the pedestrian clearance interval, the countdown device displays a zero and the DON'T WALK indication appears.

Marked Crosswalks

Marked crosswalks are the portion of the roadway designated for pedestrians to use in crossing the street. Various crosswalk marking patterns are given in the MUTCD. High-visibility markings include a family of crosswalk striping styles such as the "ladder," the "zebra," and the "continental."

PEDESTRIAN TOOLS

Raised Crosswalks

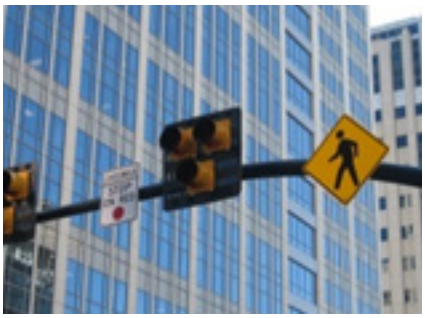
Similar to speed humps, raised crosswalks provide an elevated surface above the travel lane that attracts the attention of the driver and encourages lower speeds. It is useful in areas with high pedestrian activity by essentially raising the road surface over a short crossing distance. This treatment includes a flat area on the top that constitutes the crosswalk. This flat area may be made of asphalt, patterned concrete, or brick pavers.

Supplementary Pedestrian Crossing Channeling Device (SPCCD)

Regulatory pedestrian signage is posted on lane edge lines and/or road centerlines. The In-Street Pedestrian Crossing sign may be used to remind road users of laws regarding right of way at an unsignalized pedestrian crossing. The cones incorporate a graphic panel which reads "YIELD TO PEDESTRIANS IN CROSSWALK."

High-Visibility Signs and Markings

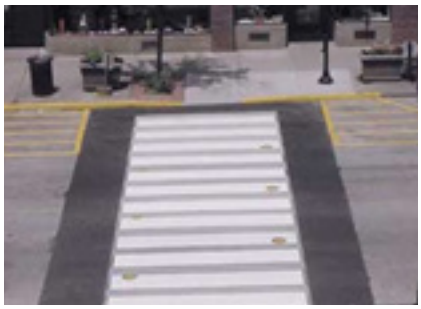
High-visibility fluorescent yellow green signs are posted to increase the visibility of a pedestrian crossing.



HAWK Beacon

HAWK Beacons (High Intensity Activated Crosswalks) are pedestrian-actuated signals that are a combination of a beacon flasher and a traffic control signal. When actuated, a HAWK beacon displays a yellow (warning) indication followed by a solid red light. During pedestrian clearance, the driver sees a flashing red "wig-wag" pattern until the clearance interval has ended and the signal goes dark. Though less expensive than a full signal, the overall effectiveness depends on the education of drivers.

PEDESTRIAN TOOLS



In-Pavement Flashing Lights Crosswalk Warning System

The devices are mounted in the street pavement adjacent to the outside of the crosswalk markings and typically protrude less than 0.5 inches above the pavement. They are normally dark, but they are actuated to provide a flashing yellow light while the pedestrian crossing is in use.

Staggered Pedestrian Refuge Island

Refuge islands are longer medians in the center of the roadway. The crosswalks leading to the island are staggered such that a pedestrian crosses half the street and then must walk towards traffic to reach the second half of the crosswalk. They must be designed for accessibility by including rails and truncated domes to direct sight-impaired pedestrians along the path of travel.

Roadway Narrowing

Narrow 10-12 foot wide travel lanes are created by striping residential streets and providing extra-wide left-turn and bike or parking lanes. The street can be physically narrowed by extending sidewalks and landscaped areas, or by adding on-street parking within the former curb lines.

Roadway Lighting

It is best to place streetlights along both sides of arterial streets and to provide a consistent level of lighting along a roadway. Nighttime pedestrian crossing areas may be supplemented with brighter or additional lighting. This includes lighting pedestrian crosswalks and approaches to the crosswalks.

Street Lighting for Pedestrians

Street lighting can help define a space that is created for the pedestrian, not the automobile. This improves nighttime visibility for safety and security, as well as emphasizing pedestrian activity. Lights are installed, generally 150-watt bulbs at 100-foot spacing, 10-12 feet high, on both sides of the street.

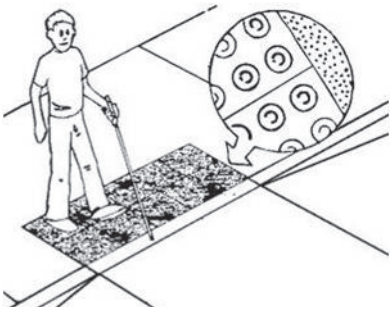
PEDESTRIAN TOOLS

Accessible Pedestrian Signals

Treatments for pedestrian signal indications, including directly audible or transmitted tones, speech messages, talking signs, and vibrating surfaces, make real-time pedestrian signal information accessible to pedestrians who are visually impaired. Accessible pedestrian signals are directional so that the user knows exactly where the transmission is coming from. Under the ADA, accessible pedestrian signal information is required at newly signalized intersections that have actuated pedestrian signals and at intersections that are undergoing signal upgrades and lack the cues needed by people with visual disabilities.

Push Button Treatments

At signalized intersections, pedestrian push-buttons (PPBs) are installed in combination with pedestrian signals that inform pedestrians when to cross. For traffic signals, pedestrian actuation changes signal timings to accommodate pedestrian walk times. In other cases, pedestrian actuation may activate a device, such as in-roadway warning lights.



Detectable Warnings

A detectable warning is a standardized surface feature, specified in the "Americans with Disabilities Act Accessibility Guidelines" (ADAAG), comprised of raised truncated domes and used to inform visually-impaired pedestrians of the hazards in the area immediately ahead. Detectable warnings are placed at the base of curb ramps or on the sidewalk edge of the street at blended curbs and at flush transitions from the sidewalk to the crosswalk. Alignment of domes is parallel to the primary direction of travel.

Curb Ramps

Curb ramps provide access between the sidewalk and roadway for people using wheelchairs, strollers, and also pedestrians with mobility impairments who have trouble stepping up and down high curbs. Directional ramps are preferred over diagonal ramps as they provide direct access to each crosswalk. Curb ramps should be ADA compliant to accommodate mobility and visually impaired pedestrians.

Pedestrian Accommodation at Interchanges

To improve pedestrian safety at interchanges and connect pedestrian facilities efficiently with surrounding land uses and transit stations, pedestrians should be designed for and accommodated at interchanges.

BICYCLE TOOLS

Bike Path

Bike paths provide a completely separate right-of-way and are designed for the exclusive use of bicycles and pedestrians with vehicle cross-flow minimized.

Bike Lane

Bike lanes provide a restricted right-of-way and are designated for the use of bicycles with a striped lane on a street or highway. Minimum required width for bicycle lanes is five feet, but at least six feet is preferred. Certain sections of the bike lane may be colored or marked utilizing special stencils to highlight high-risk locations, where motorists are permitted or required to merge into or cross the bike lane.

Protected Bike Lanes

In order to provide increased safety, bike lanes may be physically separated from motorized traffic by barriers such as parking, concrete barriers, and planters or differences in elevation.

Bike Route

Bike routes provide a right-of-way designated by signs or pavement markings for shared use with pedestrians or motor vehicles. While a basic bike route may simply have signs and markings, a bicycle boulevard is a special type of shared route that optimizes bicycle travel. Bike boulevards can have a variety of traffic calming elements to improve safety and comfort for bicyclists and often feature reduced speed limits.

BICYCLE TOOLS

Bike Rack

Bicycle racks are devices to which bicycles may be securely attached. The rack itself should be securely attached to the ground or a stationary object such as a building. Weather protection may also be provided in the form of a cover or shield. Bike racks are appropriate for short-term use.

Bike Locker

A locker or box in which a single bicycle can be placed and locked. Lockers may either be available on a first-come-first-served basis and/or for a fee. Users can reserve lockers for several months at a time for an established fee, or can rent as needed on a short-term basis.

Bike Station

A bicycle station is a building or structure that provides services to bicycle commuters such as secure bicycle storage, showers, lockers, bicycle repair services, bike parts and accessories for sale, information for bicyclists, bike rental, etc.

Salt Cycle

Bicycle Storage on Trains

Bicycle storage on trains provides a dedicated storage area and type for cyclists who take their bikes on-board. Horizontal racks or vertical hooks are the most common types of on-board storage.

American Trails

Bicycle Signage

Signs often convey important information that can improve road safety. The intent is to let bicyclists and motorists know what to expect in order to improve the chances that they will react and behave appropriately.

BICYCLE TOOLS

Bicycle Detection

When a bicyclist approaches an intersection, there are several means of detecting and facilitating his or her movements. Most of the innovations are passive detection devices such as loop detectors and infrared or video detection systems. A bicycle stencil informs bicyclists that their bicycles actuate the signal. Other detection devices are active, such as the bicycle push-button, which is similar to that used by pedestrians.

Bicycle Signal

Signals dictate traffic behaviors and patterns. Bicycle signals give priority phasing for bicycle crossing. They can also inform cyclists and drivers about the interaction between bicycles and traffic.

Bicycle Box

A bicycle box is a marked on-street waiting area designed to improve cyclist visibility when stopped. There are two types of bicycle boxes: two-point left turn and advanced stop line.

Before

After

Lane Reduction

This treatment involves reducing the number of travel lanes by widening the sidewalks, adding bike and parking lanes, converting parallel parking to angled or perpendicular parking, or converting one-way streets to two-way with a center median.

Bike Sharing

Bike sharing is a form of bicycle rental where people have convenient access to a shared fleet of bicycles on an as-needed basis. In recent years, innovations in technology have given rise to a new generation of technology-driven bicycle sharing programs. These new bicycle sharing programs can dramatically increase the visibility of cycling and lower barriers to use by requiring only that the user have a desire to bicycle and a smart card, credit card, or cell phone.

TRANSPORTATION DEMAND MANAGEMENT TOOLS

Parking Cash-Out

Parking cash-out is a policy where employees who may be offered parking as a benefit of their job are offered monthly cash benefits or free transit passes in exchange for giving up their free or employee-paid parking. Often, revenues from paid parking facilities will pay for the free employee transit passes and other related benefits. A parking cash-out policy reduces employee parking demand through financial incentives or free alternative transportation.

Guaranteed Ride Home (GRH)

GRH programs provide an occasional subsidized ride to commuters who use alternative modes. For example, if a bus rider must return home in an emergency, or a car pooler must stay at work later than expected.

On-Site Transportation Sales Support

Employers can offer a wide range of incentives to encourage the use of commute alternatives among employees, including selling transit passes on-site, providing transit subsidies, and establishing pre-tax spending accounts to pay for commuting expenses.

TRANSIT ACCESS INFORMATION AND TOOLS

Shared Bus Bays

Just as multiple airline flights use the same gate at an airport, multiple bus routes can share a bus bay. With dedicated bus bays, each bay has a permanent sign with the name of the agency or shuttle service and the route that stops there. With shared bus bays, typically signs that show multiple routes are posted, or more often electronic signs are used that can be changed to show which bus will stop at that location and when.

Integrated Fare Pay Systems

Integrated fare pay systems allow users to access multiple transportation modes with a single ticket or pass. This would comprise of a daily, weekly, monthly, or yearly pass that would allow use of public transit, bikeshare, and carshare programs.

Queue Bypass Lanes

A queue bypass lane is a lane where signal phasing allows for the queue to clear before the transit vehicle approaches the signal, effectively offering a transit-only lane.

Traffic Signal Priority

An operational strategy that facilitates the movement of transit vehicles through signal-controlled intersections. As the transit vehicle approaches the intersection, it is detected and the traffic signal may be adjusted based on a pre-programmed priority control strategy.

Bus Stop Enhancement

Bus stops are public transit's "front door" and offer riders their first impression of a transit service. An attractive, well-maintained stop that provides shelter and seating is likely to be received in a much more positive manner compared to a simple sign-post with a bus schedule.

TRANSIT ACCESS INFORMATION AND TOOLS

Bus Turnouts

A bus turnout (also known as a bus bay) is a specially constructed area separated from the travel lanes and off the normal section of a roadway that provides for the pickup and discharge of passengers. This design allows through traffic to flow freely without the obstruction of stopped buses.

Paratransit Loading Area

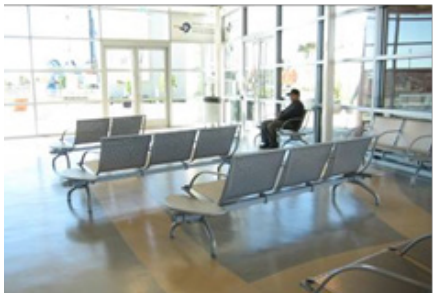
The focus of this tool is to ensure transit facilities incorporate a plan for paratransit vehicles. Transit agencies should allot space that affords a minimal distance between a dedicated paratransit bay and other station amenities.

ADA Accessible Environment at Transit Facilities

In accordance with the ADA, transit agencies are required to develop an Access Plan, which is also referred to a Transition Plan, to address any deficiencies. Its purpose is to identify physical obstacles that limit the accessibility of facilities to individuals with disabilities, describe the methods to be used to make the facilities accessible, provide a schedule for making the access modifications, and identify the public officials responsible for implementation of the Transition Plan.

Lighting

Some report that they are sometimes wary of using isolated or poorly lit transit facilities. Improved lighting enhances the feeling of personal safety and may eliminate some barriers to transit use. Most existing transit facilities have electric wiring in place that allows additional lights to be added.



Passenger Waiting Areas

Sheltered waiting areas at transit centers provide protection from rain or sun. They can be created by adding a canopy above the existing waiting area, installing pre-fabricated bus shelters in a lot or on a waiting platform, or building an extension to an existing transit center. In some cases, sheltered waiting areas may already exist at a transit center, but bus stops can be relocated closer to the shelters.

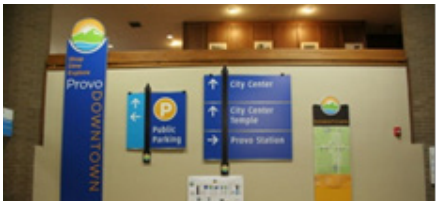
TRANSIT ACCESS INFORMATION AND TOOLS

On-Site Staffing

The presence of on-site staff, whether dedicated to security or public information (or even the sale of goods at a snack bar or newsstand), offers a valuable tool for making a transit facility more desirable for users, provides an enhanced sense of public safety, an information resource for users, and/or a way to purchase goods and services.

At Station Wayfinding and Signage

The purpose of this tool is to provide more comprehensive information at transit centers about transit routes, availability of services, and how to ride. Transit center information can be in the form of fixed maps, schedules and instructions, or brochures available for the public to take with them for personal reference.



En Route to Station Wayfinding and Signage

The purpose of this tool is to improve the visibility of routes accessing the transit station. In certain cases, information at the station is sufficient, but finding the station is difficult.

Real Time Information

Real-time information provides transit arrival information, usually updated at regular intervals, based on automated vehicle locator (AVL) data, global positioning system (GPS) data, dispatch responders (or based on modeled assumptions about speed), or even social networking feedback.

Image from Desert News

Shuttles

Shuttle services provide point-to-point transportation to fill gaps or make connections with the broader public transit network, often for specific groups of individuals. Shuttle services typically serve riders in a well-defined area or along a specific route and provide convenient and direct service to desired destinations.

AUTO ACCESS TOOLS

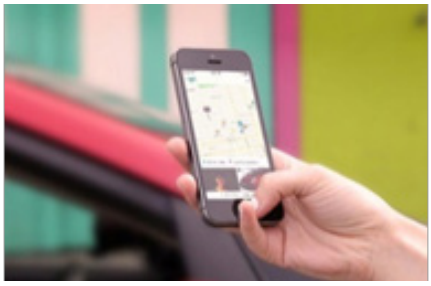


Image from Lyft

Commercial Ridesharing

Commercial ridesharing is a taxi-like service where the rideshare is created using mobile apps to connect passengers with drivers. Payment is collected through the mobile app and drivers are paid a portion of the user charge.

Dynamic Ridesharing

Dynamic ridesharing systems consider each trip individually and are designed to accommodate trips to random points at random times by matching user trips without regard to trip purpose. Dynamic ridesharing can either be an organized program run by an agency or an informal system run by users.

Taxi Sharing

Taxi service differs from rental car and car-sharing services in that the person making the trip: a) does not drive themselves, b) does not need to reserve in advance, and c) can access the service at many different locations. Under a taxi sharing program, cab drivers can pick up multiple passengers at the same time, provided each passenger is headed in the same direction.

Carpool/Vanpool

Carpooling/vanpooling is the shared use of a car by the driver and one or more passengers. When carpooling, people either get a ride or offer a ride to others instead of each driving separately. Carpooling/vanpooling arrangements can utilize personal vehicles or vehicles supplied by public agencies or private companies.

AUTO ACCESS TOOLS

Car Sharing

Through car sharing, individuals gain access to vehicles by joining an organization that maintains a fleet of cars and light trucks in a network of locations. Members must pay a fee and pay per use. Vehicle locations are distributed in neighborhoods. Vehicle reservations and access are self-service. Vehicles must be picked up and dropped off at the same location.

Image from Richard Drdul

Priority Parking

Priority parking recognizes that parking is a finite resource and should be managed to assure maximum access for patrons. It reserves the most convenient parking spaces to promote ridesharing in the form or carpool/vanpool or car-sharing (also sometimes used to promote electric vehicles and motorcycles).

Residential Permit Parking

A residential permit parking district is designed to protect local residents from parking difficulties in areas near major destinations. This is usually accomplished by issuing residents permits that allow them to park for free, while offering non-residents paid parking, either through a fee or by offering a finite number of permits. This tool can be used as a transit strategy if combined with good transit service because it limits available parking in desirable areas, encouraging the use of transit.

Parking Benefit District

Parking Benefit Districts utilize revenues generated by a variety of means including assessments, taxes, or parking meters to support transportation-related services, such as transit service improvements or active transportation enhancements.

STRATEGIES USED WITHIN THE UTA SERVICE AREA

While the Toolbox lists a comprehensive range of strategies, not all of them are currently in use within UTA's service area. This section identifies major first/last mile strategies employed by UTA and others to connect riders to stations.

GREENbike Share Program

GREENbike is a non-profit organization and private/public partnership. The program is implemented in downtown Salt Lake City and provides a short-term bike rental to users which could be picked up at one station and left at another. The GREENbike Share program provides pre-registered members with short-term, one-way access to the bikes parked at certain locations. It currently has 12 stations available within the downtown area, and 8 of these stations are at or very near TRAX or FrontRunner stations. These include the Arena, City Center, Gallivan, Library, Planetarium, and Temple Square TRAX Stations, as well as the North Temple and Salt Lake Central TRAX/FrontRunner stations. Users can purchase one of three kinds of memberships: annual, 7-day, or 24-hour. Members are charged only for the time they use, and the first 30 minutes is free. Each bike station has maps showing the available stations for bike rental/return in the network. Mobile apps such as B-cycle and Spotcycle also show the bikes and docks available at every station in real time.

On-board Bicycle Accommodations

Bicycles are currently allowed on both TRAX and FrontRunner trains, with specific loading areas identified at the stations for cyclists. FrontRunner cars can accommodate between 4-12 bicycles each, depending on the type of car; TRAX cars can accommodate up to 4 bicycles in each car. UTA is currently exploring methods of more efficient bicycle storage on cars, including the installation of hooks on TRAX vehicles for hanging bikes. Respondents to the Open UTA Survey (discussed in Section 2 of this report) identified on-board bicycle accommodations as one of the most desirable bicycle-related first/last mile solutions. In addition, some survey respondents provided open-ended comments describing their experiences bringing bikes on board, which are challenging in peak commute periods or when there are more than the prescribed number of cyclists wanting to board the trains.

Enterprise Car Share Program

More and more metropolitan areas are adopting car share programs. Having car sharing available at public transit stations may allow transit users to forgo having their own vehicle in exchange for using car share vehicle for trips on an as-needed basis. Enterprise is currently the Car Share vendor in the Salt Lake City area, and their program allows people to reserve a car by the hour. Members reserve the car online or by phone, access the vehicle with the membership card, and then return it to the dedicated parking space once their trip is finished. The car is shared by the hour at $8.00, with fuel, physical demand/liability protection included. There are several car share stations at or near TRAX and FrontRunner stations on the Wasatch Front, as listed below:

- Multiple locations downtown near the Red or Blue TRAX Lines including 225 South Main, 395 South 200 East, 310 South 300 East, 300 South 500 East, and 374 South 1000 East;
- On the University of Utah Campus at several locations including the Stadium TRAX Station, 1901 East South Campus Drive, 245 Fort Douglas, and the University Medical Towers;
- Murray Central TRAX/FrontRunner station; and
- Orem FrontRunner station.

UDOT TravelWise Travel Demand Management (TDM) Program

As Utah continues to experience unprecedented growth, challenges inevitably follow. To address some of the transportation challenges created by this growth, UDOT developed TravelWise—a set of strategies that encourage Utahns to use alternatives to driving alone, especially during peak travel hours. The state of Utah is asking individuals, businesses, communities and organizations to implement TravelWise strategies in an effort to reduce

energy consumption, optimize mobility and improve air quality, ultimately improving the quality of life in Utah. TravelWise strategies include alternative work schedules, active transportation, carpool/vanpool, public transit, "skip the trip," teleworking, trip chaining, and plan ahead. TravelWise tools include the TravelWise Tracker, Variable Message Signs (VMS), Business and Community Resource Kits, TravelWise alerts and www.travelwise.utah.gov.

Shuttles (Current and Proposed)

UTA currently operates a number of employer- or destination-focused shuttles, with several others in planning stages. There are 17 UTA shuttles currently in operation, generally connecting destinations with TRAX or FrontRunner stations. These shuttles serve 11 of the 70+ TRAX or FrontRunner stations, and are focused at FrontRunner stations in suburban locations. Examples of shuttle destinations include Weber State University in Ogden, Adobe and IM Flash in Lehi, or the International Center on the west side of Salt Lake City. Ridership on the shuttles ranges from roughly 40-45 daily boardings (i.e., the Pleasant View shuttle from Ogden FrontRunner station) to nearly 800 daily boardings (a circulator connecting Salt Lake Central Station with West Valley Central TRAX and several neighborhoods on Salt Lake City's west side). National literature suggests that successful shuttle characteristics include:

- Frequent and convenient service
- Service to areas with high residential or employment density
- Service to locations with limited or priced parking
- Service combined with other TDM measures

Many communities across the Wasatch Front have requested their own shuttle networks, and UTA is in the process of studying or implementing several new routes. These include the Davis-Salt Lake City Community Connector project and the Sandy/South Jordan Circulator, among other local and regional transit projects. The Davis-Salt Lake City Community Connector will provide enhanced bus service connecting south Davis County to Salt Lake City, and includes suggested bicycle and pedestrian improvements as well as land use policy changes that encourage transit oriented development around stations. UTA is currently seeking funding to begin environmental review of the Community Connector. The Sandy/South Jordan Circulator is being planned in response to the Sandy City Civic Center Area 30-year Development Plan, which guides development within the Sandy City area to accommodate the city's growing population, uphold the Wasatch Choice 2040 vision, reduce traffic congestion and promote the area's economy. A feasibility study is currently under way for the circulator, and the anticipated recommended mode is bus but may eventually transition to streetcar.

Active Transportation

UTA has long recognized that improving active transportation connections to its stations represents an opportunity to capture more riders, and encourage current riders to walk or bike to stations rather than driving. In 2013, the Utah Collaborative Active Transportation Study (UCATS) was completed by UDOT and UTA in partnership with WFRC, MAG, and Salt Lake County to establish a plan for a regional bicycle network and enhance access to transit. UCATS developed a decision-making framework to identify high-priority project areas for both regional bicycle routes as well as station-based access improvements. The process includes the evaluation of existing network condition, categorizing infrastructure types, assessing access to transit, determining anticipated trends or patterns in walking or bicycling and conducting public outreach to gather information on perceptions and suggestions about active transportation infrastructure. High-priority "Top 25" project areas are identified all along the Wasatch Front and include several recommendations for connectivity improvements at UTA FrontRunner and TRAX stations. These recommendations are provided in Appendix C. In addition to the recommendations made through the UCATS process, many local jurisdictions are implementing bicycle and pedestrian improvements on their own or in partnership with UTA or UDOT.

Ride Matching Services

UTA Rideshare provides several services to transit users seeking first/last mile solutions such as carpooling, vanpooling, or ride matching. UTA's Rideshare staff maintain a matching service to link carpoolers together (accessible via www.utacommuter.com), where individuals can list their information for as long as it takes to establish a carpool match. UTA also works with employers and groups of individuals to create vanpools. Prospective vanpoolers can register via the www.utacommuter.com website to see whether an existing vanpool group meets their needs, or whether they should start a new vanpool. UTA provides a van, maintenance, insurance, back-up vehicles and support, fuel, and up to 50 personal miles of travel on the van. The vanpool participants pay a fare based on the average monthly commute miles on the van, divided by the number of vanpoolers.

Wayfinding

Wayfinding signage is currently in place around all UTA TRAX and FrontRunner stations. However, in some locations the stations are not immediately visible in the urban fabric, and additional wayfinding signage to stations would be valuable. UTA is currently conducting a "branding refresh" of its existing sign designs, focusing on the style and appearance of the signs (for instance, consistency in formatting and color scheme). UTA has no immediate plans to address signage and wayfinding beyond this; recommendations for additional wayfinding improvements are provided in Section 6.

STRATEGIES USED BY PEER AGENCIES

To support the information on best practices, several peer agencies were interviewed to obtain tangible and realistic examples of their experience with various first/last mile strategies. Potential peers were identified by considering the following criteria:

- **City Population and Population Density.** Because total population and population density correlate closely to transit demand, peer cities were favored that have population and population densities that are similar to Salt Lake City.
- **Transit Services.** Peers offering a similar suite of transit services (e.g. bus, BRT, light rail, commuter rail) were favored.
- **First/Last Mile Strategies Offered.** To ensure peers could offer a breadth of experience, peers with experience implementing a range of first/last mile strategies (e.g. bicycle sharing, bicycle parking, transfer agreements, car sharing, shuttles, park-and-rides, marketing) were favored.
- **Station Typologies.** Transit systems with mostly urban type stations could be amenable to different types of first/last mile strategies than those with more suburban, lower-density type stations. Peers were targeted to get a range of station typologies.
- **Weather and Climate.** Due to the effect of the weather on people's travel choices, peer agencies operating in similar climates were chosen.
- **Existence of Major Universities.** Communities with major universities tend to rely less on private automobiles and more on modes like transit, bicycling, and walking and therefore could respond differently to certain first/last mile strategies.
- **Parking Constraints and Paid Parking.** General information on local parking regulations and availability did not filter out any peers, but rather provided some background and context on the local transportation environment and the mode choices people make.

Five agencies provided information on their use of and experience with first/last mile strategies: Chicago Transit Authority (CTA), Regional Transportation District (RTD) in Denver, Washington Metropolitan Area Transit Authority (WMATA) in Washington D.C., TriMet in Portland, and Capital Metro in Austin. Each agency was asked about the strategies they use, how they plan and prioritize among them, any specific challenges and opportunities they have discovered, marketing and information used to support them, funding sources used, and lastly, if and how they monitor and evaluate the services. The sections below describe what was learned from these peers and the interview questionnaire is provided in Appendix D.

Strategies Used

Each agency provided background information on the scope of strategies they had implemented. Figure 3-3 provides a summary of the strategies reported by the peer agencies (it may not be fully inclusive of the strategies they currently use or have used in the past). A few things stand out—every peer invests in bicycle and pedestrian strategies to address first and last mile gaps. They also consistently invest in car sharing, preferential parking for carpools and vanpools, and shuttle or circulator services. It should be noted that some agencies have been successful at seeking operational funding for these types of services from private partners.

Planners at CTA in Chicago indicated their focus is to provide connections at transit stations with restructured local bus service and privately-funded routes. CTA also has made significant efforts to encourage biking to rail stations by providing bicycle parking both inside and outside fare gates. Capital Metro emphasized the use of peak-time shuttles as its main first/last mile strategy, but works with the City of Austin, private developers, employers, and others to promote multimodal access to its stations. RTD in Denver reports a "family of services" approach to the first/last mile challenges. They have assessed four specific corridors for opportunities and are in the process of implementing several corridor-specific strategies, such as call-and-ride/demand-response transit, car sharing, improved walking conditions, and kiss-and-ride drop-off locations. Both TriMet and WMATA take a multimodal approach to the first/last mile problem with an emphasis on pedestrian and bicycle access.

Figure 3-3 Summary of First/Last Mile Strategies Reported by Peer Agencies and UTA

FIRST | LAST MILE STRATEGIES USED	CTA (Chicago)	RTD (Denver)	WMATA (DC)	TriMet (Portland)	Capital Metro (Austin)	UTA
Bike Share	●	●	●	●	●	●
Bike and Ride Facilities	●	●	●	●	●	●
Bike Parking	●	●	●	●	●	●
Bike-on-Transit Accommodations	●	●	●	●	●	●
Pedestrian Access Improvements	●	●	●	●	●	●
Bicycle Access Improvements	●	●	●	●	●	●
Car Share	●	●	●	●	●	●
Park and Ride	●	●	●	●	●	●
Shuttles *(private or partner funded/operated)*	●	●	●		●	●
Connector/ Circulator Routes *(agency funded or operated)*	●	●			●	●
Restructured Public Transit Routes	●		●	●	●	●
Real-time Arrival Information *(apps and/or displays)*	●		●	●	●	●
Call and Ride *(demand response)*		●				
Preferential Parking for Carpools and Vanpools				●		
Kiss and Ride		●	●			●
Transfer Agreements			●			
Special Marketing/ Branding			●		●	●

Planning and Prioritization

> **"[Bicycling and walking] excel at short trips and connections to transit."**
>
> *~Jeff Owen, TriMet*

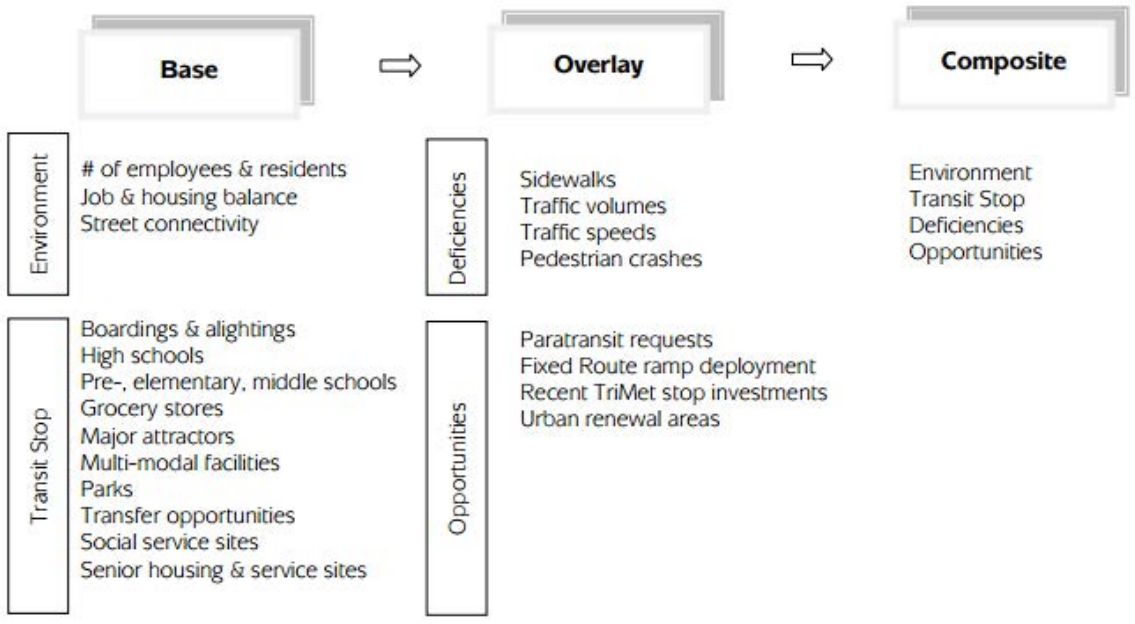
Unlike UTA's approach, many agencies have not developed a system plan for first/last mile strategies, but rather have addressed these needs as part of their existing and ongoing service planning and bike/pedestrian programs.

RTD has used a corridor-based approach rather than looking just at stations. RTD found that suburban stations require the most attention, so prioritizes investment in those locations where new or enhanced transit service is planned. In 2013, they conducted a study of access options at six park-and-rides along the U.S. 36 corridor,[1] which will begin BRT service in 2016.[2]

TriMet has planned explicitly for pedestrian access through its system-wide assessment of the pedestrian network at more than 6,500 transit stops.[3] Their data-driven, GIS-based approach highlighted ten focus areas to target pedestrian investments and helped identify potential project partners. The analysis prioritized the areas that had both the highest needs (e.g. safety issues) and the greatest opportunities (e.g. near new developments). This analysis has helped them pursue partnerships and funding opportunities by providing data-driven justification for investment priorities.

Implementation of bicycle parking on CTA-owned property was prioritized based on two criteria: 1) predicted usage and 2) space available. While no formal prioritization analysis was completed, staff reported using simple metrics such as the prominence of bicycles parked to railings to indicate demand for improved bike parking. Stations that had space available inside the fare gates were also prioritized, given patrons' preference for this added level of security. CTA contracts with six different partners who provide operational funding for routes that improve connections to their businesses (detailed further in the Funding Operations and Maintenance section, below). In general, CTA did not prioritize these routes proactively, but rather were approached by the funding partners individually as part of solving a local transit service need.

Figure 3-4 TriMet Pedestrian Network Analysis Methodology



The methodology consisted of two layers of analysis, combined into a single composite score.

1 http://36commutingsolutions.org/us36/wp-content/uploads/US36FFM_Final.pdf
2 http://www.rtd-fastracks.com/us36_1
3 TriMet. Pedestrian Network Analysis Project. Information shared with Nelson\Nygaard by Jeff Owens, Active Transportation Planner at TriMet. Reports available on the web: http://trimet.org/projects/pedestrian-network.htm

Finally, Capital Metro highlighted that despite the agency's desire to plan for and prioritize transit-oriented development and multimodal transportation, they have had to resort to increasing parking capacity at some of their most suburban rail stations. The local station context, which has been influenced by historical development decisions out of their control, dictates that autos have priority to the agency's long-term vision in that context.

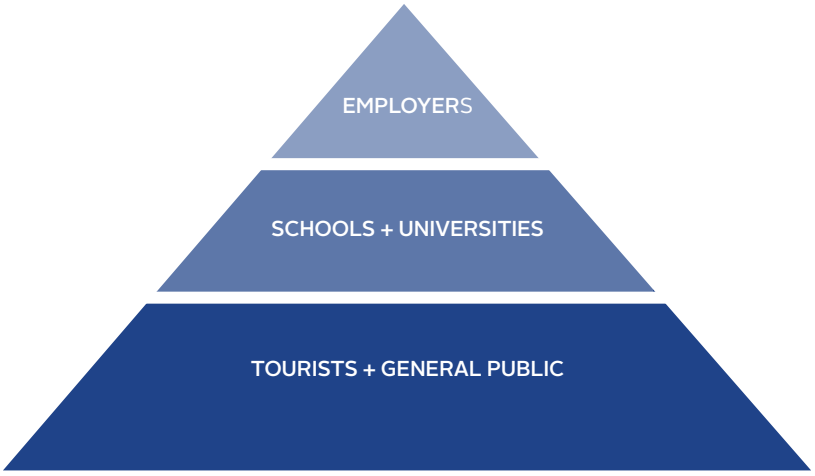
Marketing and Information

Most agencies framed their approach to marketing and information campaigns as parallel to or in coordination with their existing communications processes. In the case of contracted services, private partners who contribute funding are naturally motivated to market them to employees and visitors. CTA's General Manager of Customer Information gave the most detailed insight on their experience with different target audiences: employers, universities, and tourists or the general public.

They have learned that employers are the easiest to market to, given that employers have access to the target audience (employees/commuters). CTA has been effective at marketing new services through employers' payroll and new employee information packets, as well as by providing materials within employee break rooms.

Universities, their staff, and students are the next most challenging audience to reach; the intended audience is slightly more diffuse as students live both on and off campus and can be harder to reach with their irregular schedules. For this audience, CTA's marketing approach is to provide flyers, posters and other information at rail stations, local libraries, and institutions; announce new services to the staff of elected officials; work with local organizations to get information in their newsletters; provide materials in university orientation packets; and place ads in university newspapers.

Figure 3-5 Hierarchy of Target Audiences



Planners at CTA have found that sending information through the school is the most "sure-fire way" to get information to students, whether they be in grade school or in college. For Chicago Public Schools, CTA has worked with the school department to insert transit information handouts into report card envelopes. In addition, students aged 12 through 20 attending a Chicago area public, parochial, or private elementary or high school on a full time basis are eligible for a Student Riding Permit (giving them access to a reduced fare). For students at colleges, CTA has a U-Pass program in which participating colleges provide pre-loaded transit passes (Ventra cards) to students. The U-Pass and Student Riding Permit allow CTA to track transit use by students; student-focused marketing at stations is often done by targeting stations with the highest student ridership. These registrations also give CTA access to students' email addresses, which they occasionally use for email marketing purposes, but generally prefer to go through schools to reach students directly whenever possible.

According to CTA, the most difficult audience to reach is the tourist market or general public. For tourists, they have found it effective to target hotel concierges, who are often the "gatekeepers" of local transportation information for visitors. Like other agencies, they also have implemented wayfinding signage with maps of destinations within a ½-mile of rail stations to make transit more visible and travel easier for the general public.

Funding Operations and Maintenance

Operations and maintenance (O&M) expenses for first/last mile strategies vary widely depending on the type and scope of strategy implemented. Upfront capital costs, the ongoing O&M expenses, and the availability of funding to cover them must be taken into account when selecting and prioritizing appropriate strategies. Appendix E provides a summary of estimated capital and O&M costs for several first/last mile strategies. Agencies often estimate ongoing O&M costs on an investment lifecycle basis—that certain infrastructure will be replaced every five to seven years, for example—rather than in annual dollar costs. O&M estimates, therefore, usually annualize the up-front capital costs over the expected lifespan of the investment.

Peer agencies provided information on the funding sources used, maintenance practices, and marketing activities. Figure 3-6 summarizes some of the funding sources used by peer agencies for the implementation of first/last mile strategies. This list is not comprehensive, but demonstrates the breadth of funding sources relied upon for first/last mile investments.

Figure 3-6 Sample FMLM Funding Sources

AGENCY	FUNDING SOURCES USED
Capital Metro	Capital Metro operating budget
CTA	Private partners for contracted service, Job Access and Reverse Commute (JARC) program
RTD	Sales tax, fares, some grants
TriMet	Transportation Growth Management (TGM) grants, State Transportation Improvement Program (STIP) Enhance, MTIP Regional Economic Opportunity Fund, Metropolitan Transportation Improvement Program (MTIP) Regional Flexible Funds Allocation (Oregon-only sources)
WMATA	TIGER, FTA 5307, operating budget,* contributions from local jurisdictions‡

* *WMATA relied on its operating budget to install bike racks and installation.*

‡ *WMATA is a "regional compact agency" created by the District of Columbia, the State of Maryland, and the Commonwealth of Virginia. Each of the compact members contributes financially to its services.*

Shuttles and Special Transit Service

In Chicago, six special transit connections have been funded through partnerships with large employers or tourist centers (out of a total of 128 bus routes). These partners include the Avon distribution facility in Morton Grove, the UPS facility in Hodgkins, the Museum of Science and Industry, the University of Chicago, Metra (commuter rail), and the William Wrigley Jr. Company. The partners pay the full amount of the operating cost minus the fare revenue collected. CTA has written agreements with the partners that specify each party's financial commitments. CTA has also relied on Job Access Reverse Commute (JARC) funding for last mile connections to schools and employment centers, typically implemented by extending the service span or distances to existing routes.

Non-Motorized Connections

When purchasing bike racks for its rail stations, CTA piggybacked on an existing City of Chicago effort to install new bike racks throughout the city. By coordinating their purchasing, both parties were able to save money on their bulk orders. This kind of small-but-impactful approach was echoed by TriMet, who has adopted a philosophy of "take care, make small improvements" as part of its bike project maintenance program. TriMet has a small general fund budget line for "Bikes to Transit," which is used for things like minor repairs to lockers, new locker numbers, new locks, small purchases of bike racks, and new or replacement signage. TriMet has had success in partnering with individual cities and counties within its service area (Portland, Gresham, Tigard, Washington County) and the Oregon Department of Transportation to jointly apply for several grants for first/last mile efforts.

Other Potential Funding Sources

Other funding sources that could be available for first/last mile investments include:

- **Federal sources.** The Surface Transportation Program (STP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), and National Highway System (NHS) are flexible funding sources available for several transit, parking, bicycle, and pedestrian projects that address first/last mile gaps.[4]
- **Safe Routes to School (SR2S) Grant Funding Program.** This national grant program funds projects that increase the number and safety of children reaching school by walking and biking. It funds capital projects such as sidewalk improvements, traffic calming and pedestrian/bicycle crossing improvements, on-street bicycle facilities, off-street bicycle/pedestrian facilities, and traffic diversion improvements.
- **Private advertising in public right of way and bike share sponsorships.** Both UTA and GREENbike allow private advertisers and sponsors to display ads for a fee. Advertising revenues collected by UTA have historically made up a very small percentage of all revenues (approximately $1.5 to $2.5 million annually),[5] but are flexible dollars. Bike share station sponsorships each cover approximately one year of bike share operations per station.
- **Parking fees.** Parking fees are a parking management tool used to encourage carpooling, transit use, and other non-drive alone transportation.
- **Transportation sales taxes** *(pending local community actions on tax increases).*[6] Salt Lake City currently levies a 0.25% sales tax for transportation. Revenues collected through the sales tax are primarily intended for transit investments. As of the 2015 Legislative session, local municipalities will soon have the opportunity to vote on local sales tax options to fund transportation improvements.
- **Business Improvement District (BID) or a Property-Based Improvement District.** BIDs provide a means for businesses to assess themselves to improve the surrounding area (e.g. the Downtown Salt Lake City Alliance). A property-based improvement district (PBID) collects money from property owners rather than business owners. Once established, the District could advance public/private funding for any of the strategies provided they benefit residents or visitors within the District boundaries.
- **Transportation maintenance fees (TMF).** A TMF, also known as a transportation utility fee, street maintenance fee, or street utility fee, is a monthly fee that is collected from residential and commercial properties within the city limits based on use of the transportation infrastructure. TMFs provide a stable source of revenue that can be used to maintain city streets, sidewalks, pedestrian crossings, bike lanes, multi-use paths, and medians. Several cities in Oregon and Colorado use this fee.[7]
- **Local and regional transportation agencies such as UDOT and UTA** may also choose to use their transportation funds to implement first/last mile solutions.

Monitoring and Evaluation

Some first/last mile strategies—particularly those that are operational in nature—are implemented on a pilot basis with intentions to track usage and effects on ridership. Even when new services or infrastructure are implemented permanently, follow-up studies can inform future efforts and ensure efficiency. In some cases, evaluation studies are actually required by funding sources to ensure compliance with grant goals (JARC, for example).

Common evaluation methods among peers include patron surveys, walking audits, observations, and monitoring ridership and performance data. Several agencies also discussed their ongoing monitoring of the effects of new first/last mile strategies on existing transit performance. For example, WMATA conducts an annual "bike census" to track trends in access mode share and bike parking usage. They have set access mode share goals (to triple bike

4 Federal Transit Administration. "FTA – Flexible Funds." Web: http://www.fta.dot.gov/grants/12867.html.
5 Utah Transit Authority. 2014 Budget Document. Web: http://www.rideuta.com/uploads/2014BudgetDocument.pdf.
6 Davidson, Lee. "Utah cities seek sales tax increase to improve local roads." November 19, 2014. Web: http://www.sltrib.com/news/1846574-155/transportation-taxes-tax-local-sales-cities.
7 See the City of Oregon City (http://www.orcity.org/publicworks/transporation-utility-fee) and City of Boulder (https://bouldercolorado.gov/transportation/transportation-maintenance-fee-faq). Boulder has conducted a peer review of financing tools that catalogues many funding opportunities (https://bouldercolorado.gov/pages/transportation-finance-peer-city-review).

mode share by 2020 and quadruple by 2030) through the agency's master planning process.[8] They also informally monitor the College Park secure bike parking facility (the station is adjacent to the University of Maryland) and trends in car share usage through their partnership with Zipcar. They know that Zipcars at Metro stations are used about 30 to 40% on weekdays during a typical week; demand "skyrockets" on weekends. Staff is in the process of developing a survey to more formally track usage and reception of new bike-and-ride facilities, such as the one at College Park.

TriMet provides bike-on-board facilities on its light rail vehicles, in addition to front-mounted racks on its buses. To gauge the need for additional strategies, such as bike share and secure bike parking, TriMet has conducted onboard capacity tests of its racks. They found onboard capacity for bike storage to be extremely limited and are looking forward to implementing a bike share program (anticipated in 2015) as a way to mitigate some of that demand.

Through a study of transfers between its rail service and connector routes, Capital Metro learned there was a low level of transferring and was able to eliminate unnecessary service. This opened up funding for other, more productive connector routes.

CTA's overall approach to evaluating first/last mile solutions is a network-based approach. Through regular service planning, they look for unproductive areas to refocus resources in growing areas. They have also used JARC funding to plan and evaluate new service to growing employment and educational centers. In one such evaluation, they found that 63% of trips on the new service were for access to school or work sites.

RTD has planned formal evaluations for each of its corridor-based initiatives over the next few years. In 2008, they conducted a study of the performance of existing shuttle and circulator services.[9] They found:

- Strong correlations between performance and population density as well as between performance and the prevalence of zero-vehicle households; all routes with more than 10 boardings per hour were correlated with a population density of over 10 people per acre
- Fare had no apparent effect on ridership; the most successful routes actually charged more for service
- The performance of routes serving many activity centers (schools, hospitals, or employment centers) depends on the population density around them; serving many big destinations alone is not a recipe for success
- "The data shows that successful shuttles are built on strong local trip-making first, with regional connections playing a support role in overall success." Therefore, first-mile routes needs to be convenient.

Implementation Challenges and Opportunities

An overarching goal of this peer review is to provide UTA, UDOT, and local governments with an understanding of other agencies' first/last mile implementation process so that they can adapt their efforts to best address challenges and leverage opportunities. Agencies were asked about implementation lead time, challenges encountered and beneficial partnerships.

One of the biggest challenges to addressing first mile/ last mile gaps is finding willing and able partners.

Challenges

One of the biggest challenges to addressing first/last mile gaps is finding willing and able partners and funders. Transit agencies often do not control the right-of-way leading up to their stations and therefore must partner with cities to plan and implement access improvements.

8 For context, they currently observe about 1% of access trips on bike and 30% on foot. Between 2007 and 2012, the bike mode share increased from 0.7% to 1%, representing approximately 1,500 to 2,500 individual bike trips per day.
9 http://www.rtd-denver.com/PDF_Files/ServiceD/PerfReport_Shuttle_Circulator_Report_2008.pdf

WMATA has been challenged in managing high demand from private shuttles to access kiss-and-ride facilities at its rail stations. Existing private shuttles serve people accessing large employers, federal facilities, and residential developments—areas of high density that have prioritized first/last mile strategies. The private shuttles operate on their own, without a contract with WMATA. However, WMATA actively studies the effects of those shuttles on ridership and tries to determine how to prioritize the many demands for access to station drop-off and pickup sites.

Though often not an explicit first/last mile strategy, the restructuring of existing bus routes to provide improved transit connections can be a significant implementation challenge. Restructuring service requires garnering the support of the public and elected officials. RTD reports that this has been, by far, their biggest challenge to addressing first/last mile gaps along their focus corridors. In some cases, they have had to reinstate longer-distance express service (instead of a local connecting service) due to customer protests. To prepare for making route restructuring proposals to the public, RTD emphasizes the need to demonstrate how logical analysis led to the proposal, to acknowledge how the public's suggested options had been incorporated into the plan, and that flexibility in the plan will be maintained throughout the implementation process.

Agencies also must cope with the reality that some new solutions will fail. Capital Metro provided an example of one such situation. They had implemented several "connector routes"—peak period bus service emanating from its rail stations. There are three connector services currently in operation, however Capital Metro's three Downtown Connectors , operating in a very walkable environment, generated low ridership and had to be eliminated. However, the agency was able to turn this challenge into an opportunity. Capital Metro worked with Car2Go (a car sharing company) and the City of Austin to convert the no-longer used rail connector bus zone into Car2Go-designated parking spaces (see Figure 3-7).

The outcome of Capital Metro's Downtown Connectors reinforces the point made by RTD that first/last mile strategies are most needed outside of urban environments where walking, biking, taxis, and bus options already address much of the first/last mile gap. As TriMet has observed through partnerships with Intel and Nike (large employers in Beaverton, Oregon), suburban first/last mile strategies can also emphasize non-motorized transportation. Both campuses are piloting corporate bike share programs to link employees to nearby MAX light rail stations.

Figure 3-7 Downtown MetroRail Station Adjacent Car2Go Parking Spaces

Downtown MetroRail station, 501 E. 4th Street, Austin, TX
Image from Google Streetview

Lastly, many agencies are interested in fare payment media that is itself multimodal—one card or smartphone app that is accepted as payment on transit, car share, bike share, parking, or other mobility options. The main challenge with these programs is the high level of coordination and lead time required to implement; a long lead time can render chosen technologies obsolete or outdated by the time of implementation. Examples of this challenge are highlighted below:

- Capital Metro looked for a solution that would allow parking pay stations to dispense both parking proof-of-payment and transit tickets. With the technology available at the time (magnetic strip fare cards), they found it was not possible.
- In Chicago, the "Chicago Card Plus" could be linked to local car share provider i-Go, but the agency's recent transition to the Ventra card rendered that link obsolete. This option was curtailed partly due to the small percentage of customers who chose to link their transit and car share accounts. CTA has scheduled the launch of a smartphone app in January 2015 that will allow customers to pay for rides on its system as well as on vehicles in the Metra and PACE networks. Capital Metro has a similar app already in place.
- WMATA has begun an 18-month pilot of its New Electronics Payment Program, which will allow passengers to pay using a smart card, government I.D. cards, contactless credit cards, and smartphones. One of the program's primary objectives is to maintain seamless regional transfers between existing transit services. WMATA has partnered with more than a dozen agencies to implement this program. The pilot will encom-

pass Metro rail, bus, and parking, though the agency is in conversation with regional bike share and car share companies about integrating with their systems as well. It is several years from implementation.

Opportunities

Partnerships present a great opportunity to help fund strategies: in many cases, agencies have co-funded improvements with their public and private partnerships. For example, CTA in Chicago has worked closely with private partners such as UPS, Avon Products, and the Museum of Science and Industry to implement bus service that meets the needs of their employees and visitors.[10] In the case of UPS, bus service is timed to match employee shift changes. In exchange for this service, these private partners fund the operations expenses through contracted agreements with CTA.

In addition to public/private partnerships, transit agencies have also partnered with non-profit organizations and city departments. CTA partnered with Transit Alliance, a local advocacy organization, to enhance their outreach efforts when they began allowing bicycles on board their rail vehicles. TriMet partnered with the City of Portland to implement four rectangular rapid flash beacons near its stations and stops; but, while TriMet has completed a comprehensive pedestrian network analysis around its stations, staff are still working to find funding for projects around the region that were identified through that study.

Lastly, an opportunity highlighted by Capital Metro involves another connector—the Kramer/Domain route. The Kramer/Domain Connector links the Kramer MetroRail station to The Domain (a large mixed-use development), a University of Texas (UT) satellite campus, Austin Community College, and a few large tech employers in the area. Capital Metro had been in discussions with the Domain developers for several years, some of which were supportive of rail but had reservations about bus transit operating on its streets. Knowing they were aiming to implement BRT with stops in the area, Capital Metro treated negotiations for the Kramer/Domain connector route as a "foot in the door" for an eventually larger discussion of BRT. Today, Capital Metro's second BRT line connects downtown Austin, through the UT satellite campus, and ends on one of The Domain's internal streets. Planning staff at Capital Metro partially credit the success of the connector negotiations (that also runs on internal streets) for the ability to implement BRT in the area.

Summary of Peer Review

Partnerships are both a challenge and an opportunity. As emphasized by nearly all peers, partnerships are key to the ability of agencies to implement FMLM strategies and to the eventual success of services. Partnerships can be difficult to forge, but when solidified, can help agencies improve access and fund operations.

Rethink existing services. First/last mile strategies are not just about adding new services, but about rethinking the effectiveness of existing ones. However, one of the biggest challenges found in Denver is the reaction and push back from existing riders to proposed restructured services.

Importance of non-motorized connections. "Bike and walk is of course huge for last mile," says Jeff Owen of TriMet. These strategies are cost-effective and apply particularly well for connecting transit riders to destinations within ½ to 3 miles of stations. With increased bicycle access mode share, so too has the demand for bringing bicycles on board. Therefore, solutions to encourage people to leave their bicycles behind—such as bike share and more secure parking options—become the next priority. UTA could preempt this tension by focusing resources on these strategies—bike stations, bike share at rail stations, lockers, and racks within paid areas—from the beginning.

Start with peak service; expand as needed. When implementing new connector routes or shuttles, in most cases it is best to start with peak period service only. Productivity can be monitored and increased to mid-day, evening, or weekend service as necessary.

Messaging and framing. Communications about first/last mile strategies are important both to city partners and to the general public. When communicating about potential strategies to staff within the agency, biking and

10 CTA Routes 10 (Museum of Science & Industry), 169 (UPS Express), and X98 (Avon Express)

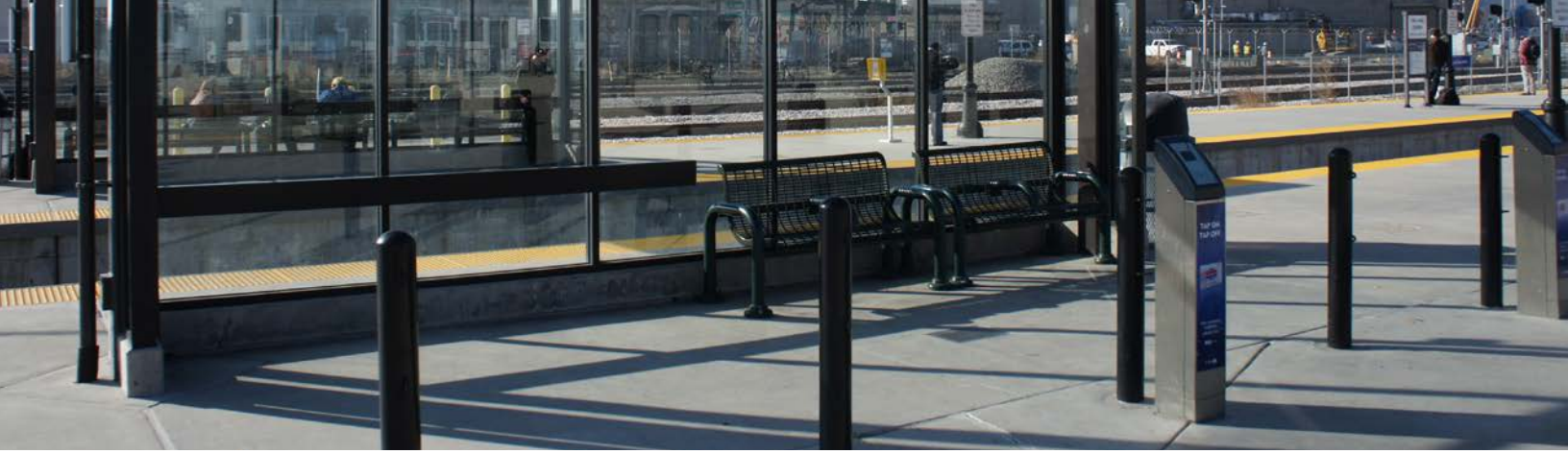
walking should be positioned as complements to transit—they support increased ridership and other agency goals.

Public input – early and often. To be successful, agencies must "develop a solid plan and offer it for review and comment to one and all" (RTD). Stakeholders and partners need to be engaged early and often—especially when rethinking existing services. People do not want to give up a one-seat ride on an express service, but that service may not be cost-effective for the agency. As with all planning projects, involvement with the community is imperative.

Plans need funding strategies. One example: TriMet's comprehensive pedestrian planning effort thoroughly studied pedestrian access to stations and developed specific projects to improve access. However, they are still working to find funding for the projects they identified around the region. Partnerships can be a critical part of bridging that funding gap.

> **"Keep at it. Remember connectivity. Cater to the 'interested-but-concerned,' who would like to walk or bike but are uncomfortable doing so."**
>
> ~Kristin Haldeman, WMATA

First/last mile strategies should be part of business-as-usual. Many agencies do not think about "first- and last-mile" explicitly. In the case of larger agencies with highly networked services, these types of connections are planned through regular service planning processes. Agencies that serve more suburban-type stations appear to be more likely to address first/last mile gaps explicitly.



4 ANALYSIS

The UTA Board of Trustees has established a goal of doubling UTA's system ridership between 2014 and 2020. Establishing effective first/last mile connections to the transit network is one way to add ridership, through increased network accessibility and a broader range of solutions. A major component of this study is to identify which first/last mile strategies have the greatest possibility for adding ridership, and prioritize implementation of strategies. In order to conduct this analysis, TRAX and FrontRunner stations were grouped into station typologies to more efficiently evaluate ridership potential and recommend solutions. The approach for identifying and analyzing is described in this section.

EVALUATION PROCESS

The process for evaluating strategies was:

- Develop a set of typologies that represent the range of TRAX and FrontRunner stations within UTA's service area;
- Determine which stations fit in which typologies;
- Analyze the effectiveness of various first/last mile strategies in adding transit riders, within the framework of the typologies;
- Consider which stations might change significantly in the future based on known plans and models;
- Evaluate strategies based on other, non-ridership factors (such as safety, ease of implementation, and successful application by other transit districts); and
- Prioritize strategies in cooperation with the stakeholder group.

This process is described in more detail in the following sections.

TYPOLOGIES

Several built-environment and ridership-based characteristics were used to identify station typologies. These include connectivity around station areas, the modes of transportation currently used by transit riders to get to and from the stations, the amount of parking available, and demographic information. These parameters were then applied to the characteristics:

- Walk access, or the percent of land within a one-mile radius of a station that could be accessed by walking a distance of one mile on the street or pathway network around the station, where:
  - High = over 50% walk access
  - Medium = 30 -50% walk access
  - Low = less than 30% walk access;
- Active transportation mode split, or the percent of people accessing each station by walking or biking, where:
  - High = over 75% of riders accessing the station by walking or biking
  - Medium = 40-75% of riders accessing the station by walking or biking
  - Low = less than 40% of riders accessing the station by walking or biking
- Non-auto access mode split, or the percent of people accessing each station by walking, biking or taking transit (in other words, any transportation mode other than driving), where:
  - High = over 75% of riders accessing the station by walking, biking or transit
  - Medium = 40-75% of riders accessing the station by walking, biking or transit
  - Low = less than 40% of riders accessing the station by walking, biking or transit;
- Availability of parking supply, where:
  - High = over 200 spaces at station
  - Low = 1 -200 spaces at station
  - None = no spaces at station

Population and employment counts around station areas were also considered in defining typologies, as was the balance of employment to population (especially in suburban areas). Using these factors, TRAX and FrontRunner stations were organized into one of six station typologies. These are shown in the table on the following page.

Figure 4-1 Station Typologies and Characteristics

TYPOLOGY	CHARACTERISTICS	STATIONS	
URBAN 	Walk Access: High Active Mode Split: High Non-Auto Mode Split: High Parking Spaces: None Population: High Employment: High	Planetarium Arena Temple Square City Center Gallivan Plaza Courthouse	900 South Library Trolley 900 East
MULTIMODAL 	Walk Access: Medium-High Active Mode Split: Medium-High Non-Auto Mode Split: High Parking Spaces: Low Population: Medium Employment: Medium	1940 W North Temple Power Fairpark Jackson/Euclid North Temple Bridge/Guadalupe North Temple Redwood Junction	West Valley Central Salt Lake Central Old Greektown Ball Park Central Pointe Millcreek Sandy Expo
INSTITUTIONAL 	This typology is determined by the location, which is a single land use/ user. University and the Airport stations were included in this typology.	Orem Stadium University South Campus Fort Douglas University Medical Center	
SUBURBAN 	Walk Access: Low-High Active Mode Split: Low-Medium Non-Auto Mode Split: Low-High Parking Spaces: Low-High Employment < Population (within suburban typology)	Midvale Fort Union Midvale Center Historic Sandy Crescent View Kimballs Lane Draper Town Center	Bingham Junction Historic Gardner West Jordan City Center Jordan Valley 4800 W Old Bingham Hwy Provo
SUBURBAN NON-RESIDENTIAL 	Walk Access: Low-High Active Mode Split: Low-High Non-Auto Mode Split: Medium-High Parking Spaces: Low-High Employment > Population (within suburban typology)	Ogden Lehi Meadowbrook Murray North Murray Central Fashion Place West	Sandy Civic Center River Trail Decker Lake Draper
AUTO-DEPENDENT 	Walk Access: Low-Medium Active Mode Split: Low |Non-Auto Mode Split: Low Parking Spaces: High (>200)	Pleasant View Roy Clearfield Layton Farmington Woods Cross South Jordan American Fork	2700 W Sugar Factory Road 5600 W Old Bingham Hwy South Jordan Parkway Daybreak Parkway

The figures below show how the different typologies are distributed throughout UTA's service area. It is interesting to note that stations with shared typologies tended to cluster along shared TRAX or FrontRunner lines, even though geographic location was not one of the parameters used to define typologies.

Figure 4-2 TRAX Station Typologies

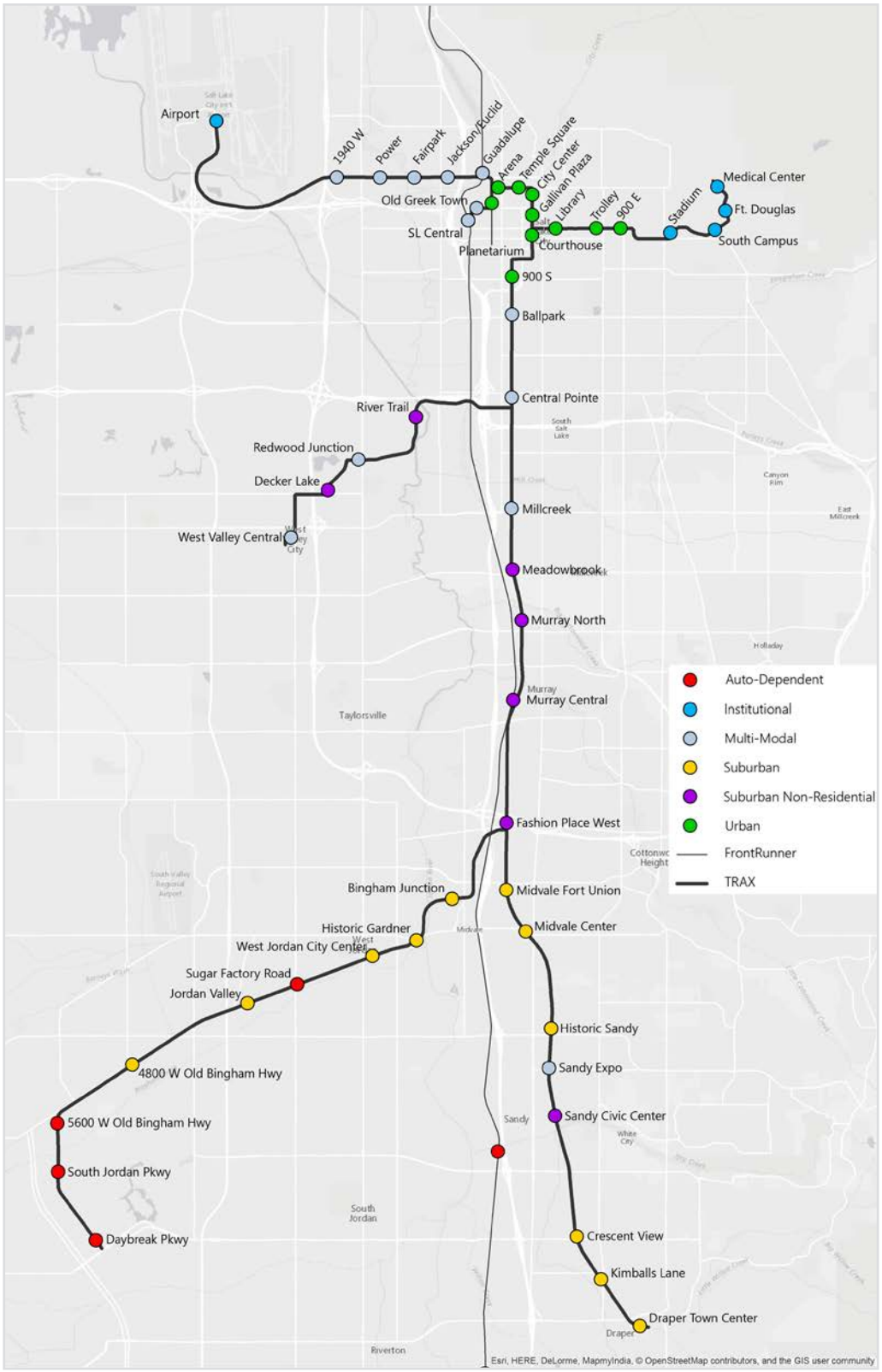
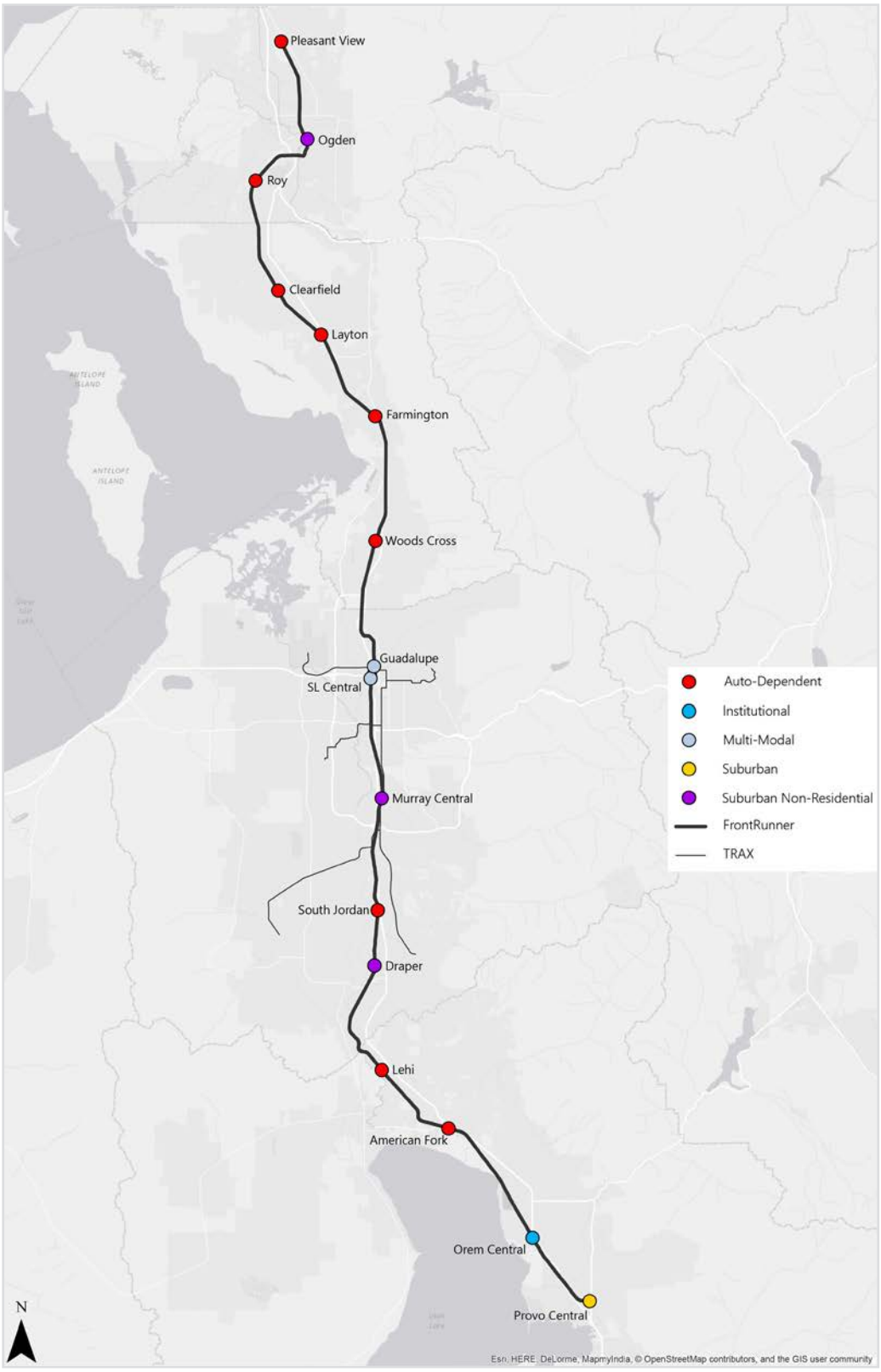


Figure 4-3 FrontRunner Station Typologies



RIDERSHIP REGRESSION ANALYSIS

The critical question of this First/Last Mile Strategies Study is: which strategies have the greatest potential to add ridership to the system? In order to answer this question, the team conducted a regression analysis to examine the impacts of first/last mile strategies and several socio-economic variables on ridership and active transportation mode split at TRAX and FrontRunner stations. This section provides information on:

- The methodology applied to the regression analysis;
- Results of the regression analysis; and
- Implications for future station area improvements.

The Regression Analysis Technical Memorandum can be found in Appendix F.

Methodology

Multi-regression analyses examine the correlation between a dependent variable and a series of independent variables. For the ridership regression analysis, total ridership at each station was considered the dependent variable whereas factors such as population, employment, and the presence of first/last mile strategies were independent variables. The results show how significant the impact of the independent variables is on the dependent variable, and whether strategies such as first/last mile solutions have a positive or negative effect on ridership and active transportation mode split. Variables that are significantly positively correlated with ridership include automobile ownership, employment, and wayfinding signage to nearby destinations. Such factors as the availability of signed bike routes near stations and the percentage of workers earning $1250 per month or less were found significantly positively correlated with active transportation modes.

Two regression analyses were conducted to examine the correlation between certain independent variables and dependent variables associated with TRAX and FrontRunner stations, respectively. In each analysis, three multi-regression tests were conducted to examine the impact of a series of socio-economic and physical variables on ridership, total mode split for active transportation, access mode split for active transportation, as well as egress mode split for active transportation.

Summary of Results

The regression analysis showed modest potential gains in ridership, which are outlined below.

- **Resources should be focused on stations located near major employment centers as these stations tend to have higher ridership.** Furthermore, a higher percentage of transit riders walk, bike, or use other forms of active transportation modes to and from stations with high employment. These findings also suggest that UTA should collaborate with local jurisdictions and site developers to encourage more construction of employment centers near its transit stations.
- **Stations with signed bike routes/lanes generally saw higher ridership and the percentage of transit users using active transportation.** This factor suggests that signed bike routes/lanes installed near station areas could attract more transit riders and encourage people to use active transportation modes to access and leave the station.
- **The presence of continuous sidewalks near the transit station has positive correlation with ridership and total, access, and egress mode splits for active transportation, although the correlation is not significant.** This factor suggests that constructing continuous sidewalks near the transit stations could potentially attract more riders and encourage them to commute to and from the station via active transportation modes. Similarly, whether the transit station is conveniently accessible to pedestrians and cyclists is positively but not significantly correlated with total, access, and egress mode splits for active transportation. This result suggests that making stations more accessible to cyclists and pedestrians could potentially encourage more people to use active transportation.

- The availability of wayfinding signage to nearby destinations for transit users is significantly positively correlated with ridership and total mode split for active transportation. This result suggests that installing wayfinding features near station areas could potentially increase ridership and the percentage of riders using active transportation modes.
- The presence of a GREENbike station near a transit station is significantly negatively correlated with ridership or the total, access, and egress mode splits for active transportation. This situation could be the result of the fact that many TRAX stations with high ridership and mode split for active transportation currently do not have GREENbike stations. In fact, GREENbike stations are only available at eight of the fifty TRAX stations examined in this study. This result thus should not discourage the deployment of GREENbike stations near transit stations. Furthermore, the availability of car share stations near the transit station is not significantly correlated with the dependent variables. However, it is positively correlated with the total, access, and egress mode splits for active transportation modes.
- Although some of the positive correlations between the dependent and certain independent variables might not be significant, improvement or installment of these features may still have positive impact to ridership and mode split for active transportation.
- This information was integrated with other decision-making criteria, outlined in this section, and used to prioritize strategies for implementation at each UTA station typology.

FUTURE STATIONS

While the regression analysis and other elements of this study were focused on current station conditions, it is important to acknowledge that station characteristics will change in the future, especially at stations in the less-developed areas of the Wasatch Front. Network connectivity around these locations will likely improve, population and employment density will increase, and opportunities will arise to integrate first/last mile solutions into transit oriented development plans. Stations in the "Auto Dependent" or "Suburban" typologies are the most prone to change, and could switch from their initial typology to another typology as development around these stations becomes more pronounced. As stations shift on the spectrum of typologies, the recommended first/last mile strategies change as well. For this reason, it is important to consider which locations become "stations to watch".

In order to predict which stations were most likely to change considerably, the project team evaluated a number of questions:

- Where might new rail transit routes be located, according to regional transportation plans or UTA's Network Study? Are any station areas identified already on these proposed routes?
- Which existing stations show a high level of population or employment growth between now and 2040 in the regional travel demand model?
- Which stations are being actively studied as part of a station area planning process or transit oriented development project? Which stations might not be actively studied now but might be next on the list for transit oriented development?

These questions informed the project team in considering which stations might change typologies in the future, and require advance coordination of first/last mile strategies in anticipation of that change. Recommendations for "stations to watch" are provided in Section 6.

STRATEGY PRIORITIZATION PROCESS

Criteria Framework

The regression analysis to establish ridership potential was only one of several criteria used to prioritize a short list of first/last mile strategies for UTA implementation. The criteria and parameters were initially applied to all strategies in the First/Last Mile Strategies Toolbox in Section 3. These criteria are outlined below, along with the scoring parameters for scoring individual strategies (the higher the score, the more effective the strategy).

- **Effective in Adding Ridership:** How effective is each strategy in potentially adding riders to the transit system?
  - 3 = Positive and significant correlation between strategy and ridership
  - 2 = Positive but not significant correlation between strategy and ridership
  - 1 = No effect or effect is undefined
  - 0 = Not enough data is available to assess the effect of this strategy on ridership

- **Improve Safety:** Does this strategy improve safety for people accessing the transit system?
  - 3 = Strategy provides separation or physical protection for travelers
  - 2 = Strategy improves traveler visibility or driver awareness
  - 1 = Strategy improves convenience but not necessarily safety

- **Used by Peers:** Has this strategy been used effectively by the peer agencies interviewed by this study?
  - 1 = Yes
  - 0 = No

- **Costliness:** What is the relative cost of implementation for each strategy? The lower the cost, the higher the score.
  - 3 = Less than $10,000
  - 2 = Between $10,000 - $100,000
  - 1 = Greater than $100,000

The project team developed rankings for each of the Toolbox strategies based on these criteria. The First/Last Mile Strategies Study Stakeholder Group was then engaged to complete the prioritization process.

Strategies Prioritization and Refinement Process

As described in Section 2, two meetings with a diverse group of stakeholders were conducted to identify the final list of recommended strategies. Stakeholders included representatives from UTA, UDOT, WFRC, MAG, the University of Utah, SLC GREENbike, Bike Utah, the Utah Department of Health, Davis County Health Department, Enterprise Carshare, and the UTA Board of Trustees. The first meeting, held in September 2014, introduced the toolbox of strategies and identified the relevant aspects of each strategy. The second meeting, held in November 2014, communicated experiences from peer agencies and prioritized strategies. The stakeholder group reviewed the pre-scored criteria completed by the project team (including ridership, safety, peer use, and cost factors) and participated in a group discussion to rank strategies using the criteria below.

- **Stakeholder Support:** How much does this stakeholder group support each strategy?
- 3 = High level of support
- 2 = Medium level of support
- 1 = Little to no support

- **Ease of Implementation:** How complicated is each strategy to implement? Key questions include: Is the strategy physically complicated?; Does the strategy require coordination among multiple partners?; Does the strategy require new administrative or oversight entities?; Does the strategy require ongoing O&M costs?
- 3 = Yes to 1 or fewer questions
- 2 = Yes to 2 questions
- 1 = Yes to 3 or more questions

Strategies were then ranked based on a cumulative score from the six criteria. The final rankings of the prioritized strategies are shown in the table below. Minutes from the stakeholder group meetings are provided in Appendix A.

Figure 4-4 Strategy Prioritization

Candidate Projects	Effective in adding ridership	Improves Safety	Used by peers	Costliness	Stakeholder Support	Ease of Implementation	Score	Overall Ranking
Crosswalk Improvements	2	2	1	3	3	3	14	1
HAWK Beacons/Ped Signals	3	3	1	2	3	2	14	1
Bike Lanes	3	2	1	3	3	2	14	1
On-site Wayfinding/Signage	3	1	1	3	3	3	14	1
Protected Bike Lanes	3	3	1	2	3	1	13	5
Wayfinding to Station	2	1	1	3	3	3	13	5
Sidewalks	2	3	1	1	3	2	12	7
Access Connections	2	3	1	2	3	1	12	7
ADA Access Improvements	1	2	1	3	2	3	12	7
Ped Signage Improvements	2	2	1	3	1	3	12	7
Bike Sharing	2	2	1	1	3	3	12	7
Bus Stop Enhancements	1	2	1	2	3	2	11	12
Car Sharing	2	1	1	2	2	3	11	12
Bike Paths	3	3	1	2	1	1	11	12
Bike Racks	2	1	1	3	1	3	11	12

As indicated in the table, the final list of strategies includes a range of solutions and types, as outlined below:

- Wayfinding and information improvements, such as on-site wayfinding and signage (sign display cases, station orientation maps, or real-time/electronic monitors); wayfinding to stations (directional signs, Braille

signage, cases for maps and schedules at bus stops, or informational apps) or pedestrian/bicycle specific signage leading to and from stations;

- Bike network improvements, such as bike lanes, cycle tracks, bike paths, routes, or other facilities;
- Access connections, such as gates or pathways allowing access from nearby neighborhoods to TRAX and FrontRunner stations;
- Pedestrian network improvements, such as sidewalks and pathways;
- Crossing treatments, including high-visibility crosswalks, pedestrian signals, or ADA accessibility features (audible pedestrian signals, curb ramps, detectable warnings, accessible push buttons, etc), as well as street lighting at crosswalks and underpasses;
- Bike sharing programs;
- Car sharing; and
- Station/stop enhancements, including installation of bus shelters, cases for maps and schedules, trash receptacles, pedestrian-scale lighting, digital message signs, and bike racks or lockers.

These strategies were advanced to the next level of analysis including cost estimation and recommendations by typology.

5 Recommendations

STRATEGIES BY TYPOLOGY

This chapter identifies recommended first/last mile strategies for prioritization in each station typology. Recommendations for prioritization were based on the results of the regression analysis, which identified the strategies which had the highest likelihood of adding more ridership to UTA's transit system. Recommendations also considered the typical characteristics of each typology and the degree to which those characteristics required improvements. For instance, stations within the urban typology are primarily located within the downtown urban area, where street connectivity is significantly better than elsewhere in the regions and all streets have sidewalks on both sides. Therefore, access connections and pedestrian network improvements are not considered "high priority" for implementation because those conditions are already generally good.

Readers should note that although only certain strategies are listed as high priority, this does not mean other strategies are not also important; it only means that agency staff should prioritize items that provide the best "bang for the buck." First/last mile and active transportation improvements frequently receive very limited funding, and it is the intent of this report to help UTA focus on the items representing the highest possible benefit. The logic behind prioritization recommendations is provided in each of the tables on the following pages.

Figure 5-1 Recommended Strategies for Urban Typology

STRATEGIES	HIGH-PRIORITY?	COMMENTS
Wayfinding and Information	**Y**	According to the Transit Station Area Audit Survey, most of the stations in this group have sufficient wayfinding information to the transit facility for transit users. However, there is a lack of wayfinding signage to nearby destinations available for transit users. It is recommended that the wayfinding and information for this typology provide information at the station to destinations and transportation options.
Bicycle Network Improvements	**Y**	Most stations whose bike lane density equals or exceeds the average bike lane density in this typology group saw higher than average ridership. Stations with sufficient and convenient bike parking facilities also saw higher ridership than those without.
Access Connections	N	All stations are easily accessible to pedestrians and bicyclists according to the Transit Station Area Audit Survey. The high accessibility for pedestrians and bicyclists is also reflected by the high (85%) active transportation mode share to and from the stations.
Pedestrian Network Improvements	N	Most of the stations in this typology have continuous and ADA-compliant sidewalks on both sides of the street with sufficient width.
Crossing Treatments	N	All stations in this typology have signalized crosswalks.
Bike Sharing	**Y**	Currently most of the stations in the downtown area have bike share except for Court House. Court House is a major transfer station with high ridership. In addition, it is flanked by hotels, civic buildings, as well as tourist attractions. A bike share station should be added at this station to capitalize on the high volume of potential customers generated by the above-mentioned conditions.
Car Sharing	**Y**	Car share stations should be available near stations where there is a large number of hotels or apartment buildings, such as Court House and Trolley.
Rail/Bus Stop Enhancements	N	Most of the stations have standard TRAX station amenities and sheltered bus stops nearby.
Most stations in this typology group had above or equal group average level of amenities, pedestrian and bicyclist infrastructure, as well as bus transit facilities and connections. In other words, most stations in this group are well-equipped and call for few improvements. Statistics shows that stations within this typology tend to have higher ridership especially when there are sufficient pedestrian infrastructure and connections.		

Figure 5-2 Recommended Strategies for Multimodal Typology

STRATEGIES	HIGH-PRIORITY?	COMMENTS
Wayfinding and Information	**Y**	Wayfinding signage and information is important at these major transfer stations, although stations with wayfinding signage saw lower ridership than those without. Currently some of the stations do not have well-maintained wayfinding signage to the transit facility for pedestrians and bicyclists according to the Transit Station Area Audit Survey. Most of the stations also do not have wayfinding signage to nearby destinations available for transit users.
Bicycle Network Improvements	**Y**	Stations with low bike-lane densities are not located in residential- or business-concentrated areas. Thus, adding bike lanes may not be the most effective way to increase ridership in areas where biking is not popular. However, stations with sufficient and convenient bike parking facilities saw higher ridership than those without.
Access Connections	**Y**	Most of the stations with low ridership do not have defined pathways from the adjacent roadways to the transit facilities.
Pedestrian Network Improvements	**Y**	Stations with this strategy saw lower ridership than those without. However, some stations, including Salt Lake Central, do not have sidewalks on both sides of the streets which could have contributed to the poor access conditions at some of the stations.
Crossing Treatments	**Y**	Some stations, such as Millcreek, do not have marked crossings on streets adjacent to the station.
Bike Sharing	N	Salt Lake Central is already in the bike share network, while most other multimodal stations are outside the existing bike share network. Therefore adding bike share stations to other multimodal transit stations may not be effective in attracting new riders unless the overall network is expanded as well.
Car Sharing	N	Currently Carshare is only available at Salt Lake Central. This station only saw slightly higher than average ridership within this typology.
Rail/Bus Stop Enhancements	**Y**	The transit mode share for this typology group is the second highest among all examined. However, not all bus stops are conveniently located near destinations or have safe pedestrian crossings according to the Transit Station Area Audit Survey.
Stations with better bus connections and facilities, station amenities, and bike infrastructure and connections saw higher ridership. Stations with better pedestrian connections and facilities had lower ridership than those whose pedestrian facility conditions are poorer. This is partially due to the reason that a few stations, including Sandy Expo and Fair Park Stations, had decent pedestrian facilities but relatively low ridership as a result of their location and the surrounding environment. This factor thus should not deter the implementation of pedestrian enhancement measures at some of these stations.		

Figure 5-3 Recommended Strategies for Institutional Typology

STRATEGIES	HIGH-PRIORITY?	COMMENTS
Wayfinding and Information	N	Although there is wayfinding signage around the stations at the University, there could be more wayfinding to and from the stations for visitors. However, it may not have significant impact on ridership.
Bicycle Network Improvements	**Y**	Orem Central Station could be better connected with the rest of the city via bike lanes, especially the residential neighborhoods nearby.
Access Connections	N	Nearly all stations are conveniently accessible to pedestrians. There is, however, room for improvement at Orem Central to provide better access to the station from the Utah Valley University located on the other side of I-15.
Pedestrian Network Improvements	N	Nearly all the stations currently have continuous sidewalks on at least one side of the street.
Crossing Treatments	N	All the stations already have signalized crossings with the exception of Orem Central.
Bike Sharing	**Y**	Currently, none of the stations have bike share program. The University may consider this as an opportunity to better connect student housing and the TRAX stations to attract students to ride the train.
Car Sharing	N	All relevant stations within the institutional typology already have car share available nearby.
Rail/Bus Stop Enhancements	N	Most of the bus stops near stations in this typology have sufficient amenities. Improvements can be made for the bus stops at the Stadium Station as they currently do not have shelters. This intervention, however, may not significantly increase ridership for TRAX.
Four of the six stations in this category are located on the campus of the University of Utah. These stations are generally well connected and are equipped with well-maintained bike and pedestrian facilities. The Airport, although included in this typology group, has unique circumstances that require different treatments. This leaves Orem as the only station with the greatest potential for improvements.		

Figure 5-4 Recommended Strategies for Suburban Non-Residential Typology

STRATEGIES	HIGH-PRIORITY?	COMMENTS
Wayfinding and Information	**Y**	There is a lack of wayfinding signage to nearby destinations and to the transit facilities for transit users at many of these stations.
Bicycle Network Improvements	**Y**	Stations with lower bike lane densities saw higher ridership than those without. However, adding bike lanes may be conducive to encouraging employees working in the surrounding employment centers to bike to and from the stations. In addition, stations with sufficient and convenient bike parking facilities saw higher ridership than those without.
Access Connections	N	Stations in this typology group are conveniently accessible to pedestrians and bicyclists according to the Transit Station Area Audit Survey.
Pedestrian Network Improvements	N	Most of the stations have continuous sidewalks on both sides of the streets immediately adjacent to the station.
Crossing Treatments	N	Most of the stations have signalized crossings to cross the adjacent streets.
Bike Sharing	**Y**	Currently, none of the stations within this typology has bike share program available. Adding bike stations to some of the stations located near major employment centers can potentially increase ridership.
Car Sharing	N	Stations with car share stations did not see higher ridership in this typology group.
Rail/Bus Stop Enhancements	**Y**	Stations of this typology saw the highest mode share for transit among all six typology groups. Stations with better bus connections and facilities also had above-average ridership in this typology. It is thus crucial to improve the conditions at bus stops especially those that are lacking amenities.
Stations with bus connections and facilities saw much higher ridership than those with poorer conditions in this category. Station with amenities such as sufficient wayfinding signage to the transit facility and adequate lighting for pedestrians and bicyclists also experienced higher ridership that those with only the standard station-area amenities.		

Figure 5-5 Recommended Strategies for Suburban Typology

STRATEGIES	HIGH-PRIORITY?	COMMENTS
Wayfinding and Information	**Y**	Currently there is a lack of wayfinding signage to and from many of the stations for pedestrians and bicyclists according to the Transit Station Area Audit Survey although stations with sufficient wayfinding signage saw lower ridership than those without.
Bicycle Network Improvements	**Y**	The average bike-lane density is low around several stations situated near residential neighborhoods, such as Midvale Fort Union and Midvale Center Stations. Bike lanes should be added to these stations to encourage biking as they tend to have higher than average active transportation mode shares and are located near residential neighborhoods. In addition, stations with sufficient bike parking facilities saw higher ridership than those without.
Access Connections	N	Most of the stations are conveniently accessible to pedestrians and bicyclists.
Pedestrian Network Improvements	**Y**	Most of the stations do not have continuous sidewalks on both sides of the street according to the Transit Station Area Audit Survey.
Crossing Treatments	**Y**	Many of the stations do not have marked crosswalks or not immediate crosswalks to cross the major streets adjacent to the stations. Only one of the stations (Provo) have signalized crossing. Stations with marked crossings saw lower ridership than those without.
Bike Sharing	N	Currently none of the stations within this typology has a bike share station. Adding GREENBike to the stations, with bike stations located at convenient locations within suburban neighborhood, could potentially attract more riders to take transit.
Car Sharing	N	TRAX stations may not be the most convenient location for car share to attract customers living in suburban residential neighborhoods.
Rail/Bus Stop Enhancements	N	Most of the rail stations already have standard amenities. Most of the bus stops nearby are also sheltered.

Stations with better bike and pedestrian connections and facilities saw much higher ridership. This factor calls for better and more convenient bicycle and pedestrian facilities to accommodate the needs of people who walk or bike to and from the stations. Transit mode share within this typology group ranked third among the six typology groups analyzed in this study. This condition suggests that the bus stops should be kept in the state-of-good-repair.

Figure 5-6 Recommended Strategies for Auto-Dependent Typology

STRATEGIES	HIGH-PRIORITY?	COMMENTS
Wayfinding and Information	**Y**	Although most transit users accessed and left the station via automobile, the lack of sufficient wayfinding signage for pedestrian and bicyclists to the transit facilities as suggested by the Transit Station Area Audit Survey should be addressed to enhance the visibility of the stations.
Bicycle Network Improvements	**Y**	Due to the auto-dependency of these stations as the result of the surrounding land use, it may not be cost effective to drastically increase the mileage of bike lanes around many of the stations in this category. However, bike lanes should be added to encourage biking at stations adjacent to higher density residential developments such as the Daybreak Parkway and South Jordan Parkway stations.
Access Connections	**Y**	Some of the stations are not conveniently accessible to pedestrians and bicyclists according to the Transit Station Area Audit Survey.
Pedestrian Network Improvements	**Y**	Many of the stations do not have continuous sidewalks on both sides of the streets.
Crossing Treatments	**Y**	Most of the stations are located next to parking lots. Many of these parking lots, however, are isolated by major roadways without proper crossing treatments.
Bike Sharing	N	Most of the stations are not located in bike-accessible locations although bike share stations could be added to stations adjacent to higher density residential development sites such as Daybreak Parkway.
Car Sharing	N	Stations that had car share service saw higher ridership than those that did not. It should be pointed out that high ridership at these stations might have been the result of the large number of commuters rather than the availability of car share.
Rail/Bus Stop Enhancements	N	All of the rail stations have standard amenities. However, most of them were not served by frequent bus services. Some did not have bus service at all. Without regular and frequent bus service, enhancements to the stations may not be effective in attracting new riders.

According to the analysis, stations with better bus transit connections and pedestrian and bicyclist facilities and connections saw higher ridership than those stations with below median scores in this typology. It should be pointed out that due to the location and surrounding land use, stations in this typology group had the lowest average active transportation and transit mode shares but highest in automobile mode share. Due to this factor, implementing measures to improve station area amenities and bike and pedestrian connections may be more effective in enhancing the experience for current riders than attracting new riders.

BUS AND SHUTTLE NETWORK RECOMMENDATIONS

UTA conducted a Shuttle Market Demand Analysis (completed by Nelson\Nygaard) in 2013. That report evaluated the effectiveness of current shuttle routes and recommended additional routes for consideration. Since then UTA has begun studying the feasibility of implementing the additional routes. This First/Last Mile Strategies Study recommends the implementing of UTA or employer-based shuttles at stations in the Suburban Non-Residential typology, all of which either have shuttles already in place or under current study. Since the topic has already been addressed in some detail, no further recommendations on shuttles are included in this study. However, readers should note that the Open UTA Survey conducted on behalf of this study in late 2014 revealed considerable community concern about the timing and frequency of bus routes connecting to TRAX and FrontRunner stations. While a detailed evaluation and recommendation of changes to the bus network is outside the scope of this study, it recommended that UTA explore ways to address this issue.

RECOMMENDATIONS FOR BUS RAPID TRANSIT AND STREETCAR

Analysis for this First/Last Mile Strategies Study has focused primarily on UTA's FrontRunner and TRAX facilities. However, developing first/last mile solutions for the existing and planned bus rapid transit (BRT) and streetcar lines is just as critical. Data was largely unavailable to sort the BRT and streetcar stations into typologies using the relevant parameters, or to analyze the effectiveness of first/last mile strategies on ridership. However, general recommendations can still be made:

- Bicycle and pedestrian network connectivity should be prioritized for both BRT and streetcar networks. It should be noted that high-quality bicycle improvements have been shown in other transit markets to increase not only bicycle mode share, but also pedestrian mode share; a high-quality environment for cyclists often also translates to a high-quality environment for pedestrians.
- Crossing treatments should also be prioritized, especially for BRT as streetcar lines are located in urban areas that tend to have a higher share of enhanced crosswalks than other areas; the 3500 South and planned Provo/Orem routes both utilize high-volume arterials with typically low-quality pedestrian environments and opportunities for crossings.
- The minimal nature and typically suburban characteristics of the BRT make it a more challenging environment for GREENbike implementation. Bike share programs typically thrive in high-employment, high-population environments with high levels of intersection density. Moreover, installation of GREENbike stations requires space for docking stations, unloading and loading procedures, and system maps. Stations along the Sugar House Streetcar line may be better candidates for GREENbike expansion.
- Wayfinding from BRT stops to nearby destinations may be useful to riders; wayfinding to stations as well as to nearby destinations from the stations may be useful for users of the streetcar.
- Implementing car share programs in Sugar House may be valuable, although on-street space for dedicated spaces may be scarce; opportunities may be more limited along BRT lines.
- While streetcar stations are generally equipped with passenger amenities, BRT stops may represent a limited opportunity to improve the passenger environment.

BENEFITS OF THE STRATEGIES

Communities along the Wasatch Front could experience a range of benefits associated with comprehensive first/last mile solutions. Aside from the obvious advantage of having improved access to transit, other benefits such as increased transit ridership, improved public health, and decreased air pollution are all possibilities. An estimate of these benefits is provided in this section.

Ridership Projections by Typology

Conceptual estimates of potential ridership increases were based on the regression analysis discussed in Section 5. This analysis compared the degree of ridership seen at stations with first/last mile strategies to the ridership at stations without first/last mile strategies, within the typology categories. The analysis indicated that a modest ridership increase ranging from roughly 3-6% might be seen on UTA's TRAX and FrontRunner networks, if a comprehensive program of first/last mile solutions were to be implemented. The ridership estimates are provided by typology in the table below.

Figure 5-7 Estimate of Increased Ridership

Station Typology	Current Total Daily Ridership	Ridership Increase	Projected Daily Ridership	Percentage Increase
Urban	23,670	600 - 700	24,300 - 24,400	2.5 - 3.0%
Institutional	8,530	350 - 700	8,900 - 9,200	4.1 - 8.2%
Multi-Modal	17,307	600 - 1,300	17,900 - 18,600	3.5 - 7.5%
Suburban	7,729	280 - 350	8,000 - 8,100	3.6 - 4.5%
Suburban Non-Residential	13,129	350 - 900	13,500 - 14,000	2.7 - 6.9%
Auto Dependent	6,696	100 - 400	6,800 - 7,100	1.5 - 6.0%
Total	77,061	2,180 - 4,350	79,200 - 81,400	2.8 - 5.6%

Health Related Benefits

Several recent studies have explored the health benefits derived from transit presence and use. The health benefits are primarily a result of higher levels of physical activity associated with walking and/or biking to transit stops. In some cases, benefits are quantified in terms of walking and biking distances, times, and steps. In other cases, benefits are converted to an estimate savings in health costs.

For example, an article titled "Walking to public transit: steps to help meet physical activity recommendations" in the American Journal of Preventive Medicine (Besser and Dannenberg, 2005) analyzed transit-associated walking times for 3,312 transit users identified in the 2001 National Household Travel Survey (NHTS). Transit users were those that walked to and from transit as documented in their 24-hour travel diary. They represented 3.1 percent of the 105,942 people in the 2001 NHTS sample. The transit users spent a median of 19 minutes walking to and from transit daily. Approximately 32 percent of them achieved the Surgeon General recommended 30 minutes of daily physical activity just from walking to and from transit. People who walked at least 20 minutes were 1.67 times more likely to have used rail. However, approximately 72 percent of single-segment walking trips to and from transit were reported as being less than 10 minutes in duration, which is less than the Surgeon General's recommendation that people obtain physical activity in periods of 10 minutes or more. Conflicting evidence made it difficult to decisively conclude whether these short walking trips qualify as beneficial physical activity.

In another example, a 2008 article by R.D. Edwards in Preventive Medicine used the same 2001 NHTS data to project differences between transit and non-transit users in terms of medical costs and welfare costs of obesity-related disabilities based on differences in daily walking activity. He first estimated several alternative specifications of ordinary least squares and Tobit regression models, converging on an estimate that transit users walk 8.3 more minutes per day than non-transit users. His models showed that train users walked an estimated 10.5 minutes more per day than non-transit users. Bus users walked an estimated 6 minutes more per day than non-transit users. These relative comparisons between transit type were consistent with those found by Besser and Dannenberg (2005).

The health effects of air quality have been studied primarily from an epidemiological perspective, where researchers try to estimate the change in health outcomes associated with changes in exposure to pollutants in the atmosphere. The studies tend to be based on time-series analyses and cohort studies. In a time-series analysis, researchers use regression to identify potential relationships between a health outcome and a pollutant concentration (e.g., 2.8 percent increase in mortality for every 10Î¼g increase in PM2.5). In a cohort study, researchers might compare the incidence of a health outcome and average pollutant concentrations between two or more regions to try to find a relationship between them, after accounting for other differences between the groups being compared. The primary goal in these studies is to identify the attributable risk associated with exposure to different pollutant concentrations as the difference in the incidence rate of health outcomes due to the change in pollutant exposure. In most cases, the health impacts are measured in terms of mortality and morbidity incidence, hospitalizations, emergency room visits, and work-loss days, amongst several other measures.

This research, along with additional information, was compiled by the University of Utah Traffic Lab and is provided in Appendix G. Traffic Lab team members also developed a Transit Health Benefit Sketch Planning Tool, which quantifies the estimated benefits of transit on health factors. The tool allows users to estimate these benefits on a station-level basis, using ridership and mode split inputs. A sample of potential benefits associated with implementation of first/last mile strategies at selected UTA stations is provided in the table below. The Sketch Planning Tool and its instruction manual is provided in the Appendix and can be accessed for use through UTA or the Traffic Lab.

Figure 5-8 Estimated Health Related Benefits at Selected UTA Stations

Station	Estimated New Daily Riders	Annual VMT Reduction	Health Care Costs Reduction	CO_2 Reduction
Salt Lake Central	98	280,000	$360,000	105,000 kg
Kimballs Lane	17	56,000	$77,000	21,000 kg
Meadowbrook	125	390,000	$495,000	150,000 kg
2700 W Sugar Factory Road	24	56,000	$81,000	20,000 kg

6 Next Steps

This section outlines the recommended strategies associated with each station typology. It also identifies steps to take towards implementation, including UTA's five-year action plan for constructing first/last mile solutions, as well as strategy-specific needs.

RECOMMENDED STRATEGIES BY STATION TYPOLOGY

The following diagram identifies recommended strategies for implementation by typology, along with the stations associated with each typology.

Figure 6-1 Recommended Strategies by Typology

Typology	Recommended Strategies	Rail Stations	
Urban	❖ Wayfinding and Information ❖ Bicycle Network Improvements ❖ Bike Share Stations ❖ Car Share Stations	• Planetarium • Arena • Temple Square • City Center • Gallivan Plaza	• Courthouse • 900 South • Library • Trolley • 900 East
Multi-Modal	❖ Wayfinding and Information ❖ Bicycle Network Improvements ❖ Access Connections ❖ Pedestrian Network Improvements ❖ Crossing Treatments ❖ Rail/Bus Stop Enhancements	• 1940 W North Temple • Power • Fairpark • Jackson/Euclid • North Temple Bridge/Guadelupe • North Temple • Redwood Junction	• West Valley Central • Salt Lake Central • Old Greektown • Ball Park • Central Pointe • Millcreek • Sandy Expo
Institutional	❖ Bicycle Network Improvements ❖ Bike Share Stations	• Orem • Stadium • University South Campus	• For Douglas • University Medical Center
Suburban Non-Residential	❖ Wayfinding and Information ❖ Bicycle Network Improvements ❖ Bike Share Stations ❖ Rail/Bus Stop Enhancements	• Ogden • Meadowbrook • Murray North • Murray Central • Fashion Place West	• Sandy Civic Center • River Trail • Decker Lake • Draper • Lehi
Suburban	❖ Wayfinding and Information ❖ Bicycle Network Improvements ❖ Pedestrian Network Improvements ❖ Crossing Treatments	• Midvale Fort Union • Midvale Center • Historic Sandy • Crescent View • Kimballs Lane • Draper Town Center	• Bingham Junction • Historic Gardner • West Jordan City Center • Jordan Valley • 4800 W Old Bingham Hwy • Provo
Auto-Dependent	❖ Wayfinding and Information ❖ Bicycle Network Improvements ❖ Access Connections ❖ Pedestrian Network Improvements ❖ Crossing Treatments	• Pleasant View • Roy • Clearfield • Layton • Farmington • Woods Cross • South Jordan	• American Fork • 270 W Sugar Factory Road • 5600 W Old Bingham Hwy • South Jordan Parkway • Daybreak Parkway

The prioritized first/last mile strategies for UTA will typically require partnerships with local municipalities and other agencies for successful implementation, and will also require more detailed design and analysis of the recommendations. The steps outlined in the next sections provide a path to begin constructing solutions and coordinating with partners for each strategy type.

UTA ACTION PLAN FOR FIRST/LAST MILE IMPROVEMENTS

As a result of this First/Last Mile Strategies Study, UTA developed a short-term action plan for incremental completion of the recommendations of this study. The action plan focuses on the strategies and station typologies that have the most potential for positive impact on ridership, beginning with the multimodal station typology. The action plan identifies the following timeline, with some items to be completed internally and others with outside assistance:

2015

- **Develop a methodology for more detailed data collection** (a Station Level Inventory), building on information gathered during the Station Area Audits
  - Conduct inventory for a ¼-mile radius around stations for pedestrian strategies
  - Conduct inventory for a three-mile radius for bike and wayfinding strategies
- **Schedule Station Level Inventories by typology and station** based on those with the highest ridership increase potential, as follows:
  - Multi-Modal
  - Urban
  - Suburban Non-Residential
  - Institutional
  - Suburban
  - Auto Dependent
- **Perform the Station Level Inventories** (including identification of responsible jurisdiction) for each recommended station and strategy in the Multi-Modal category
- **Develop appropriate strategy recommendations by station** (i.e., bike lane vs protected bike lane) based on best practices and professional input
- **Apply planning level costs** (provided in Appendix E of this report) to each strategy and station to determine a total implementation cost estimate
- **Separate costs by agency/jurisdictional responsibility**
- **Perform baseline bicycle and pedestrian station access counts**, for the purpose of before-and-after evaluations

2016 – 2020 *(items to be completed on an annual basis)*

- **Continue partner proposal collaboration and implementation** from the previous year
- **Continue Station Level Inventories** of remaining station typologies, at the rate of one typology per year
- **Develop specific strategy recommendations by station**
- **Apply planning level cost estimates** to each strategy and station
- **Identify funding and implementation partners** for each station
- **Develop partner proposal packages** including any potential UTA funds or other grants
- **Prepare funding request** for upcoming budget year to include:
  - Bicycle and pedestrian access counts
  - Capital Development Contributions
  - Upcoming consultant cost estimates for future work

RECOMMENDED NEXT STEPS BY STRATEGY TYPE

This section identifies specific next steps that should be undertaken for each individual strategy type. Additional analysis and detailed plans will be needed for each strategy in order to implement these strategies.

Wayfinding and Information Improvements

Lead Agency: *UTA*
Supporting Partners: *UDOT, local communities*

Coordinate internally within UTA to finalize the signage/branding plan, and begin development of a wayfinding plan. A successful wayfinding system provides integrated, consistent, and user-friendly information to confirm that chosen routes are efficient, safe, and ultimately lead directly to the desired destination. A wayfinding plan should identify several different sign types:

- **Pedestrian sign types** – for use within commercial districts, residential areas, and directing riders to the transit station;
- **Bicycle sign types** – for use on shared-use pathways, on-street bike lanes, and bike boulevards or other shared routes; and
- **Map kiosks** for use at transit stations.

Signs should include basic elements such as:

- **City of jurisdiction and city logo**
- **Wayfinding elements** such as maps, major destinations, distance to destinations, and common symbol typology
- **Reflective facing,** to be visible at night.

In addition to establishing a consistent design for wayfinding, UTA should review the status of current wayfinding elements around TRAX and FrontRunner stations to determine how much additional signage would be necessary and helpful. Primary responsibility for developing a consistent wayfinding and signage plan rests with UTA, and will require coordination with local jurisdictions and UDOT to place directional signs appropriately within public rights-of-way.

Bicycle Network Improvements

Lead Agency: *UDOT, local communities*
Supporting Partners: *UTA*

Bicycle network improvements encompass on-street facilities such as bike lanes, buffered bike lanes, cycle tracks, and bike boulevards, as well as off-street facilities such as pathways. In addition, improvements could include intersection upgrades such as in-pavement loop detectors for cyclists at intersections, cyclist-specific signal heads, bicycle boxes, two-stage left turns, and other concepts. However, UTA very rarely (if ever) owns the roadway network outside its stations. While UTA can facilitate discussions of bicycle network improvements and assist in finding construction funding and other resources, these network improvements will need to be led by local municipalities or UDOT, depending on which agency owns the roadways surrounding each individual station. While it is beyond the scope of the First/Last Mile Strategies Study to identify specific recommendations for bike improvements at each TRAX and FrontRunner station, some conceptual plans have been developed for the Top 25 UCATS projects identified in that study. These recommendations are provided in Appendix C and could provide a good starting point for coordination between UTA and other agencies to improve bicycle access to transit.

Access Connections

Lead Agency: *UTA*
Supporting Partners: *Local communities*

Most TRAX and FrontRunner stations outside the immediate urban area are contained within perimeter fencing, noise walls, or other features that prevent residents of adjacent neighborhoods from accessing the station without significant out-of-direction travel. The UCATS project identified multiple locations where removal of walls or fencing could improve access to stations; see Appendix C for these recommendations. However, addressing this issue is more complicated than simply removing barriers. UTA's next steps to improve access connections include review of any environmental laws that may have required installation of walls or fencing as mitigation, and exploration of actions needed to remove them. Walls or fencing may also have been installed at the request of policy makers in the individual cities, and removing them would require discussion and negotiation with those communities.

Pedestrian Network Improvements

Lead Agency: *UDOT, local communities*
Supporting Partners: *UTA*

Pedestrian network improvements include sidewalks and pathways connecting transit riders to a station. Similar to bicycle network improvements, this are typically undertaken on property not owned by UTA but by local communities or UDOT. UTA could facilitate discussion of desired improvements and assist in funding these improvements, but ultimately the local communities or UDOT will need to own and maintain these facilities in most cases. The UCATS recommendations in Appendix C provide a starting point for several high-priority pedestrian improvement needs.

Crossing Treatments

Lead Agency: *UDOT, local communities*
Supporting Partners: *UTA*

Decisions on crossing treatment installations and upgrades will typically be made by the owner of the roadway, whether that is a local community or UDOT. This may be as simple as striping a new crosswalk, or as complicated as evaluating the traffic impacts of installing a pedestrian signal and coordinating it with adjacent intersections. Traffic engineering standards such as the Manual of Uniform Traffic Control Devices may also apply, depending on the treatment selected. UTA may initiate conversations with roadway owners on the need for crossings and participate in funding improvements, but construction and maintenance of improvements will generally not be led by UTA. The UCATS recommendations in Appendix C include several crossing treatments that could represent a starting point for improvements.

Bike Sharing Programs

Lead Agency: *GREENbike/UTA*
Supporting Partners: *Regional transportation agencies, local communities*

At this writing, bike sharing is on the cusp of revolution within UTA's service area. The GREENbike program, initiated in Salt Lake City in 2013, is very popular and visible as a first/last mile solution in the City. Currently the program operates as a 501(c)(3) under the umbrella of the Downtown Alliance in the Salt Lake City Chamber of Commerce. However, there is interest in communities outside Salt Lake City for the program to expand. Extending outside Salt Lake City's geographic boundaries, however, may require transitioning the bike share program to a different governing authority. UTA and other regional transportation agencies have hosted multiple discussions on the topic in recent months, and should continue to explore options for expanding GREENbike as a regional program and a first/last mile solution in selected locations.

Car Sharing Programs

Lead Agency: *Enterprise Car Share*
Supporting Partners: *UTA, local communities*

Enterprise will likely continue as a purveyor of car share services along the Wasatch Front. UTA should continue coordination with Enterprise car share to establish reserved parking stalls in UTA lots for car share vehicles, or with local communities to allow on-street parking of car share vehicles.

Station and Stop Enhancements

Lead Agency: *UTA*
Supporting Partners: *Local communities, UDOT*

Installation of station and stop enhancements such as bus shelters, cases for maps and schedules, trash receptacles, pedestrian-scale lighting, digital message signs, and bike racks or lockers may largely be conducted within UTA's property lines. In some instances, additional right-of-way or coordination may be required – for instance, installation of pedestrian lighting may be necessary inside public rights-of-way outside the station area. In other instances, UTA collaborates with private vendors such as advertising agencies, who pay for installation of shelter facilities in exchange for the placement of advertisements on the structure. UTA may need to conduct a detailed inventory of all current station and stop enhancements to better understand the degree of improvements needed.

STATIONS TO WATCH

New real estate development projects offer significant opportunities for first/last mile solutions. New roadways may be built around stations which could be designed to better accommodate cyclists and pedestrians, new plazas at station developments could create a people-friendly atmosphere, and design regulations may be stipulated to better accommodate transit users. While UTA has over 70 individual TRAX and FrontRunner stations, only a handful are the subject of current transit oriented development discussions. Transit-oriented development specialists at UTA provided information on projects that were at least 2-5 years away from construction, which offer the best opportunities to begin coordinating now on first/last mile improvements. In addition, projections from the WFRC travel demand model suggest that certain station areas may experience a higher degree of population and employment growth than other stations. The team overlaid estimated growth projections from the model over known transit-oriented development plans at station areas and created a tiered list of "stations to watch", below.

High projected population **and** employment growth, in addition to known TOD plans:

- Ballpark TRAX Station (180 West 1300 South, Salt Lake City)
- Salt Lake Central Station (250 South 600 West, Salt Lake City)

High projected population **or** employment growth, in addition to known TOD plans:

- Meadowbrook TRAX Station (3900 South West Temple, South Salt Lake City)
- Roy FrontRunner Station (4155 South Sandridge Drive, Roy)
- South Jordan FrontRunner Station (10351 South Jordan Gateway, South Jordan)
- Clearfield FrontRunner Station (1250 South State Street, Clearfield)
- Ogden FrontRunner Station (25 West 23rd Street, Ogden)

Known TOD plans, and low to moderate projected population or employment growth:

- Sandy Civic Center TRAX Station (9890 South 200 East, Sandy)
- Jordan Valley TRAX Station (8600 South 3200 West, West Jordan)
- 1900 West North Temple TRAX Station, Salt Lake City
- Provo FrontRunner Station (690 South University Avenue, Provo)
- Farmington FrontRunner Station (700 North Park Lane, Farmington)
- Murray Central TRAX/FrontRunner Station (200 West Vine Street, Murray)
- Orem FrontRunner Station (900 South 1350 West, Orem)
- Woods Cross FrontRunner Station (770 South 800 West, Woods Cross)

APPENDIX 2:
ICARO PROJECT ELEMENTS TABLE

FIRST/LAST MILE CONNECTIONS:
IMPROVING COMMUNITY ACCESS TO REGIONAL OPPORTUNITIES

UTA

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WEBER COUNTY

						CITY/CO MATCH			UTA MATCH			WFRC	UDOT MATCH			
TYPE	**DESCRIPTION**	**MUNICIPALITY**	**LOCATION**	**STATION NAMES**	**EST TOTAL COST**	**LOCAL**	**FEDERAL**	**Prop 1**	**LOCAL**	**FEDERAL**	**FEDERAL**	**LOCAL**	**FEDERAL**	**PHASING**	**COMMENTS**
BIKE	Repair Stand	Pleasant View	FR Station	Pleasant View	$1,500			$750						2017	UTA PE Dollars
BIKE	Bike Racks	Pleasant View	FR Station	Pleasant View	$500			$250						2017	UTA PE Dollars
PED	Bus Shelter	Pleasant View	Pleasant View	Pleasant View	$52,400			$26,200						2016	UTA PE Dollars
PED	Message Board	Pleasant View	FR Station	Pleasant View	$2,000			$1,000						2017	UTA PE Dollars
PED	Develop bus stop bench/shelter	Pleasant View	1670 West 1157 W 2700 N Pleasant View	Pleasant View	$6,000			$3,000						2017	UTA can do; UTA PE dollars
PED	Continue sidewalk both North and South from US-89/2700 N intersection for 300 feet to an improved bus stops (Stop Hwy 89 @ 2685 North and)	Pleasant View	1150 W 2700 N Pleasant View	Pleasant View	$45,000			$22,500						2016	UTA with Prop1
PED	Install bus and train information and bus stop shelter new message boards	Pleasant View	1145 W 2800 N Pleasant View	Pleasant View	$7,400			$3,700						2017	UTA is planning on installing new message boards for approx $3000 at all FR Stations using Prop 1 dollars
PED	Install seating areas at bus pickup locations	Pleasant View	1145 W 2800 N Pleasant View	Pleasant View	$4,800			$2,400						2017	UTA is planning on installing new benches and shelters at all FR stations with Prop 1 dollars
					$119,600	**$0**	**$0**	**$59,800**	**$0**	**$0**	**$0**	**$0**	**$0**		
BIKE	Repair Stand	Roy	FR Station	Roy	$1,500			$750						2017	UTA PE Dollars
BIKE	Bike Racks	Roy	FR Station	Roy	$500			$250						2017	UTA PE Dollars
PED	Bus Shelter	Roy	Roy	Roy	$26,200			$13,100						2017	UTA PE Dollars
PED	Message Board	Roy	FR Station	Roy	$2,000			$1,000						2017	UTA PE Dollars
BIKE	Protected bike parking to the north of FrontRunner platform	Roy	4155 S. Sandridge Drive	Roy	$20,000			$10,000						2018	Bike racks and covered shelter all Pro 1 dollars
BIKE	2 Trail-crossing - flashing Lights and pavement striping	Roy/Unincorporated	2540 W 4000 S	Roy	$120,000			$60,000						2019	a painted crossing for the D&RG tail as well as a painted crossing on the east side of the railroad tracks near the walkway from the Frontrunner station. Both of these crossings would have some sort of blinking lights for oncoming traffic. Prop 1 dollars
					$170,200	**$0**	**$0**	**$85,100**	**$0**	**$0**	**$0**	**$0**	**$0**		
	Bus Shelter	West Haven	West Haven	Ogden	$52,400			$26,200						2017	UTA PE Dollars

WEBER COUNTY

						CITY/CO MATCH			UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
BIKE	Stripe bike lanes on SR-108 (Midland Dr) from 4000 S (SR-37) to 2700 S in Syracuse (UCATS Top 25 Recommendation)	West Haven, Syracuse	SR-108	Ogden	$113,600			$56,800						2018	UTA prop 1 dollars
					$166,000	**$0**	**$0**	**$83,000**	**$0**	**$0**	**$0**	**$0**	**$0**		
BIKE	Repair Stand	Ogden	FR Station	Ogden	$1,500			$750						2017	UTA PE Dollars
BIKE	Bike Racks	Ogden	FR Station	Ogden	$500			$250						2017	UTA PE Dollars
PED	Bus Shelter	Ogden	FR Station	Ogden	$52,400			$26,200						2017	UTA PE Dollars
PED	Message Board	Ogden	FR Station	Ogden	$2,000			$1,000						2017	UTA PE Dollars
BIKE	23rd St Transit Connection and Bike Share route to Downtown (Ogden BMP)	Ogden	23rd Street	Ogden	$4,000,000			$800,000						2018	Connecting the Intermodal Hub to downtown Ogden and the bicycle network is critical; 23rd Street is shown on the Bicycle Master Plan as the best roadway to accomplish this. Much of 23rd in this area has angle parking, this project would determine the best way to buffer bike lanes from parking. This is also the selected route for the new BRT line.
BIKE	Ogden Bike Share Stations-- 6 Stations Total	Ogden	Downtown Ogden	Ogden	$480,000						$480,000			2018	The project proposes to install 6 bikeshare kiosks, each with 12 stalls at locations within the downtown area of Ogden. 7% Local Match required. WFRC (CMAQ) Applied 7% $33,600;
BIKE	Grant avenue Promenade Bike Lane	Ogden	Grant Ave	Ogden	$11,000	$11,000								2017	The promenade is anticipated to take a number of years to fund and construct. Ogden City has prepared a bike Lane painting plan as a stopgap measure until the Promenade is finished. Cost is to demo existing paint and install, does not account for yearly maintenance. B&C Funded
BIKE	Washington Blvd Buffered Bike Lane to include 2 stage left turns 23rd-17th (Ogden BMP)	Ogden	Washington Blvd	Ogden	$11,000	$11,000								2018	Buffered Bike Lane including 2 stage left turns. Would require UDOT Approval.
BIKE	Washington Blvd Bike Lane Extension (Ogden BMP)	Ogden	Washington Ave	Ogden	$2,200	$2,200								2018	Extension of existing Bike Lanes 1 Block North on Washington Blvd from 22nd -23rd
BIKE	Madison Ave Bike Master Plan Improvements (Ogden BMP)	Ogden	Madison Ave	Ogden	$11,000	$11,000								2019	
BIKE	Jefferson Ave Shared Lane Markings and signage 20th to 26th (Ogden BMP)	Ogden	Jeffereson Ave	Ogden	$4,500	$4,500								2019	This would apply shared lane markings and signage on this route.
BIKE	Adams Ave Bike Lanes 20th-27th (Ogden MBP)	Ogden	Adams Ave	Ogden	$16,000	$16,000								2019	Bike Lanes on an important route
					$4,592,100	**$55,700**	**$0**	**$828,200**	**$0**	**$0**	**$480,000**	**$0**	**$0**		
					$5,047,900	**$55,700**	**$0**	**$1,056,100**	**$0**	**$0**	**$480,000**	**$0**	**$0**		

WEBER COUNTY

						CITY/CO MATCH			UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
TOTAL LOCAL MATCH					22%										
TOTAL FEDERAL MATCH					10%										

DAVIS COUNTY

						CITY/CO MATCH		UTA MATCH			WFRC	UDOT MATCH			
TYPE	**DESCRIPTION**	**MUNICIPALITY**	**LOCATION**	**STATION NAMES**	**EST TOTAL COST**	**LOCAL**	**FEDERAL**	**Prop 1**	**LOCAL**	**FEDERAL**	**FEDERAL**	**LOCAL**	**FEDERAL**	**PHASING**	**COMMENTS**
	Bus Shelter	Bountiful	Bountiful		$65,500			$16,375						2018-2019	UTA PE Dollars
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W 2350 South (east)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W 2350 South (west)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	400 W 2400 South (east)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	400 W 2400 South (west)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	50 W 1700 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	50 W 1700 south (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	50 W 1600 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	50 W 1600 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	75 E 1700 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	75 E 1700 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	75 E 1700 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	75 E 1700 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	75 E 1700 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	75 E 1600 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1400 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1400 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1300 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1300 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1200 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1200 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 1200 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W 300 West (SE)	Woods Cross	$2,750	$550								2018-2019	

DAVIS COUNTY

						CITY/CO MATCH			UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W 300 West (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W @ 400 West (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W @ 400 West (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	400 W 1250 S (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	400 W 1250 S (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 1250 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 1250 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 1250 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 1250 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	300 W 600 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 325 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 325 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 325 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	425 W 325 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	350 W 325 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	300 W 150 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	300 W 150 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 W 400 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 W 300 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 W Center (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 W 200 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 100 South (NE)	Woods Cross	$2,750	$550								2018-2019	

DAVIS COUNTY

						CITY/CO MATCH			UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 100 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 300 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 300 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 400 South (SW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	100 E 400 South (SE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	200 E 300 South (NE)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	200 E 300 South (NW)	Woods Cross	$2,750	$550								2018-2019	
ped	Install Pedestrian access ramp with ADA warning panel	Bountiful	200 E 300 South (SW)	Woods Cross	$2,750	$550								2018-2019	
Bike	Bike lanes from US89/500 West to Orchard Drive	Bountiful	200 E 300 South (SE)		$13,348	$2,670								2018	UTA Prop 1 dollars 25% local match
					$219,098	**$30,720**	**$0.00**	**$16,375.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**		
bike	Repair Stand	Clearfield	FR Station	Clearfield	$1,500			$300.00						2017	UTA PE Dollars
bike	Bike Racks	Clearfield	FR Station	Clearfield	$500			$100.00						2017	UTA PE Dollars
	Bus Shelter	Clearfield	FR Station	Clearfield	$117,900			$23,580.00						2017	UTA PE Dollars
	Message Board	Clearfield	FR Station	Clearfield	$2,000			$400.00						2017	UTA PE Dollars
Both	Directional markings/striping on two way ped/bike path	Clearfield	1250 S State St	Clearfield	$30,400	$4,560		$4,560.00						2017	
Bike	10 foot two way separated bike path connecting Freeport Industrial Parkway and Depot Dr	Clearfield	250 UT-193	Clearfield	$132,576	$19,886		$19,886.36						2018	
Bike	Bike connection from 1000 E into new mixed used development (TOD). Route identification to FrontRunner station.	Clearfield	1500 S 1000 E	Clearfield	$370,000	$55,500		$55,500.00						2019	
					$654,876	**$79,946**	**$0**	**$104,326.36**	**$0**	**$0**	**$0**	**$0**	**$0**		100000
bike	Repair Stand	Farmington	FR Station	Farmington	$1,500			$150						2017	UTA PE Dollars
bike	Bike Racks	Farmington	FR Station	Farmington	$500			$50						2017	UTA PE Dollars
	Bus Shelter	Farmington	FR Station	Farmington	$39,300			$3,930						2017	UTA PE Dollars - 3 bus stops are within the buffer
	Message Board	Farmington	FR Station	Farmington	$2,000			$200						2017	UTA PE Dollars
ped	650 West and Glovers Lane ADA Ramps	Farmington	State St to Pack Property and Legacy to DRG&W Trail	Farmington	$10,800	$2,700		$1,080						2018	UTA Prop 1 10% match

DAVIS COUNTY

						CITY/CO MATCH			UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
Ped	Frontage Road Sidewalk	Farmington	Glovers Lane to 20 West	Farmington	$74,925	$18,731		$7,493						2018	UTA Prop 1 10% match
Bike	650 West and Glovers Lane Bike Lanes	Farmington	State St to Pack Property and Legacy to DRG&W Trail	Farmington	$220,591	$55,148		$22,059						2019	UTA Prop 1 10% match
Ped	650 West and Glovers Lane Sidewalks	Farmington	State St to Pack Property and Legacy to DRG&W Trail	Farmington	$462,611	$115,653		$46,261						2020	UTA Prop 1 10% match
Ped	North Main Sidewalk East Side	Farmington	675 N to 1225 N	Farmington	$135,000	$33,750		$13,500						2018	UTA Prop 1 10% match
Ped	North Main Sidewalk West Side	Farmington	675 N to 1225 N	Farmington	$142,763	$35,691		$14,276						2019	UTA Prop 1 10% match
ped	Crosswalk and Rectangular Rapid Flashing Beacon for users to cross from the north sidewalk to the pedestrian bridge (KFAT recommendation)	Farmington	400 W State St	Farmington	$15,500	$3,875		$1,550						2017	UTA Prop 1 10% match
bike	Secure Bike Parking (KFAT recommendation)	Farmington	155 E Promontory	Farmington	$8,000	$2,000		$800						2018	UTA Prop 1 10% match
bike	Secure Bike Parking (KFAT recommendation)	Farmington	260 Station Pkwy	Farmington	$8,000	$2,000		$800						2018	UTA Prop 1 10% match
ped	Rectangular Rapid Flashing Beacon (KFAT recommendation)	Farmington	500 Station Pkwy	Farmington	$15,000	$3,750		$1,500						2018	UTA Prop 1 10% match
ped	Rectangular Rapid Flashing Beacon (KFAT recommendation)	Farmington	900 W 100 N (Clark Lake)	Farmington	$15,000	$3,750		$1,500						2018	UTA Prop 1 10% match
Ped	Install sidewalks along Station Pkwy along north side of Nordstrom Rack	Farmington	380 Station Pkwy	Farmington	$15,000	$3,750		$1,500						2019	UTA Prop 1 10% match
ped	Crosswalk and pedestrian crosswalk signs	Farmington	350 Station Pkwy	Farmington	$500	$125		$50						2018	UTA Prop 1 10% match
ped	Crosswalk and pedestrian crosswalk signs	Farmington	380 Station Pkwy	Farmington	$500	$125		$50						2018	UTA Prop 1 10% match
ped	Rectangular Rapid Flashing Beacon (KFAT recommendation)	Farmington	375 W State St	Farmington	$15,000	$3,750		$1,500						2018	UTA Prop 1 10% match

DAVIS COUNTY

						CITY/CO MATCH		UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
bike	Bike detection and two way lefeet turn bike box	Farmington	650 W State St	Farmington	$12,000	$3,000		$1,200						2019	UTA Prop 1 10% match
Both	5% switchbacks for quicker access between Farmington FrontRunner station and Park Ln path.	Farmington	450 N. 800 W.	Farmington	$120,000	$30,000		$12,000						2019	UTA Prop 1 10% match
bike	Repair Stand	Farmington	450 N. 800 W.	Farmington	$1,500	$375		$150						2017	UTA Prop 1 10% match
both	Signage and user information for multi-use path	Farmington	450 N. 800 W.	Farmington	$6,000	$1,500		$600						2017	UTA Prop 1 10% match
Both	Tippetts Ln to Legacy Pkwy Trail connection	Farmington	85 S 650 W	Farmington	$38,000	$9,500		$3,800						2019	UTA Prop 1 10% match
Bike	Bike lanes on State St (100 N) (KFAT recommendation)	Farmington	State St (100 N)	Farmington	$17,608	$4,402		$1,761						2019	UTA Prop 1 10% match
Bike	Repair Stand	Farmington	450 N. 800 W.	Farmington	$1,500			$150						2017	UTA Prop 1 10% match
both	Signage and user information for multi-use path	Farmington	450 N. 800 W.	Farmington	$6,000			$600						2017	UTA Prop 1 10% match
Both	Tippetts Ln to Legacy Pkwy Trail connection	Farmington	85 S 650 W	Farmington	$38,000			$3,800						2018	UTA Prop 1 10% match
					$1,423,098	**$333,574**	**$0**	**$142,310**	**$0**	**$0**	**$0**	**$0**	**$0**		
bike	Repair Stand	Layton	FR Station	Layton	$1,500			$375						2017	UTA PE Dollars
bike	Bike Racks	Layton	FR Station	Layton	$500			$125						2017	UTA PE Dollars
	Bus Shelter	Layton	FR Station	Layton	$78,600			$19,650						2017	UTA PE Dollars
	Message Board	Layton	FR Station	Layton	$2,000			$500						2017	UTA PE Dollars
Bike	Bike lanes on Flint Street from Gentile to Philip Street	Layton	Flint Street from Gentile to Philip Street	Layton	$20,000	$5,000		$5,000						2017	UTA Prop 1 funds with city contribution in design
Bike	Bike lanes on Gentile from DNRGW to Fort Street	Layton		Layton	$25,000	$5,000		$6,250						2017	UTA Prop 1 funds with city contribution in design
Bike	Bike lanes on Fort Street from 1000 North to Main Street	Layton		Layton	$25,000	$5,000		$6,250						2017	UTA Prop 1 funds with city contribution in design
both	Connect Weaver Lane and West Layton paths; Dawson to Layton Parkway; Kay's Creek Trail End to Angel St	Layton/West Kaysville	800 W Abbey Way	Layton	$455,000	$132,824		$113,750						2019	Developer to pay $132,824 plus UTA Prop 1 @ 25% local match

DAVIS COUNTY

						CITY/CO MATCH		UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
Both	Improve the D&RGW Trail and Gentile St. crossing by extending the trail beyond the sidewalk, developing curb-cuts, and installing trail crossing road markings and signage	Layton	1130 W Gentile St	Layton	$14,000			$3,500						2018	UTA Prop 1 dollars 25% local match
Bike	Bike lanes along Gentile St	Layton	Gentile St	Layton	$22,720			$5,680						2018	UTA Prop 1 dollars 25% local match
Bike	Bike lanes along Church St	Layton	Church St	Layton	$12,780			$3,195						2018	UTA Prop 1 dollars 25% local match
Both	Incorporate Kay's Creek Trail recommendations (in coordination with Layton City Trails Master Plan recommendations) City Library to Gentile and Flint to Dawson	Layton	125 S Main St	Layton	$189,394	$119,948		$47,349						2018	Shovel Ready; 68,850 to be paid by city and RAMP funds; 51,098 to be paid by devloper - total project cost (federalized- $189,394) plus UTA Prop 1 @ 25%
	Add shelters to bus stops to protect riders from inclement weather	Layton	150 S Main St	Layton	$39,300			$9,825						2017	UTA Prop 1 dollars 25% local match
	Install FrontRunner identification and wafinding signage at the entrance of the northern parking lot	Layton	150 S Main St	Layton	$2,500			$625						2017	UTA Prop 1 dollars 25% local match
bike	Install high visibility bike crossing and bike signal at the intersection connecting eastbound Layton Parkway bike lane to Main Street.	Layton	Layton Parkway/Main St	Layton	$77,000			$19,250						2017	UTA Prop 1 dollars 25% local match
ped	Evaluate Main St mid-block crossing feasibility with UDOTS mid-block crossing and signal warrant analysis	Layton	160 S Main St	Layton	$75,000			$18,750						2020	UTA Prop 1 dollars 25% local match
ped	Main Street/Gentile Street intersection active transportation crosswalk improvements: curb-cuts, bulb-outs, raised crosswalks or high visibility crosswalk.	Layton	Gentile St/Main St	Layton	$4,000			$1,000						2018	UTA Prop 1 dollars 25% local match
Ped	Establish a walking path through the north parking lot for pedestrians to access the station from Main St.	Layton	150 S Main St	Layton	$33,750			$8,438						2017	UTA Prop 1 dollars 25% local match
	Install FrontRunner identification and wayfinding signage at the entrance of the eastern parking lot.	Layton	150 S Main St	Layton	$2,500			$625						2017	UTA Prop 1 dollars 25% local match
Bike	Install northbound/southbound bike lanes on Main St	Layton	Main St	Layton	$6,248			$1,562						2018	UTA Prop 1 dollars 25% local match

DAVIS COUNTY

						CITY/CO MATCH		UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
bike	Move UTA bike lockers from the parking lot to the train platform ramp. Provide short term rental options with detailed instructions on use.	Layton	150 S Main St	Layton	$32,000			$8,000						2017	UTA Prop 1 dollars 25% local match
Both	Design a 10 foot wide two directional multi-use path along the west side of Main Street connecting the Layton FrontRunner station with the Layton Parkway bike lane. Delineate travel direction with arrows and bike stencils.	Layton	250 S Main St	Layton	$100,000			$25,000						2020	UTA Prop 1 dollars 25% local match
botj	Install additional curb cuts to improve access to the train platform from the northern parking lot for wheeled travelers (wheelchairs, heavy bikes, and strollers).	Layton	150 S Main St	Layton	$2,000			$500						2018	UTA Prop 1 dollars 25% local match
both	Install wayfinding signage from north parking lot to train platform ticket and waiting area.	Layton	150 S Main St	Layton	$2,500			$625						2017	UTA Prop 1 dollars 25% local match
both	Install wayfinding signs, trail crossing road markings, and crossing signage at the West Layton Path and Vance Dr crossing.	Layton	850 S Vance Dr	Layton	$5,000			$1,250						2017	UTA Prop 1 dollars 25% local match
both	Install wayfinding signs, trail crossing road markings, and crossing signage at the Church St and Bamberger Trail crossing.	Layton	205 Chruch St	Layton	$5,000			$1,250						2017	UTA Prop 1 dollars 25% local match
both	Install wayfinding signs, curb-cuts, and share-the-road signage at the Gentile St and Bamberger Trail intersection.	Layton	250 Gentile St	Layton	$5,000			$1,250						2018	UTA Prop 1 dollars 25% local match
both	Install Kays Creek Trail identification signs at the trailhead parking lot on Golden Ave. Accommodate future Kays Creek Trail expansion to the north by developing curb-cuts, wayfinding signs, and crossing signage.	Layton	230 Golden Ave	Layton	$10,000			$2,500						2018	UTA Prop 1 dollars 25% local match
ped	Install curb-cuts, wayfinding signs, share-the-road signage, and crossing signage to accommodate the transition from Kays Creek Trail to Hawthrone St.	Layton	145 Hawthorne St	Layton	$10,000			$2,500						2018	UTA Prop 1 dollars 25% local match

DAVIS COUNTY

						CITY/CO MATCH		UTA MATCH			WFRC	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAMES	EST TOTAL COST	LOCAL	FEDERAL	Prop 1	LOCAL	FEDERAL	FEDERAL	LOCAL	FEDERAL	PHASING	COMMENTS
	LAYTON TOTALS				**$1,258,292**	**$267,772**	**$0**	**$314,573**	**$0**	**$0**	**$0**	**$0**	**$0**		
bike	Repair Stand	Woods Cross	FR Station	Woods Cross	$1,500			$375						2017	UTA PE Dollars
bike	Bike Racks	Woods Cross	FR Station	Woods Cross	$500			$125						2017	UTA PE Dollars
	Bus Shelter	Woods Cross	FR Station	Woods Cross	$52,400			$13,100						2017	UTA PE Dollars
	Message Board	Woods Cross	FR Station	Woods Cross	$2,000			$500						2017	UTA PE Dollars
bike	Add bike from 800 W to US-89, instead of having bikers cross under I-15 at 500 S	Woods Cross	800 W 1500 S	Woods Cross	$3,976			$1,988.00						2017	UTA Prop 1 dollars 25% local match
bike	Install U-racks instead of current bicycle racks	Woods Cross	750 S 800 W	Woods Cross	$1,750			$1,750						2017	Prop 1
					$62,126			**$17,838**							
					$3,617,489	**$712,012**	**$0**	**$595,422**	**$0**	**$0**	**$0**	**$0**	**$0**		
TOTAL LOCAL MATCH					**36%**										
TOTAL FEDERAL MATCH					**0%**										

SALT LAKE COUNTY

								CITY		UTA MATCH		WFRC	UDOT		TIGER FUNDS		
TYPE	DESCRIPTION	MUNICIPALITY	STATION_NAMES	LOCATION	COST PER UNIT	EST TOTAL COST	CATNIP	LOCAL	FEDERAL	LOCAL	FEDERAL		FEDERAL	LOCAL		PHASING	COMMENTS
bike	Repair Stand	Draper	Draper Town Center	FR Station	$1,500	$1,500				$300	$1,200					2017	UTA PE Dollars
bike	Bike Racks	Draper	Draper Town Center	$4,259,677	$100	$500				$100	$400					2017	UTA PE Dollars
	Bus Shelter	Draper	Draper Town Center	FR Station	$13,100	$26,200				$5,240	$20,960					2017	UTA PE Dollars
	Message Board	Draper	Draper Town Center	FR Station	$2,000	$2,000				$400	$1,600					2017	UTA PE Dollars
BOTH	Trail connection between Draper Frontrunner Station and Jordan River Parkway	Draper	Draper FR Station	FR Station	$625	$500,000										2018	
BOTH	Corner Canyon Creek East Jordan Creek Canal Trail	Draper	Draper Town Center	300 E 13400 S - 900 E 12800 S		$630,500						$630,500				2019	
BOTH	Provide a multi-use pathway connection to the Jordan River Parkway Trail from Vista Station Blvd.	Draper	Draper Town Center	855 W 12300 S	$200	$378,000	$76,000									2020	
BIKE	Install bike lanes on Vista Station Blvd. south from 12300 S. to 13490 S.	Draper	Draper Town Center	Vista Station Blvd. & 12300 S. to Vista Station Blvd. & 13490 S.	$3	$23,938										2017	
BIKE	Install bike lanes or use pavement markings and signs to mark a bike route on FrontRunner Blvd.	Draper	Draper Town Center	12827 S FRONTRUNNER BLVD to 13173 S FRONTRUNNER BLVD	$3	$10,044	$2,000									2018	
bike	Install right turn bike intersection treatment using either a Through Bike Lane or Combined Bike Lane/Turn Lane	Draper	Draper Town Center	Vista Station Blvd. & 12300 S.	$800	$800										2018	
bike	Install right turn bike intersection treatment using either a Through Bike Lane or Combined Bike Lane/Turn Lane	Draper	Draper Town Center	Vista Station Blvd. & 12300 S.	$800	$800	$160									2018	
ped	Re-stripe cross walk lines and consider using pavers or pavement colors to make the crossing more visible.	Draper	Draper Town Center	12827 S FRONTRUNNER BLVD	$2,000	$2,000	$0									2019	
BIKE	Install bike lanes on Galena Park Blvd. south from 12300 S. to 700 W.	Draper	Draper Town Center	Galena Park Blvd. & 12300 S. to Galena Park Blvd. & 700 W.	$3	$4,743	$1,000									2019	
BIKE	Formalize bike lane through intersection with 1300 East. Current striping ends bike lane in advance and picks up again after intersection.	Draper	Draper Town Center	Draper Parkway (12300 So) / 1300 East	2.84	$2,840	$600									2019	
BIKE	Substandard bike lane widths, esp on south side from rail crossing to 1300 East. Consider lane narrowing or removal of two-way center turn lane.	Draper	Draper Town Center	Pioneer Road (12400 South) / 1200 East	$3	$2,556	$500									2020	
BIKE	New bike lanes on Pioneer Road from 300 East to Fort St, including signage and transitions through intersections.	Draper	Draper Town Center	Pioneeer Road from 700 East to Fort St	$3	$16,200	$3,300									2018	
BIKE	New bike lanes on 300 East from Juan Diego High School to Carlquist Drive.	Draper	Draper Town Center	300 East from Juan Diego High School to Carlquist Drive	$3	$21,300	$4,300									2018	
BIKE	New bike lanes on 1300 East from 11000 South to Draper Parkway	Draper	Draper Town Center	1300 East from 11000 South to Draper Parkway	$3	$24,992	$5,000									2019	
BIKE	New bike lanes on 700 East from Pioneer Raod to Kimball Lane (Crescent View TRAX)	Draper	Draper Town Center	700 East from Pioneer Raod to Kimball Lane (Crescent View TRAX)	$3	$10,224	$2,000									2019	
BIKE	New bike lanes on Kimballs Lane (11800 South) from 150 East to 630 East (near Crescent View TRAX). Spot widening, paint, signage.	Draper	Draper Town Center	Kimballs Lane (11800 South) from 150 East to 630 East (near Crescent View TRAX)	$3	$23,856	$5,000									2019	
BIKE	New bike lanes on 300 East to connect with new facility on Kimballs Lane	Draper	Draper Town Center	300 East from Kimballs Lane to 11400 South	$3	$7,668	$1,500									2019	

SALT LAKE COUNTY

								CITY		UTA MATCH		WFRC	UDOT		TIGER FUNDS		
TYPE	DESCRIPTION	MUNICIPALITY	STATION_NAMES	LOCATION	COST PER UNIT	EST TOTAL COST	CATNIP	LOCAL	FEDERAL	LOCAL	FEDERAL		FEDERAL	LOCAL		PHASING	COMMENTS
BIKE	New bike lanes on 300 East to connect existing bike facilities on 11000 South and 11400 South	Draper	Draper Town Center	300 East from 11400 South to 11000 South	$3	$7,952	$1,600									2019	
PED	Potential neighborhood connection to minimize out of direction travel	Draper	Draper Town Center	356 E LA VERA LN	$75	$6,750	$1,350									2020	
PED	Potential neighborhood connection to minimize out of direction travel	Draper	Draper Town Center	11707 S THORNBERRY DR	$75	$18,750	$3,700									2020	
						$1,724,113	**$108,010**	**$0**	**$0**	**$6,040**	**$24,160**	**$630,500**	**$0**	**$0**	**$955,403**		
	Bus Shlters	Midvale	Midvale Ft Union	State Street	$13,100	$39,300				$3,930	$15,720						
	Bus Shlters	Midvale	Midvale Center	State Street	$13,100	$39,300				$3,930	$15,720						
BOTH	Bike/Ped crossing to TRAX station along neighborhood street	Midvale	Bingham Junction Station	900 West 7300 S	$750	$750,000		$300,000								2018	
BOTH	9th Avenue street widening and pedestrian crossing	Midvale	Midvale Ft Union	700 West 9Th Avenue		$1,000,000								$800,000		2017	UDOT paying for street reconstruction; Local dollars from UDOT per Chip Mason
BIKE	Bike lanes and intersection improvements along 700 East from Van Winkle to 9000 So	Midvale/UDOT	Midvale Ft Union			$1,090,822							$466,666			2018	
bike	Provide short term bike locker parking options	Midvale	Midvale Ft Union	95 W CENTER ST	$4,000	$16,000				$3,200	$12,800					2018	
ped	Install flashing beacons or other high visibility treatment at N Center Square corsswalk	Midvale	Midvale Ft Union	7682 S CENTER SQ	$15,000	$15,000		$3,000								2017	
BIKE	Install bike lanes on Center St. from the bridge over the Jordan River east to Main St.	Midvale	Midvale Ft Union	8056 S MAIN ST to Center St. & Main St.	$3	$8,520	$0	$1,704		$1,704	$6,816					2017	
BIKE	Install pavement marking sharrows that signal to cyclists and autombilies that bikes can use the right lane. The roadway is too narrow to install bike lanes, but this will allow those comfortable riding in traffic with a more direct route.	Midvale	Midvale Ft Union	1127 W 7800 S to 8056 S MAIN ST	$3	$11,644	$0	$2,329		$2,329	$9,315					2017	
BIKE	Install bike lanes on Bingham Junction Blvd. south from 7200 S. to Center St.	Midvale	Midvale Ft Union	Bingham Junction Blvd. & 7200 S. to Bingham Junction Blvd. & Center St.	$3	$11,800	$0	$2,360		$2,360	$9,440					2018	
ped	Install marked crosswalk on south leg of intersection.	Midvale	Midvale Ft Union	7387 S BINGHAM JUNCTION	$500	$500		$100								2017	
PED	Sidewalk on East Jordan Road to connect upcoming housing development with FrontRunner Station	Midvale	Midvale Ft Union	Bingham Junction Blvd. & 7200 S. to Bingham Junction Blvd. & Junction View Dr.	$75	$52,500		$10,500	$0	$23,493	$93,971			$800,000		2017	
BIKE	Provide a marked bike route using signs and/or pavement markings on Junction View Dr. and Fl Smidth Dr. connecting between Bingham Junction Blvd. and 7200 S.	Midvale	Midvale Ft Union	901 W LEGACY CENTER WY to 910 W LEGACY CENTER WY	$1	$1,080		$216								2017	
BIKE	Provide a marked bike route using signs and/or pavement markings on river Gate. Dr. from 7200 S. to 700 W.	Midvale	Midvale Ft Union	River Gate Dr. & 7200 S. to 700 W. & River Gate Dr.	$1	$1,425		$285								2017	
BIKE	Provide a bike route using signs or pavement markings on Bingham Junction Blvd. north from 7200 S. to River Gate Dr.	Midvale	Midvale Ft Union	Bingham Junction Blvd. & 7200 S. to Bingham Junction Blvd. & River Gate Dr.	$1	$900		$180								2017	

SALT LAKE COUNTY

								CITY		UTA MATCH		WFRC	UDOT		TIGER FUNDS		
TYPE	**DESCRIPTION**	**MUNICIPALITY**	**STATION NAMES**	**LOCATION**	**COST PER UNIT**	**EST TOTAL COST**	**CATNIP**	**LOCAL**	**FEDERAL**	**LOCAL**	**FEDERAL**		**FEDERAL**	**LOCAL**		**PHASING**	**COMMENTS**
ped	Install high visibility crosswalk treatment using different pavement coloring or pavers and flourescent yellow green signs. Conduct signal warrant analysis to determine if the intersection should be signalized or a HAWK crossing is warrented to improve c	Midvale	Midvale Ft Union	Bingham Junction blvd. & Tuscany View Rd.	$2,600	$2,600		$520								2018	
						$3,041,391	**$0**	**$21,194**	**$0**	**$33,086**	**$132,343**	**$0**	**$466,666**	**$1,600,000**	**$788,103**		
PED	Main Street Connecting Sidewalk and Protected/Buffered Bike Way: Sidewalk, Signing and Striping, ADA Ramps, Raised Pedestrian Crossings	Millcreek	Meadowbrook	Main Street: 3900 South to Big Cottonwood Creek/Murray City Boundary	$132	$330,825	$66,165									2020	
BOTH	Bike/Ped Bridge, signage (19) and 2 bus stops	Millcreek/Taylorsville/ West Valley City	Meadowbrook	3900 So/Jordan River	$6,667	$1,000,000.00				$6,000	$24,000					2019	
BIKE	Sign Shared Roadway on Cenral Ave. from Main St. to Commerce Dr.	Millcreek	Meadowbrook	Central Ave. & Main St. to Central Ave. & Commerce Dr.	$3	$6,830				$1,366	$5,464					2017	
BIKE	Implement bike lane design from UCATS Phase 2 work: Buffered Bike Lane - Signing and Striping	Millcreek and South Salt Lake	Meadowbrook	3900 South - 1300 W. to State Street	$11.50	$131,675	$26,335									2018	
						$1,469,330	**$92,500**	**$0**	**$0**	**$7,366**	**$29,464**	**$0**	**$0**	**$0**	**$1,340,000**		
bike	Repair Stand	Murray	Murray Central	FR Station	$1,500	$1,500				$300	$1,200					2017	
bike	Bike Racks	Murray	Murray Central	FR Station	$100	$500				$100	$400					2017	
	Bus Shelter	Murray	Murray Central	FR Station	$13,100	$26,200				$5,240	$20,960					2017	
	Message Board	Murray	Murray Central	FR Station	$2,000	$2,000				$400	$1,600					2017	
	Bus Shlters	Murray	Murray Central	State Street	$13,100	$78,600				$50,000	$50,000					2017	
BIKE	Bike lanes and intersection improvements along 700/900 East from Van Winkle to 9000 So	Murray/UDOT	Murray/Fashion Place			$1,090,822							$466,666			2020	
BIKE	Install bike lanes on 500 W. south from 4500 S. to Vine St	Murray	Murray Central	4500 S. & Riverside Dr. to Vine St & Riverside Dr.	$3	$70,000		$14,000		$14,000	$56,000					2018	
BOTH	Install a pedestrian and bicycle access on the south side of the station platform to the west to connect with apartment complex.	Murray	Murray Central	111 W FIRECLAY AVE	$250	$25,000		$5,000								2017	
BOTH	Continue mulit-use path along Big Cottonwood Creek from station to State Street	Murray	Murray Central	59 E GILBRIDE AVE to 345 E 4500 S	$200	$150,000		$30,000								2020	
BOTH	Continue multi-use path south to the station.	Murray	Murray Central	4274 S BIRKHILL BLVD	$200	$25,000		$5,000								2018	
BIKE	Install bike lanes on 500 W. north from 4500 S. to 3900 S.	Murray & Millcreek	Meadowbrook/Murra y	4500 S. & 500 W. to 3900 S. & 500 W.	$3	$12,752	$0			$2,550	$10,201					2019	
BOTH	Continue multi-use path to the west via viaducts/underpasses and bridges over rail corridors, I-15 and the Jordan River to connect with the Jordan River Parkway.	Murray & Millcreek	Meadownbrook/Murr ay	4252 S BIRKHILL BLVD		$1,000,000	$200,000									2021	
PED	New sidewalk on Jefferson St to connect high density housing on Lester St	Murray City	Fashion Place	Jefferson St from Winchester St to Lester Ave	$75	$135,000				$27,000	$108,000					2020	
PED	Sidewalk gaps on Lester St	Murray City	Fashion Place	Lester St from Jefferson St to 85 West	$75	$30,000				$6,000	$24,000					2017	
BOTH	New pedestrian overpass to connect paths, Medical Center, park, and numerous community assets in park.	Murray City	Murray Central	5101 S STATE ST		$6,500,000		$3,250,000								2021	50% local match from Murray
						$9,147,374	**$200,000**	**$3,304,000**	**$0**	**$105,590**	**$272,361**	**$0**	**$466,666**	**$0**	**$4,798,756**		
BOTH	Folsom Trail	Salt Lake City	North Temple			$2,000,000		$400,000								2018	
PED	Provide pedestrian path connection to Lucy Way.	Salt Lake City	Ballpark	180 W. 1300 S.		$400,000	$40,000	$80,000		$40,000	$160,000					2017	Still need $40,000 local match from City
BOTH	300 North rail overpass	Salt Lake City	North Temple			$4,500,000		$900,000				$2,869,777				2021	the federal WFRC dollars won't be fuly committed for a weeks

SALT LAKE COUNTY

								CITY		UTA MATCH		WFRC	UDOT		TIGER FUNDS		
TYPE	DESCRIPTION	MUNICIPALITY	STATION_NAMES	LOCATION	COST PER UNIT	EST TOTAL COST	CATNIP	LOCAL	FEDERAL	LOCAL	FEDERAL		FEDERAL	LOCAL		PHASING	COMMENTS
both	Upgrade current bus stop with solid surface landing area connected to sidewalk.	Salt Lake City	Power	1758 W. North Temple	$13,100	$13,100				$2,620	$10,480					2017	
	Add shelter and bench to bus stop waiting area	Salt Lake City	900 East	388 S 900 E	$20,000	$20,000				$4,000	$16,000					2016	
bike	Install bike racks and/or short term bike lockers	Salt Lake City	900 East	410 S 900 E	$200	$1,600				$320	$1,280					2016	
	Install shelter at bus stop	Salt Lake City	Stadium	380 University St	$1	$13,100				$2,620	$10,480					2017	
bike	Install bike racks	Salt Lake City	University Medical	10 North Mario Capecchi Drive	$500	$4,000				$800	$3,200					2017	
	Install bus shelter and bench.	Salt Lake City	Library	400 S. 270 E.	$13,100	$13,100				$2,620	$10,480					2017	
BIKE	GREENbike Expansion - 10 stations, 124 bikes	Salt Lake City	Library/Trolley/ North Temple/Fairpark/Arena/Temple Square/Courthouse/900 South/900 East	Salt Lake City	$75,000	$1,125,000		$230,000								2017-2019	Funds coming from GREENbike directly not SLC
ped	Pedestrain Activated Signal Crossings Main Street from 200 So - 900 So	Salt Lake City	Gallivan/ Courthouse	Salt Lake City		$200,000						$200,000				2020	
bike	Repair Stand	Salt Lake City	North Temple	North Temple	$1,500	$1,500				$300	$1,200					2017	
bike	Bike Racks	Salt Lake City	North Temple	North Temple	$100	$500				$100	$400					2017	
	Bus Shelter	Salt Lake City	North Temple	North Temple	$13,100	$26,200				$5,240	$20,960					2017	
	Message Board	Salt Lake City	North Temple	North Temple	$2,000	$2,000				$400	$1,600					2017	
bike	Repair Stand	Salt Lake City	SL Central	SL Central	$1,500	$1,500				$300	$1,200					2017	
bike	Bike Racks	Salt Lake City	SL Central	SL Central	$100	$500				$100	$400					2017	
	Bus Shelter	Salt Lake City	SL Central	SL Central	$13,100	$26,200				$5,240	$20,960					2017	
	Message Board	Salt Lake City	SL Central	SL Central	$2,000	$2,000				$400	$1,600					2017	
						$8,350,300	**$40,000**	**$1,610,000**	**$0**	**$65,060**	**$260,240**	**$3,069,777**	**$0**	**$0**	**$3,305,223**		
bike	Bike Racks	Sandy	Sandy Civic	Station	$100	$500				$100	$400					2017	
	Bus Shelter	Sandy	Sandy Civic	Station	$13,100	$26,200				$5,240	$20,960					2017	
	Message Board	Sandy	Sandy Civic	Station	$2,000	$2,000				$400	$1,600					2017	
bike	Install short term and long term bike racks.	Sandy	Sandy Civic		$660	$660				$132	$528					2017	
BOTH	Porter Rockwell Trail (8400 S to Pioneer Ave/8530 S)	Sandy	Historic Sandy	Sandy		$135,000	$33,750									2018	
BOTH	10000 S Trail (TRAX to Jordan Canal) Phase I and Phase II	Sandy	Sandy Expo	590 ft + 375 ft 10000 S Trail from TRAX to Jordan Canal Trail		$50,000	$12,500									2018	
bike	Install bike repair station (accessible to UTA and Rail Trail users)	Sandy	Sandy Civic	115 East Sego Lily Drive	$1,500	$1,500				$300	$1,200					2017	
						$215,860	**$46,250**	**$0**	**$0**	**$6,172**	**$24,688**	**$0**	**$0**	**$0**	**$138,750**		
bike	Repair Stand	South Jordan	Daybreak	FR Station	$1,500	$1,500				$300	$1,200					2017	
bike	Bike Racks	South Jordan	Daybreak	FR Station	$100	$500				$100	$400					2017	
	Bus Shelter	South Jordan	Daybreak	FR Station	$13,100	$26,200				$5,240	$20,960					2017	
	Message Board	South Jordan	Daybreak	FR Station	$2,000	$2,000				$400	$1,600					2017	
ped	Ped Project Interesection Improvement - Ped Actuated Signal Crossing	South Jordan/Daybreak	Daybreak	Daybreak Parkway to Lakerun Intersection	$269,400	$269,400						$269,400				2020	
BIKE	Stripe a bikelane from the roundabout to the South Jordan Parkway park-and-ride, allowing commuter cyclists to ride on the roadway rather than on the sidewalk.	South Jordan/Daybreak	Daybreak	Split Rock Dr. & South Jordan Parkway to South Jordan Parkway park-and-ride lot.	$3	$10,025				$2,005	$8,020					2018	
bike	Add bicycle repair station	South Jordan/Daybreak	Daybreak	11405 S. Grandville Ave.	$1,500	$1,500				$300	$1,200					2017	
BIKE	Stripe bike lanes from Mountain View Corridor to Grandville Ave. Currently, only short segmenet at the intersection of Mountain View corridor and Daybreak Pkwy are marked.	South Jordan/Daybreak	Daybreak	Daybreak Pkwy. & Mountain View Corridor to Daybreak Pkwy. & Grandville Ave.	$3	$3,465	$0			$693	$2,772					2018	

								CITY		UTA MATCH		WFRC	UDOT		TIGER FUNDS		
TYPE	DESCRIPTION	MUNICIPALITY	STATION_NAMES	LOCATION	COST PER UNIT	EST TOTAL COST	CATNIP	LOCAL	FEDERAL	LOCAL	FEDERAL		FEDERAL	LOCAL		PHASING	COMMENTS
BIKE	Install bike lanes on Jordan Gateway from South Jordan Pkwy. to 11400 S.	South Jordan	Daybreak	South Jordan Pkwy. & Jordan Gateway to 11400 S. & Jordan Gateway	$3	$17,375	$0			$3,475	$13,900					2018	
BIKE	Use shared lane markings to indicate shared-use of the lane in the merging zone at the intersection of South Jordan Pkwy. & Jordan Gateway. Currently there is a small sign that designates a bicycle route, but with no pavement markings.	South Jordan	Daybreak	10542 S JORDAN GATEWAY	$3	$3,749	$750									2017	
BIKE	Use shared lane markings to indicate shared-use of the lane in the merging zone at the intersection of South Jordan Pkwy. & Jordan Gateway. Currently there is a small sign that designates a bicycle route, but with no pavement markings.	South Jordan	Daybreak	10542 S JORDAN GATEWAY	$3	$3,749	$750									2017	
BIKE	Install bike lanes on River Front Pkwy. from South Jordan Pkwy. to 11400 S. with appropriate transitions for round abouts.	South Jordan	Daybreak	South Jordan Pkwy. & River Front Pkwy. to 11400 S. & River Front Pkwy.	$3	$17,466	$3,500									2018	
	Install shelters and seating at current bus stop.	South Jordan	Daybreak	10726 S. River Front Pkwy.	$1	$13,100				$2,620	$10,480					2016	
	Install shelters and seating at current bus stop.	South Jordan	Daybreak	10749 S. river Front Pkwy.	$1	$13,100				$2,620	$10,480					2016	
	Install shelters and seating at current bus stop.	South Jordan	Daybreak	10834 S. River Front Pkwy.	$1	$13,100				$2,620	$10,480					2016	
	Install shelters and seating at current bus stop.	South Jordan	Daybreak	10903 S. River Front Pkwy.	$1	$13,100				$2,620	$10,480					2016	
bike	Install bike repair stands.	South Jordan	Daybreak	10351 South Jordan Gateway	$1,280	$1,280				$256	$1,024					2017	
bike	Install a two-stage left turn bike box from South Jordan Parkway to 1300 W.	South Jordan	Daybreak	1300 W. & South Jordan Parkway	$2,000	$4,000	$800									2017	
bike	Stripe bike lanes from Mountain View Corridor to Mustang Trail Way. Currently, only short segment at the intersection of Mountain View Corridor and Daybreak Pkwy. are marked.	South Jordan & Herriman	Daybreak	Daybreak Pkwy. & Mountain View Corridor to 11800 S. & Mustang Trail Way	$3	$12,255	$2,500									2018	
bike	Install bike lanes on Jordan Gatweay from South Jordan Pkwy. to 9000 S.	South Jordan / Sandy	Daybreak	South Jordan Pkwy. & Jordan Gateway to 9000 S. & Sandy Pkwy.	$3	$30,786	$6,200									2018	
BIKE	Continue bike lanes on 1300 W. from Four B Ln. to 9000 S.	South Jordan / West Jordan	Daybreak	1300 W. & Four B Ln. to Temple Dr. & 9000 S.	$3	$7,597	$1,500									2018	
bike	Add bicycle repair station	South Jordn	Daybreak	10605 S. Grandville Ave.	$1,500	$1,500										2017	
						$466,746	**$16,000**	**$0**	**$0**	**$23,249**	**$92,996**	**$269,400**	**$0**	**$0**	**$65,101**		
PED	Provide mid-block crossing across 900 W. A HAWK beacon should be considered, especially with the construction of the Parley's Trail, but other options could work as well.	South Salt Lake	Central Pointe	2298 S 900 W	$89,000	$89,000		$89,000								2018	This is part of the Parley's 300 West to 900 West project.
BOTH	Complete the western section of the Parley's Trail from the existing pedestrian/bike facilites on the TRAX bridge over the Roper Rail yard.	South Salt Lake	Central Pointe	2265 S 900 W	$200	$571,000	$115,000									2020	Being done now by SLCO; will be built - 300 West-600 West to 900 West but not over Roper Yard
BIKE	Install short term bike parking.	South Salt Lake	Central Pointe	211 W. 2100 S.	$500	$3,500				$700	$2,800					2017	
	Bus Shlters	South Salt Lake	Central Pointe	State Street	$13,100	$78,600				$50,000	$50,000					2017	

SALT LAKE COUNTY

								CITY		UTA MATCH		WFRC	UDOT		TIGER FUNDS		
TYPE	DESCRIPTION	MUNICIPALITY	STATION NAMES	LOCATION	COST PER UNIT	EST TOTAL COST	CATNIP	LOCAL	FEDERAL	LOCAL	FEDERAL		FEDERAL	LOCAL		PHASING	COMMENTS
BOTH	Incorporate S-Line/Parley's Trail connection via Utopia Ave. and the South Salt Lake Master Plan	South Salt Lake	Central Pointe	193 W. 2100 S.	$200	$30,000	$6,000									2018	
PED	Install pedestrian crosswalks and signs between western bus stios and TRAX station.	South Salt Lake	Central Pointe		$1,100	$1,100										2017	
BOTH	Connect Parley's Trail and the Central Pointe station.	South Salt Lake	Central Pointe		$200	$450,000	$90,000									2020	
BOTH	Finish path connections to activate pedestrian and bike overpass over Roper Railyard.	South Salt Lake	Central Pointe		$200	$1,100,000	$220,000									2021	
BOTH	Parley's Trail Connection from State Street to 300 West - Design and construction	South Salt Lake	Central Pointe	State Street to 300 West		$150,000	$25,000									2018	
BIKE	Provide wayfinding to connect 300 E. bike lane via Gregson Ave., via existing signalized crosswalk on State Street.	South Salt Lake	Central Pointe	State Street and Gregson Ave.	$500	$3,000										2018	
BIKE	Bike lane connection to West Temple bike lane via Washinton St. and then to Gregson Ave.	South Salt Lake	Central Pointe	3227 S Washinton St. to Washington St. and Gregson Ave.	$3	$3,294	$600									2017	
BIKE	bike lane connection to West Temple bike lane via Gregson Ave.	South Salt Lake	Central Pointe	Washington St. and Gregson Ave. to West Temple and Greson Ave.	$3	$3,124	$600									2018	
BIKE	Continue bike lanes south along West Temple from UTA park-and-ride enterance to Central Ave.	South Salt Lake and Millcreek	Central Pointe	3844 S. West Temple to Central Ave. & West Temple	$3	$6,191				$1,238	$4,953					2018	
						$2,488,810	**$457,200**	**$89,000**	**$0**	**$51,938**	**$57,753**	**$0**	**$0**	**$0**	**$1,832,918**		
BOTH	Jordan River Ped Bridge to TRAX and Gardner Village	West Jordan	Jordan Valley	7800 South Jordan River		$347,700							$347,700			2021	West Jordan application
bike	Add bicycle repair station	West Jordan	Old Bingham Hwy	5651 W. Old Bingham Hwy.	$1,500	$1,500				$300	$1,200					2017	
BIKE	Provide a bike lane on Sugar Factory road between 2700 W. and 2200 W.	West Jordan	Jordan Valley	2700 W. & Sugar Factory Rd. to 2200 W. & Sugar Factory Rd.	$3	$7,796	$1,600									2018	
	Provide a shelter and bench at bus stop.	West Jordan	Jordan Valley	8035 S. 2700 W.	$13,100	$13,100				$2,620	$10,480					2017	
BIKE	Provide bike lanes on Old Bingham Hwy.from the existing bike lanes at Mountain View Corridor east to Halwey Park Rd. Current crossings at Mountain View Corridor should also be improved.	West Jordan	Sugar Factory	Old Bingham Hwy & Mountain View Corridor to Old Bingham Hwy. & Halwey Park Rd.	$3	$13,973	$2,800									2018	
bike	Add a bicycle box for each directional approach at the intersection of 9000 S. and 4800 W.	West Jordan	Old Bingham Hwy	9000 S. & 4800 W.	$1,800	$1,800	$360									2017	
BIKE	Install bike lanes on 4800 W. from Old Bingham Hwy. to existing facilities at the intersection of NewBingham Hwy. and 4800 W.	West Jordan	Old Bingham Hwy	Old Bingham Hwy. & 4800 W. to New Binghma Hwy. & 4800 W.	$3	$21,868	$4,400									2018	
PED	Continue sidewalk to Wasatch Meadows Dr.	West Jordan	Old Bingham Hwy	4773 W. Old Bingham Hwy	$75	$60,000		$12,000		$9,600	$38,400					2020	
BIKE	Install bike lanes on Old Bingham Hwy. from exisiting bike facilies on 9000 S. to Hawley Park Rd.	West Jordan	Old Bingham Hwy	9000 S. & Old Bingham Hwy & to Hawley Park Rd. & Old Bingham Hwy.	$3	$25,915	$5,200									2020	
bike	Install bike repair stands next to short-term bike parking.	West Jordan	Old Bingham Hwy	4773 W. Old Bingham Hwy	$1,280	$1,280										2017	
BIKE	Install bike route on 3200 S. from the existing bike facilities on 9000 S. to 7800 S. Install bike lanes where feasible and use signs and pavement markings where ROW is restricted.	West Jordan	Jordan Valley	9000 S. & 3200 W. to 7800 S. & 3200 W.	$3	$22,266	$4,400									2018	

SALT LAKE COUNTY

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TYPE	DESCRIPTION	MUNICIPALITY	STATION_NAMES	LOCATION	COST PER UNIT	EST TOTAL COST	CATNIP	LOCAL	FEDERAL	LOCAL	FEDERAL		FEDERAL	LOCAL		PHASING	COMMENTS
BIKE	Install bike lanes on 3400 W. from existing bike facilities on 9000 S. to 8660 S.	West Jordan	Jordan Valley	9000 S. & 3400 W. to 3354 W 8660 S	$3	$5,396				$1,079	$4,317					2019	
BOTH	Gardner Village TRAX connection-trail signage, ped signals	West Jordan	Gardner Village		$2,500	$650,000						$290,000				2019	
bike	Add bicycle repair stands.	West Jordan	Jordan Valley	3400 W. 8600 S.	$1,280	$1,280				$256	$1,024					2017	
bike	Add short term bicycle parking.	West Jordan	Jordan Valley	3400 W. 8600 S.	$200	$1,200				$240	$960					2017	
BIKE	Install bike route on 3200 W. from the existing bike facilities on 9000 S. to 9800 S. Install bike lanes where feasible and use signs and pavement markings where ROW is restricted.	West Jordan	Jordan Valley		$3	$14,839	$3,000									2018	
bike	Install a two-stage left turn bike box for left turning movements from 9000 S. to 3400 W.	West Jordan	Jordan Valley	9000 S. & 3400 W.	$1,800	$1,800	$360									2018	
BIKE	Install appropriate right turn bike lane transition.	West Jordan	West Jordan City Center	7800 S. & Redwood Rd.	$3	$284	$60									2017	
both	Install wayfinding sigange to Gardner Village and Jordan River Parkway trail.	West Jordan	West Jordan City Center	1127 W 7800 S	$500	$3,000	$600									2017	
	Provide shelters and seating at bus stops adjacent to station.	West Jordan	West Jordan City Center	1127 W 7800 S	$1	$13,100				$2,620	$10,480					2017	
	Provide shelters and seating at bus stops adjacent to station.	West Jordan	West Jordan City Center	1126 W 7800 S	$1	$13,100				$2,620	$10,480					2018	
PED	2 Sidewalk connections to station	West Jordon	Riverpark Station	2320 S on west side of street	$324	$162,000		$32,000								2018	
BIKE	Install pavement marking sharrows that signal to cyclists and autombiles that bikes can use the right lane. The roadway is too narrow to install bike lanes, but this will allow those comfortable riding in traffic with a more direct route.	West Jordan	West Jordan City Center	1127 W 7800 S to 8056 S MAIN ST	$3	$11,644	$2,400									2017	
BIKE	Install bike lanes on Temple Dr. south from 7800 S. to 9000 S.	West Jordan	West Jordan City Center	Temple Dr. & 7800 S. to Temple Dr. & 9000 S.	$3	$22,138	$4,400									2018	
BIKE	Install bike lanes on Temple Dr./1300 W. north from 7800 S. to 5400 S.	West Jordan / Taylorsville	West Jordan City Center	Temple Dr. & 7800 S. to 1300 W. & 7000 S.	$3	$46,491	$9,500									2019	
						$1,463,469	**$39,080**	**$44,000**	**$0**	**$19,335**	**$77,341**	**$290,000**	**$347,700**	**$0**	**$646,013**		
BIKE	Stripe bike lanes from Jordan River trail to Redwood Rd. along 2320 S.	West Valley	West Valley Central	1035 W. 2320 S. to Redwood Rd. & 2320 S.	$3	$13,504		$945		$2,701	$10,803					2018	
	Provide bus shelter.	West Valley	West Valley Central	2327 S Redwood Rd.	$13,100	$13,100				$2,620	$10,480					2017	City says not priorities - should we delete?
	Provide bus shelter, bench, and trash can.	West Valley	West Valley Central	2340 S redwood Rd.	$13,100	$13,100				$2,620	$10,480					2017	City says not priorities - should we delete?
BIKE	Install bicycle treatment on the 215 overpass	West Valley City	West Valley City Central	3100 S	$3	$4,260		$300		$852	$3,408					2017	
BIKE	Install bike sharrows through 3100 South 2700 West intersection	West Valley City	West Valley City Central	3100 South 2100 West	$1	$240		$20		$48	$172					2017	
ped	Restripe intersection crosswalks with high visibility paint and striping	West Valley City	West Valley City Central	3100 S Decker Lake Dr	$2,000	$8,000		$560		$1,600	$6,400					2018	
BIKE	Provide additional bike lane identification along 2700 W. with bike buffers and bike stencils.	West Valley City	West Valley City Central	3500 S. & 2700 W. to 3590 S.	$4	$2,637	$0	$200								2019	
						$54,841	**$0**	**$2,025**	**$0**	**$10,441**	**$41,743**	**$0**	**$0**	**$0**	**$632**		
						$28,422,234	**$999,040**	**$5,070,219**	**$0**	**$328,277**	**$1,013,089**	**$4,259,677**	**$1,281,032**	**$1,600,000**	**$13,870,899**		
TOTAL LOCAL MATCH					**$7,997,536**	**28%**											
TOTAL FEDERAL MATCH					**$6,553,798**	**23%**											

						CITY/CO MATCH		UTA MATCH		MAG	UDOT MATCH			
TYPE	DESCRIPTION	MUNICIPALITY	STATION NAME	LOCATION	EST TOTAL COST	LOCAL	FEDERAL	LOCAL	FEDERAL		LOCAL	FEDERAL	PHASING	COMMENTS
bike	Repair Stand	Provo	Prove FR Station	FR Station	$1,500			$300	$1,200				2017	UTA PE Dollars
bike	Bike Racks	Provo	Prove FR Station	FR Station	$500			$100	$400				2017	
	Bus Shelter	Provo	Prove FR Station	4259677	$10,000			$2,000	$8,000				2017	
	Message Board	Provo	Prove FR Station	FR Station	$2,000			$400	$1,600				2017	
BOTH	Bike/Ped Bridge	Provo	Prove FR Station	Provo FR Station	$1,900,080				$0				2019	The Provo FrontRunner Station is sited on the south side of the rail corridor through Provo. Most residences are on the north side, consequently most A/T access is via an at-grade road crossing over four active rail lines. Trains are regularly stopped in this zone, blocking all access, diverting traffic east to a highway viaduct. This is neither attractive nor safe for A/T users as the viaduct has only a narrow sidewalk. A/T users are regularly observed weaving between stopped train cars in order to access the station, a huge safety concern. A 180 ft single span pedestrian overpass parallel to Provo 200 W would solve this problem.
ped	Stripe high-visibility ladder (Zebra/Continental) crosswalk on all legs of the roundabout.	Provo	Prove FR Station	200 West/920 South	$2,000			$400.0	$1,600.0				2017	City Supports
					$1,916,080	**$0**	**$0**	**$3,200.0**	**$12,800.0**	**$0.0**	**$0**	**$0**		
bike	Repair Stand	Orem	Orem FR Station	FR Station	$1,500			$300	$1,200				2017	UTA PE Dollars
bike	Bike Racks	Orem	Orem FR Station	FR Station	$500			$100	$400				2017	UTA PE Dollars
	Bus Shelter	Orem	Orem FR Station	FR Station	$10,000			$2,000	$8,000				2017	UTA PE Dollars
	Message Board	Orem	Orem FR Station	FR Station	$2,000			$400	$1,600				2017	UTA PE Dollars
BOTH	Sidewalk from 1000 S to station (southside)	Orem	Orem FR Station	1000 South 1350 West	$45,000	$45,000							2018	going in with current private development
					$59,000	**$45,000**	**$0**	**$2,800**	**$11,200**	**$0**	**$0**	**$0**		
bike	Repair Stand	American Fork	American Fork FR Station	FR Station	$1,500			$300	$1,200				2017	UTA PE Dollars
bike	Bike Racks	American Fork	American Fork FR Station	FR Station	$500			$100	$400				2017	UTA PE Dollars
	Bus Shelter	American Fork	American Fork FR Station	FR Station	$10,000			$2,000	$8,000				2017	UTA PE Dollars
	Message Board	American Fork	American Fork FR Station	FR Station	$2,000			$400	$1,600				2017	UTA PE Dollars
ped	Improve underpass sidewalk and lighting	American Fork	American Fork FR Station	200 South/Frontage Rd	$0								2018	See #761
BIKE	Frontage road bike lanes (American Fork B&PMP)	American Fork	American Fork FR Station	Frontage Rd	$12,212								2018	See #761
ped	Connect UTA routes 811 and 850 with the American Fork FrontRunner Station	American Fork	American Fork FR Station	782 West 200 South	$0								2018	See #761
					$26,212	**$0**	**$0**	**$2,800**	**$11,200**	**$0**	**$0**	**$0**		
	Repair Stand	Lehi	Lehi FR Station	FR Station	$1,500			$300	$1,200				2017	UTA PE Dollars
bike	Bike Racks	Lehi	Lehi FR Station	FR Station	$500			$100	$400				2017	UTA PE Dollars
	Bus Shelter	Lehi	Lehi FR Station	FR Station	$10,000			$2,000	$8,000				2017	UTA PE Dollars
	Message Board	Lehi	Lehi FR Station	FR Station	$2,000			$400	$1,600				2017	UTA PE Dollars
bike	Bike lockers/racks on the west side of station	Lehi	Lehi FR Station	3101 North Ashton Boulevard	$9,200			$1,840	$7,360				2018	City Supports - UTA PE Dollars
PED	Jordan River / Murdock Connector Trail - paved path (MAG RTP 2015)	Lehi	Lehi FR Station	Between Garden Dr and Jordan River Trail	$2,890,000	$196,262				$2,693,728			2019	MAG Funded TIP Project/local match committed
BIKE	2300 W (Triumph Boulevard)-Buffered Bike Lane and overpass (MAG RTP 2015)	Lehi	Lehi FR Station	2300 West	$32,100,000	$0	$0				$32,000,000		2019	Buffered bike lanes will be $15,000To go in with funded I-15 Technology Corridor Project/Price TBD
BOTH	Trail overpass at SR 92; The overpass will make this connection between the Murdock and the Rail Trail much safer and far more comfortable	Lehi	Lehi FR Station	I-15 and SR 92	$2,000,000								2020	Trail overpass at SR 92: The Lehi Tech Corridor is a rapidly growing business and residential area that surrounds the intersection of I-15 and SR 92 in north Utah County. The 18 mile Murdock Canal Trail and the 6 mile Lehi Rail Trail meet on the south side of SR 92, east of I-15 in Lehi, and the Rail Trail continues north into Salt Lake County. To the west of I-15 is the Lehi FrontRunner Station. The Murdock runs east to west along SR92, and is a heavily used A/T route from the station to surrounding businesses. The Rail Trail runs north-south and is built within the ROW for the future Light Rail into Utah County and is also heavily used to connect residential neighborhoods to this tech corridor, including from Salt Lake County. Currently trail users must cross SR 92 at-grade across seven lanes of high speed, high volume traffic. Waiting for a crossing signal is quite long, well over 1.5 minutes after signal call and during rush hour is far longer.
ped	Stripe high-visibility ladder (Zebra/Continental) crosswalk and sign on all Club House Dr. I-15 on/off ramps.	Lehi	Lehi FR Station	Club House Dr	$0			**$13,040**	**$52,160**		**$0**	**$0**	**2018**	city supports
					$37,013,200	**$196,262**	**$0**	**$17,680**	**$70,720**	**$2,693,728**	**$32,000,000**	**$0**		
BIKE	Vineyard Connector Trail or Vineyard Connector Buffered Bike Lane (MAG RTP 2015)	American Fork/ Unincorporated Utah County	American Fork FR Station	200 South (Undeveloped land)	$0								2019	See #761 - included
BIKE	200 S buffered bike lanes (American Fork B&PMP)	American Fork/ Unincorporated Utah County	American Fork FR Station	200 South									2019	See #761 - included

UTAH COUNTY

						CITY/CO MATCH		UTA MATCH		MAG	UDOT MATCH			
TYPE	**DESCRIPTION**	**MUNICIPALITY**	**STATION NAME**	**LOCATION**	**EST TOTAL COST**	**LOCAL**	**FEDERAL**	**LOCAL**	**FEDERAL**		**LOCAL**	**FEDERAL**	**PHASING**	**COMMENTS**
PED	Trail and other improvements along 200 S (High Priority Sidewalk – American Fork B&PMP)	American Fork/ Unincorporated Utah County	American Fork FR Station	200 South (850 E - I-15 underpass)	$4,877,000	$330,173				$4,546,827			209	MAG Funded TIP Project/local match committed
PED	Provo River Parkway Gap Project - 10' Asphalt Trail	Utah County / Wasatch County	Orem FR Station/Provo FR Station	Vivian Park to Deer Creek Dam	$4,000,000	$800,000							2020	Cities and counties support, regional priority, pledged match
					$8,877,000	**$1,130,173**	**$0**	**$0**	**$0**	**$4,546,827**	**$0**	**$0**		
					$47,891,492	**$1,371,435**	**$0**	**$26,480**	**$105,920**	**$7,240,555**	**$32,000,000**	**$0**		
TOTAL LOCAL MATCH					**70%**									
TOTAL FEDERAL MATCH					**0%**									

SUMMIT COUNTY

							CITY/CO MATCH		UTA MATCH		UDOT MATCH		TIGER FUNDS	PHASING	
ID NUMBER	TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	STATION NAME	EST TOTAL COST	LOCAL	FEDERAL	LOCAL	FEDERAL	LOCAL	FEDERAL			COMMENTS
	BOTH	Paved 10 foot commuter path connection along SR224 between Kimball Junction and SilverSprings Drive	Summit Co	SR224 between Kimball Junction and SilverSprings Drive	Kimball Junction	1,100,000	550000							2018	Summit co funding half with local funds
	bike	Bike Share Prgram-- 8 Stations	Summit Co	Summit Co	Kimball Junction	1000000	500000							2018	Funds for bike share stations (8 total and O&M for 1 year); all $500,000 funded locally by Summit Co, Park City, Vail Resorts, Newpark Business Owners, Central Dev, The CanyonsRVMA, and Tanger Outlets
SUMMIT TOTALS						**2,100,000**	**1,050,000**	**0**	**0**	**0**	**0**	**0**	**1,050,000**		
TOTAL LOCAL MATCH						**50%**									
TOTAL FEDERAL MATCH						**0%**									

TOOELE COUNTY

							CITY/CO MATCH		UTA MATCH			UDOT MATCH		PHASING	
ID NUMBER	TYPE	DESCRIPTION	MUNICIPALITY	LOCATION	EST TOTAL COST	CITY/CO PRIORITY	LOCAL	FEDERAL	PROP 1	LOCAL	FEDERAL	LOCAL	FEDERAL		COMMENTS
	BIKE	Bike lanes - 2.5 miles	Tooele	Tooele	$55,000				$27,500					2017	
	BOTH	Stansbury Park SR36 Sound Wall Bike/Walk Trail	Tooele/Stansbury	SR36 Sound Wall	$400,000				$80,000					2019	
		Bus Stops and Shelters	Tooele	Tooele	$60,000				$30,000					2017	
TOOELE TOTALS					**$515,000**		**$0**	**$0**	**$137,500**	**$0**	**$0**	**$0**			
TOTAL LOCAL MATCH					**27%**										
TOTAL FEDERAL MATCH					**0%**										

UTA Contributions

	Total Projects	Estimated Costs	Local City/Co Contributions	Prop 1	Local	Formula	WFRC Contributions	MAG Contributions	UDOT Contributions
Weber County	28	$5,047,900	$55,700	$1,056,100	$0	$0	$480,000	$0	$0
Davis County	117	$3,617,489	$712,012	$579,047	$0	$0	$0	$0	$0
Salt Lake County	162	$28,422,234	$6,069,259	$0	$328,277	$1,013,089	$4,259,677	$0	$2,881,032
Utah County	30	$47,891,492	$1,371,435	$0	$26,480	$105,920	$0	$7,240,555	$32,000,000
Summit County	2	$2,100,000	$1,050,000	$0	$0	$0	$0	$0	$0
Tooele County	2	$515,000	$0	$137,500	$0	$0	$0	$0	$0
Jordan River Commission	2	$213,227	$0	$0	$42,645	$170,582	$0	$0	$0
Total	**343**	**$87,807,342**	**$9,258,406**	**$1,772,647**	**$397,403**	**$1,289,591**	**$4,739,677**	**$7,240,555**	**$34,881,032**
					Total UTA	$3,459,641			

Match %	Costs	TIGER Local Match	Other Dedicated Federal Match	Federal Funds	State Funds	TIGER Grant	TIGER Grant Percentage of Total Cost	Other Federal Funds as Percentage of Total Costs	TOTAL TIGER FUNDS
67.85%	$87,807,342	$10,234,828	$1,193,628	$13,269,823	$34,881,032	$28,228,031	32.15%	6.62%	$28,228,031

	Total Dollars	Total Feet	Total Mile	Total # of Projects by Typology	Non-feet projects
BIKE	$38,370,785	354,878.00	67.21	125	
PED	$14,931,875	28,024.54	5.31	113	
BOTH	$28,427,674	36,665.00	6.94	41	
Total	$81,730,334	419,567.54	79.46	263	203

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APPENDIX 3:
ICARO FULL BENEFIT-COST ANALYSIS

FIRST/LAST MILE CONNECTIONS:
IMPROVING COMMUNITY ACCESS TO REGIONAL OPPORTUNITIES

UTA

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Improving Community Access to Regional Opportunities

Benefit-Cost Analysis

Economic Analysis Supplementary Documentation

2016 TIGER Grant Program

April 22, 2016

A benefit-cost analysis (BCA) was conducted for the Improving Community Access to Regional Opportunities (ICARO) application which includes 466 projects to improve first and last mile access to thirty-six transit stations throughout six counties in the greater Salt Lake Region. The analysis provided was prepared for submission to the U.S. Department of Transportation (U.S. DOT) as a requirement of a discretionary grant application for the Transportation Investment Generating Economic Recovery (TIGER) 2016 program. The analysis was conducted in accordance with the benefit-cost methodology as recommended by the U.S. DOT in the 2016 TIGER Benefit-Cost Analysis Guidance.[1] The period of analysis corresponds to twenty-six years and includes six years of construction and twenty years of benefits after full completion of all the identified projects is assumed to begin in 2022. Prior to 2022 incremental benefits have been monetized for projects as they are completed.

Utah Transit Authority's (UTA) ICARO project is part of the first phase of their First and Last Mile Strategy[2] to improve access to their stations throughout the greater Salt Lake region. It is made up of thirty-six top-priority stations, chosen based on their ability to increase ridership and improve safety, and associated treatments, based on the First and Last Mile Strategies Study. The goal is to make safety and comfort improvements to encourage residents to access the light rail system, with the particular goal of increasing the number of people who access the system on foot or by bike.

UTA has identified the ICARO project as a priority improvement investment for the region. UTA is requesting $28 million in TIGER Grant funding to match existing UTA and regional commitments of federal and state funding to complete all of the projects included in the $87.8 million plan. The ICARO project will not only provide safe and convenient access to public transit throughout the region but will also provide local communities and municipalities with improved connections to other regional facilities including bike trail facilities such as the Denver-Rio Grande Western Rail Trail, Murdock Canal Trail and Legacy Parkway. Based on the improvements included in the ICARO project, the following variables were monetized for the benefit-cost analysis:

- Reductions in vehicle operations & maintenance costs, pavement damage, and noise with reduced vehicle miles traveled attributed to mode shift from driving to transit;
- Safety benefits due to a reduction in crash rates with reduced vehicle miles traveled attributed to mode shift from driving to transit;
- Safety benefits for the general communities around the planned improvements;
- Health benefits attributed to people accessing transit stations by walking or cycling and;
- Emissions reductions associated with reduced vehicle miles traveled attributed to mode shift from driving to transit.

Offsetting the above benefits, the monetized dis-benefit attributed to greater travel times as a result of mode shift from personal vehicles to transit has also been considered. Based on regional information on travel times by mode a 2.012 factor was applied to average vehicle travel time based on weighted average travel time using the number of new trips generated per transit station and the corresponding average travel time for vehicle and transit during rush hour. In addition to the travel time between

[1] U.S. Department of Transportation. Benefit-Cost Analysis Guidance for TIGER Applicants. 2016. https://www.transportation.gov/policy-initiatives/tiger/tiger-bca-guidance

[2] UTA, *First/Last Mile Strategies Study,* April 2015

origin and destination station the factor includes the average time it takes for users to access the station from their home or place of work and time spent waiting at the station, which was derived using the average headway divided by two. This is a conservative approach considering the strong reliability of the current transit system which allows users to adjust their departure time to reduce waiting time at the station.

Based on the above benefits, Table ES-1 shows the overall base case results of the BCA. In 2015 dollars, the project benefits will lead to an overall Net Present Value of $70.1 million and a Benefit Cost Ratio (BCR) of 2.04 with a 7 percent discount rate. Using a 3 percent discount rate the BCR increases to 2.99. The base case analysis includes the benefits listed above, capital costs and future offsets for the residual value of those improvements calculated using straight line depreciation, and increases in projected routine operations and maintenance and periodic repair and replacement costs attributed to the project improvements. The base case excludes benefits that would be attributed to increased cycling and walking as a result of improved access to the regional trail networks. Using the methodology presented in the National Cooperative Highway Research Program (NCHRP) report 522, *Guidance for Analysis of Investments in Bicycle Facilities* (2006)[3] as the sensitivity case the BCR increases to 3.57 using a 7 percent discount rate and 5.39 using a 3 percent discount rate.

Table ES-1. Benefit Cost Analysis Summary Results

Scenario	Net Present Value (2015 $)	B/C ratio Base Case	B/C ratio Sensitivity [A]
Assuming a 7% discount rate	$70,096,064	2.04	3.57
Assuming a 3% discount rate	$149,620,863	2.99	5.39

[A] Sensitivity test includes benefits associated to projected increases in cycling as a result of bike lane improvements that provide connections to the regional trail network.

The overall project benefit matrix can be seen in Table ES-2.

[3] Transportation Research Board, *NCHRP Report 552: Guidelines for Analysis of Investments in Bicycle Facilities*, Washington D.C. 2006

Table ES-2: Project Impacts and Benefits Summary, Monetary Values in Millions of 2015 Dollars

Current Status/Baseline & Problem to be Addressed	Change to Baseline/Alternatives	Type of Impact	Population Affected by Impact	Economic Benefit (dis-benefit)	Summary of Results (at 7% discount rate)	Summary of Results (at 3% discount rate)
Limited station access, safety concerns, and lack of connectivity to the UTA network	Improved station access through infrastructure enhancements around 37 UTA stations providing safe access and allowing for enhanced connectivity to the UTA network	Commuters switching from driving to transit	Auto commuters switching to transit	Travel time increase (dis-benefit)	($44.7 million) decrease	($76.3 million) decrease
		Commuters switching from driving to transit	Auto drivers switching to transit	Fuel savings	$14.8 million in savings	$25.6 million in savings
		Commuters switching from driving to transit and safety enhancements	Drivers and society within the vicinity of station improvements	Reduced fatalities and injuries	$99.4 million in savings	$165.5 million in savings
		Commuters switching from driving to transit	Society and surrounding communities	Reductions in emissions	$4.6 million in savings *	$4.7 million in savings
		Commuters switching from driving to transit	Auto drivers switching to transit	Reduction in driver O&M costs, non-fuel	$59.7 million in savings	$99.5 million in savings
		Commuters switching from driving to transit	Society and surrounding communities	Reduction in noise	$231,000 in savings	$385,000 in savings
		Commuters switching from driving to transit	Government and society	Reduction in pavement damage	$231,000 in savings	$385,000 in savings
		Commuters accessing transit by cycling or walking	Transit riders accessing stations through cycling and walking	Lower healthcare costs	$3.1 million in savings	$5.1 million in savings

** The social cost of carbon was discounted at a 3 percent discount rate, consistent with the U.S. DOT's guidance.*

Contents

1 Introduction

A benefit-cost analysis (BCA) was conducted for the Improving Community Access to Regional Opportunities (ICARO) project for submission to the U.S. Department of Transportation (U.S. DOT) as a requirement of a discretionary grant application for the TIGER 2016 program. The following section describes the BCA framework, evaluation metrics, and report contents.

1.1 BCA Framework

A BCA is an evaluation framework to assess the economic advantages (benefits) and disadvantages (costs) of an investment alternative. Benefits and costs are broadly defined and are quantified in monetary terms to the extent possible. The overall goal of a BCA is to assess whether the expected benefits of a project justify the costs from a national perspective. A BCA framework attempts to capture the net welfare change created by a project, including cost savings and increases in welfare (benefits), as well as dis-benefits where costs can be identified (e.g., project capital costs), and welfare reductions where some groups are expected to be made worse off as a result of the proposed project.

The BCA framework involves defining a Base Case or "No Build" Case, which is compared to the "Build" Case, where the grant request is awarded and the project is built as proposed. The BCA assesses the incremental difference between the Base Case and the Build Case, which represents the net change in welfare. BCAs are forward-looking exercises which seek to assess the incremental change in welfare over a project life-cycle. The importance of future welfare changes are determined through discounting, which is meant to reflect both the opportunity cost of capital as well as the societal preference for the present.

The analysis was conducted in accordance with the benefit-cost methodology as recommended by the U.S. DOT in the 2016 FASTLANE Benefit-Cost Analysis Guidance.[4] This methodology includes the following analytical assumptions:

- Assessing benefits with respect to each of the five long-term outcomes defined by the U.S. DOT;
- Defining existing and future conditions under a No Build base case as well as under the Build Case;
- Estimating benefits and costs during project construction and operation, including at least 20 years of operations beyond the Project completion when benefits accrue;
- Using U.S. DOT recommended monetized values for reduced fatalities, injuries, property damage, travel time savings, and emissions, while relying on best practices for monetization of other benefits;
- Presenting dollar values in real 2015 dollars. In instances where cost estimates and benefits valuations are expressed in historical dollar years, using an appropriate Consumer Price Index (CPI) to adjust the values;
- Discounting future benefits and costs with real discount rates of 7 percent and 3 percent (sensitivity analysis) consistent with U.S. DOT guidance;

[4] U.S. Department of Transportation. Benefit-Cost Analysis Guidance for TIGER Applicants. 2016.

1.2 PRISM

This benefit cost analysis was done using PRISM™, a benefit cost analysis tool that uses a methodology consistent with the most recent guidelines developed by USDOT. The tool determines benefits according to the following five categories: Quality of Life; Economic Competitiveness; Safety; State of Good Repair; and Environmental Sustainability. Due to the nature of this project benefits (and dis-benefits) were realized for all five categories.

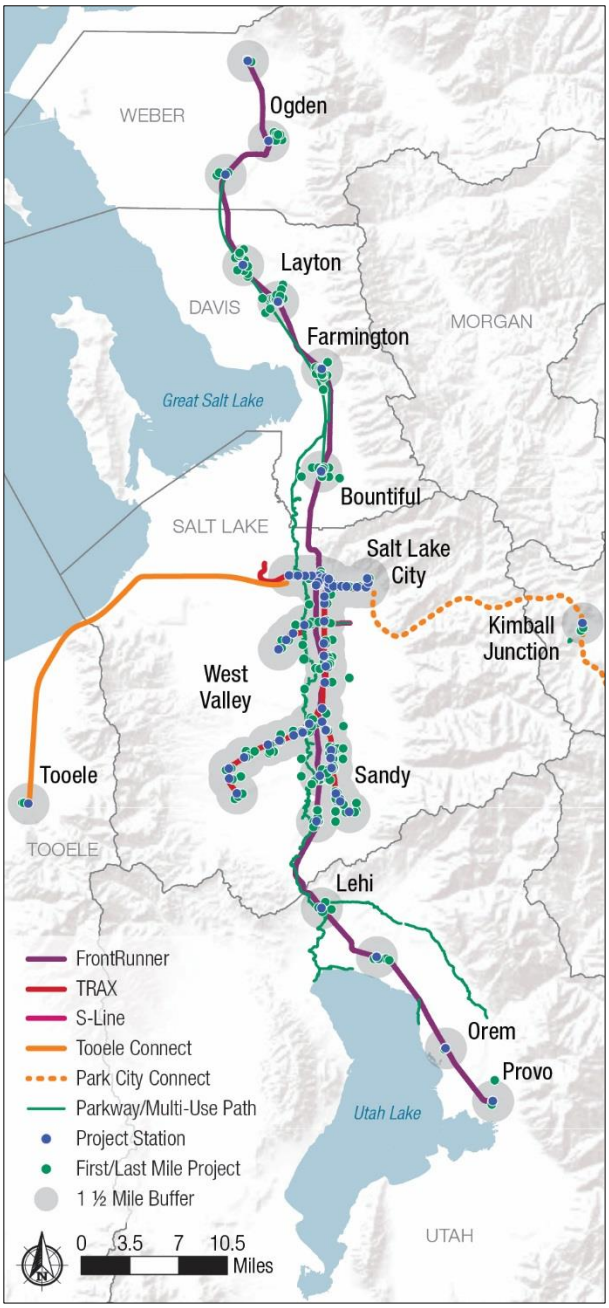
1.3 Report Contents

Section 2 presents an overview of the ICARO project and the analytical assumptions used in the structure of the benefit-cost analysis. Section 3 provides detail on the data inputs and assumptions included in the analysis. Finally, Section 4 presents a summary of the benefit-cost analysis results.

2 Project Overview

2.1 Description

ICARO, is Utah Transit Authority's (UTA) Phase I First/Last Mile Strategy Implementation plan. It includes over 466 improvements at thirty-six transit stations, focused on improving access, safety, and connectivity to the UTA network. The goal of the project is to increase transit ridership by implementing the supported strategies identified in the First/Last Mile Strategies Study, and to work with municipalities and other stakeholders to provide a safer, more convenient travel environment where residents from across the region can feel more comfortable, and confident in walking, biking, or taking transit to access the UTA transit system. This far-ranging, multi-modal, regional project will:



- Build more than 79 miles of network connections, including cross-walks, trail connections, sidewalks, and bike lanes and filling sidewalk and network gaps along commuting trails;
- Implement 203 separate "spot treatments" such as bus shelters and ADA accessible pads, sidewalk condition improvements, curb extensions and curb cuts, raised crosswalks, HAWK beacons, detectable bicycle and pedestrian warnings, painted or protected bike lanes, improved wayfinding, street and station lighting, bike parking, and bike maintenance kiosks.

By building these improvements, ICARO will:

- Provide better connectivity and access to UTA's transit network for 89,396 people with disabilities, 191,350 people of color, and 388,650 low-income residents;
- Link transit stations and downtowns with active transportation corridors;
- Increase safety for people walking to transit, by adding 154 pedestrian safety treatments within 1.5 miles of UTA's stations;
- Ensure that busses, vanpools, and other transit vehicles have safe and efficient access to UTA's rail stations.

The *First/Last Mile Strategies Study* estimates that the entire set of improvements identified in the study could result in a 3-6% increase in the number of riders on the UTA transit system. The specific stations and treatments identified in the ICARO project (Phase I) are estimated to have a ridership impact of approximately 2%, adding more than 760,000 new annual boardings. The benefits of approaching these types of first/last mile problems from a regional perspective is that the improvements are leveraged to improve the overall sense of connectivity of the network. If UTA were to simply make small, incremental changes at discreet locations, patrons of the system may not feel that they can get to or from the transit system once arriving at their destinations; also, by addressing the needs of the region as a whole, the ridership benefits are regionally cumulative rather than geographically isolated. A regional approach also allows UTA to engage with third parties whose mission is to help disadvantaged populations along the Wasatch Front and demonstrate benefits to a larger population.

UTA has built more than 70 miles of new light rail and commuter rail line within the last seven years. While this investment represents significant capital improvements to the transit system, there has been a shift within the region and at UTA away from an emphasis on capital expansion to a focus on leveraging this new infrastructure. The ICARO project represents the first significant investment toward leveraging this new rail investment and broadening its impact through targeted improvements around the infrastructure itself. The ICARO project represents a structured, prioritized approach to making connectivity improvements, focusing in areas where significant growth is projected or where treatments help traditionally underserved populations. The ICARO project allows for a regionally collaborative, data-driven, results-oriented approach to a project that would otherwise be handled in a piecemeal fashion and dependent on local governments, funding, and political winds.

2.2 Analytical Assumptions

2.2.1 Evaluation Period

The evaluation period includes the relevant (post-design) construction period during which capital expenditures are undertaken, plus 20 years of operations beyond initial project completion of the first phase of projects within which to accrue benefits. For the purposes of this study, project construction begins in 2016. The construction period continues for six years until final completion in 2021. The analysis period, therefore, begins with the first expenditures occurring in 2016 and continues after project completion in 2021 through 20-years of full operations, or through 2041.

With the assumption that the initial phase of project construction begins in 2016 and not all improvements specific to a station location will be complete within a single calendar year, a conservative approach was taken in that benefits for a station will not be monetized until the last year in which individual station improvements are completed.

2.2.2 Discount Rates

For project investments, dollar figures in this analysis are expressed in constant 2015 dollars. In instances where certain cost estimates or benefit valuations were expressed in dollar values in other

(historical) years, the U.S. Bureau of Labor Statistics' Consumer Price Index for Urban Consumers (CPI-U) was used to adjust them to 2015 dollars.[5]

The real discount rates used for this analysis were 7.0 percent and 3.0 percent (sensitivity analysis), consistent with U.S. DOT guidance for 2016 TIGER grants.[6]

2.3 Base Case and Build Case

For the purpose of this analysis, a base case, or "No Build" scenario, and a Build scenario are assumed. The No Build scenario represents future conditions assuming no improvements are made to the existing infrastructure. The Build scenario represents future conditions with inclusion of the project investment and the associated benefits and costs.

2.4 Project Costs

In the benefit-cost analysis, the term "cost" refers to the additional resource costs or expenditures required to implement, and maintain the investments associated with the ICARO project improvements. The BCA uses project costs that have been provided by UTA. All costs were provided in current dollars and discounted accordingly based on project schedule.

2.4.1 Initial Project Investment Costs

Initial project investment costs include engineering and design, construction, real estate services, and other capital investments. These costs were reported by UTA and include costs beginning in 2016, continuing through six years of construction, and ending in 2021. All of the ICARO project improvements are expected to be completed by the beginning of calendar year 2022.

A summary of project costs is presented in Table 1. In undiscounted terms, the capital costs total $87.8 million (2015 $). At a 7 percent real discount rate, the total present value of costs are $66.3 million; at a 3 percent discount rate, the total present value of costs are $77.6 million.

Table 1: Project Schedule and Costs, Millions of 2015 Dollars

Variable	Unit	Value
Construction Start	Year	2016
Construction End	Year	2021
Construction Duration	Years	6
Full Completion of all Projects	Year	2022
Capital Cost – Construction, Professional Services, and Right-of-Way	$ M	87.8
Operations and Maintenance (O&M) Costs	$ M/Year	0.3
Repair and Replacement (R&R) Costs	$ M/Year	0.2

[5] U.S. Bureau of Labor Statistics. Consumer Price Index, All Urban Consumers, U.S. City Average, Series CUSR0000SA0. 1982-1984=100

[6] TIGER 2015 NOFA: Benefit-Cost Analysis Guidance, Updated March 27, 2015; http://www.dot.gov/tiger/guidance

2.4.2 Ongoing Annual Costs

Operations and maintenance costs are expected to be higher as a result of improvements associated with this project, specifically barrier separated bike lane facilities, and bike-share stations. As a conservative approach the higher costs associated to bike-share stations do not considered other sources of O&M funding through user fees, community contributions, and sponsorship.

2.4.3 Residual Value

After the initial capital investments for the ICARO project, periodic incremental rehabilitation and replacement costs are anticipated to be incurred to maintain the assets and achieve projected life-cycles of the improvements. Costs associated to rehabilitation and replacements are based on industry experiences on other bicycle facilities and are estimated to be the equivalent of 3.8 percent of initial capital outlays spread over a 20 year horizon. With continued maintenance of the projects they are assumed to have a weighted average life cycle of 50 years, after which point all of the improvements with the longest life cycle projections will be in need of complete replacement. The benefit cost period analyzed ends in 2041 – therefore at the end of the analysis period, some infrastructure that has been put in place will not have been completely worn out, and will continue to provide benefits into the future. These future benefits associated to the remaining asset value are captured in the residual value, also referred to as “Remaining Capital Value,” or RCV. In this analysis the RCV is calculated using a straight line depreciation method.

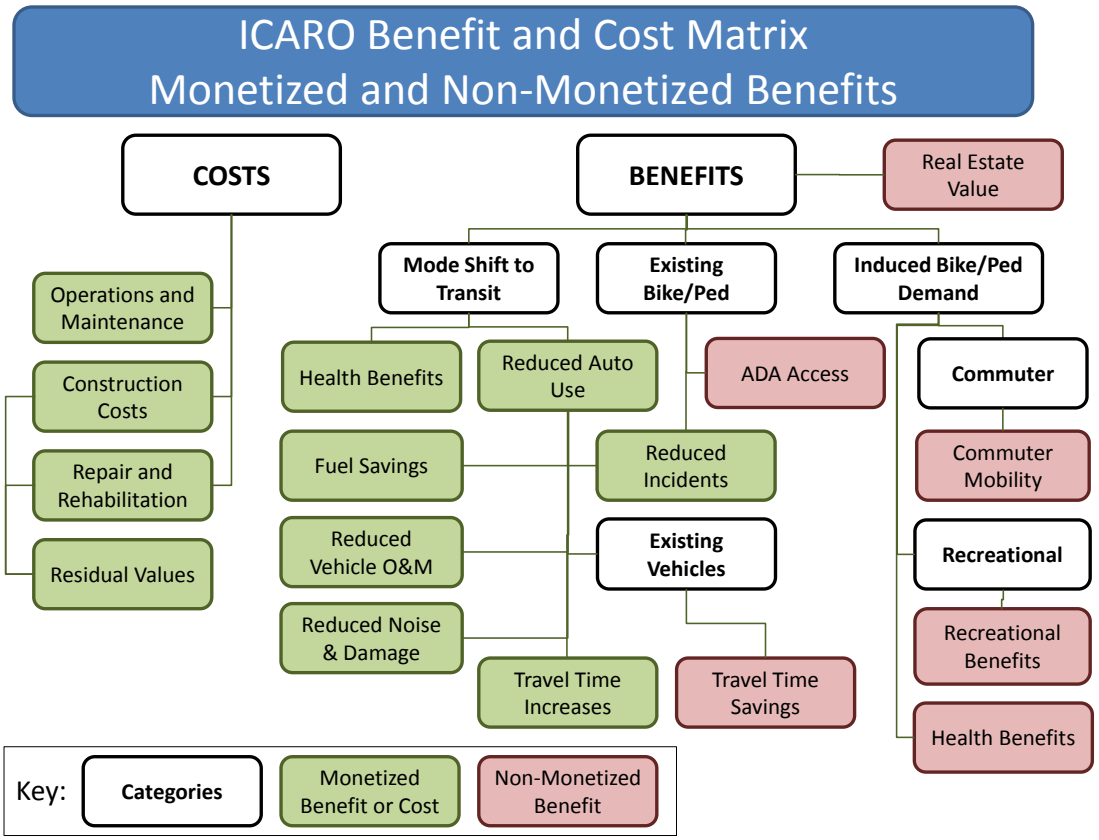
2.5 Project Benefits

The following identifies the benefits that are included and excluded in the BCA as part of the analysis for the ICARO project improvements as shown in Figure 1.

Based on the project configuration, the following variables were monetized for the benefit-cost analysis:

- Capital costs, studies and contingencies for the building of the ICARO project improvements;
- Increases in routine operations and maintenance and periodic repair and replacement costs to account for ongoing upkeep of the project improvements;
- Residual value of the assets based on state of good repair and straight line depreciation of the primary assets;
- Reductions in vehicle operations & maintenance costs, pavement damage, and noise with reduced vehicle miles traveled attributed to mode shift from driving to transit;
- Safety benefits due to a reduction in crash rates with reduced vehicle miles traveled attributed to mode shift from driving to transit;
- Safety benefits for the general communities around the planned improvements;
- Health benefits attributed to people accessing transit stations by walking or cycling and;
- Emissions reductions associated with reduced vehicle miles traveled attributed to mode shift from driving to transit.

Figure 1: Overview of Benefits and Costs



Additional benefits were not monetized in the base case benefit-cost analysis due to uncertainty in accurately developing the required underlying data and as a measure of conservatism. The following variables were not monetized for the base case benefit-cost analysis:

- Real estate value increases associated to the net increase in property values adjacent to the station and roadway improvements;
- Benefits to the existing population associated to ADA improvements that will greatly assist mobility and safety for disabled residents;
- Commuter mobility and health benefits attributed to additional bicycle and pedestrian commuter trips as a result of neighborhood improvements, specifically bicycle infrastructure that provides connectivity to primary regional trails;
- Recreational benefits and health benefits attributed to additional bicycle and pedestrian recreational trips as a result of neighborhood improvements;
- Travel time savings for current and continued vehicle users who benefit from less vehicles being on the road due to a shift of other roadway users to transit.

Section 3 provides further details and assumptions for the benefits included in this analysis.

3 Benefit-Cost Analysis Data and Assumptions

3.1 Demand Projections

In April 2015 Fehr and Peers and Nelson Nygaard completed a comprehensive analysis of potential improvements that could be made to infrastructure in and around stations throughout UTA's transit network to induce new ridership[7]. Entitled the "First/Last Mile Strategies Study" the report developed a toolbox of options that could be considered for each station based on station characteristics, ridership patterns, and engagement with local community stakeholders. In addition, specific station improvements were ranked by ease of implementation, relative costs, and ability to improve safety. Multi-regression analysis was used to assess the correlation between various types of investments and increases in ridership for Frontrunner and TRAX stations, evaluated independently. Once it was determined what strategy would be most effective at each station a comprehensive list of improvements were developed which form the basis of the cost and benefit analysis provided in this document.

The study projected a general increase in ridership of between 3-6 percent if all the recommended improvements were implemented. As not all of the recommendations were included in the final project list additional adjustments were made by station based on the final list of improvements. Table 4 on the following page provides the name of each station, anticipated year that all of the proposed improvements will be complete, 2015 weekday boardings, improvements ranked 1-3 based on the level of investment, and the associated daily increase in boardings based on the applied factors by station as shown in Table 3 below and based on the multi-regression analysis results.

Table 3: Station Improvement Rankings and Corresponding Ridership Increases

Level of Investment	Station Amenities	Walk	Bike
1	1.0%	1.0%	1.0%
2	2.5%	2.5%	2.0%
3	4.0%	5.0%	3.5%
0	0.0%	0.0%	0.0%

Source: Fehr and Peers, 2014, UTA, 2016

The resulting total daily increase in boardings were further disaggregated into users who access the station by walking and bicycling, shown in the last two columns in Table 4 respectively. The average trip length is based on average travel distances from origin and destination data as provided by UTA based on analysis of TAZ level data from 2015.

[7] UTA, *First/Last Mile Strategies Study,* April 2015

Table 4: Increase in Ridership by Station and Mode

Transit Station	Year of Full Completion of Station Improvements	2015 Weekday Boardings	Improvements (ranked 1-3 for level of investment)			Daily Increase in Boardings	Average Trip Length	Increase in Walk/Bike Station Access	
			Station Amenities	Walk	Bike			Walk	Bike
Pleasant View	2017	41	3	2	1	3	4.2	1	0
Ogden	2017	1,290	2	2	3	110	15.0	32	45
Roy	2017	421	2	1	2	23	76.2	4	8
Clearfield	2017	768	2	0	2	35	58.8	-	15
Layton	2017	713	2	3	3	78	58.6	36	25
Farmington	2017	509	2	3	3	56	83.4	25	18
Woods Cross	2020	536	2	2	1	32	95.0	13	5
North Temple	2018	2,122	1	2	2	117	4.4	53	42
Murray	2020	1,692	2	3	3	186	25.8	85	59
Lehi	2017	1,072	2	2	3	91	80.1	27	38
American Fork	2017	720	2	1	2	40	46.6	7	14
Orem Central	2017	1,280	2	1	1	58	59.4	13	13
Provo Central	2017	1,706	2	2	2	119	3.2	43	34
Draper Town Center	2017	719	2	1	3	50	0.5	7	25
Midvale Ft Union	2018	877	2	3	2	83	10.1	44	18
Meadowbrook	2020	1,659	1	3	2	133	12.6	83	33
Murray Central	2017	3,336	2	3	3	367	19.5	167	117
Fashion Place	2020	2,137	0	2	1	75	12.6	53	21
Misc SLC TRAX stations	2017	5,000	2	2	2	350	7.0	125	100
Sandy Civic Center	2017	686	2	0	1	24	14.8	-	7
Sandy Expo Center	2018	316	0	1	2	9	12.1	3	6
Daybreak	2017	1,161	2	2	3	99	0.7	29	41
Central Pointe	2018	4,224	1	2	3	296	11.6	106	148
4800 W. Old Bingham Hwy	2017	588	0	1	2	18	18.3	6	12
Jordan Valley	2021	478	2	2	2	33	24.7	12	10
2700 W. Sugar Factory Rd	2018	345	0	0	1	3	18.5	-	3
West Jordan City Center	2017	559	2	1	2	31	16.8	6	11
West Valley Central	2018	1,556	2	1	2	86	0.7	16	31
Kimball Junction	2018	n/a	n/a	n/a	n/a	20	25.0	10	10
Tooele	2017	300	2	1	1	5	34.0	-	5
					Total Daily	**2,629**		**1,005**	**916**

Source: UTA, 2016, aggregated by station by WSP | Parsons Brinckerhoff, 2016

Daily increases in weekday boardings as shown in Table 4 were annualized and adjusted to derive the primary forecast values that were used in to monetize the applicable benefits. Table 5 provided the primary forecast values based on the following adjustments:

- **Annual Boardings:** Daily boardings, based on peak period ridership increases, are multiplied by an expansion factor of 294 days to account for peak travel and reduced off-peak travel including mid-day periods and weekends to derive annual values. Annual boardings are expected to increase at a rate of 3 percent per year based on historical average system growth. Annual values are calculated by station and aggregated to a total project value based on the last year of improvements at each station.
- **Increase in Personal Hours Traveled:** The increase in annual boardings are multiplied by the weighted average car trip time of 15.5 minutes to derive total current personal vehicle travel times. A factor of 2.012 is applied to account for the increase in time associated to walking or bicycling to the station, wait time at the station based on the midpoint of peak time headways, and in-transit travel time. This is considered a conservative approach as not all new trips are expected to be generated by passengers who walk or bicycle to the station and strong system schedule reliability allows users of TRAX and Frontrunner to reduce their wait time at the station and arrive closer to scheduled departure times.
- **Reduction in Vehicle Miles Traveled:** The increase in annual boardings per station are multiplied by the average trip vehicle trip length based on TAZ origin and destination mid-points to derive the total annual reduction in gross vehicle miles. An additional factor of 0.5 miles per trip is added to account for average distance to the TAZ centroids. Total miles are them divided by an average vehicle occupancy rate of 1.2 based on state and national averages to account for the number of passengers per car.
- **Increase in Annual Walking and Bicycling Miles:** Used to calculate health benefits, increase in people walking and bicycling to transit stations, provided in Table 4, are multiplied by the annual expansion factors and growth rates to forecast the base ridership values by mode.
    - For new riders accessing the transit stations by walking a factor of 0.25 miles per trip was applied as the average distance traveled to and from the origin and destination stations.
    - For new riders accessing the transit stations by bicycling a factor of 1.5 miles per trip was applied as the average distance traveled to and from the origin station. Assumes that the bicycle was left at a station bicycle storage facility. This is a conservative assumptions as there would likely be some walking distance required at the destination station or distance traveled using a bicycle share facility.

Capital costs are forecasted based on anticipated project schedule for each of the improvements by station. Incremental operations and maintenance costs are incurred in the years associated bike lane and bike share facilities are completed. Repair and replacement costs are included starting the first full year of total project completion in 2022 and incurred on an annual basis thereafter.

Table 5: Primary Forecast Values used to Derive Project Benefits

Year	Increase in Annual Boardings	Increase in PHT (dis-benefit)	Reduction in VMT	Increase in Annual Miles	
				Walking	Bicycling
2017	471,492	(123,264)	9,981,828	39,972	239,833
2018	677,146	(177,029)	11,791,201	59,262	367,736
2019	697,462	(182,340)	12,144,989	61,040	378,768
2020	859,350	(224,663)	15,452,579	82,229	448,700
2021	896,377	(234,343)	16,152,303	85,718	467,273
2022	923,269	(241,373)	16,636,876	88,289	481,291
2023	950,969	(248,615)	17,135,985	90,938	495,730
2024	979,499	(256,074)	17,650,065	93,666	510,602
2025	1,008,887	(263,757)	18,179,679	96,476	525,920
2026	1,039,156	(271,670)	18,725,155	99,371	541,698
2027	1,070,333	(279,821)	19,286,984	102,352	557,949
2028	1,102,443	(288,215)	19,865,600	105,422	574,687
2029	1,135,516	(296,862)	20,461,464	108,585	591,928
2030	1,169,579	(305,767)	21,075,212	111,842	609,686
2031	1,204,666	(314,940)	21,707,500	115,198	627,976
2032	1,240,806	(324,388)	22,358,763	118,654	646,815
2033	1,278,032	(334,120)	23,029,589	122,213	666,220
2034	1,316,373	(344,144)	23,720,425	125,880	686,207
2035	1,355,862	(354,468)	24,431,970	129,656	706,793
2036	1,396,536	(365,101)	25,164,868	133,546	727,996
2037	1,438,434	(376,055)	25,919,882	137,552	749,836
2038	1,481,587	(387,336)	26,697,450	141,679	772,331
2039	1,526,036	(398,957)	27,498,469	145,929	795,501
2040	1,571,816	(410,925)	28,323,396	150,307	819,366
2041	1,618,973	(423,254)	29,173,190	154,816	843,947

Source: WSP | Parsons Brinckerhoff, 2016, based on factors provided by UTA

3.2 Quality of Life and Livability

The ICARO project improvements will create quality of life / livability benefits which include health benefits attributed to people who previously drove, and with the improvements in station access, will start cycling or walking to and from their nearest transit station and a reduction in noise pollution attributed to fewer vehicles on the road as drivers switch to transit.

Table 6: Quality of Life / Livability Estimation of Benefits, Millions of 2015 Dollars

Benefit	First Year of Full Operations (2022)		Project Lifecycle (2017-2041)	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Health Benefits	$258,610	$161,049	$7,966,959	$3,062,329
Reduced Noise	$19,510	$12,150	$601,084	$231,236

Table 7: Quality of Life / Livability Assumptions and Sources

Variable	Unit	Value (2017-2041)	Source
Health Benefits	Ped and bike miles	17,535,381	Modeled Data
Reduced Noise	Vehicle Miles Traveled	512,565,421	Modeled Data

3.2.1 Health Benefits

Increases in physical activity are linked to improved health. This improved health, in turn, produces societal benefits in two ways. First, the individual experiences private benefits from an extended life expectancy, reductions in certain diseases such as heart disease and type II diabetes, and the medical expenses the individual will pay. Further, there are external benefits from the improved health of the individual because of reduced costs in subsidized medical care, emergency room visits, and marginal reductions group health insurance rates.

The Victoria Transportation Policy Institute has accordingly monetized these benefits, thus estimating the external health cost savings to society that result from more active lifestyles.[8] Table 6 illustrates the range of values walking and biking health benefits used in the PRISM™ sensitivity analysis, and all values were adjusted to 2015 dollars using a CPI adjustment:[9]

Table 6: Non-motorized Health Benefits, 2015 $

Category	2015 $ per mile Likely
Cycling Health Benefits	$0.20
Walking Health Benefits	$0.50

Source: Victoria Transportation Policy Institute, 2015, WSP | Parsons Brinckerhoff, 2016

3.2.2 Noise Pollution

Reducing VMT, creates environmental benefits to society in the form of noise reduction. On a per-VMT basis, these values were estimated based on a Federal Highway Administration cost allocation study report.[10] As the VMT reductions associated to the ICARO project improvements are assumed to be auto users switching to biking and walking to access local transit stations the benefits of reduce noise is based on the entire length of the auto trip that is avoided.

[8] Victoria Transport Policy institute (2015), *Evaluating Active Transport Benefits and Costs,* p.44, (http://www.vtpi.org/nmt-tdm.pdf)

[9] Bureau of Labor Statistics, Consumer Price Index, All Urban Consumers, US City Average, All Items, Series CUSR0000SA0.

[10] Federal Highway Administration, *Addendum to the 1007 Federal Highway Cost Allocation Study,* Table 13. (http://www.fhwa.dot.gov/policy/hcas/addendum.htm).

An urban and rural split of 94 percent and 6 percent respectively was used to create a weighted average of the FHWA values for those environments. All values were adjusted to 2015 dollars using a CPI adjustment.[11] See Table 7 for the values used in this analysis.

Table 7: Noise Costs Auto, 94-6 Urban-Rural Split, 2015 $

	Noise Costs per VMT Likely
Auto	$0.0012
Truck	$0.0291

Source: FHWA, WSP | Parsons Brinckerhoff, 2016

3.3 Economic Competitiveness

The ICARO project improvements would contribute to increasing the economic competitiveness of the greater Salt Lake City region through improvements in the mobility of people in the study area through providing transportation options. Three types of societal benefits or dis-benefits are measured in the assessment of economic competitiveness: travel time increases due to mode shift from personal vehicles to transit, and vehicle operating savings including reductions in fuel consumption due to fewer vehicle miles traveled by people mode shifting from personal vehicles to transit.

Travel time savings associated to vehicle drivers who do not switch to transit but will benefit from reduced congestion on account of other previous drivers switching to transit have not been monetized and are therefore excluded from this analysis and BCR results. While it would be possible to derive the value associated to reduced congestion through lower throughputs and higher travel speeds, there is also the potential for induced demand by current users who may take more trips or marginal users who are not currently using the roadways due to congestion and perceived travel costs, who may start to take trips. While this would provide a separate economic benefit for new trips, there would also be associated dis-benefits that would likely be equivalent to the benefits that have been monetized as a result of mode shift from driving to transit.

The estimated benefits and dis-benefits associated with travel time savings are summarized in the table below.

Table 8: Economic Competitiveness Estimation of Benefits, Millions of 2015 Dollars

Benefit	First Year of Full Operations (2022)		Project Lifecycle (2017-2041)	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Travel Time Savings	(3,533,905)	(2,200,738)	(121,197,329)	(44,734,462)
Vehicle Operating Costs	5,040,244	3,138,811	155,284,860	59,737,917
Fuel Savings	1,125,599	700,967	42,220,246	15,154,500

[11] Bureau of Labor Statistics, Consumer Price Index, All Urban Consumers, US City Average, All Items, Series CUSR0000SA0.

Table 9: Economic Competitiveness Assumptions and Sources

Variable	Unit	Value (2017-2041)	Source
Travel Time Savings	Personal Hours Traveled	(7,427,478)	Modeled Data
Vehicle Operating Costs	Vehicle Miles Traveled	512,565,421	Modeled Data
Fuel Savings	Vehicle Miles Traveled	512,565,421	Modeled Data

3.3.1 Travel Time Increases

Travel time is considered a cost to users, and its value depends on the disutility that travelers attribute to time spent traveling. An increase in travel time translates into less time available for work, leisure, or other activities. Although studies have shown that switching from driving to transit provides greater opportunities for work and leisure through the positive utility of travel[12], for example people are increasingly able to use handheld devices for both work and personal activities, this benefit was not factored into the analysis.

In the case with ICARO project improvements travel times are projected to increase as the result of additional travel time for auto drivers and passengers who switch from driving to transit. The weighted average time for each individual trip increases as transit in the region tends to travel at slower speeds than vehicles and often does not provide direct door-to-door access. The travel time changes include the difference between in-vehicle travel time for auto drivers with in-transit time as well as travel time to and from the origin and destination stations and wait time at the station for transit users.

Value of Time Assumptions

Travel time savings must be converted from hours to dollars in order for benefits to be aggregated and compared against costs. This is performed by assuming that travel time is valued as a percentage of the average wage rate, with different percentages assigned to different trip purposes. Because the exact division between personal and business travel is not known for trips potentially impacted by this project, the values of time for "all purposes" are used; these represent a weighted average of the personal and business values of time according to national proportions of personal and business as calculated by the U.S. DOT and provided in Table 10.[13] Values that were used in this analysis are consistent with those recommended by U.S. DOT. Additionally, U.S. DOT guidance accepts the use of a real growth rate of 1.2 percent a year for the value of time.[14]

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[12] Lyons, G. and Urry, J. (2005) Travel time use in the information age. Transportation Research Part A Policy and Practice, 39 (2-3). pp. 257-276. (http://eprints.uwe.ac.uk/6065/1/6065.pdf)

[13] Office of the Secretary of Transportation. (2014). *Revised Departmental Guidance: Valuation of Travel Time in Economic Analysis,* p. 11-12. (http://www.dot.gov/sites/dot.gov/files/docs/USDOT%20VOT%20Guidance_0.pdf)

[14] Office of the Secretary of Transportation. (2014). *Revised Departmental Guidance: Valuation of Travel Time in Economic Analysis (Revision 2),* p. 14. (http://www.dot.gov/sites/dot.gov/files/docs/USDOT%20VOT%20Guidance%202014.pdf)

Table 10: Travel Time Savings Assumptions and Sources

Variable	Unit	Value	Source
Surface local travel (except High-Speed Rail)			
Local Travel			
Personal	$/hour	12.92	*TIGER Guide 2016*
Business	$/hour	24.93	*TIGER Guide 2016*
Personal Travel	Percent	95.4	*TIGER Guide 2016*
Business Travel	Percent	4.6	*TIGER Guide 2016*
Weighted Average All Purposes	$/hour	13.47	*calculation*
Average Vehicle Occupancy			
Auto	factor	1.20	*UTA*

Because travel time savings are accrued by individuals and not per vehicle, it is necessary to identify the number of person-hours traveled utilizing vehicle-hours traveled from the travel demand model results. In order to do this, this analysis assumes an average vehicle occupancy (AVO) rates of 1.20 for autos based on UTA guidance consistent with factors used in assessing air quality benefits.

3.3.2 Operating Cost Savings

Vehicles have operating costs beyond fuel costs that will be addressed in the next section. These costs include maintenance and repair, replacement of tires, and the depreciation of the vehicle over time. The per VMT factors of these costs were estimated by the American Automobile Association[15] and the American Transportation Research Institute,[16] and used in this analysis. Since the original studies estimated the likely range for these values in 2013 dollars, the values for this analysis have been updated to 2015 dollars using a CPI adjustment.[17] The VMT based costs are multiplied by the total projected annual reduction in VMT as provided in

Table 11.

[15] AAA Exchange. (2013). *Your Driving Costs*, p.7-8. (http://exchange.aaa.com/wp-content/uploads/2013/04/Your-Driving-Costs-2013.pdf)

[16] American Transportation Research Institute. (2014). *An Analysis of the Operational Costs of Trucking*, p.15. (http://atri-online.org/wp-content/uploads/2014/09/ATRI-Operational-Costs-of-Trucking-2014-FINAL.pdf)

[17] Bureau of Labor Statistics, Consumer Price Index, All Urban Consumers, US City Average, All Items, Series CUSR0000SA0.

Table 11: Non-Fuel Vehicle O&M Costs Automobile

Cost Category	Automobile (2015 $ / VMT) Likely
Maintenance / Repair	0.0506
Tires	0.0102
Depreciation	0.2422
Total	**0.3030**

Source: AAA Exchange, 2013; WSP | Parsons Brinckerhoff, 2016

The VMT reductions associated to the ICARO project improvements are assumed to the result of auto users switching modes to transit and accessing the transit stations by biking and walking. Trip distances are based on average commute distances as calculated from analysis of traffic analysis zone data as provided by UTA.

3.3.3 Fuel Savings

Fuel efficiency values were derived from the U.S. Energy Information Administration (EIA), which provides estimates for fuel efficiency through 2040. The values used to calculate fuel efficiency are provided in Table 12 below and can be found in the full report published by EIA titled "Transportation Sector Key Indicators and Delivered Energy Consumption." The fuel efficiency values were used for the following vehicle class:

- "Light Duty Stock" energy efficiency (mpg) for passenger vehicles.

Table 12: Fuel Efficiency (miles per gallon)

Fuel Type	2016	2020	2030	2040
Automobiles (Light Duty Stock)	23.00	25.00	32.30	37.00

Source: U.S. Energy Information Administration, 2015; WSP | Parsons Brinckerhoff, 2016

The EIA provides estimates for fuel prices through 2040 that were used for the purposes of estimating the reduction in fuel costs associated to the reduction in VMT. Because fuel taxes are considered a pecuniary benefit, or transfer payment, they cannot be accurately included in benefit calculations of a BCA. Thus, the federal and Utah state taxes published by the EIA are subtracted out of the end user fuel prices.

Table 13 provides the range of fuel prices, in real 2015 dollars, and a breakdown of values used for sensitivity analysis, for selected years.

Table 13: Fuel Prices for Select Forecast Years (real 2015 dollars per gallon)

Fuel Type	2016	2020	2030	2040
Motor Gasoline	$1.84	$1.92	$2.24	$2.73

Source: U.S. Energy Information Administration, 2015; WSP | Parsons Brinckerhoff, 2016

To account for change in the cost of motor gasoline beyond the EIA forecast horizon, this analysis applies the CAGR forecasted for likely fuel costs calculated based on values from 2018-2040. This allows the cost of fuel to grow in years after 2040.

3.4 Safety

The ICARO project improvements will result in two distinct safety benefits. The first, and smaller of the two, is the reduction in highway fatalities and incidents associated to the reduction in vehicle miles traveled by auto users who switch to transit. The second, and larger factor, is the reduction in fatalities and incidents that are a direct result of the ICARO project improvements, including sidewalks, bike lanes, signals, and other safety measures.

Table 14: Safety Estimation of Benefits, Millions of 2015 Dollars

Benefit	First Year of Full Operations (2022)		Project Lifecycle (2017-2041)	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Reduced Incidents - Mode Shift	$253,595	$157,926	$7,813,009	$3,005,656
Reduced Incidents - Safety Improvements	$8,129,018	$5,062,344	$250,446,853	$96,346,632

Table 15: Safety Assumptions and Sources

Variable	Unit	Value	Source
Reduced Incidents - Mode Shift	Vehicle Miles Traveled	512,565,421	Modeled Data
Reduced Incidents - Safety Improvements	Fatality and Incident Counts	Various by Category	State of Utah Provided Data

3.4.1 Reduced Incidents – Mode Shift

The analysis assumes a reduction in accident rates for the build scenario due to reductions in vehicle travel due as a result of mode shift to transit. The reduction in vehicle travel was calculated based on the average modeled trip distance between the various TAZs where stations improvements are planned and primary commute destinations along the primary corresponding transit corridors.

Accident rates for this analysis were derived from data extracted from the State of Utah Department of Public Safety 2013 report, which provided average accident rates using information from 2013, it should be noted that this is likely a conservative assumption given recent increases in incident rates in 2015 as indicated in preliminary data. Data was provided based on fatalities, injuries, and property damage only (PDO) rates.

In order to convert these accident rates into the appropriate AIS scale for calculating benefits, national statistics from the National Highway Traffic and Safety Administration were used. [18] By using the

[18] National Highway Traffic Safety Administration (2002), The Economic Impact of Motor Vehicle Crashes, 2000, p. 9, Table 3 "Incidence Summary – 2000 Total Reported and Unreported Injuries."

national statistics, it was possible to derive the distribution of total injuries into their respective AIS categories, as indicated in Table 16 which lists each AIS category as a proportion of all possible injuries

Table 16: U.S. AIS Categories as Proportions of All Non-Fatal Injuries

Injury Type	Proportion
AIS 5	0.18%
AIS 4	0.69%
AIS 3	2.39%
AIS 2	8.28%
AIS 1	88.46%
All Injuries	100%

Source: NHTSA, WSP | Parsons Brinckerhoff, 2016

Table 17 lists the three primary rates as derived from the State data and subsequently converted into AIS standards:

Table 17: Safety Benefits Assumptions and Sources

Variable	Unit	Value	Source
Current Crash Data			
Fatality	incidents	220	*State of Utah Department of Public Safety*[19]
Injury	incidents	16,134	
Property Damage Only	incidents	39,301	
Annual Crash Rate			
No Build - Existing	#/100MVMT	0.81	*State of Utah Department of Public Safety*[20]
Build – Statewide	#/100MVMT	59.7	
Reduction in Crashes	#/100MVMT	145.5	
Change in Rate by Type - 2022			
Fatality	#/year	0.013	*calculation*
Injury	#/year	0.993	*calculation*
Property Damage Only	#/year	2.421	*calculation*

Monetized values for fatalities, and injuries categorized on the AIS scale are reported in the U.S. DOT's guidance for "Treatment of the Economic value of a Statistical Life".[21] Values pertaining to property damage only accidents were reported by the National Highway Traffic and Safety Administration,[22] and

[19] State of Utah Department of Public Health. Utah Crash Summary 2013. Published by the Transportation Data Section, Crash Analysis and Reporting Unit.

[20] ibid

[21] Office of the Secretary of Transportation, *Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses* (2013 update), Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses.

[22] National Highway Traffic Safety Administration (2002*), The Economic Impact of Motor Vehicle Crashes, 2000,* p. 62, Table 3.

have subsequently been updated to 2015 dollars by the U.S. DOT.[23] Table 18 lists the range of values used in the sensitivity analysis for each accident type:

Table 18: Monetized Injury Values

Injury Type	Unit Value (2015 $) Likely
Fatality	$9,600,000
AIS 5	$5,692,800
AIS 4	$2,553,600
AIS 3	$1,008,000
AIS 2	$451,200
AIS 1	$28,800
Property Damage Only	$4,198

Source: U.S. DOT, 2016 update; WSP | Parsons Brinckerhoff, 2016

3.4.2 Reduced Incidents – Safety Improvements

In addition to the reduction in incidents attributed to reduced vehicle miles traveled a significant reduction in incidents is expected as a direct result of the safety improvements included in the ICARO project improvements. Improvements including new sidewalks, bike lanes, signals, and other safety measures are expected to greatly enhance the areas around the stations and benefit both existing and new riders alike.

To derive the anticipated reduction in incidents as a result of the ICARO project improvements historical incident and fatality data was extracted for a 1.5 mile radius around the stations listed for improvements. The data for non-fatal injuries specified AIS crash severity therefor no adjustments were required.

Table 19 lists the six year average injuries by type, including fatalities.

Table 19: Historical Injury Data

	Six Year Annual Average for 1.5 mile Radius of Station Improvements	
Injury Type	**Unadjusted**	**Assuming a 0.5% Reduction**
Fatality	16	0.08
AIS 5	72	0.36
AIS 4	182	0.91
AIS 3	463	2.31
AIS 2	189	0.95
AIS 1	22	0.11

Source: State of Utah Crash Data Extracted Based on GIS Coordinates, 2016

[23] U.S. Department of Transportation (2015), *Tiger Benefit-Cost Analysis (BCA) Resource Guide*, p.3. (http://www.dot.gov/sites/dot.gov/files/docs/Tiger_Benefit-Cost_Analysis_%28BCA%29_Resource_Guide_1.pdf).

It is not expected that the proposed improvements under the ICARO project improvements will eliminate all incidents and fatalities within a 1.5 mile radius of the project areas, rather a very conservative assumption was made that the improvements will only result in a half of a percent reduction. Monetized values for fatalities, and injuries categorized on the AIS, as presented in Table 18, are then applied to the adjusted values to derive the annual safety benefits. Given the high level of historical traffic related injuries and fatalities even with the adjustment the reduction becomes a substantial component to the overall benefits to the project.

3.5 State of Good Repair

The state of good repair benefits assessed in this analysis are the result of reduced VMT which leads to less road and pavement damage. Reduction in VMT are a product of auto drivers and passenger's mode shifting to transit as a result of the ICARO project improvements and improved walking and biking access to transit stations.

As shown in Table 20 there is an overall benefit of $19.5 million in the first full year after the capital improvements have been completed and a benefit of $601 million over the 20 year forecast horizon. The monetized values are based on the anticipated mode shift of riders and reduction in VMT corresponding to their previous travel distances as shown in Table 21.

Table 20: State of Good Repair Estimation of Benefits, Millions of 2015 Dollars

Benefit	First Year of Full Operations (2022)		Project Lifecycle (2017-2041)	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Reduced Road Damage	$19,510.0209	$12,149.8605	$601,084.1115	$231,236.4043

Table 21: State of Good Repair Benefits Assumptions and Sources

Variable	Unit	Value	Source
Reduced Road Damage	Vehicle Miles Traveled	512,565,421	Modeled Data

3.5.1 Road Damage

As with noise pollution, reductions in VMT lead to societal benefits in the form of reduced costs of pavement damage. Fewer vehicle-miles lead to a lower need of maintenance on roads. The per-mile costs of these values were estimated based on the same Federal Highway Administration cost allocation study report that reported estimations of the cost of noise pollution.[24]

The same urban/rural split used in the noise pollution calculations of 94 percent to 6 percent were used to create a weighted average of the FHWA values. All values were adjusted from the FHWA study's

[24] Federal Highway Administration, *Addendum to the 1007 Federal Highway Cost Allocation Study,* Table 13. (http://www.fhwa.dot.gov/policy/hcas/addendum.htm).

2000 values to 2015 dollars using a CPI adjustment.[25] Table 22 provides the value used to calculate the weighted average auto pavement damage cost used to derive the monetized benefit.

Table 22: State of Good Repair Values for Auto, 94-6 Urban-Rural Split, 2015 Dollars

Variable	Unit	Value
Auto Pavement Damage Costs		
Rural / Rural Interstate	$/mile	0.0001
Urban / Urban Interstate	$/mile	0.0012
Rural Travel	Percent	6
Urban Travel	Percent	94
Weighted Average Auto Pavement Damage Cost	$/mile	0.0012

Source: FHWA, WSP | Parsons Brinckerhoff, 2016

3.6 Environmental Sustainability

The ICARO project improvements will create environmental and sustainability benefits relating to reduction in air pollution associated with reduced vehicle use and miles travelled associated to people who mode shift from driving to transit. Five forms of emissions were identified, measured and monetized, including: nitrous oxide, particulate matter, sulfur dioxide, volatile organic compounds, and carbon dioxide.

Table 23 provides the results from the emissions calculations which include an undiscounted reduction of $232,900 in the first full year after completion of the projects and an overall undiscounted benefit of $7.5 million over the benefit forecast horizon. The monetized value of the benefits is based on modeled VMT for the current year build and no build scenarios and the anticipated mode shift of riders and resulting reduction in VMT corresponding to their previous auto travel distances with total VMT savings provided in Table 24 below.

[25] Bureau of Labor Statistics, Consumer Price Index, All Urban Consumers, US City Average, All Items, Series CUSR0000SA0.

Table 23: Environmental Sustainability Estimation of Benefits, Millions of 2015 Dollars

Benefit	First Year of Full Operations (2022)		Project Lifecycle (2017-2041)	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Reduced Emissions	$232,900	$184,478	$7,450,589	$4,575,871

Table 24: Environmental Sustainability Benefits Assumptions and Sources

Variable	Unit	Value	Source
Reduced Emissions	Vehicle Miles Traveled	512,565,421	Modeled Data

3.6.1 Reduced Emissions

Per-mile emissions rates for automobiles were derived from the California Environmental Protection Agency's Air Resources Board EMFAC2011 Emissions Database.[26] This tool provides emissions rates projected out to 2035. After 2035, emissions rates are assumed "flat-line." The flat-line represents both a leveling out of emissions rates, as well as consideration for the uncertainty in estimating rates that far into the future. Per mile emissions factors differ depending on vehicle, fuel efficiency, average speed, and driving conditions. This BCA used emissions factors for automobiles at aggregated model years. It is important to note that a unique set of emissions factors exists at each speed. Thus, the emissions data set consists of emissions factors for each emissions type, by year, and by speed.

In order to monetize the emissions, the values of $PM_{10,}$ NO_x, SO_x, and VOC emissions were derived from a National Highway Traffic and Safety Administration's CAFE standards for MY2017-MY2025.[27] These are consistent with U.S. DOT guidelines. Resulting values are shown in Table 25 below.

Table 25: Non-CO2 Emissions Costs, 2015 dollars per metric ton

Variable	Unit	Value	Source
CO2	$/metric ton	varies*	**See table below*
NOX	$/metric ton	$8,010	*NHTSA, 2012*
PM	$/metric ton	$366,414	*NHTSA, 2012*
SOX	$/metric ton	$47,341	*NHTSA, 2012*
VOC	$/metric ton	$2,032	*NHTSA, 2012*

[26]California Environmental Protection Agency Air Resources Board. (2011). EMFAC2011 Emissions Database. (http://www.arb.ca.gov/emfac/)

[27] National Highway Traffic and Safety Administration (August 2012), *Corporate Average Fuel Economy for MY2017-MY2025 Passenger Cars and Light Trucks*, page 922, Table VIII-16, "Economic Values Used for Benefits Computations (2010 Dollars)", http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE_2012-2016_FRIA_04012010.pdf

The per-ton costs of carbon emissions were derived from the Interagency Working Group on the Social Cost of Carbon[28] as well as the analysis conducted by U.S. DOT in the TIGER Benefit–Cost Analysis Resource Guide.[29] The social cost of carbon was discounted at a 3 percent discount rate, consistent with the U.S. DOT's guidance.

Table 26: Social Cost of Carbon at 3 percent Discounting, 2015 Dollars

Variable	Unit	Value	Source
Social Cost of C02, select years			
Year 2010	$/metric ton	$35	*US EPA, 2013*
Year 2020	$/metric ton	$47	*US EPA, 2013*
Year 2030	$/metric ton	$56	*US EPA, 2013*
Year 2040	$/metric ton	$68	*US EPA, 2013*

[28] U.S. Environmental Protection Agency, Interagency Working Group on Social Cost of Carbon (2013), *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,* p.18., Table A1, (https://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf).

[29] U.S. Department of Transportation (2016), *Tiger Benefit-Cost Analysis (BCA) Resource Guide*, p.7. (https://www.transportation.gov/sites/dot.gov/files/docs/BCA%20Resource%20Guide%202016.pdf)

4 Summary of Results

4.1 Evaluation Measures

The benefit-cost analysis converts potential gains (benefits) and losses (costs) from the Project into monetary units and compares them. The following common benefit-cost evaluation measures are included in this BCA:

- **Net Present Value (NPV)**: NPV compares the net benefits (benefits minus costs) after being discounted to present values using the real discount rate assumption. The NPV provides a perspective on the overall dollar magnitude of cash flows over time in today's dollar terms.
- **Benefit Cost Ratio (BCR):** The evaluation also estimates the benefit-cost ratio; the present value of incremental benefits is divided by the present value of incremental costs to yield the benefit-cost ratio. The BCR expresses the relation of discounted benefits to discounted costs as a measure of the extent to which a project's benefits either exceed or fall short of the costs.

4.2 BCA Results

Table 27 below presents the evaluation results for the project. Results are presented in undiscounted, discounted at 7 percent and discounted at 3 percent (sensitivity) as prescribed by the U.S. DOT. All benefits and costs were estimated in constant 2015 dollars over an evaluation period extending 20 years beyond system completion in 2021.

- At a 7 percent discount rate, the proposed project investments yield a net present value of $70.1 million, and a benefit-cost ratio of 2.04.
- At a 3 percent discount rate, the proposed project investments yield a net present value of $149.6 million, and a benefit-cost ratio of 2.99.

Table 27: Benefit Cost Analysis Results, Millions of 2015 Dollars

BCA Metric	Project Lifecycle		
	Undiscounted	Discounted (7%)	Discounted (3%)
Total Benefits	$350.2	$137.2	$224.9
Total Capital Costs	$87.8	$66.3	$77.6
Total O&M and R&R Costs	$11.5	$4.5	$7.4
Residual Value	$21.1	$3.6	$9.8
Net Present Value (NPV)	$272.0	$70.1	$149.6
Benefit Cost Ratio (BCR)	n/a	2.04	2.99

The benefits over the project lifecycle are presented in Table 28 below by long-term outcome category.

Most significant to the benefits of this project investment are safety benefits resulting from a reduction in injuries and fatalities within a 1.5 mile radius of the project improvements. Reductions in VMT associated factors including vehicle and roadway maintenance, vehicle emissions, gasoline consumption, and additional safety benefits are the primary driver for the other benefits.

Table 28: Benefits by Long-Term Outcome, Millions of 2015 Dollars

Long-Term Outcome	Project Lifecycle		
	Undiscounted	Discounted (7%)	Discounted (3%)
Quality of Life / Livability	$8.6	$3.3	$5.5
Economic Competitiveness	$75.3	$29.8	$48.8
Safety	$258.3	$99.4	$165.5
State of Good Repair	$0.6	$0.2	$0.4
Environmental Sustainability	$7.5	$4.6	$4.7

4.3 Sensitivity Testing

A sensitivity analysis was used to help identify additional benefits associated to new commuter and recreational bicycle trips generated through the ICARO project improvements, specifically providing connectivity to the regional network of bicycle trails which include the Denver-Rio Grande Western Rail Trail, Murdock Canal Trail and Legacy Parkway. This analysis can be used to estimate the additional impact of new bicyclists above and beyond benefits outlined above for people who use the improvements to access transit stations, or existing users who benefit from the improved safety aspects. This allows for the assessment of the strength of the BCA, including whether the results reached using the preferred set of input variables are significantly different by reasonable departures from those values.

In Table 29 below the underlying factors that were used to calculate growth in bicycling are provided along with the data source. The primary drivers behind the induced bicycle demand calculations include population density within a mile of the bicycle facilities, forecasted population growth, and the length of the bicycle facilities. The resulting forecast values are provided in Table 30.

Table 29: Base Factors for Calculating New Bicyclists and Commute Time

Variable	Unit	Value	Source
Population Density in Improvement Area	persons/sq.mi.	3,944	UTA provided MPO data
Annual Population Growth	%	1.4	Statewide Growth Rates
Length of Bicycle Facilities	mile	65.78	Derived from UTA Project List
Percentage of Bicycle Commute Share	%	3.46	American Community Survey data 2012
NCHRP Biking Likelihood Multiplier of Population Living Within 1/4 mile of a Bike Trail	unit	1.93	NCHRP Guidelines for Analysis of Investments in Bicycle Facilities, 2006.
NCHRP Biking Likelihood Multiplier of Population Living Within 1/2 mile of a Bike Trail	unit	1.11	NCHRP Guidelines for Analysis of Investments in Bicycle Facilities, 2006.
NCHRP Biking Likelihood Multiplier of Population Living Within 1 mile of a Bike Trail	unit	0.39	NCHRP Guidelines for Analysis of Investments in Bicycle Facilities, 2006.

Table 30: Forecast for New Bicyclists and Hours of Commute Travel

Year	New Bicyclists			Total Hours of Travel Time for Commute
	Commuters	Recreational	Total	
2021	7,765	18,117	**25,882**	**485,287**
2022	7,873	18,371	**26,244**	**492,081**
2023	7,984	18,628	**26,612**	**498,971**
2024	8,095	18,889	**26,984**	**505,956**
2025	8,209	19,153	**27,362**	**513,040**
2026	8,324	19,422	**27,745**	**520,222**
2027	8,440	19,694	**28,134**	**527,505**
2028	8,558	19,969	**28,527**	**534,890**
2029	8,678	20,249	**28,927**	**542,379**
2030	8,800	20,532	**29,332**	**549,972**
2031	8,923	20,820	**29,742**	**557,672**
2032	9,048	21,111	**30,159**	**565,479**
2033	9,174	21,407	**30,581**	**573,396**
2034	9,303	21,706	**31,009**	**581,423**
2035	9,433	22,010	**31,443**	**589,563**
2036	9,565	22,319	**31,884**	**597,817**
2037	9,699	22,631	**32,330**	**606,187**
2038	9,835	22,948	**32,783**	**614,673**
2039	9,972	23,269	**33,242**	**623,279**
2040	10,112	23,595	**33,707**	**632,004**
2041	10,254	23,925	**34,179**	**640,853**

The sections below outline the methodology used to calculate the additional benefits attributed to new recreational and commuter bicyclists as a direct result of the addition of on-road bike lanes and dedicated bicycle and pedestrian trails. Similar benefits for new pedestrians were not included to avoid double counting the safety aspects that are already monetized in the baseline benefit cost analysis.

4.3.1 Health Benefits

Health benefits apply to new cyclists who would otherwise not be able or willing to use a roadway under existing conditions. These cyclists realize benefits by increased daily physical activity, which has been shown to improve the health of users and reduce future medical costs. The NCHRP Guidelines for Analysis of Investment in Bicycle Facilities[30] identified ten studies which estimated the overall health benefit of increased physical activity. These benefits ranged from $19 to $1,175 per new cyclist per year, with a median value of $128 (all values in 2006 $), with detailed review available in appendix E of that document. These values were adjusted to 2015 dollars with resulting value of $150.34 per cyclist. The NCHRP Guidelines state that this benefit is ascribed per daily new user; since our cyclist volumes represent one-way trips, we divided the volume by two in order to estimate the number of total users. This is slightly conservative since not all bicyclists use the same route for the return trip. The benefit is thus defined:

$$Health\ Benefit = \frac{b_n}{2} \cdot H$$

Where:

b_n *= volume of daily new bicyclists, divided by two to convert to trips*
H *= distribution of value of per-capita health benefit, 2014$*

Health benefits have also been studied for pedestrians. However, our analysis has assumed that since there are a low relative number of pedestrian trips we do not ascribe any health benefit to pedestrians. This is a conservative assumption, as it is likely some pedestrians, in the absence of the ICARO project improvements, would opt not to walk primarily due to safety concerns on the existing facilities or lack thereof.

4.3.2 Commuter Mobility Benefits

Commute users experience a benefit because research has shown that bicyclists and pedestrians prefer using certain facilities over others, with dedicated bicycle infrastructure showing the greatest monetized value of benefit.

The NCHRP Guidelines for Analysis of Investment in Bicycle Facilities reviewed available research and found that bicycle commuters are willing to spend 20.38 extra minutes per trip[31] to travel on an off-street bicycle trail and significantly improved roadway bike lane for reasons including higher level of safety, more pleasant and lower stress experience, and lack of auto impacts such as road spray and

[30] *Ibid*. **Error! Bookmark not defined.**, p. 33.
[31] NCHRP Report 552 (2006). *Guidelines for Analysis of Investments in Bicycle Facilities*, Transportation Research Board, Washington, D.C. (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_552.pdf)

exhaust fumes. These benefits can be directly applied to new commute trip bicyclists according to the following formula (modified from NCHRP Report 552):

$$Commute\ Mobility_{bicylcists} = \frac{20.38}{60} \cdot b_{n,c} \cdot \bar{W} \cdot 5 \cdot VOT$$

Where:

$20.38/60$ = *additional value of off-road bike facility in minutes, converted to hours*
$b_{n,c}$ = *volume of daily new commute bicyclists*
$\bar{W}$ = *weighted average of workweeks per year*
5 = *number of work days per week*
VOT = *distribution of value of time, 2015$ / hr*

NCHRP Report 552 Guidelines assumed 50 commute weeks per year. The value of time applied for this benefit is the same as that previously documented and used for travel time savings; that is, the likely values of time for local travel across all trip purposes.

4.3.3 Recreation Benefits

The NCHRP Guidelines for Analysis of Investment in Bicycle Facilities also identified benefits for recreational users of bicycle facilities. These benefits result from the time spent performing recreational activity, since this represents a revealed preference in how recreational cyclists choose to spend their time. This time is assumed to be one hour per bicyclist including preparation and clean-up time[32]. The value of time for this benefit is assumed to be lower than the value of time used for commuters or the population at large. The NCHRP Guidelines indicate a value of $10 per hour in 2006 dollars, which becomes $11.76 per hour in 2015 dollars. The benefit is computed as follows:

$$Recreation\ Benefit = \frac{b_{n,r}}{2} \cdot 365 \cdot VOT_r$$

Where:

$b_{n,r}$ = *volume of daily new recreational bicyclists, divided by two to convert to trips*
365 = *number of recreation days per year, per NCHRP Report 552*
VOT_r = *distribution of recreational value of time, 2015$ / hr*

This benefit is only computed for bicyclists. While a similar argument may be made for recreational pedestrians, the amount of time pedestrians spend in recreational activity is unknown, so it is not monetized. It should be noted that the demand forecasting process produced trips on an average weekday.

4.3.4 Sensitivity Test Results

Including the additional benefits for induced recreational and commuter bicyclists results in a significant improvement in the overall benefits and benefit-cost analysis. Sensitivity test values are provided in

[32] *Ibid*, p. 39.

Table 31 below and provide a benefit cost ratio of 3.57 and 5.39 for the 7 percent and 3 percent discounted factors respectively.

Table 31: Sensitivity Analysis for Induced Bicycling Demand

BCA Metric	Project Lifecycle		
	Undiscounted	Discounted (7%)	Discounted (3%)
Total Baseline Benefits	$350.2	$137.2	$224.9
Health Benefits New Bicyclists	*$94.2*	*$33.5*	*$58.8*
Commuter Mobility Benefits	*$193.2*	*$66.8*	*$119.0*
Recreational Benefits	*$5.2*	*$1.8*	*$3.2*
Total Capital Costs	$87.8	$66.3	$77.6
Total O&M and R&R Costs	$11.5	$4.5	$7.4
Residual Value	$21.1	$3.6	$9.8
Net Present Value (NPV)	$564.6	$172.2	$330.6
Benefit Cost Ratio (BCR)	n/a	3.57	5.39

Appendix I: Supplementary Data

Table A-1: Annual Travel Time Savings, 2015 Dollars

Year	Travel Time Savings (Increase)		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	(1,700,194)	(1,485,015)	(1,602,595)
2018	(2,471,080)	(2,017,138)	(2,261,389)
2019	(2,575,761)	(1,965,036)	(2,288,531)
2020	(3,211,705)	(2,289,901)	(2,770,445)
2021	(3,390,290)	(2,259,093)	(2,839,314)
2022	(3,533,905)	(2,200,738)	(2,873,388)
2023	(3,683,609)	(2,143,894)	(2,907,875)
2024	(3,839,650)	(2,088,515)	(2,942,772)
2025	(4,002,309)	(2,034,571)	(2,978,094)
2026	(4,171,857)	(1,982,019)	(3,013,838)
2027	(4,348,586)	(1,930,824)	(3,050,011)
2028	(4,532,792)	(1,880,948)	(3,086,611)
2029	(4,724,800)	(1,832,359)	(3,123,650)
2030	(4,924,932)	(1,785,022)	(3,161,127)
2031	(5,133,551)	(1,738,911)	(3,199,059)
2032	(5,351,008)	(1,693,992)	(3,237,448)
2033	(5,577,685)	(1,650,236)	(3,276,302)
2034	(5,813,956)	(1,607,607)	(3,315,618)
2035	(6,060,225)	(1,566,077)	(3,355,400)
2036	(6,316,928)	(1,525,621)	(3,395,660)
2037	(6,584,522)	(1,486,213)	(3,436,412)
2038	(6,863,442)	(1,447,822)	(3,477,649)
2039	(7,154,184)	(1,410,423)	(3,519,384)
2040	(7,457,230)	(1,373,988)	(3,561,614)
2041	(7,773,130)	(1,338,498)	(3,604,359)

Table A-2: Annual Fuel Savings, 2015 Dollars

Year	Fuel Savings		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	619,911	541,454	584,325
2018	732,435	597,885	670,281
2019	756,972	577,491	672,560
2020	977,787	697,149	843,448
2021	1,043,651	695,429	874,042
2022	1,092,894	680,600	888,623
2023	1,147,044	667,590	905,487
2024	1,205,079	655,483	923,593
2025	1,266,041	643,591	942,054
2026	1,331,029	632,362	961,563
2027	1,397,930	620,698	980,480
2028	1,469,594	609,829	1,000,722
2029	1,545,374	599,323	1,021,675
2030	1,625,203	589,048	1,043,156
2031	1,712,252	579,999	1,067,019
2032	1,809,765	572,925	1,094,937
2033	1,912,029	565,700	1,123,115
2034	2,014,011	556,891	1,148,562
2035	2,124,945	549,126	1,176,530
2036	2,240,229	541,045	1,204,234
2037	2,360,338	532,759	1,231,843
2038	2,492,545	525,795	1,262,952
2039	2,639,513	520,371	1,298,466
2040	2,778,804	511,992	1,327,172
2041	2,917,263	502,340	1,352,719

Table A-3: Annual Reductions in Vehicle O&M Costs, 2015 Dollars

Year	Vehicle O&M Cost Reduction		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	3,024,056	2,641,328	2,850,463
2018	3,572,217	2,915,993	3,269,085
2019	3,679,399	2,806,996	3,269,099
2020	4,681,454	3,337,812	4,038,264
2021	4,893,440	3,260,706	4,098,179
2022	5,040,244	3,138,811	4,098,180
2023	5,191,452	3,021,473	4,098,181
2024	5,347,196	2,908,520	4,098,181
2025	5,507,646	2,799,808	4,098,206
2026	5,672,901	2,695,155	4,098,225
2027	5,843,111	2,594,411	4,098,240
2028	6,018,406	2,497,425	4,098,242
2029	6,198,927	2,404,051	4,098,221
2030	6,384,866	2,314,169	4,098,202
2031	6,576,421	2,227,661	4,098,208
2032	6,773,725	2,144,388	4,098,215
2033	6,976,956	2,064,230	4,098,227
2034	7,186,249	1,987,058	4,098,218
2035	7,401,816	1,912,770	4,098,206
2036	7,623,852	1,841,260	4,098,196
2037	7,852,588	1,772,433	4,098,207
2038	8,088,157	1,706,172	4,098,203
2039	8,330,831	1,642,395	4,098,217
2040	8,580,748	1,580,996	4,098,213
2041	8,838,198	1,521,898	4,098,226

Table A-4: Annual Reduction in Emissions, 2015 Dollars

Year	Emissions Reductions		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	145,357	135,702	137,013
2018	173,024	156,230	158,341
2019	175,939	153,708	156,319
2020	221,170	187,004	190,783
2021	228,937	187,301	191,731
2022	232,900	184,478	189,369
2023	241,185	185,092	190,393
2024	250,242	186,043	191,790
2025	254,191	183,046	189,142
2026	258,856	180,582	187,003
2027	270,004	182,533	189,376
2028	275,947	180,809	187,906
2029	277,928	176,433	183,743
2030	291,631	179,549	187,187
2031	304,316	181,881	189,640
2032	313,057	181,537	189,405
2033	322,541	181,510	189,459
2034	342,264	186,992	195,189
2035	353,589	187,552	195,773
2036	366,465	188,558	196,993
2037	391,451	195,431	204,296
2038	406,632	196,961	206,037
2039	428,711	201,610	210,898
2040	445,968	203,503	212,997
2041	478,284	211,827	221,778

Table A-5: Annual Reduction in Fatalities and Injuries, 2015 Dollars

Year	Fatality and Injury Reductions		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	5,029,417	4,392,888	4,740,708
2018	5,941,083	4,849,694	5,436,933
2019	6,119,342	4,668,417	5,436,956
2020	7,785,896	5,551,236	6,716,182
2021	8,138,457	5,422,997	6,815,829
2022	8,382,613	5,220,270	6,815,831
2023	8,634,092	5,025,120	6,815,832
2024	8,893,115	4,837,265	6,815,832
2025	9,159,965	4,656,462	6,815,874
2026	9,434,807	4,482,409	6,815,905
2027	9,717,889	4,314,859	6,815,932
2028	10,009,429	4,153,557	6,815,934
2029	10,309,659	3,998,264	6,815,899
2030	10,618,901	3,848,778	6,815,868
2031	10,937,484	3,704,904	6,815,878
2032	11,265,627	3,566,409	6,815,890
2033	11,603,628	3,433,095	6,815,909
2034	11,951,711	3,304,748	6,815,894
2035	12,310,228	3,181,197	6,815,875
2036	12,679,504	3,062,266	6,815,858
2037	13,059,923	2,947,797	6,815,876
2038	13,451,707	2,837,596	6,815,869
2039	13,855,306	2,731,527	6,815,893
2040	14,270,952	2,629,411	6,815,886
2041	14,699,127	2,531,123	6,815,908

Table A-6: Annual Reduction in Pavement Damage, 2015 Dollars

Year	Pavement Damange Reduction		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	11,706	10,224	11,034
2018	13,828	11,287	12,654
2019	14,242	10,865	12,654
2020	18,121	12,920	15,632
2021	18,942	12,622	15,863
2022	19,510	12,150	15,863
2023	20,095	11,696	15,863
2024	20,698	11,258	15,863
2025	21,319	10,838	15,864
2026	21,959	10,433	15,864
2027	22,618	10,043	15,864
2028	23,296	9,667	15,864
2029	23,995	9,306	15,864
2030	24,715	8,958	15,864
2031	25,456	8,623	15,864
2032	26,220	8,301	15,864
2033	27,007	7,990	15,864
2034	27,817	7,692	15,864
2035	28,651	7,404	15,864
2036	29,511	7,127	15,863
2037	30,396	6,861	15,864
2038	31,308	6,604	15,864
2039	32,247	6,357	15,864
2040	33,215	6,120	15,864
2041	34,211	5,891	15,864

Table A-6: Annual Reduction in Vehicle Noise, 2015 Dollars

Year	Vehicle Noise Reduction		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	11,706	10,224	11,034
2018	13,828	11,287	12,654
2019	14,242	10,865	12,654
2020	18,121	12,920	15,632
2021	18,942	12,622	15,863
2022	19,510	12,150	15,863
2023	20,095	11,696	15,863
2024	20,698	11,258	15,863
2025	21,319	10,838	15,864
2026	21,959	10,433	15,864
2027	22,618	10,043	15,864
2028	23,296	9,667	15,864
2029	23,995	9,306	15,864
2030	24,715	8,958	15,864
2031	25,456	8,623	15,864
2032	26,220	8,301	15,864
2033	27,007	7,990	15,864
2034	27,817	7,692	15,864
2035	28,651	7,404	15,864
2036	29,511	7,127	15,863
2037	30,396	6,861	15,864
2038	31,308	6,604	15,864
2039	32,247	6,357	15,864
2040	33,215	6,120	15,864
2041	34,211	5,891	15,864

Table A-7: Annual Improvements in Health Benefits, 2015 Dollars

Year	Health Benefits Bicycles and Pedestrians		
	Undiscounted	Discounted (7%)	Discounted (3%)
2017	128,063	111,855	120,712
2018	195,952	159,956	179,324
2019	201,831	153,976	179,324
2020	241,081	171,888	207,959
2021	251,078	167,304	210,274
2022	258,610	161,049	210,274
2023	266,369	155,029	210,274
2024	274,360	149,233	210,274
2025	282,590	143,655	210,274
2026	291,068	138,284	210,274
2027	299,800	133,115	210,274
2028	308,794	128,139	210,274
2029	318,058	123,348	210,274
2030	327,600	118,737	210,274
2031	337,428	114,298	210,274
2032	347,550	110,026	210,274
2033	357,977	105,912	210,274
2034	368,716	101,953	210,274
2035	379,778	98,142	210,274
2036	391,171	94,473	210,274
2037	402,906	90,941	210,274
2038	414,993	87,542	210,274
2039	427,443	84,269	210,274
2040	440,267	81,119	210,274
2041	453,475	78,086	210,274

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